Progress and Challenges in Disaster Risk Management in **GUYANA, 2014**

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Progress and Challenges in
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1. Foreword

The global economic losses caused by disasters are increasing in recent years. The Caribbean region is one of the most vulnerable in the world, and Guyana is not an exception. We have seen how destructive disasters can be; disrupting the normal lives of the people, strongly affecting the economy, and even resulting in non-recoverable loss of biodiversity.

Hazards of hydro-meteorological nature and other types pose a tangible risk to the economy, environment and population in Guyana. Furthermore, the effects of climate change might exacerbate the recurrence and intensity of extreme events.

It is the mission of the Civil Defence Commission to reduce loss of life and damage to property, and to improve the quality of life in Guyana by leading, coordinating, and supporting the nation in the development and enhancement of a comprehensive disaster risk management (DRM) system, involving preparedness, mitigation, response and recovery.

In recent years, the Government of Guyana promoted several measures to strengthen the capacities, reduce the vulnerabilities, and improve the resilience of our communities, by developing tools for disaster risk management.

"Progress and Challenges in Disaster Risk Management in Guyana, 2014" has been produced with the support of the United Nations Office of Disaster Risk Reduction (UNISDR) and the European Union humanitarian aid. It is a reference document to guide policy and decision-making, programmes and projects planning, and to orient potential donors. It provides a comprehensive overview of the disaster risk conditions in the country, outlining progress made and gaps, challenges, and priorities for the coming years.

I would like to take this opportunity to thank all the stakeholders and partners in making this publication possible.

Chabilall Ramsarup, MSM

Col. (Retired)

Director General

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3. Acronyms

AIDS, Acquired immunodeficiency syndrome.

ANEOC, Alternative National Emergency Operations Centre.

AOAG, Aircraft Owners Association of Guyana.

BCP, Business Continuity Plan.

CADM 2, Caribbean Disaster Management Project Phase 2.

CAP, Conservancy Adaptation Project.

CAMI, Caribbean Agro-meteorological Initiative.

CARIWIN, Caribbean Water Initiative.

CBDRM, Community Based Disaster Risk Management.

CC, Climate change.

CCCCC, Caribbean Community Climate Change Centre.

CCESD, Climate Change Education for Sustainable Development.

CCRDR, Caribbean Community Resilience to Disaster Risk.

CCRIF, Caribbean Catastrophe Risk Insurance Facility

CDC, Civil Defence Commission.

CDCVC, Civil Defence Commission Volunteer Corps.

CDEMA, Caribbean Disaster Emergency Management Agency.

CDERA, Caribbean Disaster Emergency Response Agency.

CDM, Comprehensive Disaster Management.

CDPMN, Caribbean Drought and Precipitation Monitoring Network.

CIMH, Caribbean Institute for Meteorology and Hydrology.

CJIA, Cheddi Jagan International Airport.

COOP, Continuity of Operations Plan.

DDI, Disaster Deficit Index.

DHBC, Demerara Harbour Bridge Corp.

DIPECHO, Disaster Preparedness Programme of ECHO.

DRM, Disaster Risk Management.

DRR, Disaster Risk Reduction.

ECHO, Humanitarian Aid and Civil Protection Directorate General of the European Commission.

ECLAC, Economic Commission for Latin America and the Caribbean.

EDF, European Development Fund.

EDWC, East Demerara Water Conservancy.

ENSO, El Niño Southern Oscillation.

EU, European Union.

EOC, Emergency Operations Centre.

EPA, Environmental Protection Agency.

FA-HUM, Humanitarian Allied Forces (in Spanish, Fuerzas Aliadas Humanitarias).

FCPF, Forest Carbon Partnership Facility.

GAR, Global Assessment Report.

GBS, Guyana Bureau of Statistics.

GCAA, Guyana Civil Aviation Authority.

GDP, Gross Domestic Product.

GEF, Global Environment Facility.

GFC, Guyana Forestry Commission.

GGB, Guyana Gold Board.

GGMC, Guyana Geology and Mines Commission.

GLASOD, Global assessment of soil degradation.

GL&SC, Guyana Lands and Surveys Commission.

GMRP, Guyana Mangrove Restoration Project.

GRC, Guyana Relief Council.

GRIF, Guyana REDD+ Investment Fund.

GRO, General Registrar Office.

GYD, Guyanese Dollar.

GW, Guyana Wildlife.

HFA, Hyogo Framework for Action.

HfHG, Habitat for Humanity Guyana.

HIV, Human immunodeficiency virus.

HRBA, Human Rights Based Approach.

HVRA, Hazard, Vulnerability and Risk Assessment.

ICT, Information and Communication Technologies.

ILO, International Labour Organization.

ITCZ, Inter-Tropical Convergence Zone.

JICA, Japan International Cooperation Agency.

LAC, Latin America and the Caribbean.

LCDS, Low Carbon Development Strategy.

LDI, Local Disaster Index.

MARAD, Guyana Maritime Administration Department.

MDG, Millennium Development Goals.

MLGRD, Ministry of Local Government and Regional Development.

MNRE, Ministry of Natural Resources and the Environment.

MoA, Ministry of Agriculture.

MoAA, Ministry of Amerindian Affairs.

MOE, Ministry of Education.

MOH, Ministry of Health.

MOHA, Ministry of Home Affairs.

MoPW, Ministry of Public Works.

MSE, micro and small enterprises.

NASA, National Aeronautics and Space Administration.

NCD, National Commission on Disability.

NCERD, National Centre for Educational Resource Development.

NFI, Non-food items.

NIDRMP&IS, National Integrated Disaster Risk Management Plan and Implementation Strategy.

NDRRCP, National Disaster Risk Reduction Coordination Platform.

NCS, National Competitiveness Strategy.

NDRMC, National Disaster Risk Management Commission.

NDC, Neighbourhood Democratic Council.

NDS, National Development Strategy.

NEC, National Emergency Coordinator.

NEOC, National Emergency Operations Centre.

NOAA, National Oceanic and Atmospheric Administration.

NPC, National Parks Commission.

OCA, Organizational Capacity Assessment.

OP, Office of the President.

PA, Priority for Action.

PAC, Protected Areas Commission.

PAHO, Pan American Health Organization.

PASSA, Participatory Approach for Safe Shelter Awareness.

PET, Polyethylene terephthalate.

PPP, Purchase Power Parity.

PRSP, Poverty Reduction Strategy Paper.

PVI, Prevalent Vulnerability Index.

RCC, Rescue Coordination Centre.

RDC, Regional Democratic Council.

REDD, Reducing Emissions from Deforestation and Forest Degradation.

REOC, Regional Emergency Operation Centre.

RMI, Risk Management Index.

SAR, Search and rescue.

SDG, Sustainable Development Goals.

SIDS, Small island developing states.

SGP, Small Grants Programme.

SMC, Search and Rescue Mission Coordinator.

SRTM, Shuttle Radar Topography Mission.

SRDD, Sea and River Defence Division.

STEM, Science, Technology, Engineering and Mathematics.

STI, Sexually Transmitted Infections.

TB, Tuberculosis.

THD, Transport and Harbours Department.

TWC, Tapakuma Water Conservancy.

UN, United Nations.

UNCBD, United Nations Convention on Biological Diversity.

UNCCD, United Nations Convention to Combat Desertification.

UNDAC, United Nations Disaster Assessment and Coordination.

UNDP, United Nations Development Programme.

UNESCO, United Nations Educational, Scientific and Cultural Organization.

UNFPA, United Nations Population Fund.

UNFCCC, United Nations Framework Convention on Climate Change.

UNICEF, United Nations Children's Fund.

UNISDR, United Nations Office for Disaster Risk Reduction.

USAID, United States Agency for International Development.

USD, United States Dollar.

USSOUTHCOM, United States Southern Command.

WASH, Water, Sanitation and Hygiene.

WDWC, West Demerara Water Conservancy.

WSG, Work services group.

WMO, World Meteorological Organization.

4. Glossary

The terminology used in this document is aligned with the definitions captured in the 2009 Terminology on Disaster Risk Reduction[1], published by the United Nations Office for Disaster Risk Reduction (UNISDR). The most relevant concepts are presented below.

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.

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

Climate change: 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 forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use".

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, organizations, 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 analyse 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.

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

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.

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

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.

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.

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.

Preparedness: The knowledge and capacities developed by governments, professional response and recovery organizations, 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.

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

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

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.

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 analysing 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.

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.

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

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

5. Executive Summary

5.1. Introduction

This document has been produced with the financial assistance of the Humanitarian Aid and Civil Protection department of the European Commission (ECHO), in the framework of the 2013-2014 DIPECHO Caribbean Action Plan, under the regional project *Strengthened Disaster Risk Reduction in the Caribbean through greater fostering of the Hyogo Framework for Action priorities for action at the local, national and regional levels* implemented by the United Nations Office for Disaster Risk Reduction (UNISDR).

The key objective of the document "Progress and challenges in Disaster Risk Management in Guyana, 2014" is to provide a holistic vision of Disaster Risk Reduction (DRR) at the national level. It is expected that this document will be useful as an national reference document to guide the design of policies and strategies, and to promote informed decision making, and the formulation of DRR actions and activities. As a working document, it should be updated to include continuous improvements and innovations.

5.2. International and regional framework for DRR

The 2005-2015 **Hyogo Framework for Action (HFA)** is the global reference framework for DRR outlining five priorities for action and offering guiding principles and practical means for achieving resilience of nations and communities to disasters.

At the regional level the **Comprehensive Disaster Management (CDM) Framework** 2014-2024 of the Caribbean Disaster Emergency Management Agency (CDEMA) outlines four high level priority outcomes. The priorities of these two instruments are different but show strong interlinks.

As assessed by the HFA Monitor in 2014, the higher levels of progress achieved in Guyana are related to institutional commitment and arrangements, to building a culture of safety and resilience and to the preparedness and response capacities. On the other hand, the lower levels of progress are related to risk assessment and monitoring, early warning and the reduction of underlying risk factors.

In this section, links between disaster risk, sustainable development, climate change and environmental governance are highlighted.

5.3. National Context

This section provides summary information about the physical and socio-economic aspects of the country, focusing on the conditions that exacerbate risk.

Guyana has four **natural regions**. The densely populated coastal plain where most of the large-scale agricultural land is located; the hilly sands and clays in the north east; the forested highlands; and the interior savannas.

The Guyana Shield is known for its rich **biodiversity**, the presence of endangered species, its high forest coverage and low deforestation levels. Threats to biodiversity are associated with agriculture, extractive industries, forestry and other human activities.

The **weather** is highly influenced by the El Niño Southern Oscillation (ENSO). During El Niño episodes drier and warmer conditions are found, and the likelihood of experiencing droughts and malaria epidemics increases. On the other hand, during La Niña episodes conditions are wetter and colder and heavy rainfall is experienced. During the last several decades, the number of El Niño episodes has increased, and the number of La Niña episodes has decreased.

Changes in the rainfall pattern due to climate change are expected to lead to more intense periods of rainfall and longer dry periods. Sea level rise trends for Guyana are in excess of 10 mm per year, while the global average is 2-4 mm per year.

Surface **water resources** are abundant across the country, with brackish to saline water on the coast. Two main aquifers provide drinking water on the coastal plain. Salt-water intrusion has already been observed, but dynamics between water systems, hydrology and the climate remain under-analyzed. In the hinterlands, a combination of groundwater and surface water extraction with domestic rainfall harvesting is used. Sources of pollution include industrial effluents, sewerage, fertilizers and pesticides, solid waste, mining, and pollution carried by floods.

Water conservancies have two functions: to provide flood regulation and to facilitate irrigation. Unseasonal rainfall can cause breaches and over topping. During periods of drought low water levels can produce tension cracks that can develop into major breaches. Changes in population, agricultural demand, land use and sea level rise have stressed the irrigation and drainage canals system. Consequently, continuous maintenance, rehabilitation and upgrading is undertaken. The infrastructure is being upgraded to improve drainage capacity from 1.5 inches to 2.5 inches of rainfall in a 24 hour period.

Significant progress has been made over the past twenty years in achieving access to improved **drinking water sources**, but the quality is hindered by deterioration of distribution networks. The sewerage system covers a small proportion of the population, and the rest relies on individual solutions. Improved **sanitation** coverage was 88% in urban areas, and 82% in rural areas in 2012. Not all solid waste is correctly collected and disposed. New sanitary landfills are being constructed to enhance those services.

Mangroves provide protection against coastal erosion, but sea level rise, reduced run-off and wave energy flow into the land can increase the degree of salinity, posing a threat to mangrove eco-systems. This is aggravated by the historical clearance and damage caused by human activities. To revert the situation, a project to protect and restore the mangroves is ongoing.

The **sea defence system** is also composed of hard structures, with an estimated minimum direct economic benefit of between USD 161 M and USD 724 M annually. The dynamics of the sediments in the ocean affect concentration of wave energy and erosion of the sea walls. The Ministry of Public Works undertakes annual condition surveys and rehabilitation works.

With regard to **demographics**, the total population of Guyana has slightly decreased in the last ten years, but the number of households has increased by 40% since 1980. The majority of the population live in the coastal areas (Regions 1 to 6), and the age structure has high proportions of young and older people linked to long periods of out-migration by a significant number of working-age individuals. In terms of ethnic diversity, the population is comprised of 43% of East Indians, 30% African/Black, 17% Mixed, 9% Amerindian (nine peoples: Wai Wais, Macushis, Patamonas, Arawaks/Lokonas, Caribs, Wapishanas, Arekunas, Akawaios and Warraus), and less than 1% Portuguese, Chinese, White and other. Amerindians are the main ethnic group in Regions 1, 7, 8, and 9, and Africans/Blacks form the majority in Regions 4 and 10.

The tradition of constructing houses on stilts to avoid flooding is changing. Converting the ground floor and raising and concreting yards decreases percolation into soils and increases physical exposure to floods. More than half of the houses are made of wood, making them prone to fire.

In recent years, reported larceny and rape offences have increased significantly.

Typical causes of death in children under 5 years of age are prematurity, birth asphyxia, malaria, congenital anomalies, injuries, neonatal sepsis, acute respiratory infections, diarrhoea, and HIV/AIDS. Typical causes of death for the general population include violence, heart disease, cerebrovascular disease, diabetes, accidents, HIV/AIDS, hypertensive diseases, cirrhosis/liver disease and pneumonia/influenza.

Regarding **health**, Guyana has attained universal access to HIV/AIDS medication and the number of malaria infections and mortality have been reduced, but hypertensive and heart diseases related deaths and tuberculosis rates have increased. Fliariasis is endemic on the coast, and since 2014 chikungunya virus is present. The incidence of accidents as a cause of death is significantly higher among men than among women.

The national **economy** has experienced sustained growth over the last decade, with a significant reduction of external debt. Rice production has almost doubled in the period 2002-2013, but the sugar production has decreased by 50% over the same period. Bauxite extraction has been steady in the past years, whereas gold production has almost doubled since 2005. Mining products comprise 50% of the total exports value of the country, 92% of it due to gold exports. Traditional challenges to economic development are related to shortage of highly skilled labour, high transportation and energy costs and limited infrastructure and energy production. Twenty two percent (22%) of the male working-age population is not engaged in any type of income generating activity. For females this figure reaches sixty six percent (66%). Disparities in employment also exist between the rural and urban areas. In 2009, 20% of the population was vulnerable to or living with multiple deprivations.

Poverty levels are higher in the rural interior regions, where Amerindians are concentrated, and lower in the urban areas. Young people have higher poverty rates. The main occupations for the lowest quintile are agriculture and domestic service in the case of women, and skilled manual labour and agriculture in the case of men.

Regarding **vulnerable groups**, the country has made significant progress towards ensuring children and women's rights and has prioritized enhancement of equity by fostering achievement of goals in the hinterland and rural areas. Quality of primary education, disparities in secondary education coverage, child abuse, gender-based violence and sexual abuse, human trafficking, and gender inequality remain areas of concern and priority. The Guyanese society faces challenges in ensuring access to education, employment, health services and recreation to persons living with disabilities, but is progressively addressing these challenges.

5.4. Legal, normative and institutional framework

The **Declaration of Turkeyen** highlights Guyana's commitment to addressing vulnerability. The priorities for development are outlined under the National Development Strategy (NDS), the National Competitiveness Strategy (NCS), the Poverty Reduction Strategy Paper (PRSP), and the Low Carbon Development Strategy (LCDS).

The **NDS** and **NCS** were aimed at attaining equitable economic growth, alleviating poverty, and diversifying the economy. The PRSP also focuses on investing in human capital, enhancing social safety, and supporting the improvement and development of infrastructure, and includes a low-carbon development approach in economic growth, mainstreaming disaster risk management and environmental sustainability as cross-cutting issues.

The **LCDS** is an innovative approach to forge a low-carbon economy. It is based on the commitment to protect Guyana's forests from unsustainable uses by setting up an innovative REDD+ mechanism of international payments for ecological services, and on the use of these payments to re-orient the economy towards a low carbon, environmentally-sound trajectory. The LCDS also emphasizes the link between climate change and flooding, urging for adaptation measures with a focus on flood management.

The draft **Disaster Risk Management (DRM) Policy** establishes the guiding principles and architecture for disaster risk management in Guyana, by presenting the institutional structures, roles, responsibilities, authorities and key processes required to achieve a coordinated, coherent and consistent approach to DRM.

The DRM Bill establishes a Natural Resources and Environment Cabinet Sub-Committee, with the role of advising Cabinet on issues affecting DRM. It reconstitutes the Civil Defence Commission (CDC) as the National DRM Commission, to move from a reactive to a proactive approach. It also mainstreams DRM and Climate Change Adaptation (CCA) into development planning, enacts the National DRM Platform, establishes coordination mechanisms, roles and responsibilities, provides for a disaster emergency management system and a multi-hazard alert system, and establishes a National DRM Fund to assist DRM activities.

The draft **National Integrated Disaster Risk Management Plan and Implementation Strategy** outlines strategic actions to tackle floods and droughts encompassing the following elements of DRMS: Risk Identification, Prevention and Mitigation, Financial Risk Management, Preparedness and Response and Recovery. The Strategy includes draft project outlines to implement those actions, as well as a ten-year implementation plan, a proposed structure for DRM in Guyana, an overview of technical and financial resources necessary, and a Monitoring & Evaluation (M&E) framework.

The draft **Multi-hazard Preparedness and Response Plan** focuses on establishing the roles and responsibilities of the different actors for preparedness and response and the mechanisms for early warning, and provides guidelines and procedures for emergency and disaster management.

The draft **Early Warning System (EWS) Framework** sets the overarching principles of the system, clarifies the structure and mechanisms, establishes decision making, communication, and dissemination procedures and protocols, and provides guidance for implementation.

The draft **Shelter Management Policy and Standards** provides a framework for the establishment of a national shelter management body, the actions to be undertaken, and a description of the coordination levels for activation and closure of shelters. It also provides orientation for the various aspects of shelter management.

According to the **Search and Rescue (SAR) Plan**, the responsibility for maritime and aeronautical SAR policy rests with the Ministry of Public Works (MoPW). The coordination of land-based and inland water SAR rests with the Guyana Police Force.

The **National DRM Platform** is chaired by the CDC and is the main national mechanism for coordination and policy guidance regarding DRM. After passing the DRM Bill it will be enacted and the terms of reference will be reviewed.

In the case of an emergency or disaster the **National Emergency Operations Centre** (NEOC) is activated. An alternative NEOC is has been constructed in 2014.

5.5. Risk conditions

The data collected on **historical emergencies and disasters** in Guyana is periodically uploaded to the Desinventar database. Historical data on disasters show an increase in the number of reported flood and gale emergencies after the major flood in 2005. Most of these events are related to high precipitation and river overflow. Sea defences and conservancies breaches are less common but one single event can have a higher impact due to high exposure.

Reported **floods** occur predominantly during the rainy seasons, both in the interior and on the coast. While reported droughts show a strong correlation with El Niño conditions, the influence of La Niña conditions on the number of floods is not clear.

In January 2005, heavy rainfalls exceeding the 100-year event in Regions 3, 4, and 5, coupled with blockage of drainage in the conservancies and malfunctioning of pumps, caused over topping of the East Demerara Water Conservancy that exceeded the capacity of the drainage system, causing devastating floods affecting 274,774 persons, and causing an economic damage and loss of USD 465 M. In December 2005-January 2006 severe flooding occurred again, with a damage and loss of USD 30 M.

Droughts like those experienced in 1998 and 2009-2010 have caused water rationing and extensive crops and livestock losses.

Fires most predominantly affect the coastal fringe. In the savannahs fire is used as an agricultural technique (slash-and-burn). Fires in the hilly sand and clay region are less frequent, and in the forested areas are almost non existent, except for the area of the Pakaraima Mountains.

Regarding **chemical** events, in 1995 waste from Omai Gold Mine in Region 8 overflowed from the retention dam, causing a release of four million cubic metres of cyanide-bearing tailings into the Omai River (a tributary of the Essequibo), reaching concentrations of 28 milligrams per litre in the river. Concentrations above 2 milligrams per litre are fatal.

Past **epidemics** episodes have included whooping cough (pertussis) and waterborne diseases such as leptospirosis, diarrhoea and gastroenteritis.

Civil unrest has taken place in the past. In 2012, demonstrations against the rise of electricity costs in Linden lead to several buildings being intentionally burned down, three persons being shot dead and several persons being wounded.

With regard to **analysis of hazards**, extensive work has been undertaken in the mapping and analysis of floods with various geographic scopes and scales and different methodological approaches: based on past events, based on digital elevation models, in some cases using land use and run-off coefficients, and based on mathematical modelling and simulations. **Drought** maps have been developed for the northern regions.

The main **biological** hazards affecting humans are related to vector and waterborne diseases, exacerbated by poor environmental hygiene conditions, water and sanitation and waste management practices. Other biological hazards are plagues in crops (eg. acoushi ants) and epidemics in livestock (eg. rabies, botulism, etc.).

The main **chemical** hazards affecting the country are the by-products of the mining industry, the chemicals used in agriculture and inappropriate waste disposal and management.

Fires affect both the urban and rural areas of the country. To date, information on this hazard has not been extensively systematized and analyzed.

An agreed national methodology to conduct **vulnerability analysis** does not exist, but several sources of information can be used to compile a comprehensive assessment system, such as: the hazard, vulnerability and risk assessments conducted in the Community Based Disaster Risk Management initiatives, the outputs of the Participatory Approach to Safe Shelters initiatives, the monitoring, reporting and verification system of the Low Carbon Development Strategy (LCDS), the various maps developed by the Guyana Lands and Surveys Commission, censuses, the infrastructure assessments conducted by the Ministry of Public Works, the Guyana Flood Risk Modelling Report, the communications to the United Nations Framework Convention on Climate Change (UNFCCC), the vulnerability assessments to sea level risk undertaken by the Caribbean Community Climate Change Centre (CCCCC), the vulnerability and flood risk assessments prepared by the Economic Commission for Latin America and the Caribbean (ECLAC), and the future databases of the Ministry of Agriculture, among others.

Challenges to be overcome in conducting hazard and vulnerability analysis are mainly related to the quality of data, and in particular: to the lack of systematic data collection, to low levels of disaggregation of data, and to the time lapse between the collection and release of data. Additionally, some valuable information is not geo-referenced, thus limiting its applicability.

In upcoming vulnerability assessments, the social, physical, environmental, economic and political factors of vulnerability should be considered, as well as the effects of climate change.

The **indicators for disaster risk** developed by the Inter-American Development Bank (IDB) were applied in 2012 (using data from 2010). According to those results, if in 2005 the maximum considered event for a 50-year return period would have caused an economic loss higher than available resources (even taking as much debt as possible), then economic resilience improved, and in 2010 the resources available would have been enough to cope with such an event, even though it would have affected the financial sustainability of the country's budget. In terms of the geographical incidence and uniformity of the distribution of local disasters, the majority of the regions suffer small disasters and their effects are almost similar in all affected regions. However, the methodology has to be refined in upcoming assessments to ensure that extreme events are excluded from the analysis.

The Indexes used by the IDB to assess vulnerability consider exposure and susceptibility, socio-economic fragility and lack of resilience. According to these Indexes, in the period 1995-2000 the vulnerability

was reduced, but it rose in the period 2000-2007. The main contributions to this increase in vulnerability are caused by factors related to lack of resilience. It makes evident that development per se does not necessarily reduce vulnerability, and that specific measures for Disaster Risk Reduction are needed.

The foreseen effects of **climate change** include sea level rise, with a strong impact on the mangrove ecosystems, and increase of extreme weather events such as intensified rainfall, as well as more consecutive dry days. Important measures for climate change adaptation and mitigation put in place in Guyana are related to shifting the economy towards low carbon growth and improving the use of renewable energy, development and improvement of defence infrastructures, tackling deforestation, desertification, soil degradation and land use planning, and diversifying crops.

The negative consequences of an event are inversely related to the capacities of persons, communities and institutional systems to cope with emergencies.

The Risk Management Index, calculated in 2012, shows a notable progress for every indicator in the period 1990-2010. In particular, those indicators related to **preparedness and effectiveness of disaster management** reached "significant" progress by 2010. Areas that needed improvement were housing and relocation of human settlements away from disaster-prone areas, and the reinforcement and retrofitting of public and private assets. The indicators related to Governance and financial protection reached an "incipient" stage by 2010 according to the assessment.

The Hyogo Framework for Action Monitor tool, as of 2014, outlined several challenges in terms of **capacities** in the country: limited financial resources and high dependence on external aid for DRR, high staff turnover in multiple institutions, limited enactment of DRM aspects, limited authority and resources at the sub-national level to incorporate DRR into planning, transportation and communication constraints, underestimation of risk due to cultural factors, and limited resources to extract valuable information to guide action from data generated.

There are a number of **institutions and organizations** that play a key role in tackling or contributing to DRM in the country. For the list below a description of roles and capacities is provided in section 9.4.1:

- The Civil Defence Commission.

- The Office of Climate Change.

- The Ministry of Natural Resources and the Environment, the Environmental Protection Agency, the Guyana Lands and Surveys Commission, the Guyana Geology and Mines Commission, and the Protected Areas Commission.

- The Ministry of Agriculture, the Hydro-meteorological Service and the National Irrigation and Drainage Authority.

- The Ministry of Public Works, the Work Services Group and the Civil Aviation Authority.

- The Ministry of Health and the National Commission on Disability.

- The Ministry of Home Affairs, and the Guyana Police Force.

- The Ministry of Local Government and Regional Development.

- The Ministry of Amerindian Affairs.

- The Guyana Defence Force.

- The Guyana Red Cross Society, the Guyana Relief Council and Habitat for Humanity Guyana.

The current organizational structure will be modified by the future DRM Act. Among other provisions, it will establish a Cabinet sub-committee as the policy-making mechanism for DRM, reconstitute the Civil Defence Commission as the National DRM Commission, enact the National DRM Platform, and establish a DRM Fund, among other provisions.

Over the past five years a number of **programmes and projects** on DRM have been undertaken in Guyana. A description of the content and main outputs is provided for the following initiatives in section 9.4.2:

1. Strengthening National and Local Capacities for Disaster Response and Risk Reduction., funded by the United Nations Development Programme (UNDP).

2. Design and Implementation of an Integrated Disaster Risk Management Plan, funded by the Inter-American Development Bank (IDB).

3. Caribbean Disaster Management Project, Phase 2, funded by the Japanese International Cooperation Agency (JICA).

4. Conservancy Adaptation Project, funded by the Global Environment Facility (GEF).

5. Mangrove Restoration Project, funded by the European Union (EU).

6. Construction of the Hope Canal and Rehabilitation of Cunha Canal, in the East Demerara Water Conservancy.

7. Georgetown Solid Waste Management Program, funded by IDB.

8. Small Grants Programme, funded by the GEF and implemented by the UNDP.

9. Climate Change Education for Sustainable Development, with support from the United Nations Educational, Scientific and Cultural Organization (UNESCO).

10. Caribbean Health Services Resilient to Impact of Emergencies and Disasters, funded by DIPECHO and implemented by the Pan American Health Organization (PAHO/WHO).

The most relevant **tools for DRM** developed in Guyana over the past years include:

1. The Guidelines for Incorporating Disaster Risk Management in Environmental Management and in Agriculture.

2. Flood risk modelling report developed under the project "Design and Implementation of an Integrated Disaster Risk Management Plan".

3. Community Based Disaster Risk Management Manual, developed under the project "Design and Implementation of an Integrated Disaster Risk Management Plan".

4. Databases and maps developed under the Caribbean Risk Management Initiative (CRMI), aimed at replicating some of the components of Cuba's Risk Reduction Management Centre (RRMC) model in four communities in Region 9 Upper Takutu - Upper Essequibo.

5. Public Education Campaign on DRM materials, with the tag line "Guyana our country, our responsibility".

Underlying risk factors are addressed with different strategies and mechanisms in Guyana:

1. DRM, the Environment and climate change adaptation. Environmental protection and low carbon development are at the core of development strategies in the country. Areas of improvement are the adoption of fully operational Integrated Water Resources Management and Integrated Coastal Zone Management approaches, and the enhancement of environmental monitoring and enforcement capacities.

2. DRM and Social Development. The Government of Guyana is committed to improving social development and reducing social vulnerability and inequity. Reduction of social inequalities, elimination of gender-based violence and discrimination, and enhanced fulfillment of the rights of disabled people are some of the main social challenges being addressed.

3. DRM and the Economy. Several initiatives are aimed at having a less vulnerable and more resilient economy, for instance through crops diversification and amelioration of defence, drainage and irrigation systems. Economic growth, access to the labour market and diversification of the economy are priorities for the country, as well as investing in enhanced health and education, which are believed to be catalysers of growth.

4. DRM and Land Planning. The Ministry of Housing and Water is committed to make affordable housing available for the Guyanese, including low-income families. Building codes include some considerations to DRM, but need stronger enforcement. A National Land Use Plan has been approved, but need to be operationalized at the sub-national level.

5. DRM and Development. In past years, DRM considerations have been included de facto in development planning, especially in major infrastructure projects. The future DRM Act will reinforce integration of DRM across all sectors.

5.6. Disaster Risk Analysis

A variety of methodologies exist to define indicators for conducting a **National Risk Analysis**. In recent years several methodologies have been applied, including the IDB Disaster Risk and Disaster Risk Management Indexes, and the HFA Monitor indicators. Additionally, strategic planning processes regarding DRM have been undertaken at the country level and CDC level. The National DRM Platform meetings also generate recommendations and insight on the priorities under each institution and at the country level.

The **findings** of those analysis were reviewed and discussed among the CDC and relevant stakeholders in a National Workshop held in September 2014. The outcomes of the discussion were a prioritization of scenarios to be developed in the short term, an updated summary of progress and challenges and a list of priorities for the period 2015-2016.

Prioritization of scenarios
1. Low onset flooding in coastal area, due to rainfall.
2. Rapid onset flooding in coastal area, due to severe dam breach.
3. Fire in urban area affecting houses, businesses and building of key agencies and institutions.
4. Delinquency related to child and juvenile gangs.

Table 1: Brief description of scenarios to be developed, which were identified in the National Workshop.

Summary of progress
1. DRM legislation and normative framework is in advanced stage. 2. High percentage of the national budget allocated to DRM and lessening underlying risk factors. 3. National DRM Platform functioning. 4. Hazards and risk analysis conducted. Risk assessments in major development projects. 5. Early Warning System for floods functioning, and overarching framework for Early Warning developed. 6. Relevant areas to DRM included in all levels of education curricula. Public education campaign on DRR. 7. Volunteerism included in DRM. 8. Civil Defence Commission and CDC Volunteer Corps receive frequent training. 9. Strong environmental protection and sustainable development framework, with Climate Change Adaptation and Mitigation approach. 10. Ongoing programmes to improve health, education, food security, and alternatives for sustainable livelihoods. 11. Infrastructural vulnerability substantially reduced. 12. National Land Use Plan. 13. Sectoral approach to DRM started. 14. Preparedness and response plans developed, national and subnational. Sectoral response plans ongoing. 15. Shelter standards and operation procedures developed. 16. CBDRM initiatives started. 17. Disability Act.

Table 2: Summary of progress highlighted at the National Workshop.

Summary of challenges
1. Enactment of new DRM legislation pending. 2. Limited sectoral capacities to incorporate DRM. Capacities to move from reactive to proactive approach. 3. Outreach to the local level. 4. Limited risk transfer mechanisms, and early recovery planning. 5. Sustainability of DRM initiatives. Dependency on external aid. 6. Limited integration of the different Early Warning Systems. System is not comprehensive. 7. National DRM Platform functions, roles and responsibilities need to be updated. 8. Hazard, vulnerability and risk analysis methodologies and procedures need harmonization and operationalization. 9. Limited communication outreach across the country. 10. Limited environmental monitoring and enforcement. 11. Gender inequality and gender based violence. 12. Limited Land Use Planning. Limited enforcement of building codes. 13. Limited Business Continuity Plans (private sector) and Continuity Of Operations Plans (public sector) in place. 14. Financial constraints to replicate Community Based Disaster Risk Management initiatives and to strengthen the Civil Defence Commission Volunteer Corps nationally.

Table 3: Summary of challenges highlighted at the National Workshop.

Summary of priorities for 2015-2016
1. Enact new legislative and normative framework. 2. Revise National DRM Platform Terms of Reference. 3. Reconstitute and strengthen the Civil Defence Commission. Capacity building in ICT and Communications. 4. Strengthen sectoral capacities to incorporate DRM into planning, in the public and private sector. 5. Standardized data management, and hazard, vulnerability and risk analysis and mapping with attention to exposure. Replicate for all sub-national regions. 6. Expand hydro-meteorological monitoring network. Strengthen EWS, including floods, droughts and fires. 7. Consider trans-boundary risks. 8. Continue undertaking Public Education Campaigns on DRM. 9. Replicate CBDRM initiatives. Support CCA&M initiatives at the local and community level. 10. Mainstream gender and disability. Further include vulnerable groups in DRM. 11. Access/implement risk transfer mechanisms. 12. Operationalize Multi-Hazard Preparedness and Response Plan, and Land Use Plan. 13. Strengthen regional (sub-national) Emergency Operations Centres and CDC Volunteers Corps. 14. Replicate shelters surveys at sub-national level. Upgrading of shelters.

Table 4: Summary of priorities for 2015-2016 identified at the National Workshop.

5.7 Conclusions and recommendations

A list of **conclusions and recommendations** is provided below:

1. Disaster Risk Management (DRM) is cross-sectoral and needs commitment and allocation of resources.

2. Guyana is aware of the importance of DRM to avoid disruption caused by disasters.

3. The development strategy provides a privileged framework to address sustainable development, DRR and climate change adaptation and mitigation.

4. The new legal and normative framework for DRM needs urgent enactment.

5. The National DRM Platform should be more action-oriented.

6. International aid is key for financial sustainability.

7. Training and capacity building will be needed under the new framework.

8. Hazard, vulnerability and risk analysis should be more coordinated, harmonized and better disseminated.

9. Non-traditional hazards should be integrated into the system, and in particular into Early Warning Systems.

10. Further inclusion of a Human Rights Based Approach, Gender Perspectives and Vulnerable Persons is needed in DRM.

11. This document can be used to guide action planning.

5.8 Methodology

The **methodology** used for the development of this document included:

1. Research and desk study on relevant documents, databases, and background information related to DRR in Guyana.

2. Structured interviews in one-on-one meetings with institutions and actors involved in Disaster Risk Management. When appropriate, the interviews addressed guiding questions from the Criteria in the identification of Key Actions for Disaster Risk Reduction Planning in Latin America and the Caribbean (UNISDR, 2014), the Common Format for the Preparation of Country Documents (UNISDR, 2012), and the Hyogo Framework for Action (HFA) indicators related to the HFA Priorities for Action.

3. Review of draft versions and validation. Comments and inputs were gathered through a combination of workshops, email communications and meetings with stakeholders.

4. The final draft was submitted to the Office of the President for approval.

Assumptions and limitations of the document were largely related to the availability and quality of data and information. A list of the persons consulted is provided in the Annexes.

6. International and Regional context of Disaster Risk Reduction

Over the past thirty years, several initiatives at the global and regional level have been adopted to tackle the adverse impacts of hazards. The *Yokohama Strategy and Plan of Action for a Safer World*[2] was adopted at the World Conference for Natural Disaster Reduction held in Yokohama, Japan, in May 1994, and recognizes the importance of incorporating prevention, mitigation, and preparedness for natural disasters, as well as environmental protection, in the implementation of sustainable development policy and planning at national, regional, bilateral, multilateral and international levels, paying special attention to the least developed countries and small island developing States.

Five years later, in 1999, the International Strategy for Disaster Risk Reduction (DRR) was adopted by the United Nations General Assembly. The United Nations Office for Disaster Risk Reduction (UNISDR) was established as the focal point in the UN system for the coordination of Disaster Risk Reduction (DRR) and the implementation of the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters[3].

The Hyogo Framework for Action was adopted in January 2005, and endorsed by the UN General Assembly in March 2006[4]. It explains, describes and details the work that is required from all different sectors and actors to reduce disaster losses. The goal of the HFA is "the substantial reduction of disaster losses, in lives as well as the social, economic and environmental assets of communities and countries". Five priorities for action are outlined under HFA. But this framework also offers guiding principles and practical means for achieving resilience of nations and communities to disasters, that is, reducing loss of lives and social, economic, and environmental assets when disasters strike.

Also under the auspice of UNISDR several coordination mechanisms were established, such as the Global Platform for DRR and the Regional Platform for DRR for the Americas, with the aim of improving coordination and implementation of disaster risk reduction activities, linking international and national efforts. In Guyana, a National Platform for Disaster Risk Management was established in 2011, chaired by the Civil Defence Commission, and attended by various stakeholders with responsibilities and interests affecting DRM.

Every two years, UNISDR publishes a new edition of the Global Assessment Report (GAR), a comprehensive review and analysis of DRM in the world that also provides strategic policy guidance.

Hyogo Framework for Action 2005-2015
Strategic Goals
G1: The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.
G2: The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.
G3: The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.
Priorities for Action
PA1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
PA2: Identify, assess and monitor disaster risks and enhance early warning.
PA3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
PA4: Reduce the underlying risk factors.
PA5: Strengthen disaster preparedness for effective response at all levels.

Table 5: HFA Strategic Goals (G) and Priorities for Action (PA).

Guyana, as a member state of the Caribbean Disaster Emergency Management Agency (CDEMA), has participated in the development of and has endorsed the Comprehensive Disaster Management (CDM) Strategy and Programme Framework 2007-2012 and the Regional CDM Strategy and Programme Framework 2014-2024[5].

The Comprehensive Disaster Management links regional sustainable development decision-making and planning with an integrated and proactive approach to disaster management, aimed at reducing the risk and loss associated with natural and technological hazards and the effects of climate change.

The goal of the Regional CDM Strategy and Programme Framework 2014-2024 is to realize "Safer, more resilient and sustainable CDEMA Participating States through Comprehensive Disaster Management". This goal is supported by four high level priority outcomes, sixteen outputs and the integration of four cross-cutting themes as indicated in Table 6.

2 www.preventionweb.net/files/8241_doc6841contenido1.pdf

3 www.unisdr.org/files/1037_hyogoframeworkforactionenglish.pdf

4 Resolution of the UN General Assembly A/RES/60/195 www.unisdr.org/files/resolutions/N0549930.pdf

5 http://www.cdema.org/CDMStrategy2014-2024.pdf

Regional CDM Framework 2014-2024
Outcomes
Outcome 1: Strengthened institutional arrangements for CDM implementation at national and regional levels.
Outcome 2: Increased and sustained knowledge management and learning for CDM.
Outcome 3: Improved effectiveness of CDM at sectoral levels.
Outcome 4: Strengthened and sustained capacity for a culture of safety and community resilience in Participating States.
Outputs
O1.1: CDEMA CU and NDO strengthened/restructured for effective support of the implementation, monitoring and evaluation of CDM in Participating States.
O1.2: CDM is integrated into national policies, strategies and legislation by Participating States.
O1.3: Partners programming aligned to national / country and regional CDM programming and priorities in the Caribbean Region.
O1.4: Effective and efficient coordination for preparedness, response and recovery at the national and regional levels.
O1.5: Resources for CDM reflect the level of need of CDEMA Participating States and CDEMA CU.
O2.1: Regional DRM Network informed decision-making at all levels improved.
O2.2: Infrastructure for fact-based policy and decision-making established / strengthened.
O2.3: Incorporation of local / community and sectoral based knowledge into risk assessment improved.
O2.4: Educational and training materials for CDM standardized, improved and applied in the region.
O3.1: DRM program at the sectoral level improved.
O3.2: Hazard information integrated into sectoral development planning and programming.
O3.3: Disaster and climate change risk proofing of development programming and investment decision-making at the sectoral level strengthened.
O4.1: Standards for safe communities developed, agreed and applied.
O4.2: Community Based Disaster Management capacity built / strengthened for vulnerable groups.
O4.3: Community EWS integrated, improved and expanded.
O4.5: Community Based Disaster Management capacity built / strengthened to address gender and vulnerable group needs.
Cross-cutting themes
Gender mainstreaming
Climate change
ICT
Environmental sustainability

Table 6: Outcomes,Outputs (O) and Cross-Cutting Themes of the CDM Framework 2014-2024.

The strategies outlined by the CDM Framework 2014-2024 build on the lessons learned from the 2007-2012 Framework, by expanding the stakeholder base with the inclusion of emerging priority sectors, by promoting public-private partnerships, and by focusing on a more strategically aligned and integrated disaster risk management approach. It also reinforces the importance of gender mainstreaming and climate change by considering them as cross-cutting issues (and not restricted to a determined output), along with Information and Communication Technologies (ICT) and environmental sustainability. In terms of implementation, the 2014-2024 Framework embraces results-oriented programming, monitoring and evaluation through the elaboration of an Implementation Plan and a Performance Measurement Framework. Guyana is in the process of developing its CDM Country Work Plan for implementation of the CDM Framework 2014-2024. In the baseline assessment for the development of the previous CDM Country Work Plan several gaps were identified, mainly the enactment of a legislative and normative framework, the inclusion of all sectors and phases, the need to address gender issues, and the provision of a robust Monitoring and Evaluation system. Strengths were identified in the Early Warning System and response capabilities, and in the Health and Agriculture sectors.

Links and synergies between the priorities for action of HFA and the outcomes of the CDM Strategy Framework are presented in Table 7.

In Guyana, a first self-assessment on the progress made according to the HFA priorities for action and the HFA Monitor Indicators has taken place during the first half of 2014. The overall Levels of progress assessed in the preliminary report are detailed below:

a) HFA Priority for action 1. "Ensure that disaster risk reduction is a national priority with a strong institutional basis for implementation". Average level of progress 3.5 over 5. Over the past years a broad number of legislative and regulatory provisions have been made for managing disaster risk and for incorporating DRR into public investment and planning decisions, from the overarching development strategies at the national level to specific regulations and plans for DRM. Risk management and environmental protection are at the core of national priorities. Accordingly, a high proportion of the national budget is destined to infrastructural measures for reducing vulnerability and enhancing resilience, and to reducing underlying risk factors. A National DRM Platform has been established to coordinate the actions of different institutions. The main constraints are referred to enactment and enforcement of the new paradigm, and the outreach to the sub-national level.

b) HFA Priority for action 2. "Identify, assess and monitor disaster risks and enhance early warning". Average level of progress 2.25 over 5. A myriad of hazard and risk assessments have

been produced at the national and regional level under different initiatives, mainly focusing on hydro-meteorological hazards. However these efforts have not been guided by a national strategy or coordinated by a single body. There are significant constraints with resources to compile and analyze the data, and to disseminate the information. Hydro-meteorological early warning has been enhanced with the acquisition of monitoring stations, the deployment of IT systems and the training of personnel.

c) HFA Priority for action 3. "Use knowledge, innovation, and education to build a culture of safety and resilience at all levels". Average level of progress 3.75 over 5. Relevant areas for DRR are being included in the curricula at all levels, from nursery school to university. The CDC and the Civil Defence Commission Volunteer Corps (CDCVC) receive and provide regular training in the various components of DRM. Guyana is adopting innovative approaches to Public Education Campaigns and the involvement of schools in DRM. However, research done by institutions, human capacities and financial resources should be enhanced. Dissemination of information in the hinterlands is hindered by communication constraints.

d) HFA Priority for action 4. "Reduce the underlying risk factors". Average level of progress 3.33 over 5. Strong mechanism for environmental protection and environmentally friendly development are in place, with a strong institutional commitment from the Office of the President and the Ministry of Natural Resources and the Environment and its agencies and commissions. Payment for ecosystem services is in place. Programmes to improve health, education, food security, alternatives for sustainable livelihoods, affordable housing schemes and land use planning are ongoing. There are limitations in environmental monitoring and enforcement capacities. The operationalization of Land Use Planning at the sub-national level is ongoing. Limited progress in the adoption of standardized methodologies for vulnerability assessments.

e) HFA Priority for action 5. "Strengthen disaster preparedness for effective response at all levels". Average level of progress 3.5 over 5. Flood Preparedness and Response Plan, Damage Assessment and Needs Analysis (DANA) Plan, National Emergency Operations Centre (NEOC) Standard Operation Procedures (SOP), Early Warning System (EWS) protocols, Search and Rescue (SAR) plans, and Environment, Health and Agriculture plans developed. National Emergency exercises conducted annually. NEOC and alternative NEOC equipped and staff trained. Contingency Fund in place. On going strengthening of capacities of the CDC at the sub-national level.

Further, good practices and lessons learnt in the establishment of Risk Reduction Management Centres in Cuba have been adapted to the national context in Guyana as a pilot experience implemented by the CDC in Region 9 during 2013, through the Caribbean Risk Management South-South Cooperation Initiative, with the support of the United Nations Development Programme (UNDP) Bureau for Crisis Prevention and Recovery and the UNDP Regional Bureau for Latin America and the Caribbean.

The post-2015 framework for Disaster Risk Reduction and the new framework for Sustainable Development are expected to further incorporate Climate Change Adaptation and Mitigation considerations and to be more aligned than previous frameworks.

The Millennium Declaration of September 2000, identified the key objectives of "Protecting the vulnerable" and "Protecting our common environment", and resolved to "intensify cooperation to reduce the number and effects of natural and man-made disasters". The Millennium Development Goals (MDG) and specific targets established in the subsequent 2005 World Summit are aimed at enhance human development and environmental sustainability, which contributes to reduced vulnerability.

Regional CDM Framework 2014-2024	Hyogo Framework for Action 2005-2015
Outcomes	**Priorities for Action**
Outcome 1: Strengthened institutional arrangements for CDM implementation at national and regional levels.	PA1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
Outcome 2: Increased and sustained knowledge management and learning for CDM.	PA3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
Outcome 3: Improved effectiveness of CDM at sectoral levels.	PA4: Reduce the underlying risk factors.
Outcome 4: Strengthened and sustained capacity for a culture of safety and community resilience in Participating States.	PA2: Identify, assess and monitor disaster risks and enhance early warning. PA5: Strengthen disaster preparedness for effective response at all levels.

Table 7: CDM Outcomes and HFA Priorities for Action (PA).

The outcome document of the 2012 UN Conference on Sustainable Development (Rio+20), "The future we want"[6], advocates for the integration of DRR and Climate Change (CC) Adaptation and Mitigation into the development agenda, and in particular:

1. Reaffirms commitment to the HFA and calls to accelerate its progress.

2. Recognizes the importance of early warning systems and comprehensive hazard and risk assessments as part of effective disaster risk reduction.

3. Calls for more coordinated and comprehensive strategies that integrate disaster risk reduction and climate change adaptation considerations into public and private investment, decision-making and the planning of humanitarian and development actions.

4. Underlines the importance of considering disaster risk reduction, resilience and climate risks in urban planning.

5. Recognizes the need to integrate a gender perspective into the design and implementation of all phases of disaster risk management.

6. Calls for all relevant stakeholders to take appropriate and effective measures, taking into account the three dimensions of sustainable development to reduce exposure to risk for the protection of people, and infrastructure and other national assets, from the impact of disasters.

7. Emphasizes that adaptation to climate change represents an immediate and urgent global priority and calls for urgent measures in this regard.

During Rio+20 it was agreed to launch a process to develop a set of Sustainable Development Goals (SDG) to guide the post-2015 Development Agenda.

The UNISDR is involved in the process of developing a post-2015 DRR Framework[7], with the engagement of a full range of actors, from Member States to civil society. It is expected to be adopted at the 3rd World Conference on DRR and endorsed by the General Assembly in 2015.

Guyana is fully committed to attaining higher human development standards and developing its economy while protecting the environment and preserving biodiversity. In this regard, Guyana is a signatory to various United Nations Conventions related to environment protection, such as:

1. United Nations Framework Convention on Climate Change (UNFCCC) 1992 as a Non-Annex I Party, ratified 8/29/1994, and the Kyoto Protocol to the UNFCCC 1997, acceded 8/5/2003.

2. United Nations Convention on Biological Diversity (UNCBD) 1992 , ratified 8/29/1994, and the Cartagena Protocol on Biosafety to the Convention on Biological Diversity 2000, acceded 3/18/2008.

3. United Nations Convention to Combat Desertification (UNCCD) in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa 1994, acceded 6/26/1997.

Aligned with this environmentally-friendly strategic approach to development, Guyana is one of the first countries to be formally approved as a participant in the World Bank's Forest Carbon Partnership Facility (FCPF), looking at ways of Reducing Emissions from Deforestation and Forest Degradation (REDD).

Guyana is playing an important role in promoting a global agreement on the United Nations Collaborative Programme on REDD. In the framework of its Low Carbon Development Strategy, lead by the Office of the President, the Guyana REDD+ Investment Fund (GRIF) has been implemented, with the support of the Government of Norway, which is an innovative finance mechanism intended to be a model for REDD+ payments internationally.

6 http://sustainabledevelopment.un.org/futurewewant.html

7 http://www.preventionweb.net/posthfa/

7. National context

7.1. Physiography and Orography

Guyana is located on the northen-eastern coast of South America, bounded by the Atlantic Ocean (Caribbean Sea) on the north, Suriname on the East, Venezuela on the West and Brazil on the South. It is located between latitudes 1º 9' N and 8º 34' N; and longitudes 56º 29' W and 61º 25' W. It has a surface area of 214,970 square kilometres and a coastline of 430 km. The coastline lies below the average high tide level and is protected by sea-defence structures, mangroves and beaches. Georgetown is the capital city, located on the coast, by the eastern part of the mouth of the Demerara river.

Image 1: Situation Map.

As indicated in the National Land Use Plan[8] 2013 (GL&SC) consists on four main natural regions:

a) Coastal plain. It occupies about 4% of the country's area and is densely populated (666,261 persons, 89% of the total population) in contrast to the Hinterland regions, though this

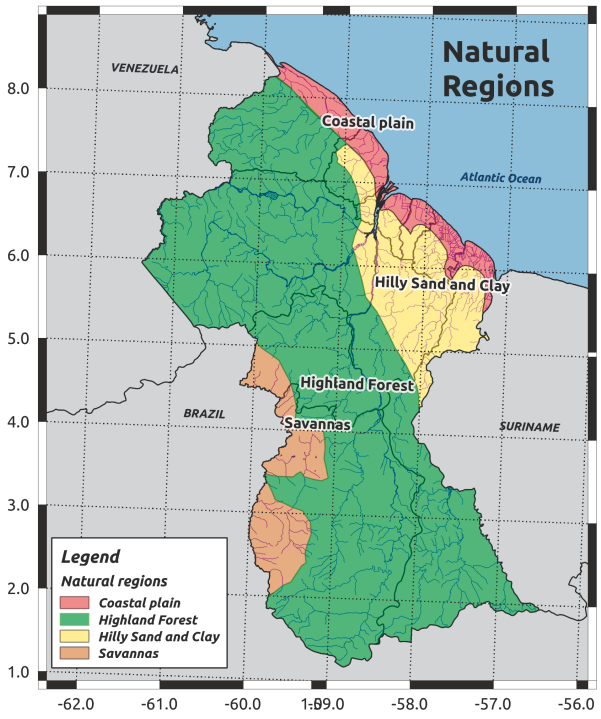


Image 2: Natural Regions Map.

density is not evenly distributed as there are some interior parts of the coastal belt that are also sparsely populated. The plain ranges 8 to 65 km wide along the coast and provides most of the agriculture production. West of the Essequibo River the coastal plain narrows with extensive "pegasse" (tropical peat) deposits inland. In general, the soils closer to the shore and along rivers are more fertile than the soils further inland, which can have very low fertility.

The recent plain occurs at elevations of 2 m below to 3 m above sea level , while the older coastal plain lies at an altitude of about 3-9 m above sea level. Since the normal tide range is about 3 m, sea invasion and sea over topping of sea defences is usual, especially during the wet seasons and during high tides. Guyana's agrarian economy, which contributes over 35% to the GDP, is highly dependent on the coastal drainage and irrigation systems, which, among other benefits, provide flood control and allows for harvesting of rice and sugar twice a year.

b) Hilly sand and clay region, which occupies about 14% of the country's surface area. This area is 150 to 250 km wide and consists of low sandy hills interspersed with rocky outcroppings with hardwood forest. Altitudes vary from about 15 m above sea level close to the coast to 150 m above sea level in the south . These sands cannot easily support crops and, if the trees are removed, erosion is rapid and severe.

8 http://www.lands.gov.gy/National%20Land%20Use%20Plan%20GoG%20June%202013%20with%20cover%20pages.pdf

c) Forested Highlands, with an area of 15.7 million ha, comprises 74% of the surface of the country, and are made up of mostly inaccessible forests and woodlands, with plateaus and flat-topped igneous and metamorphic mountains to a maximum height above sea level of 2,810 m (Mount Roraima).

d) Interior Savannas, count up to 8% of the surface area. The Rupununi Savannah is divided into the northern (100-110 m in altitude) and southern savannahs (100-120 m in altitude) by the Kanuku Mountains (760-840 m). It presents a variety of soils, with extensive presence of alluvium materials, is are generally of low fertility.

The surface of Guyana is mostly flat, except for the Kamoa Mountains on the southern border, and the Pakaraima Mountains to the Brazil-Guyana-Venezuela tri-point border. The highest mountains are Mount Ayanganna (2,042 m), Mount Caburai (1,465 m) and Mount Roraima (2,810 m).

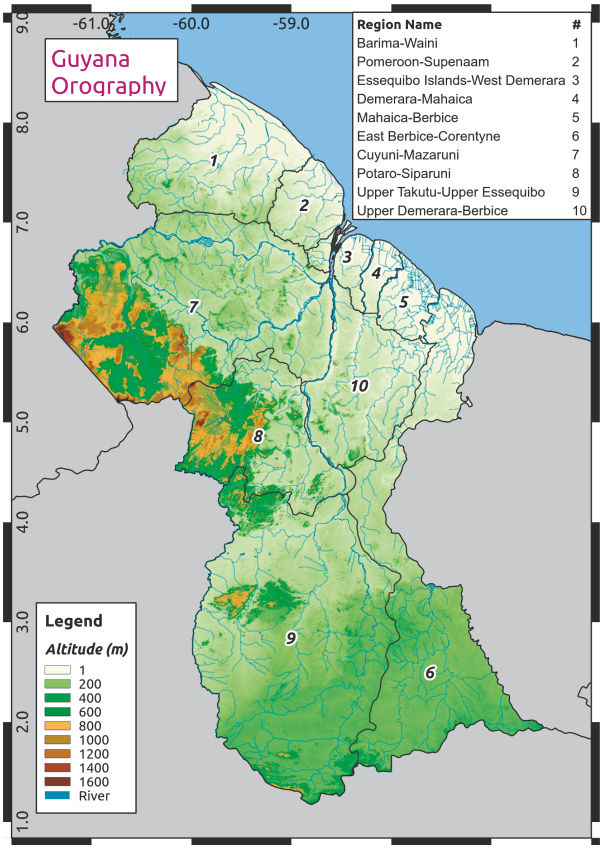


Image 3: Orography of Guyana based on SRTM 90 m.

7.2. Biodiversity

Guyana is part of the broader natural area called the "Guianas" or the "Guyana Shield", known for its rich biodiversity, including both plants and animals, high forest coverage and low deforestation levels.

It is estimated that 40% of the flowering plant species are found only in the Guianas, with new species still being discovered in scientific explorations. Guyana's floral diversity is estimated to include over 8,000 species, with approximately 6,500 of those species being identified[9].

Animal endangered species such as the giant river otter have significant populations in the rivers of Guyana as well as cetaceans like the West-Indian manatee, despite the pressure posed by human activities. Four of the world's eight endangered species of marine turtles, Leatherback (*Dermochelys coriacea*), Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*) and Olive Ridley (*Lepidochelys olivacea*), come to lay their eggs on the shoreline, and more specifically on Shell Beach, a protected area.

The direct threats to biodiversity identified by the Environmental Protection Agency are associated with the main economic activities such as rice and sugar agriculture, forestry, and extractive industries (gold, diamond and bauxite), overfishing, forest fires, uncontrolled harvesting of non-timber forest products, inappropriate use of agro-chemicals, and the introduction of alien invasive species.

The forest cover estimated for 1999 was between 76% and 80%, while in 2010 the official national estimate stands at approximately 85%, according to the Guyana Forestry Commission (GFC). Around half of this cover falls in the category of primary forest. Deforestation is below 0.1% annual change.

The GFC indicated in 2011 that the main driver of deforestation was found to be mining, which accounts for 60% of the change , followed by forestry itself (26%) then agriculture at 9% with infrastructure development and fire accounting for under 3% each. Mining also accounted for the vast majority (97%) of forest degradation (as opposed to deforestation).

9 EPA. *Guyana Fourth National Report to the Convention on Biological Diversity*. 2010. https://www.cbd.int/doc/world/gy/gy-nr-04-en.pdf

7.3. Climate and weather

Guyana has a tropical climate with almost uniformly high temperatures and humidity, and much rainfall, modified slightly by northeast trade winds and midday and afternoon breezes along the coast.

Temperatures in Georgetown are fairly constant, with the hottest months being those of September – October and the coolest months being that of January and February. The highest temperature recorded in the capital is 35.4°C and the lowest 18.4°C.

Locations in the interior, away from the moderating influence of the ocean, experience slightly wider variations in daily temperature, and slightly lower humidity.

Guyana lies south of the path of Caribbean hurricanes and none is known to have hit the country.

Rainfall is heaviest in the northwest and lightest in the southeast and interior. Annual averages on the coast near the Venezuelan border are near 2,500 mm, farther east at New Amsterdam 2,000 mm, and 1500 mm in southern Guyana's Rupununi Savannah. Areas on the northern-eastern sides of the Pakaraima Mountains catch the trade winds and average as much as 3,500 mm of precipitation annually.

Although rain falls throughout the year, about 50% of it is concentrated in the rainy season that extends from May to the end of July along the coast and from April through September further inland. Coastal areas have a second rainy season from November through January, due to the influence of the Inter Tropical Convergence Zone (ITCZ) traveling to the south. Rain generally falls in heavy afternoon showers or thunderstorms.

Most days include four to eight hours of sunshine from morning through early afternoon.

The commencement of rainy seasons, duration and rainfall quantities express high variability, and this can be attributed to a number of features, including El Niño Southern Oscillation (ENSO).

ENSO is a meteorological phenomenon characterized by anomalous warm or cold sea surface temperatures for long periods of time developing off the western coast of South America. It has two phases: El Niño being the warm phase and La Niña being the cool phase. A warm sea surface is coupled with high air surface pressure in the tropical Western Pacific, whereas the cold sea surface phase is accompanied with low air surface pressure in the same area. The fluctuations are rather irregular, but tend to appear every three to six years. The extremes of this oscillation cause extreme weather in many regions of the world, including Guyana.

During the warm episode (El Niño) dryer conditions are found on the north coast of South America from December to February, and drier and warmer conditions are found in the Caribbean from June to August.

During the cold episode (La Niña) wetter conditions are found on the north coast of South America from December to February, and wetter and colder conditions are found in the Caribbean from June to August.

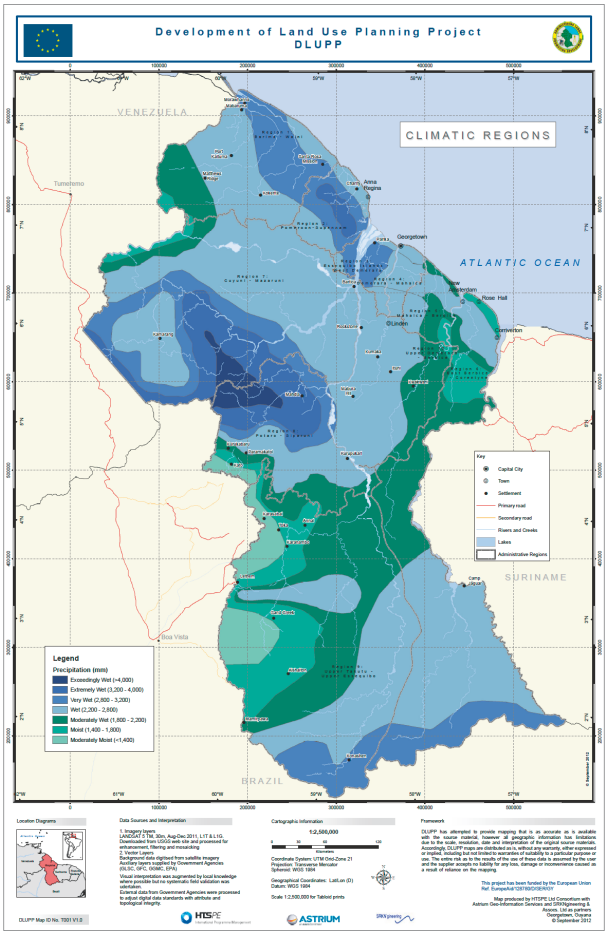


Image 4: Climatic Regions. Source: GL&SC.

Over the past decades, the number of El Niño events increased, and the number of La Niña events decreased, although observation of ENSO for a longer period is needed to detect robust changes and relation with climate change.

Guyana normally experiences droughts during El Niño events and heavy rainfall during La Niña events. As of 2014 neutral to moderate El Niño conditions are fore-casted, and below average amounts of rainfall have been experienced along Guyana's coast, resulting in low levels of water in the various water conservancies (Ministry of Agriculture, El Niño Watch, 16 May 2014).

In Guyana, a statistically significant correlation between El Niño and malaria epidemics has been found (Gagnon et al, 2002). Furthermore, a correlation between El Niño and the prevalence of insect pests and diseases such as diarrhoea and asthma is also well documented.

On the other hand, above average rainfall patterns during La Niña episodes increase the likelihood of experiencing flooding.

With respect to rainfall patterns and the effects of climate change, the Initial National Communications Report and the National Vulnerability Assessment (2002) presented evidence that, since 1960, there has been a tendency for below averagel rainfall, as well as an increase in intensity of rainfall events. Peterson et al. (2002) indicated that in the Caribbean extreme precipitation and extreme daily maximum temperature occurrence since 1950 to 2000 is increasing, with a rise in precipitation due to weather events above the 95th percentile. The greatest 5-day rainfall total is also increasing, and the number of days of maximum temperature above the 90th percentile is also rising.

For a doubling of carbon dioxide concentrations in the period 2020-2040, increases in excess of 1.5ºC are expected in southern Guyana in the Second Dry Season (August to October). Rainfall is expected to decrease by an average of 10 mm per month but the decrease in the First Wet Season and Second Dry Season (May to October) will be 12 mm per month or higher. Thus changes in the pattern of rainfall are expected to lead to more intense periods of rainfall and longer dry periods.

Simulations of precipitation, however, vary. For instance the UNDP Climate Change Country Profile (2012) states that the ensemble median values for the various projections of mean annual rainfall are between -18% and -4% by 2090. The largest decreases in total rainfall are projected for the wettest season (May-June-July, -68 to +21mm per month), the relative decreases are higher in August-September-October and November-December-January (-82 to +68%).

Furthermore, model simulations show wide disagreement in projected changes in the amplitude or frequency of future El Niño events, thus contributing to uncertainty in climate projections.

Finally, while sea levels are rising worldwide at a rate o f 2-4 mm/year, the Guyana National Vulnerability Assessment (2002) forecast a more severe impact locally. Analysis of tide gauge records shows the trend in sea level rise for Guyana to be in excess of 10 mm/year (Guyana's National Vulnerability Assessment to Sea Level Rise. Environmental Protection Agency, 2002).

7.4. Water

7.4.1. Water resources

Guyana is rich in surface water resources. Long rivers originate in the southern highlands and small rivers originate in the interior planes and flow northward to the coast or primary rivers. A few minor Amazon tributaries flow southwest out of the country and are part of the Amazon watershed.

The main basins are:

1. Corentyne River (724 km), one of the four principal rivers, bordering Suriname, and its tributaries the New, Kutari, and Coeroeni Rivers.

2. Berbice River (545 km), one of the four principal rivers, and its tributary Canje River. The city of New Amsterdam is located on the east bank of the Berbice River.

3. Abary River.

4. Mahaiconi River.

5. Mahaica River. The village of Mahaica is found at its mouth.

6. Demerara River (346 km), one of the four principal rivers, and its tributaries Haiama, Haianari, Haiakwa, and Kuruabaru Rivers. The Demerara's width and depth allow oceangoing vessels up to 5,000 metric tonnes to navigate up to Linden (105 km from the mouth), while smaller vessels may reach up to Malali (245 km from the mouth).

7. Essequibo River (1,010 km), it is the largest river and its basin encompasses most of the country. Its 20 km wide estuary is dotted with numerous small islands. The major tributaries are the Mazaruni, Potaro, Konawaruk, Siparuni, Rupununi, Kuyuwini, and Kassikaityu Rivers. The mouth of the Essequibo is divided by the large and fertile islands of Leguan, Wakenaam, and Hog Island.

8. Pomeroon River, and its tributary the Wakapau River.

9. Moruka River.

10. Waini River and its tributary the Barama River. It flows into the Atlantic Ocean near the border with Venezuela.

11. Barima River, and its tributary the Kaituma River. The Barima River is a tributary of the Orinoco River, entering 6 km from the Atlantic Ocean. It originates in Guyana, flowing for approximately 340 km before entering Venezuela about 80 km from its mouth.

12. Takutu River, and its tributary the Ireng River. It forms part of the boundary with Brazil, and is a tributary of the Rio Branco / Rio Negro / Amazon River. The Takutu River's sources almost join up with those of the Essequibo River.

The United States Army Corps of Engineers undertook a study of the water resources of Guyana[10] in 1998. The study produced maps of water resources; a combination of surface water (Image 5) and groundwater resources (Image 6).

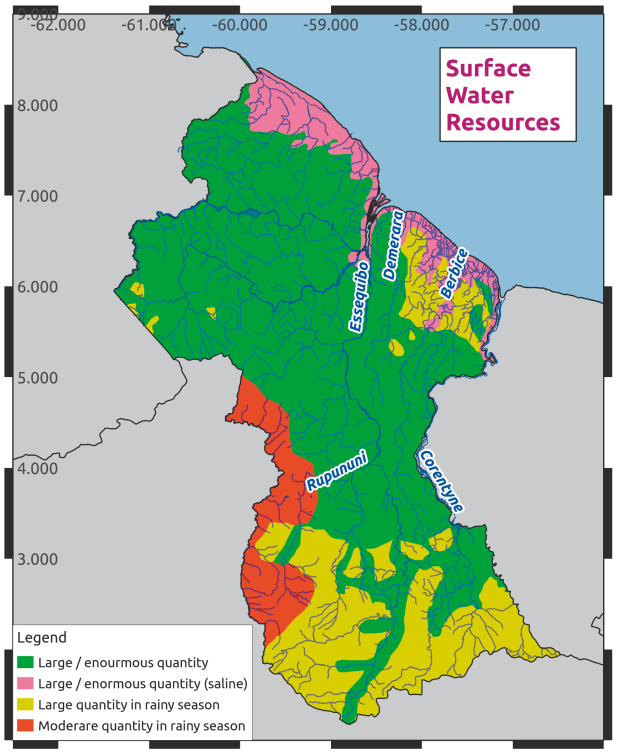


Image 5: Surface Water Resources Availability, based on "Water Resources Assessment of Guyana", US Army Corps of Engineers, December 1998.

According to the study, the majority of the country perennially has plentifully available fresh water with enormous (defined as >400 m3/min) quantities available for 8 months of the year (wet seasons) and large (4-40 m3/min) to very large (40-400 m3/min) quantities available for the rest of the year. Exceptions include the coastal plain backlands, the Rupununi Savannahs and Pakaraima Mountains and the far south of the country where water is seasonally plentiful. Along the coastal plains there are large to enormous amounts of brackish to saline water available throughout the year from tidal influenced rivers and streams, coastal marshes mangrove swamps, and tidal lowlands. Tidal influence can extend as far as 64 kilometers to 80 kilometers upstream on the four major rivers.

Although water resources are abundant in the nation, the Guyana National Development Strategy[11] 2001-2010 identified some challenges related to water sector management: the need for input from farmers in planning and monitoring; the lack of, or deteriorating infrastructure; the need for public input on environmental issues; and the need to increase the potable water supply in rural areas.

The Hydro-meteorological Service of the Ministry of Agriculture has highlighted the need for a deeper understanding of the dynamics among water systems, hydrology and the climate, which remain under-analyzed.

Water supply for domestic, industrial and commercial purposes are extracted from wells drilled mainly from two aquifers known as the 'A' and 'B' sands. The water is distributed through a network of pipes of around 5,000 km, laid in villages along the coastal plain.

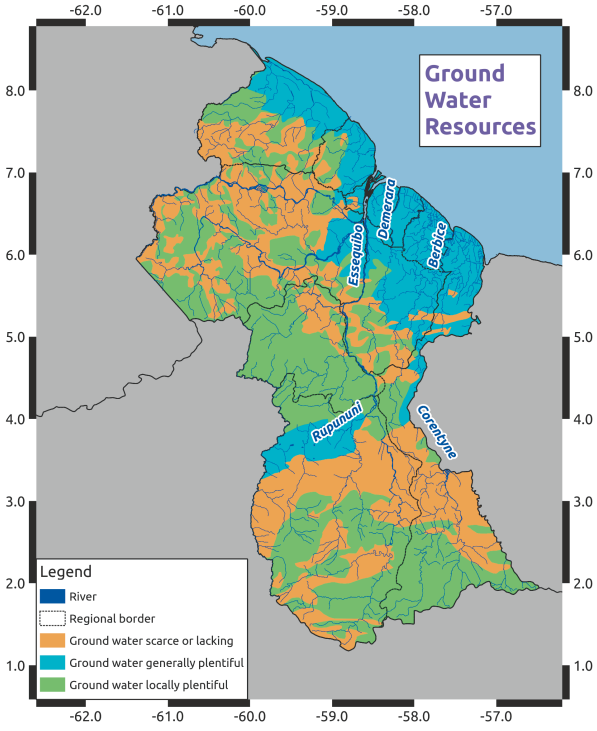


Image 6: Groundwater Resources Availability, based on "Water Resources Assessment of Guyana", US Army Corps of Engineers, December 1998.

10 *Water Resources Assessment of Guyana*, US Army Corps of Engineers, December 1998.
http://uog.edu.gy/faculties/fot/repository/sites/default/files/Water%20resources,%20Guyana.pdf

11 *Guyana's National Development Strategy 2001-2010.*
http://www.guyana.org/NDS/NDS.htm

In the hinterlands a combination of groundwater and surface water extraction with domestic rainwater harvesting is widely used as a strategy to improve water access (Guyana Demographic and Health Survey, MOH, GBS, 2009). The use of unimproved water sources or inappropriate treatment leads to problems with diarrheal diseases.

A survey[12] conducted in 2009 by the Bureau of Statistics and the Ministry of Health showed that:

"Overall, about 10% of children under age 5 were reported to have diarrhoea in the two weeks before the survey. Prevalence is higher in households where the drinking water source is not improved (15%) than when it is improved (9%). Similarly, it is higher in households with non-improved or shared toilet facilities (15%) compared with households with an improved, not shared facility (8%), clearly indicating the need to address the issues of safe drinking water and improved sanitation. Prevalence of diarrhea in Rural areas (11%) and the Interior area (14%) is significantly higher than the prevalence in Urban areas (6%) and in the Coastal areas (9%). The prevalence of diarrhea among children under age 5 ranges from 6% in Region 10 to 20% in Region 1."

As a result of the water supply situation, a significant proportion of Guyana's population relies on bottled water.

Drinking water source	Urban	Rural	Coastal	Interior
Piped into dwelling/yard/plot	28.5%	33.9%	34.9%	10.5%
Rainwater	14.9%	31.9%	24.9%	46.5%
Surface water	0.1%	4.9%	1.9%	17.9%
Unprotected dug well	0.0%	0.7%	0.3%	4.3%
Bottled water	54.2%	23.4%	35.3%	4.7%
Other drinking water source	2.3%	5.2%	2.7%	16.1%

Table 8: Percentage of population in each residence area using various drinking water sources. Source: GBS, 2009.

It is believed that large numbers of coastal aquifers are already experiencing salt-water intrusion caused by both natural and man-induced processes (Economic Commission for Latin America and the Caribbean, ECLAC, 2011). Sea level rise will only aggravate such situations. The high level of dependence on the coastal aquifers for domestic water supply renders the population extremely vulnerable to the effects of salt-water intrusion as a result of sea level rise. This could also be detrimental to agriculture, as there could be further penetration of salt water into the land.

With regard to pollution of waters several threats to the water quality of rivers and aquifers have been identified:

1. Industrial effluents and untreated sewerage discharges into rivers and the ocean.
2. Agricultural fertilizers and pesticides, saw milling and poultry rearing affecting streams and percolating into aquifers.
3. Solid waste blocking drains in urban areas. Furthermore, improper solid waste management increases the pollution concentration of run-off waters.
4. Commercial effluents and wastes disposed along roadsides.
5. Sand mining can modify the infiltration capacity of soils, affecting underground waters.
6. Flooding has implications for the quality of freshwater resources available or domestic consumption.

The National Assessment on Land Degradation Diagnostic Report (Guyana Lands and Surveys Commission, GL&SC, 2008) revealed medium to severe level of water pollution in several mining districts. Furthermore, GL&SC has already identified sites of waterways degradation due to mining.

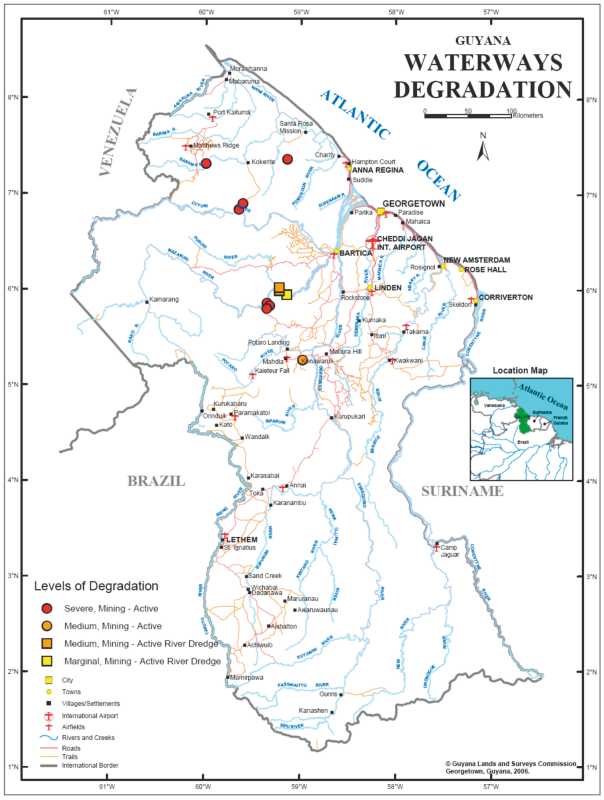


Image 7: Waterways Degradation Map. Source: GL&SC, 2008.

12 *Guyana Demographic and Health Survey*, MOH, GBS, 2009.
http://dhsprogram.com/pubs/pdf/FR232/FR232.pdf

7.4.2. Water Conservancies, Drainage and Irrigation

To facilitate the country's agricultural output, irrigation waters are also extracted from water conservancies. During the rainy seasons, conservancies regulate runoff and prevent flooding, while storing water during the dry seasons. There are four man-made conservancies along the coastal plain:

1. The East Demerara Water Conservancy (EDWC), built in 1888 in Region 4 – West Demerara/Mahaica, linked with the east coast irrigation system, provides water storage and flood control mechanisms for Guyana's most populous region (Reg. 4, Demerara-Mahaica, 313,429 people, 42% of the total population), including the capital city of Georgetown. The EDWC is a large shallow reservoir bounded on three sides by a low earthen dam in length, with a capacity of 340 hm3 and an area of 550 km2. This area lies around or below sea level, so that any water collected can only be discharged by pumping, or at low tide when the sea level is low enough to allow for gravity-based release through the drainage channels and the 136 sluice gates. The main channels are the Kofi Channel, Land of Canaan, Maduni, Lama and Cuhna Channel. Currently the Hope Dochfour Channel located in the agricultural lowlands between the Atlantic Ocean and the earthen dam is under construction. The EDWC acts as both a flood defence for the coastal area in the wet season and as a water storage system in the dry season. Weather events – such as the 2005 flood when extreme rainfall caused flooding throughout the coastal lowland - have highlighted the vulnerability of the EDWC system. Drinking and irrigation water is collected and stored within the conservancy behind the EDWC dam. In the coastal lowlands, between the dam and the sea defences, an intricate network of canals manages water for irrigation and drainage.

2. The West Demerara Water Conservancy (WDWC), built in the 1950's in Region 3 – Essequibo Islands/West Demerara, has a capacity of 165 hm3 and a reservoir area of 235 km2. This conservancy is also gravity based, but more commonly used for agricultural purposes rather than drinking water because of the rice crops area that lies on the north. Flood control is managed using the drainage relief structures and drainage channels from the reservoir to the Atlantic Ocean, to the Essequibo river at Namryck and to the Bonasika river at Waramia.

3. The Tapakuma Water Conservancy, operational since 1974, in Region 2 – Pomeroon/Supenaam, has a capacity of 18.1 hm3 and a reservoir area of 140 km2. It has drainage channels used for releasing excess water during rainy seasons. The most important channel is the Cozier Canal located at the north boundary of the dam crest, near the Pomeroon River.

4. The Abary Dam at Copeman, operational since 1985, in Region 5 – Mahaica/Berbice, has a capacity of 609 hm3 and a reservoir area of 808 km2. The Mahaica-Mahaicony-Abary Project is aimed at constructing dams for the Mahaicony (Phase 2) and Mahaica (Phase 3) rivers, incorporating them in the conservancy, and linking the system with the EDWC. Design of Phase 2 is ongoing during 2014.

Image 8: Location of East Demerara (EDWC), West Demerara(WDWC) and Tapakuma (TWC) Water Conservancies. Source: IDB, 2013.

Over the past decades unseasonal rainfall has led to breaches and over-topping of many of the conservancies giving rise to excessive flooding in areas such as East Coast and West Coast Demerara and to a lesser extent on the Essequibo Coast. This has caused damage to crops and loss of livestock as well as damage to property.

Breaches in the EDWC can occur also during periods of drought[13], when the water levels drop below dead storage level, causing tension cracks that can deteriorate into major breaches.

13 *Supplementary Flood Survey for CADM-2, The Mahaica River, Guyana*. H & H Surveying and construction services. September 2010.

According to the National Drainage and Irrigation Authority (NDIA), the drainage and irrigation infrastructure in Guyana is more than 150 years old. Traditionally this infrastructure has been able to drain up to 1.5 inches of rainfall within a 24-hour period. The NDIA has been upgrading it to cater for 2.5 inches and above, at a high economic cost[14].

The Conservancy Adaptation Project (CAP) was designed in the wake of the 2005 flood to help Guyana adapt to climate change by reducing the vulnerability of this coastal area to catastrophic flooding. Concluded in 2013, the CAP Phase I is an innovative project for Guyana and the Caribbean applying modern technology to support a long-term strategy to reduce flood risk. Several strategic investments have been identified, totalling over US$ 123 million, that include rehabilitation of key drainage relief channels and improved conveyance within the EDWC, strengthening of the EDWC dam and various investments in the east coast drainage systems, including the construction of the Hope Canal, which will drain into the Atlantic Ocean, reducing the volume of water passing through the Maduini and Lama sluices.

There are about 500 km of main irrigation canals and 1,100 km of secondary canals, and about 500 km of main drainage channels and 1,500 km of secondary drainage channels. There is a network of sluices and pumps to aid drainage and irrigation (Ministry of Agriculture, 2013). The network originated in the Dutch Colonial days, and after hundreds of years of operation, population growth and increased agricultural demand, the system is operating at reduced capacity. Changes in land use, effects of sea level rise and impacts of weather events have altered the characteristics of the system, making the coastal areas susceptible to flooding. Therefore, continuous rehabilitation and upgrading of drainage and irrigation systems actions are undertaken to ensure proper functioning, thus allowing agricultural development and acceptable levels of food security. This includes routinely de-silting the mouths of rivers, rehabilitation of sluices and kokers, enhancement of the outlets' drainage capacity, and routine maintenance.

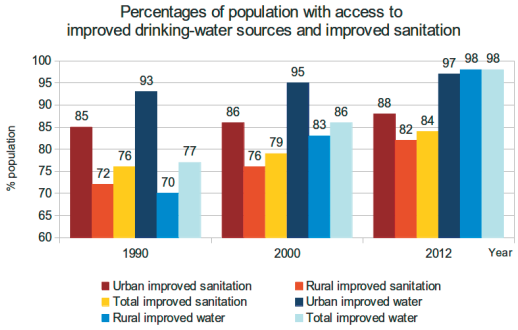
The drainage capacity of the EDWC is also being improved through the construction of the new Hope Canal and head regulator, and through the rehabilitation and widening of the Cunha Canal and sluice (co-funded by the GRIF with the World Bank as a partner entity).

14 *A National Strategy for Agriculture in Guyana: 2013 – 2020*, Ministry of Agriculture. http://agriculture.gov.gy/National%20Agriculture%20Strategy%2013-2020.pdf

7.5. Water, Sanitation and Waste management

An outstanding progress has been achieved over the past decade in providing access to safe sources of water and improved sanitation. The Join Monitoring Programme established by the Wold Health Organization (WHO) and the United Nations Children's Fund (UNICEF) indicates that the goal of reducing by half the population without access to improved water and sanitation has been met in the case of drinkable water but progress in attaining improved sanitation has been insufficient.

Despite this progress water and sewage services in Georgetown and other coastal areas still face constant institutional, financial and operational challenges.



Graph 1: Percentages of population with access to improved drinking-water sources and improved sanitation. Source: WHO/UNICEF, 2014.

For instance, the quality of water supply services is hindered by a deterioration in water distribution networks, and the current sewage system covers a small proportion of the national population. The rest of the population seeks individual solutions, such as latrines and septic tanks, but in some cases these arrangements are not fully adequate.

Increased waste generation and inadequate solid waste management practices have become important environmental health problems in Guyana. This problem has become increasingly acute over time, representing a major public health hazard.

Nowadays not all the waste is correctly collected and disposed of. Waste not delivered to landfills is burned, buried, or disposed of in empty lots, canals, and community dump sites. This increases the risk of flooding and the spread of communicable diseases. The Government of Guyana with financing from the Inter-American Development Bank (IDB) is initiating a new Sanitary Landfill for the greater Georgetown area, which will significantly reduce hazards presented by the current situation.

7.6. Mangroves and Sea and River Defences

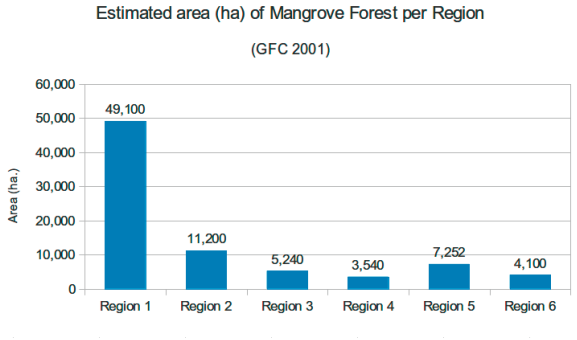
Since the Dutch colonial period in the late 1600s the natural system of mangroves on the coastline has been partially replaced by a complex system of sea defences, dykes, polders, canals, sluice gates, irrigation and sewerage networks, and conservancies.

There are three main species of mangroves in Guyana: the dominant Black mangrove ("Courida bush", *Avicennia germinans*), the Red mangrove (*Rhizophora mangle*), and the White mangrove (*Laguncularia racemosa*).

As highlighted by the National Mangrove Management Action Plan 2010-2012[15], the typical composition pattern of the mangrove forest, with *Rhizophora* forming the seaward fringe, and *Avicennia* and *Laguncularia* established within this, does not prevail in Guyana. *Avicennia* is almost always found as the outermost species, with *Rhizophora* restricted to riverside and estuarine environments.

Mangroves can form effective barriers to certain types of coastal erosion, keeping soil together, trapping sediments, breaking down pollutants, and absorbing most of the wave energy, but certain conditions pertaining to tidal inundation, rate of siltation, availability of fresh water and sedimentation are needed for the growth of mangroves. Therefore, measures to improve the characteristics of the coastal fringes need to be put in place. Mangrove vegetation grows in a coastal saline environment; however, it is capable of tolerating only a certain degree of salinity. This tolerance of a saline environment varies with the species. The salinity of the soil is affected by tidal and wave action, and rainfall and riverine discharge patterns. Additionally, sea defences modify the fresh water run-off and the wave-energy flow into the land. Moreover, the distribution of different species is an important determinant of the ability of mangrove ecosystems to deliver shoreline protection.

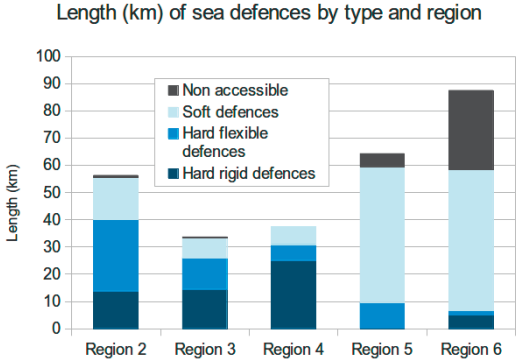
The historical clearance of mangroves for obtaining fuel wood and resources for the tanning industry, localized damage caused by fishering boats, dumping, and the grazing of livestock in mudflats has resulted in thin (tens of meters wide) mangrove areas along the coast. The connection between mud banks and areas of mature mangrove is severed by channels, reducing the likelihood of the natural vegetalisation of mudflats occurring by seeds migration. Moreover, changes in trapping capacity of the coastal fringes reduces the level of maturation of mud banks, as well as consolidation of sediment and cracking. This also reduces natural colonization. Nevertheless Guyana accounts for more than 80,000 hectares of mangrove forest, most of them (75%) in Regions 1 and 2.



Graph 2: Estimated area (ha.) of mangrove forest per region. Source: Guyana Forestry Commission (GFC), GIS Analysis, 2001.

The infrastructural sea defence system of Guyana is 279 km long and its composed of hard (rigid and mobile) and soft structures, namely earthen embankments, masonry sea walls and sand banks protected by more than 80,000 hectares of mangroves in several places. The sea defence system has an estimated minimum direct economic benefit of between US$ 161million and US$ 724 million annually (Economic Commission for Latin America and the Caribbean, ECLAC, 2011).

The dynamics of the shoreline of Guyana are dominated by the occurrence of large mud banks composed of clay sediments from the Amazon River flowing into the Atlantic Ocean. The dynamics of the sediments cause a balance between concentration of wave energy in certain locations and dissipation of energy due to the high viscosity of the waters



Graph 3: Length of sea defences by type and region, in regions 2, 3, 4, 5, and 6. Source: WSG.

15 *National Mangrove Management Action Plan 2010-2012*
http://www.gcca.eu/sites/default/files/catherine.paul/national_mangrove_management_action_plan_2010-2012.pdf

with clay solids suspensions. Therefore it is difficult to predict the location of the erosion and breach of seawalls, but local experience has shown that the severity of the erosion lasts between one and three years at one place before the action moves on to a new site.

The following three criteria are applied by the Work Services Group (WSG) to identify critical areas of the sea and river defences, due to higher breakage probability and / or flood:

1. Areas with artificial defences older than 50 years.

2. Areas with artificial defences with no mud bank protection.

3. Areas with only natural defences (mangrove).

Most of these critical areas are found in Regions 1 Barima - Waini, 5 Mahaica – Berbice, and 6 East Berbice - Corentyne. The 2013 Sea and River Defences Conditions Survey Report (WSG, Ministry of Public Works) provides maps and breakdowns of types and condition of defences across Regions 2 Pomeroon - Supenaam to 6 East Berbice - Corentyne.

7.7. Demographics

According to the Census 2012[16], Guyana's total population stand at 747,884, representing an annual negative growth rate of -0.04% since 2002. The majority of the population (87.4%) live in the coastal Regions 1 Barima - Waini to 6 East Berbice – Corentyne. The decrease in total population has been uneven across the regions, with an increase in Regions 1 Barima - Waini, 3 Essequibo Islands - West Demerara, 4 Demerara - Mahaica, 7 Cuyuni - Mazaruni, 8 Potaro - Siparuni, and 9 Upper Takutu-Upper Essequibo. The population has decreased in Regions 2 Pomeroon - Supenaam, 5 Mahaica - Berbice, 6 East Berbice - Corentyne and 10 Upper Demerara - Berbice, Region 6 being the one that has experienced the highest loss (14,264 persons). In Regions 2 and 5, the decrease of population shows a change in tendency from the previous census.

The Regions of the Essequibo Islands – West Demerara (Region 3), Demerara – Mahaica (Region 4) and Mahaica – Berbice (Region 5) are the most densely populated areas, with the majority of Guyana's citizens located in Region 4. The highest population densities are found in the vicinity of the capital, Georgetown, and its adjoining areas due to its proximity to the agricultural zone and the access to port facilities.

There are six areas that are officially classified as urban townships inclusive of the capital city of Georgetown and its suburbs. The percentage of the total population of the country living in those cities is 25.6%, distributed as follows:

- Anna Regina (Region 2), 1.6% of total population.

- Georgetown city and suburbs (Region 4), 15.8% of total population.

- New Amsterdam (Region 6), 2.3% of total population.

- Rose Hall (Region 6), 0.8% of total population.

- Corriverton (Region 6), 1.5% of total population.

- Linden (Region 10), 3.6% of total population.

Comparing the changes in population for the regions against the changes in the urban townships:

1. In Region 2, both the rural and urban population have decreased.

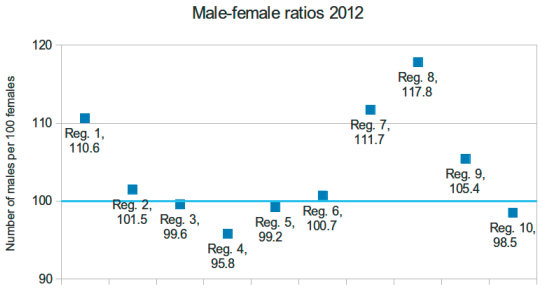
2. In Region 4, the rural population has increased, whereas the urban population has decreased.

3. In Region 6, the rural population has decreased, but the urban population has increased.

4. In Region 10, the rural population has increased, while the urban population has decreased.

As indicated by the Guyana Bureau of Statistics (GBS) the decline in the size of Georgetown's population could be as a result of the population shift from the city centre towards the new housing schemes established outside the city limits during the inter-census period.

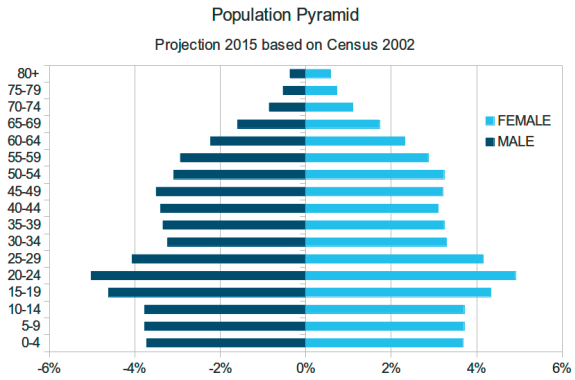
At a current national level, females slightly outnumber males (sex ratio of 99.3 males to every 100 females), whereas at the the regional level, all the Hinterland regions show high sex ratios, that is, more males than females, in contrast to the Coastland regions. The disparities could be due to male migration or other associated population factors.



Graph 4: Male-female ratios per region, 2012. Source: GBS, 2014.

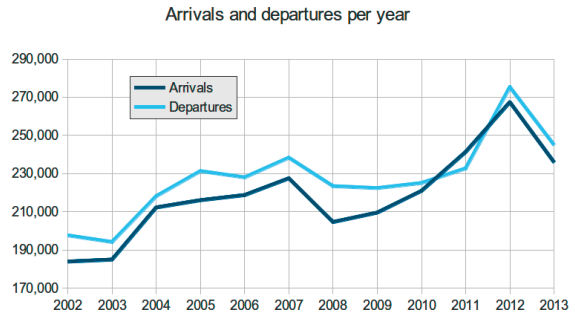
16 2012 Census Preliminary Report. GBS, 2014

http://www.statisticsguyana.gov.gy/download.php?file=88



Graph 5: Population pyramid for2015 projection based on the Census 2002 data. Source: GBS.

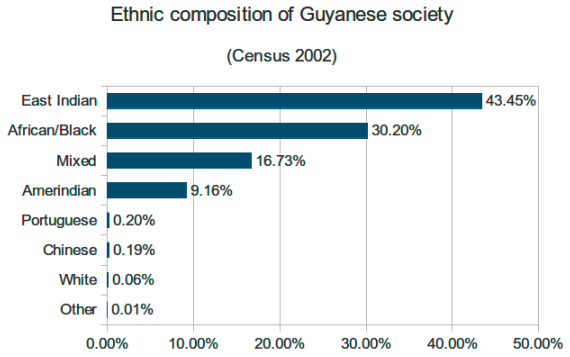
Guyanese society has an unusual age structure with high proportions of young and older people; linked to a long period of out-migration by a significant number of working-age individuals. The net migration rate counts around -13.5 migrants/1,000 people in 2013, with the trends illustrated in the graph below:



Graph 6: Arrivals and departures per year. Source: GBS, Immigration Department, Guyana Police Force and Cheddi Jagan International Airport .

The estimated proportion of immigrants was 1.8% in 2013, 45.6% of those being women, according to the United Nations Department of Economic and Social Affairs.

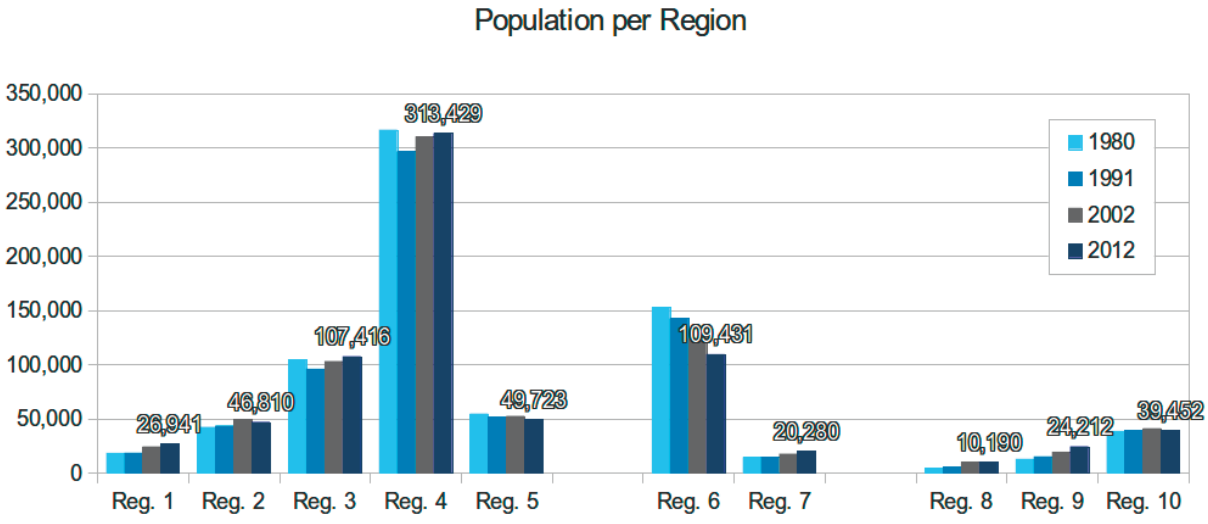
Due to its historical past, with episodes of colonialism, slavery and indentured labour, Guyana has an ethnically diverse society. The institutionalized ethnicity categories, as expressed in the Census forms, are: African/Black, Amerindian, East Indian, Chinese, Mixed, Portuguese, White and Other.



Graph 8: Ethnic composition of Guyanese society (Census 2002). Source: GBS.

There are nine Amerindian peoples: Wai Wais, Macushis, Patamonas, Arawaks/Lokonas, Caribs, Wapishanas, Arekunas, Akawaios and Warraus. Each group has their own language.

According to the Census 2002, Amerindians are the main group in regions 1, 7, 8, and 9, and African/Black citizens form the majority in Regions 4 and 10. In the rest of the regions East Indian is the prevalent ethnicity. Regions with a mixed population of over 20% are Regions 1, 2, 7 and 10.



Graph 7: Population per region. Figures from Census 2012 labeled. Source: GBS, 2014.

The religions and spiritual movements with a significant presence in the country (Census 2002) are: Hinduism (28%), Pentecostalism (17%), Catholicism (8%), Anglicanism (7%), Islam (7%), Seventh Day Adventist Church (5%), Methodism (2%), Jehovah Witness (1%), Rastafari (0.5%) and Bahai (0.1%).

According to the Census 2012, the number of households is 210,124, representing an increase of 40% since 1980, or 15% since 2002. In fact, in the period 2002-2012 16,143 new mortgages were subscribed (value GYD 110.2 Billion), while 10,801 mortgages were canceled (value GYD 52.4 Billion).

Household size 2012 (persons/household)	
Reg. 1	5.5
Reg. 2	3.9
Reg. 3	3.4
Reg. 4	3.4
Reg. 5	3.6
Reg. 6	3.5
Reg. 7	4.0
Reg. 8	4.3
Reg. 9	4.9
Reg. 10	3.7
Guyana	3.6

Table 9: Household size 2012. Source: GBS, 2014.

This circumstance, coupled with the overall decline in population, has decreased the average household size in every region. While in 1980 the average household size in Guyana was 5.1 persons/household, in 2002 it was 4.1 persons/household and in 2012 was 3.6 persons/household. This trend is consistent with the growth of housing development. For instance, the total number of buildings in 2012 was 219,509, 16.9% more than in 2002, and the number of dwellings was 221,741, 8.1% more than in 2002. Occupation rate was 97.0% in 2012, as compared with 91.2% of occupied dwellings in 2002.

The Government policy of making land available for home construction as well as the increase in development of both government and private housing schemes is seen as the main reason for this growth. The decrease in the household size also indicates a shift in the structure of the Guyanese family setting from that of a traditional extended family type to something more like a nuclear family type, particularly in the urban areas.

The hinterland regions and Region 1 have rates of above 4 persons/household. These regions are predominantly inhabited by indigenous population who have historically recorded a higher household size relative to the rest of the country.

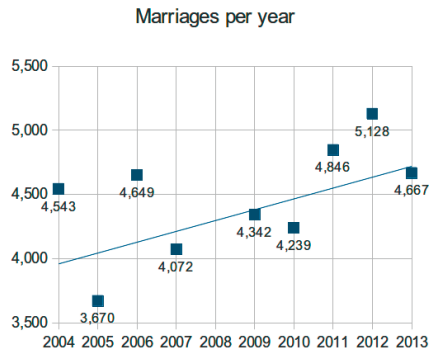
In terms of vulnerability of housing, the Economic Commission for Latin America and the Caribbean (ECLAC) indicates that traditionally only persons in the high income bracket have been able to afford secure housing in Guyana, especially those in Georgetown. In Administrative Regions 3 to 5, approximately 33% of the houses in each region were built before 1970 and have not been not properly maintained, especially among low income communities. This increases their vulnerability to flooding.

One traditional mitigation measure with regards to flooding is the construction of houses on stilts about 3 to 4 metres above ground level. The raising of yards is another mechanism to avoid flooding but it exacerbates the run-off flow into the drainage system. A recent practice is to convert the ground floor of houses built on stilts for rental accommodation and to concrete the yard. This practices decrease percolation of rainfall into the ground and increases the physical exposure of belongings in case of flood (Leung, 2002).

In Guyana, 60% of all houses are constructed from wood (especially the outer walls) while other building materials used in conjunction with wood are concrete, stone, clay brick and adobe. In Region 4, 55% of the outer walls of houses are constructed from wood, compared to 80% of outer walls in Regions 5 and 6. Along the coast, 90% of all housing is constructed from sheet metal, namely zinc, aluminum and galvanized steel, and these materials are more regularly used in Regions 3, 4, 5 and 6 with an average use of 98%.

The Government of Guyana has been actively involved in promoting access to land and housing schemes at an affordable price, as well as in tackling squatting.

The crude marriage rate is increasing, from 5.2 marriages per 1,000 persons in 2009 up to 6.3 in 2013[17].

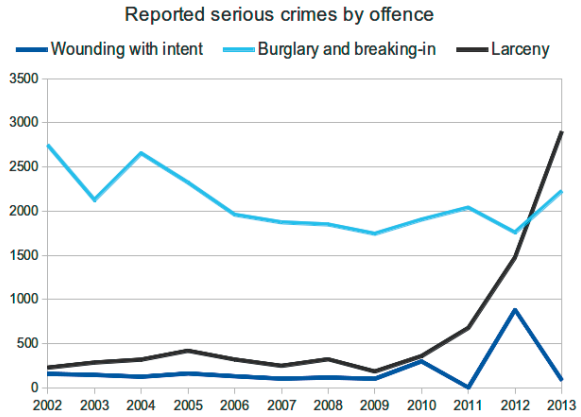


Graph 9: Marriages per year. Source: GBS and General Registrar Office.

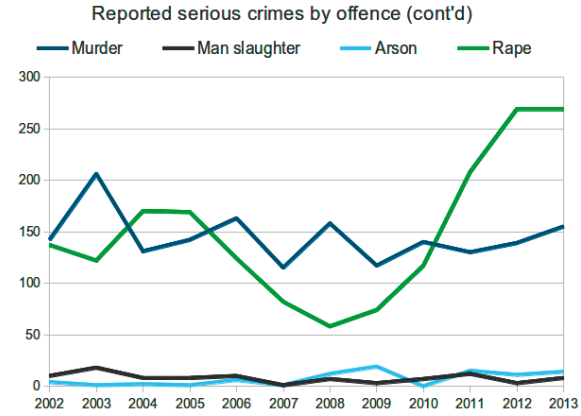
17 *Fourth Quarter 2013 Recent Stats Bulletin*, GBS, 2014.

http://www.statisticsguyana.gov.gy/download.php?file=7

The Criminal Investigation Department keeps track of reported serious crimes by offenses. The most prevalent are Larceny, Burglary and Breaking-in offences, and Wounding with intent. In recent years the number of reported cases of Larceny and Rape has increased. The number of estimated total small arms, and firearms owned by civilians is 110,000, half of them being illegal (Karp, 2009).



Graph 10: Reported serious crimes by offence, 2002-2013. Source: GBS, and Criminal Investigation Department 2014.



Graph 11: Reported serious crimes by offence (cont'd), 2002-2013. Source: GBS, and Criminal Investigation Department 2014.

7.8. Health

Some Communicable Diseases still present formidable challenges to the health status of the population, but Non Communicable Diseases are progressively accounting for the highest burden of mortality and morbidity.

Guyana has a fertility rate of 2.32, which is slightly lower than the regional average. The contraceptive prevalence rate is 42.5% (2009 Demographic and Health Survey). The Guyana Bureau of Statistics (GBS) reports that maternal mortality was 86 per 100,000 births in 2008, which is far below the regional average of 169.

In Guyana, life expectancy rates over the past decade have seen remarkable improvements., reaching 70 years life expectancy at birth.

The infant mortality (< 1 year) rate decreased from 34.9 per 1,000 live births in 1995 to 12.9 per 1,000 live births in 2013. 8.9% of total live births are low birth-weight babies (<2,500 g). 96% of births are attended by trained health personnel (GBS and MOH, 2008).

Typical causes of death in children under 5 years are prematurity, birth asphyxia, malaria, congenital anomalies, injuries, neonatal sepsis, acute respiratory infections, diarrhoea, and HIV/AIDS. Malnutrition in children under 5 years has decreased from 5.7% to 2.2% in the period 2009-2013. Immunization coverage against Measles, Polio, Tuberculosis and the Pentavalent (diphtheria, pertussis, tetanus, hepatitis B, and Hib disease) in children under 1 year is above 97%.

The total per capital expenditure on health has been steadily increasing in past years. However, the health workforce remains small, counting only 9.5 physicians and 15.3 nurses per 10,000 people. Significant differences in human resources exist among regions; for instance in 2010 the number of doctors and medexes[18] in Regions 1, 7, 8, and 9 was 21, while for the rest of the Regions combined it was 217 (MOH, Human Resources Department 2010). However, a proportionally higher presence of health posts and health centres per capita are found in the hinterland regions.

High blood pressure in adults is common (30%). Females present a higher prevalence of obesity: 27%, versus 8% in males. Males have higher tobacco use: 27%, as opposed to 6% in the case of females, and males consume more alcohol on average.

18 A *medex* or medical extensor is a category of health workers who fill the gap between a certified doctor and a nurse to provide primary health care, particularly to residents of rural, Amerindian and other hinterland communities.

The prevalence of overweight children under 5 years old has increased from 2.3% to 7.6 % in the period 2009-2013 (GBS).

HIV/AIDS, tuberculosis, and malaria continue to pose challenges to the health system in Guyana .

Guyana has attained universal access to HIV/AIDS medication and has made tremendous efforts in setting in place country-wide programmes to provide service, and counseling and to raise awareness in all regions. However, the prevalence remains high when compared to the Caribbean region. A survey conducted in 2005 identified a significantly high prevalence among commercial sex workers, STI patients, and men who have sex with other men in the capital city, as well as among prisoners.

Over the last ten years, tuberculosis rates have increased almost three-fold in Guyana. This increase is observed mainly among young adults in the most populated regions of the country and mirrors closely the patterns seen for HIV and AIDS. The current incidence of tuberculosis is 80 cases per 100,000 persons, about twice that of Latin America and the Caribbean (LAC). Furthermore, 31% of tuberculosis (TB) patients are HIV positive (2012, World Health Organization, WHO). This has lead to a focus on fostering collaboration with the National HIV and AIDS Control Program to reduce illness and death associated with TB/HIV co-infection.

Malaria is endemic in the interior regions (1 Barima - Waini, 7 Cuyuni - Mazaruni, 8 Potaro - Siparuni, and 9 Upper Takutu - Upper Essequibo) of Guyana. The migrant populations, primarily miners, and Amerindians are the most affected groups. This condition seems to affect many more males than females at a ratio of almost 4:1. Over the last few years, there has been a significant reduction in the total number of cases. In 2013 there were 23,489 cases, against 31,602 for the previous year. Additionally there has been a marked decrease in the number of malaria-related mortality. The malaria surveillance system has been decentralized to the endemic regions.

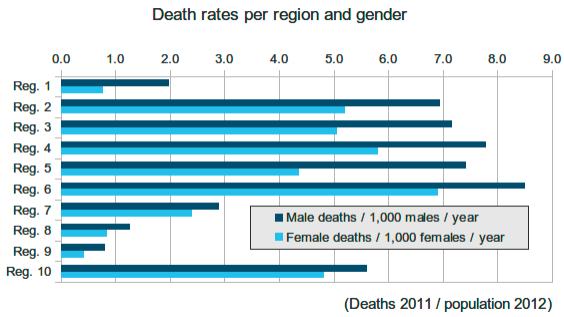
Dengue is another vector-borne disease that is endemic to Guyana, with most of the cases diagnosed in the coastal areas. So far, there have been no reported deaths from dengue haemorrhagic fever. The main control methods used are entomological surveillance to monitor larval and adult vector population in order to maintain adult Aedes aegypti population at a level below which the dengue virus could be transmitted.

In 2014 Chikungunya virus cases were been reported. The Government sprayed pesticides to control the vector. So far, samples have been sent to the Caribbean Public Health Agency (CARPHA) in Trinidad and Tobago for analysis.

Filariasis is endemic to Guyana's coastal belt. The Ministry of Health has tackled the problem with a national programme based on the introduction of diethylcarbamazine-fortified salt and albendazole.

Death rates are highly variable across the regions and very dependent on gender. The highest death rates occur in Regions 2 Pomeroon - Supenaam, 3 Essequibo Islands - West Demerara, 4 Demerara - Mahaica, 5 Mahaica - Berbice, 6 East Berbice - Corentyne, and 10 Upper Demerara - Berbice, with more than 4 deaths per 1,000 males and more than 4 deaths per 1,000 females in the year 2011. In all regions, mortality is higher among men than among women. This can be explained by the fact that the above-mentioned regions have more geriatric wards, health centres, and district, regional, national and specialist hospitals, and therefore patients might be transferred from their original region to these ones.

For the whole country, the crude death rate is decreasing, from 7.0 deaths per 1,000 in the year 2009 to 6.6 in 2013.



Graph 12: Death rates per region and gender. Death figures from 2011 and Population of regions Census 2012. Source: GBS, GRO (Ministry of Home Affairs).

In the period 2005-2008, according to the Ministry of Health, the main causes of death were as follows:

1. Unknown cause (50%).
2. Violence, including homicide (10%).
3. Heart disease, including Ischaemic heart disease (7%).
4. Cerebrovascular Disease (5%).
5. Diabetes Mellitus (4%), with higher mortality among females (5%).
6. Accident (3%), with higher mortality among males (5%).
7. HIV / AIDS (3%).
8. Hypertensive Diseases (2%) with higher mortality among females (3%).
9. Conditions Originating in Perinatal Period (2%).
10. Symptoms, Signs & ill-defined Conditions (2%).

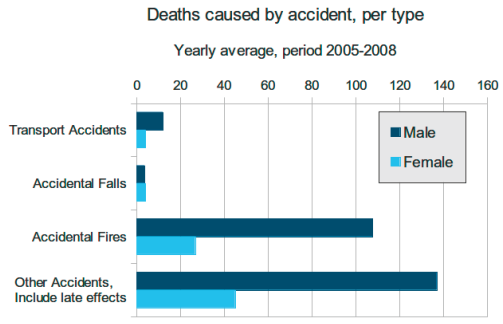
Among men, Cirrhosis & Other Chronic Diseases of the Liver (2%) is also a substantial cause of death, whereas for women Pneumonia & Influenza caused 2% of the deaths in this period.

In the period 2005-2008 an increase of deaths caused by Hypertensive Diseases and Heart diseases was observed. On the other hand, the following causes of death decreased substantially:

1. HIV / AIDS.
2. Conditions Originating in Perinatal Period.
3. Cirrhosis and Other Chronic Diseases of the Liver, among men.
4. Suicide and Self-inflicted injury.
5. Tuberculosis, among women.
6. Enteritis/Other Diarrhoeal Diseases.
7. Malignant Trachea, Bronchus & Lungs.

Incidence of mental health disorders remain high, schizophrenia being the most commonly diagnosed mental illness. The suicide rates were recently reported to be the highest in the world.

The incidence of accidents as a cause of death is significantly higher among men than among women, and specifically accidental fires cause four times more deaths among men. As some have suggested, this might be linked to men having a lower perception of risk, to the division of labour, and in the case of traffic accidents to alcohol consumption. Alcohol consumption in individuals over 15 years of age is 4.7 litres of pure alcohol per capita per year in the case of females, and 11.7 litres for males.



Graph 13: Death caused by accidents, per type in the period 2005-2008. Source: GBS.

The number of transport accidents has not increased significantly with time, even though in the period 2005-2008 an average of 9,403 new motor vehicles were registered. This trend in registration went up in 2013 to an average above 15,000 new vehicles registered per year.

With regard to chemical hazards, a study done by Lowe in 2006 revealed the uptake and accumulation of mercury in residents of mining areas, who depend principally on fish as their main source of protein. A more comprehensive assessment is needed, since industry practices are becoming more environmentally friendly.

While there have been undoubted advances in the network of health services on the coastal areas, access to health care is challenging in the more remote regions of the country. Communications with those areas is challenging, and therefore, delivery and monitoring of health services is problematic.

7.9. Economy and Industry

The national economy has been experiencing sustained growth over the last decade. Guyana's Gross Domestic Product (GDP) per capita in 2012 was US$ 3,148. Annual growth was determined to be 2.3% and inflation 3.5%. Over the past years inflation has been under control.

External debt has been reduced significantly but it is still sizable (US$ 1.2 billion, as of June 2013 Ministry of Finance). Moreover, there is urgent need for expanded public investment.

The national economy is based mainly on agriculture (sugar and rice accounted for 25% of GDP in 2012) and extractive industries (35% GDP in 2012), and depends on the global commodity prices of sugar, gold, bauxite, shrimp, timber, and rice. These sectors are also highly vulnerable to climatic and weather conditions.

Approximately one fifth (i.e. 103,460 hectares) of current arable lands are subject to the mono-cultural cultivation of rice and sugar. The areas used for these cultivations has not changed significantly in the past century in the case of rice and in the past three centuries in the case of sugar. It has been suggested that these soils may suffer from nutrients depletion, increasing the need for intensive use of fertilizers.

Rice production has almost doubled in the period 2002-2013, increasing from 443,000 tonnes of harvested paddy to 823,800 tonnes yearly, with only a 53% increase in the harvested area. The exported value in 2013 was GYD 49,104 M (around USD 240 M).

On the other hand, sugar production has progressively decreased, from 302,400 tonnes in 2003 to 152,500 tonnes in 2013, and its contribution to the GDP has decreased from 15% to 4.1%. Rum manufacturing has decreased from 12 million litres to 4.1 million litres in the same period.

Most of the industries found in Guyana are located on the coast, mainly due to the proximity of the

transport system and raw materials.

Since 2005, between 1.5 and 2.2 million tonnes of bauxite have been produced yearly, whereas gold production has increased from 8.33 tonnes to 14.96 tonnes. Extractions from small-scale gold mining account for a significant part of total mining products.

In terms of exports, the value of exports from mining and quarrying increased from US$ 375 M in 2009 to US$ 447 M in 2010 comprising 50.2% of total exports. Gold comprises most of the export value at US$ 346 M followed by Bauxite at US$ 94 M and Diamonds at US$7 M. Quarry stone and sand represent negligible amounts. The increase in the overall value of mineral production and exports is due to the high gold and bauxite prices (gold exports by volume actually fell by 3% and bauxite exports by 20%) and the increased production of quarry stone and sand.

Marine fisheries constitute an important economic sector, providing export earnings, employment, and incomes.

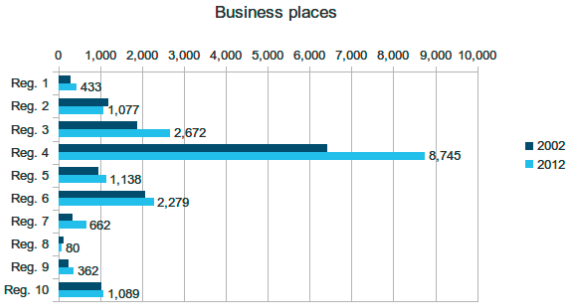
Structural problems are related to the shortage of highly skilled labour, high transportation costs and limited infrastructure and energy production. The Government of Guyana is actively involved in ameliorating the transportation network and in diversifying energy sources.

Female comprise a little over one-half of the total population, and 50.4% of the working population. While 22% of male working-age population is not engaged in any type of income generating activity, for females this figure reaches 66%. Disparities in employment also exist between the rural and urban areas.

The levels of unemployment and under-employment, coupled with the high cost of living relative to paid salaries causes socio-economic challenges. Food prices have been increasing steadily.

The Multidimensional Poverty Index (MPI)[19] figures for Guyana (2009) showed that 7.7 % of the population lives in multidimensional poverty (i.e. a 7.7% of the population is deprived of at least one third of the weighted indicators considered by the MPI). An additional 12.3% of the population is vulnerable to multiple deprivations.

More than one million Guyanese people are believed to reside overseas. Some of them contribute to the Guyanese economy through remittances (an estimated USD 493 million in 2013, World Bank).



Graph 14: Businesses places 2002, 2012. Source: GBS, 2014.

Data from the Census 2012 indicates a noticeable increase of 26.4% in places of business over the past 10 years (Graph 14). Only in Regions 8 Potaro - Siparuni and 2 Pomeroon - Supenaam the number of places of business has decreased.

7.10. Poverty and unemployment

The Gross National Income per capita (2011) is PPP$ 6,341, 54% lower than the average in Latin America and the Caribbean, and 33% lower than the average in Small Islands Developing States.

The public sector minimum wage has been increasing in the past years at a rate higher than the rate of inflation, from GYD 31,626 in 2009 to GYD 50,000 in 2013. In 2013 there were 28,997 public workers. The national minimum wage is GYD 35,000.

As of 2006, the proportion of the population estimated to be below the moderate poverty line is 36%, with 19% below the extreme poverty line. Nonetheless there are remarkable differences among the various regions (Poverty Reduction Strategy Paper, PRSP 2011-2015). The urban population has a poverty rate about half that of the national average, whereas in the rural interior regions, where Amerindians are concentrated, three out of four people live in poverty. While 33.7% of young people aged 16-25 lived in poverty in 2006, the figure for people aged 41 and above was 24%. Almost half of all children aged 16 and below were living in poverty (47.5%). This group also represents more than a third of the population. The inequality in income estimated by UNDP[20] is 24.4%.

19 Oxford Poverty and Human Development Initiative (2014) Global Multidimensional Poverty Index Databank. OPHI, University of Oxford.
http://www.dataforall.org/dashboard/ophi/index.php/

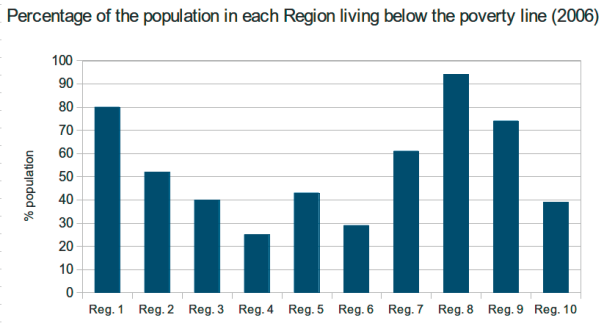
20 Based on data from household surveys estimated using the Atkinson inequality index.
http://hdr.undp.org/en/content/table-3-inequality-adjusted-human-development-index

However, as indicated in the PRSP 2011-2015, this disaggregation of data uses the same consumption basket for both the urban and rural areas, and should therefore be treated with caution. Typically cash crops at the household level and other means of subsistence such as hunting might be in place, decreasing reliance on the purchase of final products.

In 2006, the labour force had a participation of 81% of the total males and 35% of the total females in the country. Of that labour force, 9.18% of the men and 13.95% of the women were unemployed. No figures on the informal work performed by women, and the contribution to the general economy through reproductive work (i.e. the work done to care for, nurture and sustain human beings) are available, but the 2009 Demographic and Health Survey stated that in the lowest wealth quintile the proportion of persons not having worked in the last 12 months was 68% for women, and 9% for men, whereas in the highest wealth quintile proportions were 48.9% and 14.9% respectively. The main occupations for the lowest quintile are agriculture (27.2%) and domestic service (13.6%) for women, and skilled manual labour (34.6%) and agriculture (28.7%) in the case of men. Seasonal and occasional work was the norm for 17.1% of women who had worked in the previous 12 months. Child (5-14 years) labour is estimated to be at 16.4%.

The UNDP Gender Inequality Index is 0.524. However, the 2011 MDG Report states that the poverty assessment of 2006 highlights that there are no gender differentials related to poverty. It also indicates that youngsters (16-25) face higher poverty rates than people aged 41 and above.

The unemployment rate was 10.7% in 2006, and the Government is actively tackling this problem with a number of programmes to increase the number of available jobs and to empower job-seekers through training and other means.



Graph 15: Percentage of the population in each Region living below poverty line (2006). Source: MDG Report 2011, based on Household Budget Survey data 2006 (BOS).

Nevertheless, poverty is understood as the interaction of various factors, and its estimation cannot only be based on income. UNDP has developed a multi-dimensional poverty index, taking into account indicators of health, education and living standards.

In Guyana it is estimated that 7.83% of the population is living in multi-dimensional poverty, suffering from deprivation in almost 40% of indicators considered by the MPI, on average. 1.36% of the total population is homeless.

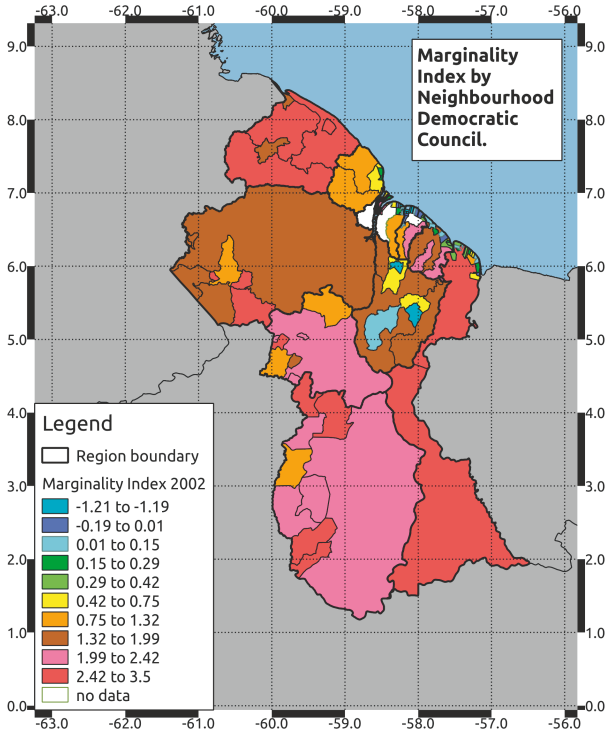


Image 9: Distribution of the Marginality Index by NDC Map, based on Census 2002 data. Source: GBS and World Bank.

The World Bank elaborated a Marginality Index[21] based on selected data form the Census 2002, capturing:

1. Proportion of adults without primary education completed.

2. Proportion of adults working in the primary sector.

3. Proportion of children not attending school full time.

4. Proportion of dwellings without piped water as their main water source.

5. Proportion of dwellings without WCs linked to the sewer system.

21 Poverty indicators, GBS

http://www.statisticsguyana.gov.gy/pubs.html#povertyind

6. Proportion of dwellings without electricity as the main source of lighting.

7. Proportion of dwellings not having collection service, compost or burying as the main garbage disposal method.

8. Average number of family members per bedroom

Guyana adopted its first Poverty Reduction Strategy Paper in 2001 to improve the economic and regulatory framework to create economic opportunities, especially for the poor, and to generate sustained growth. Currently, the main tools for addressing poverty reduction are the PRSP 2011-2015, the Low Carbon Development Strategy and the National Competitiveness Strategy. The World Bank supports Guyana in improving infrastructure and the quality of health, education and water and sanitation services. UNDP is also working to improve the economic status of the most vulnerable groups and to establish community livelihood projects.

7.11. Most vulnerable groups

Guyana has a young population. According to estimates from the Guyana Bureau of Statistics (Population projections Guyana 2005-2015, November 2006, GBS), under a low variation scenario, by 2015 almost 50% of the population will be under 30 years old, 31% under 20 years old, and 22% under 15 years old. People over 45 years old will constitute 31% of the population.

The 2011 Millennium Development Goals (MDG) Progress Report confirmed that the country has made a significant progress towards the realization of children and women's rights, and has prioritized the enhancement of equity by driving the achievement of goals in hinterland and rural areas. Children make up 55% of the hinterland population and about 45% of those in rural areas.

The MDG target on child malnutrition has been achieved, but there are some disparities across regions. The proportion of underweight children under the age of five is almost 12% in both hinterlands and rural areas, as compared to less than 7% for urban areas along the coast. Nearly 13% of children are stunted in the interior, compared to only 3.3% in coastal areas.

Guyana is on track to achieve universal primary education. Areas of improvement are the quality of education, school attendance, enrollment in Early Child Development programmes, and the availability of trained teachers, especially in the hinterland areas.

In secondary education disparities linked to poverty are found, with net enrolment for children in the poorest quintile at 54% compared to 85% in the richest (Guyana Multiple Indicator Cluster Survey[22] 2006).

The Government is highly involved in tackling child abuse and violence against children, and in expanding the legal and institutional framework for the care and protection of children. Corporal punishment in homes and schools remains a controversial topic with a relatively high adherence rate.

The situation with HIV/AIDS among children has improved remarkably in the past few years. Deaths related to HIV/AIDS among children have reduced from 7.1% in 2001 to 1.9% in 2008 thanks to an intense programme to prevent mother-to-child transmission.

Women play a significant role in Guyanese society, contributing to the economy, participating in Parliament and filling senior positions in the public sector. Enrollment in secondary and tertiary education is higher among women than among men, and women outperformed Guyanese men in regional examinations. However, disparities in participation in the labour market persist as a result of unequal power relationships.

The Ministry of Human Services and Social Security has been working assiduously to raise the awareness of the Guyanese population with regard to sexual abuse and violence against women. Progress is likely to be evident in the mid and long term.

There is also a noticeable tendency to leave women with the primary responsibility of care for children. 56% of children under the age of 18 live with both parents, 27% live with their mothers but not with their fathers; 3% live with their fathers but not with their mothers; and 12% live with neither of their natural parents. The proportion of children living with both parents decreases with age, and is also lower in urban areas.

However, these indicators do not capture contributions to the upbringing or welfare of children made by "absent fathers", social support networks, and extended family. Further sociological or anthropological studies would be needed to assess these contributions.

Little data is available on sex workers in Guyana. It is reported that they suffer various forms of discrimination, and have a higher prevalence of HIV than the rest of the population.

Human trafficking affects children, Guyanese women and foreign women in particular, and normally involves forced labour or forced

22 http://www.statisticsguyana.gov.gy/pubs.html

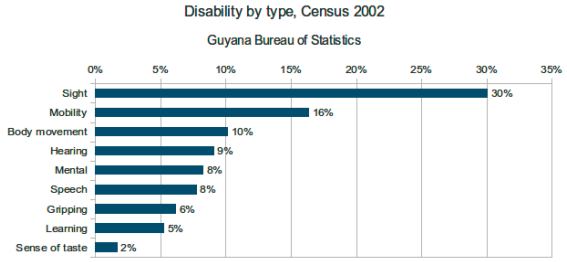
prostitution. The Ministry of Human Services has distributed anti-trafficking awareness materials throughout the country, and the Combating Trafficking of Persons Act (2005) prohibits all forms of trafficking and establishes penalties ranging from three years' to life imprisonment.

Substantial progress has been achieved in terms of poverty reduction. The Household Income and Expenditure Survey found that 13% of the population is living in absolute poverty and concluded that the minimum personal living standard is out of reach for at least 31% of Guyanese people. It is believed that Amerindians, the predominant population group throughout most of the country's interior, is also the poorest social sector group.

The interior of the country faces difficulties with staff shortages, and in transportation, difficult terrain, amongst other issues, which increases the vulnerability of its population to various threats. Furthermore, mining communities in the interior are characterized by rapid population growth, increasing vulnerability factors in the areas of land use, housing standards, and environmental health.

Populations affected with HIV/AIDS normally present a higher vulnerability to certain epidemics and have some special needs in the case of emergencies or disasters, such as requiring a higher daily water intake and having a higher demand for health services.

The Census 2002 indicated that 6.2% of the population is living with disabilities. Guyanese society faces challenges in ensuring access to education, employment, health services and recreation to those persons. Of the disabled population 51% are women. In over 50% of the cases, either sight, mobility, or hearing are affected.



Graph 16: Type of disability among people living with disability. Source: Census 2002, GBS.

However, the Director of Rehabilitation Services has recognized hat the Census 2002 did not take certain categories of disabled people into consideration. The number of people with disabilities is projected to be some 200,000 and this figure includes those who are institutionalized, living on the streets and those who are temporarily disabled. Prevalence of disability has grown, mainly as a consequence of motor vehicle accidents, mental health, violence in the community and the rise of chronic health conditions.[23]

The Census 2012 forms include more detailed information on conditions surrounding disability, such as severity of the difficulty/problem, medical diagnosis, acquisition of the disability, effects on social development, and sources of support. The data is expected to be released by the end of 2015.

The National Commission on Disabilities is the advisory group established by the Constitution which advocates for the fulfillment of rights through policy changes at all levels and raises awareness amongst the general public. It also conducts surveys and drives, and is implementing a register of persons living with disabilities to better advocate for their rights and provide support.

23 http://www.stabroeknews.com/2014/news/stories/11/06/number-people-disabilities -pegged-200000-year/

8. Legal, Normative and Institutional Framework

8.1. Legal and Normative Framework

8.1.1. Development framework

The Constitution of Guyana[24] recognizes the right of every citizen to proper housing accommodation, free medical attention and also to social care in case of old age and disability. Every citizen has a duty to participate in activities designed to improve the environment and protect the health of the nation. The State is obligated to protect and make rational use of its land, mineral and water resources, as well as its fauna and flora, and to take all appropriate measures to conserve and improve the environment.

It is the duty of local democratic organs to maintain and protect public property, improve working and living conditions, promote the social and cultural life of the people, raise the level of civic consciousness, preserve law and order, consolidate the rule of law and safeguard the rights of citizens.

The Declaration of Turkeyen[25] 2007 highlights Guyana's commitment to addressing vulnerability through disaster prevention and response. The Declaration in Clause 11 additionally emphasizes Guyana's commitment to the Hyogo Framework for Action.

Guyana's development priorities are outlined in the National Development Strategy (NDS), the National Competitiveness Strategy (NCS), the Poverty Reduction Strategy Paper (PRSP), and the Low Carbon Development Strategy (LCDS).

The NDS[26] was prepared in the late 1990s, and was initially designed to cover the time period 2000 to 2010, with the following objectives: 1. attainment of economic growth, 2. poverty alleviation, 3. attainment of geographical unity, 4. equitable geographic distribution of economic activity, and 5. diversification of the economy.

In order to support the achievement of the NDS, the NCS[27] was launched by Guyana in 2006, to encourage new strategies for economic growth and to increase Guyana's ability to compete both regionally and sub-regionally. The NCS contained three major areas of focus: core policies, sector policies and policies targeting strategic sectors of the economy.

In terms of its influence on Disaster Risk Management and underlying factors of vulnerability, the contributions of the NCS are:

1. General strategies aimed at achieving economic growth, including among the SME sector.
2. Enhancement of human resources and training to decrease the levels of unemployment.
3. Improvement of infrastructure: transport (roads, water, and air), telecommunications and energy.
4. Modernization of the land and property markets, and enhancement of land use planning.
5. Diversification of the economy. Increased competitiveness of traditional sugar, rice, forestry (logging) and mining activities and progressive move to key opportunities such as non-traditional agriculture, fisheries, manufacturing, tourism, and information technology.

Many of the policy areas identified in the NCS are still priorities for the country.

During the late 1990s and early 2000s, the first complete Poverty Reduction Strategy Paper (PRSP)[28] for Guyana was prepared for the time period 2001 to 2006. It highlights the vulnerability of Guyana to disaster risks, and particularly natural disasters, due to the geo-topography of Guyana. Furthermore, it describes the following specific development priorities for Guyana, most of which are still relevant:

1. Support for economic policies to stimulate growth.
2. Promotion of good governance and restoration of confidence in the business environment.
3. Investment in human capital, including improvement of education and health services.

24 *Constitution*, Chapter 1:01.
http://www.oas.org/juridico/spanish/mesicic2_guy_constitution.pdf

25 *Declaration of Turkeyen*
http://www.minfor.gov.gy/tsite/images/minfor_docs/rio_group/2007/decl_turkeyen.pdf

26 NDS Home Page. http://www.guyana.org/NDS/NDS.htm

27 NCS
http://www.finance.gov.gy/images/Docs/Government%20Documents/Policy%20Documents/NCS.pdf

28 PRSP 2001-2006
http://www.finance.gov.gy/images/Docs/Government%20Documents/Policy%20Documents/PRSP.pdf

4. Support improvements in infrastructure services, including water systems, sewage/ sanitation and housing.

5. Design of a social safety net strategy to support the poor and vulnerable directly in times of need.

6. Major infrastructure development, including improving the maintenance, quality and coverage of sea defences, roads and drainage/ irrigation schemes, and rural electrification.

The PRSP paid special attention to regions with high poverty rates and social vulnerabilities.

A high level of progress was made towards attaining key targets of the PRSP, although it was acknowledged that detailed operational plans to effectively implement all aspects were missing in some instances. Therefore, in July 2011, the new PRSP for the period 2011-2015[29] was approved. It builds on the reforms that were not completed, incorporating many of the recommendations that arose from public and thematic consultations. The PRSP 2011-2015 rests on the following pillars:

1. Broad-based, low-carbon led jobs creation for economic growth.

2. Stronger governance institutional, and regulatory structures.

3. Accelerated investment in human capital, with emphasis on primary education and basic health care.

4. Accelerated investment in physical infrastructure in support of growth strategy.

5. Special intervention programmes to address regional and demographic pockets of poverty.

In the PRSP 2011-2015, DRM and the mainstreaming of environmental sustainability are treated as cross-cutting issues.

Guyana's Low Carbon Development Strategy[30] (LCDS) was developed in the period 2008 to 2010, and updated in March 2013. The LCDS is an innovative approach to forge a low-carbon economy for the next decade. It is based on the commitment to protecting Guyana's forests from unsustainable uses in the long-term, by setting up an innovative REDD+ mechanism of international payments for ecological services, and use these payments to re-orient the economy towards a low carbon, environmentally-sound trajectory. The LCDS also emphasizes the link between climate change and flooding, urging for adaptation measures with a focus on flood management. In 2009, the Governments of Guyana and Norway signed an agreement in which Norway committed to providing substantial resources in support of the LCDS.

The Economic Value to the Nation (EVN) of this agreement is estimated to be equivalent to an annual payment of US$580 million., with an Economic Value to the World (EVW) provided by Guyana's forests of US$40 billion to the global economy each year.

In order to re-align its economy, Guyana is making use of the REDD+ payments in the following ways:

1. Investment in strategic low carbon economic infrastructures, such as: a hydro-electric plant at Amaila Falls; improved access to arable, non-forested land; and improved fibre-optic bandwidth to facilitate the development of low-carbon business activities.

2. Nurturing investment in high-potential low-carbon sectors, such as fruits and vegetables, aquaculture, business process outsourcing and ecotourism.

3. Reforming existing forest-dependent sectors, including forestry and mining, where necessary, so that these sectors can operate at the standards necessary to ensure the sustainable protection of Guyana's forests.

4. Expanding access to services, and creating new economic opportunities for Amerindian communities through improved social services (including health and education), low-carbon energy sources, clean water, and employment which does does not threaten the forest.

5. Improving services to the broader Guyana citizenry, including improving and expanding job prospects, promoting private sector entrepreneurship, and improving social services with a particular focus on health and education.

Furthermore, the LCDS recognizes the urgent necessity of implementing Climate Change Adaptation and Risk Reduction Measures. The areas identified for immediate intervention are:

1. Upgrading infrastructure and assets to protect against flooding through urgent, near-term measures (US$225 million).

2. Hinterland Adaptation Measures (US$10 million).

3. Addressing systematic and behavioural concerns (US$33 million).

4. Developing innovative financial risk management and insurance measures to improve resilience (US$10 million).

29 PRSP 2011-2015

http://eeas.europa.eu/delegations/guyana/documents/eu_guyana/prsplaugust2011_en.pdf

30 LCDS website http://www.lcds.gov.gy/

5. Switching to flood resistant crops (US$10 million).

The LCDS outlined the following priorities specifically targeting Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA):

1. Upgrading infrastructure and assets to protect against flooding through urgent, near-term measures. This initiative includes maintaining and upgrading the intricate drainage and irrigation system of Guyana and entails the construction and rehabilitation of sluices, kokers, revetments and embankments. It also requires empoldering as well as the continuous dredging and de-silting of Guyana's major rivers and creeks. Smaller but crucial rivers that protect major farming areas from flooding, such as the Mahaica, Mahaicony and Abary are also considered under this initiative. In addition, the ocean sea wall which protects most of the low-lying coastal areas from the Atlantic would be reinforced. Groynes to reduce siltation of outfalls will be constructed and additional drainage pumps will be installed in strategic locations across the coastline. The East Demerara Water Conservancy (EDWC) and other conservancies will be upgraded and strengthened.

2. Hinterland Adaptation Measures. These initiatives include the development, reproduction and distribution of plant varieties and crop management techniques that are suitable for the Hinterland communities, thereby ensuring the sustainability and further development of their livelihoods. In addition, all-weather roads and bridges which are crucial for the transport of agricultural inputs to markets will be constructed. Training and educational programmes and the introduction of additional drainage and irrigation equipment in particularly vulnerable areas will need to be provided in order to improve the capacity of hinterland communities to prepare for and deal with the impacts of more extreme weather events. Solar and wind power for water distribution, facilities for rain water harvesting, and the creation of systems that will guarantee access to safe drinking water during crisis situations will also be pursued under this initiative. Environmental impacts from climate change will also need to be incorporated into building designs, particularly for clay, sandy and loam areas.

3. Addressing systematic and behavioural concerns. These initiatives include significantly revamping Guyana's early warning system and improving the timely and accurate of collection and dissemination of data and information on weather related events and their impacts on the ground. In addition, an emergency response system will need to be set up that will minimize the risks to public health, ensure that crucial civil structures such as the major infrastructure, safe drinking water systems and electricity and communications networks are maintained in a functioning state. Training and education campaigns of the wider population will also be provided.

4. Developing innovative financial risk management and insurance measures to improve resilience. These initiatives will include the conceptualization and introduction of instruments suitable in the Guyana context, that will aim to introduce incentives to avoid and reduce all possible sources of risk ex ante while aiming to transfer risks that are outside of the control of individuals and firms to third parties, which will compensate the insured in the event of an extreme event ex-post. Significant investments will need to be channelled towards training, data collection and transmission systems, particularly in relation to vital weather and hydrological information.

5. Switching to flood resistant crops. These initiatives will include the funding of research to identify flood resistant crops that are applicable to Guyana, the creation of flood-proof germplasm banks and the introduction of new technology that allows for cultivation of crops during prolonged flood conditions.

The LCDS is also aimed at improving community-based risk and vulnerability assessments, developing of national and community-level natural disaster plans, building capacity to implement plans and effective use early warning systems, and increasing information, coordination and communication capacities.

It must be noted that Amerindian communities are not obligated to participate in the initiative from the outset, but may also choose to opt into the REDD+ mechanism at any point over the coming years.

8.1.2. Disaster Risk Management framework

8.1.2.1. Disaster Risk Management Policy

The Draft Disaster Risk Management (DRM) Policy (December 2013), prepared by the Civil Defence Commission with financial aid from

UNDP, establishes the guiding principles and architecture for disaster risk management in Guyana, by presenting the institutional structures, roles, responsibilities, authorities and key processes required to achieve a coordinated, coherent and consistent approach to disaster risk management.

The goals stated in the Policy are:

1. The prevention and/or reduction of disaster impacts on families, infrastructure, livelihoods, and the environment.

2. Increased resilience of communities in terms of reducing their vulnerability and increasing their ability to withstand and minimize disaster impacts.

3. The integration and dovetailing of DRM actions, strategies and initiatives with national priorities.

4. DRM mainstreamed into national development planning and integrated into each departmental/ministerial development plans with dedicated financial allocations are marked in the national budgetary provisions for mitigation measures.

5. Strategic direction for DRM in Guyana oriented with international and regional norms and best practices.

6. Sustained and adequate capacities and resources to address DRM at local, regional and national levels.

7. Strengthened governance, institutional, legal, financial and sectoral arrangements supporting DRM at all levels.

8. Holistic DRM policy, planning and programmes embracing multi-disciplinary, and multi-sector agendas, whilst maintaining multi-stakeholder participation.

9. A human-rights based approach mainstreamed throughout DRM, including elements of equality and disparity such as gender issues, and including focus on the most vulnerable populations, the very poor, and those living remotely, as well as those with disabilities and special needs, including their carers, the infirmed, the very young and elderly, and also including emphasis on social protection during and after events, and DRM related psycho-social issues.

10. DRM policy, planning, and programs encouraging better linkages of DRM with Climate Change Adaptation (CCA).

11. National capacities to maintain state of the art, evidenced-based information and data, including future modelling capacities on risk related economic, social and ecological climate change impacts globally, and especially impacts related to Guyana.

12. A balance between corrective and prospective approaches to DRM maintained in DRM policy, planning, and programs, simultaneously addressing existent DRM challenges and ensuring that present risks are not increased.

Key strategic objectives identified in the Policy are related to:

1. Systematically incorporating international, regional, national and local disaster risk reduction strategies and approaches.

2. Mainstreaming disaster management.

3. Promoting linkages between DRM, sustainable development, and climate change adaptation.

4. Establishing an institutional system to efficient DRM.

5. Developing and strengthening mechanisms and capacities to build resilience and preparedness.

6. Promoting a culture of prevention, preparedness and resilience.

7. Promoting a balance between supporting corrective DRM measures and prospective DRM measures.

8. Having enabling regulatory environment and compliance mechanisms for ensuring disaster risk management.

9. Enhancing Early Warning Systems (EWS) and fail-safe communications.

10. Using post-disaster recovery and reconstruction as an opportunity to build back better.

11. Enhancing monitoring and evaluation.

12. Ensuring a proactive partnership with the media, private sector organizations, academic and research, and other civil society bodies for disaster risk management.

13. Ensuring sustainability.

14. Ensuring that DRM organizations maintain organizational learning and development, and the ability to adjust to future scenarios with potentially great demands.

Furthermore, the Policy advocates for the adoption of an approach to DRM that is multi-faceted, multi-hazard, multi-disciplinary, multi-sector, and multi-stakeholder, both corrective and prospective, and inclusive of a Human Rights Based Approach (HRBA) to DRM, with a focus on Gender.

A code of conduct for all stakeholders has been agreed upon, which includes respect for human dignity and cultural differences, and reliance on evidenced-based decision making.

8.1.2.2. Disaster Risk Management Bill

In 1985, the first National Disaster Preparedness Plan was developed and put in place. Responsibility for the Civil Defence Commission (CDC) was subsequently moved to the Office of the President in 1992, with the Head of the Presidential Secretariat becoming the National Emergency Coordinator (NEC). In June 1997 the CDC was reconstituted by Cabinet. In 2013 the Civil Defence Commission drafted a new Disaster Risk Management (DRM) Bill to strengthen its legal framework. Key aspects of the Bill (Nov 2013) are:

1. Presentation of a comprehensive framework with shared responsibility and ownership for all stakeholders consistently with the principles of Comprehensive Disaster Management (CDM) and integrated CDM.

2. Definition of disaster in an all-encompassing manner in the context of development, also to include climate change given that CDM's objective is to address climate change.

3. Establishment of a Natural Resources and Environment Cabinet Sub-Committee as the policy-making mechanism for DRM.

4. Reconstitution of the CDC as the National Disaster Risk Management Commission, vested with the power to establish and implement a National Disaster Risk Management Strategy and Plan to coordinate all DRM activities.

5. Enactment of the DRM Platform to ensure the incorporation of disaster risk in economic and physical planning for all entities that discharge disaster-related functions.

6. Establishment of coordination mechanisms between the National Disaster Risk Management Commission and other entities.

7. Detail of the roles and responsibilities related to risk identification, prevention and mitigation, preparedness and response; risk identification, risk reduction and financial risk management.

8. Inclusion of provisions for emergency response.

9. Creation of a disaster emergency management system and establishment of a communication link.

10. Vesting the President with the power to declare a disaster and establish remedial measures and vesting the pertinent Minister with the power to establish regulations, inter alia, for shelters, evacuations and other emergency responses.

11. Establishment of a National Disaster Risk Management Fund to assist with DRM activities.

12. Provision of mechanisms to manage vulnerability.

13. Provision for requisitioning of private property in crises situations.

14. Provision for volunteers and other persons who assist in emergency operations.

15. Provision for the training of staff.

16. Provision for the establishment of a National Multi-hazard Alert System.

Although the Bill has not been passed yet, the framework outlined is already used as a basis for strategic planning within the CDC and for the proposal of projects in the mid-term.

8.1.3. Normative Framework and Plans for DRM

8.1.3.1. National Integrated Disaster Risk Management Plan and Implementation Strategy

During 2012 and 2013, with the support of the Inter-American Development Bank (IDB), a National Integrated Disaster Risk Management Plan and Implementation Strategy (NIDRMP&IS) were prepared, mainly to address strategic actions over the next ten years to tackle floods and droughts encompassing the following elements of Disaster Risk Management (DRM): Risk Identification, Prevention and Mitigation, Financial Risk Management, Preparedness, and Response and Recovery.

The Strategy includes draft project outlines to implement those actions, as well as a ten-year plan for its implementation, a proposed Structure for DRM in Guyana, an overview of technical and financial resources necessary, and a Monitoring and Evaluation framework.

The priority needs identified under the NIDRMP&IS are:

1. Risk identification:

1. Conduct additional flood mapping as needed.

2. Identify the status of maps showing population and infrastructure.

3. Develop/update new ones particularly for flood-prone areas.

4. Diagnosis of the structural reliability of each one of the critical infrastructure components in order to determine critical components requiring strengthening and reinforcement.

5. Identify information to be mapped in drought maps.

6. Improve mechanisms to improve access to existing maps and information.

7. Need to conduct national-level Hazard, Vulnerability and Risk Assessments.

8. Design and implementation of a National Hazard, Vulnerability and Risk Mapping Plan.

9. Deliver training to key government staff in the design and use of mapping software and processes, including analysis.

10. Bring all stakeholders involved together to identify mapping priorities and information needed to prepare maps and databases. Determine and agree on mechanisms for data collection, storage and availability.

2. Prevention and mitigation:

1. Determine the needs for vulnerability assessments of all conservancy dams.

2. Identify needs in terms of capacity for regular inspection and maintenance of sea walls, conservancy dams and drainage structures.

3. Identification of areas in sea walls and conservancy dams needing repairs.

4. Identification of drainage capacity needs and works needed to increase it.

5. Identify vulnerable elements that need vulnerability assessments: schools, health facilities, government buildings, infrastructure, etc.

6. Based on flood maps and scenarios and the estimation of risk, determine the need and feasibility of relocating human settlements to less risky areas.

7. Use of flood maps to identify specific floodable areas and to assess risk in them in order to determine which specific activities are to be allowed and under what circumstances (types of constructions).

8. Establish criteria and meet with farmers to agree on specific practices to reduce risk during the flooding season.

9. Design/revise Building Code and identify specific needs for enforcement in Guyana: personnel, training, equipment, vehicles, etc.

10. Based on past events, determine water needs and sources of water in case of droughts.

11. Enhance coordination among all key stakeholders involved in mitigation.

3. Financial Protection/Risk Transfer:

1. Development of legislation for compulsory flood and drought insurance.

2. Explore feasibility of establishing flood insurance for crops and livestock.

3. Identification of best insurance practices; development of guidelines, identification of risk transfer options in the country and the region.

4. Explore international mechanisms that could cover flood insurance (eg. Caribbean Catastrophe Risk Insurance Facility, CCRIF)

4. Preparedness/Response:

1. Approval of DRM Bill with comprehensive DRM approach.

2. Inclusion of Disaster Risk Management (DRM)/Comprehensive Disaster Management (CDM) considerations in legislation (e.g. Building code).

3. Clarify the different responsibilities under the DRM Policy.

4. Foster the establishment of preparedness and response plans, both sectoral and hazard specific. Establish a national emergency planning process, including the thorough creation, revision and updating of all existing plans. Ensure gender, environmental and climate change issues are considered.

5. Regular revision and update of response plans.

6. Revise coherence of all response plans.

7. Foster Early Warning Systems (EWS), for instance through approval of EWS protocol, establishment of EWS Sub-committee and liaising with neighbouring countries.

8. Identify specific needs in terms of type and number of equipment, vehicles needed. Identify existing resources. Identify needs for purchasing.

9. Destine more resources for capacity building and to the CDC to coordinate all DRM activities. Establish regional and local DRM committees and sub-committees.

10. Eliminate discrepancies in the National Emergency Operations Centre (NEOC) management system documents.

11. Ensure that Emergency Operations Centres (EOCs) are established at the regional level.

12. Revise structure of the national sub-committees for DRM.

13. Revision of the National DRR Platform, its composition and functions.

14. Increase simulation exercises to test all response plans.

15. Mainstream DRM into school curricula.

16. Increase public awareness about risks/hazards and to enhance their capacity to participate in risk reduction and response planning.

5. Recovery:

1. Development of an early recovery plan for floods or droughts.

2. Design Continuity of Operations Plan (COOPs) and Business Continuity Plan (BCPs).

3. Identification of existing and needed equipment for recovery.

4. Enhance existing Contingency Fund and guidelines for its use.

The Key activities identified in the National DRM Plan are regrouped in the National DRM Implementation Strategy into coherent groups of initiatives, to provide a set of suggested draft projects. For each draft project the Implementation Strategy details key objectives, expected results, the level of priority, general requirements, proposed activities, key agencies involved and responsible, resources required (financial and technical), possible sources of financial support and proposed timing of implementation (refers to the duration of the project).

8.1.3.2. Multi Hazard Preparedness and Response Plan

In November 2013, with financial support from the United Nations Development Programme (UNDP), a National Multi Hazard Preparedness and Response Plan was developed. The plan focuses on:

1. Establishing the functions of different actors for effective preparedness and response at national and regional levels. This includes, inter alia, the elaboration of preparedness and response sub-plans, the decentralization of tasks to the local level, the provision of guidance for the elaboration of response plans, the enhancement of communication capacities, the establishment of regional Emergency Operations Centres (EOCs), the promotion of citizen awareness and involvement, the maintenance of an inventory of resources for disaster response involving other departments and civil society organizations, and the conduction of regular simulation exercises.

2. Decision making processes within the Early Warning System (EWS) and dissemination of information procedures.

3. Guidelines for declaring a disaster, and procedures to be undertaken by different actors depending on the level of the emergency once activated.

4. Guidelines for evacuation, Damage Assessment and Needs Analysis, Search and Rescue, and Early Recovery.

8.1.3.3. Early Warning System Framework

The main purpose of having an Early Warning System (EWS) is to protect lives and livelihoods from known hazards, while minimizing negative impacts on the economy and environment.

In 2013 Guyana developed its EWS Framework with financial support from the United Nations Development Programme (UNDP). It focuses on:

1. Setting the overarching guiding principles and approach.

2. Clarifying the EWS structure and mechanisms at the various levels, detailing functions and operational guidance for each of them, namely: The National Early Warning sub-committee, the Technical Support Group and the National Emergency Operations Centre (NEOC).

3. Establishing decision making, communications and dissemination protocols.

4. Providing guidance on synergies with other areas of Disaster Risk Management (DRM) and outlining actions to be undertaken for implementation.

8.1.3.4 Shelter Management Policy and Standards

One of the recurring gaps identified by stakeholders over the past few years was the lack of a comprehensive inventory and assessment of shelters. In 2013-2014, the Civil Defence Commission (CDC) with support from the Inter-American Development Bank (IDB), developed a Shelter Management policy and minimum Shelter Management Standards with the following goals:

1. Ensure that victims of disasters who have been made homeless are provided with temporary shelter or support for expediting their rehabilitation.

2. Establish minimum shelter requirements for facilities that are potential emergency shelters.

3. Establish a mechanism for the provision of services for emergency shelters.

4. Link shelter management with the national evacuation and relief programmes.

5. Establish a mechanism for the management, identification, maintenance and upkeep of shelters.

It provides a framework for the establishment of a national shelter management body with the participation of diverse stakeholders, and the actions to be undertaken by Government at the policy, legal, budgetary and coordination levels for activation and closure of shelters. Furthermore, it recognizes the necessity of maintenance, of adherence to minimum standards, of training of personnel, and of the establishment of shelter regulations. Priority is given to vulnerable groups, particularly persons living with disabilities, the elderly, children and low-income groups.

An inventory of tentative buildings to be used as shelters in Region 4 has been drafted, as well as a Manual on Shelter Management. This contains information on: stocks, the pre-activation process, the Activation process, the opening of shelters, the registration process, the orientation of occupants, the closure of shelters, deactivation and handover. The Manual also provides orientation on various aspects of shelter management, such as assessment of needs, general regulations, food and sanitation, safety, health and mental health.

A draft Evacuation Plan for Region 4 was developed to feed into the Regional Disaster Risk Management Plan. This Evacuation plan should be tested, reviewed and updated by a Regional Disaster Risk Management Committee established under the Regional Democratic Council (RDC).

The Shelter Management Standards for Guyana include considerations for the selection, inspection, layout design, structural characteristics, security, services, sleeping accommodation, Water, Sanitation and Hygiene (WASH), non-food items (NFI), and logistics needed during an emergency. These Standards are not officially approved or enacted, but will guide policy making in the near future.

8.1.3.5 Search and Rescue Plan

Guyana developed a Search and Rescue (SAR) Plan in 2009, encompassing land, maritime and aeronautical SAR. The responsibility for maritime and aeronautical SAR policy rests with the Ministry of Public Works, the Guyana Civil Aviation Authority (GCAA) and the Guyana Maritime Administration Department (MARAD) being the national lead agencies for coordination respectively. The responsibility for the coordination of land-based and inland water SAR rests with the Guyana Police Force.

The Guyana SAR Strategic Committee is an inter-agency national forum with oversight responsibility for SAR in Guyana, and the plan indicates that it consists of members from: the Ministry of Public Works, the Office of the President, the Ministry of Home Affairs, the Ministry of Health, the Guyana Civil Aviation Authority, the Maritime Administration Department, the Aircraft Owner's Association of Guyana, and the Civil Defence Commission. The SAR Operators Group is a technical group to be involved in specific SAR administration and operations.

The aeronautical SAR authority is comprised of the GCAA, the GDF, AOAG, GPF, GFS, MARAD and supporting agencies, and the provision of services is organized around three types of facilities:

1. The Aeronautical Rescue Coordination Centre

2. Alerting facilities (air traffic service units)

3. Tactical facilities made available ad hoc.

The maritime SAR authority is comprised of the MARAD, the GDF Coast Guard, the Marine Police, the GCAA, the AOAG, the Fisheries Department, the Shipping Association of Guyana, the GFS, and the CDC. The system of alert is comprised of two facilities:

1. Coast Stations and designated alerting posts.

2. Light House Operator.

For each SAR incident, a SAR Mission Coordinator (SMC) is designated by the SAR authority, who will establish the Rescue Coordination Centre (RCC) as necessary.

The plan further details the responsibilities of the SMC and provides comprehensive instructions for the management of operations.

The National Land Search and Rescue sub-plan is under development.

In order to improve the SAR services some gaps and possible measures have been identified:

1. Need for strengthened information management on available resources nationwide.

2. Enhance operationalization of the rescue coordination centres.

3. Increase response capabilities in terms of human resources and assets, with a focus on response actions that require extraction.

4. Stronger collaboration between the public and private sector.

8.1.3.6. Other Plans Related to DRM

Over the past few years, both the Civil Defence Commission and a number of partners have been involved in developing plans pertaining to different areas of Disaster Risk Management. A list is provided below:

1. National Flood Response and Preparedness Plan.
2. Damage Assessment and Needs Analysis Plan, Policy and Framework.
3. National Influenza Preparedness Plan.
4. National Health Sector Disaster Plan.
5. Upper Mahaica Evacuation Plan.
6. National Environment Emergency Response Plan.
7. Integrated Coastal Zone Management Action Plan.
8. Climate Change Action Plan.
9. National Environmental Action Plan.
10. National Land Use Plan.
11. Evacuation Plan.

8.2. Institutional framework

The National Disaster Preparedness and Response Plan from 1985 defined the current institutional framework as shown in the picture below:

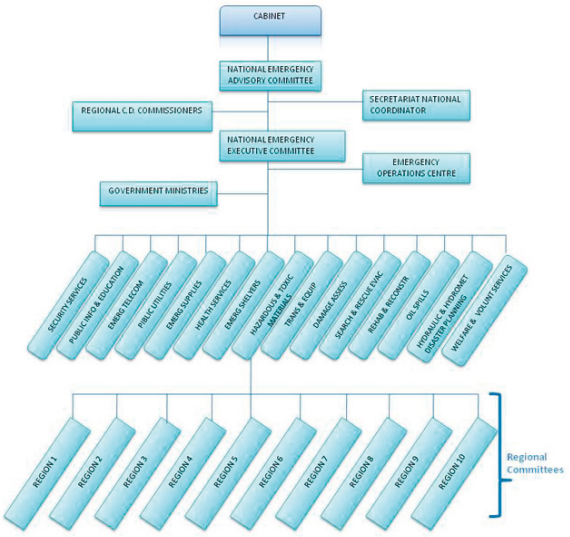


Image 10: Institutional framework for DRM as defined in the 1985 National Disaster Preparedness and Response Plan. Source: CDC.

The Caribbean Disaster Emergency Management Agency (CDEMA) agreement requires the establishment and maintenance of a National Disaster Office, directed by a National Disaster Coordinator. The Head of the Presidential Secretariat is the National Disaster Coordinator, and the Civil Defence Commission (CDC) falls under the responsibility of the Office of the President.

In June 1997 the CDC was reconstituted by Cabinet with the following mandate:

1. To identify disasters according to established criteria and classification;
2. To produce plans for the management of national disasters;
3. To identify and implement mechanisms for disaster response and mitigation;
4. To maintain a permanent body, to enhance the national capacity for disaster management and response;
5. To train human resources involved in disaster response mechanisms;
6. To educate at all levels in the tenets of disaster responses.

The National Multi Hazard Preparedness and Response Plan (2013) proposes a new National Disaster and Response Structure, which is outlined in Annex I.

The National Disaster Risk Management (DRM) Platform is currently chaired by the CDC and is the national mechanism for coordination and policy guidance on disaster risk reduction. It includes members of various public and private bodies and civil society organizations. The current Platform, while in use, has not yet been institutionalised, its membership is voluntary and the responsibilities of members are not clearly stated. However, in 2014 the Platform discussed mechanisms for enhancing its impact, such as:

1. Reviewing the Terms of Reference of the Platform.
2. Establishing working groups under the Platform.
3. Using electronic means for reporting and using Platform meetings for action planning.
4. Enhancing knowledge transfer within the Platform.
5. Establishing a mechanism to disseminate the recommendations of the Platform to the highest level of relevant institutions on a regular basis.

In the case of an emergency or disaster, the National Emergency Operations Centre (NEOC) is activated to coordinate the response, gather information, keep records and analyze data for decision-making, manage operations, manage resources and disseminate public information. Early Warning and NEOC Standard Operation Procedures have been developed and tested.

The current NEOC is located on the premises of the CDC in Thomas Lands, Georgetown, next to the Headquarters of the Guyana Defence Force. This is a low lying flood-prone area 1 km away from the sea. Therefore, an Alternative National Emergency Operations Centre (ANEOC) was constructed and equipped in 2014, with the support of the United States Southern Command (SOUTHCOM). The new centre is located in Timehri, 35 km away from Georgetown, and 30 metres above sea level.

With the change in approach in recent years towards CDM and integrated DRM, the CDC and the Government of Guyana have recognized that a change in institutional arrangements is needed.

These changes will be implemented through the adoption of the new DRM Bill, which makes provisions for the following:

1. Establishing a Natural Resources and Environment Cabinet Sub- Committee, with the role of advising Cabinet on issues affecting DRM and in particular on the definition of a DRM Strategy. The Sub-Committee will also be responsible for the coordination among Ministries in the implementation of the DRM Strategy and for monitoring and evaluation.

2. Reconstituting and renaming the Civil Defence Commission as the National Disaster Risk Management Commission (NDRMC), with the aim of becoming the national coordinating and monitoring body for disaster risk management in Guyana, with the mandate and power to develop and implement a National Disaster Risk Management Strategy and Plan, and to review and approve DRM plans at sectoral and regional levels. The National DRM Plan has to be approved by Cabinet.

3. The Director General of the NDRMC will be the National Disaster Risk Management Coordinator. The NDRMC is empowered to establish committees, sub-committees and advisory or working groups. The names of the chairpersons of these groups will be published in the Gazette.

4. A Secretariat will be responsible for the day to day management of the Commission.

5. At least two Committees will be established: the National Disaster Risk Management Committee and the National Damage Assessment and Needs Analysis (NDANA) Committee. Representatives of the Guyana Defence Force, Guyana Police Service and the Ministries of Health and Agriculture will be members of the NDANA Committee.

6. Different government-related entities will have to take the national disaster risk management strategy into consideration when developing their strategies and implementation plans. Furthermore, every entity will have to develop a disaster management plan in relation to their functions.

7. The National Disaster Risk Reduction Coordination Platform is the main coordination, collaboration and reporting mechanism among the various actors.

8. The National Early Warning Alert System will be operated under the supervision of the National Disaster Risk Management Coordinator.

9. In each Region, a Regional Disaster Risk Management Committee will be established, and a Regional Risk Management Plan developed.

10. The NDRMC is responsible for the establishment and maintenance of a NEOC and supplementary Regional Emergency Operations Centres (REOCs) in response to an emergency, disaster, event or alert. Representatives from public bodies and civil society can be members of the NEOC and REOCs.

11. The Cabinet Sub-Committee after consultation with the Commission may, depending on the scope, magnitude of damage or implications of the adverse effects of the disaster, recommend that Government request international assistance.

The Bill provides tentative member lists for the different bodies:

1. Natural Resources and Environment Cabinet Sub-Committee, to be comprised of:

- the President;
- Ministers with responsibility for:
- disaster risk management
- national security
- health
- the environment
- transport and works
- housing
- agriculture
- finance
- foreign affairs
- physical and economic planning
- any other Minister that Cabinet may appoint.

2. The Members of the National Platform will include:

- Deputy Director-General of the NDRNC;

- National Disaster Risk Management training officer who will be the Secretary to the Platform;

- A senior representative designated by the Minister of each Ministry that is a member of the Cabinet sub-Committee

- Minister or public officer nominated by the Minister who chairs the Platform;

- Other members nominated by the Minister responsible for disaster risk management representing the Police Force, Defence Force, Fire Service, Prison Service, organized business, labour or agriculture, faith-based organisations, medical, paramedical and hospital organisations, organisations representing disaster risk management professions in Guyana, Private Sector Commission, Regional Chambers of Commerce, University of Guyana, United Nations Development Programme, United Nations High Commission on Refugees, Guyana Red Cross Society, National Commission on Disability, United Nations agencies and other relevant non-governmental and international organisations and relief agencies and other bodies, persons or organizations designated by the Minister.

3. The National Damage Assessment and Needs Analysis (NDANA) Committee is to be comprised of representatives from:

- The NDRMC

- Ministry of Natural Resources & the Environment

- Ministry of Agriculture

- Ministry of Education

- Ministry of Health

- Ministry of Housing & Water

- Ministry of Local Government and Regional Development

- Guyana Defence Force

- Guyana Police Force

- Guyana Lands & Surveys Commission

- Guyana Bureau of Statistics

- Guyana Telephone and Telegraph and all the major ICT private companies

- Private Sector Commission

- Any other person or entity that the Coordinator deems appropriate.

4. The NEOC can be comprised of, but not limited to, representatives from:

- The NDRMC

- Ministry of Natural Resources & the Environment

- Ministry of Agriculture

- Ministry of Amerindian Affairs

- Ministry of Education

- Ministry of Finance

- Ministry of Foreign Affairs

- Ministry of Health

- Ministry of Housing & Water

- Ministry of Labour & Human Services and Social Security

- Ministry of Local Government and Regional Development

- Ministry of Public Works and Communication

- Ministry of Tourism

- Guyana Defence Force

- Guyana Police Force

- Guyana Fire Service

- Environmental Protection Agency

- Guyana Lands & Surveys Commission

- Guyana Bureau of Statistics

- Guyana Geology and Mines Commission

- Guyana Telephone and Telegraph and all the major ICT private companies

- Guyana Power and Light

- Guyana Water Inc.

- Guyana Civil Aviation Authority

- Guyana Red Cross Society

- National Commission on Disabilities

- Guyana Sugar Corporation

- Guyana Rice Development Board

- Habitat for Humanity

- Mayor and City Council of Georgetown

- Private Sector Commission

Once the DRM Bill is enacted, it will provide the enabling framework for addressing DRM in a more coordinated and comprehensive manner, mainly by:

1. Adapting the mandate of the current CDC from a responsive approach to a Comprehensive Disaster Management (CDM)/Disaster Risk Management (DRM) approach, and empowering

it to establish committees, sub-committees and advisory or working groups.

2. Setting up a modern and centralized Early Warning System.

3. Enacting prevention and mitigation in the planning process of different agencies.

4. Providing the regulatory framework for first response at the regional and local levels.

5. Enhancing the participation of the education and private sectors and of civil society.

6. Making a DRM Fund available at the national level.

One of the limitations identified in the current situation is the limited availability of disaster risk transfer measures. This is common at various levels:

1. Limited insurance coverage at the household level.

2. Limited insurance coverage in the agriculture and infrastructure sector.

3. Guyana as a country is not a member of the Caribbean Catastrophe Risk Insurance Facility (CCRIF). This instrument does not cover flood or drought impacts. However, it is expected that the CCRIF will expand its services in the coming years to include an "excess rainfall product", as stated in the CCRIF Strategic Plan 2013-2015.

The Government of Guyana is committed to improving the capacities for DRM and resilience in the country, as reflected by the financial provision made:

1. The CDC has been receiving allocations for capital expenditure from the National Budget since 2011 on a regular basis.

2. The 2014 National budget was assessed in the HFA Monitor. Although the proportion of capital expenditure labeled as "DRM" is low, a myriad of allocations are contributing to reducing disaster risk and increasing resilience, mainly embedded in projects relating to climate change adaptation (CCA) and mitigation, and infrastructural rehabilitation and adaptation (drainage, irrigation, water and sanitation and sea and river defences). The budget also includes allocations for reducing underling factors of vulnerability, by targeting the health and education sectors, citizen security, and the improvement of living conditions for vulnerable groups. It is estimated that 53% of the capital expenditure in the 2014 national budget contributes to risk reduction and prevention.

3. Furthermore, international aid plays an important role in DRM, the major contributors being the European Union (EU), the World Bank (WB), the Inter-American Development Bank (IDB), the Japan International Cooperation Agency (JICA), the United States Agency for International Development (USAID), the United Nations Development Programme (UNDP), the United Nations Children's Fund (UNICEF), the Panamerican Health Organization (PAHO/WHO), and the United Nations Office for Disaster Risk Reduction (UNISDR).

In terms of decentralization, over the past years the CDC has been increasing its presence in the various administrative regions, and the capacities for DRM within the Regional Democratic Councils (RDC) have been increased. However, the future legal framework should cater not only for Disaster Management at the sub-national level (First response, Damage Assessment and Needs Analysis, and Early recovery actions), but also for disaster risk reduction (prevention, mitigation and transfer) measures, with a clear indication of roles, responsibilities and coordination mechanisms.

9. Risk conditions

9.1. Historical data on disasters

9.1.1. Floods and droughts

The main disasters in the country are due to floods, affecting the coastal areas in particular. This is caused by the interplay between high tides, high rainfall and a network of drainage and irrigation canals, pumping stations, conservancy dams, and sluices designed to support agriculture. Impacts are exacerbated by exposure, with coastal areas housing a high population density, key infrastructure and agricultural activities.

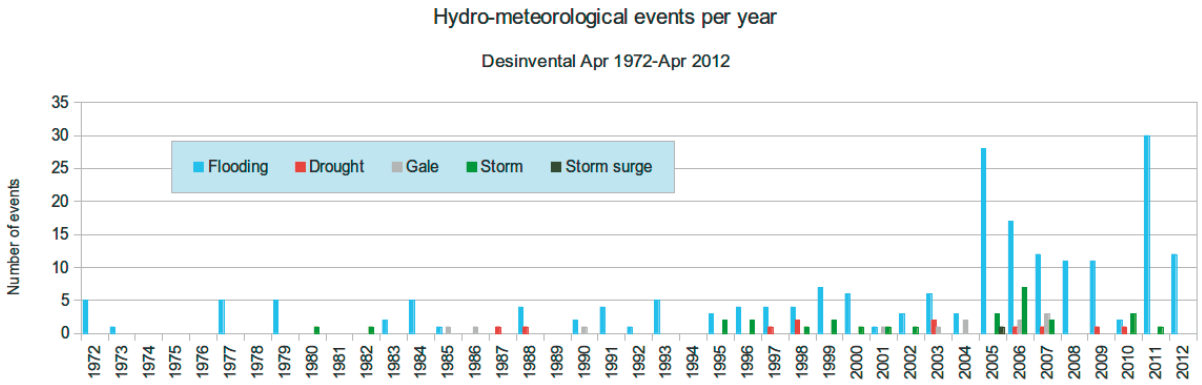
Records of trans-boundary flooding from the Rio Branco – Rio Negro river basin in Brazil coming into Region 9 Upper Takutu - Upper Essequibo in Guyana are also frequent (e.g. June 2011). Brazil gathers hydrological and meteorological data from this river basin which might be suitable for enhancing Early Warning Systems (EWS) in Guyana, but no Memorandum of Understanding has been established in that regard.

The Civil Defence Commission (CDC) contacts the various administrative regions on a regular basis to collect data on emergencies and disasters affecting the country at a sub-national level. Monthly reports on fires are gathered from the Guyana Fire Service, and in 2014 a collaboration with the Guyana Police Force was established to get timely information on accidents.

Traditionally the data gathered is completed with information coming from the media and other secondary sources, and uploaded to the Desinventar Database. Additionally, the situation reports of major disasters are posted on the CDC website. Communications are both paper and e-based. A stronger use of Information and Communication Technologies (ICT) is advisable, in order to reduce time lags, transcription errors, and duplication of tasks. The CDC is already making progress in increasing the use of computer technologies for communications (in-house, with institutions and with the public), for inventory management, and for knowledge management, but an ICT policy and stronger human capacities are needed.

The Desinventar Database (http://online.desinventar.org consulted June 2014) details about 834 emergencies and disasters in the period April 1973 to April 2012. Prevalence of flooding and/or gales is high (216 occurrences), as these are found in 75% of the years in the reported period. There has also been an increase in the number of reported hydro-meteorological events since 2005, increasing from an average of 4.5 floods/gales per year in the period 1995-2004 to an average of 16.6 floods/gales per year in the period 2005-2011. Regular storms and storm surges have been reported since 1995.

In terms of impact of the 216 floods and gales, 75% of them have affected the entire population, but that impact has not been quantified. 10% of them have not affected the population, and 15% (33 events) have affected a total of 428,830 persons. A diagram of these impacts is presented in Graph 17. It is estimated that a third of the households in Georgetown and large agricultural areas experience regular, low-impact flooding.



Graph 17: Hydro-meteorological events per year. Source Desinventar.

The causes stated in the Desinventar database for flooding and gale events have been reviewed against stated observations, to refine the quality of the data. Flooding occurs due to a number of factors such as: high precipitation, river overflowing, sea swell, overtopping or breach of sea defences and conservancy dams, and sometimes from a combination of high tides and heavy rainfall:

Cause	Percentage (%) of floods and gales (Apr 72-Apr 12)
Rainfall	51
Overflow	15
High tide	9
High tide causing defence breach	7
Atmospheric conditions	6
Rainfall causing defence breach	4
No drainage due to rainfall and high tide	3
Defence breach	1
Other	1
Overtopping	1
Sea defence breach	1
Storm	0.5
Tropical depression	0.5

Table 10: Frequency of the different causes for flooding and gales. Source: Desinventar database after data quality check.

A less likely cause of flooding in coastal areas, but presenting higher risks due to high exposure, are failures of water conservancies and drainage systems, and overtopping of sea defences by the Atlantic Ocean.

As expected based on climate patterns and the influence of the Inter-Tropical Convergence Zone (ITCZ), the regions on the coast (1 to 6) experience two rainy seasons, and floods and gales are more prevalent during December and January, and to a lesser extent from May to July.

In Regions 9 Upper Takutu - Upper Essequibo and 10 Upper Demerara - Berbice, located in the interior, floods and gales are reported predominantly from April to August, and the total number of flood events are much lower than on the coast.

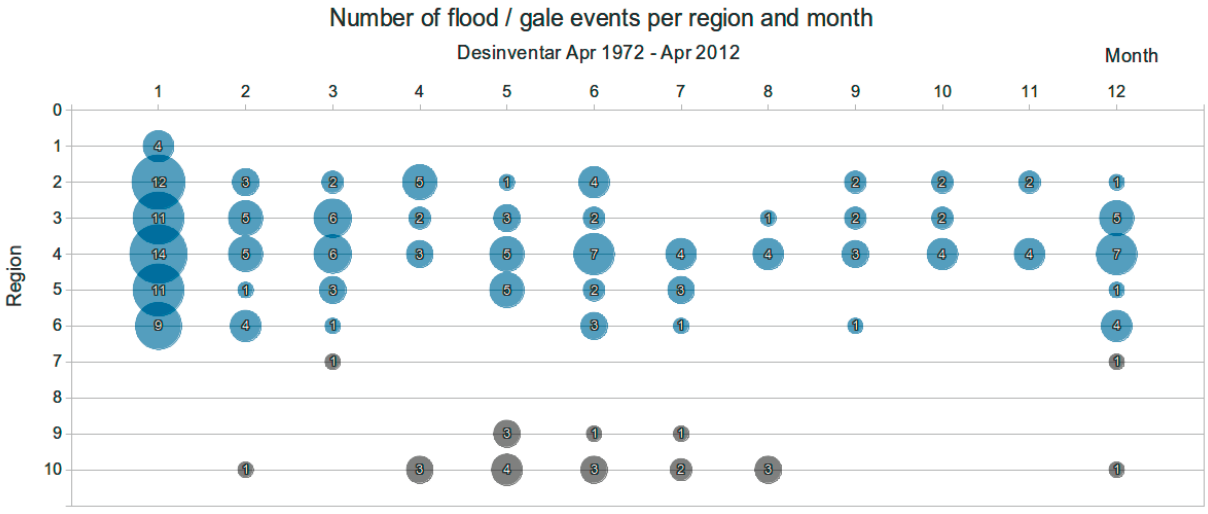
On Graph 18, months are on the horizontal coordinate, and regions on the vertical coordinate. The size of the circles is proportional to the number of registered flood events. Bigger circles are in months December and January for Regions 1 to 6 (coastal), and in months April to August in Regions 9 and 10 (interior).

No correlation has been found between the number of floods and gales reported and La Niña conditions, not even among the events caused only by heavy rainfall (see Table 11).

The Hydro-meteorological Service indicates that Guyana normally experiences heavy rainfall during La Niña events, but according to the Desinventar database this relationship does not imply a higher number of reported floods.

On the other hand, regular droughts take place across the country and show a strong correlation with El Niño conditions (Table 12).

The impacts on the population of these various hydro-meteorological events are determined by long-term patterns in extreme event occurrence, the levels of vulnerability and exposure of the population, the dissemination of early warnings, and



Graph 18: Number of flood / gale events per region and month of the year. Source: Desinventar Apr 1972 to April 2012.

Dates for La Niña conditions	Reported Flood / gale events
Apr 73-Feb 76	1
Aug 83-Dec 83	0
Sep 84-Aug 85	3
Apr 88-Apr 89	3
Aug 95-Feb 96	1
Jun 98-Feb 01	16
Oct 05-Feb 06	27
Jul 07-May 08	12
Jun 10-Mar 11	25
Aug 11-Feb 12	13
Total La Niña	**101**
Total Non La Niña	**115**

Table 11: Reported flood / gale events under La Niña Conditions. Source: Desinventar and National Oceanic and Atmospheric Administration (NOAA).

Drought date reported	Regions affected	ENSO conditions
Mar 1987	Reg. 4	El Niño
Jan 1988	Reg. 3	El Niño
Oct 1997	Reg. 5	Severe El Niño
Mar 1998	Reg. 9 and 10	Severe El Niño
Apr 2003	Reg. 4	Immediately after El Niño
Sep 2006	Reg. 4	El Niño
Feb 2007	Reg. 5	Immediately after El Niño
Nov 2009	Reg. 8	El Niño
Jan 2010	Reg. 2, 4 and 5	El Niño

Table 12: Droughts reported in Desinventar and NOAA website.

the capacities of people to cope with the effects of these events. With such complex interactions the data does not show any particular trend in the number of affected persons for the 40 year period considered, but the fact that many reports have not quantified these impacts has to be taken into consideration.

The overall impact of floods on crops, livestock, and the destruction of property, and sea and river defences accounts for several millions of dollars. The most devastating flood was that of 2005, which was caused by heavy rainfalls in Regions 3 Essequibo Islands - West Demerara, 4 Demerara - Mahaica and 5 Mahaica - Berbice from 14th to 22nd January. This exceeded the 100-year event and in fact was the country's heaviest rainfall since records started in 1888. The drains of the East Demerara Water Conservancy (EDWC) and West Demerara Water Conservancy (WDWC) were blocked by debris and grass, and many of the over top pumps were out of commission. As a result, 10% of the length of the EDWC was over topped. This flow of water far exceeded the capacity of the drainage system, resulting in floods within the affected communities.

The floods led to the displacement of thousands of coastal families, affecting 274,774 persons, and causing an economic loss of 465.1 million USD (further estimations rise the figure from 46% to 60% of the GDP). The damage to the agricultural sector was most severe in Region 4 Demerara - Mahaica accounting for 55% of the total damage, followed by Region 2 Pomeroon-Supenaam with 23.2% and Region 5 Mahaica - Berbice with 18.8 %. Significant losses were recorded in the sugar, livestock and crop sub-sectors. The rice industry was also heavily impacted by the flood disaster, with some 1,000 farmers operating in the 19,680 acres affected.

At the time Guyana had little experience in managing a major disaster and sufficient external technical support was lacking during the first 72 hours. On January 17, hours after the flooding started, the President summoned an emergency meeting with Cabinet, experts and leaders of the opposition. The Guyana Defence Force (GDF) and Guyana Police Force (GPF) were deployed to assess the situation and support the relief response, and Ministerial Committees were appointed to work on sectoral interventions: food, water, health, infrastructure, shelter, external aid, and public information. Emergency allocations of GYD 20 M were made on the first day, with an additional allocation of GYD 200 M made on the second day. On January 18, 2005, Regions 3 to 5 were declared disaster areas. The Joint Operations Centre was established at the Police Headquarters. After two weeks of operations of the Joint Services, the authority was handed over to the Civil Defence Commission (CDC).

The focus during the first steps of the response was in tackling the following:

1. Provision of food relief. Cooked meals and dry rations were provided on a daily basis during the first 4 weeks.

2. Provision of safe drinking water. Potable water was distributed to all affected areas.

3. Improved drainage of flood waters. Fifty drainage pumps were deployed from Guyana Sugar Corporation Inc. (GUYSUCO), mining companies and rice farmers. Instructions were given to clear drainage systems.

4. Prevention of outbreak of diseases. Ministry of Health teams were in affected areas from day one providing treatment. Later, the Ministry of Agriculture vaccinated livestock.

5. Provision of shelter to populations in need. The President instructed the GDF to open fifteen additional shelters. Telephone hotlines were set up. Hundreds of mattresses were bought for distribution to shelters.

6. Access to international aid. The first plane loaded with relief supplies was from Brazil.

7. As soon as possible, programmes to clean-up affected areas were put in place and a mass evacuation plan was prepared.

8. An additional GYD 2M was allocated to Region 10 for flood victims who were relocated to Linden, plus food hampers were distributed.

The situation demanded the formulation of a plan to provide potable water to areas where the system was compromised and to those areas which never had an installed water supply system. Guyana Water Incorporated, the Ministry of Housing and OXFAM established a water distribution plan which satisfactorily ensured the provision of potable water to affected communities. The Ministry of Health along with local government, the Pan American Health Organization (PAHO/WHO), the United Nations Children's Fund (UNICEF), the Guyana Red Cross Society, the Mayor and City Council and Neighbourhood Democratic Councils embarked on measures to alleviate the potentially disastrous medical situation. During the initial stages 34 medical teams and 3 environmental groups were deployed thus enabling treatment for 1214 and 264 patients respectively. The main treatment administered was doxycycline to prevent the spread of leptospirosis. Reportedly, most medical reports were of headaches, muscle pain, skin infections, fever, vomiting, abdominal pain and diarrhoea. Unfortunately 23 persons died due to leptospirosis.

The drainage capacity of sluices was augmented with new drainage pumps along the coast. About 50 shelters managed by the Guyana Defence Force, Guyana Relief Council (GRC) and several private organizations were established to accommodate 5,000 persons. Furthermore, material support was obtained from the World Food Programme, Guyana Red Cross and several religious organizations to ensure their appropriate functioning. A daily list of areas receiving relief aid was released. In the following days, Ministerial teams, with the help of a UN team conducted damage assessments for early recovery, while the relief effort was reinforced and a programme for the distribution of mosquito nets to pregnant women and children was established.

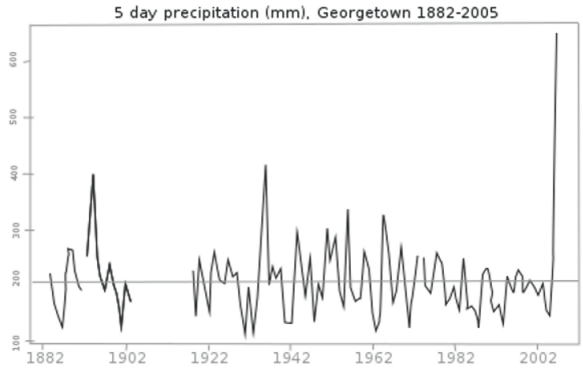
Damage and Losses (Million GYD)	Total	Direct	Indirect
Total	**93,023**	**83,660**	**9,363**
Social sectors	55,666	55,247	419
Productive sectors	27,459	20,945	6,514
Infrastructure	9,143	7,452	1,691
Environment	15	15	-
Emergency Relief	740	-	740

Table 13: Summary of Damage and Losses Caused by the January 2005 Floods. Source: ECLAC.

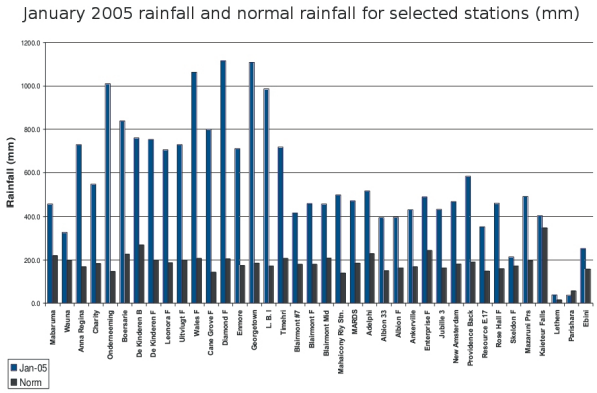
Food
201 dry ration truckloads 73,889 hampers 120,047 hotmeals
Health
150,000 leptospirosis preventive treatments 350 health teams deployed with 450 health workers and 3,000 volunteers
Water
161,184 bottles of water 2.9M gallons of water distributed by water trucking 29 stand pipes installed 115 water distribution tanks at strategic points
Sanitation
Garbage collection in East Coast Demerara (contract cost GYD 25 M as of Feb. 20, 2005) Georgetown City Council allocated GYD3M for clean-up MOH distributed 48,000 hampers with cleaning agents
Agriculture
Anti – epidemic treatment of 10,000 animals GYD 6M support for livestock Food suppliments for cattle distributed 4 veterinary extension teams and 2 feed distribution teams deployed, with daily visits to flooded areas
Shelter
50 shelters for 4,200 persons in regions 3, 4 and 5 Support for 3,000 families providing shelter to neighbours in Linden.
Infrastructure
60 pumps installed Emergency drainage works in Georgetown, East Coast Demerara, West Demerara, Mahaica, Mahaicony, EDWC, and WDWC.

Table 14: Summary relief after major floods in Jan 2005.

The exceptional flooding in January 2005 was triggered by heavy rainfalls, that exceeded the 100 years event as shown in Graphs 19 and 20.



Graph 19: 5 day accumulated precipitation (mm) in Georgetown, 1882-2005. Source: Hydro-meteorological Service.



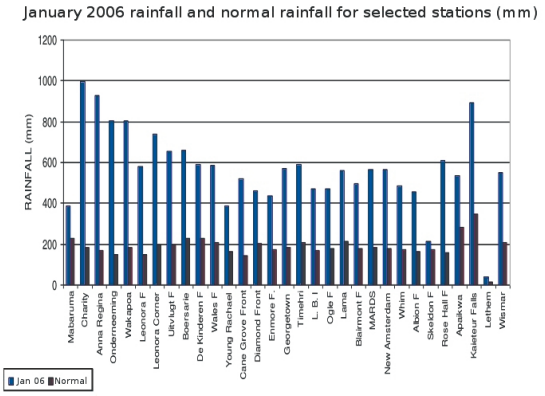
Graph 20: January 2005 rainfall and normal January rainfall for selected stations (mm). Source: Hydro-meteorological Service.

In January 2006 severe flooding occurred again, attracting the attention of the Government and the international community, who recognized flood risk management as crucial for economic and social development. The event resulted in losses to the agricultural sector of US$ 22.5 million in the major affected regions.

Regions 1 to 6 were the most affected, with floods being most severe in Regions 2 and 5. Both regions were declared disaster areas by the Government of Guyana on January 28th, 2008.

Flooding in the Pomeroon area (Region 2) began in December 2005 and was likely caused by poor drainage and an influx of water from the backlands. The heavy rains of the first half of December 2005 apparently saturated the soil so that a large percentage of the January 2006 rainfall immediately ran off from the Pomeroon River and its tributaries to the low lying areas along its banks. This flooding pattern was the reverse of the January-February 2005 floods since during that period the Pomeroon River did not flood but in contrast the coastal area was subjected to flooding. In Region 5 the continuous rainfall during December 2005 and January 2006 was over 900 mm, more than 4 times higher than the 180mm of rainfall normally experienced.

The rainfalls registered in many of the stations experienced more than a twofold increase as compared to the long term average.



Graph 21: January 2006 rainfall and normal January rainfall for selected stations (mm). Source: Hydro-meteorological Service.

Damage and Losses (Million GYD)	Total impact	Direct damage	Indirect losses
Total	**6,011**	**4,442**	**1,560**
Productive Sectors	4,415	3,924	492
Social Sectors	158	92	66
Infrastructure	940	426	504
Emergency expenditures	498	-	498

Table 15: Summary of Damage and Losses Caused by the Dec 2005-Jan 2006 Floods. Source: ECLAC.

According to the Emergency Events Database EM-DAT of the Centre for Research on the Epidemiology of Disasters (CRED) and Desinventar the main flood disasters affecting Guyana in the period 1900-2013 were:

Date	Location	Affected persons	Damage
1971	-	21,000	USD 0,2 M
1989	-	-	-
Nov 1993	Reg. 4	1,500	Livestock and agriculture, deaths, evacuation and health.
Jul 1995	Reg. 9	~870	Livestock and agriculture, relocation.
Jul 1996	All regions	38,000	Livestock and agriculture, deaths, evacuation and health.
Jan, Feb, May, Jun 1997	Reg. 2, 3, 4.	7,200	Agriculture
Jan 2005	Reg. 2, 3, 4, 5, 6.	354,717 (34 deaths)	USD 465,1 M
Jan 2006	Reg. 2, 5.	37,780	USD 169 M
Jan, Mar, May, Jun, Jul, Dec 2008	Reg. 2, 4, 5, 6, 10.	100,000	Agriculture, infrastructure and other.

Table 16: Impacts of the main historical floods in Guyana. Source: EM-DAT and Desinventar.

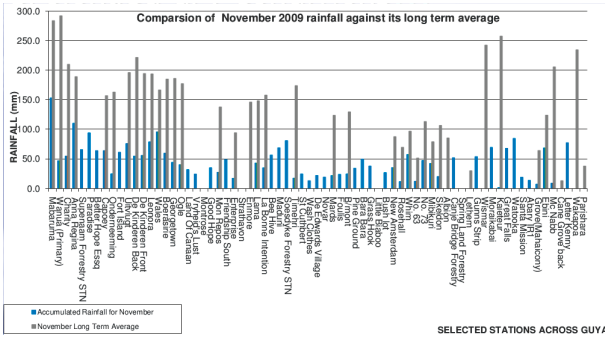
The main droughts that have affected the country are indicated in the table below:

Year	Affected persons	Damage (Million USD)
1988	-	-
1997	607,200	29
2010	-	14.7

Table 17: Impacts of the main historical droughts in Guyana. Source: EM-DAT and Desinventar.

During drought, Guyana experiences water rationing, cessation of logging and river transport in some places and the loss of livestock.

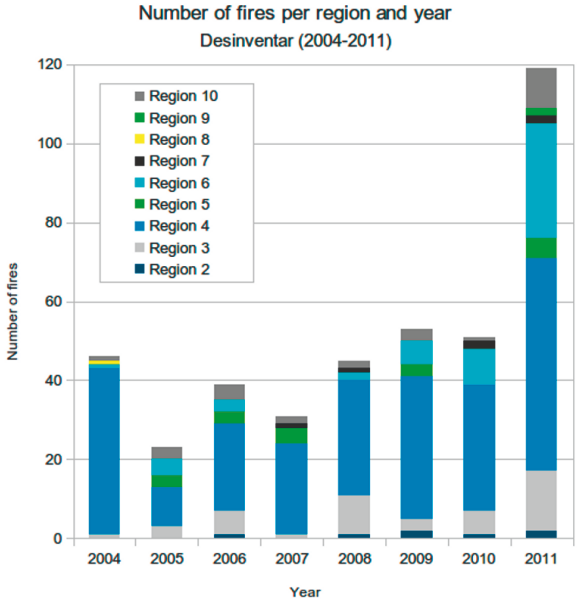
The drought of 2009 - 2010 affected the whole Caribbean region. Stations recorded their lowest six month (October 2009 to March 2010) totals, leading to water rationing and major crop loss. In one of Guyana's regions the delivery of water through pumping and the creation of canals reached a cost of US$ 16,000 per day, pumping saline water to about 150 acres of rice lands. In February 2010, the Government of Guyana allocated US$ 1.3 million for farmer relief in Region 2.



Graph 22: Comparison of November 2009 rainfall with the long term November rainfall average, selected stations. Source: Hydro-meteorological Service.

9.1.2. Fire events

Other recurrent disasters are related to fire, both at a household level, likely caused primarily by electrical failures and carelessness, and also forest fires in the interior. It is important to note that although slash-and-burn is commonly used for shifting cultivations in hinterland areas, and especially in the savannah, this technique is always applied under community supervision, using firebreaks, and does not pose a significant risk to people or assets. However, the data input in the Desinventar database does not allow a direct analysis of the type of fire. A review of the reporting format would be advisable.



Graph 23: Number of fires per region and year. Source: Desinventar.

The increase in the number of fires reported is suspected to be linked to the enhancement of reporting systems and to increased collaboration between the CDC and the Fire Services, more than symptomatic of an actual increase in the occurrence of these events. Similar arrangements are being established with the Police service for the reporting of accidents. When more comprehensive data is available, further analysis should be undertaken.

The two main fires recorded in EM-DAT are:

1. A fire originating in the Water Street Shopping Centre in Georgetown, October 17, 1979, affecting two business places and 200 people, and killing one person.

2. A fire recorded in 1988, with 281 persons directly affected and damage estimated at 0.4 million USD.

Several fires were detected in forested areas near Amerindian lands in the Kamarang-Mazaruni River area and in forests between the Potaro, Essequibo, Demerara, and Berbice Rivers, but individually these events rarely consumed more than 0.5 ha each.

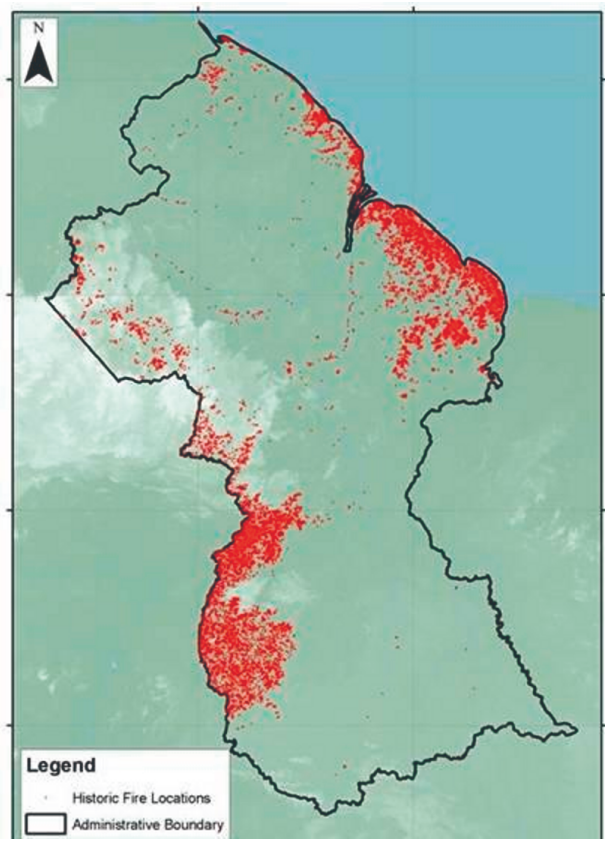


Image 11: Map of active fires Oct 2009-Sep 2010. Fire Information Resource Management Service, derived from MODIS. Source: Guyana Forestry Commission (GFC) and Indufor.

Remote sensing, through the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor, confirms that the majority of fires detected are located in the savannah (controlled slash-and-burn agricultural practices, not posing a significant risk) and along the coastal fringe. Fires in the hilly sand and clay region are less frequent, and in the forested areas are almost non-existent, except for the area of the Pakaraima Mountains (Image 11).

9.1.3. Chemical events

Chemical hazards have caused localized disasters across the Caribbean, the Omai Gold Mine incident in 1995 in Guyana being one of the most remarkable.

Beginning in 1993, Omai Gold Mines Limited carried out operations at the Omai Gold Mine (Reg. 8). It was one of the largest open pit gold mines in the world. In 1995, waste from the mine overflowed from the retention dam, causing a release of four million cubic metres of cyanide-bearing tailings into the Omai River, a short tributary stream that feeds into the Essequibo. The cyanide reached concentrations of 28 ppm in the river, while it is well known that concentrations above 2 ppm are fatal. President Cheddi Jagan declared a stretch of 50 contaminated miles of the Essequibo River as an environmental disaster zone. Two hundred persons were directly affected. The damage was estimated at 15 million USD and the mine closed in 2005.

Currently, mining is one of the main economic activities of the country but stronger environmental laws are in place, and mining sites above a determined production level need to conduct an Environmental Impact Assessment in order to obtain an environmental license.

Whereas in medium and large scale mining cyanide is extensively used, mercury remains common in small scale production.

The Government has recently committed to eliminating the use of mercury in mining operations (Minamata Convention), cyanide being a cleaner option although it is not exempt from risk. Furthermore, a Land Reclamation Project (GYD 500 million) has been launched in 2014 to reclaim forested lands and undertake reforestation activities in areas affected by mining and timber extraction.[31]

31 "Multi-million dollar land reclamation project underway". GINA, March22, 2014. http://gina.gov.gy/wp/?p=20414

9.1.4. Biological events

Regarding epidemic outbreaks the following information is available in the Desinventar Database.

Date	Location	Type	Description
Oct 1995	Reg 6. New Amsterdam and Skeldon	Diarrhea caused by rotavirus	Many children affected, 4 deaths.
Nov 1995	Reg 8. Four communities.	Wooping cough (pertussis)	Many people affected, mainly children. 2 deaths
Jul 1997	Reg 5. Bath Settlement	Diarrhea caused by contamination of water supply	Children affected. 2 deaths.
Mar 2013	Reg 1. Port Kaituma	Gastro due to fecal contamination of water	More than 400 people affected. 3 children died.

Table 18: Epidemic outbreaks. Source: Desinventar.

During these types of events, food security is normally compromised.

Apart from these outbreaks, Chikungunya virus has been present in Guyana since May 2014. The first cases were detected in Region 5 Mahaica-Berbice and by June it had already reached the capital city.

In 2014, the country also established measures to restrict the entry of persons infected with Ebola virus, and to be prepared in case of an outbreak.

9.1.5. Other events

Disasters caused by landslides are not common in Guyana due to the relatively flat topography and the low population density registered in areas of high slopes. However, in the year 2000 a mass movement with hydrological origin caused 10 deaths according to EM-DAT.

Civil unrest has taken place in the past. In 2012, demonstrations against the rise of electricity costs in Linden led to several buildings being intentionally burnt down, to three people being shot dead and to several people being wounded.

9.2. Hazards

9.2.1. Hydro-meteorological hazards

Flooding is regarded as a major environmental hazard on the coastal zone due to extreme rainfall events combined with insufficient drainage capacity, to dam breaches and to sea level rise and sea defence breaches. Flooding is also a major hazard in the flat areas of the interior's savannah, were the water can remain stagnant for weeks.

In recent years, several initiatives have been undertaken to analyse flood hazards and elaborate maps using a variety of different approaches:

1. Based on past experience:

- The Guyana Lands and Surveys Commission has mapped the extent of the floods in 2005 on the coastal areas.

2. Based on digital elevation models and, in some cases, giving consideration to land use and run-off coefficients, the following analyses has been performed:

- Area vulnerable to 1 m sea rise. Countrywide.

- Flood map due to sea level rise (projections 2031, 2051 and 2071), storm surge (2 m and 5 m) and combined sea level rise and storm surge. Only for the coastal area around Georgetown.

- Flood prone areas in Region 9. Caribbean Risk Management Initiative project.

3. Based on modelling tools and simulations:

- Maps of the northern half of the country for 1, 2, 3, 4 and 5 days of rain with return periods of 50, 100, 500 and 1,000 years. National scale and limited regional scale (see section 8.4.2.2).

- Flood hazard maps due to breach in East Demerara Water Conservancy (EDWC), West Demerara Water Conservancy (WDWC), and Tapakuma Water Conservancy (TWC). Regional scale, they portray the hazard level based on a range of selected scenarios, and therefore must be used with caution.

- Flood hazard maps due to breach in EDWC. They portray the hazard level based on a range of selected scenarios, and therefore must be used with caution. Developed under CAP project.

- Precipitation risk maps developed for the coastal regions 2, 3, 4, 5 and 6.

All this information generated has been informing decision-making in recent years in Guyana. However, the different assessments have not been put together in order to identify discrepancies and to obtain a comprehensive flood map for the entire country. Furthermore, while assessments have focused mainly on the coastal regions, the interior regions are also affected by floods, and trans-boundary floods coming from the Rio Branco basin in Brazil into Region 9 of Southern Guyana are common.

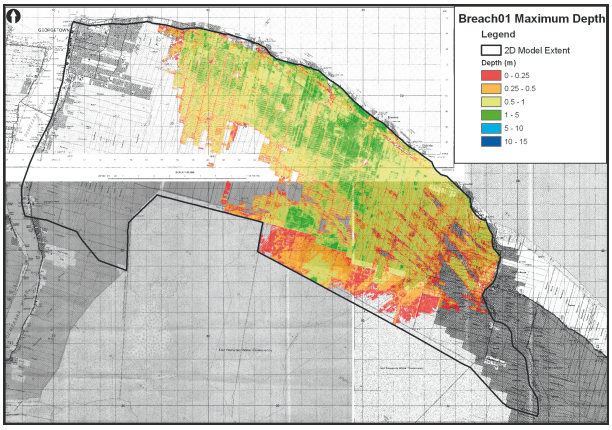


Image 12: Maximum Depth Map for Breach Location 1 at the EDWC . Source: MoA, 2013.

There are also hazard maps developed at the community level under the recent Community Based Disaster Risk Management (CBDRM) initiatives, but these have not yet been compiled into a centralized repository.

A number of different institutions working in the area of agriculture have an interest in improving knowledge on drought hazards, namely the Hydro-meteorological Service, the National Irrigation and Drainage Authority (NDIA) and the Guyana Sugar Corporation Inc. (GUYSUCO). Traditionally, monitoring methodologies use comparison of monthly rainfall against historical averages. They are also reliant on biological indicators from the field. Typically the Hydro-meteorological Service produces monthly bulletins tailored for the agricultural sector, with consideration given to drought.

The Hydro-meteorological Service has also developed drought hazard maps for the northern regions of Guyana, but further data analysis is recommended. In particular, under the framework of a UNDP-supported project to align Guyana's National Action Plan on land degradation with the United Nations Convention to Combat Desertification (UNCCD)'s 10-Year Strategy (2008-2018)[32], an Early Warning System (EWS) protocol for drought will be developed.

In the recent years the Caribbean region, lead by the Caribbean Institute for Meteorology and Hydrology (CIMH), has been engaged in a comprehensive effort to establish a more structured, proactive and coordinated approach to monitoring and predicting drought, supported by monitoring impacts on the ground. Some of the indexes used are the Standardized Precipitation Index and Decile Information over various time scales.

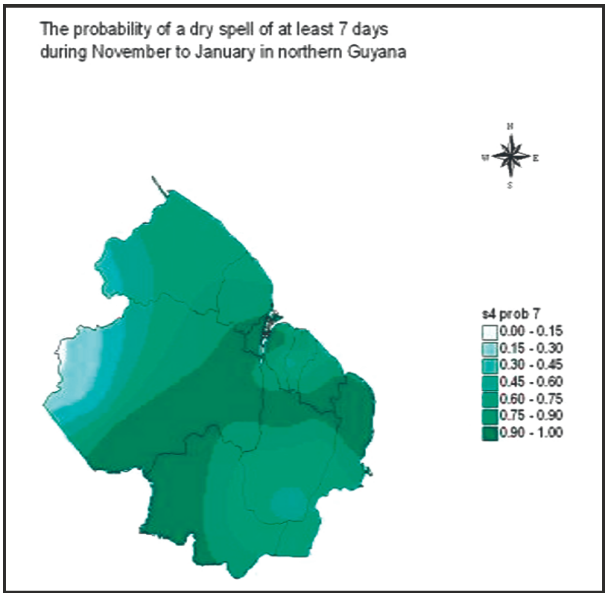


Image 13: Probability of a dry spell of at least 7 days during November to January in northern Guyana. Source: Hydro-meteorological Service.

As indicated in the Report of Indicators of Disaster Risk and Risk Management (Inter-American Development Bank, IDB, 2012), other natural phenomena that have a lower probability of affecting the country, such as hail storms, storm surges, and lightning. However, these hazard events are able to result in significant local damage.

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9.2.2 Biological hazards

The main biological hazards affecting humans in Guyana are related to vector and waterborne diseases such as gastroenteritis, malaria, dengue, leptospirosis, and the chikungunya virus. Their prevalence is determined mainly by environmental hygiene conditions, quality of water and sanitation, and solid waste management practices. As indicated before, a statistical correlation between prevalence of malaria and El Niño conditions has been found.

Other biological hazards affecting the country are plagues in crops, such as acoushi ants, and epidemics in livestock. Typical diseases affecting livestock include rabies spread by bats, botulism, bovine spongiform encephalopathy, equine encephalomyelitis, and in the case of poultry hypo-glycaemia, coccidiosis, fowl pox, and parasitism.

9.2.3 Chemical hazards

With regard to chemical hazards, one of the main threats identified is the possibility of a chemical spill from mining sites. The Guyana Geology and Mines Commission and the Environmental Protection Agency have relevant information on mining activities in the country, but to date, this has not been compiled into a complete chemical hazard assessment or map.

Cyanide is used in certain stages of large and medium-scale gold extraction, and mercury is extensively used in the small-scale sector. Both cyanide and mercury are pollutants that pose a high risk to human health and the environment, but cyanide is normally better contained, with lower risk of spillage. Mercury is a heavy metal, highly toxic to all biodiversity, and can pollute the water, evaporate and migrate, form stable products such as monomethylmercury, and remain for long periods in the environment.

The intensive use of chemicals in agriculture poses a risk to the water quality of aquifers and to human health. The Ministry of Agriculture has launched a Pesticide and Toxic Chemical Control Strategy 2013-2020 to implement, among other things, measures to comply with the Stockholm Convention Rules for Persistent Organic Pollutants.

These two sources of pollution have different dynamics. While the mining by-products are only likely to be released into the environment during short high intensity events as a consequence of a failure in protective measures (eg. dam breaches), the agricultural chemicals are a diffuse source of pollution, with slow on-set, and therefore strategies for prevention and mitigation should have a different approach.

Indiscriminate and inappropriate disposal and management of solid wastes, both hazardous and non-hazardous, in urban and rural areas, is another source of contamination, and a potential biological hazard. It is also a contributing factor to floods when it clogs the canals in urban areas.

9.2.4 Fire hazards

The attention given to major risks such as those posed by flooding and drought has traditionally caused fires not to be viewed as a major concern. However, due to the progress made in tackling floods over the past few years, the necessity of addressing fires is becoming more significant.

The main types of fire that take place in Guyana are:

1. Urban fire due to carelessness.
2. Urban fire due to electrical fire.
3. Forest fire due to carelessness.
4. Forest fire originating in agricultural practices.

Monthly reports on fires are gathered from the Guyana Fire Service, but the format of the information as it is does not allow for a hazard study to be elaborated. Efforts to systematize and compile the information are needed.

9.2.5. Other considerations on hazard assessments

It must be noted that several small-scale hazard assessments are undertaken in different projects and inititatives. This information can also be used as an input to develop broader hazard assessments at the regional and national level. Several sources of information are listed below:

- All infrastructural projects funded by the IDB and the World Bank need to provide a disaster risk assessment, and to comply with minimum DRM standards.

- The Environmental Protection Agency (EPA) requires the elaboration of an Environmental Impact Assessment (EIA) for obtaining an environmental permit.

- Community Based Disaster Risk Management (CBDRM) initiatives conduct Hazard, Vulnerabiity and Risk Assessments, but the number of communities covered remains low and the assessments are not compiled into a national scale information system.

- The Guyana REDD+ Monitoring, Reporting and Verification System (MRVS) developed in the framework of the Low Carbon Development Strategy (LCDS) is aimed at establishing a comprehensive, national system to monitor, report and verify forest carbon emissions resulting from deforestation and forest degradation in Guyana. The deforestation and forest degradation assessments can be used as an input for other multi-hazard assessments.

9.3. Vulnerability

The Low Carbon Development Strategy (LCDS) estimates that 39% of the population producing 43% of the Gross Domestic Product live in regions exposed to significant risk of flooding.

Although there is not a standardized methodology for conducting Vulnerability and Risk assessments in Guyana, several initiatives have undertaken their own vulnerability studies and collected valuable information driven by the specific needs of each institution. Nonetheless, some of this information can be used for further vulnerability assessments. For instance:

1. Community Based Disaster Risk Management (CBDRM) initiatives implemented by the Civil Defence Commission (CDC) and the Guyana Red Cross Society (GRCS) conducted Hazard, Vulnerability and Risk Assessments (HVRA) but the number of communities covered remains low and the assessments are not compiled into a national scale information system.

2. Habitat for Humanity Guyana (HfHG) conducted participatory assessments of housing and shelters at the community level, with the PASSA[33] (participatory approach for safe shelter awareness) methodology.

3. The LCDS has implemented a monitoring system to assess deforestation.

4. The Guyana Lands and Surveys Commission (GLSC) has produced a range of valuable maps at a national level: climatic regions, natural regions, physiographic regions, surface waters resources, deforestation, available land, population distribution, population density, soil degradation, potentially vulnerable areas, waterway degradation, mining concessions, tourist sites, forest fires frequency, etc.

5. The GLSC has also undertaken a National Assessment on Land Degradation.

6. Some other maps have been developed by the GLSC for coastal areas, such as land use patterns, soil erosion, and saline water intrusion.

7. The Guyana Bureau of Statistics (GBS) has gathered very useful data through the Census:

1. Type of building, year of completion, material of outer walls and roofing. Occupation arrangement.

2. Sources used for cooking, lighting, water supply, drinking water supply, sanitation facilities, waste disposal.

3. Appliances.

4. Crime, mortality, migration, disability, education, employment, training, fertility and pregnancy, economic activities (including informal economy), sources of livelihood, and access to the internet.

8. The Ministry of Public Works conducts regular conditions assessments of the sea and river defences and compiles the information in a GIS database to guide maintenance and upgrading works.

9. The Guyana Flood Risk Modelling Report includes the mapping of infrastructural and agricultural assets. It provides hazard, vulnerability and risk analysis. The urban areas are divided into blocks of similar characteristics and classified by use and average age of buildings.

10. The Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) provided a comprehensive vulnerability and adaptation assessment.

11. The Caribbean Community Climate Change Centre (CCCC) has undertaken vulnerability assessments following the International Panel for Climate Change (IPCC) guidelines for assessing vulnerability to sea level rise. The indicators include physical condition, ecological function, environmental condition, socioeconomic variables, land use, land values and natural habitats.

12. The Economic Commission for Latin America and the Caribbean (ECLAC)[34] has conducted general vulnerability and flooding risk assessments for the coastal regions based on population, Gross Domestic Product (GDP) and estimated contributions of ecological services.

33 *PASSA. Participatory Approach for Safe Shelter Awareness*. International Federation of Red Cross and Red Crescent Societies, 2011. http://www.ifrc.org/PageFiles/95526/publications/305400-PASSA%20manual-EN-LR.pdf

34 ECLAC. *An assessment of the economic impact of climate change on the coastal and human settlements sector in Guyana*. LC/CAR/L.327 . October 2011.

13. The National Strategy for Agriculture in Guyana 2013-2020 plans to establish several databases, geodatabases and registers that can be used to develop vulnerability analyses in agriculture, and drainage and irrigation.

Some of the constraints affecting the elaboration of vulnerability assessments are:

- Socioeconomic and gender data presents low disaggregation.

- There is a lack of systematic collection and integration of sectoral data.

- The data is not always released expeditiously, hindering the use and relevance of the information.

- Not all the information gathered is Geo-referenced. In particular, the Census information could be compiled in a GIS database with the highest disaggregation allowed by privacy constraints. This could better guide risk reduction measures but also preparedness and response actions.

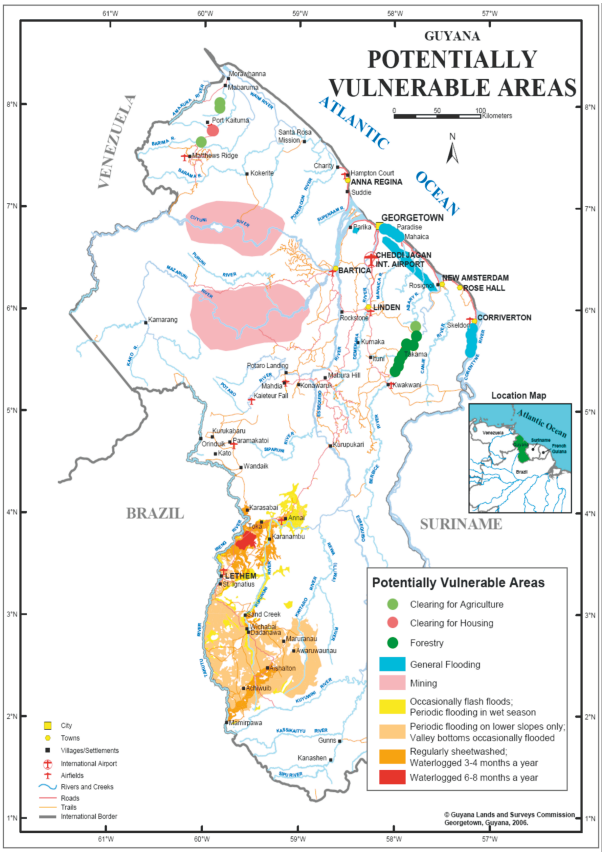


Image 14: Potentially Vulnerable Areas to Land Degradation. Source: GL&SC, 2008.

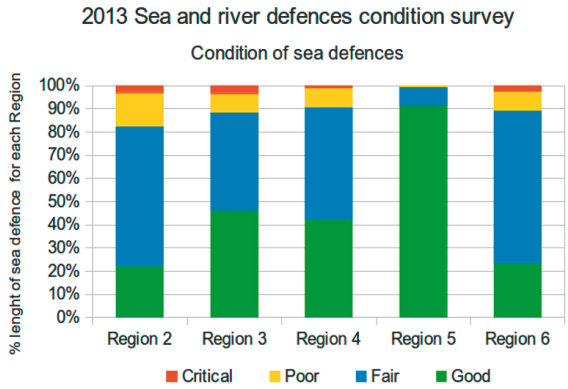


Image 15: 2013 Sea and river defences condition survey results per region. Source: Ministry of Public Works, 2014.

For upcoming vulnerability assessments different components of vulnerability should be incorporated into the analysis:

Social vulnerability. With consideration to age patterns, poverty, unemployment, education, health conditions, gender differences, disability, population density and living arrangements, effects of migration in social support networks, etc.

Physical vulnerability. Influenced by dwelling exposure, infrastructure, building materials and conditions, construction standards, mangrove areas, sea and river defence and conservancies maintenance conditions, drainage capacity, etc. The Poverty Reduction Strategy pointed out that the increased pressure on land resources in the coastal plain made the development of a land use policy and plan crucial.

Environmental vulnerability. Shaped by waste management systems, pollution and disposal of hazardous chemicals, water and sanitation conditions, sea and river defence conditions, land management, soil degradation, deforestation, and biodiversity, amongst others.

Economic vulnerability. Dependency on limited range of income sources and rising costs of food and fuel, low insurance use, and high exposure of economic wealth and infrastructure in the hazard prone areas increase the vulnerability of the population at risk.

Political vulnerability. In particular the degree of integration of DRM considerations into development planning at the local, sub-national and national level, and the enforcement of regulations.

Effects of climate change on vulnerability, and in particular its effects on livelihood.

In 2012, the Inter-American Development Bank (IDB) assessed the Indicators for Disaster Risk. A succinct description of conclusions is provided below.

The Disaster Deficit Index, DDI, measures the economic loss that a particular country could suffer when a catastrophic event takes place, and the implications in terms of the resources that would be needed to address the situation. A DDI greater than 1.0 reflects the country's inability to cope with extreme disasters, even by taking as much debt as possible. The greater the DDI, the greater the gap.

In 2005, the DDI was between 1 and 2 for the maximum considered events of 50 and 100 years of return period, and higher than 2 for the 500 years of return period event. For the period 2000 to 2010 the DDI decreased in all scenarios, with the DDI for 2012 for the event of 50 years of return period being lower than 1 (0.75).

Based on this estimation, the IDB warns "Reduction in DDI values in 2005 and 2010 demonstrates that the country has improved its economic resilience. Nevertheless, given that most of the resources to which the government could have access are its own funds and new debt, and, additionally, that government retains the majority of the losses and its financing represents a high opportunity-cost, given other needs of investment and the country's other existing budget restrictions, disasters would imply an obligation or non-explicit contingent liability that could have an impact on fiscal sustainability. "

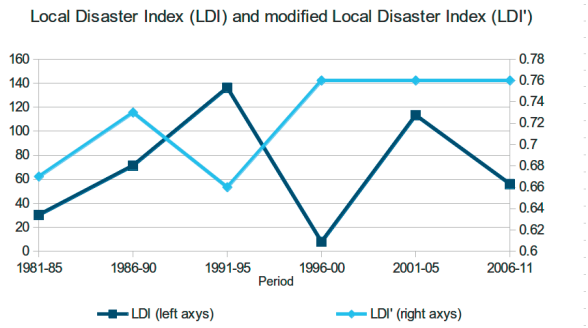
The Local Disaster Index, LDI, is calculated based on historical information from the Desinventar database, and it captures the incidence and uniformity of the distribution of local disaster effects.

A low LDI value (0-20) means high concentration of small disasters in few regions and a low spatial distribution of their effects between the regions where they have taken place. Medium LDI values (20-50) means small disaster concentration and distribution of their effects are intermediate; high LDI values (greater than 50) indicate that the majority of regions suffer small disasters and their effects are similar in all affected regions. Only the periods 1981-85 and 1996-2000 exhibit an LDI value of lower than 50. The rest of the periods considered indicate a high uniformity of the distribution of local disaster effects.

Since the purpose of this indicator is not to assess the distribution of extreme events, it is recommended that in further assessments it should take into consideration only small and moderate events.

The modified Local Disaster Index (LDI') measures the concentration of aggregate losses at regional level. Its value is between 0 and 1.

A high LDI' value means that a high economic loss concentration due to small disasters has occurred, but in few regions. The higher the LDI' the more concentrated the economic loss due to small disasters is. For example, an LDI' of 0.79 means that approximately 10% of the country will have a concentration of approximately 70% of the loss. In the considered period, LDI' is medium-high, which is consistent with the spatial distribution of the assets in the country.



Graph 24: LDI and LDI' for Guyana. Source: IDB, 2012.

The Prevalent Vulnerability Index, PVI, characterizes predominating vulnerability conditions reflected in exposure in disaster-prone areas, socio-economic fragility, and lack of social resilience. It ranges between 0 and 100. A value of 80 or above means very high vulnerability, from 40 to 80 means high, from 20 to 40 is a medium value, and less than 20 means low. It is comprised of four sub-indicators:

a. Exposure and susceptibility, PVI_{ES}, is calculated based on: Population growth, urban growth, population density, poverty-population below US$1 per day PPP, capital stock, imports and exports of goods and services, gross domestic fixed investment, and arable land and permanent crops.

b. Socio-economic fragility, PVI_{SF}, is calculated based on: Human Poverty Index, dependents as proportion of working-age population, social disparity, concentration of income measured using the Gini index, unemployment as % of total labour force, inflation, food prices, dependency of GDP growth on agriculture, debt servicing, and human-induced soil degradation (Global assessment of soil degradation, GLASOD).

c. Lack of resilience, PVI_L, is calculated based on: Human Development Index, gender-related development index, social expenditure on pensions, health, and education, governance index, insurance of infrastructure and housing, television sets per 1000 people, hospital beds per 1000 people, and environmental sustainability index.

The PVI was evaluated using data from the years 1995, 2000, 2005 and 2007. Prevalent vulnerability was reduced between 1995 and 2000 but has increased in 2005 and 2007 (Graph 24). The component with the highest contribution to vulnerability is the lack of resilience. It makes evident the fact that development per se does not necessarily reduce vulnerability, and that specific measures for DRR are needed.

9.3.1. Climate Change Adaptation and Mitigation

The foreseen effects of climate change include a globally averaged surface temperature increase of 1.4 to 5.8 ºC over the period 1990 to 2100. One of the results of this projected increase of temperature will be higher sea levels due to thermal expansion. The global mean sea level is projected to rise by 0.09 to 0.88 metres between 1990 and 2100 and the predicted sea level rise for the Caribbean is four times higher than the global average.

Comparisons of historical records on sea levels indicate that there has been rising in the Caribbean Sea with a trend of about 1.6 mm ± 0.4 mm per year.

Large scale impacts of climate change on oceans are expected to include increases in sea surface temperature and mean global sea level, decreases in sea ice cover, and changes in salinity and saline intrusion, wave conditions, ocean circulation, marine and land ecosystems equilibrium disruption and migration of species, changes in wetlands distributions, erosion of beaches, freshwater shortages, increase in coastal erosion, and other effects.

Mangroves prove to be an efficient and cheap protection measure, with estimated contributions of US $3.3 billion yearly in shoreline protection, and a reduction of Guyana's annual average vulnerability by US $15.54 billion (in combination with existing hard structures). However, the mangrove habitats themselves are particularly vulnerable to sea level rise, and under the worst sea-level rise scenario, mangroves will disappear from low-lying coastlines all over the globe.

Changes in precipitation patterns are more complex, and regional projections are less reliable. Projections indicate that there will be a steady increase in extreme weather events and longer periods of time between one rainfall and the next (more consecutive dry days). Rainfall is expected to intensify in the tropics of South America.

A significant increase in heat waves is projected for the entire region, and particularly the Caribbean. There is evidence that forest fires are increasing as a result of higher temperatures and especially heat waves, in combination with greater water stress.

In order to counteract the effects of climate change the Government of Guyana is putting in place both climate change adaptation and mitigation strategies. The most important contributions are:

1. Shifting the economy towards a low carbon path and improving the use of renewable energy sources.
2. Enhancing the level of protection provided by the different defence infrastructures.
3. Improving the capacity of conservancies, and drainage, irrigation and sewerage systems to deal with extreme events.
4. Avoiding deforestation.
5. Monitoring desertification and soil degradation.
6. Diversifying crops and introducing drought and flood resistant species and practices.
7. Improving land use practices.
8. Limiting impacts to the environment through environmental regulations and controls.
9. Increasing the availability of housing schemes, especially for the middle-low income groups.
10. Enhancing the awareness of the population on climate change effects and coping mechanisms.

9.4. Capacity

In 2009 a Capacity Assessment for Disaster Risk Management (DRM) was funded by the United Nations Development Programme (UNDP). The capacity assessment focused both on disaster and emergency response and on DRR, mitigation and early recovery.

Most of the indicators in the Capacity Assessment scored Low or Very Low, proving the necessity for implementing a project on Strengthening National and Local Capacities for Disaster Response and Risk Reduction. The project was implemented between 2009 and 2013, and included the establishment of the National DRM Platform, the draft DRM Policy, the National Multi Hazard Preparedness and Response Plan, the Early Warning System framework, the National Emergency Operations Centre (NEOC) Standard Operations Procedures (SOPs), the provision of training in DRM, the drafting of Guidelines for Development of Sectoral Disaster Preparedness and Response Plans, the development of Regional disaster plans, the procurement of IT equipment, the launching of the Civil Defence Commission (CDC) website and Sahana system, the draft of the Flood preparedness and response plan,

the development of the Damage Assessment and Needs Analysis (DANA) policy, plan, framework and forms, the establishment of early warning system (EWS) communications protocols, and support to the CDC Volunteer Corps.

This project made significant progress in building the capacities of the CDC. Once the DRM Bill is passed, different institutions at the national and regional levels in Guyana will need to develop their own DRM plans, and the CDC will have to provide guidance on the process. Therefore, a succinct analysis of the different stakeholders is pertinent.

The Hyogo Framework for Action (HFA) Monitor Progress Report 2014 provides the following insights about the capacity challenges present in the country:

1. Limited financial resources, and high dependency of external aid for Disaster Risk Reduction (DRR), with limited capacity for sustainable implementation.

2. High staff turnover and high levels of migration in many institutions. Need for continuous training. Duplication of initiatives. Limited organizational and historical knowledge.

3. Many aspects of DRM are not enacted, and therefore the strategies and work plans of the various institutions address its components in a non-holistic, integrated or harmonized manner.

4. Limited authority and resources of Regional Democratic Councils (RDCs) and Neighbourhood Democratic Councils (NDCs) for implementing DRR initiatives at the sub-national level.

5. Transportation and communication across the country is challenging and expensive, limiting outreach of centralized initiatives, monitoring of ongoing activities and enforcement of regulations.

6. Underestimation of risk due to cultural factors, leading to low preparedness and awareness.

7. The amount of information generated exceeds capacities to compile, analyze, and extract valuable information to guide planning.

In 2012, the Inter-American Development Bank (IDB) assessed the Risk Management Index (RMI), which measures performance in risk management. This index is a qualitative measurement of risk based on pre-established levels (targets) or desirable referents (benchmarking) towards which risk management should be directed, according to its level of advancement. For RMI formulation, four components or public policies are considered: risk identification, risk reduction, disaster management, and governance and financial protection.

With regard to risk identification the following indicators were considered: systematic disaster and loss inventory, hazard monitoring and forecasting, hazard evaluation and mapping, vulnerability and risk assessment, public information and community participation, training and education on risk management. From 1990 to 2010 risk identification shows a notable progress in every indicator, jumping from an overall value of 7.39 to 37.9 out of 100.

Risk reduction requires the execution of structural and non-structural prevention and mitigation measures. The indicators selected for the assessment of the Risk reduction component of RMI were: risk consideration in land-use and urban planning, hydrological basin interventions and environmental protection, implementation of hazard-event control and protection techniques, housing improvements and human settlement relocation from disaster-prone areas, updating and enforcement of safety standards and construction codes, reinforcement and retrofitting of public and private assets. Between 2005 and 2010 there was a significant increase in measures for Risk Reduction, from 17.2 to 32.4. However, no progress has been identified since 1995 on implementation of hazard-event control and protection techniques, housing improvements and human settlement relocation from disaster-prone areas, and the reinforcement and retrofitting of public and private assets.

In terms of capacities for preparedness and effectiveness of disaster management, the following indicators were assessed: organization and coordination of emergency operations, emergency response planning and implementation of warning systems, endowment of equipment, tools and infrastructure, simulation, updating and testing of inter-institutional response, community preparedness and training, rehabilitation and reconstruction planning. All the indicators started in 1990 at a low level, and show a progressive advance, most of them reaching "significant" progress in 2010. The overall value goes from 5.3 in 1990 to 39.5 in 2010.

The Governance and financial protection component of the RMI is assessed through: inter-institutional, multi-sectoral and decentralized organization, reserve funds for institutional strengthening, budget allocation and mobilization, implementation of social safety nets and funds response, insurance coverage and loss transfer strategies of public assets, and housing and private sector insurance and reinsurance coverage. It shows little progress in the period 1990 to 2010, changing from 8.3 to 17.2, with all the indicators remaining at an "incipient" stage in 2010.

9.4.1. Institutional mapping and coordination

9.4.1.1. Civil Defence Commission

The Civil Defence Commission (CDC) was first established in 1982 under the Office of the Prime Minister. In 1985, the first National Disaster Preparedness Plan was developed and put in place. Responsibility for the CDC was subsequently moved to the Office of the President (OP) in 1992, with the Head of the Presidential Secretariat becoming the National Emergency Coordinator.

In June 1997 the CDC was reconstituted by Cabinet with the following responsibilities:

1. To identify disasters according to established criteria and classification;
2. To produce plans for the management of national disasters;
3. To identify and implement mechanisms for disaster response and mitigation;
4. To maintain a permanent body, and to enhance the national capacity for Disaster Management and Response;
5. To train human resources involved in disaster response mechanisms;
6. To educate at all levels in the tenets of disaster response.

As stated on the CDC website and brochures, the current functions of the CDC are:

1. Service Provider – Promoting its role of providing services to local authorities/communities and for that purpose, to develop programmes designed to enhance those services.
2. Planning and Implementation – Ensuring the promotion and development at national level of disaster planning and management and, in co-operation with local authorities, facilitating the implementation of disaster management measures for the purpose of emergency relief and support;
3. Loss Reduction and Mitigation – Promoting the adoption of disaster loss reduction and mitigation policies and practices at the national and local authority level;
4. Voluntary Service – The promotion and development of voluntary service as an integral aspect of disaster management;
5. Training and Education – To establish and promote the development, maintenance and improvement of the tenants of disaster management training and education; and
6. Permanent Staffing – Maintaining a permanent body to enhance the national capacity for disaster management services.

In 2013 the CDC, in collaboration with stakeholders, drafted a new DRM Bill that once passed will reconstitute the CDC as the institution responsible for policy-making, coordination, supervision, monitoring and evaluation functions related to disaster risk management including damage assessment planning and any other matter relating to disaster risk management. The CDC would have the power to:

1. Advise the National Emergency Coordinator.
2. Develop and implement a National Disaster Risk Management Strategy and Plan.
3. Ensure multi-stakeholder participation in the development, updating, and sharing of a Disaster Risk Management Information System.
4. Develop criteria and make recommendations on the proclamation of a public emergency.
5. Establish a comprehensive early warning system.
6. Make recommendations for the establishment, management and monitoring of appropriate risk transfer mechanisms.
7. Monitor the development and enforcement of DRM measures by agencies and organizations.
8. Manage and mobilize resources for disaster risk management including the National Disaster Risk Management Fund.

The CDC has a staff of 22 workers, comprising military personnel, retired military personnel and civilians. To date the areas identified in need of human resources are Communications and Public Relations, and IT (website maintenance and geographic information systems).

The above-mentioned DRM Bill foresees the appointment of a National Disaster Committee, a National Damage Assessment and Needs Analysis Committee and an Essential Services Disaster Committee, and contains provisions for the appointment of any other committee, sub-committee, advisory or working groups as needed under the CDC to assist in the performance of its functions.

In 2014 the CDC completed the drafting of its Strategic and Implementation Plans for 2014-2017, with the following key points:

Mandate: To coordinate and monitor Disaster Risk Management and Comprehensive Disaster Management in Guyana.

Vision: Leading, coordinating and facilitating a sustainable disaster risk management system for Guyana that reduces risks and enhances resilience to all hazards and impacts.

Mission: To reduce loss of life, damage to property and improve the quality of life in Guyana by leading, coordinating and supporting the nation in the development and enhancement of a comprehensive disaster risk management system, involving preparedness, mitigation, response and recovery.

Core values: Teamwork, Equity, Professionalism, Honesty, Accountability, Selflessness, and Impartiality.

The draft Strategic plan has also identified twelve goals:

Goal 1.1 Reduce Vulnerability through Structural and Non- Structural Methods.

Goal 1.2 Reduce Economic Losses from Hazard Impacts.

Goal 1.3 Promote and maintain an Effective Level of Preparedness and Response Capacity.

Goal 1.4 Establish Early Recovery Mechanisms, Procedures and Systems.

Goal 2.1 Advocate successfully for the systematic integration of Disaster Risk Reduction in Sustainable Development Policies, Planning and Sector Programmes.

Goal 2.2 Enhance Commitment at the National Level to Comprehensive Disaster Management (CDM).

Goal 3.1 Strengthen Disaster Risk Management (DRM) Capacity among Public, Private, Civil Sector and Community Entities.

Goal 3.2 Expand and Develop the Volunteer Corps.

Goal 3.3 Work with Response Agencies to Enhance Competence in Response.

Goal 4.1 Restructure the CDC to Effectively Execute a CDM Mandate.

Goal 4.2 Use Technology to Promote Organizational Efficiency at the CDC.

Goal 4.3 Institutionalize Strategic Planning at the CDC.

Furthermore, a Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis has been undertaken to guide strategic management of the CDC.

9.4.1.1.1. Civil Defence Commission Volunteer Corps

The Civil Defence Commission (CDC), in compliance with its core values, and as a way of promoting volunteerism and enhancing awareness and preparedness in the general population, launched its CDC Volunteer Corps (CDCVC) on the International Day for Disaster Reduction in 2012.

The CDC believes that volunteerism is an ideal way to foster a sense of community and partnership. It bridges generational, cultural, social and political gaps by creating a platform for engaging people whilst addressing developmental issues and changes. Particularly in the Disaster Risk Management field, volunteerism creates an opportunity for participation by all in preparing for disasters, mitigating impacts on communities and responding to devastation.

Volunteers are trained in different aspects of Disaster Risk Management (DRM), such as damage assessment and needs analysis, community based DRM, search and rescue, relief, first aid, preparedness and response, community mobilization and conflict resolution.

As of 2014, the CDCVC has more than 120 members, and has established bases in Regions 3, 4, 5, 6, 7 and 9, with plans to have an official launch in the remaining regions before the end of 2015.

9.4.1.2. Office of Climate Change

The Office of Climate Change (OCC) was established in 2009 within the Office of the President to coordinate climate initiatives. Its mandate includes the following:

1. To support work on climate adaptation, mitigation and forest conservation, working closely with the REDD-Secretariat in the Guyana Forestry Commission (GFC).

2. To align the efforts of various government agencies on the issue of climate change.

3. To serve as the secretariat for the Multi-Stakeholder Steering Committee of the Low Carbon Development Strategy (LCDS).

4. To coordinate the efforts of bilateral, multilateral and non-governmental organizations assisting Guyana's climate change agenda.

5. To provide support to negotiations at appropriate global and regional forums.

The LCDS is aimed at investing in a strategic low carbon sustainable economy, at improving and expanding access to services and economic opportunities, and at protecting Guyana's people and productive lands from the negative effects of climate change.

In the first phase of the LCDS (2009-2013) the priority areas were: investment in renewable sources of energy, fostering the low-carbon development of Amerindian peoples, Amerindian land titling, expanding the digital economy and avoiding the digital divide, supporting micro and small enterprises (MSE) and vulnerable groups with low carbon livelihoods, establishing a centre for bio-diversity research and curriculum development, implementing measures for climate resilience and mitigation (in particular the rehabilitation of canals in the East Demerara Water Conservancy), and monitoring, evaluation and support tasks.

For the period 2013-2015, the previous priorities remain valid, and further priorities are added, namely: upgrading infrastructure and assets to protect against flooding, hinterland adaptation to climate change (infrastructure and agriculture), improvement of early warning systems, support to high potential low carbon sectors such as aquaculture and eco-tourism, expanding the support to hinterland and Amerindian development, and starting a clean transportation programme.

The OCC also coordinates Government engagement with international forestry programmes, including the Forest Carbon Partnership Facility, the Forestry Investment Programme and the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD).

9.4.1.3. Ministry of Natural Resources and Environment

The Ministry of Natural Resources and the Environment (MNRE) was established in 2011 to have oversight responsibilities for forestry, mining, wildlife, environmental management, protected areas and land management.

It has responsibility for the following agencies and commissions:

1. Guyana Geology and Mines Commission (GGMC).
2. Guyana Forestry Commission (GFC).
3. Guyana Lands and Surveys Commission (GLSC).
4. Guyana Gold Board (GGB).
5. Environmental Protection Agency (EPA).
6. National Parks Commission (NPC).
7. Wildlife Division (WD).
8. Protected Areas Commission (PAC), wich currently includes the National Parks Commission (NPC).

In 2013 MNRE launched the first National Policy on Geographic Information, which will help to consolidate, integrate and centralize diverse environmental geographic information generated by different agencies and commissions into the Geospatial Information Unit. The policy is also aimed at improving accessibility for the public and other stakeholders to any geo-referenced dataset produced by the Guyanese public sector.

In terms of reducing risks, Guyana is now on track to implement the Minamata Convention on Mercury, which implies a ban on new mercury mines, the phase-out of existing ones, control measures on air emissions, and the regulation of the informal sector for artisanal and small-scale gold mining. An action plan for promoting clean technologies has been drafted.

The "Pick it up Guyana" campaign is an initiative of MNRE's which links littering in the drainage systems to flooding, and seeks to address citizen attitudes towards the environment through clean-up exercises, public awareness tools and collaboration among other governmental agencies, businesses and local communities.MNRE has developed a Strategic Framework for 2013-2018, to introduce a more effective institutional framework and legislation, the adoption of holistic and integrated planning, and the enhancement of monitoring capacities. One specific gap identified is the lack of Strategic Environmental Assessments for national policies. These types of assessments could foster the integration of environmental protection, sustainable development, development planning, and DRM into policy-making.

Both Country Environmental Analyses and Strategic Environmental Assessments are valuable tools for planning decision-making and for mainstreaming environmental considerations into policy making across sectors.

Country environmental analyses are a systematic analytical tool that provide an overview of key environmental issues most critical to the sustained development of a country. They highlight constraints, environmental implications of key development policies, and detail the environmental management capacity and performance of the country. Strategic environmental assessments are a tool for the integration of environmental considerations into policies, plans and programmes at the earliest stages of decision-making.

The Guyana Geology and Mines Commission (GGMC) was created in 1979 from the Department of Geological Surveys and Mines, and it is divided

into the following technical divisions: Geological Services, Mines, Environment, Petroleum, and Land Management.

Functions that are relevant for Disaster Risk Management (DRM) include the responsibility of acting as a national repository for all information relating to geology and mineral resources; research in exploration, mining, and utilisation of minerals, and the enforcement of conditions for Mining Licences, Mining Permits, Mining Concessions, Prospecting Licences (for Large Scale Operations), Prospecting Permits (for Medium and Small Scale Operations) and Quarry Licences. Due to the responsibility it has for issuing permits for specific mining sites, and for environmental monitoring of those mines, GGMC could become a key partner in DRM.

The Forests Act mandates the Guyana Forestry Commission (GFC) with the overall management of Guyana's State Forests. The National Forest Plan gives GFC responsibility for the development of a national mangrove management plan. The National Forest Policy Statement was issued in 2011 with as overall objective the conservation, protection, management and utilization of the nation's forest resources, while ensuring that the productive capacity of forests for both goods and services is maintained or enhanced.

The Forest Policy Statement has specific objectives to:

1. Promote sustainable and efficient forest activities, which utilize the broad range of forest resources and contribute to national development while allowing fair returns to local and foreign entrepreneurs and investors;

2. Achieve improved sustainable forest resource yields while ensuring the conservation of ecosystems, biodiversity and the environment;

3. Ensure watershed protection and rehabilitation: prevent and arrest the erosion of soils and the degradation of forests, grazing lands, soil and water; promote natural regeneration, afforestation and reforestation; and protect the forest against fire, pests and other hazards; and

4. Identify and quantify environmental services to generate forest incentives for national development.

GFC is also responsible for management of the Guyana REDD+ Monitoring Reporting and Verification System, the monitoring instrument created to track deforestation in the framework of the Low Carbon Development Strategy (LCDS) and REDD+ mechanism.

The Guyana Lands and Surveys Commission was established in 2001 and is responsible for land administration (public lands applications, long-term land leases, and mortgage permissions), for land surveys (cadastral, engineering, topographic, hydraulic, etc) and for all issues related to land information and mapping.

The GL&SC is also the National Focal Point Agency to the United Nations Convention to Combat Desertification (UNCCD). As Focal Point Agency, the GL&SC is tasked with implementation of the Convention and has conducted various studies and research in keeping with the National Action Programme (NAP) to Combat Desertification, 2006. Additionally, the Commission has prepared national reports to the UNCCD on the progress of implementation of the Convention. The work under the Convention has been accomplished with the cumulative support of programmes and projects undertaken by the Natural Resource Sectoral Agencies. GL&SC prepared an Early Warning System (EWS) study in March 2010 tackling rainfall floods, breach and overtopping of the sea wall floods, drought caused by consecutive dry days, intense storms, and wild fire. This study was used by the Civil Defence Commission (CDC).

From 2014- 2015, the GL&SC has an Alignment of National Action Plan Project which intend to prepare an Early Warning System for Drought.

Regarding Land use and management, in 2012, GL&SC commissioned a consultancy to advise the Government of Guyana on the incorporation of Sustainable Land Management (SLM) principles into the Draft National Land Use Policy. In 2013 GL&SC developed a National Land Use Plan to guide development planning and policy making.

In the future, GL&SC would update the National Land Use Plan and continue to prepare and update Regional Land Use Plans. The information on location of natural disasters is useful for the current situation, analyses in the land use options and recommendations.

The Environmental Protection Agency (EPA) was established by the EPA Act of 1996 (amended in 2005), and is a body for the management, conservation, protection and improvement of the environment, the assessment of the impacts of economic development on the environment and the sustainable management of natural resources. The EPA works in close collaboration with other agencies having responsibilities in environmental rotection through the Natural Resources and Environment Advisory Committee (NREAC). The NREAC is chaired by the Minister of Agriculture, who is also a member of Cabinet and of the Cabinet Sub-committee on Natural Resources and Environment.

The Environmental Act establishes an Environmental Trust Fund for protecting the environment and conserving natural resources, for providing incentive

measures for reducing environmental pollution and for raising awareness on environmental protection and natural resource management.

The functions of the EPA include: requesting, examining, reviewing, evaluating and approving or rejecting environmental impact assessments and risk analyses, and establishing conditions or making suitable recommendations for the mitigation of adverse effects of any proposed activity on the environment.Environmental Impact Assessments (EIA) are publicized on the EPA website. When the EPA has concerns regarding DRM for a particular site, it liaises with the CDC, and normally shares the Environmental Management Plan and Environmental Emergency Response Plan of the affected site.

The EPA is also responsible for the monitoring of activities subjected to environmental permits, and has a duty to respond in the case of environmental disasters.

A hazardous waste inventory was completed in 2013.

Current constraints in the performance of the EPA are related to monitoring (lack of rangers in the regions) and the enforcement of punitive actions. The system mainly relies on self-monitoring and an audit for every permit renewal. However, complaint reports, damage assessment reports and hot-spot reports are continuously generated.

Integrated Water Resources Management is a new area of action for the EPA, under the recently established Water Management Unit. Some new activities in the country, like off-shore drilling, reveal the necessity of continuous training and upgrading of knowledge.

The Protected Areas Commission (PAC) was established to facilitate the management, maintenance, promotion and expansion of Guyana's National Protected Areas System. The PAC has responsibility for the Shell Beach Protected Area, Kaieteur National Park, the Kanuku Mountains Protected Area, as well as urban parks, such as the National Park, Zoological Park, Botanical Gardens and Joe Vieira Park. The Kanashen Community Owned Conservation Area has applied to join the National Protected Areas System as an Amerindian Protected Area. In total, approximately 8.6% of the country's surface area is under some form of Protection. The United Nations Convention on Biological Diversity (UNCBD) target for Protected Areas coverage is 17% by 2020.

Relevant environmental plans and legislation have been developed under the umbrella of MNRE and its commissions and agencies:

- National Environmental Action Plan (2001-2005).

- National Biodiversity Strategy and Action Plan (2012-2020).

- National Forest Plan (revised in 2011).

- National Protected Areas System Plan (2013-2015).

- National Land Use Plan (developed in 2013).

- National Mangrove Management Action Plan (revised in 2010).

- Integrated Coastal Zone Management Action Plan (developed in 2000).

- Fisheries Management and Development Plan 2006 (developed in 2006).

- Environmental Protection Act (1996).

- Environmental Protection Regulations (2000).

- The Environmental Protection Authorization Regulations.

- The Environmental Protection Air Quality Regulations.

- The Environmental Protection Water Quality Regulations.

- The Environmental Protection Hazardous Waste Management Regulations.

- The Environmental Protection Noise Management Regulations.

- Litter Enforcement Regulations(2014).

- Wildlife Management and Conservation Regulations, 2009.

- Species Protection Regulations (1999).

- Protected Areas Act (2011).

- Forest Act (2009).

- Fisheries Act (2002).

- Mining Environmental Regulations (2005).

- Kaieteur National Park Act (1929).

- Iwokrama Act (1996).

- Wild Birds Protection Act.

- Plant Protection Act (1919).

9.4.1.4. Ministry of Agriculture

The Ministry of Agriculture (MoA) is organized into departments, two project units and different agencies:

1. Fisheries Department.
2. Hydro-meteorological Service.
3. Agricultural Sector Development Unit.
4. Agricultural Programme Cycle Unit.
5. Agencies:

    1. National Agricultural Research and Extension Institute.

2. Guyana Livestock Development Authority.

3. Guyana School of Agriculture.

4. New Guyana Marketing Corporation.

5. Guyana Rice Development Board.

6. Mahaica Mahaicony Abary/Agricultural Development Authority.

7. National Drainage and Irrigation Authority.

8. Pesticides and Toxic Chemicals Control Board.

9. Rice Assessment Committees (Regions 2, 3, 4, 5 and 6).

Additionally, the Guyana Sugar Coorporation (GUYSUCO) is a public company that falls under the responsibility of the MoA, and is managed by a Board of Directors.

In April 2013 the Ministry of Agriculture launched its Disaster Risk Management (DRM) Plan for the Agriculture Sector 2013-2018[35], with afocus on the following areas:

i. Key area 1. Strengthening policies, institutional and technical capacities on DRM within the Agriculture Sector.

ii. Key Area 2. Risk identification, information systems and early warning.

iii. Key area 3. Build resilience for sustainable livelihoods in the Agriculture Sector.

iv. Key area 4. Preparedness, Response and Rehabilitation.

The DRM Plan for the Agriculture Sector incorporates considerations to Climate Change Adaptation (CCA), financial risk transfer, vulnerability and risk assessments, early warning and research on risk mitigation measures. Furthermore it establishes the institutional framework for DRM within the Ministry of Agriculture, at National, Ministerial and Regional levels. The need for the agriculture sector to adapt to climate change is also addressed in the National Agricultural Sector Adaptation Strategy to Address Climate Change 2009-2018.

The National Strategy for Agriculture in Guyana 2013-2020[36], establishes 25 priority areas, many of them related to DRM and reducing underlying drivers of risk. The most important in this regard are:

1. Advance Water Security and Water Management.

2. Enhance hydro-meteorological and weather forecasting.

3. Improvement of plant and animal health.

4. Improvement of food and nutrition security.

5. Promoting environmental sustainability.

6. Improvement of land management.

7. Expand agrodiversity and diversification of crops, and modernize farming systems.

It is expected that under the new strategy an Agricultural DRM coordinator will be appointed, as well as DRM focal points in each agency and department. A National Drought Management Plan and a Pesticide and Toxic Chemical Emergency Response Plan will be developed. Risk transfer instruments will be implemented. A standardized methodology for conducting Vulnerability and Risk Assessments will be developed, and the EWS for floods will be strengthened.

9.4.1.4.1. Hydrometeorological Service

The Hydro-meteorological Service of the Ministry of Agriculture (colloquially known as "Hydromet") is one of the key stakeholders of the Civil Defence Commission (CDC) due to the fact that hydro-meteorological disaster events are among the most common.

The Hydro-meteorological Service was established in 1965, but the collection of rainfall data started more than 100 years ago. The Service is the official provider of weather, water and climate information and related products and services for Guyana.

Its general responsibility is to monitor and evaluate the weather, climate, surface water and groundwater resources in Guyana and to actively support the government and agencies working on aeronautics, water, agriculture and engineering with disaster risk management. The Service provides warnings on individual meteorological events, and weather bulletins both for the general public and tailored for farmers.

One of the recent flagship achievements for the Hydro-meteorological Service is the Doppler Radar installed in 2009 as part of the Caribbean Regional Weather Radar Warning System funded by the EU under the 9th EDF. Other participating States in the system are Belize, Jamaica, the Dominican Republic, Guadeloupe, Barbados, Martinique, Trinidad and French Guiana. This radar increases capacities for

35 *Disaster Risk Management Plan for the Agriculture Sector 2013-2018* http://www.un.org.gy/un-media/publications/item/download/12_948a2ac3a5d43dfcd7cda204843e380c

36 *National Strategy for Agriculture in Guyana 2013-2020.* http://agriculture.gov.gy/National%20Agriculture%20Strategy%202013-2020.pdf

weather forecasting, especially in terms of rainfall, operating 24/7.

A new Strategic Development Plan 2014-2018 for the Hydro-meteorological Service is being drafted. The Service has the basic infrastructure to generate and deliver information-based products for agriculture and other sectors, which will enable citizens to cope with weather, water, and climate-related hazards. However, the strategy recognizes the need for improving sector-specific weather, climate and hydrological information and early warnings, and for the incorporation of climate information and climate risk considerations into development decisions to address mitigation and adaptation policies and strategies. It identifies the necessity for strengthening the institutional framework and the capability of the Hydro-meteorological Service for accurately predicting localized extreme weather events.

Image 16: National Weather Watch Centre (NWWC), Doppler Radar. Source: Hydro-meteorological Service.

The Current Meteorological and Hydrological Network is comprised of synoptic stations, rainfall stations, climate Stations, automatic weather stations, hydrological stations and a Doppler Weather Radar Monitoring station. Support is needed to improve the density of monitoring stations across Guyana, and access to satellite receiving systems. A better understanding of the interactions between water resources and the global environment is also needed, with enhanced hydrology monitoring capabilities, including flood warning. Enhanced capacity for climate data acquisition and scientific analysis is also a priority.

In 2013 a new IT system for the automatic acquisition and exploitation of data in real time was set up. The existing database needs to be updated with historical data. Another constraint related to IT is the lack of adequate computer systems to run advanced numerical weather prediction models in a timely manner. More information should be available online.

The strategy recognizes the need to upgrade communications systems and equipment to improve the supply of data to pertinent agencies in case of emergencies. In particular, there is a need to establish a flood and drought warning programme, and a water/ground water quality monitoring programme.

9.4.1.4.2. National Drainage and Irrigation Authority

The Agriculture sector contributes over 35 % of the country's GDP, and is highly dependent on the coastal drainage and irrigation network, as are the households and businesses in this region. There are over 150,000 ha of land equipped for agricultural production within this network.

The National Drainage and Irrigation Authority (NDIA) deals with the management, improvement, extension and provision of drainage, irrigation and flood control infrastructure and services in drainage and irrigation declared areas. It was established in 2006 under the Drainage and Irrigation Act, and has focused on improving and upgrading drainage and irrigation services countrywide, ensuring that agricultural land is more resilient against adverse weather related events.

Ambitious plans for the maintenance, upgrading and rehabilitation of drainage and irrigation infrastructure are implemented on a regular basis in Regions 2 to 6 and in Region 10, with the construction of new dams, canals and sluices and the installation of more pumps (fixed and mobile). In particular, the construction and rehabilitation of sluices allows for the spatial expansion of agricultural activities and for better coping with extreme rainfall events associated with climate change. These sluices are designed to equip areas to withstand in excess of 2.5 inches of rainfall in 24 hours.

From 2003 to 2011, the Government of Guyana has invested US$ 6.12 million on average per year on water-related infrastructure and programmes, channelled mainly into agricultural water resources (53.5%) and large systems of water supply and sanitation (37.2%).

The Flood Prevention and Drought Control Plan 2013-2020 (draft) describes actions that are intended to reduce and prevent floods and control and mitigate drought events. This Plan is derived from the Disaster Risk Management Plan for the Agriculture Sector and also from the National Drainage and Irrigation Authority (NDIA) Infrastructure Portfolio 2013-2030.

The Community Drainage and Irrigation Programme has also been supporting vulnerable residential areas by clearing about 900 miles of critical drains and canals in Regions 2 to 6 and in Region 10 every month. NDIA undertakes the rehabilitation of community canals, while the Ministry of Local Government and Regional Development (MLGRD) is in charge of maintenance.

Coordination is assured through the participation of the Permanent Secretary of the Ministry of Agriculture, the Chairperson of the Sea Defence Board, officers from the Hydro-meteorological Service, the Guyana Lands and Surveys Commission, and Hydraulics, and local authorities and others on the Drainage and Irrigation Board.

The National Strategy for Agriculture in Guyana 2013-2020 captures the priorities and planned actions from NDIA to address water management and DRM, including amongst others:

- Maintaining an annual register of assets and maintenance needs with detailed GIS information.

- Implementation of a portfolio of drainage and irrigation development projects.

- Implementation of flood prevention strategy.

- Expansion of drainage and irrigation capacity.

- Annual Report from NDIA to capture all flood situations and analysis for flood losses prepared.

-Strengthen Water Users Associations.

- Reorganization of the Community Drainage and Irrigation Programme for greater effectiveness.

9.4.1.5. Ministry of Public Works

The Ministry of Public Works (MoPW) executes most of the planning, construction and maintenance of the major public civil works in Guyana. The following departments and agencies fall under it:

1. Work Services Group (WSG)
2. Transport and Harbours Department (THD)
3. Demerara Harbour Bridge Corp. (DHBC)
4. Guyana Civil Aviation Authority (GCAA)
5. Maritime Admin. Department (MARAD)
6. Cheddi Jagan International Airport (CJIA)
7. Canawaima Management Company

The Sea and River Defence Division, now a part of the Work Services Group (WSG), was established under the 1998 Sea Defence Act of Guyana, with responsibility for both man-made and natural defences, and to reduce the risk of flooding and loss of land in protected areas due to river and sea encroachment.

In the annual programming of activities, the continuous reconstruction of critical sea and river defences to support risk reduction accounts for one of the biggest budget expenditures.

The new institutional framework associated with the WSG encompasses corporate and operational planning, human resource management, and management systems and procedures. The new organizational structure includes a Design department, and a GIS department with a Shore Zone Management System. Staff were trained in the latest GIS technologies and related hardware and software was purchased.

Due to the magnitude of the work that has to be carried out, eight districts have been set up. In each district, sea and river defence rangers are deployed to undertake a comprehensive condition survey of the sea and river defence systems, along with geodetic topographic and bathymetric surveys.

This information is entered into a geo-database with tidal, hydrological and infrastructural conditions data for continuous monitoring and to provide sound information for decision-making. It is a priority for the WSG to digitize information that has been gathered. The modular design of the information systems allows expansions to include new datasets and capabilities.

Some of the challenges experienced by the WSG are related to the shortage of staff to execute maintenance work and of skilled contractors to execute sea defence works. Additionally, the gaps in funding are filled with financial support from external aid, namely from the EU through the 8th, 9th and 10th European Development Funds (EDF), and from the Caribbean Development Bank.

For instance, the Sea Defences Programme (9th EDF) provided EUR 17 M for the maintenance and rehabilitation of Sea Defences at 33 sites, for institutional capacity building of the Sea and River Defence Division, and for policy development.

Also within the Ministry of Public Works, the Guyana Civil Aviation Authority was established in March 2002, after the approval of the Civil Aviation Act in 2000. It is responsible for the development of civil aviation, and ensuring compliance with international standards. The Civil Aviation Authority has full authority to monitor, inspect, certify, and issue licenses to civil aviation operators. The GCAA supervises all airports and airstrips in the country, including the Cheddi Jagan International Airport, the Ogle International Airport and the Lethem International Airport. It also conducts investigations into incidents and accidents involving Guyanese registered aircrafts, and foreign-registered aircrafts in Guyanese airspace, and maintains a database of aircraft accidents and incidents.

In terms of Disaster Risk Management (DRM) capacities the two major airports have emergency

plans, and flood risk mitigation measures are in place in both airports.

Private airstrips are required to submit an emergency plan and a Business Continuity Plan (BCP).

In 2009 an Aeronautical and Maritime Search and Rescue Plan was approved, and the different stakeholders have signed a Memorandum of Understanding. A rescue coordination centre was established.

Training and funds have been allocated to enhancing capacities for accident investigation, although the number of staff available for these tasks is limited. Certain remote areas in the interior of the country can pose challenges, especially when the response involves extraction from forested areas.

9.4.1.6. Ministry of Health

Guyana's constitution guarantees health as a fundamental right and it is a priority in the development agenda. While the overall responsibility for health rests with the Ministry of Health, the National Health Policy Committee is the leading policymaking body, and the Ministry of Local Government and Regional Development is responsible for managing finances allocated by central government and for providing services at the regional level through the Regional Democratic Councils. These receive technical and professional guidance from the Ministry of Health. However, Guyana is in the process of transferring regional responsibilities to the Regional Health Authorities.

The National Health Sector Strategy 2008-2012 had the following broad goals:

- Equity in distribution of health knowledge, opportunities and services.
- Consumer-oriented services: people focused and user friendly.
- High quality services (good value for money).
- Accountable providers and government.

The Health Strategy also had five main components:

1. Decentralization of health service providers.
2. Strengthening the skilled workforce and human resources systems.
3. Strengthening government capacity for sector leadership and regulation.
4. Strengthening sector financing and performance management systems.
5. Strengthening strategic information.

In 2009, the Ministry of Health with the support of the Pan American Health Organization (PAHO/WHO) developed the National Health Sector Disaster Plan for Guyana. It encompasses, inter alia:

1. Establishment of minimum standards for health response in disaster planning and mass casualty.
2. Outline of the roles and functions of different actors at various levels.
3. Establishment of management and operation procedures during response.
4. Prioritization of scenarios:
    1. Flooding. Consistent heavy rain leading to overtopping of the East Demerara Water Conservancy (EDWC).
    2. Flooding. Breach in sea or river defences.
    3. Flooding. Heavy rainfall causing localized flooding in one of the coastal regions.
    4. Mass casualty. Plane crash or stampede at the Providence Stadium.
    5. Scenarios of avian flu were set out in the National Influenza Preparedness Plan.
    6. Establishment of activities and tasks to be implemented at various levels with regard to Prevention/Mitigation, Preparedness, Response and Early Recovery.

The Central Board of Health is the main coordination forum for health issues, chaired by the Chief Medical Officer and with attendance of representatives from relevant ministries and bodies, including the Ministry of Housing and Water, the National Commission on Disability, the Guyana Lands and Surveys Commission, the Guyana National Bureau of Statistics, etc.

In 2014, Guyana started evaluating the safety of major hospitals when faced with disasters, through the assessment of the Hospital Safety Index, a methodology developed by PAHO/WHO. This methodology encompasses the assessment of elements relating to the geographic location, structural safety of the facility, non-structural safety and functional capacity.

The project is being implemented by PAHO/WHO under the DIPECHO Action Plan for the Caribbean 2013-2014.

9.4.1.6.1. National Commission on Disability

The National Commission on Disability (NCD) was established in 1996. It is a President-appointed advisory body promoting the rights of people living

with disabilities, and influences policy changes and the enforcement of laws that protect the rights of persons with disabilities in Guyana.

The Disability Act, passed in 2010, guarantees the full enjoyment of rights by persons with disabilities, strengthens the mandate and power of the NCD and details offences and penalties for acts of discrimination.

The NCD is currently developing its strategic plan, which will focus on capacity building for the NCD and non-governmental organizations, on advocacy, and on the mainstreaming of rights for persons living with disabilities in various public bodies.

One of the first priorities for the NCD is tackle the gathering of sound information, to better achieve its goals in terms of service and to have sound information as a basis for advocacy and planning. Based on this, the NCD has undertaken surveys and registration drives, and has liaised with the Guyana Bureau of Statistics to expand the amount of information and the level of detail on disabilities gathered through the Census 2012. The NCD faces constraints in terms of human resources to conduct its surveys and to enhance data quality assurance and data exploitation.

Key areas for improvement highlighted by the NCD are:

1. Access to education. Will be tackled in the Educational and Recreational Act and in the Special Needs Education Law.

2. Need to adapt building codes to cater for mobility constraints, and to conduct outreaches to the building sector.

3. Need to implement programmes for early identification.

4. Outreach to media and civil society organizations.

5. Educate the population in language use.

6. Lack of guide dogs.

In 2013, the NCD, in collaboration with the United Nations Children's Fund (UNICEF), the Civil Defence Commission (CDC), the CDC Volunteer Corps, the Red Cross Society and Habitat for Humanity Guyana, implemented a pilot project with three main components:

1. Workshop: "Introduction to Disaster Risk Reduction and Persons Living with Disabilities".

2. In-school art and essay competition for school students.

3. Pilot community registration drive in two communities.

9.4.1.7. Ministry of Home Affairs

The Ministry of Home Affairs (MOHA) is responsible for the formulation of policies with respect to public order and safety and for evaluating the implementation of such policies while assisting in the protection and maintenance of Guyana's social fabric. The mandate of the Ministry is discharged through various departments and agencies, namely the Police Force, the Prison Service, the Fire Service, the Register Office, and the Police Complaints Office.

The Ministry of Home Affairs also liaises with a number of ministries and with local, regional and international committees and tasks forces with responsibilities in security issues.

The Ministry of Home Affairs' Strategic Plan establishes seven strategic goals for the period 2012 to 2017. The goals are:

1. Realign and modernize MOHA's organization structure for greater responsiveness.

2. Establish MOHA as a centre of Excellence in Public Service.

3. Enhance the physical infrastructure of MOHA.

4. Deepen inter- organizational linkages for greater security sector cohesiveness and impact.

5. Increase border surveillance and management for greater citizen security.

6. Ensure greater citizen security through effective performance of subvention agencies.

7. Reduce road fatalities through enhanced traffic management surveillance.

Furthermore, the Citizen Security Programme and the Guyana Police Service Strategic Plan 2011-2015 establishes operational priorities for the Ministry of Home Affairs concerning the following issues: drugs, firearms, people trafficking, traffic, cybercrime, international crime, money laundering, youth crime, piracy, domestic violence and offences involving weapons.

ith regard to coordination with the Civil Defence Commission and the DRM System, the Police Service is represented on the National DRM Platform, and fire and accident reports are shared on a monthly basis to update the emergency and disaster events database.

9.4.1.8. Ministry of Local Government and Regional Development

The Ministry of Local Government and Regional Development (MLGRD) is the primary body which links various local and regional

authorities with Central Government.

There are ten Regional Democratic Councils (RDC), seven municipalities and 65 Neighbourhood Democratic Councils (NDC).

The Regional Democratic Council is the supreme Local Government Organ in each region with responsibility for the overall management and administration of the Region and the coordination of all the activities of Local Democratic Organs within its boundaries. Each RDC is headed by a Chairperson. The Regional Executive Officers (REO) are responsible for the authorization of expenditures emerging from the national budget. Those allocations go to health, administration, public works and education. The REOs report both to the Regional Chairperson and to the Ministry of Local Government and Regional Development.

The RDCs and municipalities are required to establish finance, work and social development committees, whereas the NDCs have to establish finance and work committees. They all have full discretion to establish further committees as needed. Regional Disaster Risk Management Committes are being established.

The municipalities ensure that drainage and irrigation systems are kept in such a state so as not to be injurious to public health and are properly cleansed and drained. Municipalities have the power to require owners to conduct drainage works to prevent flooding. They can also provide relief to persons in need, establish and maintain fire services and ambulances, manage dangerous buildings, and maintain roads, street lights and other infrastructures.

The RDCs are responsible for health, education and agricultural support services.

Neighbourhood Democratic Councils cover a small geographic area within each region and are tasked with responsibilities for the management and administration of the area within their boundaries. Specifically, the NDCs are responsible for waste collection and sanitation, roads, dams and markets. The NDCs receive a subvention from Central Government every year to assist in the execution of development works. Other functions of the NDCs are to maintain and protect public property and to levy and collect taxes which are retained by the Council for providing services to citizens.

The 75 Amerindian village councils have responsibilities similar to the NDCs but are supervised by the Ministry of Amerindian Affairs and not by the MLGRD.

The planning process from the regional to the national level operates with a bottom-up approach. The RDCs identify the priorities and the REOs send budgetary requests to the Ministry of Local Government. Once endorsed by the MLGRD, they are submitted to the Ministry of Finance, Ministry of Health, Ministry of Public Works, and Ministry of Education. The sector ministries review the proposals to avoid incoherencies or overlapping, and the Ministry of Finance compiles, scrutinizes and reviews all proposals before delivering a draft Annual Budget.

9.4.1.9. Ministry of Amerindian Affairs

The Amerindian Act of 2006 grants Amerindian people the right to apply for communal land and recognizes the autonomy of Amerindian villages in terms of governance. Village Councils have the power to establish rules for their communities and to set fines within the legal confines of the law.

The planning decisions adopted in villages are therefore supervised by the Ministry of Amerindian Affairs (MoAA) and not by the Ministry of Local Government and Regional Development.

A number of projects and initiatives are in place to foster the development of Amerindian communities:

1. The Young People Apprenticeship and Entrepreneurship programme. The Apprenticeship Trust allows young Amerindians to be trained in various competencies through skills-based training in the areas of IT and Communications, Governance and Leadership, Business and Financial Management, Social and Welfare Services, Eco-tourism, Monitoring and Reporting, Disaster Management, and Agriculture. The Entrepreneurship Trust aims to encourage young Amerindians to start businesses through productive activities and innovation by allowing young people to have first-hand experiences in certain trades and services.

2. Presidential Grants allocated to help Amerindian communities in establishing income-generating projects to advance their growth and development.

3. Credit Schemes to promote and encourage the development and growth of industries to include Trade, Commerce, Manufacturing, Agriculture and Fisheries in communities.

4. Amerindian Land Titling, to complete the process of titling and demarcation of Amerindian lands.

5. The Amerindian Development Fund, which provides funding to support the socio-economic development of Amerindian communities and villages through the implementation of their Community Development Plans.

6. The Hinterland Scholarship Programme, to enhance access to education to populations from the hinterlands.

9.4.1.10. Guyana Defence Force

The Guyana Defence Force (GDF) is organized into different units: Headquarters, the Coastal Guard, the Air Corps, the Medical Corps, the Band Corps, the Agri Corps, the Signal Corps, the 5th Service Support Battalion, the 1st Infantry Battalion and the 2nd Infantry Battalion Reserve, the Finance Department, the Training Corps, the 21st Artillery Company, Legal services, the Credit Union, the G2 Branch (former Intelligence Centre), the IT department, and the Engineer Battalion.

It has permanent bases in Regions 1, 2, 4, 6, 9 and 10, but these are not equipped with early warning capacities for civilian use.

The main mandate of the GDF is the defence of the country, but the GDF plays a significant role in DRM in Guyana, participating in the Disaster Response plans, especially in search and rescue. Accordingly, the GDF training programme has tended to progressively incorporate more contents about Disaster Risk Management (DRM). A signal of this commitment towards DRM is expressed in the 2014 annual theme: "towards greater operational readiness for national defence and security", where the word "security" refers to operations of emergency and disaster response, and human security.

For emergencies in regions other than Region 4, base commanders have the authority to deploy exploration patrols, but if the emergency involves major flooding or Search and Rescue (SAR) activities are needed, then permission from GDF headquarters has to be granted.

For those emergencies taking place in Region 4, normally the GDF responds to the Civil Defence Commission (CDC). The current arrangement between the CDC and the GDF allows for the use of GDF's manpower and vehicles, with supplies provided by the CDC.

The GDF is involved in multiple international cooperation activities, namely in coordination with the U.S. Southern Command, (US SOUTHCOM), Fuerzas Aliadas Humanitarias (FA-HUM), Miami National Guards, the Union of South American Countries (UNASUR), etc. The type of activities include Emergency Operations Centre management training, participation in exercises, Subject Matter Expert Exchanges, defence cooperation, etc.

9.4.1.11. Ministry of Education

The Ministry of Education (MOE) is currently developing its new Strategic Plan. The priorities in the 2008-2013 Strategic Plan were focused on providing quality education, attaining universal secondary education, improving the teacher education sub-system, bridging the gap between the education system and workplace demands, improving inclusiveness, implementing a school health, nutrition and HIV/AIDS programme, developing managerial capacity and furthering Monitoring and Evaluation.

During the implementation of the last plan several initiatives were implemented addressing biodiversity awareness and climate change. In the future Strategy it is expected that Sustainable Development, Climate Change, Clean Energy and Disaster Risk Management issues will be progressively incorporated in Science, Technology, Engineering and Mathematics (STEM) education.

With assistance from the United Nations Children's Fund (UNICEF), a DVD on climate change titled *Our Earth is Heating Up? Let's Take Action Now* was produced for Nursery Level. At the primary level, workshops on science teacher training targeted the use of the Inquiry Based Science Education approach in teaching climate change. Under the National Mangrove Management Action Plan several resources for schools on the sustainable coastal zone protection through mangroves were developed. These included a DVD titled *Holding Back the Sea* and a teacher's resource book for secondary schools in Guyana – *Mangroves: Our Natural Sea Defence*. The establishment of the Mangrove Visitors' Centre led to several field trips being made by primary and secondary school teachers and students.

In 2010 the Ministry developed its Disaster Preparedness Policy. It establishes an Incident Command System, a Unified Command for National Emergencies, Standard Operation Procedures for Response, and different roles and responsibilities at various levels. The Policy also outlines activity plans for prevention and mitigation, preparedness response, recovery and monitoring, and provides checklists for risk assessment. Finally, the policy addresses specific considerations for evacuating persons with special needs.

In 2011 the Ministry of Education launched the Protocol for Safe and Secure Schools, aimed at establishing a secure and safe school environment through:

1. Tackling disruptive behaviour, gangs and anti-social cliques.

2. Establishing Security and Safety Committees, assessing the safety of schools, launching safety and security campaigns at the school level, and maintaining a safe and secure physical environment.

3. Regulating access to the building.

4. Managing possession of weapons and illicit substances.

5. Establishing communication protocols with the Police and Fire Services, and maintaining working relationships with local and national agencies that can assist schools with security and safety issues.

6. Designating emergency procedures and assembly points.

7. Establishing guidelines to prevent violence.

The Non-Academic Standards approved by the Ministry of Education set minimum requirements in, amongst others, the following areas: the location of schools and exposure to hazards, infrastructural conditions, provisions for persons living with disabilities, water and sanitation standards, fire extinguishers, space availability and ratios of enrolment.

The Civil Defence Commission (CDC), with the collaboration of the Ministry of Education, launched in 2014 a National Public Education and Information Campaign on Disaster Risk Management (DRM), targeting both the general population and specifically school children, encompassing the use of short infomercials, audio advertisements for radio, a ten minute documentary for television, newsletters, and awareness materials and competitions for schools.

The MOE, through the National Centre for Educational Resource Development (NCERD), and with the support of the United Nations Educational, Scientifical and Cultural Organization (UNESCO), UNICEF, Conservation International, the National Agriculture Research and Extension Institute (NAREI), and the Mangrove Restoration and Management Department, is planning to implement the project "Strengthening Climate Change Education for Sustainable Development (CCESD) in Guyana Phase II", to ensure that Climate Change Education for sustainable development is infused in the Curriculum at bothprimary and secondary levels.

9.4.1.11.1. University of Guyana

The University of Guyana has been incorporating Disaster Risk Management (DRM) into its curriculum for several years.

Due to the environmental, economic and social conditions and priorities of the country, a strong curriculum in Environmental Studies is necessary to address needs in skilled labour.

The School of Earth and Environmental Studies[37] offers bachelors degrees in Geography, Environmental Sciences and Economics, as well as a course on Emergency Planning and Management. It also offers a Postgraduate Diploma/Master of Science Degree in Environmental Management, with two specialization streams: 1) Natural Resources Management, and 2) Climate Change and Disaster Management.

Representatives from the School of Earth and Environmental Studies are regular attendees at the National DRM Platform meetings, and several lecturers have conducted studies and consultancies related to DRM in the past.

9.4.1.12. Guyana Red Cross Society

The Guyana Red Cross Society (GRCS) was Established in 1948 as a branch of the British Red Cross. In 1967 after Guyana gained its independence the name changed from the British Red Cross to the Guyana Red Cross Society.

The Guyana Red Cross Society, like the rest of the National Societies, is a national voluntary organization acting as an auxiliary to the public authorities of the country in the humanitarian field.

The core areas in which the GRCS works are:

1. Promotion of the Movement's Fundamental Principals and Humanitarian values

2. Disaster response

3. Disaster Preparedness

4. Health and Care in the Community.

These areas of action unfold in a range of services addressing both immediate and long term needs, including:

1. First Aid and cardiopulmonary resuscitation, community-based health and first aid Training.

2. Health Care Programmes: Fundamentals of Health, Home Nursing, Care for Children, Care for the Elderly.

3. Trainings in Violence Prevention.

4. HIV and AIDS Prevention, Care, Treatment and Support.

5. Disaster Relief.

6. Disaster Risk Reduction (DRR) and Disaster Risk Management (DRM).

7. Management of the Children's Convalescence Home.

8. Youth Development and Empowerment.

9. Physiological Support.

37 http://uog.edu.gy/schools/sees

10. Water, Sanitation and Hygiene (WASH).
11. Gender Awareness.
12. Health & Safety.
13. Blood Donor Recruitment.

The Guyana Red Cross is implementing the project "Improved water, sanitation and hygiene conditions for hinterland communities" in 23 communities of Region 1 Barima – Waini since 2011, contributing to the reduction of WASH related disease prevalence and child and maternal mortality. To date, noticeable improvements have been achieved in sanitation, hygiene and livelihood practices as well as in the availability of safe drinking water.

In terms of DRM, the methodology used by the GRCS involves the creation of Community Disaster Risk Teams, the development of Vulnerability and Capacity Assessments, Disaster Plans, Mitigation Projects, and the establishment of Early Warning Systems at the community level.

In 2010, the Canadian Red Cross launched the Caribbean Community Resilience to Disaster Risk (CCRDR) project. At the regional level it involved developing and piloting a strategic targeting mechanism to determine the location of the most vulnerable communities. It also established a Disaster Risk Reduction Reference Centre in Barbados to provide technical training and expert advice and promote community resilience in the Caribbean. At the community level it provided direct community-based disaster risk reduction programming through three National Red Cross Societies (Dominica, Jamaica and Guyana) in collaboration with National Disaster Management Agencies and other partners.

In Guyana, twenty communities in Regions 2, 3, 5, 6 and 9 completed the disaster risk reduction process (risk assessment, preparedness teams, and mitigation projects). Additionally, two trainings in Livestock Emergency Guidelines and Standards[38] were delivered. Once the project is completed, the outcomes will be handed over to the Civil Defence Commission (CDC).

The GRCS advocates for the implementation of projects with an integrated approach, encompassing first aid, Community Based Disaster Risk Management (CBDRM) and health support.

One example of this approach is the project "Building Community Resilience" being implemented since 2013 in 13 communities in Regions 1 and 7. This project addresses WASH conditions and community-based health care, and strengthens the learning capacity of children, adolescents and young adults.

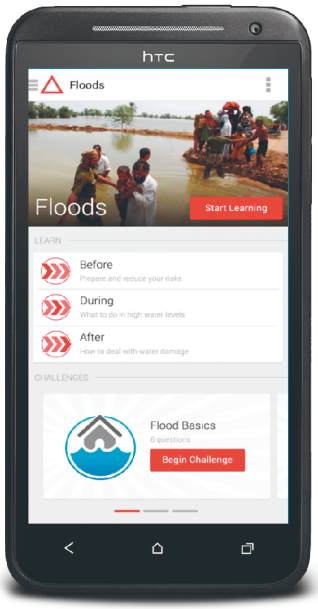


Image 17: Promotional image of the hazard app. Source: GRCS, 2014.

In 2014 the GRCS adopted an innovative mobile application (Image 17) to tackle first aid, and disaster preparedness and response, given the national context. The application provides step by step guidance and emergency checklists for different emergency situations. It also allows for donations to be made to the national society.

9.4.1.13. Habitat for Humanity

Habitat for Humanity Guyana (HfHG) was established in 1994, and aims at ameliorating the housing conditions of the population as a means to overcome poverty. To date Habitat for Humanity Guyana has served over 3,000 families in Regions 3, 4, and 10, through community and housing development.

In 2013, Habitat for Humanity adopted a new programmatic model, which places emphasis on community development, disaster risk reduction (DRR), and social action and awareness.

One of the flagships of this new approach is the use of participatory assessments of housing and shelters at the community level, with the PASSA (participatory approach to safe shelter awareness) methodology. This activity is linked to the work undertaken by the Guyana Red Cross Society and the Civil Defence Commission, and collaboration among the three is fluid to enhance coherence and synergies.

38 LEGS website http://www.livestock-emergency.net/

9.4.1.14. Guyana Relief Council

The Guyana Relief Council (GRC) is a non-profit voluntary organization founded in 1994 which aims to to bring relief to people affected by disasters and unforeseen circumstances. The Council has a non-discriminatory policy, and is geared to give assistance, as far as is practicable, to all citizens of Guyana who have suffered through natural or man-made disasters such as fires, floods, drought, freak storms/ high winds, road and river accidents; and to deserving persons in difficult circumstances.

The GRC provides the following services:

1. Immediate assistance to disaster victims in the form of foodstuffs, clothing, kitchen utensils, beds and mattresses.

2. Monetary donations towards building materials to repair buildings, to cover partial funeral expenses of persons who die as a result of fire or other disasters, or to purchase tools of trade.

3. Assistance to replace documents in particular passports and birth certificates.

4. Provision of temporary shelter and other basic amenities to families displaced due to fires and other disasters. The GRC has a modern shelter (build in 2003).

5. Provision of assistance through the welfare assistance program to orphanages, schools, hinterland schools, women's groups and health centers, and to deserving persons in difficult circumstances.

6. Counseling of affected persons.

The GRC normally links and collaborates with the Ministry of Human Services and Social Security, Habitat for Humanity and the Civil Defence Commission (CDC) in referring cases, and providing assistance, as well as on receiving training on DRM-related issues such as shelter management.

The assistance of the GRC was key during the floods in 2005 and 2006, providing shelter to more than 100 persons from a nearby geriatric home and to villages on the east coast, and delivering cleaning tools to more than 200 families in order to improve environmental sanitation conditions.

9.4.2. DRM programmes and projects mapping

9.4.2.1. Strengthening National and Local Capacities for Disaster Response and Risk Reduction

The project Strengthening National and Local Capacities for Disaster Response and Risk Reduction was funded by the United Nations Development Programme (UNDP) and implemented by the Civil Defence Commission (CDC). It started in 2008 and ended in 2014.

A description of the Outputs and Activity results is presented below:

1. Output 1. Response Preparedness capacity strengthened at national and local levels
    1. Result 1.1: CDC and National Emergency Operations Centre (NEOC) equipped with appropriately trained staff.
    2. Result 1.2: Strengthened Early Warning System (EWS) for Floods and Droughts.
    3. Result 1.3: Multi-Hazard Preparedness and Response Plan.
    4. Result 1.4: Disaster Preparedness Plans developed and response preparedness capacity strengthened at community level with effective participation of volunteers.
    5. Result 1.5. Emergency Shelters meet minimal acceptable standards (physical condition, water, sanitation and hygiene, and others).
    6. Result 1.6: Disaster Preparedness Plans developed and response preparedness capacity strengthened at community level with effective participation of volunteers.

2. Output 2. Strengthened Disaster Risk Reduction capacity at national and local levels
    1. Result 2.1. National Disaster Risk Management (DRM) coordination platform in place.
    2. Result 2.2. Disaster Risk Management Policy and Disaster Risk Management Act drafted.

Relevant tools developed under this project are:

1. DRM Strategy.
2. DRM Bill.
3. EWS Framework.
4. Regional Disaster Preparedness Plans for the various Regions, with Standard Operations Procedures tested.
5. Multi-hazard DRM Plan.
6. Damage Assessment and Needs Analysis (DANA) plan
7. CDC Strategic Plan.

9.4.2.2. Design and Implementation of an Integrated Disaster Risk Management Plan

The project Design and Implementation of an Integrated Disaster Risk Management Plan, was funded by the Inter-American Development Bank (IDB) and implemented by the Civil Defence Commission (CDC). It ended in 2014.

The specific objectives were to: (i) evaluate climate change-related disaster risk; (ii) strengthen national capacity for Integrated Disaster Risk Management (IDRM); and (iii) raise awareness on disaster risk reduction and preparedness thrugh a Public Education Campaign.

The activities under the three components are presented below:

1. Component 1: Country Risk Indicators and Risk Evaluation
    1. Development of the four IDB Indicators of Disaster Risk and Risk Management for Guyana.
    2. A comprehensive flood risk evaluation of vulnerable regions, with emphasis on the coastal zone.
    3. Presentation of the results to government authorities.

2. Component 2: Strengthening National and Local Capacity for Integrated Disaster Risk Management
    1. Preparation of a Disaster Risk Management (DRM) Bill.
    2. Development of a national IDRM plan.
    3. Implementation of pilot projects (involving non-structural activities) designed to strengthen local capacity of regional and neighbourhood committees through community-based DRM.

3. Component 3: National Public Education Campaign
    1. Develop a nationwide Public Education Programme.
    2. Promote knowledge transfer and

dissemination of information for improving awareness about risk reduction, prevention and mitigation through educational projects and learning materials that are strong at the grass roots level, innovative, creative and gender sensitive. The school / community programme included the establishment of flood monitoring teams in schools and poster, essay, drama and debate competitions.

3. Develop a framework for monitoring and evaluation that can be used to inform changes in strategies necessary for improving impacts of the Public Education Programme.

Relevant tools developed under this project are:

1. National Integrated Disaster Risk Management Plan and Implementation Strategy.

2. Disaster Risk Indicators Report.

3. Flood hazard assessment.

4. Public education tools: documentary, infomercials, radio messages, CDC newsletter.

9.4.2.3. Caribbean Disaster Management Project Phase 2 (CADM 2)

The first phase of the Caribbean Disaster Management Project (2002-2006) was implemented under the agreement signed by the Caribbean Community (CARICOM) and the Japan International Cooperation Agency (JICA), through the Caribbean Disaster Emergency Response Agency (currently the Caribbean Disaster Emergency Agency, CDEMA), and was focusing on flood hazard mapping and community disaster management. The software used was ArcView, Watershed modelling System, HEC-RAS and FLO-2D.

The second phase was implemented from 2009 to 2011, using the mechanisms, processes and products previously established to prepare Flood Hazard Maps and community-based disaster management plans.

The outputs of the project included:

1. Hydrological Observation and flood analysis technology reviewed, strengthened and expanded. Hydrological monitoring stations established in the participating States, and a Hydrological database established at the Caribbean Institute for Meteorology and Hydrology (CIMH). In Guyana, several hydrological stations were deployed around the East Demerara Water Conservancy (EDWC) and Mahaica river basin. Flood surveys and analyses were conducted to determine the scope and characteristics of major floods in the previous 10 years.

2. GIS capability for Flood Hazard Mapping strengthened and expanded. Development of a Flood Hazard Mapping manual, and Flood Early Warning System manual, and provision of training.

3. Early Warning Systems for flood hazards established and implemented at pilot sites. Hazard maps prepared. A flood response plan for pilot sites (Little Baiboo and Big Baiboo) was developed, covering early warning, evacuation and relief.

9.4.2.4. Conservancy Adaptation Project 2008-2013

The Conservancy Adaptation Project (CAP) was supported with funds from the Special Climate Change Fund of the Global Environment Facility (GEF). It was designed to reduce vulnerability in the low-lying coast by improving infrastructure and increasing the storage capacity of the East Demerara Water Conservancy (EDWC), via three components:

1. Component 1: Pre-investment studies for engineering design of works. The objective of this component was to provide the hydrologic baseline necessary for contemplating rational interventions aimed at increasing the current discharge capacity of the flood control system.

2. Component 2: Investments in specific adaptation measures.

3. Component 3: Institutional strengthening and project management. The objective of this component was to strengthen the institutional framework for flood control within the context of the national emergency management sector headed by the Civil Defence Commission (CDC). The project also supported an institutional consolidation of flood control in Guyana to help create consensus around a medium- and long-term intervention strategy to help the country adapt to sea level rise

The methodology used for the implementation of the first component is presented below. Products of interest for other tentative Disaster Risk Management (DRM) initiatives are highlighted:

Task 1. Topographic and Bathymetric Mapping to support Modelling. Products of this task that provide valuable baseline information for DRM are: High accuracy/High Resolution large-scale topography and aerial photography using LIDAR, Digital Terrain Model (DTM) and Digital Elevation Model (DEM), Conservancy Levelling 500mx500m grid and bathymetric survey of canal and channel cross sections at a minimum of 500 m intervals for internal waterways.

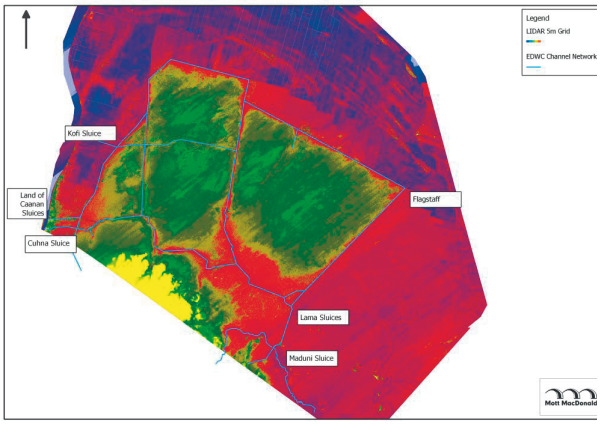


Image 18: LIDAR raster used to delineate EDWC. Source: Ministry of Agriculture.

Task 2. Modelling of the EDWC for flood Control Management and Water Supply. Detailed hydrodynamic model of the EDWC and associated environment to ascertain the effectiveness of the modified drainage conditions in reducing the risk of flooding. Includes recommendations for the installation of additional monitoring stations. Rainfall run-off transformation model, 1D-2D hydraulic model of flow within the EDWC and Mahaica River downstream of the confluence with the Maduni Creek. Simulations using 1,000 year and 10,000 year design floods, including scenarios for existing, modified internal conveyance conditions and modified internal conveyance and outlet conditions. Recommendations to improve the operational rules and management practices for improved utilization of conservancy resources for agricultural and potable water use.

Task 3. EDWC Dam Safety and Feasibility Analysis.

The EDWC dam is constructed of earth and pegasse (weak peaty soils) in different sections. Deterioration of the dam over the last 130 years coupled with severe stress events have served to weaken the structure. This task comprised Geotechnical investigations (10 boreholes); Evaluation of the structural integrity at its weakest locations; Evaluation of the Water Control Structures; Development of Plans for required critical repairs to the dam and outlet structures; and a Comprehensive operation and monitoring plan for water management and dam safety.

Task 4. Coastal Lowlands Drainage Analysis and Works Identification. The drainage analysis maps actual water flows, the effects of damaged outlet and inlet structures and abandoned structures. Development and test of the drainage model, taking into account sea level rise and current sea level conditions. Recommended interventions designed to mitigate potential flooding with critical storm events of different durations for 25, 50, 100 and 1000 year return periods.

Task 5. Internal Flow Modelling and works recommendations. Simulation of internal flow with various modifications to the flow regime by opening of internal waterways and improvement of the discharge capacity to the Cunha sluice. Identification of selected works within the EDWC to improve water flow from east to west. Recommendations to repair several water control structures in the conservancy to improve operational safety.

Task 6. Installation of Hydrologic Monitoring Equipment and data capture over two rainy seasons.

The main findings of the first phase were:

Under old operating rules and infrastructure, the safe flood operating water levels in the conservancy (17.83 mGD) would be exceeded in various locations of the dam for any 50-year event or higher, and the theoretical top of the embankment (18.29 mGD) would be exceeded for any 1000-year event or higher. The actual top level of the embankment can be lower than in theory and therefore this assessment can be considered optimistic.

This risk will be reduced in the future as Hope Dochfour Canal becomes operational, reducing the number of locations where the safe operational level would be exceeded and eliminating the possibility of having water levels above the top of the embankment for 1000-year events. Only under 10,000-year events would the top of the embankment ever be overtopped.

Various infrastructural improvements were tested in the hydrological model, some of them providing enough drainage capacity so as to avoid overtopping in 10,000-years events. The preferred option was the widening (50 m) of the Borrow Channel from Flagstaff to Kofi.

Under Component 2, the CAP funded the complete rehabilitation and upgrade of the two sluices at Lama on the eastern side of the Conservancy. A long-boom excavator was also purchased to rapidly mobilize equipment to areas of the dam in need of repair and to respond to dam breaches, thereby improving dam safety.

Under Component 3, training was given to various government agencies in the use and maintenance of hydro-meteorological instruments, and in data management, dam safety, and hydrological modelling.

The portfolio of recommended discrete and strategic investment (US$ 123 million) can be used to guide the prioritization of infrastructural interventions in the coming years.

Apart from the infrastructural interventions undertaken under the project, the Government has

been carrying out some improvement and rehabilitation works on the dam and relief structures. A new channel was excavated from the northern borrow channel near Flagstaff to Kofi, in order to improve conveyance within the conservancy. According to the modelling results, these could improve the outflow capacity of the conservancy by 25% during 50 and 100-year flood scenarios.

The Emergency Preparedness Plan relating to the EDWC was not completed within the project time frame.

Hydrological data continues to be gathered, to provide a longer term dataset that can be used to run and refine the model.

9.4.2.5. The Guyana Mangrove Restoration Project

The overall objectives of the Guyana Mangrove Restoration Project (GMRP) as detailed in the National Mangrove Management Action Plan (NMMAP) is to respond to climate change and to mitigate its effects through the protection, rehabilitation and wise use of Guyana's mangrove ecosystems through processes that maintain their protective function, values and biodiversity while meeting the socio-economic development and environmental protection needs in estuarine and coastal areas.

The project is funded by the European Union (EU) and managed by a Mangrove Action Committee led by the Climate Change and Agricultural Adaptation Unit of the National Agricultural Research and Extension Institute (NAREI). The Committee is made up of representatives from all stakeholders who represent inter-agency commitment to the restoration and management of mangroves. The function of the Committee is to oversee the progress made towards meeting the goals of the Mangrove Management Action Plan and towards the indicators for the release of EU funds.

The Action Plan includes:

1. Establishment of the administrative capacity for the management of mangroves.

2. Promotion of sustainable management of mangrove forest.

3. Establishment of a legal framework for mangrove ecosystem management and encouragement of community-based mangrove management.Support to research and development of Guyana's mangrove forest (coastal resource baseline data, research on mangroves, mud banks and their stabilization, and research on fisheries and tourism).

4. Development and enhanced effectiveness of mangrove ecosystem protection and rehabilitation (planting, site selection criteria, nursery capacity and propagule acquisition, site specific interventions).

5. Increase of public awareness and education on the benefits of the mangrove forests.

6. Visibility and sustainability.

Under the project's restoration programme (2010-2012), an estimated 336,000 mangrove seedlings (Avicennia germinans) were planted across nine (9) coastal sites concentrated in Regions 4, 5, and 6.

9.4.2.6. Construction of the Hope Canal and Rehabilitation of the Cunha Canal

In order to increase the discharge capacity of the East Demerara Water Conservancy (EDWC), a new relief canal is being constructed at Hope Dochfour, on the eastern side of the conservancy. The construction works include a new intake regulator, a bridge over the public road and a sluice into the Atlantic Ocean.

The decision to construct the Hope Canal is based on the recommendations of the hydraulic modelling of the EDWC carried out in 2004 under the Hydrology and Water Resources study for Guyana's Drainage and Irrigation Rehabilitation Project, further updated by the Task Force for Infrastructure Recovery and the Guyana Floods Geotechnical and Hydraulic Assessment of the EDWC dam[39], to evacuate a 10,000-year storm flood.

The new canal will improve the discharge capacity and flood control performance of the conservancy, ensuring direct discharge to the Atlantic, instead of through the Lama and Maduni sluices.

The Cunha Canal is located on the western side of the EDWC and was constructed as an additional outlet into the Demerara River. Around 1900, the canal was diverted from its original alignment to a smaller discharge canal, reducing the discharge capacity and eventually becoming non-operational. The discharge through this canal was re-established during the 2005 flood but with a limited capacity of 40%. With the expansion and rehabilitation of this canal and sluice, the functional outlet will be increased, and drainage for an additional 144,000 acres of land will be provided.

39 *Guyana Floods Geotechnical and Hydraulic Assessment of the EDWC dam*. UNDAC, Feb 2005. https://docs.unocha.org/sites/dms/Documents/Final_Version_4102005.pdf

These interventions, coupled with those implemented by the Conservancy Adaptation Project (CAP) will lead to a significant reduction in water levels in the conservancy.

9.4.2.7. Georgetown Solid Waste Management Program

Inappropriate solid waste disposal is prevalent in Georgetown and is increasing the vulnerability of the population and the environment with regard to flooding due to clogging of canals, to health hazards due to communicable diseases and to fires in the old Mandela landfill.

In order to tackle this, the Georgetown Solid Waste Management Program is being implemented with funds from the Inter-American Development Bank (IDB). The purpose of the program is to implement sustainable solutions for solid waste management for Georgetown and participating Neighbourhood Democratic Councils (NDCs), contributing to an improvement in the quality of life of the population.

The components of the programme are presented below:

1. Component 1. Institutional strengthening and capacity building for solid waste management
2. Component 2. Community participation and public awareness program.
3. Component 3. Design, construction, and operation of the Haags Bosch sanitary landfill.
4. Component 4. Waste collection and disposal from participating NDC.
5. Component 5. Rehabilitation, expansion and closure of the Mandela landfill.
6. Component 6. Treatment and disposal of health care and hazardous waste.

9.4.2.8. Small Grants Programme

The Global Environment Facility (GEF) Small Grants Programme (SGP) provides grants directly to Civil Society Organizations, Community-Based Organizations and Non-Governmental Organizations to design and implement projects that will bring environmental and livelihood benefits to communities. Priority is given to poor and vulnerable communities with a comprehensive environment and development approach in the GEF focal areas of:

- Biodiversity Conservation
- Climate Change Mitigation
- Sustainable Forest Management (SFM) and Prevention of Land Degradation
- Reduction and/or Elimination of Persistent Organic Pollutants (Chemicals)
- Protection of International Waters

In addition, the SGP seeks to generate sustainable livelihoods, reduce poverty, and create community empowerment particularly with youth, women and indigenous groups.

The SGP is funded by the GEF, implemented by the United Nations Development Programme (UNDP), and executed by the United Nations Office for Project Services (UNOPS).

A National Steering Committee for the SGP was established, comprising representatives from government and civil society stakeholders, and two Country Programme Strategies have been approved: the SGP Core Resources strategy and the SGP Community Based Adaptation Component strategy.

Several grants have been approved since the SGP started operating in 2013. Some of the projects have strong implications for improving disaster risk management, normally reducing vulnerability and underlying risk factors by enhancing climate change adaptation. A selection of projects is presented below:

1. Community and Farmers Environment, Health and Recycling Project (Global Youth Movement-Guyana). The project seeks to address the improper disposal of polyethylene terephthalate (PET) plastics and burning of solid waste in Region 5 Mahaica - Berbice, and the improper use, storage and management of farming chemicals which contribute to soil degradation. It also seeks to reduce the use of mercury in gold mining and jewellery production.
2. Community led Mangrove Restoration: Towards Sustainable Management of Guyana's Mangrove Forest (Guyanese Women in Development). The project seeks to address climate change by replanting 2km mangroves (carbon sequestration through reforestation) at Mon Repos, Victoria and potentially Buxton on the East Coast Demerara, and No. 43 Village – Wellington Park in Corentyne. The project also includes community monitoring, awareness and income generating activities.
3. Capacity Building and Protected Agriculture Demonstration for Farmers in Guyana (Guyana Agriculture Producer's Association). The project seeks to address climate change impacts on the agricultural sector by building capacity amongst poor, rural and vulnerable vegetable farmers in Regions 2, 3, 4, 5 and 6 by providing training and setting up demonstration facilities in Hydroponics and Grow Box/ Shade Houses.

4. Building climate change resilience amongst the 21 communities of the Kanuku Mountains Community Representative Group (KMCRG). The project seeks to develop the capacities of the KMCRG and the 21 Amerindian communities of the Kanuku Mountains Protected Area (KMPA) on climate change and the role forests play in mitigating climate change.

5. Safeguarding Katoonarib's bush island forests through savannah farming (South Central People's Development Association). The project seeks to demonstrate savannah farming as an alternative to shifting cultivation which contributes to deforestation and climate change.

6. Reducing deforestation in Aishalton Village through savannah farming (Aishalton Village Council). The project seeks to plant upland rice in the savannah as opposed to clearing forests to plant rice which contributes to deforestation and climate change.

9.4.2.9. Climate Change Education for Sustainable Development

The Ministry of Education (MOE), through the National Centre for Educational Resource Development (NCERD), and with the support of the UNESCO, UNICEF, Conservation International, the National Agricultural Research and Extension Institute (NAREI), and the Mangrove Restoration and Management Department, is planning to implement the project "Strengthening Climate Change Education for Sustainable Development (CCESD) in Guyana Phase II". The project has the following objectives:

1. Develop a national policy on Education for Sustainable Development (ESD), as well as a strategy and implementation plan which includes climate change, disaster risk reduction, food safety and security, water management, health and biodiversity.

2. Train teachers in CCESD, Disaster Risk Reduction (DRR) and biodiversity, while reviewing and developing curricula (Grades 1 to 9) for core subject areas and Technical Vocational Education and Training.

3. Develop resources to support the implementation of the curriculum.

The draft proposal was prepared in 2014, and the foreseen time frame for implementation is 24 months.

9.4.2.10. Caribbean Health Services Resilient to Impact of Emergencies and Disasters

The Pan American Health Organization/World Health Organization (PAHO/WHO) with support from the European Commission Directorate-General for Humanitarian Aid and Civil Protection (ECHO) as part of its commitment to Safe Hospitals is implementing the project Caribbean Health Services Resilient to Impact of Emergencies and Disasters.

This initiative started on 1 April 2013 and will continue until 30 September 2014 in the Dominican Republic, Grenada, Guyana, Jamaica, Saint Lucia, Suriname and Trinidad. The project aims to improve the resilience of health services to respond to emergencies through the strengthening of health services capacity at the regional and national level

In 2014, Guyana started evaluating the safety of major hospitals (New Amsterdam, Linden and Lethem) in the face of disasters, through the assessment of the Hospital Safety Index, a methodology developed by PAHO/WHO. This methodology encompasses the assessment of elements relating to geographic location, structural safety of the facility, non-structural safety and functional capacity. The participating hospitals obtain valuable recommendations for enhancing resilience through the implementation of both structural and non-structural measures.

9.4.3. Tools Inventory

A tool is defined as "a guide, a product or instrument that stemmed from a project, initiative, programme, experience or intervention, and that serves to improve capacity to design, develop or implement actions to manage disaster risk".

9.4.3.1. Guidelines for Incorporating Disaster Risk Management in Environmental Management and in Agriculture

The Ministry of Agriculture, with financial support from the Inter-American Development Bank (IDB), developed a Guideline for Incorporating Disaster Risk Management in Environmental Management and a Guideline for Incorporating Disaster Risk Management in Agriculture. Both guidelines have a five-step process to implement Integrated Disaster Risk Management.

The steps outlined are 1) preparatory work, 2) risk identification and exposure of environmental assets 3) risk assessment and development of scenarios 4) elaboration of an action plan for risk reduction and management 5) implementation strategy.

Each step includes a series of detailed sub-steps, examples and guidance tips to avoid typical mistakes.

If the guidelines are applied, the outcomes can be used in the planning processes of various institutions, led by MNRE and MOA.

9.4.3.2. Flood Risk modelling Report

The project "Design and Implementation of an Integrated Disaster Risk Management Plan", funded by the Inter-American Development Bank (IDB) to support the Civil Defence Commission (CDC), included the activity "Risk Indicators and Flood Risk Evaluation for Guyana".

The scope of the flood risk evaluation was to assess the flood risk due to conservancy breach and to heavy rainfall in certain areas of the Guyanese coast. For the dam breach event flood risk maps, the process involved:

1. Exposure inventory mapping based on digital satellite images, complemented with population statistics, aerial photographs, official indicators, and recommendations from local experts. A homogeneous block resolution was used, with assets being classified in industrial, commercial or residential areas with old or new buildings, and in sugar or cane agricultural fields.

2. Characterization of the reservoirs and the discharge hydrographs.

3. Selection of dam break points based on probabilistic distribution of failure.

4. Generation of flooding scenarios based on the rainfall of January 2005 for 1, 5, 24 and 48 hours after breach.

In the case of events caused by heavy rainfall, the same exposure inventory was used, but the process continued by developing Intensity-Duration-Frequency curves, characterizing the basin under analysis in terms of Precipitation-Area of catchment-Duration-Frequency and in terms of geographical limits. After generating stochastic storms the floods were simulated with a hydraulic model that takes into account the run-off, with the topography parameters of the zone posing very limited influence on the model.

The rainfall flood risk maps produced are detailed to guide policy at a national level, and to a lesser extent at a regional level, but not at the local level, due to the limitations of the input data and methodology employed. However, the Intensity-Duration-Frequency data obtained can be used as an input for further flood risk assessments that use a different methodology.

The evaluation of the expected physical damage used vulnerability functions assigned to the different infrastructure types based on expert criteria. The same approach can be used at the local level, refining the functions with local knowledge.

Probable maximum loss and annual average loss was calculated for the different return periods (of rainfall and dam breach) and the various components (sugar, rice, and urban infrastructure).

A number of outputs were produced, namely:

1. Emergency Response software, specifically developed for this project, allows the user to visualize and read the results for the five most critical scenarios.

2. Agricultural risk transfer planning. This automated application allows the user to include in the risk transfer scheme different parameters such as deductible values, liability limits and co-insurance values. The Risk Transfer software has the results for the different agricultural portfolios (sugar-cane and rice), and the risk results can be displayed in terms of the loss exceedance curve (for separate or all temporalities), as well as in terms of the probable maximum loss.

The study also offered recommendations for the way forward, in particular:

1. Refine structural reliability of critical infrastructure.

2. Review all operational systems to adapt them to the risk scenarios developed.

3. Prevention activities should be implemented in the short term, including regulation and land-use planning and control. In particular, building construction and occupation of the first floor of all constructions in potentially flood-prone areas should be regulated and enforced.

4. Maintain protection infrastructures on the coastline.

5. Avoid trash and weed overgrowth in urban drainage systems.

6. Detailed information for cash crops should be gathered in order to be included in the analysis.

9.4.3.3. Community Based Disaster Risk Management Manual

The project "Design and Implementation of an Integrated Disaster Risk Management Plan", funded by the Inter-American Development Bank (IDB) to support the Civil Defence Commission (CDC), included the activity "Pilot Programme in Community Based Disaster Risk Management (CBDRM)", with the objectives of strengthening institutional capacity, especially that of the Ministry of Local Government and Regional Development (MLGRD) and that of Regional and Neighbourhood Democratic Councils and Municipalities, and of enhancing community resilience to disasters in areas prone to flooding.

The project involved the design and implementation of a CBDRM programme in two pilot communities: Albouystown (urban, Region 4), and West Watooka (rural, Region 10). During implementation, the CBDRM committees were established and strengthened, and training for increased awareness and skills in prevention and mitigation were provided.

As outputs of the project, a step-by-step manual and a multimedia instructional toolkit were developed. Finally, a dissemination workshop was held to present the lessons learnt from the pilot implementation and a draft toolkit.

Challenges of the project that need to be tackled for future replication are referred to as time, interaction and financial constraints, leadership identification in the community, strengthening of local authority capacities, establishment of criteria for the selection of community and implementation team members, and means to foster outreach to and engagement of other actors in the community.

9.4.3.4. Caribbean Risk Management Initiative Databases and Maps

Launched in 2004 by the United Nations Development Programme (UNDP) Bureau for Crisis Prevention and Recovery, the Caribbean Risk Management Initiative (CRMI) is a knowledge network designed to promote best practices and develop capacity in the region in the fields of risk management and climate change adaptation.

In 2013 Guyana participated in the initiative with a pilot project aimed at replicating some of the components of Cuba's Risk Reduction Management Centre (RRMC) model in four communities in Region 9.

A new fully operational Risk Reduction Management Centre was established in Lethem (Region 9) and equipped with appropriate communication and information technologies (radios, computers, and geographic information systems, GIS). Three communities were selected for the establishment and strengthening of Community Based Disaster Risk Management (CBDRM) committees with a specific early warning mandate. Relevant information is gathered and regularly compiled into a database to guide planning, risk reduction and response. GIS and database management training was offered to the different actors, and vulnerability and risk maps were developed at the regional and community levels. The lessons learnt are proactively shared among partners of the participating Caribbean countries.

The lessons learnt in this project are expected to guide further replication and establishment of an effective Disaster Risk Management system at the local and regional levels that would fit into the national system.

9.4.3.5. Public Education Campaign on Disaster Risk Management

The Civil Defence Commission (CDC) in Guyana, with support from the Inter-American Development Bank (IDB), designed its Communication Strategy and launched a Public Education Campaign on Disaster Risk Reduction in 2013-2014. The Campaign comprises:

1. The broadcasting on TV of the documentary "Guyana's Reality Check" (20 minutes) to increase awareness on flood risk, global warming and climate change.

2. Animation infomercials (90 seconds) on TV with key messages calling for actions towards preparedness.

3. Radio messages (30 and 45 seconds) to provide information and guidance on climate change, flood preparedness and response, prevention and mitigation, and safety.

4. A nation-wide school programme, establishing flood monitor teams, giving the children important tasks to perform at school, at home and in the community, as well as the authority, responsibility, recognition and guidance to perform the tasks. The programme also includes a poster, essay, drama and debate competition. The launching of the programme was linked to the International Day for Disaster Reduction 2013, dedicated to Disaster Risk Reduction and persons living with disabilities, which attracted the attention of the media.

5. The design of a newsletter template for the CDC, with the intention to release at least two newsletters per year.

One of the key points in attracting attention and interest was the use of the jingle tag line "Guyana our country, our responsibility" at the centre of all the materials reinforcing the need for individuals, families, schools, communities and companies to accept and take ownership of the flood risk situation that exists in an effort to reduce vulnerability to flooding through prevention and mitigation.

9.5. Underlying risk factors and climate change adaptation

9.5.1. DRM, the Environment and climate change adaptation

Environmental protection has been at the core of development strategies in Guyana for many years. The country has adopted measures for the protection of the environment through the enforcement of Environmental Impact Assessments, the establishment of Protected Areas, the protection and Restoration of Mangroves, land reclamation, measures to conserve biodiversity and to avoid deforestation, the establishment of an Environmental Trust Fund, etc.

The Low Carbon Development Strategy (REDD+ mechanism) is aimed at improving investment in eco-friendly small and micro enterprises (SME) and low carbon sectors, whilst avoiding deforestation and enhancing Climate Change Adaptation. It promotes the upgrade of protection infrastructures and clean energy sources, creating opportunities for Amerindian communities, improving early warning systems, developing financial risk management measures, and switching to flood resistant crops.

Areas of improvement are the adoption of fully operational Integrated Water Resources Management and Integrated Coastal Zone Management approaches, the enhancement of the monitoring and enforcement capacities of agencies with environmental protection responsibilities, a higher level of integration of DRM into Land Use Planning, and in some cases the adoption of the precautionary principle.

9.5.2. DRM and Social Development

The Government of Guyana is committed to improving social development and reducing social vulnerability and inequity. Micro credits and training programmes are offered to women and Amerindian populations, temporary financial assistance in provided to assist the infirm, aged, handicapped, orphans, persons affected by HIV and all other persons who cannot adequately maintain their households. Access to HIV/AIDS treatment is universal and free, food security has been enhanced, National School Feeding Programme helps to attain better nutrition levels among young children, measures have been put in place for child protection, and night shelters have opened to cater for homeless persons.

Social inequalities exist, for instance in access to secondary education, to the labour market and to improved water sources and sanitation, and these need to be addressed. Gender-based violence and gender inequality are still at unacceptable levels, and will require a tremendous effort from all of society to be eradicated.

The Disability Act 2010 sets the basis for enhanced fulfilment of rights of persons living with disabilities. Being a cross cutting issue with implications in so many sectors, its implementation and impacts are not likely to be perceived except until the mid and long term.

Insurance and micro-insurance could help to reduce the vulnerability of some risk prone communities and households.

9.5.3. DRM and the Economy

Agriculture is one of the main economic activities in the country. The Agriculture DRM plan builds up resilience for sustainable livelihoods. In particular, actions are undertaken to diversify crops, test drought and flood resistant crops and to anticipate floods and droughts through strengthened capacities in early warning.

Most of the economic production is concentrated in the coastal areas, where specific actions of the Ministry of Public Works and other agencies have made a significant progress in reducing vulnerabilities through the rehabilitation, upgrading and maintenance of public roads, sea and river defences and irrigation and drainage systems.

Furthermore, sectoral and public investment planning has been progressively incorporating considerations to disaster risk reduction in the past years. Standardized methodologies for cost-benefit analysis with considerations to climate change could be introduced to improve sound evidence-based decision-making.

Economic growth, access to the labour market, and diversification of the economy are key priorities in the country, and are aligned with the broader low carbon development strategy. Education and health account for a high proportion of the national budget. An educated and healthy labour force are catalyzers of economic growth. Special attention has to be given to how the power differences, beliefs,

practices, labour conditions, and support networks shape the economy of men and women, and tailor the strategies to ensure that rights are fulfilled with equality and non-discrimination.

9.5.4. DRM and Land Planning

Erratic land planning is normally considered an underlying risk factor. The Ministry of Housing and Water is committed to making affordable housing available for all Guyanese, including low-income families, through the distribution of lots, the development of new housing schemes, the increased provision of turn-key housing, mortgage interest relief programmes, core house projects, upgrading of housing lots in squatter settlements and a hinterland housing programme. The private sector and civil society organizations also contribute to spreading access to housing with a pro-poor, disaster risk smart, and disability friendly approach.

The building codes include standards for concrete and masonry works in flood prone areas, foundation characteristics for the different soil types, drainage, high buildings, latrines and septic tanks, electrolysis avoidance, fire and electric safety, and access for persons living with disabilities.

The National Land Use Plan and the future Policy and regional plans will increase the capacities of the country for risk-smart land use planning.

9.5.5. DRM and Development

The major development projects in the sectors of construction, energy production, roads, harbours and airfields, dams, wastewater treatment plants and other areas require an environmental permit and the submission of an Environmental Impact Assessment and risk analysis.

The Disaster Risk Management (DRM) Bill includes provisions for incorporating risk analysis in public investment projects, and in regional and urban development plans, programmes and projects, and related studies; as well as in spatial planning and development including land use planning, watershed management and development planning. Once enacted, this will reinforce the integration of DRM into development planning.

10. Disaster Risk Analysis in the Country

10.1. Indicators and methodology

A variety of methodologies exist to define indicators for conducting a National Risk Analysis. In recent years several methodologies have been applied, including the Inter-American Development Bank (IDB) Disaster Risk and Disaster Risk Management Indexes, and the Hyogo Framework for Action (HFA) Monitor indicators. Additionally, strategic planning processes with regard to Disaster Risk Management (DRM) have been undertaken in the past at the country level and Civil Defence Commission (CDC) level. The National DRM Platform meetings also generate recommendations and insight on the priorities under each institution and at the country level. Furthermore, strategic inputs from the Office of the Presidential Secretariat were also gathered.

An overview of the findings of the HFA Monitor are presented in section 5. The IDB Disaster Risk indexes are presented under section 8.3, and the IDB Risk Management index under section 4.

This baseline data was compiled and the main findings discussed with stakeholders to review relevance and levels of progress during the National Workshop held in September 2014.

10.2. Scenarios

A national workshop for discussion on the draft version of this document took place on September 30, 2014 at the premises of the Civil Defence Commission.

In order to develop scenarios for action, it is important to define the causes of the event, the definition and scope of the impact, the population and assets exposed and affected, and the timing of the early warning and the event itself.

A number of draft simplified scenarios were commented on in a panel discussion. Afterwards, those in need of immediate planning were ranked. The priority events to develop scenarios for are:

1. Low onset flooding in coastal area, due to rainfall.

2. Rapid onset flooding in coastal area, due to severe dam breach.

3. Fire in urban area affecting houses, businesses and buildings of key agencies and institutions.

4. Delinquency related to child and juvenile gangs.

10.3. Prioritization of scenarios and intervention areas

The priorities identified in previous analysis were discussed with the stakeholders, reviewed, consolidated and re-prioritized for the upcoming period 2015-2016.

10.3.1. Governance

The previous analyses provided the following findings regarding Governance:

1. **Inter-American Development Bank (IDB) Indexes (2010)**.

   1. Incipient achievement in inter-institutional, multi-sectoral and decentralizing organization, in the existence of reserve funds for institutional strengthening, and in budget allocation and mobilization.

2. **Hyogo Framework for Action (HFA) Monitor (2014).**

   1. Draft national policy and legal framework for disaster risk reduction exists with decentralised responsibilities and capacities at all levels, but needs to be enacted.

   2. Dedicated and adequate resources are available to implement disaster risk reduction plans and activities at all administrative levels. Implementation at the sub-national level shows lower progress.

   3. Community participation and decentralization are ensured through the delegation of authority and resources to local levels, but not in a comprehensive manner.

   4. A national multi-sectoral platform for disaster risk reduction is functioning, but the functions, roles and responsibilities need to be redefined.

   5. Further efforts to incorporate DRM into development and environmental strategies is needed.

   6. Capacities for analysis at the CDC and key ministries need to be strengthened.

The **National Integrated Disaster Risk Management Plan (NIDRMP) and Implementation Strategy** propose the following key actions:

1. Establish National Hazard, Vulnerability and Risk Mapping Plan.

2. National Prevention/Mitigation Plan.

3. Design/revision/finalization of the DRM Bill, including integration of the relevant aspects of the NIDRMP (e.g. clarification of mandated roles and responsibilities for all organizations as laid out in the NIDRMP).

4. Revise the draft Disaster Risk Management (DRM) Policy (2011) to ensure it adequately covers all five DRM components, and is comprehensive and compatible with the NIDRMP as well as supporting and aligned with the revised DRM Bill. Ensure gender, environmental and climate change issues are also considered.

5. Establish mandatory insurance for housing, agriculture activities and key/critical infrastructure in the DRM Bill.

6. Design of other relevant policies (such as evacuation, shelter management policy, relief policy, donations policy, waste disposal) and revision of existing legislation to ensure comprehensive integration of DRM, gender, environmental and climate change issues, and compatibility with the NIDRMP.

7. Revision of the Civil Defence Commission (CDC) structure, positions, functions, legislative authority (as embedded in the draft DRM Bill (2013) and draft DRM Policy (2011)), and name to ensure it is structured as a DRM organization and enabled to address and coordinate all DRM components. This re-structuring could include positions that would take responsibility for among the following areas: risk identification, financial protection and risk transfer, prevention and mitigation, preparedness and response, and recovery or identify liaisons for these areas to coordinate and work with the lead agencies in these areas.

8. Revision of the National Disaster Preparedness and Response Structure with a view to making it a national DRM structure, focused on all DRM components.

9. Revision of all national and regional sub-committees to ensure that together they comprehensively cover all DRM components, covering key hazards, all sectors and all levels. The number, composition, functions and terms of reference of all national and regional sub-committees are to be designed or revised/enhanced, as relevant in each case.

10. Revision of the National DRR Platform, its role, composition and functions, with a view to DRM.

11. Finalize the establishment and integration of the volunteer corps into the national DRM structure, into preparedness initiatives and into emergency response planning and relevant plans.

12. Establish a national emergency planning process, including continuous updating and an assessment of linkages between and consistency/harmonization among all plans at all levels.

13. Enhancement of the EWS Plan for flood and drought. This could include specific mechanisms for liaison with neighbouring countries, the Caribbean Institute for Meteorology and Hydrology (CIMH) and Caribbean community (CARICOM) states for Early Warning System (EWS); the establishment of the EWS Sub-Committee; the revision/integration and synergy of the current EWS with stakeholders (e.g.: text messaging); and the establishment of an EWS for the entire country, flood warning systems via satellite, radio, etc. among others.

14. Design and implementation of a National DRM Public Education and Awareness Plan and Strategy.

15. Revision of National Emergency Operations Centre (NEOC) structure, roles and responsibilities and then revision of NEOC manual, standard operation procedures, staffing and equipment.

16. Establish regional DRM committees including regional DRM sub-committees, ensuring that all DRM components are addressed.

17. Establish all local DRM committees (i.e. neighbourhood or community district DRM committees and emergency operations centres) including local DRM sub-committees, ensuring that DRM components are addressed.

The draft **CDC Strategic Plan (2014)** highlights the following priorities:

1. Submit a comprehensive Disaster Risk Management Bill for approval.

2. Expedite the development of Regulations for the new disaster legislation.

3. Develop and promulgate guidelines for regulatory agencies to enforce provisions of Risk Reduction legislation.

4. Work with the DRM Platform to monitor developments that could increase environmental or human vulnerability.

5. Establish mechanism to review the DRM Plans of at least 7 DRM Platform member- agencies each year.

6. Conduct an Organizational Capacity Assessment (OCA) of the CDC as a basis for restructuring the organization to execute its CDM mandate.

7. Implement recommendations of the OCA using the CDEMA Comprehensive Disaster Management recommended structure as a template.

8. Expand physical facilities at current CDC location.

9. Operationalize the alternate NEOC at Timehri.

10. Upgrade human resources management, information management, ICT and communications at the CDC.

11. Institutionalize Strategic Planning at the CDC.

10.3.2. Risk identification. Hazard, vulnerability, capacity and risk analysis.

The previous analyses provided the following findings regarding risk analysis:

1. Inter-American Development Bank (IDB) Indexes (2010). Significant achievement in systematic disaster and loss inventory, hazard monitoring and forecasting, and vulnerability and risk assessment. Only incipient achievement in hazard evaluation and mapping.

2. Hyogo Framework for Action (HFA) Monitor (2014).

    1. Some progress, but non-systematic in national and local risk assessments based on hazard data and vulnerability information.

    2. Institutional commitment with non-comprehensive achievement in terms of systems in place to monitor, archive and disseminate data on key hazards and vulnerabilities.

    3. Early warning systems are in place for some major hazards, with limited outreach to communities.

    4. Limited incorporation of trans-boundary risks and regional cooperation.

The **Integrated Disaster Risk Management Plan and Implementation Strategy** propose the following key actions:

1. Strategy, plan and common methodology for conducting hazard, vulnerability and risk assessments, including exposure, at the national and sub-national level.

2. Strengthen Early Warning System (EWS) for floods, droughts and fires, with outreach at the sub-national level.

3. Enhance analysis capacities at the Civil Defence Commission (CDC) and key ministries.

4. Replicate Community Based Disaster Risk Management (CBDRM) initiatives.

5. Enhance collaboration with neighbouring countries in EWS for trans-bounday risks.

6. Establish a mechanism for information management.

7. Holistic assessment of national flood and drought management needs.

8. Create and/or update hazard maps for: floods (river overflow), floods on the coastline (storm surge), drought, earthquake, tropical cyclone, landslide and wildfire.

9. Acquire LIDAR data to develop detailed Digital Elevation Model (DEM).

10. Design of vulnerability and exposure maps of prioritized areas.

11. Conduct vulnerability assessments of all identified vulnerable elements to floods and droughts.

12. Collect data and conduct analysis on: Average Annual Loss (AAL), Pure Risk Premium (PRP), Loss Excedence Curve, Probable Maximum Loss (PML).

13. Develop/update a baseline database of vulnerable and at-risk areas and elements.

14. Design of risk maps and disaster scenario maps for development and emergency planning.

15. Deploy National GIS database. Develop/improve GIS-based flood and drought risk information system.

16. Deliver training to key government staff in the design and use of mapping software and processes, including analysis.

17. Hold awareness-raising and information sessions with government and decision-makers with a view to integrating hazard, vulnerability and risk mapping and analysis into national planning and decision making (including addressing enforcement).

18. Design of community risk maps and hazard, risk and vulnerability analysis (HRVAs).

19. Deliver workshops to key stakeholders for community risk mapping, at the sub-national level.

20. Incorporation of information from the regional/local level into the national database of vulnerable and at-risk areas and elements and the GIS database.

The draft **Civil Defence Commission (CDC) Strategic Plan (2014)** highlights the following priorities:

1. Consolidate and compile a comprehensive compendium of financial and technical assistance needs for the CDC for submission to development partners.

2. Work with lead agencies to expand scientific monitoring of hazards and threats.

3. Work with lead agencies to develop hazard profiles related to specific sectors and communities.

4. Advocate for approval and enforcement processes that promote more effective risk reduction procedures in development projects.

3. Some progress in incorporating DRR elements into planning and management of human settlements.

4. Some progress in assessing the disaster risk impacts of major development projects, especially infrastructure.

5. Environmental monitoring and enforcement need enhancement.

6. Gender perspective needs to be mainstreamed in key institutions.

7. Strengthening of food security and agricultural resilience is a priority.

8. Land Use Planning at national and sub-national level needs to operationalized.

10.3.3 Prevention, mitigation and underlying risk factors

In terms of prevention and mitigation, the previous analyses outline the following progress and gaps:

1. **Inter-American Development Bank (IDB) Indexes (2010).**

1. Incipient achievement in risk consideration in land-use and urban planning; implementation of hazard-event control and protection techniques; housing improvement and human settlement relocation from disaster prone-areas. Significant achievement in hydrological basin intervention and environmental protection; in updating and enforcement of safety standards and construction codes; and in reinforcement and retrofitting of public and private assets, incipient achievement.

2. **Hyogo Framework for Action (HFA) Monitor (2014)**.

1. Substantial achievement in incorporating Disaster Risk Reduction (DRR) as an integral objective of environment related policies and plans, including for land use, natural resource management and adaptation to climate change, and in reducing vulnerability of populations most at risk through social development policies and plans, with recognized limitations in capacities and resources.

2. Some progress in implementation of economic and productive sectoral policies and plans to reduce vulnerability of economic activities.

The **Integrated Disaster Risk Management Plan and Implementation Strategy (IDRMP&IS)** propose the following key actions:

1. Implementation of mitigation activities according to the National Prevention/Mitigation Plan.

2. Conduct a diagnosis of infrastructural vulnerability in dams and drainage and irrigation systems.

3. Conduct assessment of the vulnerability of the sea defences.

4. Planning and implementation of mitigation/repair works for conservancy dams, drainage and irrigation systems based on vulnerability assessments. Establishment of a mitigation plan for conservancy dams, drainage and irrigation systems.

5. Planning and implementation of mitigation/repair works on sea defences based on vulnerability assessments. Establishment of a mitigation plan for sea defences.

6. Build capacity for regular inspection and maintenance of conservancy dams, sea defences and drainage systems (personnel, training, equipment, vehicles, materials, pumps, trucks, etc).

7. Design of emergency plans for breach or overflow in conservancy dams and sea defences (including allocation of personnel and equipment for response in the case of breaches or overflow in conservancy dams and sea defences).

8. Conduct risk assessment studies to determine the feasibility of relocating specific human settlements in high risk areas.

9. Conduct assessment studies in order to identify agricultural activities that reduce risk during the flooding season.

10. Conduct assessment studies for the identification of specific measures to access and store water during droughts.

11. Design/revise and enact Building Code for Guyana including specific mandatory building measures against floods.

12. Identify/assess specific needs and related challenges for enforcement of Building Code in Guyana and develop a plan of action to address challenges identified.

13. Build capacity for enforcement of the Building Code.

14. Design/revise and enact a policy and plan for land use and human settlements.

15. Identify/assess specific needs and related challenges for enforcement of the land-use plan in Guyana and develop a plan of action to address challenges identified.

16. Ensure that environmental impact assessments (EIA) are integrated adequately into the land-use planning and construction process in the country.

17. Retrofitting and reinforcement of public and private assets and infrastructure as identified through previously completed vulnerability and risk assessments.

18. At the sub-national level, allocation of personnel and equipment for regular clean up/maintenance and inspection in conservancy dams, municipal drainage systems, channels, culverts, sluices/kokers, ducts, outlets, etc.

19. Training of personnel at the regional and local levels in identified areas for prevention/mitigation.

20. Design of maintenance and clean-up plans at the regional and local levels.

The draft **Civil Defence Commission (CDC) Strategic Plan (2014)** highlights the following priorities:

1. Design and develop a project for retrofitting emergency shelters.

2. Train Instructors in Community Emergency Response (CERT) and Community Based Disaster Risk Management (CBDRM), within the CDC Volunteer Corps.

10.3.4. Preparedness and response

Relating to preparedness and response to events and disasters, the previous analyses outline the following progress and gaps:

1. **Inter-American Development Bank (IDB) Indexes (2010)**. Incipient achievement in emergency response planning and implementation of early warning systems. Significant achievement in organization and coordination of emergency operations; endowment of equipment, tools and infrastructure; simulation, updating and testing of inter-institutional response; and community preparedness and training.

2. **Hyogo Framework for Action (HFA) Monitor (2014)**.

1. Policy, technical and institutional capacities and mechanisms for disaster risk management, with a disaster risk reduction perspective are not comprehensive.

2. Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes, with limitations in capacities and resources.

3. Some progress in establishing financial reserves and contingency mechanisms to support effective response and recovery. The financial mechanisms should be aimed at comprehensive Disaster Risk Management (DRM).

4. Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews, with limitations in resources and capacities, especially at the sub-national level.

5. Some sectoral plans for preparedness and response at the various institutions need testing and updating.

6. Development of business continuity plans and contingency plans needs support.

7. Enhancement of response capacities at the sub-national level, through training, allocation of resources and coordination mechanisms.

8. Shelters need upgrading to meet minimum standards.

The **Integrated Disaster Risk Management Plan and Implementation Strategy** propose the following key actions:

1. Design and implementation of a national simulation exercise programme for testing and updating plans and ensuring they are well known, practiced and up to date.

2. Assess the need for equipment, hardware and software and technical staff for EWS.

3. Design and implementation of a national DRM training programme (including identification of

DRM training needs at national, regional and local levels, design of new training courses adapted to Guyana's specific needs and conditions, based on areas identified, and including allocation of budget funds for the implementation of trainings.)

4. Design of model regional and local emergency operation centre (EOC) manuals to be adapted at regional and local levels.

5. Identification of specifics measures to integrate gender issues into DRM processes.

6. Design, establish and properly equip all regional EOCs.

7. Design, establish and properly equip all local EOCs.

8. Design and test emergency response plans at the regional level and ensure they are compatible with those at the national and local levels.

9. Design and test emergency response plans at the local level and ensure they are compatible with those at the regional and national levels.

10. Design and deliver a community-based Disaster Risk Reduction/Disaster Risk Management capacity building programme.

The draft **Civil Defence Commission (CDC) Strategic Plan (2014)** highlights the following priorities:

1. Update or develop at least 3 major Preparedness and Response Plans and relevant Standard Operating Procedures (SOPs) each year – National and Regional.

2. Institutionalize annual simulation exercises as a means of capacity building especially at the Regional level.

3. Create a country-wide emergency communications network.

4. Train Instructors in Community Emergency Response (CERT) and Community Based Disaster Risk Management (CBDRM).

5. Build capacity of the Volunteers Corps by expanding numbers and broadening areas of training and establishing branches of the Corps in all Regions.

6. Develop Community Emergency Response training to a nationally recognized certificate level.

7. Participate in and support at least one agency-related field-simulation exercise each year.

8. Work with at least one partner agency to conduct a table-top exercise each year.

9. Work with partners to conduct annual emergency evacuation drills in identified institutions.

10.3.5. Financial protection and risk transfer

Relating to financial protection and risk transfer, the previous analyses outline the following progress and gaps:

1. **Inter-American Development Bank (IDB) Indexes (2010)**. Incipient achievement in implementing social safety nets and funds, insurance coverage and loss transfer strategies of public assets, housing and the private sector.

2. **Hyogo Framework for Action (HFA) Monitor (2014)**. Limited implementation of mechanisms for financial protection of infrastructure, buildings and crops, at the macro and micro level.

The **Integrated Disaster Risk Management Plan and Implementation Strategy** propose the following key actions:

1. Develop and disseminate guidelines for the implementation of risk reduction measures for accessing flood insurance.

2. Identification of risk transfer financing mechanisms and their requirements for Guyana in coordination with regional and international organizations, insurance companies and farmers.

3. Identify requirements to access CCRIF insurance for floods (excess rainfall).

4. Acquire CCRIF membership.

5. Engage regional insurance with the CCRIF to access insurance for flooding in Guyana.

6. Develop a national financial strategy for the management of the impacts of extreme events.

7. Design and deliver workshops to train government officials and communities in risk transfer financial mechanisms (sub-national level).

8. Develop and disseminate guidelines for best building practices to facilitate access to insurance.

9. Develop and disseminate guidelines for best practices to ensure access to insurance to crops and animals.

10.3.6. Recovery

Relating to early recovery and rehabilitation after the impact of disasters, the previous analyses conducted outline the following progress and gaps:

1. **Inter-American Development Bank (IDB) Indexes (2010)**. Incipient achievement in rehabilitation and reconstruction planning.

2. **Hyogo Framework for Action (HFA) Monitor (2014)**.

    1. Some progress, without systematic policy, in integration of disaster risk reduction measures into post-disaster recovery and rehabilitation processes.

    2. Need to develop an early recovery and rehabilitation plan.

The **Integrated Disaster Risk Management Plan and Implementation Strategy** propose the following key actions:

1. Design a National Early Recovery Plan for floods that include actions for all three levels: national, regional and local.

2. Design a National Early Recovery Plan for droughts that include actions for all three levels: national, regional and local.

3. Design of Continuity of Operations Plan (COOPs) and Business Continuity Plan (BCP) guidelines for the government and the private sector based on vulnerability assessments.

4. Design of COOPs for government offices and key/critical national infrastructure based on vulnerability assessments.

5. Design of BCPs for the private sector.

6. Design and delivery of a national training programme for COOPs and BCPs.

7. Revise/update and enhance the National Contingency Fund and its mechanisms, including addressing the enabling environment. This could include improving the availability and timeliness of disbursement of funds to cover the immediate costs for relief and early recovery after an event and to compensate the population for the loss of housing and agricultural assets (crops, livestock); a commitment from the GoG to provide more funds after disasters, agreement on the general contingency fund mechanisms (eligibility, amounts of compensation, etc.). The legislative, policy and institutional framework would be addressed.

8. Hold awareness raising sessions for government and the private sector about the need for recovery, COOPs and BCPs in Guyana.

9. Design COOPs for government offices and key/critical infrastructure at the regional and local levels.

10. Design of BCPs for the private sector at the regional and local levels.

11. Workshops for training in COOPs and BCPs for the regional and local levels.

The draft **Civil Defence Commission (CDC) Strategic Plan (2014)** highlights the following priorities:

1. Work with partners to finalize an Early Recovery Plan for major natural hazards – (including effects of psycho-social issues).

2. Establish procedures for obtaining technical and material assistance during Early Recovery.

3. Confirm and institutionalize an Early Recovery Task Force.

4. Establish a Monitoring Framework for Early Recovery

10.3.7. Resilience

As important as reducing risk, is increasing the resilience of communities at risk. The previous analyses indicated the following levels of progress:

1. **Inter-American Development Bank (IDB) Indexes (2010)**. Incipient achievement in public information and community participation, and in training and education on risk management.

2. **Hyogo Framework for Action (HFA) Monitor (2014)**.

    1. Substantial achievement in making relevant information on disasters available and accessible at all levels, to all stakeholders.

    2. School curricula, education material and relevant trainings include disaster risk reduction and recovery concepts and practices. Due to the peculiarities of Guyana, Disaster Risk Management (DRM) issues should be more linked to sustainable development and climate change topics.

    3. Some progress in developing research methods and tools for multi-risk assessments and cost benefit analysis, but need strengthening.

    4. Countrywide public awareness strategy exists to stimulate a culture of disaster resilience. Upcoming public education campaigns on DRM need to tailor -messages to the various audiences and a higher outreach to rural communities.

5. Analysis, Information and Communication Technologies (ITC) and communication capacities of the Civil Defence Commission (CDC) need to be strengthened, with outreach to the different administrative regions.

6. Need to build capacities for risk analysis, cost-benefit analysis, and development/implementation of DRM plans in the relevant institutions/ministries.

The draft **CDC Strategic Plan (2014)** highlights the following priorities:

1. Conduct a semi-annual briefing for the Inter-Ministerial Committee responsible for DRM after an initial briefing in 2014.

2. Deliver at least one DRM orientation course for senior public officers each year.

3. Work with partners to develop and disseminate guidelines for DRM in Agriculture and Environmental management.

4. Introduce and maintain an annual recognition event for volunteers and partner agencies.

11. Definition of Strategic Lines in the Country

The levels of progress, gaps and key actions outlined in the previous section were discussed with the Civil Defence Commission to assess their relevance and urgency for the period 2015-206.

The outcome of that discussion is a summary of progress, challenges and priorities described below.

11.1. Summary of Progress

1. Disaster Risk Management (DRM) legislation and normative framework is at an advanced stage.

2. High percentage of the national budget allocated to DRM and reducing underlying risk factors.

3. National DRM Platform functioning.

4. Hazards and risk analyses conducted. Risk assessments for major development projects.

5. Early Warning System (EWS) for floods functioning, and overarching framework for Early Warning developed.

6. Relevant areas to DRM included in all levels of education curricula. Public education campaign on DRR.

7. Volunteerism included in DRM.

8. Civil Defence Commission (CDC) and CDC Volunteer Corps receive frequent training.

9. Strong environmental protection and sustainable development framework, with Climate Change Adaptation and Mitigation approach.

10. Ongoing programmes to improve health, education, food security, and alternatives for sustainable livelihoods.

11. Infrastructural vulnerability substantially reduced. National Land Use Plan.

12. Sectoral approach to DRM started.

13. Preparedness and response plans developed, national and sub-national. Sectoral response plans ongoing.

14. Shelter standards and operation procedures developed.

15. CBDRM initiatives started.

16. Disability Act.

11.2. Summary of Challenges

1. Enactment of new Disaster Risk Management (DRM) legislation pending.

2. Limited sectoral capacities to incorporate DRM and move from reactive to proactive approach.

3. Outreach to the local level.

4. Limited risk transfer mechanisms, and early recovery planning.

5. Sustainability of DRM initiatives. Dependency on external aid.

6. Limited integration of the different Early Warning Systems. System is not comprehensive.

7. National DRM Platform functions, roles and responsibilities need to be updated.

8. Hazard, vulnerability and risk analysis methodologies and procedures need harmonization and operationalization.

9. Limited communication outreach across the country.

10. Limited environmental monitoring and enforcement.

11. Gender inequality and gender based violence.

12. Limited Land Use Planning. Limited enforcement of building codes.

13. Limited Business Continuity Plans (private sector) and Continuity Of Operations Plans (public sector) in place.

14. Financial constraints to replicate Community Based Disaster Risk Management initiatives and to strengthen the Civil Defence Commission Volunteer Corps nationally.

11.3. Summary of Priorities

1. Enact new legislative and normative framework.

2. Revise the National Disaster Risk Management (DRM) Platform's Terms of Reference.

3. Reconstitute and strengthen the Civil Defence Commission (CDC). Capacity building in ICT and Communications.

4. Strengthen sectoral capacities to incorporate DRM into planning, in the public and private sector.

5. Standardized data management, and hazard, vulnerability and risk analysis and mapping with attention to exposure. Replicate for all sub-national regions.

6. Expand hydro-meteorological monitoring network. Strengthen Early Warning System (EWS), including floods, droughts and fires.

7. Consider trans-boundary risks.

8. Continue undertaking Public Education Campaigns on DRM.

9. Replicate Community Based DRM initiatives. Support Climate Change Adaptation and Mitigation initiatives at the local and community level.

10. Mainstream gender and disability. Further include vulnerable groups in DRM.

11. Access/implement risk transfer mechanisms.

12. Operationalize Multi-Hazard Preparedness and Response Plan, and Land Use Plan.

13. Strengthen regional (sub-national) Emergency Operations Centres and CDC Volunteers Corps.

14. Replicate shelter surveys at sub-national level. Upgrading of shelters.

12. Conclusions and recommendations

Disaster Risk Management (DRM) is cross-sectoral and needs to be incorporated into various sectors, with resources allocated to implement structural and non-structural measures to reduce vulnerability, enhance resilience and be better prepared to respond to emergencies and disasters, including recovery and rehabilitation activities.

The 2005 and 2006 flood experiences made institutions and civil society organizations aware of the need to incorporate these considerations into planning and policy-making to ensure that levels of development achieved are not seriously hindered by different hazards. Significant progress has been made in this regard over the past five years, in particular in incorporating DRR considerations in different strategies and plans, with uneven progress in implementation.

The national development strategies provide a privileged framework to address sustainable development, DRR and climate change adaptation and mitigation.

A new legal and normative framework for DRM has been developed, with an integrated and comprehensive approach. Enactment is urgent, to adjust the organizational framework to a more proactive approach, and to enforce incorporation of DRM considerations into planning across various sectors.

The new framework will also facilitate the establishment of functional coordination mechanisms and overcome other implementation challenges, at the national and sub-national level. In particular, the National DRM Platform should engage in tasks that are more action-oriented, but this implies further allocation of resources.

International aid has played an outstanding role in helping the country to improve capacities, reduce its vulnerability and build resilience.

In order to attain more effective DRM, it is key to strengthen human resources, providing training and financial and material resources to the Civil Defence Commission (CDC), the CDC Volunteer Corps and different ministries, institutions and organizations.

Efforts in producing hazard, vulnerability/exposure, and risk assessments should be more coordinated and harmonized, and results should be further disseminated. In general, knowledge management and communications need to be strengthened to provide a solid ground for decision-making.

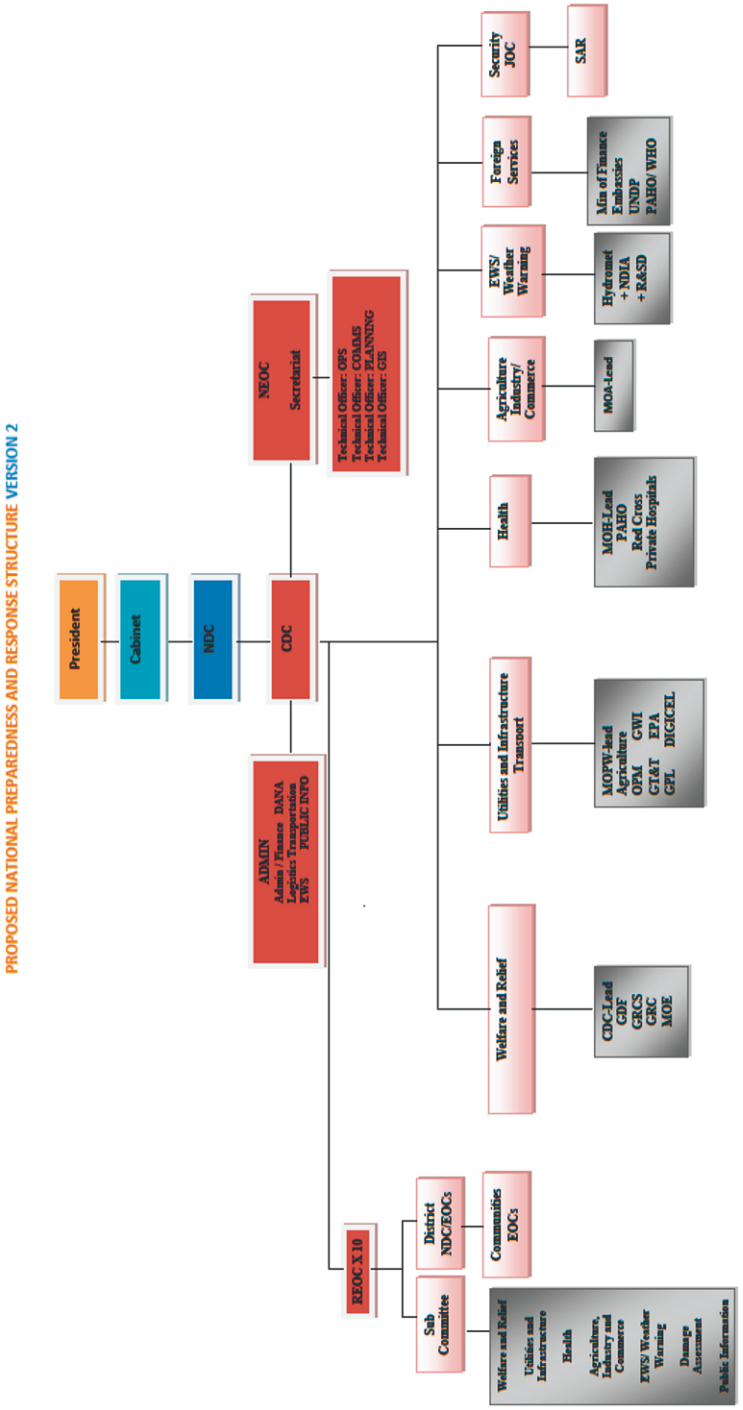
The Early Warning Systems could have a more integrated structure. As some types of flood are becoming less important due to mitigation measures put in place, other hazards such as drought, chemical spills and fires are starting to attract attention and should be further analyzed.

An important issue to consider is that efforts in DRM should be primarily oriented to supporting most vulnerable populations. Thus, a human rights based approach, with considerations given to gender, the aging population, children, and persons living with disabilities should be encouraged.

This document provides an overview of the status of DRM in Guyana as of 2014, and could be used as a valuable input for action planning in upcoming years.

13. Annexes

13.1. Annex I: Proposed National Disaster Preparedness and Response Structure



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Patrick Chesney - United Nations Development Programme
Marvin Chichester - Civil Defence Commission
Crystal Conway - National Drainage and Irrigation Authority
Alexcia Cooke - United Nations Office for Disaster Risk Reduction
Kester Craig - Civil Defence Commission
Donessa David - Hydro-meteorological Service
Jean David - Ministry of Agriculture
Geeta Devi Singh - Environmental Protection Agency
Damian Fernandes - Protected Areas Commission
Tonya France - Habitat for Humanity Guyana
Dorothy Fraser - Guyana Red Cross Society
Ren Gonzales - Ministry of Amerindian Affairs
Sonia Gumbs Luke - Environmental Protection Agency
Rex Hamza - Guyana Civil Aviation Authority
Nathalie Hanley - United Nations Development Programme
Odran Hayes - EU Delegation in Guyana
Chaitrani Heeralall - Guyana Civil Aviation Authority
Nazrul Hussain - Guyana Defence Force
Linda Johnson-Bhola - University of Guyana
Shelisa Khan - Civil Defence Commission
Michelle Klass - Civil Defence Commission
Janelle Leitch - Inter-American Development Bank
Donna Levi - Ministry of Finance
De Vaughn Lewis - Guyana Red Cross Society
Bernard Lord - Ministry of Finance

Roger Luncheon - Office of the President
Benedikt Madl - EU Delegation in Guyana
Andrea Mahammad - Guyana Lands and Surveys Commission
Amarnauth Maraj - Ministry of Health, Health Education Unit
Diana Misir - Hydro-meteorological Service
Naseem Nasir - Guyana Lands and Surveys Commission
Audrey Nedd-Johnson - Ministry of Finance
Andrea Phillips - Guyana Red Cross Society
Beverly Pile - National Commission on Disability
Petal Punalall - Ministry of Education, Science Unit
Chabilall Rampsarup - Civil Defence Commission
Tashana Redmond - Environmental Protection Agency
Bridget Roberts - Hydro-meteorological Service
Cassandra T. Rogers - Inter-American Development Bank
Kevin Samad - Work Services Group
Mahendra Saywack - Ministry of Natural Resources and Environment
Carlton Semple - Civil Defence Commission
Maitland Stewart - Work Services Group
Jackeline Tull - Guyana Bureau of Statistics
Geoffrey Vaughn - Work Services Group
Adrianus Vlugman - Pan American Health Organization / World Health Organization
Sean Welcome - Civil Defence Commission
Anita Wilson - Civil Defence Commission
Lionel Wordsworth - National Drainage and Irrigation Authority

13.4. Annex IV: Lists of images, graphs and tables

13.4.1. List of images

13.4.2. List of graphs

13.4.3. List of tables

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