living planet symposium | BONN 2022

esa

LittoSCOpe

A satellite solution to support coastal resilience

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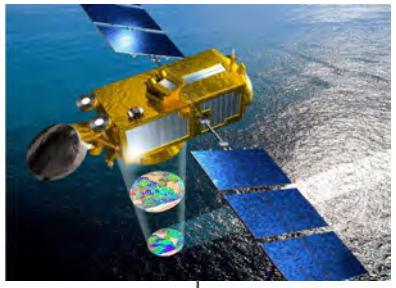
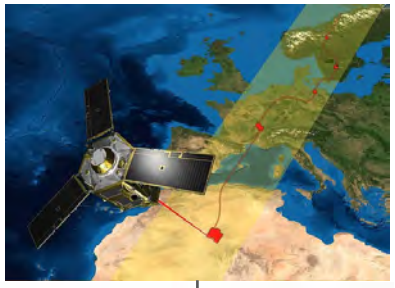
[1]CLS, [2]CNES, [3]BRGM, [4]GCF

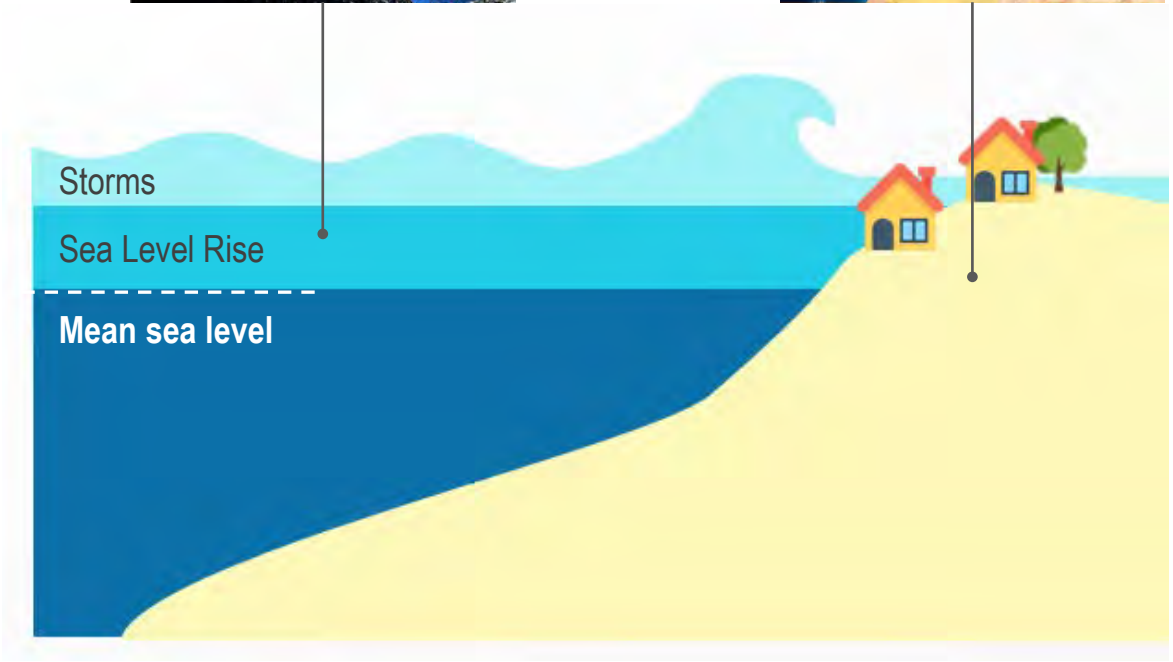
Satellite observations over ocean and land to support decision making

Satellite Altimetry



Satellite VHR Optical Imagery



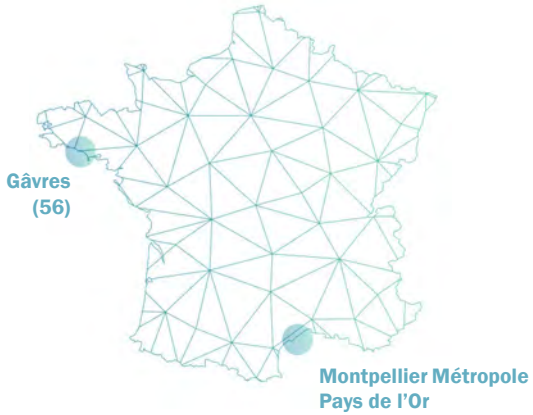


SATELLITES OBSERVATIONS

Combining **altimetry** and **VHR optical imagery** to identify impacted areas and to propose **a replicable tool** for guiding **adaptation** of **every coastal areas** facing the effects of climate change

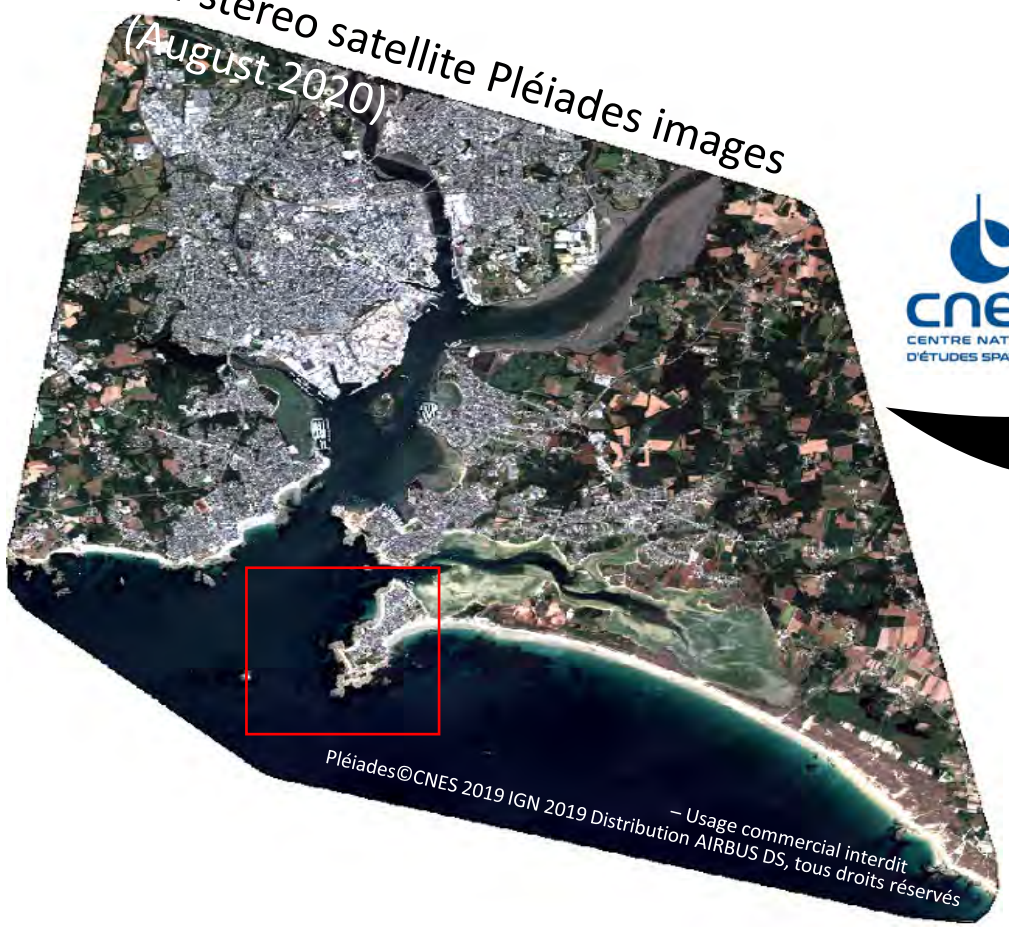
FOR AND WITH COASTAL TERRITORIES

Through **interviews** and **feedbacks**, the risk indicators and the web platform have been built in **collaboration with coastal territories** to best meet their needs and develop a relevant tool



Digital Elevation Model from VHR optical satellite imagery

Tri-stereo satellite Pléiades images (August 2020)



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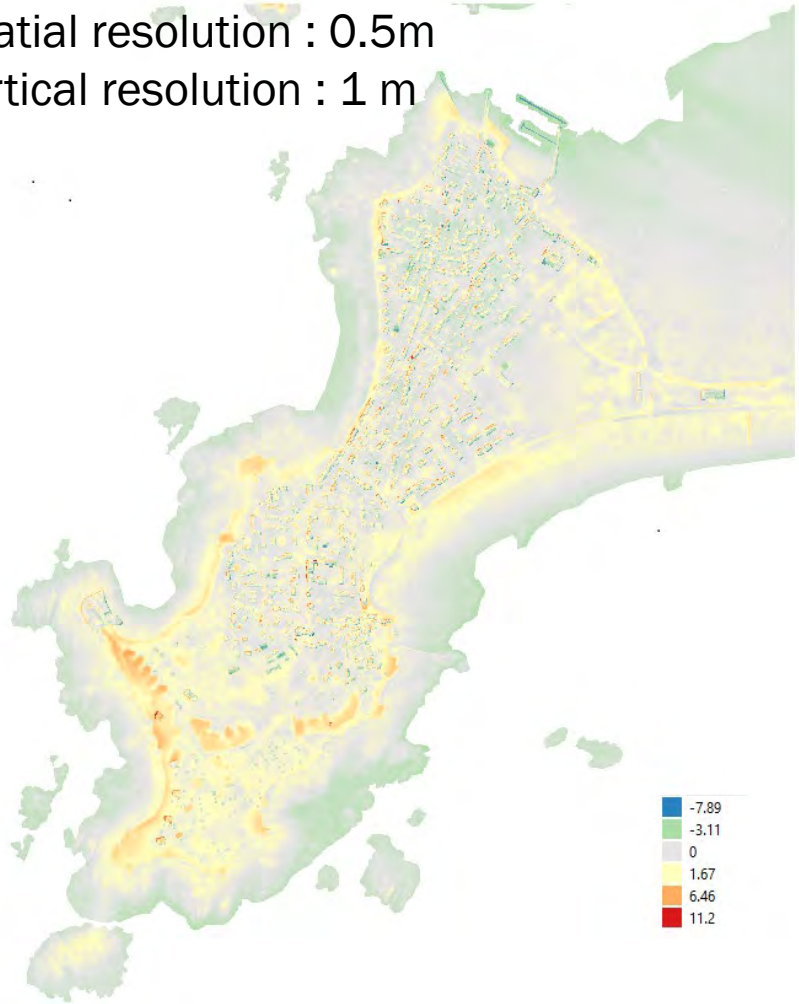
Digital Surface Model (DSM)

Digital Elevation Model (DEM)

Digital Terrain Model (DTM)

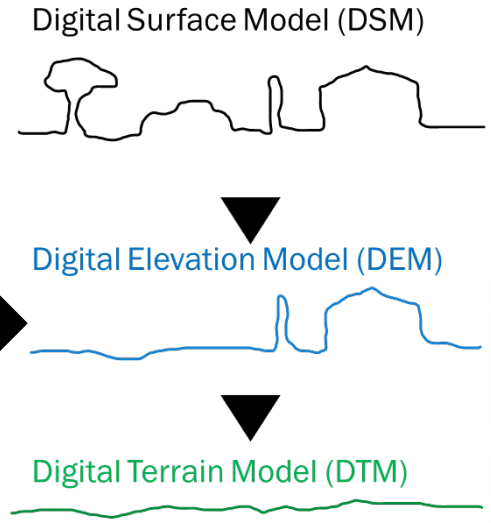
Spatial resolution : 0.5m
Vertical resolution : 1 m

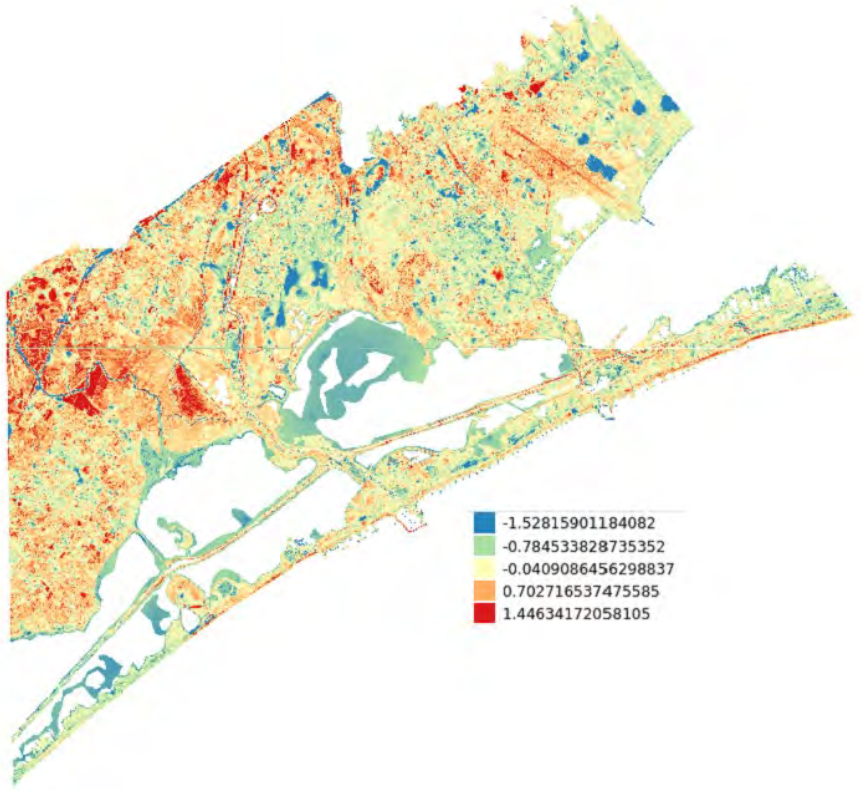


Comparison with LIDAR DEM : 0.2 m bias , 1m std

Digital Elevation Model from VHR optical satellite imagery

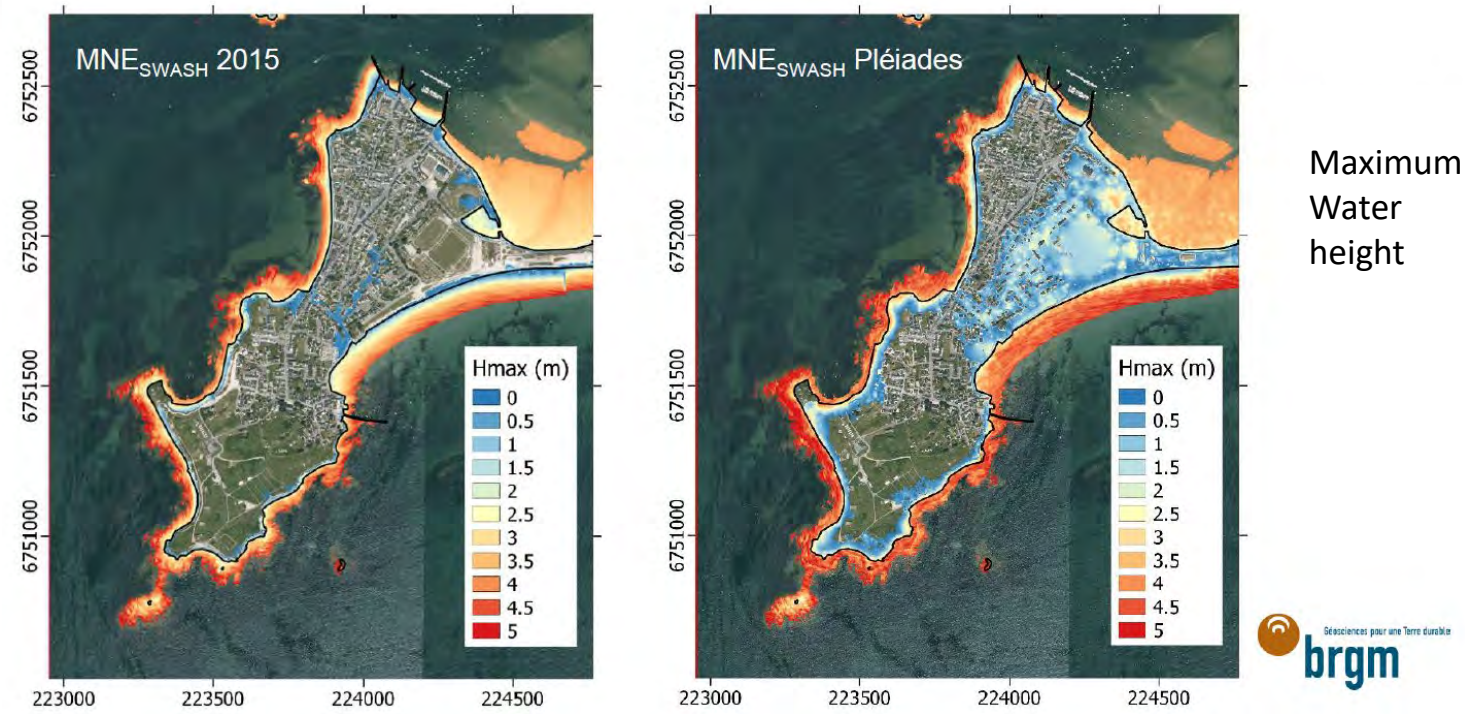
Spatial resolution : 0.5m
Vertical resolution : 0.6m



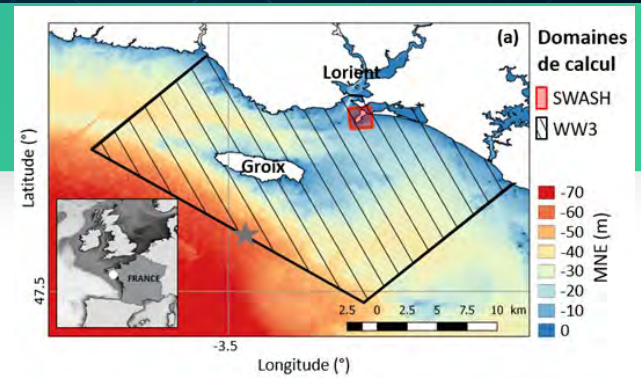


Comparison with LIDAR DTM : 0.05 m bias , 0.6 m std

Coastal hazards HR modeling with satellite DEM



Maximum Water height



- HR hydrodynamic Meta-modeling chain
- Reproducing a major coastal flood event in 2015 (Storm Johanna)
- DEM from LIDAR measurements → replaced by the satellite-derived DEM

- Flooding over-estimation with satellite DEM
- Satellite DEM accuracy to be improved (processing, new missions) when HR modeling is needed

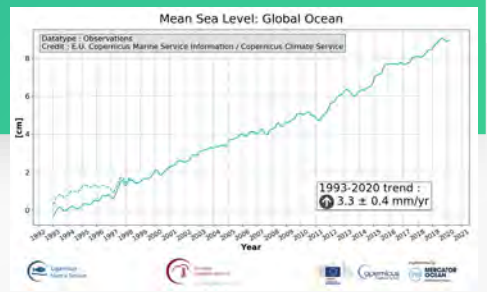
Coastal flood hazard first-level assesment

- Satellite DEM
- Water level at the coast

- Static flooding method
- 24 scenarios on both territories

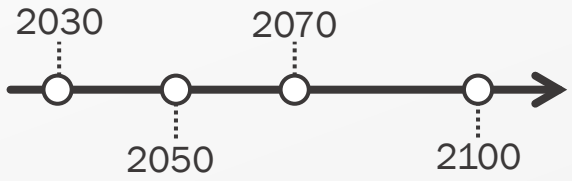
Trends of sea level rise

-Satellite Observation



-IPCC scenario from SROCC (RCP 2.6 et 8.5)

Dates



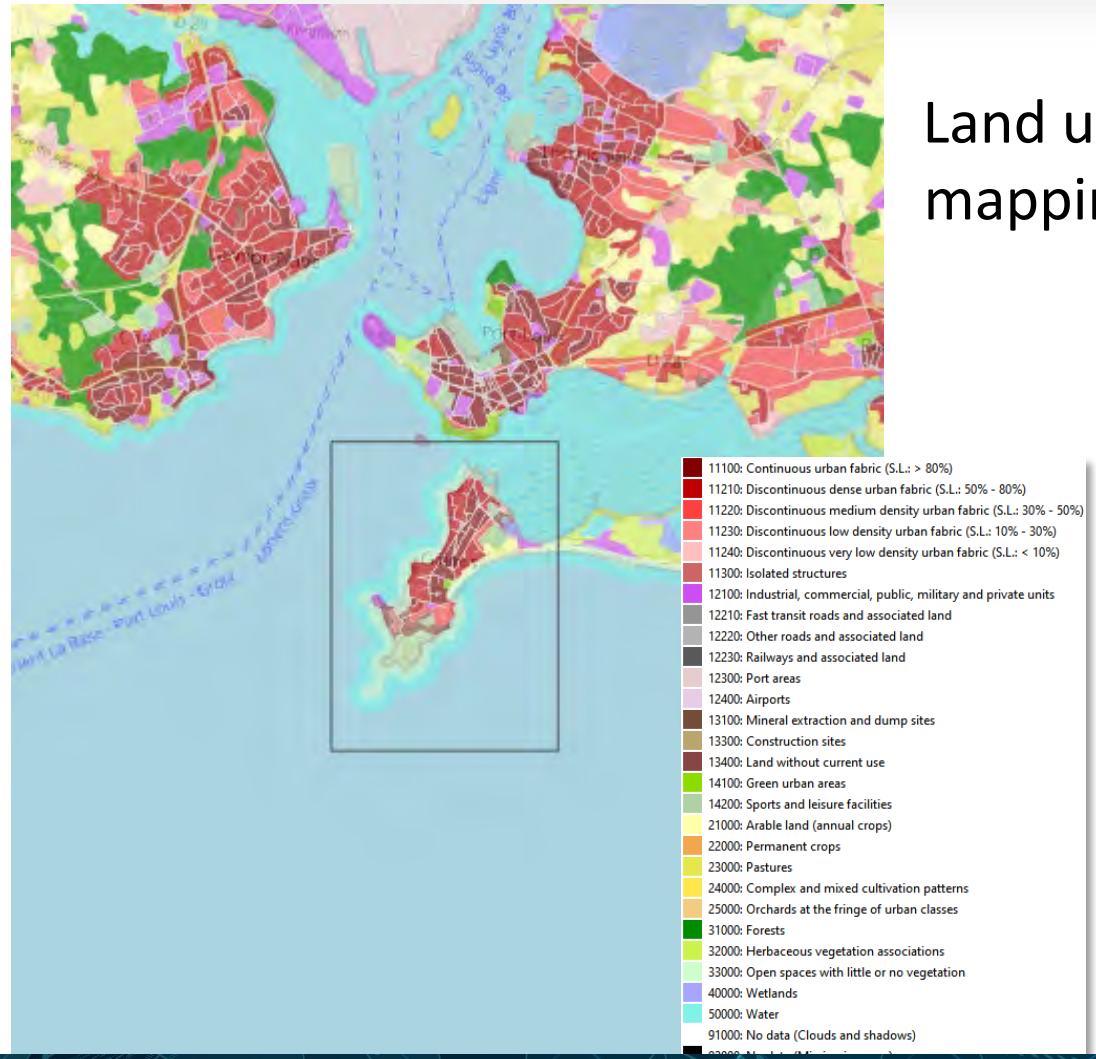
Addition of extreme events

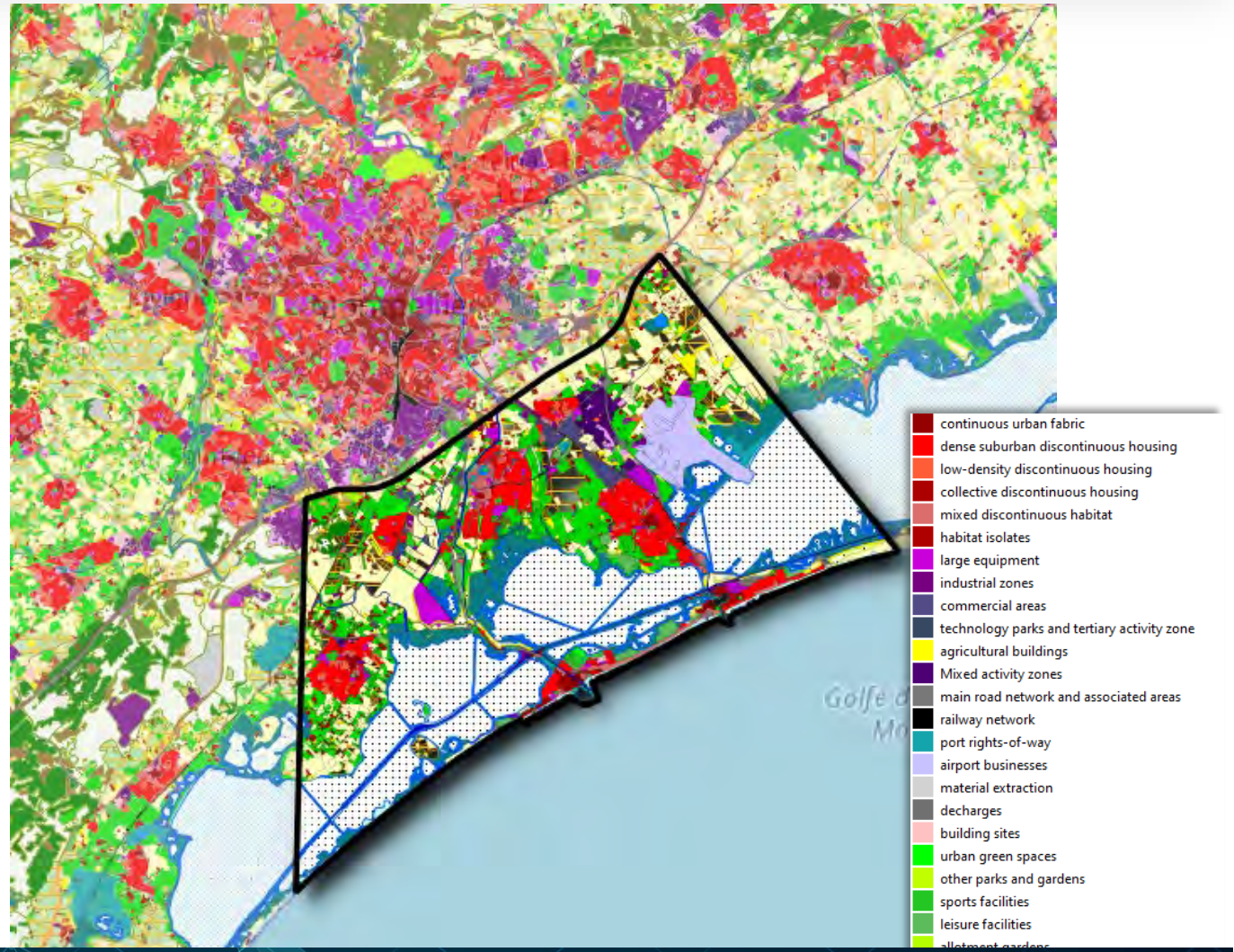
Decadal storm (with/without)

4 dates, 3 SLR trends; with or without decadal storm/tide combination

Mapping socio-economics assets from satellite VHR optical imagery

Land use mapping



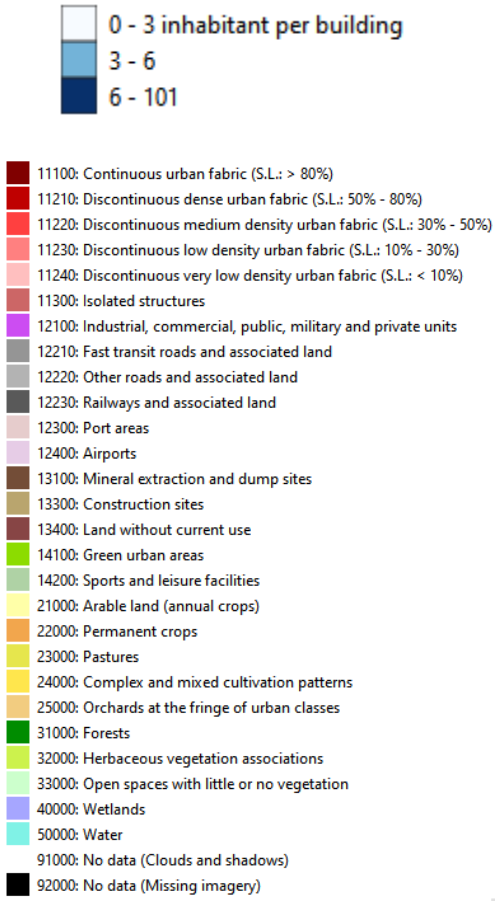


Mapping socioeconomics assets from satellite VHR optical imagery

Low season

Population distribution (building level)

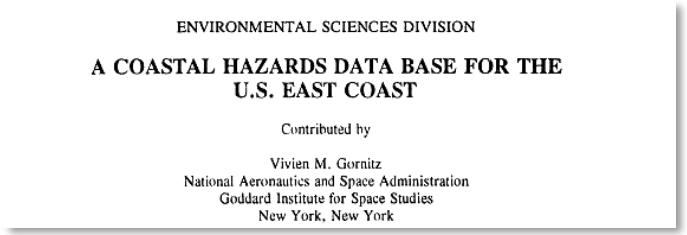
Gavres



High season

From exposure to risk

- Risk calculation: CVI (Coastal Vulnerability Index) developed par Gornitz & al. (1992)



ENVIRONMENTAL SCIENCES DIVISION

A COASTAL HAZARDS DATA BASE FOR THE U.S. EAST COAST

Contributed by

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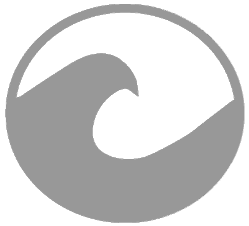
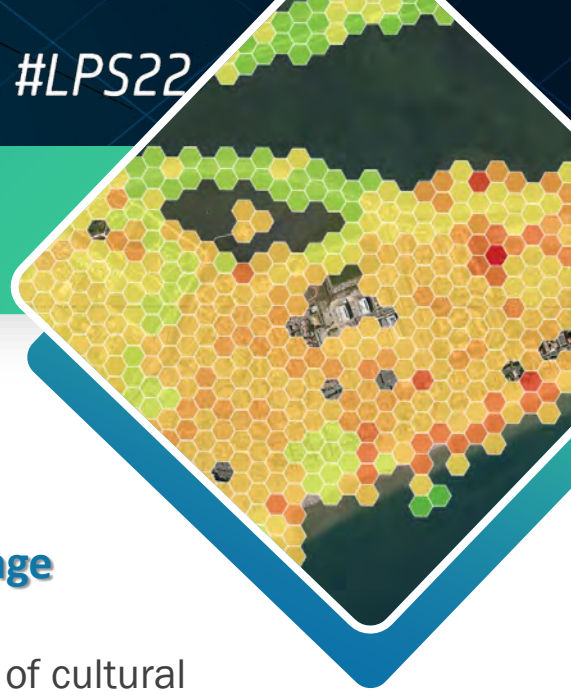
New York, New York

Includes **physical and morphological parameters as well as** et **socio-economical data from the coastal** zone
Calculation of « Risk index » on a 1 to 5 scale

EXPOSURE x HAZARD = RISK



Synthetic Index to evaluate coastal risks



Combining coastal flooding hazard intensity with 5 types of exposure (normalised as an index on a 1 to 5 scale)

Human

- Number of people
- Vulnerable population rate (<10 years old and > 65 years old)

Socio-economic

- Land cover
  → Gâvres : HR (Urban atlas)
  → Palavas : MR
- Number of jobs
- Number of companies/businesses
- Number of touristic accomodation units
  → Gâvres : HR (Google search)
  → Palavas : MR (municipality level)

Environmental

- Presence of 1+ natural protection areas

  (RAMSAR, ZNIEFF I & II, Natura 2000, ZICO, APB…)

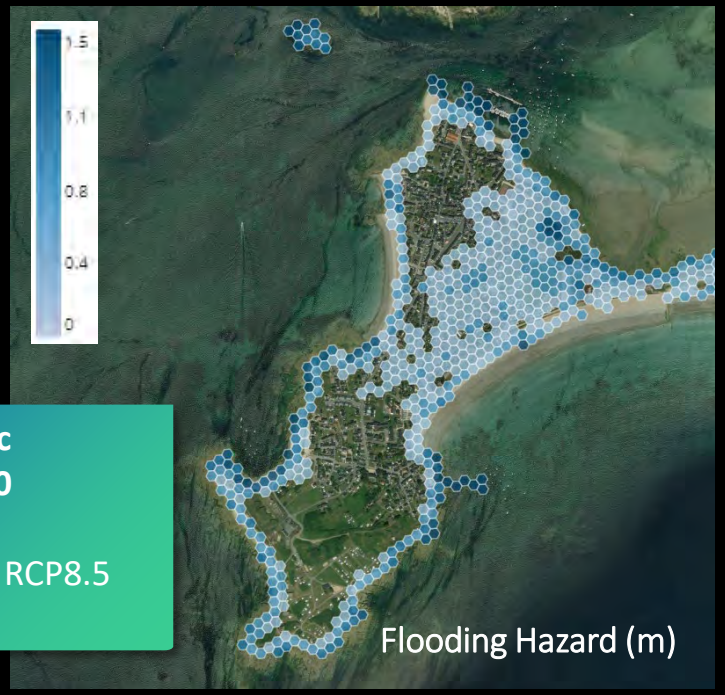
Heritage

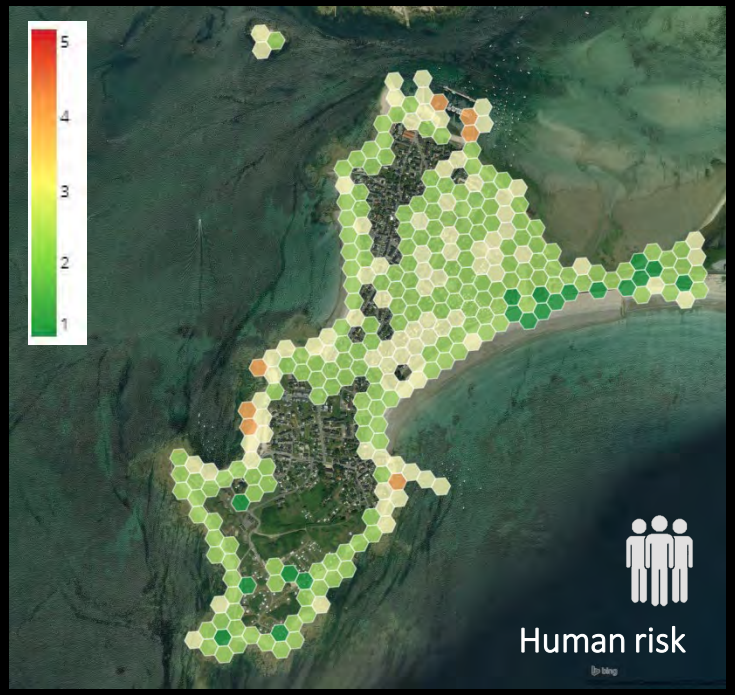
- Presence of cultural sites classified or registered

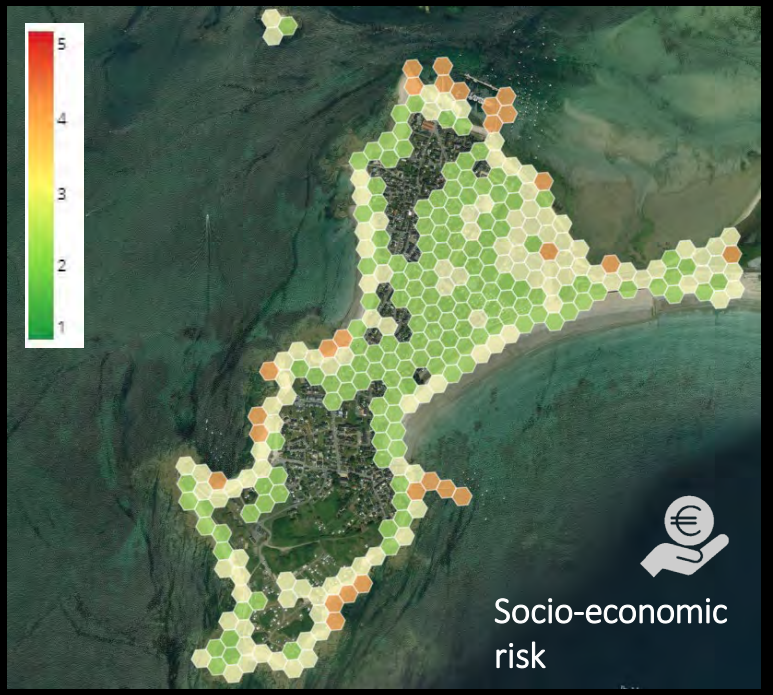
5
4
3
2
1

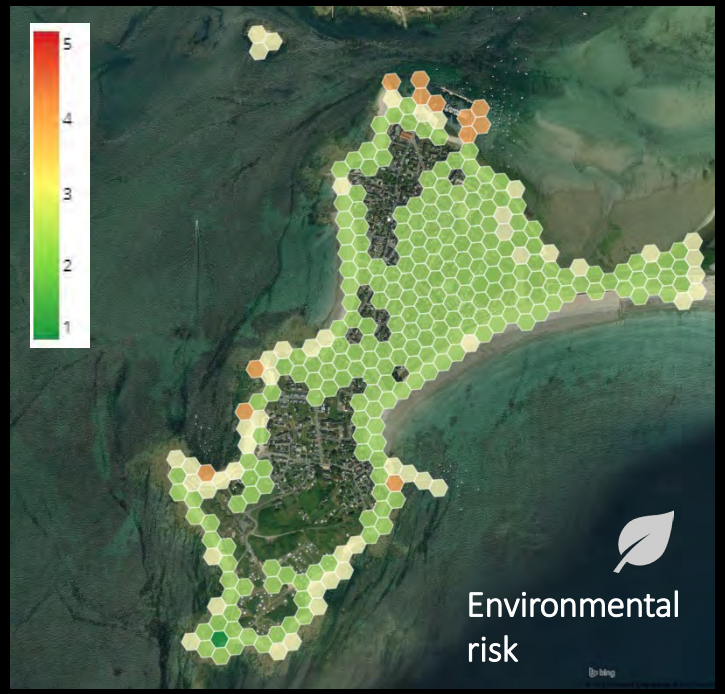
→ **Total exposure**

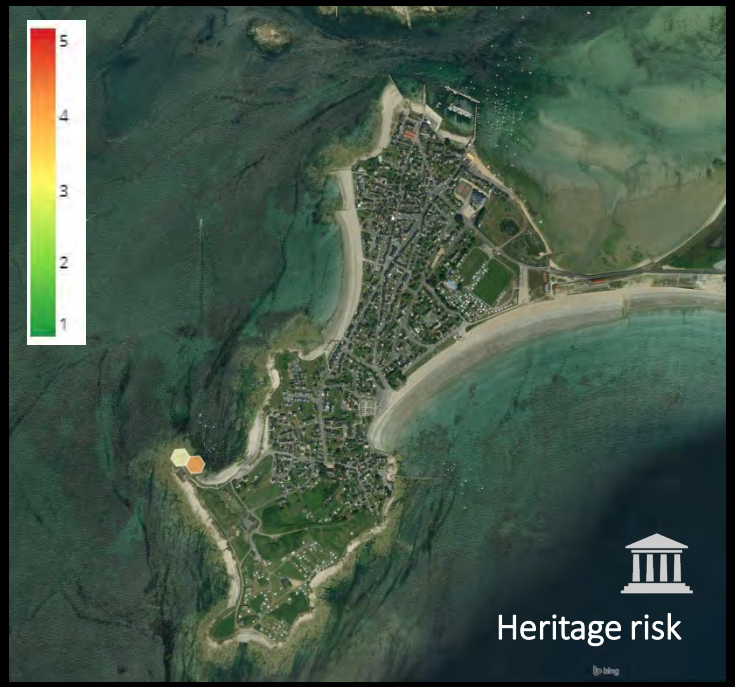
Test on a specific scenario: MA100
Decadal storm
Trend from IPCC RCP8.5
Year 2100

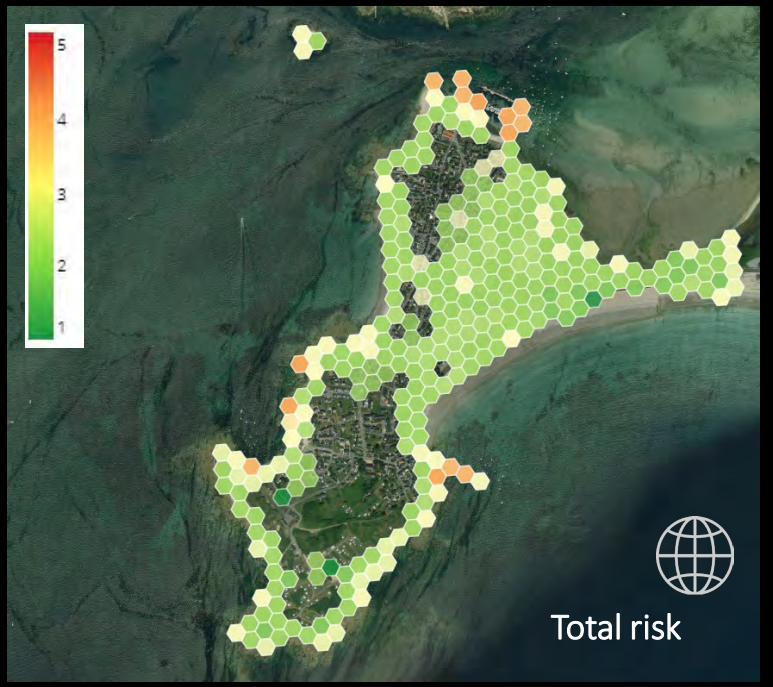




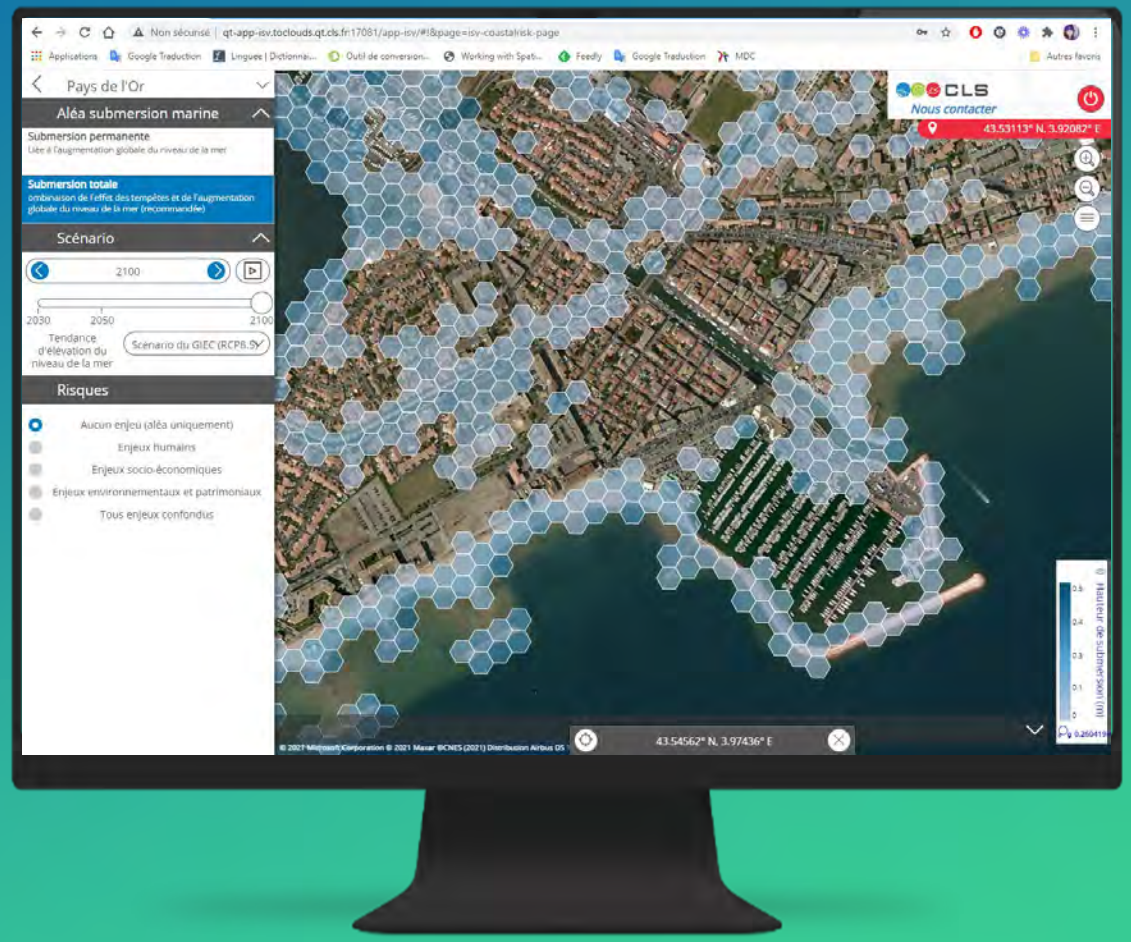








Improved knowledge for better decison making



Inform decision-makers

Make information available through an **interactive web interface** to help managers familiarize themselves with the risks totheir coastal area.

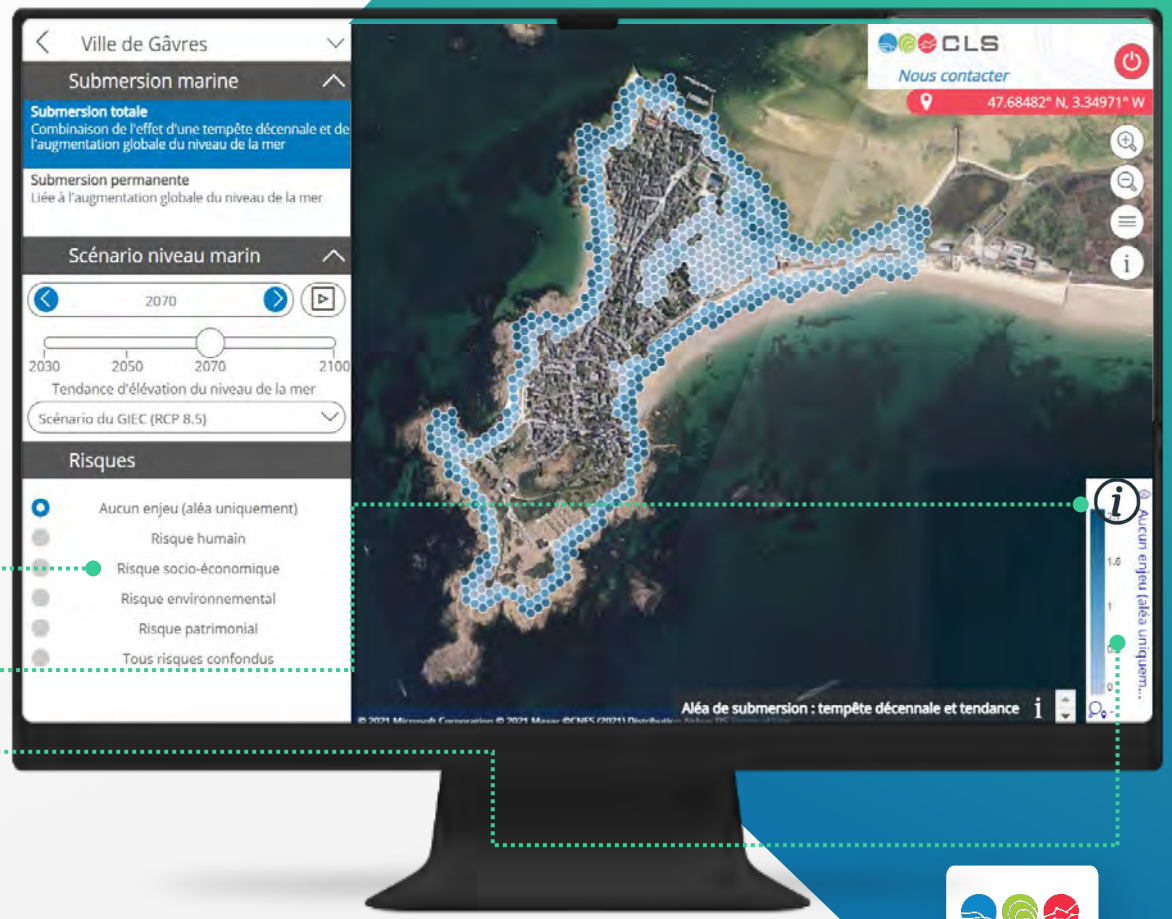
Provide an **enlightening** and **easy-to-use** decision guiding tool.
Co design of the platform with end users

Hazards Identification

Risk Evaluation

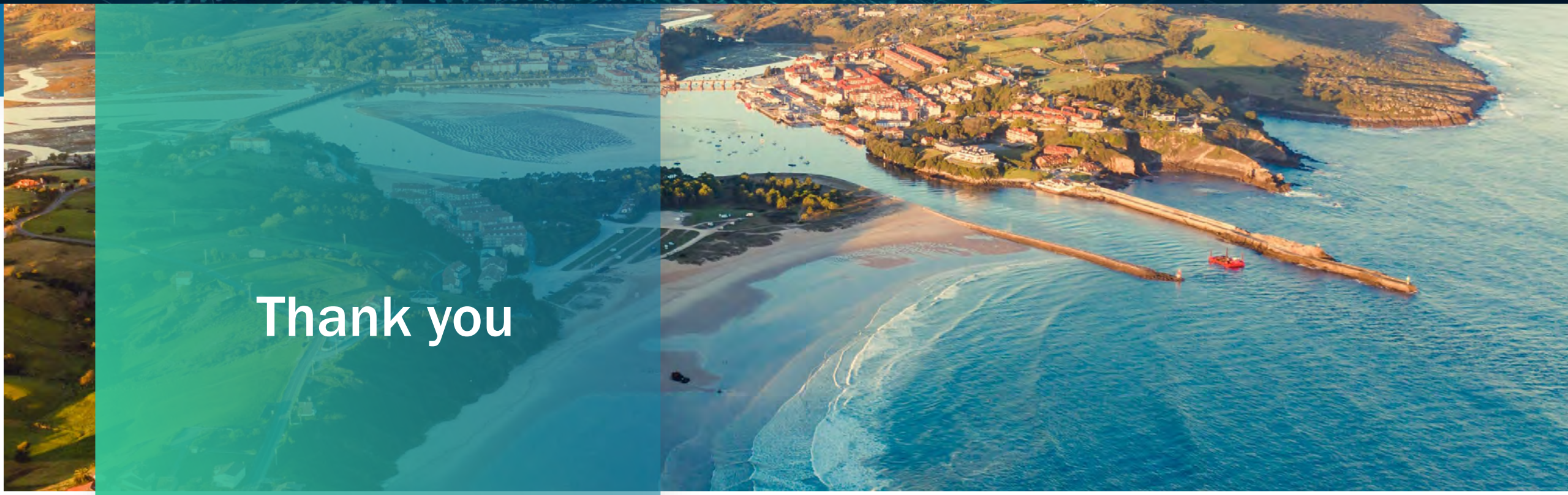
Users feedback

- ✓Interested in the maps to increase their knowledge about risks
- ✓a tool for local dialogue within elected /managers
- ✓Design and ergonomy +++
- ✓Authentified access to control the dissemination of this sensitive information about risks



Future Evolutions:

- Make the educational content more accessible and complete
  - Tooltips and buttons
  - Highlighting of data units and colorbar
- Communicate more on limits and application scales of the results



Thank you

LittoSCOpe

a satellite solution in support of coastal resilience

For and with coastal territories

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