



### National workshop:

Generating climate change and disaster indicators for policy decision-making in Belize  
09 – 11 Nov 2022

# The geospatial dimension of environment, climate change and disaster statistics and indicators

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# Content

- Introduction
- Geospatial dimension of environment statistics
- Georeferencing
- Data/information sources
- Conclusion



# Introduction

## Everything happens somewhere

Statistics and geographic information are crucial to improve measurements and broaden the vision of well-being in all the SDG's



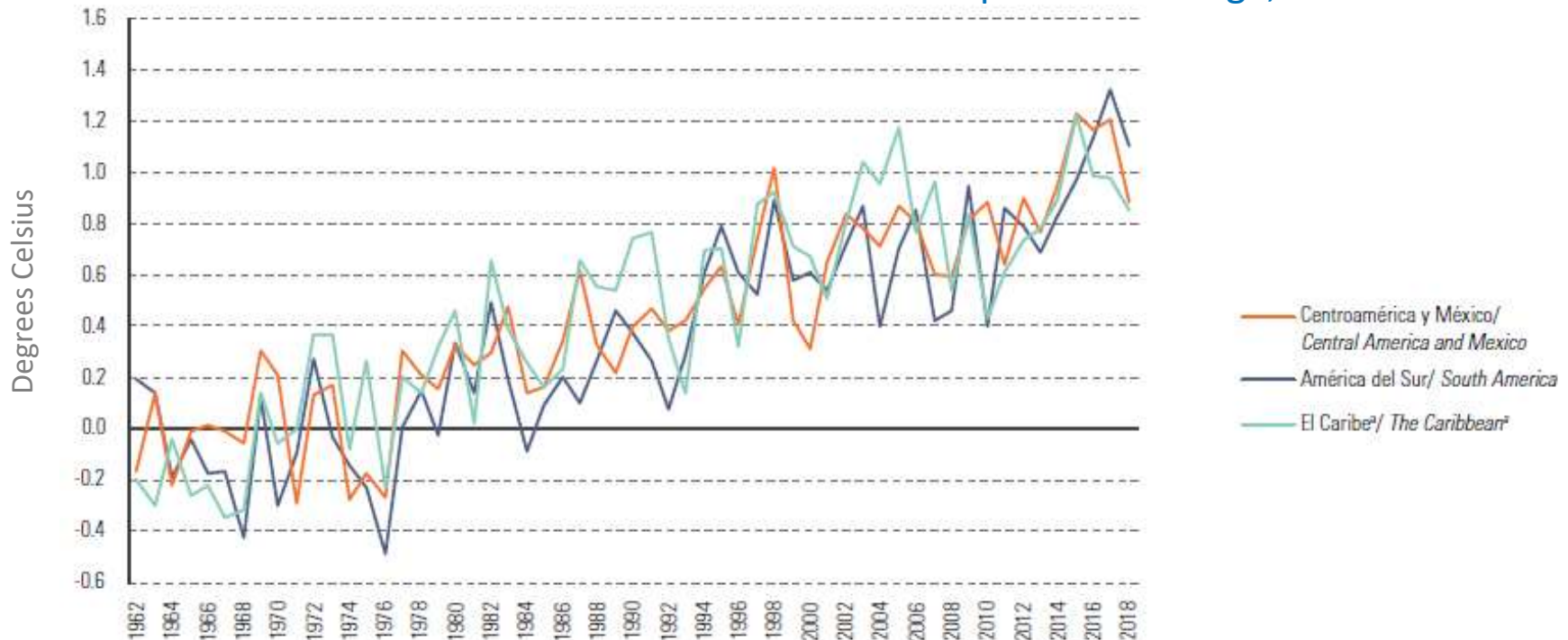
**Source:** Ocampo, R. (2015). The geospatial dimension of development [Slide]. Third Europe-Latin America Forum. Santiago, Chile.

# Introduction

## Climate change: A permanent concern

- Latin America and the Caribbean region is especially vulnerable to climate change due to its geographical and climatic situation, socio-economic characteristics, and the high sensitivity of its natural assets (ECLAC, 2015).

Latin America and the Caribbean: mean annual temperature change, 1961–2018



<sup>[A]</sup> FAO, Base de datos estadísticos (FAOSTAT) [en línea] <http://www.fao.org/faostat/es/#home>.

\* Incluye Cuba y la República Dominicana.

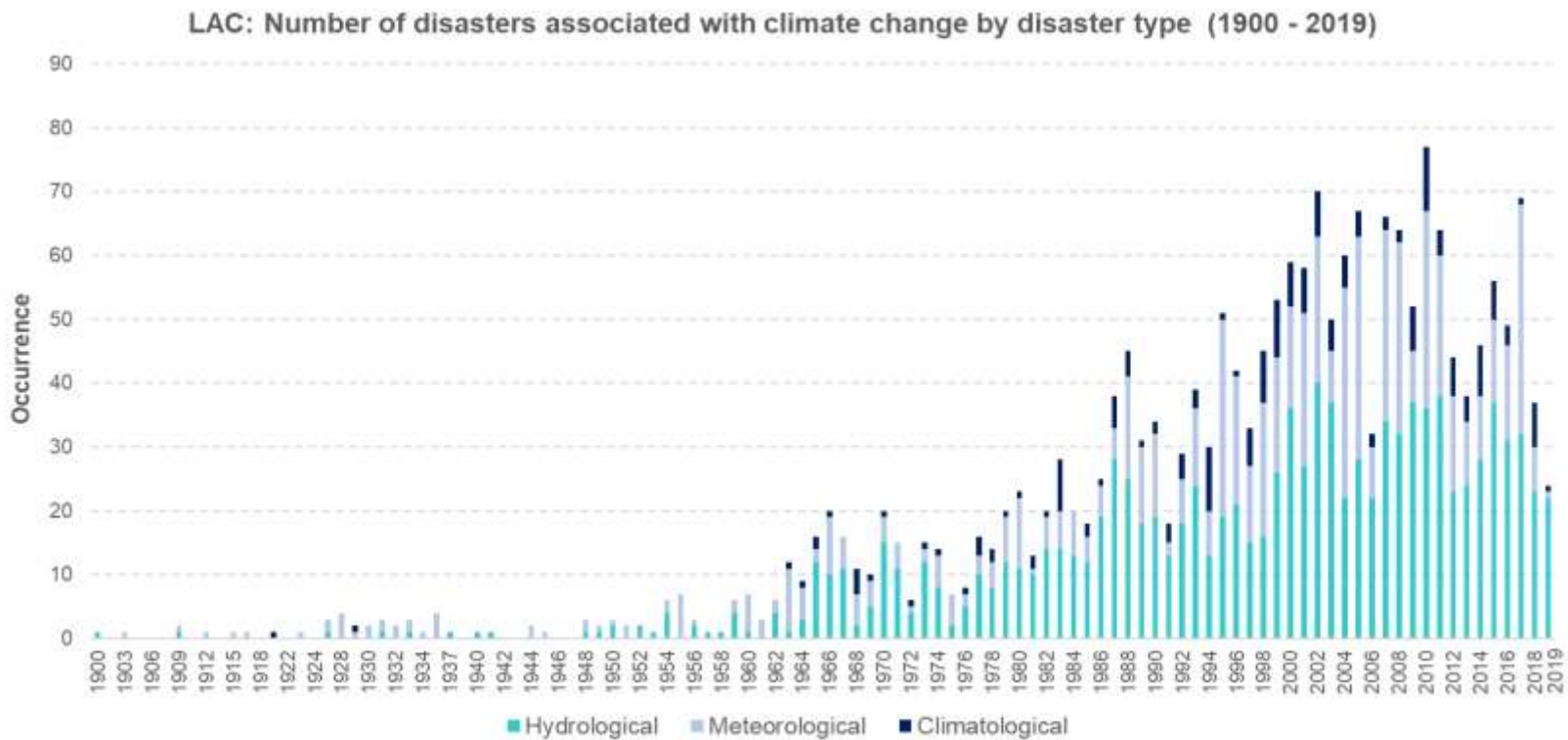
<sup>[A]</sup> FAO, Database for Statistical Data (FAOSTAT) [online] <http://www.fao.org/faostat/en/#home>.

\* Includes Cuba and the Dominican Republic.

# Introduction

## Climate change: Impacts and risks

- Evidence of the impacts of climate change in LAC shows that these effects are already significant and, with a high probability, will be more intense in the future (IPCC, 2013).



# The geospatial dimension of environment statistics

- The phenomena captured through the environment statistics occur on the earth's surface
- Phenomena happen in geographical spaces that do not always coincide with administrative limits
- They present gradients that go from a planetary to a local scales



## The importance of where

When looking at a map, we start turning that map into information by analyzing its content —finding patterns, assessing trends and making decisions. This process is called “spatial analysis.”

Using spatial analysis, you can combine information from many independent sources and derive new sets of information. And by employing time series, you can detect changes over time.

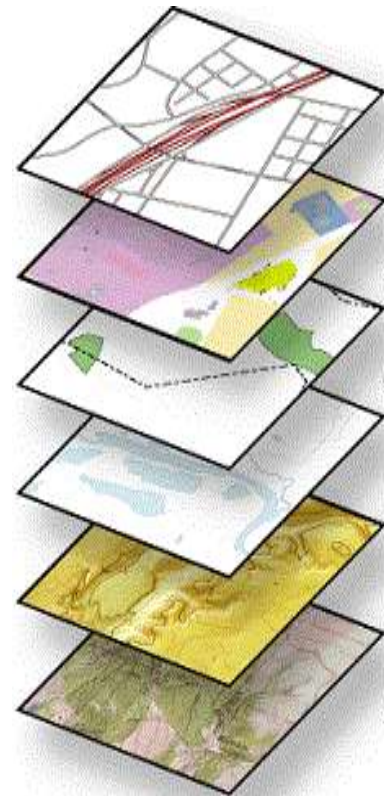


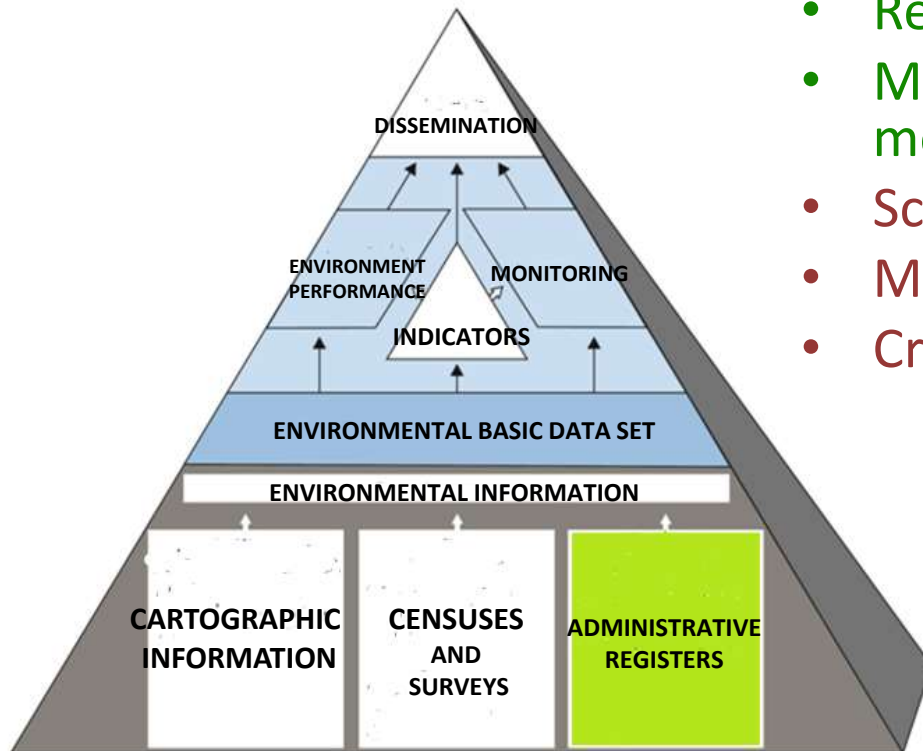
- *Geographic shapes - lines, points, polygons. Georeferencing is an attribute of the data.*
- *The integration of databases (layers) in a Geographic Information System (GIS) implies the precise location of the objects / entities*





- The possibility of overlay and correlate different layers of GIS data allows spatial relationships with other entities (topology) and temporal patterns.
- It is also possible to perform calculations, **build indicators**, analyze distributions, prepare thematic maps, and obtain new variables.





- Cartography
- Census and surveys
- Administrative records
- Remote sensing
- Monitoring stations and field monitoring programs
- Scientific research
- Modelling and Estimation
- Crowd sourcing

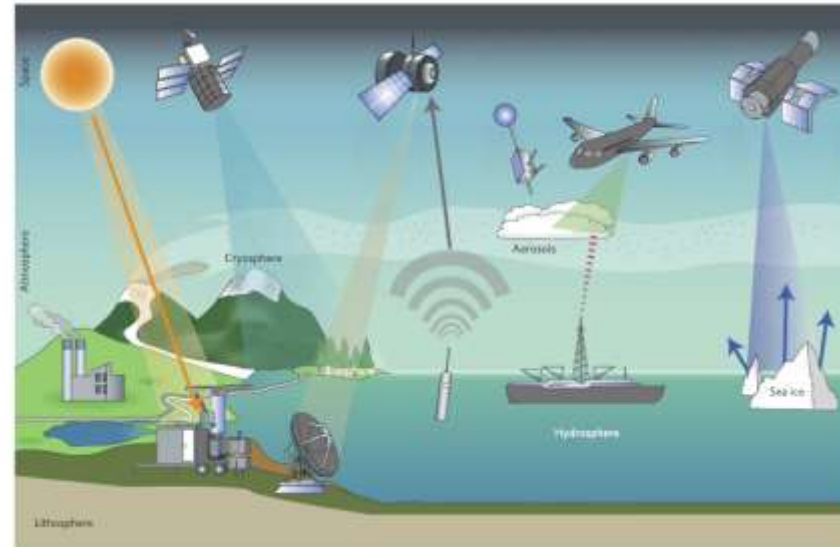
## Data sources and georeferencing

- In censuses and surveys, the use of mobile capture devices (tablets or similar) with global positioning capacities (GPS) allows the georeferencing of units through the geographic location of a point, line, or polygon, in these dwellings, economic establishments or agricultural holdings, during the same data collection process.



# Other sources

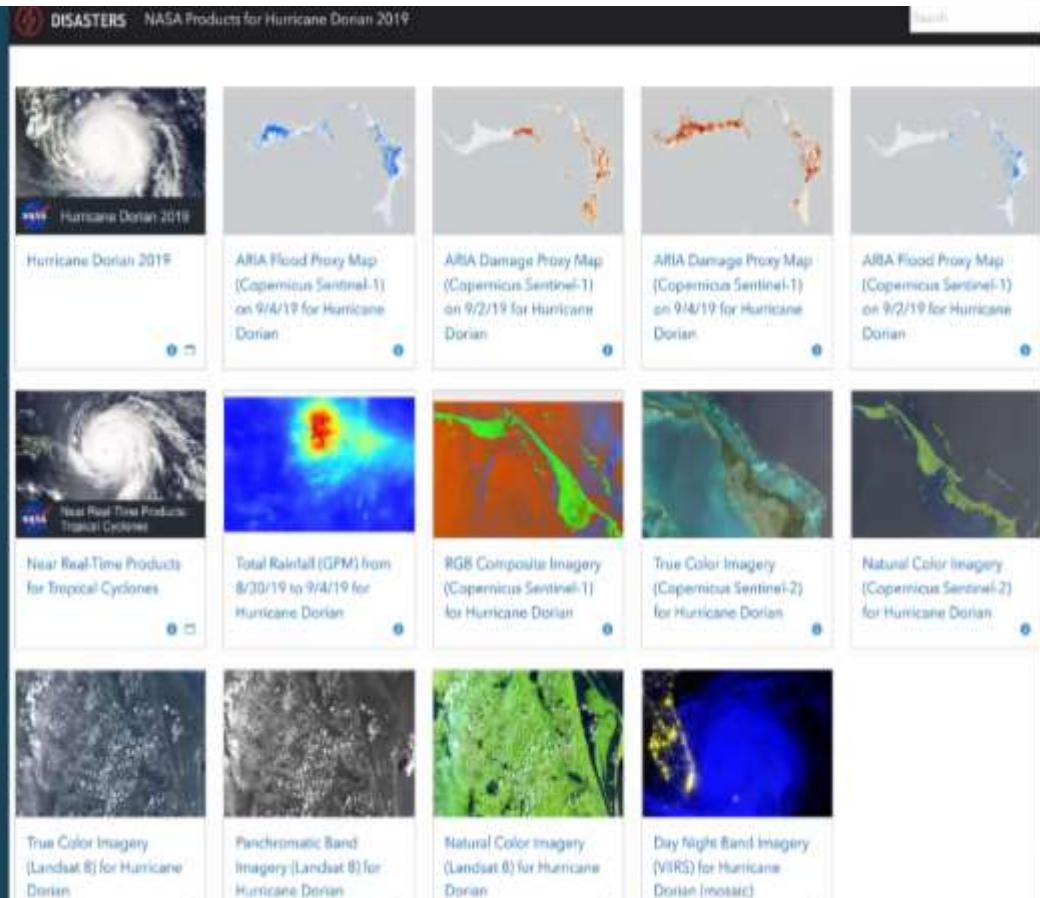
- Remote sensing offers a broad spectrum of geo-referenced environmental data that provides a synoptic view of the different components of the environment.
- Data is obtained in digital format from instruments that measure the electromagnetic response of the different elements over the earth's surface.
- These data are subject to be processed applying classification techniques supported by field validations



## NASA products

### Product Gallery Hurricane Dorian

- Event Specific Products
- Relevant Near Real-Time Products and Dashboards
- Story Map



The screenshot displays a grid of 15 satellite and sensor data products for Hurricane Dorian. Each product includes a thumbnail image and a descriptive title. The products are:

- Hurricane Dorian 2019
- ARIA Flood Proxy Map (Copernicus Sentinel-1) on 9/6/19 for Hurricane Dorian
- ARIA Damage Proxy Map (Copernicus Sentinel-1) on 9/2/19 for Hurricane Dorian
- ARIA Damage Proxy Map (Copernicus Sentinel-1) on 9/4/19 for Hurricane Dorian
- ARIA Flood Proxy Map (Copernicus Sentinel-1) on 9/2/19 for Hurricane Dorian
- Near Real-Time Products for Tropical Cyclones
- Total Rainfall (GPM) from 8/30/19 to 9/4/19 for Hurricane Dorian
- RGB Composite Imagery (Copernicus Sentinel-1) for Hurricane Dorian
- True Color Imagery (Copernicus Sentinel-2) for Hurricane Dorian
- Natural Color Imagery (Copernicus Sentinel-2) for Hurricane Dorian
- True Color Imagery (Landsat 8) for Hurricane Dorian
- Panchromatic Band Imagery (Landsat 8) for Hurricane Dorian
- Natural Color Imagery (Landsat 8) for Hurricane Dorian
- Day Night Band Imagery (VIIRS) for Hurricane Dorian (mosaic)

## NASA products

### Near Real-Time Products

- Global unless noted otherwise
- Coarser resolution
- Automatically updated every few hours to daily or weekly
- Many products for the Caribbean
  - Black Marble Nighttime Blue/Yellow Composite
  - FIRMS Active Fire Points (MODIS, VIIRS)
  - Global Landslide Nowcast
  - Flood Detection – 2, 3 Observations (MODIS)
  - Precipitation Accumulation – 30 min, 3 hour, 1 day (GPM IMERG)
  - Soil Moisture and Soil Moisture Anomaly – 3-Day Composite (SMAP)
  - Evaporative Stress Index – weekly
  - Global Fire Emissions – Daily (VIIRS)
  - True Color Imagery – Daily (MODIS at 250m, VIIRS at 375m)
  - Natural Color Imagery – Daily (MODIS at 250m, VIIRS at 375m)



# Data/information sources

## Soil Moisture

- Soil Moisture Active Passive (SMAP) derived product
- 3-Day Composite
- 25.4mm = saturated
  - Red = dry
  - Green = wet
- Resolution: .25°
  - Best for larger Countries



## Evaporative Stress Index

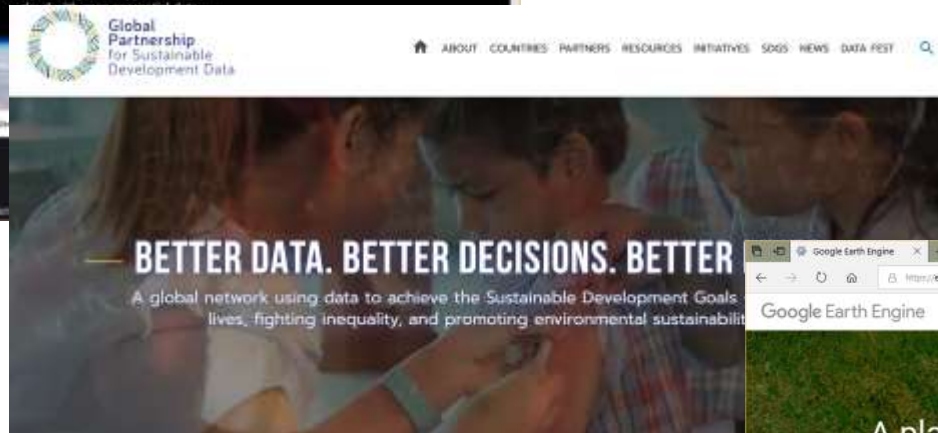
- Weekly product
- Yellow to Red = Dry, stressed vegetation
- Latency = ~2 weeks
- Resolution: 5km



## Data availability through other platforms

### Amazon Web Services:

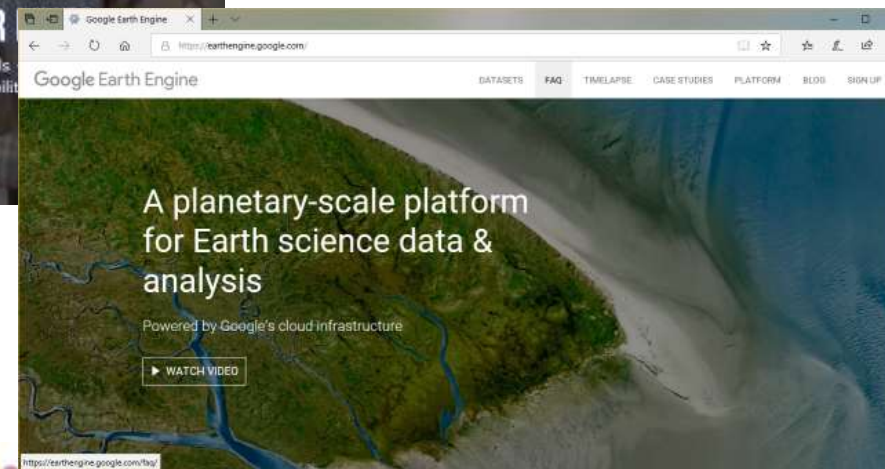
<https://aws.amazon.com/earth/>



<http://www.data4sdgs.org/>

### Google Earth Engine

<https://earthengine.google.com/>





# GlobeLand30

GlobeLand30, the 30-meter resolution global land cover data product, was developed by the Ministry of Natural Resources from China.

The availability is for: 2000, 2010 and 2020.



Clase	Año	Superficie Km <sup>2</sup>	%
Bosque	2000	294.63	81.95
Bosque	2010	257.56	71.64
Bosque	2020	238.67	66.38

Maybe change this for the case of Belize??

	Area km <sup>2</sup>	Cultivated land		Forest		Grassland		Shrubland		Wetland		Water bodies		Tundra		Artificial Surfaces		Bare Land		Permanent snow and ice	
		km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%	km <sup>2</sup>	%
Grenada	2000	359.53	0.00	0.00	294.63	81.95	19.99	5.54	1.86	0.46	1.00	0.28	0.41	0.11	0.00	25.71	9.93	0.00	0.00	0.00	0.00
	2010	359.53		0.00	257.56	71.64	37.01	10.36	0.49	0.14	0.77	0.21	0.21	0.06	0.00	35.26	9.81	0.07	0.02		0.00
	2020	359.53		0.00	238.67	66.38	45.14	12.55	0.45	0.13	2.99	0.83	0.34	0.09	0.00	65.14	18.12	0.07	0.02		0.00

# Dynamic World Landcover 2020

Maybe change this for the case of Belize??



# Conclusion

Location intelligence is the ability to analyze and find spatial patterns in data to provide powerful insights for understanding our world and communicating our needs.

This is possible through a combination of local data and advanced geospatial tools.







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**Thank you for your attention!**

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