National workshop on Environment and Climate Change Statistics

Ministry Of Agriculture, Land Use Division

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Chief Land Use Officer (Ag)

Presentation Overview - Questions

1. **National experience on GIS/Land cover work**
2. **Overview of national data on land cover and land use, cadastral data: timeseries of land cover change, classifications.**
3. **Who does official GIS/land cover work, what satellite/aerial information was used, what is the land-cover data used for?**
4. **Are there multiple data sources, are the data comparable?**
5. **Is the attached data compiled from international sources (please see sheet 6 and 7) coherent with national data?**

GIS IN GRENADA

- **Established under FAO Project in 1994-1995**
- **Expanded under CPACC Project in 1997-2000**
- **Upgraded under the MACC Project 2004- 07**
- **Upgraded Under GEF IWCAM 2010-2012**
- **Improved under RDVRP/DVRP - 2013-15**
- **IMPROVED UNDER EU OECS GCCA -2015-2018**

Software

- ARCGIS: including ArcMap, ArcCatalog, ArcToolbox
- Spatial analyst
- 3D analyst
- Image analyst
- ArcView 3.2a
- ALES (Automated Land Evaluation System)
- Microsoft Office
- FAO SDBM (Soil Database Program)
- FAO APT (Agricultural Planning Toolkit Program)
- ECOCROP1

Some GLIS Outputs

1. Physical Land Suitability Assessment for forestry (21 species)
2. Physical Land Suitability Assessment for rainfed cropping (42 crops)
3. Economic Land Suitability for rainfed cropping at high and low levels of inputs
4. High quality Cartographic Maps outputs for Specific User Needs
5. Climate Change- Sea Level Rise Impact, Flood and Landslide Hazard Maps, etc.
6. Networking-Route Direction, Facility mapping etc.

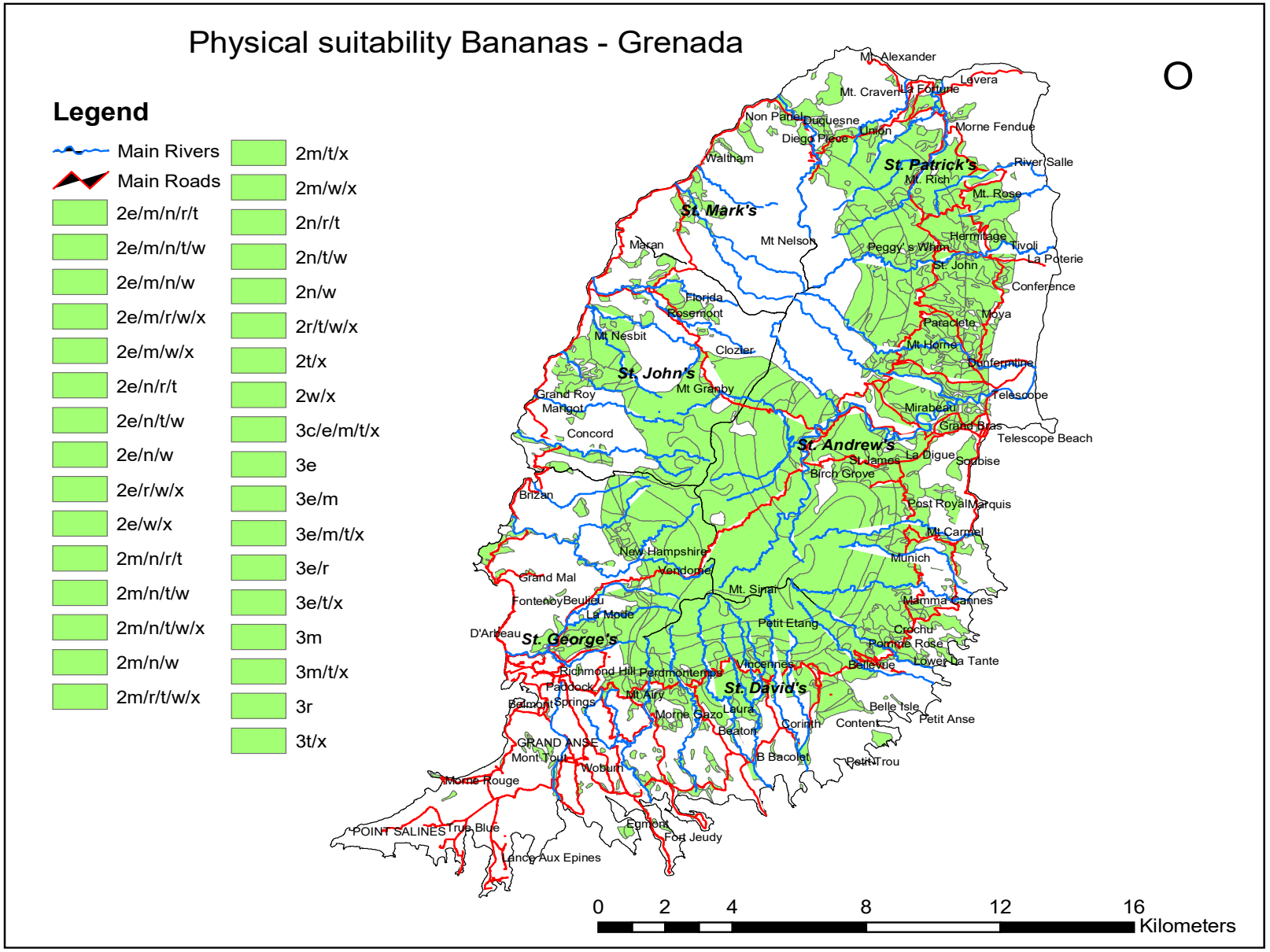
National Experience-Operation Constraints

- Licenses cost.
- Human resource.
- Training resource.
- Cost of High resolution imagery.
- Cost of GIS computing hardware.
- Time between New Mapping ventures

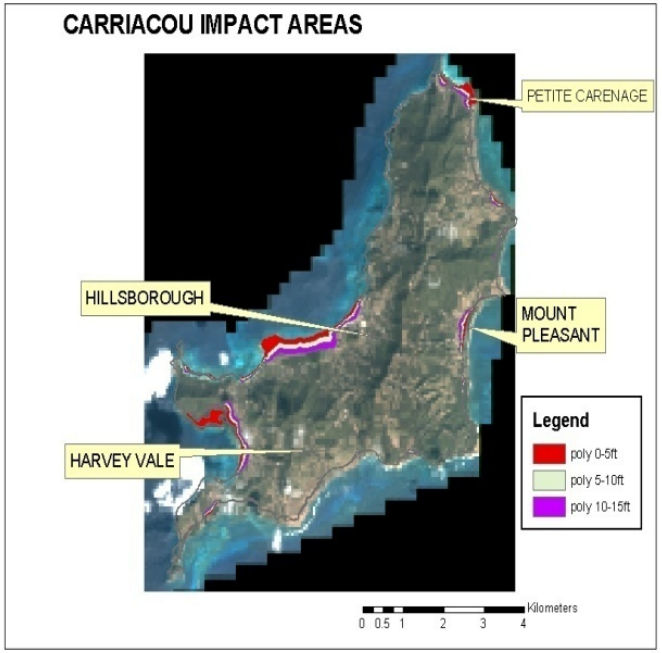
Positives

- Revolutionize Mapping
- Ease of Access to Data
- Up to date outputs
- Timely Recommendations

Physical suitability Bananas - Grenada

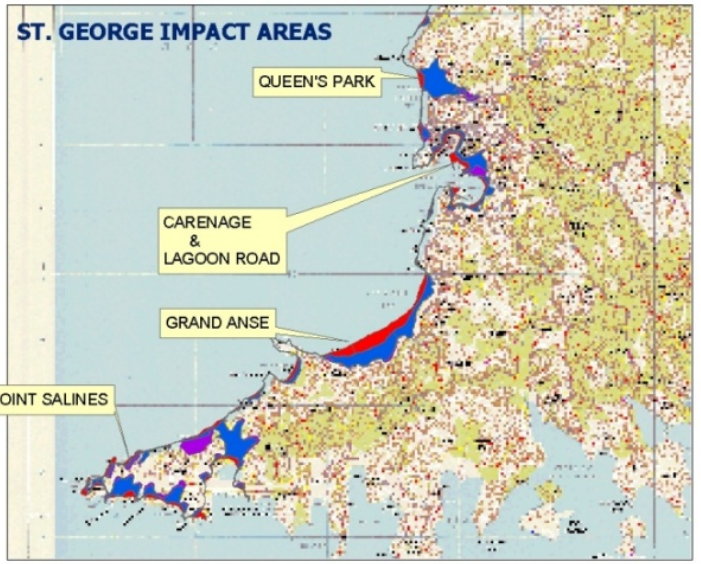


Sea level rise Impact on coastal Areas

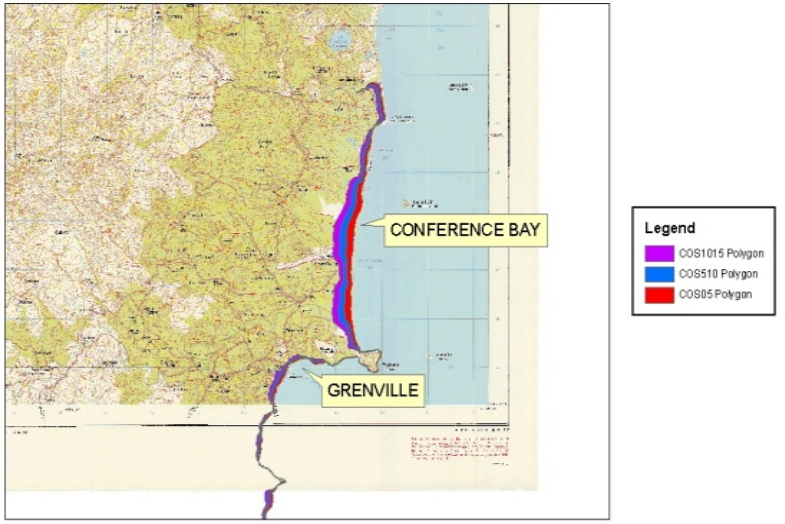


Sea Level Rise
SLR1 = 0.2 meters for 2020
SLR2 = 0.5 meters for 2050
SLR3 = 1 meter for 2100

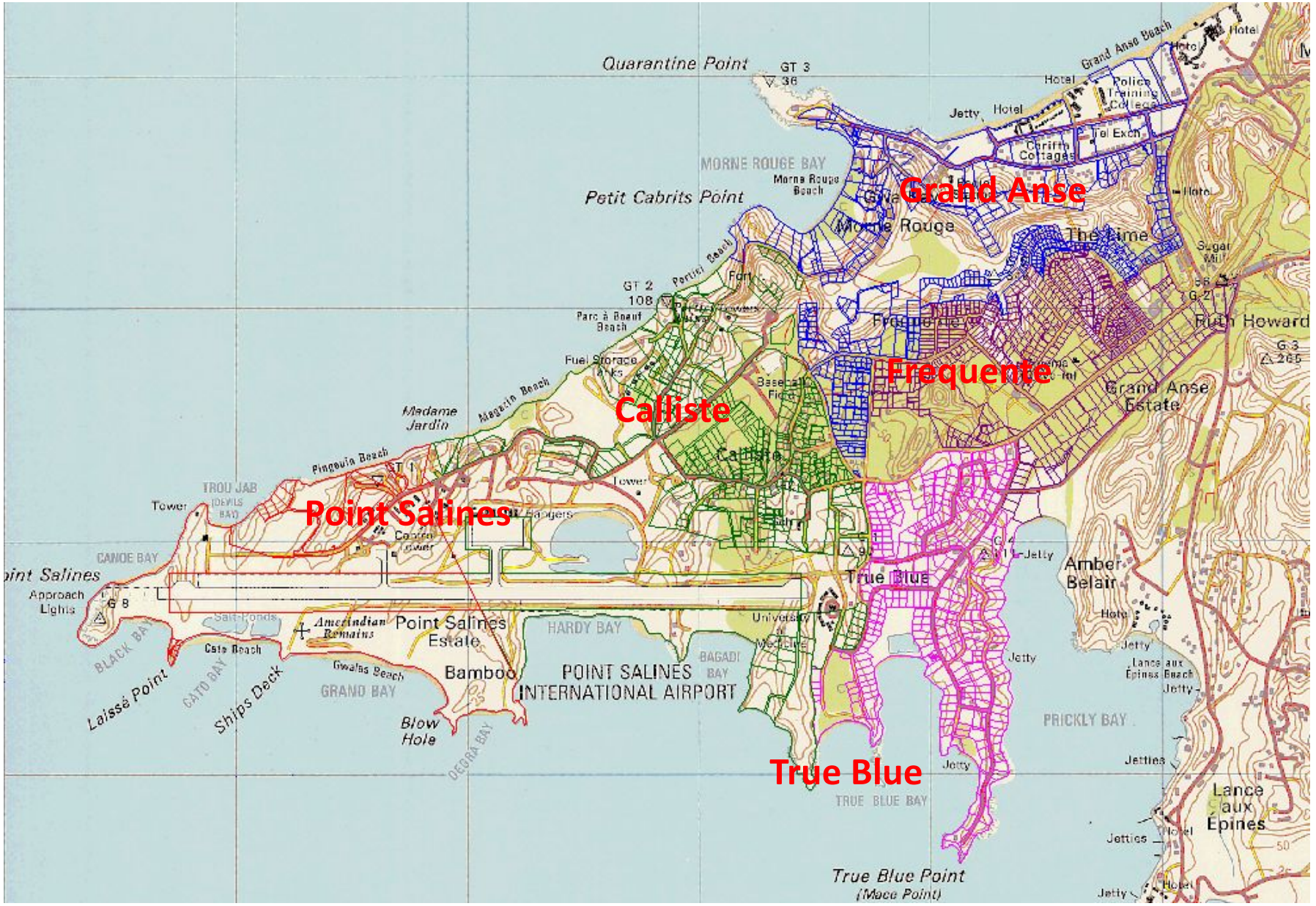
Southwest Impact Areas

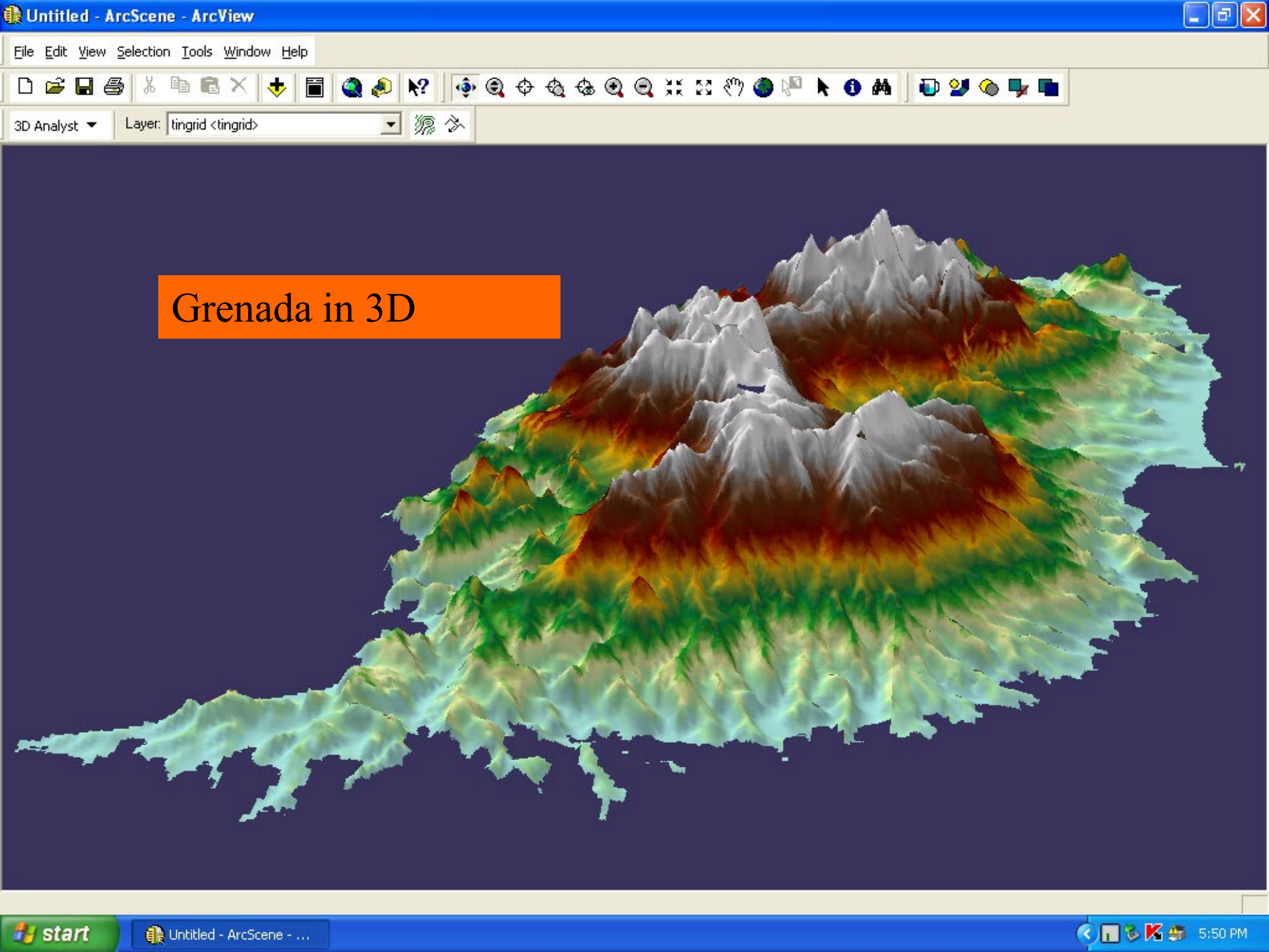


EAST COAST IMPACT



Land Parcels

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Grenada in 3D
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Organization Responsible GIS/Land Cover Mapping.

Ministry of Agriculture, Land Use Division

Collaborate With Many Stakeholders:

- PPU
- INLAND REVENUE
- LANDS & SURVEYS
- MINISTRY OF WORKS
- NAWASA
- CLIMATE RESILIENCE
- ENVIRONMENT
- FORSTRY
- CENTRALS STATISTICS
- GRENADA PORT AUTHORITY
- MBIA MET SERVICES

Land Cover and Land Use

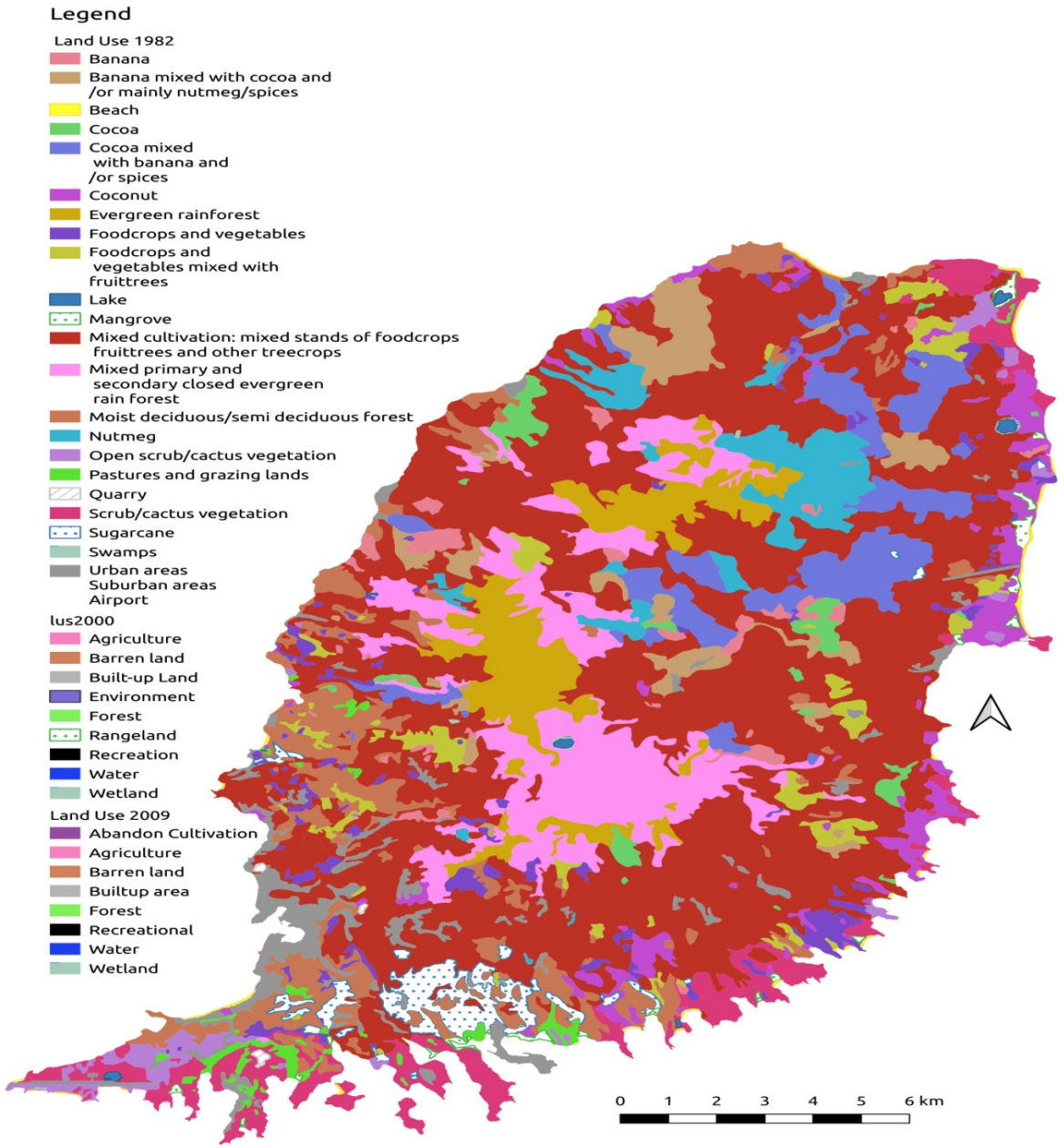
USES:

- **Land use planning**
- **Agricultural planning.**
- **Physical development planning.**
- **Environment Management & Assessment.**
- **Coastal Zone Management.**
- **Historical references**
- **Disaster recovery/ Damage Assessments**
- **Studies and Reports.**
- **Consultancy**
- **Research**

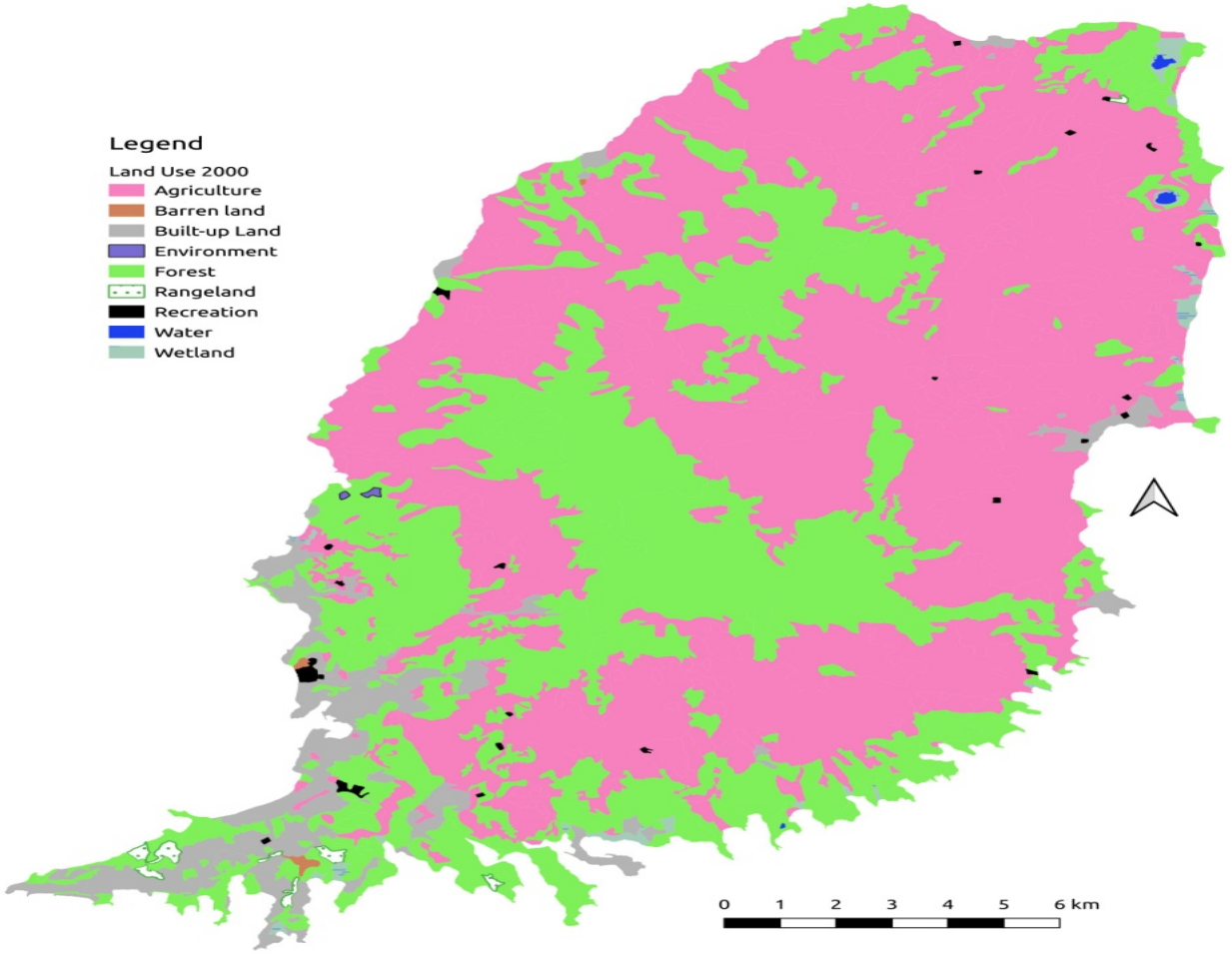
Current
Land Cover / Land Use Map

Year	**Remote Sensor source**	**Land Cover**	**Land Use**
1982	Aerial Photography	X	
2000	Ikonos 5m Satellite	X	X
2010	Ikonos 5m Satellite	X	X

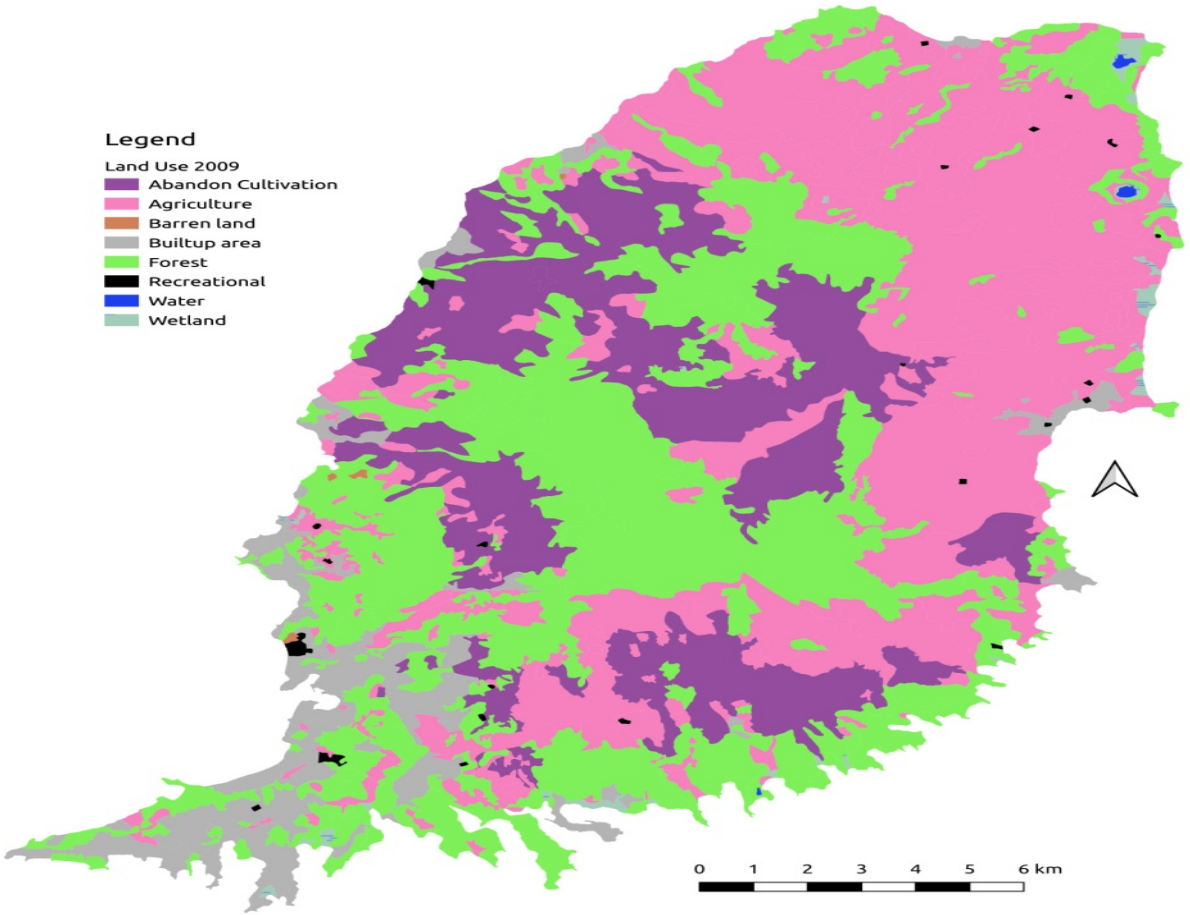
1982 Land Cover map



2000 Land Use Map



2010 Land Use Map



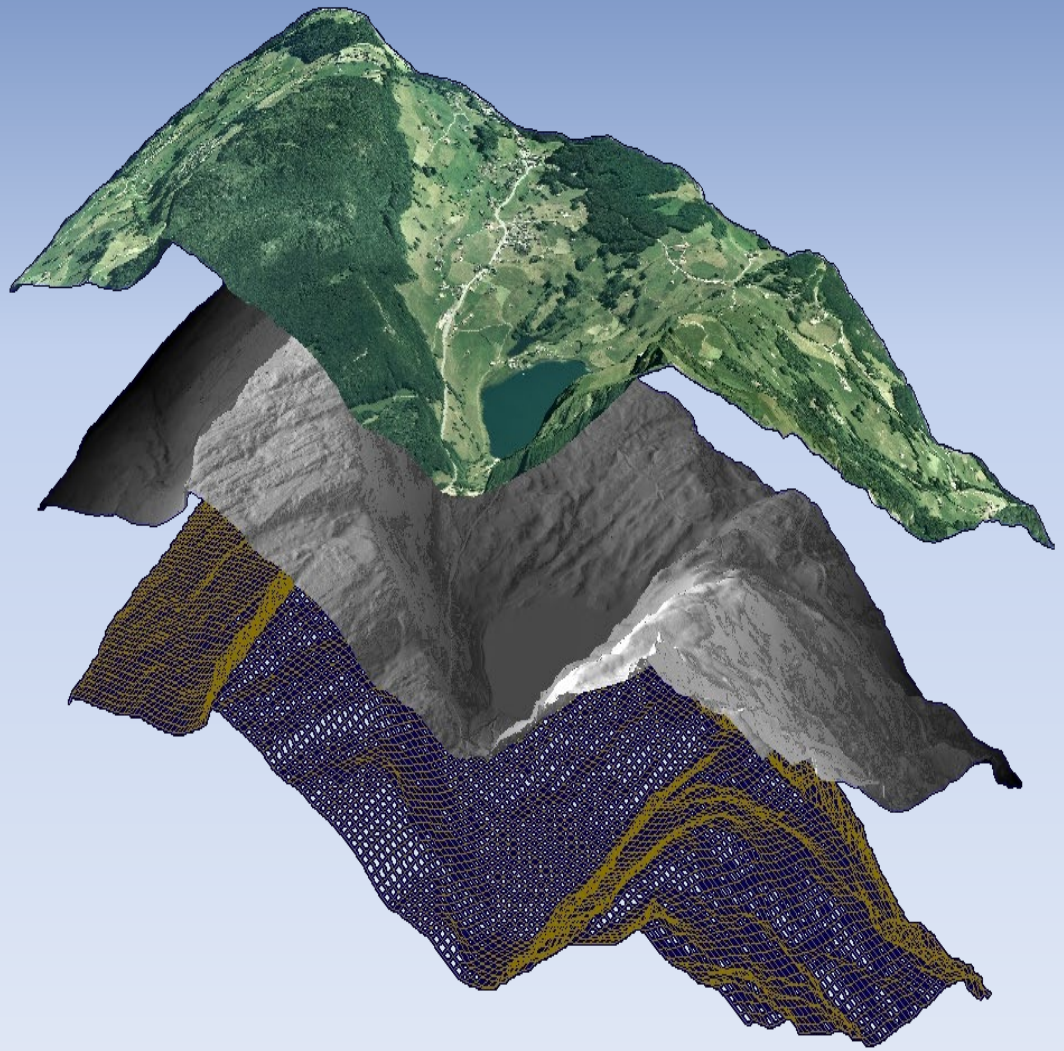
LAND USE TYPES 2000 vs 2009

Land Use Types	Grenada 2000	%	Grenada 2009	%
Abandon cropland	**359.00**	**1.14%**	**6,122.15**	**19.54%**
Annual cropland	1,456.00	4.64%	1,583.69	5.05%
Beach	53.00	0.17%	50.66	0.16%
Forest	6,835.00	21.79%	7,204.22	22.99%
Mangrove	**172.00**	**0.55%**	**159.31**	**0.51%**
Pasture & Grazing	140.00	0.45%	0.00	0.00%
Perennial	**16,282.00**	**51.90%**	**9,707.08**	**30.98%**
Protected Area's	2,481.00	7.91%	2,481.78	7.92%
Shrub & Grassland	1,730.00	5.51%	1,718.13	5.48%
Urban & Buildup area	**1,825.00**	**5.82%**	**2,266.72**	**7.23%**
Water	40.32	0.13%	40.32	0.13%
Total Area Ha	**31,373.32**		**31,333.79**	

- **Lidar and imagery data collection campaign (from 10/11 to 25/11)**

Example of data (picture):
GSD : 5cm

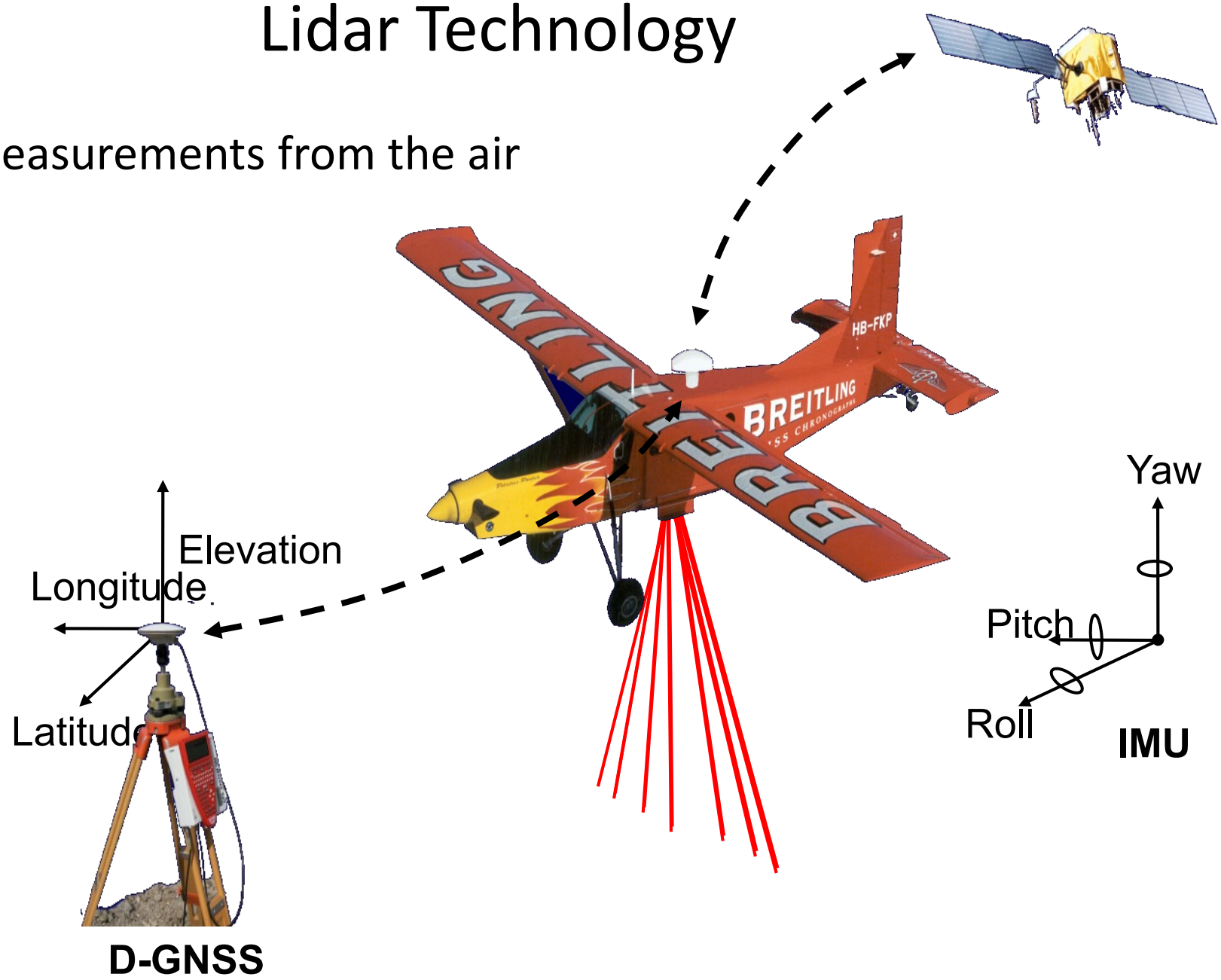
Lidar and Imagery – Products, Uses and Benefits



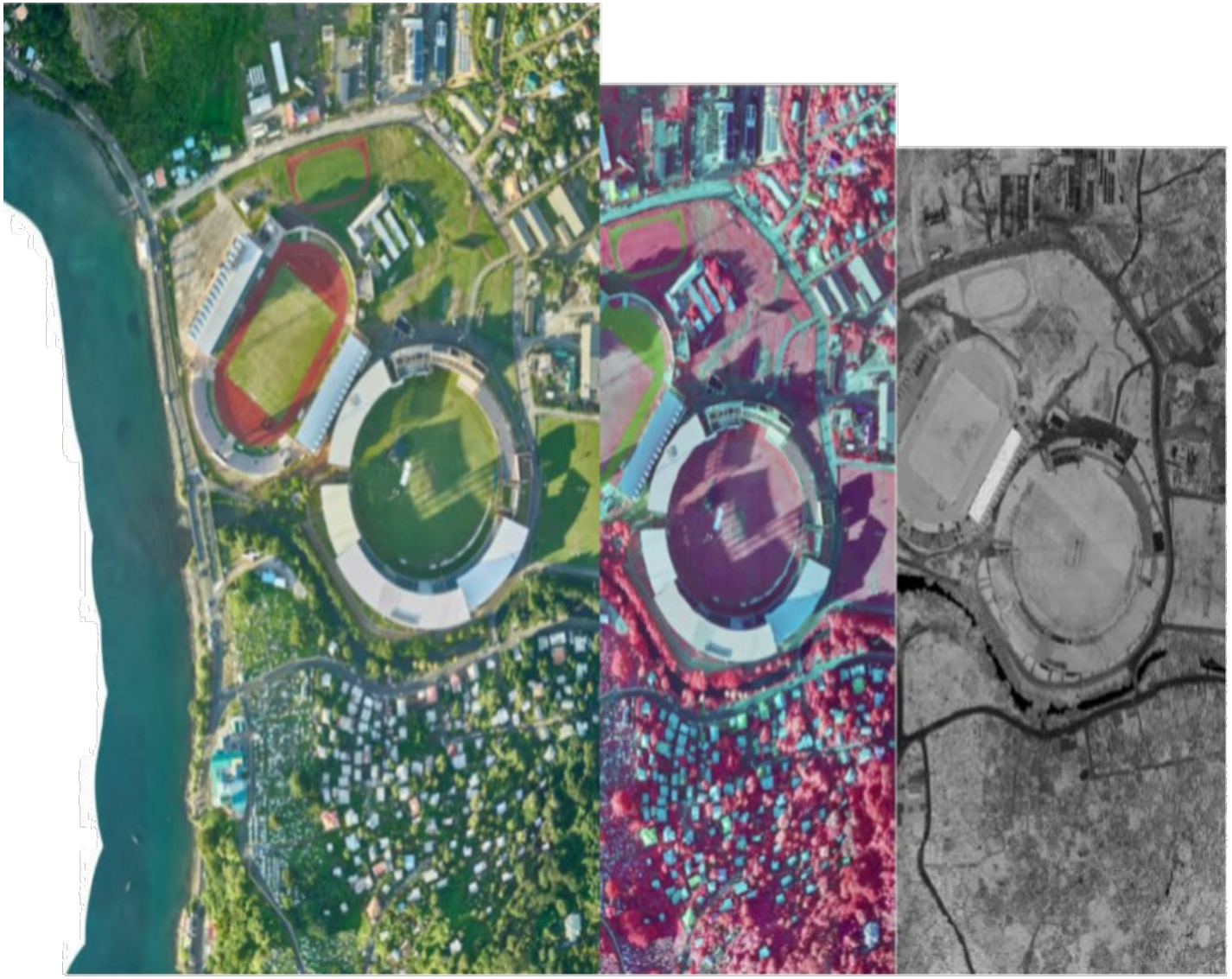
Lidar Technology and Products

Lidar Technology

Rapid 3D measurements from the air



Imagery Products



Imagery - Full Resolution

Digital Surface Model (DSM)

Digital Terrain Model (DTM)

Lidar Products

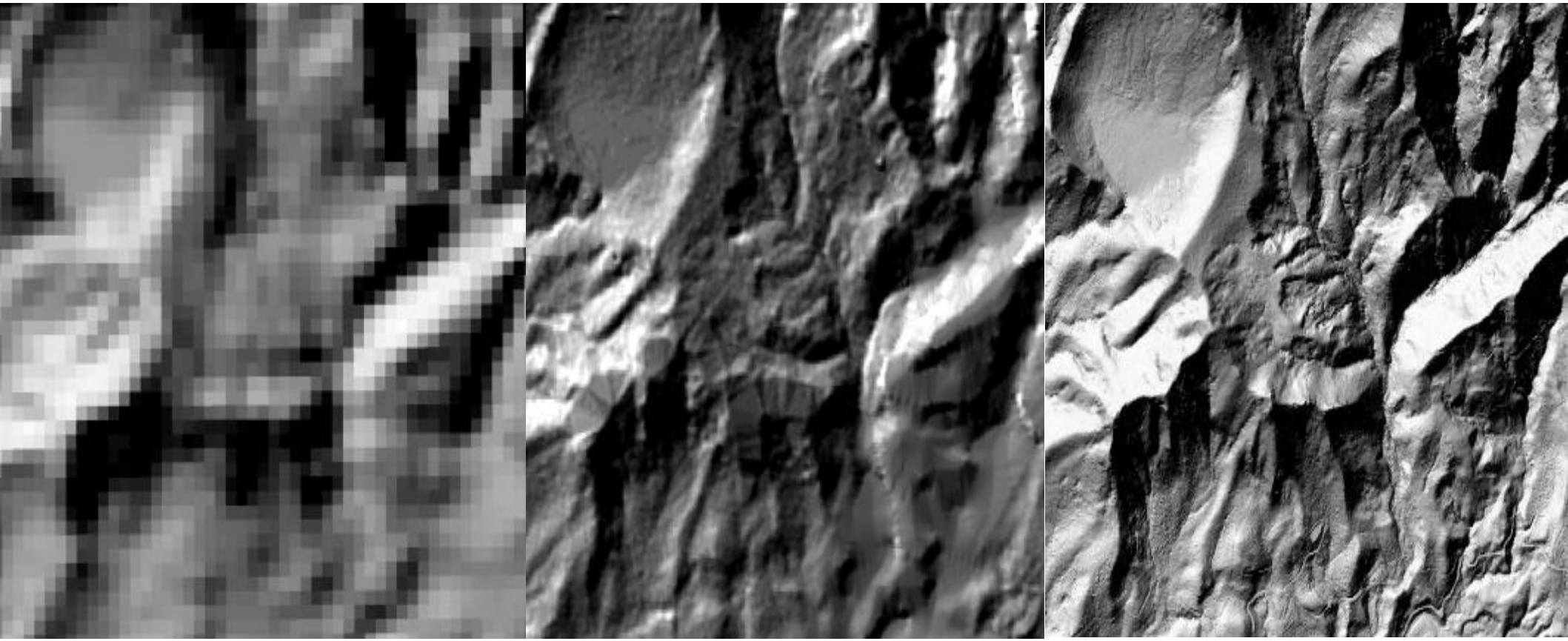
Data Quality Evolution

Digital Terrain Model – Resolution and Detail

25 m (1950s Topo Map)

5 m (2010 Lidar)

0.5 m (2018 Lidar)



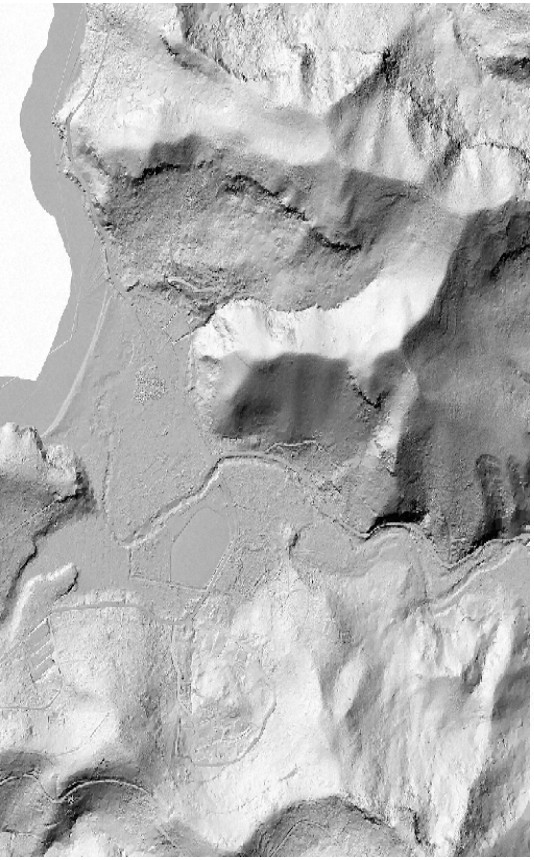
Lidar and Imagery – Uses and Benefits

Natural Hazard Risk Mitigation

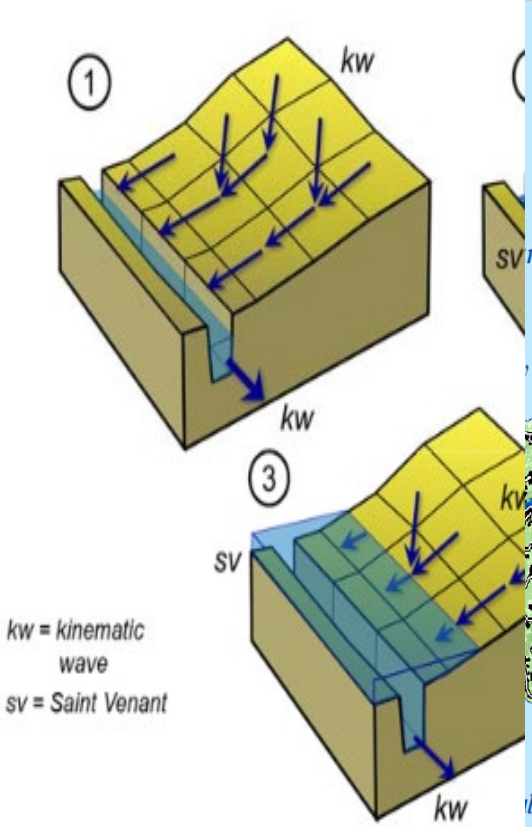
Flood Mapping

Numerical Simulation for Flash Flood Protection

Digital Terrain Model



Runoff Analysis



Flood Risk Map

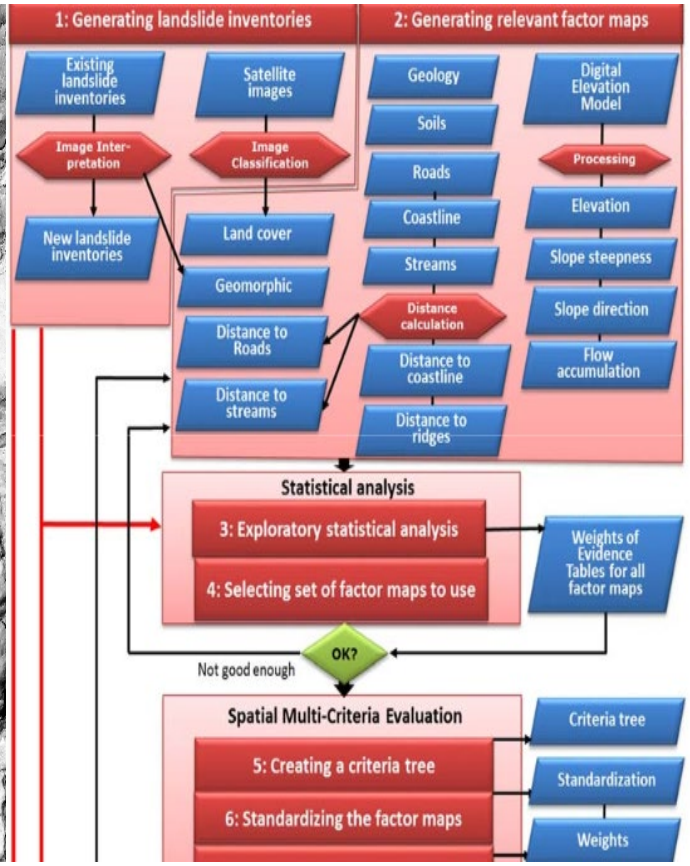
Protection Measure

Landslide Risks

Identifying Endagered Infrastructure

Digital Terrain Model

Slope and Soil Analysis



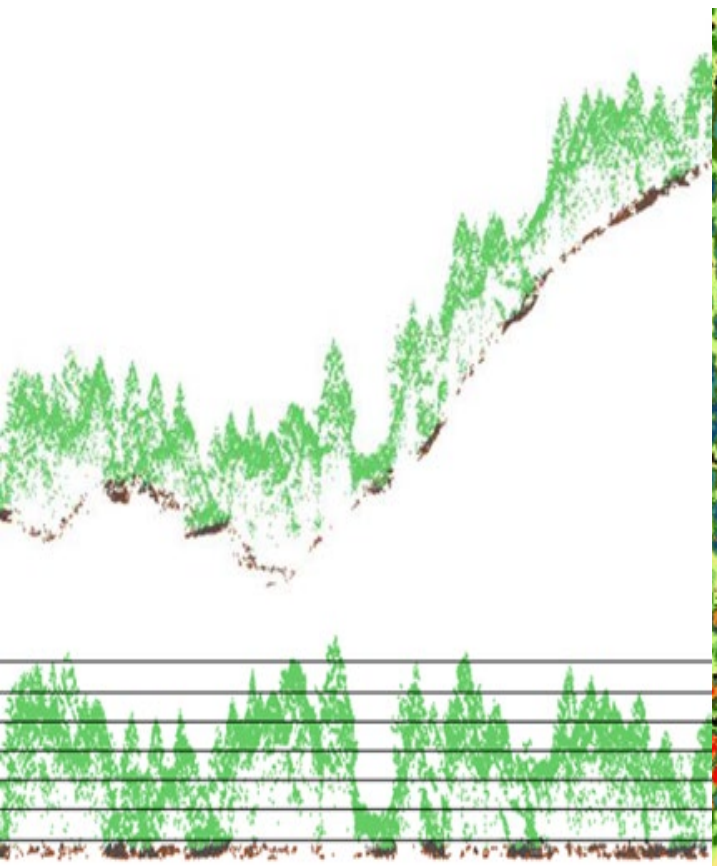
Risk Map

Land Use, Forestry

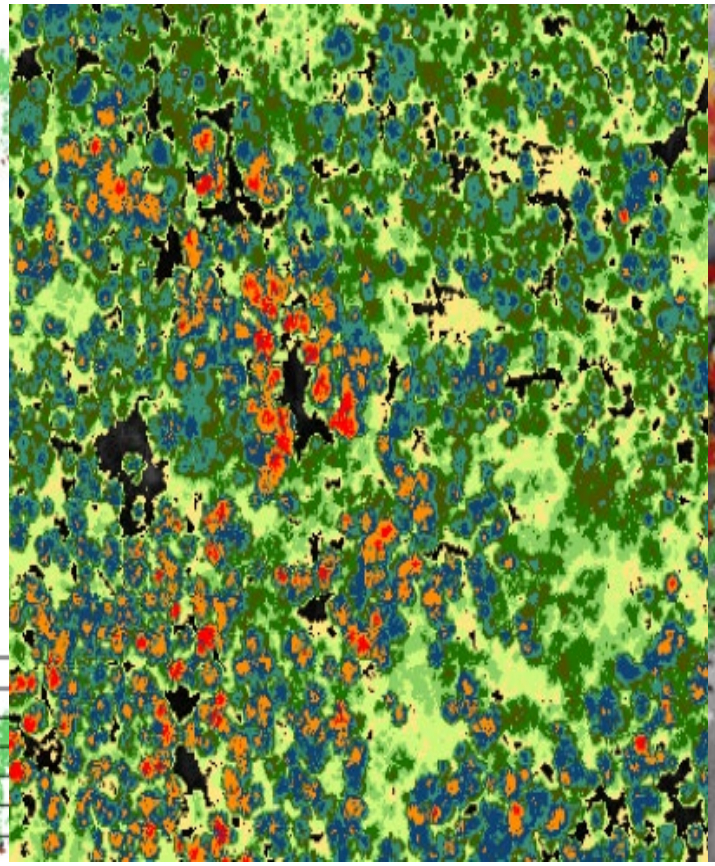
Forestry

Natural Resource Inventory and Management

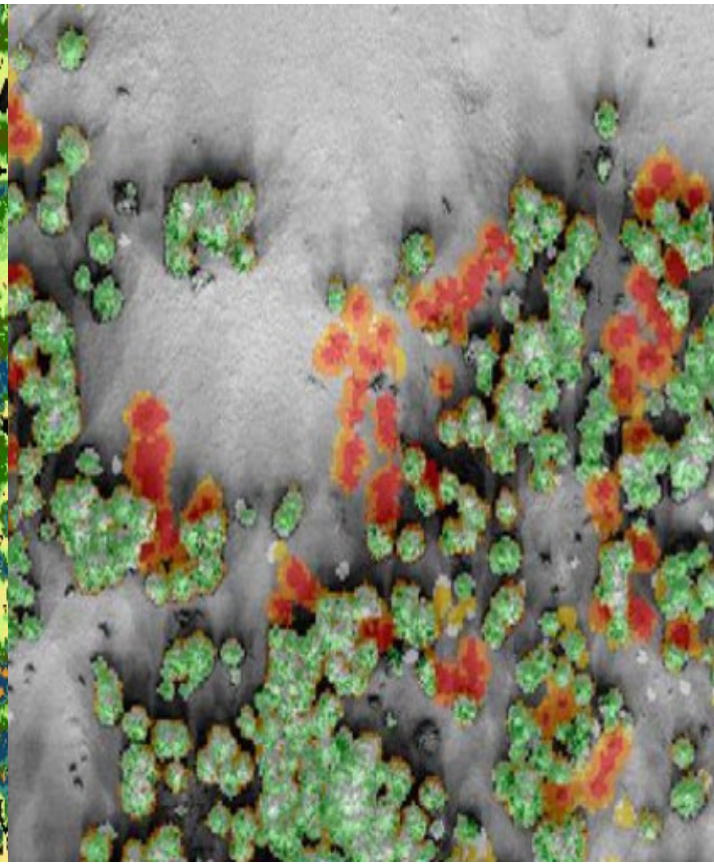
Canopy Height Profile



Canopy Height Model



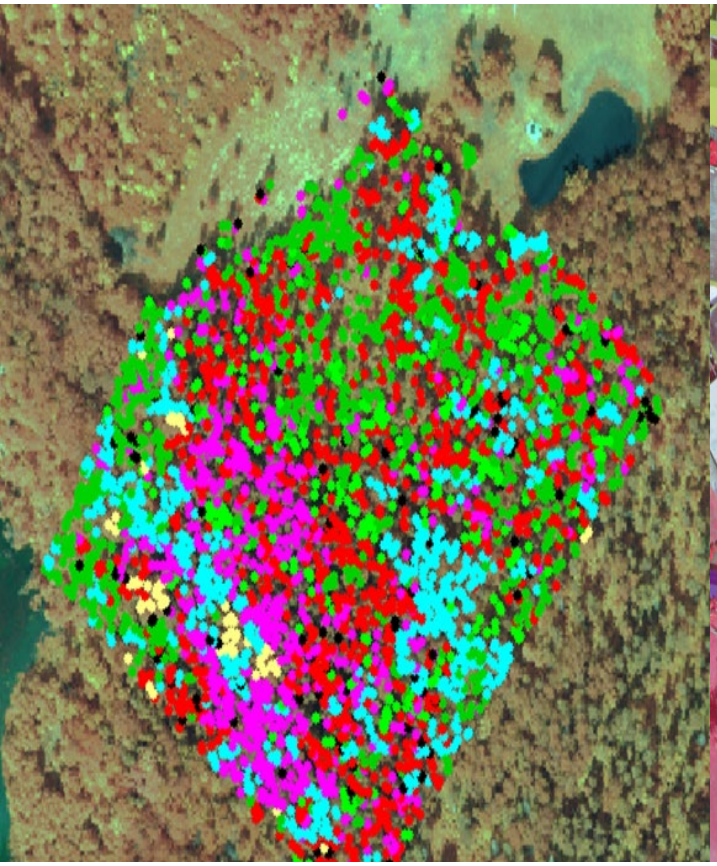
Change Detection



Forestry and Agriculture

Plant Population Inventory and Health Monitoring

Species Inventory



Plant Health – Infrared

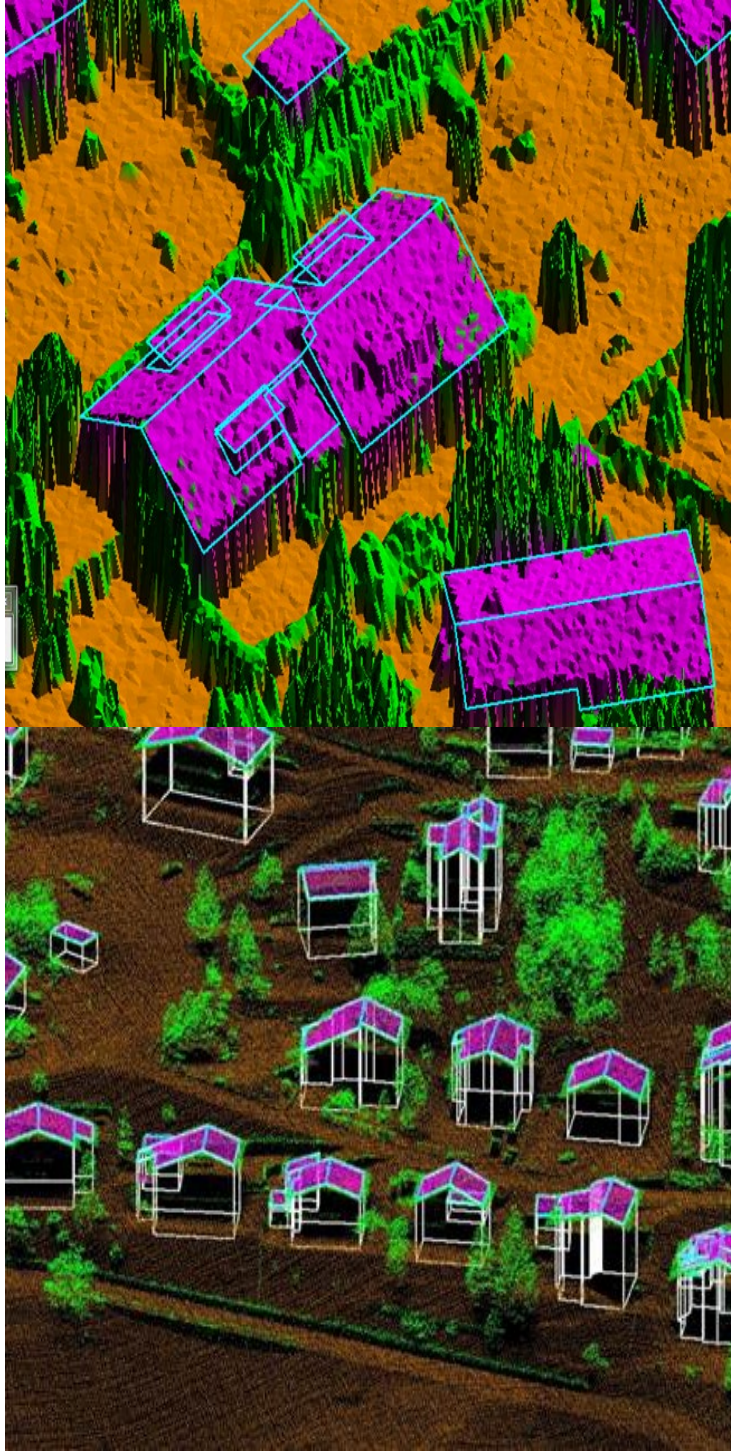
Improved Cultivation

Physical Planning

3D Models

As-Built Inventory

- 3D Models for visualizations and planning
  - Terrain Model and Contours directly availabe
  - Semi-automated 3D Building Model and building footprint extraction from classified Lidar data
- Provide detailed, current 3D base data to planners and developers



Solar Energy Potential

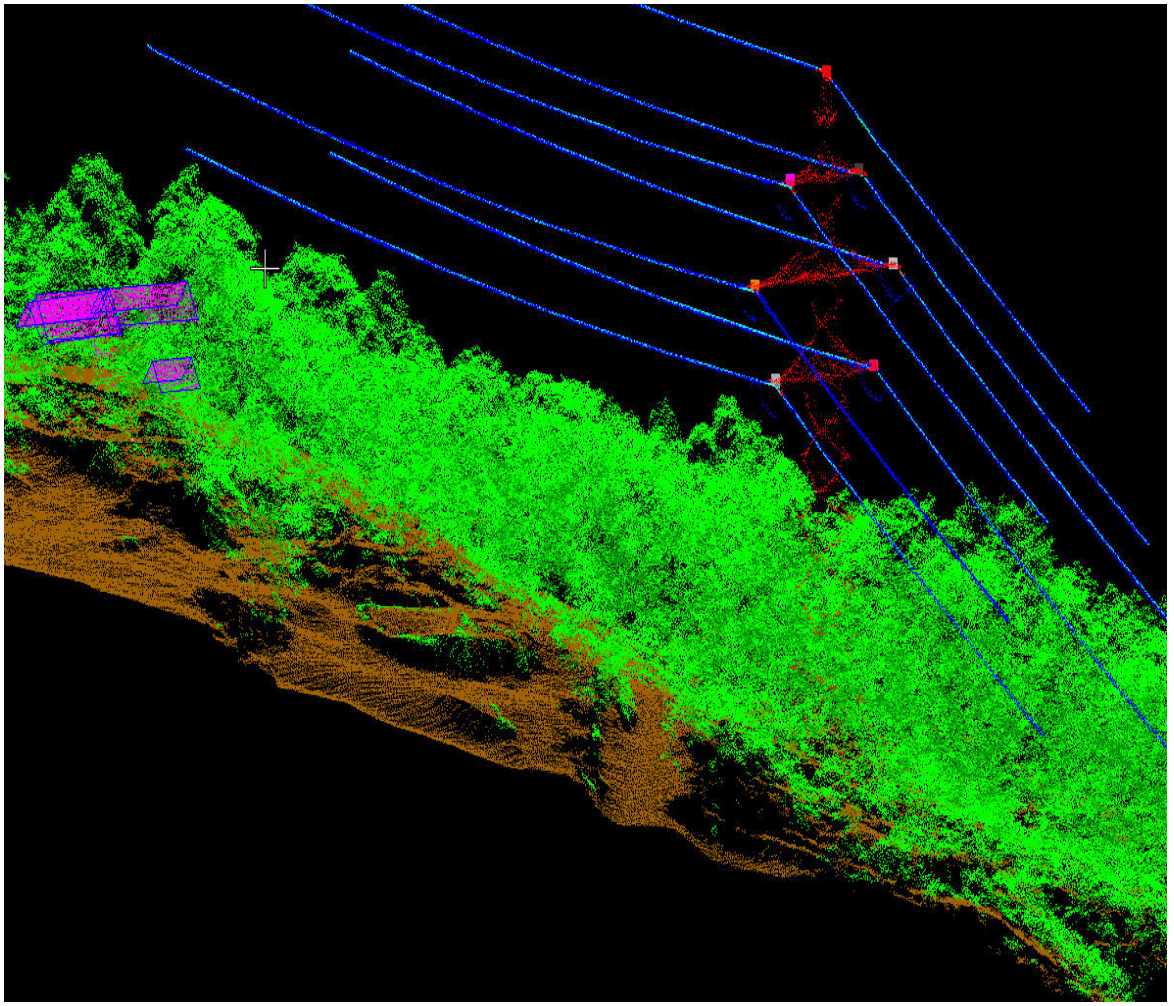
Optimizing Photovoltaic Yields

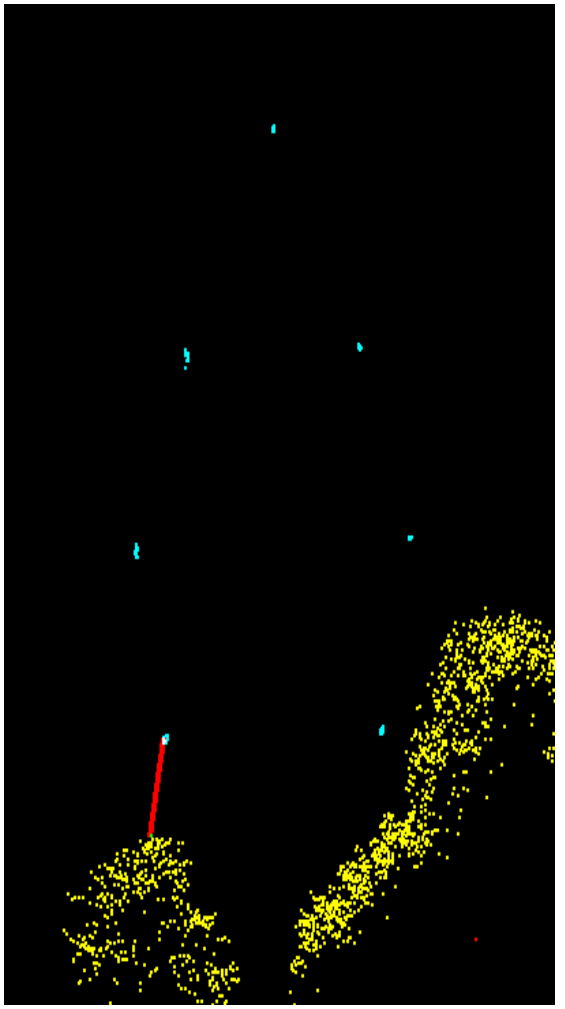
- Simulation of sun incidence per roof area based on the Digital Surface Model (DSM)
- Identify roofs with high potential for generating photovoltaic energy
- Reduce Grenada's dependence on fossil energy
- Reduce output of greenhouse gases

Infrastructure

Utility Lines

Inventory and Planning



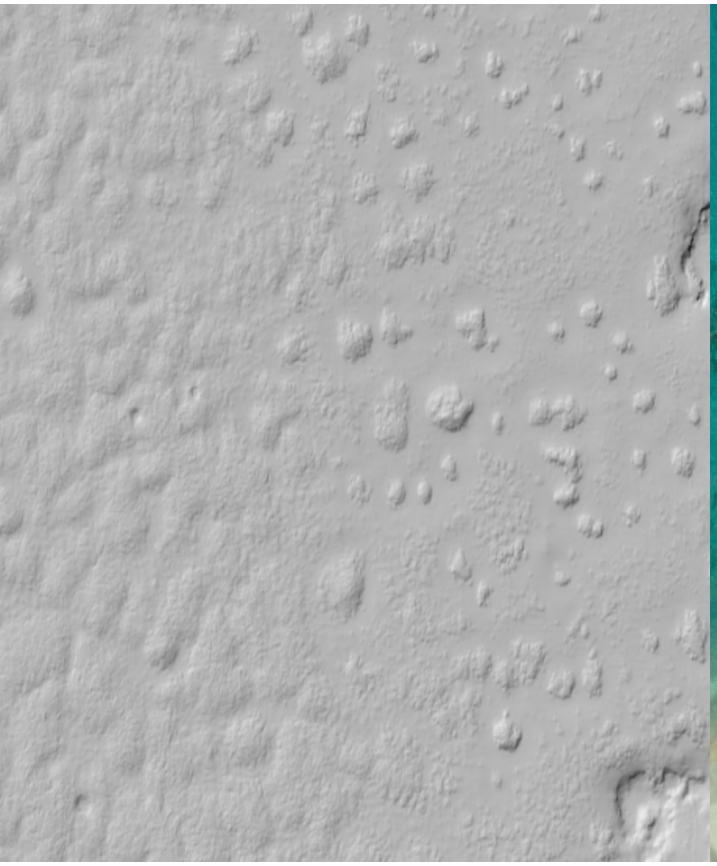


Science and Environment

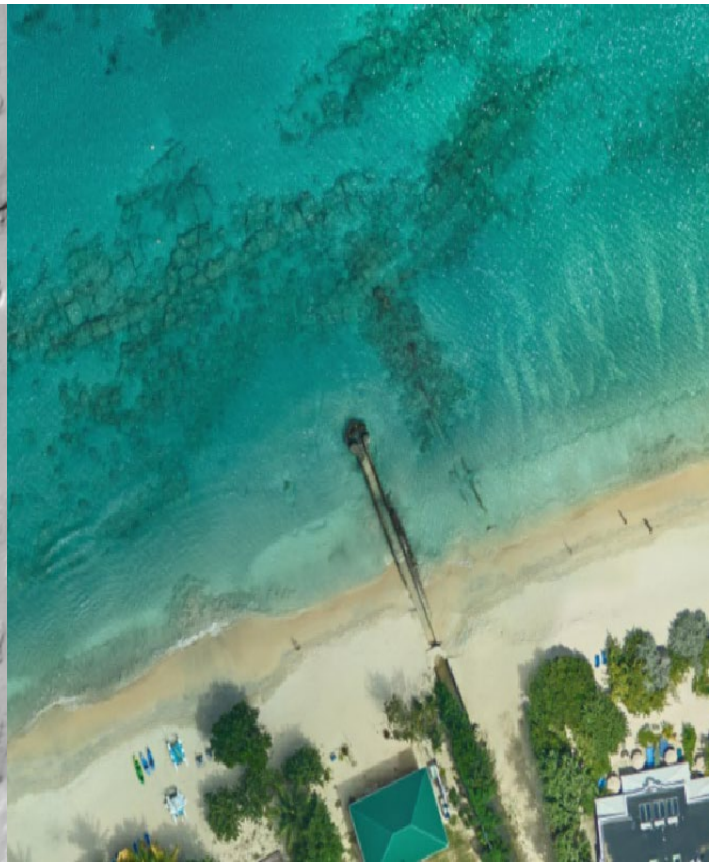
Marine Science

Understanding and Protecting Coastal Habitats

Bathymetry Data



Aerial Imagery



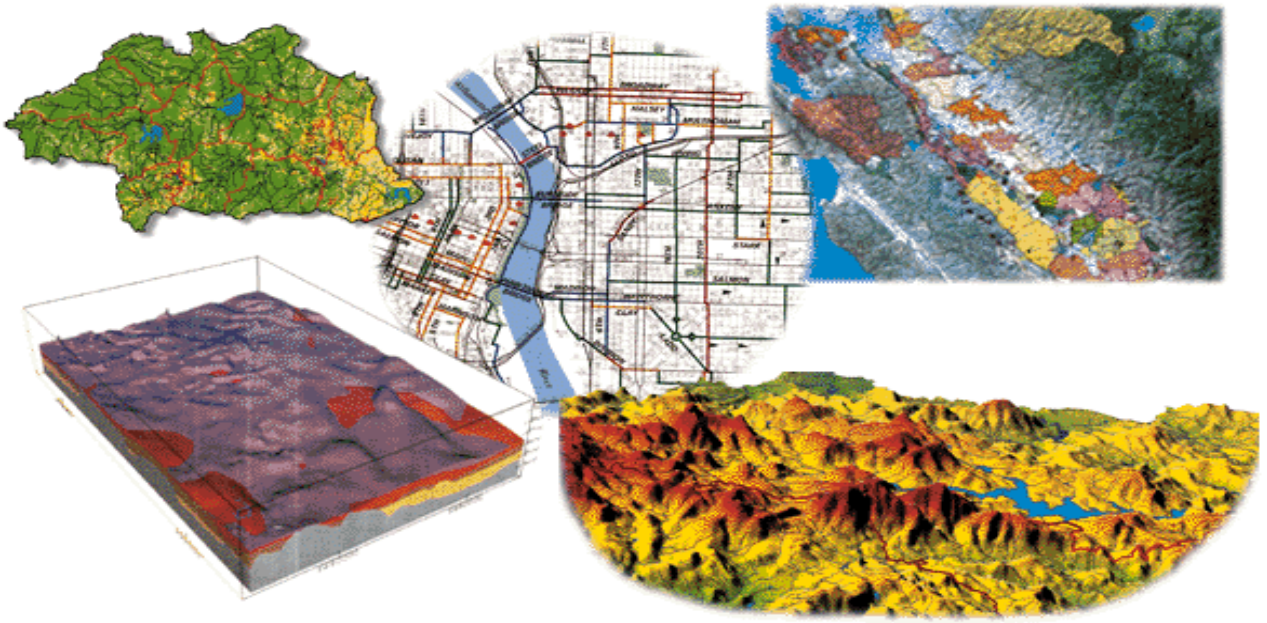
Protection Measures

GMPA

Grenada Marine Protected Areas

Future Plans

- To use the 2017 LIDAR Imagery to generate a new Land Use and Land Cover map.
- Explore use of drone in the updating of future Land use/land cover map.
- Support implementation of National Land Policy, to support decision making at all scales
- Accelerate growth in data availability
- Vulnerability reduction Projects
- Safe development of any part of the territory
- To improve access to and interoperability of cadastral and mapping data
- The strategic decision to make now is not whether, but when and how to use GIS to support decisions at all levels



The End