COASTAL EROSION RISK ASSESSMENT AT PORTUGUESE SPEAKING COUNTRIES

CERA: An open-source application to assess coastal erosion risk

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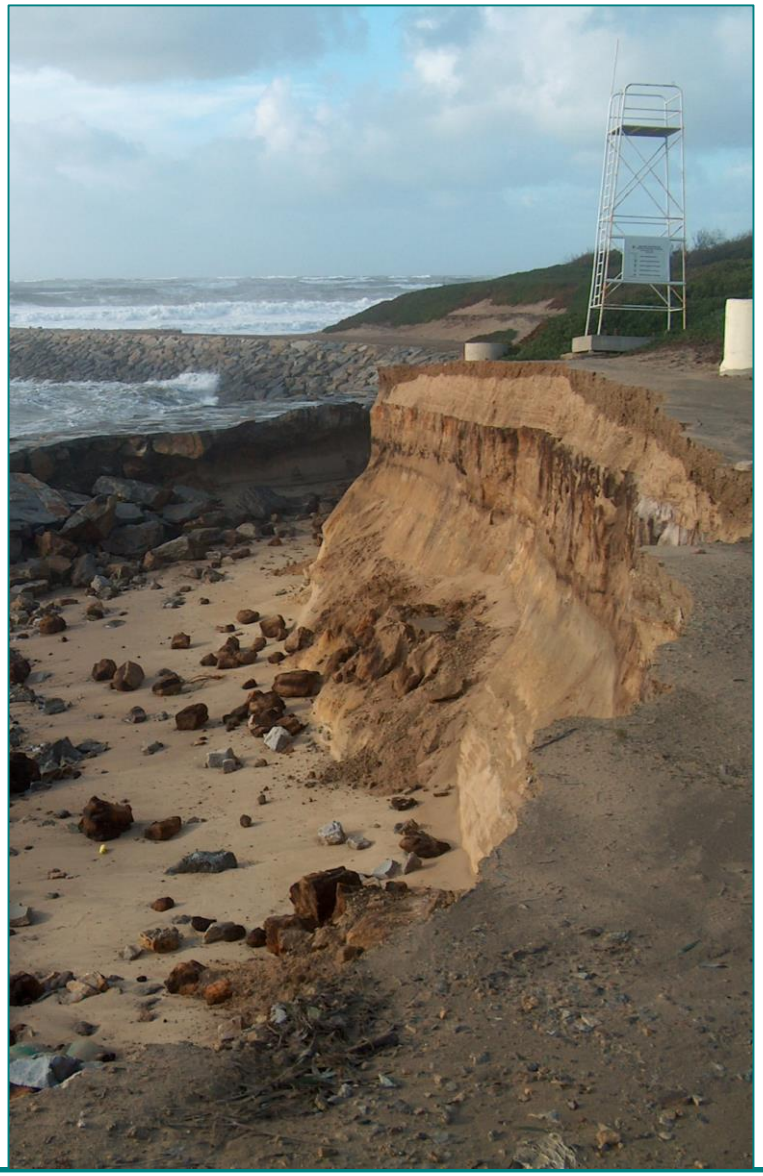
PRESENTATION STRUCTURE

- Introduction;
- Vulnerability assessment;
- Consequence assessment;
- Risk assessment;
- Geographic Information Systems (GIS);
- Study areas;
- Data gathering and processing;
- Results;
- Conclusions;
- Future Developments.



INTRODUCTION

- 2/3 of worldwide population live within coastal zones;
- Anthropic action increases vulnerability of coastal zones;
- Existent methodologies are specific of one location and are difficult to use and have access;
- Objective: create a methodology and respective application that is both easy to use and flexible enough to be applicable in different coastal environments.

VULNERABILITY ASSESSMENT

VULNERABILITY PARAMETERS OF COELHO (2005)

Parameters	Very low 1	Low 2	Moderated 3	High 4	Very high 5
Distance to shoreline	>1000	]200, 1000]	]50, 200]	]20, 50]	≤ 20
Topography (m)	> 30	]20, 30]	]10, 20]	]5, 10]	≤ 5
Geology	Magmatic rocks	Metamorphic rocks	Sedimentary rocks	Non-consolidated coarse sediments	Non-consolidated fine sediments
Geomorphology	Mountains	Rock cliffs	Erosive cliffs; sheltered beaches	Exposed beaches; plain	Dunes; river mouths; estuaries
Ground cover	Forest	Vegetation cultivated	Non-covered	Rural urbanized	Urbanized; industrial
Anthropogenic actions	Shoreline stabilization intervention	Intervention without sediment sources reduction	Intervention with sediment sources reduction	Without interventions or sediment sources reduction	Without interventions and with sediment sources reduction
Maximum significant wave height (m)	< 3.0	[3.0, 5.0[	[5.0, 6.0[	[6.0, 6.9[	≥ 6.9
Maximum tidal range (m)	< 1.0	[1.0, 2.0[	[2.0, 4.0[	[4.0, 6.0[	≥ 6.0
Average erosion / accretion rates (m/year)	> 0.0 Accretion	[0.0, -1.0[Erosion	[-1.0, -3.0[Erosion	[-3.0, -5.0[Erosion	≤ -5.0 Erosion

CONSEQUENCE AND RISK ASSESSMENT

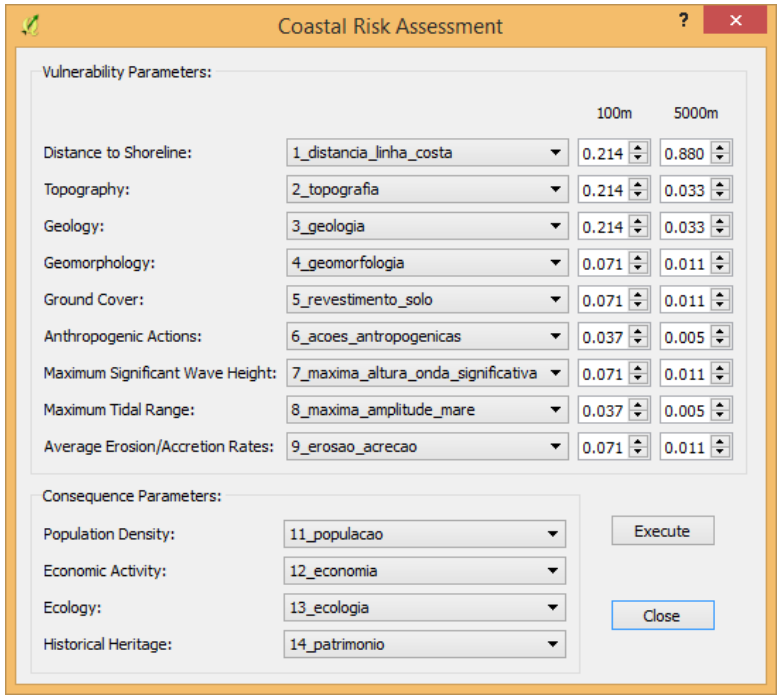
CONSEQUENCE PARAMETERS OF COELHO (2005)

Parameters	Very low 1	Low 2	Moderated 3	High 4	Very high 5
Population density (inhabitant/km²)	< 125	[125, 250[	[250, 500[	[500, 1000[	≥1000
Economy (employment/km²)	0	]0, 120]	]120, 240]	]240, 480]	> 480
Ecology	No ecological relevance	Agricultural reserve; areas of community interest	Ecological protected area	Coastal protection zone	Natural reserve
Heritage	No heritage to preserve	Scattered houses; roads	Urban centers	Regional historic buildings; critical facilities	National monuments

RISK MATRIX OF COELHO (2005)

		Consequence				
		1	2	3	4	5
Vulnerability	1	I Very low	I	I	II	III
	2	I	II Low	II	III	IV
	3	I	II	III Moderate	IV	V
	4	II	III	IV	IV High	V
	5	III	IV	V	V	V Very high

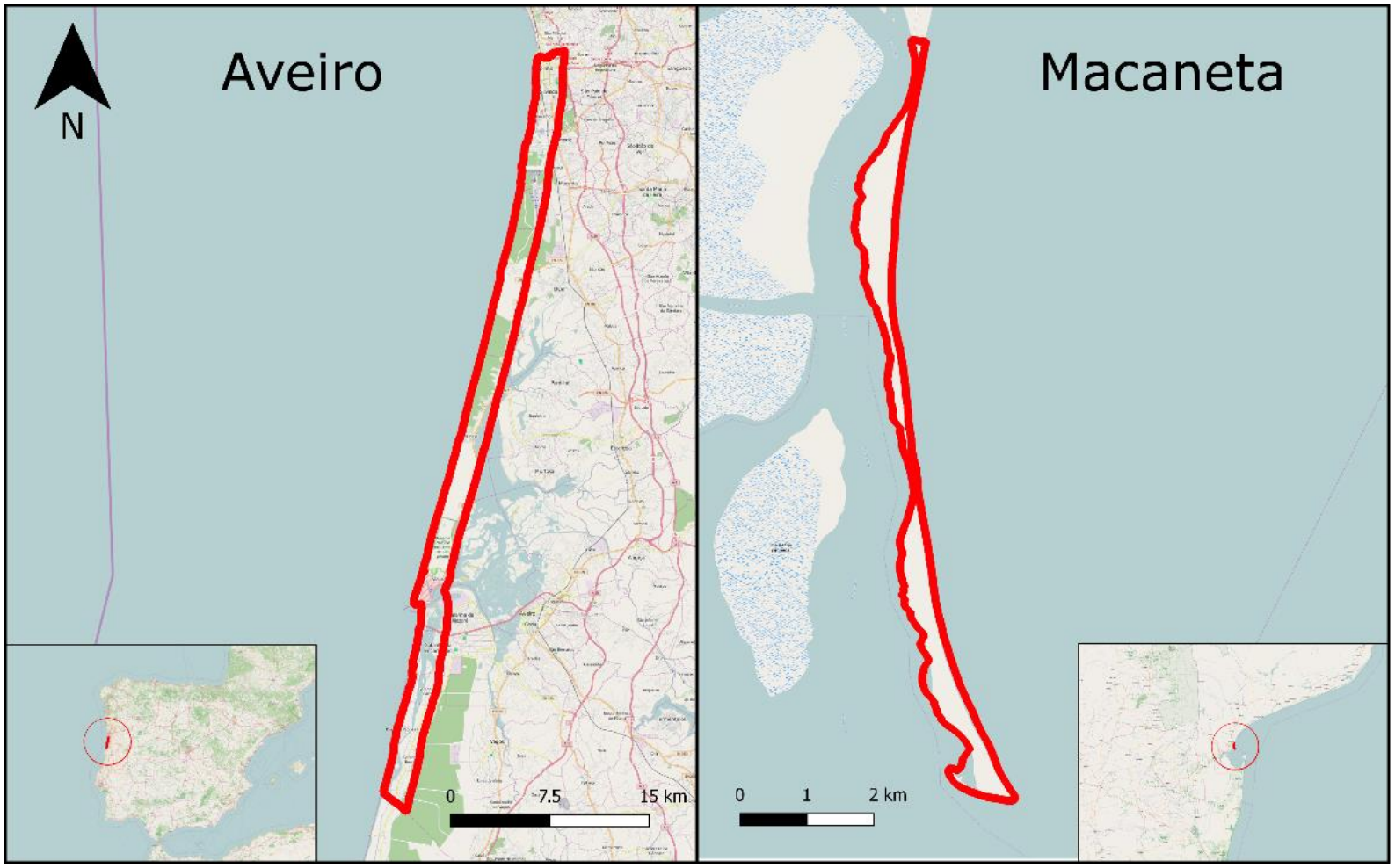
GEOGRAPHIC INFORMATION SYSTEMS (GIS)



GRAPHIC USER INTERFACE OF CERA

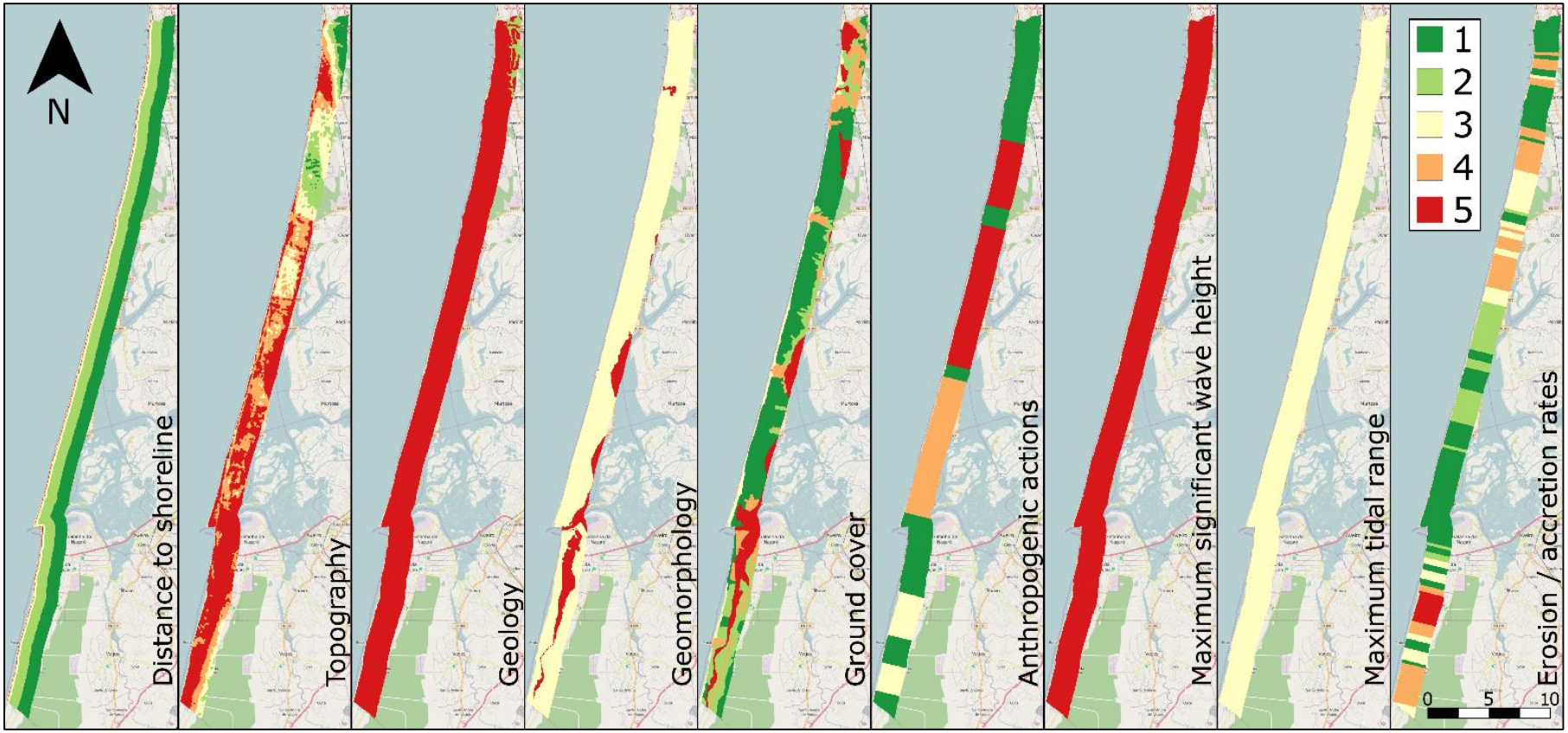
- GIS application called CERA (Coastal Erosion Risk Assessment);
- Uses Coelho (2005) methodology
- Developed in Python and Qt;
- Plugin for QGIS, a free and open-source software;
- Allows integration with other GIS features.

STUDY AREAS



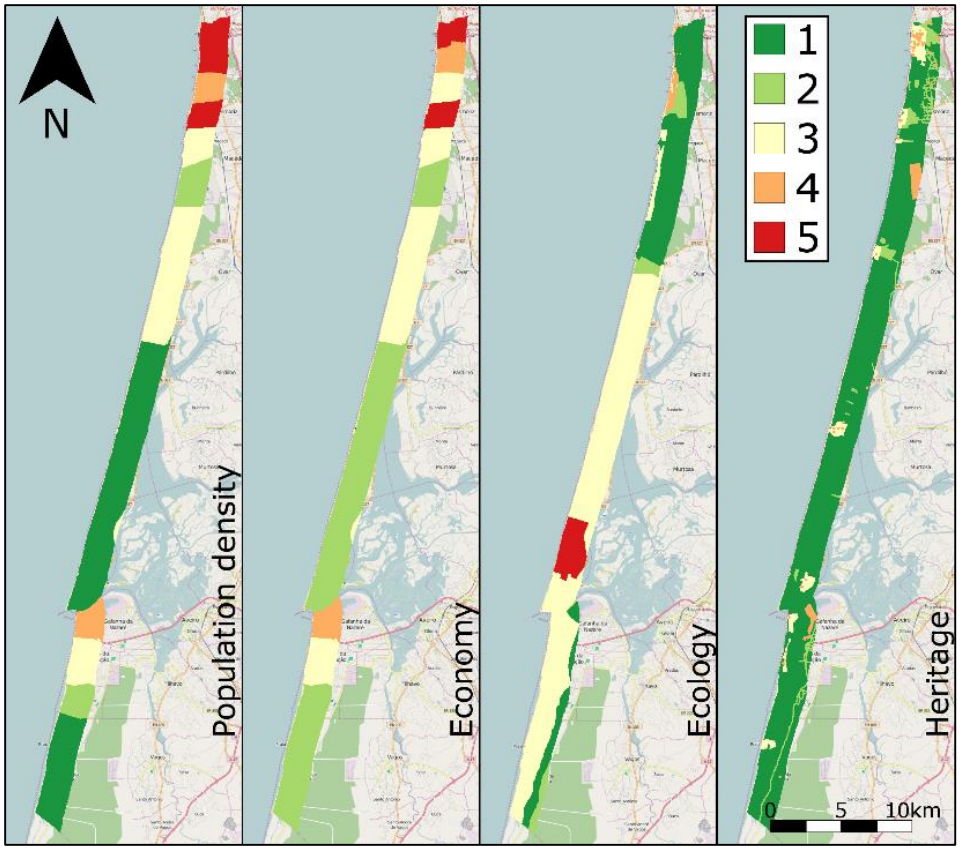
TESTING STUDY AREAS FOR CERA: AVEIRO, PORTUGAL AND MACANETA, MOZAMBIQUE.

DATA GATHERING AND PROCESSING



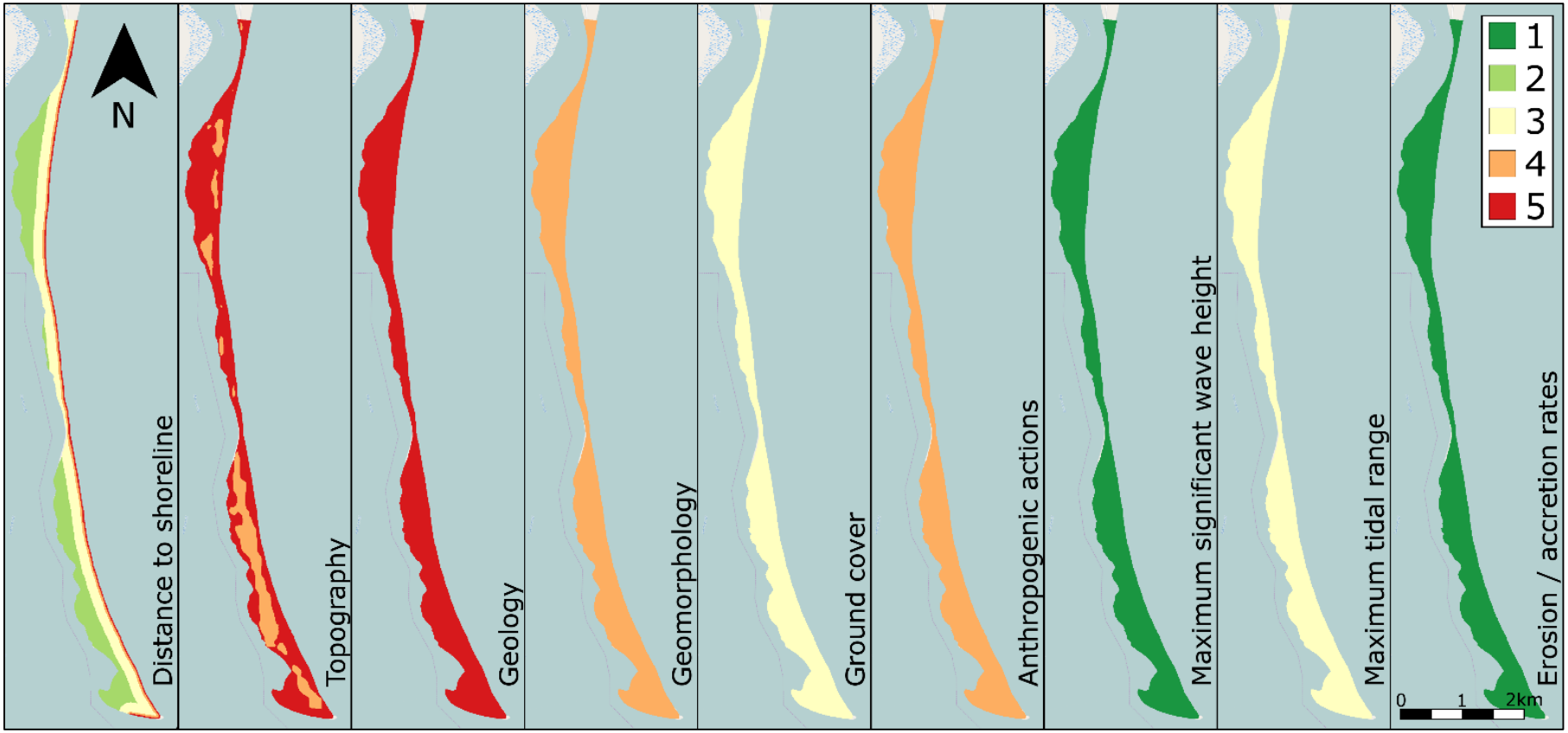
MAPS FOR VULNERABILITY PARAMETERS IN AVEIRO, PORTUGAL.

STUDY AREAS



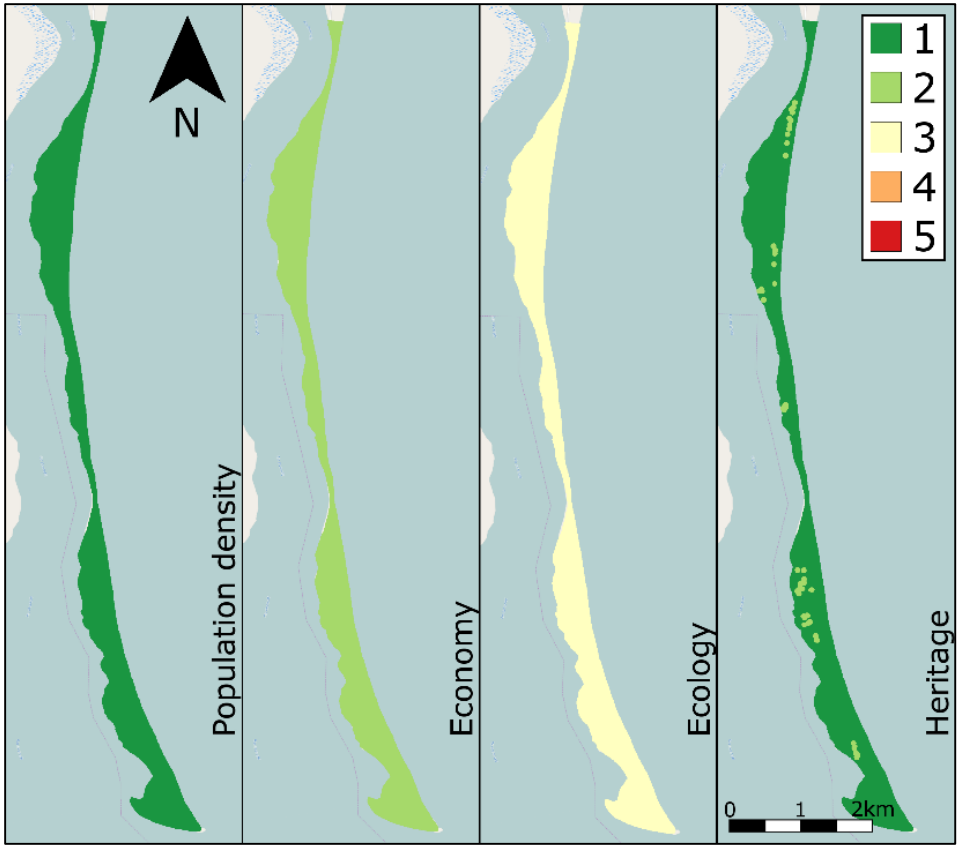
MAPS FOR CONSEQUENCE PARAMETERS IN AVEIRO, PORTUGAL

STUDY AREAS



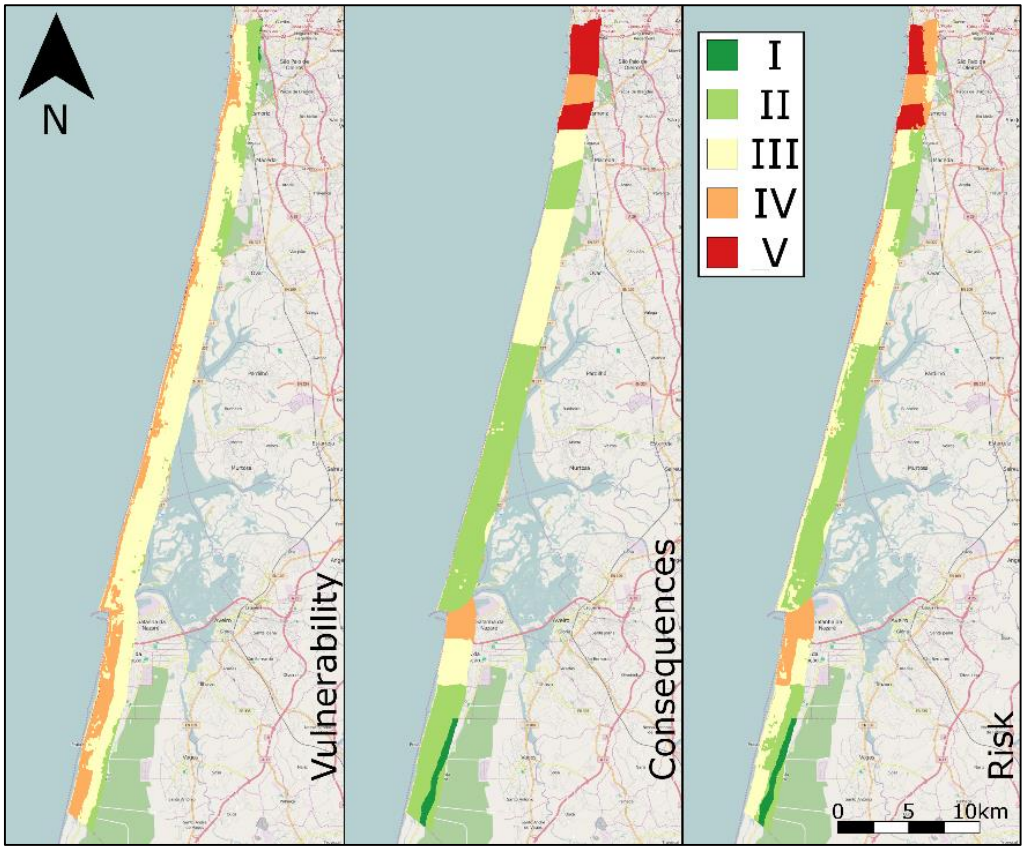
MAPS FOR VULNERABILITY PARAMETERS IN MACANETA, MOZAMBIQUE

STUDY AREAS



MAPS FOR CONSEQUENCE PARAMETERS IN MACANETA, MOZAMBIQUE

RESULTS

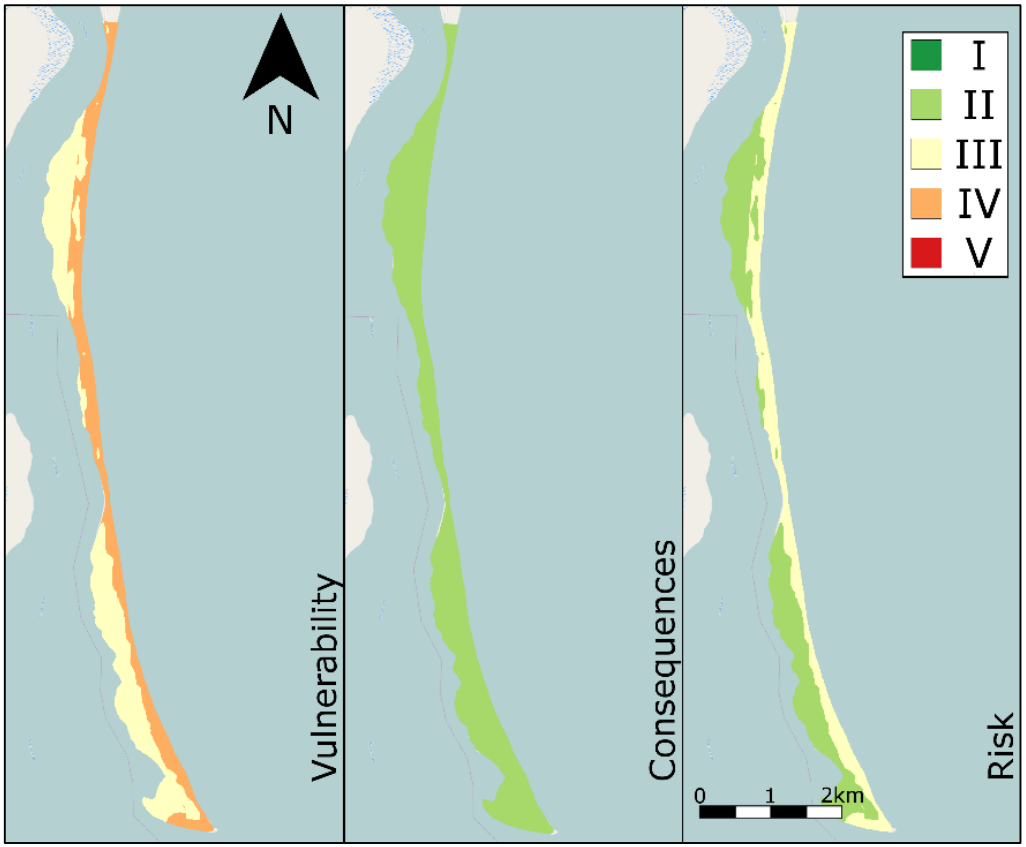


FINAL OUTPUTS FOR AVEIRO, PORTUGAL

- Stripe of 2 km parallel to the shoreline was classified;
- High vulnerability along the coastline (class IV);
- Consequence level varies across all classes;
- Parishes at north present higher level on consequences;
- Risk is higher at north and at Aveiro port.

RESULTS

- Classifications in Macaneta are less varied;
- Vulnerability class is similar to Aveiro, due to its similarities in terms of coastal environment;
- Consequences are mostly absent from this area;
- Risk is lower than in Aveiro.



FINAL OUTPUTS FOR MACANETA, MOZAMBIQUE

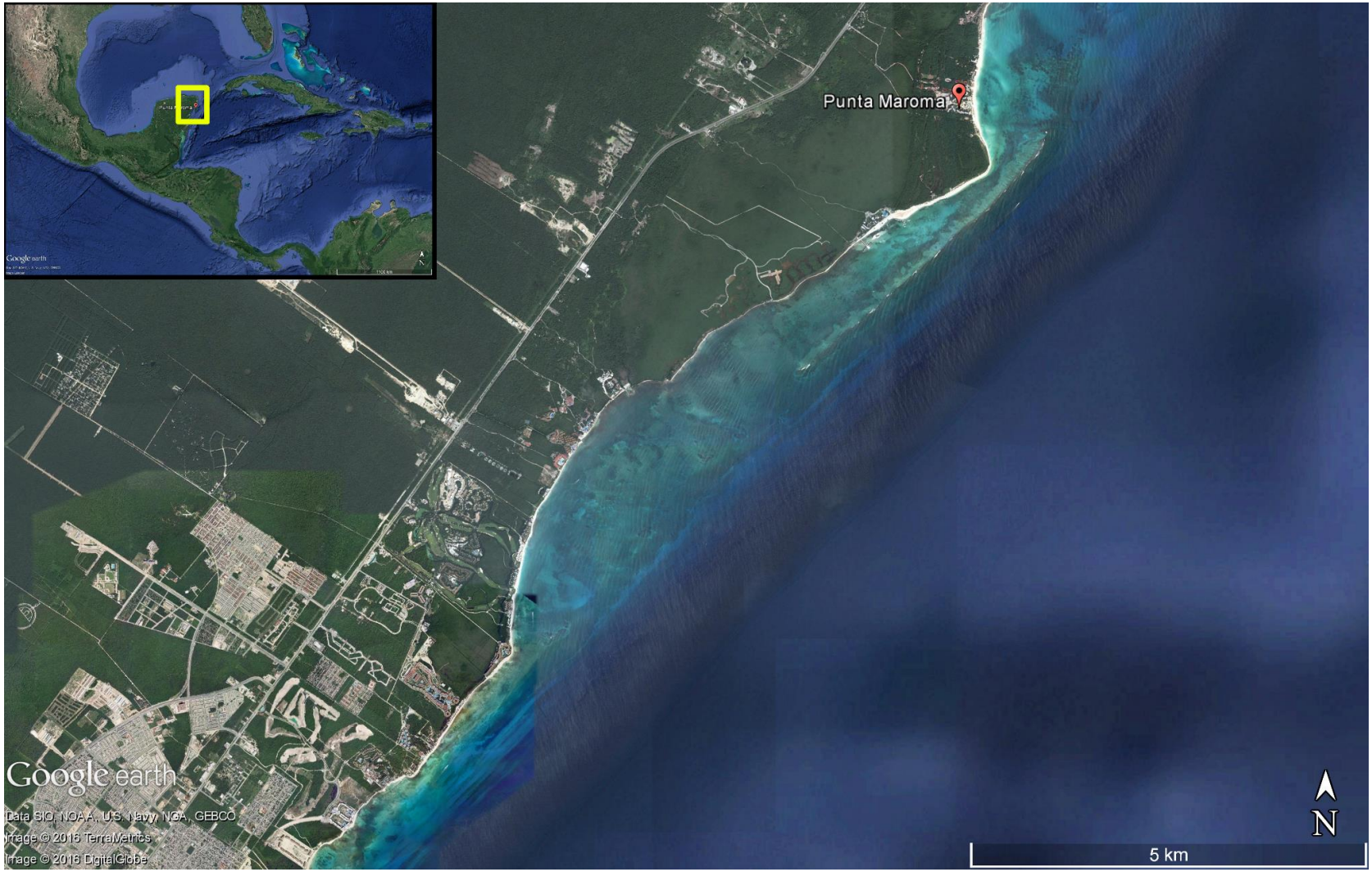
CONCLUSIONS

- Objective: create a methodology and respective application that is both easy to use and flexible enough to be applicable in different coastal environments;
- GIS application was developed, integrating Coelho methodology to assess vulnerability, consequences and risk to coastal erosion;
- Aveiro and Macaneta were used as test areas to the application.

FUTURE DEVELOPMENTS

- Assessment of new study area: Mexico;
- Locate an additional study area, with different characteristics from the current study sites;
- Sensitivity analysis on the parameters identified as important in coastal erosion risk assessment;
- Start development of original methodology and respective GIS application.

FUTURE DEVELOPMENTS



NEXT STUDY SITE TO ASSESS: TRANSECT BETWEEN PUNTA MAROMA AND PUNTA BETE, MEXICO

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Past and Future Development

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Thank you for your attention and feedback!