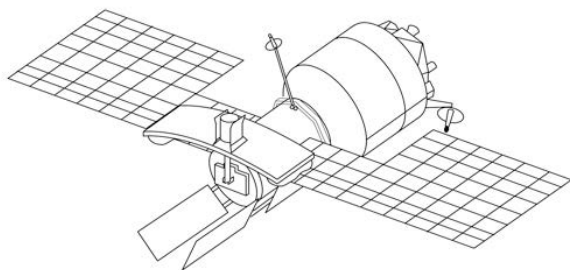




*Building Capacity for a Centre of Excellence for
EO-based monitoring of Natural Disasters*

Copernicus EMS: Αξιολόγηση πολλαπλών φυσικών κινδύνων - Σχεδιασμός και Ανάκτηση



Γιάννης Παπουτσής
ΙΑΑΔΕΤ
Εθνικό Αστεροσκοπείο Αθηνών



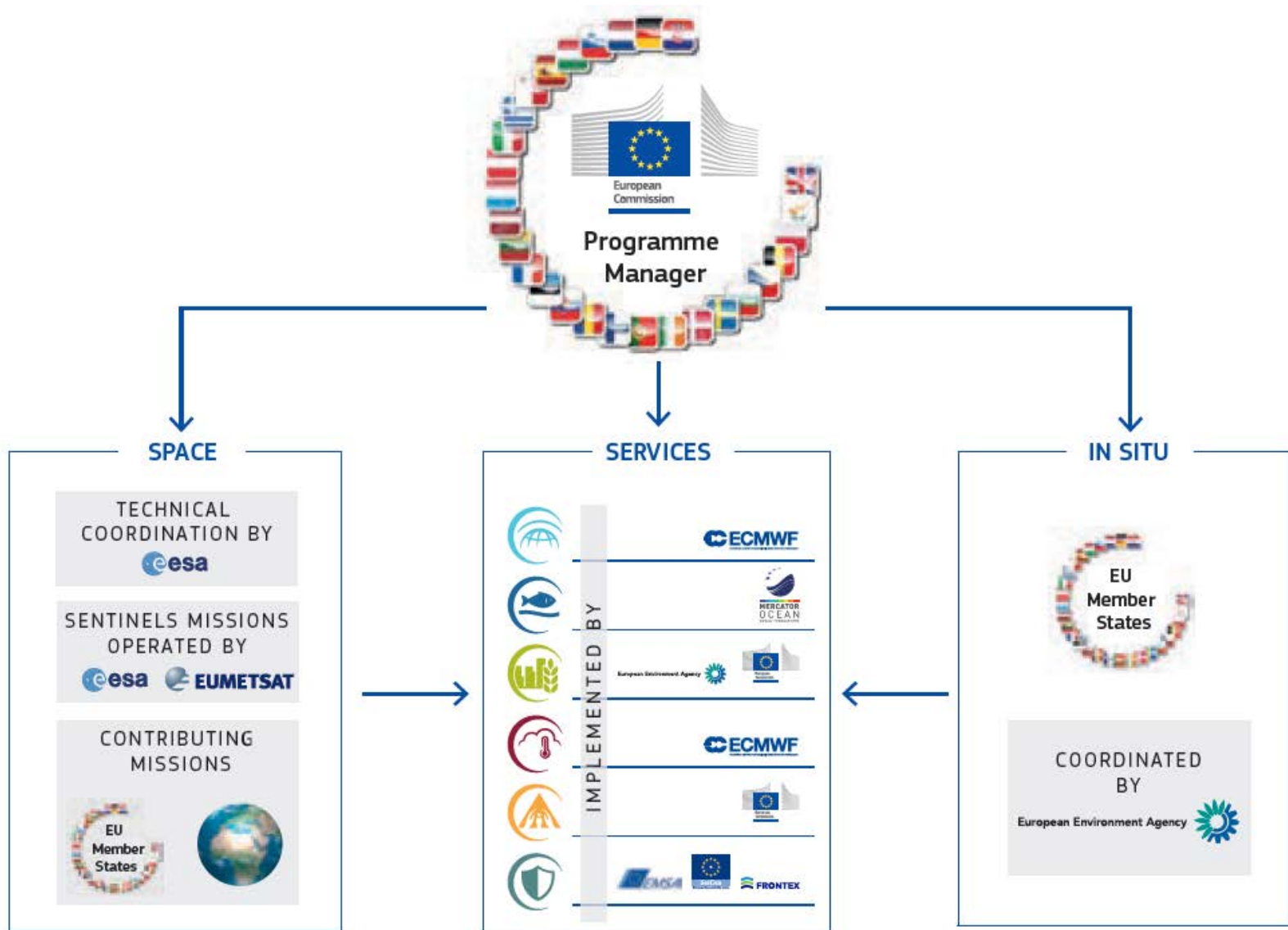
The Final BEYOND Workshop
17 May 2016
Athens, Electra Palace



FP7-Regpot-2012-23-1

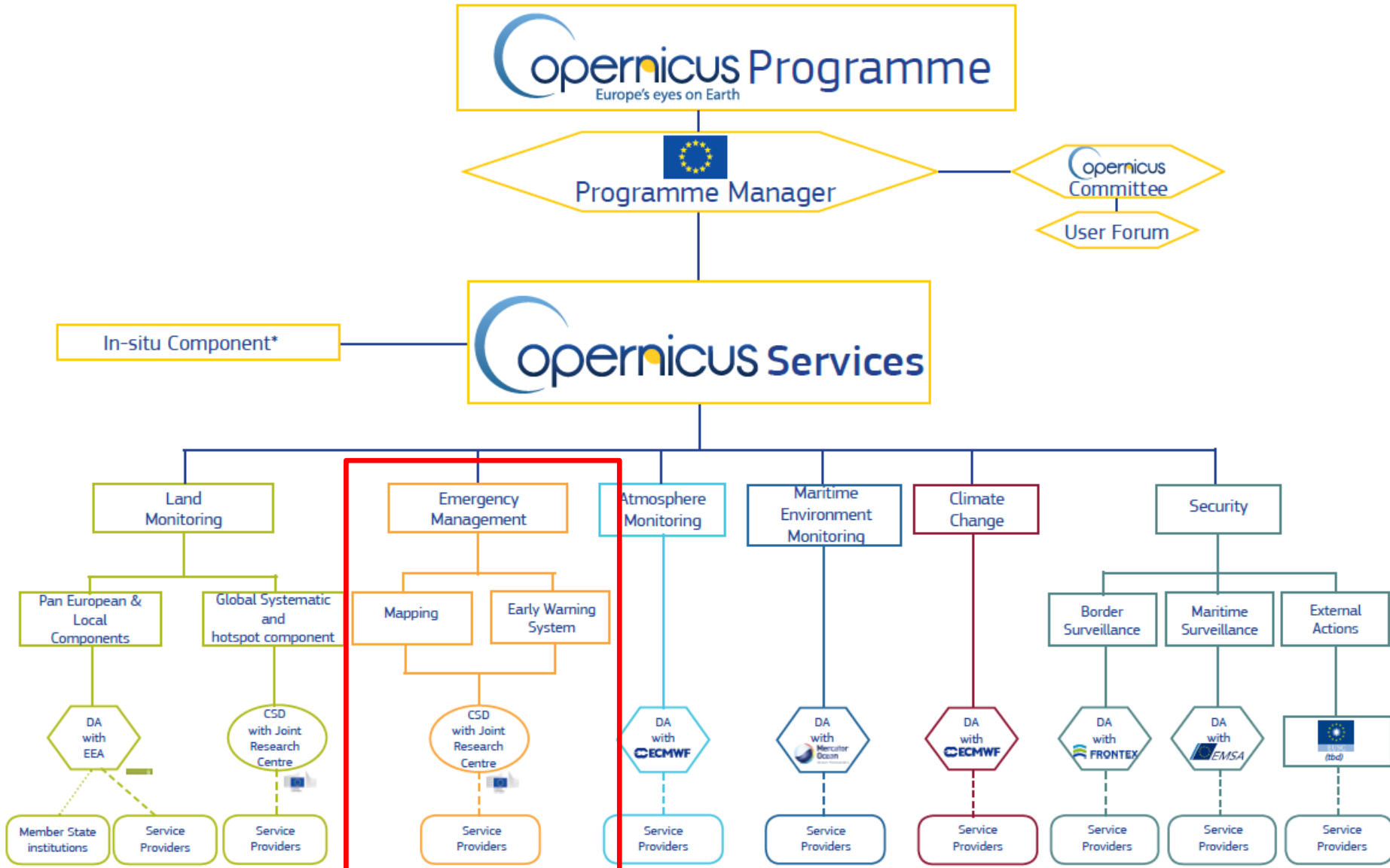
What is Copernicus?

An overview



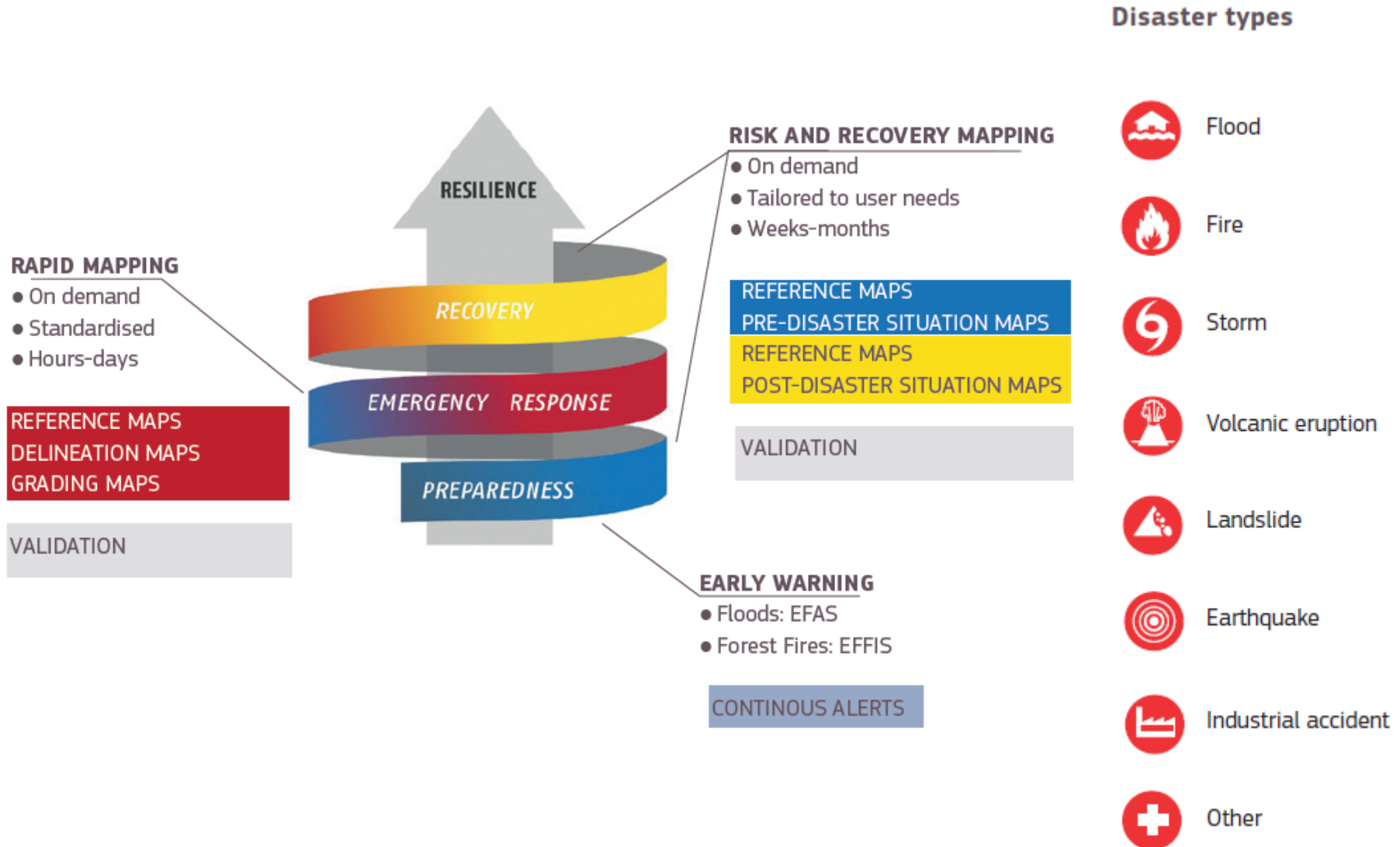
Copernicus EMS

BEYOND's involvement



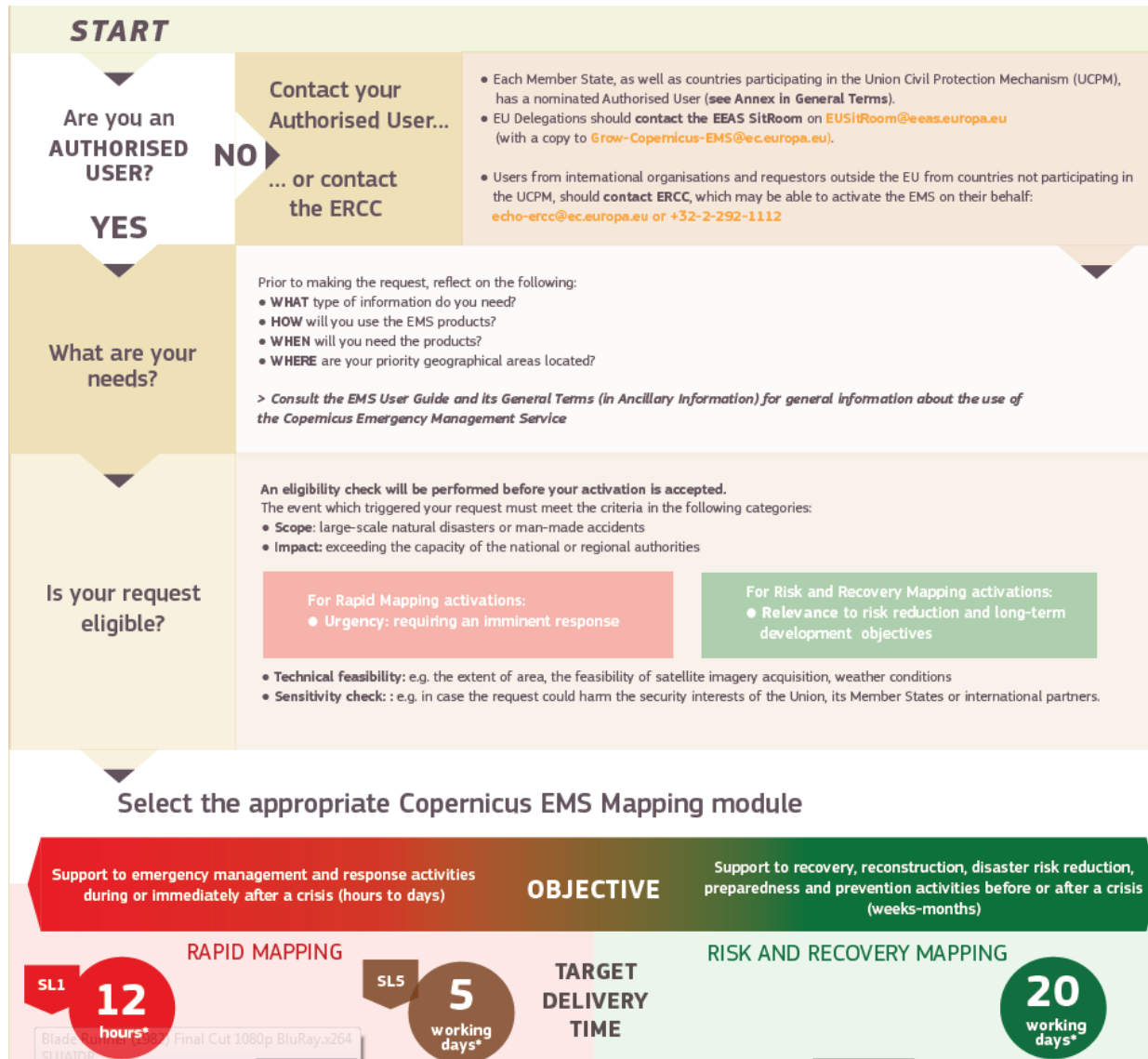
Copernicus EMS

The three pillars



Copernicus EMS

Procedural workflow



<http://emergency.copernicus.eu/mapping/>

Product portfolio

Reference mapping

- Hydrology
- Transport
- Industry & utilities
- Land cover & physiography

Pre-disaster mapping

- Hazard
- Vulnerability
- Risk status
- Evacuation plans
- Mitigation measures

Post-disaster mapping

- Hazards
- Changes in vulnerability
- Risk status of new assets
- Detailed damage assessment
- Recovery plans
- Reconstruction & rehabilitation monitoring

Copernicus Risk & Recovery

Completed & ongoing projects

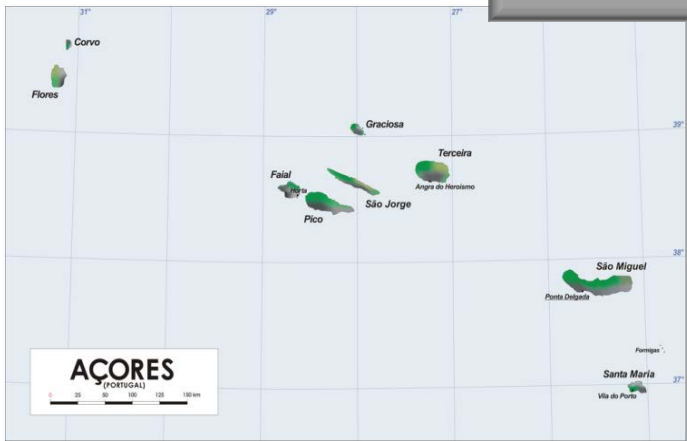
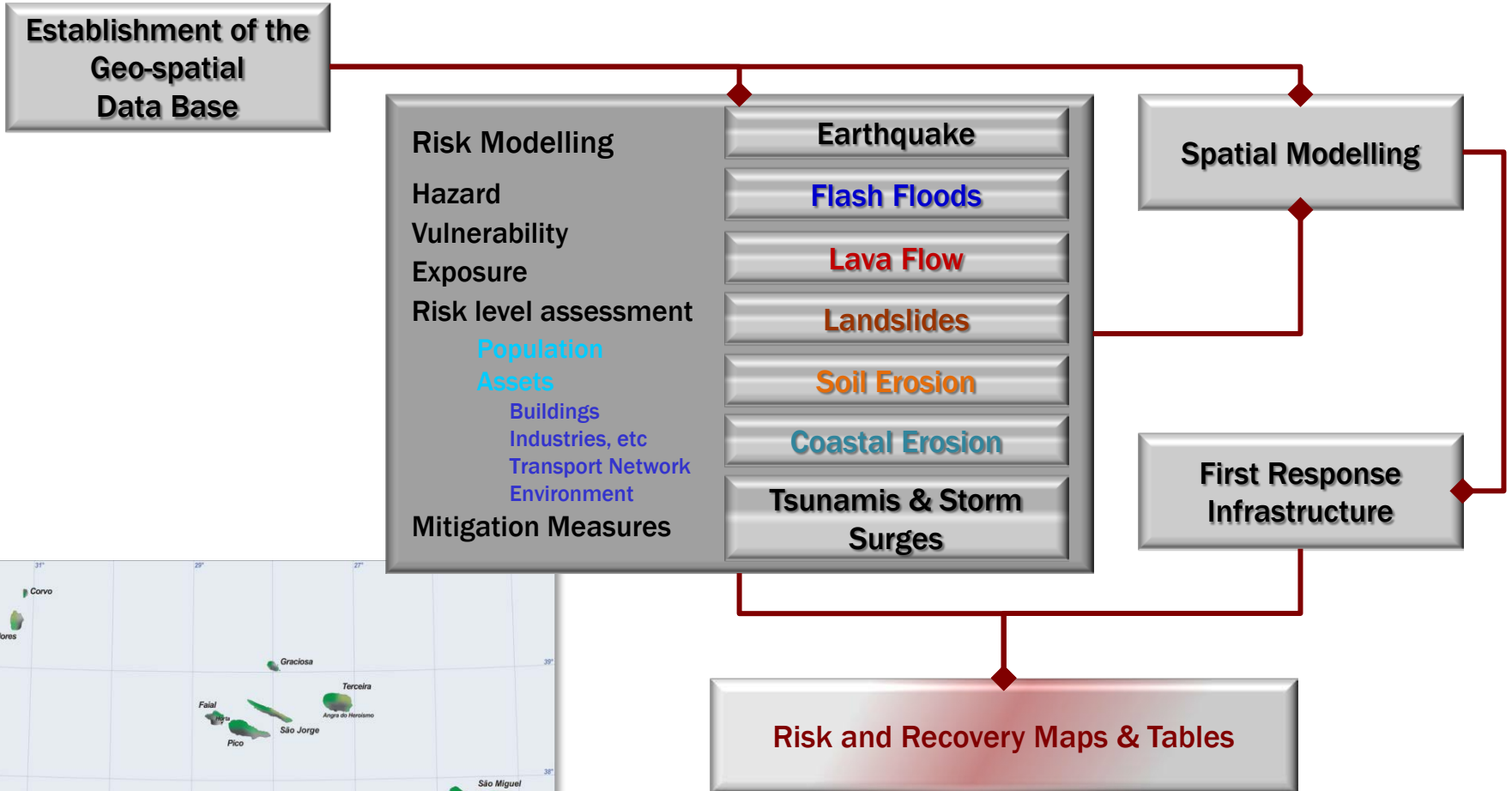


- Multiple natural hazard risk assessment – Planning and Recovery: The Azores Islands
- Multiple natural hazard risk assessment – Planning and Recovery: Madeira
- Earthquake risk assessment Austria – Planning and Recovery
- Post-disaster flood assessment in Bulgaria – Planning and Recovery

8 M€

Azores activation

An example



Azores activation

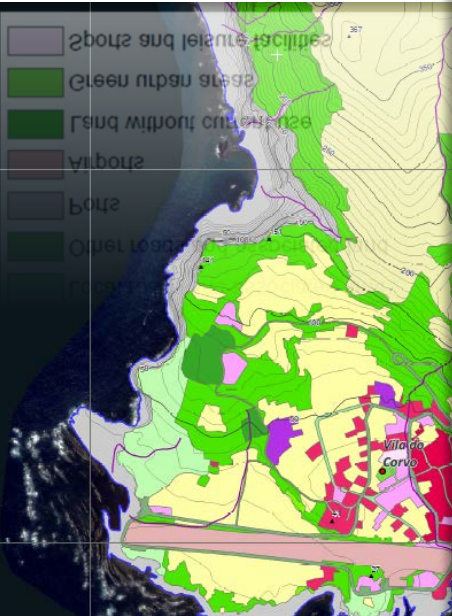
Reference mapping



Land Use - Land Cover

Continuous Urban Fabric (P.B.F. > 80%)	Arable land
Isolated Structures	Pastures
Commercial, Public & Private Services	Broad-leaved forest
Industry & Utilities	Coniferous forest
Main roads and associated land	Shrubs and/or herbaceous vegetation
Local roads and associated land	Natural grassland
Other roads and associated land	Bare rock
Ports	Beaches, dunes and sand planes
Airports	Sparsely vegetated areas
Land without current use	Inland wetlands
Green urban areas	Lakes
Sports and leisure facilities	Water reservoirs

Thematic Layers / nomenclature



Risk Level

Very Low
Low
Medium
High
Very High

First Aid Areas

First Aid Areas
Camp location
Shelter
Field hospital
Helicopter landing spot
Gasoline tank

Mitigation Measures

Breakwaters, seawalls, groynes
Structural reinforcement of assets

Administrative boundaries

Municipality

Populated places

City
Town
Village

Buildings

Airport
Port
Commercial, Public & Private Services
Industry & Utilities
Place of worship
Other
Unclassified

Transportation

Airport
Port
Bridge & overpass
Tunnel
Highway
Primary Road
Secondary Road
Local Road
Other

Physiography

- 300 - Primary
Secondary
Spot heights

Hydrography

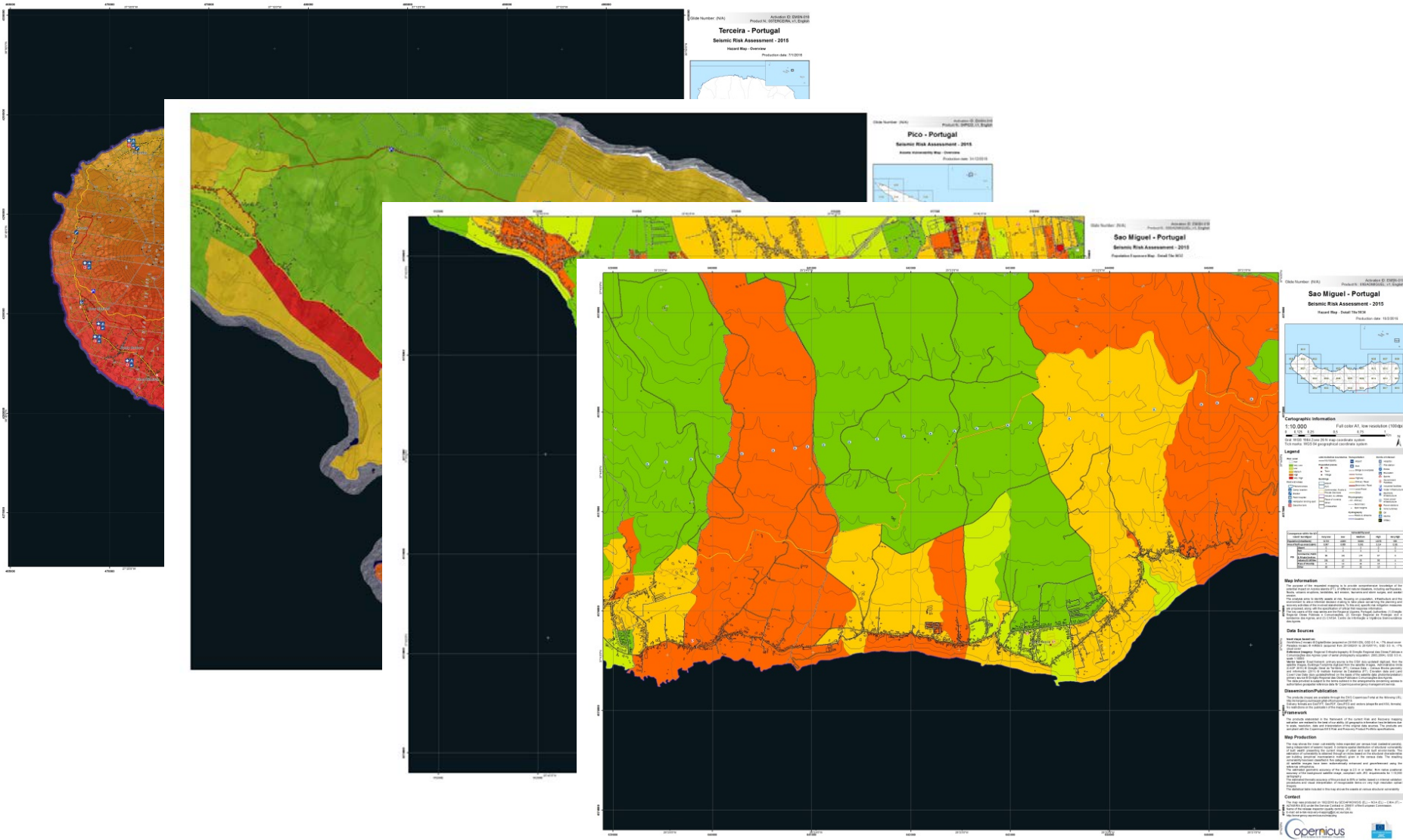
Rivers & streams
Coastline

Points of Interest

Hospital
Fire station
Police
Education
Sports
Government Facilities
Industrial facilities
Water infrastructure
Electricity infrastructure
Wave power infrastructure
Power stations
Wind turbines
Oil
Marina
Military

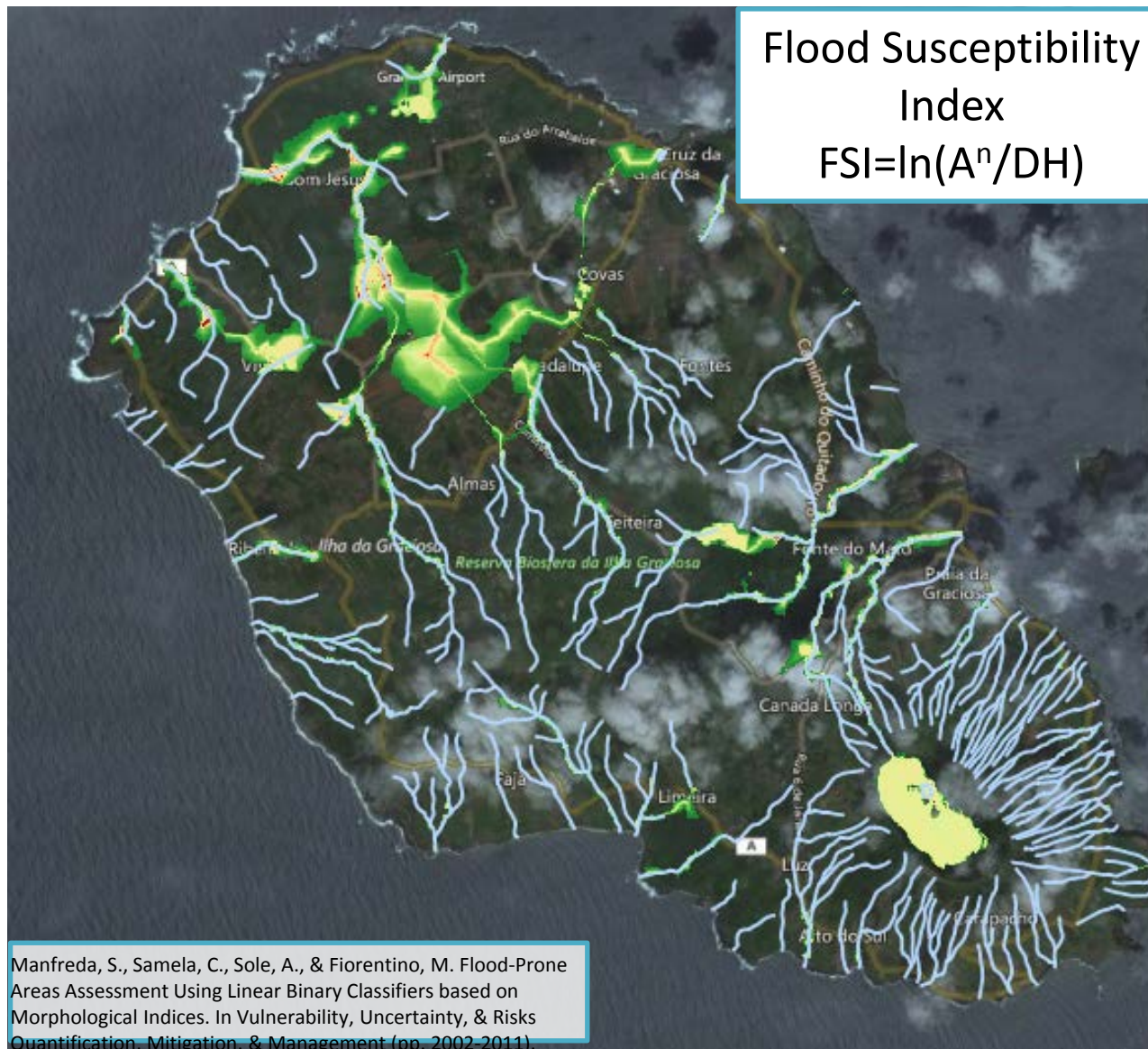
Azores activation

Earthquake



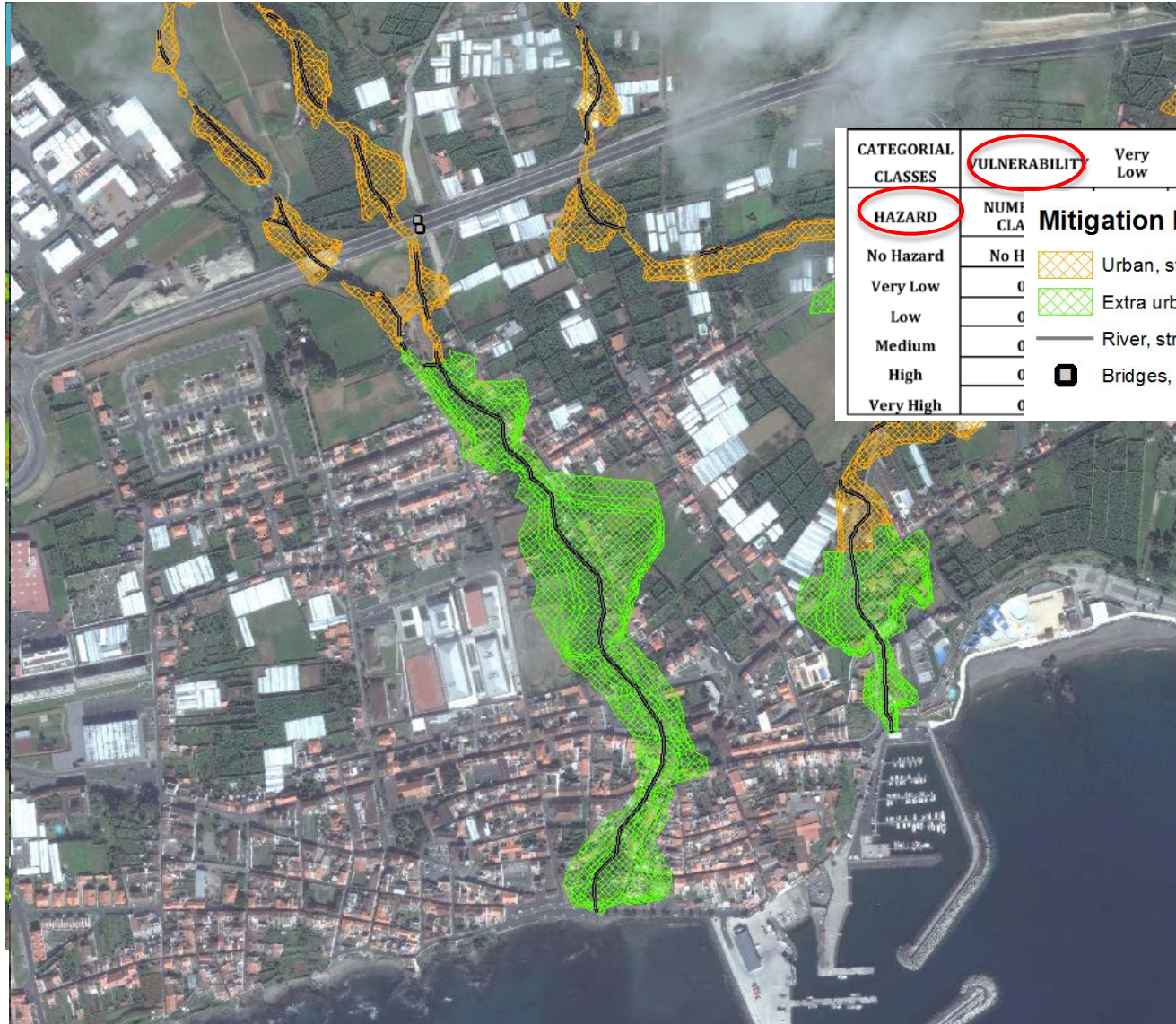
Azores activation

Flood



Azores activation

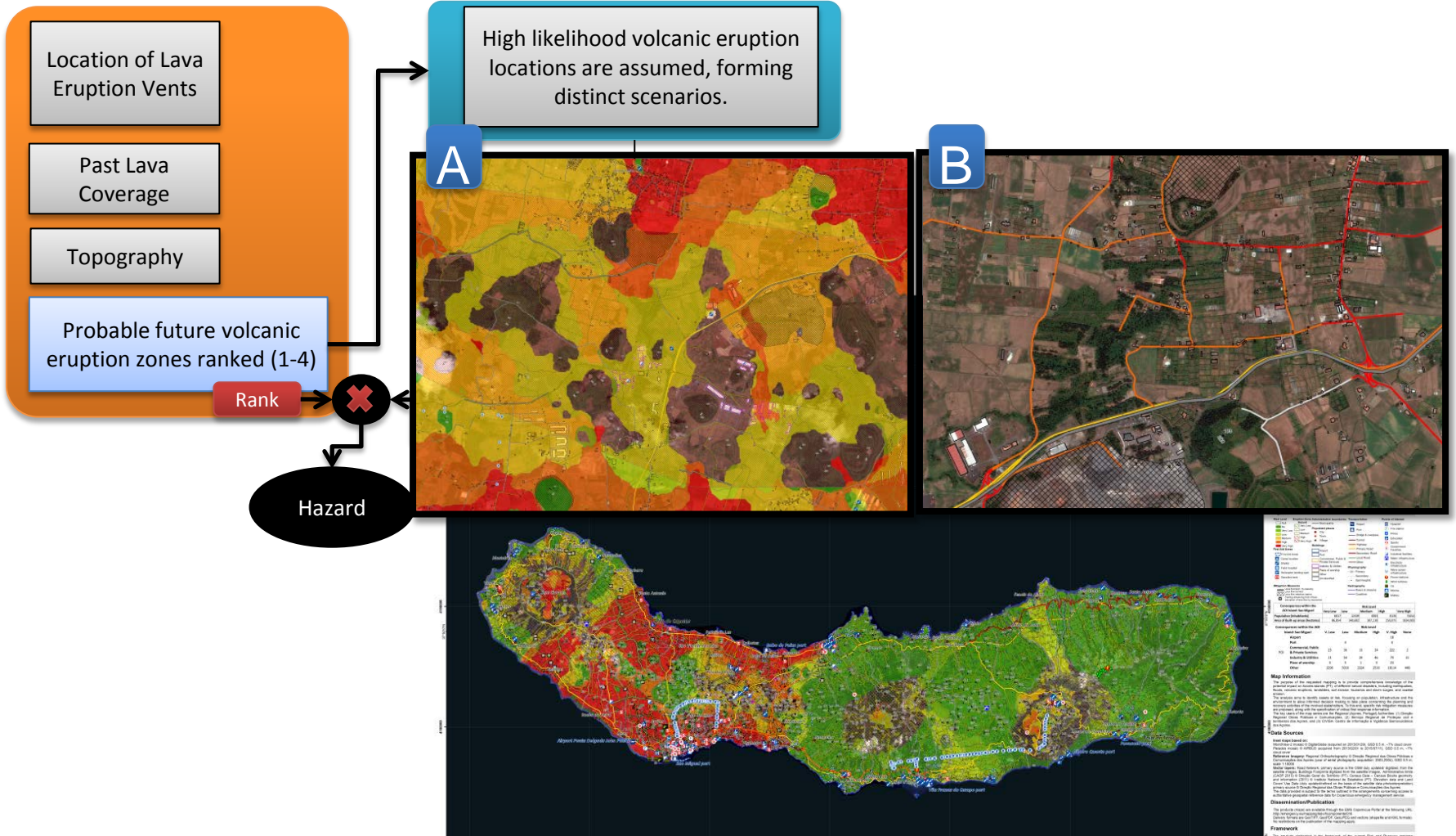
Flood



CATEGORIAL CLASSES	VULNERABILITY	Very Low	Low	Medium	High	Very High
HAZARD	NUMI CLA	Mitigation Measures				
No Hazard	No H	Urban, struct. and non struct. measures				
Very Low	0	Extra urban, planning				
Low	0	River, struct. measures				
Medium	0	Bridges, structural measures				
High	0					
Very High	0					

Azores activation

Lava flow



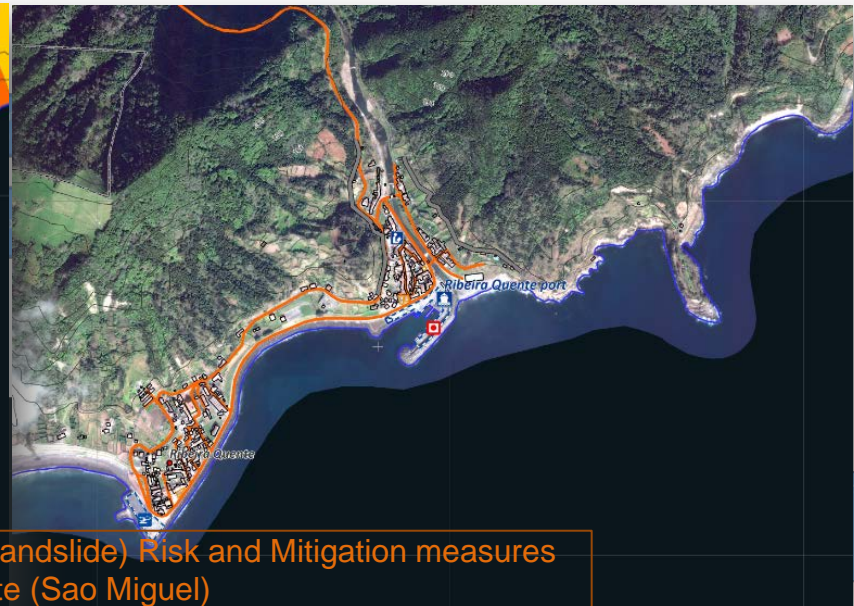
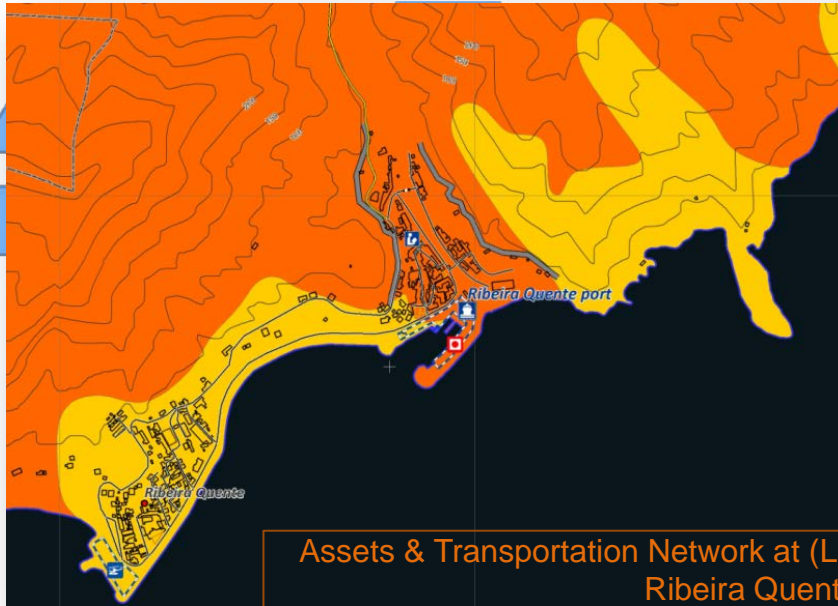
Legend	Symbol	Description
[Red]	Point	High Hazard
[Orange]	Point	Medium-High Hazard
[Yellow]	Point	Medium Hazard
[Green]	Point	Low-Medium Hazard
[Brown]	Point	Low Hazard
[Blue]	Line	Water
[Black]	Line	Urban
[Grey]	Line	Road
[Green]	Area	Forest
[Brown]	Area	Barren
[Blue]	Area	Water
[White]	Area	Urban
[Grey]	Area	Road

Map Information	Value	Unit
Map Scale	1:50,000	Scale
Map Date	2023-10-27	Date
Map Author	BEYOND	Author
Map Project	Azores Activation - Lava Flow	Project
Map Version	1.0	Version
Map Status	Final	Status
Map License	CC-BY-NC-SA	License

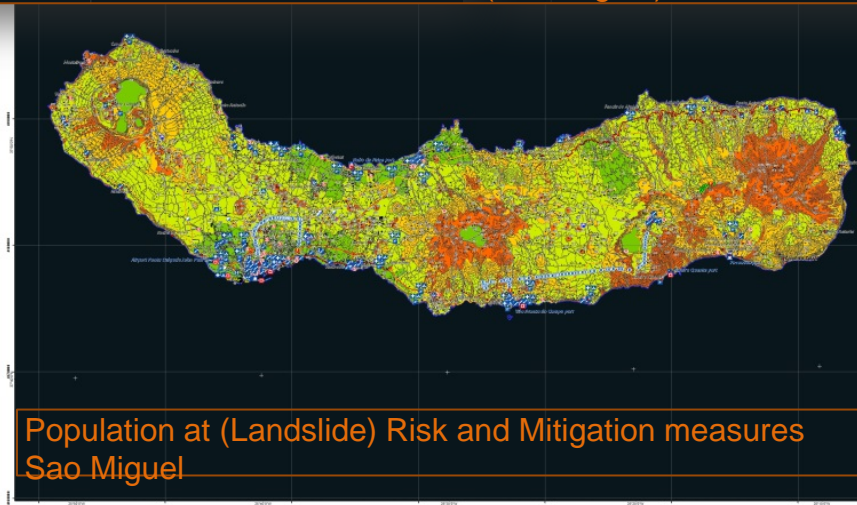
Data Sources	Source	Description
Topography	DEM	Digital Elevation Model
Past Lava Coverage	Historical Maps	Historical maps and records
Location of Lava Eruption Vents	Geological Data	Geological data and records
Probable future volcanic eruption zones ranked (1-4)	Model Output	Model output results

Azores activation

Landslides



Assets & Transportation Network at (Landslide) Risk and Mitigation measures
Ribeira Quente (Sao Miguel)



Population at (Landslide) Risk and Mitigation measures
Sao Miguel

Legend

Symbol	Description
[Orange]	High Risk
[Yellow]	Medium Risk
[Green]	Low Risk
[Blue]	Water
[Grey]	Urban
[Black]	Transportation Network

Map Information

Map Scale

Disclaimer/Publisher

Footer: opencius

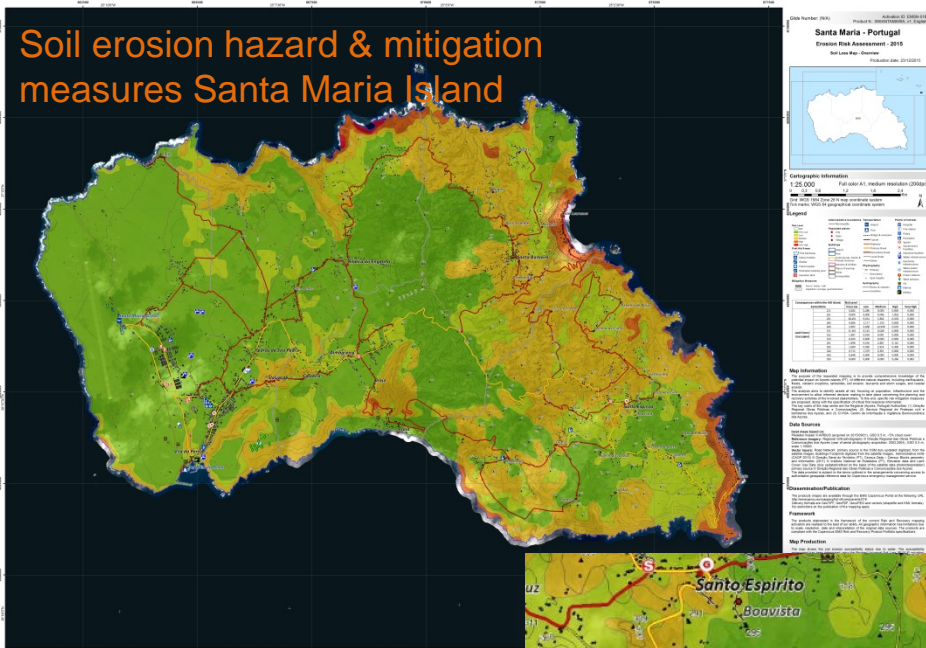
Azores activation

Soil erosion



Input Data

Soil erosion hazard & mitigation measures Santa Maria Island



Overview Statistics Table

Soil Erosion Risk Level	Land Cover/Use (Ha.)									
	Corvo	Flores	Faial	Pico	Sao Jorge	Graciosa	Terceira	Sao Miguel	Santa Maria	TOTAL
Very Low	45	3694.4	6482.6	0	3819.1	2169.6	22650.9	39600	4359.7	82821.3
Low	306.4	2325.7	4876	21787.6	6064.2	1715.8	8710	49600	1680.4	97066.1
Medium	1045.9	4126.1	215.2	19279.5	12223.8	1671.5	4701.4	56800	2598.2	102661.6
High	100.1	300.3	0	1994.4	1383.5	159.9	6.6	9700	282.1	13926.9
Very High	0	0	0	70.3	0	0	0	0	8.3	8.3



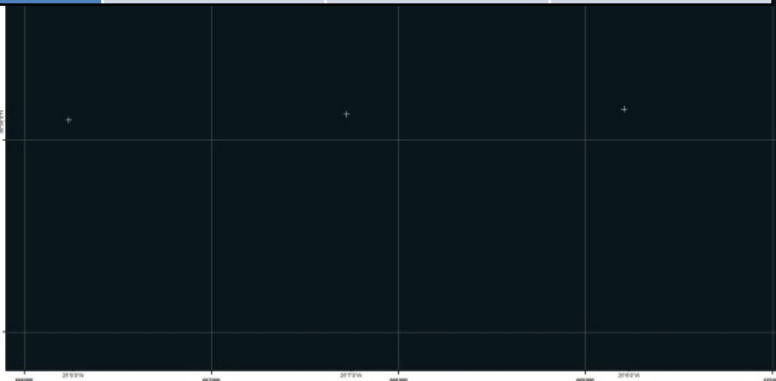
Azores activation

Coastal erosion



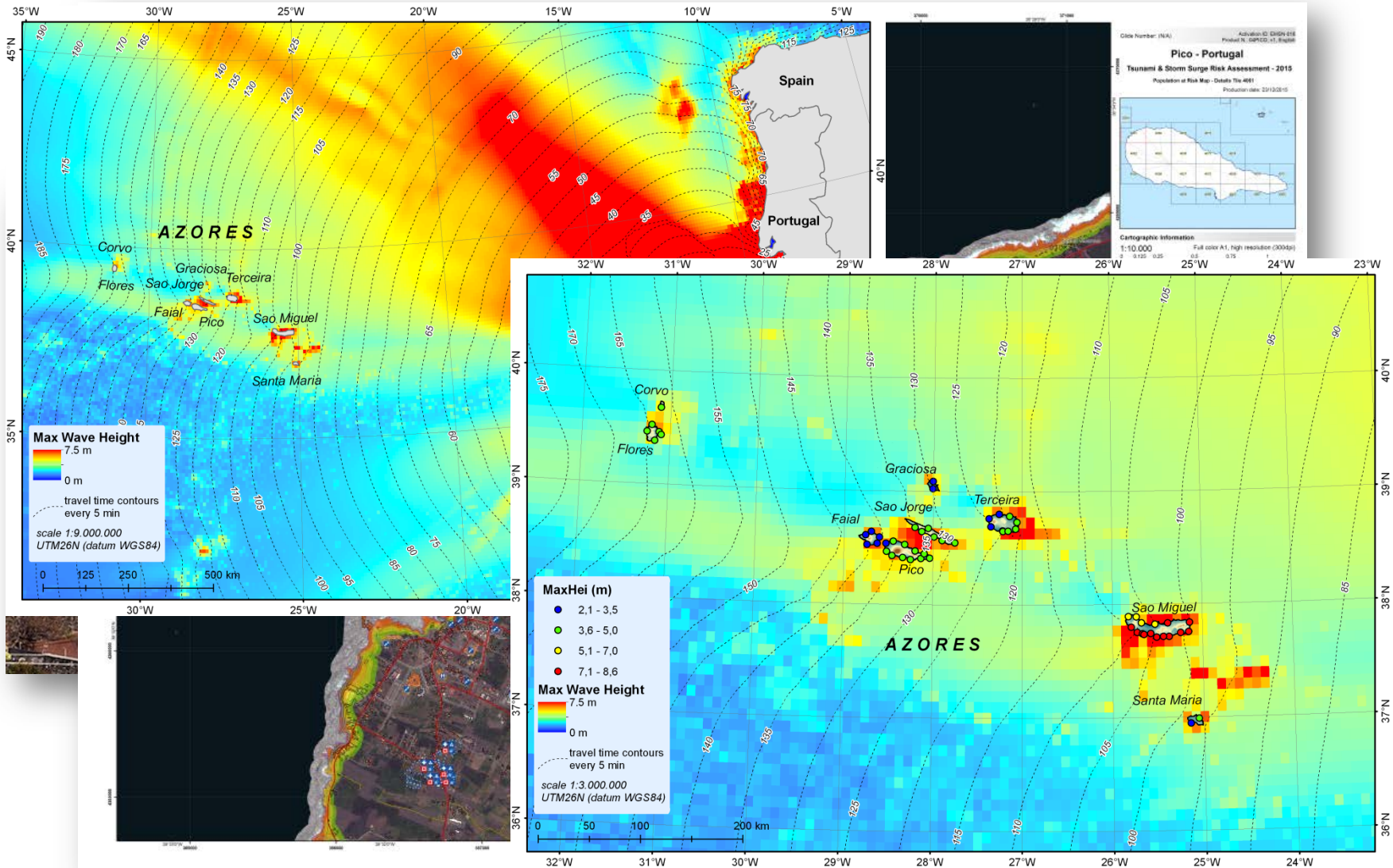
Table of Ratings of Azores in terms of coastal erosion hazard

	1 point	2 point	3 points		1 point	2 point	3 points
Relative sea level rise (best estimate for next 100 years)	< 0 mm/y	Between 0 and 0,40mm/y	>0,40 Mm/Y	Digital Elevation Model	< 5% of the region area lies below 5 meters	Between 5 and 10% of the region area lies below 5 meters	> 10% of the region area lies below 5 meters
Shoreline evolution trend Status	Less than 20% of the shoreline is in erosion	Between 20% and 60% of the shoreline is in erosion	More than 60% of the shoreline is in erosion	Engineered frontage	< 5% of engineered frontage along the regional coastline	Between 5% and 35% of engineered frontage along the regional coastline	> 35% of engineered frontage along the regional coastline
Highest water level	Less than 1,5 meters	Between 1,5 and 3 meters	More than 3 meters	Near shore currents	Distance >100m	Distance 50-100 m	Distance <50 m
Geological coastal type	> 70% of "likely non erodible segments"	"likely non erodible segments" between 40% and 70%	< 40% of "likely non erodible segments"				



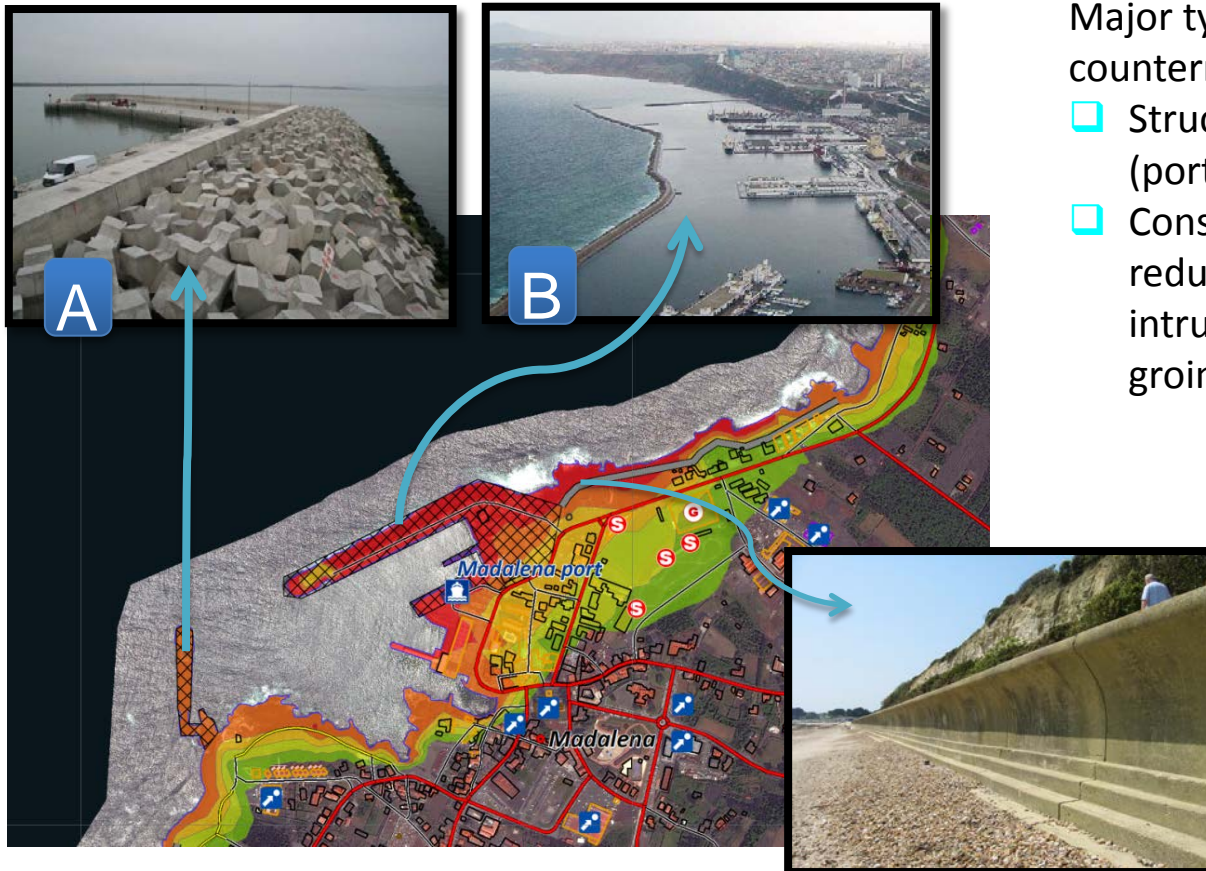
Azores activation

Tsunami



Azores activation

Tsunami









Major types of structural countermeasures:

- ❑ Structural reinforcement of assets (ports & other on-land facilities) [A]
- ❑ Construction of defences in order to reduce tsunami & storm surges intrusion (Breakwaters, seawalls, groins, quays, dykes / levees) [B]

Azores activation

Integrated analysis

Integration of Risk Data

-  First Aid Areas
-  Camp location
-  Shelter
-  Field hospital
-  Helicopter landing spot
-  Gasoline tank

Response Infrastructure Hierarchy (efficiency)

FIRST SLIDE



- ✓ JRC feedback: users were thrilled!
- ✓ Big data handling (EO, production mapping)
- ✓ Expertise & know-how on EO-based monitoring and risk modeling for multiple natural & manmade disasters
- ✓ Strategic positioning as a key Copernicus Service Provider

Thank you for your attention!



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Haris Kontoes: kontoes@noa.gr