University of Bucharest (UB)

Danube Delta Biosphere Reserve storyline

Constantin Cazacu, Mihai Cristian Adamescu, Relu Giuca
University of Bucharest,
Department/Research Centre
in Systems Ecology and Sustainability
constantin.cazacu@g.unibuc.ro

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

The relationship between ecosystems provisioning on cultural services (tourism)

- Aim at development an environment to help management to relate the natural productivity of ecosystems to cultural services
- Our belief is that the quality of water is reflected by the aquatic ecosystems productivity.
- Productive systems are attracting fish-eating birds, that are attracting birdwatchers and leisure fishermen.
- Natural landscape and sea-side is another attraction type.

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

The relationship between ecosystems provisioning on cultural services (tourism)

- Plenty of data from various sources/studies/monitoring
- Hard to find direct relations among these datasets

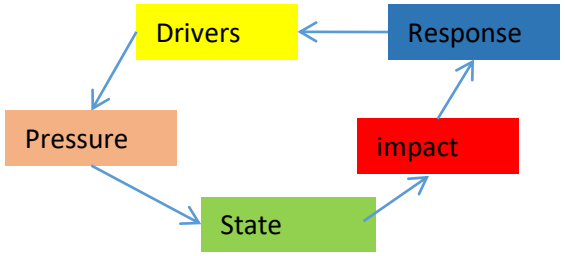
Solution:

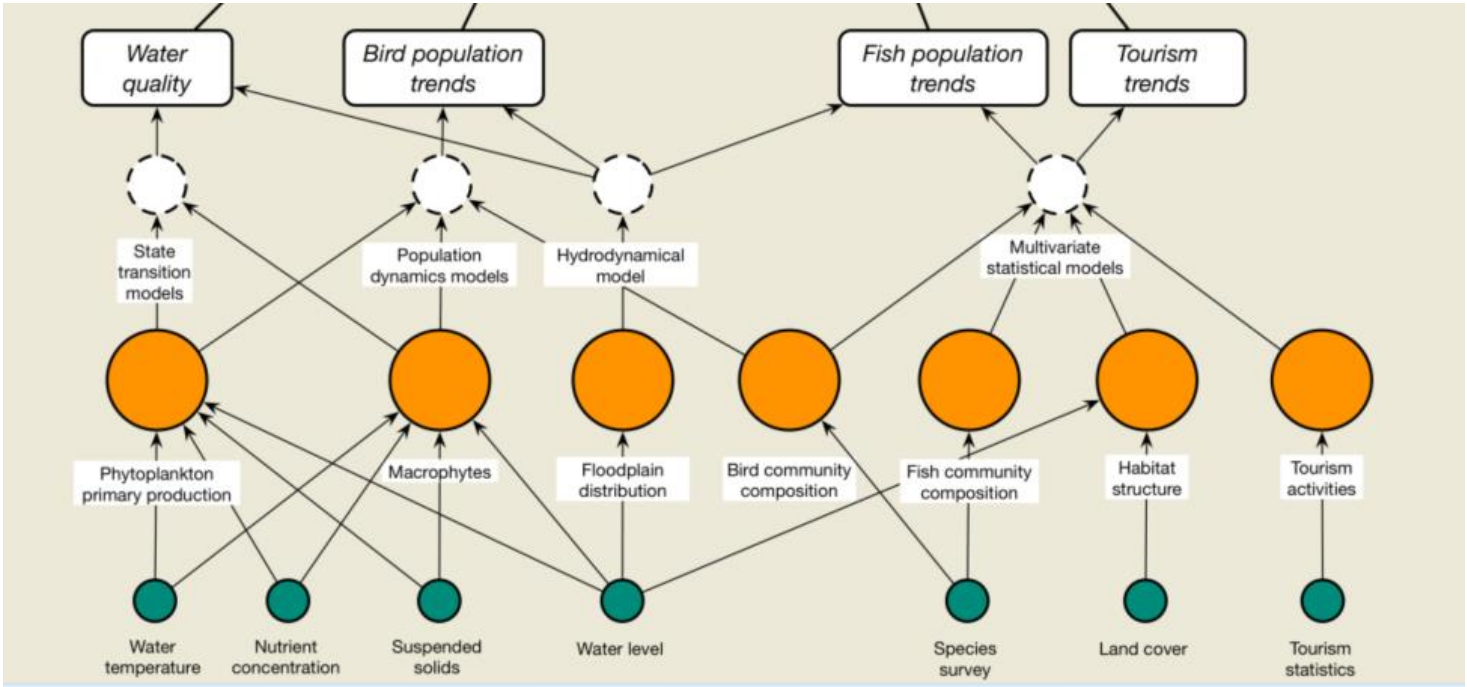
- We developed a Bayesian Belief Network
- We assessed the potential of ecosystem to produce services
- We used social media to assess the cultural services based on the pictures tourists/visitors are taking

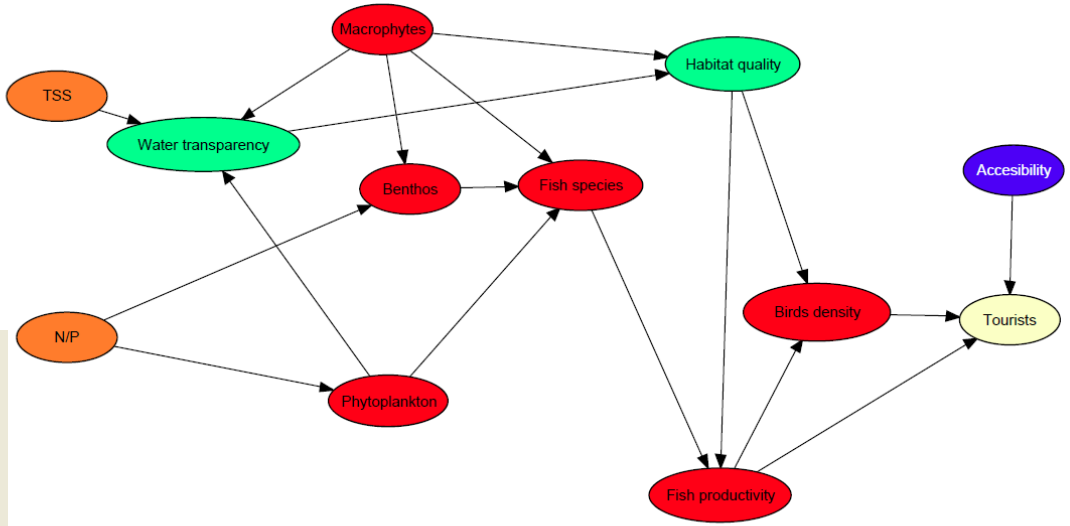
This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

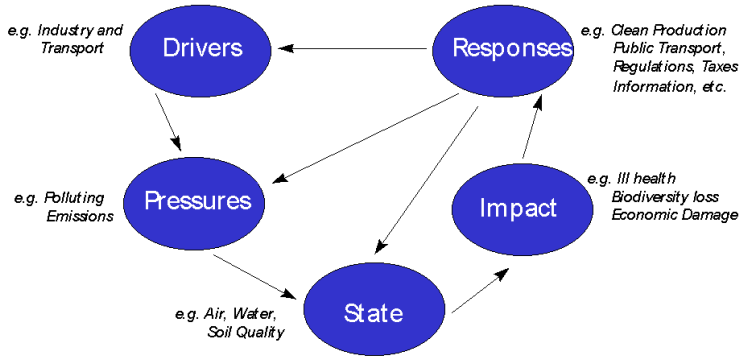
Danube Delta - DPSIR

University of Bucharest (UB)





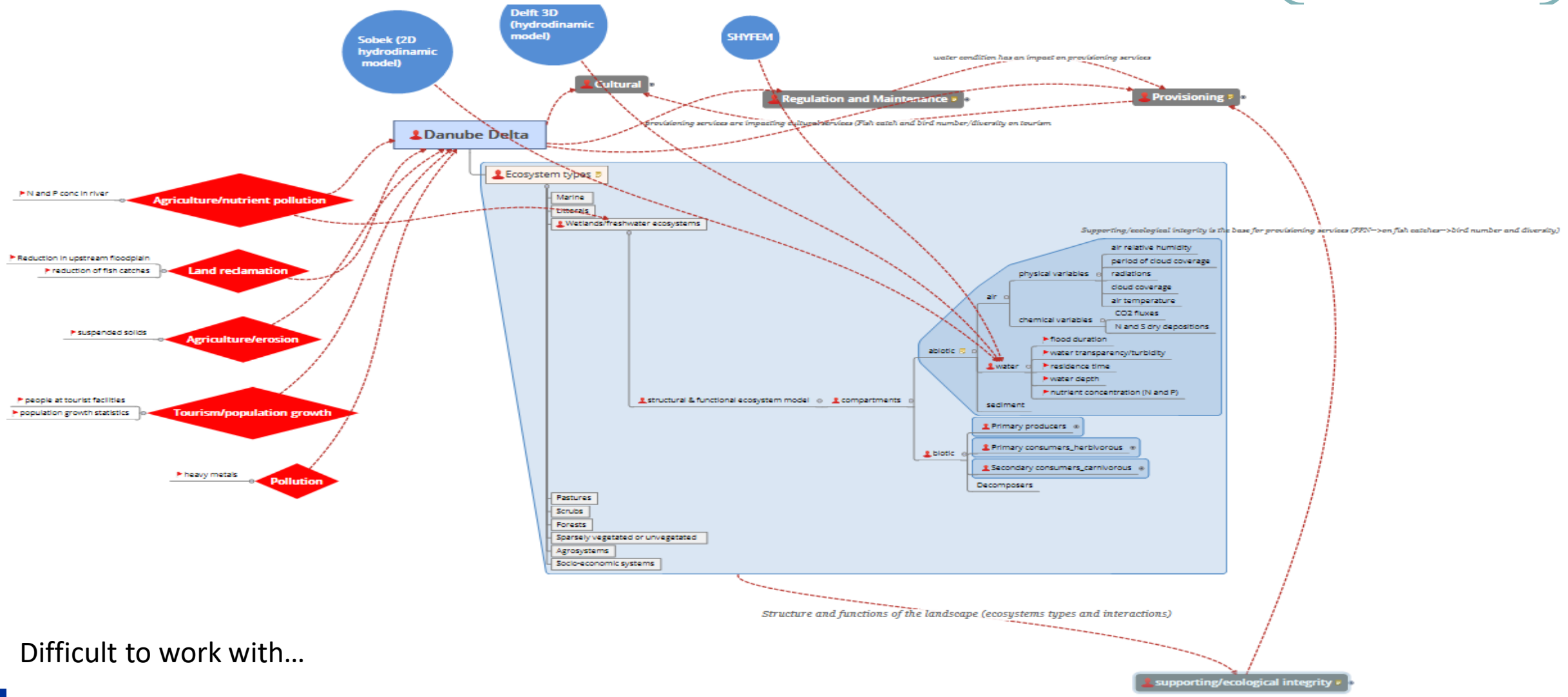




This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Complex mind map

University of Bucharest (UB)

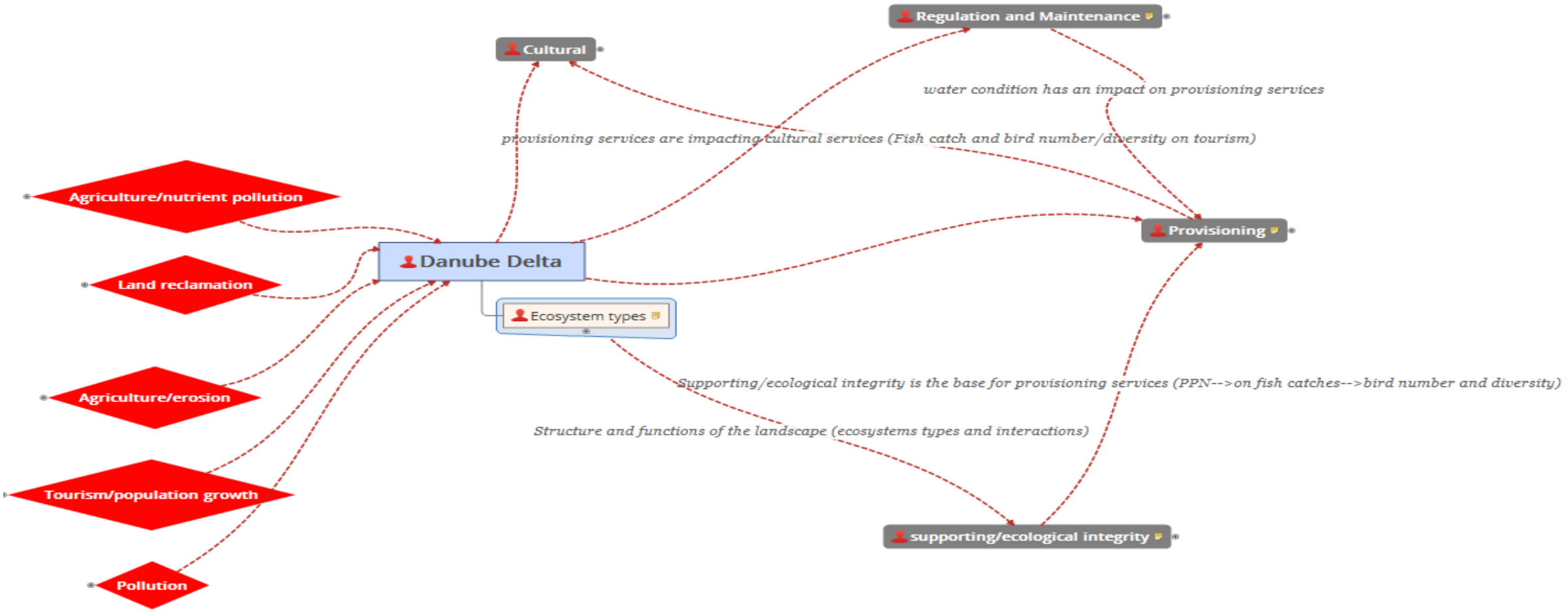


Difficult to work with…

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Simplified Mind Map

University of Bucharest (UB)



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Working with concepts

University of Bucharest (UB)

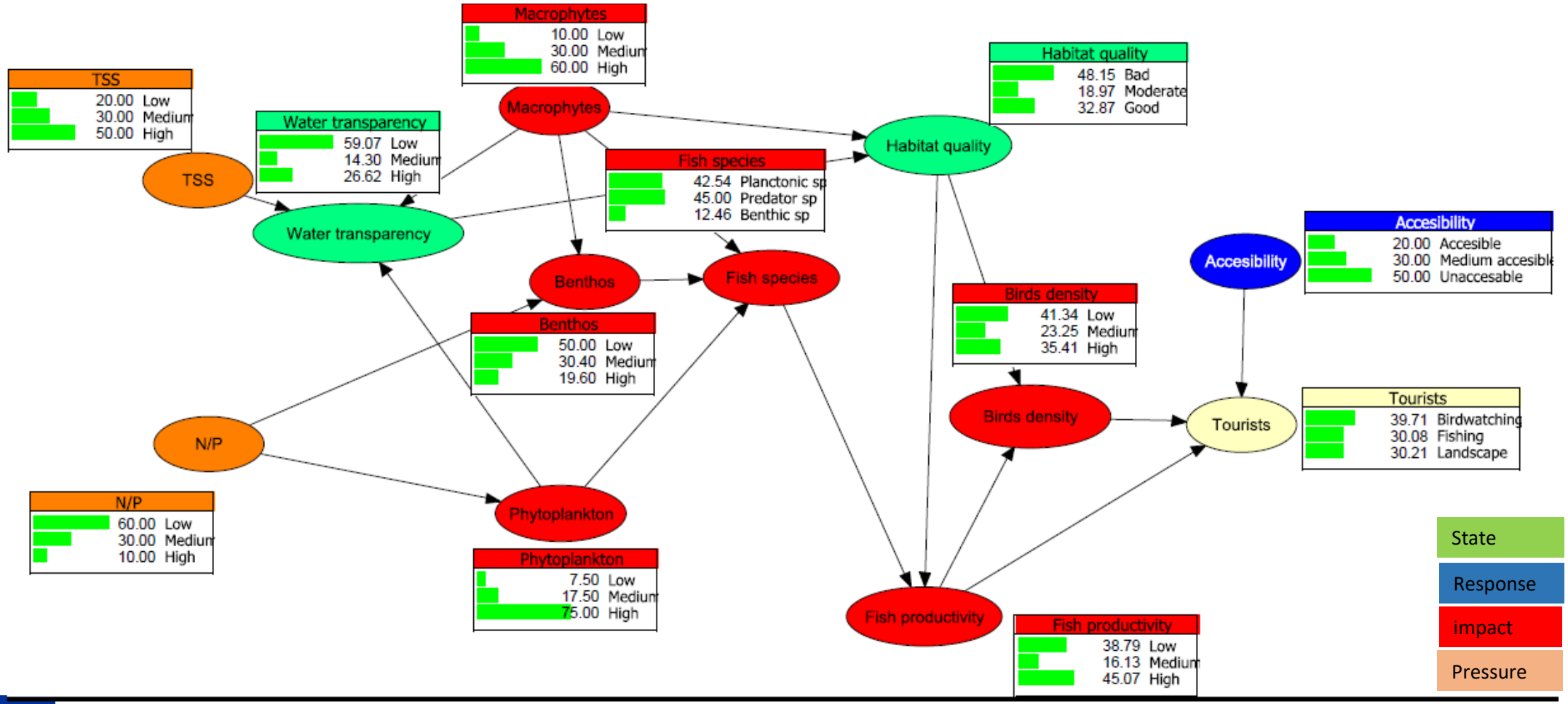
- Starting from a narrative description (the storyline) translated into a Mind Map and finally into a BBN.

In building up the BBN we have used the concept of DIPSIR

- **Pressures**: - *N/P, nitrogen phosphorous ratio, TSS*;
- **Impact: -** *Phytoplankton, Fish species, Fish productivity, Bird density, Macrophytes, Benthos;*
- **Status: –** *Habitat quality, Water transparency;*
- **Response:** - *Accessibility*). We also considered that some of the concepts used could be classified as production ES (*Fish productivity*), regulation services (*N/P, Water transparency, Habitat quality*), Supporting services (*Macrophytes*) and cultural services (*tourism*).

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

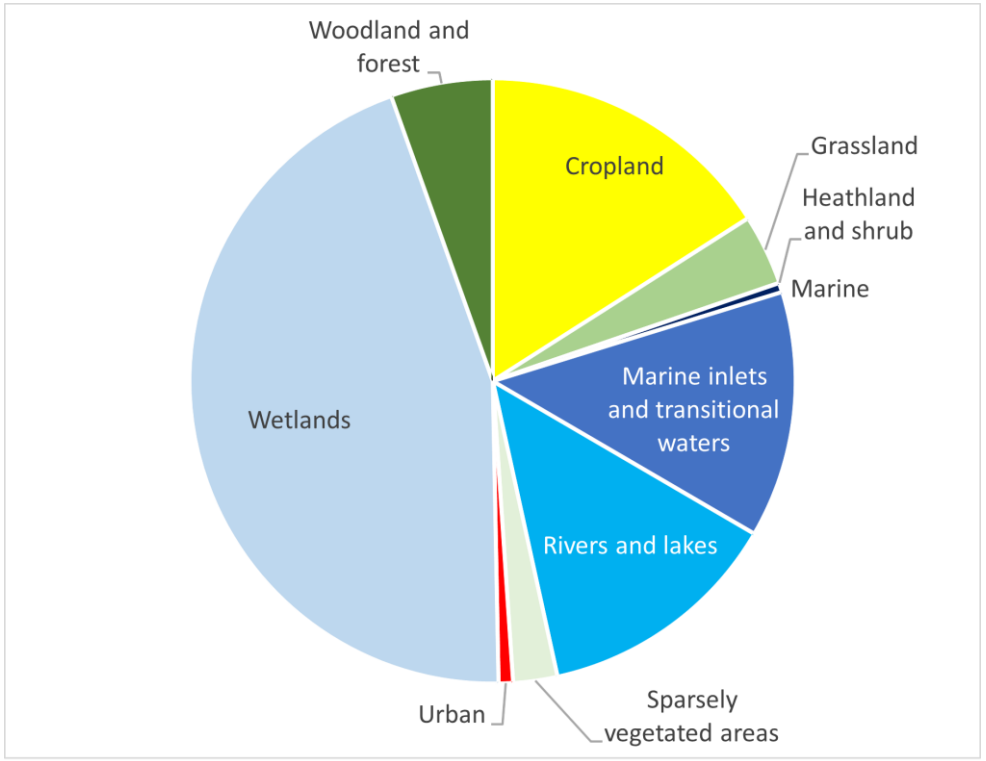
Bayesian Belief Network

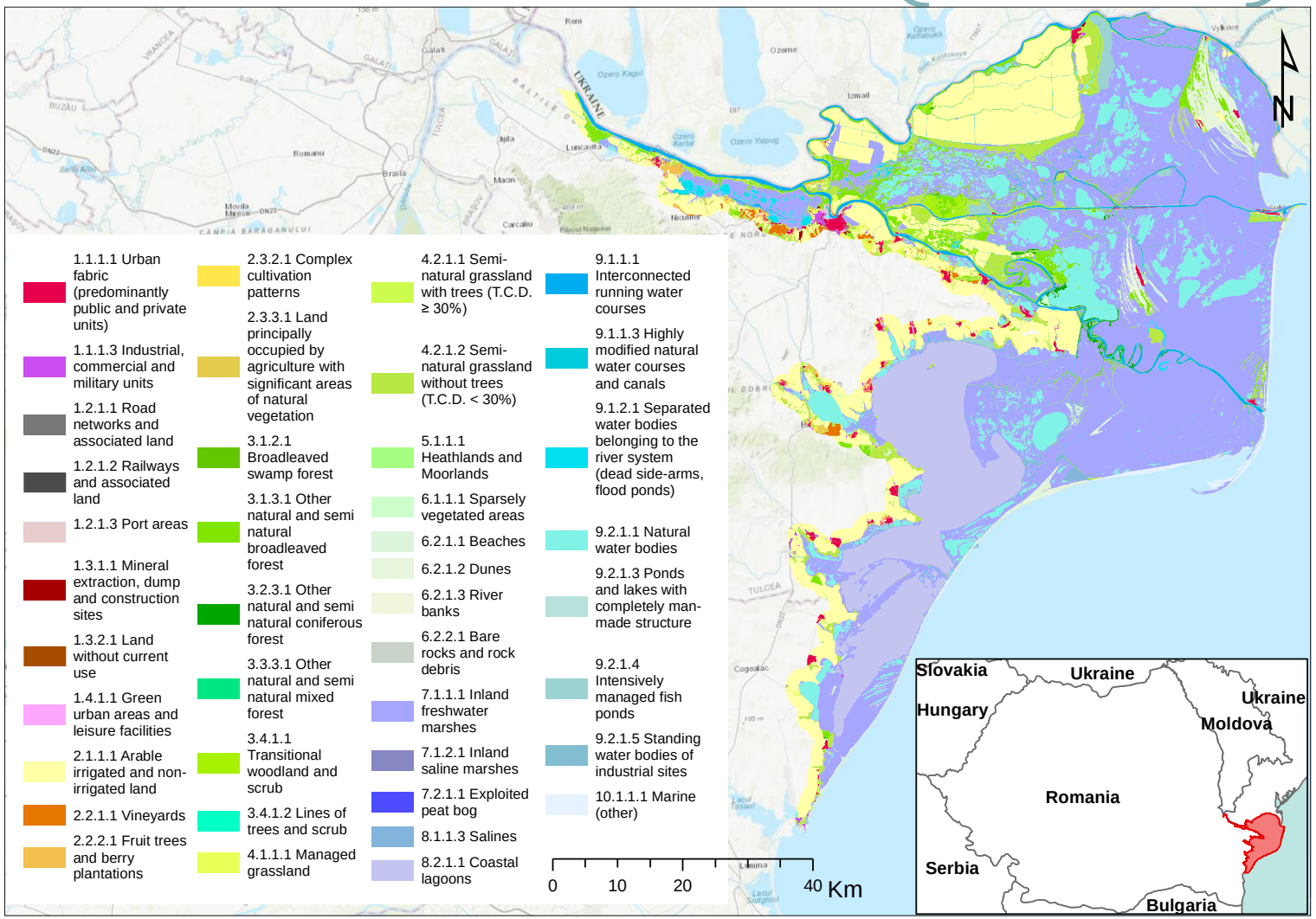


This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Ecosystem types

41 ecosystem types according to MAES level two classification





This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

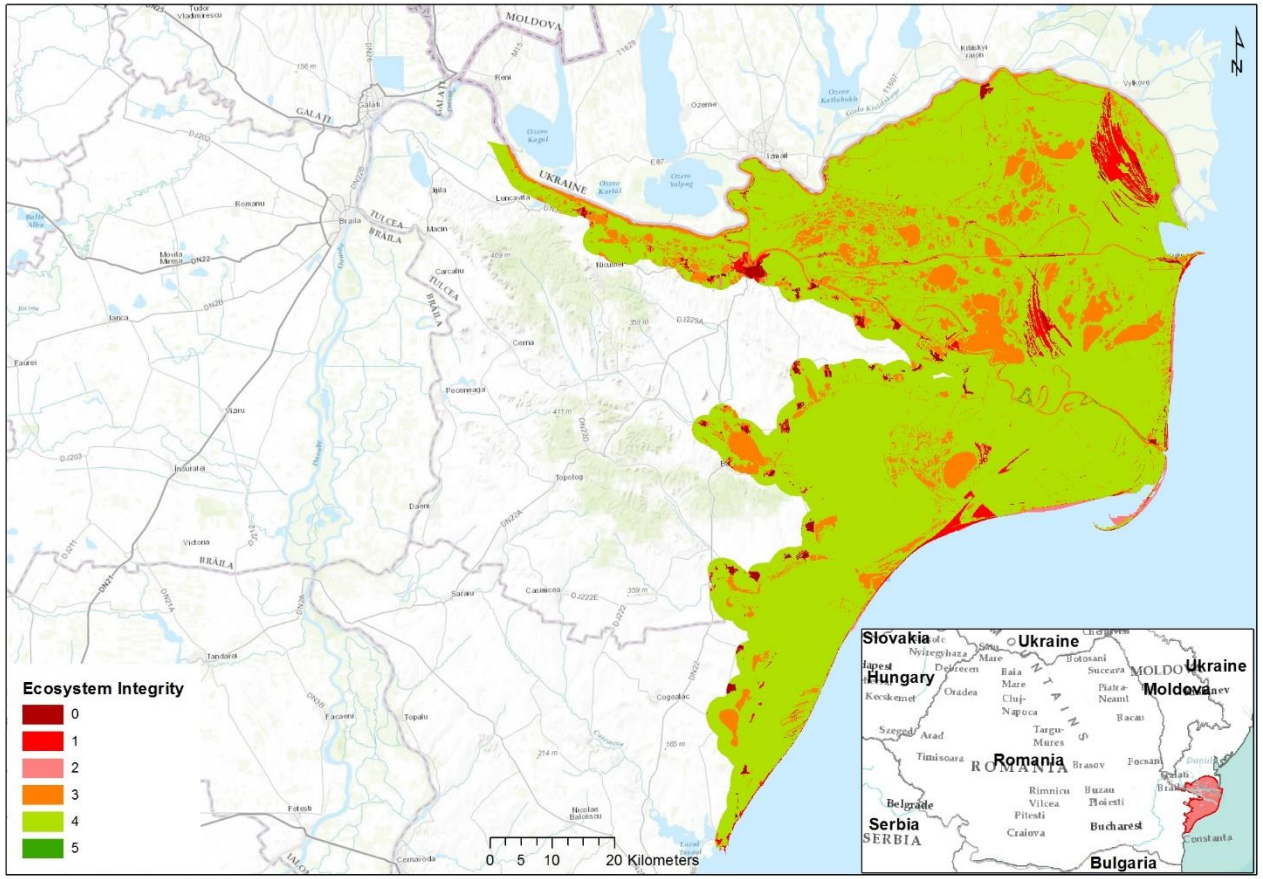
Stakeholder engagement

University of Bucharest (UB)

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Ecological Integrity

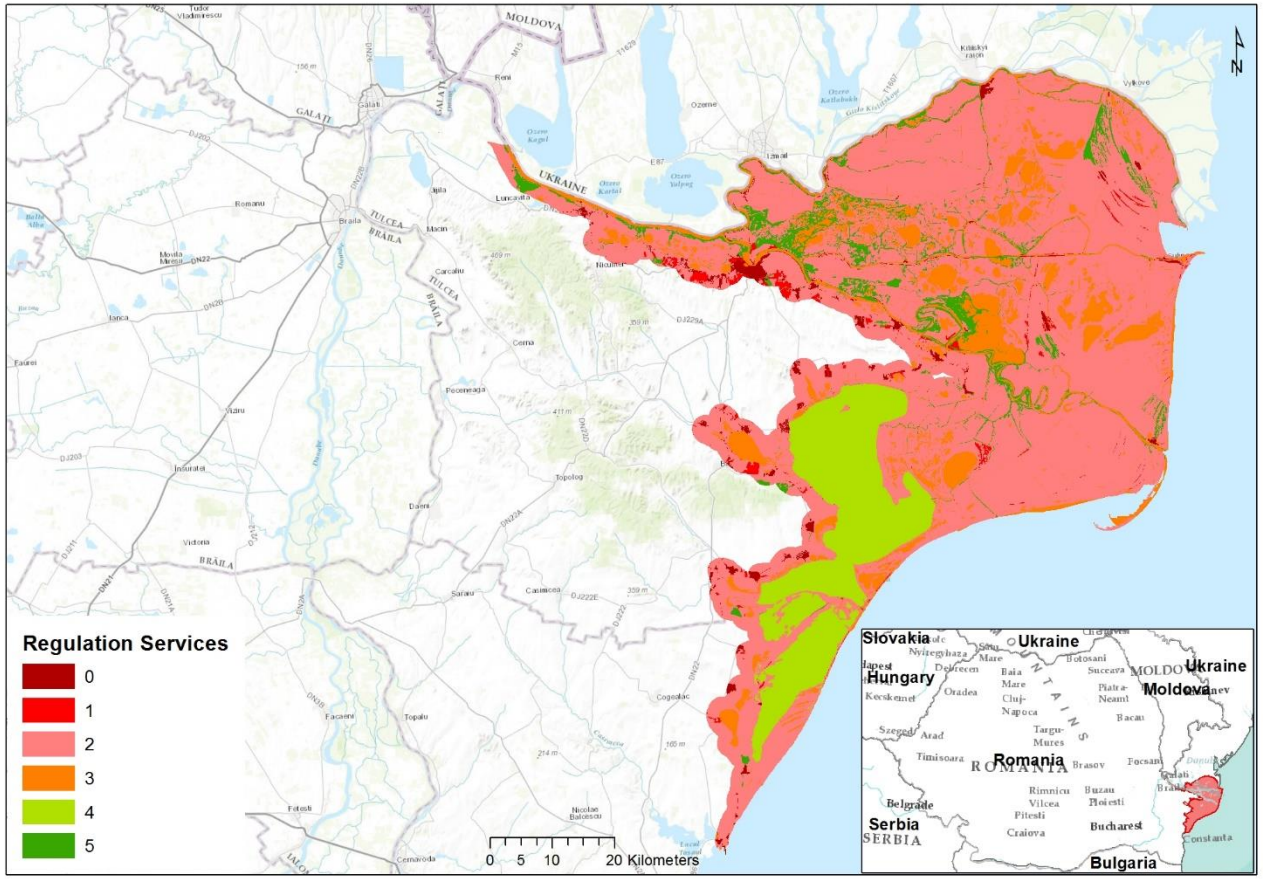
Exergy Capture (Radiation)
Entropy production
Storage capacity (SOM)
Reduction of Nutrient loss
Biotic waterflwos
Metabolic efficiency
Abiotic heterogeneity
Biodiversity



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Regulating Services

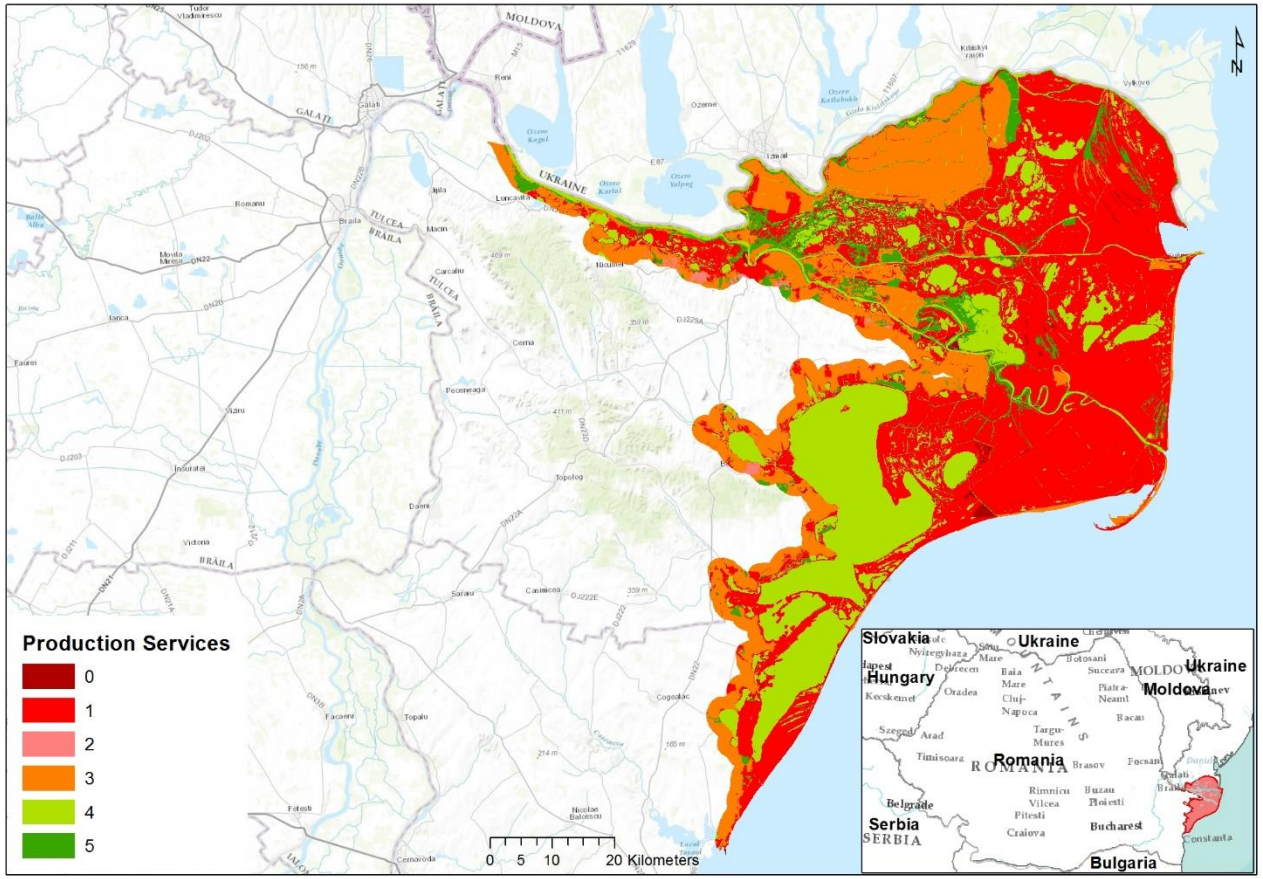
Global climate regulation
Local climate regulation
Air Quality Regulation
Water flow regulation
Water purification
Nutrient regulation
Erosion Regulation
Natural hazard protection
Pollination
Pest and disease control
Regulation of waste



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Provisioning Services

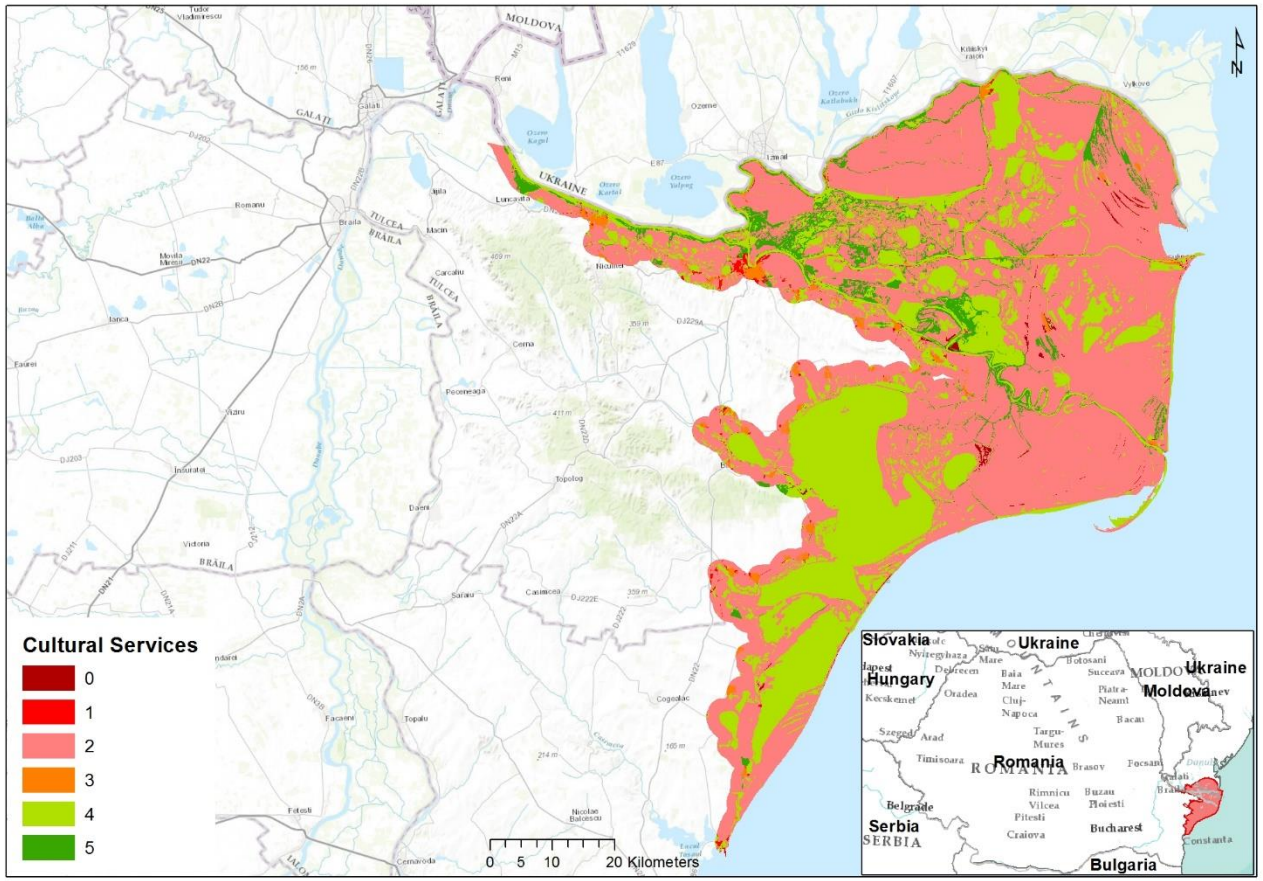
Crops
Energy (Biomass)
Fodder
Livestock
Fiber
Timber
Wood Fuel
Capture Fisheries
Aquaculture
Wild Foods
Biochemicals / Medicine
Freshwater
Mineral resources
Abiotic energy sources



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Cultural Services

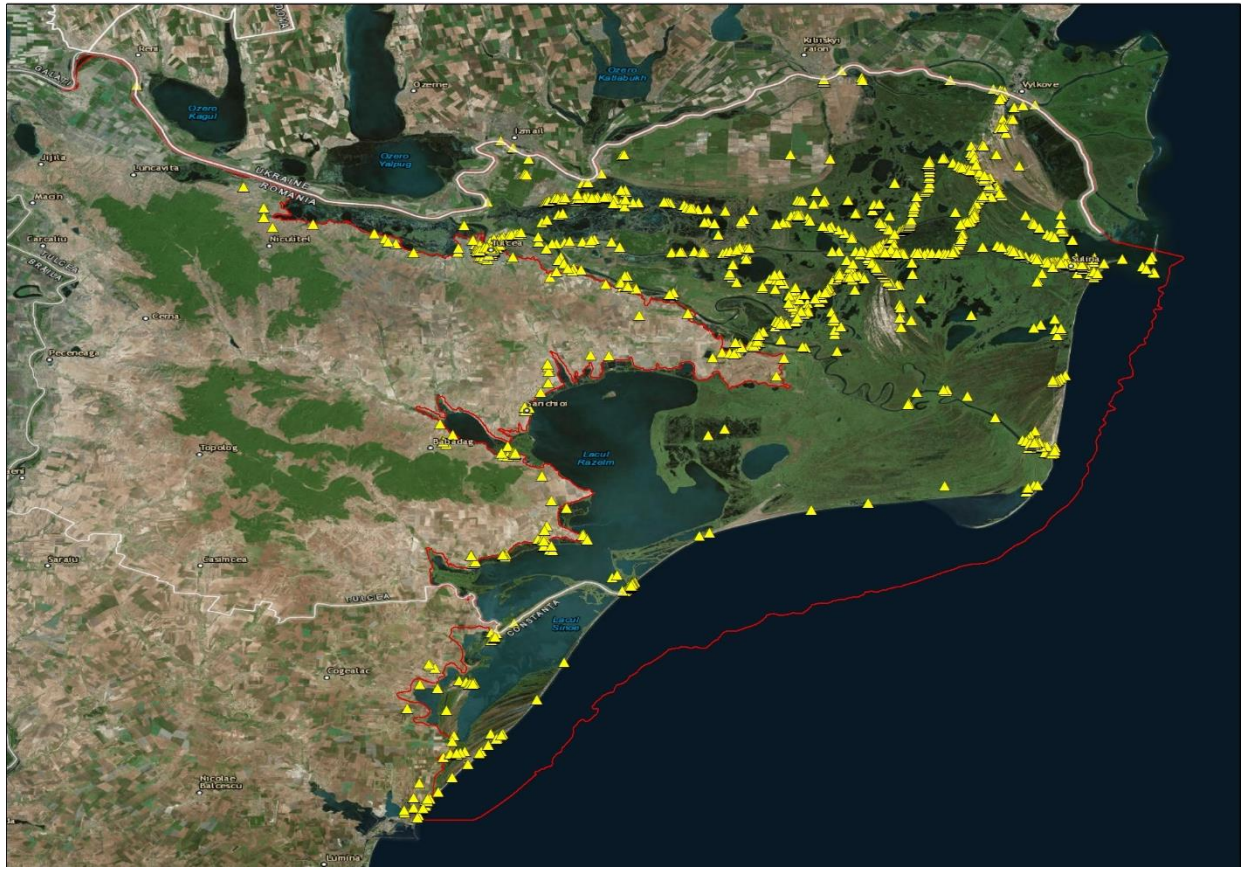
Recreation & Tourism
Landscape aesthetics, amenity and inspiration
Knowledge systems
Religious and spiritual experiences
Cultural heritage & cultural diversity
Natural Heritage & natural diversity



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Social media used to reveal the cultural services



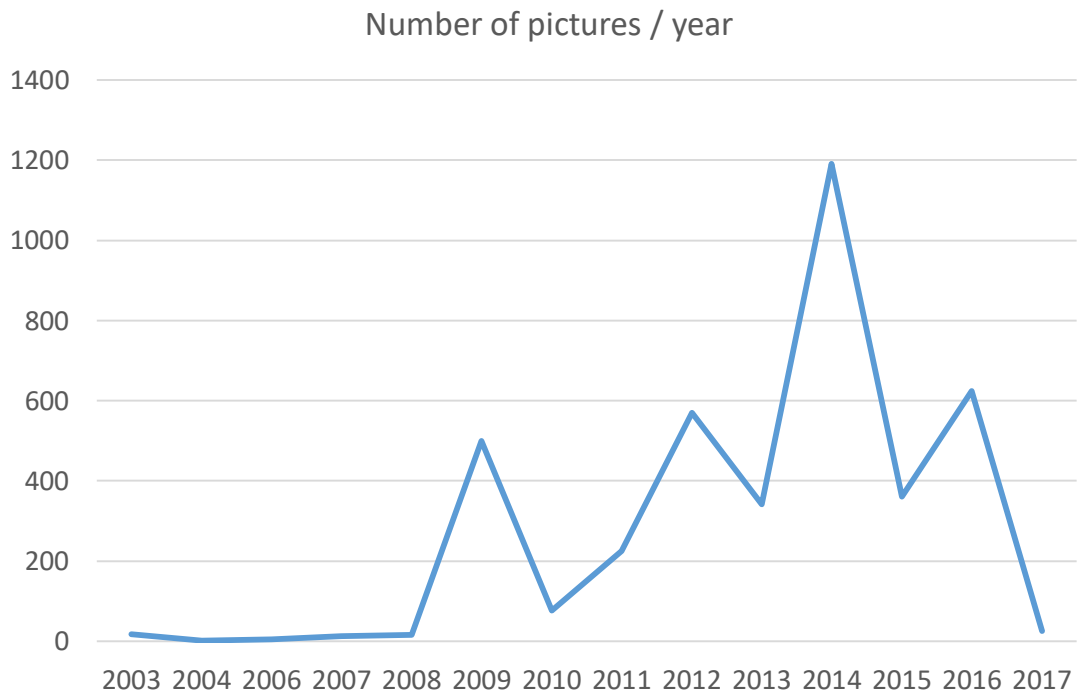
Physical interactions	Wild species, invertebrates
	Wild species, vertebrates
	Non-wild species (cattles, sheep, etc.)
	Plant species/Vegetation
	Landscape appreciation
	Other
Experiential interactions/Activities	Bird watching
	Swimming/Diving/Snorkelling
	Hiking
	Boating/Cayaking
	Leisure fishing and hunting
	Biking
	Camping
	Other
Intellectual and representative interactions	Educational
	Scientific
	Heritage, cultural
	Entertainment
	Aesthetic
	Inspirational
	Bequest
	Other
Spiritual and/or emblematic	Symbolic
	Sacred and/or religious
	Other

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

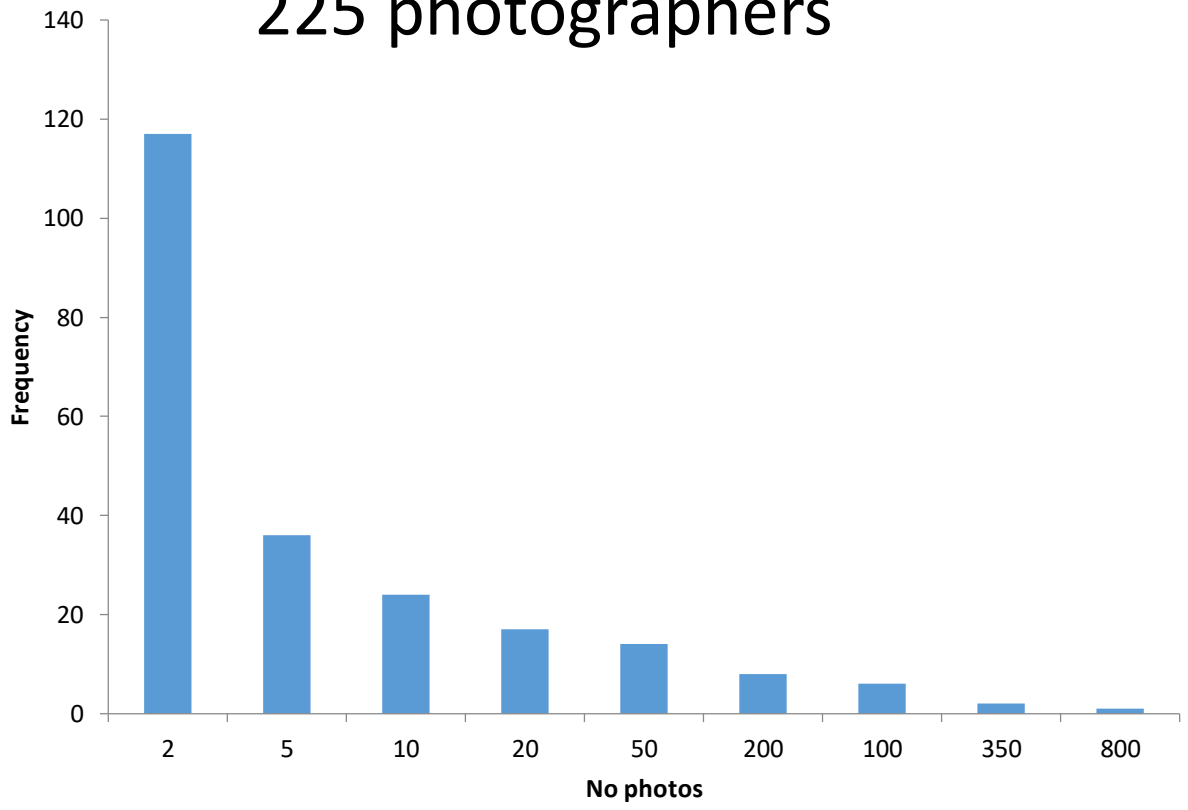
University of Bucharest (UB)

Social media used to reveal the cultural services

3965 unique pictures



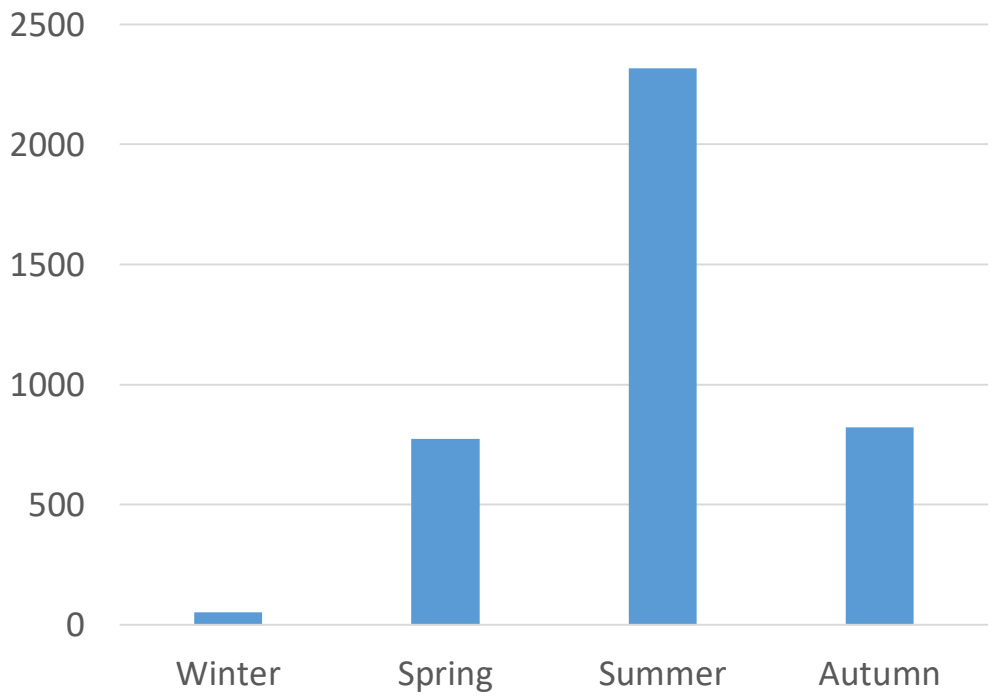
225 photographers



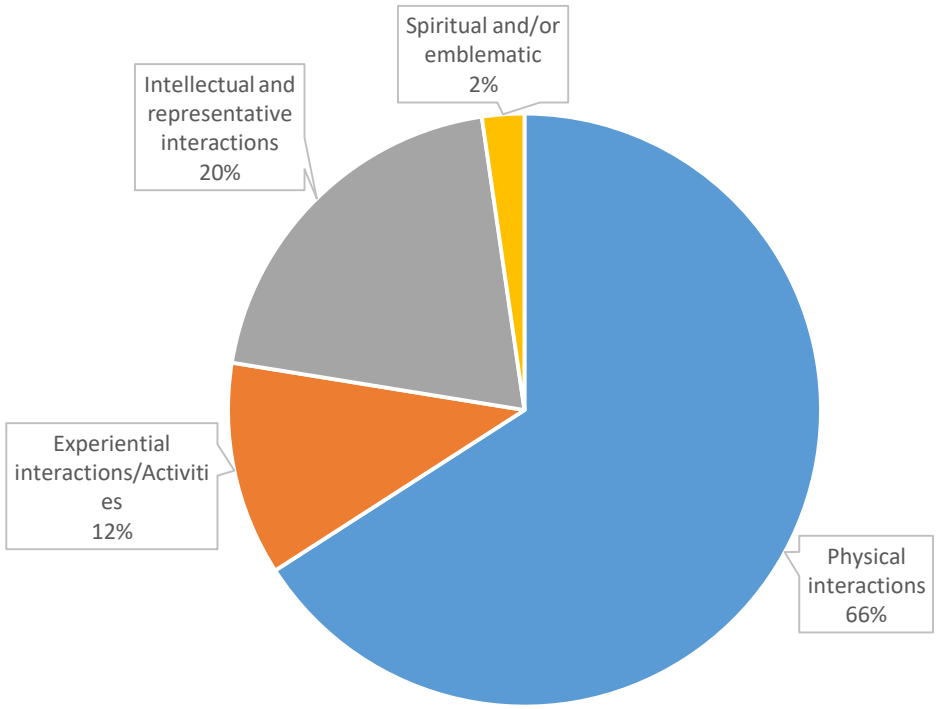
This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Social media used to reveal the cultural services

Pictures per seasons

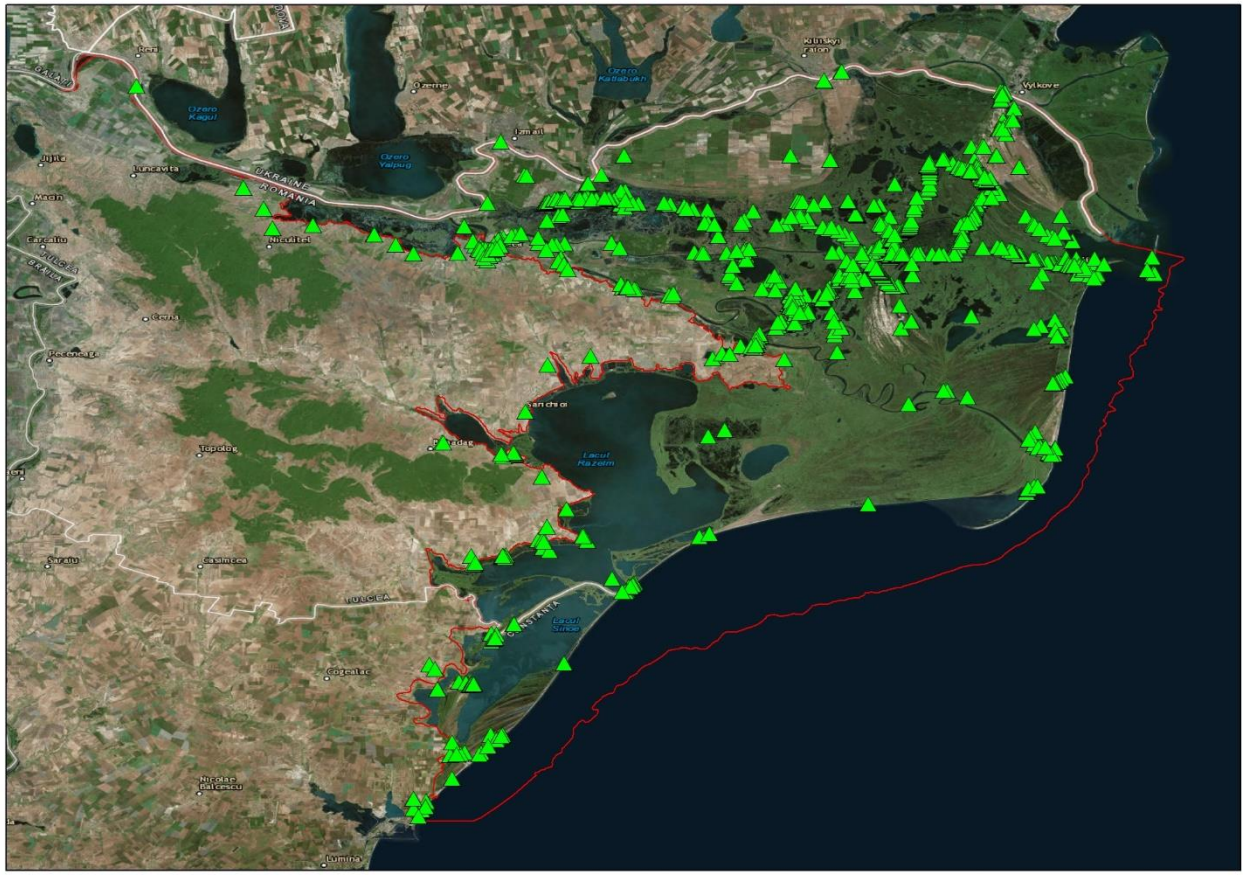


Pictures per categories



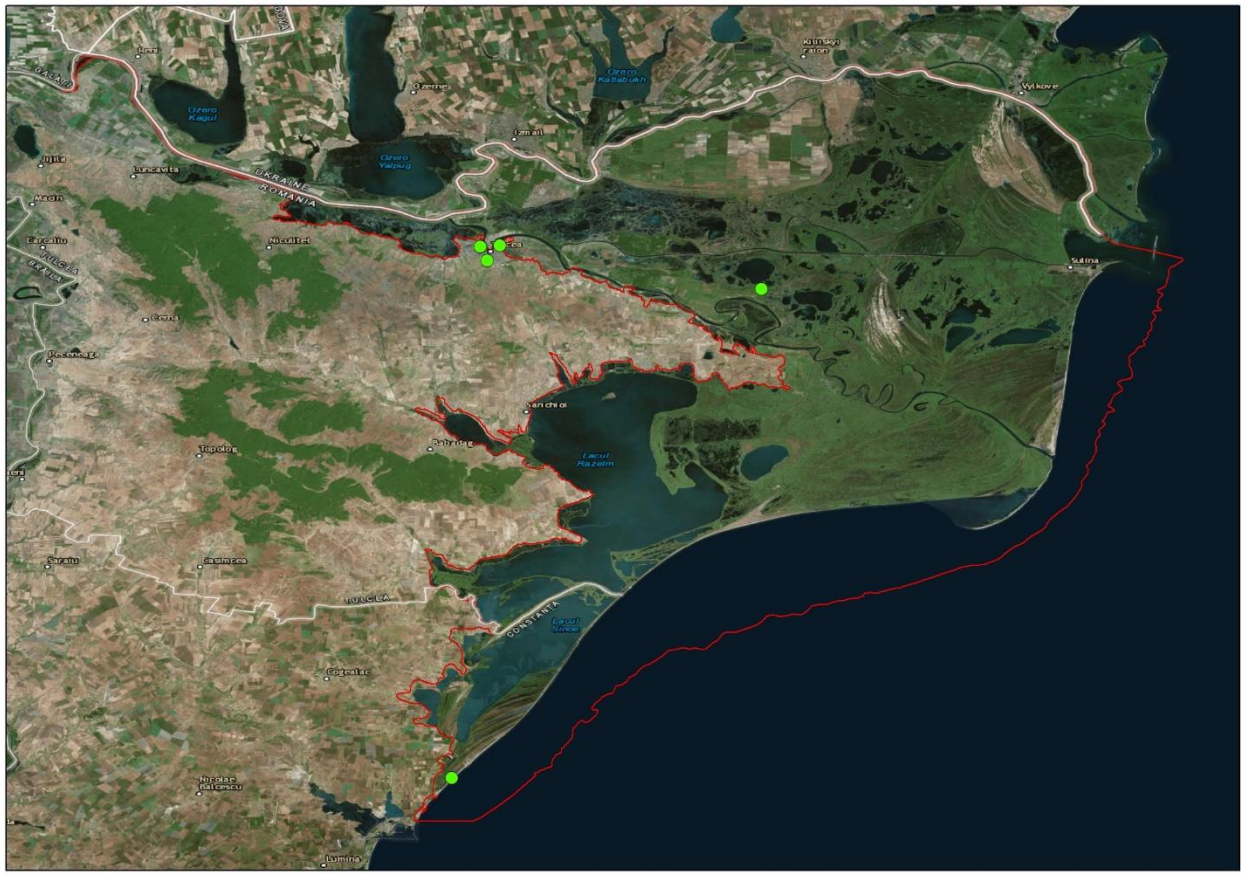
This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Physical interactions



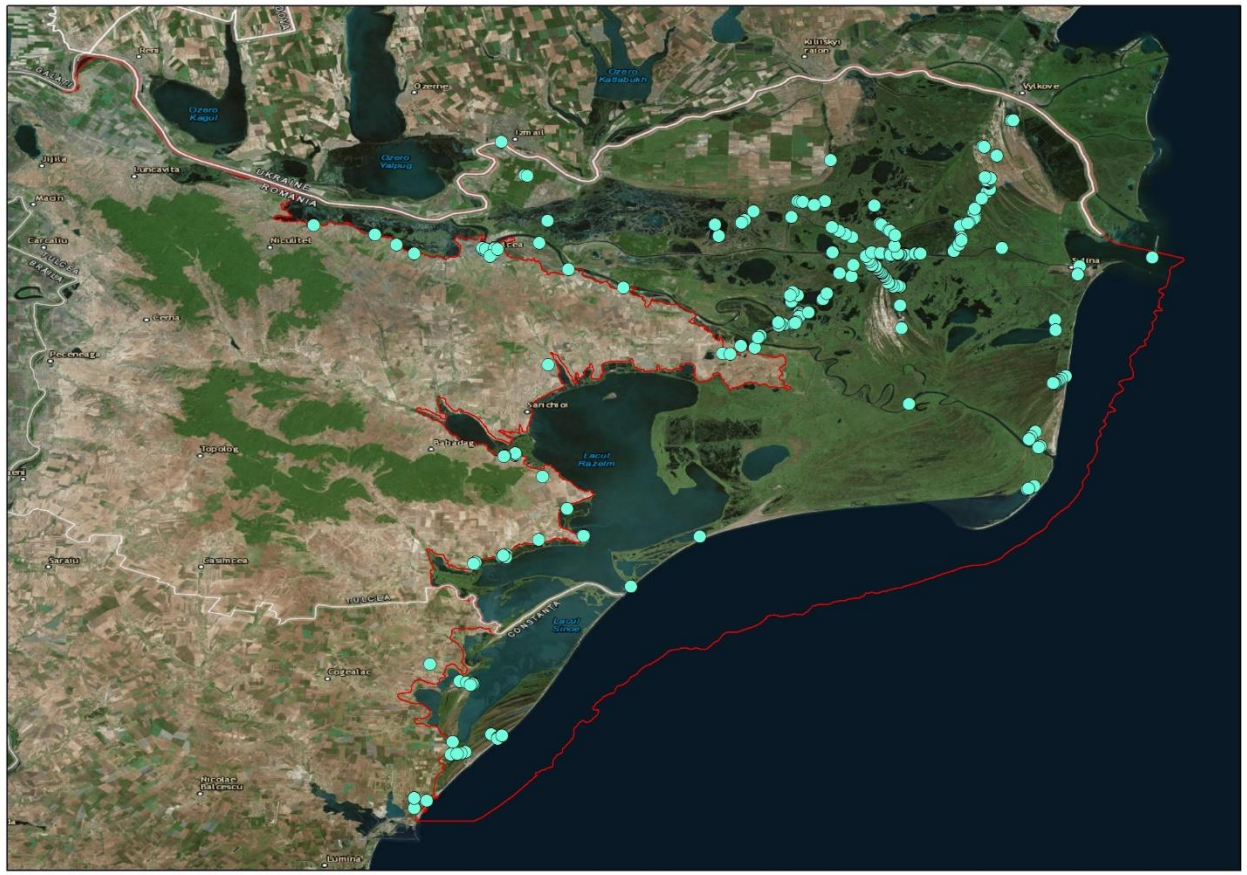
This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Physical interactions - winter



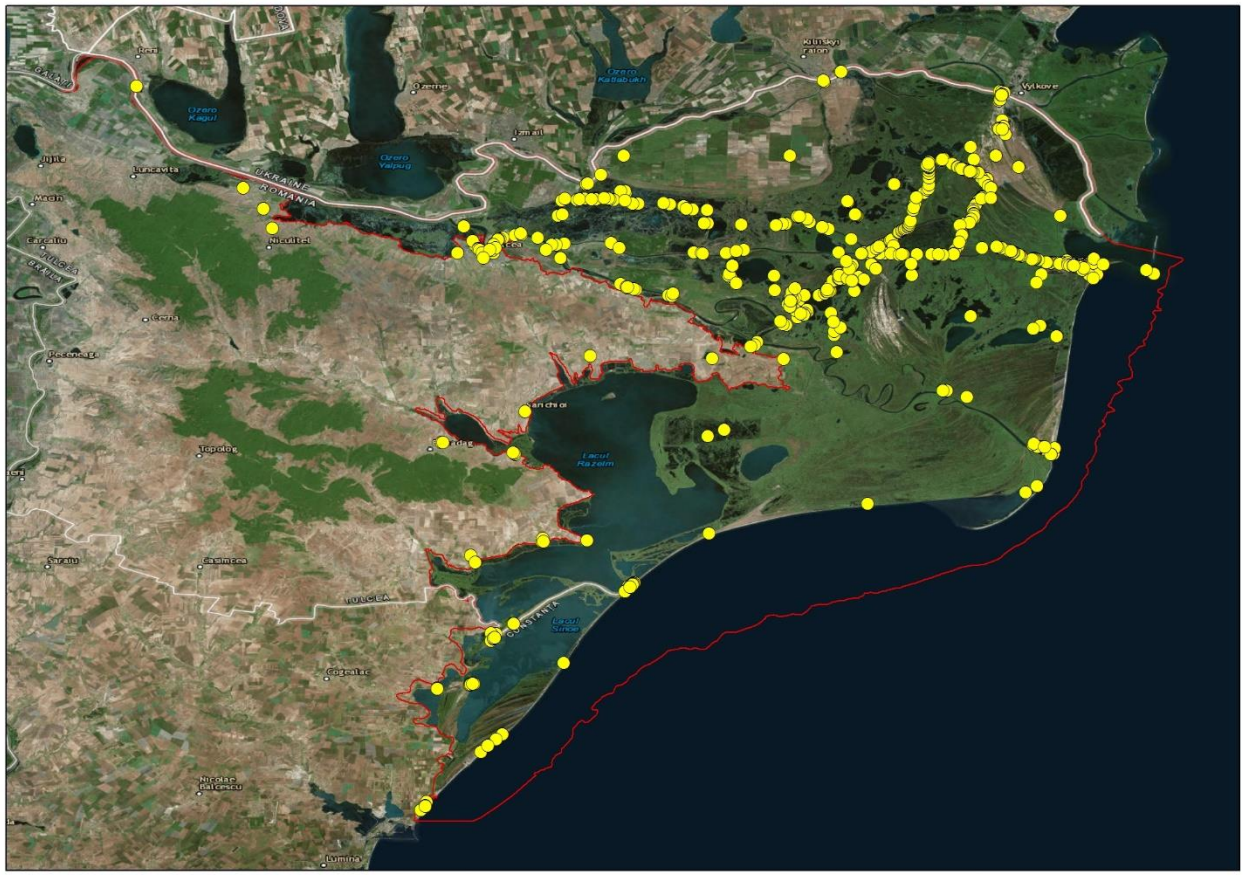
This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Physical interactions - spring



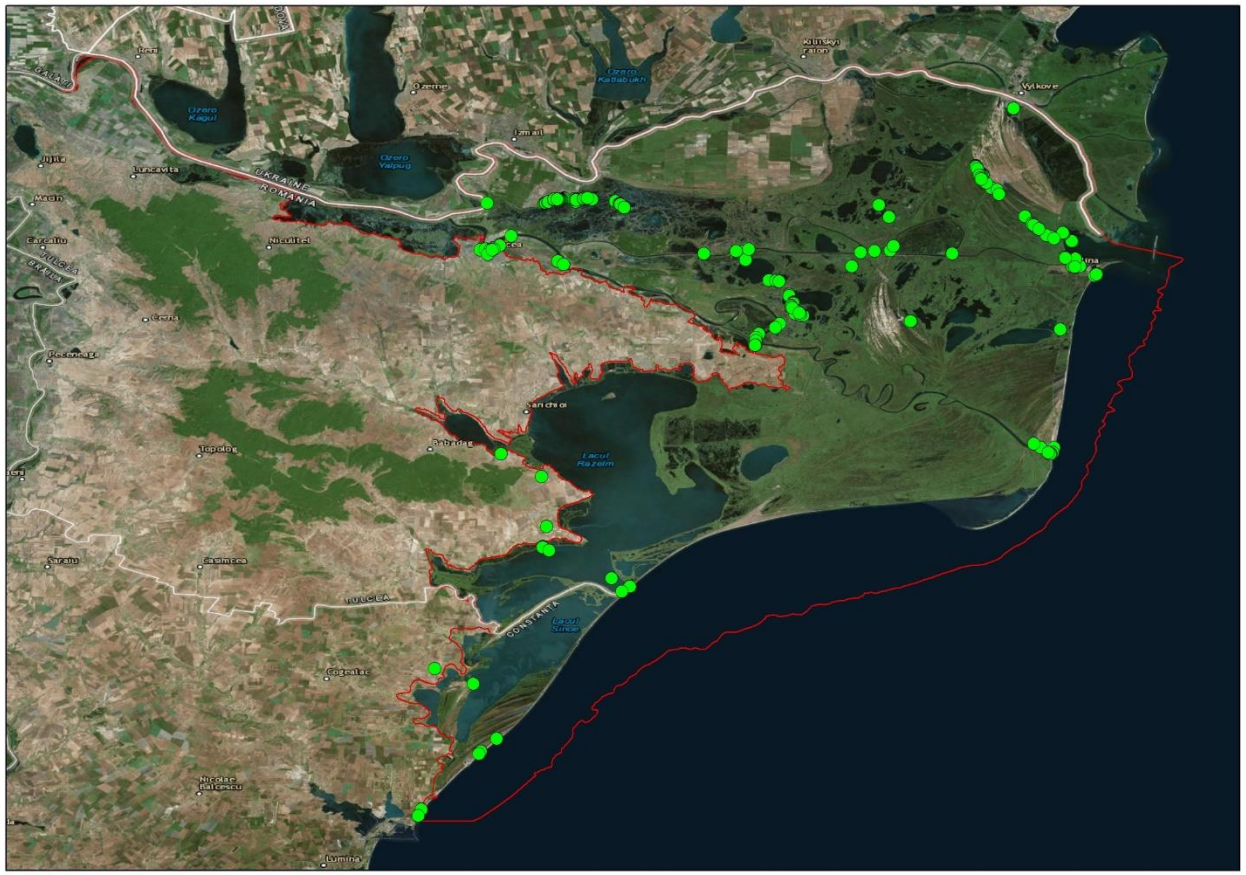
This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Physical interactions - summer



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

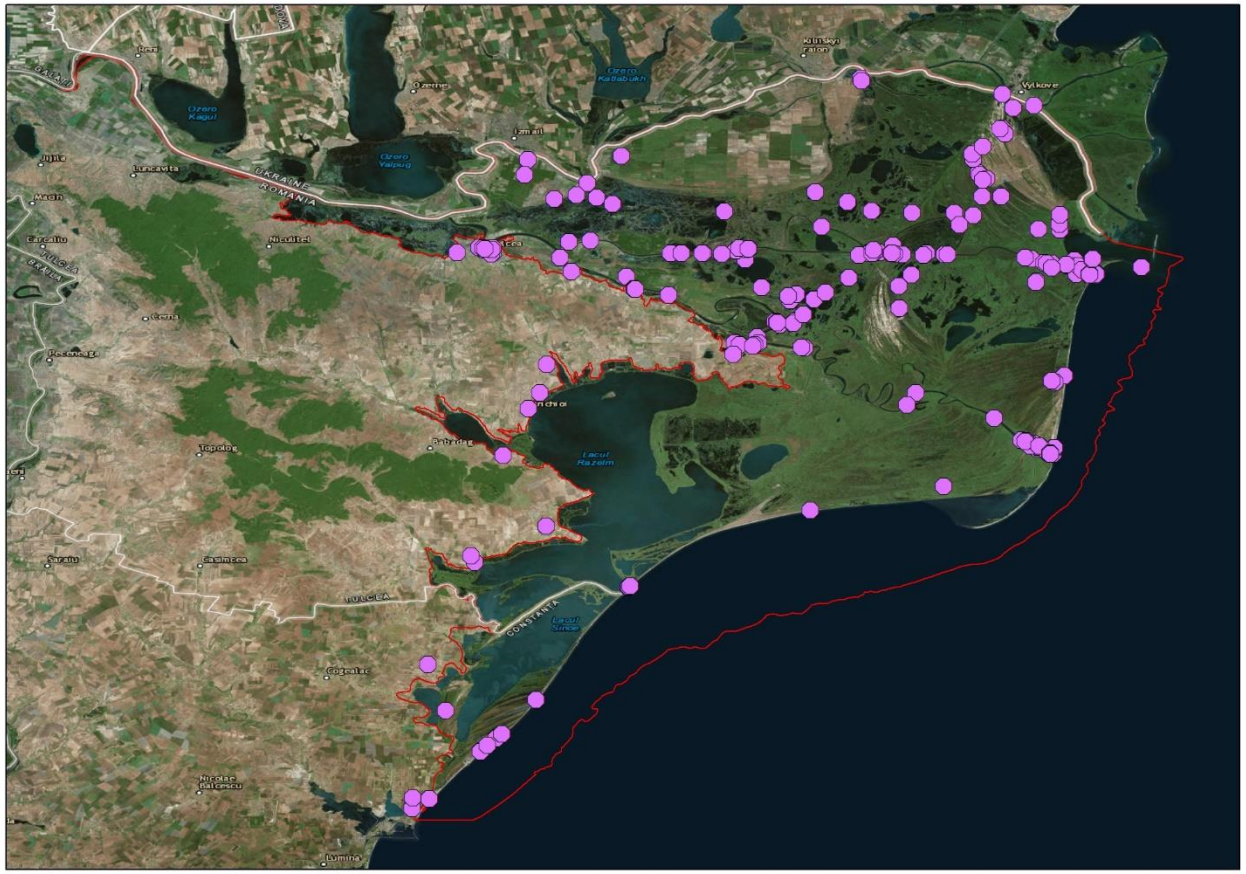
Physical interactions - autumn



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

University of Bucharest (UB)

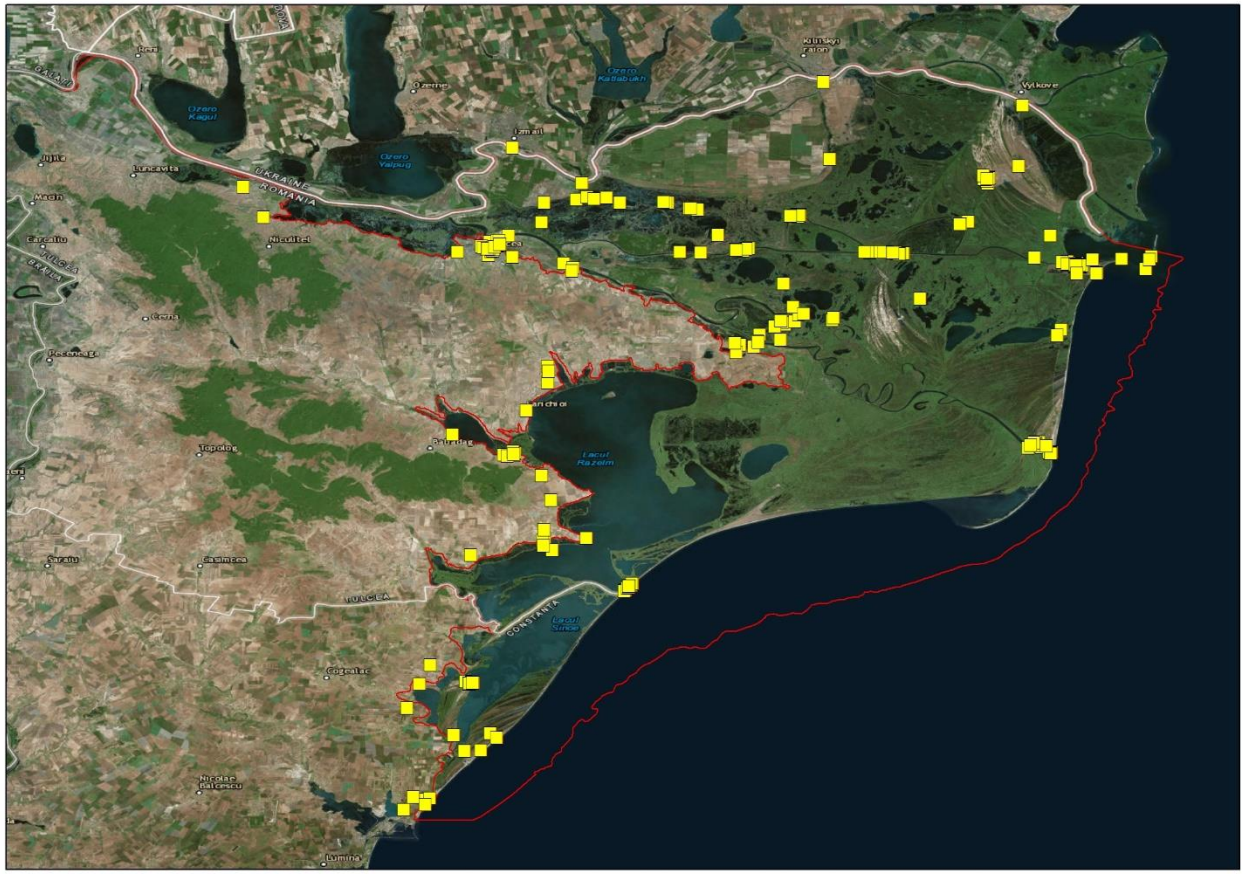
Experiential interactions/Activities



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

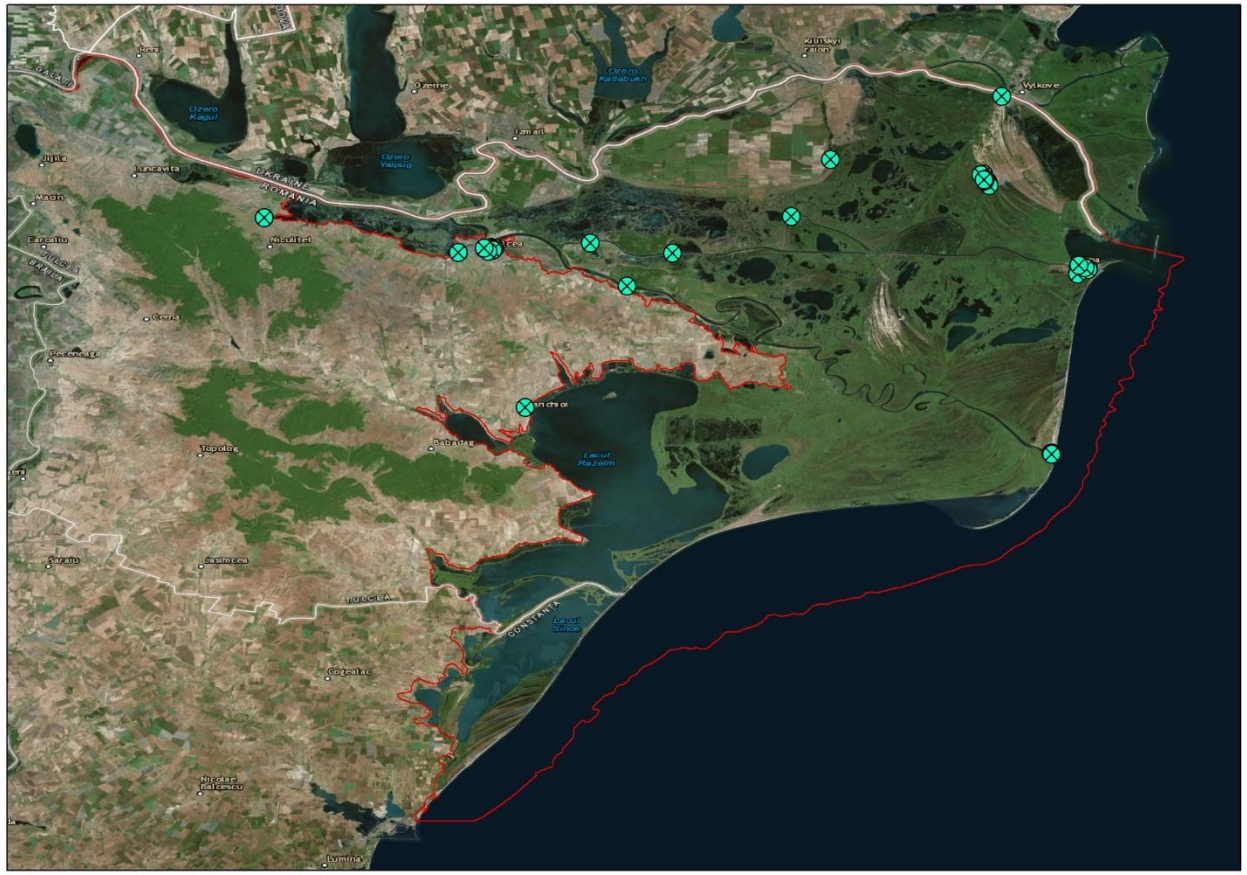
University of Bucharest (UB)

Intellectual and representative interactions



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Spiritual and/or emblematic



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Conclusions

- We found out that remote sensing is useful for identification of the ecosystem types and their distribution. The advantage to use remote sensing is also that we can assess the changes that may occur on short time (e.g. hydroperiod, distribution of chlorophyll, gross primary production for terrestrial ecosystems).
- There is still need for remote sensing derived products that can be used as proxies for water quality of the shallow water or marshy areas.
- We empirically observed that ecosystem productivity has an influence on the distribution of visitors within protected areas, and the scenery of landscape is the most attraction of the Danube Delta.

To do

- Spatial BBN including EO products
- Refinements of the potential of ecosystems to provide various services
- Compare the manually photoseries classification to the automate algorithms (e.g. google api)

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762