



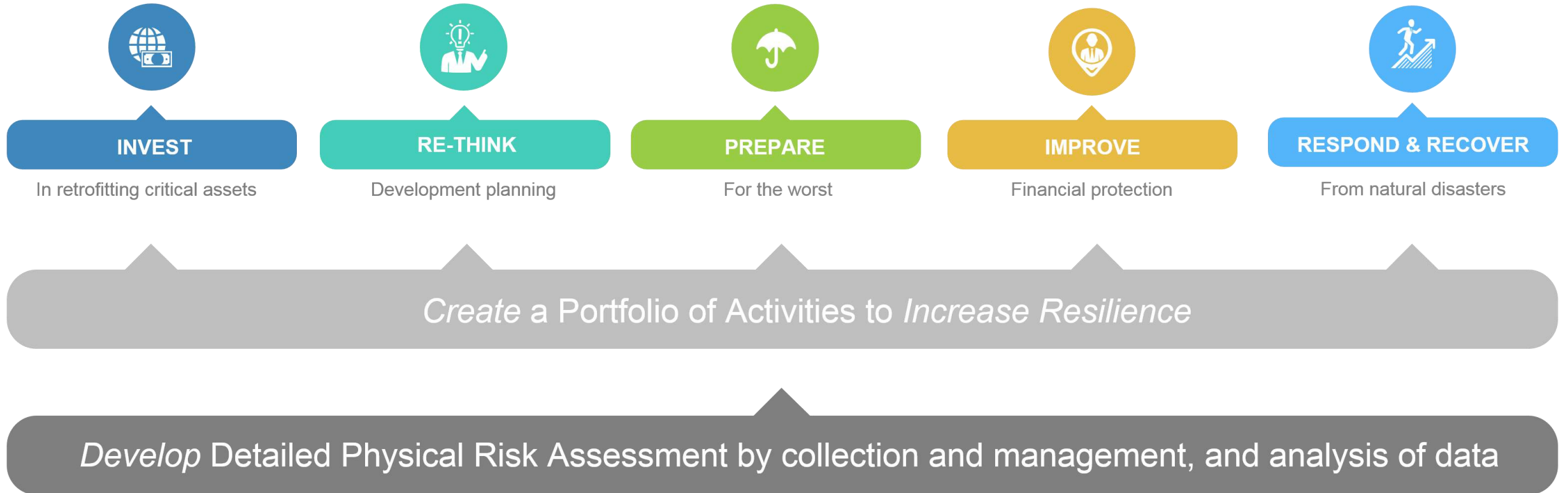
# Open Imagery for Crowdsourced (Exposure) Mapping

UAV and Satellite Imagery in OpenAerialMap

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Geospatial Technology Specialist  
October 24, 2017

# OpenDRI - Developing Risk Information to Inform Decisions

**Create a platform to inform resilient development across sectors**



[www.OpenDRI.org](http://www.OpenDRI.org)

# Open Data for Resilience



[PROJECTS](#)

[NEWS](#)

[RESOURCES](#)

[ABOUT](#)



FILTER BY PILLAR:

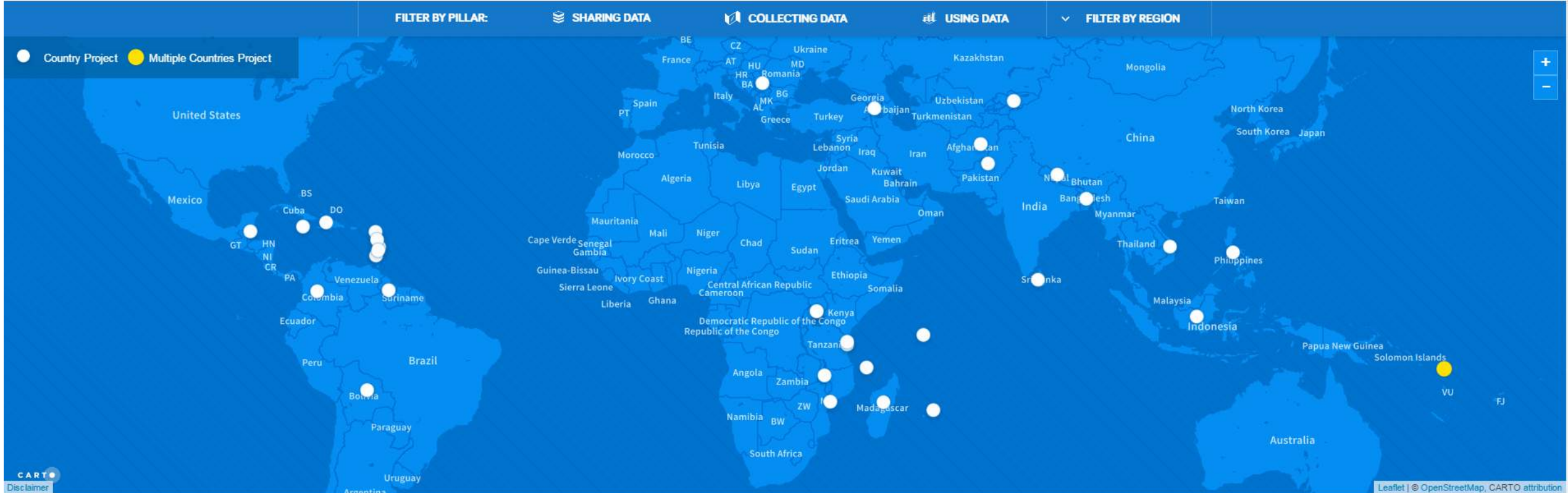
SHARING DATA

COLLECTING DATA

USING DATA

FILTER BY REGION

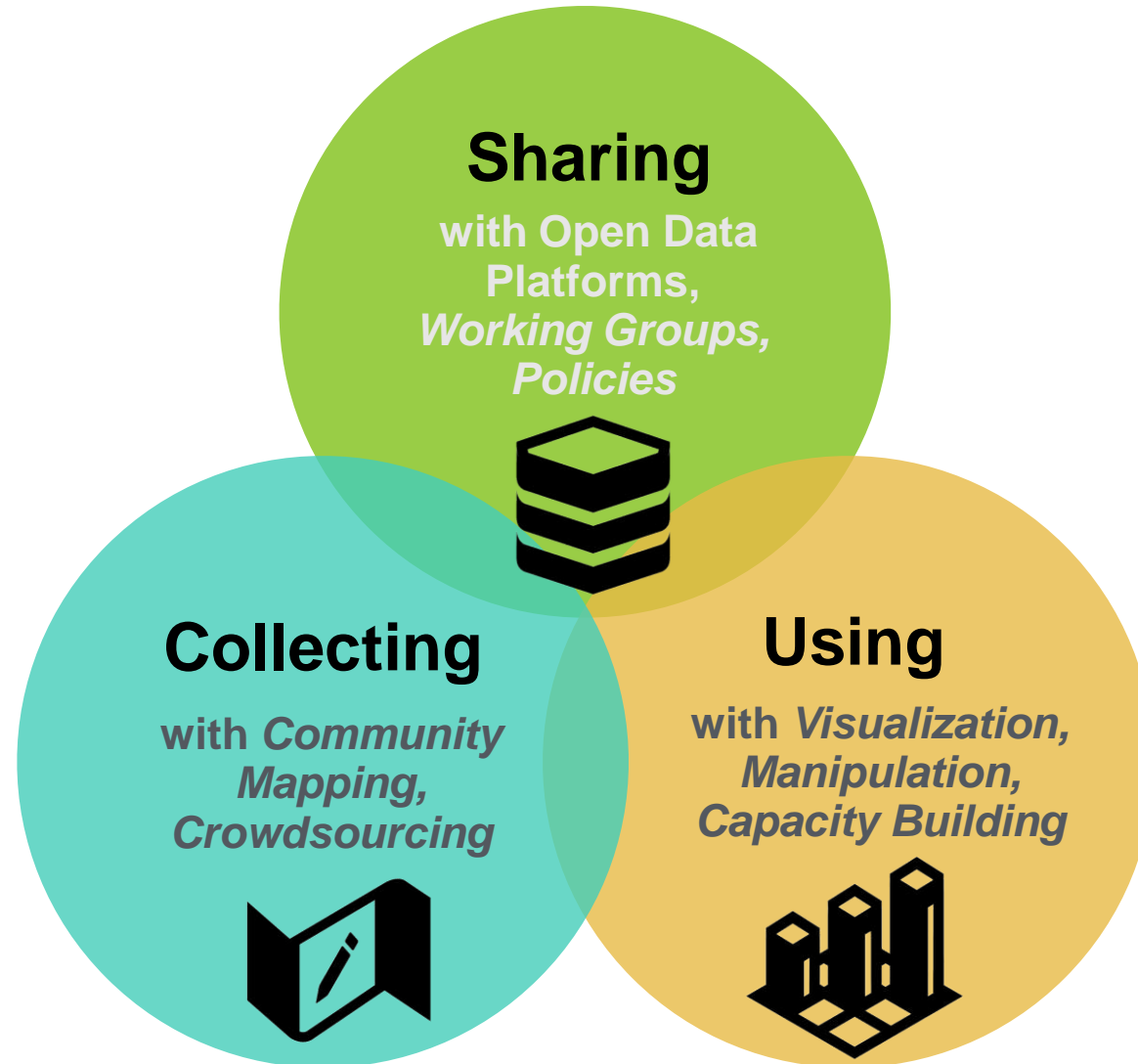
Country Project Multiple Countries Project



# Collecting Risk Information to Inform Decisions

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## Open Data for Resilience Initiative



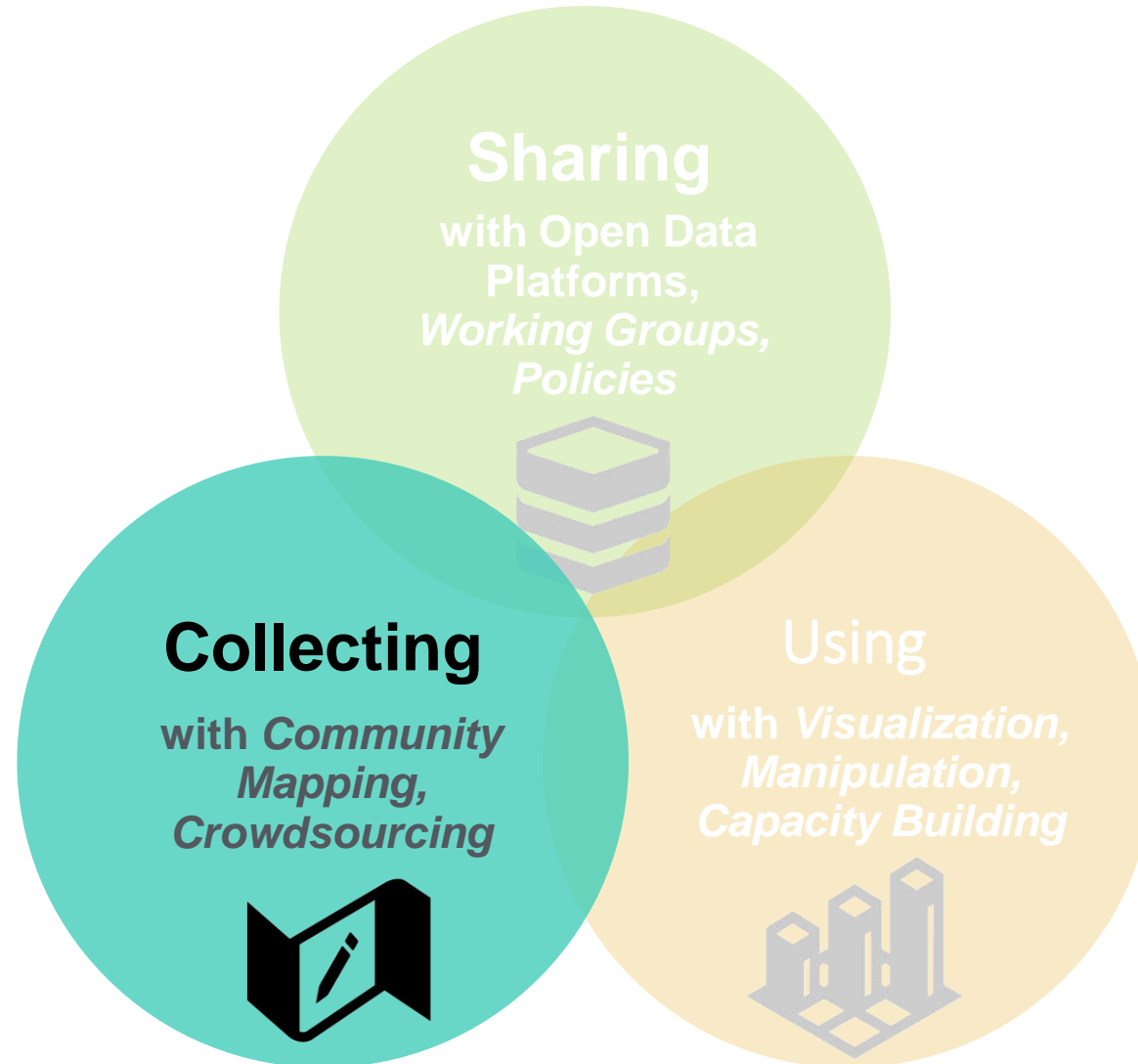
# The Problem – Missing Maps and Exposure Information

- Understanding and quantifying disaster and climate risks requires accessible, detailed and up to date data on the hazard, exposure and vulnerability
- In developing countries, data gaps prohibit meaningful analysis of risks – for example:
  - Impact of Sea Level Rise when current coastal dataset has a ~16 m vertical error
  - Impact of disasters on schools when there is no database of schools and their attributes
- The data issues:
  - Fragmentation and duplication
  - Discoverability and inaccessibility
  - Stale and incomplete data
  - Curation expense
  - Weak usage / application creates a disincentive for investment in data

# Collecting Risk Information to Inform Decisions

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## Open Data for Resilience Initiative



# Traditional Approach to Data Collection

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Open mapping to the rescue!



# Why OpenStreetMap (OSM) ?

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## A community:

- ✓ an active global community of users
- ✓ possibility to get richer and more detailed data
- ✓ data can get corrected and be kept up to date

## A website:

- ✓ open source tools for online or offline mapping
- ✓ a common platform for uploading and hosting data with free and open access
- ✓ resources for growing your community: training materials, communication platforms

## A database:

- ✓ Freely an openly downloadable datasets that can be repurposed

# Advantages to a Collaborative Approach

Started in Haiti and Indonesia using the OpenStreetMap platform

**Resources focused  
towards building  
capacity**

**Transparent &  
Reusable**

**Scalable and  
Maintainable**

**Foster more  
usage of the data**



**Collaborative**

**Builds Govt capacity to  
understand risk**

**Building local ownership and  
trust in the data**

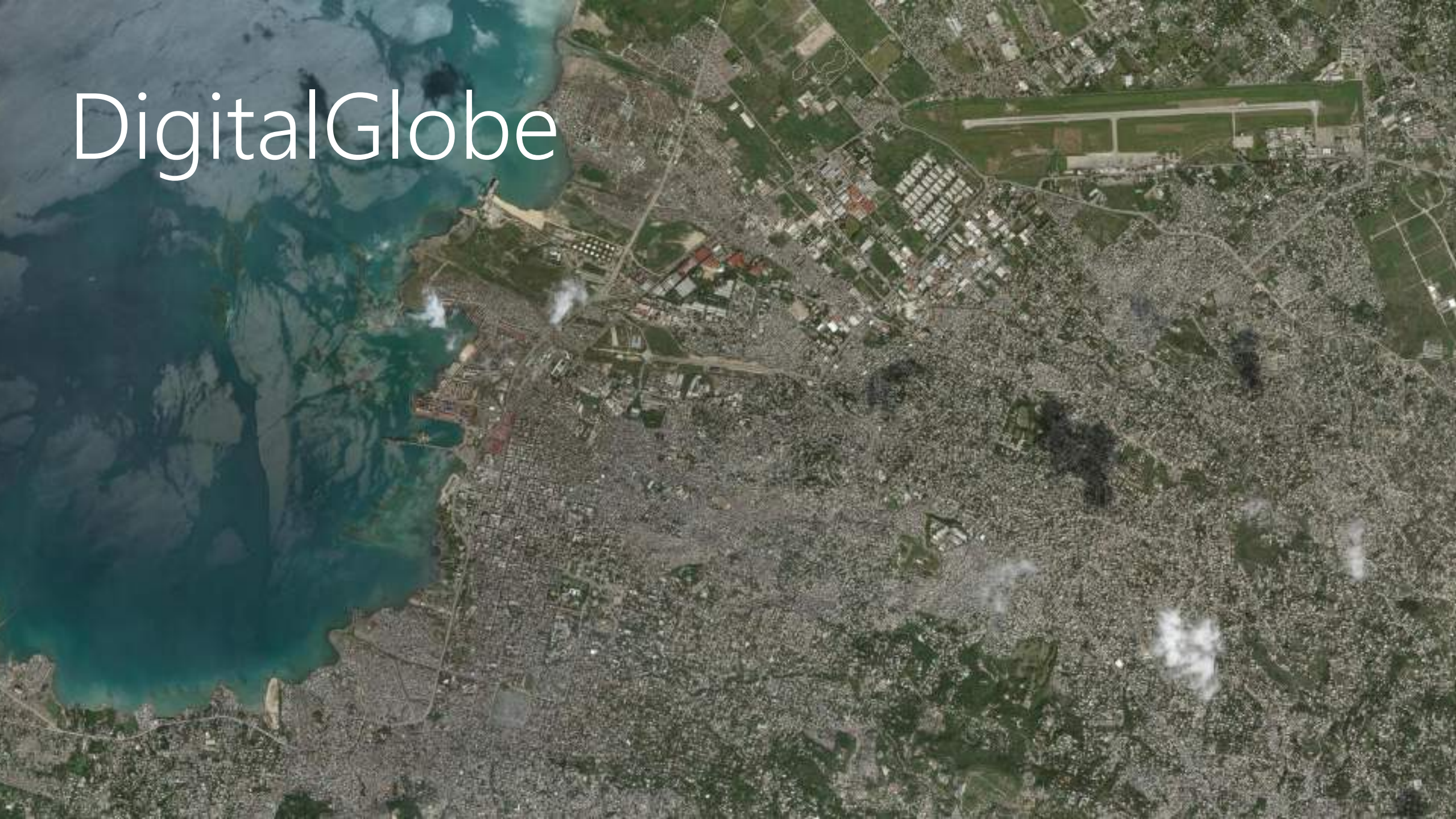
**Raises community  
awareness of risk**

7 years ago...

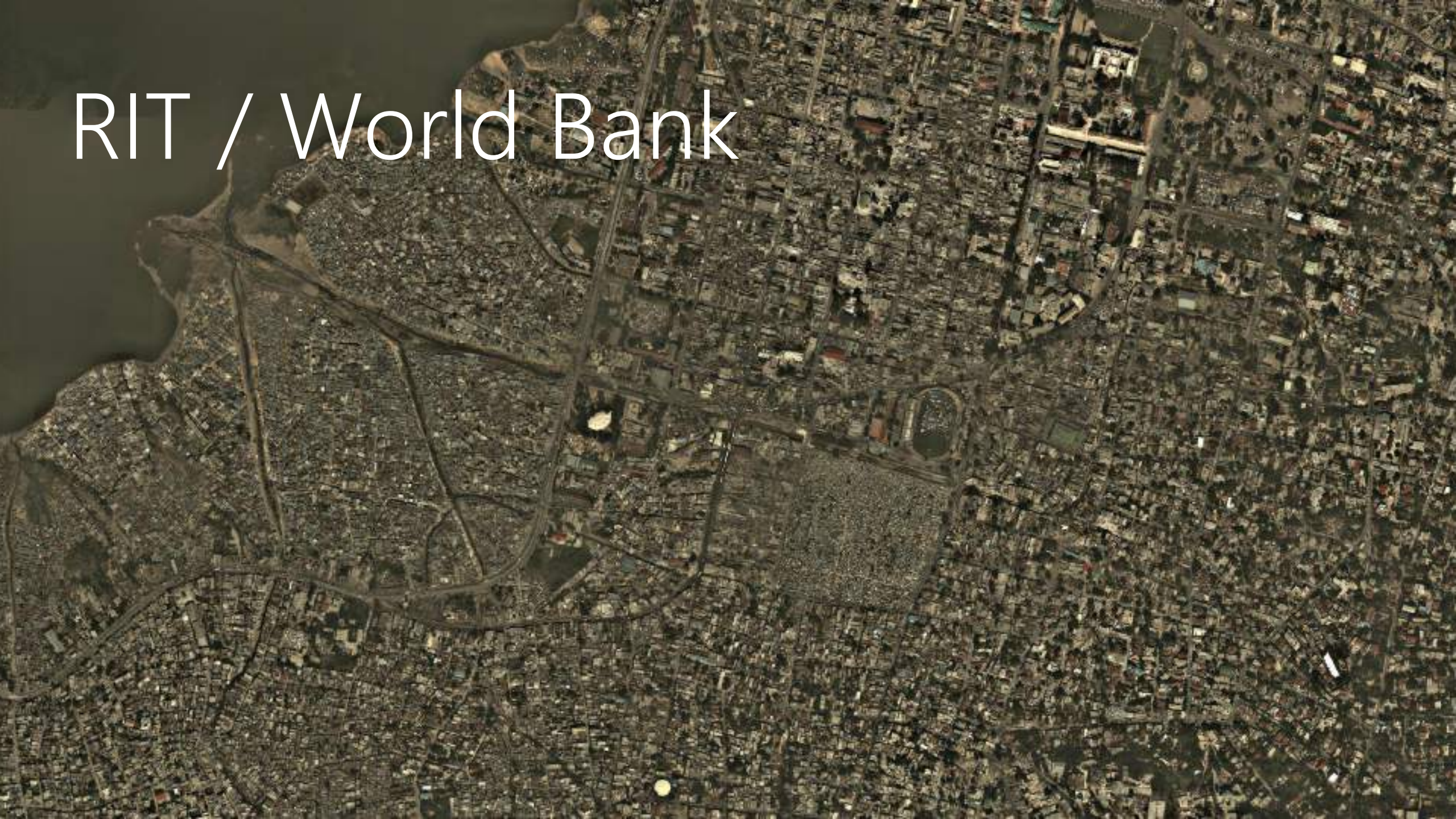


Open imagery helped drive  
tracing in OpenStreetMap

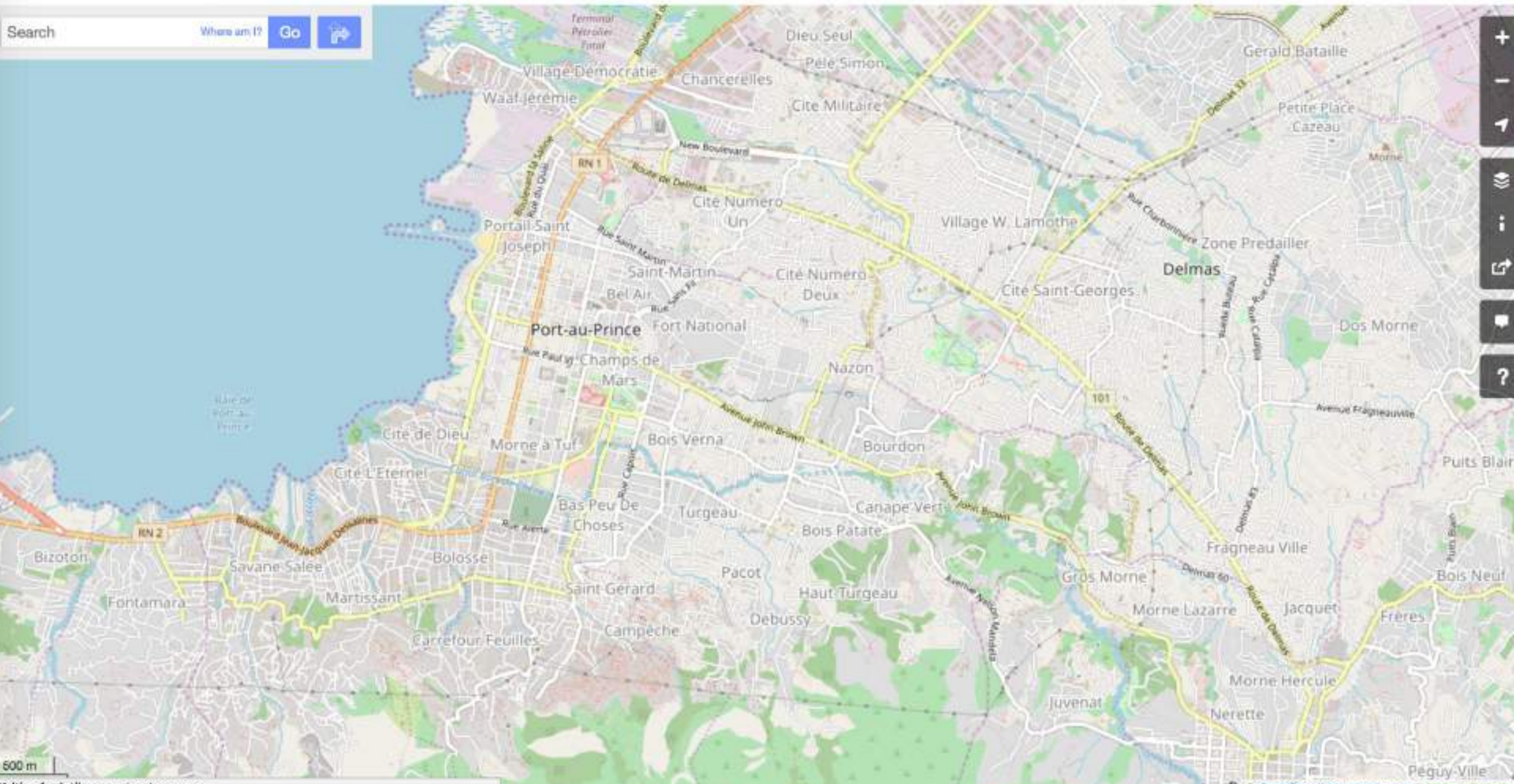
DigitalGlobe



RIT / World Bank

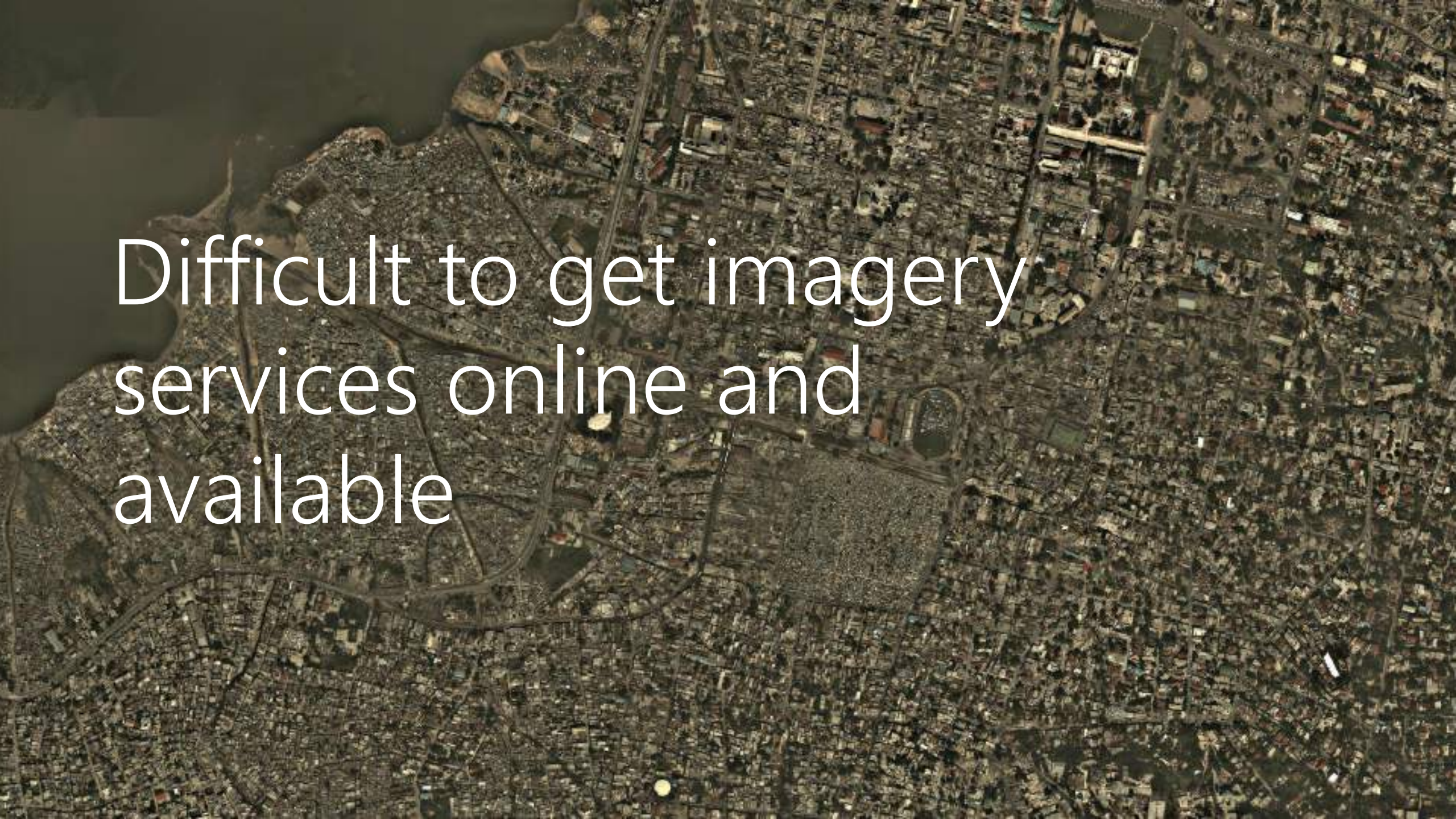


Search Where am I? Go



500 m

Waiting for b.tile.openstreetmap.org...

An aerial photograph of a densely populated urban area, likely a slum or informal settlement. The image shows a complex network of narrow, unpaved streets and small, closely packed buildings. A large, dark, irregularly shaped area on the left side of the image appears to be a body of water or a large, dark, possibly flooded area. The overall scene is one of extreme density and limited infrastructure.

Difficult to get imagery  
services online and  
available



# 7 YEARS AGO IMAGINED A WORLD

RIGHT LICENSE  
OF IMAGERY + TOOLS TO SEARCH  
AND ACCESS



BETTER AND FASTER USE OF  
IMAGERY IN FOR MAPPING



# OpenAerialMap

**A distributed commons for sharing aerial imagery.**

OpenAerialMap is a set of tools for searching, sharing, and using open satellite and drone imagery.

**[www.openaerialmap.org](http://www.openaerialmap.org)**



**Browse**

Search and Find



**API**

Access the Data



**Upload**

Contribute imagery



## Upload Imagery

Title

My New Imagery



Platform

Satellite  Aircraft  UAV  Ballon  Kite

Sensor

High Quality Sensor

Type or model of image sensor or camera used (ex: Worldview-3).

Date start

Oct 21, 2017 12:00 AM



If the exact start time is unknown using 00:00:00 will suffice.

Date end

Oct 21, 2017 7:55 AM



If the exact end time is unknown using 23:59:59 will suffice.

Imagery location

Local File



Url



Dropbox



Drive





11 images within selected grid square

DG 103001005D974E00 (Hurricane...  
2016-10-09 / 0 cm  
DigitalGlobe



DG 103001005E7F9A00 (Hurricane...  
2016-10-09 / 0 cm  
DigitalGlobe



DG 103001005E85AC00 (Hurricane...  
2016-10-09 / 0 cm  
DigitalGlobe

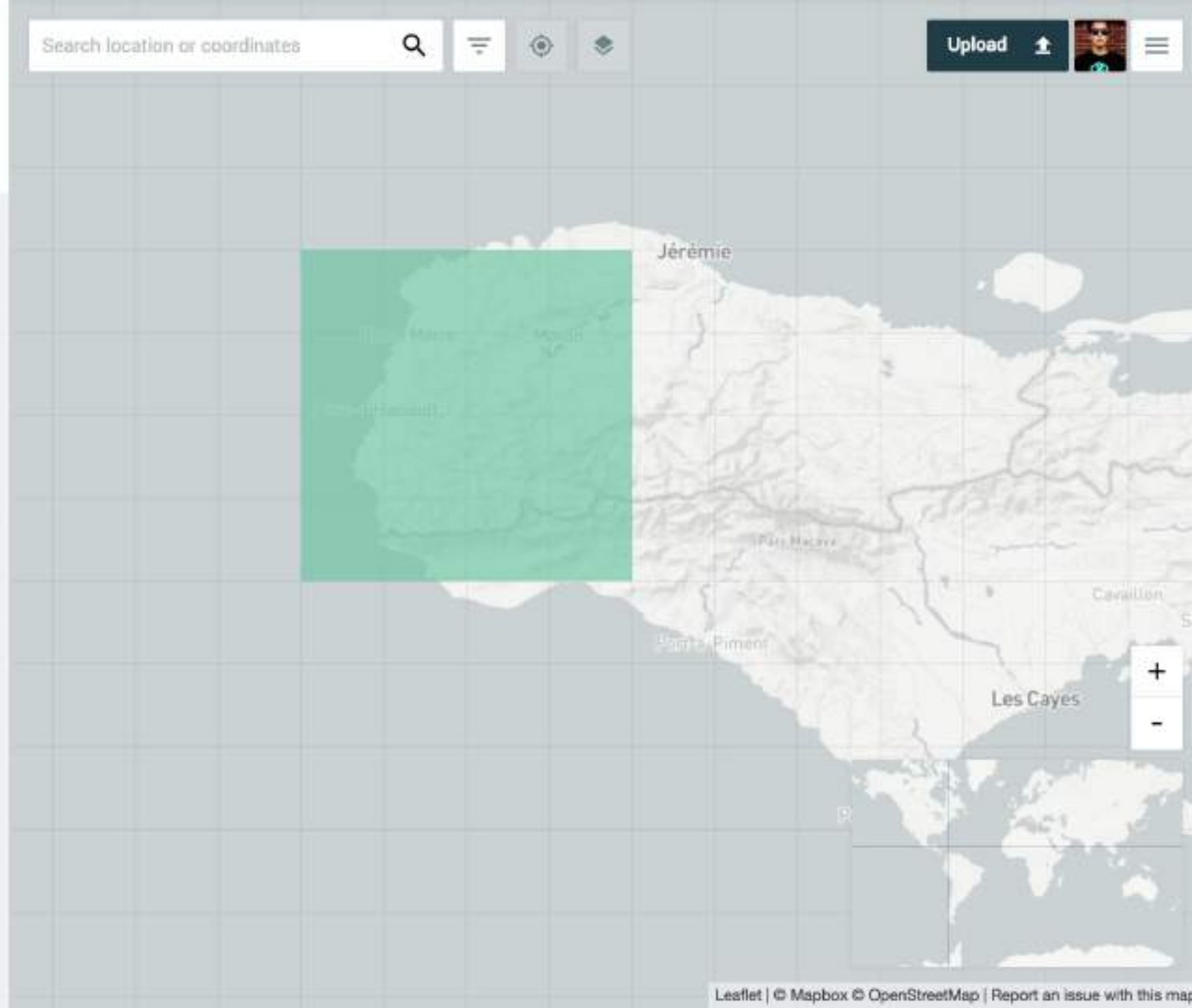


DG 1040010023084800-south (Hur...  
2016-10-10 / 0 cm  
DigitalGlobe



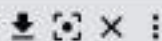
DG 103001005DC1B300 (Hurricane...  
2016-10-11 / 0 cm  
DigitalGlobe

DG 103001005F7D7A00 (Hurricane...  
2016-10-09 / 0 cm  
DigitalGlobe





DG 1040010022588400  
(Hurricane Matthew)



DigitalGlobe



Display as

TMS

Thumbnail

Open in

[iD editor](#) | [JOSM](#)

Copy image URL

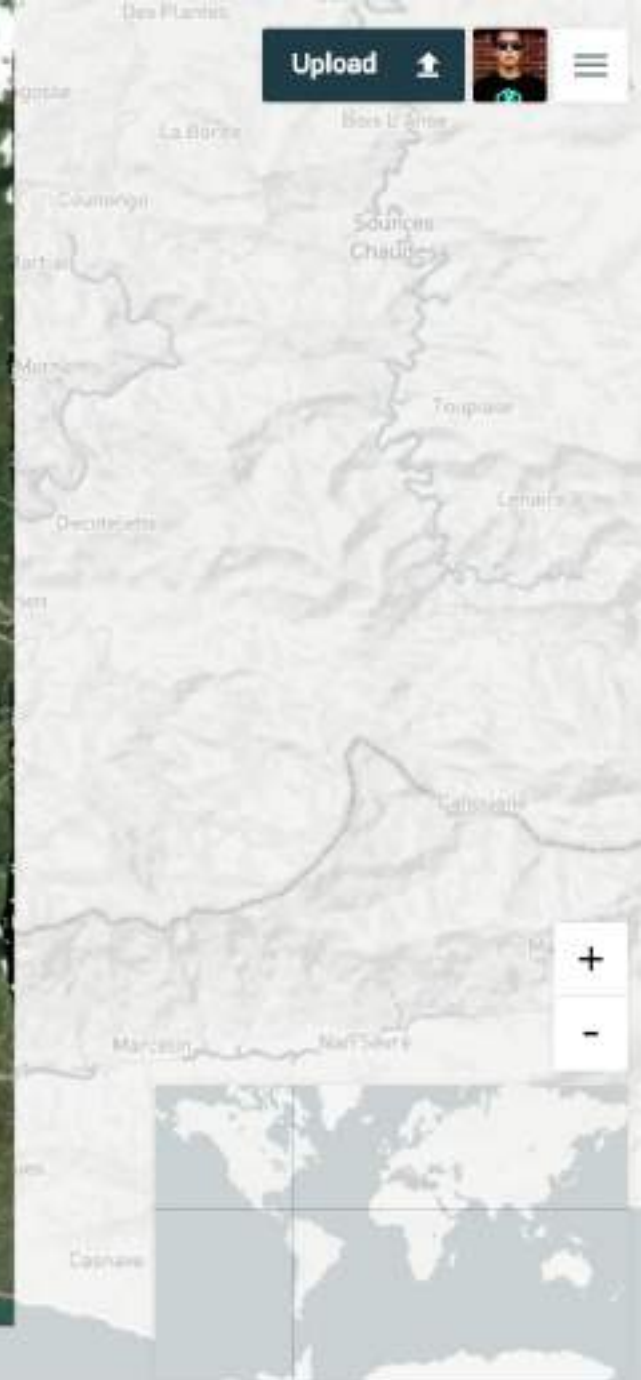
[TMS](#) | [WMTS](#)

DATE

2016-10-10

RESOLUTION

0 cm



Make imagery easy to find,  
browse, view, ingest, and  
download

OpenAerialMap (OAM) is a set of tools for searching, sharing, and using openly licensed satellite and unmanned aerial vehicle (UAV) imagery.

### Latest uploads

Lazo, trudovaya, Partyzansky  
2017-09-04 / 7 cm  
Vitali Danilovich



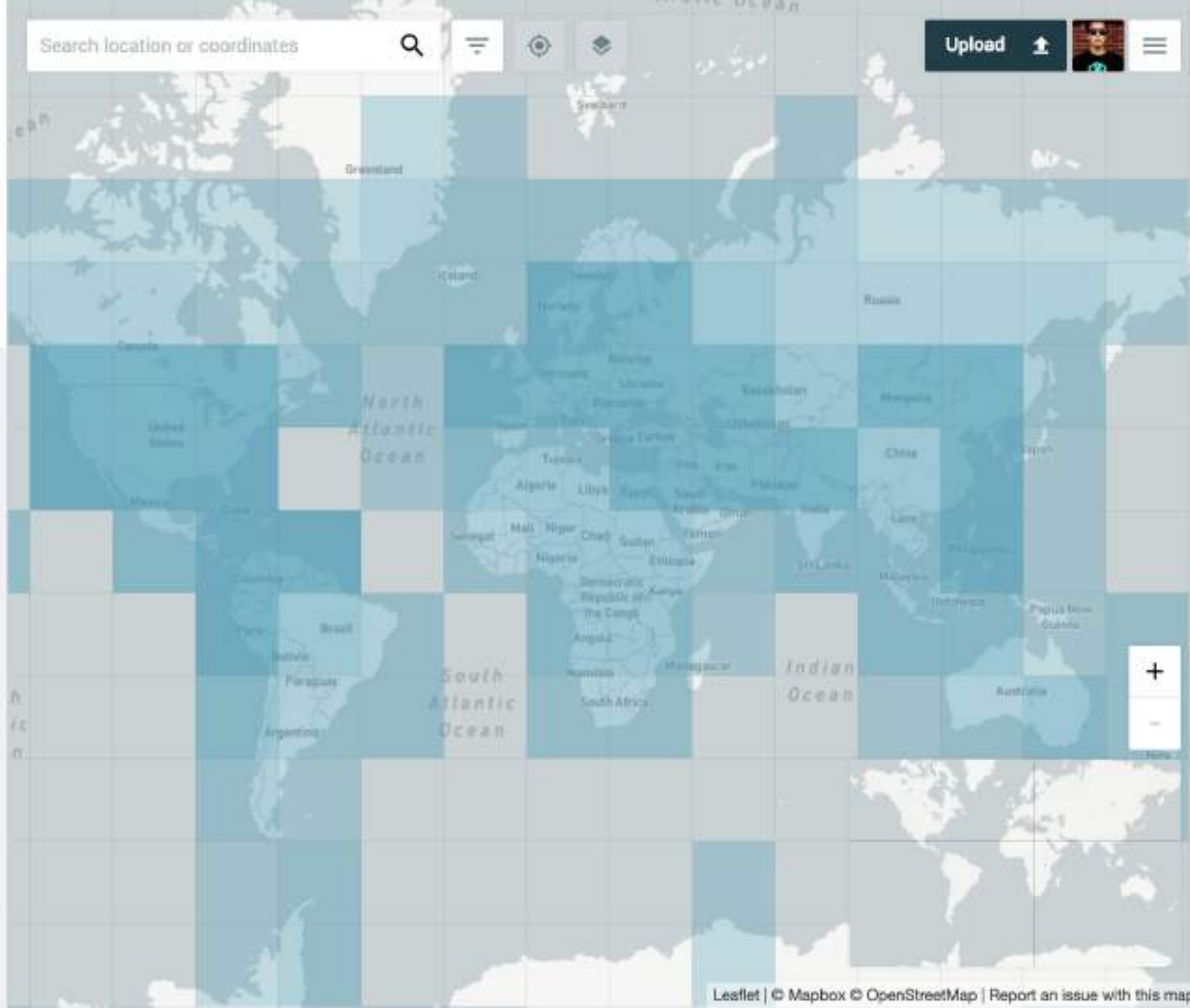
Canefield - East  
2017-10-19 / 4 cm  
GlobalMedic - RescUAV



Collibistri  
2017-10-19 / 3 cm  
GlobalMedic - RescUAV



Mahaut  
2017-10-19 / 3 cm  
GlobalMedic - RescUAV





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Mahaut  
2017-10-19 / 3 cm  
GlobalMedic - RescUAV



Time

- All
- Last week
- Last month
- Last year

---

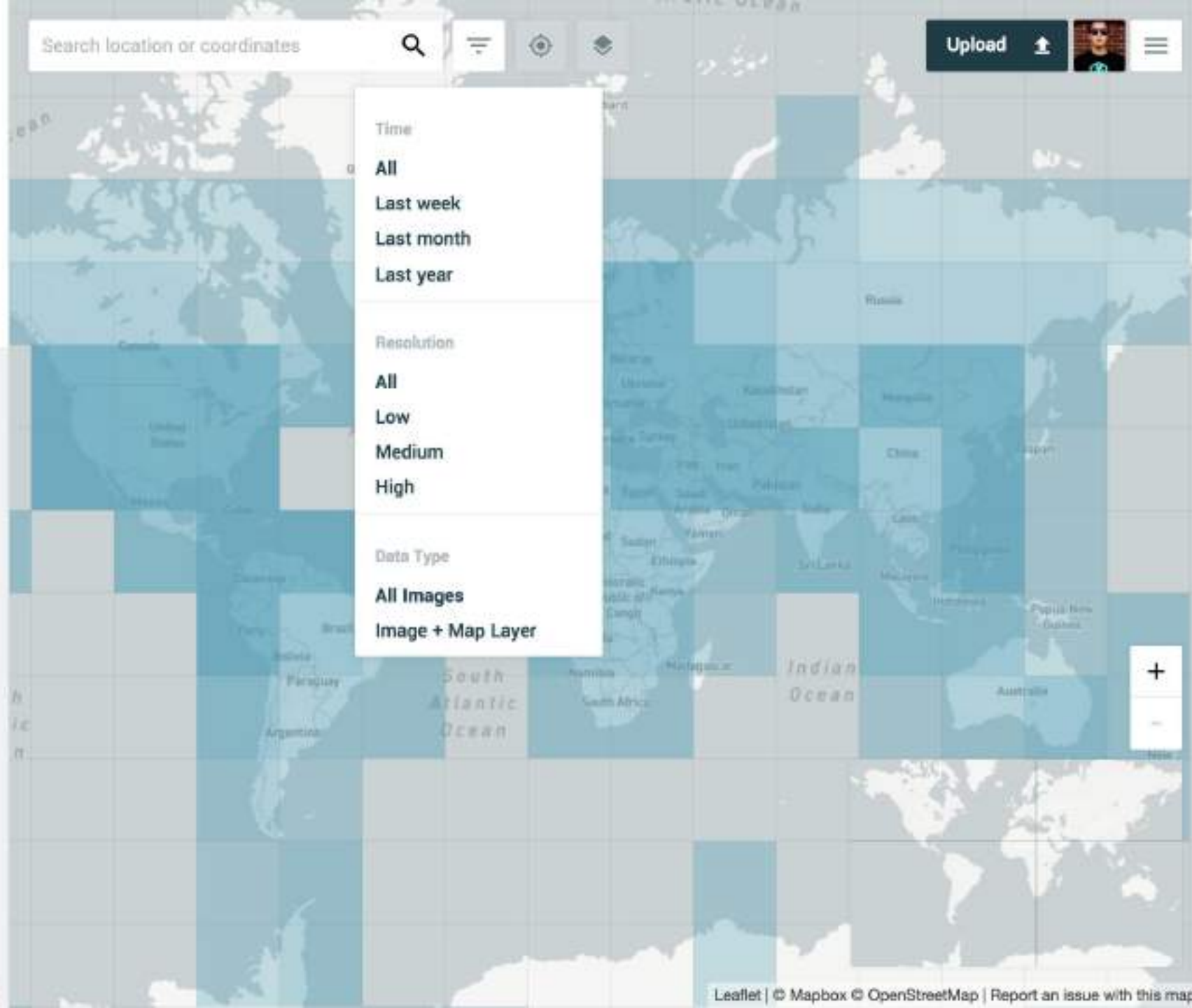
Resolution

- All
- Low
- Medium
- High

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Data Type

- All Images
- Image + Map Layer







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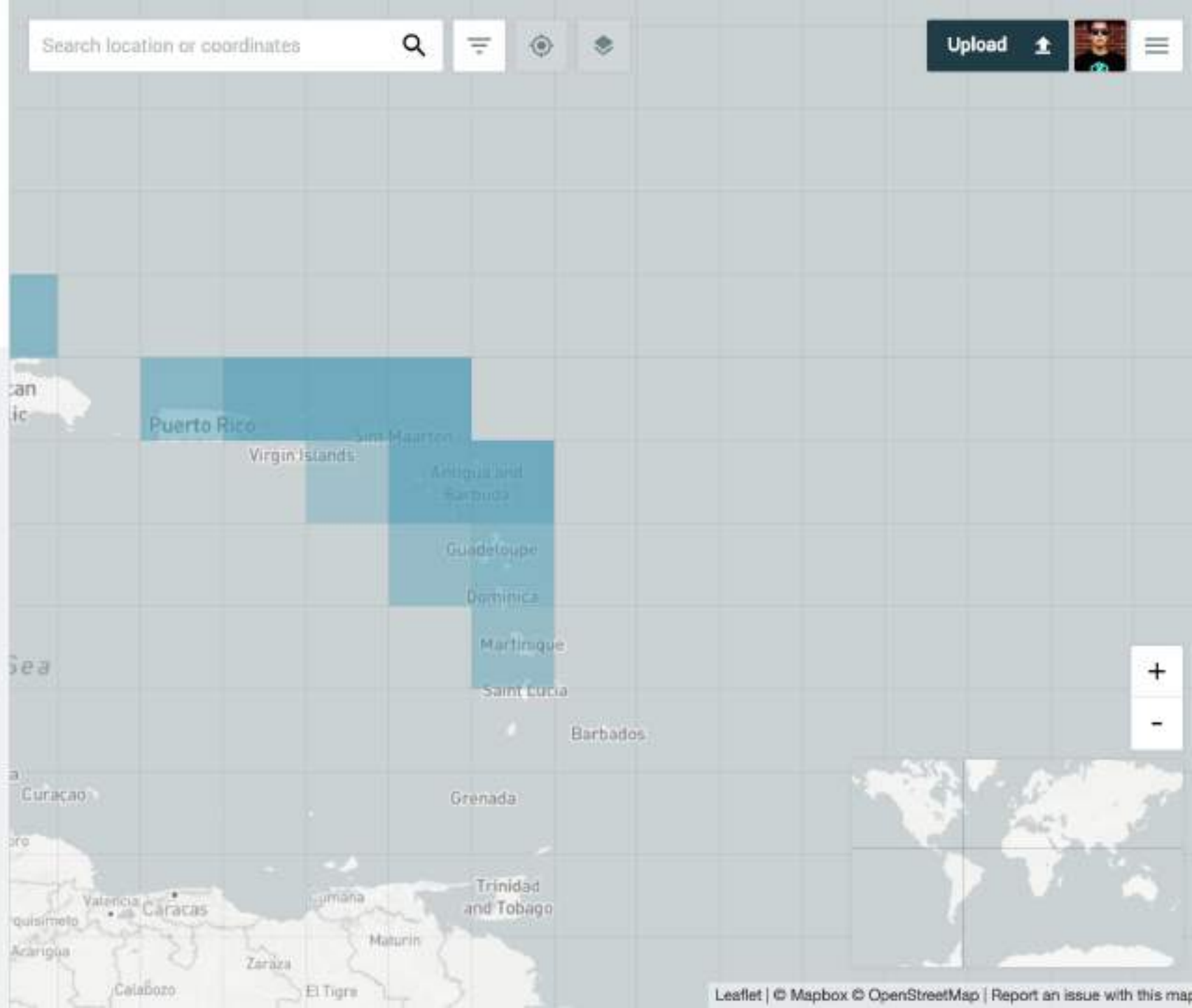
Latest uploads

Lazo, trudovaya, Partyzansky  
2017-09-04 / 7 cm  
Vitali Danilovich

Canefield - East  
2017-10-19 / 4 cm  
GlobalMedic - RescUAV

Collibistri  
2017-10-19 / 3 cm  
GlobalMedic - RescUAV

Mahaut  
2017-10-19 / 3 cm  
GlobalMedic - RescUAV





## Soufriere



GlobalMedic - RescUAV



Display as

TMS

Thumbnail

Open in

[iD editor](#) | [JOSM](#)

Copy image URL

[TMS](#) | [WMTS](#)

DATE 2017-10-10

RESOLUTION 3 cm

PROVIDER GlobalMedic - RescUAV



Dominica

Roseau





# Soufriere



GlobalMedic - RescUAV



Display as

TMS

Thumbnail

Open in

[iD editor](#) | [JOSM](#)

Copy image URL

[TMS](#) | [WMTS](#)

DATE 2017-10-10

RESOLUTION 3 cm

PROVIDER GlobalMedic - RescUAV



Search features

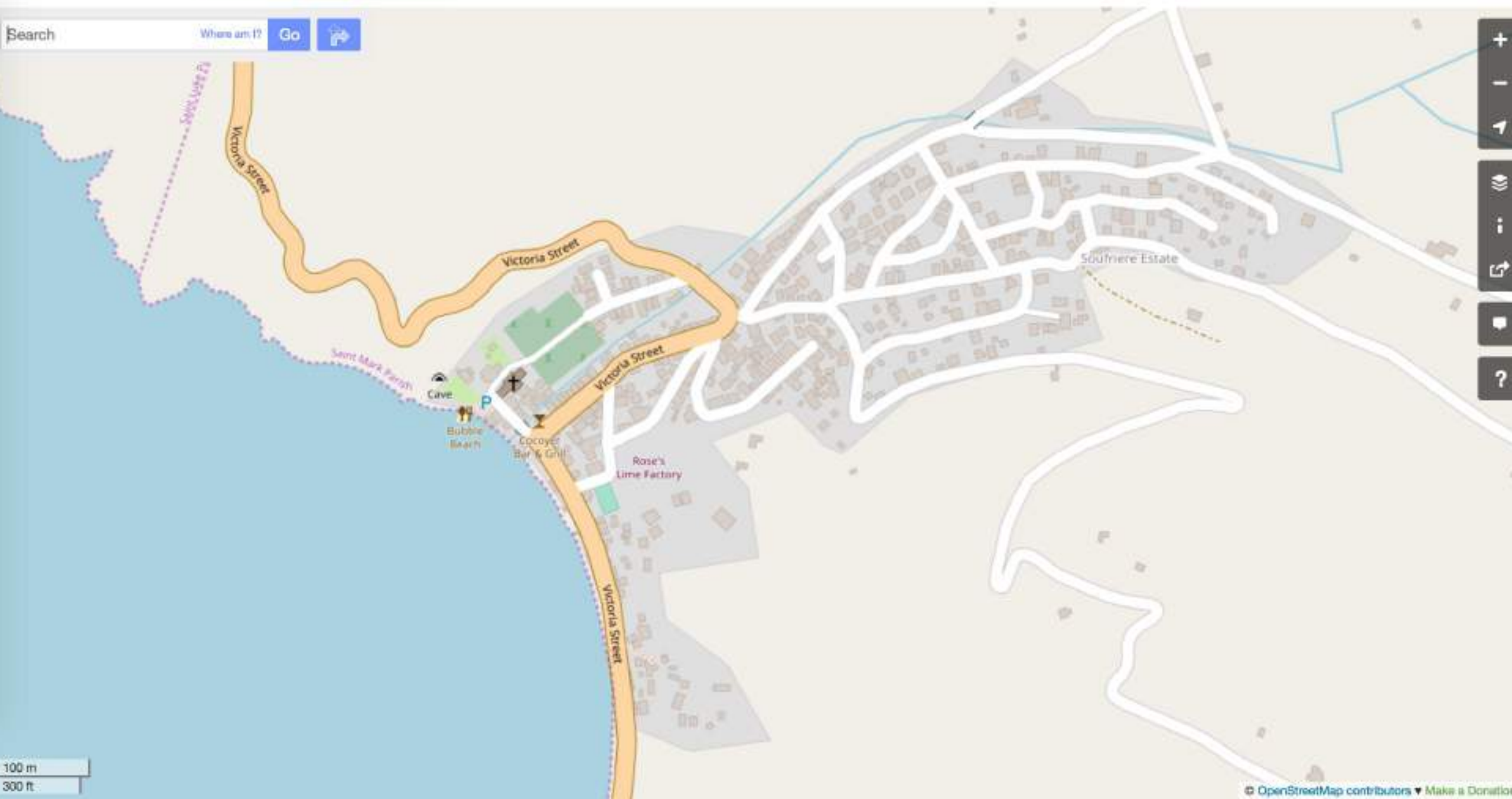
Search



Search

Where am I?

Go



100 m  
300 ft



**Browser Panel**

- Home
- Favourites
- /
- Volumes
- DB2
- MSSQL
- PostGIS
- SpatiaLite
- ArcGisFeatureServer
- ArcGisMapServer
- OWS
- Tile Server (XYZ)
- WCS
- WFS
- WMS

**Layers Panel**

- Soufriere



# Crowdsourcing imagery + in-situ data

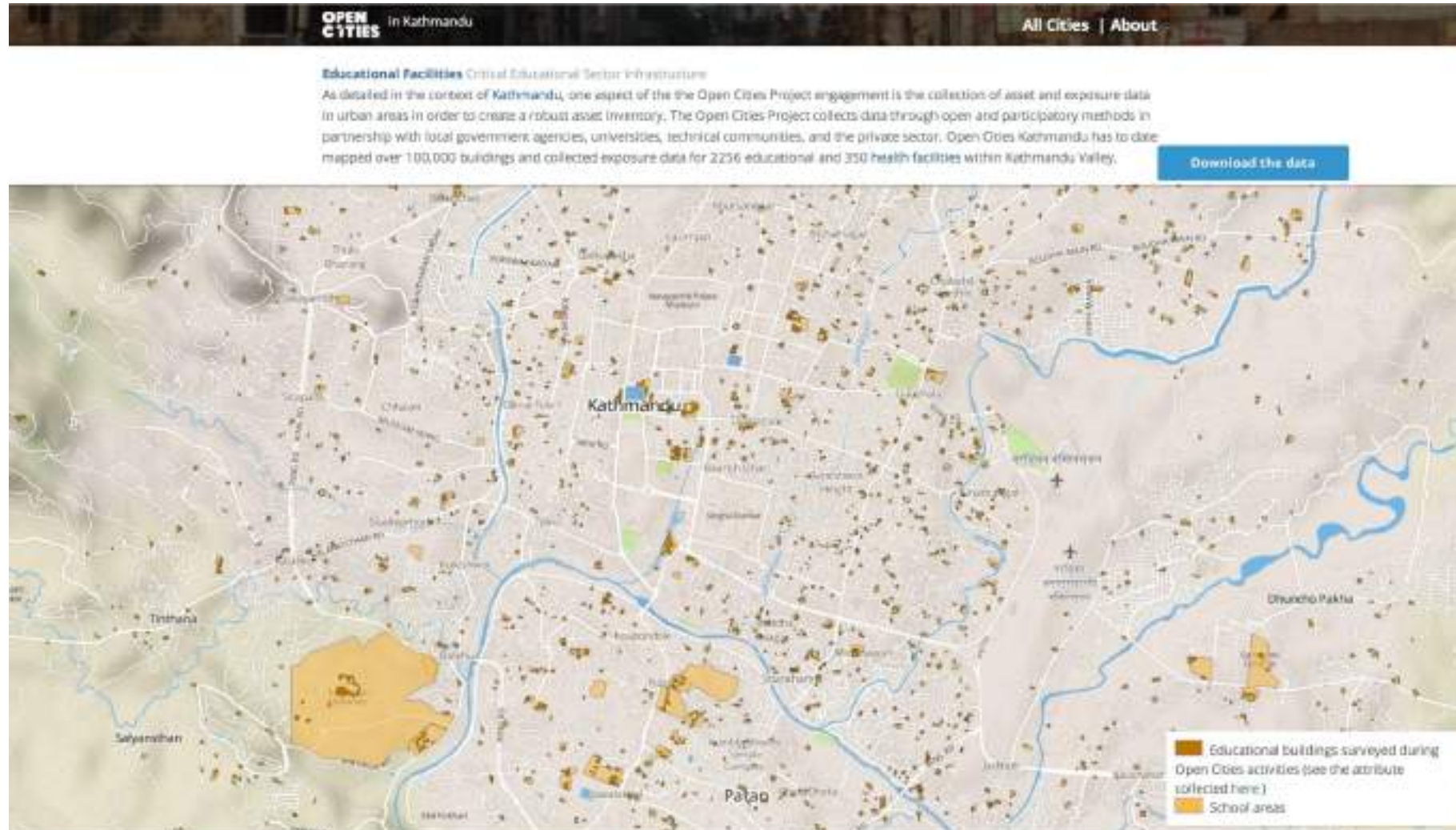
---

- Derive spatial geometry (e.g. building footprints) from aerial imagery, then plan and collect in-situ data (when accessible)
- Train government officials, university students, local communities and NGOs
- Identify and map assets at risk, village locations, transportation networks and village facilities and to make this data open



# Example – Kathmandu, Nepal

## *Mapping Schools and Hospitals for Seismic Risk Assessment*





# Tanzania: Ramani Huria (>50 sqkm)

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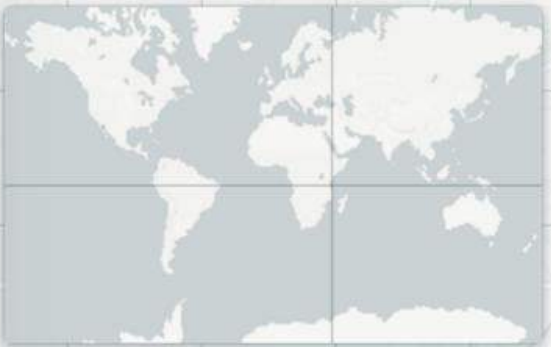


Search location



OpenAerialMap **BROWSER**

Upload



2015-05-20\_tandale\_merged\_transp...   
2 of 5 results

PREVIEW Thumbnail **TMS** None



<http://tiles.openaerialm:>

**Download**

DATE	2015-05-20
RESOLUTION	5 cm
TYPE	Image + Map Layer



dar es salam



or

Outline Custom Area

Sinza

Buildings

Map Legend

- Buildings
- Highlighted buildings

Last Data Update: 17 hours ago

Makuburi

2011

382  
Buildings

460,587  
Buildings

now

Close Comparison View

2007

2008

2009

2010

2011

2012

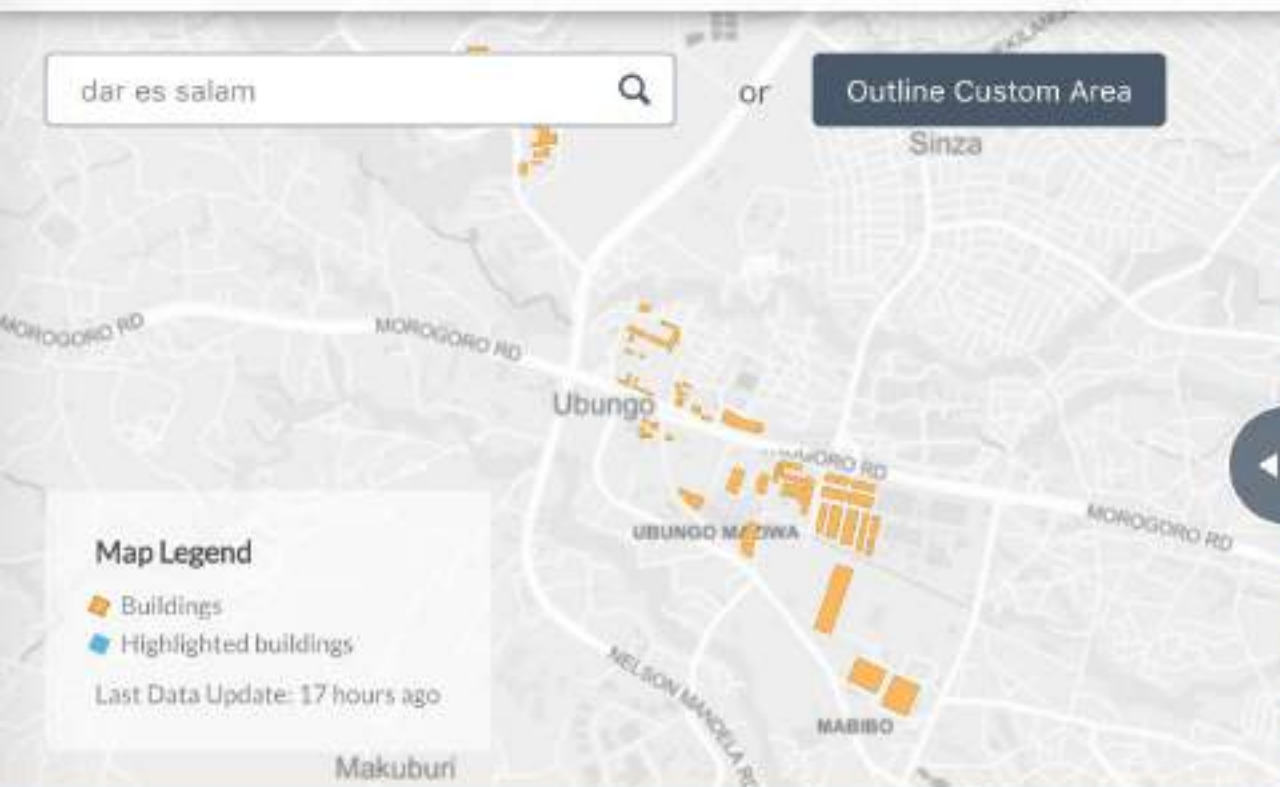
2013

2014

2015

2016

2017



# Example – Dar Es Salaam, Tanzania:

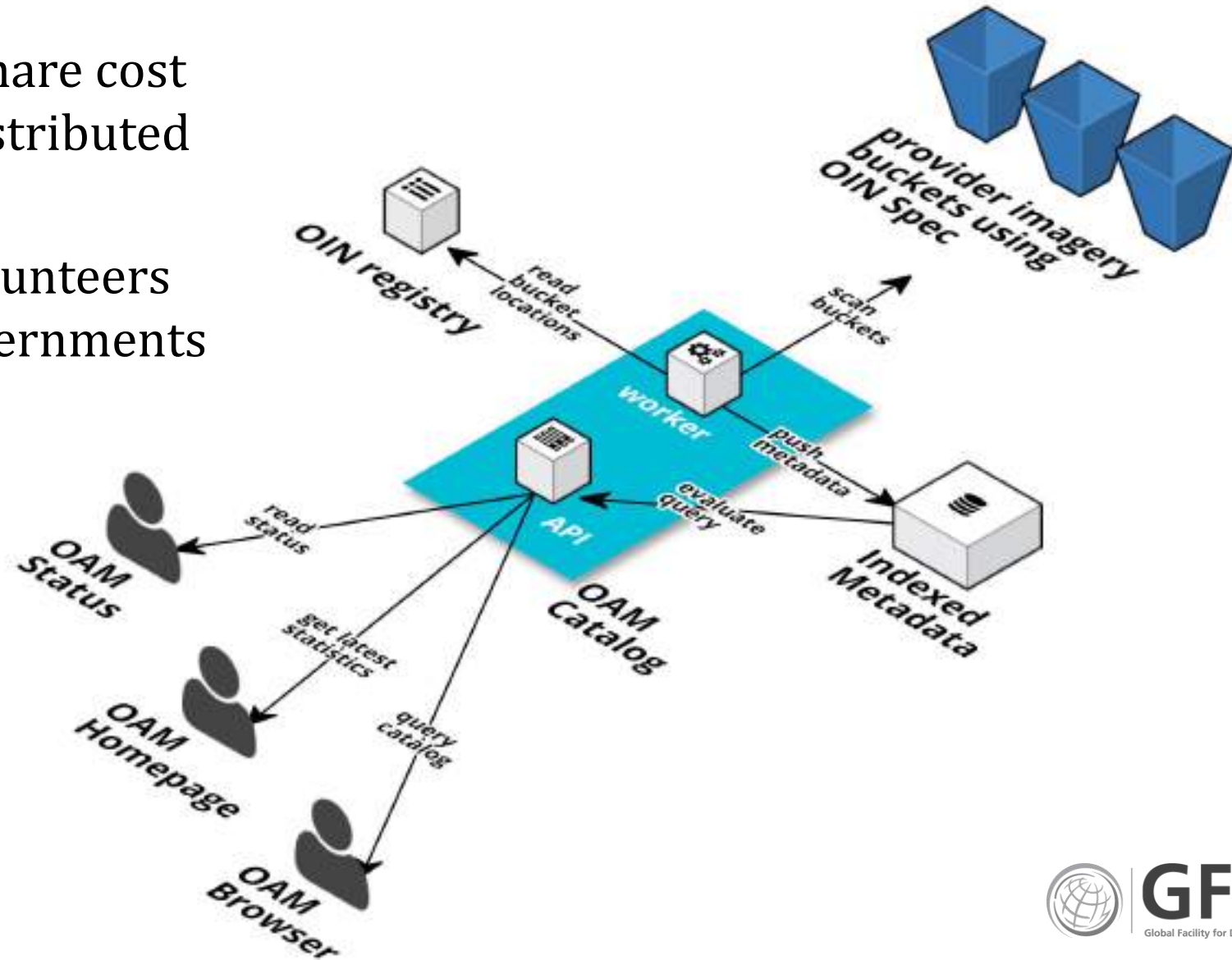
*Mapping Flood Prone Areas with Local Governments and Red Cross*

---



# A Sustainable and Interoperable System?

- Sustainable model to share cost of storage through a distributed model
- Engage citizens and volunteers to collaborate with governments



# What we're Doing

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- What can be mapped from where (unmanned vs manned vs satellites)?
- What is the best UAV platform + sensor for application?
- Imagery accuracy and quality of derived data
- Defining a simple set of metadata for UAV (and satellite) imagery



# Call to Action

- Actively discuss **privacy issues** of ultra-high resolution imagery
- Integration of data created by DRM **professionals and volunteers**
- Define and adopt clear **regulatory frameworks** for using UAVs in DRM
- Connect providers and end users through **coordination tools**
- Define and adopt reference use **licenses for EO data**
- **Machine learning** for automatic feature extraction (and smarter crowd-sourcing!)



# Thank you!

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[cgiovando@worldbank.org](mailto:cgiovando@worldbank.org)

[www.OpenDRI.org](http://www.OpenDRI.org)

[www.OpenAerialMap.org](http://www.OpenAerialMap.org)