

# Developing Policy-Relevant Mangrove Statistics from EO: Results from the GDA Marine Activity in Cambodia, Ecuador and Guinea-Bissau

These studies demonstrated the potential of EO data to enhance sustainability reporting through the analysis of mangrove extent and dynamics in Cambodia, Ecuador, and Guinea-Bissau. Across all three case studies, an integrated EO framework was applied, combining Sentinel-1 and Sentinel-2 with a machine-learning classification approach based on the LGBM.

In **Cambodia**, losses between 2017 and 2021 were uneven and linked to environmental pressures such as rising sea levels, increasing salinity, and variable temperature and chlorophyll patterns.

In **Ecuador**, a new national baseline map for 2023 was created to improve monitoring and policy support.

In **Guinea-Bissau**, mangroves declined by about 5.1% (≈9,100 ha) between 2018 and 2023, with significant regional differences.

Overall, the results demonstrate that harmonized EO-based data can strengthen environmental indicators, enhance comparability over time, and support policy and reporting on ecosystems, biodiversity, and climate.

## Cambodia

The 1<sup>st</sup> study analysed recent mangrove changes and their potential relationship with marine environmental drivers. Mangrove extent maps for 2017 and 2021 were used to quantify mangrove gain and loss across the entire Cambodian coastline. Mangrove changes were analysed within coastal land zones linked to adjacent marine zones, where EO-derived sea surface temperature, salinity, sea level, significant wave height, chlorophyll-a, and turbidity were assessed over the period 2016-2022. Results show pronounced spatial variability, with significant mangrove losses in several coastal and estuarine zones and limited gains observed in only one area. No consistent or recurring correlation was identified between mangrove changes and the analysed marine environmental parameters. These findings indicate that recent mangrove dynamics in Cambodia cannot be explained by marine environmental trends alone. In line with existing literature, the results suggest that anthropogenic pressures (e.g., aquaculture expansion, charcoal production, salt farming, and coastal development) remain the dominant drivers of mangrove loss.

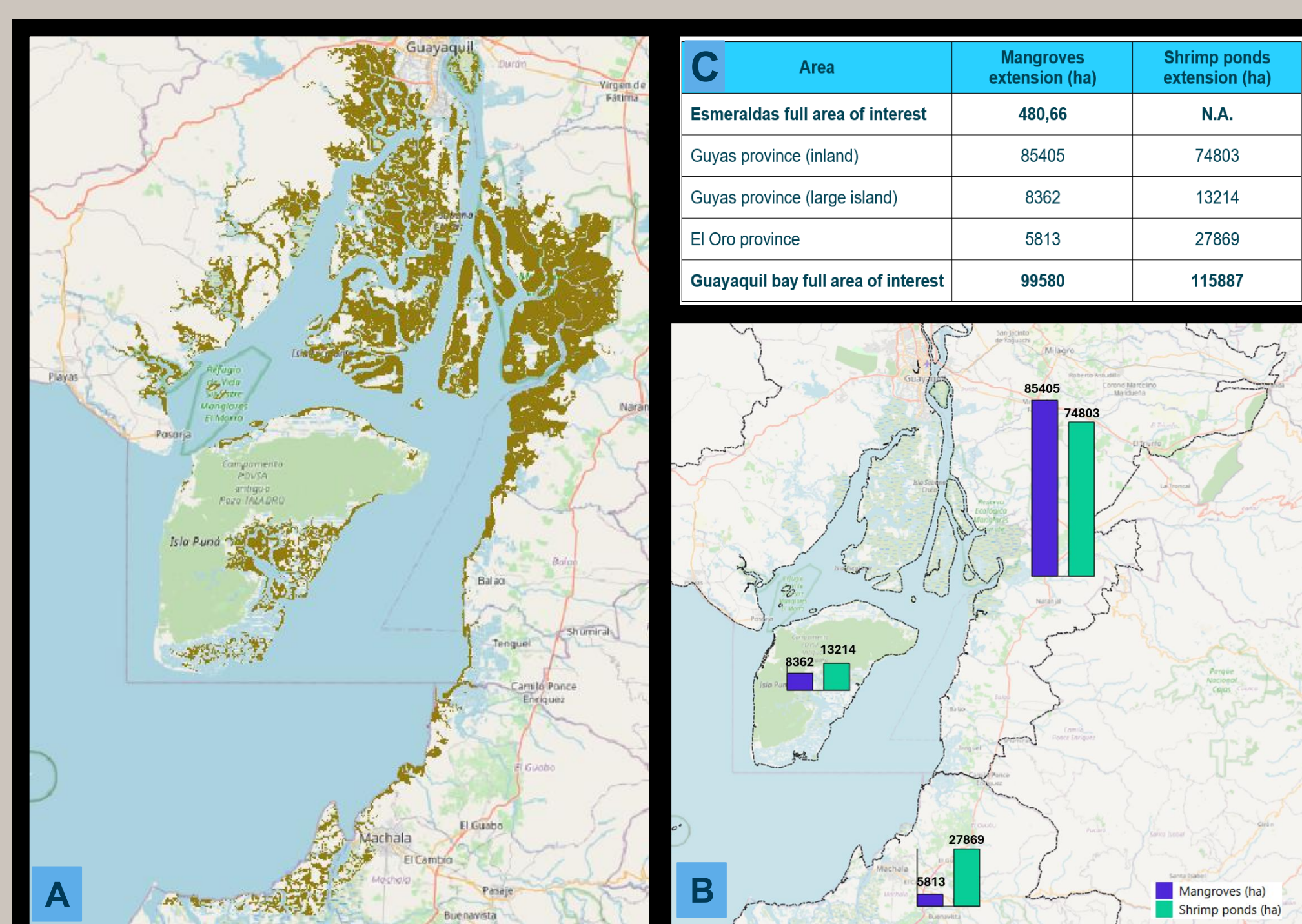
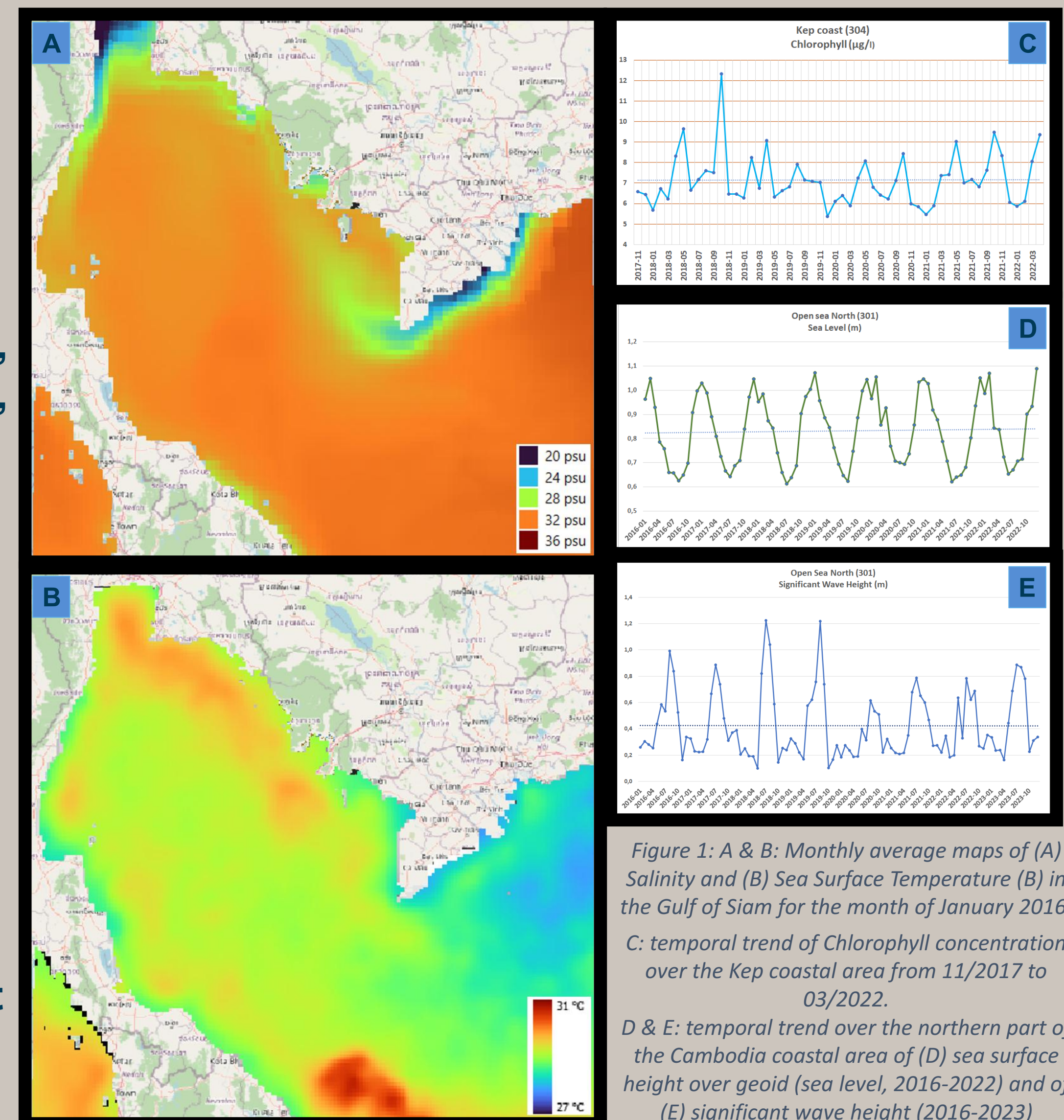


Figure 2: A: Mangroves map for 2023 over the Gulf of Guayaquil in Ecuador; B: The surface extension of mangroves and shrimp ponds over the three main regions in the Gulf of Guayaquil; C: Aggregated statistics of mangroves and shrimp ponds surface over Gulf of Guayaquil and Esmeraldas in Ecuador

## Ecuador

The 2<sup>nd</sup> activity focused on two priority areas: the Gulf of Guayaquil, where large mangroves areas coexist with extensive shrimp aquaculture, and the Esmeraldas coastal region, characterised by natural mangrove systems. The main output was a mangrove extension map for 2023, providing a consistent baseline of mangrove distribution across the areas of interest. The product was designed as an operational geo-information layer, supporting environmental monitoring, land-use planning, and assessment of interactions between mangroves and human activities.

## Guinea Bissau

The 3<sup>rd</sup> study mapped mangrove distribution for 2018 and 2023 using). Two large coastal areas of interest were analysed and change detection was performed through post-classification comparison, supported by automatic corrections and expert visual interpretation. Results highlighted a net mangrove loss at the national scale, with marked spatial variability between zones. In northern coastal areas, mangrove loss reached approximately 5%, while southern zones showed a smaller overall decline (about 1.3%), with most areas remaining relatively stable. Losses were primarily associated with conversion to agricultural land and settlements, whereas localized gains were limited. Changes within ±1% were considered stable, reflecting mapping accuracy.

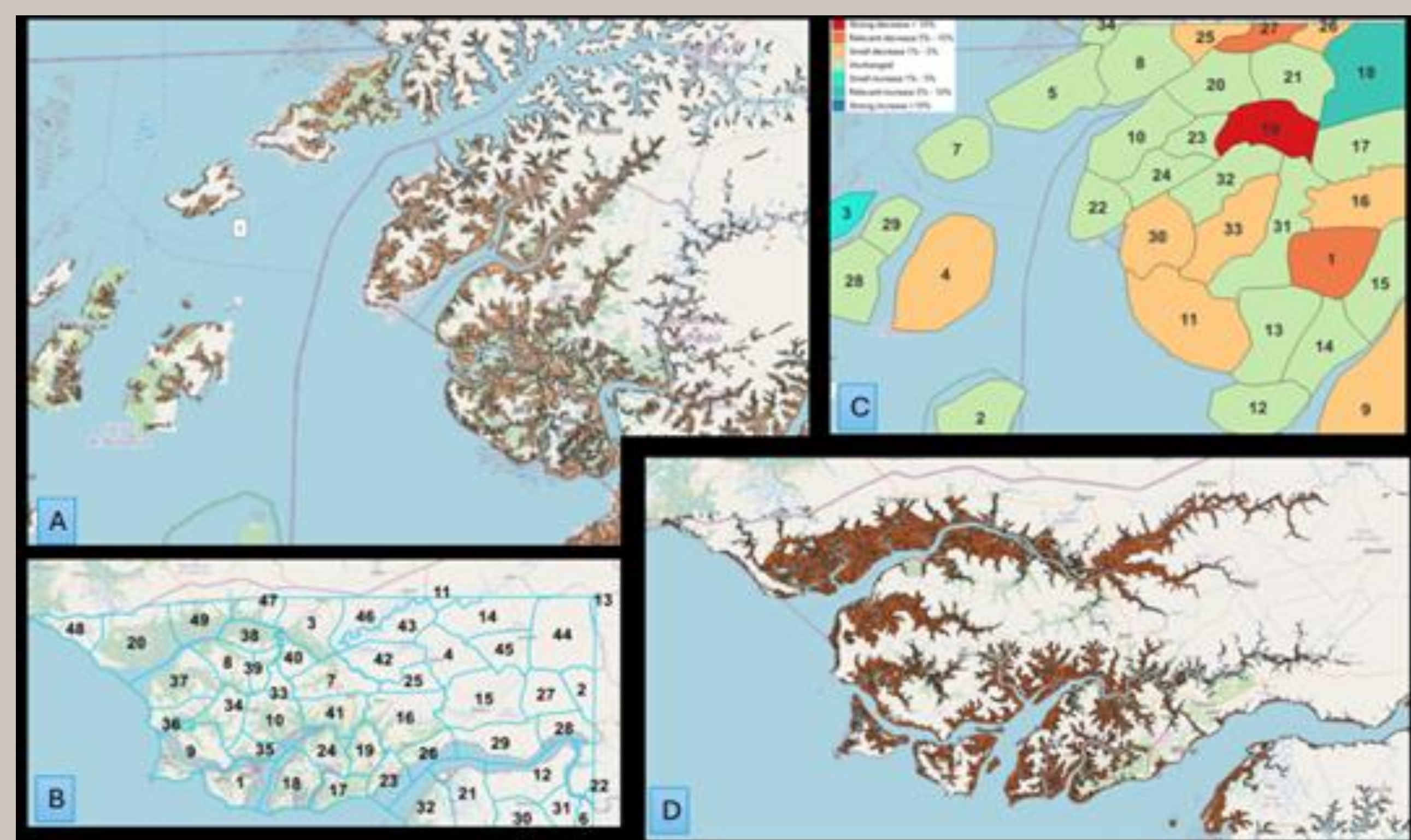


Figure 3: A: Mangroves map for 2023 over the southern coast of Guinea Bissau; B: The AOI in the north was divided into 49 zones; C: Analytics resulting from the change analysis of mangrove extension between 2018 and 2023 over the subzones in the southern coast of Guinea Bissau; D: Mangroves map for 2018 over the northern coast of Guinea Bissau