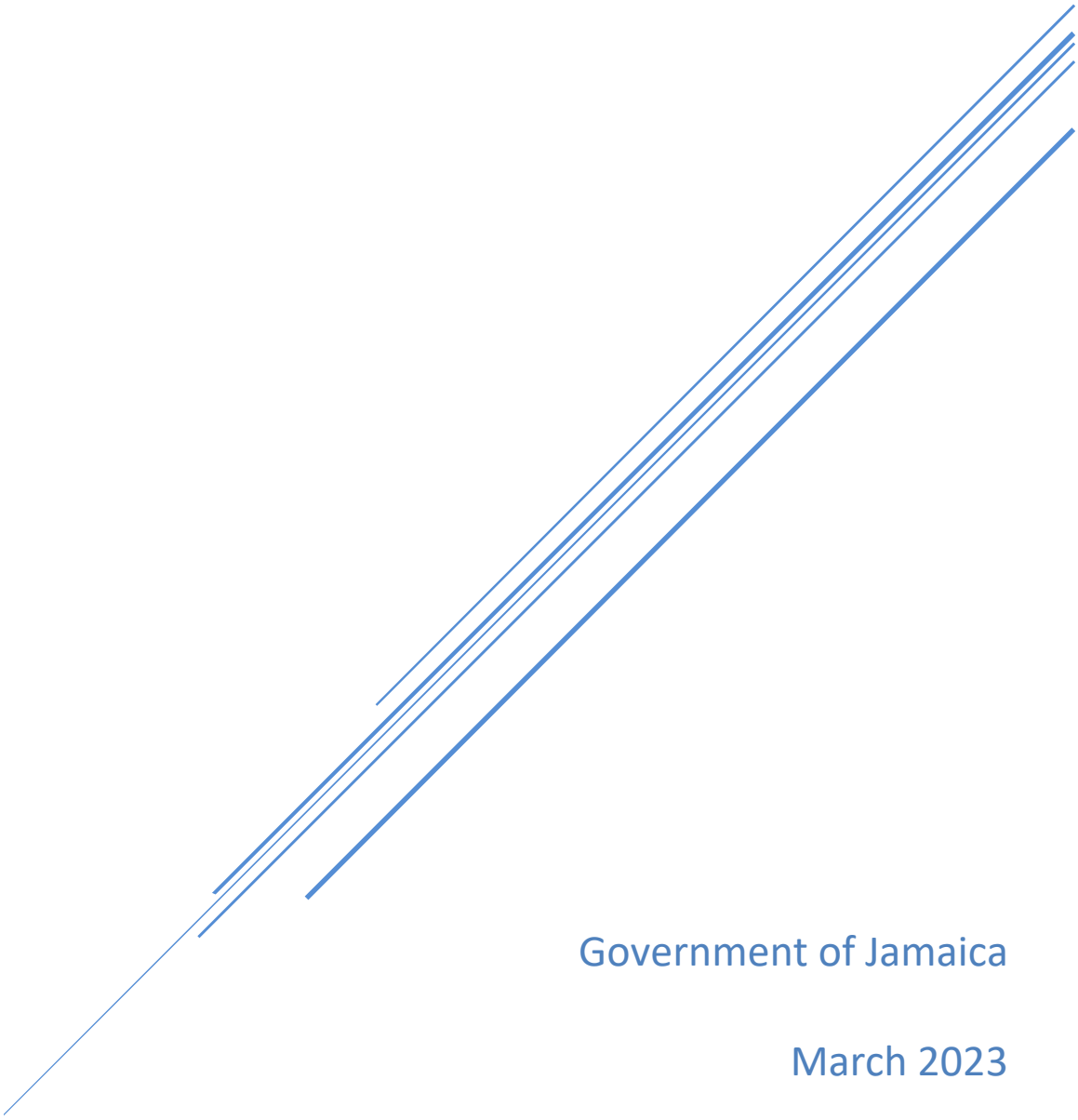
WATERSHEDS POLICY FOR JAMAICA (GREEN PAPER)



Government of Jamaica

March 2023

Draft Policy for Public Consultation

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MESSAGE BY THE MOST HONOURABLE ANDREW HOLNESS, ON, PC, MP

The health and productivity of the island's watersheds are critical to the economic growth and development and environmental sustainability of the country based on the myriad of ecosystem functions and services that they provide. Hence, it is imperative that the island's twenty-six (26) Water Management Units are effectively restored and rehabilitated, particularly those that are severely degraded.

According to the 2017 State of the Environment Report, more than a third of the total watershed areas in Jamaica were classified as either degraded (22%) or severely degraded (14%). The importance of these watersheds to the quality of life we experience cannot be overly emphasized.

It is estimated that the Hope-Yallahs River Watershed is the source of approximately 40% of the Kingston Metropolitan Area. The restoration of these areas will require an integrated and coordinated approach involving various stakeholders, including the public and private sectors, civil society and importantly the general public working collaboratively to achieve a common objective – preservation of the island's watersheds.

In this regard, every Jamaican is encouraged to play his/her part in facilitating the requisite paradigm shift in how we treat the environment, on which lives and livelihoods depend. Small positive actions by many can have a domino effect and result in significant outcomes.

One of the primary functions of watersheds is to provide an area for the filtration, catchment and storage of the island's water resources. Hence, the sustainable management and resilience of these areas are particularly important in responding to the impacts of climate change.

Indeed, watersheds may be deemed as the natural reservoirs for our water resources. Therefore, it is important that we protect these areas from all sources of pollution, including air pollution, discharge of inadequately treated or untreated effluent, chemical pollution (pesticide and fertilizer run off from agricultural areas) and improper disposal of solid wastes, ecosystem degradation, including deforestation and habitat destruction due to human activities (including open burning), as well as inappropriate construction and development practices.

The Watersheds Policy for Jamaica will provide the policy prescriptions necessary to inform the amendment of the Watersheds Protection Act (WPA), 1963. Indeed, the Policy seeks to, *inter alia*, identify and institute the governance arrangements and institutional framework necessary to allow for the sustainable management of the island's watersheds. Additionally, the Policy recommends the establishment of a sustainable finance mechanism to support watersheds management as well as the promotion of sustainable land management practices.

Once the Policy is approved, the Ministry of Economic Growth and Job Creation will be tasked with amending the WPA to align it with the Policy prescriptions. The Watersheds Policy will support and complement existing policies and strategies, including the Water Sector Policy and Implementation Plan, the Forest Policy, the updated Climate Change Policy Framework and the Emissions Policy Framework as well as the relevant pieces of legislation, namely the Natural

Resources Conservation Authority Act, the Water Resources Act, Forest Act, Public Health Act, Pesticides Act and the Mining Act.

Additionally, it is also important to promote tools and arrangements such as payments for ecosystem services (also referred to as payments for environmental services) where individuals within the watershed areas are 'incentivized' or 'compensated' to conserve and maintain the ecological integrity within these areas.

I would like to thank the Environment and Risk Management Branch of the Ministry of Economic Growth and Job Creation for their coordination in the development of this draft Policy. I would also like to encourage all stakeholders to become actively engaged in the finalization of this Policy and its effective implementation.

The Most Honourable Andrew Holness, ON, PC, MP
Prime Minister and Minister of Economic Growth and Job Creation

ACRONYMS

BPOA	Barbados Programme of Action for the Sustainable Development of Small Island Developing States
CBD	Convention on Biological Diversity
CBO	Community-based Organisation
CCAM	Caribbean Coastal Area Management Foundation
CLME	Caribbean Large Marine Ecosystems (Project)
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GIS	Geographic Information System
GIS-DSS	Geographic Information System - Decision Support System
GOJ	Government of Jamaica
IDB	Inter-American Development Bank
IWCAM	Integrating Watershed and Coastal Area Management
IWRM	Integrated Water Resources Management
IWRMC	Integrated Water Resources Management Council
LFMC	Local Forest Management Committee
LIWRMC	Local Integrated Water Resources Management Committee
MDA	Ministries, Departments and Agencies
MoAF	Ministry of Agriculture and Fisheries
NEPA	National Environment and Planning Agency
NIC	National Irrigation Commission
NIWMC	National Integrated Watershed Management Council
NIWMP	National Integrated Watershed Management Programme
NLA	National Land Agency
NRCA	Natural Resources Conservation Authority
NWC	National Water Commission
NGO	Non-Governmental Organisation
PASMP	Protected Areas System Master Plan, 2013–2017
PES	Payments for Ecosystem Services (scheme)
PIOJ	Planning Institute of Jamaica
RADA	Rural Agricultural Development Authority
SIDS	Small Island Developing States
SDC	Social Development Commission
SPAW	Specially Protected Areas and Wildlife
SWB	Sustainable Watersheds Branch
TCPA	Town and Country Planning Authority
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WAMM	Watershed Area Management Mechanism
WMU	Watershed Management Unit
WPA	Watersheds Protection Act
WRA	Water Resources Authority

EXECUTIVE SUMMARY

The term 'watershed' is defined as the land area in which rain falls and from which water drains into a stream or river. This area covers not only the mountains and hill slopes but also includes the forests, farms, industries and housing developments on them. Jamaica is divided into 10 hydrologic basins and 26 watershed management units (WMUs) each usually identified by the name of the major river, which runs through it.

While the protection of watersheds and areas adjoining watersheds and the promotion of the conservation of water resources were assigned to a specific entity with the enactment of the Watersheds Protection Act (WPA), 1963, the range of issues to be addressed is wide and involves several different agencies. Since the enactment of the WPA, there have been many changes in the institutions involved, new policies and legislation have been put in place, new technology has become available, several projects implemented and new global commitments made. It is within this context that this Policy seeks to address the institutional arrangements for effective watershed management.

The Government of Jamaica seeks to articulate a comprehensive policy on watershed management given the degradation of the island's watersheds, challenges in the management of watersheds, involvement of several entities in various areas, outdated laws and policies, and threats such as climate change.

According to the State of the Environment Report 2017, on the status of the country's watersheds, "…all 26 WMUs have been assessed as degraded to some extent… More than a third of the total watershed area in Jamaica were classified as either degraded (22%) or severely degraded (14%); these are generally located on the eastern side of the island. The most severely degraded WMUs included Rio Minho, Wagwater, Hope River and Yallahs".

This Policy sets out the goals and the principles that should guide decision-making by public sector agencies that have mandates concerning watershed management and includes provisions related to the involvement of communities and other stakeholders in watershed protection. The Policy takes into account commitments made by Jamaica under various global agreements related to environmental protection and sustainable development as well as the goals and objectives of related national plans and policies.

The **Vision** of the Watersheds Policy for Jamaica is aligned to Vision 2030 Jamaica – National Development Plan, which is:

> ***"Jamaica has healthy and optimally functional watersheds that are efficient and effective in the provision of ecosystem services for the benefit of all."***

The **Goals** of the Policy are:

1. To develop comprehensive legislative and institutional frameworks to support the effective management of Jamaica's watersheds.
2. To provide adequate and sustainable finance mechanisms for improved watershed management.

3. To ensure enhanced watershed management through increased access to information and data to inform decision-making at all levels.
4. To ensure that Jamaicans are aware of the importance of watersheds and are active participants in their conservation.
5. The promotion of sustainable land management within watersheds through the utilisation of best environmental practices and best available technologies.

The basis of these goals is that the government will make it a matter of policy, to every extent possible, to support the responsible entities to enable them to manage effectively and protect critical areas within the island's Watershed Management Units. These partnerships span all levels— national and local —and include community-based and non-governmental organisations, academia, the private sector and multilateral agencies.

The Policy includes the following nine **guiding principles**:

1. Transparency and accountability
2. Precautionary approach
3. Sustainability and inter-generational equity
4. Participation and collaboration
5. Conflict resolution
6. Environmental economic tools and technology
7. Protection and sustainable use of water resources
8. Evidence-based approach
9. Polluter Pays Principle

The six **objectives** of the Policy are:

1) Rationalization of legislative and institutional frameworks for watershed and water resources management.
2) Updating the national watersheds management programme and provision of adequate human and technical resources for the implementation of the programme.
3) Provision of adequate and sustainable financing for watershed management activities.
4) Increased availability of appropriate information and data for effective watershed management.
5) Increased public education and awareness initiatives geared towards positive changes in attitudes to watershed conservation and promotion of public participation in the planning of watershed management interventions.
6) Support initiatives to encourage appropriate land use and sustainable land management.

The monitoring and evaluation of this Policy will be carried out through the Medium Term Socio-Economic Policy Framework (MTF) of Vision 2030 and in the corporate and operational plans of the agencies involved. The related targets of the Sustainable Development Goals will also be monitored through the Vision 2030 Secretariat. Reports on other commitments in relation to global and regional agreements to which Jamaica is a Party will be done through the respective national focal points. However, elements related to watershed management should be raised with the Natural Resources Conservation Authority (NRCA) and the Integrated Water Resources Management Council (IWRMC). Reports on the State of the Environment will continue to include information on the state of Jamaica's watersheds.

1. INTRODUCTION

The main purpose of this Policy is to address the institutional and legal framework for more effective management of Jamaica's critical watershed areas, considering relevant policies and legislation as well as Sustainable Development Goals (SDGs).

Definitions
The Watersheds Protection Act, (1963), the principal law related to the island's management of watersheds, does not define the term 'watershed'. It is therefore imperative that this Policy defines key terms, including 'watershed', 'watershed area' and 'watershed management unit', as outlined below:

a. Watershed: ***"Area having a common outlet for its surface runoff"*** (World Meteorological Organization & United Nations Educational, Scientific and Cultural Organization, 2012).

b. Watershed area: ***"An area defined and declared to be a watershed area under section 5 of the Watersheds Protection Act."***

c. Watershed Management Unit: ***"A defined land area from the ridge of a mountain to the coast within which a group of sub-hydrological basins drain into a major water body."***

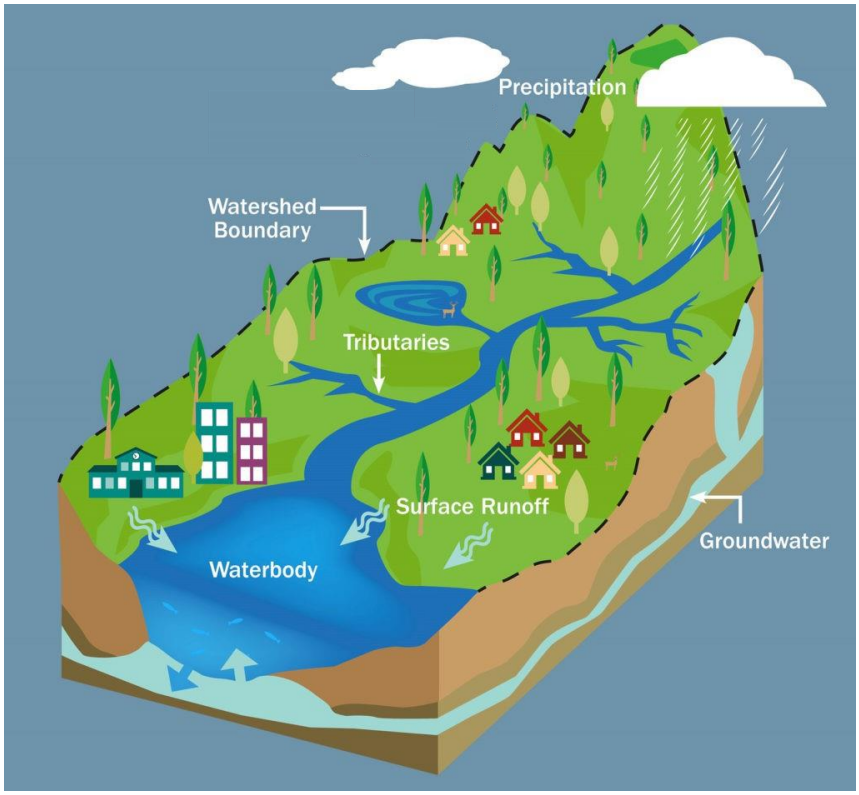

Figure 1: Watershed diagram
Adapted from the National Oceanic and Atmospheric Administration, 2022

The watershed is the land area in which rain falls and from which water drains into a common outlet/common body of water such as a stream or river (Figure 1). This area covers not only the mountains and hill slopes, but also includes the forests as well as the farms, industries and housing developments on them.

Generally, watersheds provide many functions including a wide range of ecosystem services and goods, such as provision for freshwater, timber, food, fibre, soil formation, water and air filtration, nutrient cycling, carbon storage and medicinal plants. Watersheds typically feature high terrestrial biodiversity, ground and surface water catchment and high mineral content. As a result of drainage and surface water flow, watersheds are linked to mountains/high elevations making the two systems interrelated. Watersheds and mountains are often fragile ecosystems that are susceptible to erosion, landslides and other natural hazards, which make them a priority area for strengthening resilience to climate change (Food and Agriculture Organization, 2017).

Additionally, productive and healthy watersheds can also provide opportunities for recreation, ecotourism and support sustainable livelihoods. It should be noted that in countries like Colombia and Costa Rica, payments for ecosystem services (PES) programmes compensate or incentivize landowners for conserving land, enabling others to benefit from the ecosystem services provided by the land. In this regard, sustainable land management and best management practices in watersheds must be observed.

Integrated Watershed Management Approaches

The management of land and water resources has been carried out in Jamaica since the late 1800s when recommendations were made to establish forest reserves in the Blue Mountains and in certain limestone formations for soil conservation, the retention of timber trees and protection of the hillsides from clearing (Hooper, 1886, as cited in Forestry Department, 2017). Documented reports from the 1900s continued to highlight the need for forest cover to improve water retention in catchments to ensure reliable potable/domestic water and reduce soil erosion (National Environment and Planning Agency, 2013).

In the decades after, the Government of Jamaica took steps to strengthen the legislative and institutional frameworks for watershed management. The government undertook the following agriculture and land-use initiatives in collaboration with donor agencies in the 1900s:

- the establishment of Land Authorities;
- the enactment of the Watersheds Protection Act of 1963;
- the implementation of the Farm Development Scheme;
- the Integrated Rural Development Project 1978-1983; and
- the Hillside Agriculture Development Project of 1987-1997.

In the 1980s, the emphasis gradually shifted to an integrated approach, which combined soil conservation and rural development, including improvement in livelihood opportunities. Following the United Nations Conference on Environment and Development (UNCED) (Rio de Janeiro, Brazil, 1992), watershed conservation programmes started to emphasise the improvement of the rural environment and living standards, alleviation of poverty and public participation, as well as the protection of tropical forest and other natural resources.

Several projects in the 2000s employed the ridge-to-reef approach, which is a holistic method considering the interconnectivity between coastal and marine areas ('reef') and their uplands ('ridge'). One such project was the 'Ridge to Reef Watershed Project'. It was a five-year initiative between the Government of Jamaica's National Environment and Planning Agency (NEPA) and the United States Agency for International Development (USAID). The 'Integrating Watershed and Coastal Areas Management (IWCAM)' Project, funded by the Global Environmental Facility (GEF) and implemented by NEPA, was another project of that time using the ridge-to-reef approach.

According to the National Water Sector Policy and Implementation Plan, 2019, a key goal of water resources management decisions is to protect watersheds at all points — from ridges and headwaters to the coastal waters that they feed. Jamaica's National Ecological Gap Report (2009) (NEGAR) noted that research on marine, freshwater and terrestrial ecosystem connectivity in protected areas should be a priority for the effective conservation of 'ridge to reef' areas. The NEGAR also considers how ecological connectivity could be incorporated into conservation strategies such as zoning and restoration.

Another approved method for watershed management is the ecosystem approach, which views watershed management as the management of a complex ecosystem. It regards all its components — air, land, water, wildlife and humans — as interrelated.

Appendix II gives a brief overview of the various strategies in watershed management that have been applied in Jamaica.

2. BACKGROUND

2.1 Physical Setting

The island of Jamaica consists primarily of mountainous regions with over 60 per cent of the island having altitudes greater than 230 metres above sea level. It is often described as having a mountainous backbone attributed to the central ridge that transverses the length of the island. In the east, the crest of the ridge exceeds 2,100 metres above sea level for at least 16 kilometres, with the highest summit in the Blue Mountains. Limestone soils cover about 65 per cent of the watersheds, with the remainder being soils derived from weathered igneous and metamorphic rocks. Alluvial soils are mostly along the coastal plains and interior valleys. Figure 2 shows the distribution of soil types across the island.

The watershed includes all the land from the mountains to the sea. Lands in the upper parts of the watersheds are characterised by steep slopes, the majority of which are greater than 20 degrees. The Blue Mountains Range — the island's highest and most extensive mountain form — is composed of igneous and metamorphic rocks and is dissected by a network of steep-sided ravines. This land formation gives rise to surface drainage by an extensive network of streams and rivers. In the limestone areas drainage by rivers is significantly less dominant.

Under section 5 of the Watersheds Protection Act (WPA), thirty-three (33) watershed areas were declared by the Minister from 1964 to 1983 with the majority being between 1982 and 1983 (Appendix III).

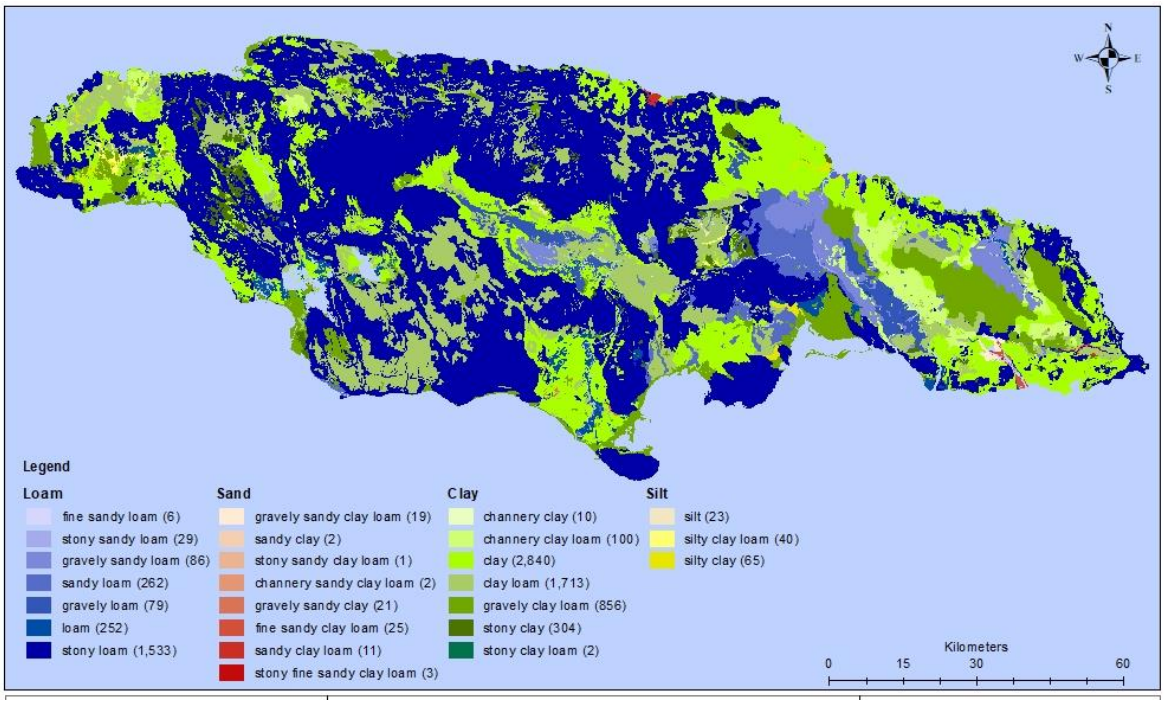

Figure 2: Soil Map of Jamaica - Sources: NEPA (Design) and Rural Physical Planning Division [RPPD] (Data), 2020

In 1995, for management purposes, the Underground Water Authority (later replaced by the Water Resources Authority [WRA]) and the Natural Resources Conservation Authority (NRCA), in collaboration with other agencies,[1] divided the island into 26 Watershed Management Units (WMUs) each usually identified by the name of the major river, which runs through it. The WMUs are composites of watersheds within the 10 hydrological basins. Figure 3 illustrates the subdivision of the island into the WMUs, while the list of the areas, their approximate sizes and related hydrological basins are presented in Appendix IV.

Each watershed has three physical and management subdivisions. These are **the upper watershed**, which begins at mountain tops and is characterised by steep slopes often over 20 degrees; **the middle watershed,** which separates the upper and lower areas; and **the lower watershed**, which consists of gently undulating foothills and flatlands ending on the coast. The upper and middle watersheds (lands 305 metres or 1000 feet and above) occupy almost three-quarters of the island and approximately 40 per cent of Jamaica's population is located therein, including the majority of small farmers, and a significant portion of Jamaica's non-traditional crops. Urban centres are mainly established in coastal areas, particularly on the southern side of the island, where there are more extensive, better-developed plains.

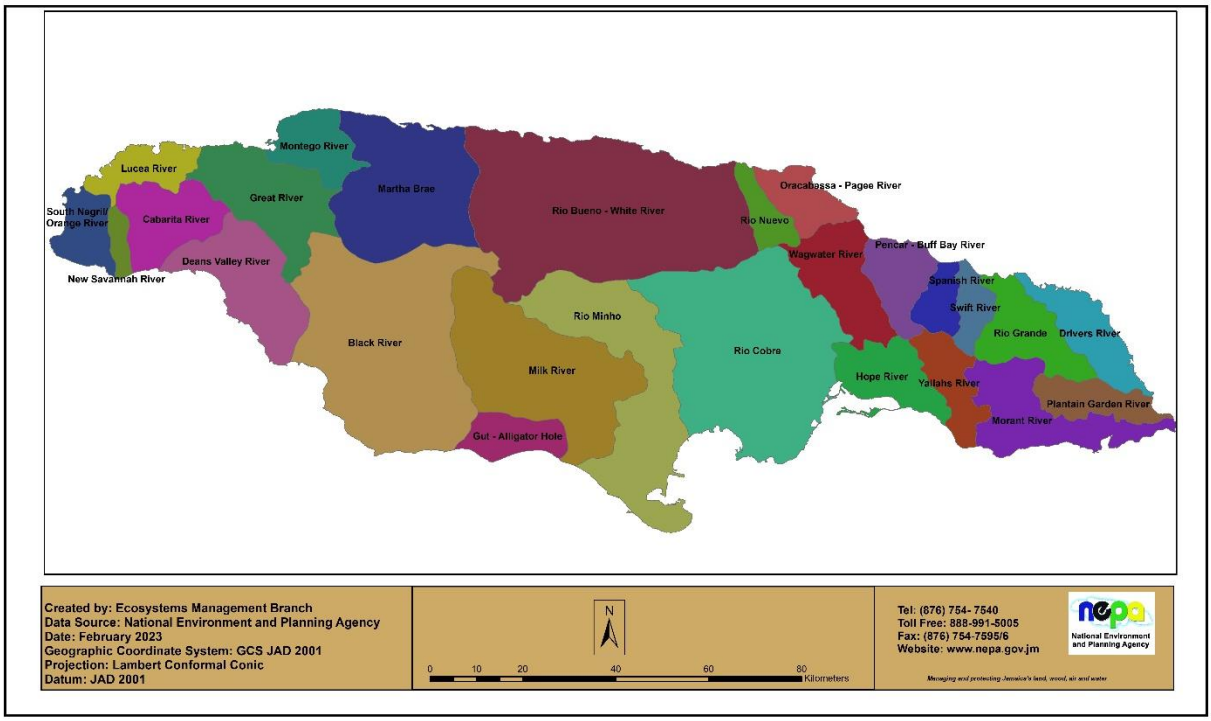

Figure 3: Map of Jamaica illustrating the 26 Watershed Management Units - Source: NEPA, 2023

[1] The collaborating agencies included the National Water Commission, National Irrigation Commission, Meteorological Service of Jamaica, Rural Physical Planning Division, Caribbean Agricultural Research & Development Institute and the Planning Institute of Jamaica - State of the Environment Report 2013 (National Environment and Planning Agency, 2015).

Many upland watersheds — due to their location — are of utmost importance for providing water for urban, industrial, and agricultural development. Also, they are the sites for many other resources such as forestry, energy, recreation, mineral, and domestic and export crops, as well as the homes of small-scale farmers.

2.2 Situational Analysis

2.2.1 Activities affecting watersheds

The lowland areas are associated with many of the same environmental problems observed in the ridge area, notably erosion and poorly managed and excessive application of agricultural chemicals applied to cash crops such as sugar cane, papayas, bananas, and coconut plantations. Larger population centres and industries characterise these areas. The human settlements in the lowland areas are the major contributors to environmental degradation in many of the watersheds, primarily because of inadequate solid waste disposal practices and lack of sewage infrastructure or treatment.

In urban watershed areas, there has been an increase in impervious surfaces. Water quality can be impacted by harmful pollutants in urban stormwater runoff which are channelled into gullies, rivers and other waterways. Surface water runoff, which may contain contaminants and sediments, is less likely to be intercepted before reaching surface waters. Further, hydrological functions, especially stream flows and channels, are substantially altered. Urban sprawl into areas zoned for agriculture can cause decreasing availability of agricultural land (Presentation on Watersheds, 2003).

Soil erosion, land slippage and slope failure are widespread in the non-limestone watersheds as a result of the steep slopes, and thin or erosive soils, compounded with heavy and high-intensity rains in the upper watershed areas. Other particular features of Jamaica that necessitate due diligence in the protection of watersheds include the country's location within an area of earthquake susceptibility and hurricane tracks (Edwards, 2003). Anthropogenic activities exacerbate the pre-existing vulnerabilities, including cultivating without soil conservation, indiscriminate forest removal, improper construction and maintenance of roads, uncontrolled grazing, and unregulated and illegal quarrying and mining.

All the above factors result in heavy siltation to surface waters such as rivers, reservoirs, irrigation canals, water intakes, as well as harbours. Surface runoff is significantly increased from the excavation of slopes, diminished vegetation cover, compacting of soils, and other activities that reduce water intake to the soils. During heavy rains and hurricanes, floods become more frequent and severe. Contrastingly, in dry seasons, water shortage becomes a severe problem.

NEPA's monitoring of watersheds has shown that improper solid waste disposal is also negatively impacting the condition of watersheds (NEPA, 2019). The solid waste problem has health, environmental, and aesthetic dimensions. Unplanned development exacerbates garbage accumulation. Further, many urban areas outside the major cities lack managed sanitary landfills. These unmanaged disposal sites are a nuisance, harbour rodents, and result in noxious odours. They may also result in the leaching of various pollutants into rivers, streams, and coastal bays. The ubiquitous litter, burning trash piles, and unmanaged dumps detract from the scenic beauty of the countryside.

The problem of water pollution has also drastically increased in recent decades due to agricultural expansion and intensification, the use of more agricultural chemicals, agro-industry, and resettlement programmes in the watersheds. Pollution not only degrades water quality for domestic and industrial use, but also affects coastal resources including beaches, seagrass and coral reefs, and has direct and indirect negative impacts on the tourism industry.

2.2.2 Status of Watersheds

In 1999, a National Watershed and Monitoring Programme for Jamaica was developed by Computer Assisted Development Inc. for the Government of Jamaica. The 26 WMUs were classified into four groups of management priorities, mainly according to their physical conditions and management needs (Figure 4).

A process for the identification of priority watersheds was employed using the following steps:

1. Limestone vs Non-Limestone Areas
   In step 1, WMUs dominated with limestone, using a 60% area in the upper watershed as a cut-off line, were not considered high priority areas. These are areas dominated by karst topography, especially in white limestone regions. Little can be done in such areas to influence hydrology regimes, including water quantity, quality, erosion and sediments. Lucea River, Montego River, Martha Brae, Rio Bueno, Deans Valley River, Black River, Gut-Alligator Hole, Milk River and Drivers River were dominated by limestone; therefore, they were not considered as high priority areas and were placed in Group 4. Hence, the remaining WMUs were considered at step 2 for further priority ranking.

2. With and without downstream interests
   The second step was to differentiate WMUs with downstream interests and those without. Downstream interests include cities, tourist attractions, reservoirs or dams. WMUs with downstream interests were considered for further priority ranking and those without downstream interests (such as Rio Nuevo, Spanish River, Plantain Garden River and New Savannah River) were placed into Group 3.

3. Watershed stability classification
   A stability evaluation was done for upper watersheds, using factors such as permanent vegetative cover, erosion hazards, landslide risk, rainfall intensity, stream density and road density. Each factor was given a value of "1" or "0" according to its condition. WMUs that had a score above 4 were more critical. South Negril/Orange River, Great River and Cabarita River were relatively stable; hence they were assigned to Group 3. However, the remaining WMUs were assigned to either Group 1 or 2. WMUs that had a score from 4-5 were assigned to Group 2 (second priority) and those with a score of 6 were assigned to Group 1 (first priority) (Figure 4).

The WMUs of the highest priority for intervention were Hope River, Yallahs River, Wagwater River and Rio Minho (Computer Assisted Development, Inc. 1999).

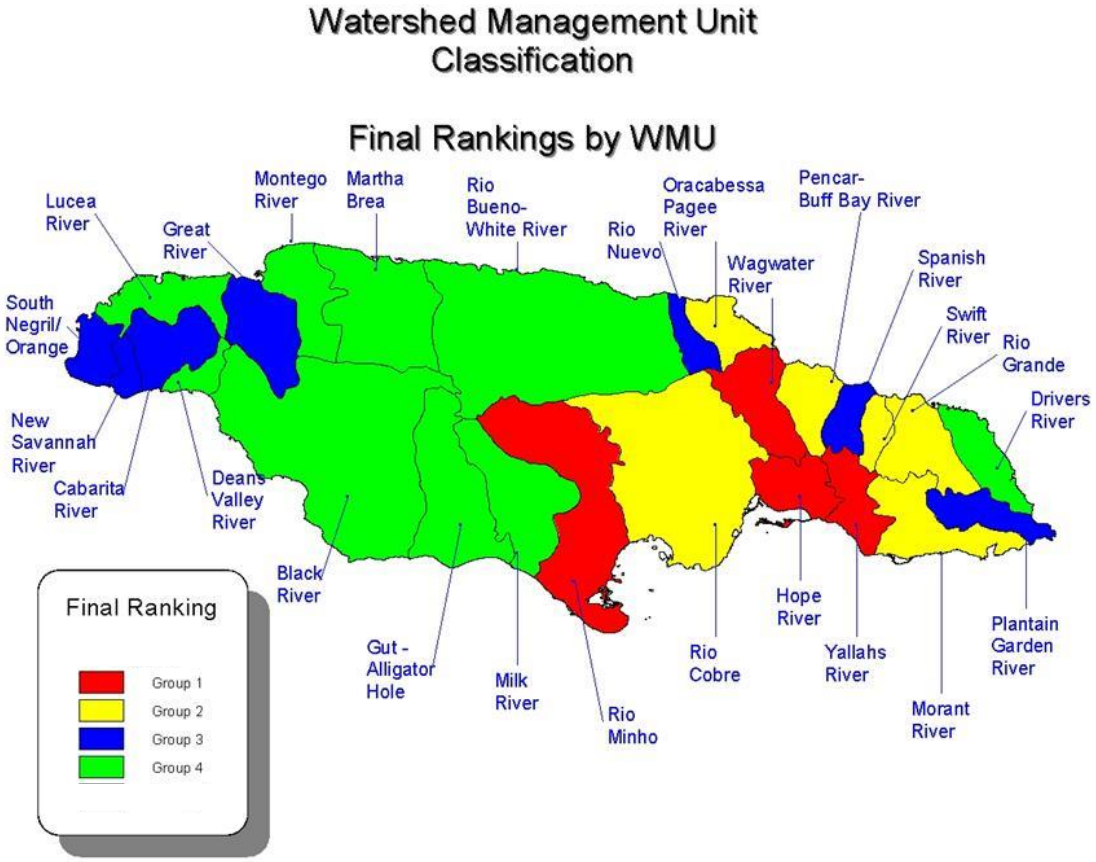

Figure 4: Classification of Watershed Management Units (WMUs) - Source: NEPA, 1999

In 2010, the Ecosystems Management Branch of the National Environment and Planning Agency assessed 17 of the 26 WMUs, using four parameters namely: stream density, road density, downstream interest and population density. The results showed that several of the watersheds had deteriorated compared with the ranking done in 1999, except for Swift River, New Savannah River and Drivers River WMUs. These Units are in the same category as they were in 1999, while improvements were noted in the Oracabessa-Pagee River and Rio Nuevo watersheds (Ecosystems Management Branch, 2010).

The 2010 findings resulted in five key recommendations; one of which is that "…the Agency needs to engage in aggressive on the ground watershed initiatives to watershed users and so create the paradigm which is needed in our Jamaican Watersheds." The other recommendations addressed watershed assessment and classification; database management; and the regulation of land use within watersheds, including the incorporation of zoning plans specific to watershed areas into Development Orders.

According to the State of the Environment Report, 2017, on the watershed status, "all 26 WMUs have been assessed as degraded to some extent by the Global Environment Facility-Integrating Watershed and Coastal Area Management project… In terms of relative proportion of land area,

just over half (52%) of the total watershed area was classified as 'Least Degraded'. These included nine of the 26 WMUs, including the two largest WMUs (Rio Bueno-White River and the Black River). Another seven WMUs (accounting for 12% of the total watershed area of Jamaica) were classified as "Less Degraded," including the Great River and the Cabarita River. More than a third of the total watershed area in Jamaica was classified as either degraded (22%) or severely degraded (14%); these are generally located on the eastern side of the island. The most severely degraded WMUs included Rio Minho, Wagwater, Hope River and Yallahs" (National Environment and Planning Agency, 2019).

One important observation that is being addressed by the NEPA is that water quality within the watersheds is added as a parameter to support the watershed classification process. It started in 2021 and should last for a period of seven years. In this regard, the Agency has commenced routine water quality monitoring in the following watershed areas: Black River, Rio Cobre, Montego River, White River, Negril Orange River and Rio Minho. This programme will be expanded over time to include other watershed areas.

The boundaries in the map in Figure 4 are being updated by the relevant government agencies and departments, based on the revisions of the watershed descriptions which is in progress.

2.2.3 Threats to Jamaica's watersheds

In 2013, the Forestry Department conducted a land-use cover assessment of the pressures and threats that Jamaica's forests are currently facing. The key activities identified and their impacts are as follows:

- The encroachment by farmers and informal settlers into forested areas, especially in the upper watersheds and riparian forests (along riverbanks), seeking to carry out small farming;
- Illegal logging for lumber — especially for highly prized hardwoods such as Jamaican Mahogany and Blue Mahoe — but also for trees to make stakes for yam (yam sticks), scaffolding, fence poles and posts, or wood for charcoal kilns. These activities contribute to reduced quality of the country's forests;
- Infrastructural development to link major conurbations in Jamaica — in particular, the development of Highway 2000 and new toll roads — which facilitate greater access to forested areas for agriculture expansion and growth;
- Forest removal to facilitate the extraction of minerals. When this removal occurs in areas of native limestone forest, the impact on biodiversity and the quantity and quality of groundwater can be significant. Furthermore, following mine closure, in line with provisions under the Mining Regulations, 1947 amended 2006, sites are to be restored "to the level of agricultural or pastoral productivity or of utilisation for afforestation purposes or such other uses as may be approved by the Commissioner or the Town and County Planning Authority"; and
- Climate variability and change are leading to longer dry periods, which make forests more vulnerable to fires, droughts, and more intense hurricanes which — when coupled with deforestation, especially in the most critical watersheds — have increased human vulnerability to disasters and the loss of natural barriers to the spread

of disease and the reproduction of pollinators.

NEPA conducted 20 stakeholder consultations over the 2013/14 financial year[2] (National Environment and Planning Agency, 2015), and the top six issues impacting watersheds were concluded as:

- improper disposal of solid waste;
- flooding;
- poor farming practices including the improper use of agricultural chemicals;
- soil erosion and landslides;
- clearing of wetlands; and
- blockage of drains and sinkholes.

Other issues identified were charcoal burning, poisoning of fish in rivers and poor quarrying practices. In a similar assessment conducted in the 2011/12 financial year, similar problems affecting the majority of the island's watersheds were identified by NEPA. Additional issues then included deforestation and indiscriminate land clearance. Several of the factors contributing to these activities included socio-economic concerns such as people's need to earn and support themselves financially, have a place to live and have access to essential social services. Another critical finding was the disinclination towards proactive enforcement of environmental and planning legislation, opting instead for reactive approaches (Ecosystems Management Branch, 2012).

Urban watersheds are not without challenges, although they slightly differ from rural sections. The issues in urban watersheds include the following:

- rapid population growth;
- finite land resources;
- vulnerability to natural disasters;
- soil erosion;
- mining and quarrying;
- chemical contamination;
- lack of land tenure;
- infrastructural development;
- informal settlements;
- deforestation;
- forest conversion;
- large developments linked to tourism in commercial and residential areas;
- poor access to and availability of freshwater resources;
- groundwater pollution—from sewage, suspended solids, agricultural chemicals, runoff; and
- inadequate solid waste disposal.

[2] This is the last evaluation of multiple WMUs. Since then, NEPA has taken a more targeted approach at watershed management doing more in-depth studies such as rapid ecological assessments in a few WMUs per financial year.

2.2.4 Impact of Climate Change on Watersheds

The modelling of climate projections shows that temperatures in the Caribbean region are increasing, which could result in changes in the frequency and intensity of extreme weather events, more significant climate variability (Ministry of Water, Land, Environment and Climate Change, 2013) and rising sea levels. As noted in the Third National Communication of Jamaica to the United Nations Framework Convention on Climate Change, 2018, these changes will adversely affect Jamaica's critical sectors including agriculture, fisheries, tourism, human health and energy.

Several floods and hurricanes have had a significant impact on Jamaica. In 1996 and 1998, Portland experienced floods which had an associated rehabilitation cost of approximately JA$261.5 million and JA$832.3 million respectively. For Hurricane Ivan (2004), the total cost of repairs was estimated at over JA$36 billion with the damages to environmental assets — excluding any loss of ecological services — accounting for more than ten per cent (Economic Commission for Latin America and the Caribbean, 2004). The island experienced the effects of Hurricane Dean in 2007 with resulting damage of over JA$23 billion; however, as there was a lack of information on environmental assets before its passing, it was unrealistic to assess the impacts of this system quantitatively. Damage to the coastal and inland ecosystems was described to be as a result of "storm surge, and defoliation; destruction of wildlife habitats; landslides and vegetation damage" (Planning Institute of Jamaica, 2007).

The Climate Change Policy Framework, 2015, lists the potential impacts of climate change on water resources including:

- contamination of groundwater resources due to the intrusion of seawater into coastal aquifers as sea level rises;
- higher levels of sedimentation in reservoirs and dams and sediment transport to coastal areas as soil erosion increases with higher incidences of more intense rainfall and hurricane events;
- adverse shifts in climatic conditions for agricultural cultivation due to changes in temperature;
- increasing degradation and destruction of watersheds caused by the displacement of traditional activities/livelihoods such as farming;
- shortage of water during periods of prolonged droughts; and
- damage to infrastructure (roads, bridges, electricity generation and transmission systems, seaports, airports, pipelines, dams) caused by extreme and slow onset events.

The Policy Framework recognises the potential impact of climate change on water resources and the economic sectors that depend on water. As such, the Framework includes as a priority a Special Initiative for Water Resources "to develop programmes that address water resources management including watershed protection and the scaling up of conservation programmes (e.g., rainwater harvesting)."

The Economic Commission for Latin America and the Caribbean, in 2014, conducted an overview of the economics of climate change in Latin America and the Caribbean (Economic Commission for Latin America and the Caribbean, 2014). The integrated management of watersheds and coastal areas and protection of coastal wetlands and education on ecosystem services were amongst the adaptation measures proposed to combat the impact of climate change on agriculture, coastal areas and the water sector.

3. CURRENT LEGISLATION, POLICIES AND INSTITUTIONAL ARRANGEMENTS

3.1 Existing Legislative Framework

The following legislations primarily govern watershed management in Jamaica: the Watersheds Protection Act (WPA) (1963), the Natural Resources Conservation Authority Act (NRCA Act) (1991), the Forest Act (1996), Water Resources Act (1995), and Rural Agricultural Development Authority Act (RADA Act) (1990). As per Section 42 of the NRCA Act, the Authority is the Watersheds Commission. Section 22 of the WPA empowers the Commission, subject to the Minister's approval, to "from time to time appoint committees to be known as Watersheds Protection Committees to whom work may be committed by the Authority." These committees have all functions of the Authority in the watershed within which it is assigned, except for the powers of making regulations, entering into an assisted improvement agreement (without the Authority's authorization) and the acquisition and disposal of property as outlined in section 23 of the WPA.

The objective of the **Watersheds Protection Act,** 1963**,** is to protect water resources by effectively controlling land use and regulating specific activities that are likely to harm water resources. Under section 5 of the WPA, Ministerial Orders for the declaration of thirty-three (33) Watershed Areas were issued over the period 1964 – 1983. The Watersheds Protection Commission was also appointed for a period. The WPA is outdated and has no provisions regarding participatory approaches, incentives to encourage watershed development, public education or the involvement of local communities in watershed management. Several key definitions are not included in the Act, including the term 'watershed'. Additionally, no regulations have been promulgated per the WPA, which limits the effectiveness of implementing the Act. Notably, however, the WPA included novel concepts on the protection of watersheds such as the Assisted Improvement Agreement[3] and provisional schemes[4] partnership between the government and the private sector.

The **Natural Resources Conservation Authority Act**, 1991, establishes the provisions for the effective management of the physical environment of Jamaica to ensure the conservation, protection and proper use of its natural resources and promoting public awareness of the ecological systems of Jamaica and their importance to the social and economic life of the island. In performing its functions, the Authority may develop, implement and monitor plans and programmes relating to the management of the environment and the conservation and protection of natural resources (section 4).

Under the Natural Resources Conservation (Permits and Licences) Regulations, 1996, environmental permits are required for the following:

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[3] According to Section 10 (1) of the WPA: "Subject to subsections (2) and (3), the Authority may enter into an agreement with the owner of any merit construction parcel and with any other interested person for the carrying out of improvement works in relation to such construction parcel (in this Act referred to as an assisted improvement agreement). The WPA defines the Authority as the NRCA.

[4] Section 12 of the WPA: "…after the preparation of any provisional scheme, the authority shall cause to be published in not less than three issues of the *Gazette*, and at intervals not less than seven or more than ten days in three issues of the daily newspaper printed for sale and published in Jamaica."

- River basin development and improvement projects;
- Irrigation and water management projects including improvements;
- Land reclamation and drainage projects; and
- Watershed development and soil conservation projects, including river training such as works in river channelling and water resources transferal amongst river basins, check dams and retaining walls.

The Natural Resources Conservation Authority (Environmental Protection Measures) Order, 2016, outlines measures to address the threat of wildfires, which are associated with dry conditions, to biodiversity, ecosystems and watersheds. The Order specifies that from February to October annually, special environmental protection measures are to be applied, along with any requirements for land use, in 10 watersheds, namely:

i. Black River
ii. Yallahs Valley
iii. Bull Savannah
iv. Rio Minho Extension
v. Wag Water
vi. Fresh River
vii. Rio Minho
viii. Hermitage
ix. Hope River
x. Rio Cobre

The Forest Act, 1996, provides for the Forestry Department to protect and preserve Forest Reserves and Forest Management Areas. The Forest Act includes among the functions of the Forestry Department, the "protection and preservation of watersheds in forest reserves, protected areas and forest management areas" [section 4 (n)]. This mandate is clear and is further addressed in the Forest Policy for Jamaica, 2016. Proposals for the amendment and updating of the Forest Act are included in the Forest Policy, 2016, and the National Forest Management and Conservation Plan 2016–2026.

The **Water Resources Act**, 1995, established the Water Resources Authority (WRA) to regulate, allocate, conserve and manage the water resources of Jamaica. The Act also enables the WRA to perform such other functions relating to the management, conservation and use of water resources as may be assigned to it by or under this Act or any other enactment. The Authority may obtain, compile, store and disseminate data concerning the water resources of Jamaica and prepare a Master Plan for the proper management of such resources. Section 14 of the Act provides for the appointment of a Water Resources Advisory Committee to inform the Minister of (i) general policy matters related to the management, development, conservation and use of water resources, and (ii) the Master Plan and Water Quality Control Plans, among other things.

The **Rural Agricultural Development Authority Act**, 1990, provides for the Authority to "encourage and, so far as may be practicable, having regard to the financial and other resources and to the statutory powers of the Authority, to secure the proper economic and efficient utilisation of land in the rural areas" (section 4 [1] [b]). A provision of 'improvement work' is included in section 9 (1) of the WPA and section 14 (1) of the RADA Act. The main difference is that the RADA Act stops short of a reference to the conservation of water resources.

The **Town and Country Planning Act**, 1957, addresses the orderly development of land primarily through development orders which are the primary means of control of land use in Jamaica. Section

5 (1) provides that "the Authority may after consultation with any local authority concerned prepare so many or such provisional development orders as the Authority may consider necessary in relation to any land, in any urban or rural area, whether there are or are not buildings thereon, with the general object of controlling the development of the land comprised in the area to which the respective order applies, and with a view to securing proper sanitary conditions and conveniences and the coordination of roads and public services, protecting and extending the amenities, and conserving and developing the resources, of such area." Several of the more recently promulgated development orders contain sectoral policies that speak to watershed protection; particularly the recent ones such as Hanover.

Other legislation relevant to watershed management includes the:

a. Country Fires Act, 1942
b. Wild Life Protection Act, 1945
c. Mining Act, 1947
d. Floodwater Control Act, 1958
e. Land Development and Utilization Act, 1966
f. River Rafting Act, 1970
g. Quarries Control Act, 1984
h. Public Health Act, 1985
i. National Solid Waste Management Act, 2001
j. The Pesticides Act, 1987
k. National Water Commission Act, 1963

3.1.1 Proposals for New Legislation

There are proposals for the amendment of laws or the development of new legislation relevant to watershed management. Both the Forest Policy for Jamaica and the National Forest Management and Conservation Plan refer to the proposed amendment of the Forest Act, 1996, and the Forest Regulations, 2001, regarding the use of the term 'protected area' and the provisions concerning private lands in forested watersheds. The National Water Sector Policy and Implementation Plan, 2019, addresses the need for amendment of the Water Resources Act — including the institutional arrangements for integrated water resources management— and the Floodwater Control Act. Section 14 of the Mining Act of 1947 provides for the acquisition of lands, that are wholly or in part covered by an active mining lease, for public purposes. The National Minerals Policy (2017-2030) refers to proposals to modernise the Mining Act of 1947, incorporating best practices for environmental management.

The Public Health Act (1985), the Country Fires Act (1942) and the National Solid Waste Management Act (2001) require in-depth review and updating given the institutional and policy developments since their enactment.

In 2005, preliminary drafting instructions were prepared for the development of the National Environment and Planning Act to marry environmental and planning laws such as the Wild Life Protection Act (1945), the Watersheds Protection Act (1963), the Town and Country Planning Act (1957) and the Land Development and Utilization Act (1966). The preliminary instructions include a new structure for environmental management. The proposals are under review.

The preliminary drafting instructions, which were developed in 2016 for legislation related to the establishment of a protected areas system in Jamaica, are under review.

3.2 Existing Policy Framework

Several policies, plans and guidelines developed by the government are of relevance to watershed management as they affect many types of activities which take place in watershed areas. Several policies related to natural resources management have been approved since 2015 or are in the process of revision and updating. However, others are dated or remain in draft.

Vision 2030 Jamaica — National Development Plan 2009–2030 has four national goals: Goal 1: Jamaicans are empowered to achieve their fullest potential; Goal 2: The Jamaican society is secure, cohesive and just; Goal 3: Jamaica's economy is prosperous and Goal 4: Jamaica has a healthy natural environment. Goal 4, which considers the environment and, is most applicable under this policy has three National Outcomes: Outcome 13 (Sustainable Management and Use of Environmental and Natural Resources), Outcome 14 (Hazard Risk Reduction and Adaptation to Climate Change), and Outcome 15 (Sustainable Urban and Rural Development).

Goal 4 recognises that healthy, productive and protective environments, social systems and economies are the bases of development, sustainability and human welfare and that while some benefits have been derived from the pattern of development, there exists a myriad of challenges including:

- fragmented subdivisions;
- imbalanced regional development;
- urban sprawl;
- limited availability of affordable housing and squatting;
- inequity and poverty;
- environmental degradation;
- deteriorating air and water quality;
- poor management of solid, liquid and hazardous wastes;
- loss of biodiversity;
- watershed degradation;
- net loss of forest cover; and
- Increasing incidence of fires.

The central policies relevant to watershed management include the following:

I. **The National Land Policy (1997): The objectives of this policy are to ensure sustainable, productive and equitable development, use and management of the country's natural resources.** Revisions made to the policy in 2017 address watershed protection, noting among the issues the lack of a coordinated approach to the management of watersheds, forests, protected areas, coastal areas and waste, including hazardous waste.

II. **Policy for Jamaica's System of Protected Areas (1997):** This policy defines a protected area as an area of water or land that is managed for the protection and maintenance of its ecological systems, biodiversity and specific natural, cultural or aesthetic resources. The policy includes the category of 'protected watershed.'

A Draft Overarching Policy for Jamaica's Protected Areas System, 2019, prepared under the project 'Strengthening the Operational and Financial Sustainability of the National Protected Areas System' funded by the Global Environment Facility incorporated provisions of the Protected Areas System Master Plan (PASMP) 2013–2017.

III. **Protected Areas System Master Plan [PASMP] 2013–2017:** The matter of inter-agency coordination is central to the plan. The plan is based on the Protected Areas Programme of Work of the Convention on Biological Diversity. One of the main principles of the PASMP is to "Protect habitats, ecosystems, species and genetic resources and cultural and natural heritage". This would include restoration and protection of watersheds, rivers, wetlands, forests, coral reefs, and other critical ecosystems so that essential resources, such as water, soil, and related ecosystem services are available for the sustainable development of the country.

IV. **Forest Policy for Jamaica (2016):** The goals of the Forest Policy are (i) Improved Governance Arrangements in Relation to the Management of the Island's Forests; (ii) Increased Forest Ecological System Conservation and Protection; and (iii) Incorporation of Socio-Economic Considerations into Forest Conservation and Preservation. The Forestry Department's supporting role to the executing agencies, NEPA and WRA, is set out in the policy, including its responsibility to protect and preserve Forest Reserves and Forest Management Areas in the upper watersheds around water sources. It noted that transparency, public participation, education and awareness and the involvement of communities and the private sector are essential aspects of forest management.

V. **National Forest Management and Conservation Plan (NFMCP) 2016–2026**: The National Forest Management and Conservation Plan updates the five-year Strategic Forest Management Plan for the period 2010–2015. The goal of the NFMCP is to "Sustainably manage and utilise Jamaica's forest resources to enhance social and economic development and contribute to building the country's climate resilience." Among the issues noted in the plan is that there is insufficient institutional capacity in the Forestry Department, its partners and forest communities to support the efficient and effective implementation of the NFMCP. Coordination and harmonization among stakeholders are identified as a cross-cutting issue.

VI. **National Strategy and Action Plan on Biological Diversity in Jamaica 2016-2021 (2016):** The Strategy outlines plans and programmes for the sustainable use of Jamaica's biodiversity and notes that the protection and conservation of forests and

watershed areas are critical to species diversity and the preservation of ecosystems and habitats.

VII. **National Water Sector Policy and Implementation Plan, 2019:** The Policy provides an update to the 2004 Water Sector Policy Strategies and Action Plan and outlines the current situation in the water and wastewater sector and the principles, objectives and policy directions for the management of the country's water resources in keeping with ***Vision 2030 Jamaica—National Development Plan***. The Policy recognizes the critical role that water resources play in the realization of the National Vision "Jamaica, the place of choice to live, work, raise families and do business," and will therefore seek to manage the resources in a sustainable and integrated way to facilitate the population having universal access to potable water and adequate sanitation by 2030.

The Water Sector Policy focuses on the Integrated Water Resources Management (IWRM) approach and the mainstreaming of climate adaptation initiatives and participatory processes in the sector. The goal of the policy is to ensure that Jamaica's water resources are effectively managed to provide for our nation's social, economic, and environmental well-being, now and in the future. The vision, goals and objectives of the Water Sector Policy and Implementation Plan are consistent with those in the Watersheds Policy.

VIII. **Local Sustainable Development Plans:** Several local authorities have prepared Local Sustainable Development Plans. The purpose of the Trelawny Local Sustainable Development Plan, for example, is "for guiding the orderly growth and development of the Parish while identifying and bringing together projects and activities that will facilitate the long-term growth of Trelawny".

A recurring theme among the policies and actions related to the supply of water is the evaluation of watersheds and identification of practices and activities that contribute to degradation; the establishment of corrective guidelines and monitoring strategies to mitigate degradation; and the promotion of public involvement and participation in the decision-making process.

IX. **National Minerals Policy (2017–2030):** Goal 3 of the policy recognises that land use should consider watershed, forest and ecological protection. It considers coordination between economic development and environmental conservation to achieve the sustainability of both sectors. According to the policy, a strategy related to environmental stewardship is to "ensure effective rehabilitation of mined-out and other disturbed lands". In order to improve environmental stewardship in the mining sector, best environmental management practices should be adhered to, including the disposal of waste materials that are generated by the sector. "New, innovative and appropriate technologies are to be employed to address sector generated waste including dry-stacking."

Other relevant policies pertaining to watershed management and conservation include the Housing, Transport, Land Use, and Agricultural Land Utilization Policies.

3.3 Institutional Framework

The institutional framework for watershed management in Jamaica comprises a mix of management structures based on regulatory, technical, advisory and extension functions. Currently, management functions are undertaken by government agencies established by statute, *ad hoc* coordinating committees, non-governmental organisations (NGOs) and external funding agencies.

3.3.1 Natural Resources Conservation Authority (NRCA)/National Environment and Planning Agency (NEPA)

The Natural Resources Conservation Authority (NRCA) has the responsibility to manage, conserve and protect the natural resources of Jamaica. Overall responsibility for local watershed management is conferred on the Authority, which by Section 42 of the NRCA Act, 1991 is the NRCA. As per section 4 of the WPA, the duty of the Authority in the promotion of the conservation of water resources is to "…institute such measures and to recommend to the Minister for the implementation such programmes as it considers necessary for the protection of those areas which constitute or adjoin the watersheds of the Island".

With the establishment of NEPA in 2001 (a merger of the staff of the NRCA, the Town Planning Department and the Land Development and Utilization Commission), the Sustainable Watersheds Branch (SWB) came into being to replace the Watersheds Protection Management Unit of NRCA. The focus of the SWB was on monitoring and coordinating activities within watersheds, providing general oversight and promoting public awareness of watershed issues. The SWB was then merged with the Biodiversity and Coastal Zone Management branches of NEPA to form the Ecosystems Management Branch (EMB). Although the NEPA no longer carries out physical works, the agency advises the National Works Agency on watershed-related works, primarily restoration, when the need arises.

As established by the National Water Sector Policy, 2019, in the context of the appointment of the Integrated Water Resources Management Council, the role of NEPA will be to coordinate and implement integrated watershed management; regulate development; pollution control and wastewater management; ecosystem protection and conservation; public education; policy formulation and legislative review related to natural resources management.

3.3.2 Forestry Department

The Forestry Department has responsibility, among other things, for the protection and preservation of watersheds in areas declared as forest reserves, protected areas or forest management areas. The National Forest Conservation and Management Plan 2016–2022 sets out in detail the Department's plans to manage forests including mangrove forests.

In some forest reserves in upper watershed areas, forest management plans are developed by the Local Forest Management Committees (LFMC) established under section 12 of the Forest Act.

According to the Act, the Conservator shall, from time to time, make available to any forest management committee technical advice and assistance as may be necessary to assist the committee in its functions. Eighteen LFMCs have been established to date.

3.3.3 Water Resources Authority (WRA)

The role of the Water Resources Authority established under the Water Resources Act, 1995, includes the management of water resources, allocation of water and control of the quality of water resources. The Managing Director of the WRA is to be the Secretary of the Water Resources Advisory Committee and in that capacity would also be the coordinator of the Integrated Water Resources Management Council.

As it regards inter-agency responsibility for water quality, there is a current Memorandum of Understanding amongst WRA, NRCA/NEPA, the Office of Disaster Preparedness and Emergency and the Ministry of Health. The Agreement was signed in 2020 for an effective period of five years, with the option of extending for a further three years. It represents the shared acceptance of the responsibility for proper water quality, amongst other things.

3.3.4 The National Integrated Watershed Management Council

The National Integrated Watershed Management Programme (NIWMP), 1999, included a recommendation for the establishment of the National Integrated Watershed Management Council (NIWMC). In 2000, the Cabinet approved the appointment of a multi-disciplinary and multi-sectoral Council whose role was to improve cohesion, planning, fundraising, resource allocation, coordination, monitoring and evaluation and implementation of watershed programmes and projects. The Council was to be the critical link with donor and lender agencies that are active in watershed management in Jamaica and provide policy advice to Cabinet.

The Council was to report to Cabinet and the Minister responsible for the environment portfolio on the implementation of the NIWMP Framework.

Included in the responsibility of the NIWMC are:

- ensuring consensus for acceptance by all major stakeholders, of future/projects and development proposals;
- ensuring that planning is based on an integrated approach and incorporates the input of the local stakeholders;
- identifying funding in support of the programs;
- liaising with NEPA in monitoring the effectiveness of the NIWMP; and
- preparing and submitting progress reports to the Houses of Parliament.

NIWMC's achievements included the implementation of the Better Environments for Social Transformation (BEST) Community Competition and Programme; an annual national competition and programme aimed at the sustainable development of communities and Jamaica (BEST Community Competition and Programme, 2008). It encouraged community self-help activities in a variety of areas. It also sought to establish partnerships between communities and those who have technical, professional, spiritual, educational and financial capabilities. The priority areas

included the built environment; natural environment; socio-economic; hazard mitigation and disaster preparedness; education; health; waste management and heritage and culture.

3.3.5 The Integrated Water Resources Management Council (IWRMC)

Under the National Water Sector Policy and Implementation Plan 2019, the Integrated Water Resources Management Council (IWRMC) was established with an expanded role replacing the National Integrated Watershed Management Council. Similar to the NIWMC, the IWRMC is a multi-disciplinary and multi-sectoral body led by the Ministry with portfolio responsibility for water and reporting to the Cabinet. It involves key stakeholders in the land, water and water-related sectors.

The IWRMC will be responsible for:

- making recommendations to the Minister responsible for water for all IWRM related matters;
- overseeing the preparation of a comprehensive IWRM framework;
- coordinating the implementation of water management plans/programmes at the macro and micro levels. This will eliminate the overlapping of responsibilities of Ministries, Departments and Agencies, which often results in conflicting objectives;
- reviewing, monitoring and evaluating the implementation of the IWRM framework;
- identifying financial and technical support for projects and programmes;
- making recommendations for amendments to existing laws and/or the need for new laws;
- reviewing periodically development plans within the context of the IWRM framework;
- liaising with agencies to obtain relevant data to guide decision-making;
- recommending incentives for private sector investment for improving water resources in Jamaica;
- developing criteria and procedures for the establishment of Local Integrated Water Resources Management Committees (LIWRMC) and the integration of existing groups;
- reviewing and monitoring the institutional capacities and strengthening of the LIWRMC and governance mechanisms; and
- preparing and submitting progress reports through the Ministry with portfolio responsibility for water to the Cabinet.

3.3.6 Watershed Area Management Mechanism (WAMM)

The Watershed Area Management Mechanism (WAMM) was developed under the GEF/UNEP/UNDP/GOJ project "Integrating Watershed and Coastal Area Management in Caribbean Small Island Developing States" (2006–2011). The development and subsequent implementation of the WAMM was one of the outputs of Jamaica's component under the regional project. The WAMM provides a framework for collaboration between public bodies to achieve an integrated approach to watershed management and to focus on attitudinal and behavioural changes of community members individually and collectively. It also provides a means of replication of

watershed initiatives as experiences are recorded and shared. The WAMM has 10 main components which are:

I. Engagement of the Community
II. Formalisation of Governance Approach
III. Reconnaissance of Resources
IV. Capacity Building through Training
V. Establishing Indicators for Assessment and Evaluation
VI. Environmental Monitoring, Mitigation and Evaluation
VII. Capacity Building to Access External Funding
VIII. Developing Sustainable Livelihoods
IX. Capturing Lessons Learnt
X. Broadcasting the Experience

The WAMM was implemented as a pilot in the Driver's River Watershed Management Unit by the project between 2009–2010. Since its development, various components of the WAMM have been implemented in selected communities in 14 WMUs. Limited financial and human resources have restricted the full implementation of all WAMM components within the 26 WMUs.

The Medium Term Socio-Economic Policy Framework 2015–2018 set out that there was to be a refinement of the mechanism resulting from its review. The Project Executing Unit of the Inter-American Development Bank/Global Environment Facility Yallahs and Hope River Watershed Area Project (2014–2020) completed this activity in 2020.

3.4 Regional and Global Commitments

Jamaica has commitments under several environmental treaties and has developed Action Plans for implementation accordingly. An overview of the main treaties which are relevant to the protection of biodiversity and watershed management is provided in Appendix V and summarised below:

- The Convention on Biological Diversity, 1992;
- The United Nations Framework Convention on Climate Change (UNFCCC), 1994;
- The United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa (UNCCD), 1994;
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971 (Ramsar Convention);
- The Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, 1983 (Cartagena Convention);
- The United Nations Forest Instrument, 2015 — formally known as the Non-Legally Binding Instrument on All Types of Forests (NLBI);
- The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, 1995;
- Regional agreement on access to information, public participation and justice in environmental matters in Latin America and the Caribbean, 2018 (based on Principle 10 of the Rio Declaration on Environment and Development);

- The Convention Concerning the Protection of World Cultural and Natural Heritage, 1972 (the UNESCO World Heritage Convention); and
- International Plant Protection Convention, 1951.

While the international agreements/treaties do not speak specifically to watershed management, the country's obligations to these agreements focus on the conservation and sustainable use of the resources of the terrestrial and marine environment. Appendix VI highlights the key global agreements that are focused on sustainable development.

With Agenda 21, the 1992 United Nations Conference on Environment and Development (UNCED) established sustainable development as a shared global priority and identified integrated approaches to the management of natural resources as a means to achieve it (UNCED, 1992).

The Sustainable Development Goals (SDGs), under Transforming Our World: the 2030 Agenda for Sustainable Development, 2016–2030, comprise 17 global goals, 169 targets and 230 indicators. Several of the goals are relevant to watershed management, specifically:

- Goal 2: Zero Hunger
    - End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
- Goal 5: Gender Equality
    - Achieve gender equality and empower all women and girls.
- Goal 6: Clean Water and Sanitation
    - Ensure availability and sustainable management of water and sanitation for all.
- Goal 13: Climate Action
    - Take urgent action to combat climate change and its impacts.
- Goal 14: Life Below Water
    - Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- Goal 15: Life on Land
    - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

The Watersheds Policy is consistent with Jamaica's international obligations concerning the protection of biodiversity and watershed management and Jamaica's commitment to meeting the Sustainable Development Goals. The Road Map for SDG Implementation, 2017[5], was developed in Jamaica as a commitment to meet the SDGs. The map outlines the critical steps towards the achievement of the 2030 Agenda. It, therefore, covers the alignment of the SDGs with Vision 2030, the implementation of which is monitored by the Planning Institute of Jamaica (PIOJ) and

[5] The Road Map is the product of a collaboration between the national focal points — the Planning Institute of Jamaica (PIOJ), Ministry of Foreign Affairs and Foreign Trade (MFAFT) and the Statistical Institute of Jamaica (STATIN) — and the United Nations Development Programme (UNDP).

other national priorities, financing, accelerators to galvanise progress towards national development objectives, data requirements, institutional coordination and advocacy (Government of Jamaica, 2017). Jamaica has reported on its progress in meeting the SDGs through the submission of Voluntary National Reviews to the United Nations (in 2018 and 2022 to date).
The Government of Jamaica has committed to maintaining a 'no-net-loss' policy for its forests. This is embodied in the country's efforts towards the United Nations Framework Convention on Climate Change (UNFCCC) to reduce emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+). This commitment will also contribute to progress on the Sustainable Development Goals.

3.5 National Projects/Programmes on Watersheds Management

There have been several national projects and programmes towards watershed management in recent history; Appendix VII provides an overview of such projects between 2006 and 2020. Several selected ones are highlighted below, along with major plans or programmes that were conceptualized to proceed with the life of the project's achievements.

- GEF/UNEP Integrating Watershed and Coastal Areas Management [GEF/UNEP IWCAM] (2006–2011) — Watershed Area Management Mechanism (WAMM)
- IDB/GEF Integrated Management of the Yallahs and Hope Watershed Management Areas Project (2014–2020) — Conservation Plan for the Yallahs and Hope River WMUs and the Geographic Information System Decision Support System (GIS-DSS)
- USAID Jamaica Rural Economy & Ecosystems Adapting to Climate Change [Ja REEACH] Reforestation Initiative (2010–2018) — Disaster and Climate Risk Management Plans
- USAID Jamaica Rural Economy and Ecosystems Adapting to Climate Change II [Ja REEACH II] (2014–2018)
- The Nature Conservancy (TNC) Water Fund
- Jamaica National Group (JN)/IDB/Pilot Program for Climate Resilience
- The Water Project Jamaica

3.6 Summary of Gaps and Challenges

The legislative and institutional frameworks for watershed management require urgent attention as do human resources and technical capacity. A new coordination mechanism is to be put in place with the adoption of the Integrated Water Resources Management approach as set out in the National Water Sector Policy, 2019. The new arrangement does not, however, take away from the responsibility of the NRCA/NEPA to address pollution control, ecosystem management and integrated watershed and coastal zone management.

Effective integrated management is challenging to put into effect. Since watershed work is interdisciplinary and multi-sectoral, no single organisation can do the job thoroughly and efficiently. Strengthened institutions and commitment, as well as a willingness to collaborate in the pooling of resources, are essential. Therefore, coordination amongst MDAs becomes necessary. Effort should be made to promote mutual interests among agencies, specify the details of coordination and responsibilities, locate resources, and set up proper mechanisms for working together to obtain effective stakeholder coordination (Sheng, Challenges and Strategies of

Integrated Watershed Management in Developing Countries, 1994). In other words, coordination needs to be pursued with specific details and objectives among related agencies, not merely as a general agreement. An ambitious watershed project or program which coordinates too many agencies and integrates too many activities will seldom succeed. Both the items of work and the institutions should be carefully selected.

The main areas for which issues and concerns have been identified for watershed management include legislative, policy and institutional framework; human resources and technical capacity; finances; public awareness and governance; and land use (Table 1).

Table 1: Summary of Issues and Concerns regarding Watershed Management

Legislative, Policy and Institutional Framework	Human Resources and Technical Capacity	Finances	Public Awareness and Governance	Land Use
• Outdated laws (e.g., the Watersheds Protection Act, 1963 and the Country Fires Act, 1942) • Overlap in responsibilities in watershed management for some areas • Need for updated penalties under relevant Acts including the NRCA Act, 1991, Watersheds Protection Act, 1963 and Country Fires Act, 1942 • Absence of appropriate legal framework for incentives for participation in watershed management • Inadequate enforcement of laws that protect the watersheds and the environment, generally • Absence of a policy on rivers	• Insufficient number of personnel working in watershed management • Limited opportunities for ongoing training and improvement of skills • Challenges in the retention of staff previously trained in watershed management • Limited extension services • Limited equipment supplies and technology • Up-to-date comprehensive and centralised data management system needed • Improved access to and sharing of data required	• Over-reliance on project funds – not conducive to sustainable watershed management • Absence of a flexible and long-term strategy for funding watershed management • No effective scheme of incentives for the utilization of sustainable land management • Lack of funding to support training programmes and the acquisition of technology	• Inadequate general knowledge of the value of watersheds • Limited knowledge of the importance of trees and green spaces • Inadequate stakeholder participation in governance	• Land use capability recommendations not being implemented • Security of tenure issues remains unresolved, especially regarding 'family lands' • Unplanned development

4. POLICY

4.1 Vision

The vision of the Watersheds Policy for Jamaica, in alignment with Vision 2030 Jamaica — National Development Plan, is:

"Jamaica has healthy and optimally functional watersheds that are efficient and effective in the provision of ecosystem services for the benefit of all."

4.2 Goals

The **Goals** of the Policy are:

1. To develop comprehensive legislative and institutional frameworks to support the effective management of Jamaica's watersheds.
2. To provide adequate and sustainable finance mechanisms for improved watershed management.
3. To ensure enhanced watershed management through increased access to information and data to inform decision-making at all levels.
4. To ensure that Jamaicans are aware of the importance of watersheds and are active participants in their conservation.
5. The promotion of sustainable land management within watersheds through the utilisation of best environmental practices and best available technologies.

4.3 Policy Statement

The Government of Jamaica will support the responsible entities to enable them to manage effectively and protect critical areas within the island's Watershed Management Units, including through partnerships at the national and local levels with community-based and non-government organisations, academia, the private sector and multilateral agencies.

4.4 Guiding Principles

I. **Transparency and accountability**: There is a commitment to open and transparent decision-making processes, accountable governance and provision of opportunities to encourage and facilitate the participation of all citizens in the implementation of programmes aimed at addressing watershed management issues.

II. **Precautionary approach:** Ensure that the precautionary approach (Principle 15 of the Rio Declaration 1992) is applied as widely as possible to avoid or minimise environmental degradation and loss of biodiversity.

III. **Sustainability and inter-generational equity**: The effective management of watersheds will provide many functions for present and future generations including a wide range of ecosystem services and goods, such as freshwater, timber, food, fibre and medicinal plants.

IV. **Participation and collaboration:** Local involvement and community engagement in watershed management are essential, and planned interventions and implementation will include non-governmental organisations (NGOs), community-based organisations (CBOs), youth and gender matters. Close

collaboration and coordination among government agencies and between public and private entities are essential for success.

V. **Conflict resolution:** Where possible, compromise and complementary approaches are employed in resolving conflicts of interest that may arise in resource uses.

VI. **Environmental economic tools and technology**: Adequate investment in financial capital for resource management tools and technology for the benefit of the communities concerned, upstream and downstream, and for all sectors.

VII. **Protection and sustainable use of water resources:** Conservation work carried out in a watershed requires maintenance and must be considered an integral part of the watershed programme.

VIII. **Evidence-based approach:** The best scientific information — social and technical —is integrated with local knowledge to form an interdisciplinary body of knowledge by the decision-makers.

IX. **Polluter Pays Principle:** An environmental policy principle that requires that the cost associated with pollution be borne by those who cause it - Principle 16 of the Rio Declaration (United Nations, 1992).

4.5 Objectives

The objectives of the Watersheds Policy for Jamaica are:

1. Rationalization of legislative and institutional frameworks for watershed and water resources management.
2. Updating the national watersheds management programme and provision of adequate human and technical resources for the implementation of the programme.
3. Provision of adequate and sustainable financing for watershed management activities.
4. Increased availability of appropriate information and data for effective watershed management.
5. Increased public education and awareness initiatives geared towards positive changes in attitudes to watershed conservation and promotion of public participation in the planning of watershed management interventions.
6. Support initiatives to encourage appropriate land use and sustainable land management.

The Policy directives are derived from the implementation strategies and necessary activities needed to attain the stated objectives. The strategies are examined in the text to follow.

Objective 1: Rationalization of legislative and institutional frameworks for watershed and water resources management

Implementation Strategies

i. Review and streamline the provisions of the NRCA Act and Watersheds Protection Act. Also, to be taken into consideration are the RADA Act, the WRA Act and the Forest Act.

a. The amendment of the Watersheds Protection Act, 1963, should include the definition of a watershed and Integrated Watershed Management Unit, declaration of watershed and zones of protection, provisions for compliance schemes and increase in the fines. Other issues are outlined in Table 1 on page 33.

ii. Prepare the boundary description and zoning plans for the Watershed Management Units for inclusion in the Watersheds Protection Act.

Objective 2: Updating the national watersheds management programme and provision of adequate human and technical resources for the implementation of the programme

Implementation Strategies

i. The Watershed Area Management Mechanism will be established as a code of practice for watershed management.
ii. A national programme will be developed and implemented to facilitate training in watershed management including soil conservation, soil fertility, hydrology, agricultural engineering, forest management, land husbandry and Geographic Information Systems (GIS).

Objective 3: Provision of adequate and sustainable financing for watershed management activities

i. The Minister with responsibility for the environment will be charged with coordinating the implementation of a Payments for Ecosystems Services scheme as developed under the Government of Jamaica (GOJ)/Inter-American Development Bank/Global Environment Facility Yallahs and Hope Watershed Area Project, or an appropriate alternate.
ii. NRCA, Tourism Product Development Company (TPDCo), Mines and Geology Division and municipal corporations will make a contribution towards watershed management from the administrative fees associated with permits and licenses issued by these entities.
iii. NEPA in collaboration with the Social Development Commission (SDC) will build the capacity of community groups within the watershed management unit to enable access to funds for sustainable livelihoods. The development of sustainable livelihoods is considered under Component 8 of the WAMM.

Implementation Strategies

A. Rehabilitation and management needs in Watershed Management Units will be identified

i. In recognition of the critical socio-economic role that healthy watersheds play in national sustainable development, the government will utilise the linkages and resources of government (including the Forestry Department, NRCA/NEPA and the WRA), community-based organisations and non-governmental entities to monitor watersheds, and identify the intervention needs in WMUs.
ii. The use of green infrastructure in watershed management will be actively explored to increase the percolation and retention of water.
iii. Abandoned wells and boreholes must be appropriately managed and decommissioned to prevent them from becoming vectors for groundwater contamination.

B. Funding options will be explored and implemented

Government is committed to providing financial support within the constraints of the national budget. Where practical, joint exercises and initiatives will be encouraged among the agencies involved in watershed management and innovative low-cost solutions will be sought. Additional funds will have to be raised by various means from other national and international sources. The options for funding to be explored include:

i. Allocation of a percentage of the cost of major construction projects taking place in upper watershed areas (such as projects related to highways, reservoirs, dams and housing) for watershed protection purposes, including slope stabilization via the inclusion of a new provision under the NRCA Act.
ii. In consultation with the relevant entities, the NWC will seek to allocate a percentage of water utility bills for conservation and rehabilitation activities for water resources and watersheds in critical areas.
iii. The National Irrigation Commission (NIC) will seek to allocate a percentage of their irrigation charges towards sustainable watershed management, including best agricultural practices.
iv. Support of the capitalization of the Forest Conservation Fund which could be used for watershed rehabilitation.
v. Allocation of a percentage of the fees collected by NEPA for permit applications for projects and programmes in upper watershed areas.
vi. Exploration and support of creative financing mechanisms through NGOs and CBOs, including the Water Fund proposed by the international NGO, The Nature Conservancy.
vii. Institution of a scheme of fiscal incentives to facilitate participation of the private sector, including landowners, in watershed management.
viii. Allocation of a percentage of the environmental levy for projects and programmes related to watershed management.
ix. Application to the National Conservation Trust Fund of Jamaica for watershed management projects which fall within protected areas.
x. Development and application of a Payments for Ecosystem Services scheme in funding for forest and watershed management.
xi. Financial support will be provided from the Consolidated Fund to the relevant agencies and departments, including NEPA, the Forestry Department, WRA and RADA, for water resources and watersheds management.
xii. Development of proposals for programmes to address land-use planning, climate-smart agriculture, ecosystem-based adaptation, watershed and coastal area rehabilitation, green infrastructure under the Green Climate Fund and other climate and environment funds.

The Government will also consider the utilisation of other approaches to economic incentives for watershed conservation and management where feasible.

Objective 4: Increased availability of appropriate information and data for effective watershed management

Implementation Strategies

A. Enhance the use of information technology

i. NEPA will implement the Integrated Watershed Management GIS-Based Decision Support System to monitor and assess watersheds and to inform decision-making.
ii. NEPA, in consultation with the relevant Ministries, Departments and Agencies, will revise the watershed management unit classification system developed in 1999.
iii. All agencies involved in watershed management will utilize modern/innovative technology to monitor watershed management units.
iv. The use of drones for the monitoring of watershed health indicators will be explored and implemented in accordance with regulatory requirements.

B. Increase capacity to conduct research and exchange information

i. The Watersheds Protection Committee to be established will determine the research priorities.
ii. All relevant agencies and institutions will provide information for the maintenance of the Integrated Watershed Management Geographic Information System Decision Support System.
iii. Joint research initiatives will be undertaken with national and international organisations and institutions to the greatest extent possible. Given the resource constraints, research activities will focus on applied research. The research will include determining erosion rates; identifying the most appropriate erosion control measures; sustainable agricultural practices and technologies, particularly for small farmers, which will ensure livelihoods and provide ecological benefits for watersheds; development of appropriate treatment processes for urban stormwater runoff and identifying incentive needs and effectiveness.
iv. Conduct hydrological assessments, particularly in severely degraded watersheds, to inform decision-making by relevant regulatory authorities with respect to major infrastructure developments as well as mining.

Objective 5: Increased public education and awareness initiatives geared towards positive changes in attitudes to watershed conservation and promotion of public participation in the planning of watershed management interventions

Implementation Strategies

i. NEPA will develop new material, strategies and techniques for public awareness and education, and social media used for outreach. The material developed will produce targeted information for farmers, land users and the private sector. Sensitization of law enforcement officials, including the judiciary, on environmental laws.
ii. Implementation of components one, nine and ten of the Watershed Area Management Mechanism which speaks to engaging the community, capturing lessons learnt and broadcasting these lessons will be supported, considering the importance of their involvement for successful outcomes. Considerations will be made towards the

incorporation of Principle 10[6] which provides for public access to information, access to public participation and access to justice.

iii. A participatory approach will be used to encourage sustainable community action and facilitate the inclusion of indigenous technical and cultural knowledge in identifying and solving problems within watershed areas, using the WAMM model as appropriate. The involvement of community leaders in group activities will be encouraged to engender dynamism and continuity.

iv. Community participation in the planning and implementation of sustainable watershed management programmes and interventions will be supported, taking into account the importance of their involvement for successful watershed management.

v. Large farmers in upper watershed areas, as well as small farmers, will be included in outreach activities regarding watershed management.

vi. Initiatives to encourage the involvement of the private sector in the protection of forests and watersheds will be supported as in the private planting programme and Adopt-a-Hillside programme of the Forestry Department.

vii. Watershed management projects/programmes implemented will be reviewed. Documented lessons learnt and best practices are then considered for application in future projects and programmes — for example, in terms of cost-effectiveness of major conservation interventions or agricultural practices, or water supply and alternative livelihoods projects from small grants to communities for replication and upscaling.

viii. Gender considerations will be mainstreamed throughout national policies, plans, projects and programmes related to integrated watershed management to facilitate greater gender balance, particularly the involvement of women.

ix. Empowerment of women and girls through capacity building to facilitate effective participation in watershed management.

Objective 6: Support initiatives to encourage appropriate land use and sustainable land management

Implementation Strategies:

i. Integration of sustainable land management (SLM)[7] practices through programmes involving government entities and the private sector.

ii. The Commissioner of Lands/NLA will address the issues relating to land tenure and access to land.

iii. NEPA will ensure that during the preparation of new or revised development orders, core areas for watershed protection are included.

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[6] Principle 10 of the Rio Principles seeks to ensure that every person has access to information, can participate in the decision-making process and has access to justice in environmental matters with the aim of safeguarding the right to a healthy and sustainable environment for present and future generations. Retrieved from https://www.cepal.org/en/infographics/principle-10-rio-declaration-environment-and-development.

[7] "The United Nations defines Sustainable Land Management as the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions" (Food and Agricultural Organisation, n.d.)

iv. NEPA will recommend to the municipal corporation the inclusion of watershed protection strategies in parish development plans.
v. The NRCA/TCPA and the municipal corporation will take into consideration areas within the watershed to be protected through designation as Tree Preservation Orders under the Town and Country Planning Act.
vi. NEPA shall, in collaboration with the Climate Change Division and other relevant stakeholders, develop strategies for adaptation for land-use practices.

5. POLICY IMPLEMENTATION

The government's policy is that inter-agency coordination of watershed management initiatives will be managed by the Ministry responsible for the environment. There will also be coordination between agencies based on Memoranda of Understanding for more effective actions, considering the limitations on funding, and human and technical resources in the agencies.

The NRCA has the legal responsibility for watershed management under the Watersheds Protection Act and natural resource management under the NRCA Act. NEPA has been involved in the development of programmes and projects related to watersheds and will continue to monitor the state of critical areas in Watershed Management Units. Disaster risk management and climate change considerations must also be considered.

The NRCA should establish a Watersheds Protection Committee taking into consideration the status of the WMUs across the island. The Committee will be a decision-making body at the national level, coordinating activities and providing advice through the relevant Ministries to Cabinet. The Committee will consist of representatives from the Ministry with responsibility for the environment, Ministry of Finance and the Public Service, National Environment and Planning Agency, Forestry Department, Rural Agricultural Development Authority, Water Resources Authority, National Water Commission, Planning Institute of Jamaica, Scientific Research Council, Social Development Commission, civil society, community-based organisations and NGOs. The Ministry responsible for the environment will, in consultation with NEPA and the NRCA, review the legal provisions to identify gaps in coverage of watershed conservation as well as areas of duplication and address the legal and institutional arrangements to be put in place. NRCA and NEPA should evaluate the staff required to implement the Policy and make adequate arrangements for watershed management, in collaboration with watershed resources management agencies. This evaluation should be conducted within the first five years of the Policy.

The budget will be cast based on the programme of activities to be implemented in accordance with the GOJ's medium-term approach to budgeting.

At the local level, there are to be established Watersheds Protection Sub-Committees in each Watershed Management Unit. They will provide support to the Watersheds Protection Committee. These Sub-Committees will be empowered through various projects to address environmental concerns in their area. They will help to coordinate activities at the parish level. Individual Terms of Reference will guide the committees.

5.1 Policy Implementation Plan

The steps to actualise the Policy objectives are outlined in Table 2.

Table 2: Strategic Activities Required to Attain the Policy Objectives

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
1. Rationalization of legislative and institutional frameworks for watershed and water resources management	1.1. Review and streamline the provisions of the NRCA Act, WPA Act, RADA Act, WRA Act and Forest Act	1.1.1. Preparation of technical paper and drafting instructions for the amendment to the requisite legislation (WPA, etc.) 1.1.2. The review of the legislative provisions relating to point source pollution (e.g., livestock facilities, and solid waste collection), as well as non-point source pollution, in the context of watershed protection	Revised Watersheds Protection Act	Year 1-5	NEPA, Ministry with responsibility for the environment and the Office of the Parliamentary Counsel (OPC) Support: WRA, RADA, Forestry Department	Legal Consultant ($5 million) and Staff time

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
	1.2. Prepare the boundary description and zoning plans for the 26 Watershed Management Units for inclusion in the WPA	1.2.1 Reconnaissance of WMU boundaries; prepare maps and written descriptions; and conduct rapid ecological assessments	Gazetted boundary descriptions with zoning plans Technical paper with findings and recommendations	Year 1–5	NEPA, Forestry Department and WRA	Staff time and support from development agencies/ partners
2. Updating the national watersheds management programme and provision of adequate human and technical resources for the implementation of the programme	2.1. The Watershed Area Management Mechanism will be established as a code of practice for watershed management	2.1.1. Consultation with the relevant agencies such as NEPA and WRA to develop a code of practice for watershed management	Code of practice for watershed management developed	Year 2–5	NEPA/NRCA, WRA and Ministries with responsibility for the environment and water	Consultancy ($5 million)

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
	2.2. A national programme will be developed and implemented to facilitate training in watershed management including soil conservation, soil fertility, hydrology, agricultural engineering, forest management, land husbandry and Geographic Information Systems	2.2.1. Consultations with the relevant agencies, training institutions and the Ministries responsible for education and the environment on the gaps and the best practices to inform the development of the national programme	National programme implemented	Year 2–5	NEPA/NRCA, WRA and Ministries with responsibility for the environment, water and education	Consultancy ($5 million)
3. Provision of adequate and sustainable financing for watershed management activities	3.1. Implementation of a Payment for Ecosystems Services scheme	3.1.1. Pilot and implement the Payments for Ecosystems Service (PES) scheme 3.1.2. Develop and recommend an incentive scheme for private sector participation in watershed management	Cabinet approval received for the pilot and implementation of the PES scheme	Year 2–4	Ministries with responsibility for the environment, water and finance	Staff time

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
	3.2. Rehabilitation and management needs in Watershed Management Units will be identified	3.2.1. Establishment of the Watersheds Protection Committee and Watersheds Protection Sub-Committees with a constitution having consideration for youth and gender balances	Watersheds Protection Committee and 13 Watersheds Protection Sub-Committees[8] established and functional	Year 1–5	NEPA/NRCA	Administrative costs to support the functioning of the Committee and Sub-Committees
	3.3. Funding options will be explored and implemented	3.3.1. Solicit commitment from Government to provide financial support for watershed management	Budgetary support from the Ministry of Finance & the Public Service (MOFPS); Submission of proposals to the GEF, Green Climate Fund and Adaptation Fund	Year 1-5	MOFPS, NEPA and PIOJ	Staff time

[8] Each parish will have a sub-committee except for Kingston and St. Andrew where only one sub-committee will be assigned.

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
4. Increased availability of appropriate information and data for effective watershed management	4.1. Enhance the use of information technology	4.1.1. Implementation of the Integrated Watershed Management GIS-DSS 4.1.2. Revision of the watershed management unit classification system that was developed in 1999 4.1.3. Use of drone technology in the monitoring of watershed health indicators	GIS-DSS established, populated and current WMU classification system revised Establishment of a Watershed Improvement Tracking System	Year 1-5	NEPA	$16 million
	4.2. Increase capacity to conduct research and exchange information	4.2.1. Determination of research needs by the Watersheds Protection Committee	Research agenda prepared and implemented	Year 2–5	NEPA, WRA, Forestry Department, RADA and academia	$6 million

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
5. Increased public education and awareness initiatives geared towards positive changes in attitudes to watershed conservation and promotion of public participation in the planning of watershed management interventions	5.1. Preparation of a public awareness and education programme on watersheds	5.1.1. Strategies and material for public awareness and education developed and implemented 5.1.2. Create a public education programme on the importance of watershed protection to be used in schools in Jamaica	Communication plan on watershed management approved	Year 2–5	NEPA/NRCA Support: Watersheds Protection Committee	$30-75 million ($15 million annually)
	5.2. Implementation of the WAMM	5.2.1. Implementation of WAMM components 1 - engagement of the community, 9 - capturing lessons learnt and 10 - broadcasting the experience	Community members are engaged, and lessons learnt are broadcasted	Year 1–5	NEPA, SDC, RADA and Forestry Department	$35 million annually
6. Support initiatives to encourage appropriate land use and sustainable land management	6.1. Integration of SLM practices through programmes involving government entities and the private sector	6.1.1. Determination of existing sustainable land management practices 6.1.2. Integrated management of watershed will pay specific focus on	Report on existing sustainable land use management practices prepared Report submitted to Watersheds Protection	Year 1–5	NEPA Support: MoAF/RADA	Staff time, Consultancy ($ 10 million)

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
		changing landscapes that may impact drainage within the watershed and result in flooding and soil erosion	Committee and NRCA The changing landscape that may impact drainage within the watershed that results in flooding and soil erosion documented			
	6.2. Commissioner of Lands will address the issues relating to land tenure and access to Crown lands	6.2.1. Support the Systematic Land Registration Programme	Programmes maintained to support access and tenure	Year 1–5	NLA	Staff time
	6.3. NEPA will update existing development orders to include core areas for watershed protection	6.3.1. Assessments undertaken to determine core areas for watershed protection	Map description and justification of core areas for watershed protection submitted to Local Area Planning Branch of NEPA	Year 2–5	NEPA	GOJ allocation $30 million

Policy Objective	Strategy	Key Activities	Indicators	Timeline	Responsible Agency	Indicative Cost ($J)
	6.4. NEPA will recommend to the municipal corporation the inclusion of watershed protection strategies in parish development plans	6.4.1. Develop strategies for parishes 6.4.2. NEPA makes recommendations to the Ministry responsible for local government to include watershed protection strategies in parish development plans	Two strategies developed biennially and submitted to the respective municipal corporations	Year 2	NEPA	Staff time
	6.5. The NRCA/ TCPA and the municipal corporations will take into consideration areas within the watershed to be protected through designation as Tree Preservation Orders under the TCPA Act	6.5.1. Recommendations prepared on the designation of Tree Preservation Order at the parish level	Recommended areas declared in a timely manner	Year 3–5	NEPA and relevant municipal corporations	Staff time

5.2 Institutional Arrangement

The institutional framework for the implementation of the Policy is highlighted in Figure 5.

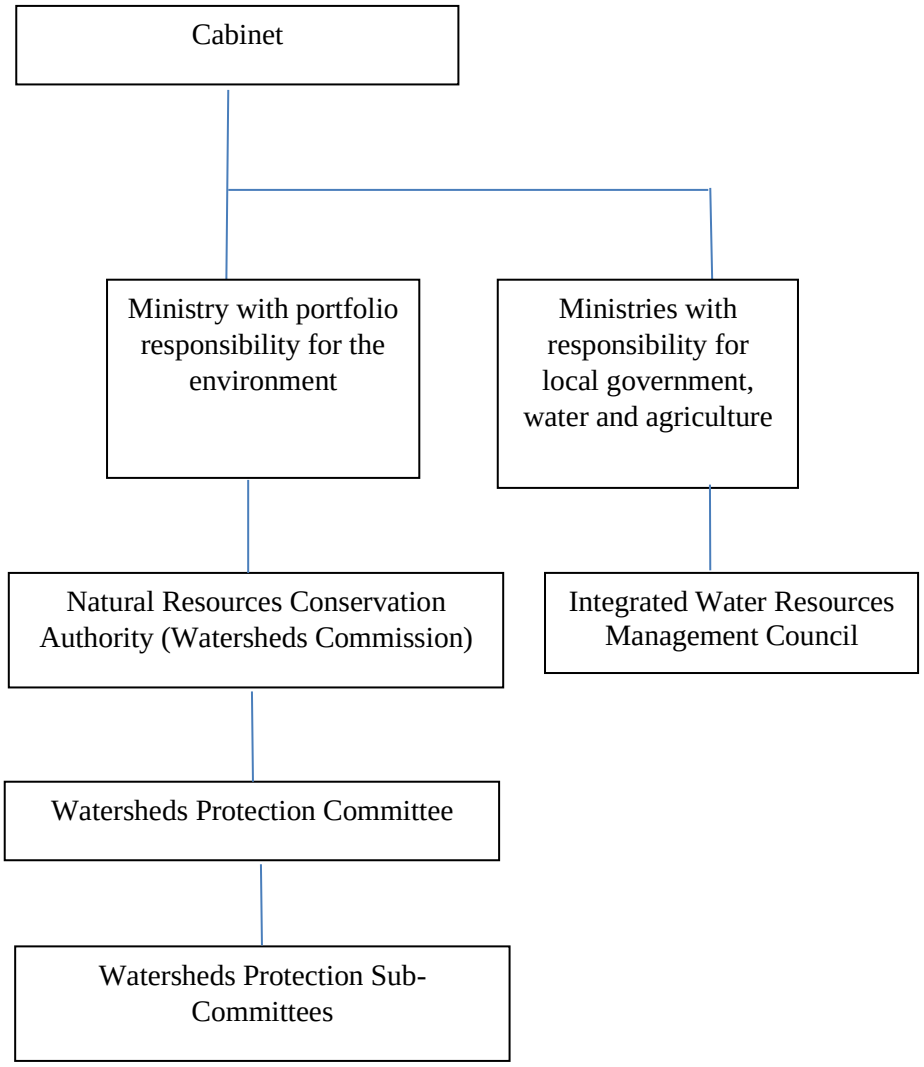

Figure 5: **Institutional arrangement for watershed management**

6. MONITORING AND EVALUATION

The monitoring and evaluation of this policy will be carried out by the Ministry with responsibility for the environment biannually. The reports will be submitted to the secretariat of the Medium Term Socio-Economic Policy Framework of Vision 2030 Jamaica. NEPA will also monitor progress towards the targets of the Sustainable Development Goals relating to watershed management. The report will be submitted annually to the Minister with responsibility for the environment.

Reports on the State of the Environment will continue to include information on the state of the Watershed Management Units. NEPA annual reports submitted to the Ministry should include a chapter on the state of watersheds and the implementation of the Policy.

Relevant government ministries, departments and agencies (MDAs) will report on commitments to biodiversity-related agreements with regards to watershed management to the Watersheds Protection Committee and the NRCA.

The GIS-DSS, developed under the Inter-American Development Bank/Global Environment Facility Yallahs and Hope Watershed Area Project functions to monitor and assess watersheds, and to inform decisions on proposed activities in the watersheds. It is expected to be the primary management tool used to monitor and evaluate the implementation of this policy. Component 6 of the WAMM covers the monitoring, mitigation and evaluation of the status and trends of social and natural resources within watersheds. Data collected through the implementation of the WAMM would complement the population and use of the GIS-DSS. The proposed framework for monitoring and evaluation is summarized in Table 3 and detailed in Appendix VIII.

Table 3: Monitoring and Evaluation Framework

Expected Result	Proposed Indicators	Targets	Means of verification	Methods of Data Collection	Key Assumptions
Objective 1: Rationalization of legislative and institutional frameworks for watershed and water resources management					
Outcome 1.1: Legislative and institutional frameworks for watershed management strengthened **Output 1.1.1:** Amended Watersheds Protection Act **Output 1.1.2:** WMUs with appropriate management mechanisms in place	• Revised Watersheds Protection Act	WPA amended by year 5	Amended WPA, Technical Reports	Observation/ secondary data	GOJ is committed to the amendment of the Watersheds Protection Act
	• # of WMUs with management and zoning plans in place.	6 WMUs by year 5	Management Plans, Zoning Plans	Observation/ secondary data	Watersheds Protection Act amended to include legislation for zoning plans
	• # of MOUs	TBD	MOUs, Technical Reports	Observation/ secondary data	Broad-scale willingness to partner towards watershed management exists
	• # of boundary descriptions gazetted	TBD	TOR, Minutes, Annual Reports	Observation/ primary data/ secondary data	
Objective 2: Updating the national watersheds management programme and provision of adequate human and technical resources for the implementation of the programme					
Outcome 2.1: National watersheds management programme updated and adequate resources for implementation provided	• Code of practice established	Code of practice developed by year 5	Reports	Observation/ primary data/ secondary data	GOJ has adequate fiscal space and will to provide funding for watershed management

Expected Result	Proposed Indicators	Targets	Means of verification	Methods of Data Collection	Key Assumptions
Output 2.1.1: Established code of practice for watershed management **Output 2.1.2:** National programme will be developed and implemented	• National programme will be developed and implemented	Programme developed and implemented by year 5	Reports	Observation/ primary data/ secondary data	GOJ has adequate fiscal space and will to provide funding for watershed management
Objective 3: Provision of adequate and sustainable financing for watershed management activities					
Outcome 3.1: Improved budgetary support for watershed management **Output 3.1.1:** Implement incentive scheme for watershed management **Output 3.1.2:** Dedicated/ recurrent budget item for watershed management **Output 3.1.3:** WMUs with detailed finance requirements	• Position Paper for PES Scheme/ water fund	Position paper submitted by year 2	Technical reports	Observation/ secondary data	
	• Incentive scheme for watershed management	Scheme designed and piloted by year 5	Technical reports	Observation/ secondary data	GOJ legislation allows for the implementation of an incentive scheme for watershed management. Private sector willingness to participate.
	• # of management activities financed	70 per cent of management activities financed by year 3	Budget Reports	Observation/ secondary data	GOJ has adequate fiscal space and will to provide funding for watershed management

Expected Result	Proposed Indicators	Targets	Means of verification	Methods of Data Collection	Key Assumptions
	• # of Sub-Committees established • # of WMUs with detailed finance plans/ budgets	13 Watersheds Protection Sub-Committees established by year 5	Finance plans, Reports	Observation/ secondary data	GOJ has adequate fiscal space and will to provide funding for watershed management
Objective 4: Increased availability of appropriate information and data for effective watershed management					
Outcome 4.1: Data requirements for watershed management are met	• # of WMUs with adequate data coverage	TBD	Data, Technical Reports	Observation/ secondary data	Adequacy threshold for data is determined by data mapping activity
Output 4.1.1: Implementation of the Watershed Information Database **Output 4.1.2:** Implementation of the Integrated Watershed Management Geographic Information System-Based Decision Support System	• # of WMUs with data populated on Watershed Information Database	Watershed Information Database with data on 13 WMUs by year 5	Database Report	Observation/ secondary data	Data gaps are identified and incorporated into project designs and operational plans of partner agencies
	• # of MDAs contributing to the GIS DSS	MOUs signed by year 2	MOUs, Data Sharing Protocols, Technical Reports	Observation/ primary data/ secondary data	Contributions to include inter alia hosting costs and data provision

Expected Result	Proposed Indicators	Targets	Means of verification	Methods of Data Collection	Key Assumptions
Output 4.1.3: Develop and implement a drone technology programme to assist in watershed management **Output 4.1.4:** Improved technical capacity for watershed management **Output 4.1.5:** Watershed Management Core Training program Developed	• Establishment of a Watershed Improvement Tracking System	Watershed Improvement Tracking System Developed by year 5	Tracking System, Reports	Observation/ secondary data	Watershed information database developed has sufficient information with which to build out a tracking mechanism
	• # of data acquisition flights	TBD	Technical Reports	Observation/ secondary data	Drone and associated software procured. Stakeholder capacities are enhanced through training
	• # of stakeholders, with direct responsibility for watershed management, trained	50% of stakeholders attending at least two capacity training events by year 5	Training Reports	Observation/ secondary data	Capacity to conduct required training is accessible at the local or regional levels
Objective 5: Increased public education and awareness initiatives geared towards positive changes in attitudes to watershed conservation and promotion of public participation in the planning of watershed management interventions					

Expected Result	Proposed Indicators	Targets	Means of verification	Methods of Data Collection	Key Assumptions
Outcome 5.1: Increased awareness of watershed management requirements **Output 5.1.1:** Knowledge, Attitudes, Practices and Behaviour Assessment **Output 5.1.2:** Public education and awareness programmes developed to address the importance of watershed protection and management **Output 5.1.3:** Increased participation in watershed management **Output 5.1.4:** Implementation of the WAMM	• Percentage of population with improved awareness of the need for watershed management • Percentage of population participating in watershed management	10 percent improvement over baseline by year 5	Knowledge, Attitudes, Practices and Beliefs (KAPB) Reports	Observation/ Primary data/ Secondary data	Baseline calculated as an average between the findings under IWECO and Yallahs Hope Projects
Objective 6: Support initiatives to encourage appropriate land use and sustainable land management					
Outcome 6.1: Improved Condition of WMUs	• # of WMUs with improved condition	3 WMUs with improved condition by year 5	Technical reports	Observation/ Primary Data/ Secondary Data	Baseline as per NEPA (2010)

Expected Result	Proposed Indicators	Targets	Means of verification	Methods of Data Collection	Key Assumptions
Output 6.1.1: Development Orders including core areas for watershed protection **Output 6.1.2:** Declaration of Tree Preservation Orders **Output 6.1.3:** SLM practices implemented in collaboration between government entities and private sector organisations **Output 6.1.4:** Reforestation of degraded areas	• # of Development Orders with core watershed areas delineated	TBD	Development Orders	Observation/ Secondary Data	Updates made to emerging development orders
	• # of hectares under SLM	TBD	Technical reports	Observation/ Secondary Data	Areas for intervention are assessed to establish baseline condition prior to implementation of programmes.
	• # of hectares reforested	TBD	Technical reports	Observation/ Secondary Data	Areas for intervention are assessed to establish baseline condition prior to implementation of programmes.

7. RISK MATRIX

The potential risks associated with the implementation of the Policy — though not exhaustive — are highlighted in Table 4.

Table 4: Potential Risks Associated with the Development and Implementation of the Policy

Risks	Impact	Probability	Risk Score	Risk Response
The Policy is not developed in a timely manner	There are challenges in watershed management with a history of not developing the relevant legislation and policy for this mandate.	Medium	Medium	The policy development and implementation responsibilities will be inclusive, overarching and comprehensive. This will enhance the Policy's attainment of the SMART goals.[9]
Efficient and effective multi-agency execution	Unavailability of technical staff due to competing assignments. Delays in getting input/approval at the management level. Problems in the sequencing of joint activities.	Medium	Medium	Enhanced monitoring through regular meetings of the respective technical working groups and steering committee. Plus, the timely execution of evaluation exercises.
Inadequate financing for the implementation of the Policy	Policy implementation may not be adequate and effective management of the watersheds may be negatively impacted	High	High	Identify additional funds to support policy implementation

[9] Specific, Measurable, Achievable, Realistic, and Timely

8. GLOSSARY

Aquifer: "any geological formation containing or conducting groundwater, especially one that supplies the water for wells, springs etc." (Queensland Curtis Limited, 2009).

Catchment area: "the area of land draining into a stream or a watercourse at a given location" (Hydrology, n.d.); also called drainage area or drainage basin or watershed.

Drainage basin: "an area of land drained by a river and its tributaries" (Rutledge, et al., 2011). It includes water found in the water table and surface run-off. There is an imaginary line separating the drainage basin called a watershed. Usually, this is a ridge of highland.

Drainage divide: watershed or water parting is the line that separates neighbouring drainage basins. "Ridges and hills that separate two watersheds are called the drainage divide" ((United States Geographical Survey, n.d.).

Ecosystem: "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit" (Convention on Biological Diversity Secretariat, 2010).

Ecosystem approach: "A strategy for the integrated management of land, water, and living resources that promotes their conservation and sustainable use in an equitable way. It is based on the application of appropriate scientific methodologies focused on levels of biological organisation, encompassing the essential structures, processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems" (Convention on Biological Diversity Secretariat, 2010).

Ecosystem Services: "Include provisioning services such as food, water and energy; regulating services such as flood, air purification and disease control; cultural services such as spiritual, recreational; education, scientific and cultural benefits, and supporting services such as nutrient cycling and soil generation" (Forestry Department, 2017).

Gender: "The social attributes and opportunities associated with being male and female and the relationships between women and men and girls and boys, as well as the relations between women and those between men" (United Nations, n.d.).

Gender equality: "The equal rights, responsibilities and opportunities of women and men and girls and boys" (United Nations, n.d.).

Hydrological basin: "A geographical area drained by a particular surface water and/or groundwater system. The basin boundaries are demarcated so that there is generally no flow from one basin to another" (MASHAV; UNDP, 1990).

Integrated Water Resources Management: "the coordinated development and management of water, land and related resources to maximize economic and social welfare without compromising the sustainability of ecosystems and the environment" (Global Water Partnership, 2014).

Integrated Watershed Management Programme: The purpose is to identify priority land and water-related issues in the watershed, determine projects or policies targeted to address the issues, and identify how land and water management programming will be cooperatively carried out throughout the watershed.

Land Authorities: Established in the 1950s, under the Land Authorities Act to rehabilitate land, check soil erosion and improve farming.

Payments for Ecosystems Services: "PES is used to describe schemes in which the beneficiaries, or users, of ecosystem services provide payment to the stewards, or providers, of ecosystem services. In practice, PES often involves a series of payments to land or other natural resource managers in return for a guaranteed flow of ecosystem services (or, more commonly, for management actions likely to enhance their provision) over and above what would otherwise be provided in the absence of payment" (UK Department for Environment, 2013).

Ridge to Reef Approach: A holistic method that considers the interconnectivity between coastal and marine areas ('reef') and their uplands ('ridge').

Slow onset events: This refers to the risks and impacts associated with increasing temperatures; desertification; loss of biodiversity; land and forest degradation; glacial retreat and related impacts; ocean acidification; sea level rise; and salinization (United Nations Framework Convention on Climate Change, n.d.).

Sub-Hydrological basin: "A discrete subunit of a larger hydrological basin, the water resources of which can be assessed, developed and managed in a near independent manner from the rest of the basin. Discharge can take place from one sub-hydrological basin to another within the same hydrological basin, via a surface channel or groundwater flow path" (MASHAV; UNDP, 1990).

Urban watershed: Watershed area in a town or city.

Water Resources: (a) water which is contained in (i) any spring, river, stream or other watercourses, whether natural or artificial, including any estuary thereof; and (ii) any lake or pond, whether natural or artificial, sustained by underground water or by a spring, river, or stream; (b) underground water (Water Resources Authority Act, 1991).

Watershed: "Area having a common outlet for its surface runoff" (World Meteorological Organization & United Nations Educational, Scientific and Cultural Organization 2012).

Watershed Management: This is resource management with the watershed as the basic organizing unit and consists of applying known skills to land use to minimize or repair degradation and safeguard the use of the land beyond its present use. It is the process of organizing and guiding

the use of land, water, and other natural resources in a watershed to provide the appropriate goods and services while mitigating the impact on the soil and watershed resources. It involves socio-economic, human-institutional, and biophysical inter-relationships among soil, water, and land use and the connection between upland and downstream areas (Wang, Mang, Cai, & Innes, 2016).

Watershed Management Unit: A defined land area from the ridge of a mountain to the coast within which a group of sub-hydrological basins drain into a major water body.

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10. APPENDICES

Appendix I: Policies and Plans Relevant to Watershed Management

POLICY/PLAN	GOAL/PRINCIPLE	STATUS
National Integrated Watershed Management Programme Framework, 2000	To promote the integrated protection, conservation and development of land and water resources in the watersheds, for their sustainable use, and for the benefit of the nation.	The National Integrated Watershed Management Council is not functional. A progress report on the NIWMP for the period 2001-2006 was prepared by NEPA. The Programmatic Framework may need to be reviewed and updated in light of changes—institutional, policy and legislative—and new developments in watershed management.
National Water Sector Policy and Implementation Plan, 2019	To ensure that Jamaica's water resources are effectively managed so as to provide for our nation's social, economic, and environmental well-being, now and in the future.	The policy was updated in 2019. One of the guiding principles of the policy is Integrated Water Resources Management.
National Biodiversity Strategy and Action Plan (NBSAP), 2016	Goal 1 — Conserve biodiversity An integrated management approach will be required to conserve Jamaica's biodiversity	This plan updated the 1998 NBSAP.
Protected Areas System Master Plan – 2013-2017	• Protect habitats, ecosystems, species and genetic resources and cultural and natural heritage - Restore and protect watersheds, rivers, wetlands, coral reefs and other important ecosystems.	The Protected Areas Committee was appointed. Review of plan to be carried out.
National Forest Management and Conservation Plan 2016-2026	Sustainably manage and utilise Jamaica's forest resources to enhance social and economic development and contribute to building the country's climate resilience.	Cabinet approved the National Forest Management and Conservation Plan 2016-2026 and its tabling in the Houses of Parliament in 2018. The development of watershed restoration plans, a joint activity being done by the Forestry Department and NEPA, is one of the main activities in the plan that seeks

POLICY/PLAN	GOAL/PRINCIPLE	STATUS
		to support water management and the wide range of products and ecosystem services including the prevention of soil erosion and landslides that forests provide.
Policy for the National System of Protected Areas System, 1997	• Expand and diversify Jamaica's natural resource-based economy • Protect the supply and quality of basic natural resources that support most economic activities including water, air and the productive land base	An Overarching Policy for the Protected Areas System has been drafted to update the 1997 Policy and provide an enabling framework for the coordinated management of protected areas.
Watershed Policy 2003 draft	The overall goal of the policy is to promote the integrated management, protection, conservation and development of land and water resources in watersheds for their sustainable use and for the benefit of the nation as a whole	The draft policy updated in 2015.
Forest Policy for Jamaica, 2016	Vision - By 2062, Jamaica's forests and its biodiversity are sufficiently restored and sustainably managed, so once again the island can adequately be described as "the land of wood and water", capable of meeting the social, economic and ecological needs of current and future generations."	The policy replaced the Forest Policy 1996.
Climate Change Policy Framework, 2015	To create a sustainable institutional mechanism to facilitate the development, coordination and implementation of policies, sectoral plans, programmes, strategies, and legislation to mitigate as well as adapt to climate change.	Institutional arrangements being addressed, with the Climate Change Division and the Climate Change Focal Point Network and incorporation of climate considerations in sector policies and plans.

POLICY/PLAN	GOAL/PRINCIPLE	STATUS
Agricultural Land Use Policy, 2015 (draft)	The policy addresses subdivision of prime agricultural lands for non-farm uses, and the denudation of land in the upper watersheds due to improper farming methods.	The draft is being reviewed.
National Ocean and Coastal Zone Management Policy (NOCZM), 2000	• Promotion of Sustainable Development • Conservation of Ocean and Coastal Resources and Ecosystems • Baseline Data Collection and Research • Utilizing the Role of Science and Traditional Ecological Knowledge for Integrated Coastal Area Management • Providing the Conditions of Governance Required for Effective Integrated Coastal Area Management	The draft update of the NOCZM Policy – the draft Coastal Resources Policy, prepared in 2015 – is being reviewed.
Food and Nutrition Security Policy, 2013	Addresses water and forest and fishery resources, recognizing that forests, watersheds, wetlands and marine resources constitute a substantive resource for food and nutrition security to be safeguarded, through the establishment of protected areas	This policy was approved by Cabinet on May 1, 2013.
The National Minerals Policy, 2017-2030	Goal 3 - To improve occupational health and safety, community relations and environmental stewardship throughout the sector	This policy was approved by Cabinet as a White Paper in July 2019 and tabled in the Houses of Parliament in March 2020. The policy is currently being implemented.
The National Squatter Management Policy and Implementation Plan (draft)	Goal D - Sustainable use of land resources by curtailment of squatting and the restoration of degraded lands to facilitate the restoration of Watershed Management Units adversely impacted by squatting	The draft policy is being reviewed.

Appendix II: Approaches to the Management of Land and Water Resources

1. **Ecosystems Approach**
   A strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way. It recognizes that humans with their cultural diversity are an integral component of many ecosystems. The ecosystem approach views watershed management as the management of a complex ecosystem and regards all its components — air, land, water, fish, wildlife and humans —as interrelated.

2. **Integrated Coastal Area Management (also known as Integrated Coastal Zone Management (ICZM) or Integrated Coastal Management (ICM)**
   A process in which coordinated strategies are developed and implemented for the protection of coastal areas and resources, to achieve the conservation and sustainable use of these resources.

3. **Integrated Water Resources Management (IWRM)**
   The coordinated development and management of water, land and related resources in order to maximize economic and social welfare without compromising the sustainability of ecosystems and the environment.

4. **Integrated Watershed management**
   Integrated planning for land and water which takes into account both ground and surface water flow, recognizing and planning for the interaction of water, plants, animals, and human land use found within the physical boundaries of a watershed" (Red Deer River Watershed Alliance, 2015).

5. **Ridge-to-reef approach**
   Integrated coastal zone management (ICZM) and watershed protection.

6. **Sustainable Land Management**
   The management of land without damaging the ecological processes or reducing biological diversity. It requires land use practices that ensure that land, water and vegetation adequately support land-based production systems for current and future generations (Food and Agricultural Organisation, n.d.).

7. **Watershed Management**
   Watershed management is any human action aimed at ensuring the sustainable use of watershed resources. Unlike sectoral development approaches, watershed management involves examining the interactions among various natural processes and land uses and managing land, water and the wider ecosystem of the watershed in an integrated way.

8. Water Resources Management (WRM)

The process of planning, developing, and managing water resources, in terms of both water quantity and quality, across all water uses. WRM includes the institutions, infrastructure, incentives, and information systems that support and guide water management. WRM seeks to ensure that there is sufficient water of adequate quality for drinking water and sanitation services, food production, energy generation, inland water transport, and water-based recreation, as well as sustaining healthy water-dependent ecosystems. Water resource management also entails managing water-related risks, including floods, drought, and contamination (The World Bank, 2017).

Appendix III: Declared Watershed Areas

The following Watershed Areas have been declared under Orders issued by the Minister pursuant to section 5 of the WPA (1964). The approximate area in hectares is also represented**.**

Watershed Area	Approximate Size (hectares)
Great River	40,549.50
Montego River	23,876.45
Martha Brae	65,559.07
Rio Nuevo	11,735.88
Oracabessa	14,609.15
Wag Water	25,090.51
Buff Bay River	45,324.79
Rio Grande	26,709.25
Plantain Garden	18,615.54
Morant River	19,020.23
White River	4,856.23
Yallahs Valley	17,806.17
Hope River	7,689.03
Rio Cobre	6,394.03
Rio Minho	174,014.83
Black River	153,052.11
Cabarita River	62,726.27
New Savannah River	7,041.53
Liguanea	11,735.88
Salt Island Creek	26,304.57
Coleburns Gully	17,927.57
Fresh River	9,024.49
Bull Savannah	26,709.25
Northwest Coast	40,063.88
Reading	4,937.16
St. Ann	126,100.05
Moneague	39,740.13
Water Valley	6,879.66
Fosters Cave	2,428.11
Northeast Coast	27,235.34
Port Morant	10,521.83
Yallahs Town	3,237.49
Cane River	7,365.28

Appendix IV: Watershed Management Units and Hydrologic Basins

Hydrological Basin	Watershed Management Unit	Parish(es)	Approximate Size (Km^2)
Great River	Great River	St. James, Hanover and Westmoreland	435.21
	Montego River	St. James and Trelawny	205.66
	Lucea River	Hanover	2,674
Blue Mountain North	Rio Nuevo	St. Mary	109.46
	Oracabessa/Pagee River	St. Mary	168.79
	Wagwater River	St. Mary, St. Andrew and St. Catherine	318.65
	Pencar/Buff Bay River	St. Mary and Portland	203.21
	Rio Grande	Portland and St. Thomas	280.99
	Drivers River	Portland and St. Thomas	237.21
	Swift River	Portland	107.63
	Spanish River	Portland	109.71
Blue Mountain South	Plantain Garden River	Portland and St. Thomas	180.04
	Morant River	St. Thomas	385.26
	Yallahs River	St. Thomas and St. Andrew	188.73
Cabarita River	Cabarita River	Westmoreland and Hanover	169.62
	New Savannah River	Westmoreland and Hanover	54.13
	South Negril/Orange River	Westmoreland and Hanover	159.87
	Deans Valley River	Westmoreland and St. Elizabeth	426.77
Rio Minho	Guts River/Alligator Hole	Manchester, St. Elizabeth and Clarendon	165.27
	Milk River	Clarendon and Manchester	855.57
	Rio Minho	Clarendon and St. Catherine	799.32
Martha Brae River	Martha Brae	Trelawny, St. Elizabeth and St. James	734.85
Dry Harbour Mountain	Rio Bueno/White River	St. Ann, Manchester, Trelawny, St. Catherine and Clarendon	1567.95
Kingston	Hope River	St. Andrew and St. Thomas	252.54
Rio Cobre	Rio Cobre	St. Catherine, St. Andrew, Clarendon, and St. Ann	1260.54
Black River	Black River	St. Elizabeth, Westmoreland, Manchester, St. James, Trelawny and Westmoreland	1316.09

Source: NEPA, 2021

Appendix V: Global and Regional Commitments Relevant to the Management of Watersheds

Treaty/Status of Accession/Plans	Provisions relevant to Watershed management
Convention on Biological Diversity, 1992 **Date of Accession:** 5 April 1995 **Action Plans:** • National Strategy and Action Plan on Biological Diversity for Jamaica, 2016-2021 • National Strategy and Action Plan on Biological Diversity for Jamaica, 2003 • Protected Areas System Master Plan, 2013-2017	**Objectives: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.** National Biodiversity Strategies and Action Plans (NBSAPS) are the main instruments for implementing the Convention. Among the Programmes of Work developed under the Convention is the Programme on Protected Areas. Parties to the Convention adopted an updated Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, for the 2011-2020 period. Of relevance to water resources is: ***Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services*** ***Target 14:*** By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable. Preparation for the post-2020 Biodiversity Framework started in 2017.
UN Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994 **Date of Accession:** 12 November 1997 **Action Plan:** National Action Plan, 2002	**Objective: "To combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification..."** The Convention focuses on improving land productivity, rehabilitation of land, conservation and sustainable management of land and water resources. Such action should also prevent the long-term consequences of desertification, including mass migration, species loss, climate change and the need for emergency assistance to populations in crisis." National action programmes are required to identify the causes of desertification and practical measures necessary to combat it and mitigate the effects of drought.

Treaty/Status of Accession/Plans	Provisions relevant to Watershed management
	The 2018-2030 Strategic Framework will contribute to (i) achieving the objectives of the Convention and the 2030 Agenda for Sustainable Development; (ii) improving the living conditions of affected populations; and (iii) enhance ecosystems services. In keeping with a global commitment to strive to achieve a land-degradation neutral (LDN) world in the context of sustainable development, the UNCCD has developed a programme on LDN. The UNCCD defines land degradation neutrality (LDN) as "a state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems" (United Nations Convention to Combat Desertification, 2017). Jamaica has been participating in the Land Degradation Neutrality Target Setting Programme aimed at supporting countries in establishing national voluntary targets for LDN and identifying transformative projects to achieve these targets.
Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971 (Ramsar Convention) **Date of Accession:** 7 October 1997 **National Report:** National Report on the Implementation of the Ramsar Convention on Wetlands, 2015	**The mission of the Ramsar Convention is the conservation and wise use of all wetlands, as a contribution towards achieving sustainable development throughout the world**. Wetlands are defined as: "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres" (RAMSAR, 1994). Wise use of wetlands means: "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development" (The RAMSAR Convention Secretariat, 2014). Jamaica has designated four wetlands of international importance covering 37,847 hectares (Black River Lower Morass, St. Elizabeth; Portland Bight Wetlands and Cays,

Treaty/Status of Accession/Plans	Provisions relevant to Watershed management
	Clarendon; Mason River Protected Area, Clarendon; Palisadoes/Port Royal, Kingston).
Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region (2000) to the Cartagena Convention for the Protection and Development of the Marine Environment **Date of simple signature**: 18 January 1990 Jamaica is a signatory, not yet a Party, to the Protocol.	**Obligations: Each Party shall take the necessary measures to protect, preserve and manage in a sustainable way (a) areas that require protection to safeguard their special value; and (b) threatened or endangered species of flora and fauna**. Among the measures is the regulation or prohibition of any activity involving modification of the profile of the soil that could affect watersheds, denudation and other forms of degradation of watersheds, or the exploration or exploitation of the subsoil of the land part of a marine protected area (UNEP–Caribbean Environment Programme, 1990).
Protocol Concerning Pollution from Land-based Sources and Activities to the Cartagena Convention for Protection and Development of the Marine Environment **Date of Accession to the Protocol**: 5 November 2015	**Objective: Protection of the marine environment of the Caribbean Sea from land-based point and non-point sources of marine pollution** by outlining the types of control and management responses required for addressing land-based issues such as regional effluent limitations for domestic wastewater (sewage) and requiring specific plans to address agricultural non-point sources of pollution. Jamaica's priority areas of action were identified as: • Sewage treatment and disposal • Agricultural practices (soil conservation, pesticides and fertilizer usage) • Collection and disposal of solid waste The 2017–2018 Work Programme of the Caribbean Environment Programme includes: • Further development of the Caribbean Platform for Nutrients Management; • Applying innovation to reduce nutrient pollution from wastewater and agricultural discharges in waterways, coastal and marine environments of the Caribbean Sea - Jamaica and Costa Rica;

Treaty/Status of Accession/Plans	Provisions relevant to Watershed management
	• Development of regional investment plans for pollution and nutrients reduction (UNDP/GEF CLME+); and • Development/implementation of an Ecosystem-Based Adaptation (EBA) sub-project for the Caribbean and North Brazil Shelf (UNDP/GEF CLME+).
The UN Environment Programme Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) Adopted in 1995	This Programme calls for the application of integrated approaches in coastal areas and river basins, such as the "ridge-to-reef concept" (United Nations Environment Programme/GPA, 2012). The **Convention on Biological Diversity** (CBD) adopted the ecosystem approach as its primary framework of action: "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way." (Convention on Biological Diversity Secretariat, 2010) The **Aichi biodiversity targets** include measures to safeguard both terrestrial and inland waters and coastal and marine areas. Further, the goal to achieve 'a land-degradation neutral world in the context of sustainable development' was approved in 2012. In 2015, commitments were also reached to address climate change and its impacts on ecosystems and livelihoods (United Nations Framework Convention on Climate Change [UNFCCC], 2015).
Two agreements of significance for small island developing states are: • **The United Nations Programme of Action for the Sustainable Development of Small Island Developing States** popularly referred to as the Barbados Program of Action (BPOA) held in June 1994 in response to UNCED and Agenda 21; and	"The BPOA highlights the special challenges and constraints that cause major set-backs to the socio-economic development of SIDS, some of which had already been addressed in Agenda 21, including small size and geographic isolation that prevent economies of scale. In addition, the BPOA underlines the excessive dependence of SIDS on international trade; high population density, which increases the pressure on already limited resources; overuse of resources and premature depletion; relatively small watersheds and threatened supplies of fresh water; costly public administration and infrastructure; and limited institutional capacities and domestic markets" (United Nations, n.d.).

Treaty/Status of Accession/Plans	Provisions relevant to Watershed management
• **The Small Island Developing States Accelerated Modalities of Action** (SAMOA) Pathway, which resulted from the Third International Conference on SIDS held in Samoa in September 2014.	The SAMOA Pathway recognises "that small island developing States face numerous challenges with respect to freshwater resources, including pollution, the overexploitation of surface, ground and coastal waters, saline intrusion, drought and water scarcity, soil erosion, water and wastewater treatment and the lack of access to sanitation and hygiene. Furthermore, changes in rainfall patterns related to climate change have regionally varying and potentially significant impacts on water supply" (United Nations, n.d.).

Appendix VI: Main Global Agreements Focused on Sustainable Development

UN Conferences on Sustainable Development and Reviews	Global Conferences on the Sustainable Development of Small Island Developing States
United Nations Conference on Environment and Development, Rio de Janeiro, June 1992 Outcome: o Agenda 21 o Rio Declaration on Environment and Development (proclaims 27 principles) The Rio Conventions: • UN Framework Convention on Climate Change • Convention on Biological Diversity • UN Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994 • New York Declaration on Forests, 2014	International Conference on the Sustainable Development of Small Island Developing States (SIDS), Barbados, 1994 Outcome: Programme of Action for the Sustainable Development of Small Island Developing States (BPOA) The BPOA set out 14 priority goals for SIDS.
World Summit on Sustainable Development, Johannesburg, June 2002 Outcome: Johannesburg Plan of Implementation Frameworks for Action: Water and Sanitation, Energy, Health, Agricultural Productivity, Biodiversity and Ecosystem Management (WEHAB)	International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States, Port Louis, Mauritius, January 2005 Outcome: Mauritius Strategy for the Further Implementation of the BPOA (MSI) (BPOA+10) The MSI set out actions and strategies in 19 priority areas, building on the original 14 thematic areas of the BPOA including health, knowledge management and culture, considering the requirements of the Millennium Development Goals.

UN Conferences on Sustainable Development and Reviews	Global Conferences on the Sustainable Development of Small Island Developing States
United Nations Conference on Sustainable Development (Rio+20), June 2012 Outcome: The Future We Want The Conference launched the development of the Sustainable Development Goals which would build on the Millennium Development Goals 2000-2015 and gave guidelines on green economy policies as well as institutional framework for sustainable development.	The Third International Conference on Small Island Developing States, Apia, Samoa, September 2014 Outcome: Small Island Developing States Accelerated Modalities of Action (SAMOA) Pathway—in which countries recognized the need to support and invest in these nations so they can achieve sustainable development.
United Nations Sustainable Development Summit, New York, September 2015 Outcome: o Transforming our world: the 2030 Agenda for Sustainable Development o Sustainable Development Goals The aims of the post-2015 development agenda include - Between 2016 and 2030, end poverty and hunger everywhere, protect human rights and promote gender equality, ensure the lasting protection of the planet and its natural resources.	

Appendix VII: Consolidated List of Watershed Management Projects (Direct and Indirect) 2006–2020

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
Biodiversity Restoration in Portland Bight Protected Area through Community Engagement	**GEF Small Grants programme**	CCAM	To protect communities, infrastructure, livelihoods and biodiversity in the Portland Ridge area through restoration and protection of the damaged, high biodiversity dry limestone forests in the area.	- Development of best techniques and approaches for forest restoration - Reduction of fire risks through the development and implementation of a fire management plan, provision of resources and awareness programme - Increase in public awareness and support for forest conservation and compliance with laws through outreach and interpretation in the community and at the exhibition at the Portland Bight Discovery Centre (PBDC).	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
Climate Change Adaptation and Risk Reduction Technology and Strategies to Improve Community Resilience (CARTS) Project	**GAC –** Administered by the CDB	Westmoreland Municipal Corporation	To improve community resilience, safety and preparedness in the context of disaster risks; and enhance public awareness of disaster risks and appropriate responses. It also seeks to improve the effectiveness of community-wide disaster planning committees and first responders and to improve community resilience to climate change impacts via improving ecosystem-based services while building the capacity of two communities to sustainably utilize local natural resources to generate earnings.	The project aims to improve knowledge of climate risks, disaster risk reduction and climate change adaptation of Savanna-la-Mar's population by 80 per cent; reduce the vulnerability of Savanna-la-Mar's population to flood hazards by 25 per cent; and enhance capacity to manage flood risk and reduce flood damage in the communities by 30 per cent.	Ongoing
Disaster Vulnerability Reduction Project	**World Bank**	Jamaica Social Investment Fund	To enhance Jamaica's resilience to disaster and climate risk, through improvement in the collection and generation of risk information, its analysis and use in monitoring systems and decision-making, retrofitting and/or construction of key	Component 1: Technical Assistance for Improved Disaster and Climate Resilience (US$3.815M); Component 2: Risk Reduction (US$23.61M); Component 3: Contingent Emergency Response; Component 4: Project Administration (US$2.5M)	Ongoing

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
			infrastructure assets, and strengthening institutional capacities for climate and disaster risk management.		
Enhancing the Legislative Framework in Jamaica while fostering community and private sectors' engagement to reduce plastic marine litter from land activities/Plastic Waste Minimization Project	**UNEP**	Ministry of Economic and Job Creation	To enhance the capacity and legislative framework of Jamaica to reduce and manage plastic marine litter from land-based activities in an integrated and environmentally sound manner and demonstrate the potential of plastic waste prevention and sound management while catalyzing action for the reduction of plastic marine litter generated by land-based activities.	- Completion of a Regulatory Impact Assessment and National Strategy and Action Plan for integrated waste management for Jamaica - Development of a national policy and strategy on plastics	Completed
Essex Valley Agricultural Development Project (UK-CIF)	**UK Department for International Development (DFID) –** Administered by CDB	NIC	To enhance production and productivity of farmers in Essex Valley in a socially inclusive gender equitable and climate sensitive manner.	Component 1: Improved Irrigation Systems; Component 2: Enhanced Agricultural Production, Marketing Facilities and Systems; Component 3: Energy Efficiency/Renewable Energy; Component 4: Technical	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
				Assistance; Component 5: Land; Component 6: Project Management, Financial Audits and Baseline Survey	
GOJ/ Adaptation Fund Programme	**Adaptation Fund** (which was established under the Kyoto Protocol of the UN Framework Convention on Climate Change)	PIOJ	The programme is aimed at protecting livelihoods, food security and safeguarding our natural resources, particularly in rural and coastal communities which are vulnerable to the adverse impacts of climate change. The GOJ/AFP involves support from the Ministry of Tourism and Entertainment in collaboration with the Office of Disaster Preparedness and Emergency Management (ODPEM), and the National Environment and Planning Agency (NEPA).	The Programme (i) strengthens coastal resilience (ii) improves land and water management for the agricultural sector and (iii) builds institutional and local capacity for climate change adaptation and disaster risk reduction.	Ongoing
Improved Forest Management for Jamaica	**European Union**	Forestry Department	The specific objectives of the programme are to: 1. Reverse forest degradation, deforestation and the loss of forest biodiversity, through conservation and sustainable	1.1 Strengthened governance, policy and legislative framework to ensure sustainable development of the forest sector. 1.2 Improved participatory	Ongoing

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
			forest management, as well as strengthening the legislative, policy and institutional framework of the sector. 2. Enhance economic, social and environmental benefits of forests through the sustainable utilization of forest resources.	planning to protect, conserve and manage Jamaica's forests. 2.1 Strengthened institutional capacity for improved availability of data and capacity for monitoring and knowledge management. 2.2 Improved availability of spatial data for sustainable forest management practices, promoting investments, and assessing vulnerabilities and risks in the forest sector. 2.3 Forest communities, the general public as well as targeted groups of professionals have increased knowledge/capacity.	
Integrated Management of the Yallahs-Hope Watershed Management Area	**GEF -** Administered by the IDB	NEPA	To improve the conservation and management of biodiversity and the provision of ecosystem services on the Yallahs and Hope River Management unites (WMUs).	Component 1: Institutional Strengthening and Capacity Building for Integrating Biodiversity into Watershed Management (US$1,453,497); Component 2: Creating Economic and Financial Incentives to Support Biodiversity	Ongoing

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
				(US$2,151,403); Component 3: Implementing Sustainability Livelihoods, Agriculture and Forestry in Watershed Communities (US$8,166,261).	
Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States (IWEco)	**GEF**	Ecosystem Division/Latin America and the Caribbean Office/CEP/CAR/RCU/UNEP/ UNDP	To contribute to the preservation of Caribbean ecosystems that are of sustainable financing for the implementation of environmentally sound and cost-effective wastewater management measures.	The project applies a "Ridge to Reef" approach integrating watershed and coastal areas management in small islands for addressing the multiple challenges of sustainable water, land (including forests) and biodiversity management and conservation within the spatial framework of the watershed unit. The project will support policy, institutional and legislative reforms, will contribute to the implementation of effective appropriate technologies to accelerate contribution to global targets on access to safe and reliable water supplies and improved sanitation, and will help to	Ongoing

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
				improve ecosystem functioning in the Caribbean.	
Pilot Programme for Climate Resilience (PPCR) - Adaptation Program and Financing Mechanism for the PPCR Jamaica	**Climate Investment Fund -** Administered by the IDB	MEGJC	To create innovative climate financing mechanisms to support implementation of climate resilience within MSMEs, NGOs and CBOs for tourism and ago-businesses across Jamaica, through access to a line of credit to MSMEs from an approved financial institution, as well as the establishment of a special climate change adaptation fund available to NGOs, CBOs and select public sector entities.	Component 1: Mainstreaming Climate Change Adaptation Measures (Grant -$5.1 M, Counterpart -$986,997.00). This includes vulnerability assessments conducted for 15 communities in the Upper Rio Minho Watershed; and Climate Change Adaptation and Disaster Risk Reduction (CCA/DDR) plans developed. Component 2: Creation of Financial Mechanisms (Counterpart -$789,597) and Component 3. Knowledge Management (Grant - $200,000.00).	Ongoing

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
PPCR-Improving Climate Data and Information Management Project	**Climate Investment Fund-** Administered by the World Bank	PIOJ	To improve the quality and use of climate related data and information for effective planning and action at local and national levels.	Component 1: Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services Component 2: Developing Climate Change Scenarios and Vulnerability Assessments and Strengthening the Web Portal Climate and Risk Information Platform and Clearinghouse Component 3: Climate Change Education, Awareness and Behaviour Change	Ongoing
Southern Plains Agricultural Development Project (UK-CIF)	**DFID –** Administered by the CDB	Ministry of Agriculture and Fisheries through National Irrigation Commission	The project will support, among others, the expansion and improvement of the irrigation and farm access road network of identified areas, strengthening commercial market linkages for small-scale farmers, installation of flood control systems; construction of packing houses and Global G.A.P structures in the rural communities of Parnassus in	Provide irrigation infrastructure on two (2) parcels of government land earmarked for leasing to small, medium and large-scale farmers, including women and youth	Ongoing

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
			Clarendon and Amity Hall in St. Catherine.		
Strengthening Community Resilience to Ensure Sustainable Management of Our Natural Resources Through Social Inclusion	**GEF Small Grants Programme**	UNDP	To address issues related to climate change, improper land use such as poor farming practices, cutting of trees in the forest, which lead to land degradation and flooding thus severely impacting the watersheds. Also, issues of social inclusion, 'youth-at-risk' and the elderly.	1. Implement climate change mitigation strategies and corrective measures to halt land degradation through Climate-Smart Agro-Ecology technologies 2. Implement Sustainable Environment and Natural Resources management practices, including Sustainable Forest Management through Social Inclusion.	Ongoing
Trash Free Waters Programme	**UNEP**	UNEP	To reduce and prevent land-based trash from entering our watersheds, coastal waters, and the marine environment	Enhancement of the Whitehouse and Bluefields Solid Waste Reduction Pilot Project (2018 -2019) - to protect two Marine Protected Areas (in the communities of Bluefields and Whitehouse) from solid waste pollution and also facilitated a participatory approach to effectively manage solid waste across the region.	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
Accelerating the Uptake of Climate Smart Agriculture in ACP Countries	**European Union**	Technical Centre for Agricultural and Rural Co-operation, the Climate Change Division in the Ministry of Economic Growth and Job Creation, and the Rural Agricultural Development Authority (RADA).	To improve agricultural productivity, adaptation and, income of smallholder farmers in selected ACP countries through promotion of widespread adoption of CSA practices that are most aligned with national policy priorities. More specifically: To promote the resilience of smallholder farmers in ACP countries To improve agricultural productivity and adaptive capacity to climate uncertainties for smallholder farmers through accelerated field uptake of smart-agricultural practices using ICT tools.	• Increased farm productivity and food security for smallholder farmers under changing climatic conditions. • Improved adaptive capacity to climate uncertainties for smallholder farmers. • Engagement of key actors in policy process that support upscaling and investment opportunities for CSA.	Completed
Assessing the Kingston Hydrologic Basin	**IAEA**	NWC	To determine the availability of adequate water resources in the Kingston Hydrological Basin (KHB) for enhanced and sustainable water supply. The specific objective is to strengthen the technical capacity of the NWC to make informed decisions relating to sustainable	Strengthening of the water management institutional capacity, provision of specialized equipment and training in enhanced water quality management, use of state-of-the-art nuclear technologies to assess the state of the Kingston Hydrologic Basin and	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
			planning, management and use of water resources.	facilitate and inform the development of strategic and mitigating plans for protecting the water supply sources in the basin and the maintenance of water and wastewater systems.	
Climate Change Adaptation and Disaster Risk Reduction in Jamaica	**GOJ/EU/ UNEP**	Planning Institute of Jamaica (PIOJ), National Environment and Planning Agency (NEPA), Forestry Department, Ministry of Water, Land, Environment and Climate Change, United Nations Environment Programme (UNEP)	To assist Jamaica with its adaptation to climate change and to contribute to sustainable development by increasing the resilience of vulnerable areas and reducing the risks that are associated with natural hazards	Rehabilitate and improve management of selected watersheds to reduce downstream run-off and associated pollution and health risks. Restore and protect coastal ecosystems to enhance natural buffers and increase resilience. Integrate climate change mitigation and adaptation into relevant national policies and plans, enhance institutional capacity and facilitate awareness building amongst Jamaica's population to better adapt to climate change.	Completed
Community Disaster Risk	**GAC**	CDB	To support community resilience in the face of	The project is implementing demonstration projects in	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
Reduction Program (Co-financed with UK and IDB) - Regional			natural disasters by undertaking demonstration projects that help determine which prevention or mitigation measures are most effective. In order to produce tangible risk reduction results in pilot communities to be disseminated across the region, these demonstration projects take lessons learned from other disaster risk reduction projects and test innovative ideas to improve or expand on them.	fifteen to seventeen communities across the Caribbean, with a focus on high-risk, low-income communities.	
Community-based Landslide Risk Reduction Project	**Japan Trust Fund**	Office of Disaster Preparedness and Emergency Management	To reduce the risk of natural disasters in vulnerable communities in Jamaica and to provide an evidence-based toolkit for vulnerability reduction throughout the Caribbean.	1. Developing a toolkit or operations manual of MoSSaiC Methodology and its application 2. Training on MoSSaiC Methodologies for Community-based Landslide Rick Reduction 3. Identification and Implementation of Community-based Landslide Risk Reduction Measures in Four Communities	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
Evaluating Ground Water Recharge in the Upper Rio Cobre Basin	**IAEA**	Scientific Research Council	To develop a map of the rate of recharge and potential contaminiation between upper and lower Rio Cobre.	The development of a database of new and existing information pertaining to the recharging of water in the Rio Cobre, inclusive of groundwater levels, spring and river discharges, isotopes, and chemistry and meteorological parameters. In addition, it will provide training for technical staff in the application of isotope in hydrology; development of a mathematical model of groundwater recharge and flow to the Rio Cobre hydro-geological system; and procurement of current meters, groundwater probes with rainwater collectors, and multi-parameter sonde for wells.	Completed
Flood Risk Management along the Highway 2000 Corridor	**IDB**	NROOC	The objective of the Program is to reduce the impacts of floods in the communities surrounding the Kingston to Clarendon sections of Highway 2000 (Phase 1A and 1B). The Program seeks to provide these	The operation covers four areas: (i) evaluate the flood risk in the communities in the Kingston to Four Paths sections of the Highway 2000 corridor; (ii) identify priorities for specific mitigation actions that can be	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
			municipalities with the capacity to better prepare for flood risk, considering climate change, with special emphasis on reducing the disruption to lives and livelihoods due to these events and protection of critical infrastructure such as Highway 2000.	taken to reduce flood risks; (iii) finance the technical design studies of these measures; and (iv) increase awareness of the affected communities regarding flood risk reduction.	
Hurricane Dean Rehabilitation Works	**CDB**	NWA	Construction of sea defences to protect the Palisadoes tombolo which links Norman Manley International Airport (NMIA) with the mainland via the	Construction of stone revetments, groynes, and replenishment of protective dunes Repairs to main roads, including rehabilitation of pavement, drainage works, river training and sea defenses	Completed
Improving Climate Resilience for Sustainable Management of Natural Resources and Disaster Risk Reduction in Mocho	**GEF Small Grants Programme**	UNDP	The water catchment area at the Lennon High School will be repaired to increase efficiency in operations at the institution; by providing sufficient access to safe drinking water; increased access to water for sanitation and waste disposal and reduction in the pollution of water resources harming biodiversity. This activity	Project results and additional information can be found at https://sgp.undp.org/spacial-itemid-projects-landing-page/spacial-itemid-project-search-results/spacial-itemid-project-detailpage.html?view=projectdetail&id=22805	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
			will reduce the problem of water scarcity by providing a sustainable solution through water harvesting techniques. A 40,000 gal water tank will be constructed to support existing system, which should result in increased water storage to support the essential social services to the community. A 10X10 cold storage unit will be built to reduce post-harvest loss. The installation of this unit should reduce the school's food bill and increase productivity level by providing storage for extra crops. The school's animal husbandry department which consists of seven (7) chicken houses, a piggery area and an abattoir will be biggest benefactor with the construction of a 750 gal tank bio-digester to include training in maintenance of the unit.		

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
Integrated Management of the Yallahs-Hope Watershed Management Area (PPG)	**IDB**	IDB	The objective is to prepare a full project proposal to be financed with GEF, including project component design a results framework with detailed timeline, indicators and targets, budget, procurement plan and plan of action. The preparation will also help identify the institutional arrangements needed for the project implementation, and linkage with other initiatives to secure co-financing as requested by the GEF (donor).	The output of the PPG: the preparation of a project proposal including a results framework with detailed timeline, indicators and targets. The proposal will show the project's contribution to the GEF Focal Areas and national sustainable development objectives and detail the expected global environmental and national benefits. To achieve this, the PPG phase will collect baseline data on key areas of the national response, elaborate the business as usual scenario and quantify the incremental activities described in general terms in the PIF. This will ensure that the project components are defined more precisely.	Completed
Integrating Watershed and Coastal Area Management in Small Island Developing	**GEF**	UNDP and UNEP	To strengthen the commitment and capacity of the participating countries to implement an integrated approach to the management	1. Watershed characterisation and compilation of baseline data for the Watershed Management Unit 2. Community training	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
States (IWCAM) **REGIONAL (US$13.99 Million)**			of watersheds and coastal areas	3. Establishment of formal management mechanism 4. Mitigation of watershed threats using environmentally sound techniques and provision of alternative livelihood opportunities. Some of the project Results and additional information can found at https://wedocs.unep.org/bitstream/handle/20.500.11822/9251/-Integrated%20Watershed%20and%20Coastal%20Areas%20Management%20(IWCAM)%20Atlas-2012GEF%20IWCAM%20Atlas-%202012.pdf?sequence=3&amp%3BisAllowed=	
Jamaica Rural Economy and Ecosystems Adapting to Climate Change II (JAREEACH II)	**USAID**	ACDI/VOCA	Objective 1 – Improve the adaptive actions of Jamaican partners and institutions to promote livelihoods and natural systems that are resilient to climate change and its impacts Objective 2 – Strengthen	1 - Systems and Strategies to Protect Lives and Livelihoods Adopted 2 - Institutional Strengthening, Capacity Building and Coordination for Climate Change Adaptation and Resilience	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
			local and national institutions needed to support the processes of adaptation and sustainability	Building 3 - Systems and Strategies to Protect Targeted Ecosystems Adopted	
Japan-Caribbean Climate Change Partnership Project (JCCCP) **REGIONAL**	**Government of Japan**	UNDP	To support countries across the Caribbean in advancing the process of low-emission risk-resilient development by improving energy security and integrating medium to long-term planning for adaption to climate change	The assistance was aimed at improving energy security and integrating medium and long-term planning for adaptation to climate change.	Completed
Optimizing Irrigation Water Management to Improve Crop Output and Water Quality Control	**IAEA**	NIC	To improve soil, water and crop management practices. Productivity of selected crops like onion and sweet potatoes as well as the efficient use of water and fertilizers	To increase the irrigation water quality in the Rio Cobre basin by utilizing water and fertilizer in an efficient manner. The project also seeks to increase productivity of onions and sweet potato productivity by training personnel in isotopic techniques	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
Securing a reliable water supply system in the community of Jacob's Ladder while improving the members' adaptive capacity to climate change impacts	**GEF Small Grants Programme**	UNDP	To construct new on-site water catchment/storage facilities, establish a completed refurbish the system for extracting water from near-by wells and expand the agro-forestry system to include drought-resistance species.	Project results and additional information can found at https://sgp.undp.org/m/index.php?option=com_sgpprojects&view=projectdetail&id=23685&Itemid=272	Completed
Upgraded Flood Early Warning System for the Rio Cobre Watershed	**European Union**	WRA	To upgrade Flood Early Warning System for the Rio Cobre Watershed	1. Increasing the number of monitoring stations, enhancing the real time monitoring of water levels and intensity at rainfall stations 2. Cost-effective mechanisms for relaying real time data and transferring information to key stakeholders.	Completed
Water Harvesting and Enhancing Sustainable Livelihoods	**GEF Small Grants Programme**	Jamaica Bauxite Institute, WINDALCO, US Peace Corps, Walkers Wood Farmers Group	To enhance the livelihoods of farmers of the Ewarton Watershed and Farmers Cooperative Society	1. Construct 2 rainwater harvesting ponds and install a solar powered water pumping system 2. Construct a 100' by 20' greenhouse to increase crop production and provide	Completed

Name of Project	Funding Agency	Implementing Agency	Objective	Components	Project Status
				training in greenhouse technology 3. Build community awareness of climate change and mitigation strategies 4. Crop and fish production. Project Results and additional information can found at https://sgp.undp.org/spacial-itemid-projects-landing-page/spacial-itemid-project-search-results/spacial-itemid-project-detailpage.html?view=projectdetail&id=20072	

Appendix VIII: Detailed Monitoring and Evaluation Framework

Narrative Summary	Indicators	Means of verification	Key Assumptions
Objective 1: Rationalization of legislative and institutional frameworks for watershed and water resources management			
Outcome	1.1 Legislative and institutional frameworks for watershed management strengthened	Watersheds Protection Act revised	Revised Watersheds Protection Act	GOJ is committed to the revision of the Watersheds Protection Act
Outputs	1.1.1 Amended Watersheds Protection Act	WPA revised by year 5	Revised WPA	GOJ is committed to the revision of the Watersheds Protection Act
	1.1.2 WMUs with appropriate management mechanisms in place	50 per cent of WMUs covered by management plans and zoning plans by year 5	Watershed Management Plans, Zoning Plans	Watersheds Protection Act revised to include legislation for zoning plans
Activities	1.1.1.1 Preparation of technical paper and drafting instructions for the amendment to the WPA	Technical paper and drafting instruction prepared by year 3	Documentation provided	Drafting approvals received
	1.1.1.2 Preparation of technical paper and drafting instructions for the amendment to the NRCA Act	Technical paper and drafting instruction prepared by year 5	Reports	Proposals for NEPA Act are not being considered

	1.1.2.1 Reconnaissance of WMU boundaries	13 Gazetted boundary descriptions by year 5	Gazetted boundary descriptions, technical papers with findings and recommendations	
	1.1.2.2 Rapid ecological assessments conducted in select WMUs	# of rapid ecological assessments	Assessment reports	Funding for the conduct of Rapid Ecological Assessments is made available by the GOJ or through international grants
	1.1.2.3 Preparation of Zoning Plans for selected WMUs	13 Zoning plans prepared	Gazetted Zoning Plans	Revised legislation allows for drafting of zoning plans
	1.1.2.4 Review of the legislative provisions relating to point source pollution (e.g., fishing with chemicals, livestock facilities, and solid waste collection), as well as non-point source pollution, in the context of watershed protection	Legislation reviewed	Documentation provided	
	1.1.2.5 Establishment of the Watersheds Protection Committee	Watersheds Protection Committee	TOR, Annual Reports	Scope of work complimentary to, but does not overlap with, those of the Integrated Water Sector Management Council as established under the Water Sector Policy

	1.1.2.6 Preparation of memoranda of understanding and cooperative agreements between agencies involved in watershed management as required	# of MOUs	MOUs	Broad-scale willingness to partner towards watershed management exists
	1.1.2.7 Watershed Management plans for selected WMUs designed and implemented	6 Watershed Management Plans designed and implemented	Watershed Management Plans	Management plans are designed using a stakeholder-led approach
	1.1.2.8 Local WMU Committee with constitution having consideration for youth and gender balances	# of Local WMU Committees established	TOR, Annual Reports	Stakeholders are not exhausted from being involved in multiple committees

Narrative Summary		Indicators	Means of Verification	Key Assumptions
Objective 2: Updating the national watersheds management programme and provision of adequate human and technical resources for the implementation of the programme				
Outcome	2.1 National watersheds management programme updated and adequate resources for implementation provided	Programme updated and implemented	Reports	GOJ has adequate fiscal space and will to provide funding for watershed management.
Outputs	2.1.1 Established code for watershed management	Code of practice developed by year 5	Reports	
	2.1.2 National programme will be developed and implemented	Programme developed and implemented by year 5	Reports	
Activities	2.1.1.1 Established code of practice	Established code used as guidance for watershed management	Reports	
	2.1.2.1. Update and revise the National Integrated Watershed Management Programme, 2000	Programme revised	Reports	NIWMP deemed relevant as an approach to existing realities

Narrative Summary		Indicators	Means of Verification	Key Assumptions
Objective 3: Provision of adequate and sustainable financing for watershed management activities				
Outcome	3.1 Improved budgetary support for watershed management	70% of management activities fully financed	Budget Reports	GOJ has adequate fiscal space and will to provide funding for watershed management.
Outputs	3.1.1 Implement incentive scheme for watershed management	Scheme designed and piloted by year 5	Reports	GOJ legislation allows for the implementation of an incentive scheme for watershed management
	3.1.2 Dedicated /recurrent budget item for watershed management	Budget line established	Budget Reports	
	3.1.3 WMUs with detailed finance requirements	50 percent of WMUs with detailed finance plans/ budgets by year 5	Finance Plans	
Activities	3.1.1.1 Develop and recommend an incentive scheme for private sector participation in watershed management.	Scheme recommended by year 2	Technical Report	Private sector willingness to contribute to an incentive scheme

	3.1.1.2 Support proposals for the establishment of a PES Scheme/Water Fund dedicated to watershed management	Position paper for PES Scheme/ water fund conducted by year 2	Position Paper	
	3.1.2.1 Solicit commitment from Government to provide financial support for watershed management	Budgetary support from the MOFPS and approvals for funded projects	MOU	
	3.1.2.2 Explore funding options such as the allocation of a small percentage of the cost of major construction projects taking place in watershed areas (such as projects relating to highways, reservoirs, dams and housing) for slope stabilization and watershed protection purposes; use of a portion of the environmental levy	Funding options explored by year 4	Reports	
	3.1.3.1 Determine the financial resources required for watershed management	Budget analysis conducted and approved by relevant Watershed Management Committees	Meeting Minutes, Report	

Narrative Summary		Indicators	Means of Verification	Key Assumptions
Objective 4: Increased availability of appropriate information and data for effective watershed management				
Outcome	4.1 Data requirements for watershed management are met	# of WMUs with adequate data coverage	Report	Adequacy threshold for data to be determined by data mapping activity
Outputs	4.1.1 Implementation of the Watershed Information Database	Watershed Information Database populated with information on 13 WMUs by year 5	Report	Data gaps identified and incorporated into project designs and operational plans of partner agencies
	4.1.2 Implementation of the Integrated Watershed Management Geographic Information System-Based Decision Support System	5 MDAs using and contributing to the GIS DSS	MOUs	Contributions to include inter alia hosting costs and data needs
	4.1.3 Develop and implement a drone technology programme to assist in watershed management	# of flights	Reports	Drone and associated software are procured. Capacities enhanced through training.
	4.1.4 Improved technical capacity for watershed management	50% of Stakeholders with direct responsibility for watershed management attending at least 2 capacity training events by year 5	Training Reports	Capacity to conduct required training is accessible at the local or regional levels

	4.1.5 Watershed Management Core Training Programme Developed	Training Manual; # of Training	Training Reports	Programme covers training in watershed management skills such as soil conservation, soil fertility, hydrology, GIS, modelling etc.
Activities	4.1.1.1 Data Sharing Protocol developed	Protocol	Signed Protocol	Partners are appreciative of the need for data sharing
	4.1.1.2 Data mapping to identify key data requirements for effective watershed management	Data requirements listing	Reports	
	4.1.1.3 Review the classification of the WMUs using appropriate technology	WMU classification revised	Report	Data requirements for adequate classification are met
	4.1.1.4 Stakeholders trained in the use of proposed Watershed Information Database	# of stakeholders trained	Training Reports	
	4.1.1.5 Implement the biomonitoring component of the National Water Quality Monitoring Programme	Biomonitoring Program implemented	Watershed Information Database	Data generated to be cleaned and incorporated into Watershed Information Database
	4.1.2.1 Stakeholders trained in the use of proposed GIS DSS	# of stakeholders trained	Training Reports	
	4.1.3.1 Acquisition of drones and appropriate software	# of drones and software procured	Procurement Reports	Funded through grants

	4.1.4.1 Review requirements for, and include measures to ensure, adequate staffing arrangements for watershed management in collaboration with watershed resources management agencies	# of staff with assigned responsibility for watershed management	Report	Allowances are made for the establishment of new posts, if required, within the civil service establishment
	4.1.4.2 Determination of research needs by the Watersheds Protection Committee	Research needs assessed	Report	Report generated by the secretariat and brought to the committee for approval
	4.1.4.3 Capacity assessment	Assessment conducted	Report	Assessment to include required staffing and skills
	4.1.4.4 IT infrastructure upgrade	Infrastructure upgraded	Report	Ongoing upgrades throughout the life of the Policy as required
	4.1.5.1 National Watershed Management Core Training Programme Developed for training in watershed management skills	Training Manual; # of Training Sessions	Training Reports; Certificates	Programme covers training in watershed management skills such as soil conservation, soil fertility, hydrology, GIS, modelling etc.

	Narrative Summary	Indicators	Means of Verification	Key Assumptions
Objective 5: Increased public education and awareness initiatives geared towards positive changes in attitudes to watershed conservation and promotion of public participation in the planning of watershed management interventions				
Outcome	5.1 Increased awareness of the need for watershed management requirements	10 percent improvement over baseline by year 5	KAPB Report	Baseline calculated as an average between the findings under IWECO and Yallahs Hope Projects
Outputs	5.1.1 KAPB Assessment	2 KAPB Reports; one in year 5	Reports	Sampling framework and survey instruments comparable to those used in baseline documents
	5.1.2 Public education and awareness programmes developed to address the importance of watershed protection and management	5 Communication Plans Developed	Communication Plans	Plans to include actions for integration between partners and MDAs
	5.1.3 Increased participation in watershed management	10 percent improvement over baseline by year	KAPB Report	Baseline calculated as an average between the findings under IWECO and Yallahs Hope Projects
	5.1.4 Implementation of the WAMM	WAMM implementation in 13 WMUs by year 5	Reports	Financing for WAMM implementation is made available through grants or recurrent funding

Activities	5.1.2.1 Develop new materials, strategies and techniques for public awareness and education and use social media for outreach	Strategies developed and incorporated into communication plans	Communication Plans	Strategies informed by baseline KAPB reports
	5.1.3.1 Promote community participation in planning and implementation of sustainable watershed management programmes and interventions following watershed management principles and the provisions of Principle 10 regarding public access to information and public participation	# of workshops	Workshop Reports	Communities engaged through the WAMM
	5.1.3.2 Include large farmers in upper watershed areas as well as small farmers in outreach activities regarding watershed management	# of farmers reached	Post Outreach Surveys	
	5.1.4.1 Utilize the linkages and resources of government and non-government entities to monitor watersheds, and identify intervention needs in WMUs	Intervention needs identified	Report	Assessed qualitatively through focus groups and or workshops

	5.1.4.2 Provide information to farmers on agroecology based on applying ecological concepts and principles to optimize interactions between plants, animals, humans and the environment, taking into consideration social aspects.	# of Farmer Field Schools	Farmer Field School Reports	Stakeholder capacities enhanced (train the trainer approach)
	5.1.4.3 Provide information for communities and schools on the value of watersheds, the connection between watershed degradation, sanitation and agricultural practices and options for improving environmental quality as well as income generation and sustainable livelihoods.	# of outreach events	Reports	Outreach events supplemented by social media and traditional media approaches
	5.1.4.4 Sensitize law enforcement officials, including the judiciary, to the importance of enforcing environmental laws generally, and specifically those affecting watershed management	# of sensitization workshops	Reports	Sensitization done post revision of the relevant legislations

Narrative Summary		Indicators	Means of Verification	Key Assumptions
Objective 6: Support initiatives to encourage appropriate land use and sustainable land management				
Outcome	6.1 Improved Condition of WMUs	2 WMUs with reduced degradation by year 5	Report	Baseline as per NEPA (2010)
Outputs	6.1.1 Development orders including core areas for watershed protection	# of DOs with core watershed areas delineated	Development Orders	Updates made to emerging development orders
	6.1.2 Declaration of Tree Preservation Orders	Tree Preservations Orders for 4 parishes/WMUs prepared by year 5	Tree Preservation Order	Orders are made specific to core areas
	6.1.3 SLM practices implemented in collaboration between government entities and private sector organisations	# of hectares with improved SLM	Report	Intervention areas are assessed with a view to obtain data on the baseline condition prior to the implementation of programmes.
	6.1.4 Reforestation of degraded areas	# of hectares reforested	Report	

Activities	6.1.1.1 Assessments undertaken to determine core areas for watershed protection	Island-wide assessment completed by year 3	Map description and justification of core areas for watershed protection submitted to Local Area Planning Branch of NEPA	Ongoing revisions with updates as required through the findings of the REAs
	6.1.1.2 Research the effectiveness of management options to enable watersheds to maintain their function of protecting water sources at the same time provide for the economic needs of the users of the watershed	Management options recommended	Report	Findings validated through a workshop
	6.1.1.3 Explore the use of green infrastructure in watershed management (for example, green gullies for the stormwater run-off in urban areas) to minimize hard surfacing	Recommendations included in emerging development orders	Development Orders	
	6.1.1.4 NEPA will recommend to the municipal corporation the inclusion of watershed protection strategies in parish development plans	Two strategies developed biennially and submitted to the respective municipal corporations	Reports	
	6.1.2.1 Recommendations prepared on the designation of	Recommendations prepared	Report	

	Tree Preservation Order at the parish level			
	6.1.3.1 Determination of existing sustainable land management practices	Report on existing sustainable land use management practices prepared	Report	
	6.1.3.2 Commissioner of Lands will address the issues relating to land tenure and access to land	Policy tabled in Parliament	National Land Policy updated	Programmes maintained to support access and tenure
	6.1.4.1 Carry out applied research, including determining erosion rates, appropriate erosion control measures, and effective conservation treatments	# of studies	Reports	Research conducted as per needs identified by committee
	6.1.4.2 Tree Planting	# of trees planted	Reports	Principles of Agroecology encouraged on farms through the provision of fruit trees. Planting of native tree species is conducted on Crown Lands