Co-funded by the
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of the European Union

Development of Regional Joint Master Program in Maritime Environmental Protection and Management
- MEP&M -

GIS applied to coastal and maritime environmental protection and management

WP3. Capacity Building through staff training and equipment purchase .
DEV 3.4.4 KNOW-HOW TRANSFER TO TEACHING STAFF RELATED TO THE MEP&M

Alfredo Fernández Enríquez, Regional Geographic Analysis (University of Cádiz)

12th of July 2022

This project has been funded with support from the European Commission. This presentation reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project no. 619239-EPP-1-2020-1-ME-EPPKA2-CBHE-JP

GIS

An integrated GIS approach for site selection of floating offshore wind...

Renewable and Sustainable Energy Reviews, Volume 134

This study presents a novel method for the selection of sites for floating wind farms based on marine spatial optimization.

IH-MSP Platform

Instituto de hidráulica ambiental - Universidad de Cantabria

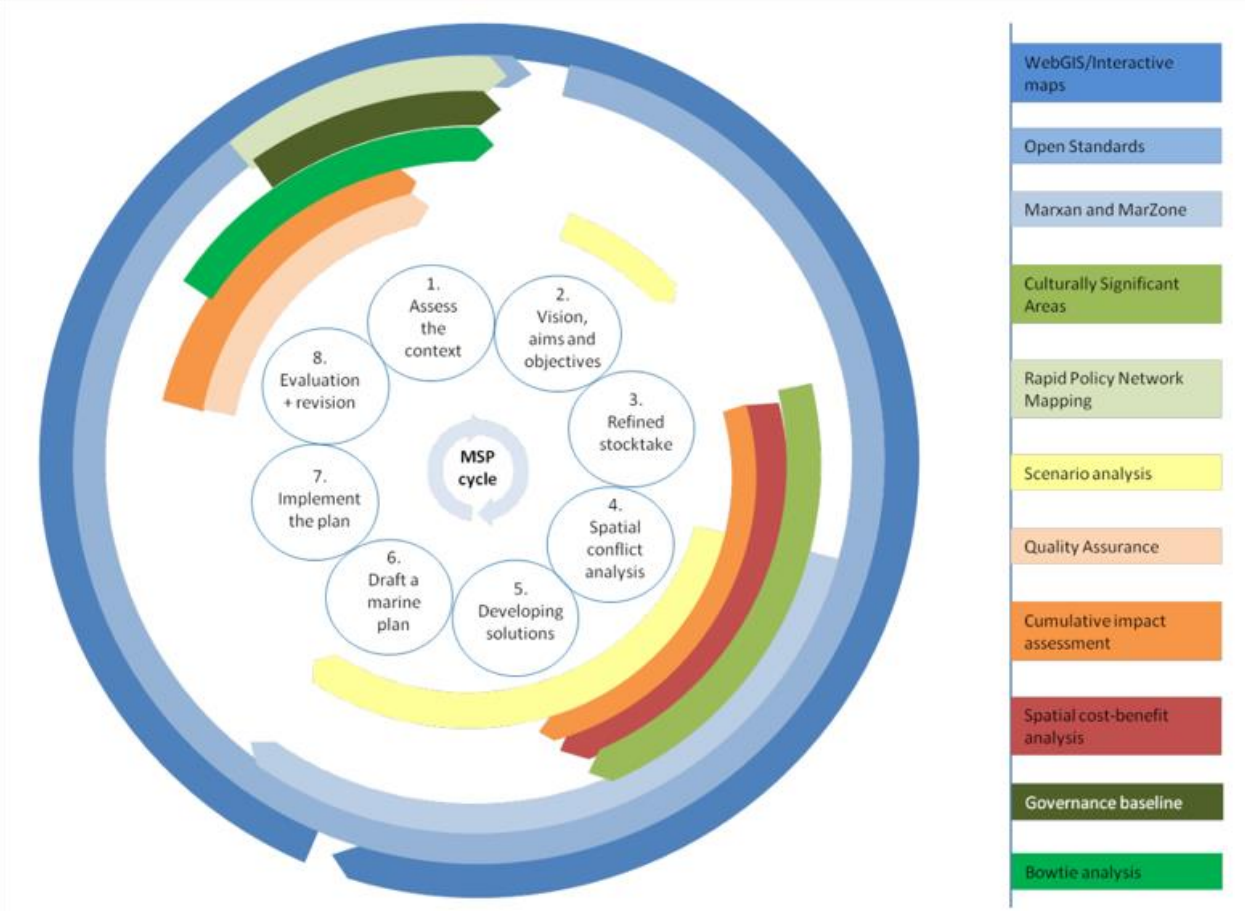
The IH-MSP Platform is the GIS platform which facilitates the implementation of maritime spatial planning in Spain. It focuses on the spatial potentials of off-shore aquaculture and wind energy.

European MSP Platform

European Commission

Co-funded by the Erasmus+ Programme of the European Union

A catalog of approaches and tools for MSP



Related GIS utilities

- **Web Map services (WMS)**
- **Web Features service (WFS)**
- **Web Coverage services (WCS)**

Kannen et al., 2016[1]

GIS tools for MSP and management

- **Biophysical – Species**
    - **Focal species abundance**
    - **Seabird abundance**
    - **Focal species distribution**
    - **Population structure**
    - **Community composition**
    - **Genetic diversity**
- **Biophysical – habitats**
    - **Fish nursery areas**
    - **Suitable environmental conditions (habitats) for species**
    - **Distribution of three key phytobenthic species**
    - **Coastal lagoons and large shallow inlets & bays (1150 & 1160)**
    - **Habitat heterogeneity indicator**

Snickars & Pitkänen, 2007[2]

GIS tools for MSP and management

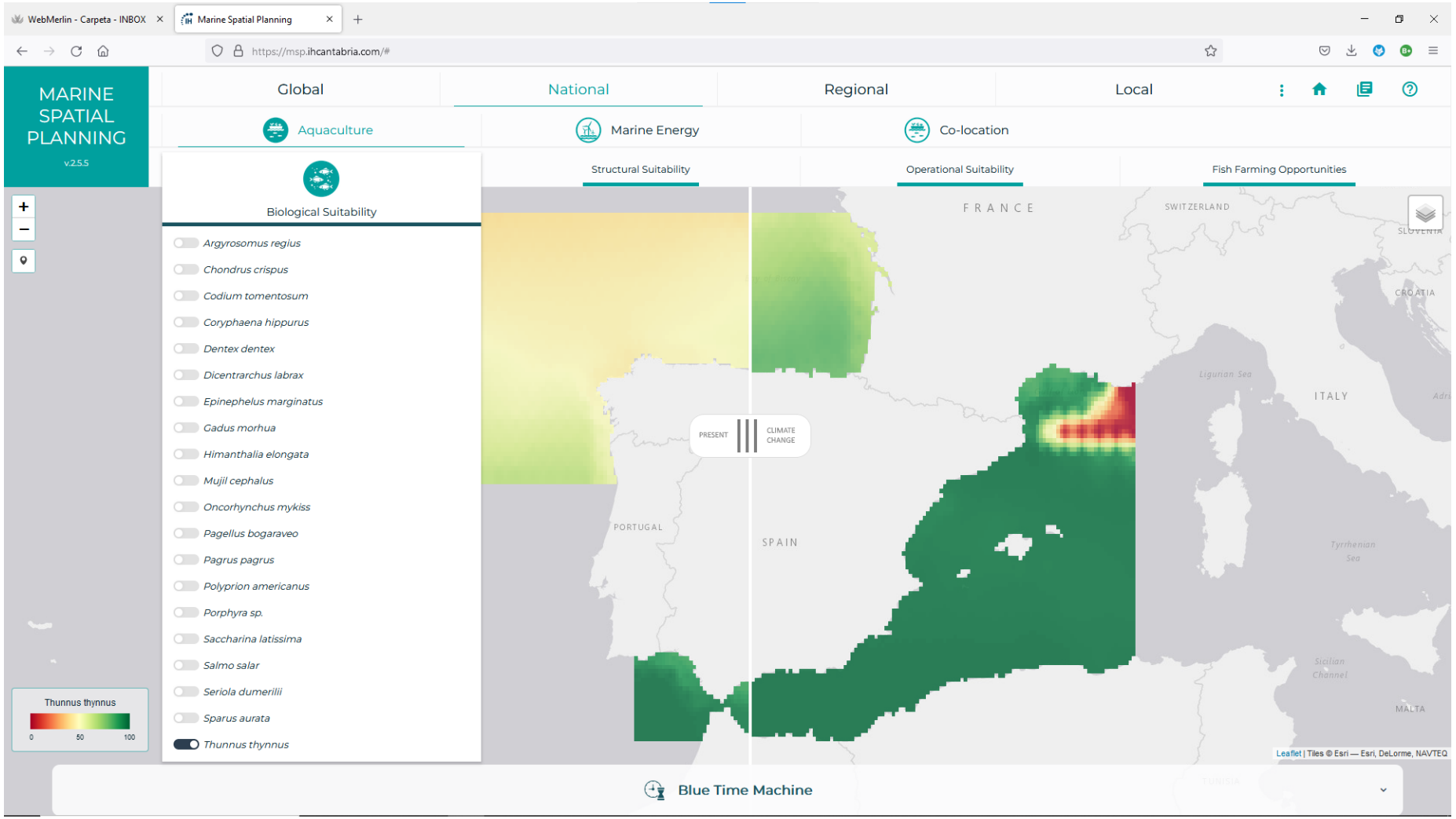
- **Geophysical**
  - **Interpolation of depth and elevation**
  - **Archipelago zonation**

- **Socio-economical – Pressure**
  - **Shoreline exploitation**
  - **Human influence on coastal lagoons and large shallow inlets and bays**
  - **Communication infrastructure**
  - **Effects of recreational boating and fishing on sensitive habitats**
  - **Marine noise disturbance from vessels**
  - **Potential dredging sites in shallow coastal areas**
  - **Shoreline erosion induced by navigational activities**

- **Socio-economical – Sate**
  - **Effects of marine management activities on fishing**
  - **Economic value of marine areas – exemplified for recreational activities**

- **Governance – Stakeholder interaction**
  - **The interaction between authorities and stakeholders**
  - **Compliance with management plans**

Focal species abundance

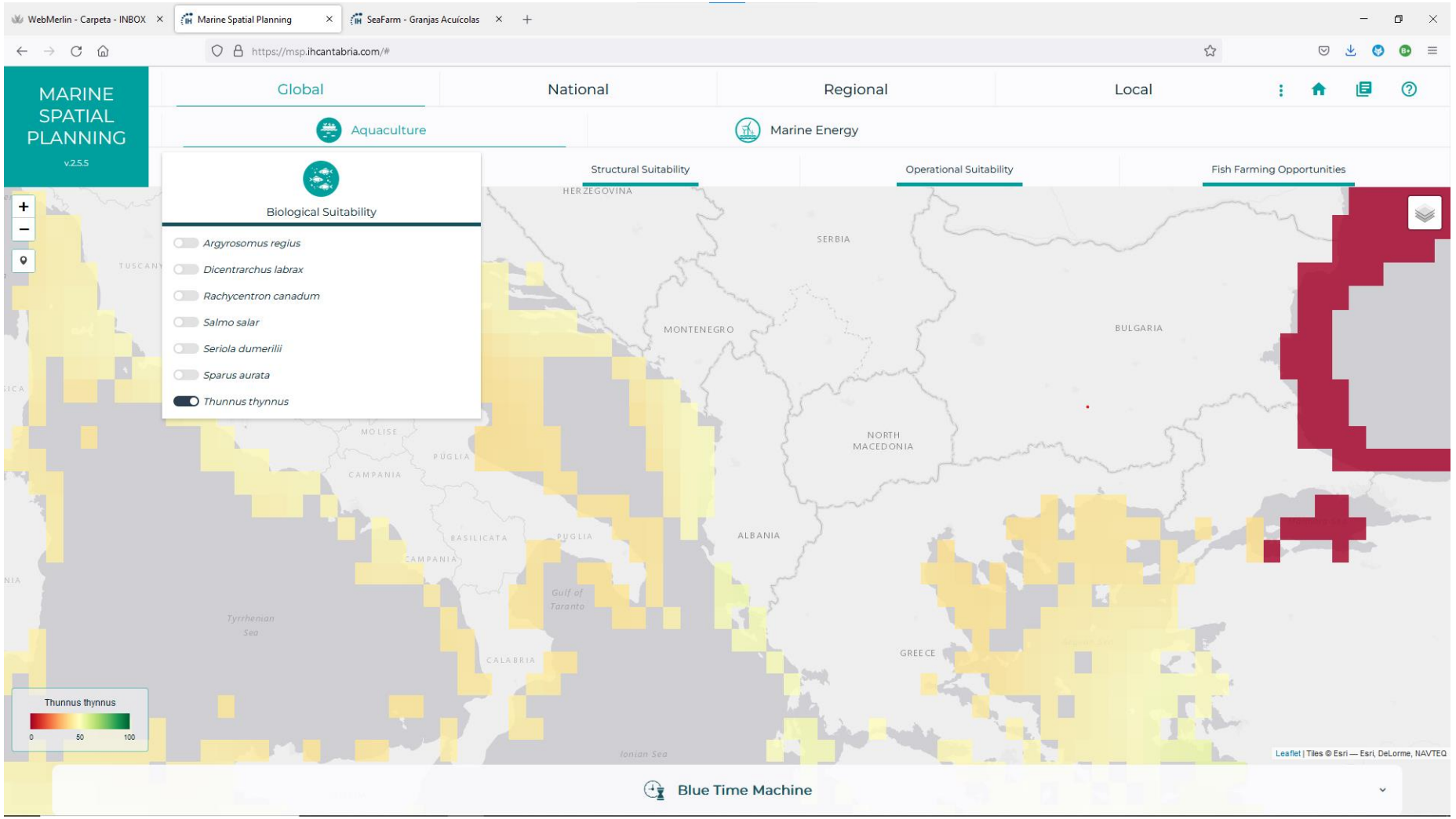


WMS

IH-MSP platform[3]

European MSP Platform
European Commission
Co-funded by the Erasmus+ Programme of the European Union

Focal species abundance

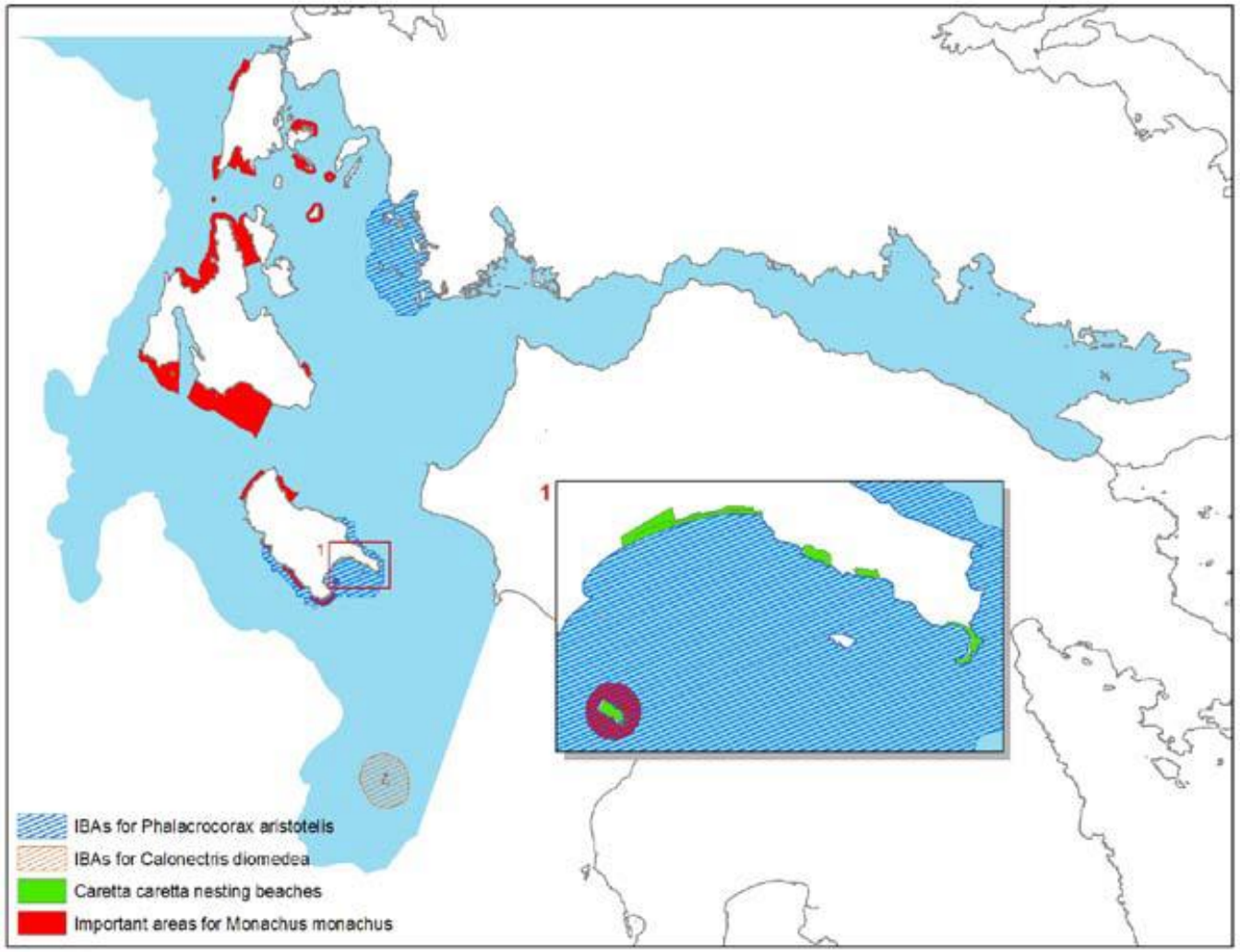


WMS

IH-MSP platform[3]

Co-funded by the Erasmus+ Programme of the European Union

Seabird abundance



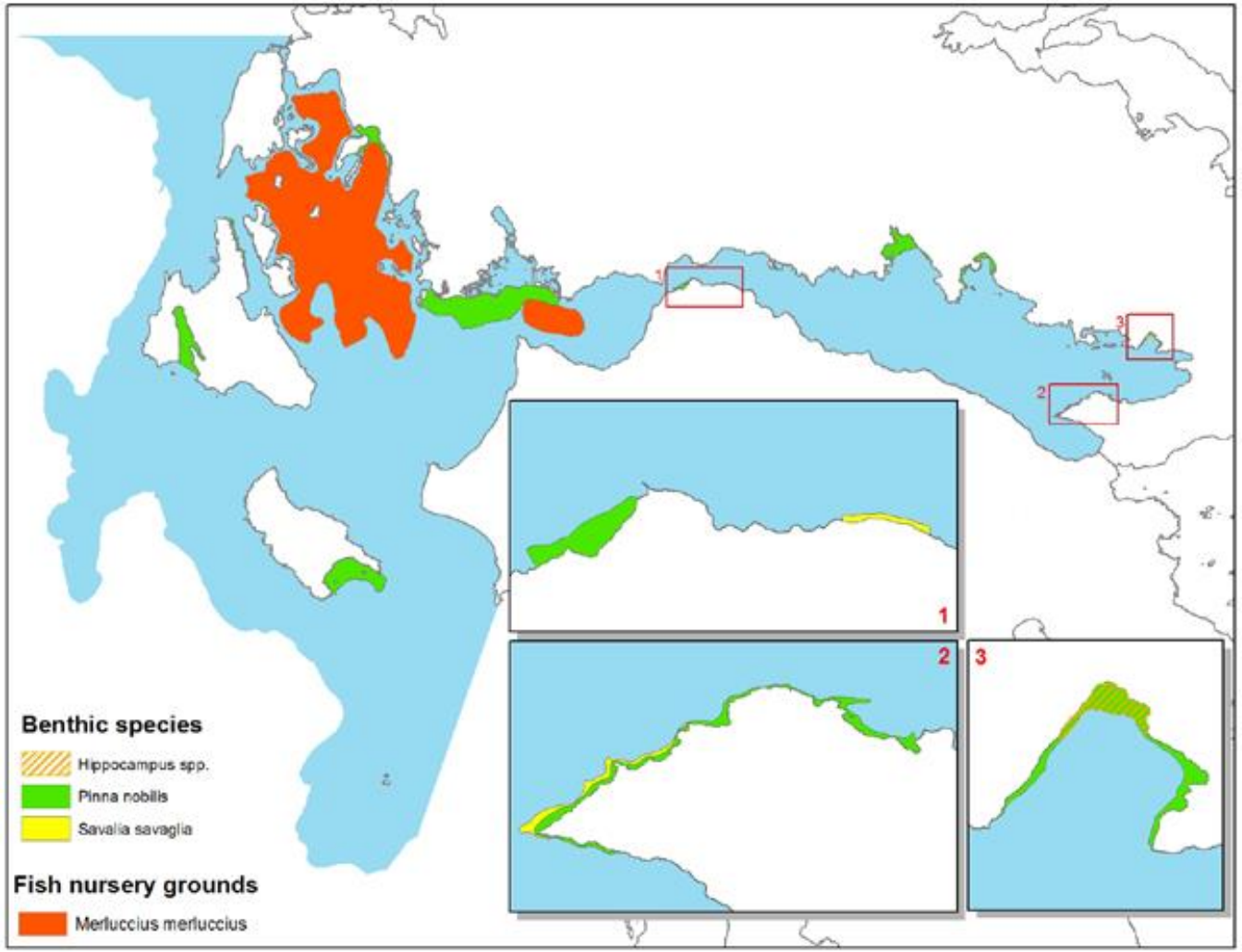
ESRI ArcGIS 9.3

- Geoprocessing tools

Issaris *et al.*, 2012[4]

Co-funded by the Erasmus+ Programme of the European Union

Focal species distribution



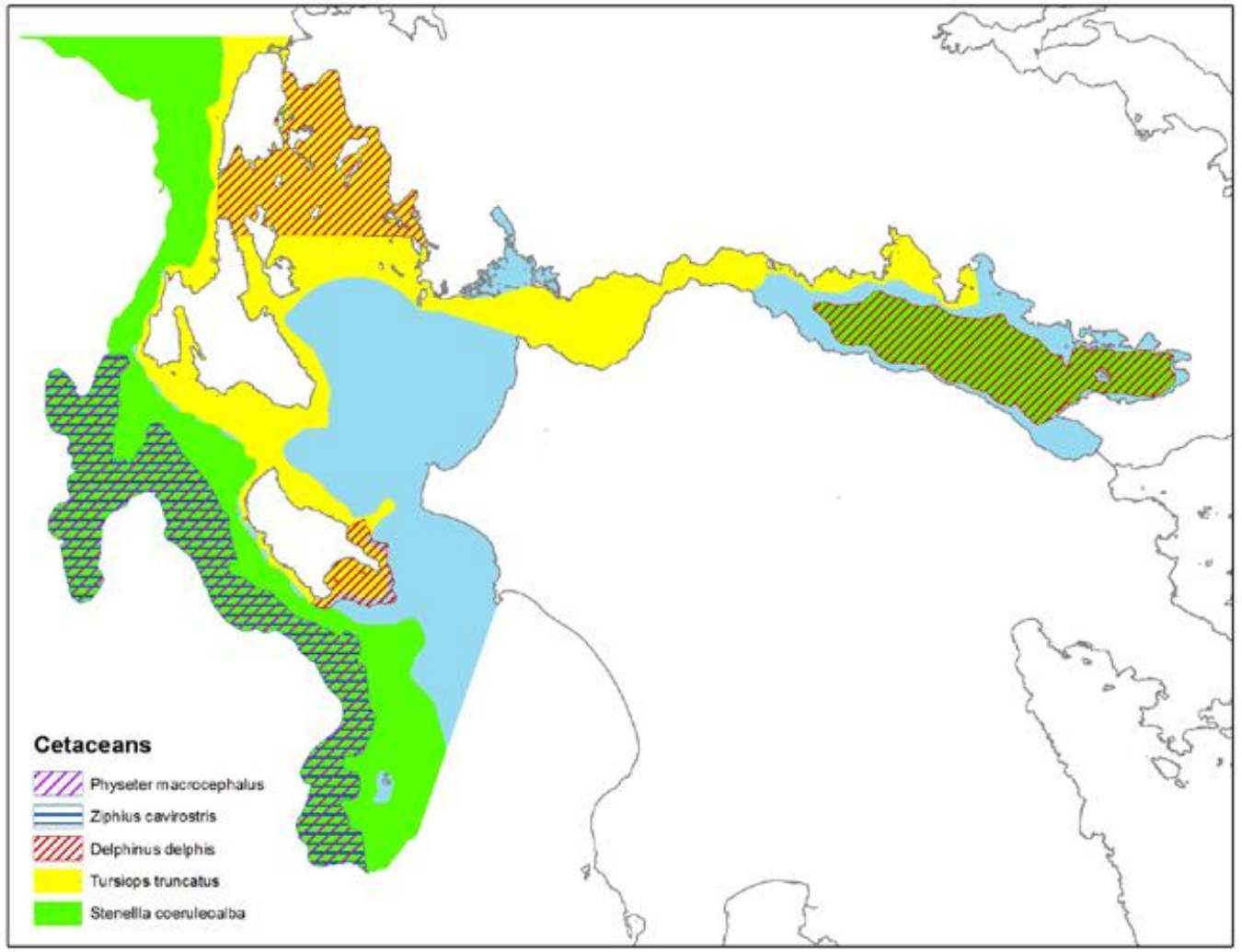
ESRI ArcGIS 9.3

- Geoprocessing tools

Issaris *et al.*, 2012[4]

Co-funded by the Erasmus+ Programme of the European Union

Focal species distribution



ESRI ArcGIS 9.3

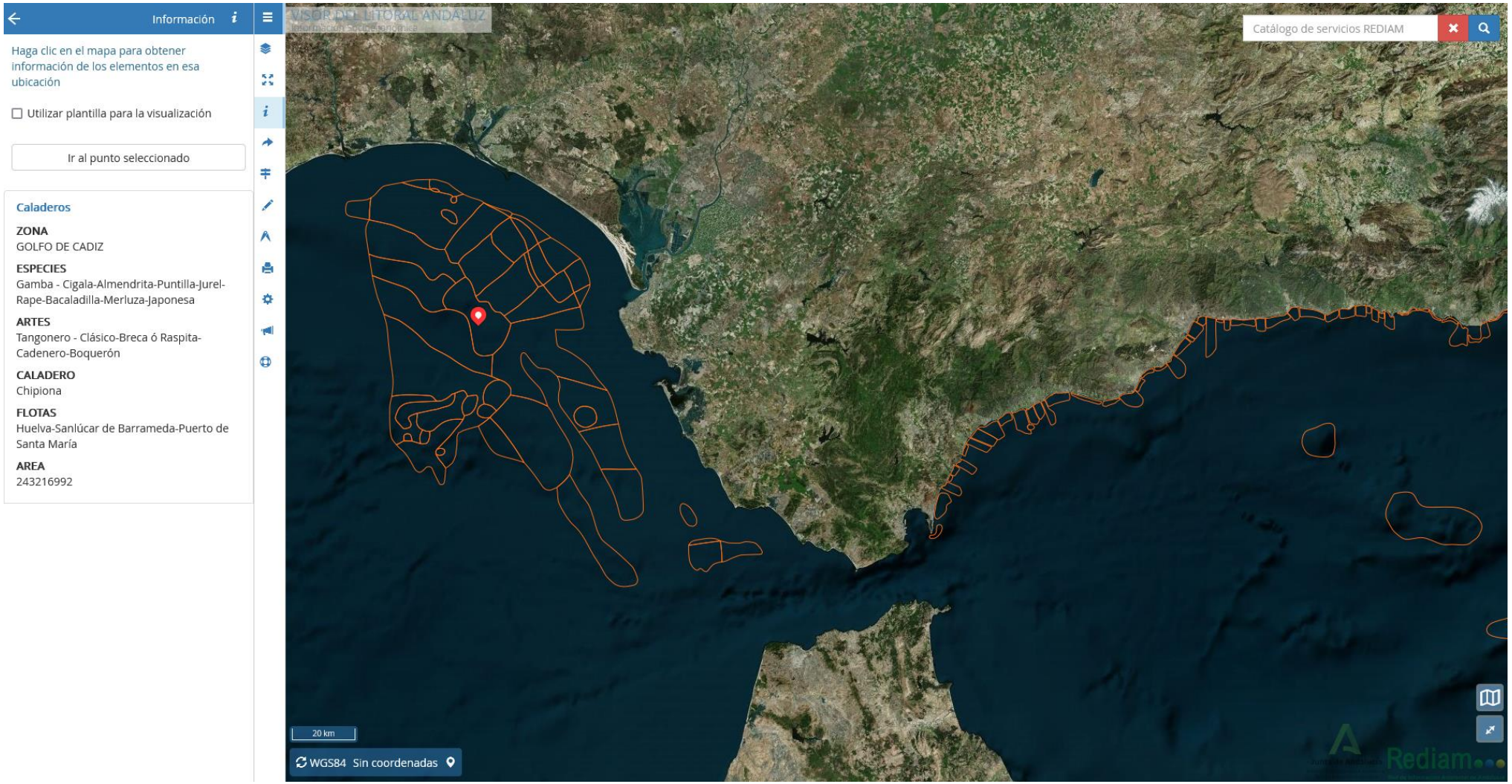
- Geoprocessing tools (Overlay)

Issaris *et al.*, 2012[4]

Rediam
Red de Información Ambiental de Andalucía

Co-funded by the
Erasmus+ Programme
of the European Union

Population structure, community composition and genetic diversity

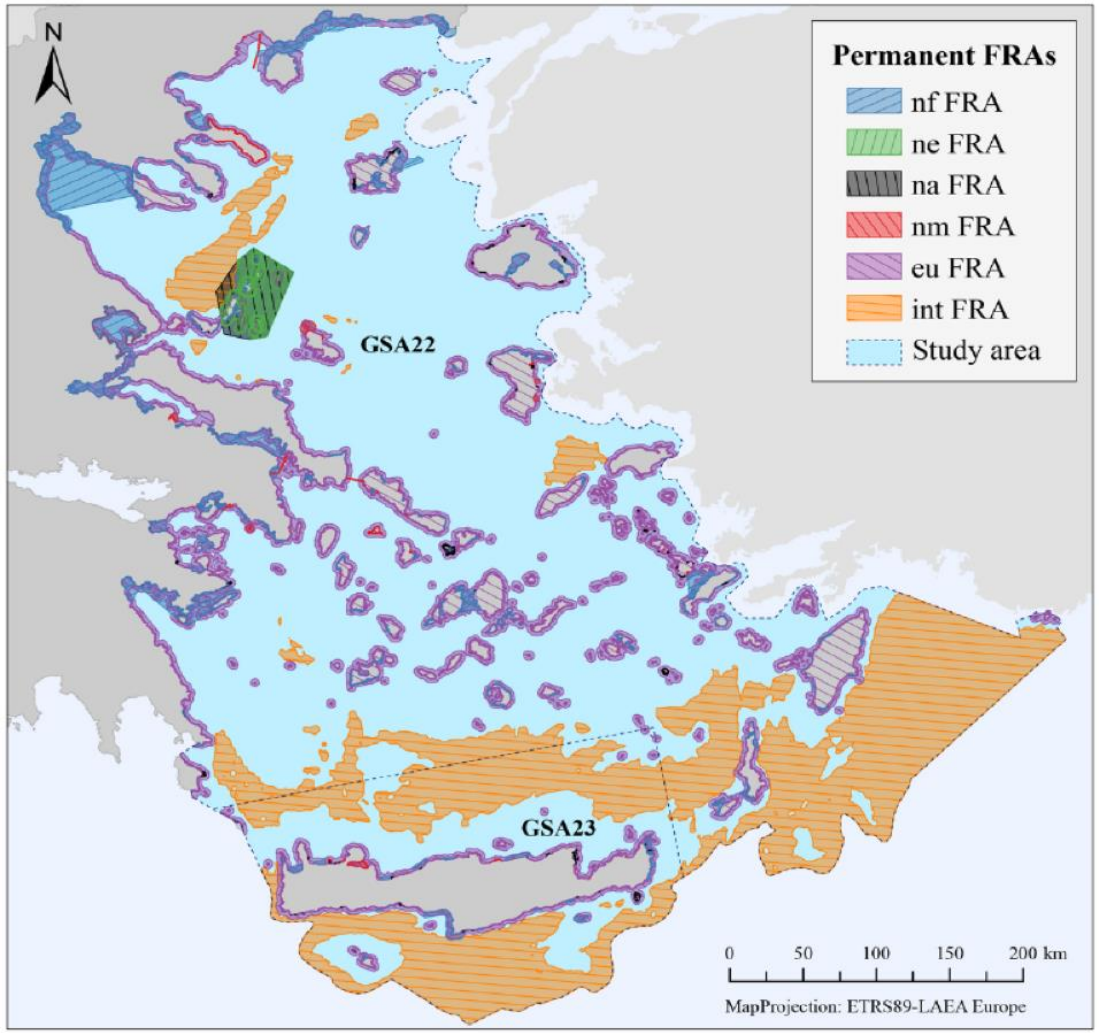


WMS

Rediam platform[5]

Co-funded by the Erasmus+ Programme of the European Union

Fish nursery areas

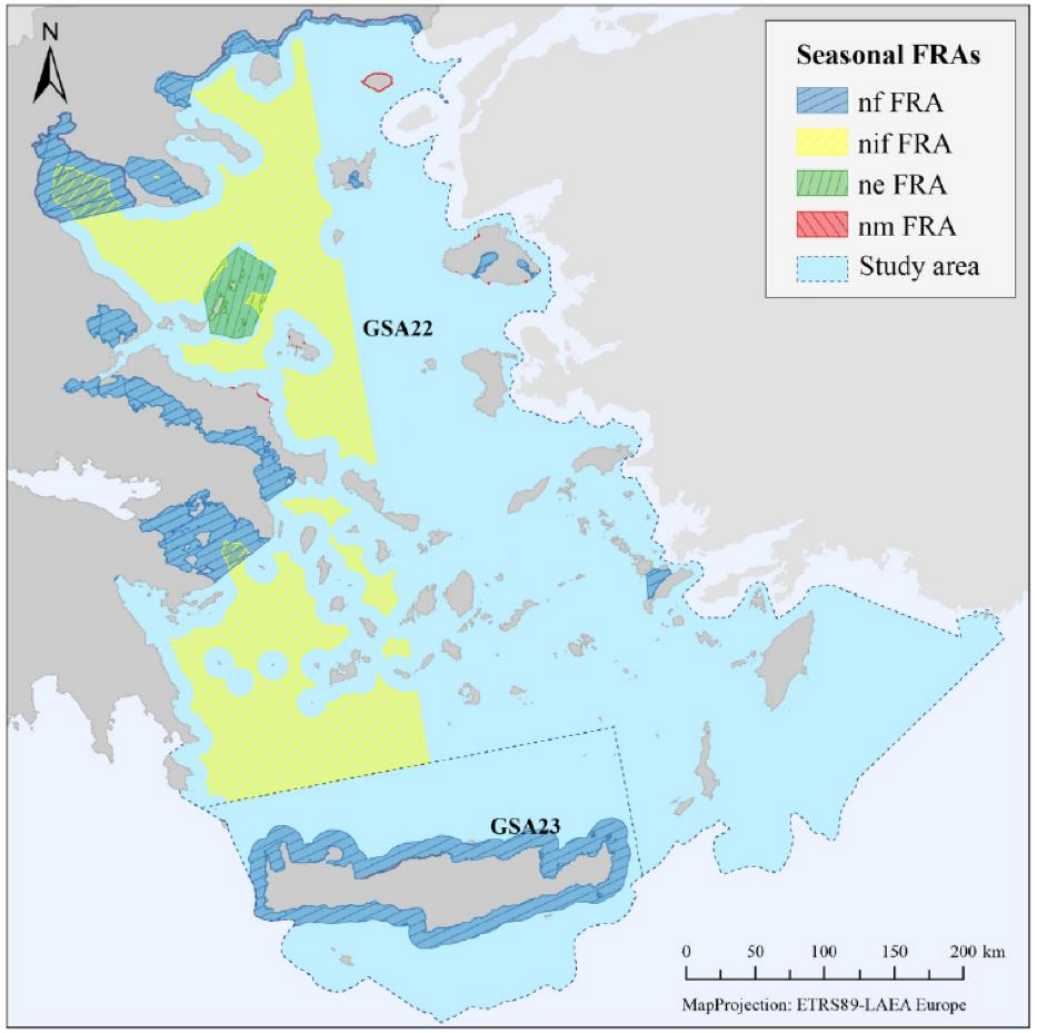


ESRI ArcGIS 10.1

- Digitizing
- Geoprocessing tools

Petza, D. et al., 2017[6]

Fish nursery areas



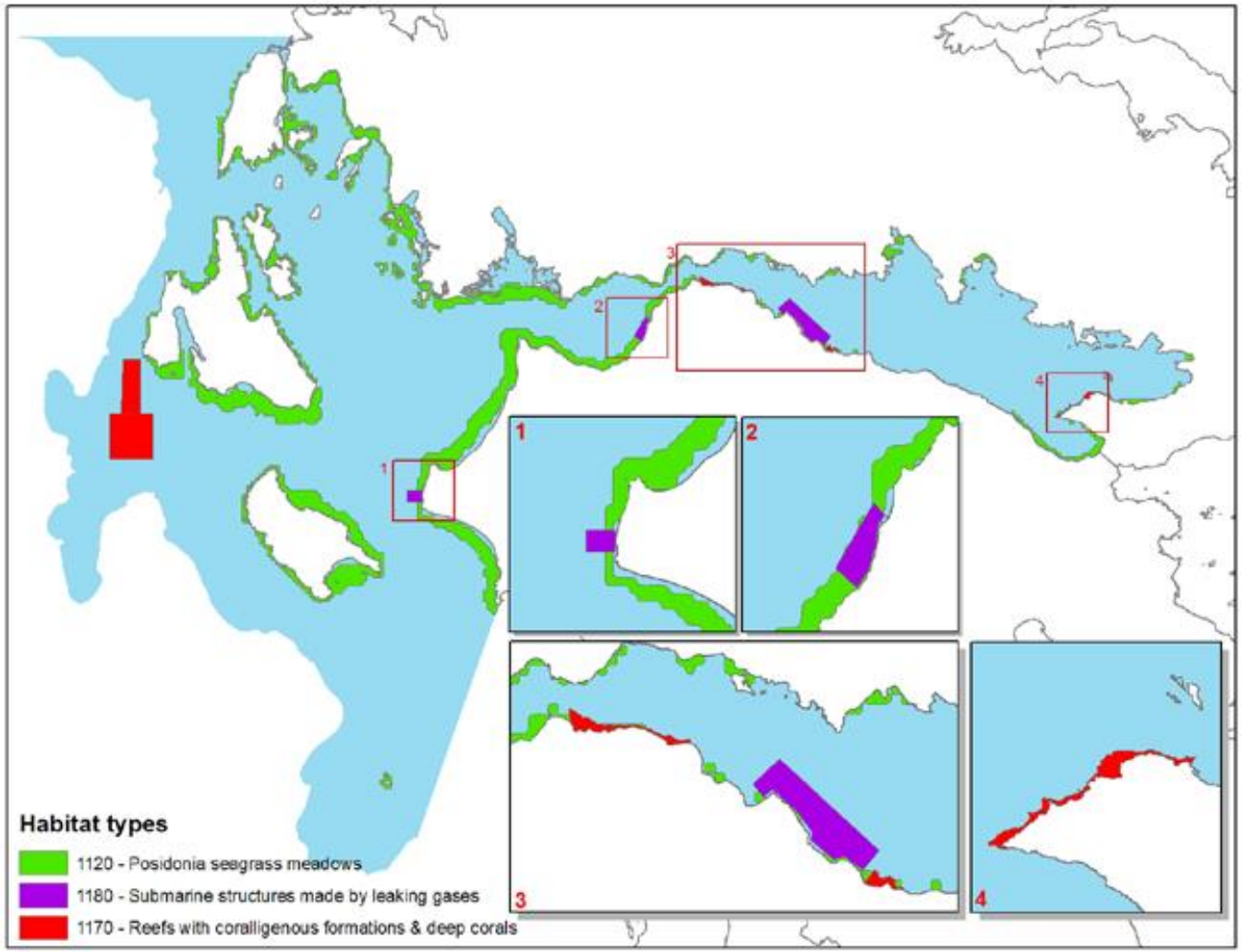
ESRI ArcGIS 10.1

- Digitizing
- Geoprocessing tools

Petza, D. et al., 2017[6]

Co-funded by the Erasmus+ Programme of the European Union

Suitable environmental conditions (habitats) for species



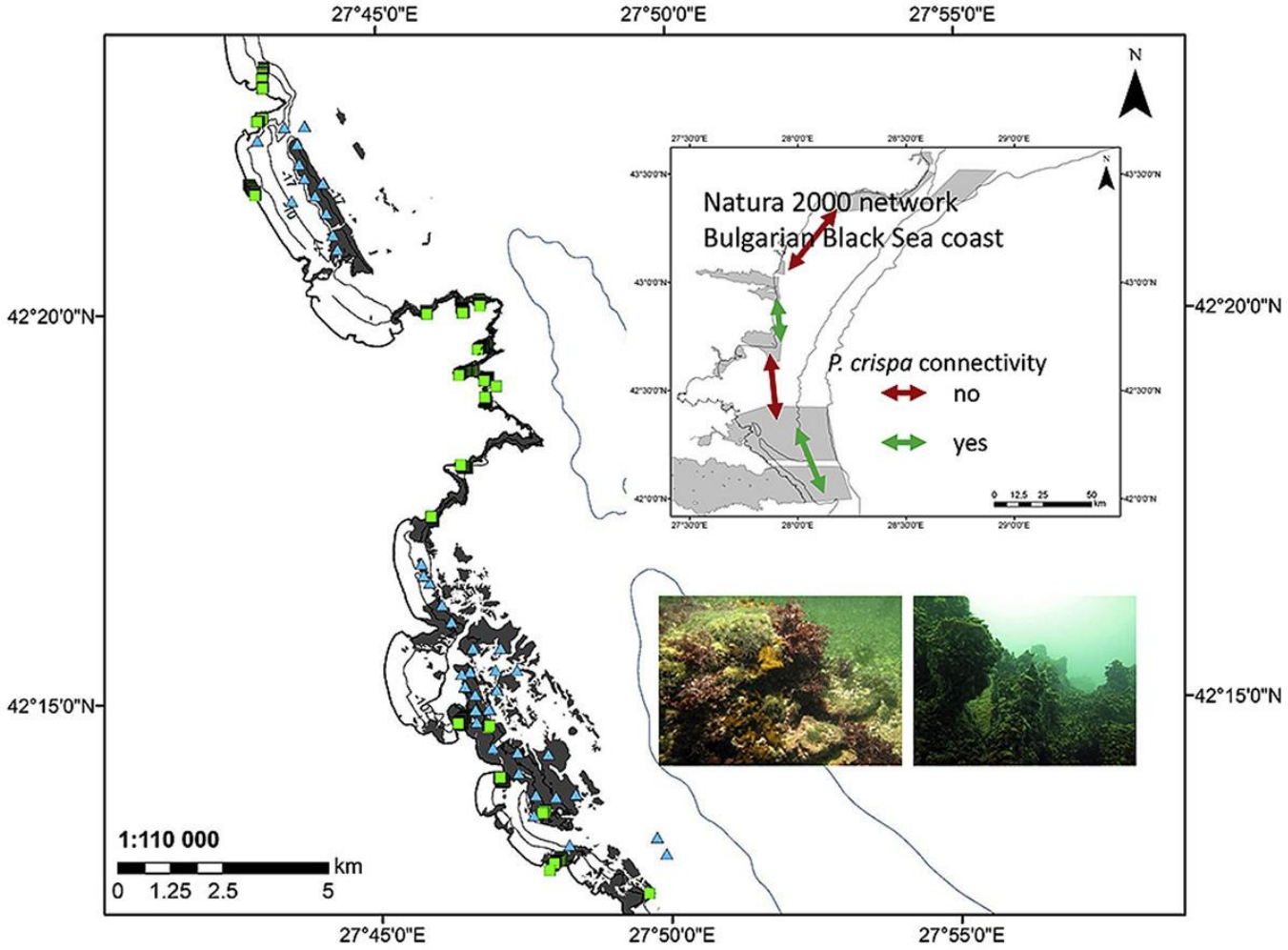
ESRI ArcGIS 9.3

- Geoprocessing tools (Overlay)

Issaris *et al.*, 2012[4]

Co-funded by the Erasmus+ Programme of the European Union

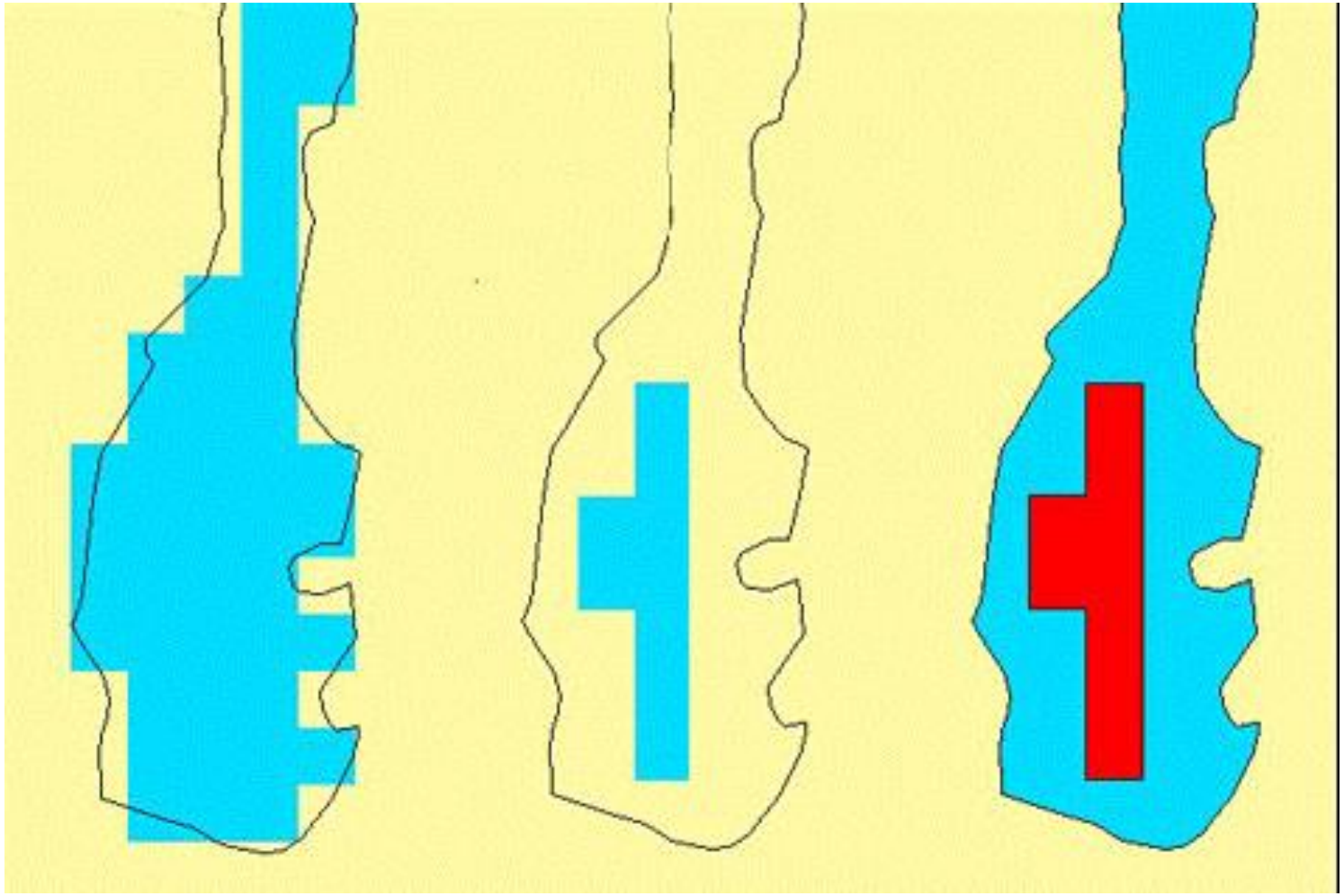
Distribution of key phytobenthic species



ESRI ArcGIS 10
Digitizing,
Spatial Analyst

Berov *et al*. 2018[7]

Coastal lagoons and large shallow inlets & bays

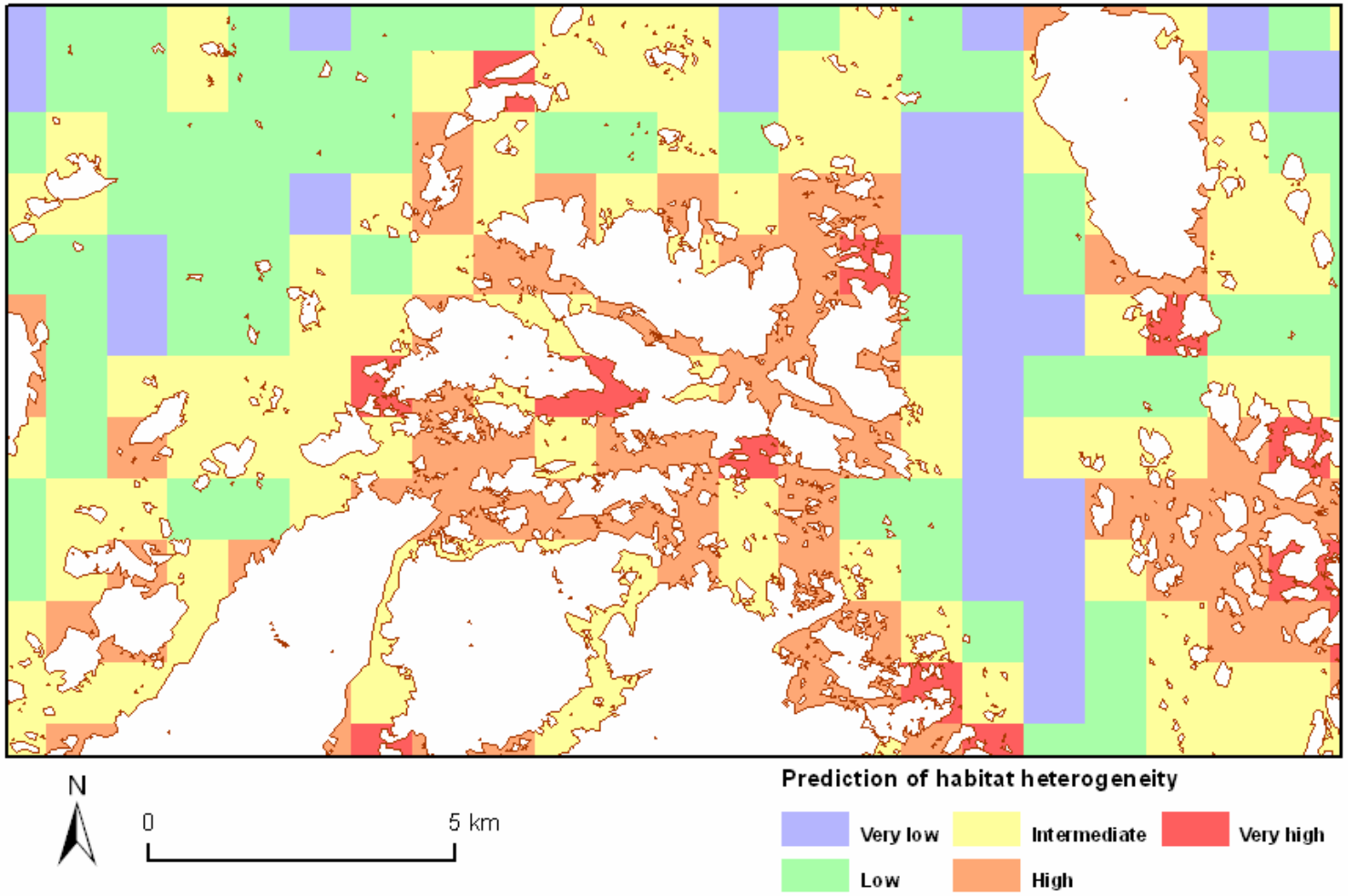


ArcView 3

- Rasterize
- Vectorize
- Reclassify
- Select (SQL)

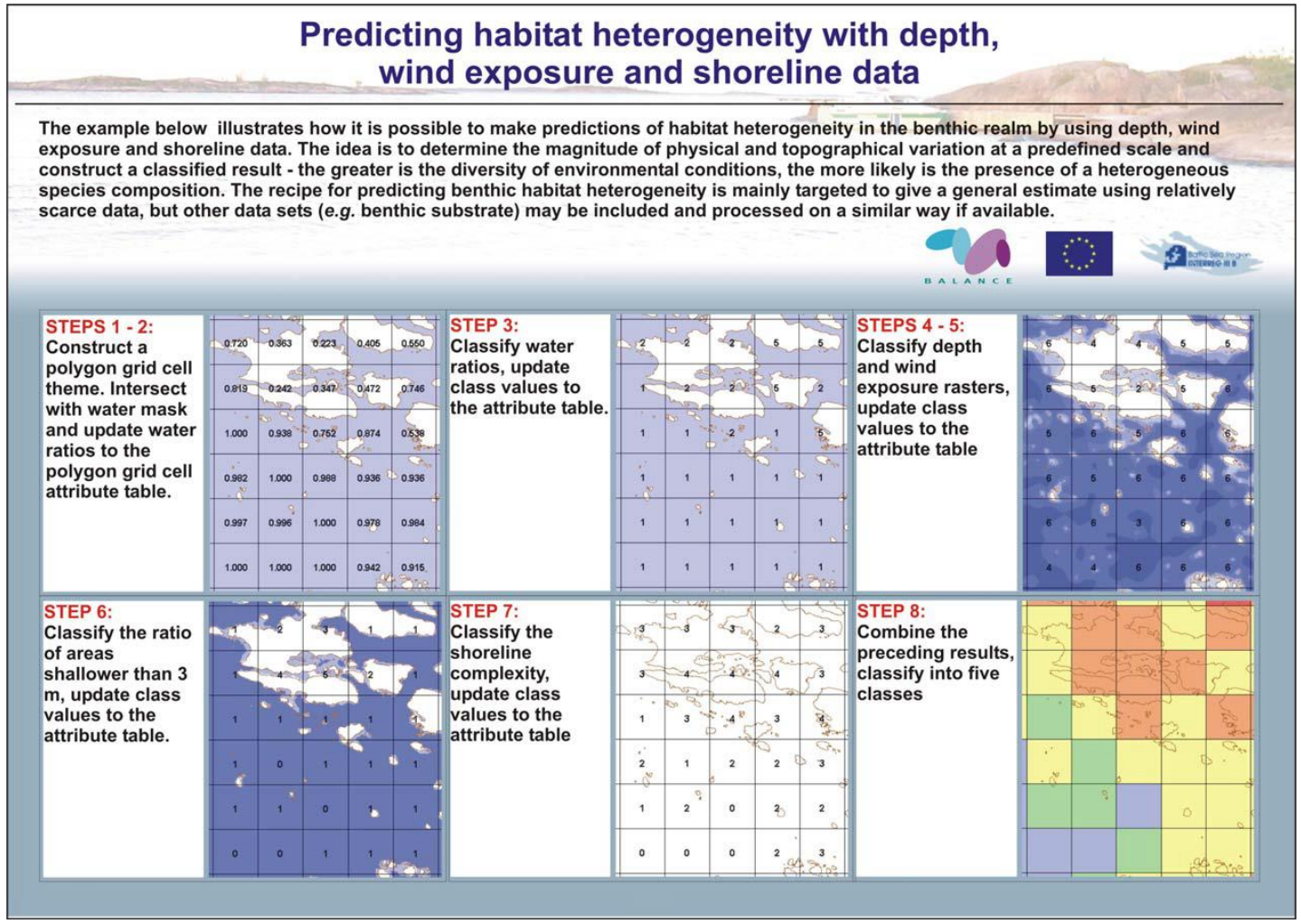
Snickars & Pitkänen, 2007[2]

Habitat heterogeneity indicator



Snickars & Pitkänen, 2007[2]

Habitat heterogeneity indicator

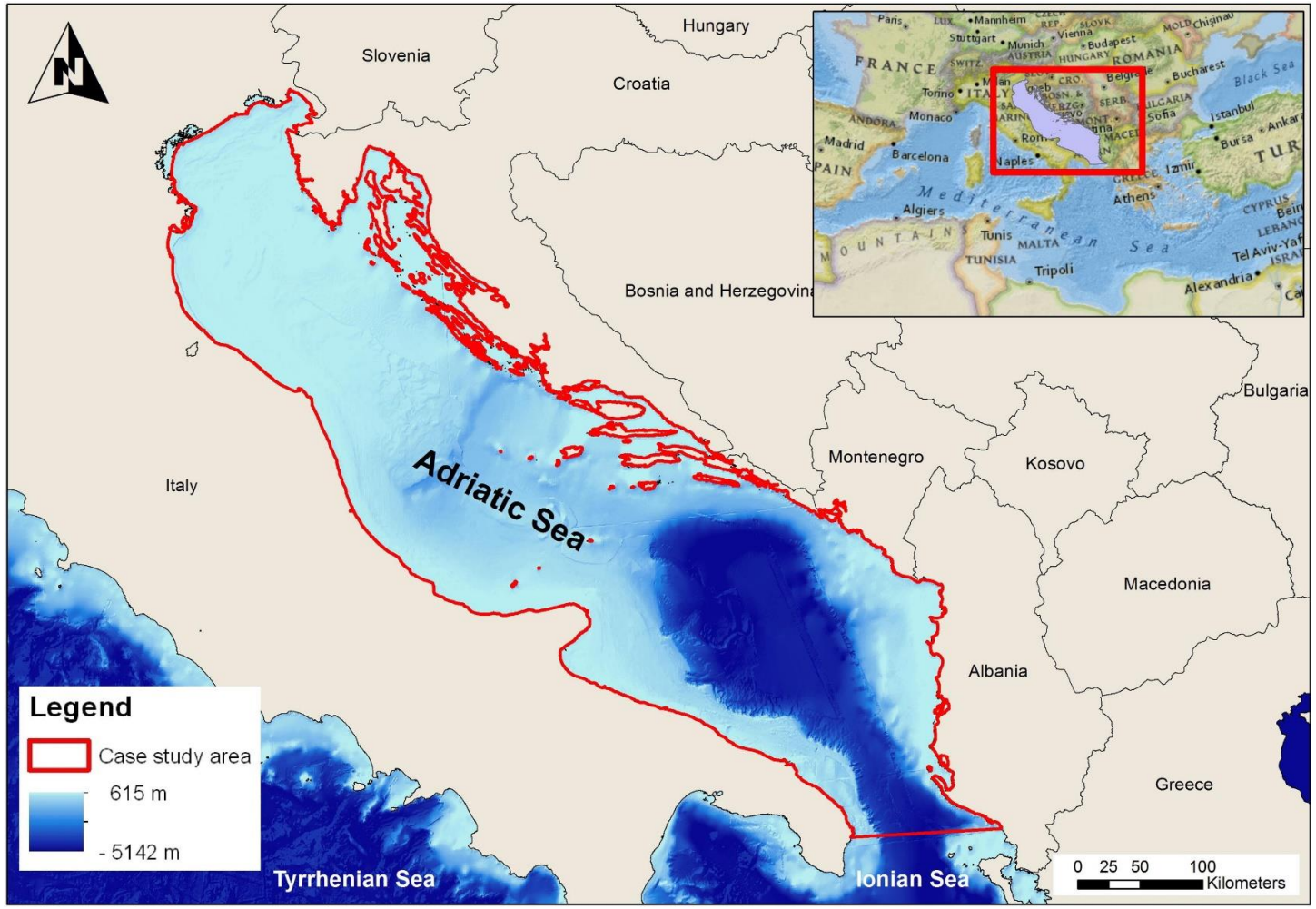


ArcView 3

- Digitizing
- Field calculator
- Join table
- Geoprocessing
- Rasterize
- Reclassify

Snickars & Pitkänen, 2007[2]

Interpolation of depth and elevation



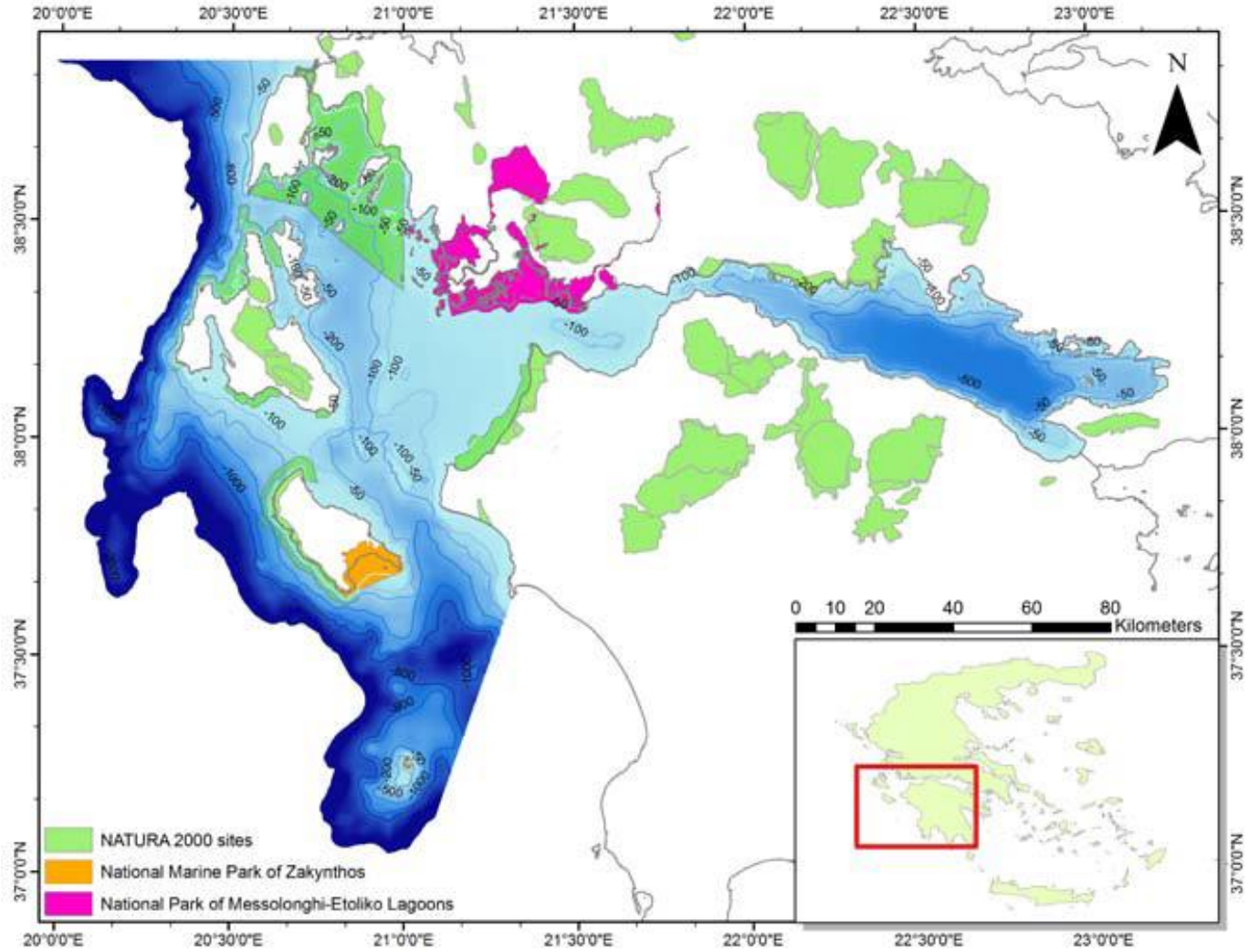
ArcGIS 10

- Geostatistical analyst

Furlan *et al.*, 2020[8]

Co-funded by the Erasmus+ Programme of the European Union

Interpolation of depth and elevation



ESRI ArcGIS 9.3

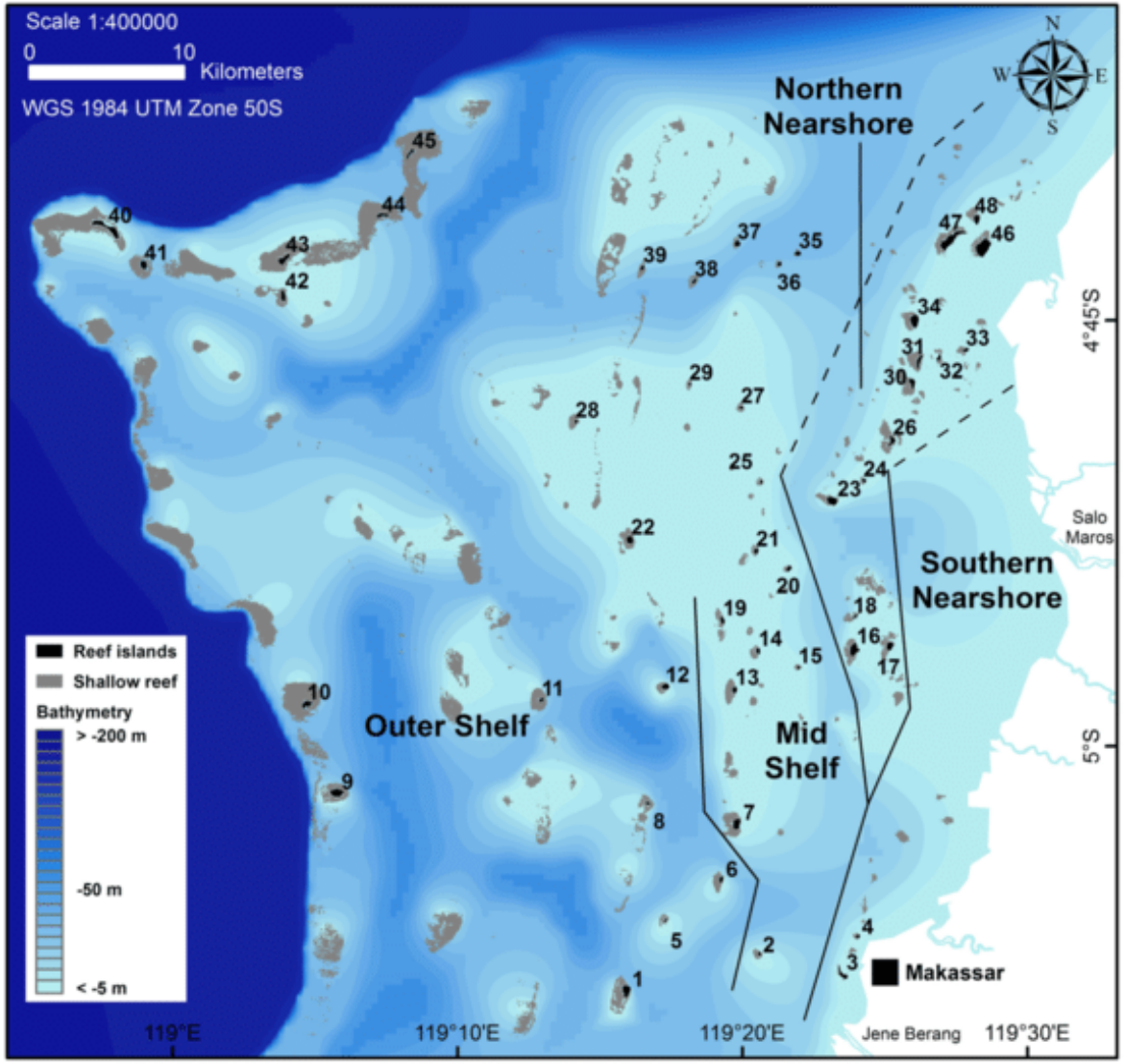
- Geostatistical analyst
- Geoprocessing tools (Overlay)

Issaris et al., 2012[4]

frontiers in Marine Science

Co-funded by the Erasmus+ Programme of the European Union

Archipelago zonation



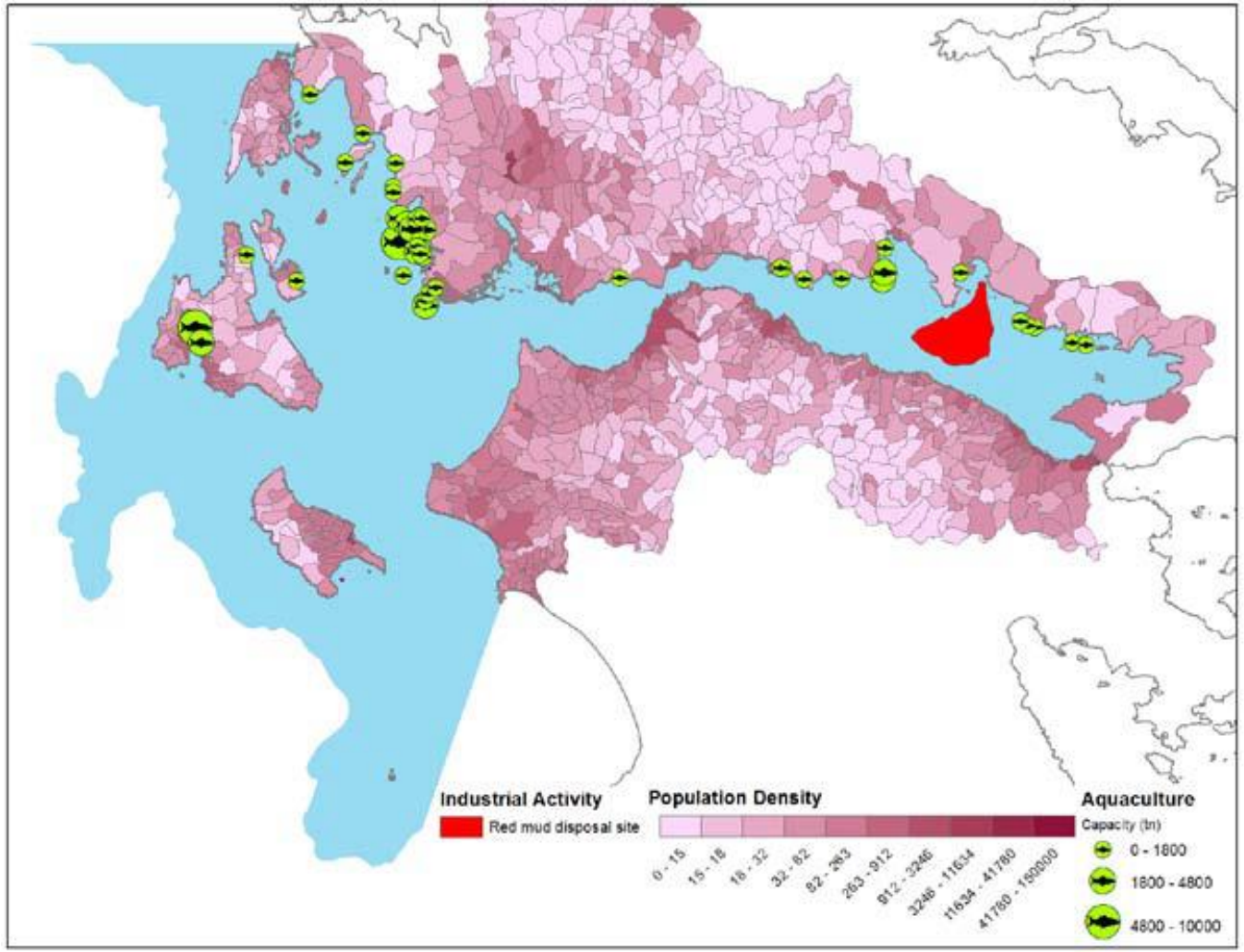
Kench & Mann, 2017[9]

sn

- Digitizing
- Labeling
- Geostatistical interpolation

Co-funded by the Erasmus+ Programme of the European Union

Shoreline exploitation

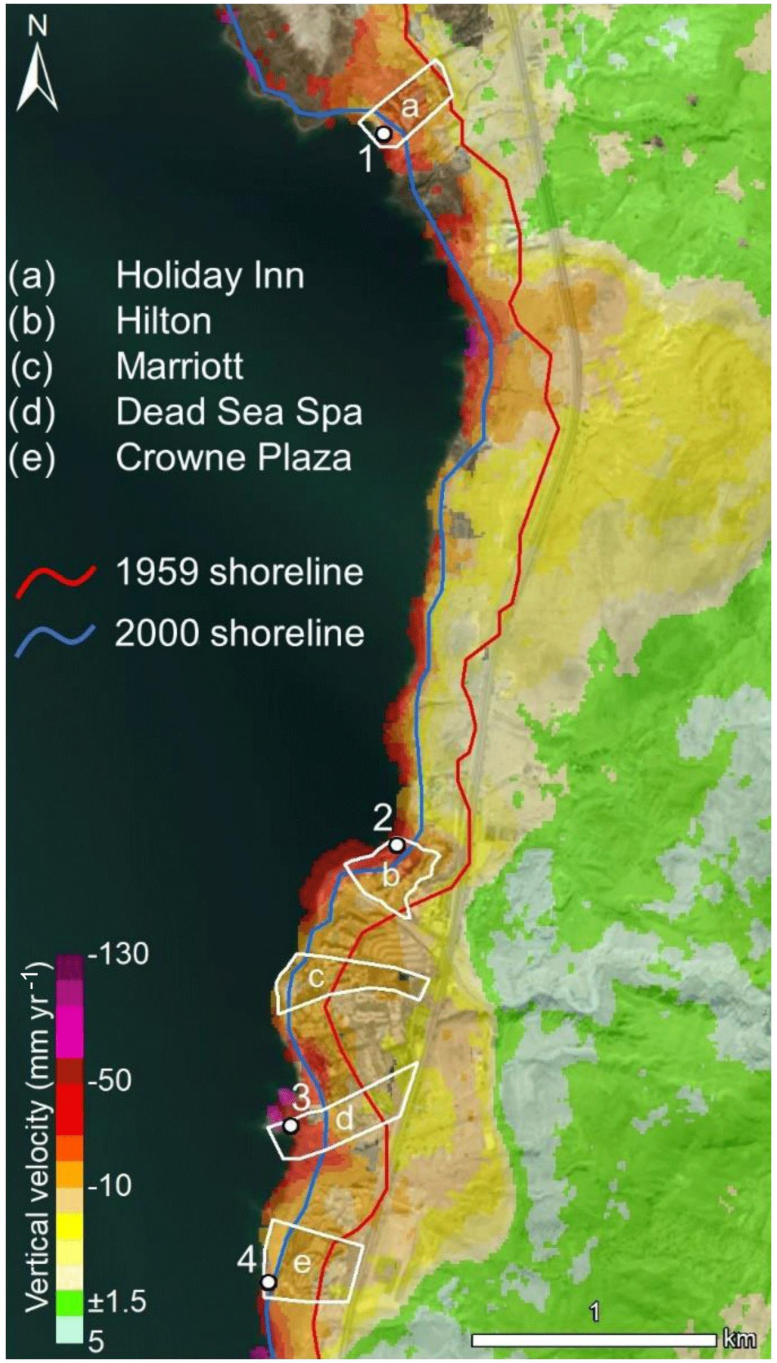


ESRI ArcGIS 9.3 Geoprocessing tolos (Overlay)

Issaris et al., 2012[4]

Co-funded by the
Erasmus+ Programme
of the European Union

Shoreline exploitation

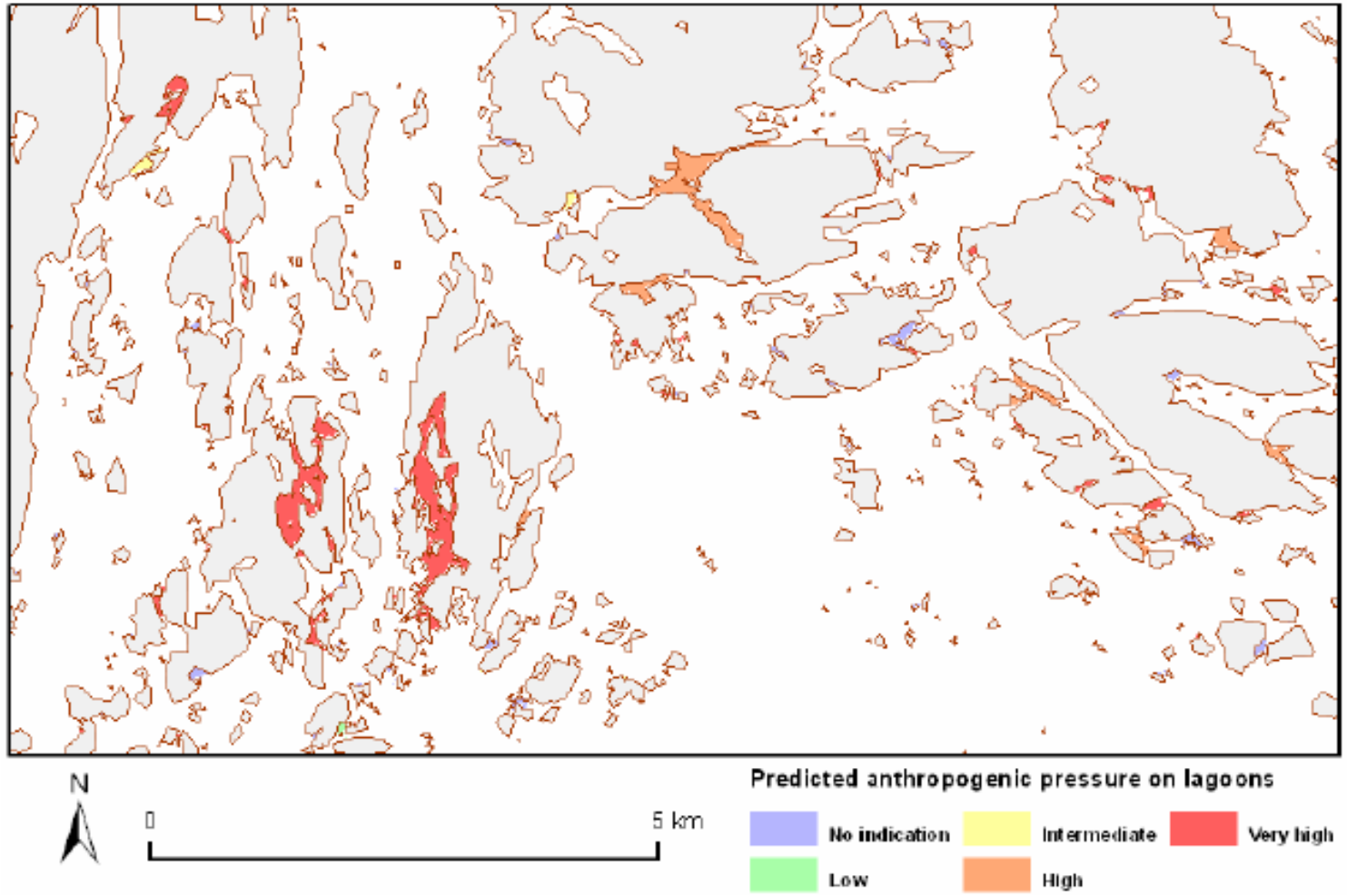


Abou Karaki *et al.*, 2019[10]

ArcGIS 10

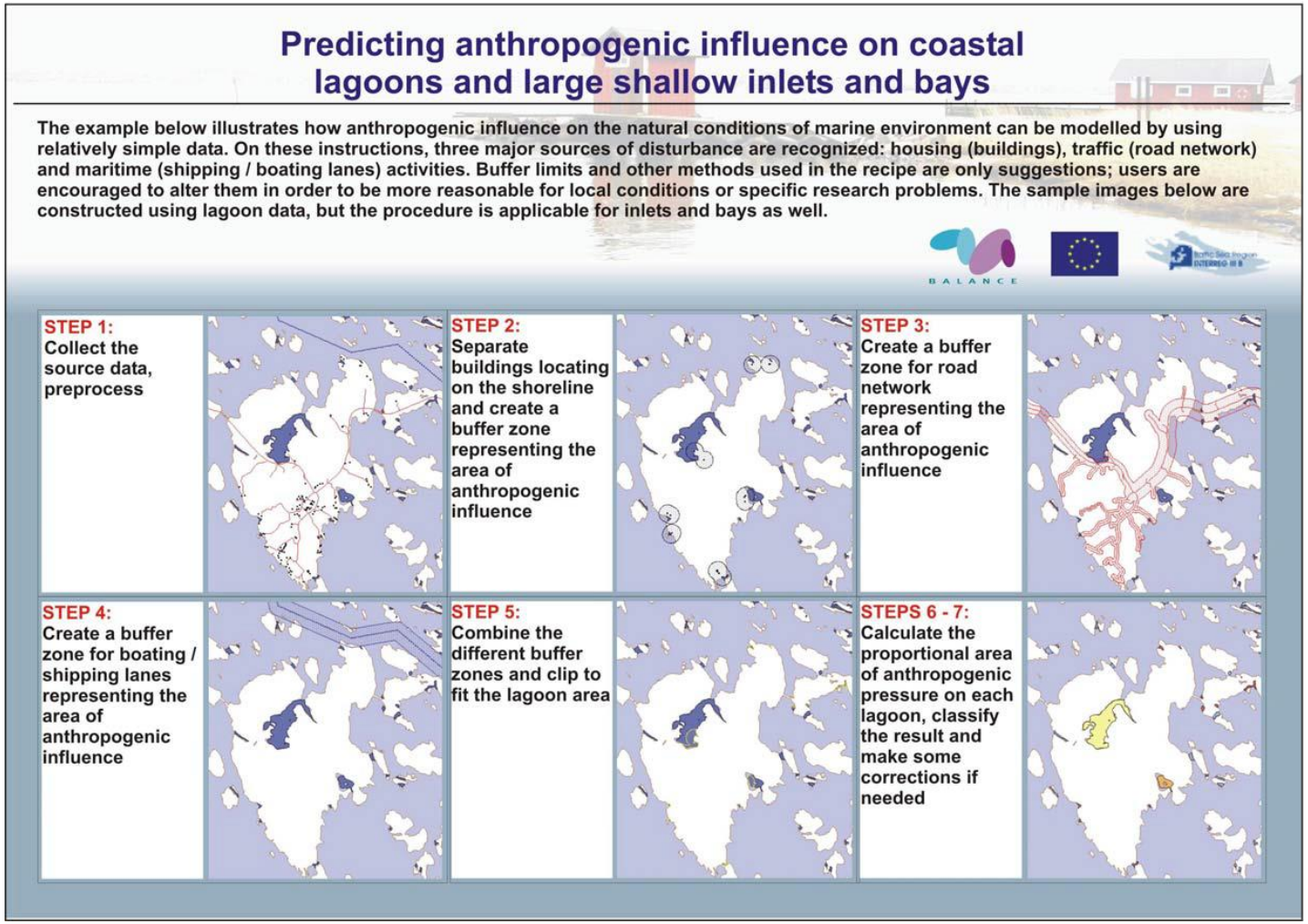
- Remote sensing
- Hidrological tools
- Digitizing
- WMS

Human influence on coastal lagoons and large shallow inlets and bays



Snickars & Pitkänen, 2007[2]

Human influence on coastal lagoons and large shallow inlets and bays

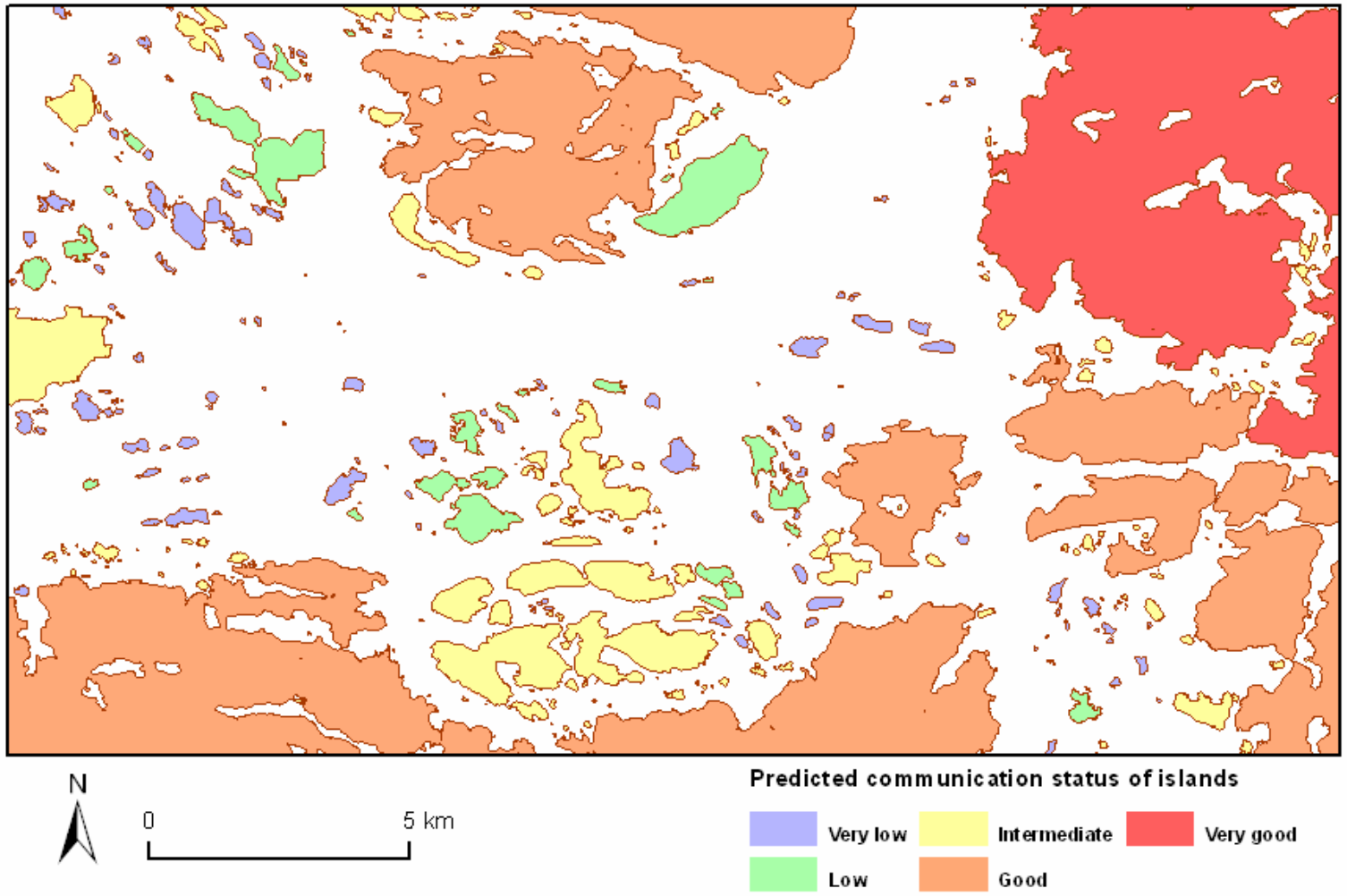


ArcView 3

- Field calculator
- Feature to point
- Join table
- Geoprocessing (buffer, clip)
- Spatial join
- Reclassify

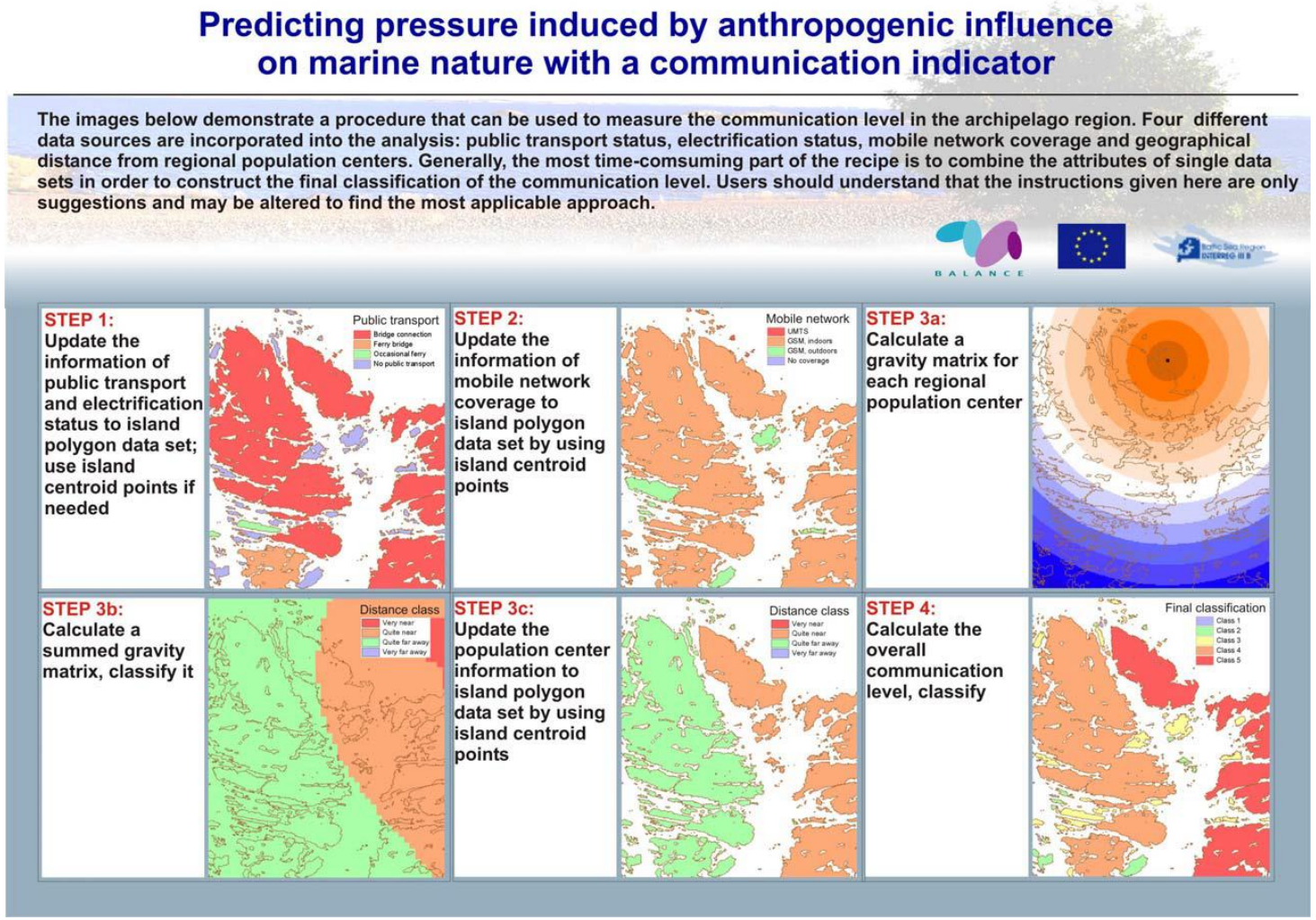
Snickars & Pitkänen, 2007[2]

Communication infrastructure



Snickars & Pitkänen, 2007[2]

Communication infrastructure



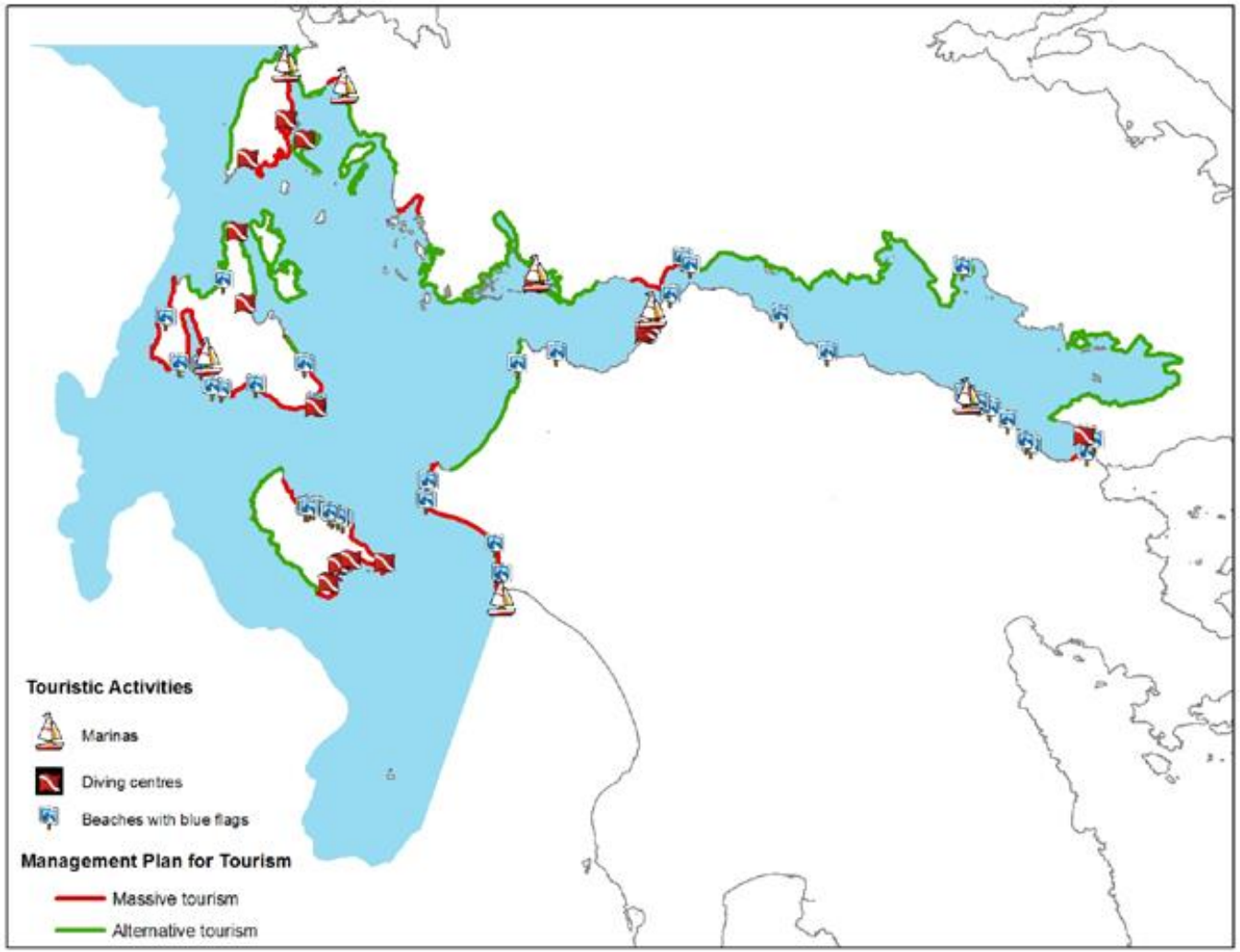
ArcView 3

- Join table
- Feature to point
- Spatial join
- Distance raster
- Reclassify
- Geoprocessing (buffer, clip)
- Field calculator

Snickars & Pitkänen, 2007[2]

Co-funded by the Erasmus+ Programme of the European Union

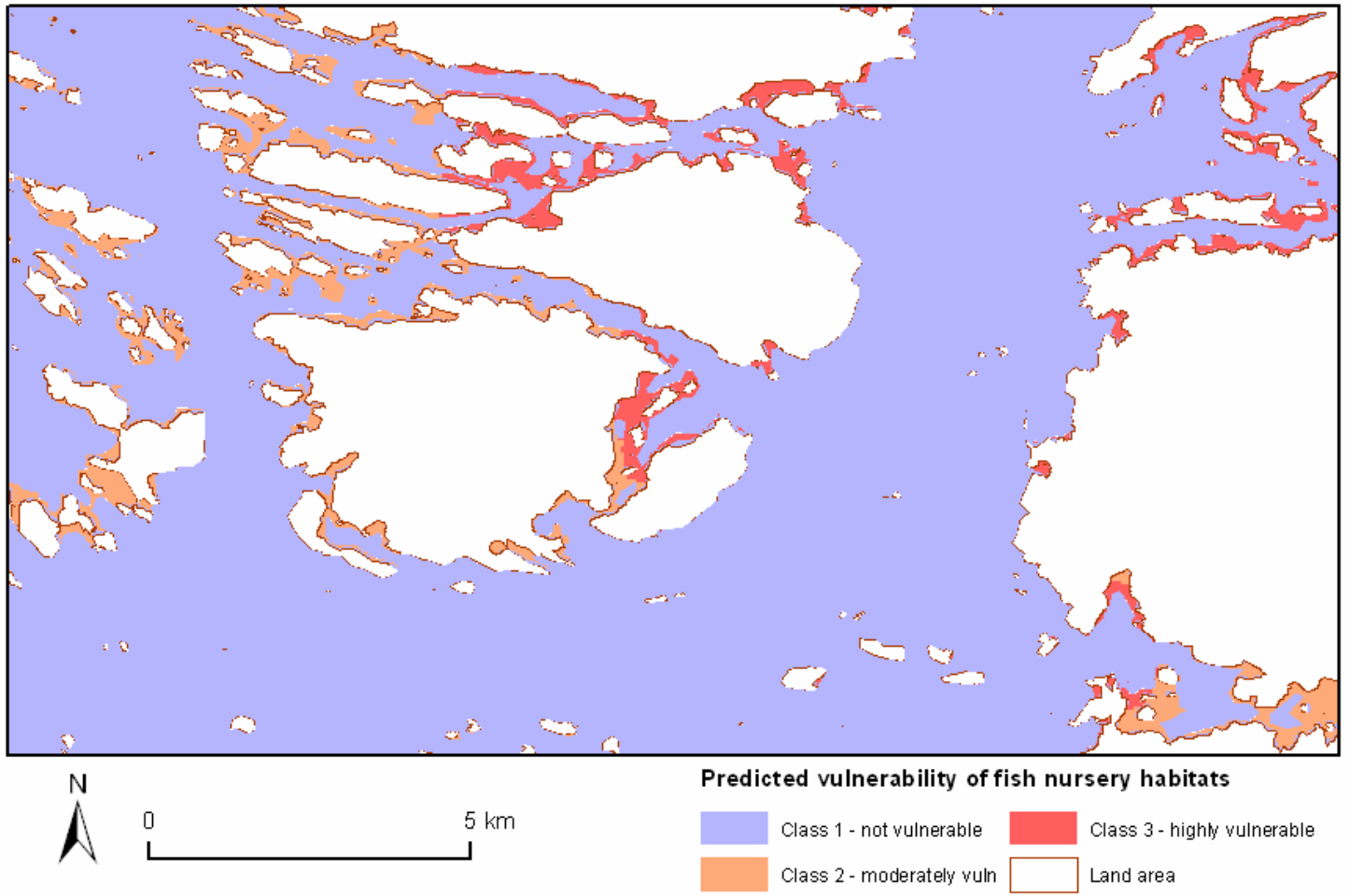
Effects of recreational boating and fishing on sensitive habitats



ESRI ArcGIS 9.3 Geoprocessing tools (Overlay)

Issaris et al., 2012[4]

Effects of recreational boating and fishing on sensitive habitats



Snickars & Pitkänen, 2007[2]

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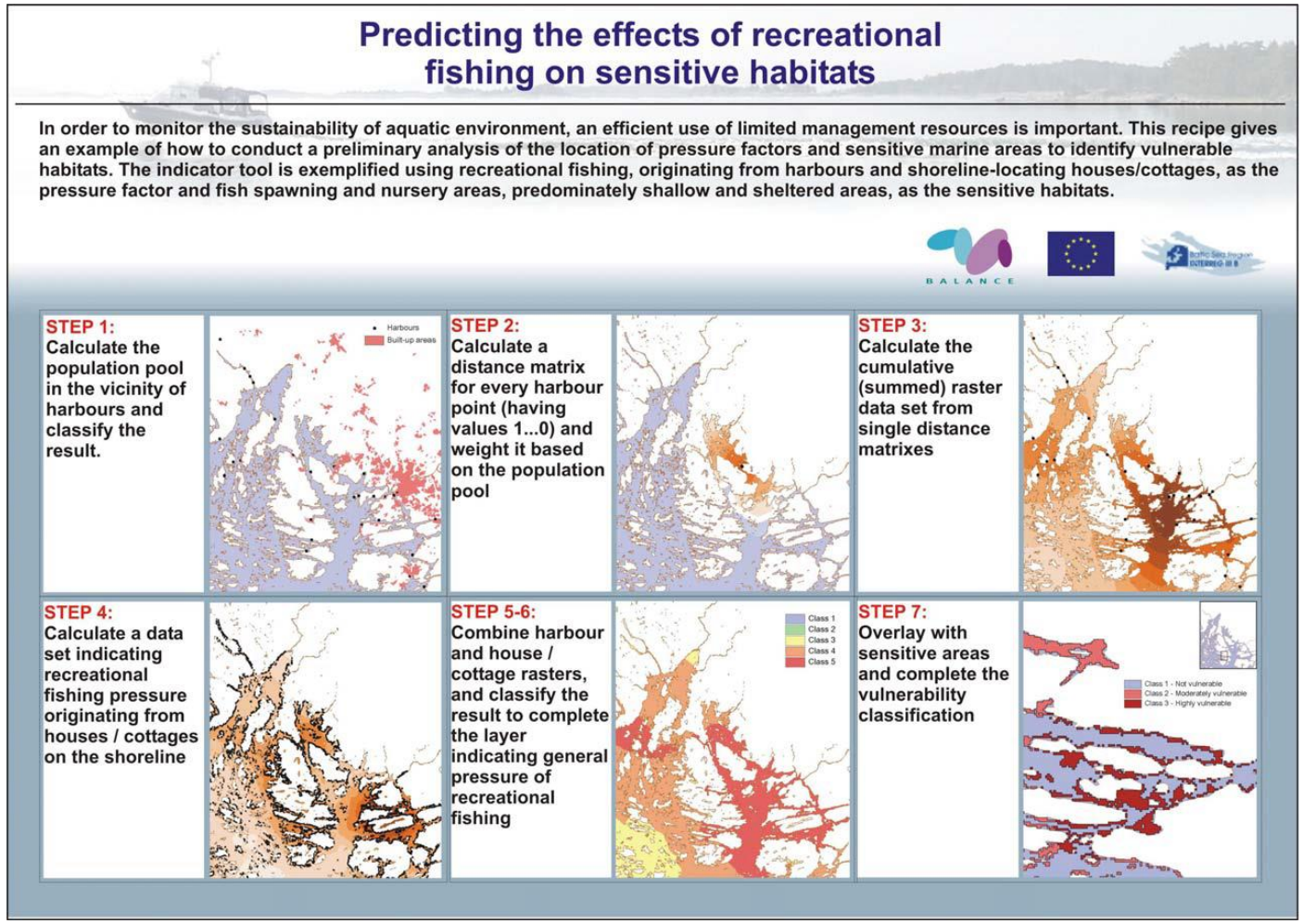
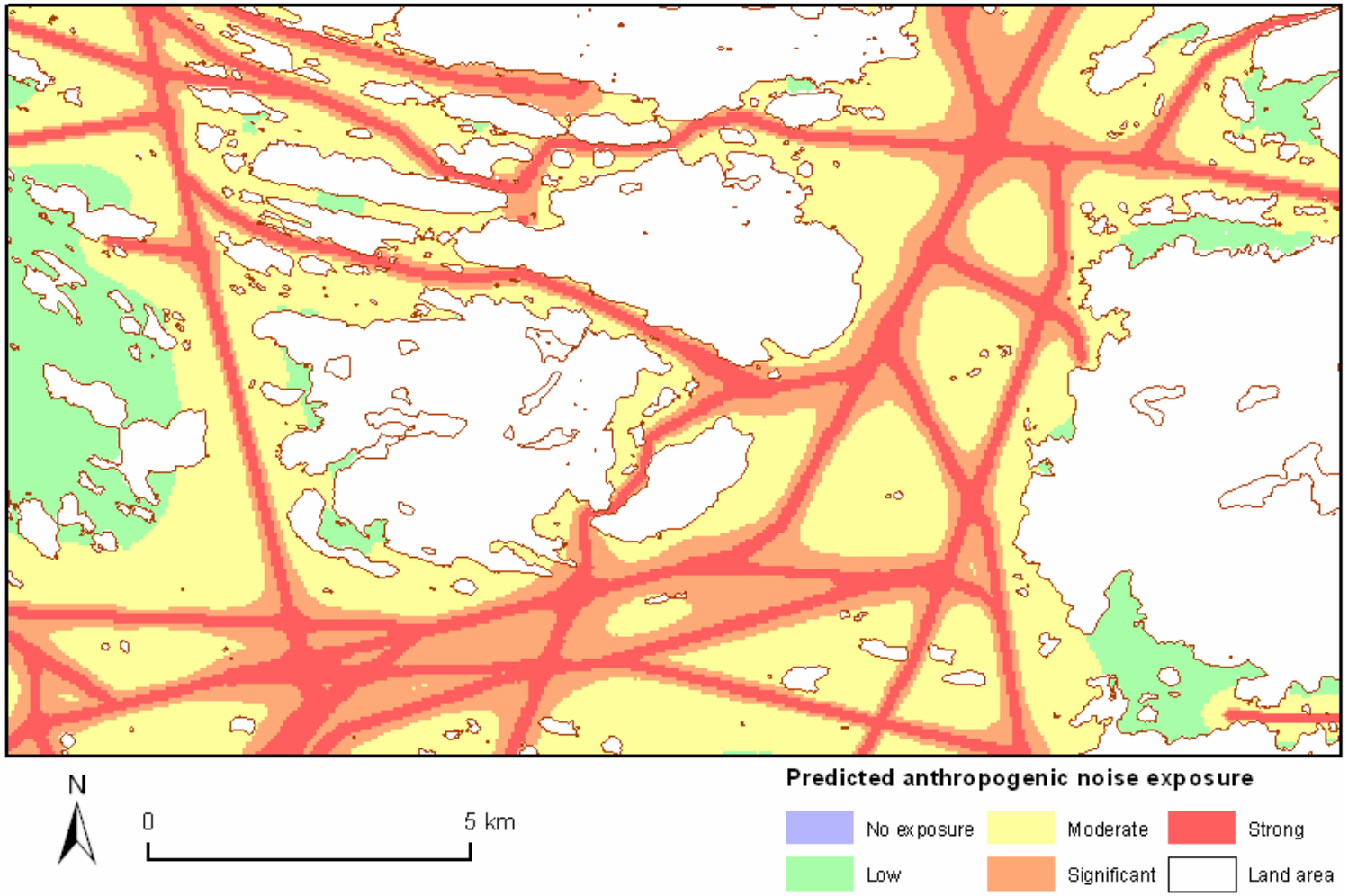


ArcView 3

- Join table
- Distance raster
- Weighted sum
- Reclassify
- Geoprocessing (overlay)

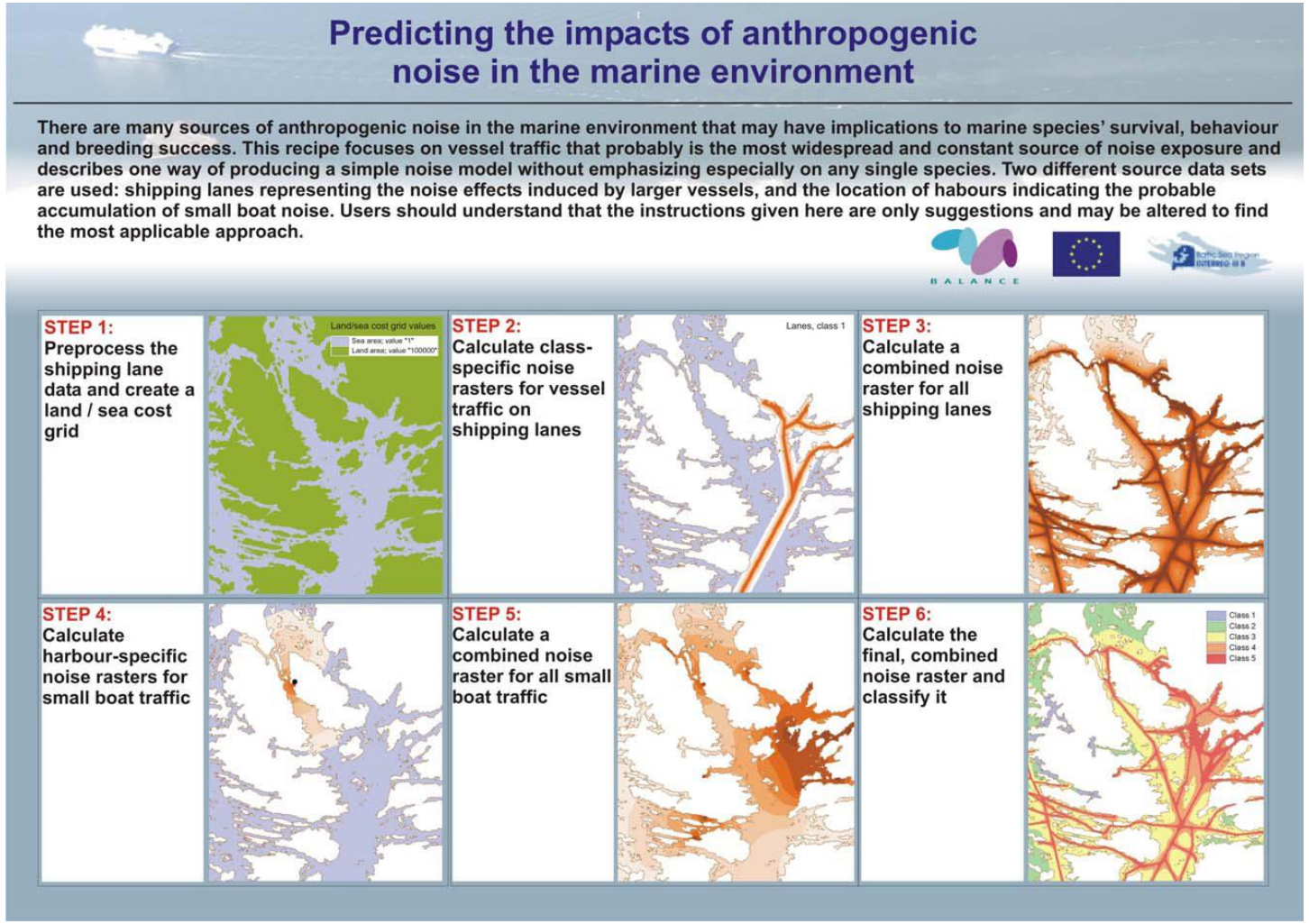
Snickars & Pitkänen, 2007[2]

Marine noise disturbance from vessels



Snickars & Pitkänen, 2007[2]

Marine noise disturbance from vessels

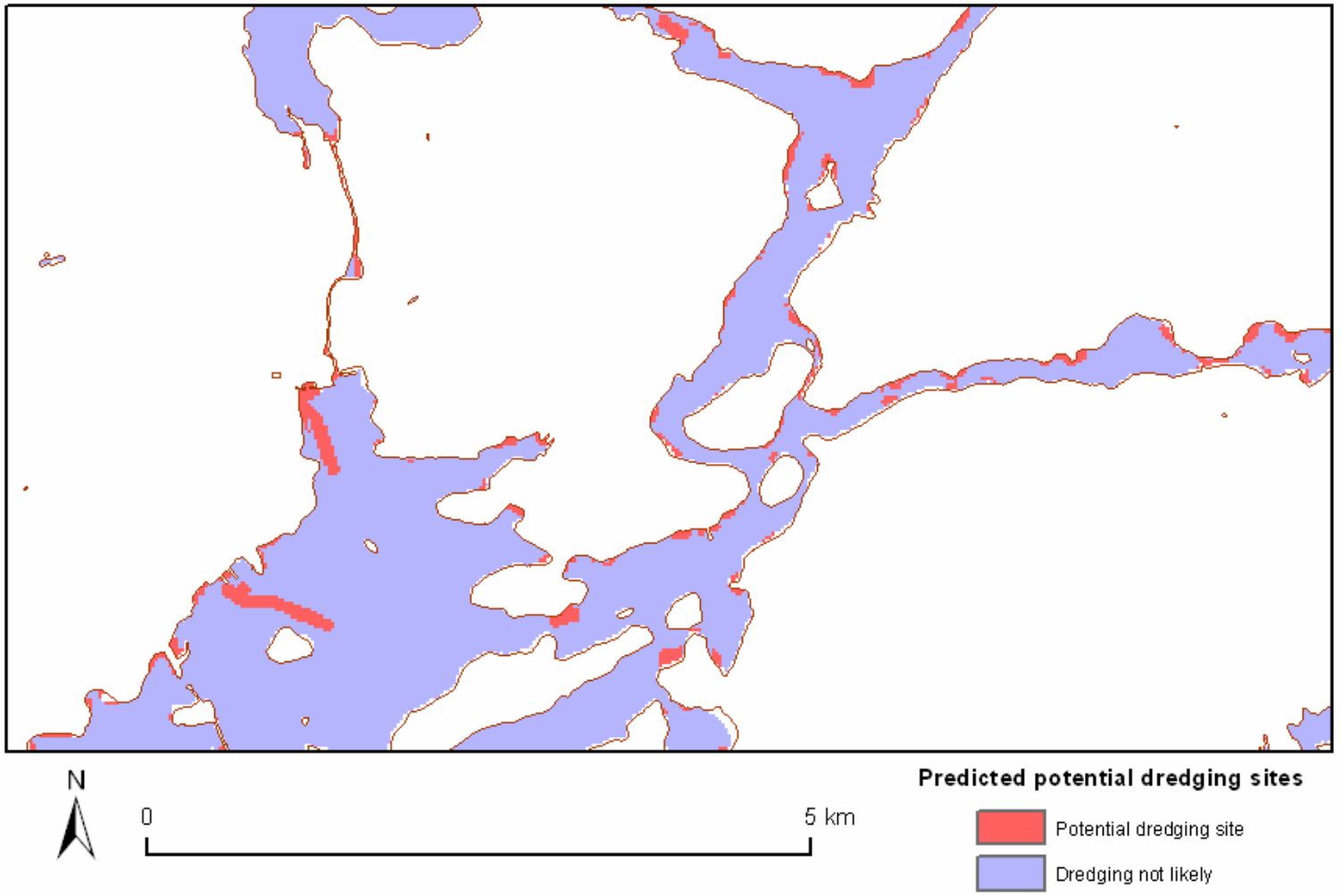


ArcView 3

- Field calculator
- Reclassify
- Distance raster
- Map algebra

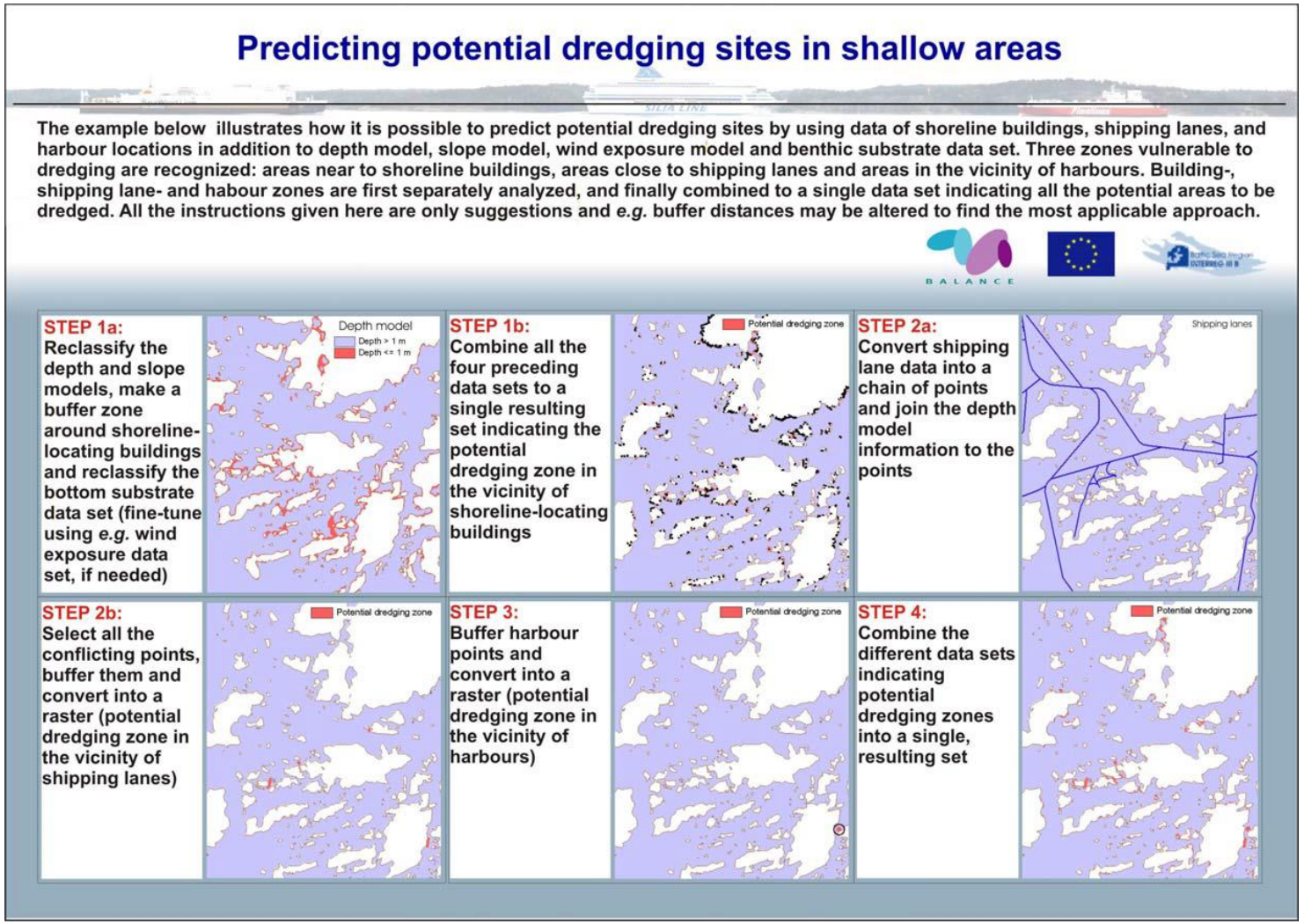
Snickars & Pitkänen, 2007[2]

Potential dredging sites in shallow coastal areas



Snickars & Pitkänen, 2007[2]

Potential dredging sites in shallow coastal areas

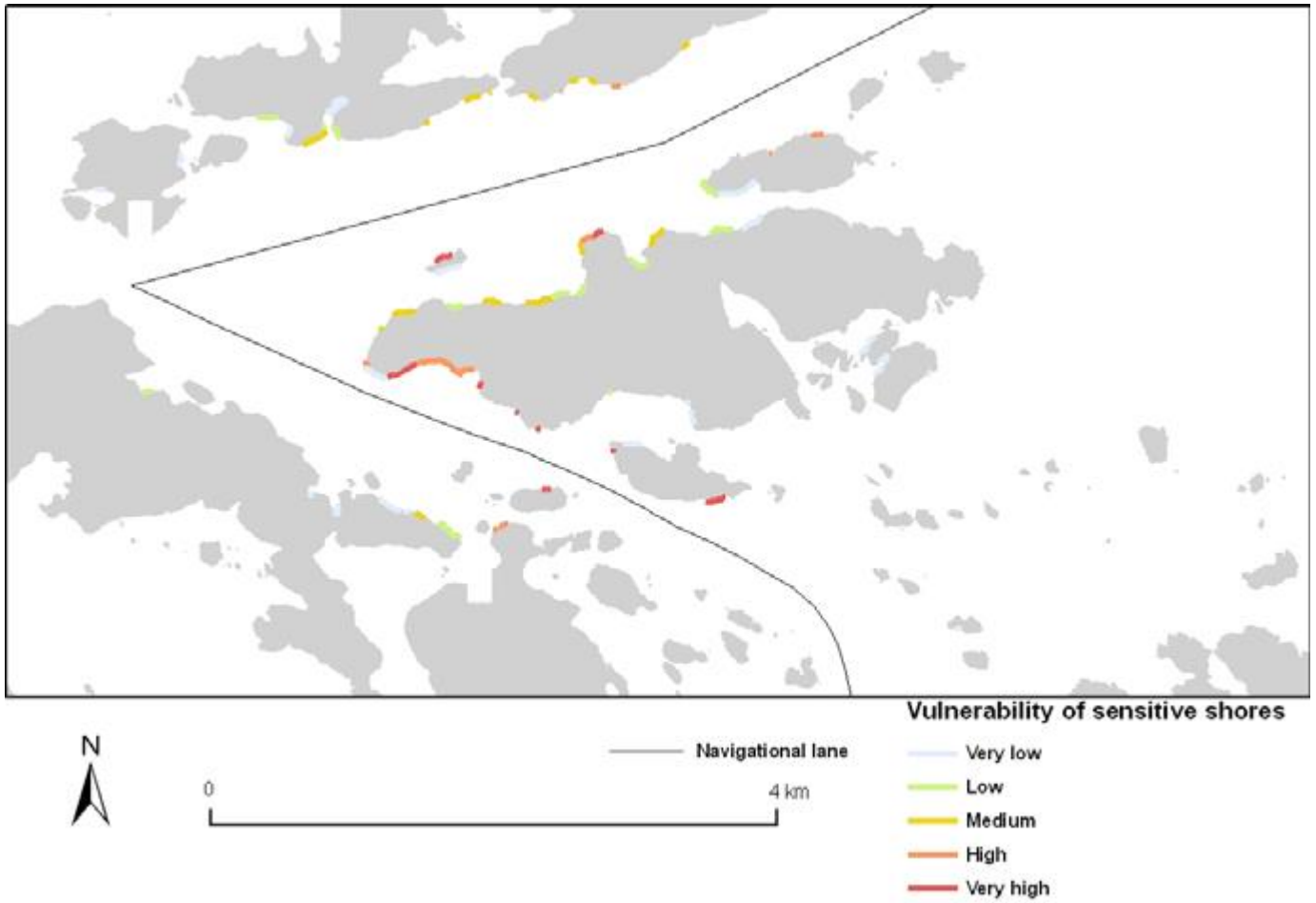


ArcView 3-ArcGIS 9

- Reclassify
- Geoprocessing (buffer)
- Rasterize
- Map algebra
- Feature to point
- Field calculator

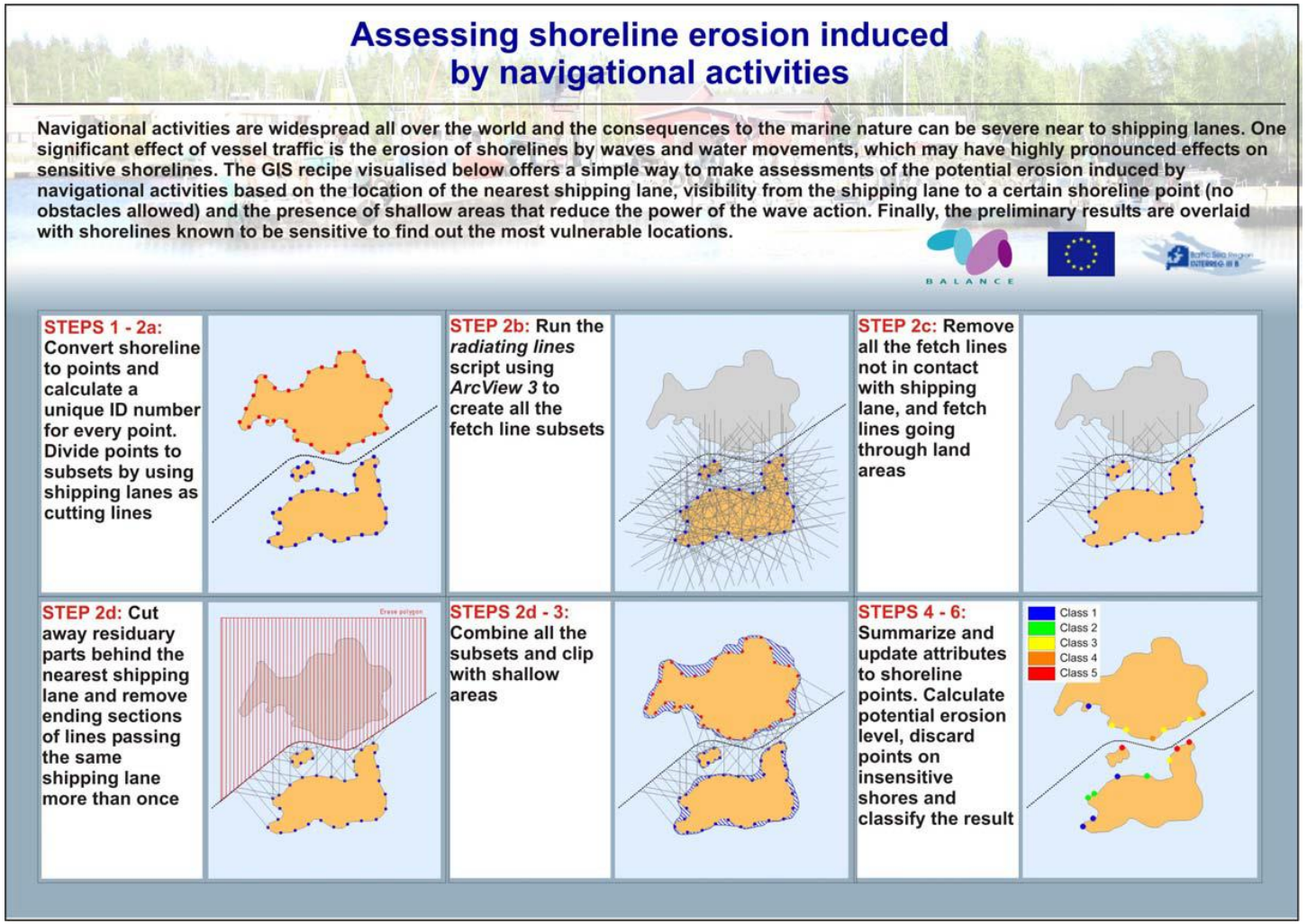
Snickars & Pitkänen, 2007[2]

Shoreline erosion induced by navigational activities



Snickars & Pitkänen, 2007[2]

Shoreline erosion induced by navigational activities

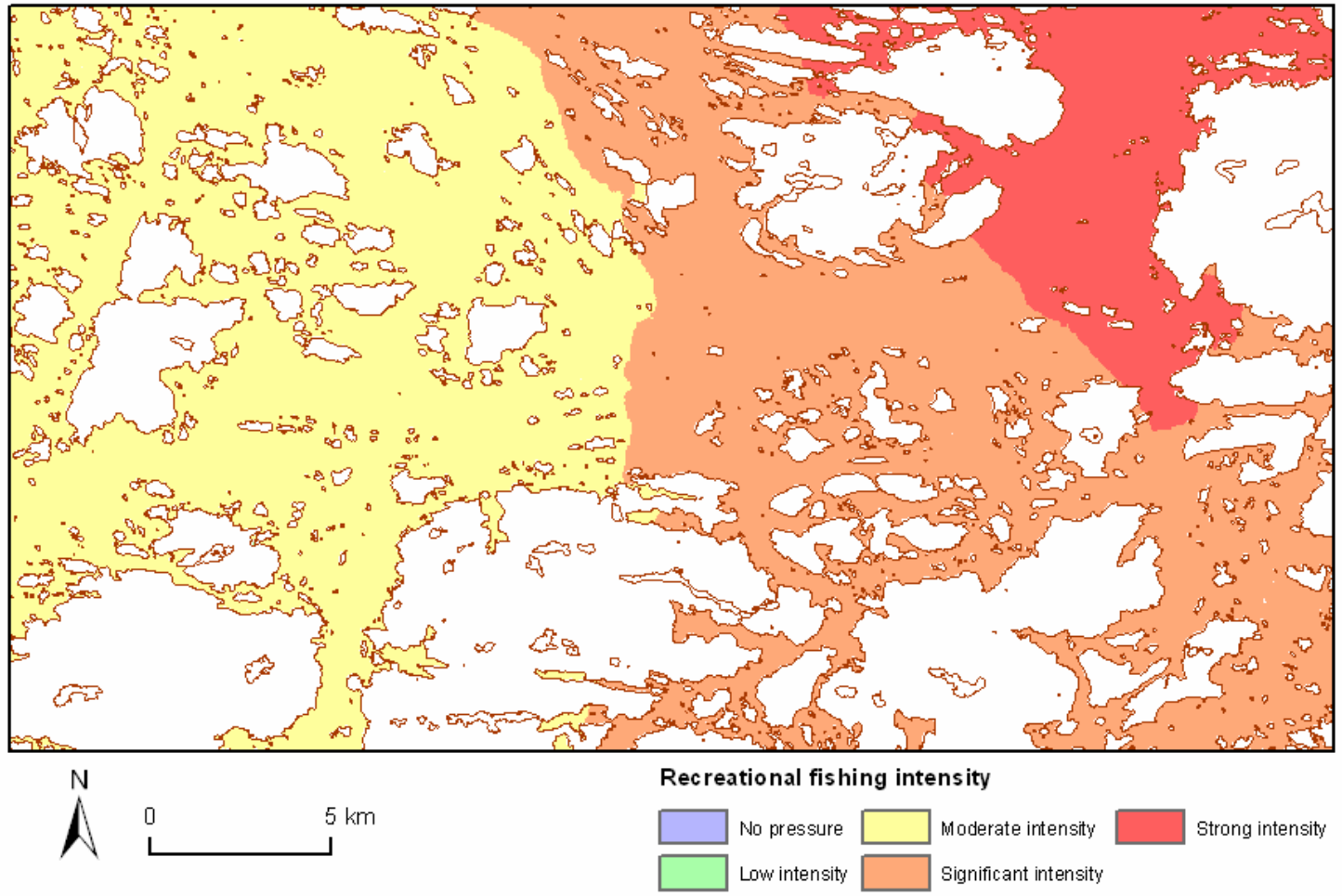


ArcView 3-ArcGIS 9

- Feature to point
- Create lines
- Geoprocessing (intersect, clip, split, union)
- Field calculator

Snickars & Pitkänen, 2007[2]

Effects of marine management activities on fishing



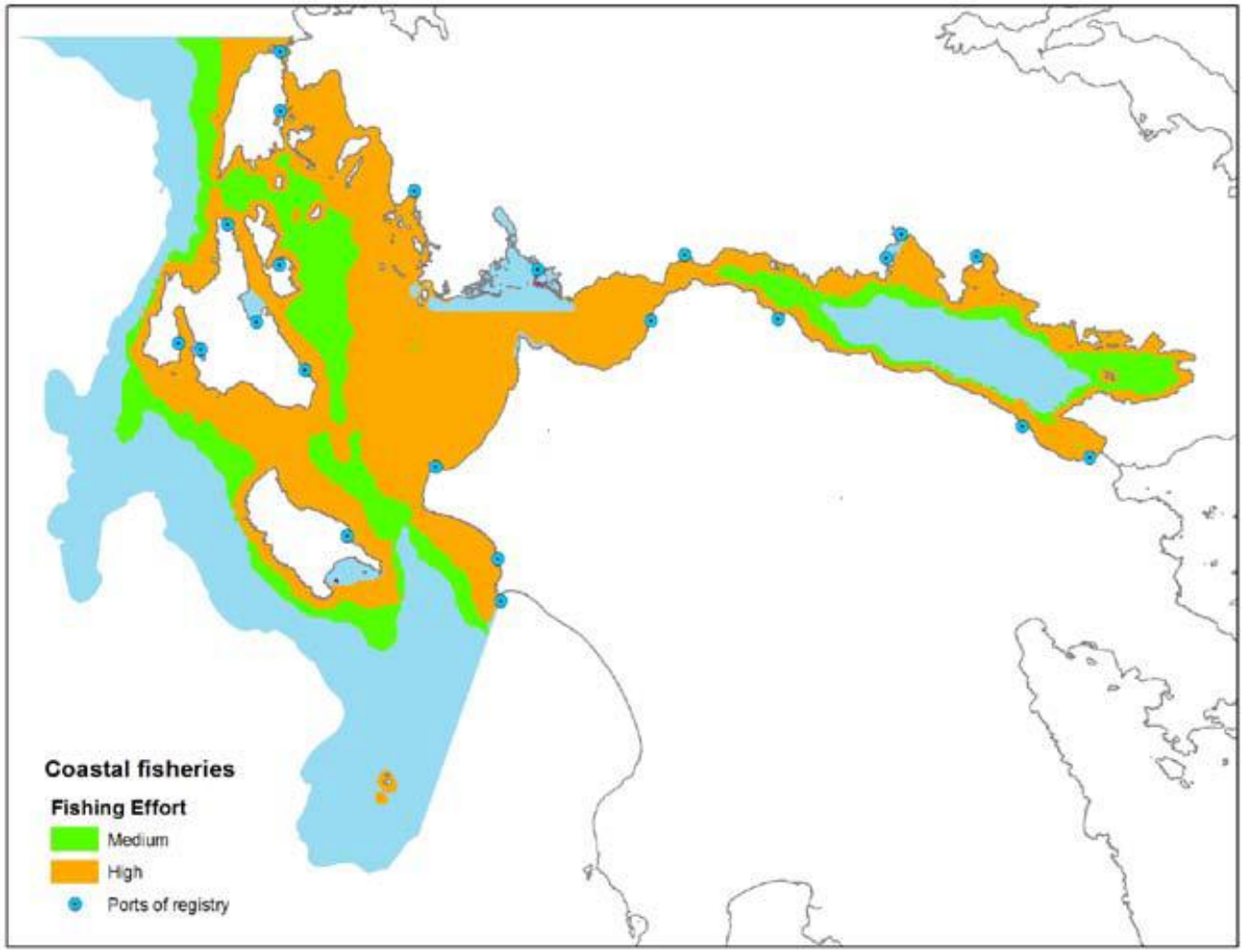
ArcView 3

- Join table
- Distance raster
- Weighted sum
- Reclassify
- Geoprocessing (overlay)

Snickars & Pitkänen, 2007[2]

Co-funded by the Erasmus+ Programme of the European Union

Effects of marine management activities on fishing

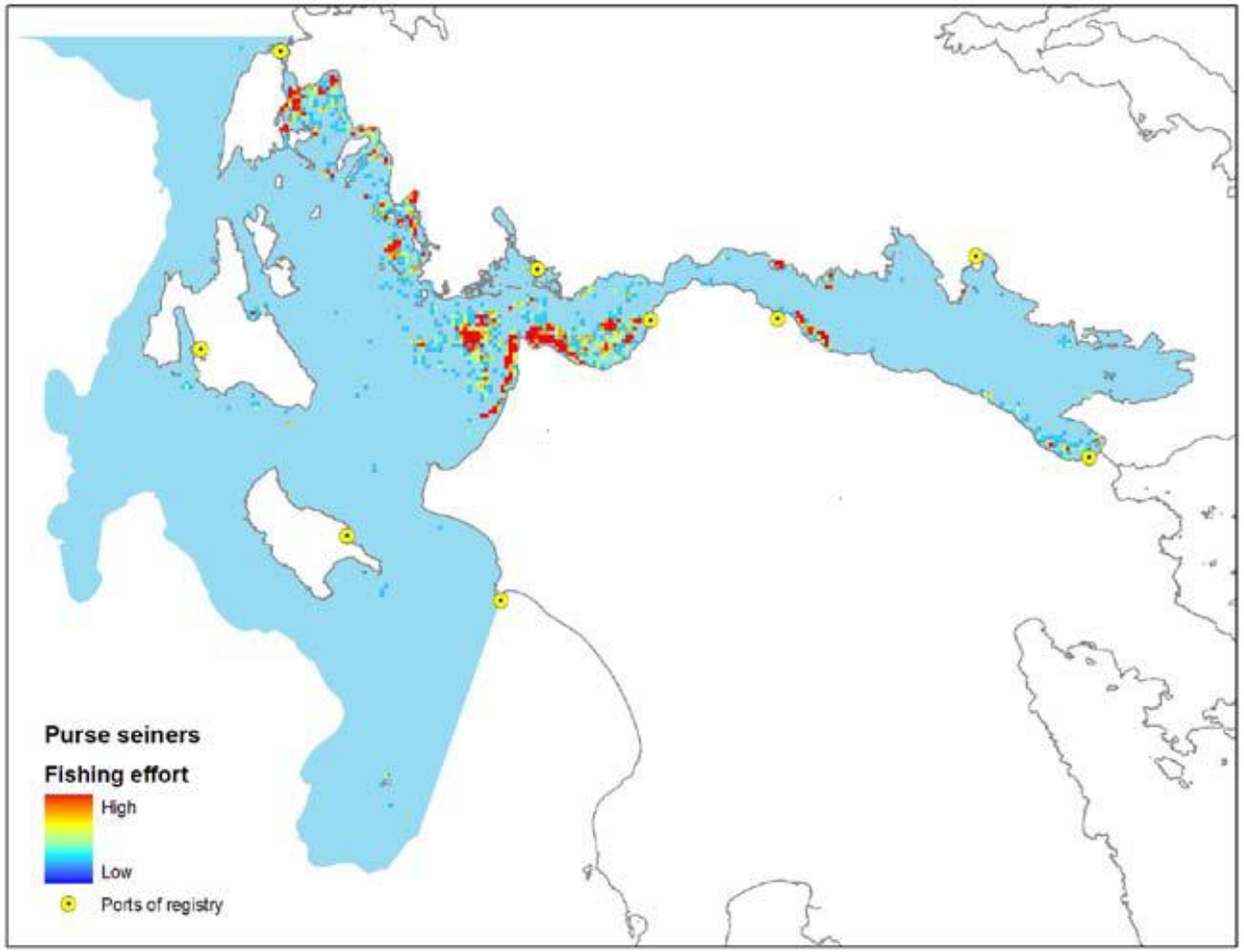


ESRI ArcGIS 9.3 Geostatistic tools

Issaris et al., 2012[4]

Co-funded by the Erasmus+ Programme of the European Union

Effects of marine management activities on fishing

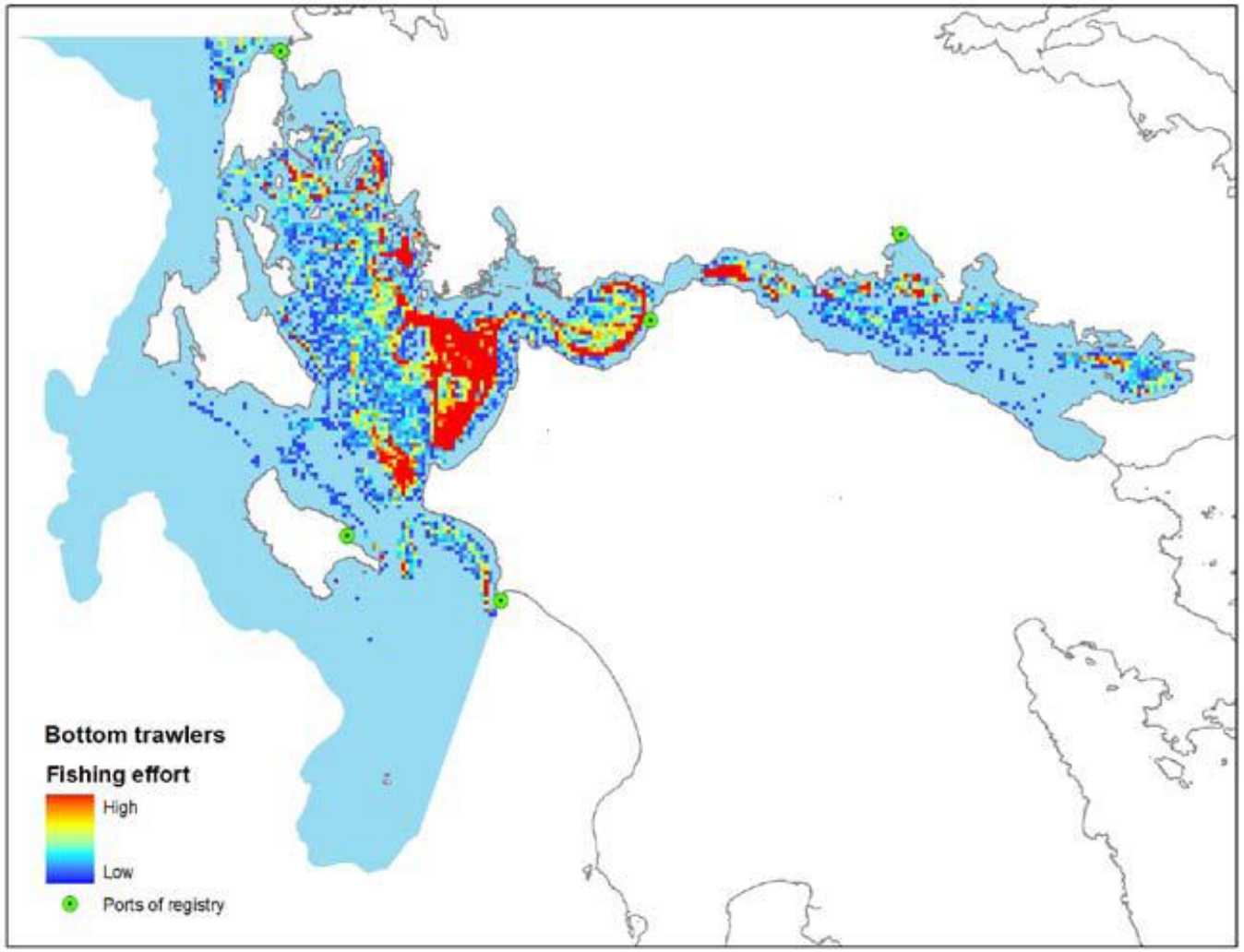


ESRI ArcGIS 9.3 Geostatistic tools

Issaris et al., 2012[4]

Co-funded by the Erasmus+ Programme of the European Union

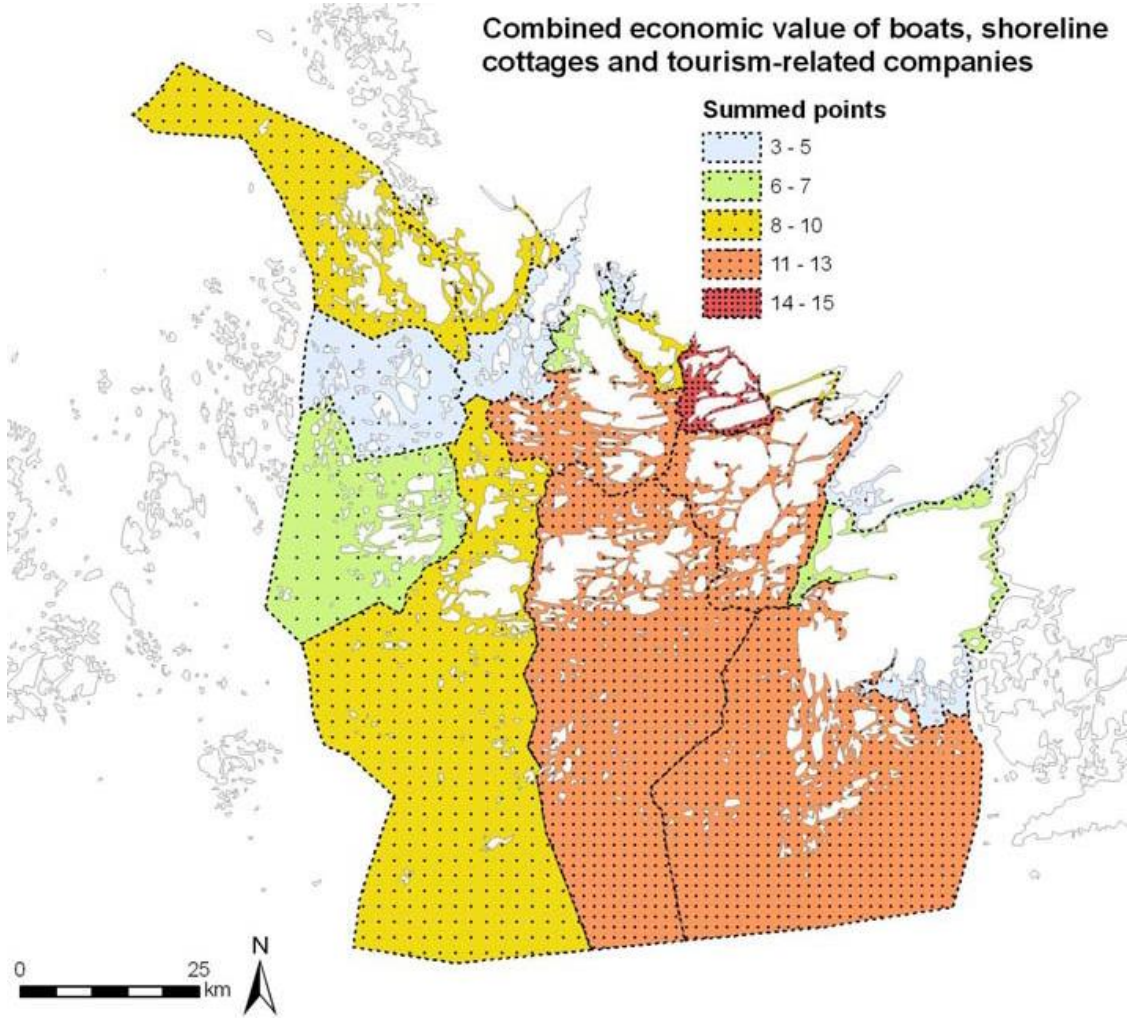
Effects of marine management activities on fishing



ESRI ArcGIS 9.3 Geostatistic tools

Issaris et al., 2012[4]

Economic value of marine areas – exemplified for recreational activities

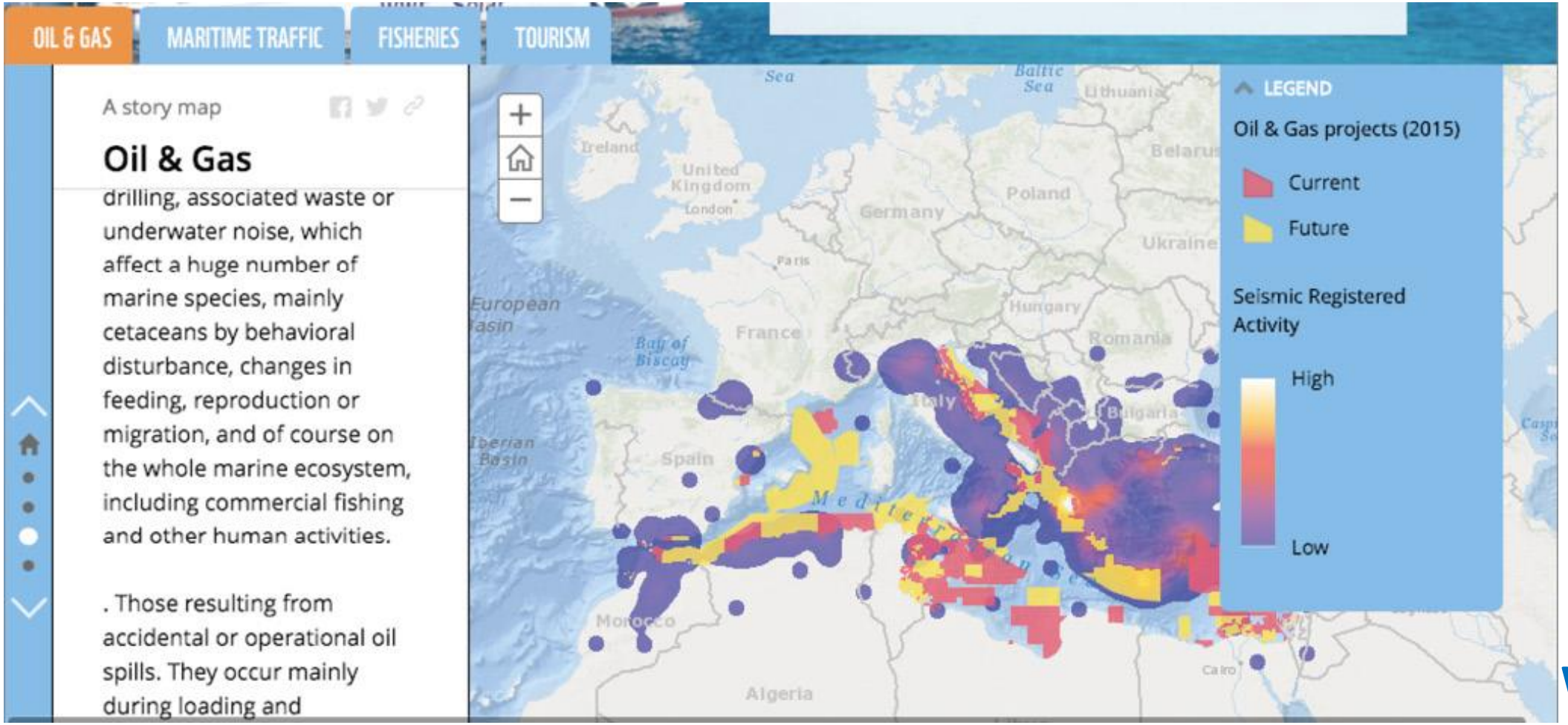


ArcView 3-ArcGIS 9
Weighted overlay

Snickars & Pitkänen, 2007[2]

Co-funded by the
Erasmus+ Programme
of the European Union

The interaction between authorities and stakeholders



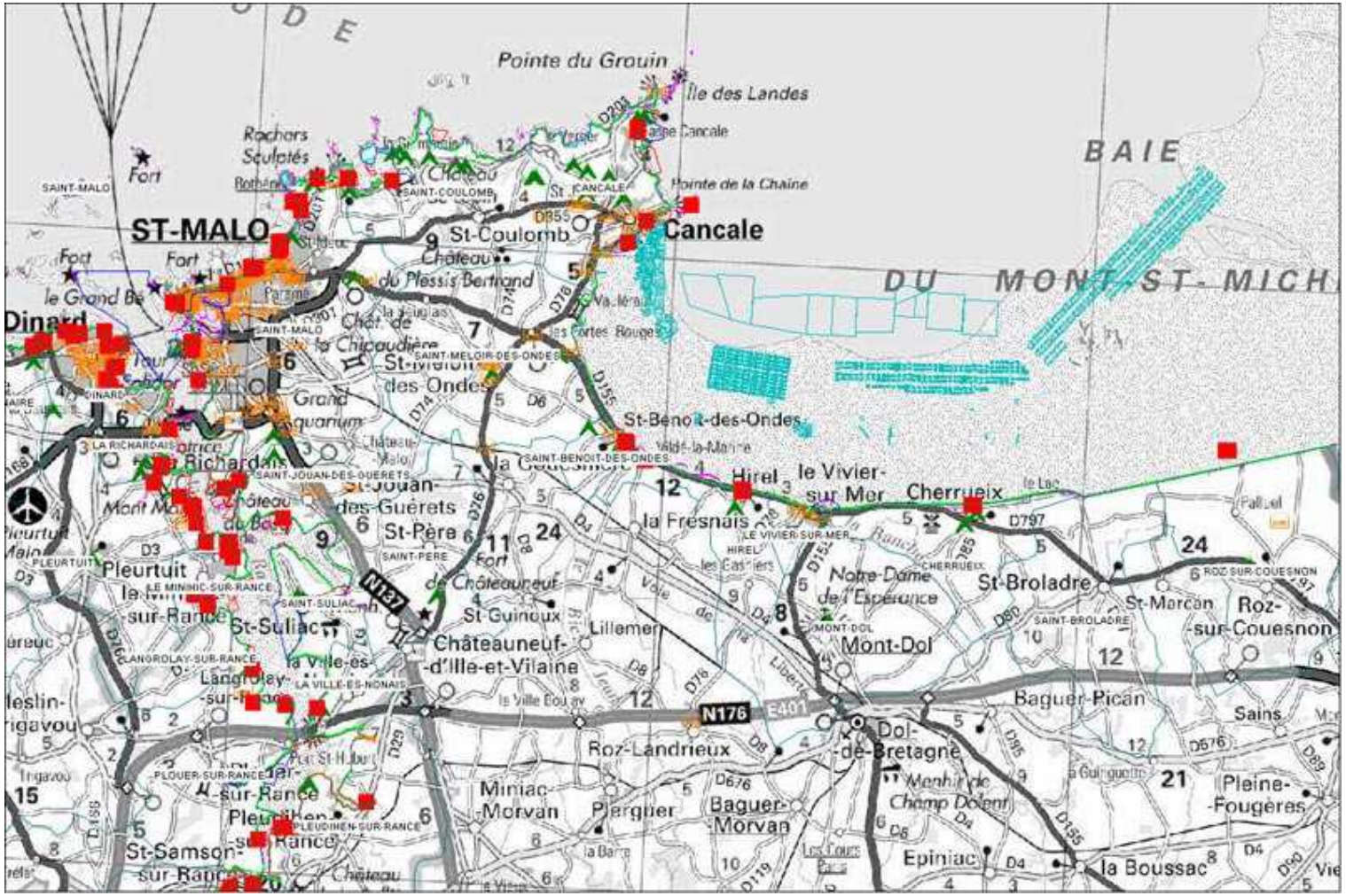
WMS

GEF platform[11]

GéoBretagne®

Co-funded by the
Erasmus+ Programme
of the European Union

Compliance with management plans



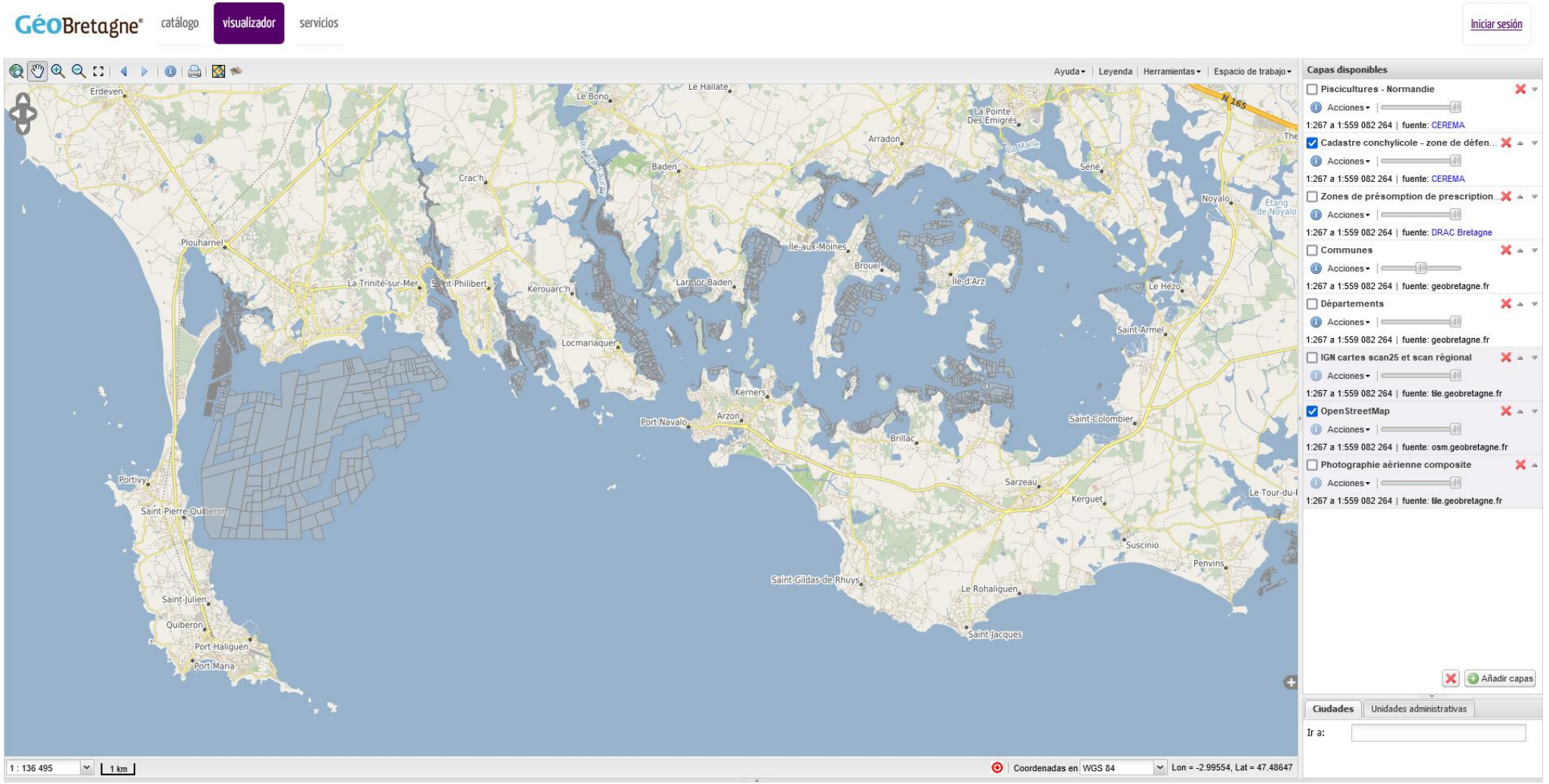
WMS

GéoBretagne platform[12]

GéoBretagne®

Co-funded by the
Erasmus+ Programme
of the European Union

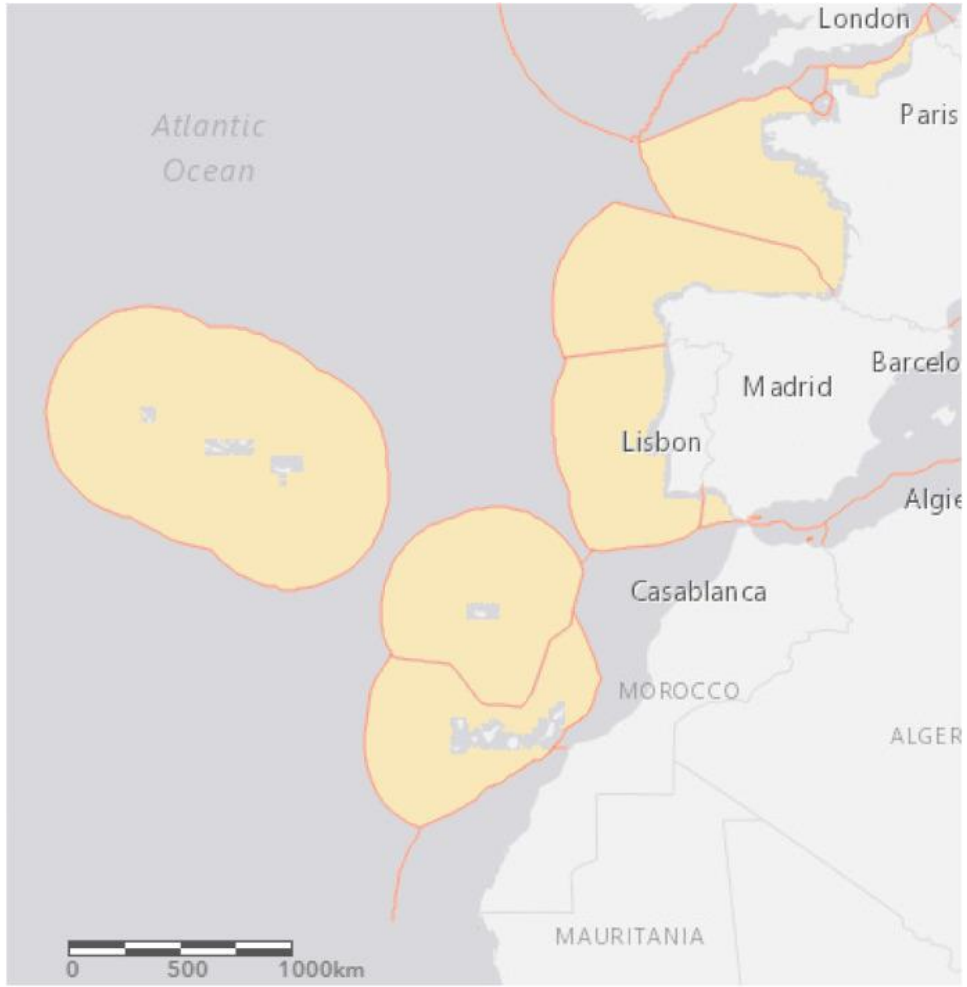
Compliance with management plans



WMS

GéoBretagne platform[12]

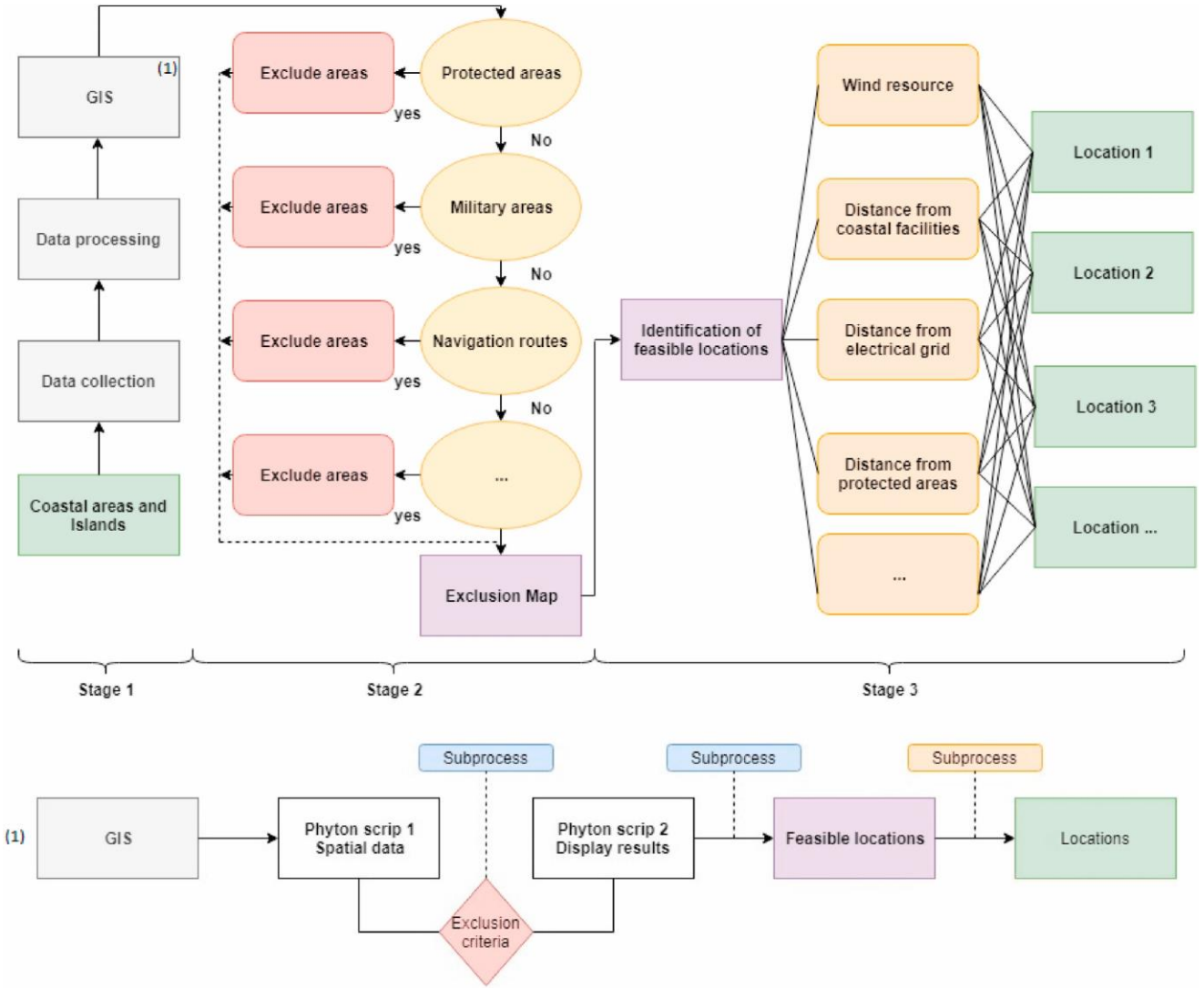
An integrated GIS approach for site selection of floating offshore wind farms in the Atlantic continental European coastline



ArcGIS 10 Geoprocessing (buffer)

Díaz & Guedes, 2020[13]

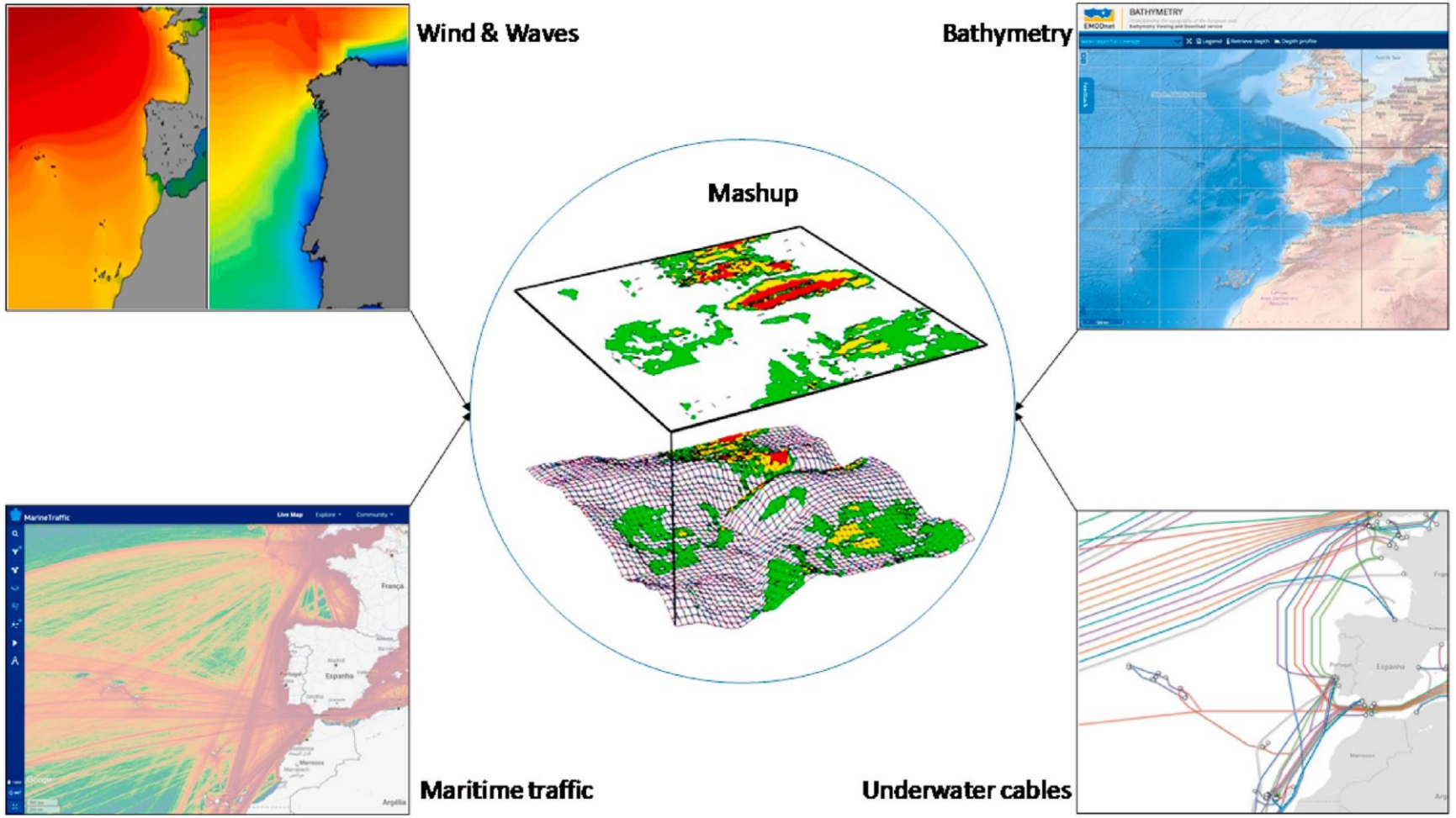
An integrated GIS approach for site selection of floating offshore wind farms in the Atlantic continental European coastline



Spatial Decision Support System (SDSS) workflow

Díaz & Guedes, 2020[13]

An integrated GIS approach for site selection of floating offshore wind farms in the Atlantic continental European coastline



ArcGIS 10

- Geostatistical analyst
- ArcPy
- Geoprocessing tolos (buffer, overlay)
- Euclidean distance
- Weighted overlay

Díaz & Guedes, 2020[13]

European MSP Platform

European Commission

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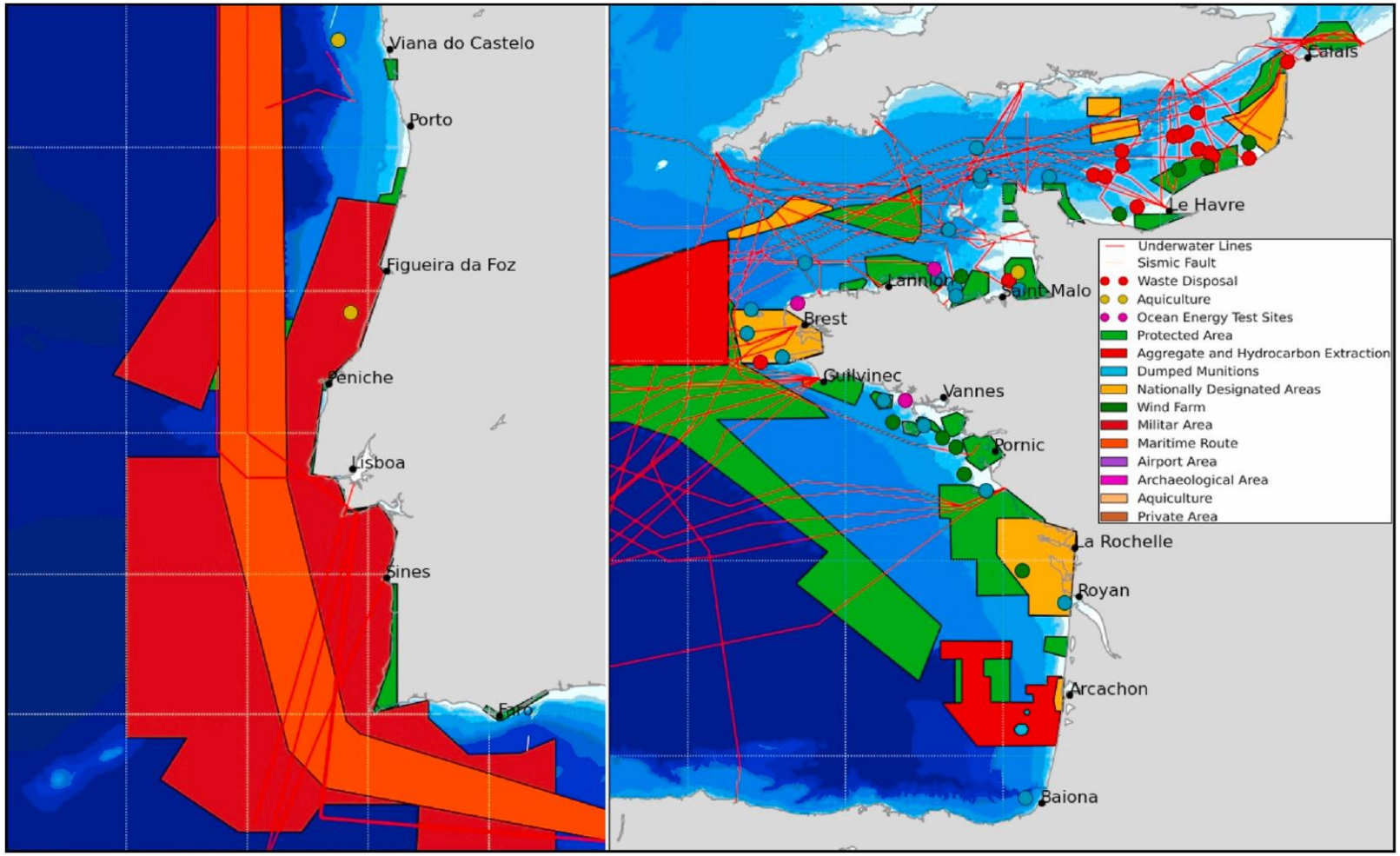
An integrated GIS approach for site selection of floating offshore wind farms in the Atlantic continental European coastline



ArcGIS 10

- Digitizing
- Overlay

Díaz & Guedes, 2020[13]

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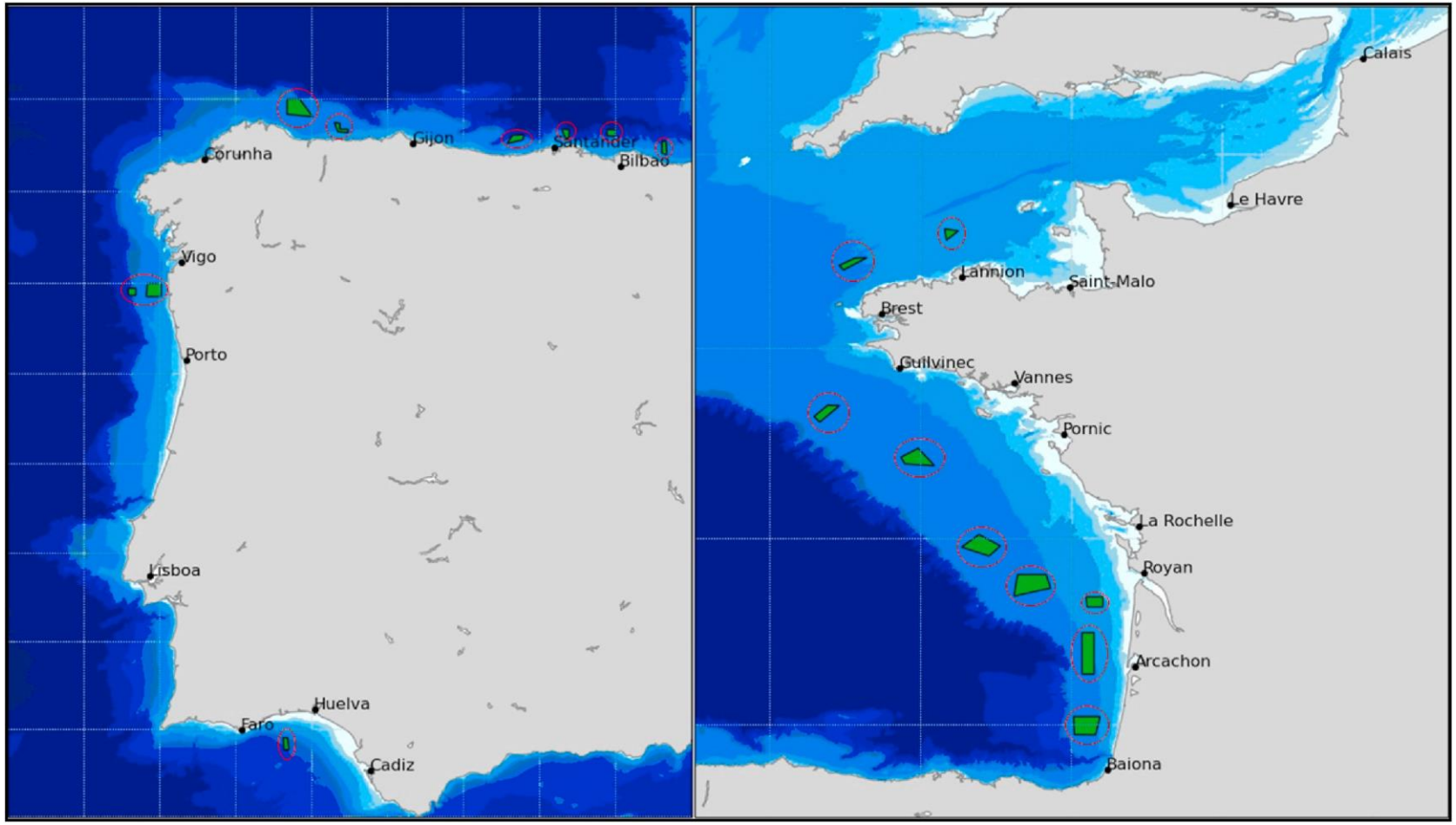
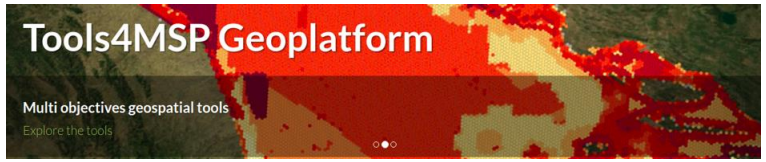
European Commission
Co-funded by the Erasmus+ Programme of the European Union

An integrated GIS approach for site selection of floating offshore wind farms in the Atlantic continental European coastline



ArcGIS 10
SDSS layout

Díaz & Guedes, 2020[13]



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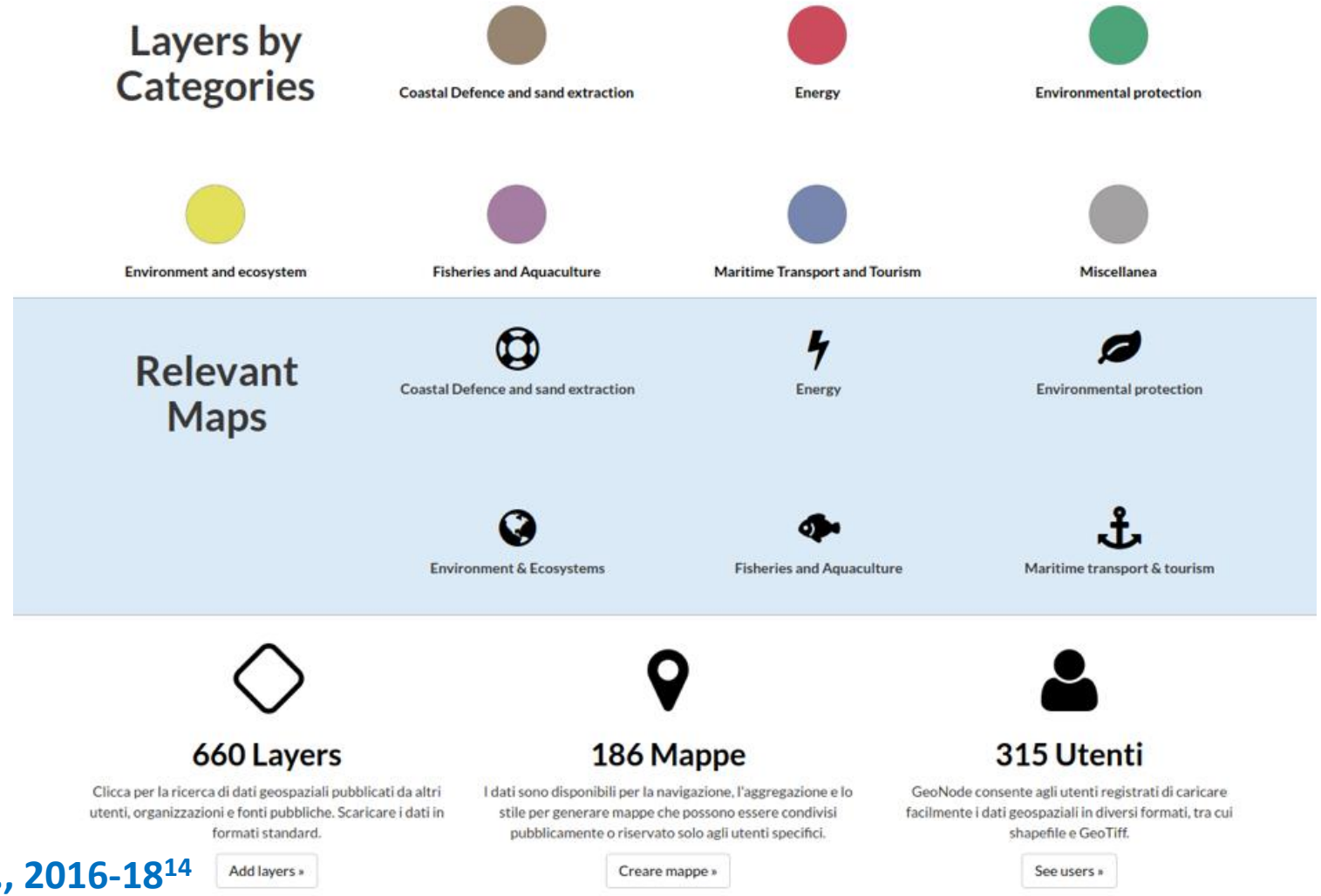
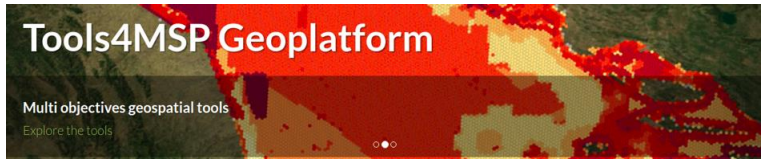
Tools4MSP Geoplatform



WMS

Menegon *et al.*, 2016-18[14]



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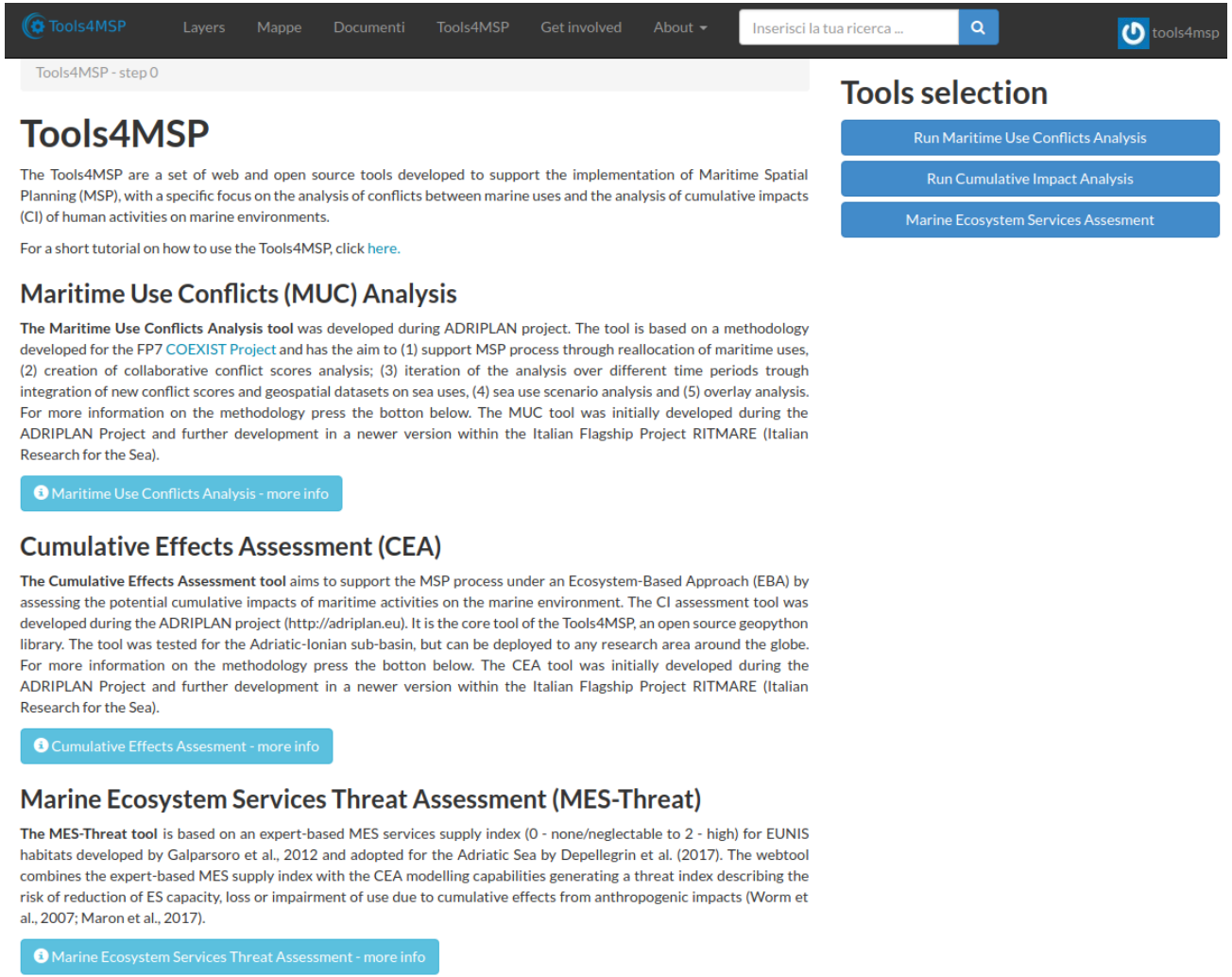
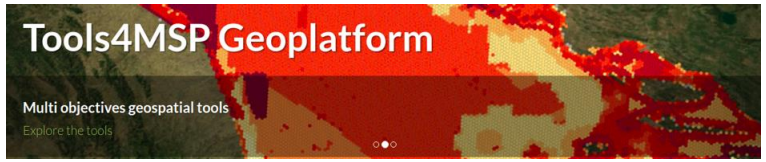
Tools4MSP Geoplatform



Scripts

Tools4MSP platform[14]



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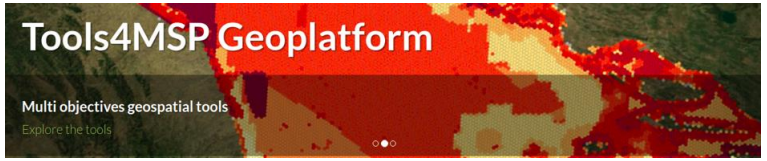
Tools4MSP Geoplatform

Tools4MSP: webtools workflow

Step 0: tool selection	CEA: Cumulative Effects Assessment MUC: Maritime Use Conflict MES-Threat: Marine Ecosystem Services Threat Analysis
Step 1: case study selection	Case study: a pre-configured, complete and consistent set of input data. Spatial domain, time reference, resolution.
Step 2: configuration	Dataset configuration: select uses, environmental components and pressures. Study area selection
Step 3: results	Geospatial results: automatic republishing Statistical outputs

Workflow



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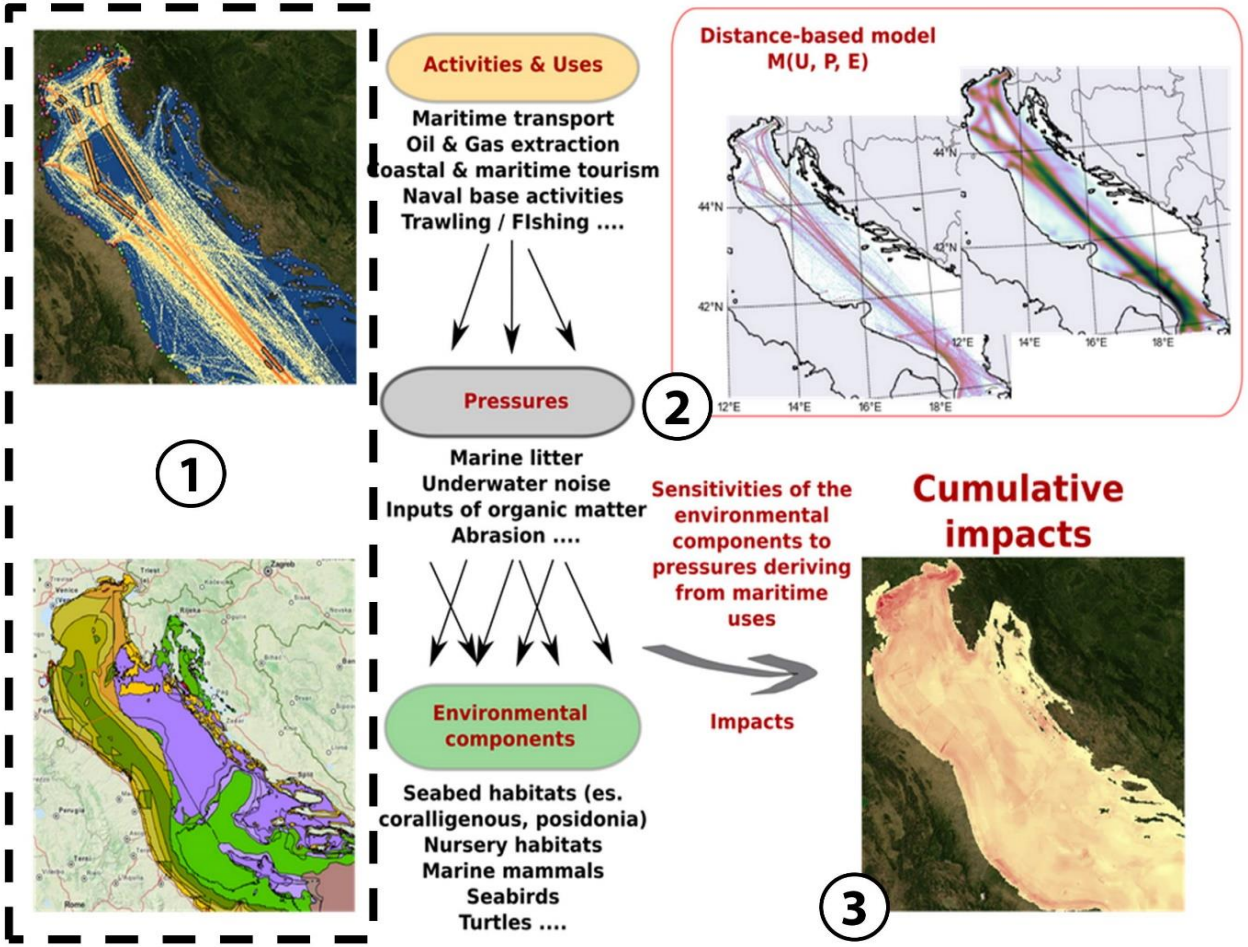
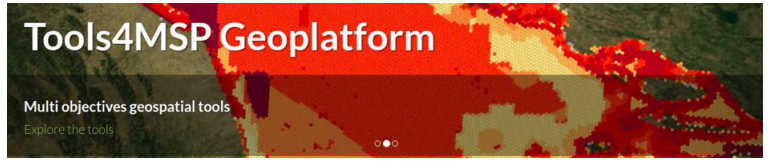
Tools4MSP Geoplatform



Cumulative Effects Assesment



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Tools4MSP Geoplatform

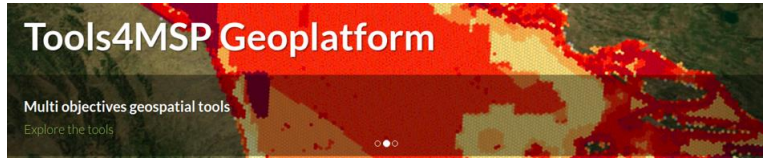
Tools4MSP / Step1

Step 1: Case Study selection

In step 1 you can select a predefined set of input data that you can use for your geospatial analyses. The Case Study areas can be differentiated by region (e.g. Adriatic Ionian Region - AIR), resolution and temporal scenario (e.g. 2014, 2020).

Case Study	Description	Additional info
CI - AIR assessment 2014 LR ci	Low resolution (10km) Adriatic Ionian Region Cumulative Impact Assesment 2014	Resolution: 10000.0 m
CI - AIR assessment 2014 ci	Run to be prepared for the paper on Cumulative Impacts. Based AIM - 2014	Resolution: 1000.0 m
RER_CI ci	High resolution dataset for the Emilia-Romagna region suitable for COEXIST analysis - 2014	Resolution: 500.0 m

Cumulative Effects Assesment



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Tools4MSP Geoplatform

Tools4MSP / Step1 / Step2

Step 2: Case Study Setup

a) Configure the list of "Activities and uses" and "Environmental Components" to be included in your case study. (NOTE: By default the case study runs with all Activities/Uses and Environmental Components).

b) Select the area of interest for your scenario analysis on the map interface: click with your mouse to define the vertices of the polygon and double click to confirm.

c) Press RUN ANALYSIS.

Activities & Uses
Available: 15 - Selected: 15
Configure

Environmental Components
Available: 36 - Selected: 36
Configure

Configuration

Input Dataset
Case Study: CI - AIR assessment 2014 LR
Type: EEA Reference Grid
Reference System: ETRS89 / LAEA Europe EPSG: 3035
Resolution: 10000.0 m
Area: 297764.2 km^2

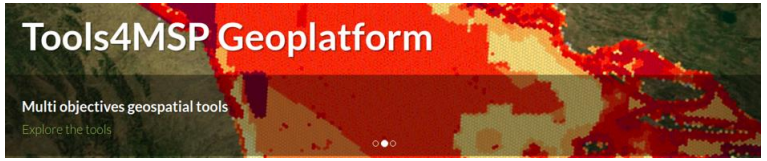
Analysis Area
By default the analyses will be performed for the whole input grid.

The user can draw a new area of analysis (polygon) on the map.

Run Analysis

Tools4MSP platform[14]

Cumulative Effects Assesment



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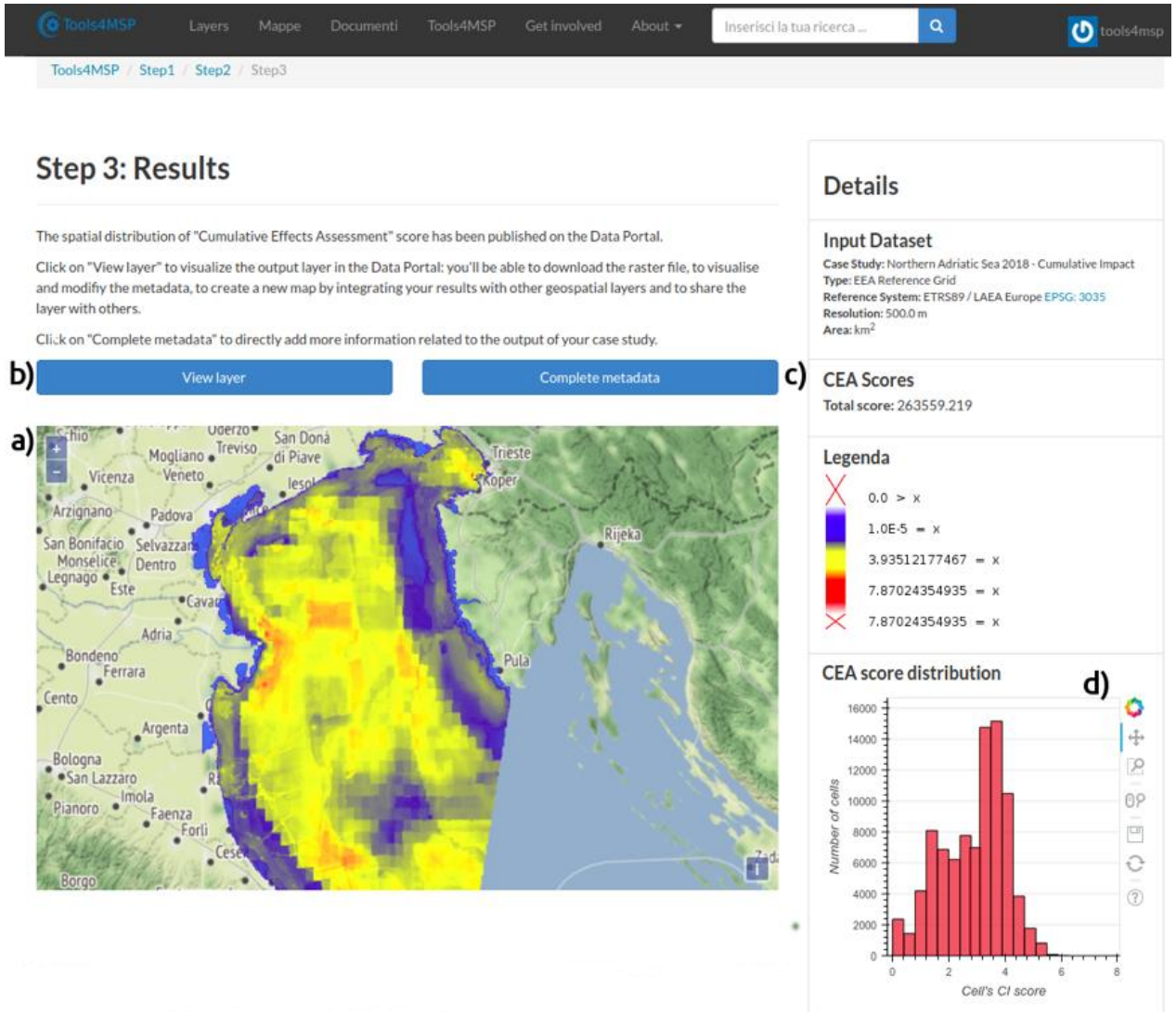
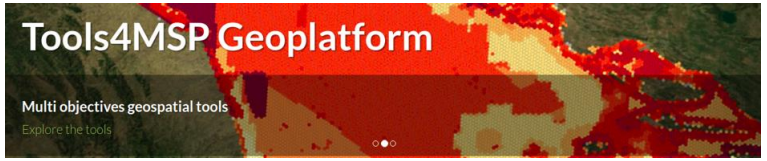
Tools4MSP Geoplatform



Cumulative Effects Assesment



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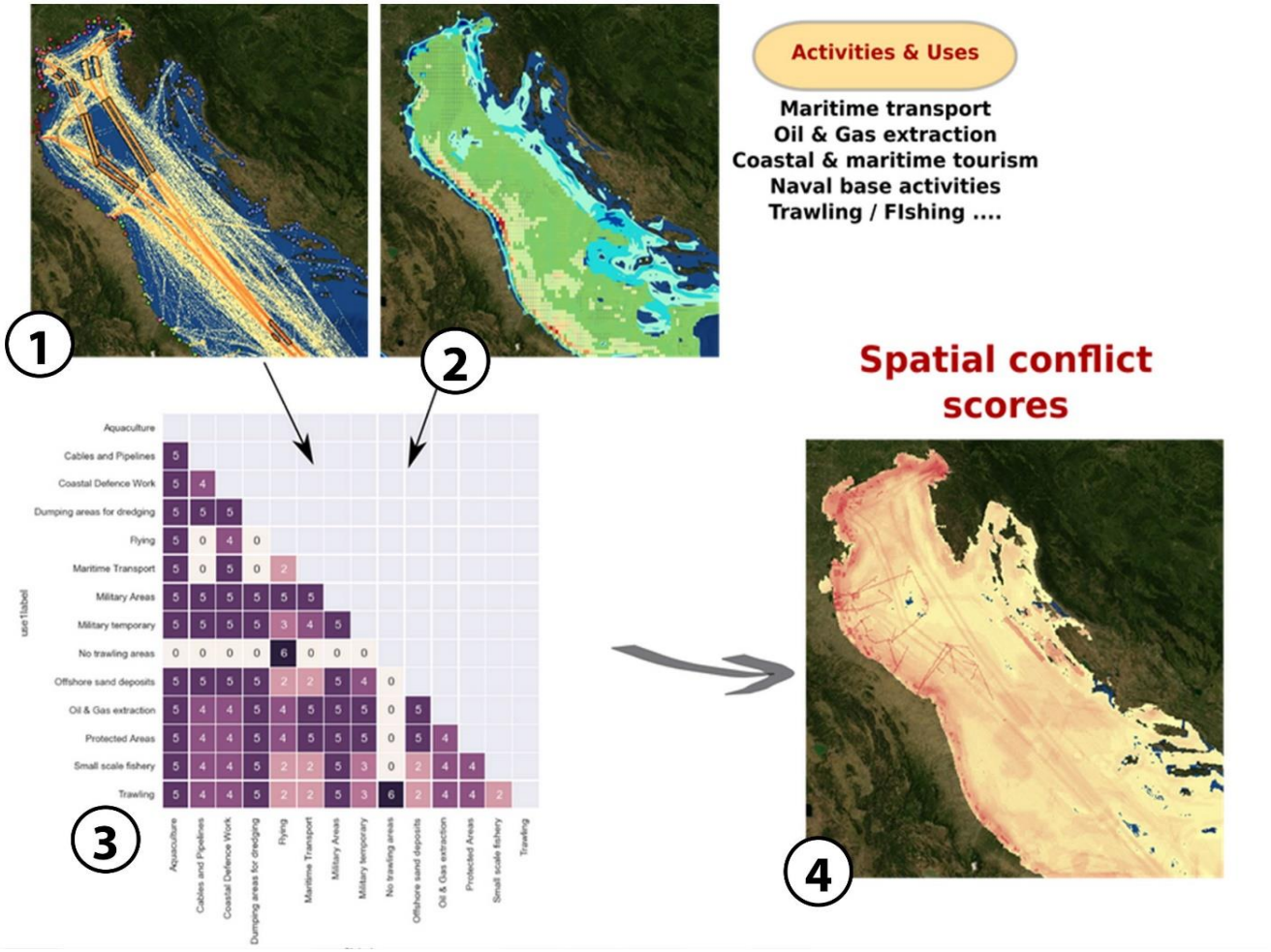
Tools4MSP Geoplatform



Maritime Use Conflicts (MUC) Analysis

Interreg Mediterranean PHAROS4MPAs

Decision Support Tool for Blue Economy in Marine Protected Areas

Co-funded by the Erasmus+ Programme of the European Union

DST-MPA platform

Start DST-MPA

Recommendations for sustainable Blue Economy in Mediterranean Marine Protected Areas

Welcome to the Decision Support Tool for Blue Economy in Marine Protected Areas (DST-MPA)

The tool has been developed by CNR ISMAR within the **Interreg MED PHAROS4MPAs** project.

The main objectives of the tool is to support the operationalization of the recommendations produced within the project, translating the knowledge from the capitalization baselines reports into a fully user-friendly online tool.

The tool is specifically intended for three kind of users: MPA managers and planners, public authorities and economic operators, to help them to easily find the recommendations and other information (e.g. best practices or case studies) that are more useful for their specific needs.

PHAROS4MPAs' core partners

PHAROS4MPAs' associated partners

Interreg Mediterranean PHAROS4MPAs

SDSS for Blue Economy in MPAs

European MSP Platform

European Commission

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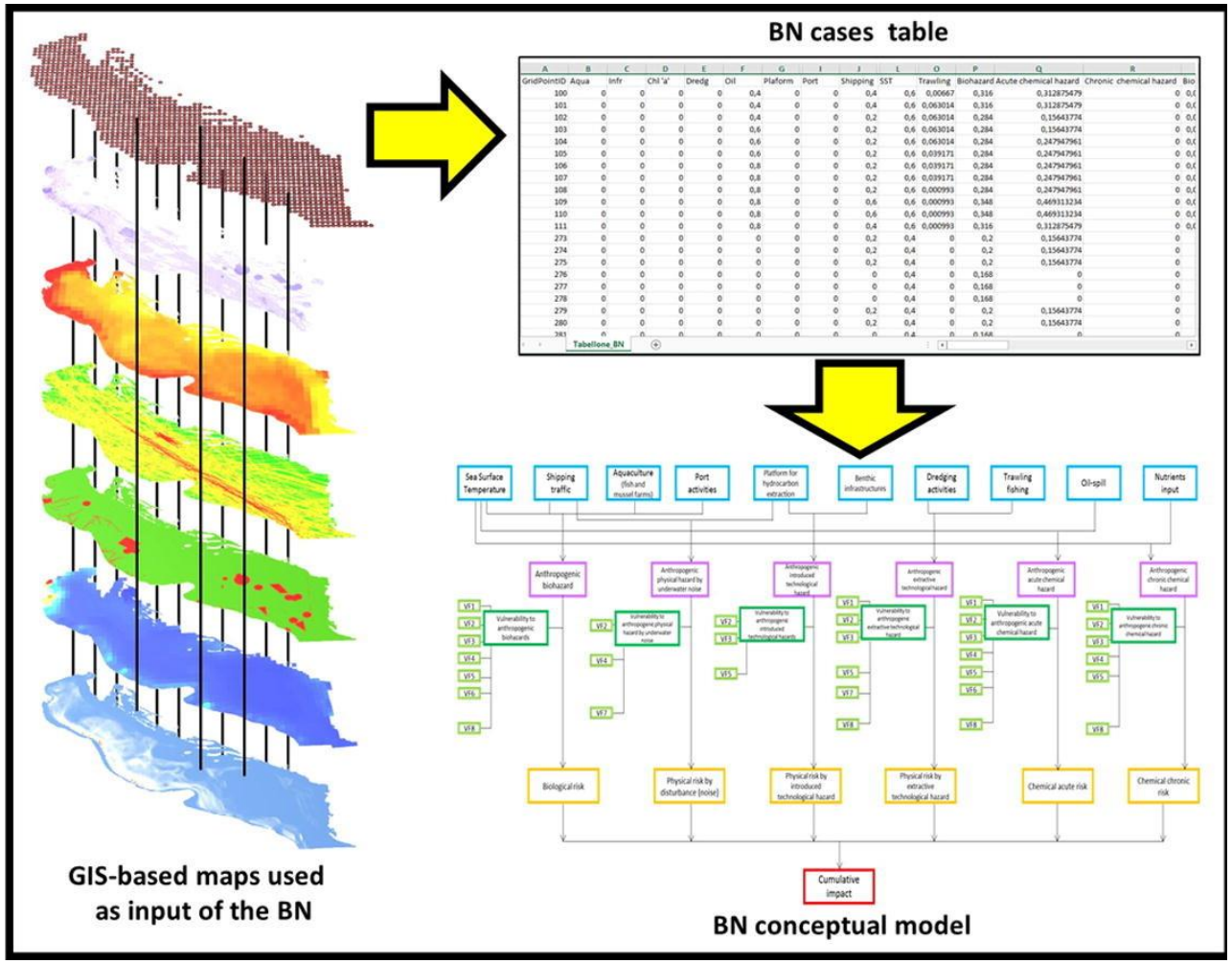
Multi-scenario analysis in the Adriatic Sea: A GIS-based Bayesian network to support maritime spatial planning



Graphical abstract

Furlan *et al.*, 2020[8]

European MSP Platform

European Commission

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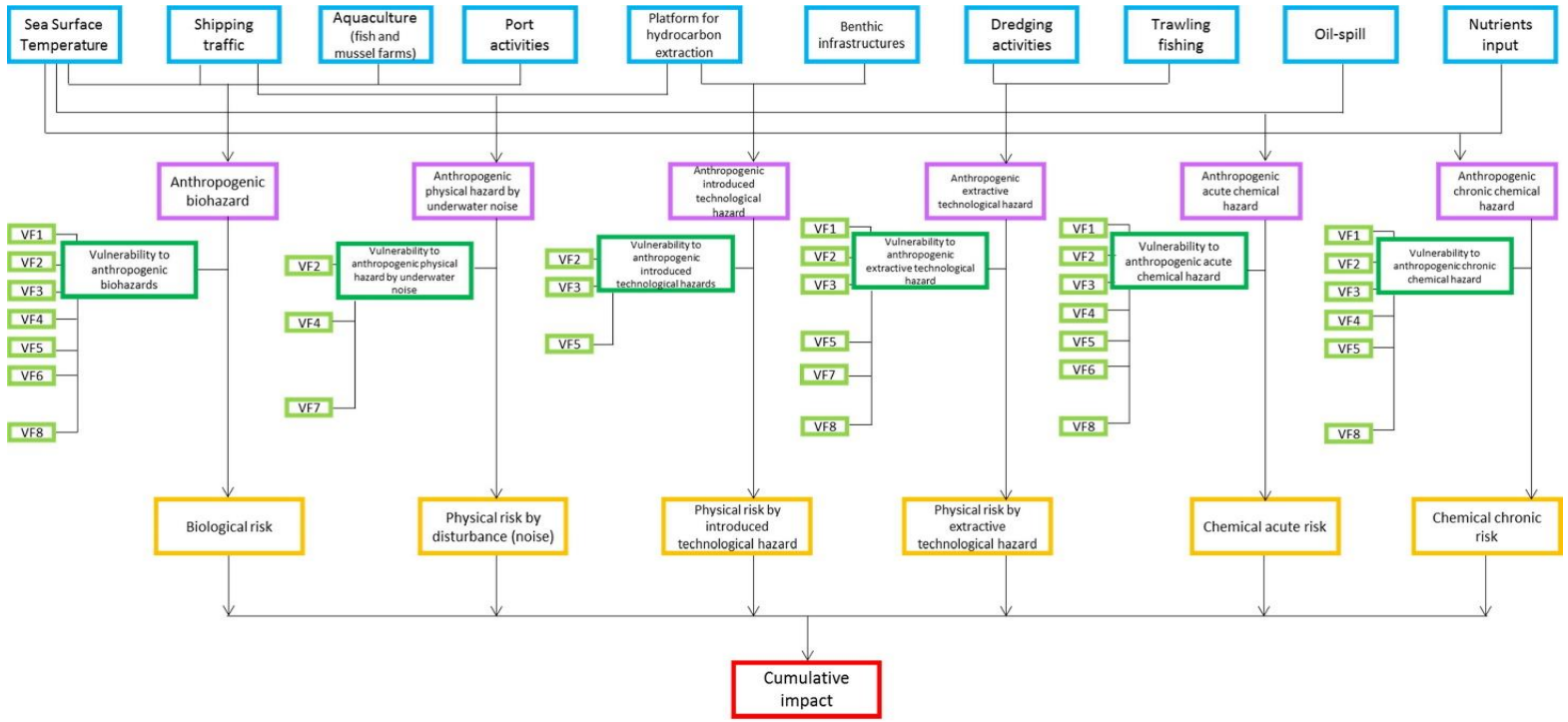
Multi-scenario analysis in the Adriatic Sea: A GIS-based Bayesian network to support maritime spatial planning



Bayesian network conceptual model

Furlan *et al.*, 2020[8]

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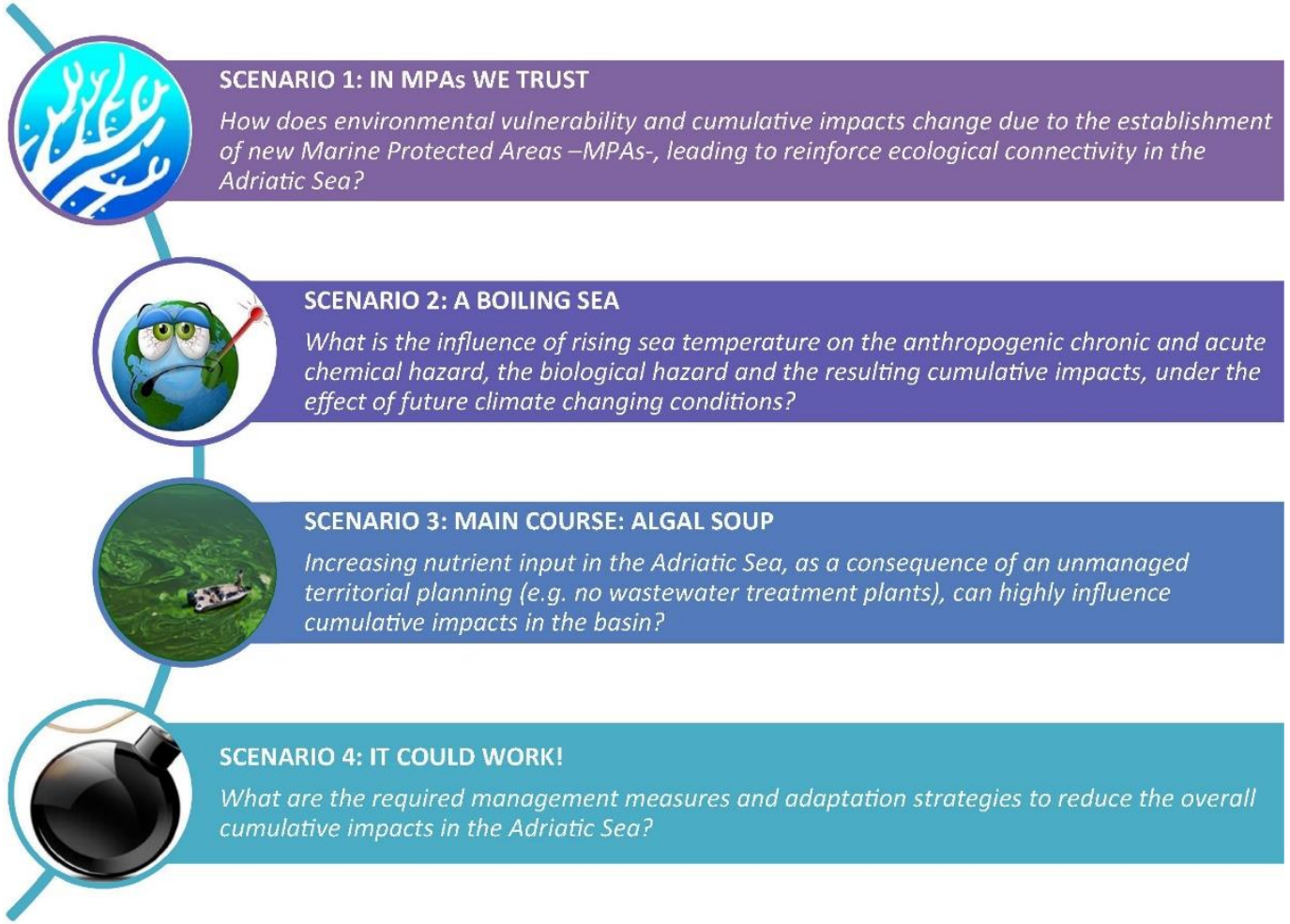

What if… scenarios

Furlan *et al.*, 2020[8]

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- Menegon, S., Depellegrin, D., Farella, G., Sarretta, A., Venier, C., Barbanti, A., 2018. Addressing cumulative effects, maritime conflicts and ecosystem services threats through MSP-oriented geospatial webtools. Ocean & Coastal Management 163, 417–436. https://doi.org/10.1016/j.ocecoaman.2018.07.009
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- Depellegrin, D., Menegon, S., Farella, G., Ghezzo, M., Gissi, E., Sarretta, A., Venier, C., Barbanti, A., 2017. Multi-objective spatial tools to inform maritime spatial planning in the Adriatic Sea. Science of The Total Environment 609, 1627–1639. https://doi.org/10.1016/j.scitotenv.2017.07.264

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Open source software
Open Geospatial Consortium (OGC, 1994)

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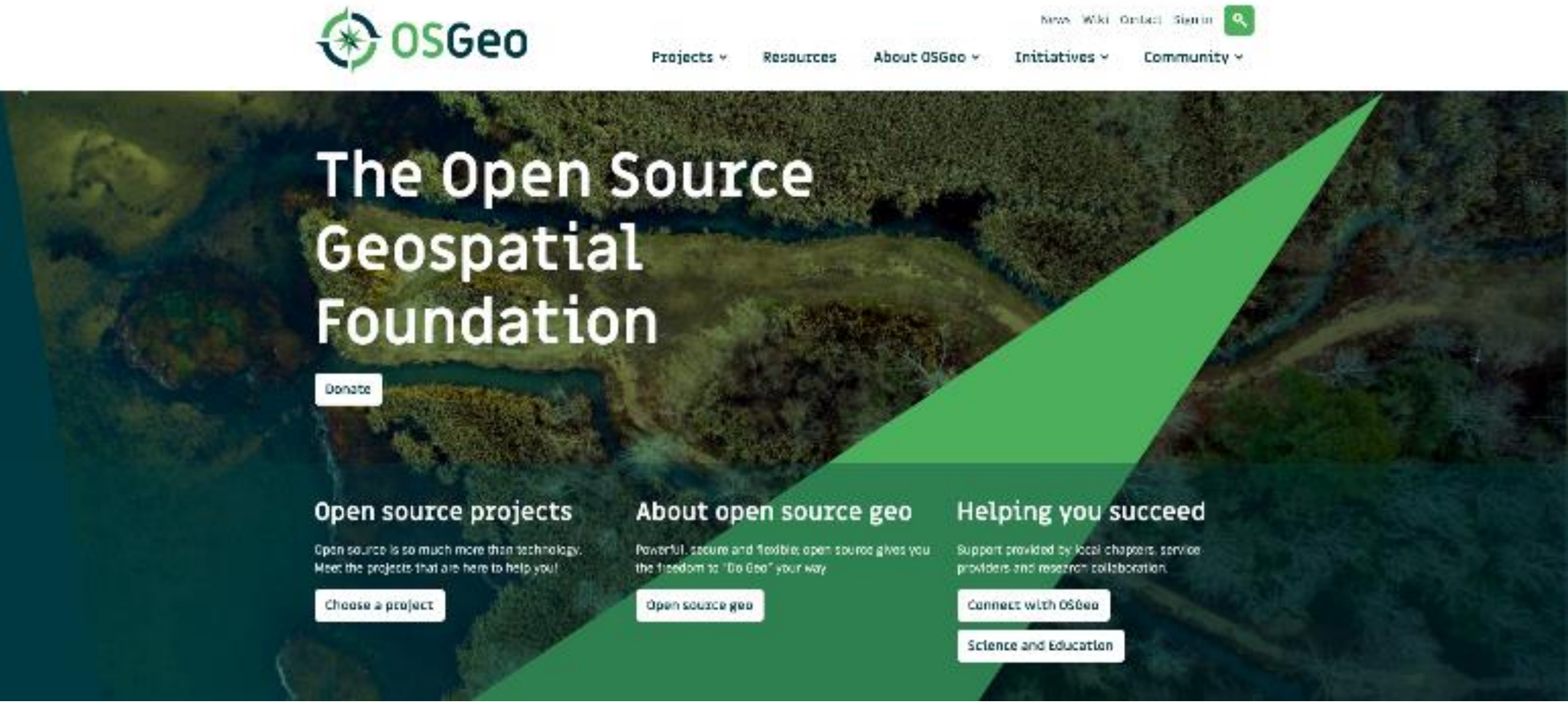

OGC
Making location count.

Menu

OGC Standards and Resources

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Made by our Member Community for use by the Global Community

Standards	Registries	Best Practices	Community Practices

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GRASS GIS, commonly referred to as GRASS (Geographic Resources Analysis Support System), is a **free** and open source Geographic Information System (GIS) software suite used for geospatial data management and analysis, image processing, graphics and maps production, spatial modeling, and visualization.

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Open source software
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Download QGIS for your platform

Binary packages (installers) are available from this page.

The current version is QGIS 3.24.3 'Tisler' and was released on 13.05.2022.

The long-term repositories currently offer QGIS 3.22.7 'Białowieża'.

QGIS is available on Windows, macOS, Linux and Android.

We are currently in feature freeze preceeding the release of QGIS 3.26. **Please consider testing the prereleases**. See road map.

INSTALLATION DOWNLOADS | ALL RELEASES | SOURCES

QGIS is open source software available under the terms of the **GNU General Public License** meaning that its source code can be downloaded through tarballs or the git repository.

QGIS Source Code is available here (latest release) and here (long term release)

Refer to the INSTALL guide on how to compile QGIS from source for the different platforms: here

Note that you can also install the development version (nightly) via an installer from the normal downloads for your platform: here

Plugins for QGIS are also available here.

Open source GIS software
QGIS

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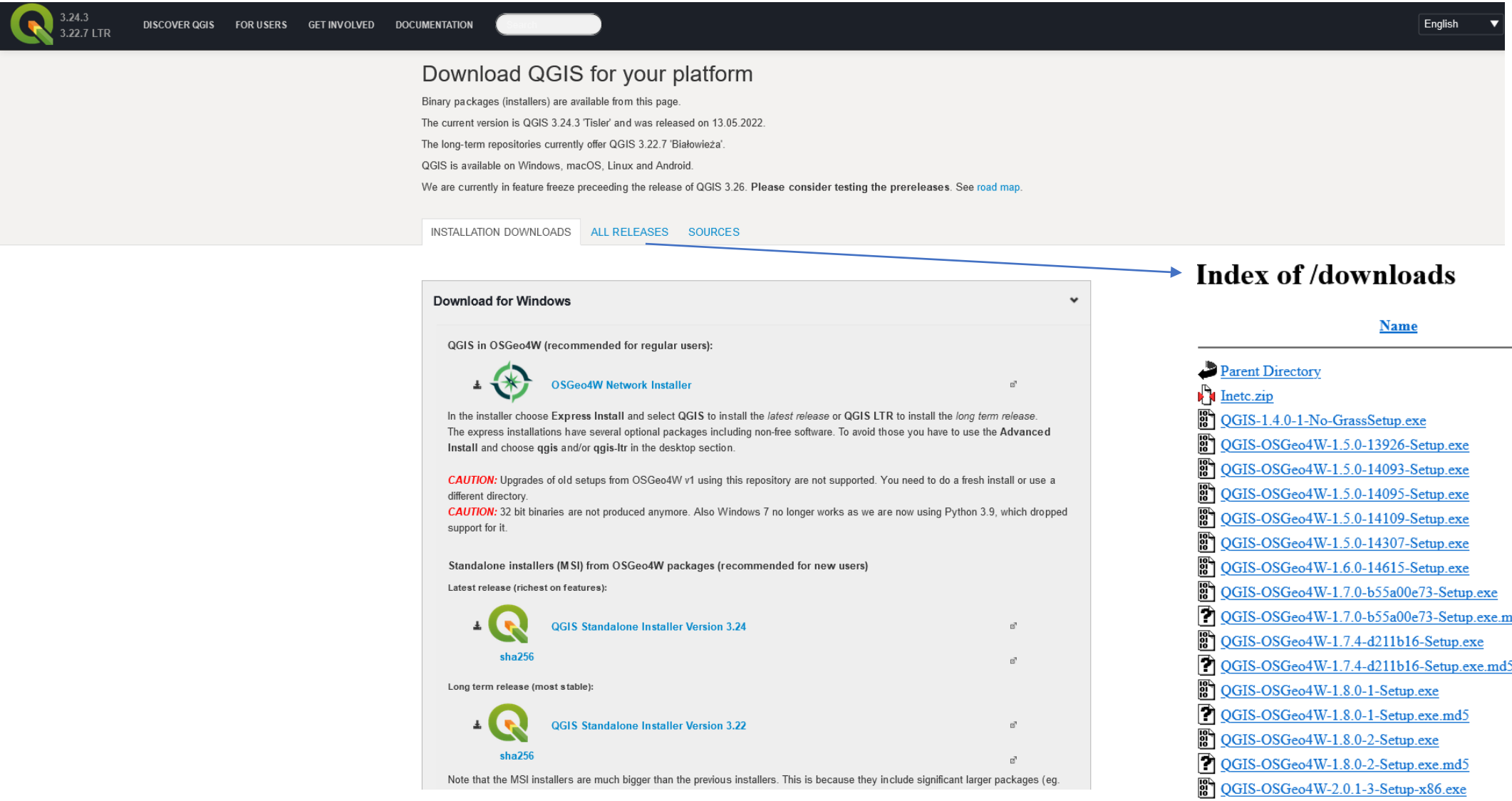

Index of /downloads

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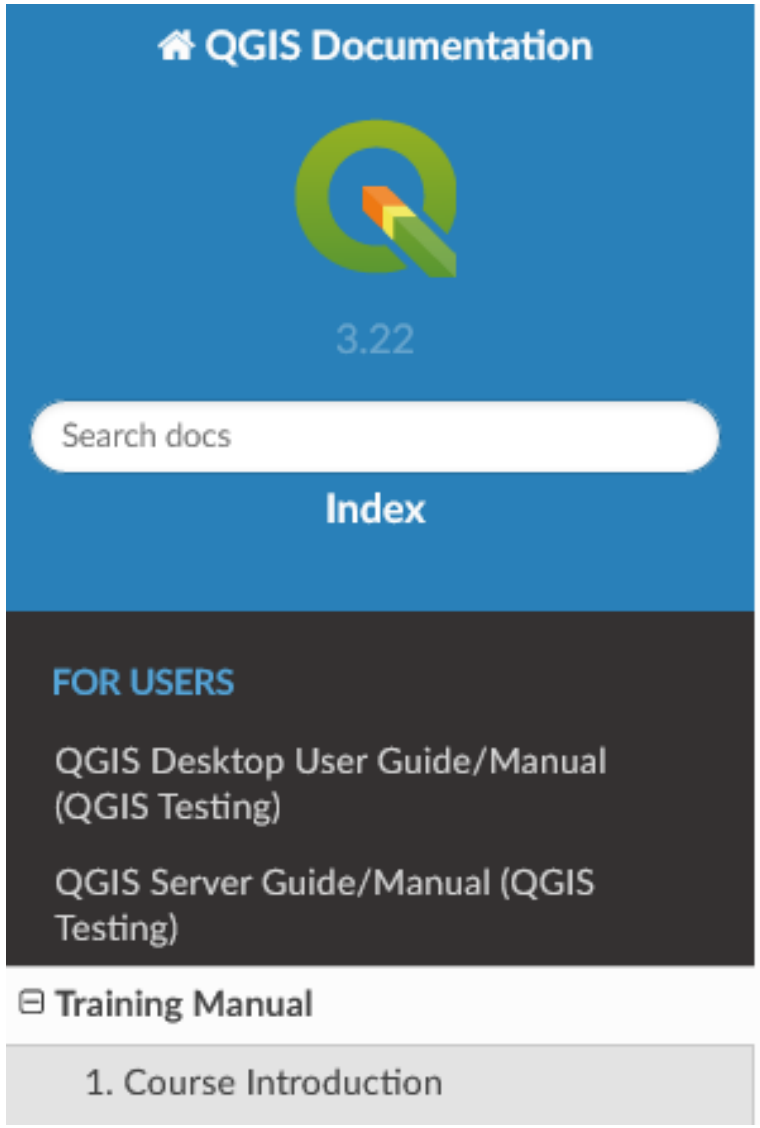

GIS analysis and data mining

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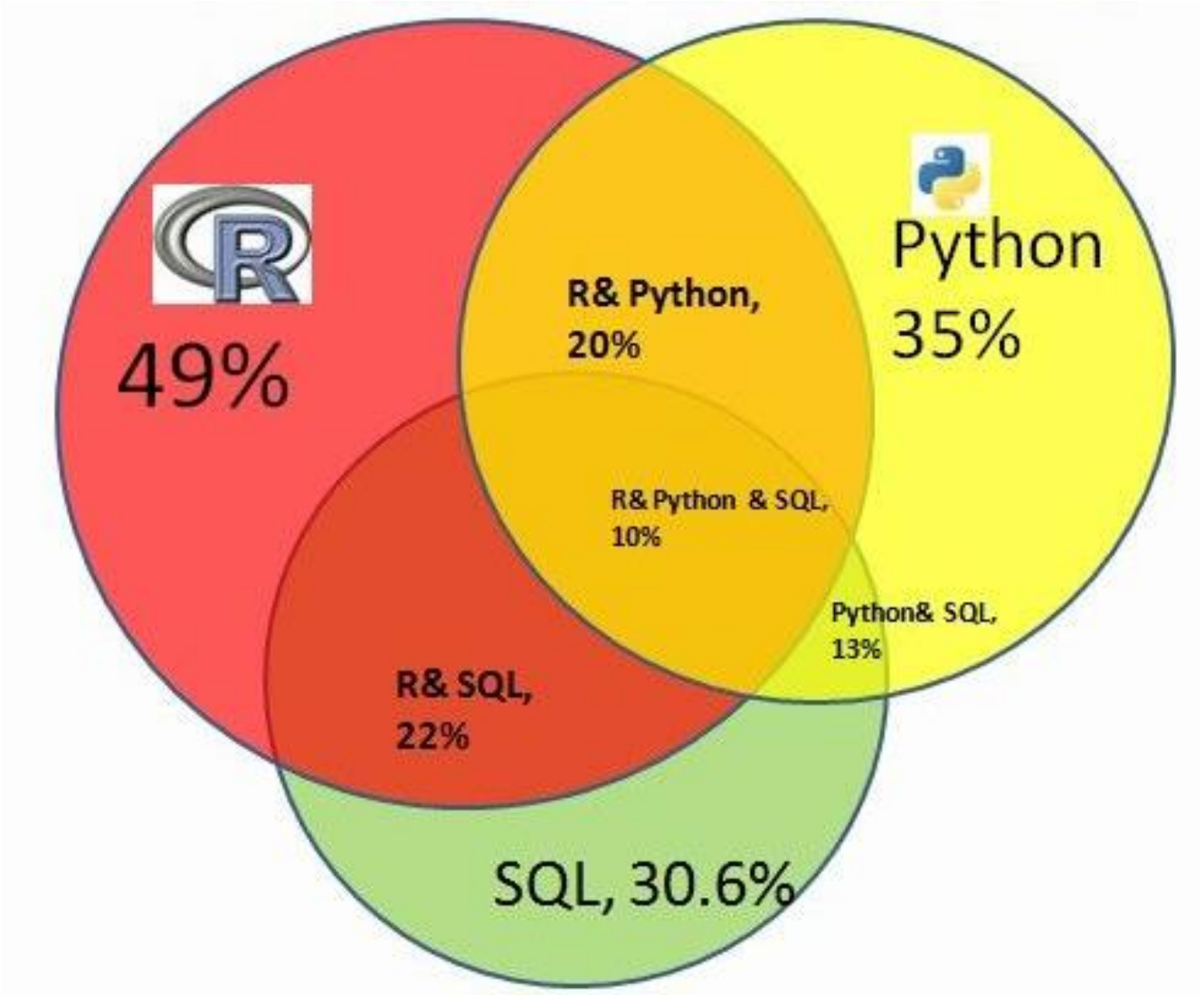

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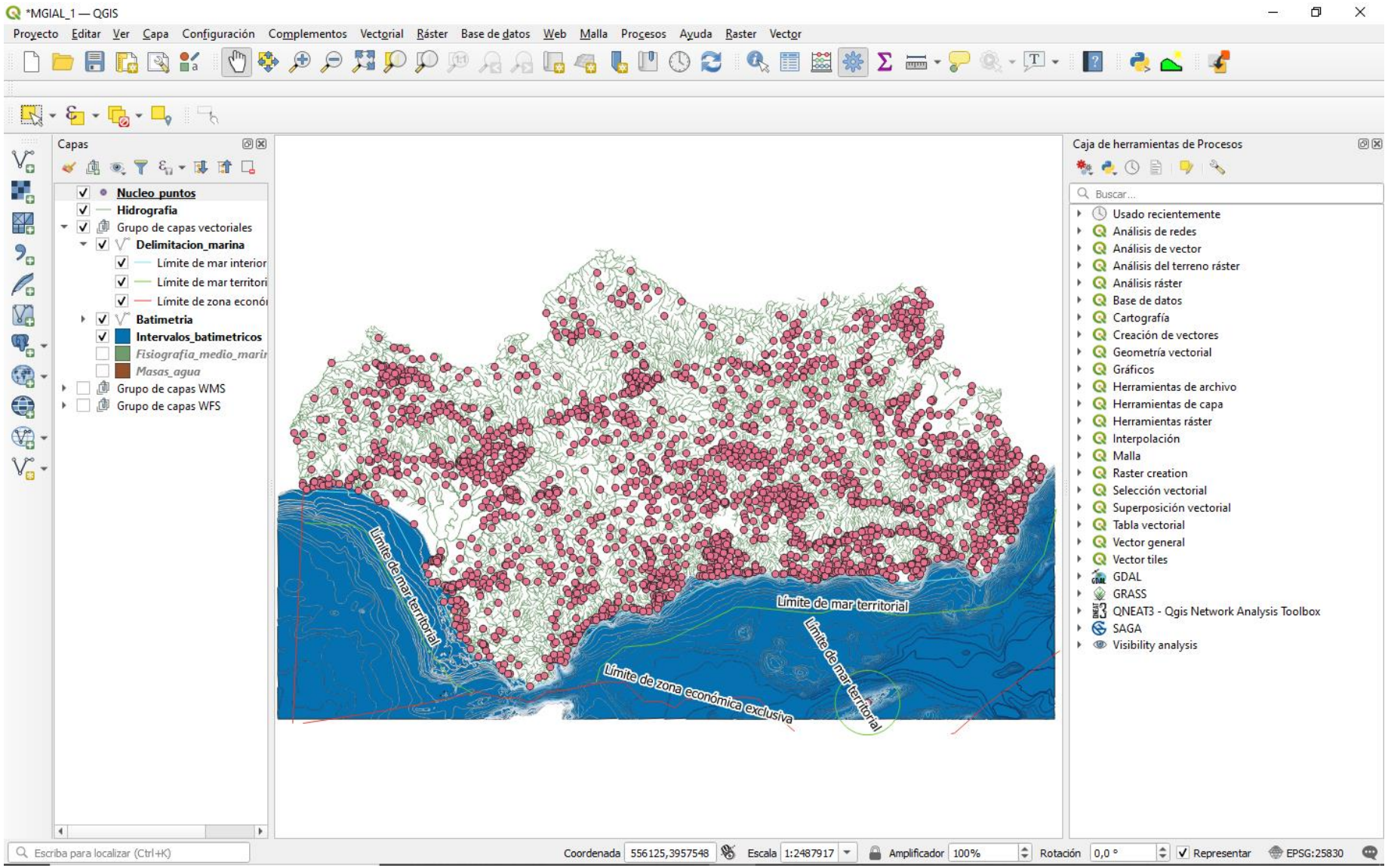

QGIS 2
WMS, WFS

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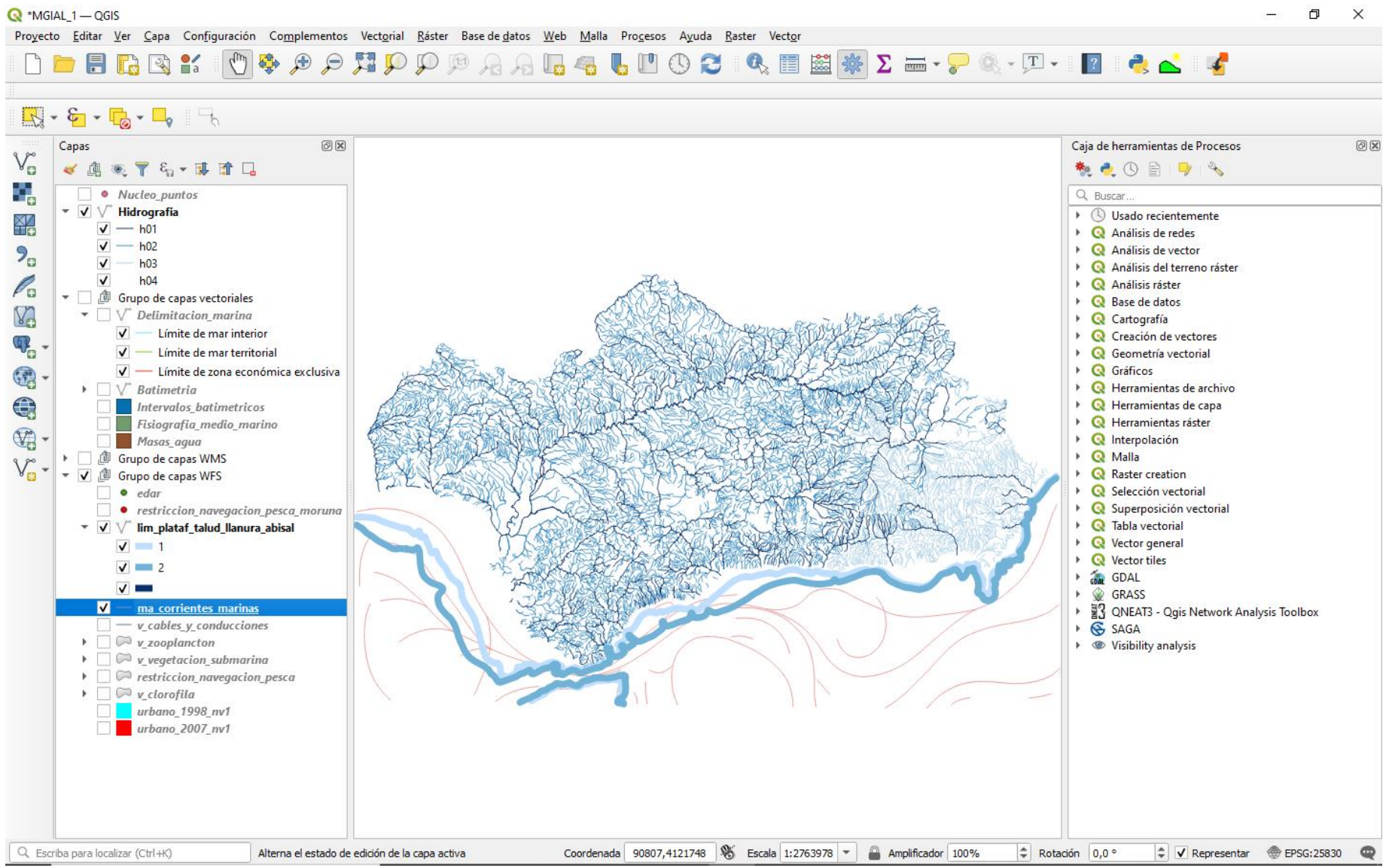

QGIS 2
WMS, WFS

Open source GIS software
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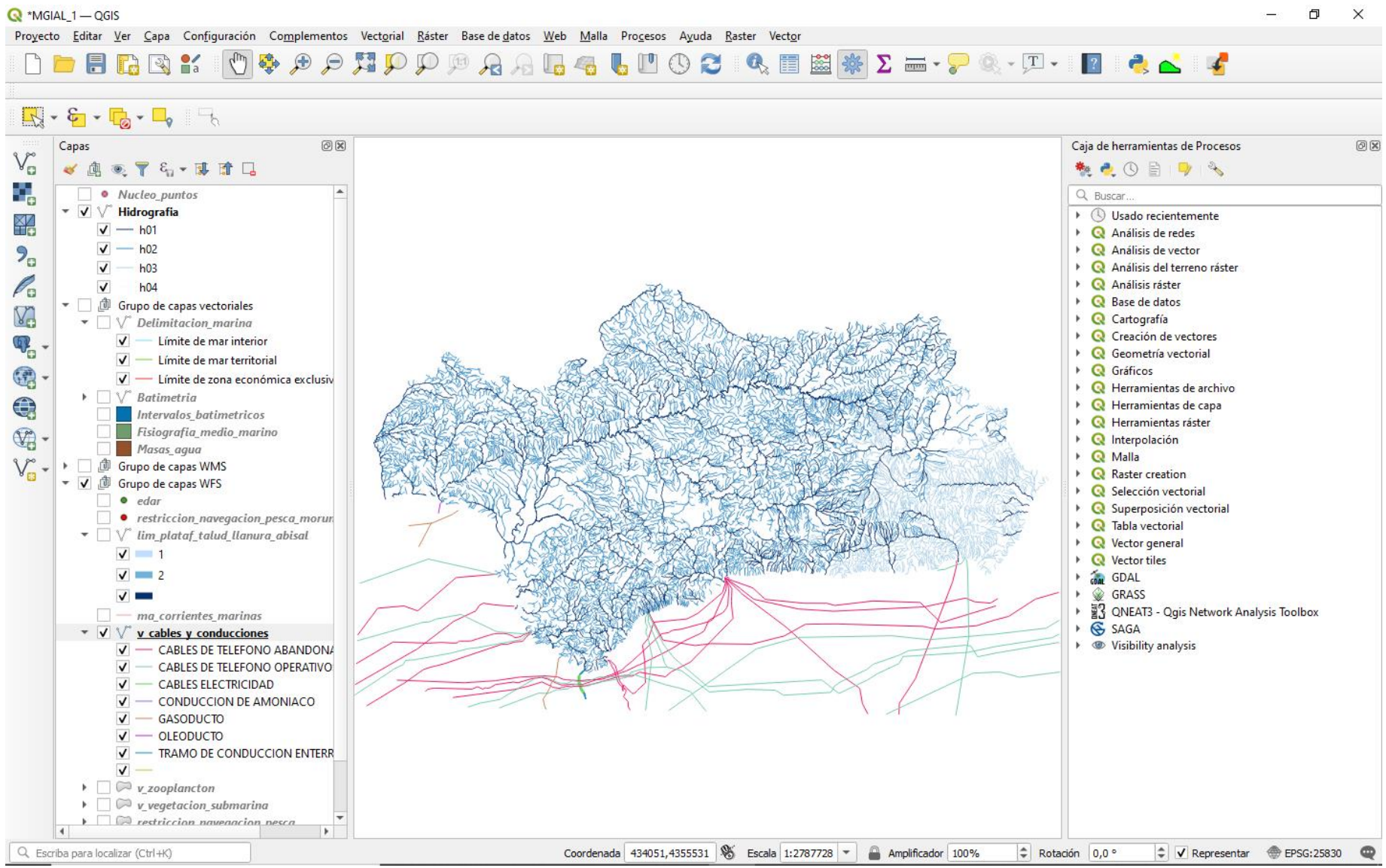

QGIS 2
WMS, WFS

Open source GIS software
QGIS

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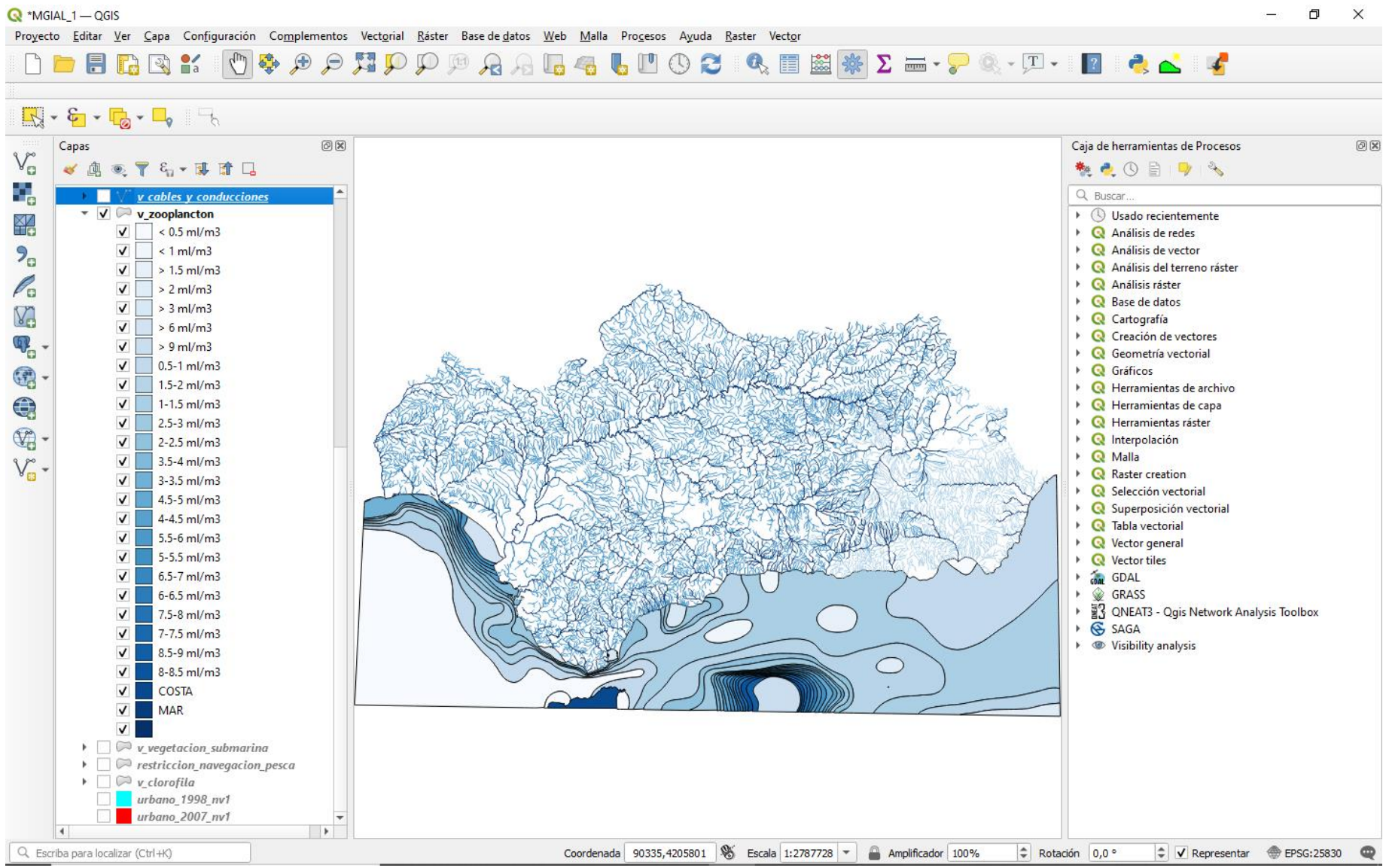

QGIS 2
WMS, WFS

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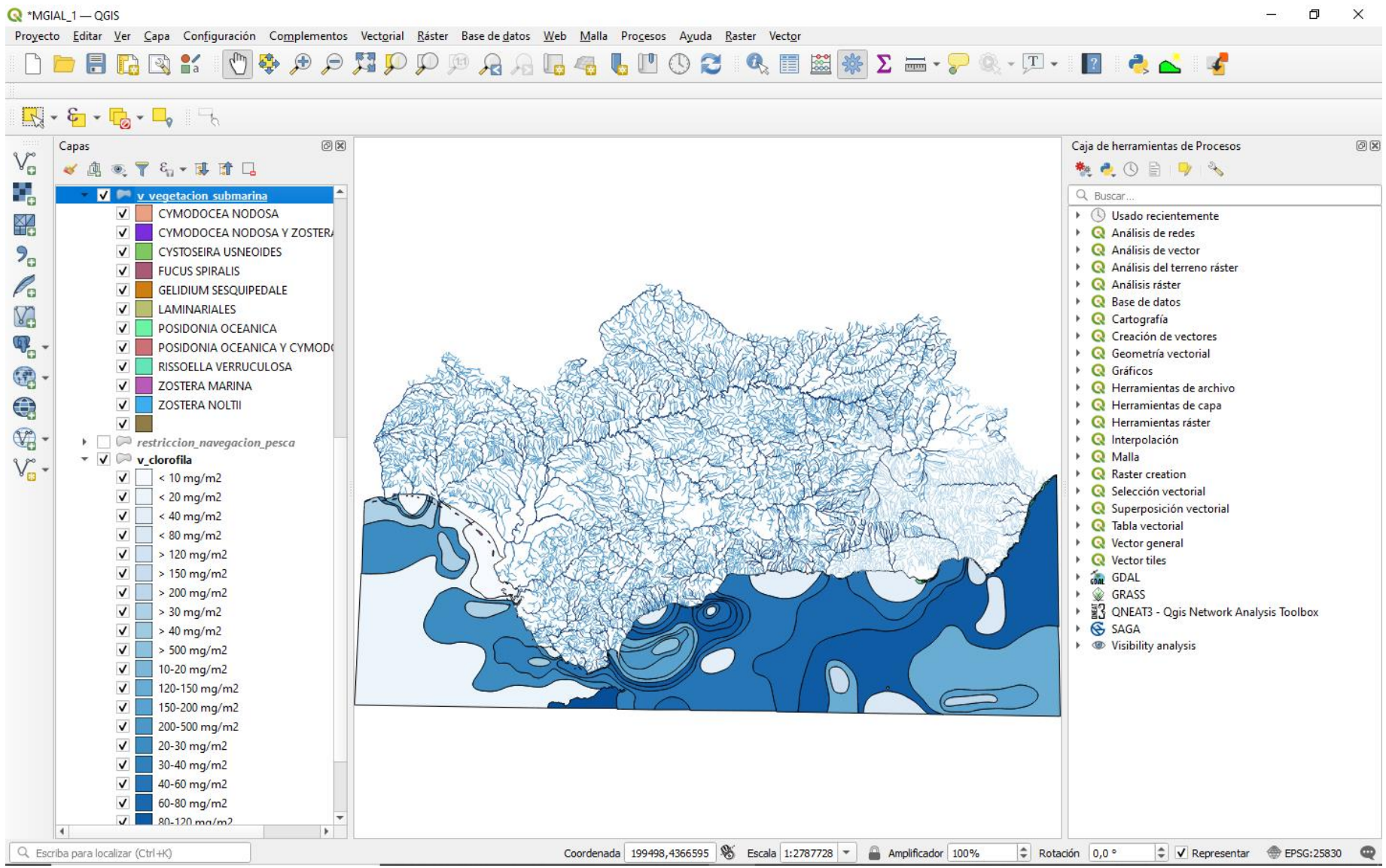

QGIS 2
WMS, WFS

Open source GIS software
QGIS

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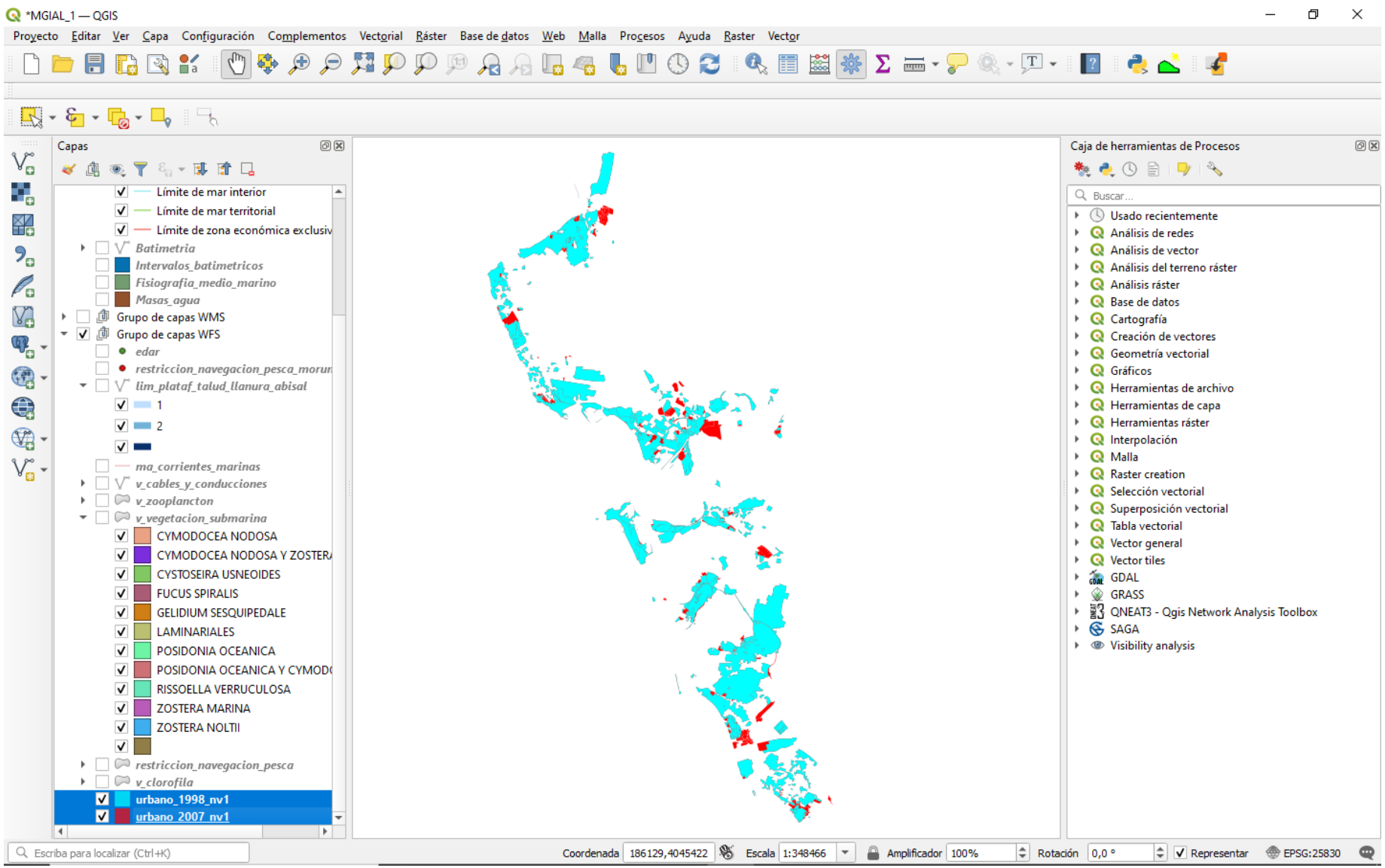

QGIS 2
WMS, WFS

Open source GIS software
QGIS

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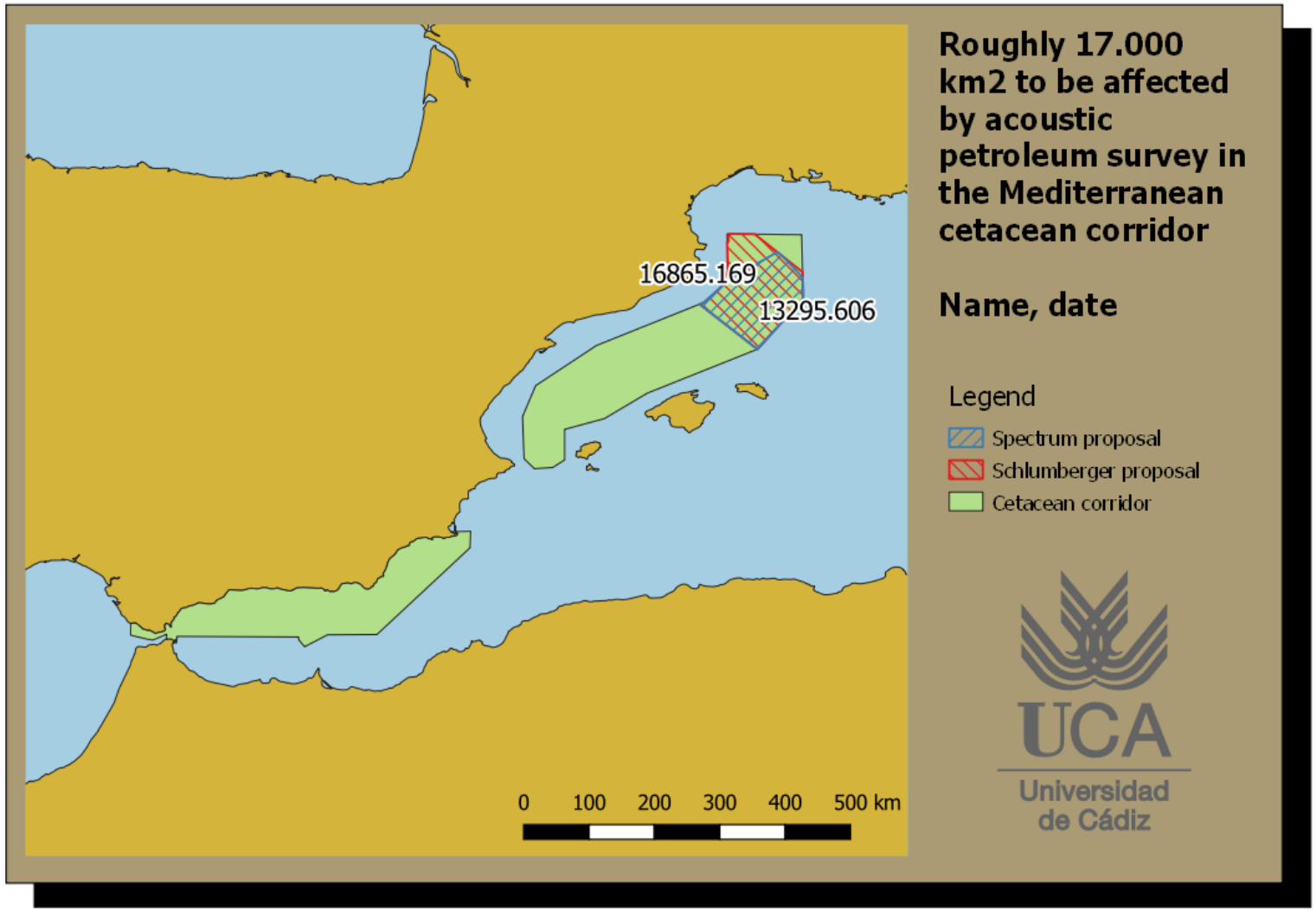

QGIS 3.22

- Georreferencing
- Digitizing
- Geoprocessing

Open source GIS software
QGIS

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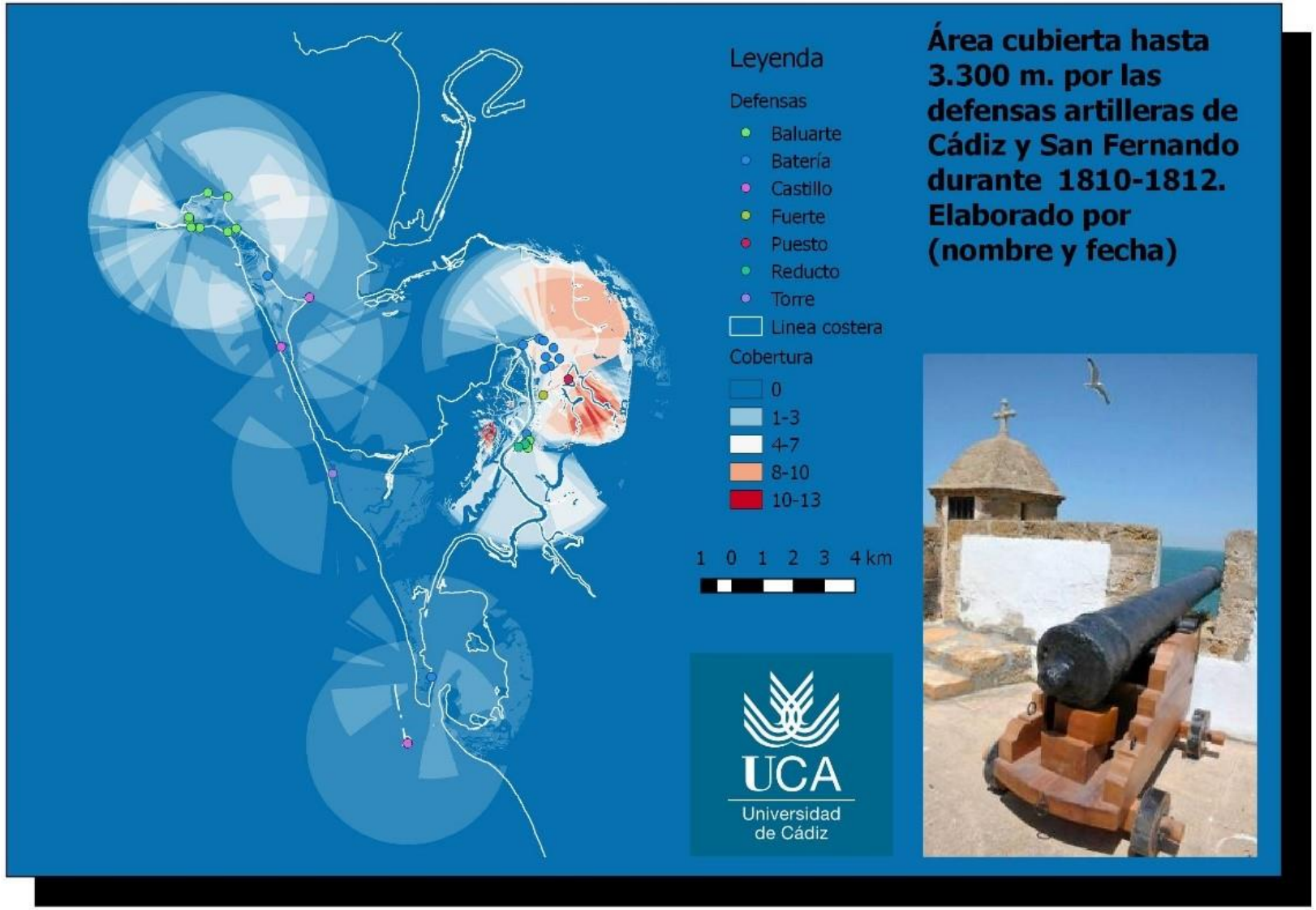

QGIS 3.22

- Georreferencing
- Digitizing
- Geoprocessing
- Rasterizing
- Map algebra
- Viewsheed

Open source GIS software
QGIS

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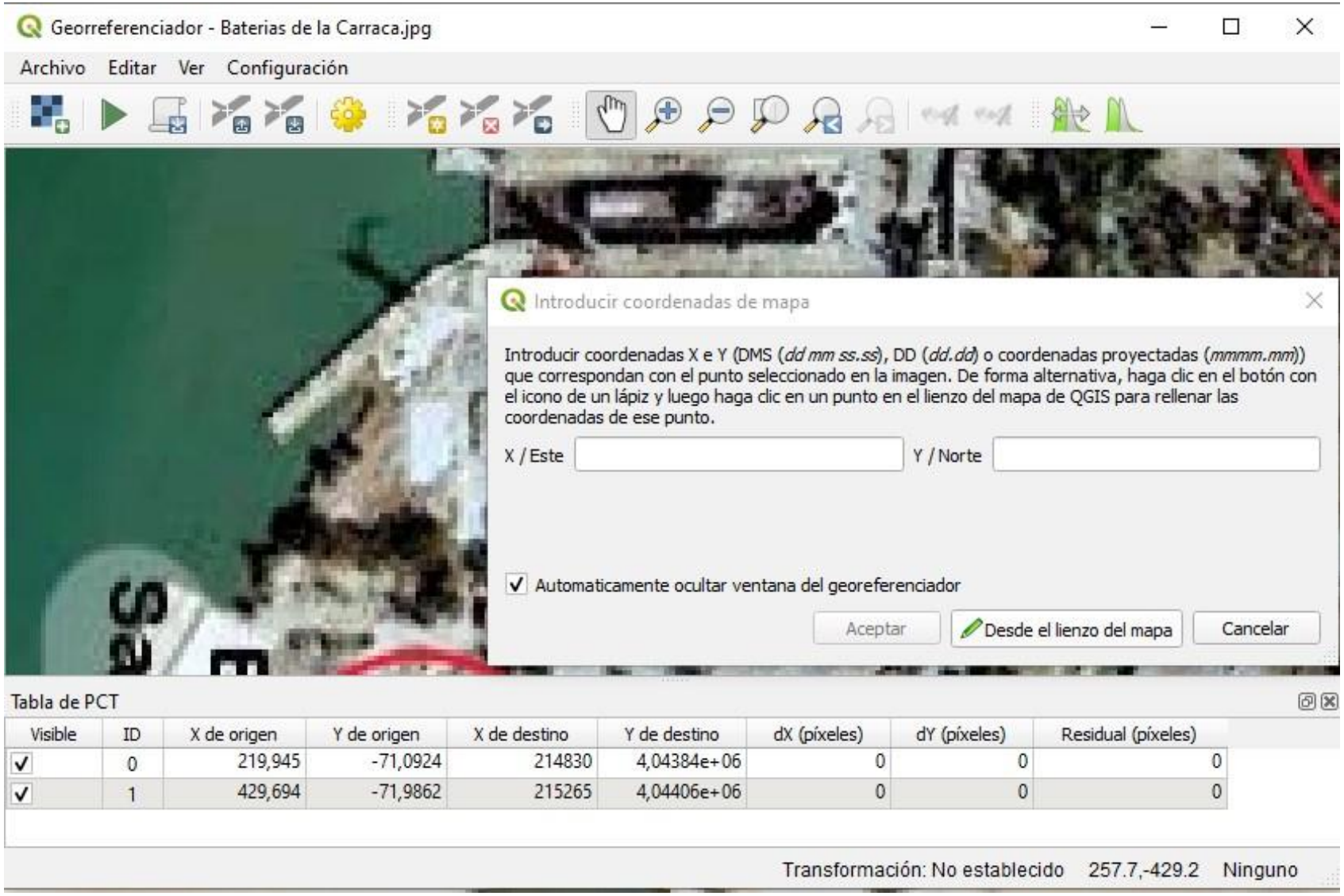

QGIS 3.22
Georreferencing

Open source GIS software
QGIS

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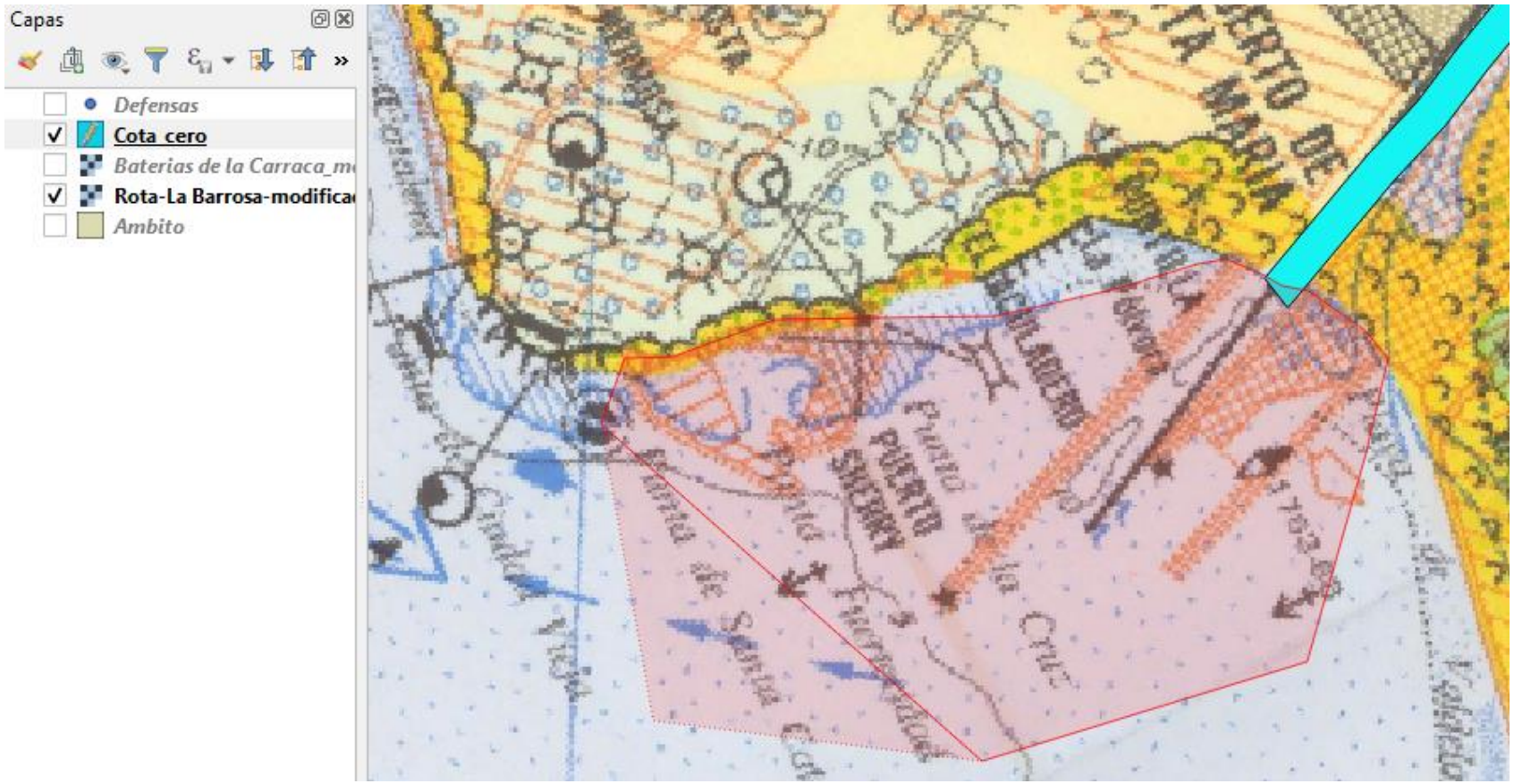

QGIS 3.22
Digitizing

Open source GIS software
QGIS

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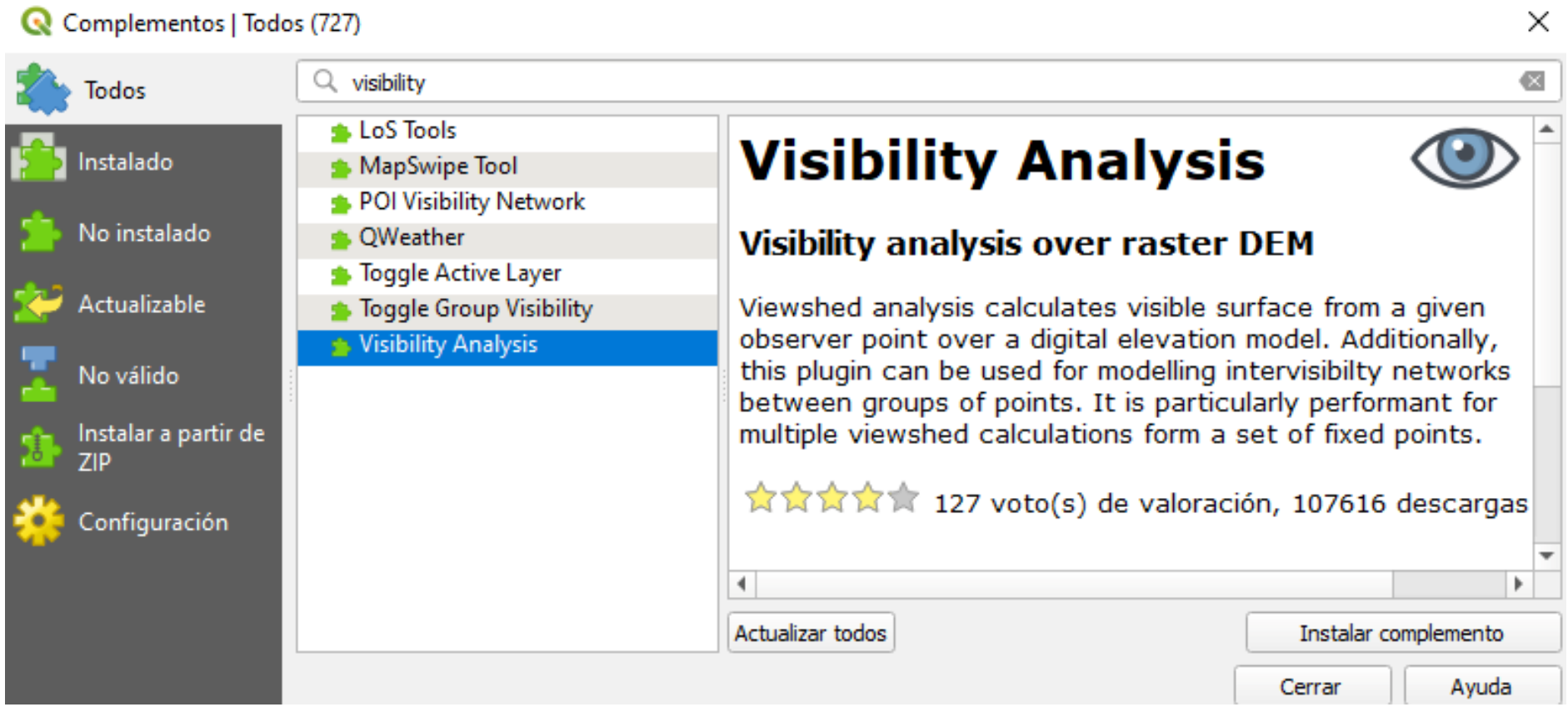

QGIS 3.22 Visibility analysis plug-in

Open source GIS software
QGIS

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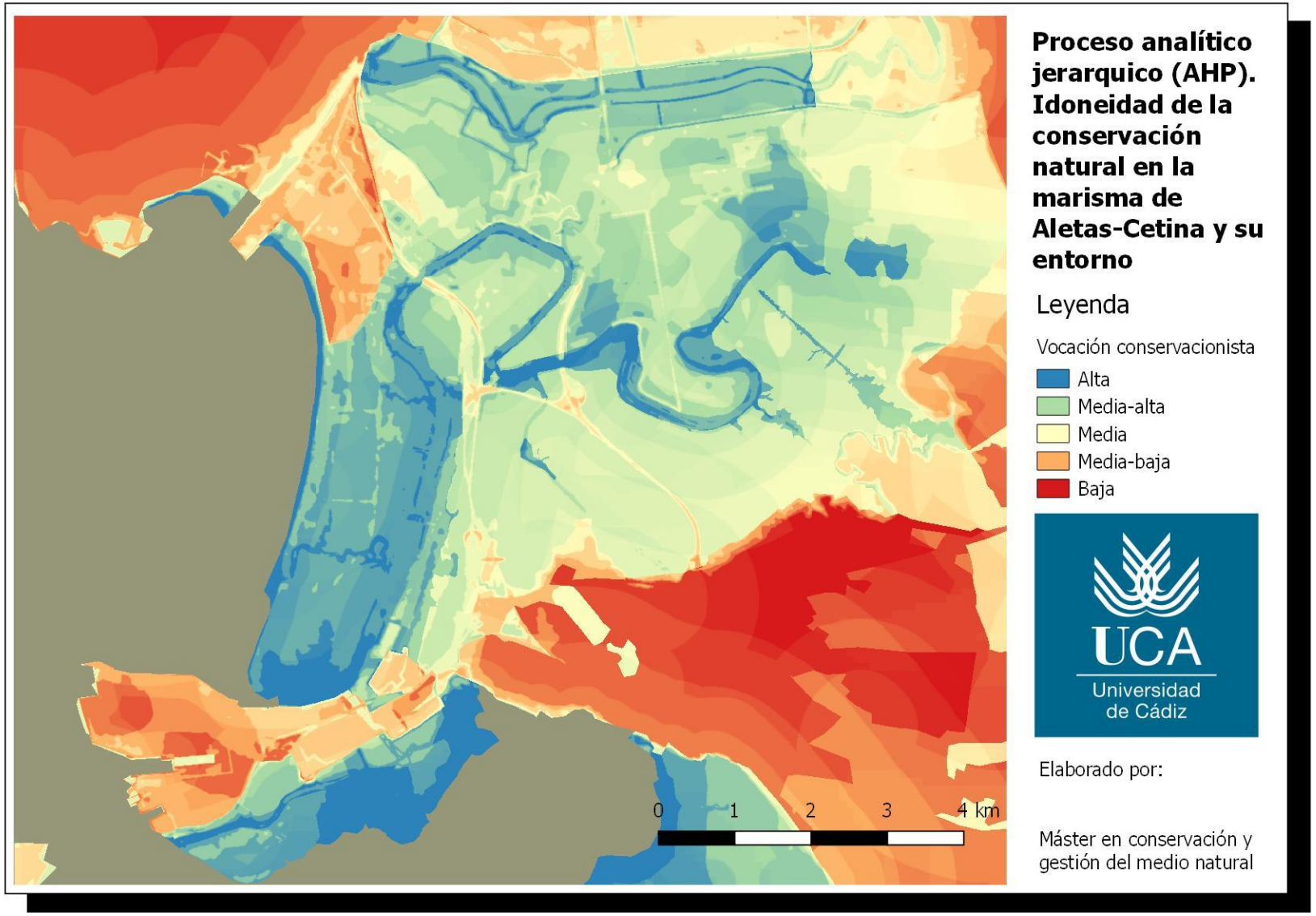

QGIS 2

- Digitizing
- Geoprocessing
- Rasterizing
- Map algebra
- Analytical Hierarchy Process (AHP)

Open source GIS software
QGIS

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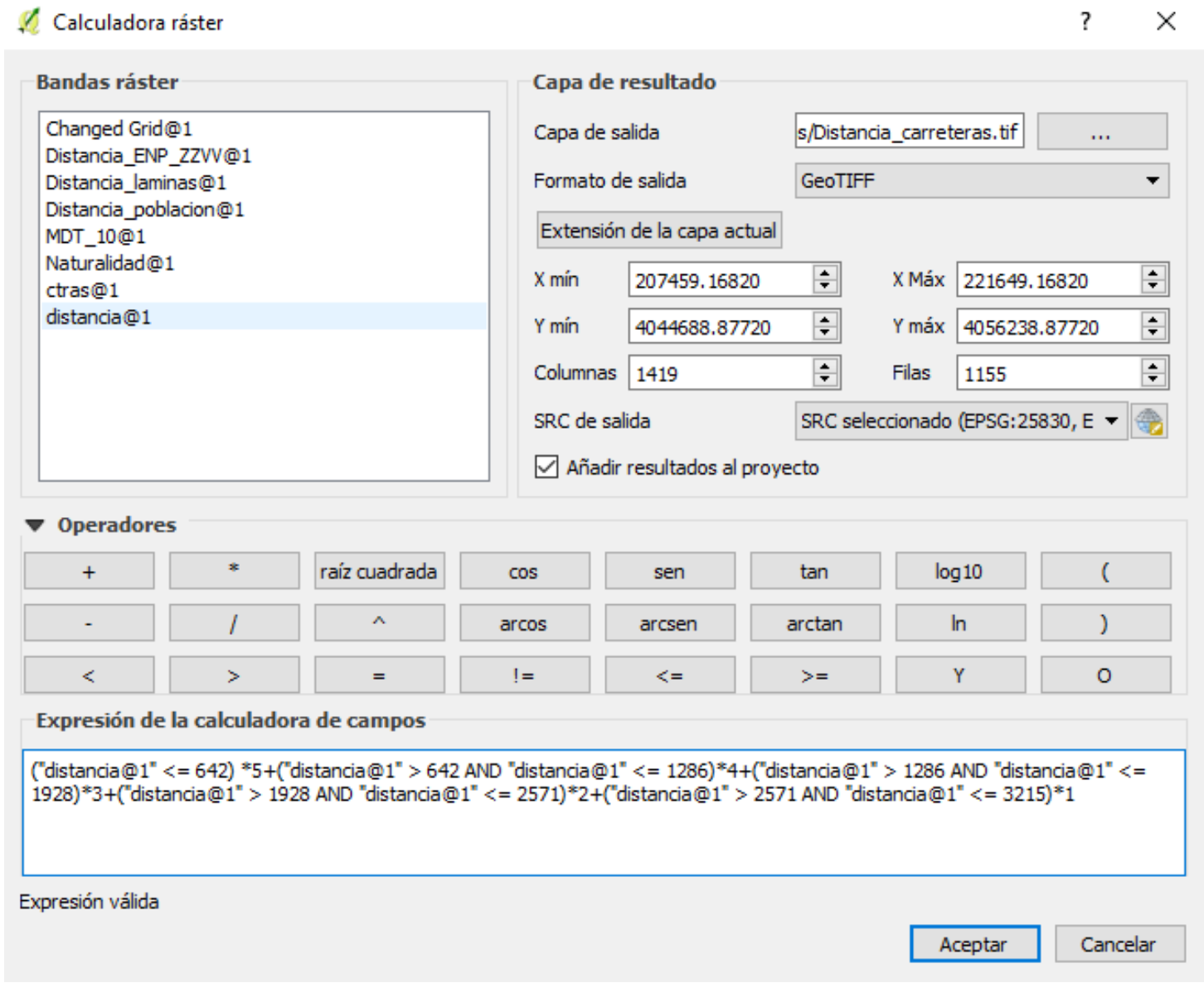

QGIS 2
Map algebra: raster calculator

Open source GIS software
QGIS

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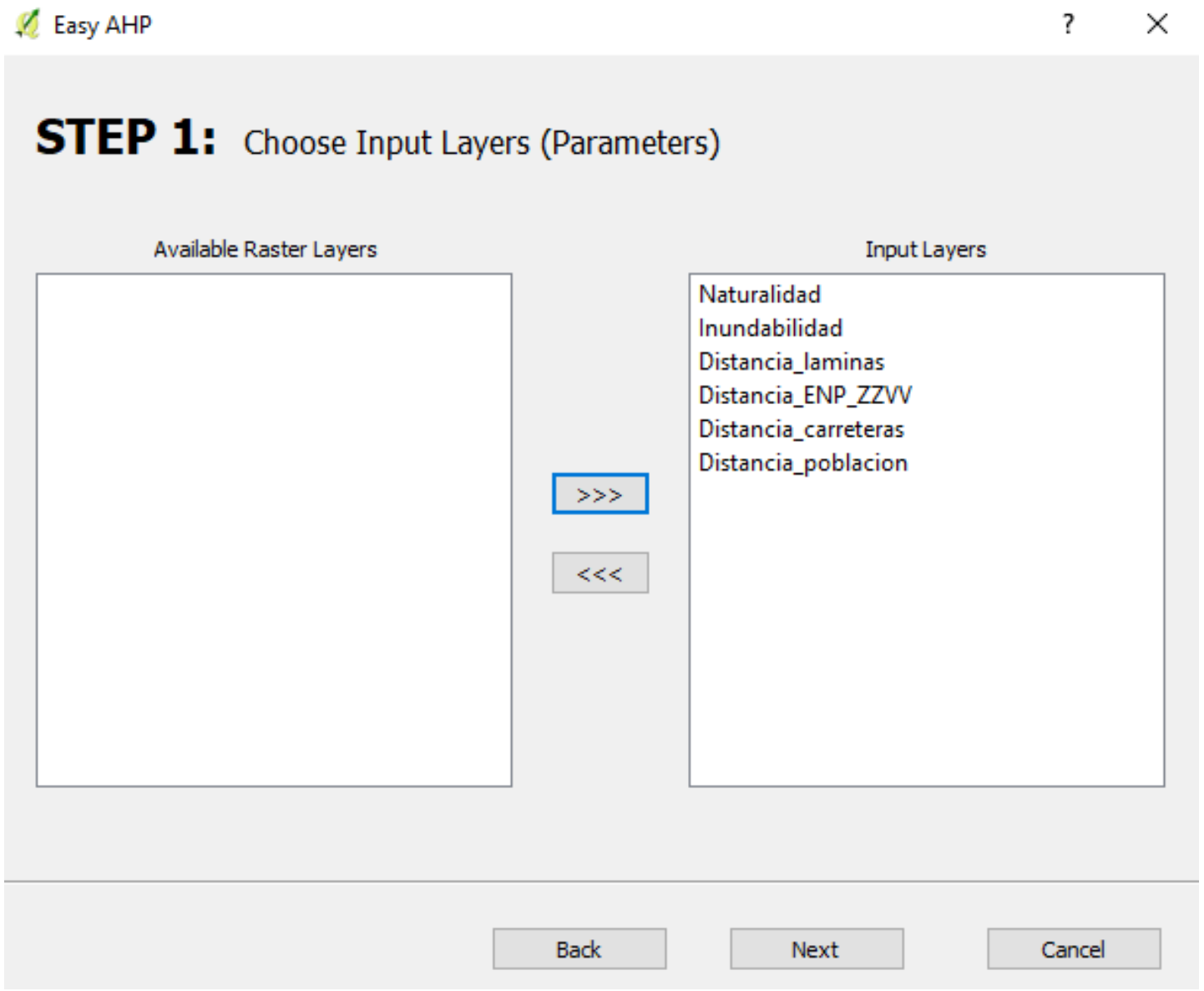

QGIS 2 Analytical Hierarchy Process (AHP)

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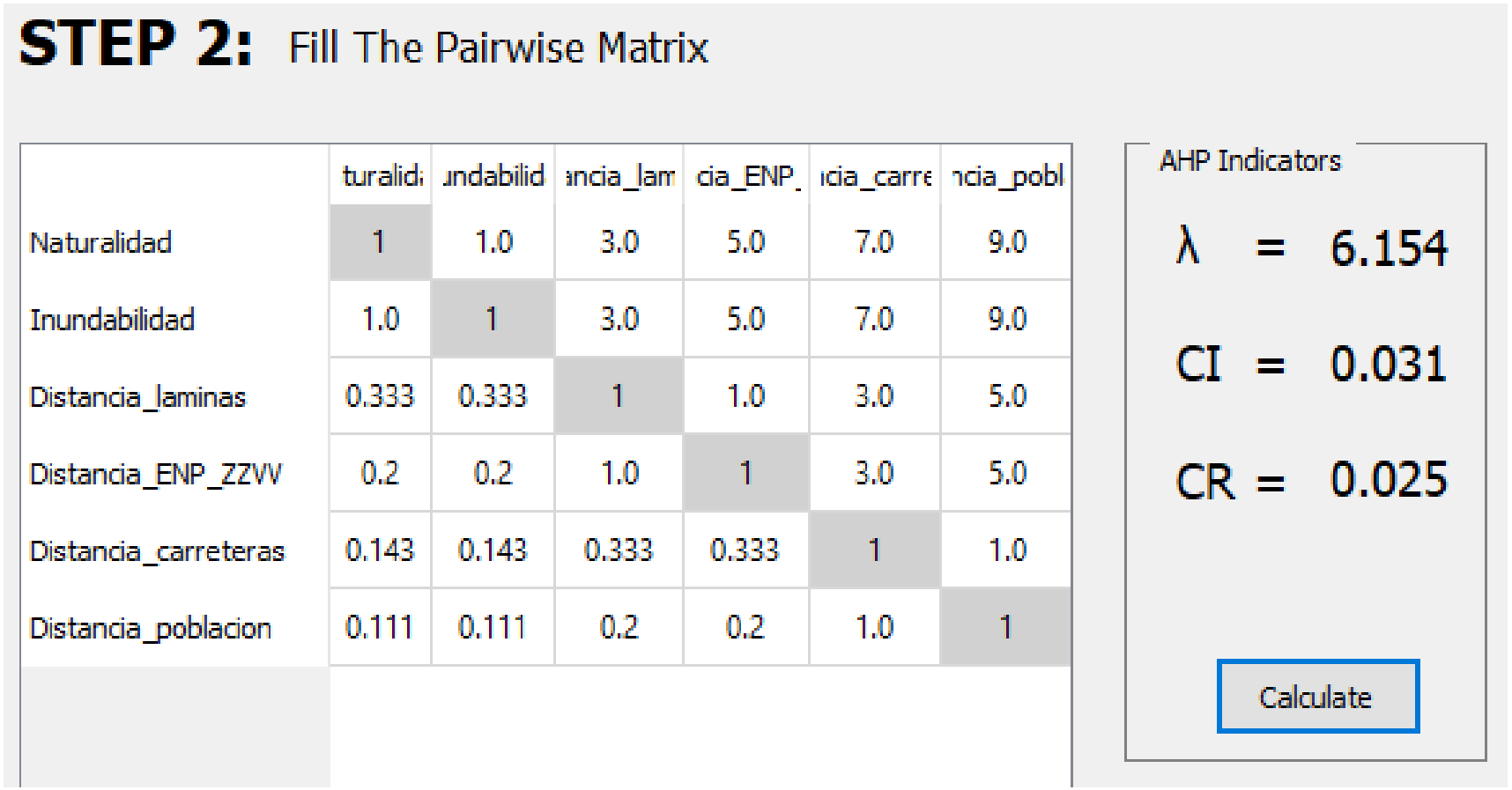

QGIS 2 Analytical Hierarchy Process (AHP)

Environmental Systems Research Institute (ESRI, 1969)

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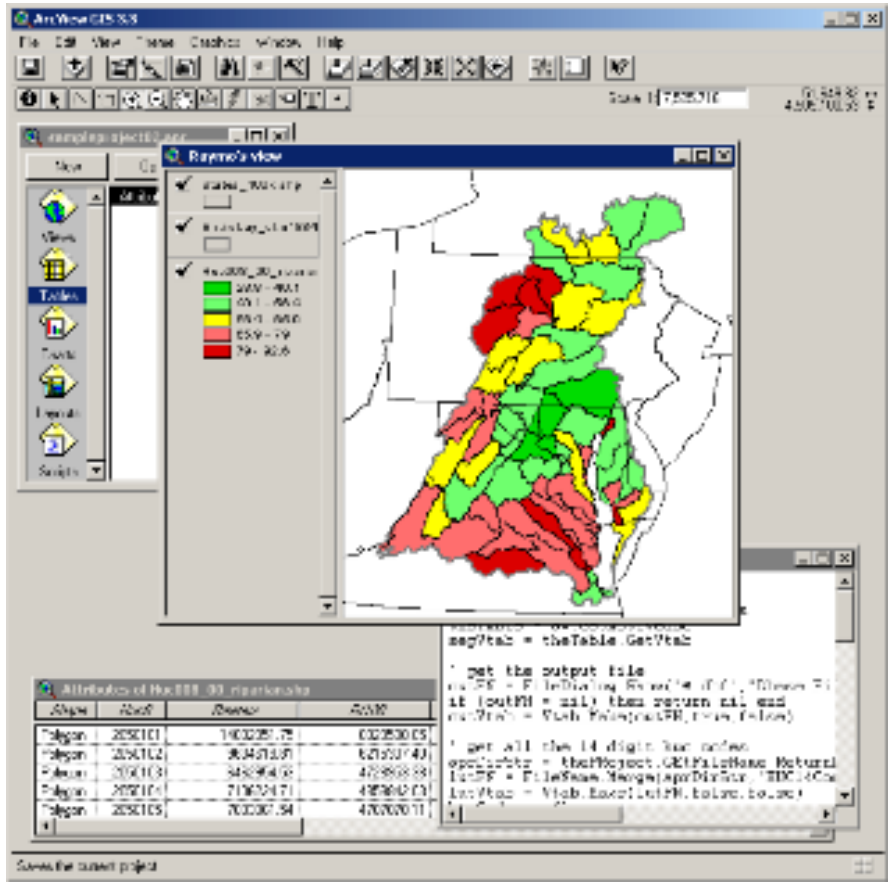
ArcInfo ® (1986)



ArcView ® (1991)
Shapefile (estándar ISO 1998)

Arc GIS 9 ® (ESRI, 1999)

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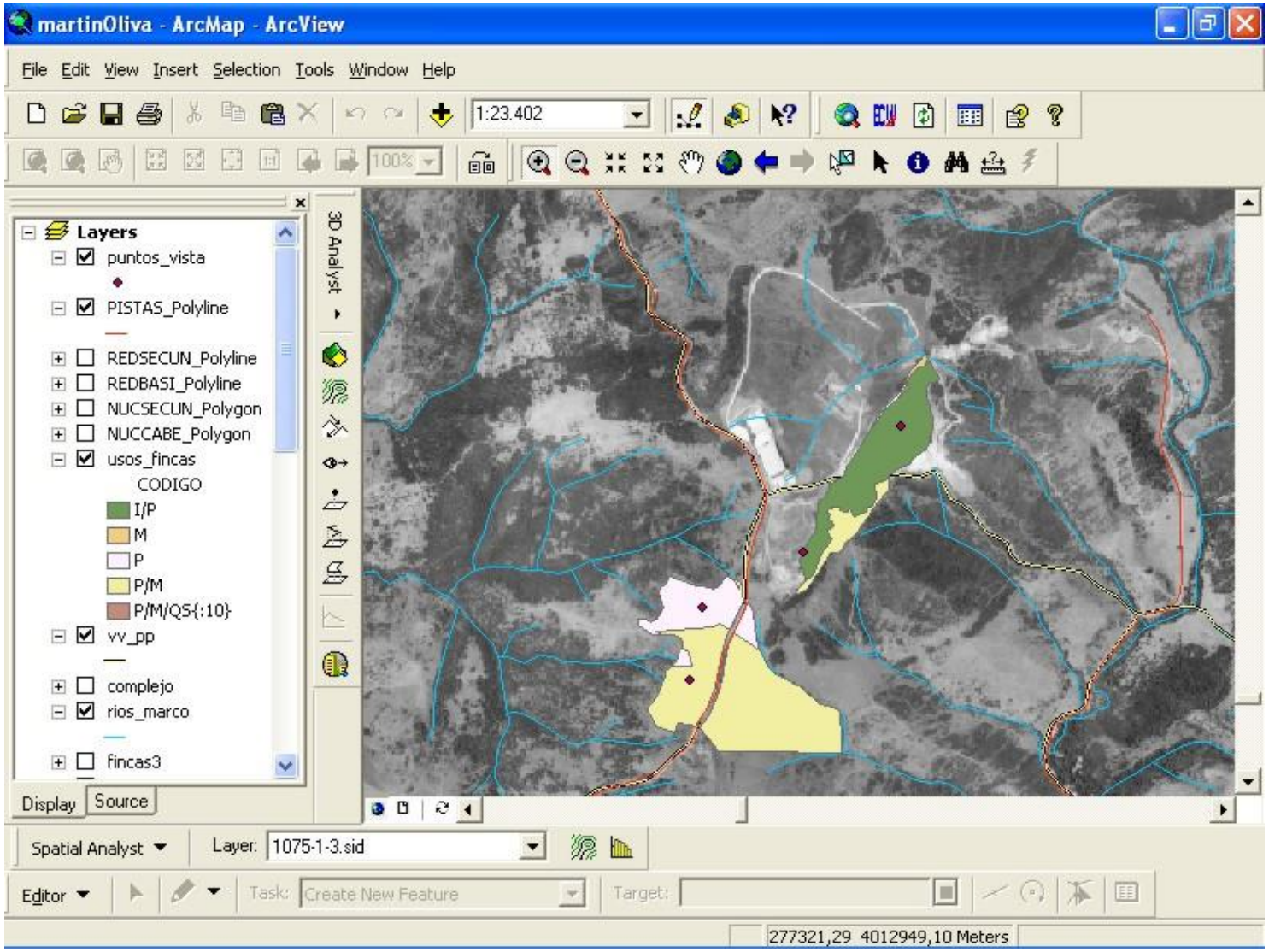

Arc GIS Pro ® (ESRI, 2018)

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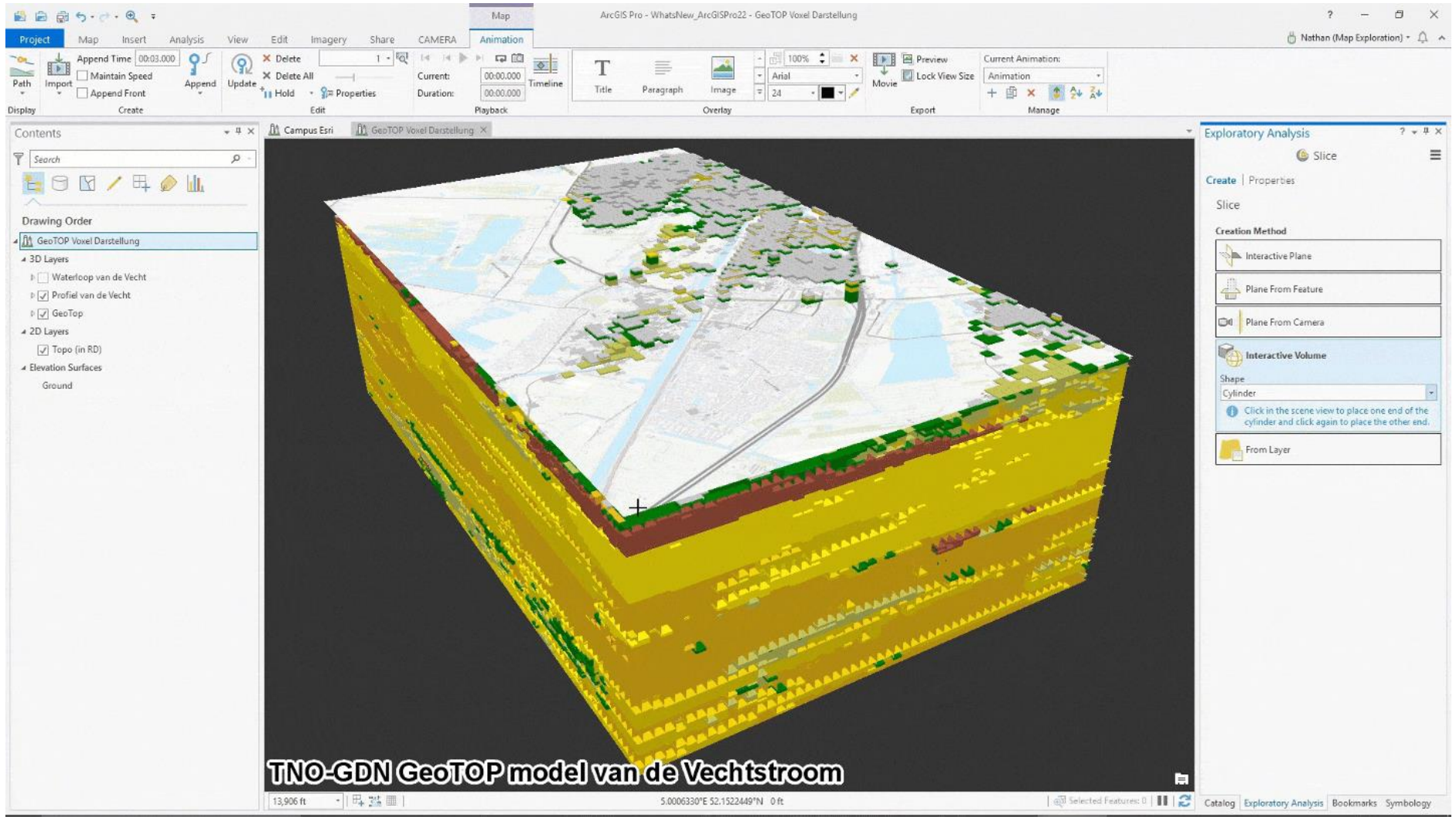

Arc GIS Pro ® (ESRI, 2018)

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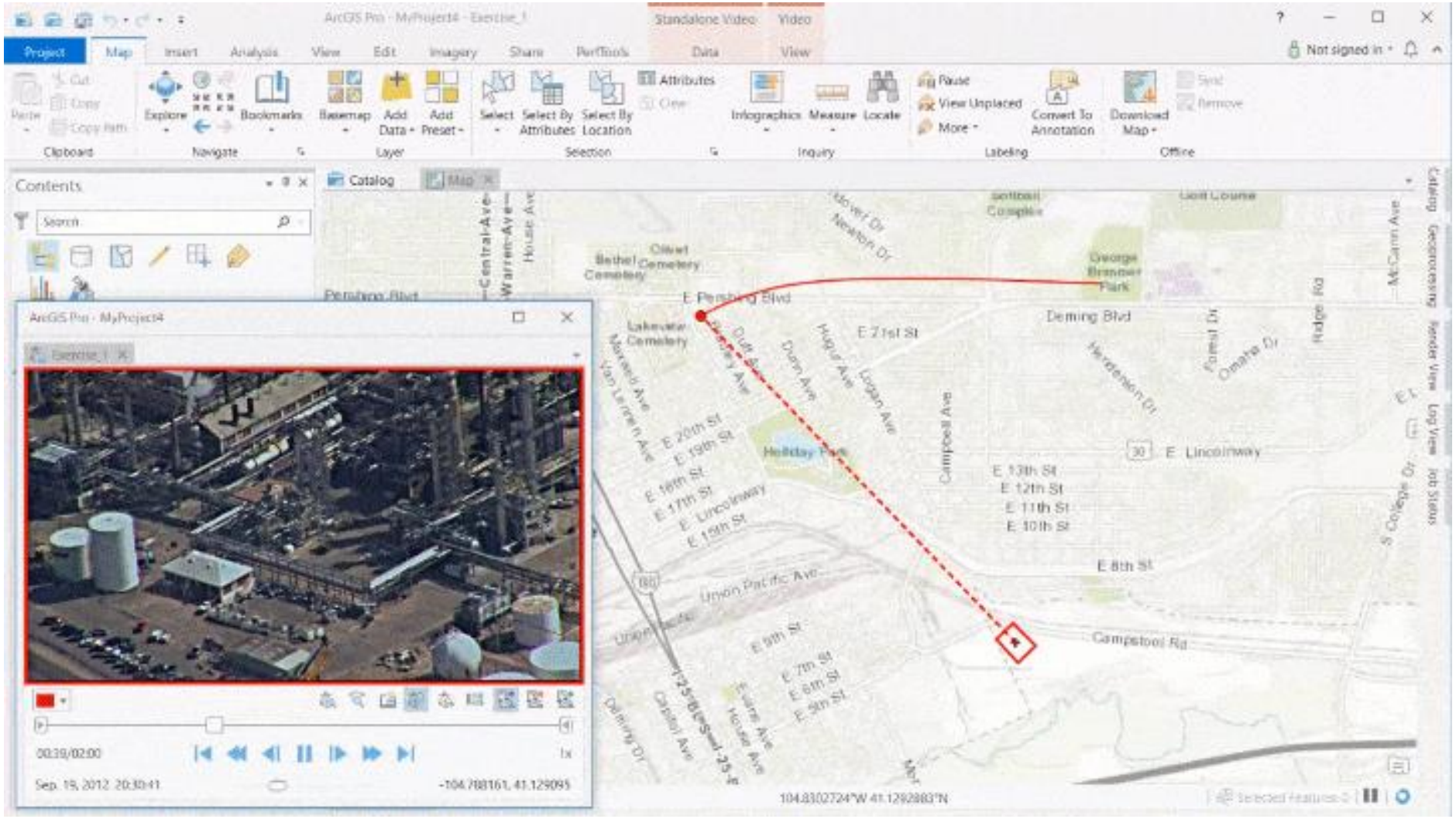

Arc Map Geostreet®

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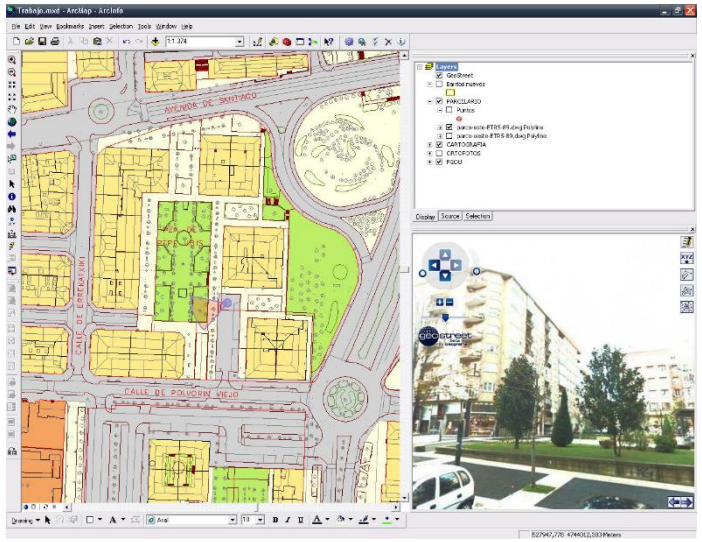

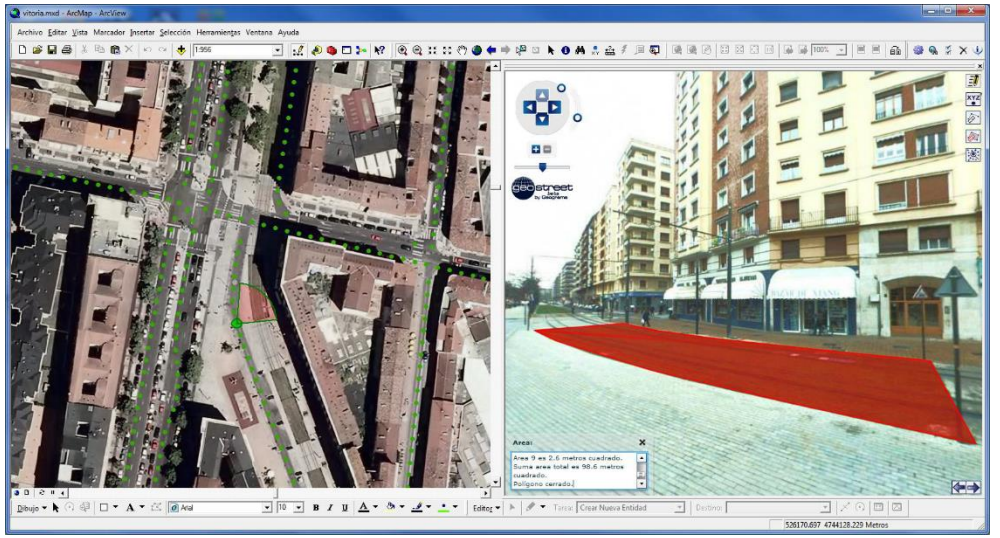

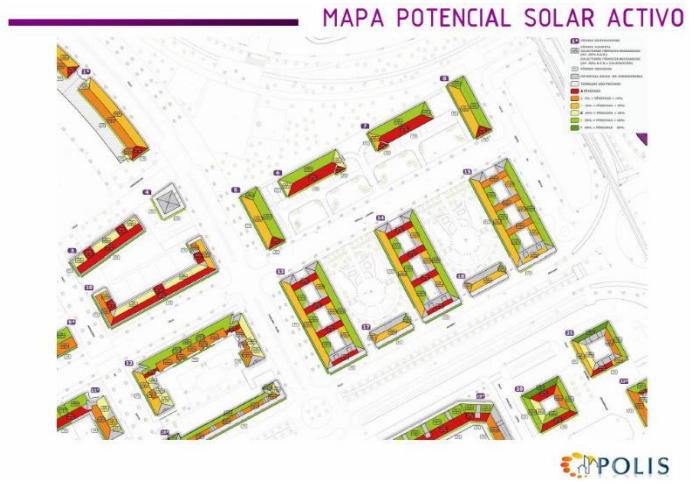

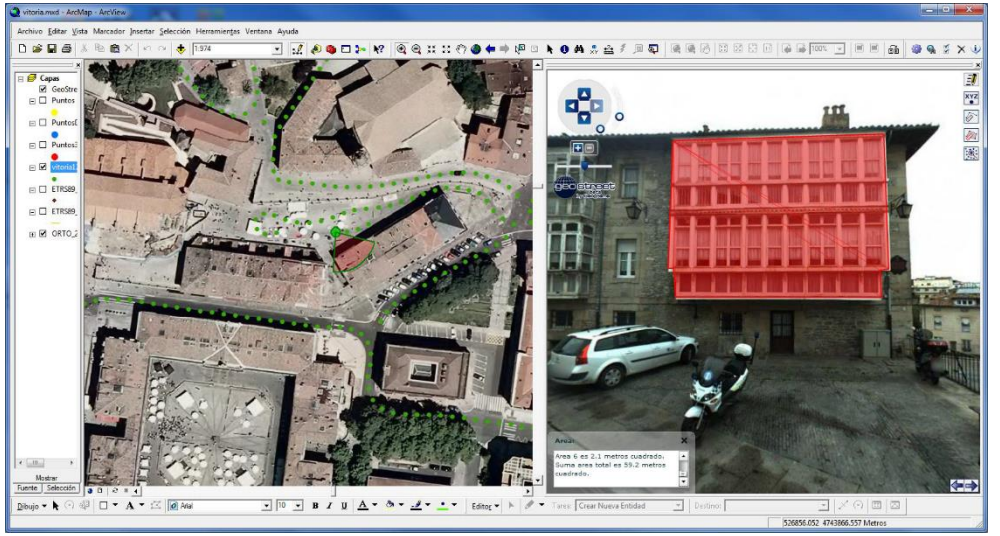

ArcGIS online

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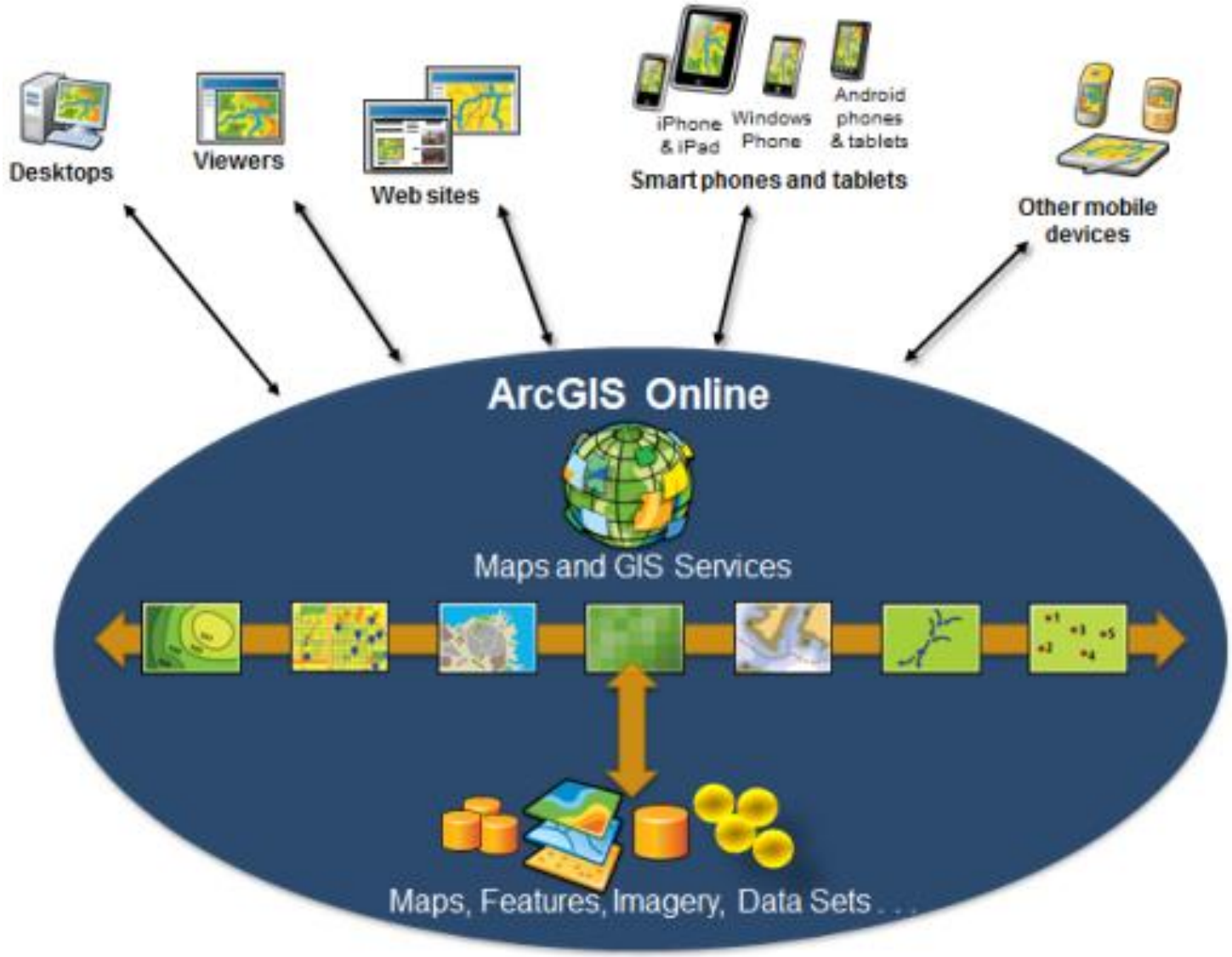

ArcGIS Enterprise ®

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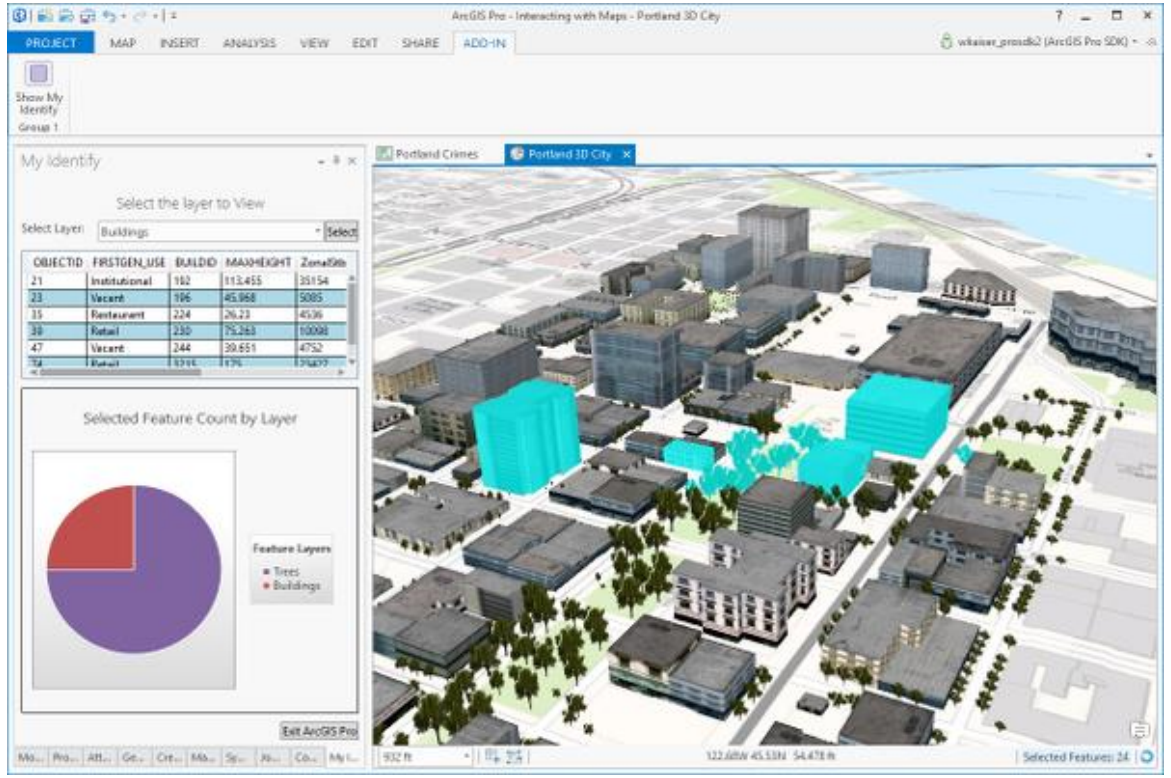

Arc GIS Pro ®

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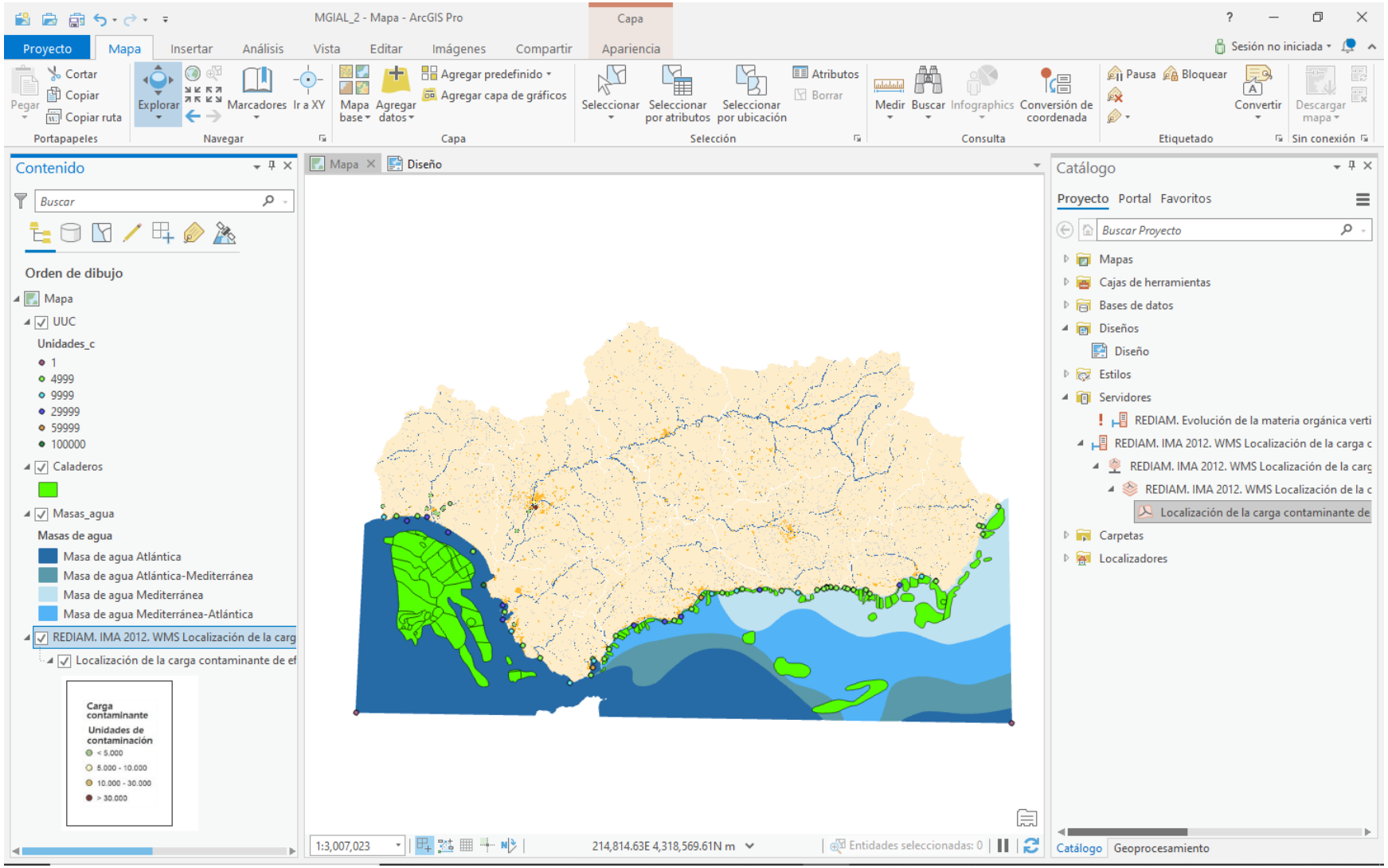

ArcGIS Pro 2.7

- Geostatiscal analyst
- Geoprocessing

Arc GIS Pro ®

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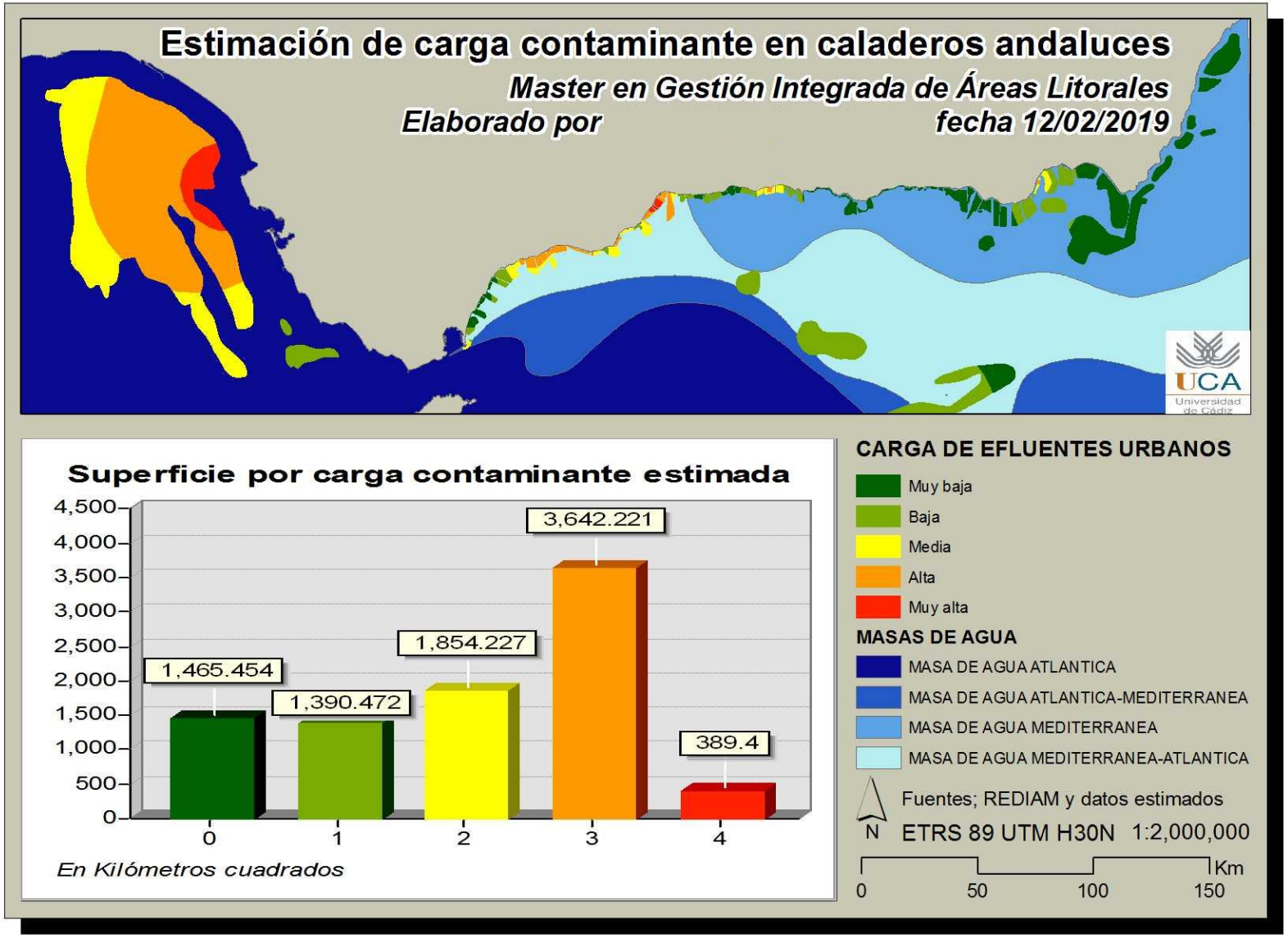

ArcGIS Pro 2.7

- Geostatiscal analyst
- Geoprocessing

Arc GIS Pro ®

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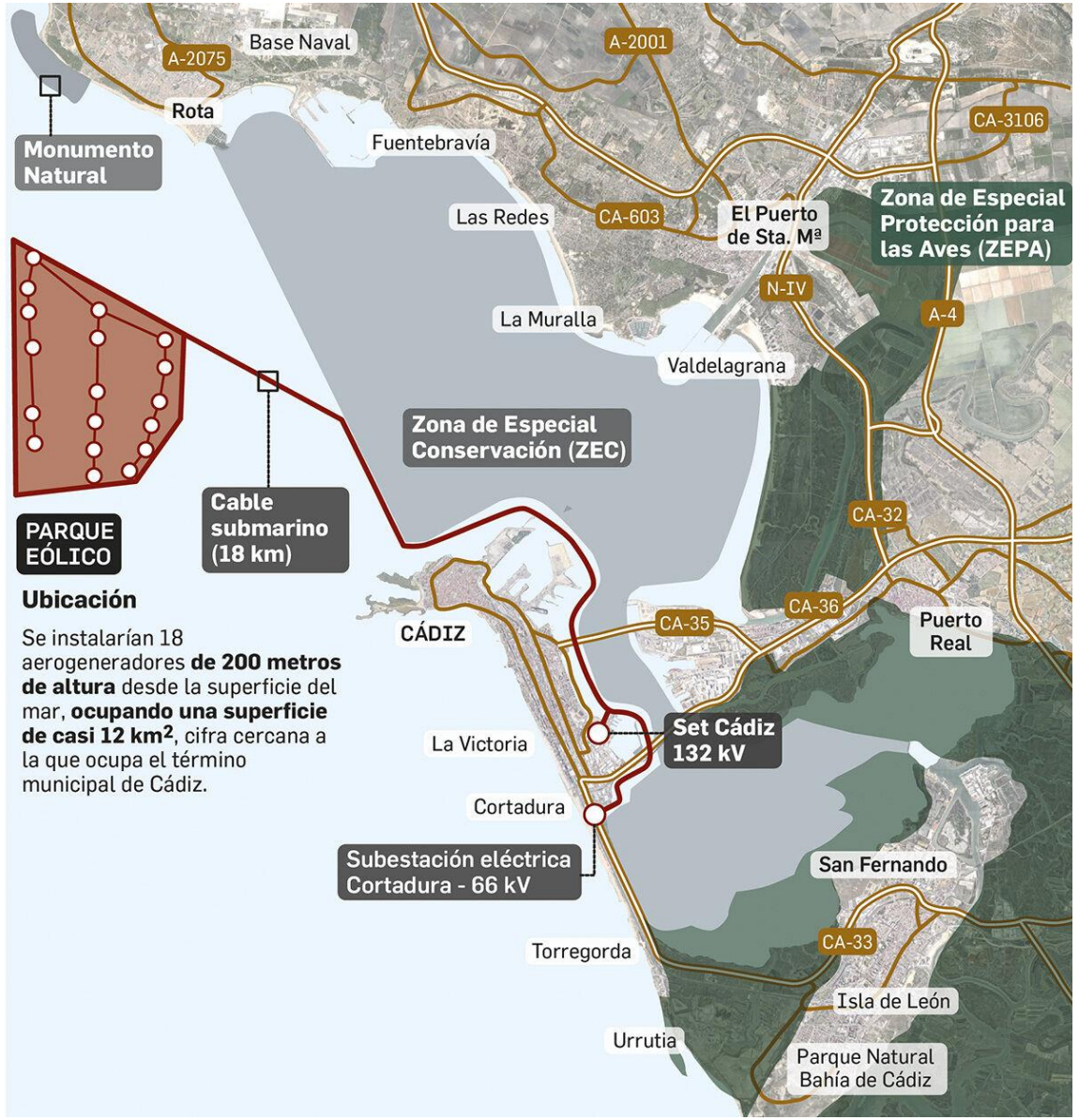

ArcGIS Pro 2.7
Fuzzy logic

Arc GIS Pro ®

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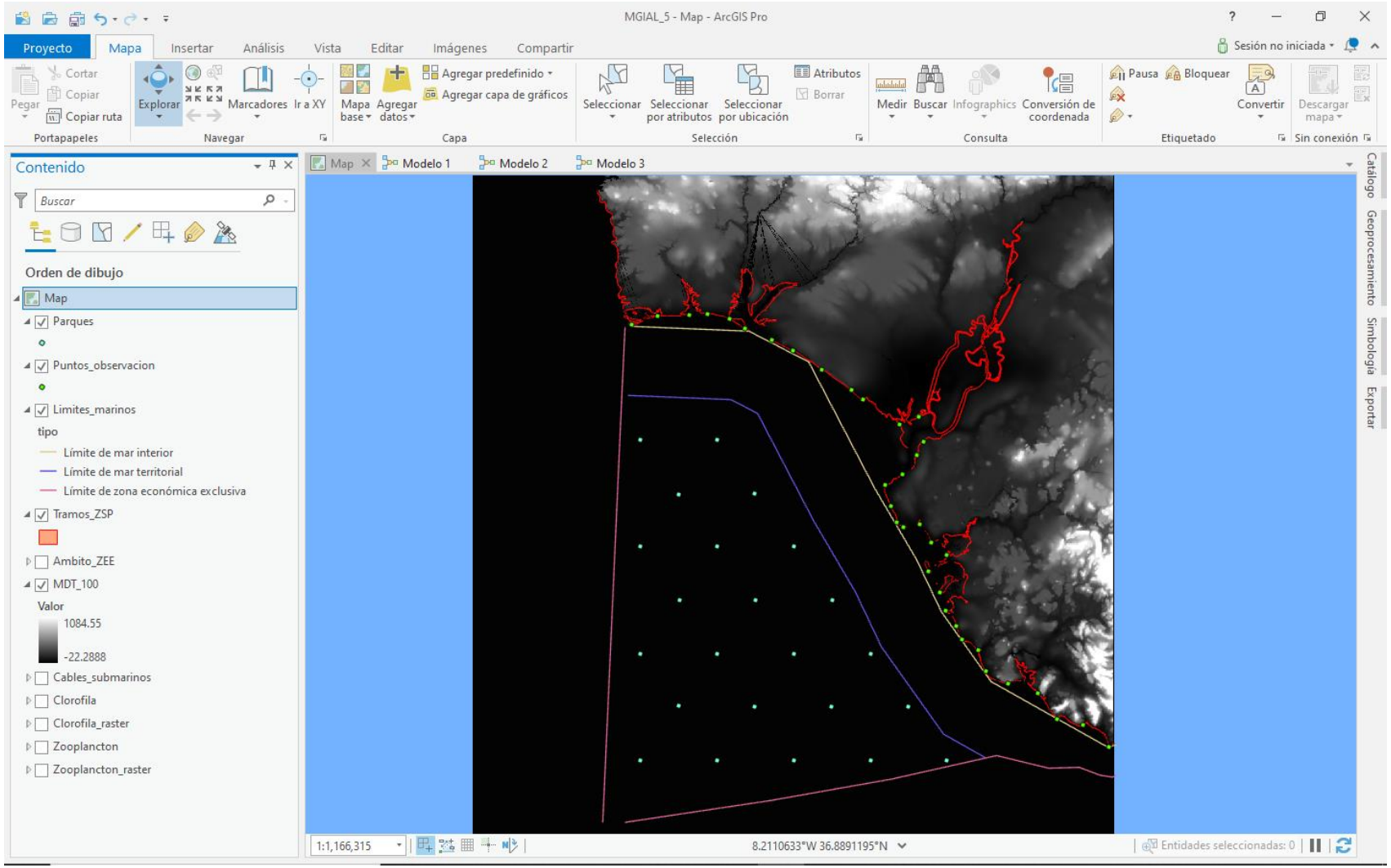

ArcGIS Pro 2.7

- Viewshed
- Fuzzy logic

Arc GIS Pro ®

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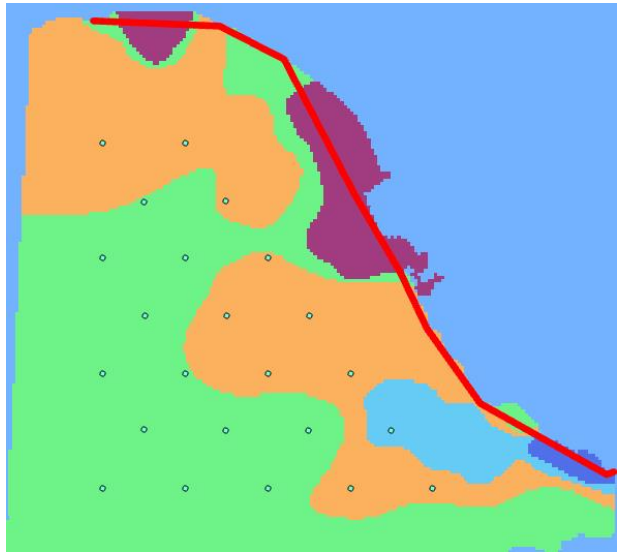

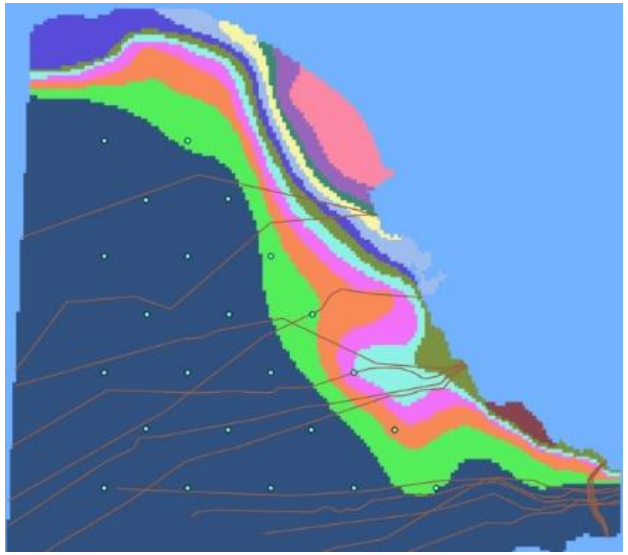

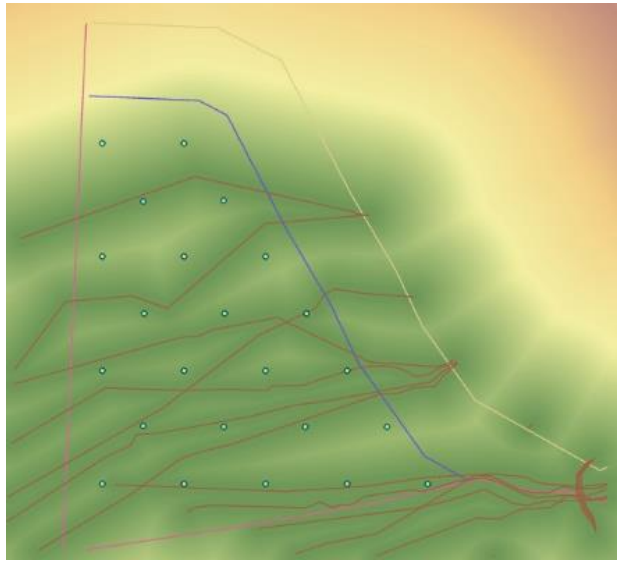

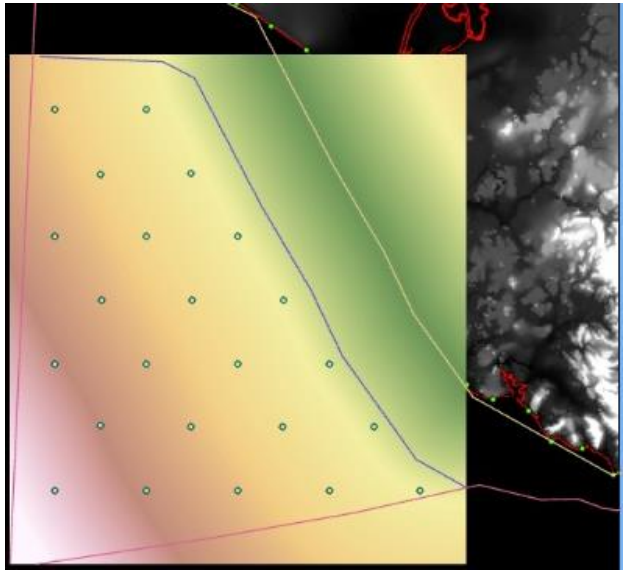

ArcGIS Pro 2.7

- Rasterizing
- Reclassify
- Euclidean distance

Arc GIS Pro ®

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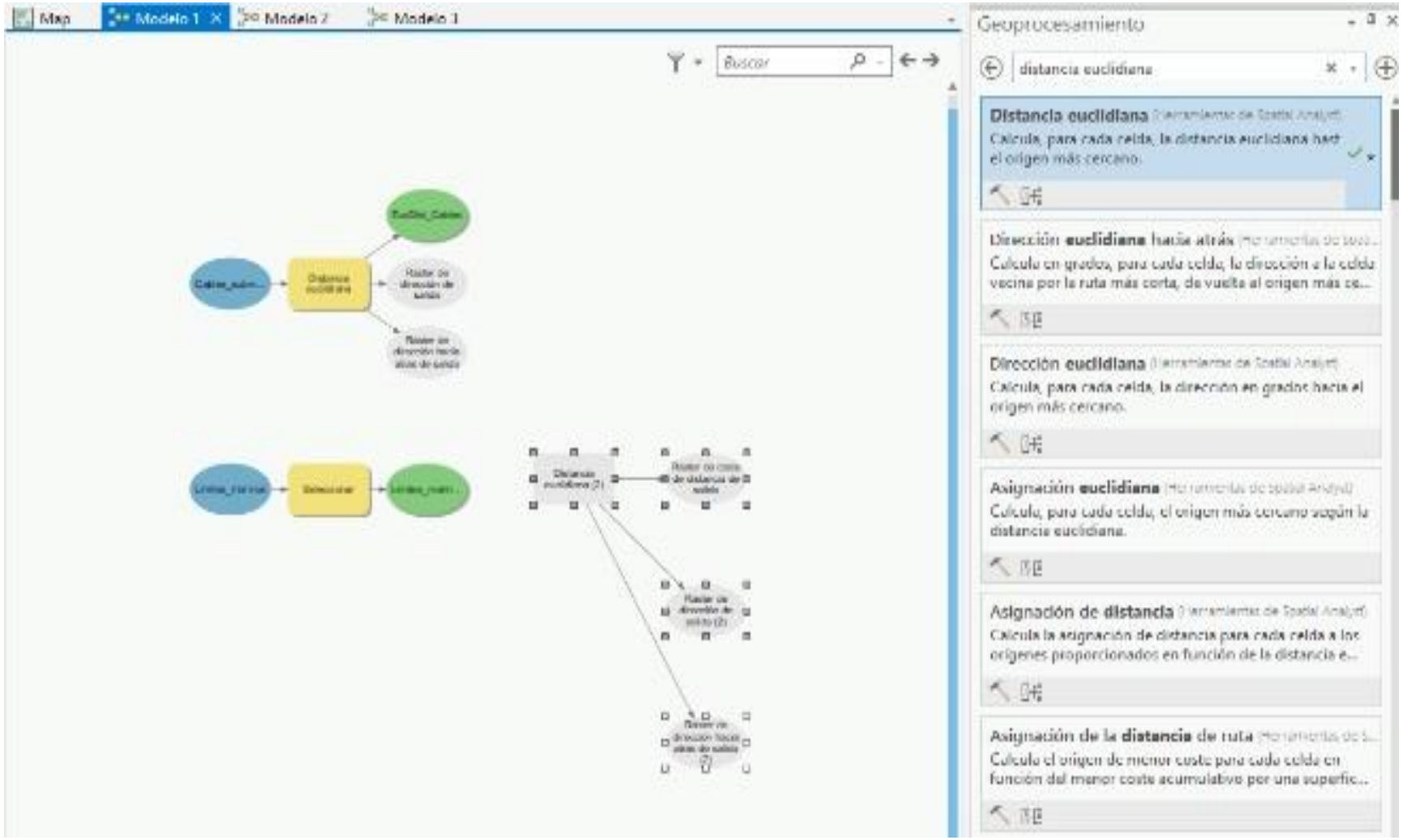

ArcGIS Pro 2.7
Model builder

Arc GIS Pro ®

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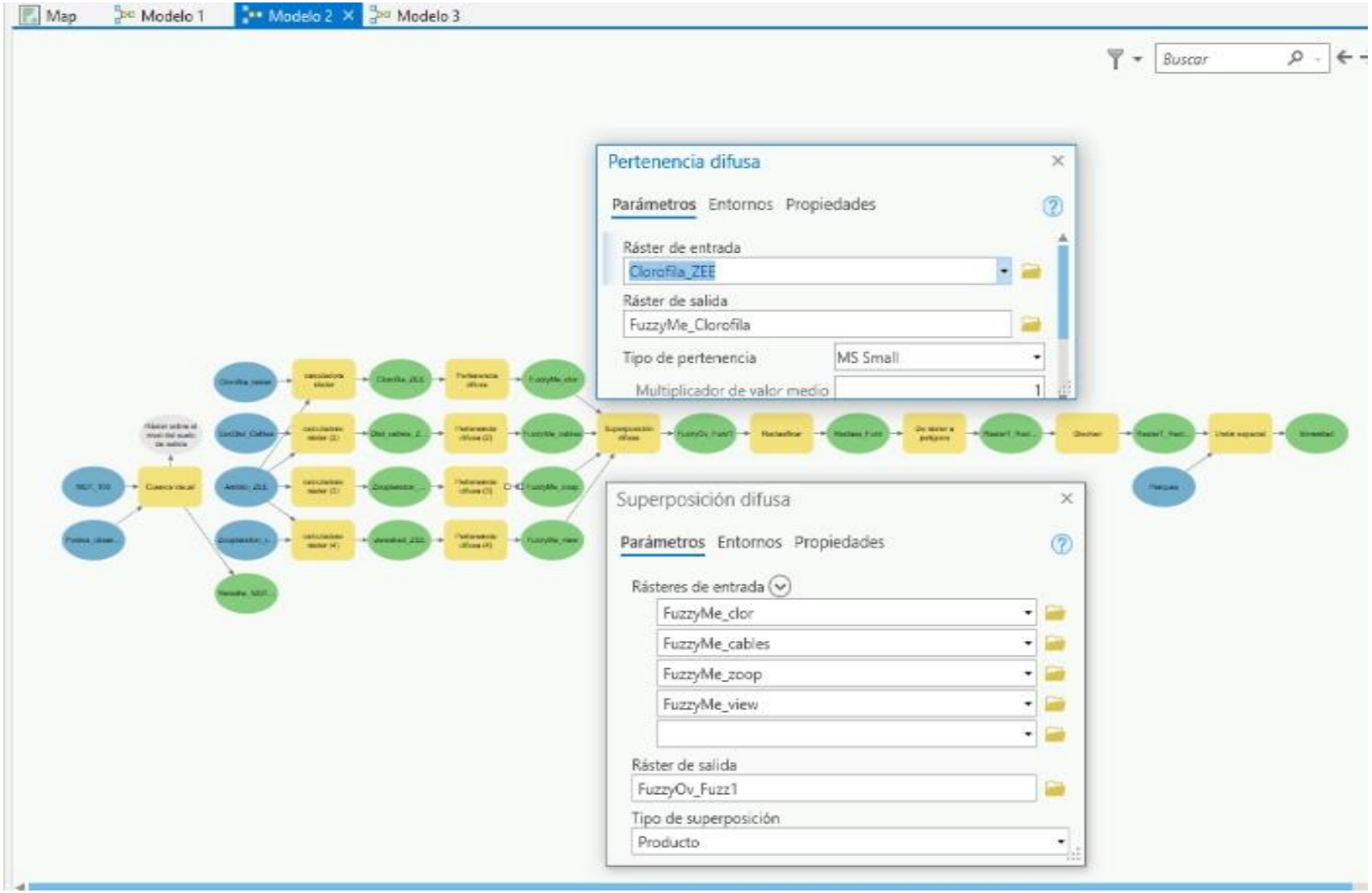

ArcGIS Pro 2.7
Model builder

Arc GIS Pro ®

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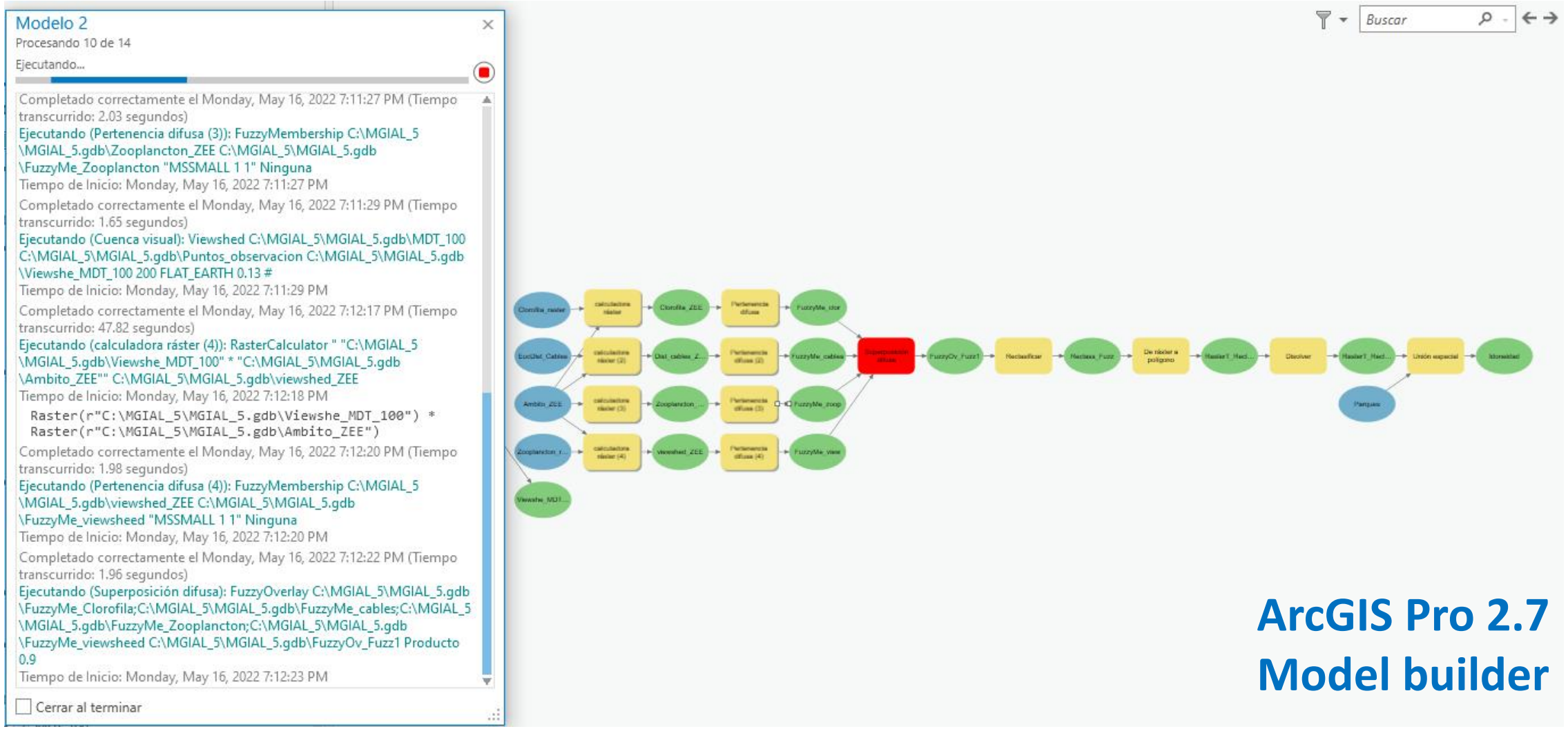

ArcGIS Pro 2.7
Model builder

Arc GIS Pro ®

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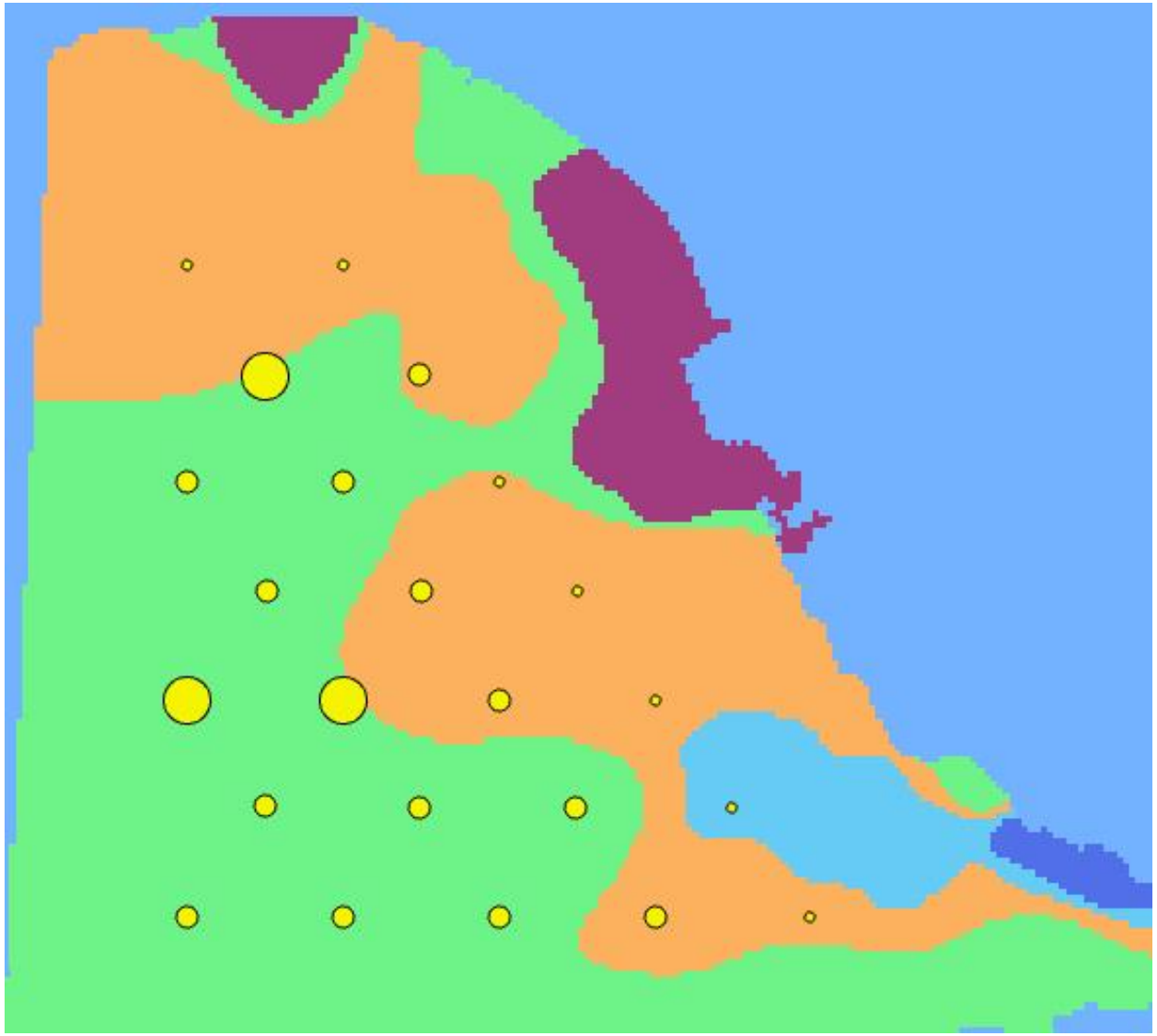

ArcGIS Pro 2.7
Fuzzy logic (chlorophylle)

Arc GIS Pro ®

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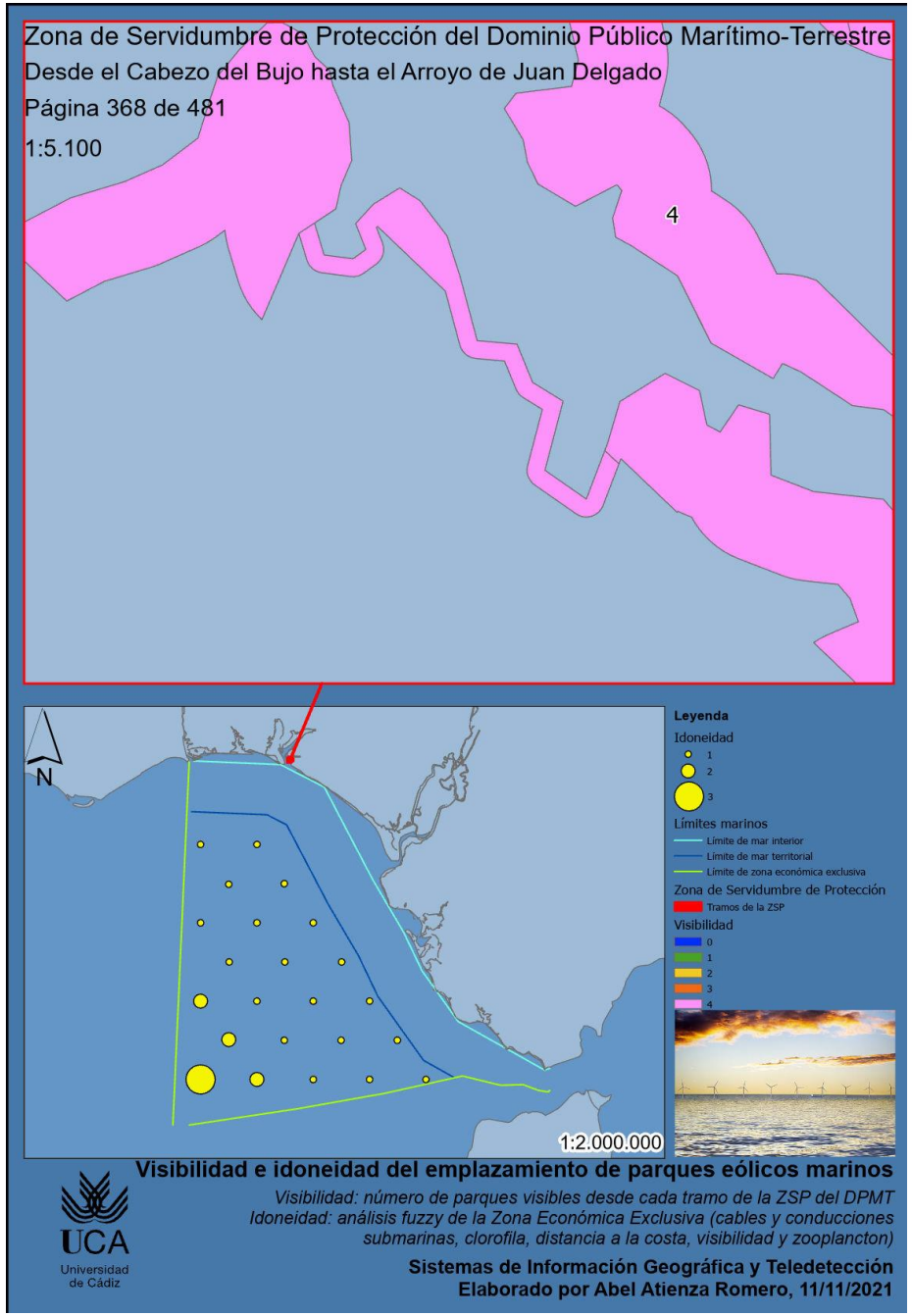
of the European Union



ArcGIS Pro 2.7

- Viewshed
- Fuzzy logic
- Data driven pages

¡GRACIAS! Thank you Faleminderit Hvala.

[NAME]
E-mail

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UCA Universidad de Cádiz

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Development of Regional Joint Master Program in Maritime Environmental Protection and Management