Copernicus Satellite Data in Chile and Latin America

Copernicus
Framework Partnership Agreement for Copernicus User Uptake

Copernicus Relays

JNCC
Joint Nature Conservation Committee

UNIVERSIDAD DE CHILE

CMM
Center for Mathematical Modeling

Disaster Preparedness & Resilience

Risk Modelling using Sentinel 2 data.

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Environment SYSTEMS
evidence and insight

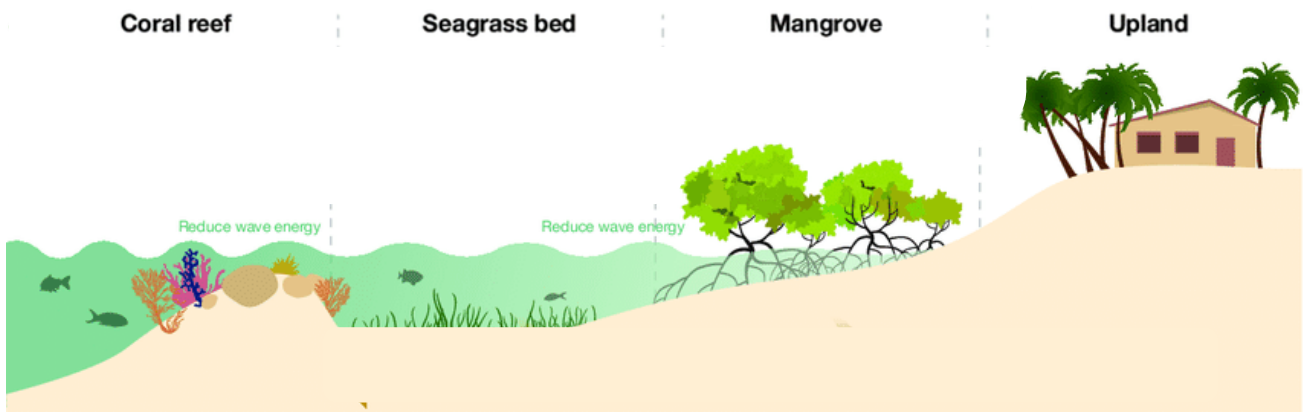
Incorporation of novel modelling techniques

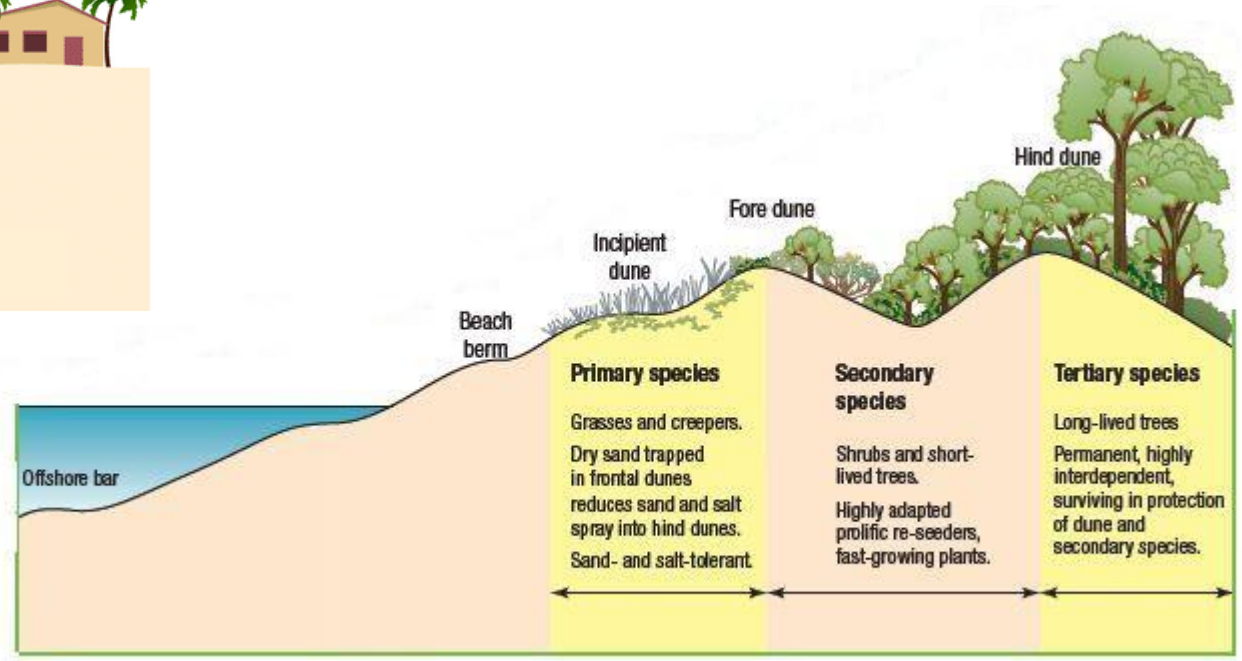
Content

- Understanding the coastal zone
- Building the models
- The shallow water marine environment
- The terrestrial environment
- Risk modelling
- Data validation

Sentinel 2 time series over the island of Anguilla in the Caribbean

The coastal zone and resilience to storm events





The coastal zone and resilience to storm events

Building the models and the use of Sentinel 2 data

Bathymetry of the shallow water area

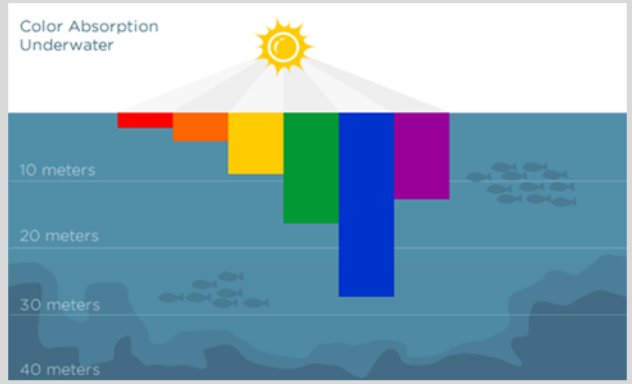
Current habitat type –shallow water marine

Current habitat / substrate –terrestrial habitat

Topography of the inland area

Information on storms, fetch and potential sea level rise risks.

Sentinel 2

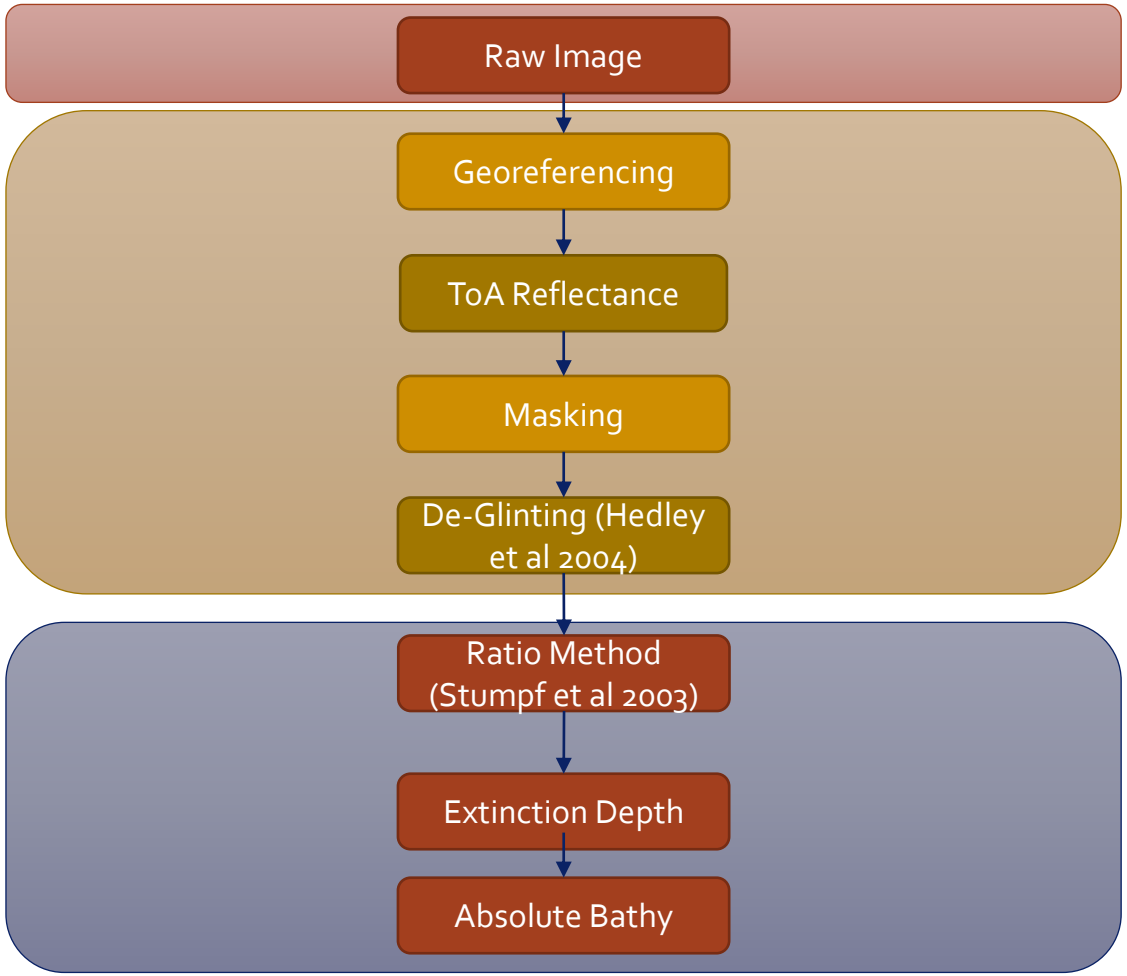


Sentinel 2
OBIA or machine learning

World DEM
LiDAR

Modelling from existing global and local datasets

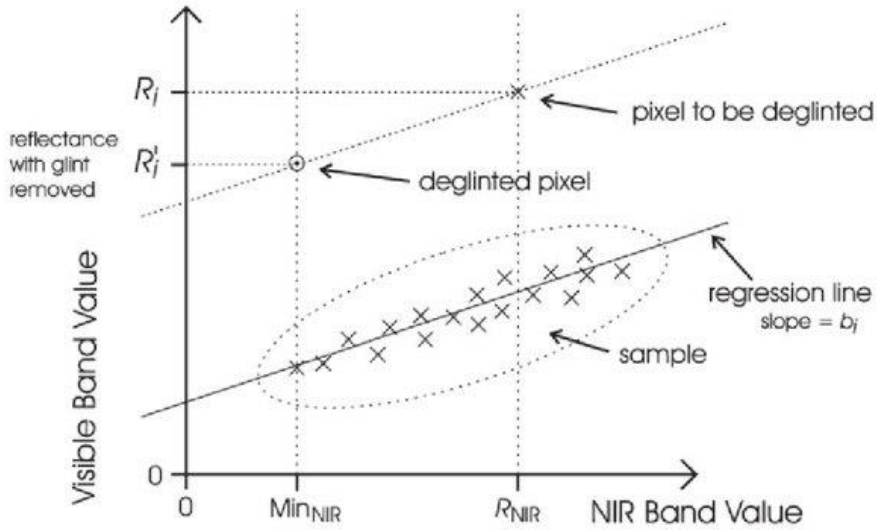
Bathymetry of the shallow water area



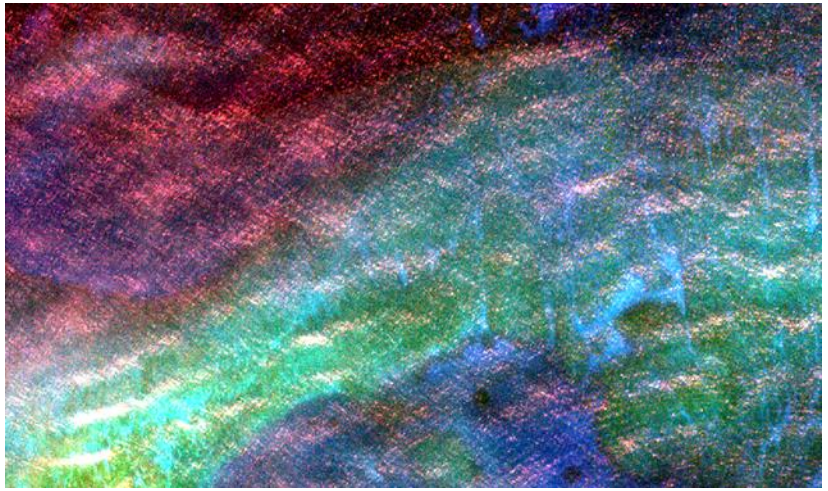
Marine pre-processing

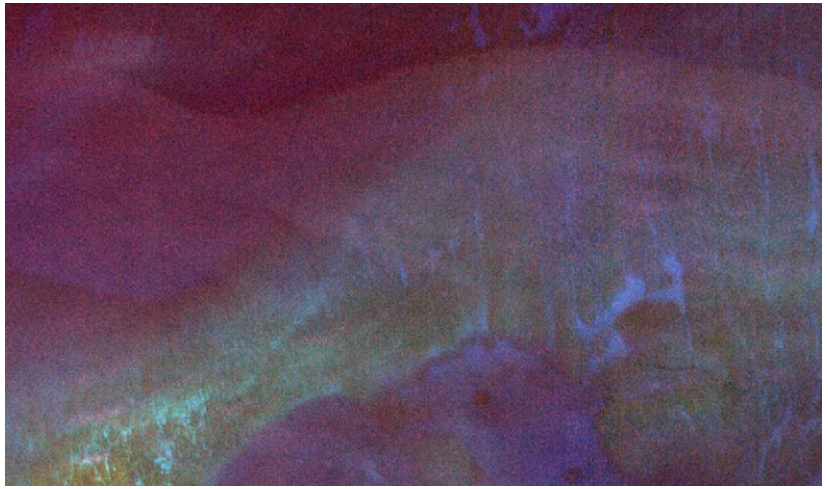
Bathymetry algorithm

Pre-processing for the marine environment

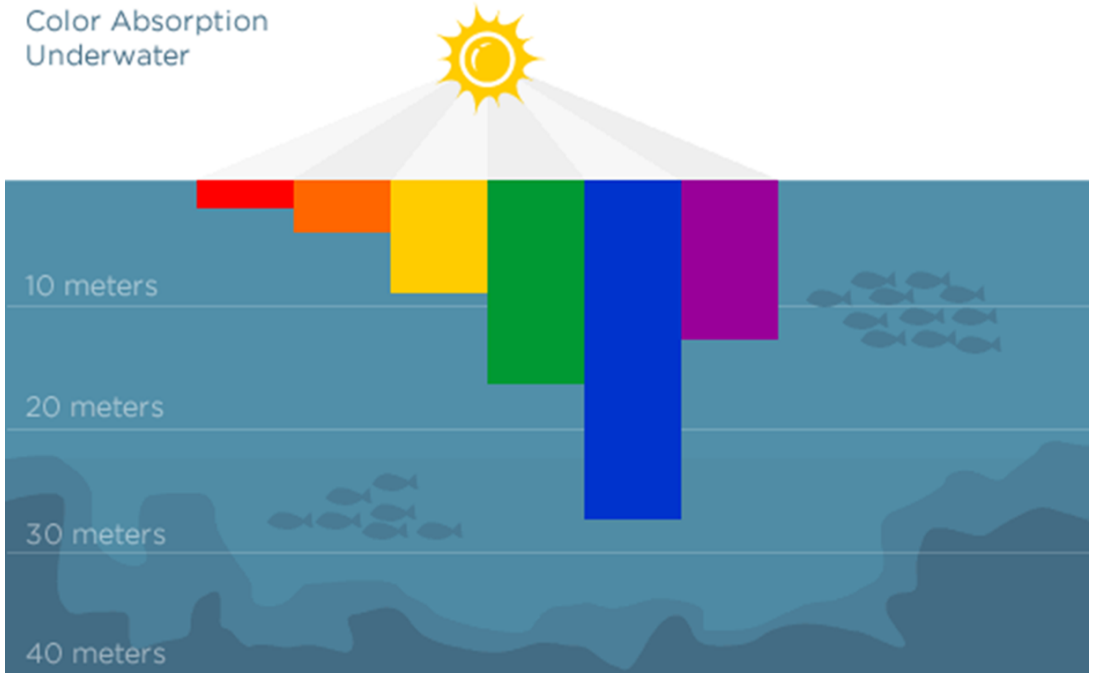


$$R_i' = R_i - b_i(R_{\text{NIR}} - \text{Min}_{\text{NIR}})$$





Measuring bathymetry using remote sensing



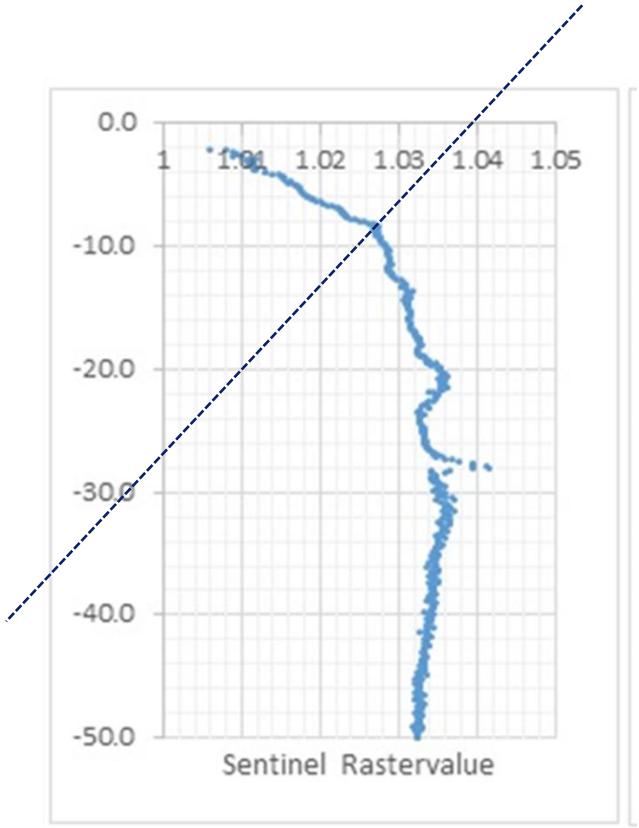
The Lyzenga85 method relies on a relationship to be formed between each band (subtracted by its mean signal over deep water), its respective linear spectral decay, and in situ depth data.

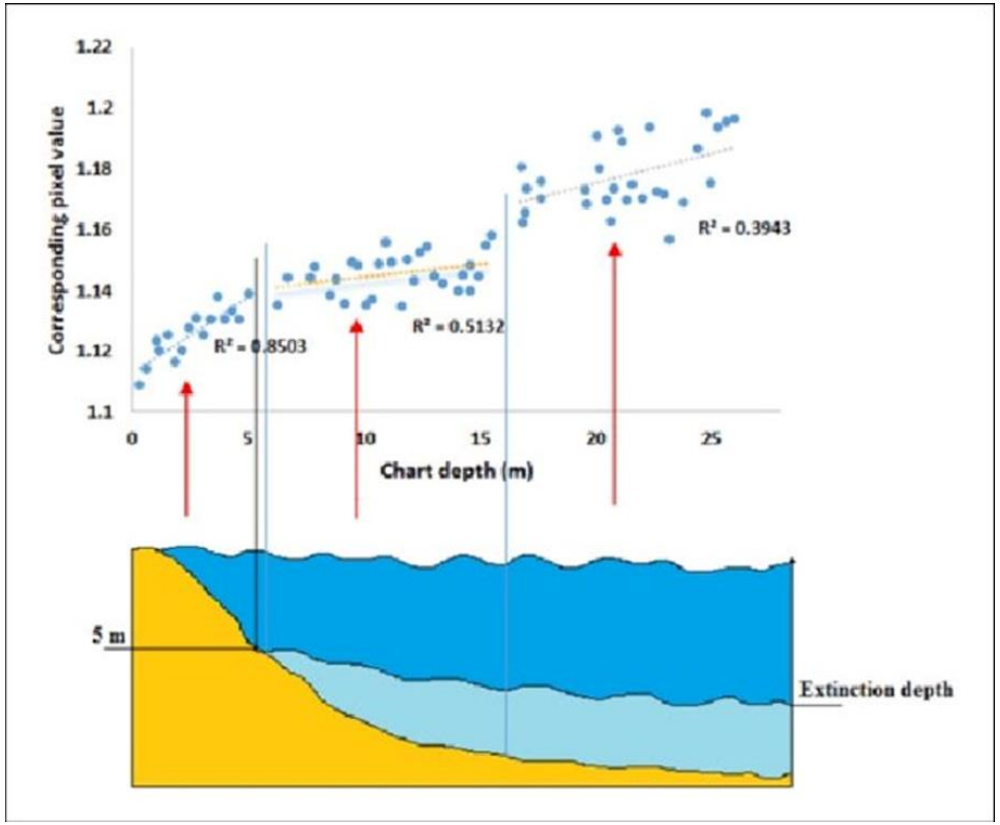
$$z = a + b_i \ln(x - x_{si}) + b_j \ln(x_j - x_{sj}),$$

The Stumpf03 method relies on a relationship to be formed between the ratio of spectral decayed blue and green bands, and in situ depth data.

$$D = m_1 \frac{\ln(nR''_1)}{\ln(nR''_2)} m_0$$

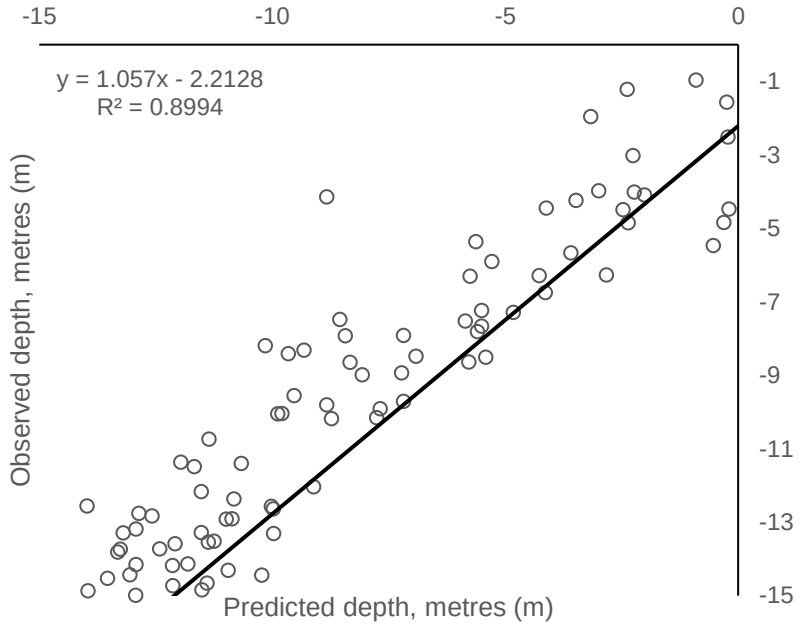
Measuring bathymetry using remote sensing





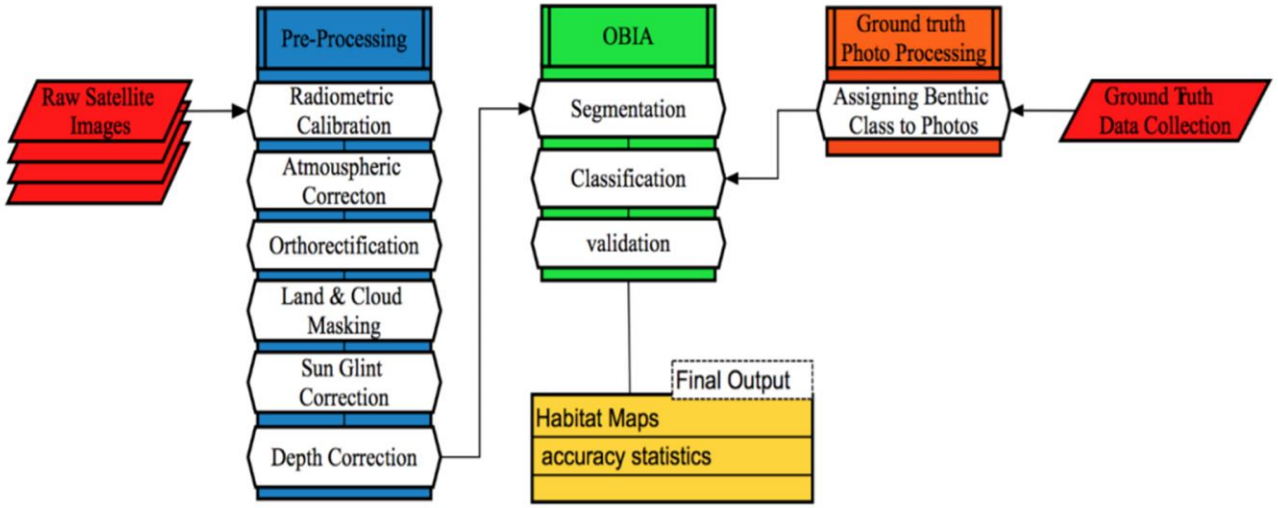
(Jagalingam & Hegde 2016)

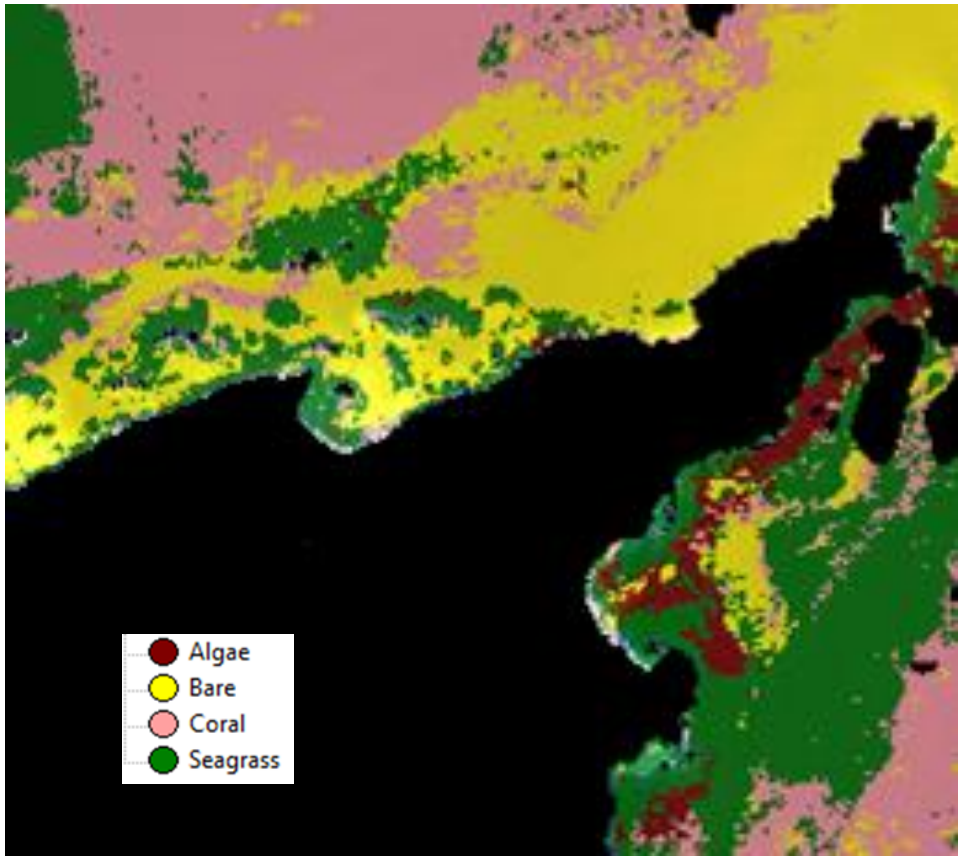
Measuring bathymetry using remote sensing



Habitat Mapping

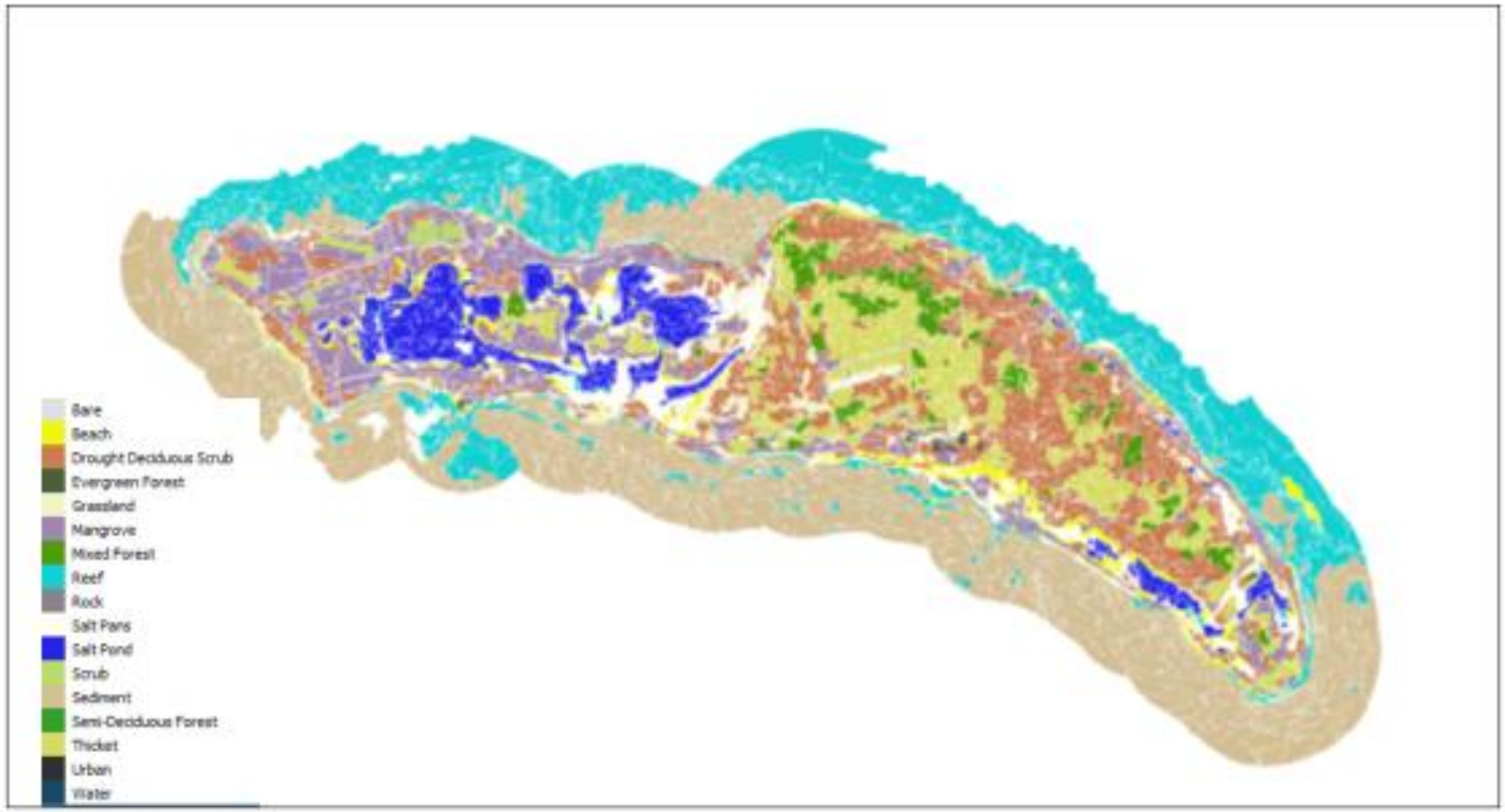
Marine habitat mapping
Created using object based image analysis.





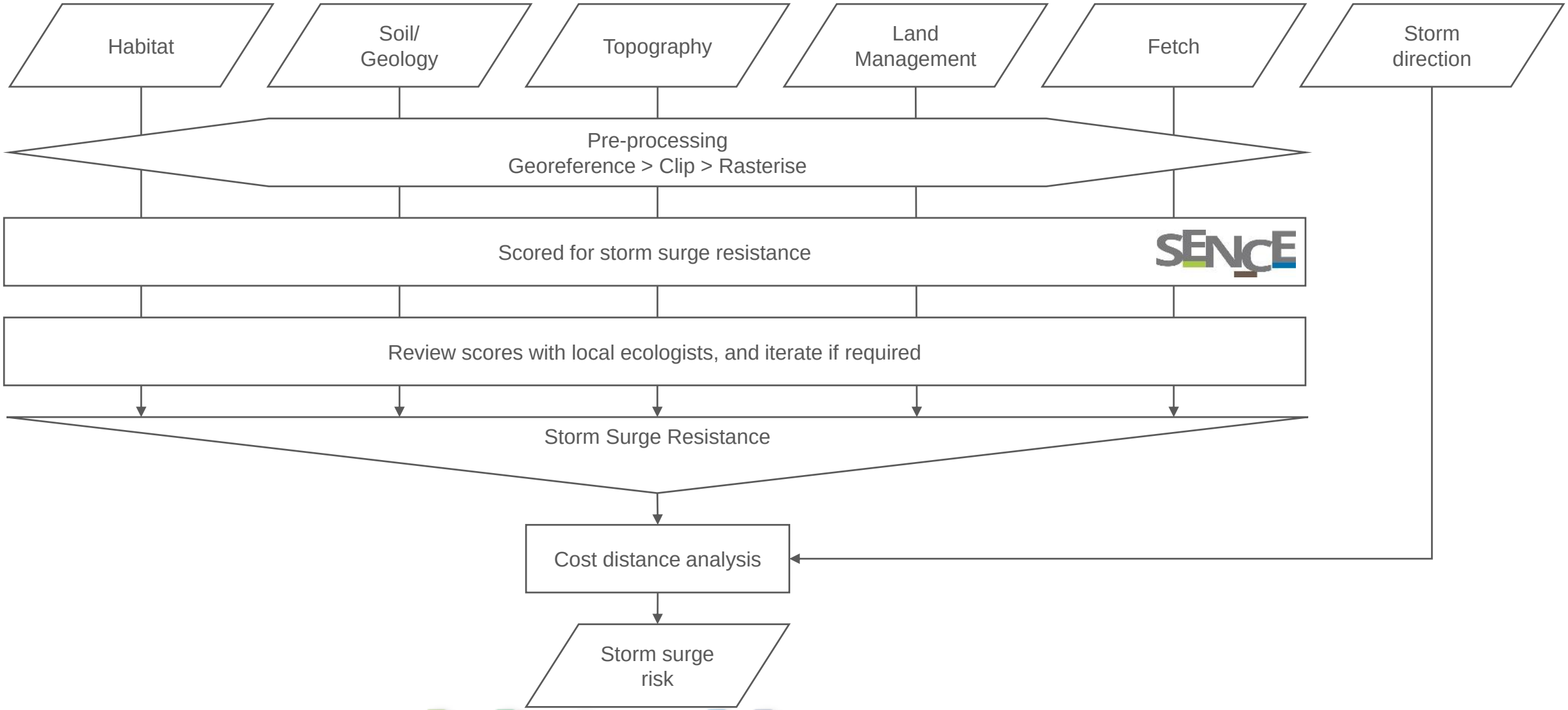
Section of shallow water habitat map Anguilla

Habitat Mapping

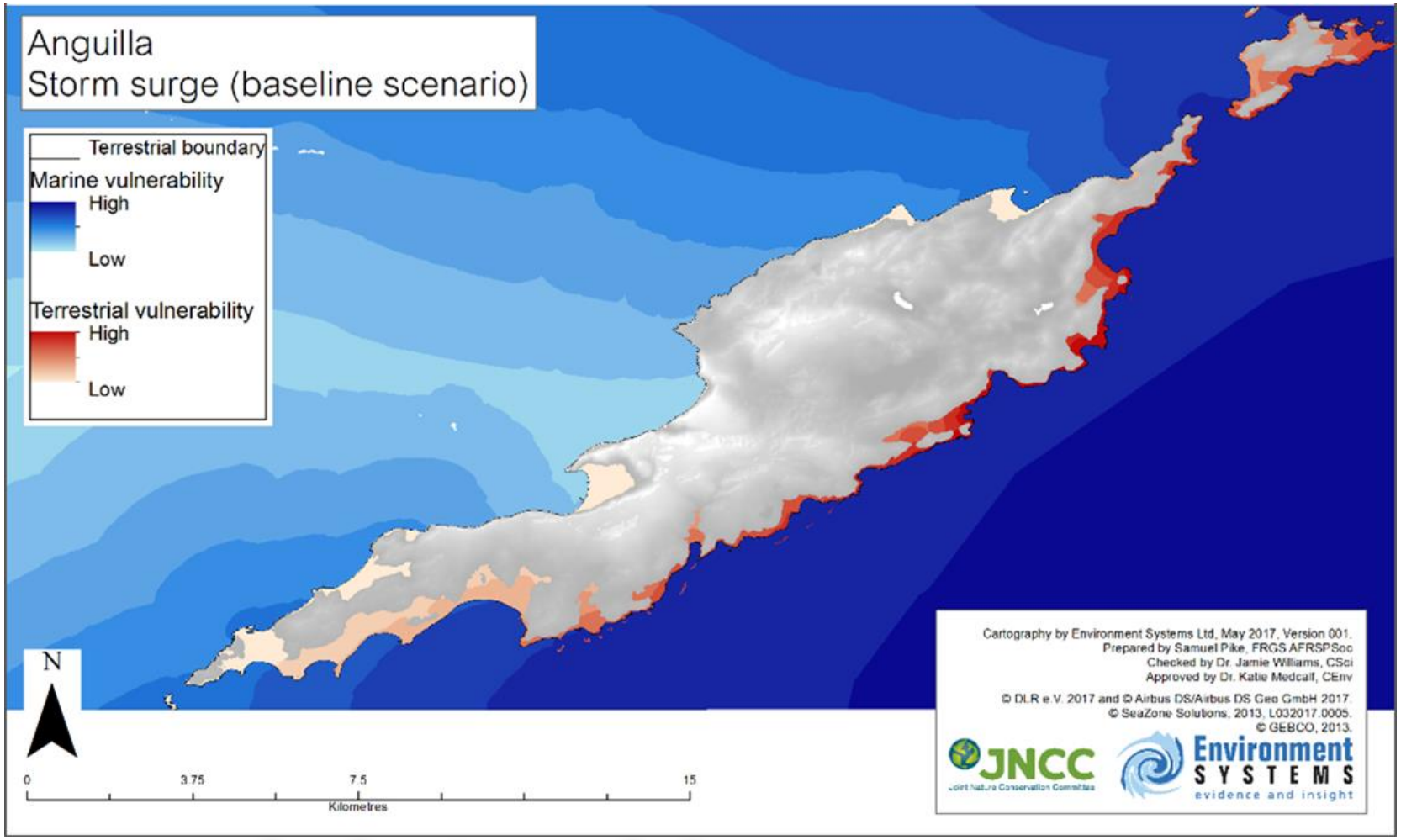


Terrestrial habitat mapping
Created with Sentinel-1 and Sentinel-2 using random forest classification for Anegada British Virgin Islands.

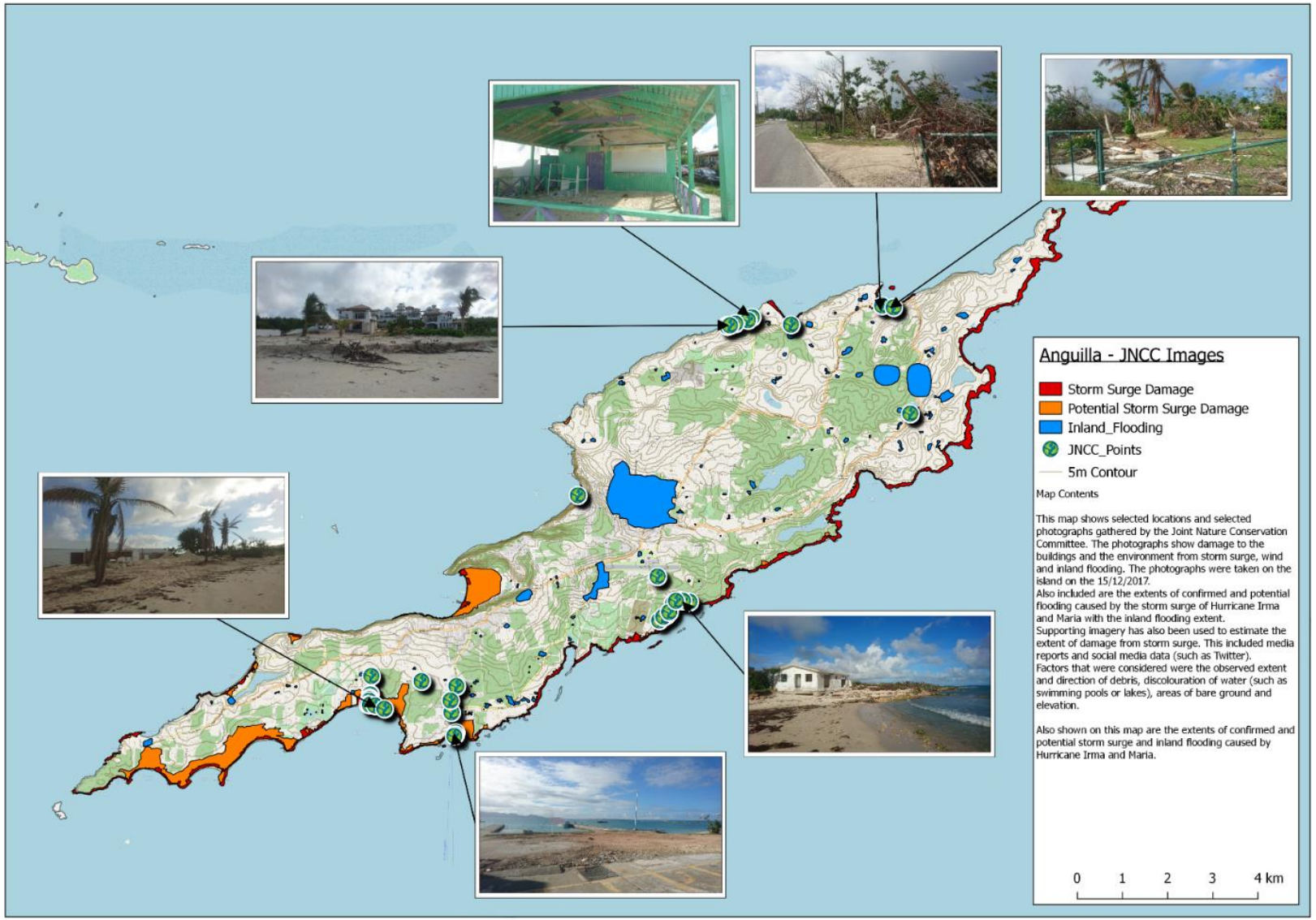
Scientific rational for combining data to find storm surge risk areas which flood



Risk modelling



Data validation



Used:

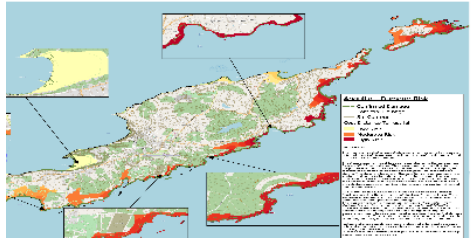
- Social Media,
- information gathered by JNCC
- interpretation of satellite imagery
- Created damage lines where the storm surge had impacted
- Compared actual damage with the risk zones

Conclusions

The habitat

Landform

The risk map



- Sentinel 2 data can describe many natural features needed for storm surge risk modelling:
- The method is efficient and repeatable
- The data created a robust baseline against which to assess future change, which is an important tool when describing the impacts of climate change and the use of natural capital to enhance resilience.

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Thank you
Questions?

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