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Using remote sensing to assess the role of coastal ecosystems in the protection against erosion in the Caribbean

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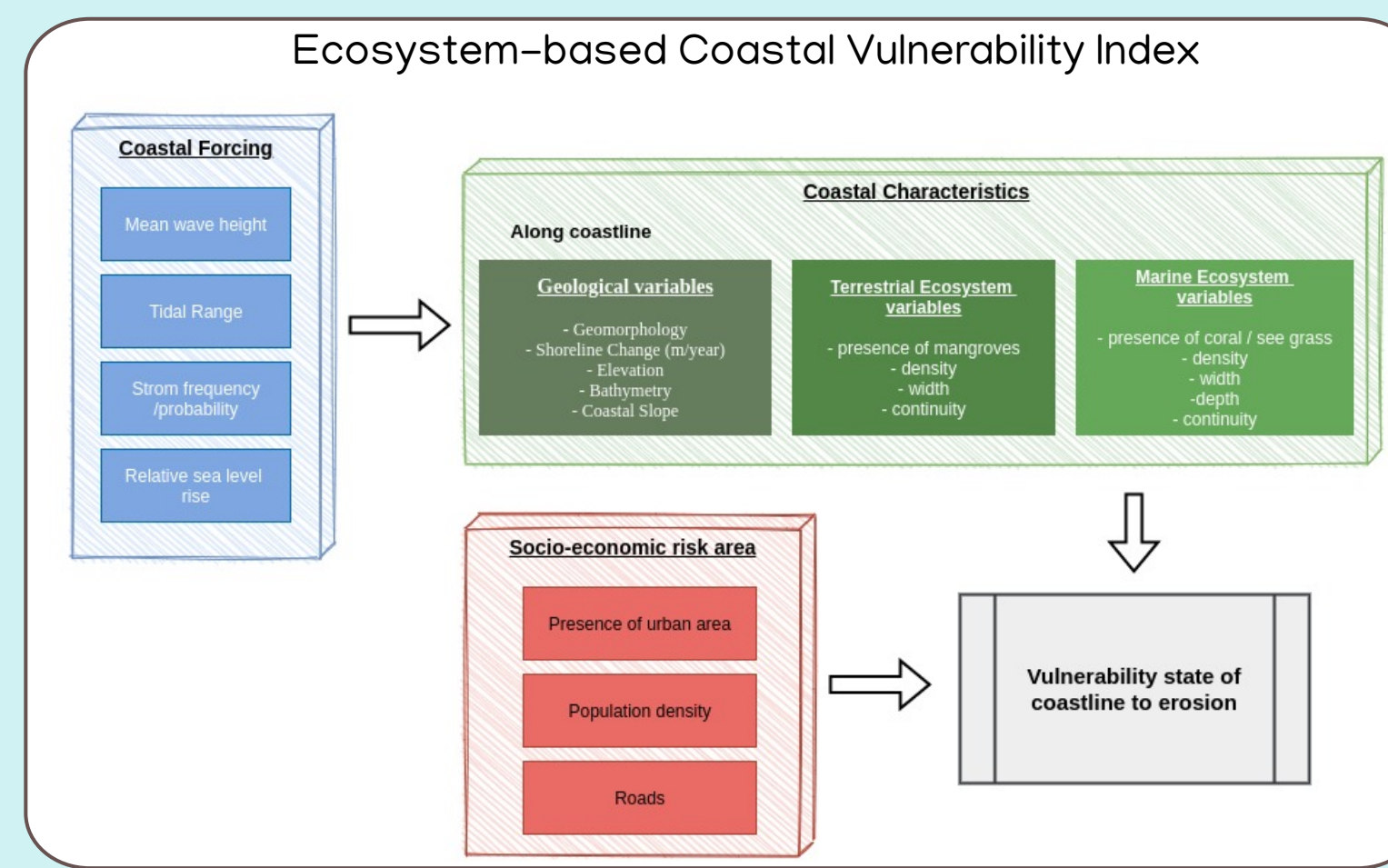
Objective: Assess the role of coastal ecosystems like mangroves, seagrass and coral reefs in the protection against coastal erosion in the Caribbean.

Introduction

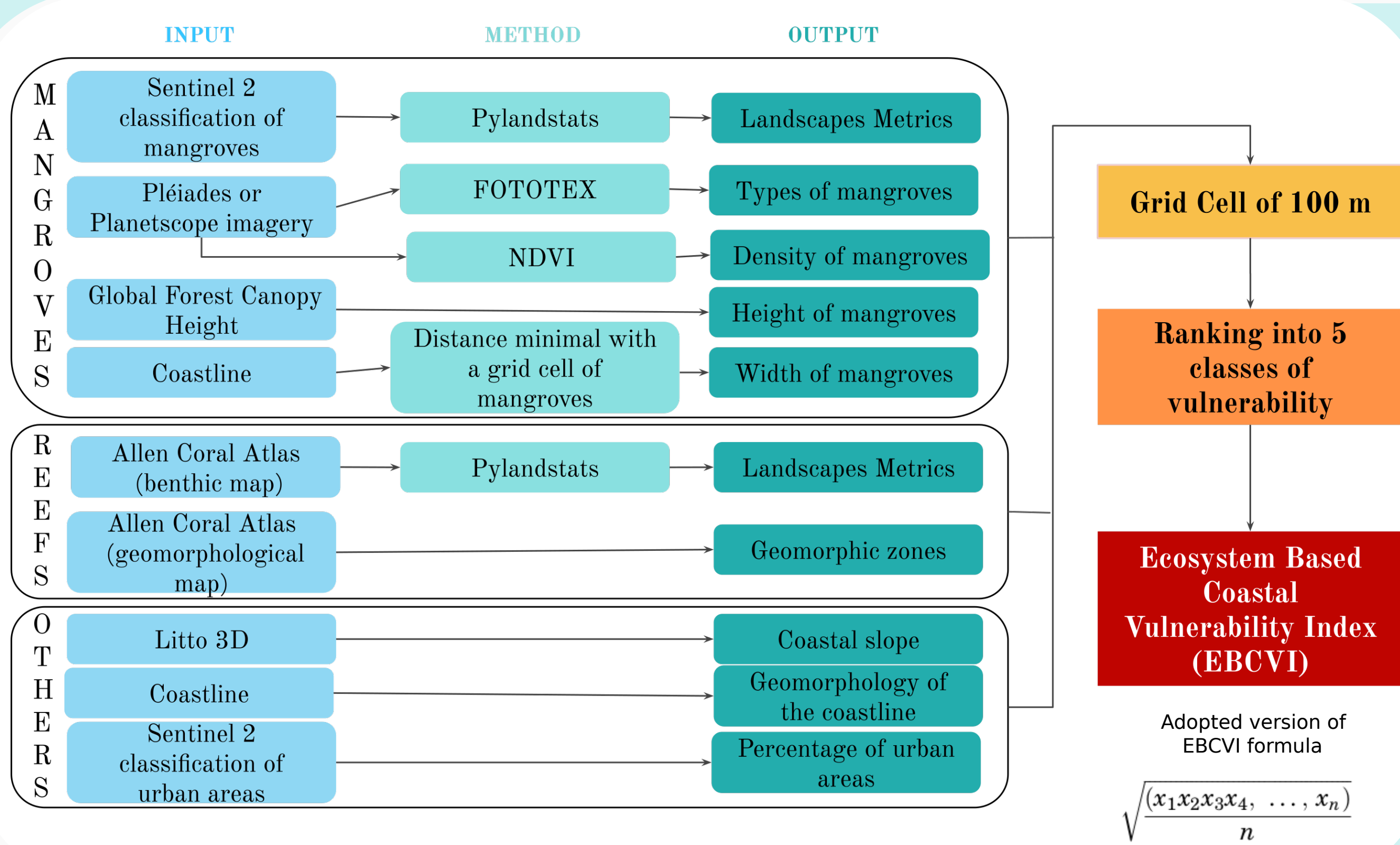
The CARIB-COAST project aims to construct and disseminate approaches for the monitoring and prevention of coastal risks, in order to help decision makers mitigate climate change impacts. The objective of the study is to characterize coastal vulnerability to erosion. Using satellite imagery and remote-sensing methods, the method proposed by Gornitz et al (1994) was adapted to integrate metrics on coastal ecosystems (mangroves, coral reefs and seagrass) for the production of an Ecosystem-based Coastal Vulnerability Index (EBCVI).

Study site

The CARIB-COAST project focuses on 6 Caribbean Islands : Guadeloupe, Martinique, Saint-Martin, Jamaica, Puerto Rico, Trinidad and Tobago



The pilot site used to develop the methodology is Cul-de-Sac in Guadeloupe



Data & Method

Multiple data has been used to create the final EBCVI:

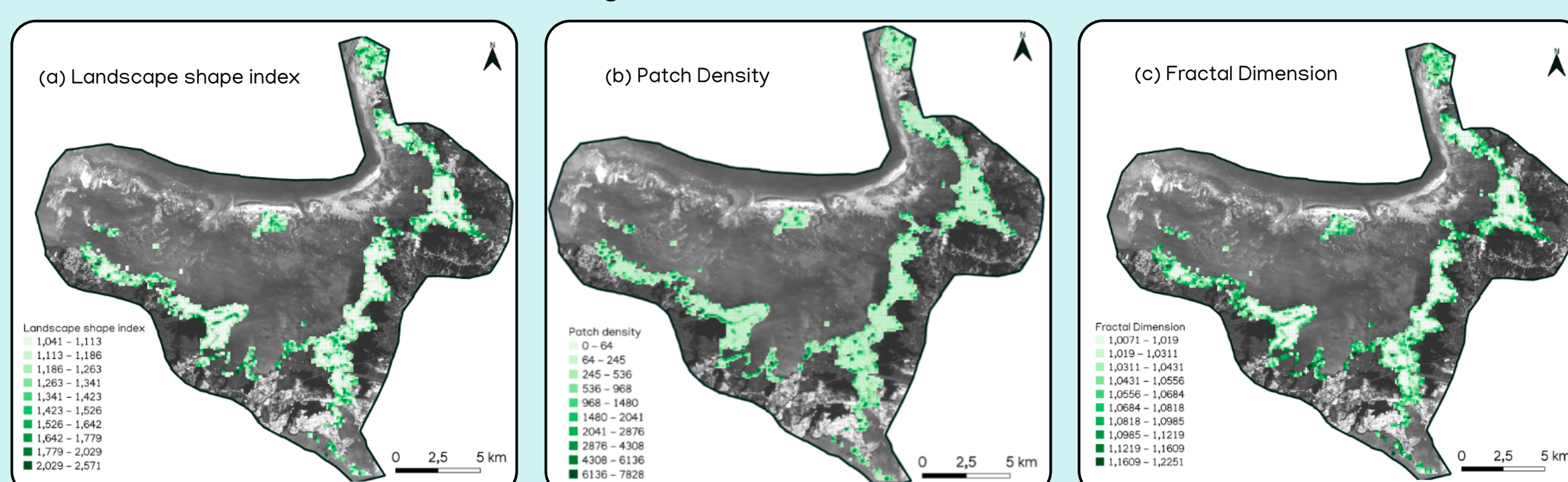
- Satellite imagery (Sentinel 2, Pléiades or PlanetScope).
- MNT (LITTO3D and COPDEM) for coastal slope
- External geodatabase (Global Forest Canopy Height, Global Mangrove Distribution, Geomorphology of the coastline, Allen Coral Atlas)

Pylandstats is used to extract landscapes metrics over mangroves and reefs in order to understand the surface state. FOTOTEX allows to differentiate textures informations which traduce different types of mangroves.

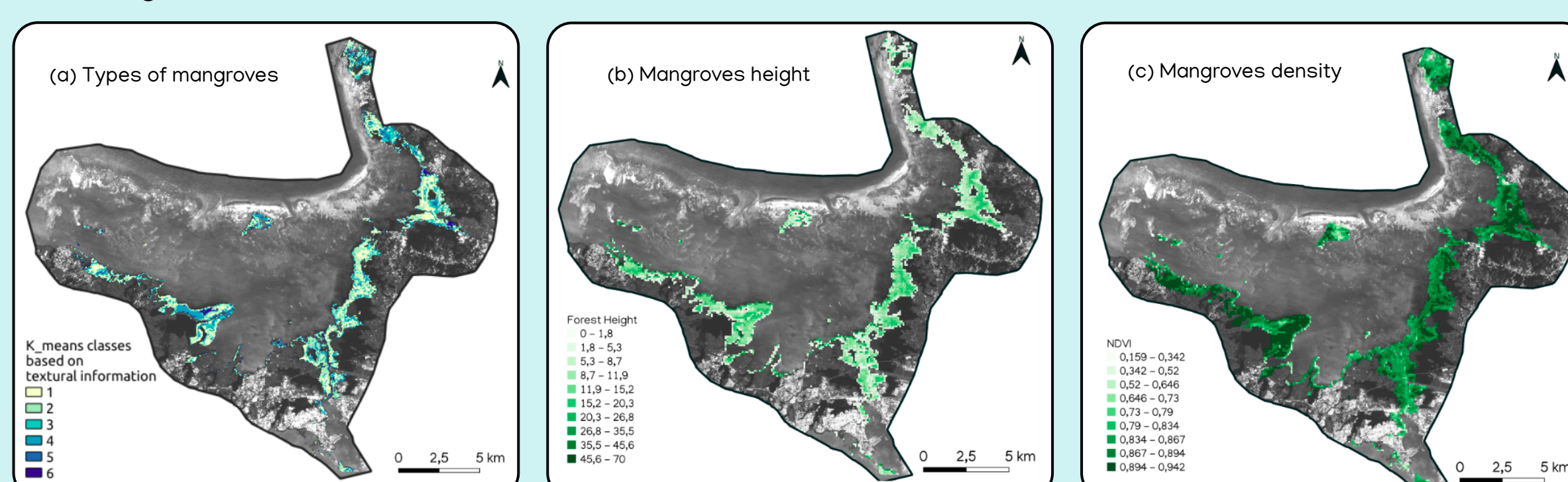
All variables are averaged over a grid cell of 100 m then a ranking into 5 classes of vulnerability allows to create the EBCVI.

Results

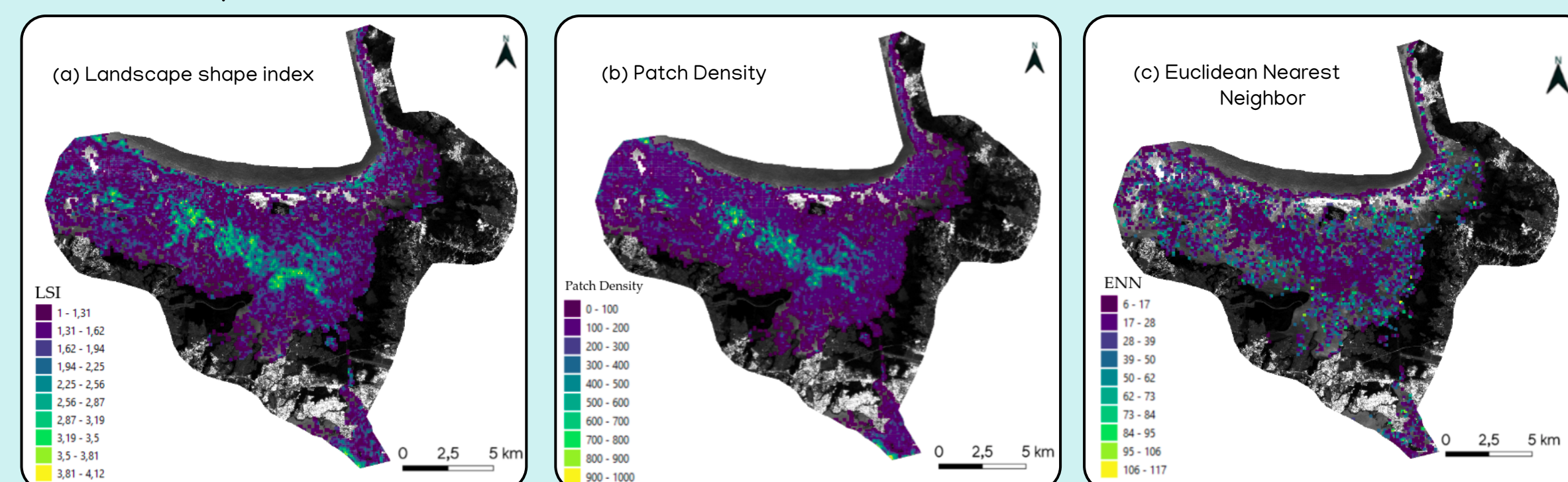
1. Landscapes metrics from mangroves classification:



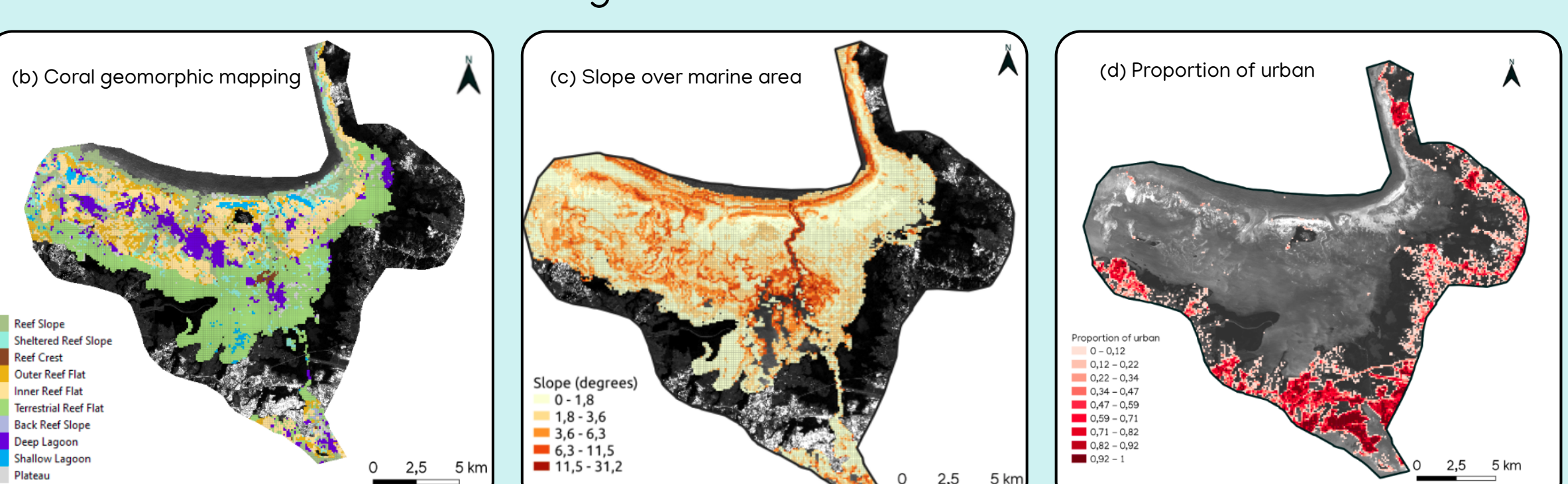
2. Mangrove surface state variables:



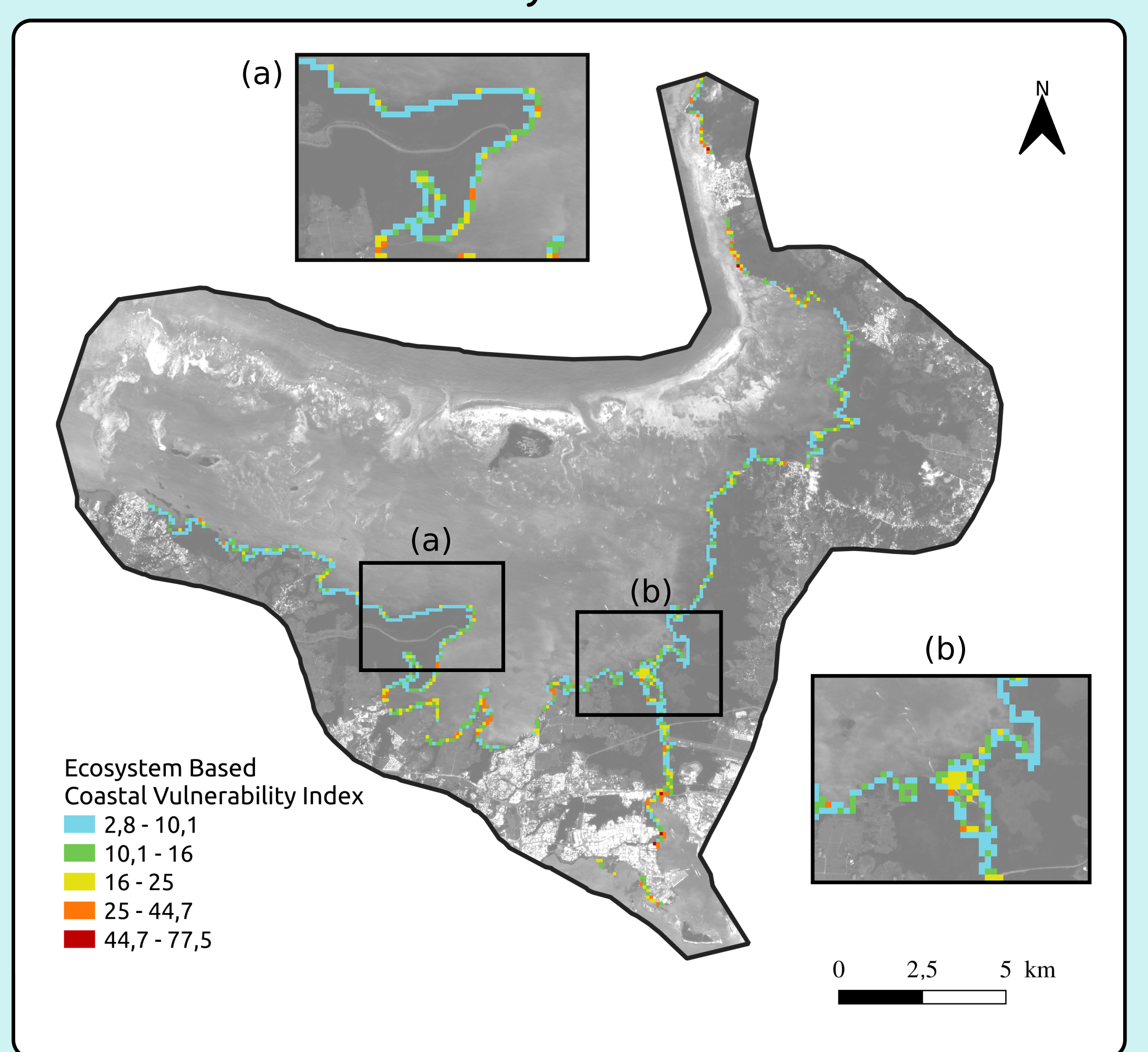
3. Landscapes metrics from Allen Coral Atlas classification:



4. Others variables from heterogeneous variables:



Preliminary EBCVI results



Conclusion

A great heterogeneity of vulnerability level is observable in the Cul-de-Sac area. In the EBCVI result above, variables are not weighted, it would be interesting to test different weightings depending on the importance of each variable, areas and sites. It is still necessary to adapt and adjust our EBCVI calculation because we do not take into account all our variables in this preliminary example. This method on the Cul-de-sac site will then be extended to the 15 pilot sites of the 6 islands of the Carib-Coast project.

MANGROVES

REEFS

OTHERS