URBAN ECOSYSTEM-BASED ADAPTATION TRAINING PROGRAMME

EbA for Urban and Peri-urban Spaces: Using Nature-Based Solutions as a Key Climate Change Adaptation Strategy for Advancing Sustainable Development in Jamaica

ABOUT THE COURSE:

EbA for Urban and Peri-urban Spaces: Using Nature-Based Solutions as a Key Climate Change Adaptation Strategy for Advancing Sustainable Development in Jamaica

Course Description

This course, **“EbA for Urban and Peri-urban Spaces: Using Nature-Based Solutions as a Key Climate Change Adaptation Strategy for Advancing Sustainable Development in Jamaica”**

Designed to build the capacity and increase knowledge of the practical application of ecosystem-based solutions (EbA) in the context of a changing climate

Capacity of whom? Public and private sector stakeholders that are working in the areas of: ecosystems management and climate change urban planning and development and natural resources management.

Will explore how EbA is a key climate change adaptation strategy for urban and peri-urban areas and necessary for building resilience of the people that reside in these areas.

The course incorporates case studies from other urban and peri-urban areas

Participants will be exposed to various topics including, environmental management, ecosystems in Jamaica, economic concepts and tools and techniques for undertaking natural resource valuation. The course content will be divided into four modules and will be delivered over a five-day period.

Course Objectives/Learning Outcomes

Knowledge	Understand the contribution of ecosystems and biodiversity to socio-economic development and the economic, social, and environmental benefits of EbA to sustainable development
	Understand the importance and benefits of valuing natural resources and of incorporating NRV techniques in the management of Jamaica's natural resources
	Understand the linkages between NRV and EbA
	Understand the benefits of using EbA in urban and peri-urban spaces
	Understand the rationale for incorporating EbA in development planning
	Understand the linkages and relationships among EbA environmental conservation and management, disaster risk reduction and other climate change adaptation strategies
	Understand the different EbA approaches and their application
	Understand how EbA fits in with other tools of climate change adaptation
	Understand the importance of mainstreaming and integrating EbA in national development and policy planning processes

Course Objectives/Learning Outcomes

Performance	
	Explain the importance of EbAfor climate change adaptation and sustainable development
	Be able to undertake at this broadest level the total economic value (TEV) of a natural resource using the defined steps
	Know how to apply EbA in urban and peri-urban planning
	Be able to apply the techniques of NRV to undertake the valuation of ecosystems
	Know how to mainstream EbA in policy development processes and be able to identify the entry points for mainstreaming EbA
	Be able to apply the techniques of NRV to undertake the valuation of ecosystems
	Define the dynamics, components and requirements of urban and peri-urban resilience and sustainability, with reference to risks, vulnerability, and strategic management
	Explain how EbA works, including the challenges, opportunities, and additional benefits beyond adaptation of securing healthy ecosystems
	Analyze the benefits of peri-urban ecosystem for urban resilience and approaches to the application of EbA
	Delineate linkages at various levels - sectoral, local, urban, rural, etc. for mainstreaming EbA into development planning

Course Objectives/Learning Outcomes

Attitude

- Appreciate the importance of the protecting and sustainably using natural resources alongside and as part of socio-economic development and other types of development, as a component of the pool of resources available for development
- Appreciate EbA as a tool of climate change adaptation on par with other development tools and approaches

Course Modules

Module 1 – Module 1: Jamaica’s Multi-Hazard Environment and Setting the Context for Scaling up the Use of EbA in Jamaica

Module 2 – Introduction to EbA

Module 3 – Natural Resource Valuation for EbA

Module 4 – Practical Applications of EbA in Urban Planning and Design

Module 5- Creating the Enabling Environment for the Mainstreaming of EbA

EBA ABC Chart

A: Altruist Value	B: Building Solutions	C: Climate Change Adaptation	D: Disaster Risk Reduction
E: Ecosystem-based Adaptation	F: Flood Risk Management	G: Green Opening Spaces	H: Hydrometeorological Events
I: Information Function	J: Justification	K: KMA	L: Linear Natural Infrastructure
M: Multi-Hazard Environment	N: Nature-Based Solutions	O: Open Green Spaces	P: Peri-Urban Spaces
Q: Quantify Quality	R: Risk	S: Street Tree Canopies	T: TEV
U: Urbanization	V: Value Transfer	W: Water Buffer	X: Examples Exercises
Y: City	Z: Zoning		

Module 1: Jamaica's Multi-Hazard Environment and Setting the Context for Scaling up the Use of EbA in Jamaica

Module 1 is structured around 6 topics as follows:

Topic 1: Jamaica's Multi-Hazard Environment

Topic 2: A Brief Analysis of Jamaica's Natural Hazard Landscape

Topic 3: State of the Jamaica's Biodiversity and Ecosystems (Discussion)

Topic 4: Climate Change and its Impacts

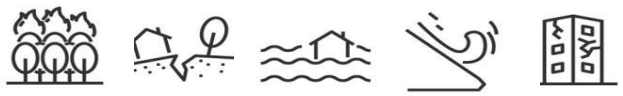
Topic 5: Future climate change projections and scenarios for Jamaica

Topic 6: Urban and peri-urban issues and challenges in Jamaica

OBJECTIVES OF MODULE 1:

Describe	Jamaica's risk profile with respect to natural hazards
Share	Using examples, how climate change is impacting economic and social sectors in Jamaica
Examine	Trends in the occurrence of hazards, loss and damage
Define	EbA
Examine	Future climate change projections and scenarios and discuss the possible impacts on the country's developmental prospects
Describe	Urbanization, its causes and linkages with risks and resilience
Be	Able to identify urban and peri-urban challenges affecting Jamaica and some of the factors contributing to, or exacerbatng these challenges

Topic 1: Jamaica's Multi-hazard Environment



- What are the different hazard types affecting Jamaica?
- We have:

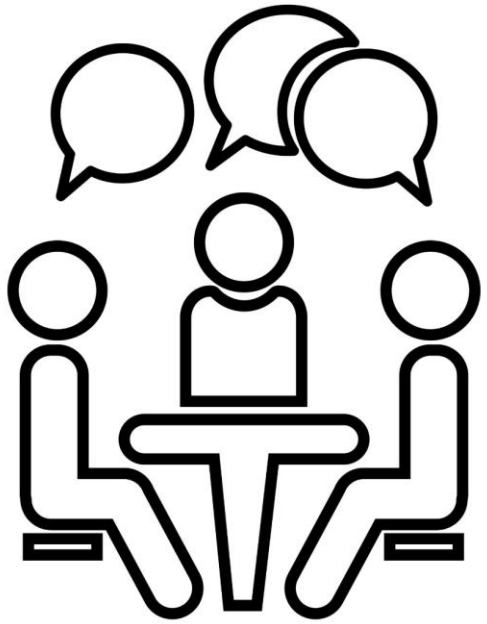
Natural Hazards	Manmade Hazards	Biological/Health Related Hazards

- Can we provide examples under each type of hazard?

Natural Hazards	Manmade Hazards	Biological/Health Related Hazards
Meteorological and Hydrological: • **Tropical cyclones (tropical storms and hurricanes)** • **Rainfall, including severe rainfall events** • **Lightning** • **Extreme heat and increasing temperatures** • **Floods** • **Drought** • **Sea-Level rise** **Geohazards:** • **Earthquakes** • **Tsunamis** **Environmental:** • **Land degradation, Soil erosion** • **Coastal erosion / Coral reef degradation** • **Landslides (secondary natural hazard often compounded by man** • **Sahara dust** • **Alien invasive species (Sargassum, Lion Fish)** • **Coastal inundation/flooding**	**Chemical:** • Oil spills • Other Chemical Spills related to spills from industry that go on to contaminate rivers and sometimes cause fish kills • Transboundary movement of hazardous materials/ wastes Technological • Road, aviation and marine and nautical accidents • Industrial accidents • Infrastructure failures • Aging infrastructure • Fires (bush and forest fires) Societal: • Fires • Crime and violence • Cybercrimes/cyber security • Societal unrest	Biological: • Human disease outbreaks, epidemics, pandemics • Animal (livestock) and plant (agricultural) epidemics • Other biological/physical hazards such as poisoning, eutrophication, air pollution, water pollution

Tabletop Discussion

1. Consider how each hazard affects Jamaica according to economic impact (fiscal indicators such as debt-to-GDP, Impact on GDP etc), social impact (# of persons affected per 100,000, loss of lives etc.), environmental impacts (loss of ecosystem services)
2. Your consensus on the top 5 hazards affecting Jamaica and why
3. Discuss how climate change may be influencing the multi-hazard environment that Jamaica exists in



Topic 2: A Brief Overview of Jamaica's Natural Hazard Landscape

- **Jamaica's Natural Hazard Risk Profile:**
- **Some Impacts of Natural Hazard Events in Jamaica**

Jamaica's Natural Hazard Landscape – An Overview

Jamaica is susceptible to a range of primary and secondary hazards

Jamaica is highly exposed to extreme weather events and climate risks, and the island's location, geology, and geography - makes it highly exposed to several natural hazards

The Global Facility for Disaster Reduction and Recovery (GDFRR) has cited Jamaica to be the third most exposed country in the world to multiple hazards, with over 96 per cent of the country's gross domestic product (GDP) and population at risk from two or more hazards

The country's exposure is attributed to its location in the Atlantic Hurricane Belt, the geophysical orientation of its low-lying coastal zones, and its mountainous topography.

Jamaica's vulnerability is further exacerbated by its relatively long coastline and the large concentration of economic activity in its coastal zones.

More than 60 per cent of the country's population live within 5Km of the coastline.

Hurricane risk is considered to be more significant than the earthquake risk for Jamaica, with average annual losses (AAL) from hurricanes estimated as being US$67.3 million (0.5 per cent of GDP) and from earthquakes US$36 million (0.3 per cent of GDP) (World Bank, 2016).

Jamaica is particularly vulnerable to drought but also is impacted by excess rainfall events (which may occur throughout the year and not only within tropical cyclones).

Earthquake risk is a very prominent natural peril in Jamaica. Jamaica is located on the boundary of two main tectonic plates – the North American plate to the north and the Caribbean plate to the south, while Kingston is located in an area with a high concentration of local faults

Interrogating Hazard, Risk and Vulnerability and Jamaica's Natural Hazard Landscape

- We already have agreed to the natural hazards that are impacting Jamaica
- **How are exposure and vulnerability driving the scale and impacts of natural hazards in Jamaica? Provide examples**

- What is exposure? The location, attributes and value of assets that are important to various communities, such as people, buildings, factories, farmland and infrastructure that are exposed to the hazard.

- What is vulnerability? the reaction of the assets when exposed to the forces produced by a hazard event. For example, a building's vulnerability to an earthquake increases with the intensity of ground shaking and decreases with improved conformity to seismic design standards.

Impacts of Natural Hazard Events in Jamaica

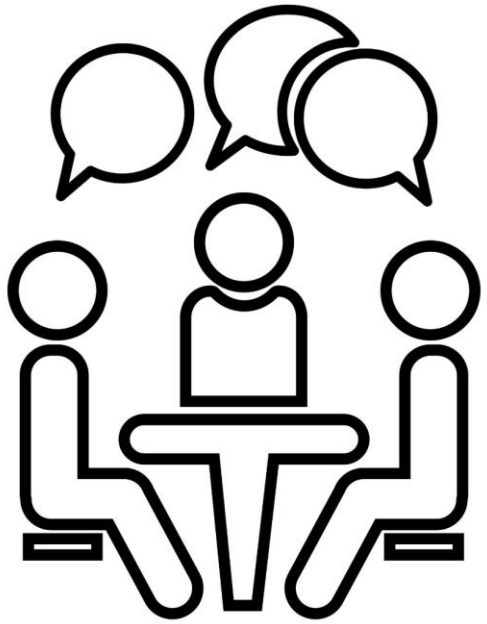
Natural Hazard Event	Year	Category Storm	Impact (% GDP)
Hurricane Michelle	2001	4	0.8
Excess Rainfall Event – May/June Flood Rains	2002		0.7
Hurricane Charley	2004	4	0.02
Hurricane Ivan	2004	3	8.0
Hurricanes Dennis & Emily	2005	4	1.2
Hurricane Wilma	2005	5	0.7
Hurricane Dean	2007	4	3.4
Tropical Storm Gustav	2008		2.0
Tropical Storm Nicole	2010		1.9

Impacts of Natural Hazard Events in Jamaica

- Damage to communities and infrastructure, injuries and in some cases loss of life. For example, Hurricane Sandy in 2012 resulted in 291 injuries and 1 death. Social sectors such as health and educational institutions as well as housing stock were impacted. 48.1% of the total costs associated with that event can be attributed to damage to health, housing, and education sectors.
- Hurricane Ivan in 2004 exceeded US$350 million in damage and loss (MFPS, 2018).
- Tropical Cyclones Zeta and Eta in 2020 caused loss of lives and significant damage, particularly to the country's road network. Three discrete but significant rainfall events associated with these two storms occurred within a two-week period. The high levels of inundation which caused severe flooding and landslides in several parts of the country could be attributed to the fact that each of these rainfall events occurred within a short period of time of each other and that the country's ecosystems such as forests and watersheds are degraded in several areas and unable to carry out several vital functions that could reduce the impacts of these hazard events.
- Over the period 2018 to 2020, three lives were lost from climate related events.
- The World Bank's Country Risk Profile for Jamaica (2016) indicates that Jamaica has suffered significant losses from hurricanes, and goes on to state that if Hurricane Gilbert, which struck Jamaica in 1988 were to happen in 2016, it would have caused a loss of US$1.3 billion, amounting to 9.6 per cent of the country's 2016 GDP. Hurricane risk is considered to be more significant than earthquake risk for Jamaica, with average annual losses (AAL) from hurricanes estimated at US$67.3 million (0.5 per cent of GDP) and earthquakes US$36 million (0.3 per cent of GDP) (World Bank, 2016).
- Natural hazards also affect critical economic infrastructure such as bridges, roads, and vulnerable groups as well as economic sectors (e.g., agriculture and fisheries, construction, and tourism) and already degraded ecosystems.

Tabletop Discussion

1. How have these natural hazard events affected the work and budgets of national organizations?
2. What new projects or programmes have been included in your strategic plans to reduce vulnerability and enhance resilience?
3. How does EIA's take into account the natural hazard landscape and vulnerability?
4. Identify some of the underlying causes of vulnerability across key economic sectors and industries (agriculture, tourism, construction, wholesale and retail, energy etc.) – hazards and impacts



TOPIC 3: STATE OF THE JAMAICA'S BIODIVERSITY AND ECOSYSTEMS

Group Discussion – Evaluating 20 Statements

Evaluate each of the 20 statements below and suggest changes, or determine based on your areas of expertise the accuracy of the statements and provide examples and/or data where relevant

1. Jamaica's main economic activities tourism, mining, agriculture, and fishing rely significantly on the country's rich natural resource-base.

2. Jamaica's natural capital is showing signs of degradation.

3. Environmental challenges faced by Jamaica include - deteriorating air and water quality, poor management of solid, liquid and hazardous wastes, loss of biodiversity, watershed degradation and net loss of forests cover and increasing incidence of fires.

4. Jamaica's coral reefs are in decline with mean coral cover at 10-meter depth, declining to as low as 3%
5. Jamaica's reefs are more degraded than the rest of the Caribbean.
6. The low coral cover is as a result of:
    a. Coral diseases
    b. Coral bleaching
    c. Storm/hurricane damage
    d. Excessive nutrients from sewage pollution
    e. Siltation and poor watershed management practices
    f. Over-fishing and indiscriminate fishing practices
    g. Inappropriate recreational practices
    h. Coastal pollution
    i. Death of sea urchin

Group Discussion – Evaluating 20 Statements

7. Coastal mangroves, wetlands and seagrass beds which provide breeding, feeding and nursery grounds for fish and shrimp face significant threats.

8. Several beaches on the western end of Jamaica could disappear in the next five to 10 years.

9. Beach erosion is a naturally occurring phenomenon but is being exacerbated by man-made factors and climate change.

10. Recreational coastal and marine water quality is influenced by several factors including the discharge of sewage and industrial effluent into the coastal and marine waters, non-point source discharges from agricultural activities, urban runoff and modifications of natural systems (including the destruction of wetlands), urbanization and the growth of informal settlements in coastal areas.

11. An estimated 30% of original mangrove forests in Jamaica have been lost. Coastal wetlands are increasingly threatened by infrastructure development and conversion from natural habitat to other uses.

Group Discussion – Evaluating 20 Statements

12. Approximately 336,000 hectares (ha) or 30% of Jamaica is classified as forest. Within this area, 94% shows evidence of human disturbance.

13. About 35% of all forests, and over 73% of closed broadleaf forest are protected.

14. Most of the country's forest reserves are located in areas of rugged terrain such as the John Crow Mountains, Blue Mountains and Cockpit Country as well as the dry, hilly uplands in the south, west and northwest sections of the country.

15. Cockpit Country supports the largest number of globally threatened species of any key biodiversity area in the Caribbean Islands Hotspot.

16. Deforestation has led to the deterioration of more than a third of Jamaica's watersheds, drying up streams and rivers. Each of Jamaica's 26 watershed management units has portions considered to be degraded, while 10 of these units are considered severely degraded.

17. Jamaica is an important contributor to biodiversity in the Caribbean Basin, which has the fifth highest concentration of endemic species out of the eight "hottest hot spots" on Conservation International's list of biodiversity hot spots.

Group Discussion – Evaluating 20 Statements

18. Seawater/saltwater intrusion of coastal aquifers is caused by over-pumping of the aquifer, pumping below sea level and poor well design. The intrusion caused by over-pumping of wells is common particularly near densely populated areas where the groundwater is oftentimes affected by improper or inadequate sewage disposal and wastewater treatment.

19. The quality of water found in many of Jamaica's rivers is threatened, due to overburdening with waste.

20. Discharges from the agricultural, industrial and mining also contribute significantly to water pollution.

Topic 4: Climate Change and its Impacts

Impacts – Agriculture

Can you provide examples of how climate change is impacting Jamaica?

How do these impacts being experienced by Jamaica compare with other SIDS?

- Raising sea levels- increased potential for flooding of farmlands and salinity of ground water
- Amplifying extreme weather events- extreme weather events such as hurricanes and droughts
- Shifting climate zones towards the poles- average temperature are expected to increase more near the poles
- Reduced soil moisture- higher air temperature will cause higher soil temperature which will accelerate the decay of soil organic matter

Impacts – Tourism

- Climate change could cause serious repercussions on the tourist industry through:
  - Accelerated erosion and flooding causing;
  - Loss of beach
  - Loss of amenity value
  - Infrastructure damage
  - Structural damage to cruise ship ports
  - More intense weather activity destroying the coastal zone
  - Increased stress on coastal ecosystems from land based pollution, storm water run-off and siltation
  - Loss of coral reefs due to hurricanes and bleaching due to higher temperature

Impacts – Water Resources

- Alterations in regional precipitation and evaporation patterns.
- Leaching and intrusions of salt water

- Can you provide examples of how climate change is impacting Jamaica?
- How do these impacts being experienced by Jamaica compare with other SIDS?

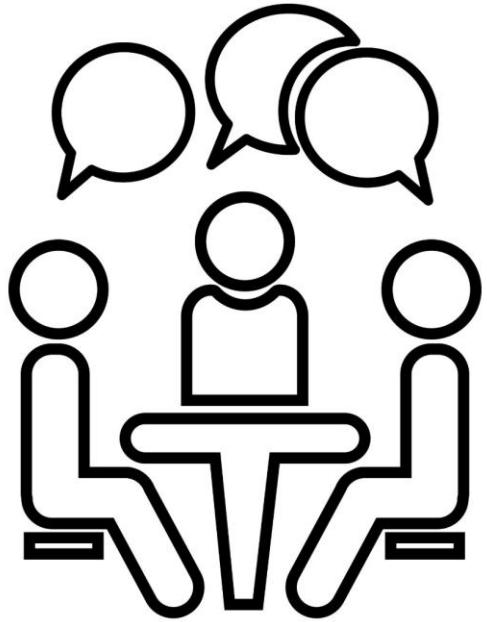
Topic 5: Climate Change Projections: What does the Future Look Like for Jamaica and the Implications for Development

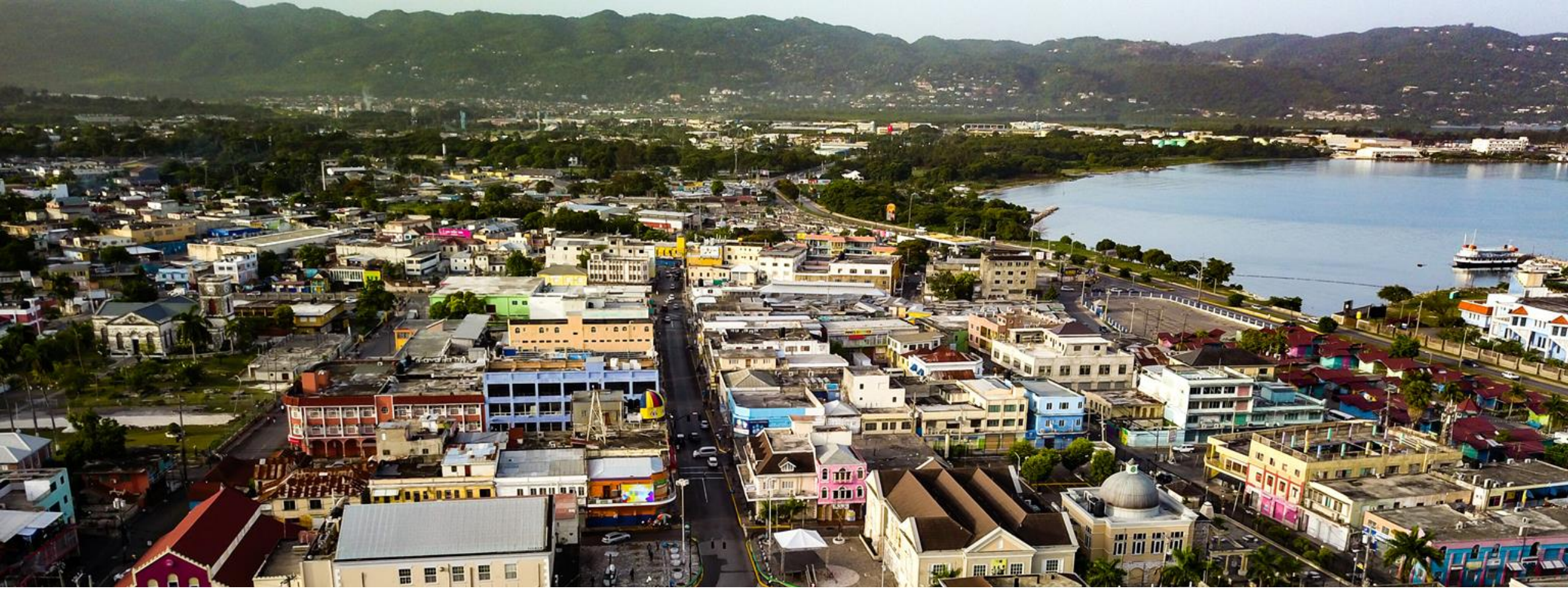
Some Findings – A Snapshot

- Climate change is expected to increase the frequency and severity of hydrometeorological hazards – tropical cyclones and drought
- Climate change and variability, in combination with non-climate drivers such as deforestation, land degradation, have altered the country's ecosystem functions and agro-ecological systems thus affecting several sectors
- Jamaica's temperatures will continue to get hotter, rainfall outside of the Hurricane Season will become more variable and less, hurricanes will likely be more intense and be accompanied by higher rainfall rates and increased maximum winds and sea level will continue to rise resulting in population displacement, loss of land, negative impacts to tourism and agriculture among others.
- studies from the CSGM indicate a likely increase in the intensity of extreme weather events due to climate change and an increase in the Intensity of storms by 2.0 to 11.0 per cent with a shift in distribution toward higher wind speeds and potential damages
- Impacts from natural hazards due to climate change will likely become greater, commensurate with growth in Jamaica's population and economy.
- Low revenue generation, combined with the increased cost of associated with the impacts of natural hazards, result in high levels of public debt for these small economies pushing them further away from advancing their sustainable development prospects
- Economic modelling done to inform the development of Jamaica's Long-Term Low Carbon and Climate Resilient Strategy, shows that as climate change intensifies, the risks posed by different climate hazards will exacerbate Jamaica's economic vulnerability, particularly in coastal locations

Tabletop Discussion

Based on the projections presented above, what are the implications for: economic sectors (tourism, agriculture, industry) and on people and infrastructure





TOPIC 6: URBAN AND PERI-URBAN ISSUES AND CHALLENGES IN JAMAICA

The Urban and Peri-Urban Landscape

Jamaica is categorized as a Caribbean Small Island Developing State (SIDS) with a population of 2,726,0006, almost a quarter of which lives in the capital city, Kingston.

The population of Kingston, St. Andrew and Portmore is 765,000, or 26 per cent of the population of Jamaica.

Overall, 52 per cent of the country's population lives in urban areas. Increasing urbanization, coupled with low levels of urban planning, puts urban and peri-urban areas at risk from the increasing frequency and intensity of natural hazards, especially hydrometeorological hazards caused by climate change.

The Urban and Peri-Urban Landscape

- Profile of Kingston's Metropolitan Area (KMA) and Jamaica's Other Urban Centres, many of which can be assumed to form the immediate urban-rural interface in Jamaica

Indicators/Characteristics	KMA	Other Urban Centres	Jamaica
Poverty (% of population)			
• 2018	9.2	12.0	12.6
• 2019	4.7	13.4	11.0
Food Poverty			
• 2018	2.9	3.9	3.5
• 2019	0.4	6.5	4.0
Safe and Affordable Drinking Water			
• 2018	98.3	89	
• 2019	98.4	87.2	
Access to Improved Adequate and Equitable Sanitation and Hygiene			
• 2018	91.8	81.4	81.5
• 2019	97.6	86.1	86.2
Housing Quality Index			
• 2018			75.3
• 2019			75.7

The Urban and Peri-Urban Landscape

- The rapid, and oftentimes inadequate and poorly planned expansion of urban areas in developing countries such as Jamaica leaves urban populations exposed to the effects of natural hazards which are oftentimes exacerbated by climate change.

- Although several benefits have been derived from Jamaica's pattern of development, this development also has contributed to a myriad of challenges including:
  - fragmented subdivisions
  - unbalanced regional development,
  - urban sprawl,
  - limited availability of affordable housing,
  - squatting,
  - inequality and poverty,
  - environmental degradation,
  - congested towns due to the increasing dependence on automobiles for example.
- Urban sprawl for example, leads to further encroachment on the limited remaining natural areas and ecosystems. Also, in urban areas there are several impermeable surfaces covered in asphalt and concrete which impact hydrological processes by preventing the flow and absorption of rainwater into the ground and/or disturbing natural water courses which lead to flooding, lack of infiltration and limited or no replenishment of groundwater. Newer developments have begun to consider approaches to allow for some level of rainwater percolation in urban areas.
- Climate change presents a significant challenge for urban systems – water and wastewater systems, infrastructure, among others.

Tabletop Discussion

- Where are Jamaica's urban and peri-urban areas (provide examples)?
- What are the implications of some of Jamaica's patterns of development presented above?
- Can you rank the issues and challenges presented above – from 1 to 5 with 5 being
- How is climate change contributing to these existing challenges in urban and peri-urban spaces?
- How is climate change exacerbating these challenges posed by the country's current pattern of development? Can you provide examples?
- What systems and mechanisms have been put in place in urban and peri-urban spaces to reduce current and future vulnerability? Any best practice examples

Case Study for Discussion: City Based Assessment and Risk Profile of Kingston

The Stimson Centre's city-based assessment or risk profile of the threat posed by climate change to Kingston indicates that due to degraded ecosystems, Kingston is not able to fully capitalize on an array of ecosystems services provided by coral reefs, sea grass beds, and mangrove forests which impacts Kingston's ability to combat climate risks. It goes on to state that flooding after rainfall is worsened because of degraded watersheds surrounding the city and by poor waste management practices within the city.

https://www.stimson.org/2020/corvi-risk-profile-kingston-jamaica/

Urban resilience means adaptation to risks and their associated dynamics and business continuity coupled with sustained improvement towards meeting the development needs of the city/urban area, in the backdrop of climate change and other related risks that make up the multi-hazard risk environment.

- Stimson Centre. 2020. CORVI Risk Profile Kingston Jamaica. Available at: https://www.stimson.org/2020/corvi-risk-profile-kingston-jamaica/