



**Session:**  
**“Sustainable urbanisation: bridging  
the digital divide,  
from knowledge to action”**

**Thursday June 17, 2021**

**4:00 - 5:00 pm (EDT)**



# “Geospatial Applications in Spatial planning & Sustainable Urbanization in Jamaica”

Presented by:

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Land Information Council of Jamaica

Ministry of Housing, Urban Renewal, Environment & Climate Change

Jamaica Focal Point - CARIGEO Steering Committee

UN-GGIM: Americas



# Acknowledgement

- The contribution of this presentation is due to the commendable efforts of the following Government of Jamaica entities and their willingness to share their achievements:
- National Environment & Planning Agency (NEPA)
- National Spatial Data Management Branch (NSDMB)
- National Water Commission (NWC)
- Planning Institute of Jamaica (PIOJ)
- Urban Development Corporation (UDC)



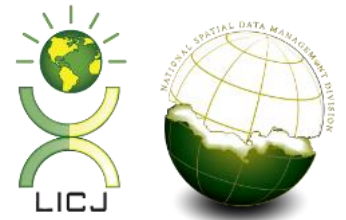
# Outline



- ❑ Jamaica's Vision 2030 NDP
- ❑ National GIS Vision & Mission
- ❑ CARIGEO Initiative: Jamaica's Support
- ❑ Urbanization in Jamaica
- ❑ NSPIT Platform
- ❑ Jamaica Next (Third) City
- ❑ Streetscape Study: Seymour Lands
- ❑ Potable Water & Wastewater Provision
- ❑ Population Distribution & Cemetery Landuse
- ❑ GOJ/ESRI ELA: AGOL Platform



# National GIS Vision & Mission



## Vision

- Geospatial data, products and services are **current, available and accessible**, to all users to facilitate planning, management and use of the island's resources thereby contributing to **sustainable development and economic growth**.



## Mission

- To coordinate the **development and implementation of a national networked GIS** inclusive of, comprehensive and accurate spatial data, for land and land related agencies and to develop and provide advice on policy, institutional requirements, legislation and regulations.

# Jamaica's Vision 2030 National Development Plan

Source:  
*Planning Institute of Jamaica (PIOJ)*



**National Vision Statement**  
“ Jamaica, the place of choice to live, work, raise families, and do business ”



# Jamaica's Vision 2030 National Development Plan



Directly aligned in Jamaica  
achieving the 17 SDGs

**Goal 1: Jamaicans are Empowered to Achieve their Fullest Potential**

NATIONAL OUTCOMES	SDGS
A Healthy and Stable Population	2 NO POVERTY, 3 GOOD HEALTH AND WELL-BEING, 6 CLEAN WATER AND SANITATION
World Class Education and Training	4 QUALITY EDUCATION
Effective Social Protection	1 NO POVERTY, 2 NO HUNGER, 10 REDUCED INEQUALITIES
Authentic and Transformational Culture	With Agenda 2030, culture is viewed as a cross cutting theme

**Goal 2: The Jamaican Society is Secure, Cohesive and Just**

NATIONAL OUTCOMES	SDGS
Security and Safety	11 SUSTAINABLE CITIES AND COMMUNITIES, 16 PEACE AND JUSTICE
Effective Governance	5 GENDER EQUALITY, 10 REDUCED INEQUALITIES, 16 PEACE AND JUSTICE

**Goal 4: Jamaica has a Healthy Natural Environment**

NATIONAL OUTCOMES	SDGS
Sustainable Management and Use of Environmental and Natural Resources	6 CLEAN WATER AND SANITATION, 12 RESPONSIBLE CONSUMPTION AND PRODUCTION, 14 LIFE BELOW WATER, 15 LIFE ON LAND
Hazard Risk Reduction and Adaptation to Climate Change	13 CLIMATE ACTION, 15 LIFE ON LAND
Sustainable Urban and Rural Development	1 NO POVERTY, 10 REDUCED INEQUALITIES, 11 SUSTAINABLE CITIES AND COMMUNITIES

**Goal 3: Jamaica's Economy is Prosperous**

NATIONAL OUTCOMES	SDGS
A Stable Macroeconomy	8 GOOD JOBS AND ECONOMIC GROWTH
Enabling Business Environment	4 QUALITY EDUCATION, 8 GOOD JOBS AND ECONOMIC GROWTH
Strong Economic Infrastructure	6 CLEAN WATER AND SANITATION, 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Energy Security and Efficiency	7 AFFORDABLE AND CLEAN ENERGY, 11 SUSTAINABLE CITIES AND COMMUNITIES, 12 RESPONSIBLE CONSUMPTION AND PRODUCTION
A Technology-Enabled Society	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Internationally Competitive Industry Structures	2 NO HUNGER, 8 GOOD JOBS AND ECONOMIC GROWTH, 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE, 12 RESPONSIBLE CONSUMPTION AND PRODUCTION, 14 LIFE BELOW WATER

Source: Planning Institute of Jamaica (PIOJ)

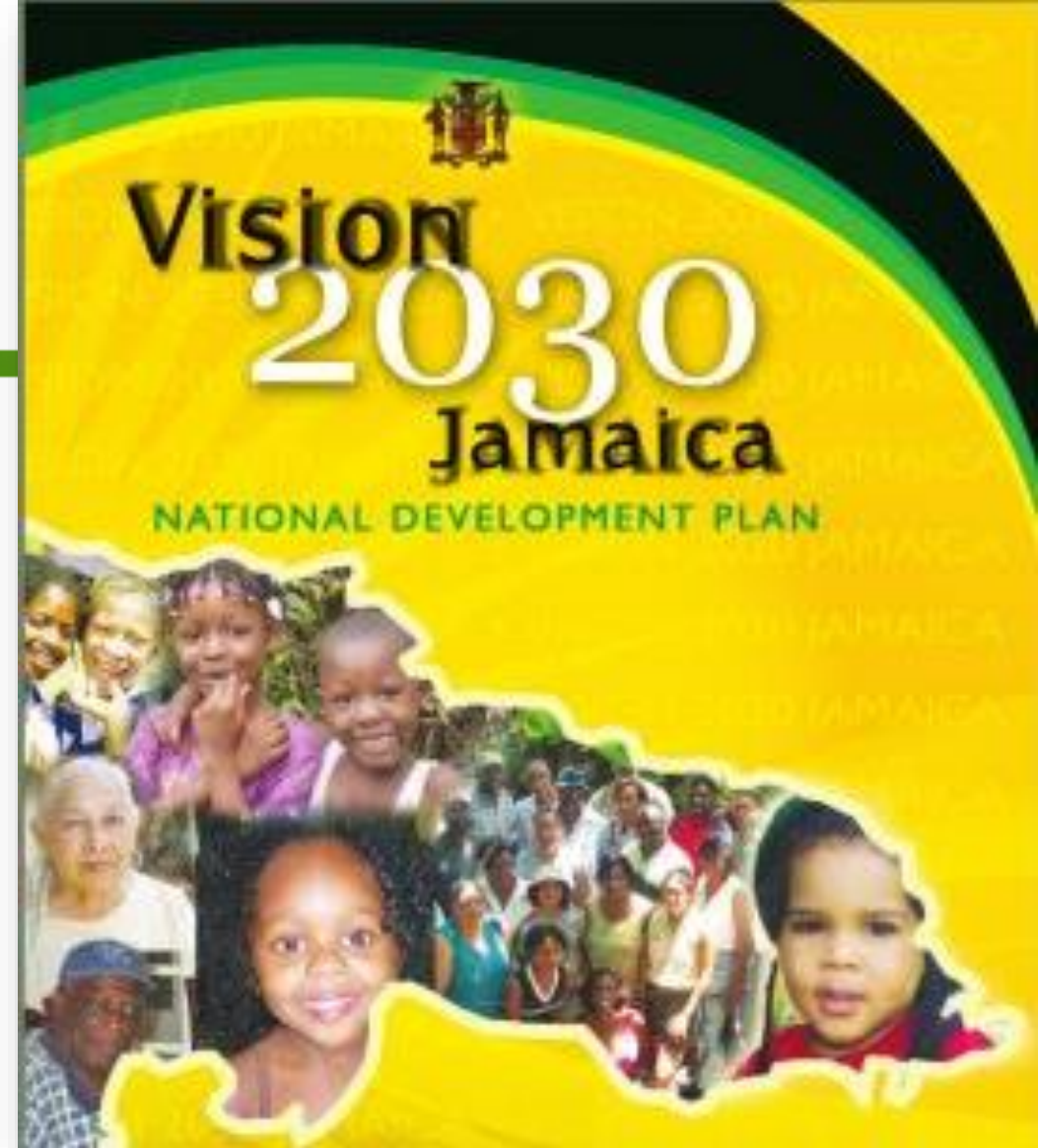




# Jamaica's Vision 2030 NDP

- **Jamaica's Vision 2030: National Development Plan** envisions a nation that is prosperous, being the ideal *'place of choice to live, work, raise families and do business'*. The integration and utilization of geospatial technologies into all areas of development will facilitate the creation of a knowledge-based, technologically-enabled and empowered society towards achieving this vision.
- **National Outcome 11**, therefore speaks to *'making available and accessible geospatial data, products and services to all users, to facilitate planning, sustainable use, management and development of the island's resources.'*

Source: Planning Institute of Jamaica (PIOJ)



# CARIGEO Initiative: Jamaica's Support



**CARIGEO**

Caribbean Geospatial  
Development Initiative

**GEO-EMPOWERING THE CARIBBEAN**

**To improve Spatial Data**

**Infrastructures at the national**

**and regional levels in the**

**Caribbean.**

- Jamaica is a member state of the United Nations Committee of Experts on Global Geospatial Information Management (**UN-GGIM**) and the regional body - **UN-GGIM: Americas**.
- Jamaica understands the value of geospatial information and technology towards **spatial planning, sustainable national development** and importantly, in **response to and recovery from the COVID-19 pandemic**.
- As such, Jamaica is a **very active member state**, serving on the CARIGEO Steering Committee, contributing to initiatives that support bridging the geospatial divide, by seeking to empower the countries and territories of the Caribbean to advance the greater use and sharing of geospatial and statistical information to support improved decision making for sustainable national and regional development.



# Urbanization in Jamaica

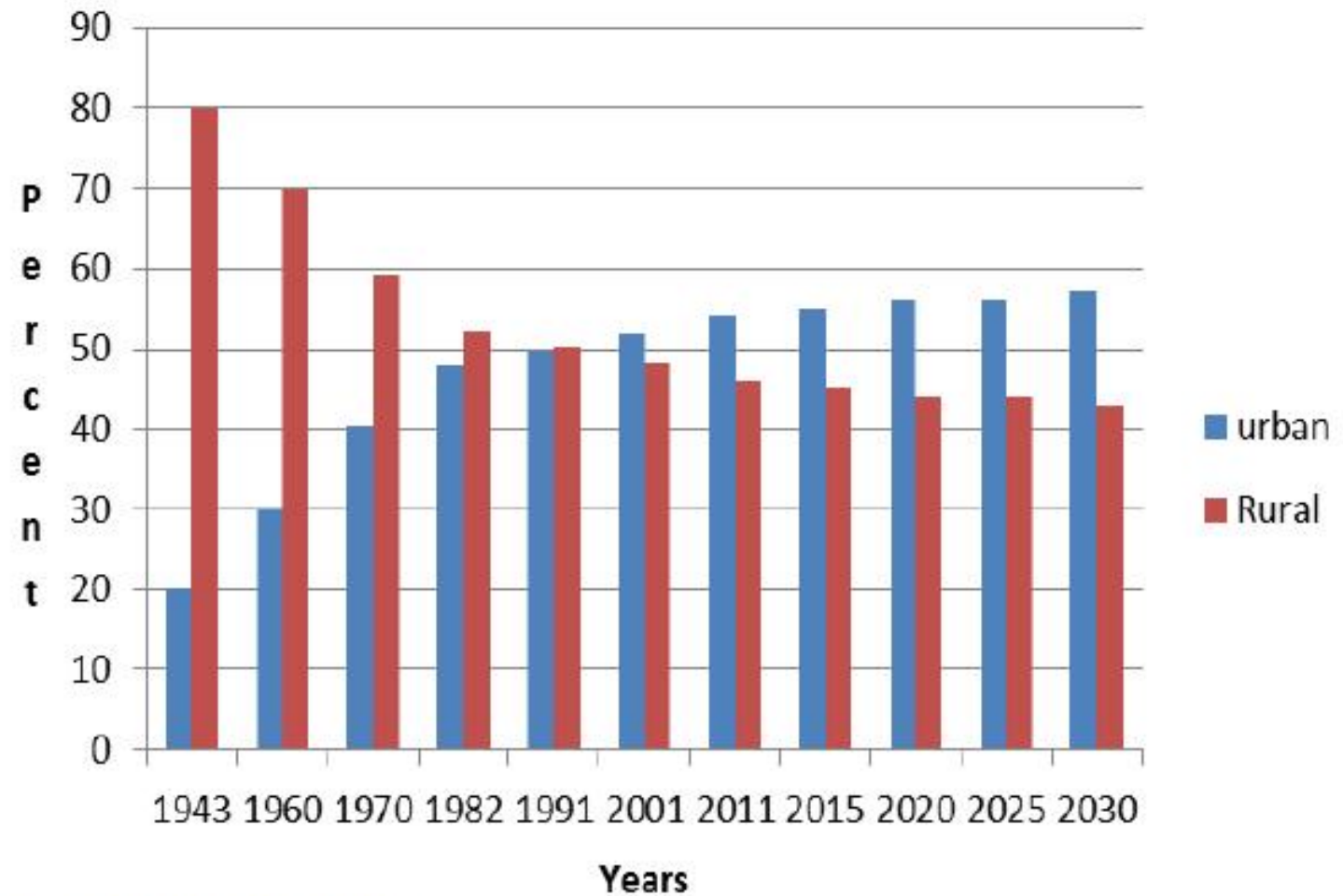
Planning Institute of Jamaica (PIOJ)

# Urbanization in Jamaica

## Quick Facts

- Jamaica has experienced rapid urbanization for more than a decade
- ~20% urban population in the 1940's
- Growth rate of ~10% seen between 1960-1970
- Urban population surpassed rural population by 2001

Trends in Urban Growth in Jamaica, 1943-2030



STATIN 2011; PIOJ 2004

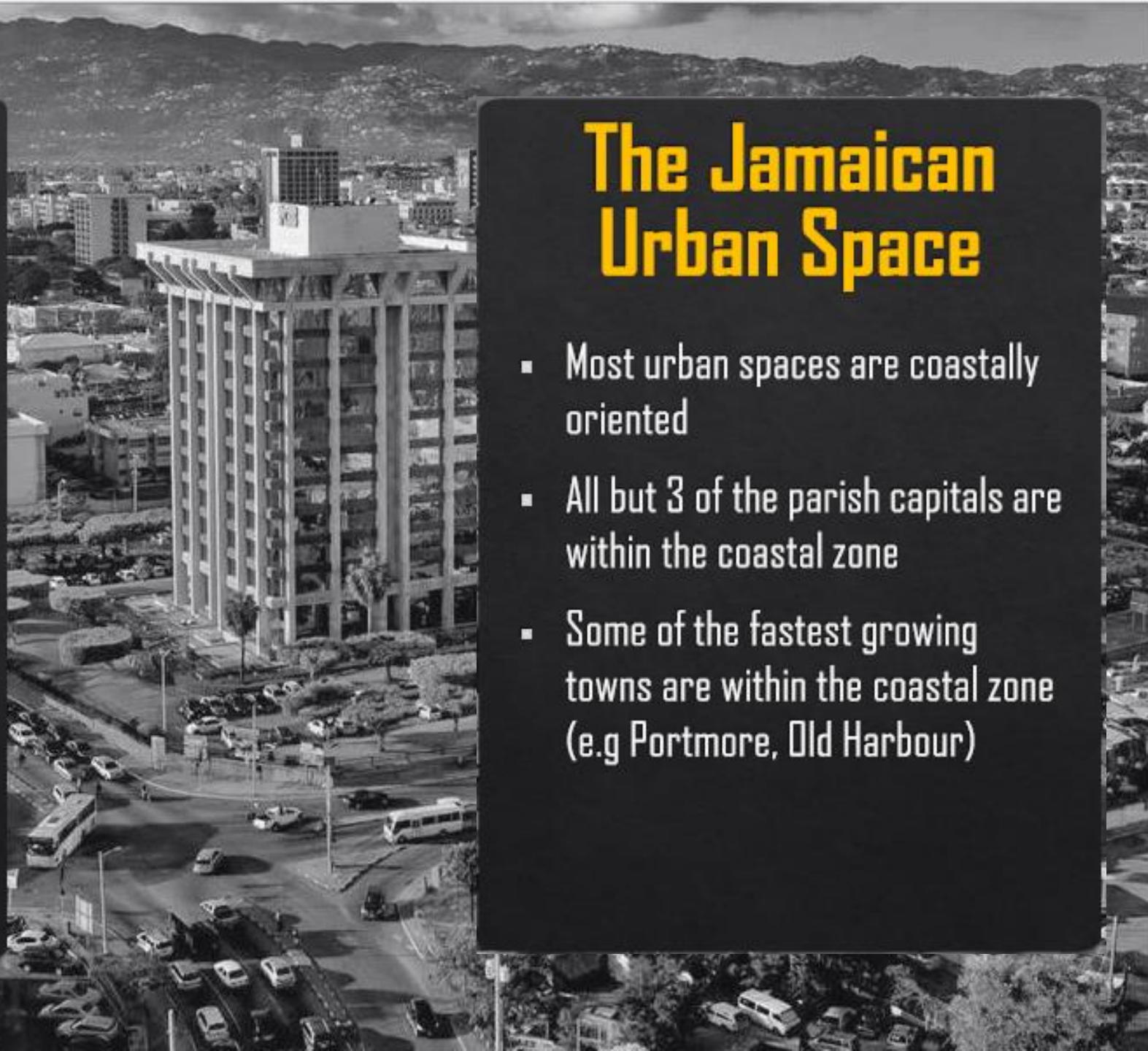
# Urbanization in Jamaica

## Quick Facts

- ~54% of the population live in urban areas (2011 census)
- This represents ~1.37 million people
- Projected to reach 58% by 2030

# The Jamaican Urban Space

- Most urban spaces are coastally oriented
- All but 3 of the parish capitals are within the coastal zone
- Some of the fastest growing towns are within the coastal zone (e.g Portmore, Old Harbour)



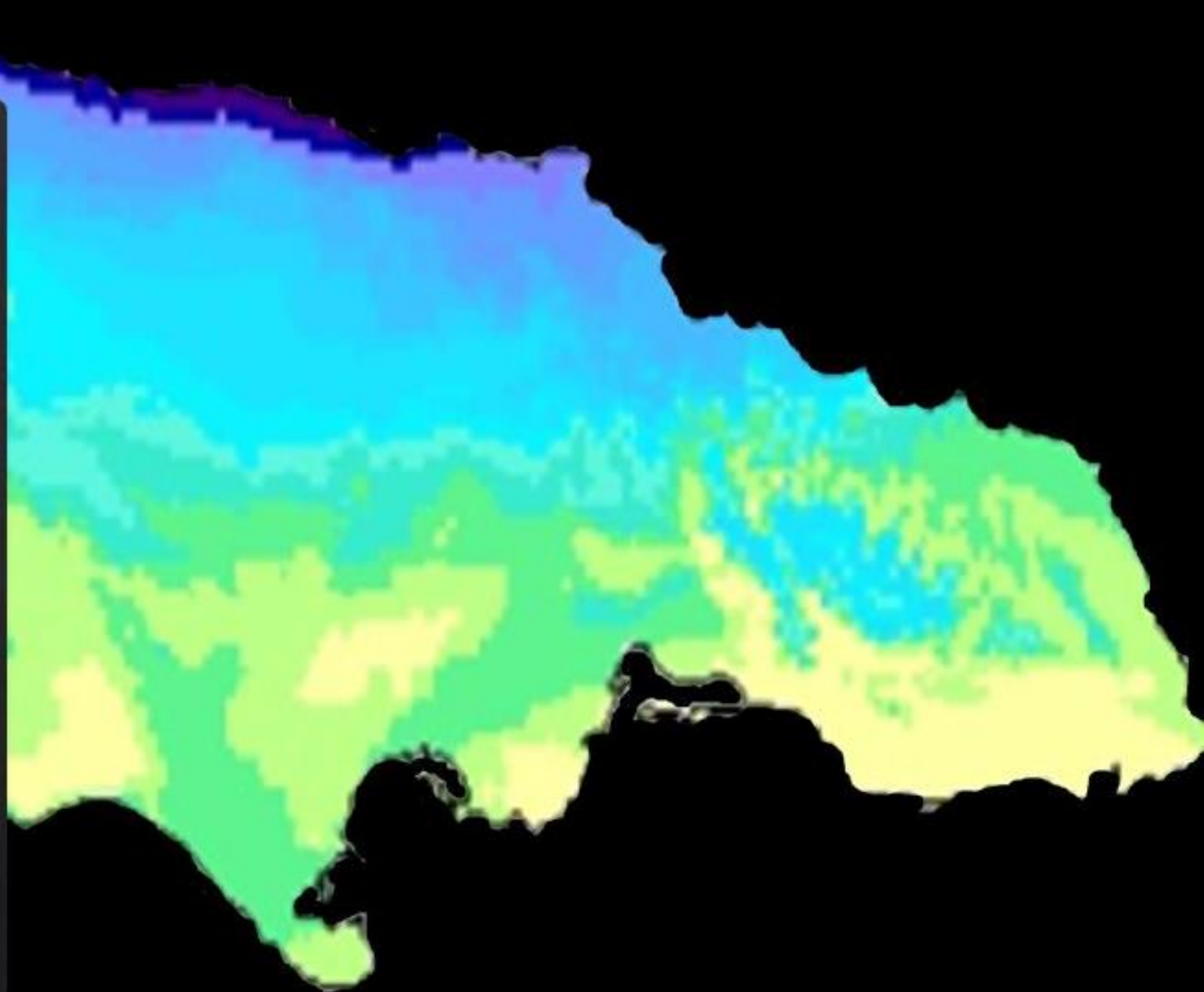
# Development Trends

- Expansion/Sprawl
  - Detached units are the most popular dwelling type (84.2%)
- Density and heat island effect
- Absence of green spaces
- Proliferation of informal/unplanned settlements
- Traffic congestion



## Jamaica's Vulnerability

- Small Island Developing State (SIDS)
- Located in the Atlantic Hurricane Belt
- Predominantly exposed to hydro-met events
- Vulnerability heightened by climate change



# Urban Planning

Integral to:

- **Green development/growth** (harmonizing development with environmental sustainability)
- **Smart Growth + Smart Cities** (liveability and the efficient use of land; integration of technology)
- **Safe Spaces** (using design to ensure resilience and human safety)







# NSPIT Platform

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National Spatial Data Management Branch  
(NSDMB)

A satellite-style map of Jamaica, showing the island's green terrain and blue coastline. The map is centered on the island, with the text overlaid in the middle.

# Welcome to the NSPIT Data Portal!

NSPIT is the National Spatial Planning Information Technology Platform of Jamaica.

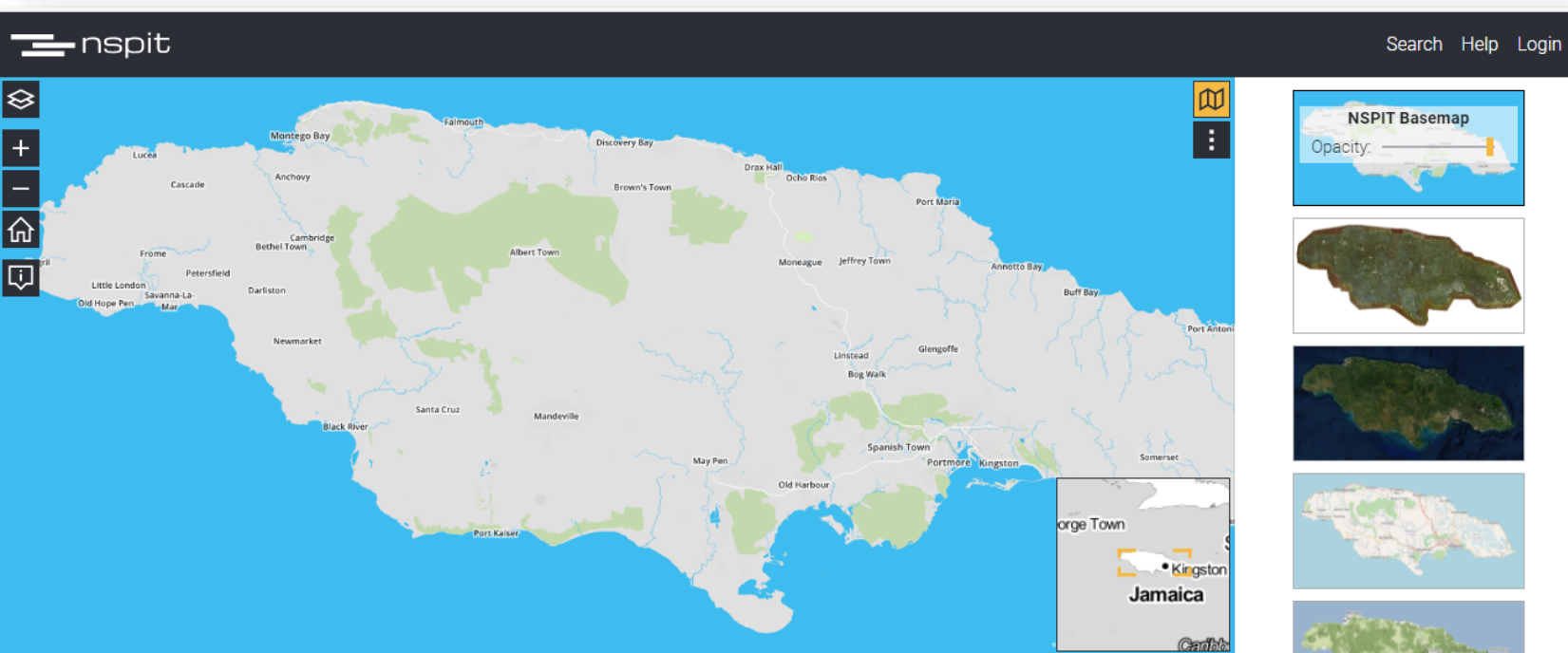
Here you get an overview of the different data in the NSPIT Platform as well as further information about these data (metadata). You can use various filter and search functions with which you can search for existing data. Many datasets include a WFS link for downloading the data.

## Search Data by Title



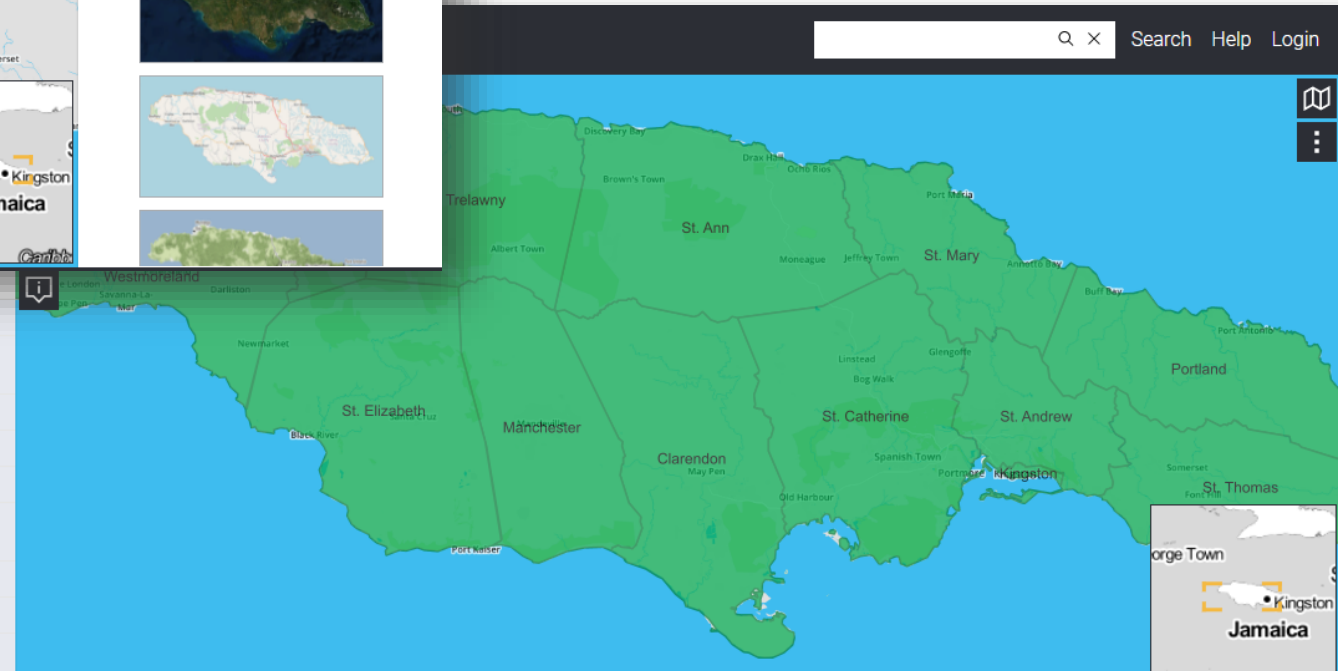
[Advanced Search](#)

# National Spatial Planning Information Technology Platform (NSPIT)



- Comprised of:

- NSPIT Viewer
- NSPIT Data Portal
- NSPIT Help Portal
- Metadata Plugin



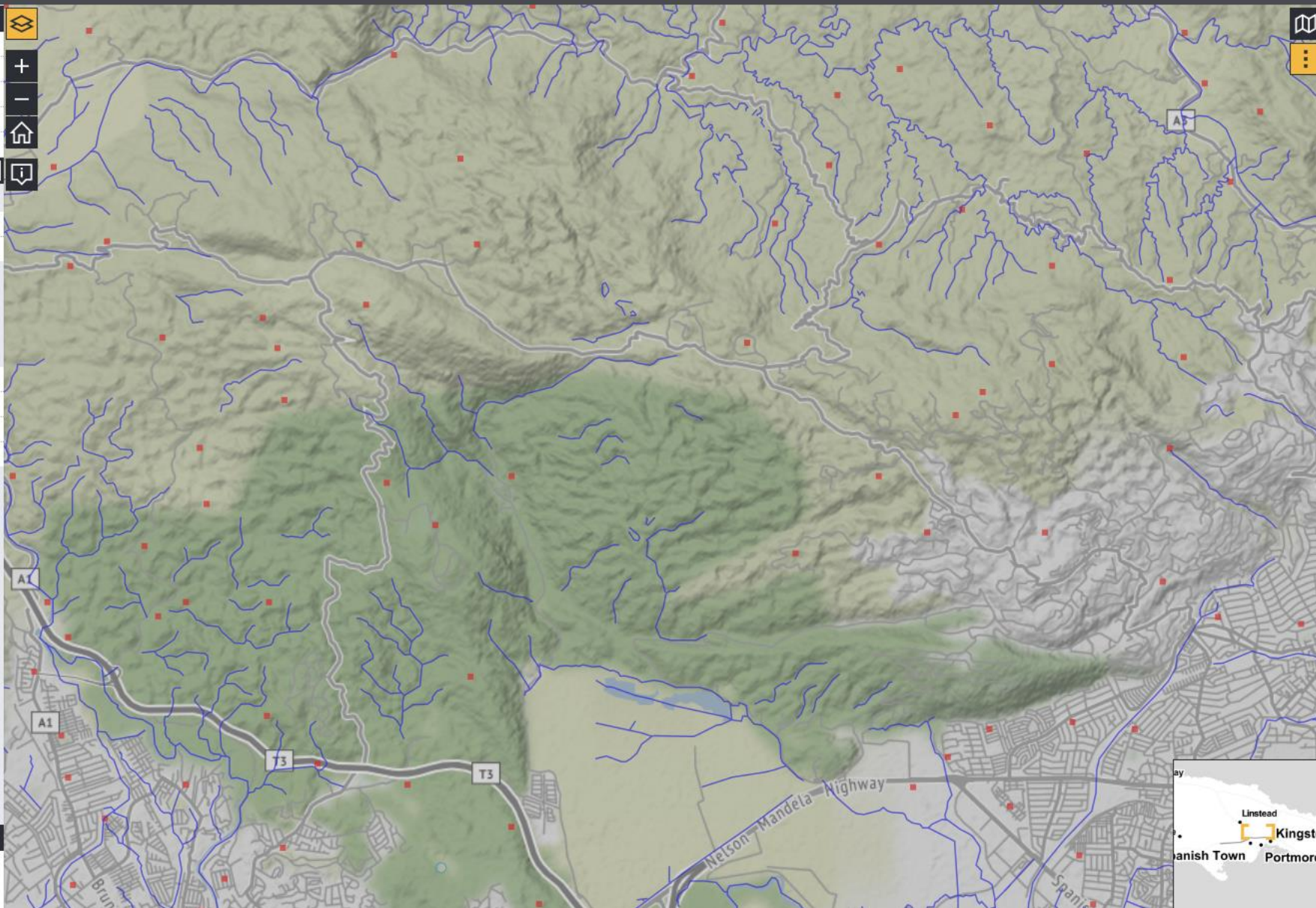
Activated Layers (5)

- rivernetwork
- administrative\_settlements
- Roads
- Settlements
- Airports

Categories

- Administrative Boundaries
  - Administrative Parishes
  - Settlements
- Economic Growth and Job Creation
- Culture, Gender, Entertainment and Sport
- Transport and Mining
  - Airports
    - Airports 2
    - Geologic Faults
  - Roads
- Tourism
- Science, Energy and Technology
- Local Government and Community Development
- National Security
- Labor and Social Security
- Industry, Commerce Agriculture and Fisheries
- Justice
- Education, Youth and Information
- Health and Wellness
- Finance and Public Service
- Uncategorized

Personal Layers



Measure

xy

Result: 0

Units: [dropdown]

Print

Title (0/40)

Subtitle (0/60)

Page size: A4

Page orientation: Portrait

Print resolution (dpi): 96

Map scale: 1:1200000

Comment (0/500)

Cancel Print



Project Manager

User Profile (user)

Settings

- Zoom
- Full Extent
- Geolocation
- Measure
- Draw
- Print
- Scale
- Scale Line
- Display Coordinates

WGS84 (4326)

- Overview Map



Measure

Draw

Symbol style:

Color:

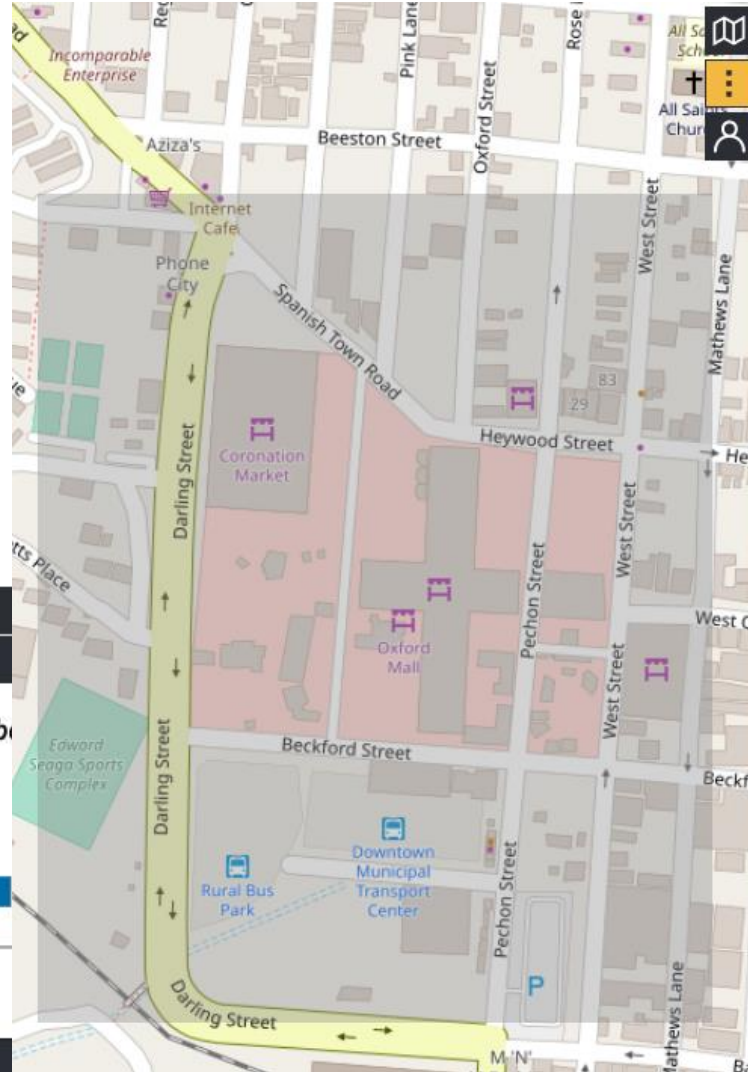
Opacity:

> Add text

Created layers:

- Emancipation Park

Print



Measure

Draw

Print

Title (26/40)  
Coronation Market and Area

Subtitle (0/60)

Page size  
A4

Page orientation  
Portrait

Print resolution (dpi)  
96

Map scale  
1:2500

Comment (0/500)

Cancel Print

Spatial Bookmarks

- OpenLayers
- PostgreSQL / PostGIS
- GeoServer
- MySQL

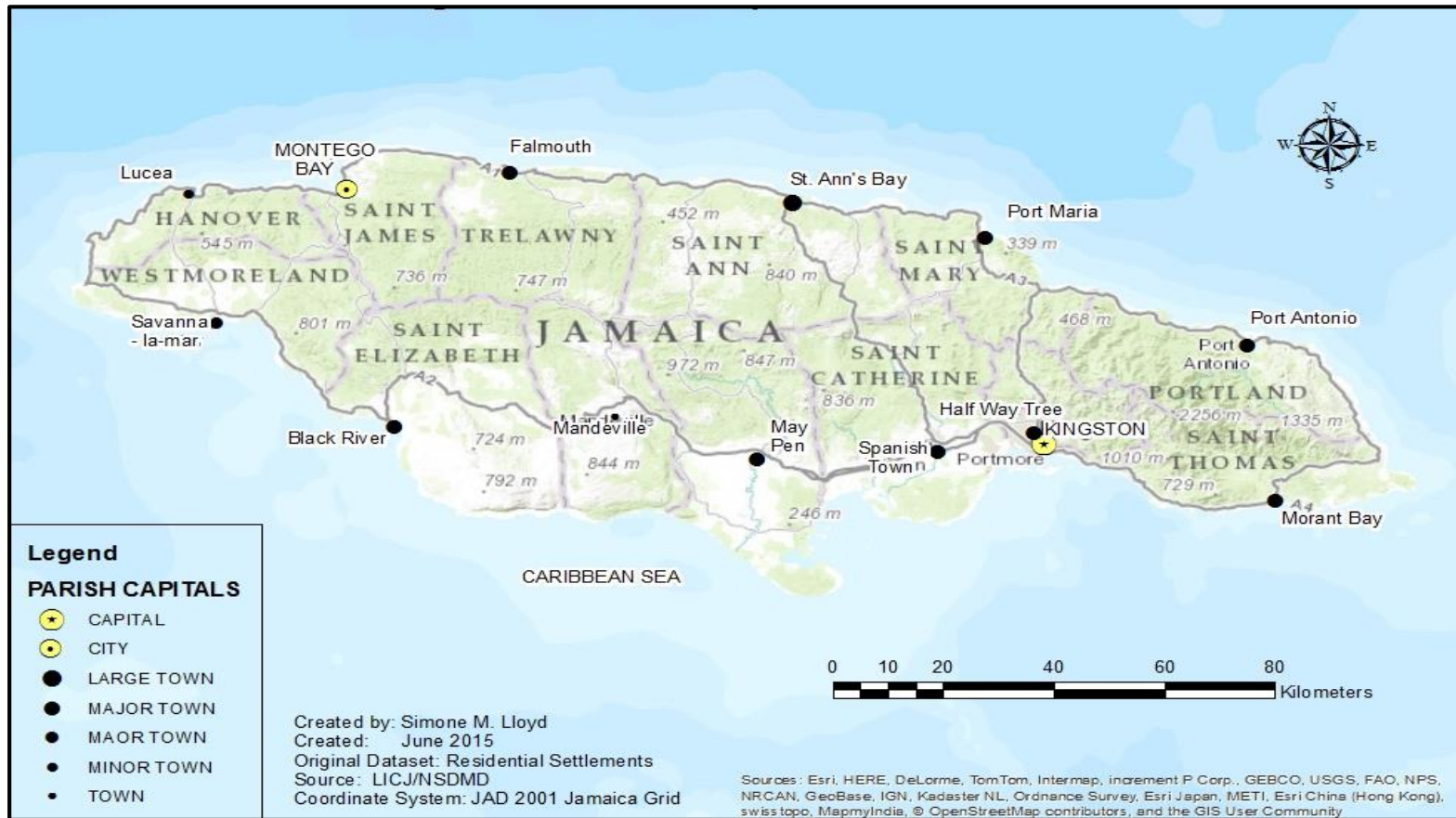




# Jamaica Next (Third) City

Urban Development Corporation (UDC)

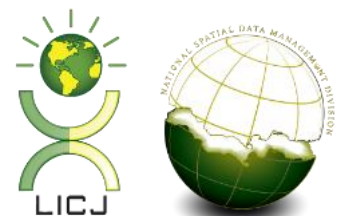
# Urbanization in Jamaica



- Jamaica currently has two cities:
  - **Kingston** – capital, serving as the seat of Government and centre for economic, social and environmental activities.
  - **Montego Bay** - second city and main tourism destination port. Considered tourism mecca of the Caribbean.

## Parish Capitals of Jamaica

Source: Lloyd, 2015 (author)





# Vulnerability to Extreme Events

- **Unplanned cities** as well as **exposure to natural hazards** exacerbates the Jamaican reality as most of Jamaica's built environment is located near or on the coast.
- The **major urban centres** of Kingston and Montego Bay are **coastal settlements** and extremely vulnerable to extreme events and the impacts of climate change.
- The costs and losses associated with these events to the resources on which these cities depend, its urban settlements and coastal areas have been significant and will worsen in light of the projected increase in frequency and intensity of these events



# Jamaica's Next (Third) City

- The development of Jamaica's Next (Third) City is an ambitious but important action to respond to the impacts and challenges of climate change. **A very high priority project.**
- Project is in alignment with achieving **SDG 11: Sustainable Cities & Communities**
- It will provide a **sustainable, carbon neutral and climate resilient environment that utilizes smart technologies, as well as local and international best practices in its overall development.**
- The project is designed to include the implementation of sustainability in all aspects of its infrastructure including **careful water, energy, and other resource management.**
- This will serve to **reduce the vulnerability of Jamaica to economic shocks** (e.g. the effects of pandemics such as COVID 19) **and its cities to natural hazards**, thereby creating a city which leads the way in **smart infrastructure management, new forms of work and living.**

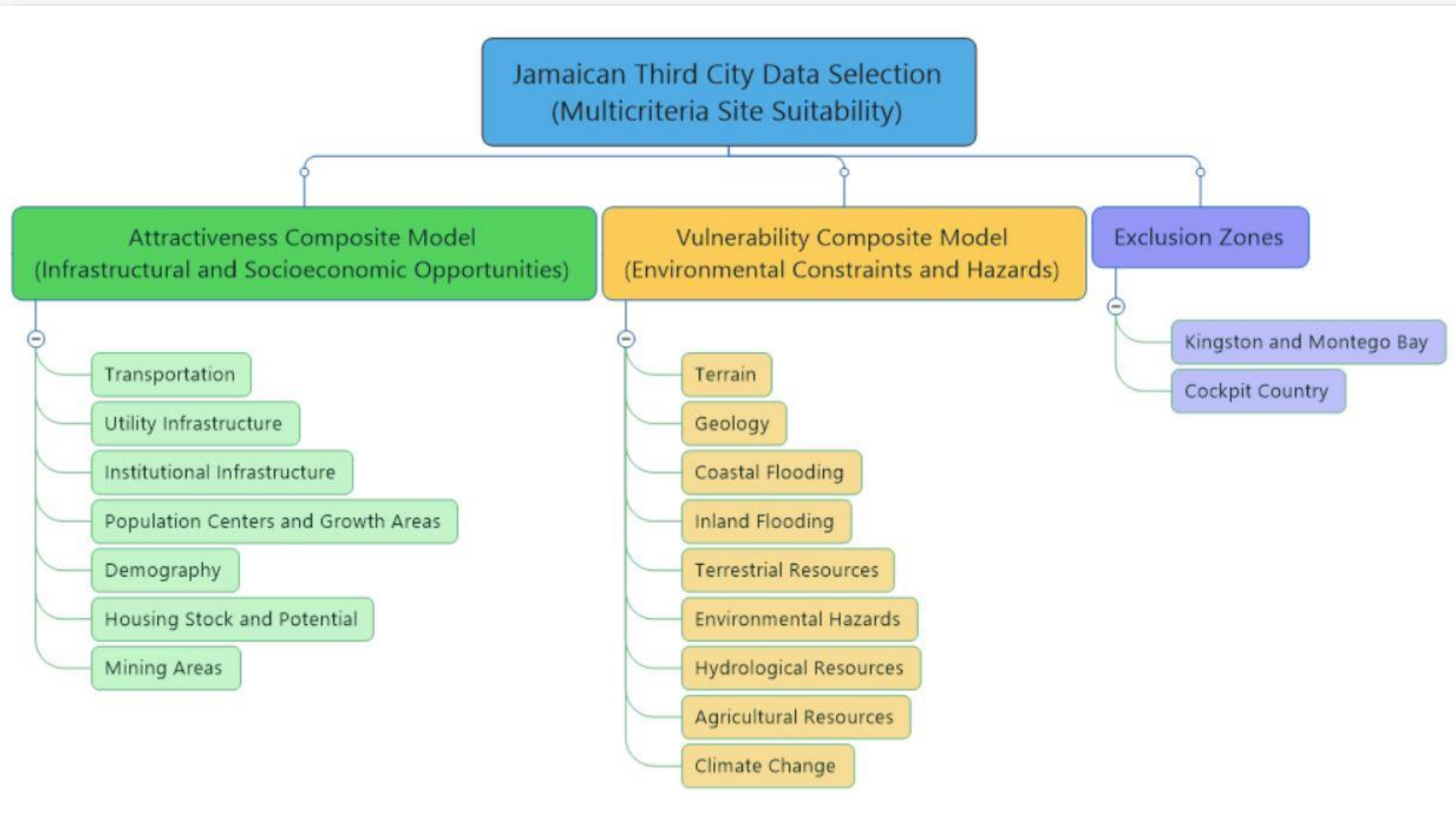


# Jamaica's Next (Third) City

- In response to the Government of Jamaica (GOJ) mandate, the **Urban Development Corporation (UDC)** initiated and with the support of its government and non-government partners, led the process to identify the location for another city which will **have minimal risk to natural and climate change induced hazards.**
- With the use of a **Geographical Information System (GIS)** and data from **government agencies**, a **multi-criteria site suitability model (MCSSM)** was created to identify areas across the island **least vulnerable to natural hazards and sea level rise.**
- Three (3) models and a number of sub-models were created. These models analyzed data associated with **hazards, protected areas and the built environment.**
- A **land suitability classification** was developed and lands falling within the ***highly suitable and suitable* bands** were deemed potential areas for urban development.
- These areas were further evaluated in the **Horizon Scanning and Foresighting analysis** to determine the which were best suited for urban development.



# Jamaica's Next (Third) Data Selection





















Attractiveness vs. Vulnerability

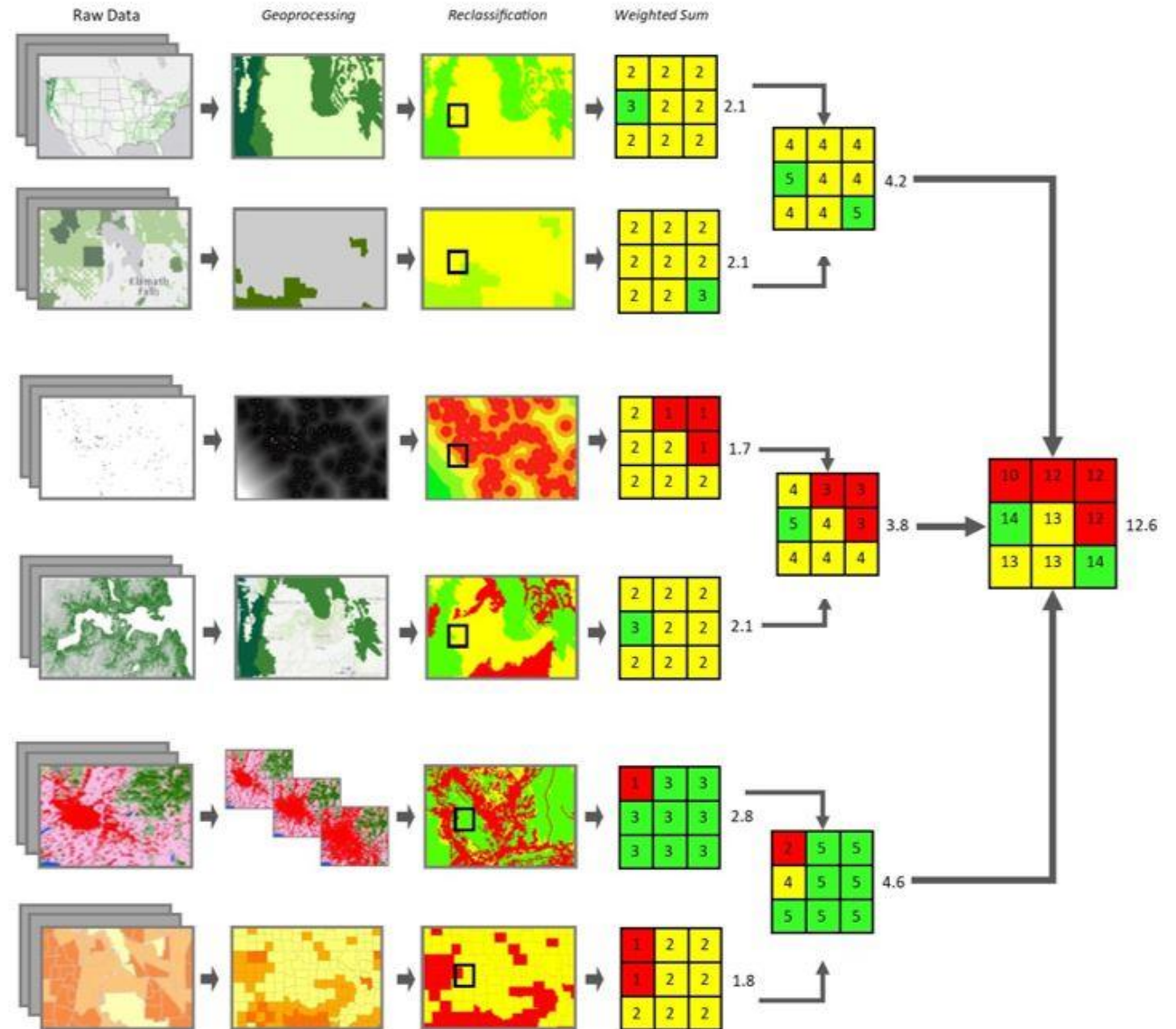


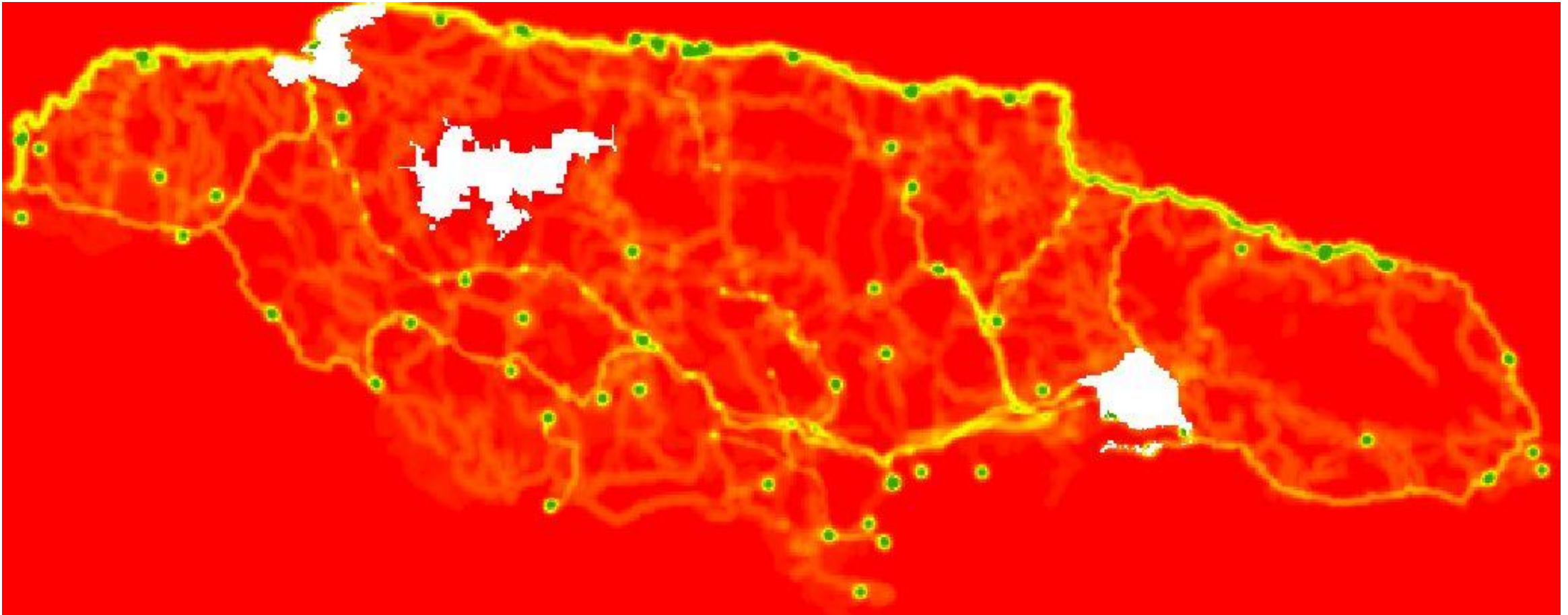
# Model Overview

## Multicriteria\_Site\_Suitability.tbx

-  Agricultural\_Resources\_Model
-  Climate\_Change\_Model
-  Coastal\_Flooding\_Model
-  Demography\_Model
-  Environmental\_Hazards\_Model
-  Exclusion\_Zones\_Model
-  Final\_Suitability\_Model
-  Geology\_Model
-  Housing\_Stock\_and\_Potential\_Model
-  Hydrological\_Resources\_Model
-  Inland\_Flooding\_Model
-  Institutional\_Infrastructure\_Model
-  Mining\_Areas\_Model
-  Population\_Centers\_and\_Growth\_Area
-  Terrain\_Model
-  Terrestrial\_Resources\_Model
-  Transportation\_Model
-  Utility\_Infrastructure\_Model

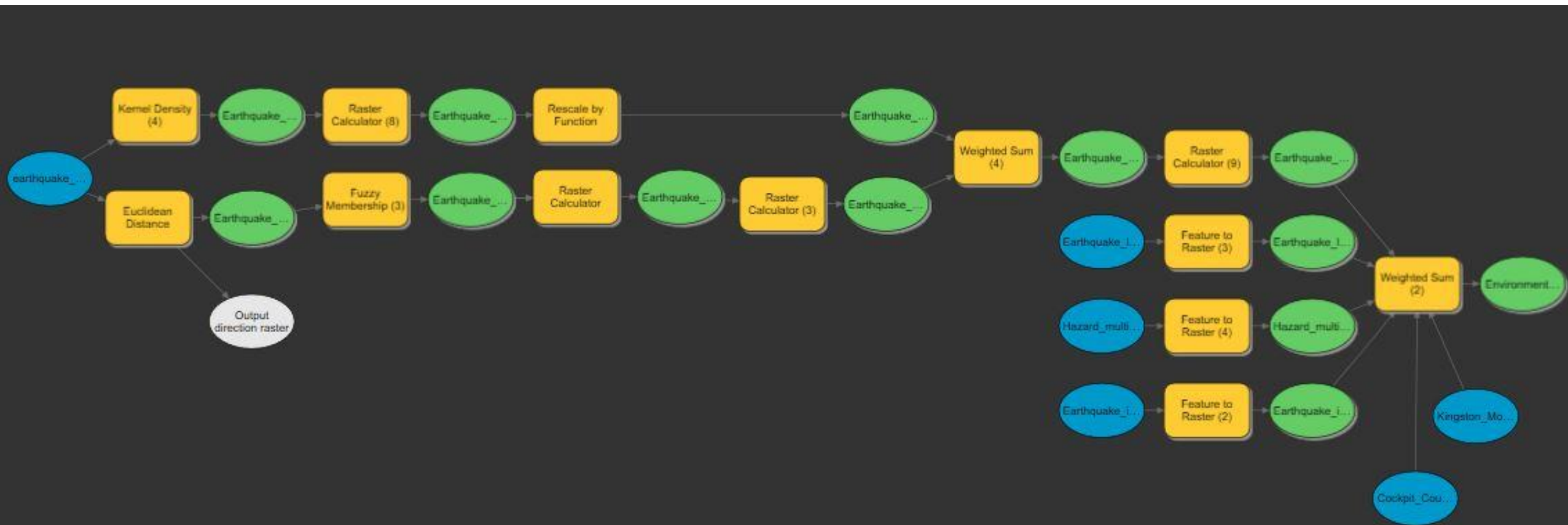
## Sub-model Overview





## Transportation Model Output





# Environmental Hazards Model



# Geospatial Application in Third/Next City Project



Extensive geospatial data from many GOJ entities and other sources

Utilization of extensive ArcGIS Desktop, web application, mobile application and enterprise tools and solutions accessed under GOJ/ESRI Enterprise Agreement

Generation of **multi-criteria site suitability model (MCSSM)**, three (3) models and a number of sub-models.

- The outcomes and final decision will officially be announced by the Most Honourable Prime Minister Andrew Holness





# Streetscape Study: Seymour Lands (Seaview Avenue) Using 3D Visualization Tool

National Environment & Planning Agency (NEPA)

# Streetscape Study: Seymour Lands

## Citizens concern

The citizens were concerned that the increased densities of 75 habitable rooms per hectare to a maximum of 125 habitable rooms per hectare will contribute to mobility chaos if the requisite detailed planning is not carried out.



## Seymour Lands Location map.

The study area is enclosed by Lady Musgrave Road, Montrose Road, Seymour Avenue, Seaview Avenue, Old Hope Road and Fairway Avenue.



# Methodology for the Study

The modelling of the project had two main objectives:

- 1) Demonstrate how advanced GIS applications can be integrated into NEPA's development planning process.
- 2) Create a GIS-based 3D model in relation to current zoning standards.

## Elements of Streetscape:

- Sidewalks & Curbs
- Street corners
- Trees and landscape strips
- Planters
- Street furnishing
- Benches
- Lighting
- Trash receptacles
- Signage
- Bus shelter
- Bicycle facilities
- Crossing



# GIS 3D Modelling

(ArcGIS CityEngine)

SEYMOUR EXISTING LAND USE

[SHARE](#) [HELP](#) [SIGN IN](#) [ARCGIS ONLINE](#)



## Layers



Street Network



Building\_Footprint\_Export\_Output



GL\_Parking\_Bays



Lot15\_SeaviewAve



T15Seaview\_fprint



broadLeaf\_2

POWERED BY  
**esri**

# GIS 3D Modelling

## (ArcGIS CityEngine)

Seymour's Land 3D Streetscape Studies

[SHARE](#) [HELP](#) [SIGN OUT](#) (SIMONE LLOYD)



### Layers



BF\_Mer



Green\_Space



SeymourPark



Park\_Bench\_3



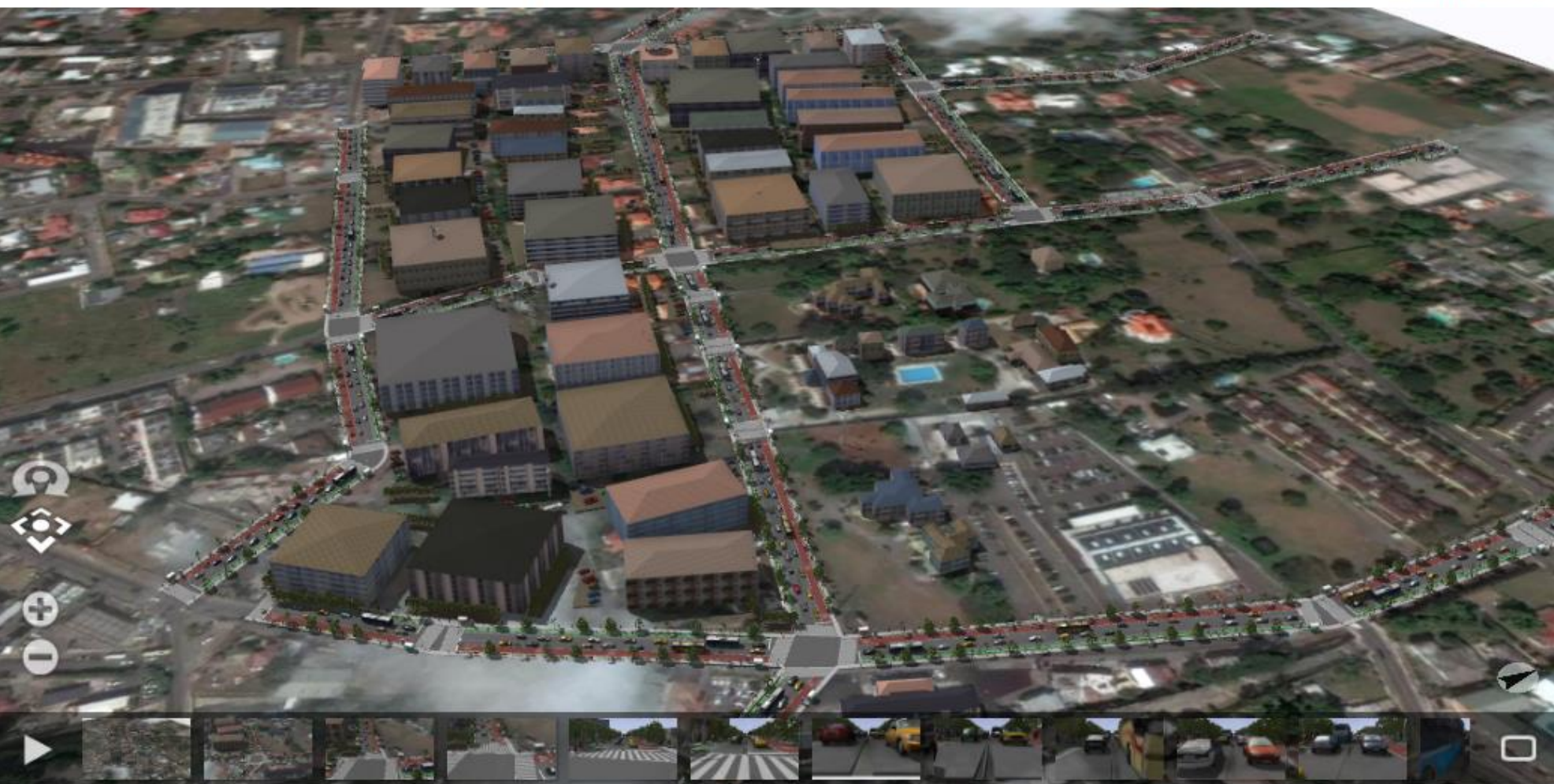
Streetnetwork



Bike\_Rack2



Circle\_SignBase

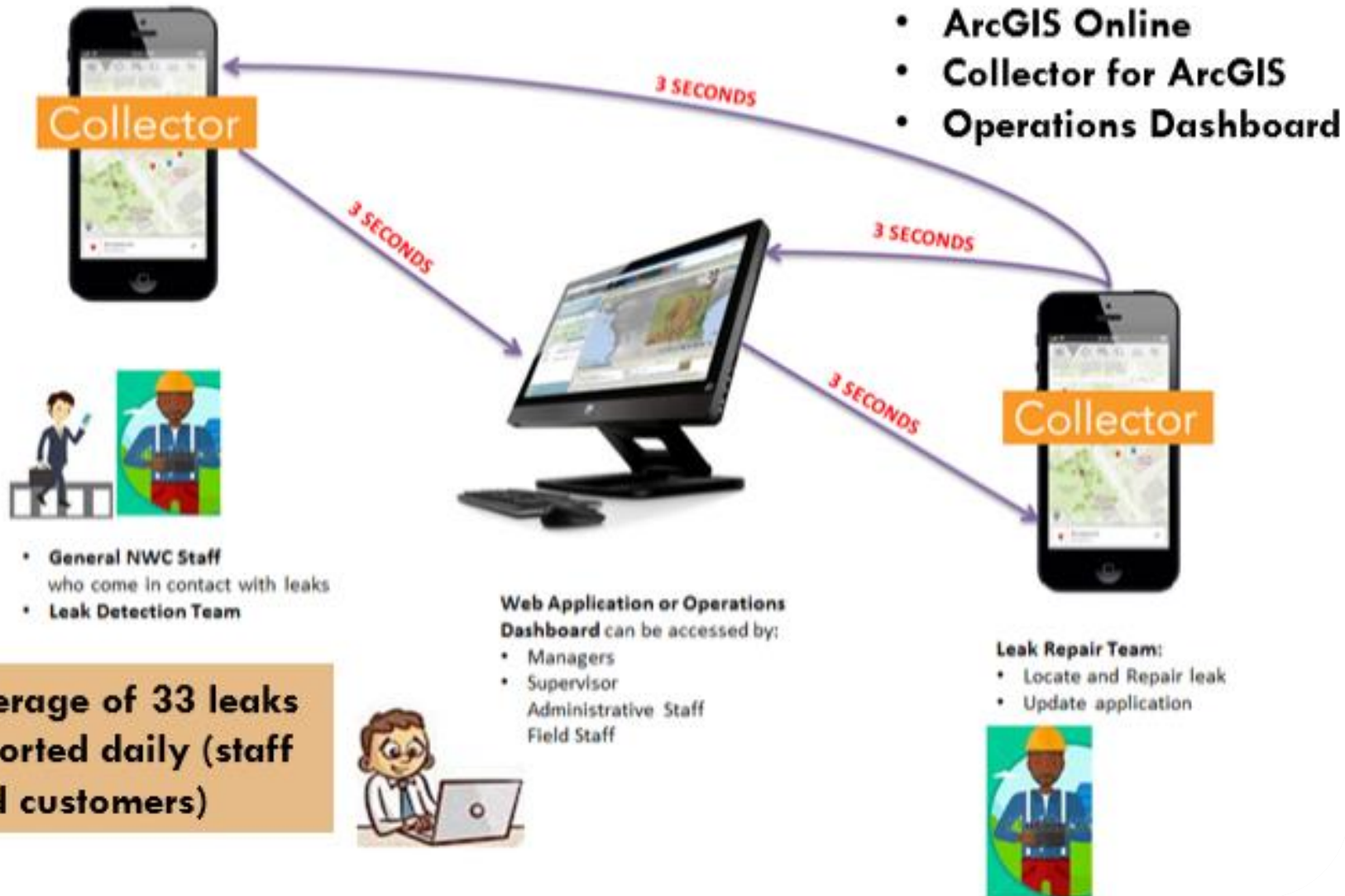




# Potable Water & Wastewater Provision

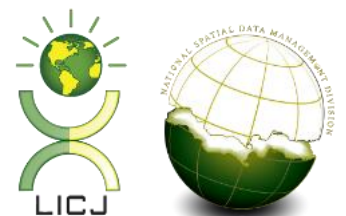
National Water Commission (NWC)

# HOW THE LEAK MAPPING APPLICATION WORKS



# NWC's Geospatial Technology Reliance

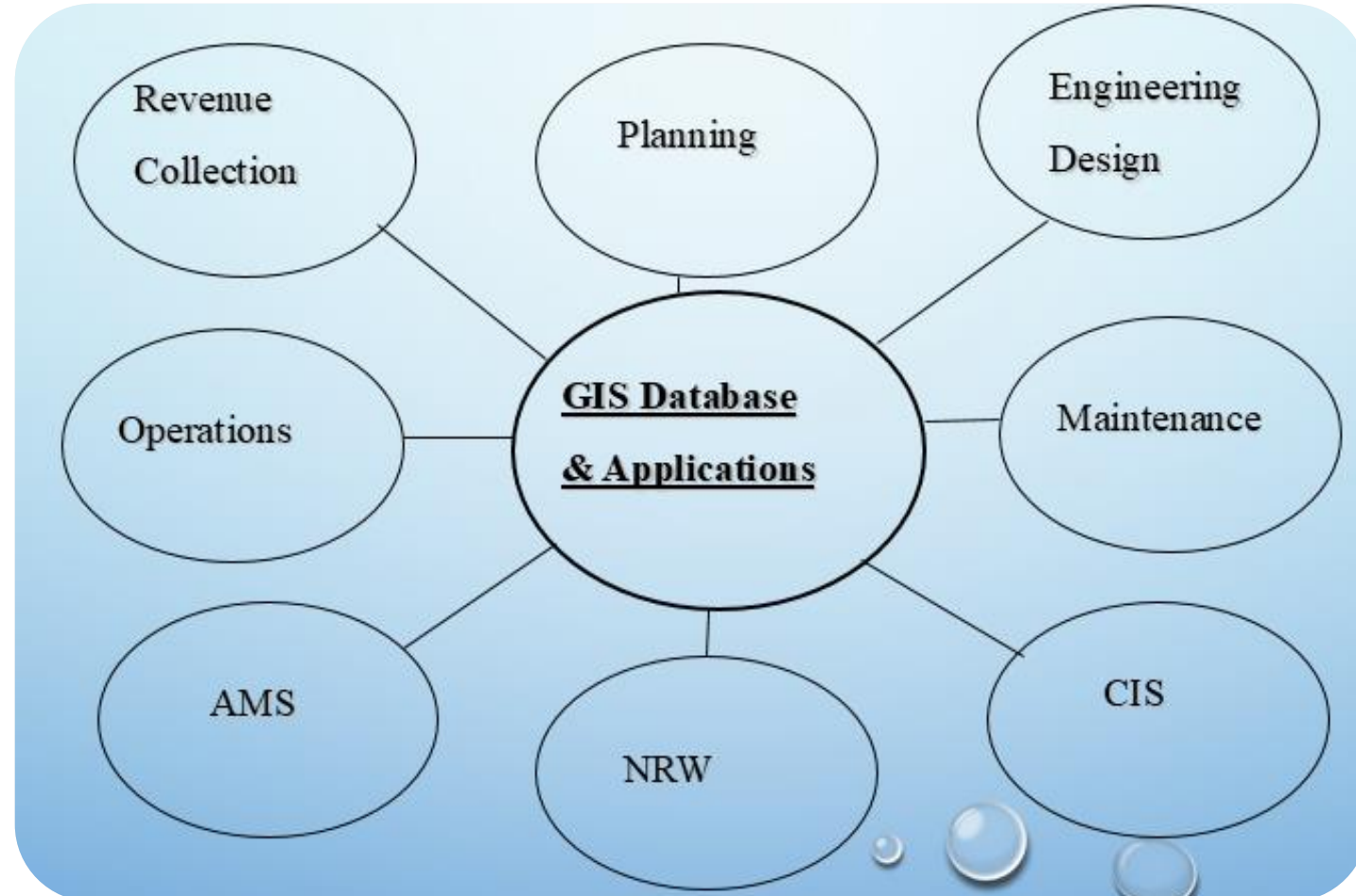
- The efforts of the NWC to provide potable and waste water resources to the island of Jamaica, is hinged on the utilization of geospatial information and technology.
- NWC has an ArcGIS enterprise system that relies on complete and accurate data on all its assets along with geospatial data from external agencies such as STATIN, NLA, NEPA, etc.
- The GIS Unit therefore ensures that:
  - the provision of tools to **perform complete analysis on existing facilities**
  - Solid software and data support for **modelling present situation**
  - Support for **simulating/analyzing the future or present impact of various scenarios on the potable and wastewater network** such as:
    - o population growth
    - o disaster management: planning, mitigation and response
    - o impact of system failure



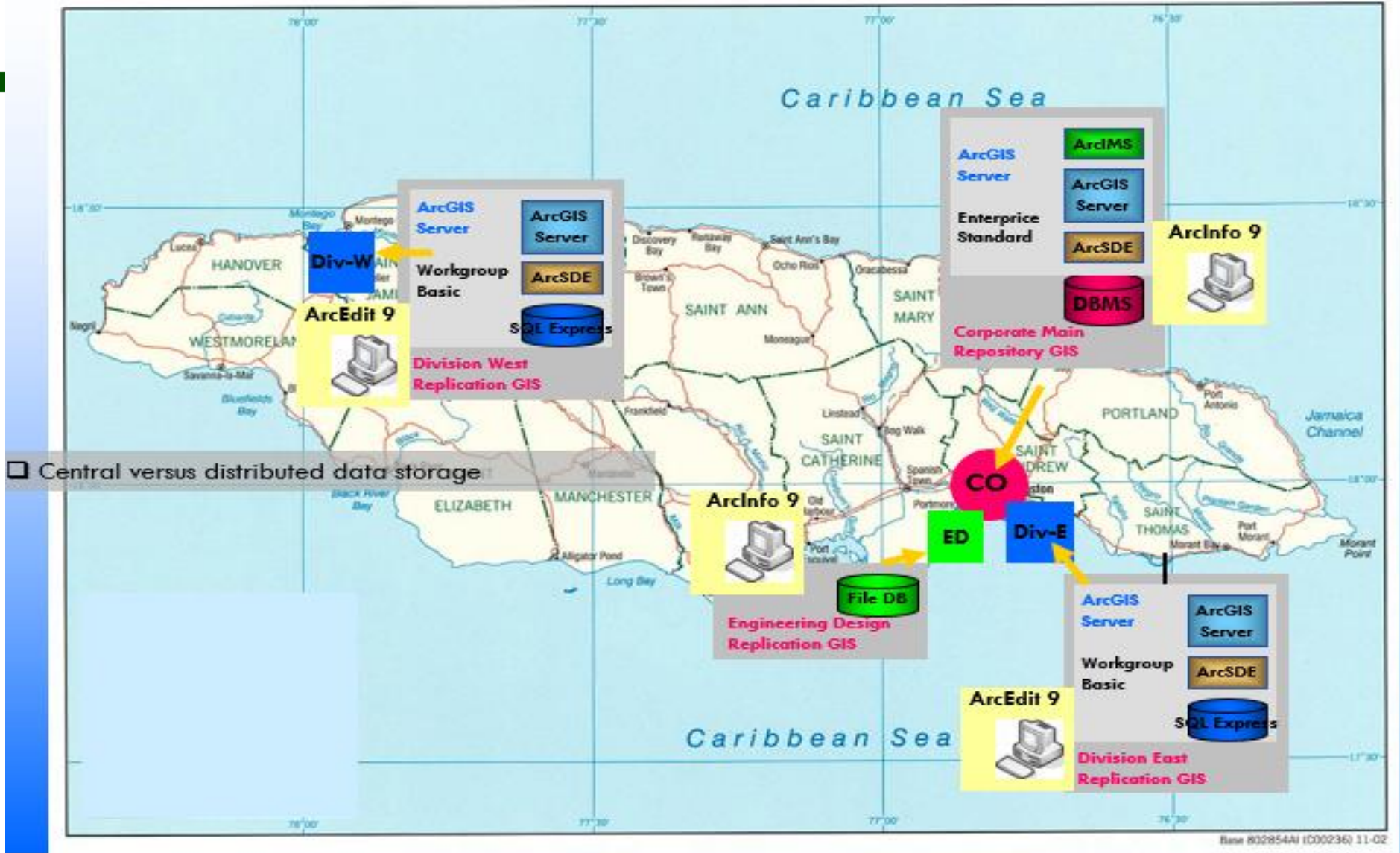


# GIS Functional Integration within NWC

- Centralized data storage
- Decentralization of data collection process
- Asset management
- Asset location
- Maintenance
- Production
- Operations
- Leak detection and repairs
- Customer data



# GIS System Architecture in NWC



# NWC's Geospatial Technology Reliance

- Geospatial support is especially necessary to support the **Engineering Department** and the **Investment and Performance Management Department**.
- The **Subdivision Approval process** relies heavily on the availability of the GIS incorporating the **potable and wastewater networks** with a number of **other critical layers** and so **minimizes the need for field verification** in many instances.
- This has enabled a **significant reduction in time** taken to process applications.





**LEGEND**

**Account Status**

- Active
- Inactive
- Parish Boundary

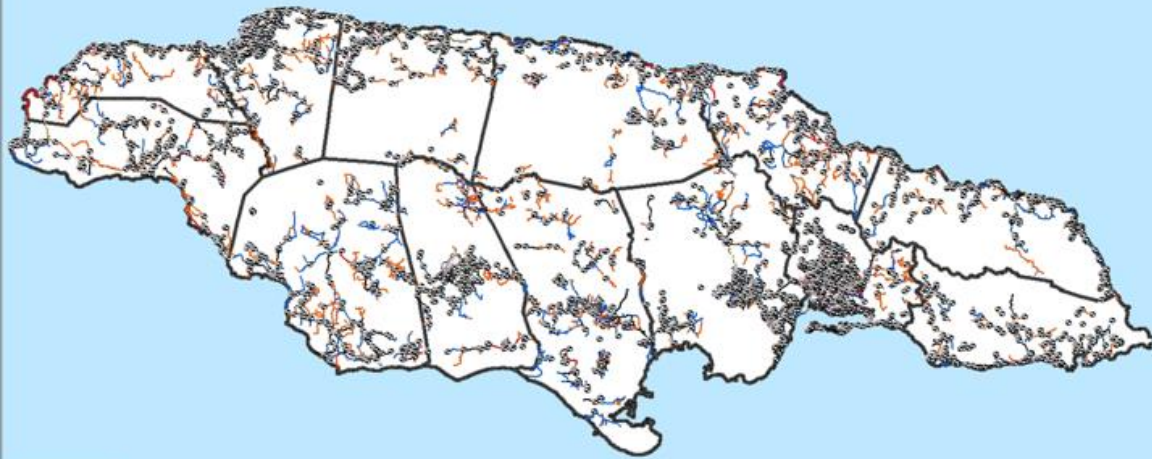
NWC Customer Location



**LEGEND**

- JFB Station
- Hydrant

**NWC & JFB Fire Hydrant Survey**



**LEGEND**

- 0.5" - 2"
- 3" - 4"
- 6" - 8"
- 10" - 12"
- 13" and over
- Parish Boundary
- System Valve

**NWC Potable Network**

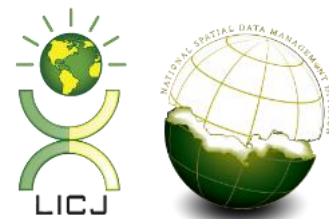


**LEGEND**

- Leak
- 0.5" - 2"
- 3" - 4"
- 6" - 8"
- 10" - 12"
- 13" and over
- Parish Boundary

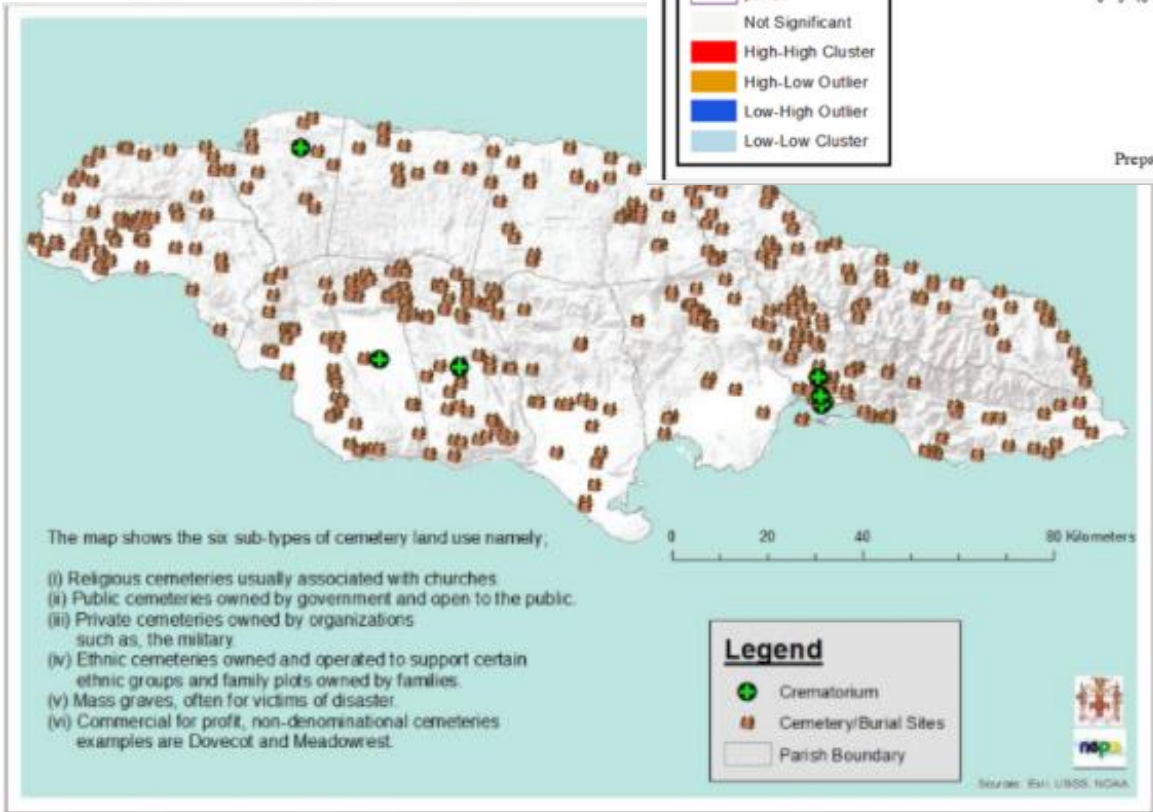
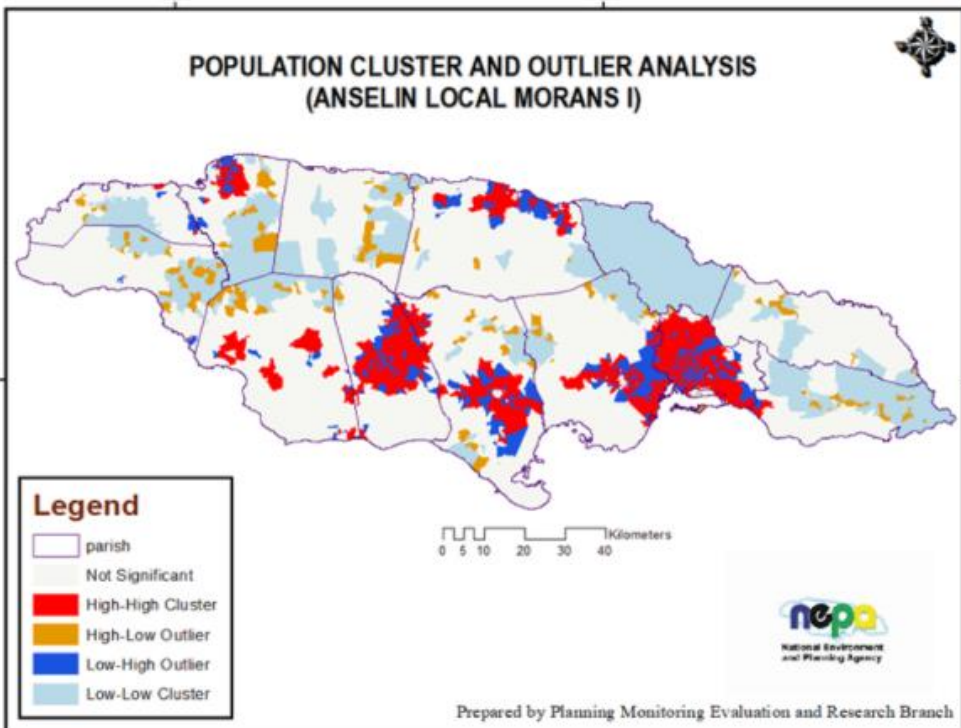
**NWC Leak Analysis**



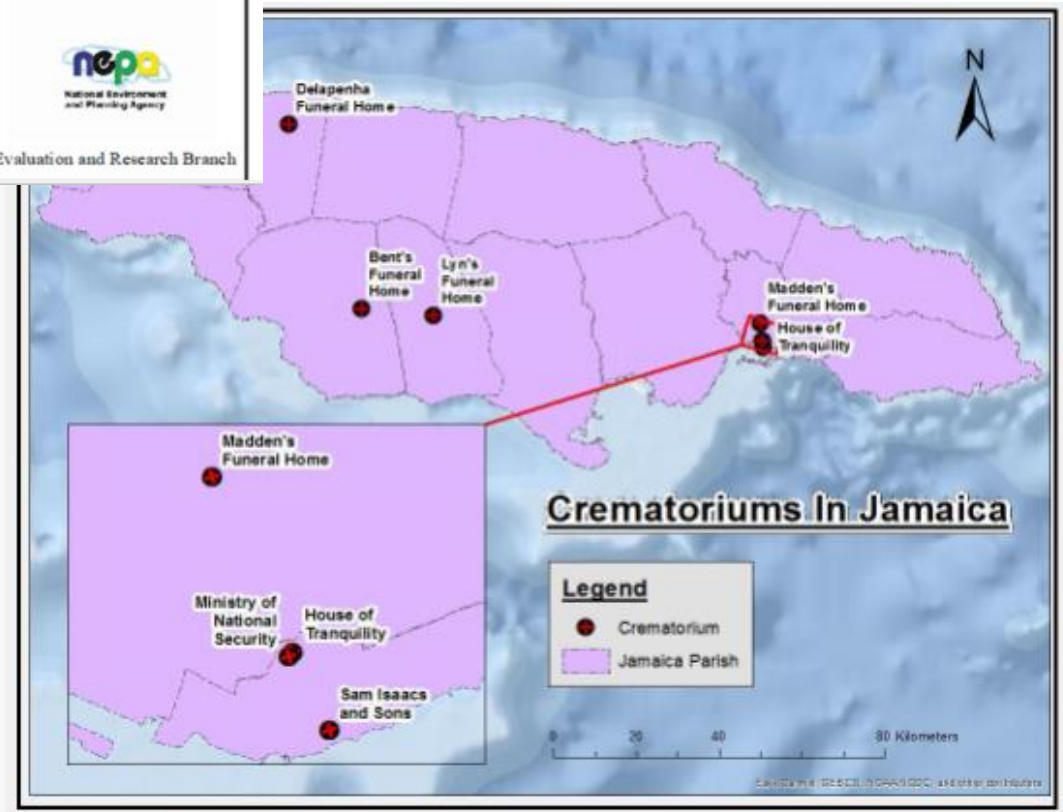


# Population Distribution and Cemetery Land use

National Environment & Planning Agency (NEPA)



Location of Cemeteries/Burial Sites in Jamaica



According to data available there are seven approved crematoriums in Jamaica and they are:



# **GOJ/ESRI Enterprise Agreement: GOJ AGOL Platform**

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# Government of Jamaica



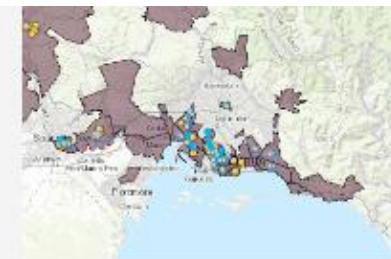
UDC, The Next 50 Years, a con...  
UDC, The Next 50 Years..



Al Ain UNESCO World Heritag...  
This is a map of the site boundaries (marked in red) and buffer zones (marked in green) around the Al A



Special Development Area Do...  
Boundary of Gazetted Tax Incentive Area (Special Development Area-Downtown Kingston 2017)



IDP Interventions in CRP Com...  
This map shows interventions funded by International Development Partners in Community Renewal



HEART Trust/NTA Training - 20...  
Map of Jamaica showing all HEART Trust/NTA training locations and applications received by the Agen



Assets in CRP Communities  
This map shows selected assets in Community Renewal Programme (CRP) communities. CRP was



Al Ain UNESCO World Heritag...  
This is a map of the site boundaries (marked in red) and buffer zones (marked in green) around the Al A



Saint Catherine Wells and Surf...  
Map shows wells and surface water sources in Saint Catherine. Data shown on map may not reflect



Total Members  
**>3070**

**>10,000 hosted services**



# GOJ AGOL Platform Items



Maps

Layers

Scenes

Apps

Tools

Files

Notebooks



My\_Basemap

🌐 by Kharriott\_forestry

Created: Aug 11, 2020

Updated: Aug 11, 2020

View Count: 1



Major Projects Presentation

🌐 by Denodain.Gardner\_GOJ

Created: May 22, 2020

Updated: May 26, 2020

View Count: 11



Recreational Trails

🌐 by jburrell\_forestry

Created: Feb 17, 2020

Updated: Feb 17, 2020

View Count: 47



Scenic Trails

🌐 by jburrell\_forestry

Created: Feb 6, 2020

Updated: Feb 7, 2020

View Count: 104





**Al Ain UNESCO World Heritag...**  
 This is a map of the site boundaries (marked in red) and buffer zones (marked in green) around the Al Ain



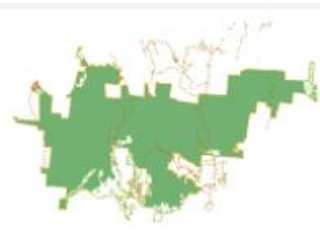
**USAID**  
 This data layer shows USAID interventions in CRP communities.



**Fatal\_Shooting\_2011\_2012\_2...**  
 This layer shows fatal shooting incidents in CRP communities



**Special Development Area Do...**  
 Boundary of Gazetted Tax Incentive Area (Special Development Area-Downtown Kingston 2017)



**Landuse\_Map\_Cockpit\_with\_T...**  
 first draft of forestry department landuse map for Cockpit Country



**Attraction\_Natural\_Resource**  
 This layer shows attractions and natural resources in Community Renewal Programme (CRP)



**JAD2001\_20190325**  
 This is the Control Point Database as at March 25, 2019. It represents marks created in JAD 2001.



**Control\_Point\_Map\_20171120**  
 This is the Control Point Database as at July 21, 2017. It represents marks created in JAD 2001. Orthometric



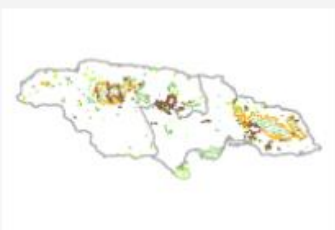
**JAD2001\_20170721**  
 This is the Control Point Database as at July 21, 2017. It represents marks created in JAD 2001. Orthometric



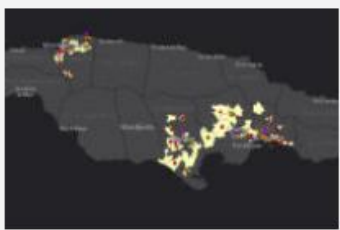
**Inter\_American\_Development...**  
 This data layer shows IDB interventions in CRP communities through the Citizen Security Justice



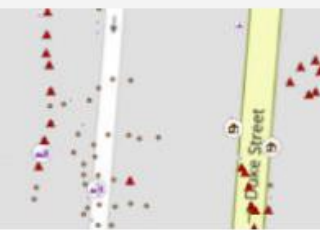
**CRP100**  
 This layer shows the 100 most volatile and vulnerability communities selected under the



**Forestry\_Department\_Web\_A...**  
 first draft of forestry reserve map and recreational parks web application



**World\_Bank\_Integrated\_Com...**  
 This data layer shows World Bank interventions in CRP communities.



**Recreational\_Assets**  
 This layer shows recreational assets within Community Renewal Programme (CRP) communities.



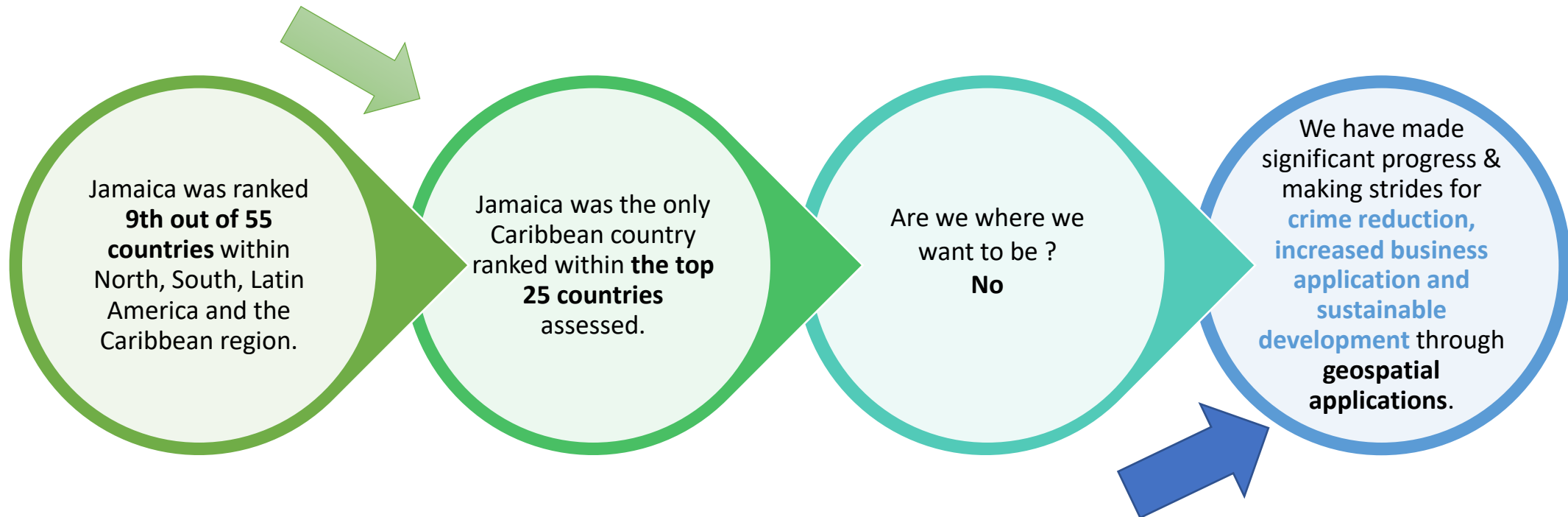
**SocialInfrastructure**  
 This layer shows selected social infrastructure in Community Renewal Programme (CRP) communities.



# Jamaica's GIS Achievement & Future



Americas Symposium 2019, in Mexico City:



New Enterprise Agreement will assist us to get to our goal



*Thank You*

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# “Geospatial Application in Spatial planning & Sustainable Urbanization in Jamaica

Presented by:

**Simone M. Lloyd, GISP**

Senior GIS Manager/Trainer

National Spatial Data Management Branch

Land Information Council of Jamaica

Ministry of Housing, Urban Renewal, Environment & Climate Change

Jamaica Focal Point - CARIGEO Steering Committee

UN-GGIM: Americas



# References



- Leak Application
  - <http://goj.maps.arcgis.com/apps/webappviewer/index.html?id=f632a99e04a04fad980ce4d1e7fbec0>
- KSA Census Mapping
  - <http://goj.maps.arcgis.com/apps/webappviewer/index.html?id=b1cc30b1caa1411180cabcc0c0e560a5>
- Route Tracker
  - <http://goj.maps.arcgis.com/apps/webappviewer/index.html?id=cae76e766af34c4b87a558fb91925514>