



The LifeWatch ERIC Biodiversity
& Ecosystem eScience Conference

PLOVDIV, BULGARIA

7-10 JULY 2026

Earth Observation tools to support ecosystem conservation actions

Presenter: Jasper Van doninck

10 July 2026



Conservation organizations have:

- Deep knowledge of areas under management
- Expertise in conservation science and research
- Community network and support
- Policy links

... but **may struggle** with

- Repeated monitoring over long temporal scale
- Assessing effectiveness over large spatial scale
- Identifying high-priority sites outside management area

Satellite Earth Observation can support conservation actions by:

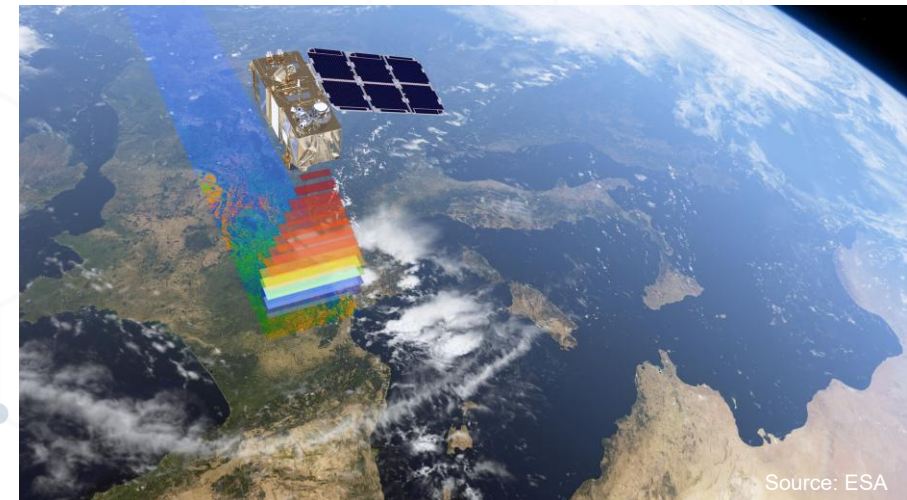
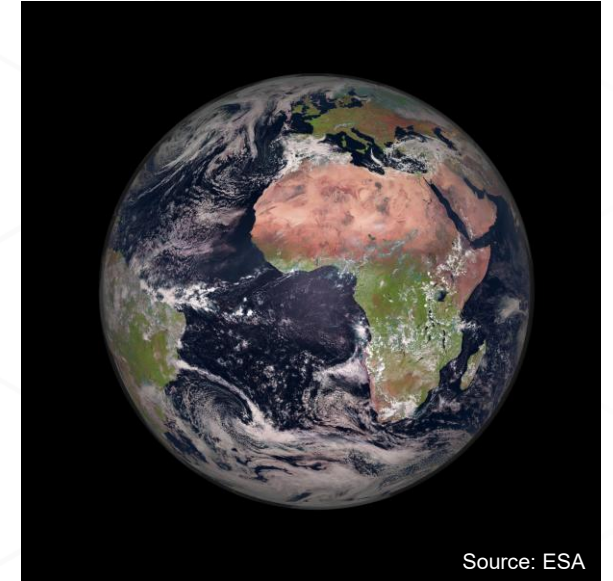
- Covering large geographic areas
- Over long and regular time series



... but

- Requires understanding of surface processes
- Needs in situ data for calibration and validation
- Can not replace on-the-ground actions and observations
- Is limited by sensor characteristics (e.g., spatial resolution) and atmospheric processes (e.g., clouds)

→ **Clear value of linking EO expertise with CSO/NGO conservation expertise**



The PEOPLE-ECCO project

Enhancing Ecosystems Conservation through Earth observation solutions, Capacity development and Co-design

Project of **ESA's PEOPLE series** (Pioneering Earth Observation Applications for the Environment)

Response to community needs identified by **CSOs/NGOs** active in ecosystems conservation

2-year project: October 2024 – September 2026

Goals:

- 1) Engage CSOs/NGOs through **co-design and capacity development**
- 2) Develop **tools and methods** for
 - A. Monitoring conditions and management effectiveness of **existing conservations actions**
 - B. Identify high-priority areas for **new conservation actions**



Who are PEOPLE-ECCO

Early Adopters



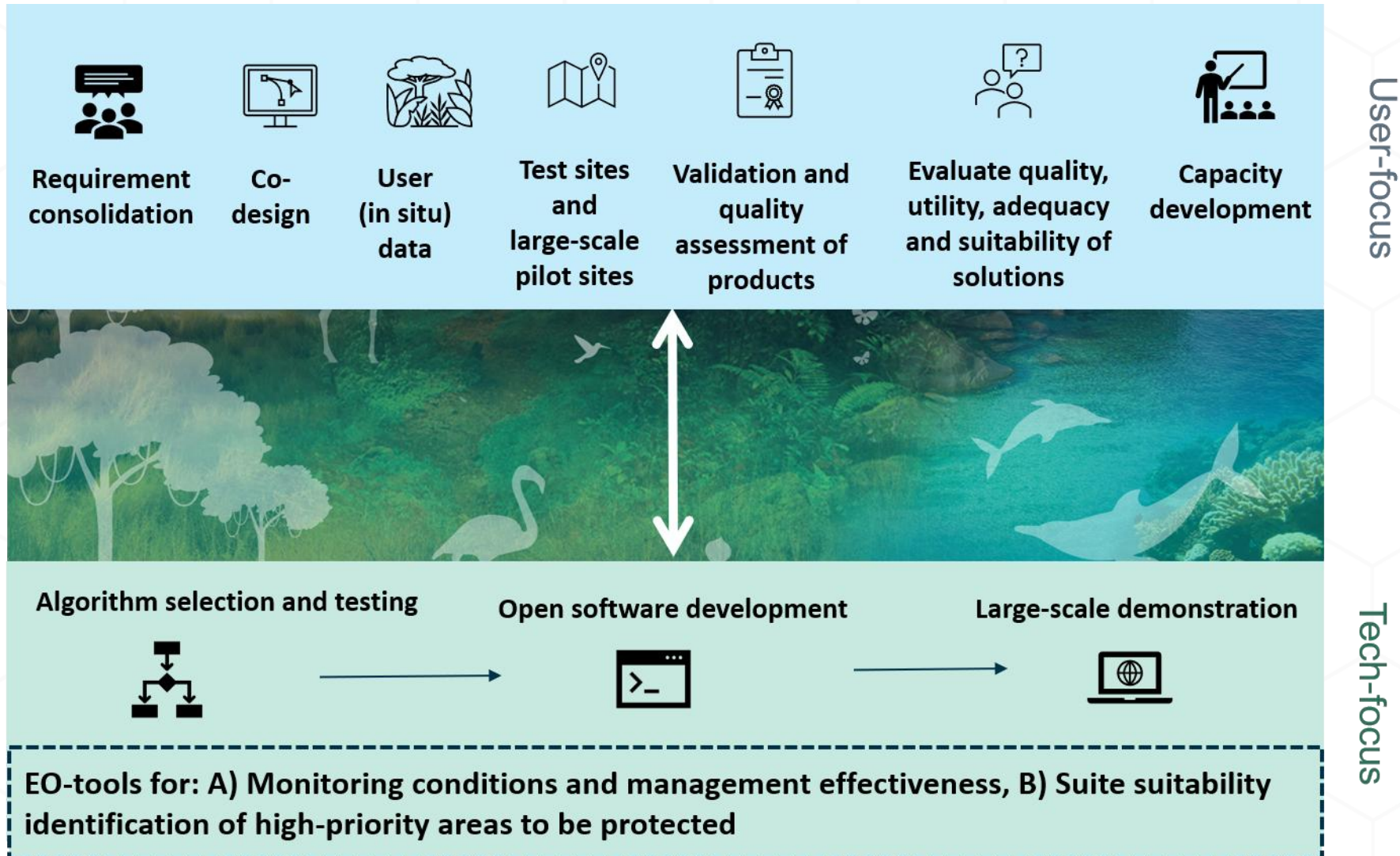
▲ Project Consortium



Advisory Board:

- WWF Italy
- IUCN
- SYKE
- WCS Uganda

How we work



Why Co-design



Enhanced Relevance and Usability



Increased Stakeholder Buy-in



Diverse Perspectives and Creativity



Improved Communication and Understanding



Early Identification of Issues



Greater Flexibility and Adaptability



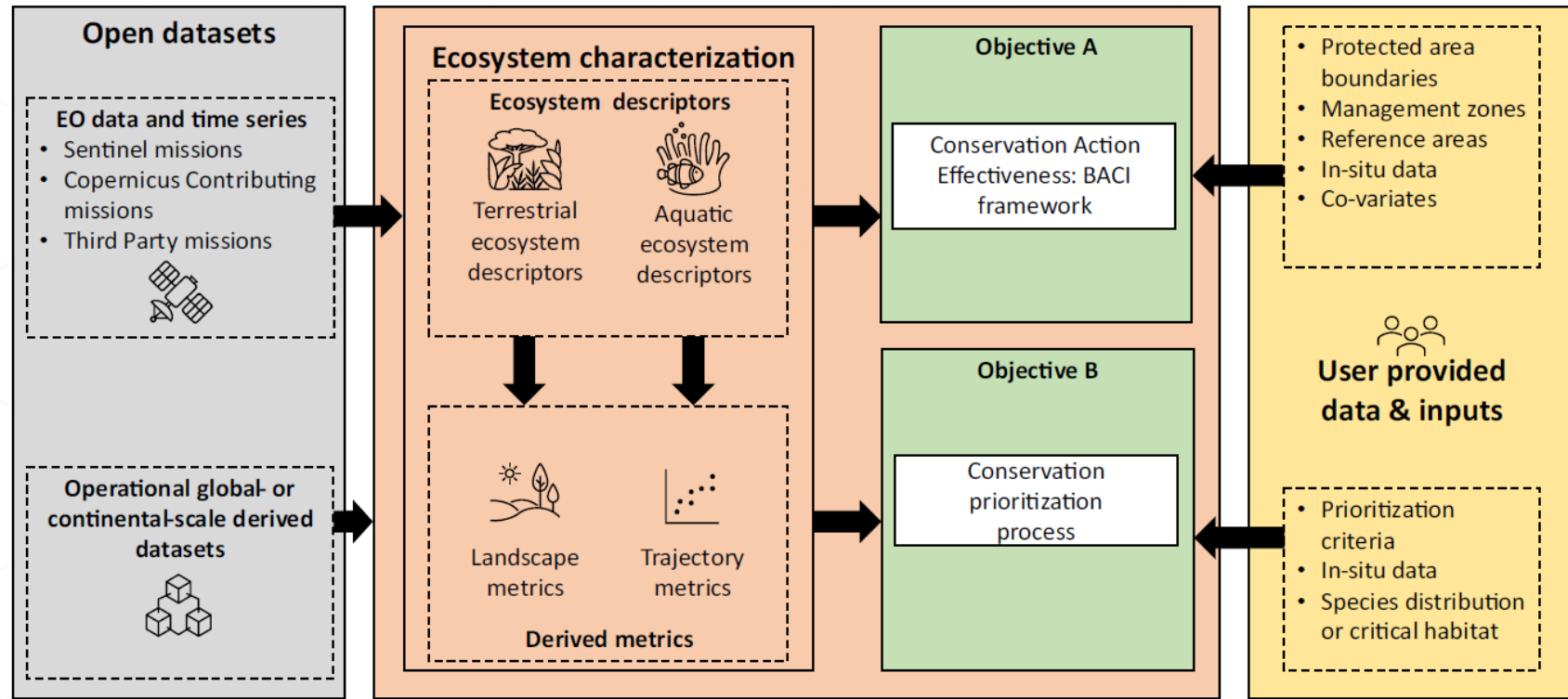
Empowerment and Capacity Building



Social and Ethical Considerations



Overall approach

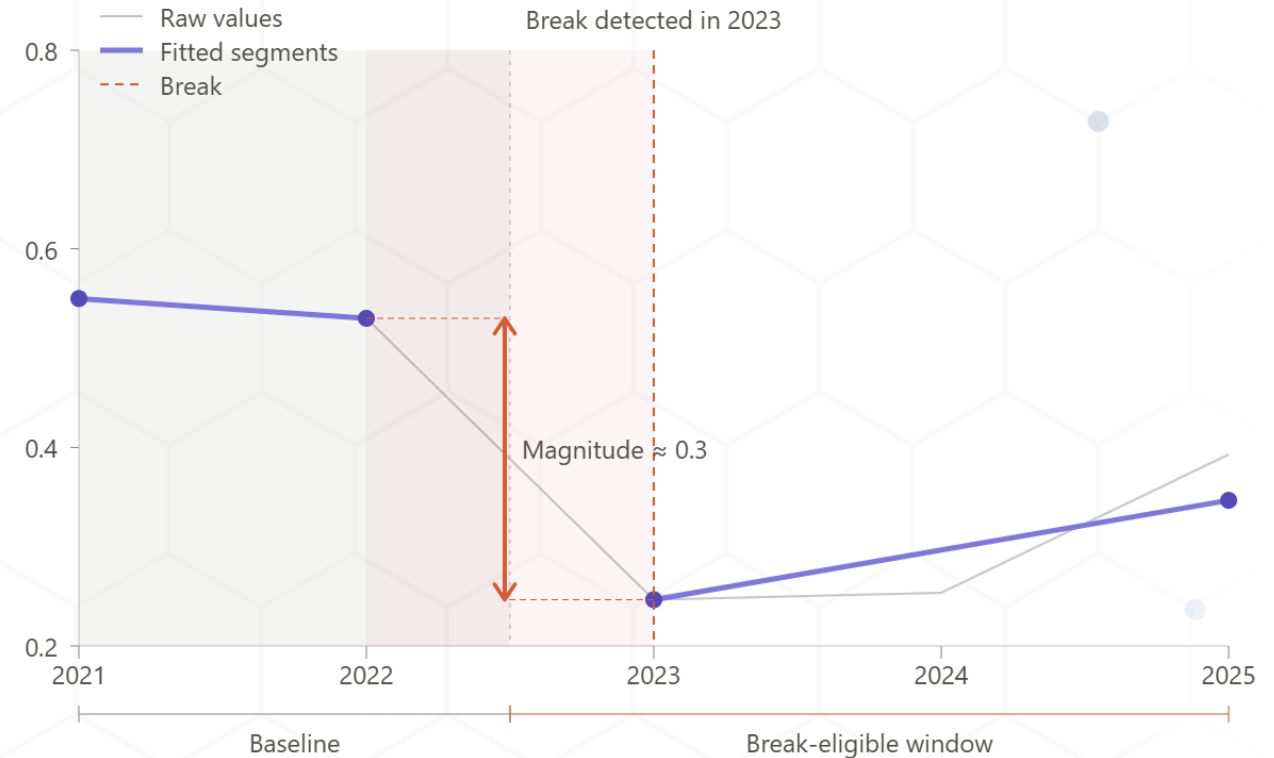


**Early Adopter-specific applications,
framed within wider community needs**

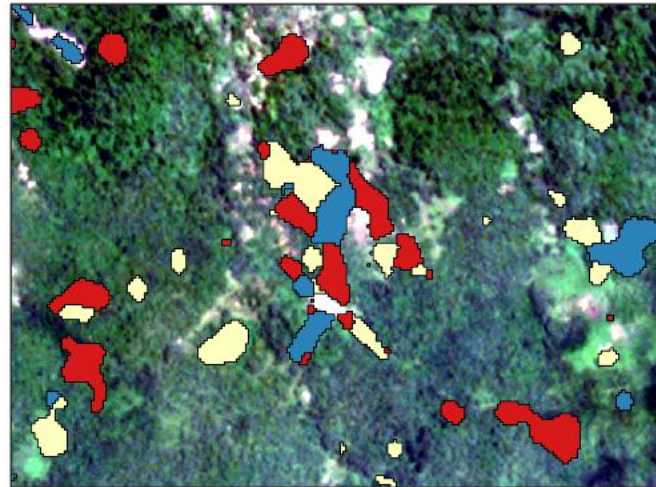
- Vegetation disturbance occurrence
- Vegetation Productivity Trend
- Habitat Disturbance Ranking
- Submerged aquatic vegetation and coral reef habitat extent, frequency, and connectivity
- Before-After-Control-Impact assessment

Vegetation disturbance occurrence

- Used to detect shifting agriculture or other vegetation disturbances
- Based on annual image composite time series
- Spectral index calculation
- Use piece-wise bottom-up regression to create a simple model for each time-step and progressively merge segments until the minimum candidate merge cost—computed from the slope's standard error, exceeds a threshold.
- The algorithm returns the Break Year (year of disturbance) and the magnitude of the disturbance (pre-disturbance value – post-disturbance value).



Vegetation disturbance occurrence



2022

Disturbances
2023
2024
2025



2023



2024



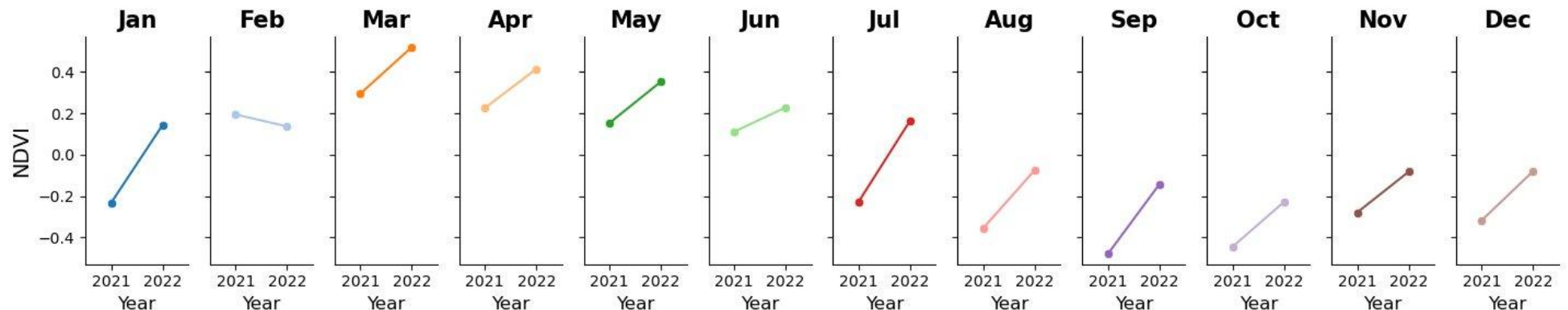
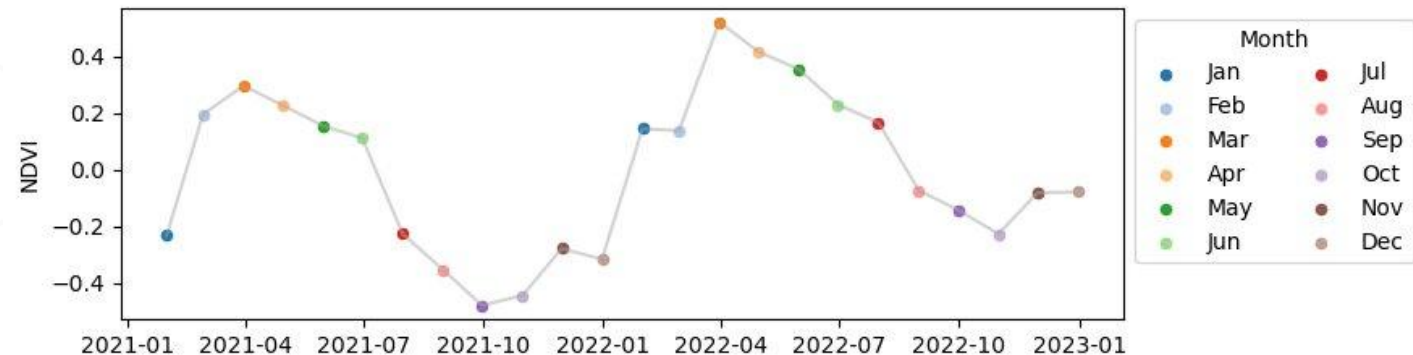
2025

0 1,000 2,000 m

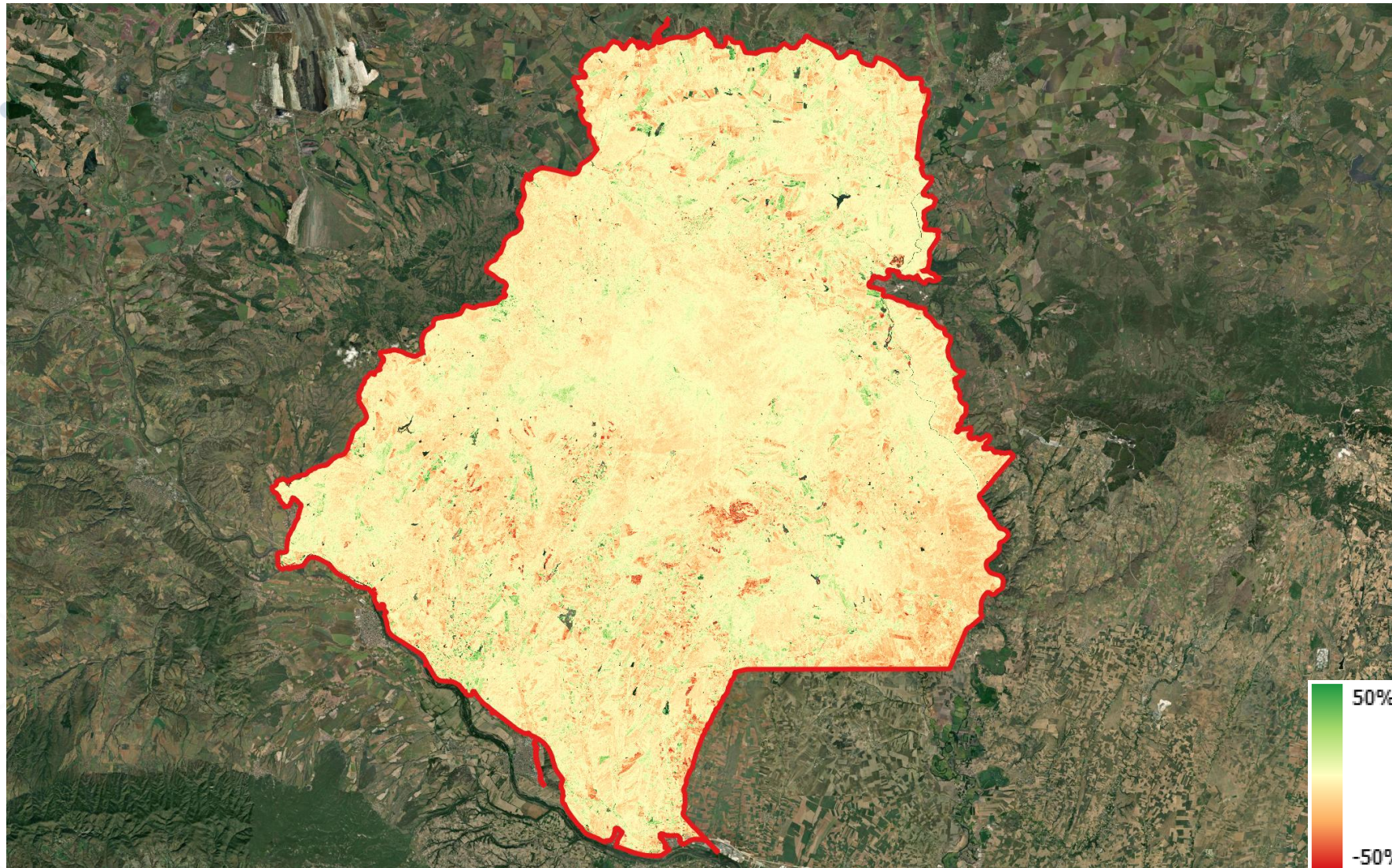


Vegetation Productivity Trend

- Used to detect long-term productivity trends (increase, stability, decline)
- Based on monthly image composite time series
- Spectral index calculation
- Use seasonal Sen's slope algorithm: median of slopes of paired months
- Robust to outliers



Vegetation Productivity Trend

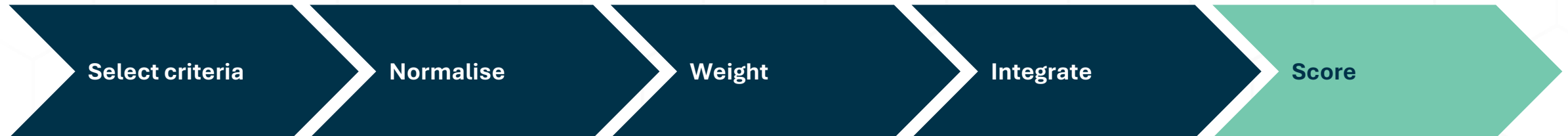


SAVI %
Change
(derived
from
Seasonal
Sen's
Slope)

Habitat Disturbance Rating

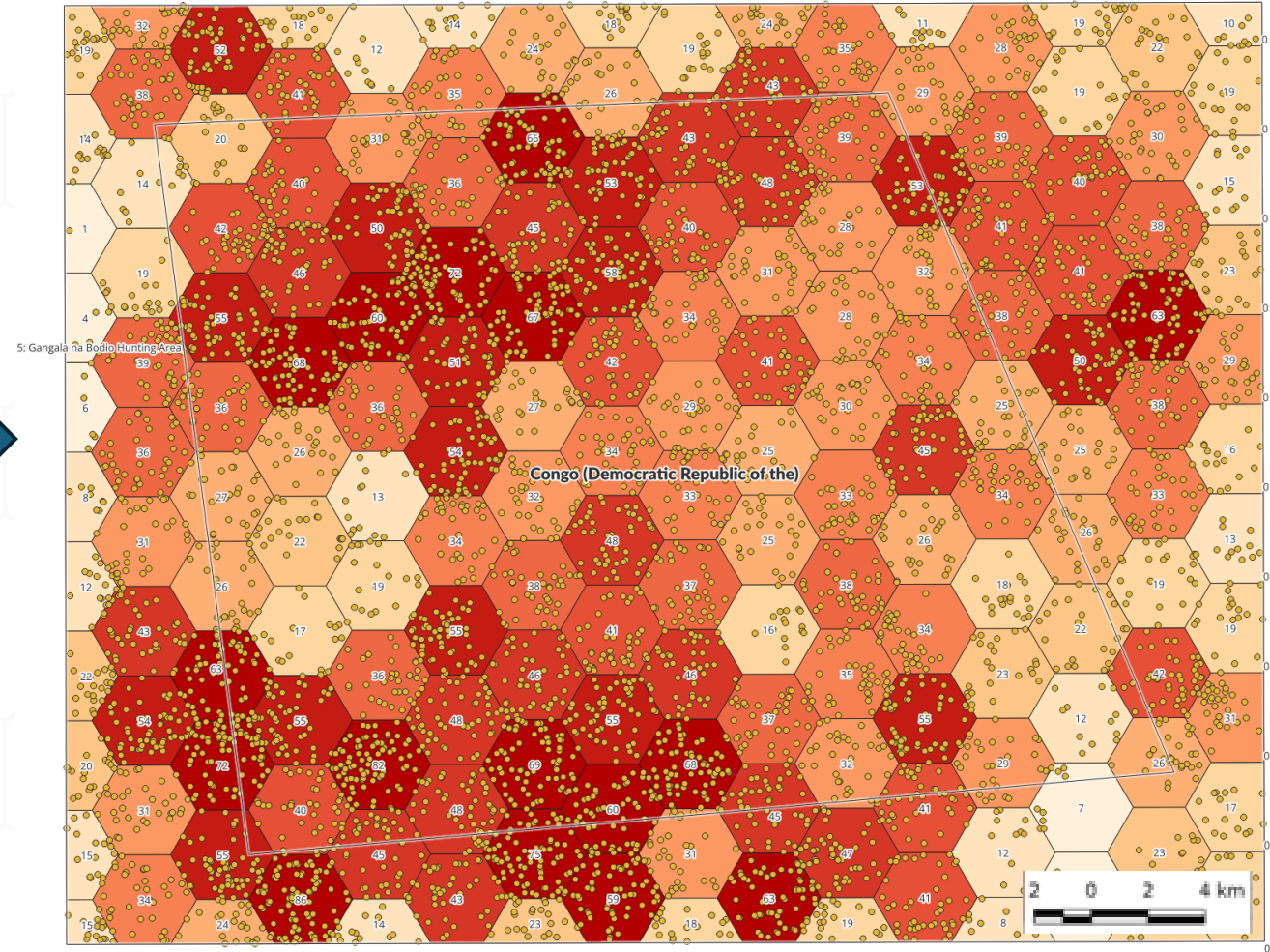
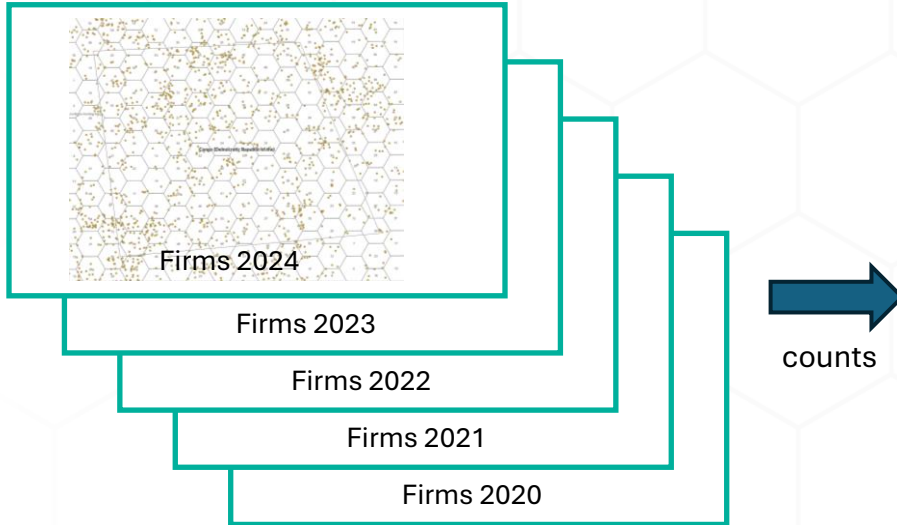
- A structured decision-support method that combines several spatial data layers into a single composite score, used to rank and prioritise areas.
- Each criterion is placed on a common scale, weighted by importance, then combined

Disturbance Score calculation



Habitat Disturbance Rating

Aggregation of fire occurrence:



Submerged aquatic vegetation and coral reef habitat extent, frequency, and connectivity

Extent

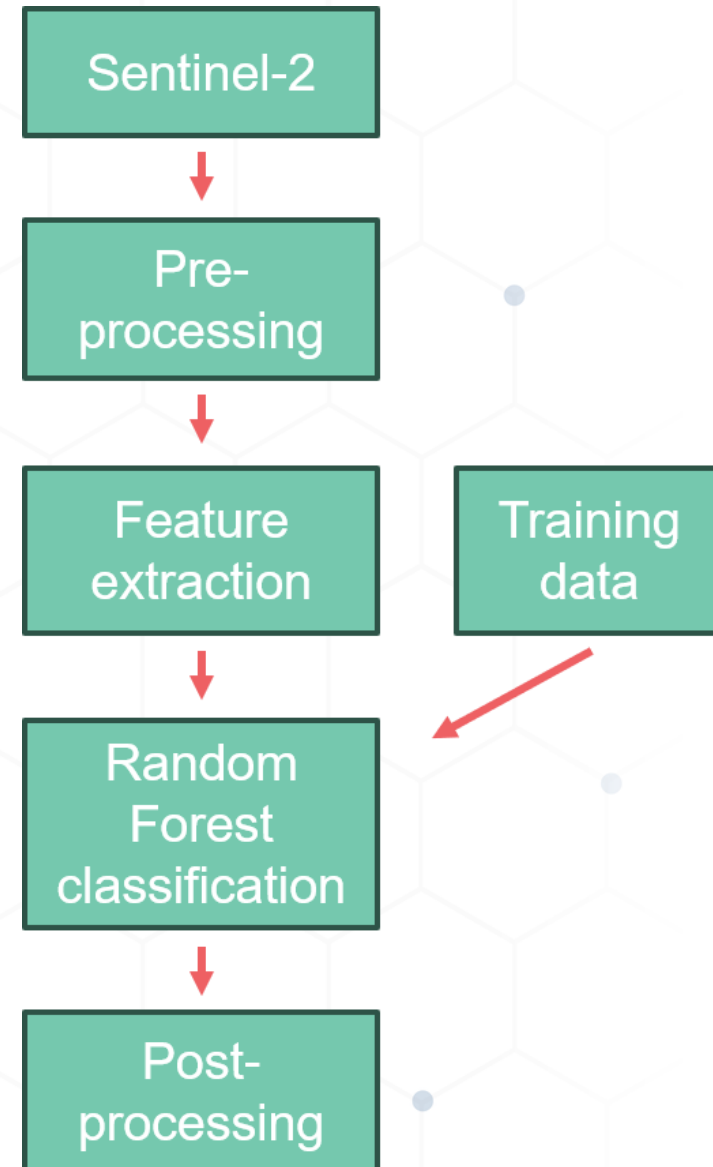
- Map submerged aquatic vegetation and coral reefs, based on Random Forests classifier
- Highly efficient workflow, able to run classification on large areas.
- Results include classification probabilities, both for coral and SAV

Frequency

- Aggregation of results over several years

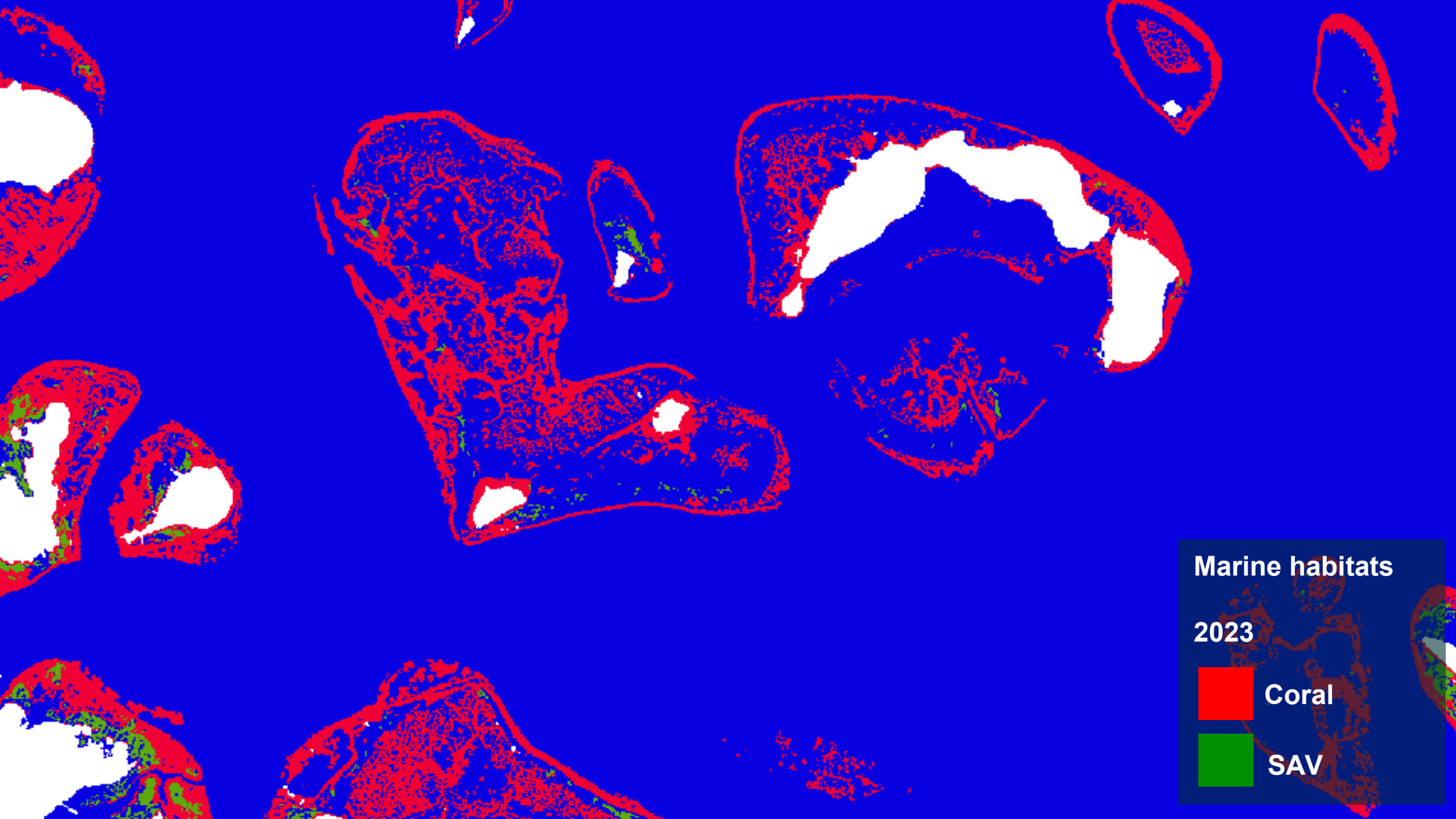
Connectivity

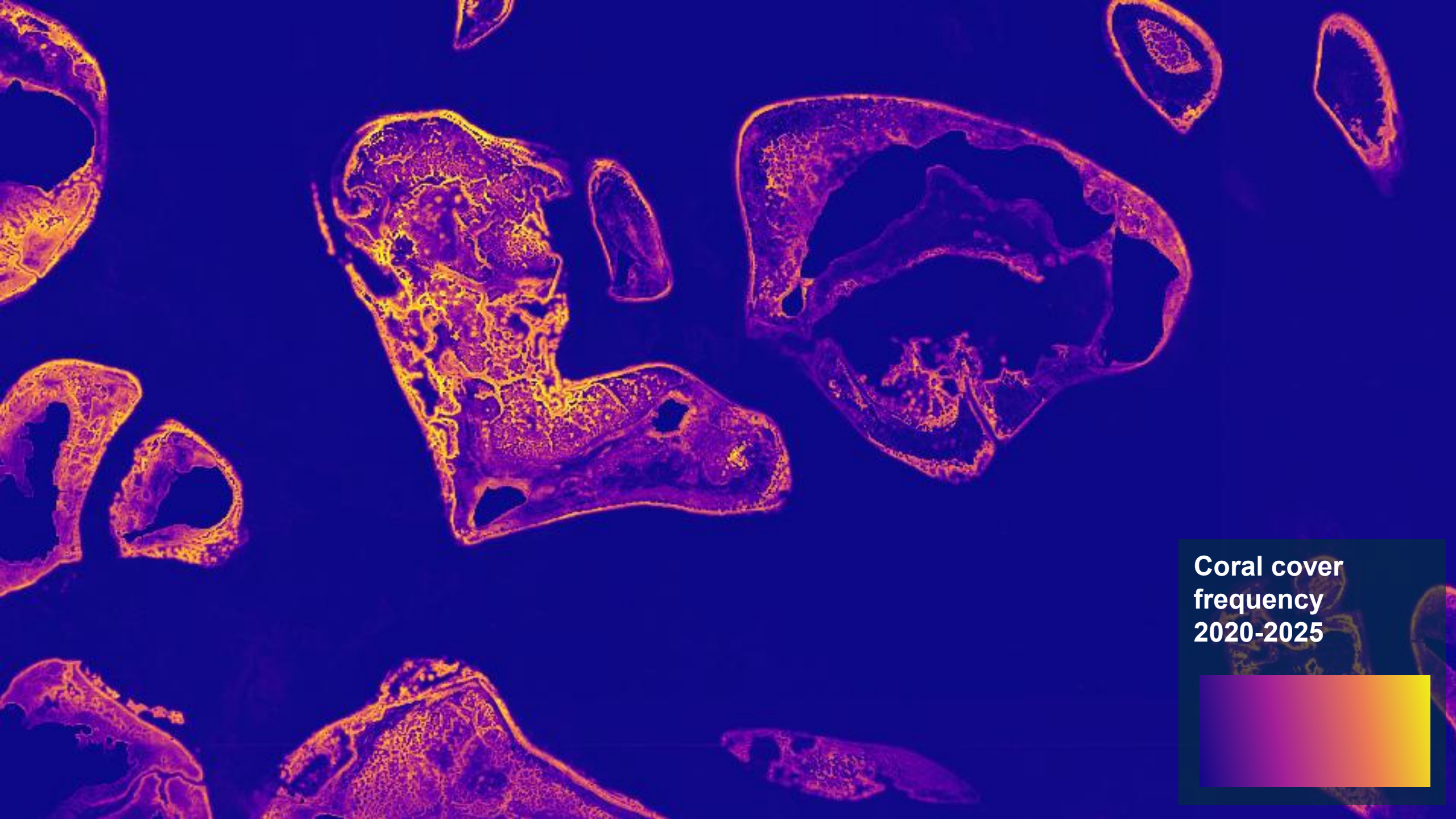
- Buffer analysis to find connected patches within a user-defined threshold
- Area calculation on individual and connected patches





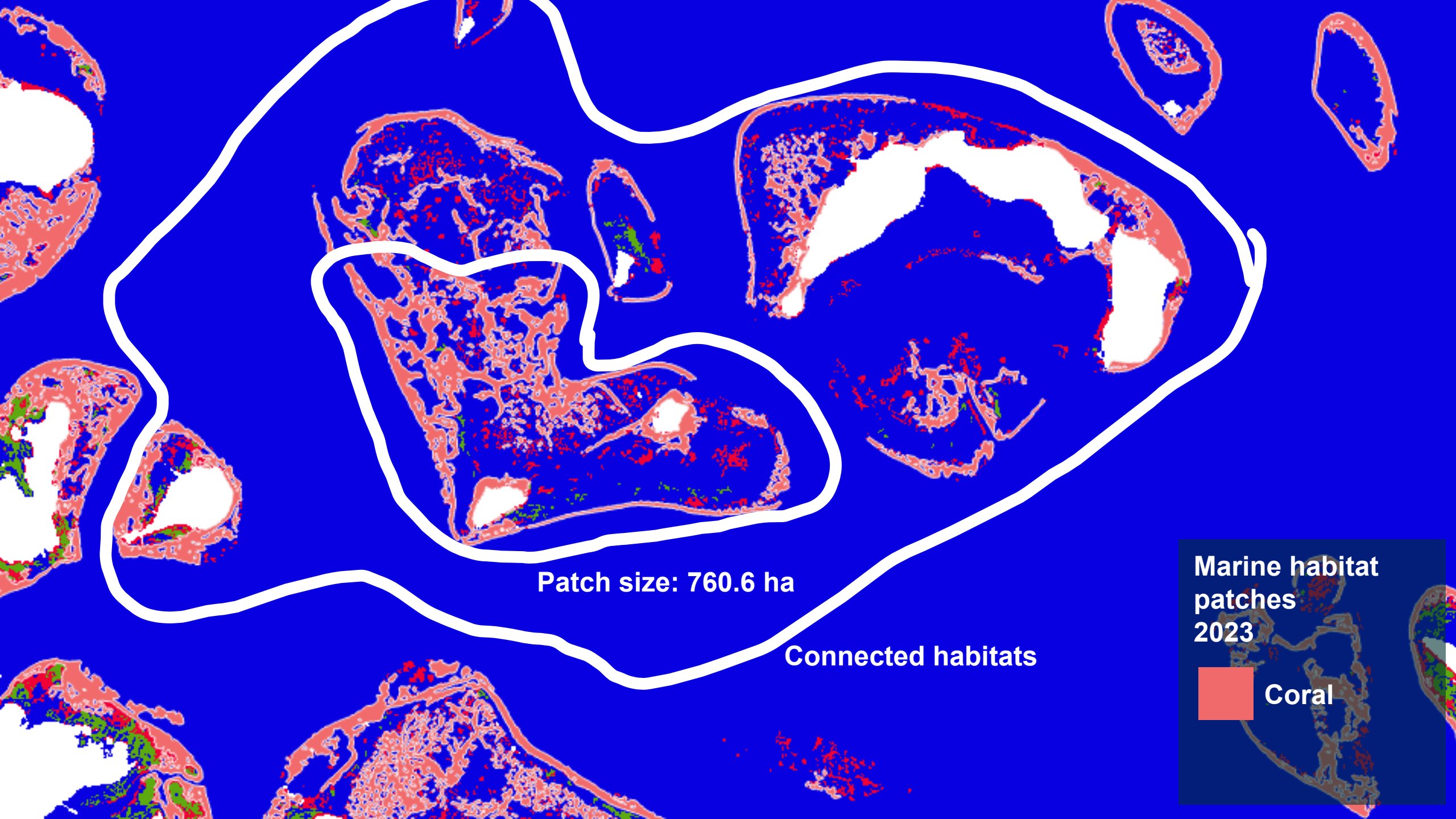
Google Earth





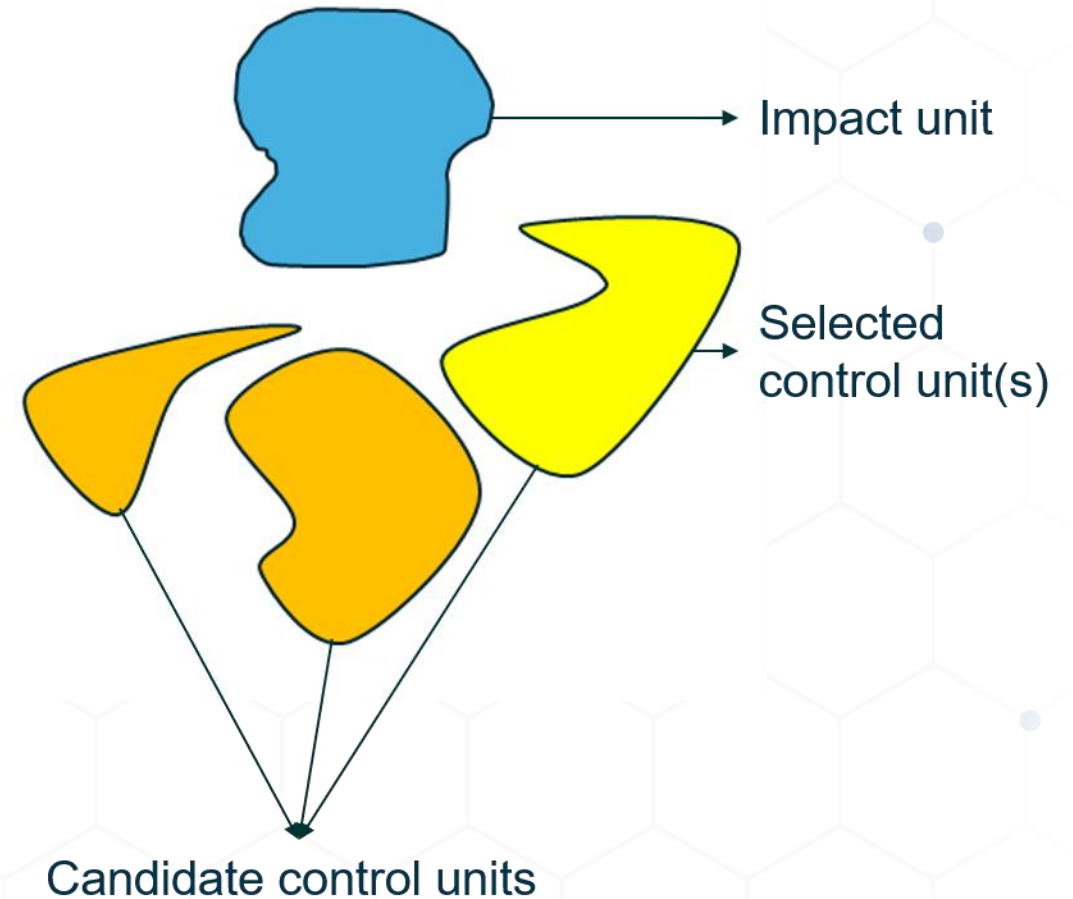
**Coral cover
frequency
2020-2025**



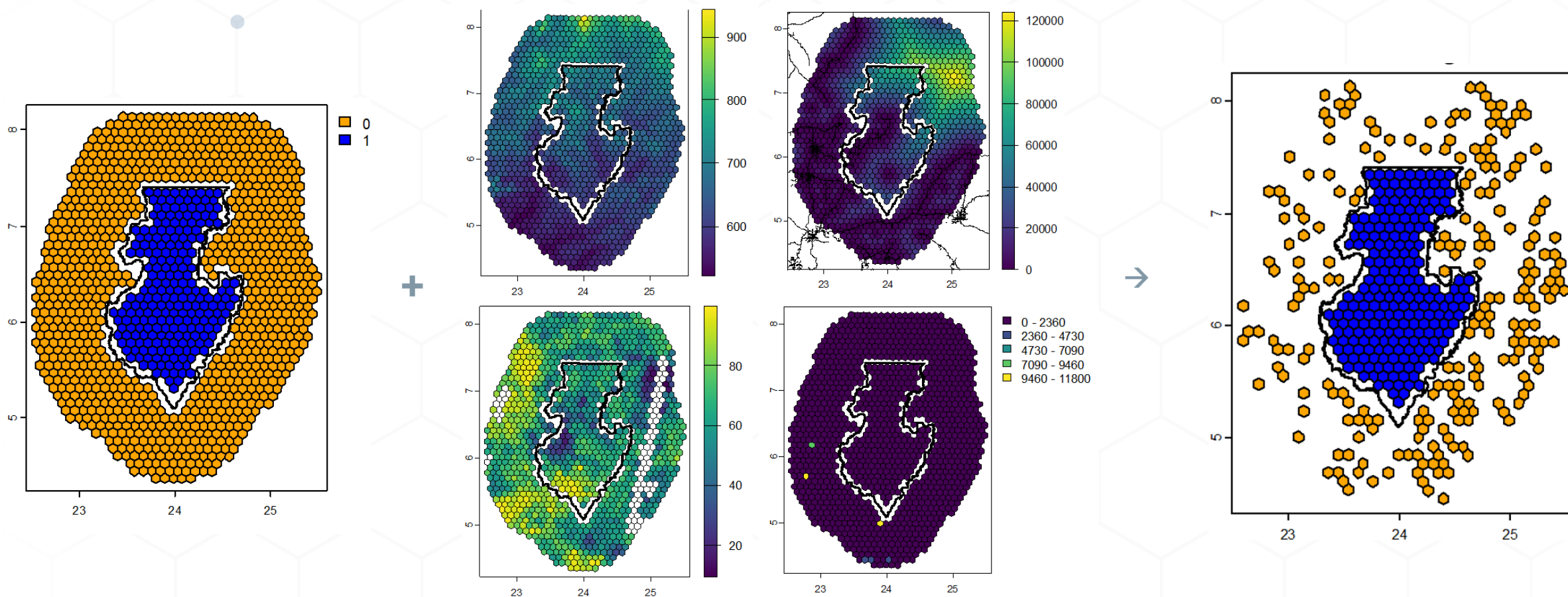


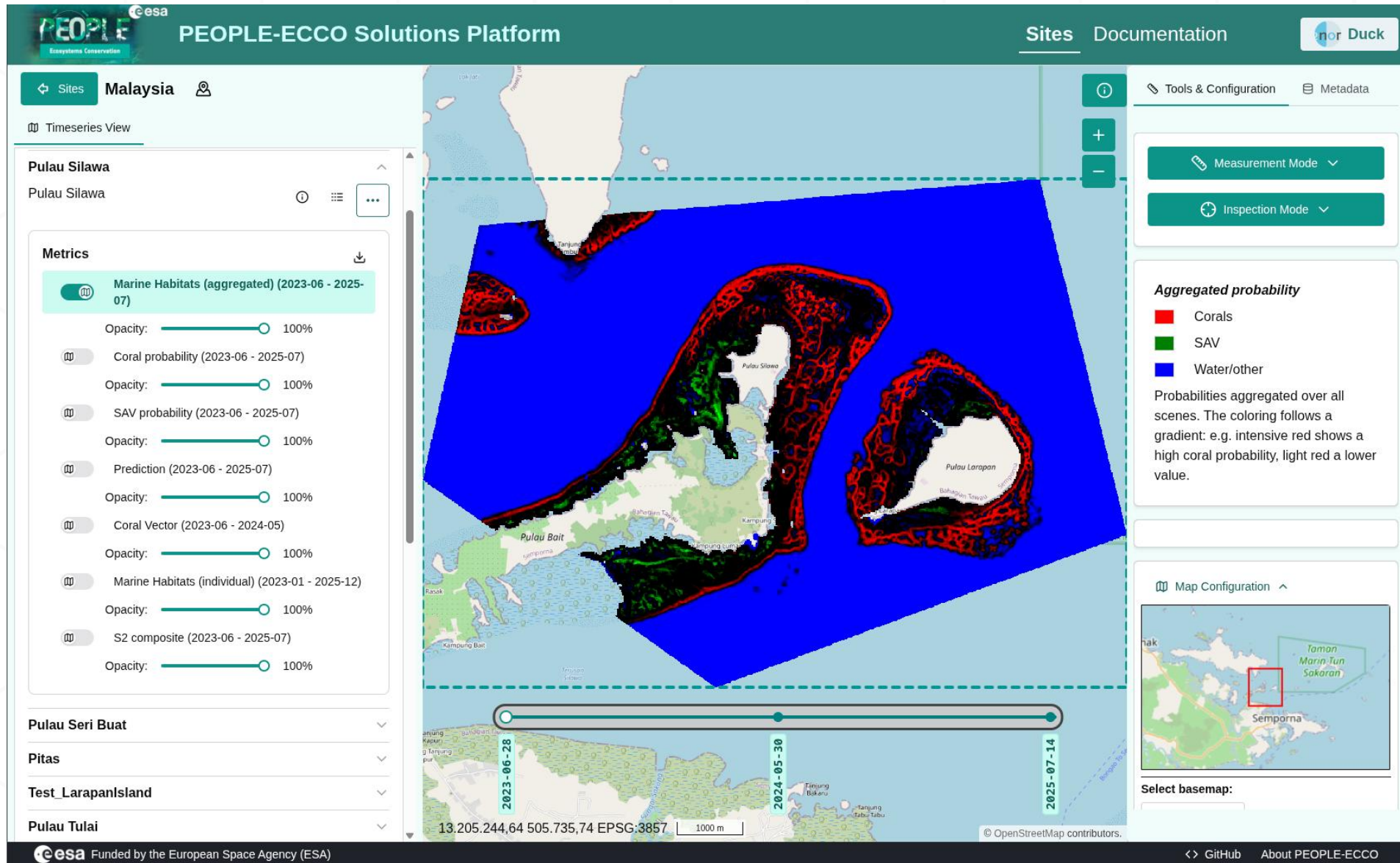
Before-After-Control-Impact assessment

- From monitoring to assessment of conservation effectiveness
- Counterfactual analysis: "What would have happened if conservation action had not occurred?"
- Select control units as similar as possible to units under conservation
- Similarity defined based on key characteristics: matching covariates



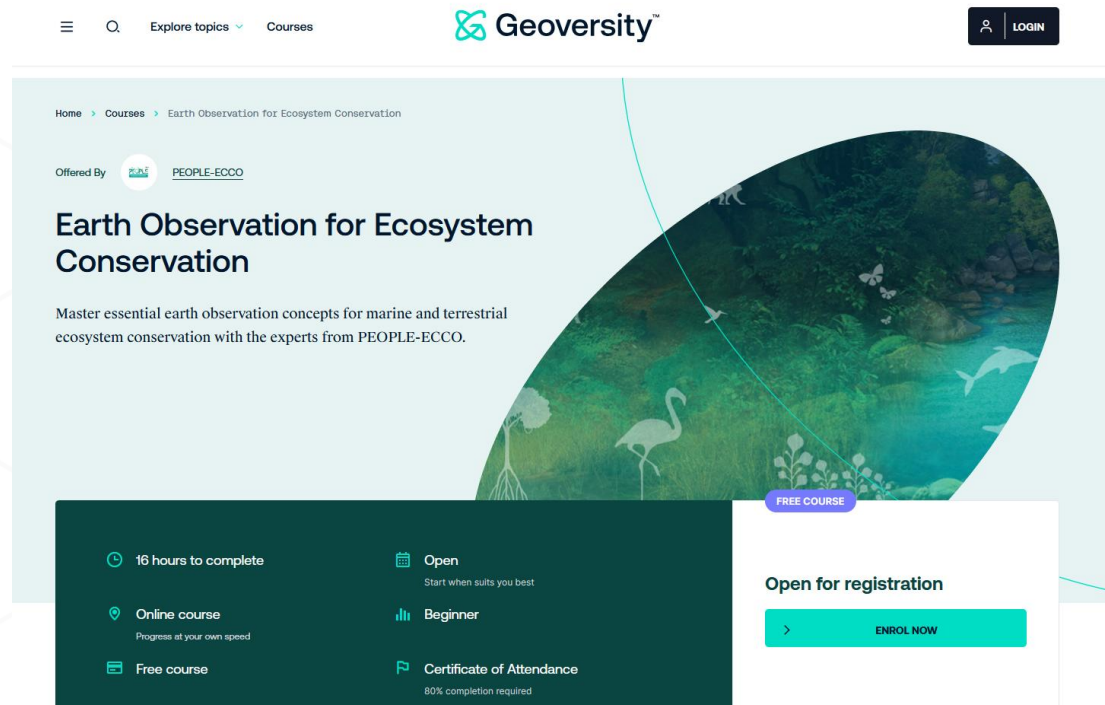
Before-After-Control-Impact assessment





Capacity Development

- Free online courses “Earth Observation for Ecosystem Conservation”: part I now open, subscribe to notifications for part II (soon to come)
- In-person workshops with Early Adopters
- Online webinars: to be announced – end September



www.geoversity.io



Acknowledgements

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More info: Visit us at www.people-ecco.eu

PEOPLE-ECCO Early Adopters

African Parks, Bulgarian Society for Protection of Birds, Lebanon Reforestation Initiative, Prince Edward Watershed Alliance, Reef Check Malaysia



PEOPLE-ECCO Advisory Board

Grace Nangendo (WCS Uganda), Petteri Vihervaara (SYKE), Amanda Fronzi (WWF Italy), Randall Jimenez (IUCN)



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THANK YOU!

Questions?

j.vandoninck@utwente.nl

