

SEAGRAPI

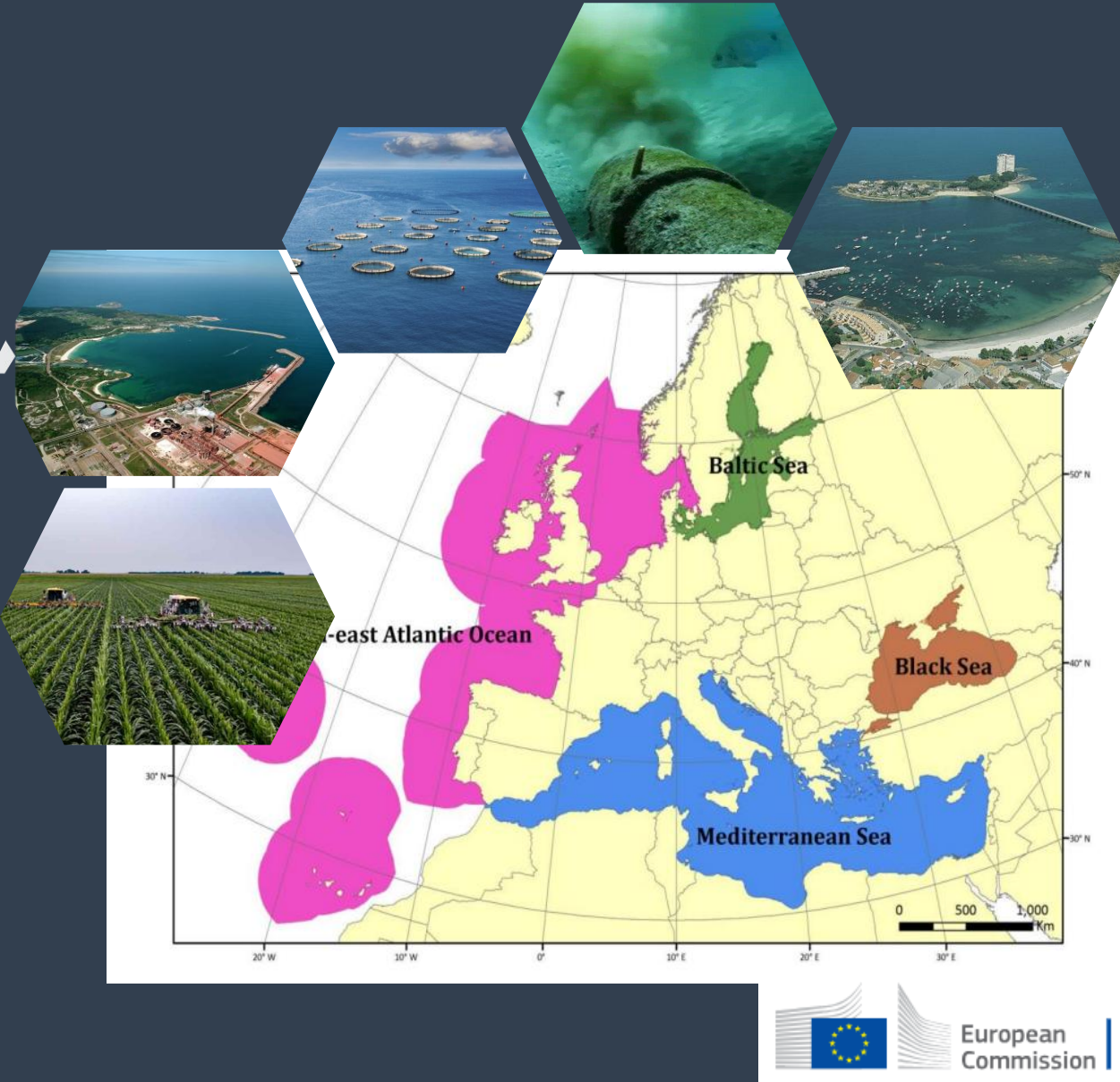
A new accumulated pressure index to assess multiple anthropogenic pressures in the infralittoral zone

Maria Dolores Belando; Marta García-Sánchez; Pedro C. Navarro-Martínez;
Irene Rojo; Aranzazu Ramos-Segura; José Martínez-Garrido; Carmen
Mompeán; Fernando García-González; Lázaro Marín-Guirao; Juan M. Ruiz;
Jaime Bernardeau-Esteller

ICES ANNUAL SCIENCE CONFERENCE 2025

CONTEXTUALIZATION

- The **MSFD** promotes an ecosystem-based management approach that integrates the impact of human activities.
- Characteristics of pressures + extent and intensity of impacts on habitats. **Pressure-habitat state relationships.**
- The infralittoral coastal zone - overlapping human activities. New tools that quantify combined effects.
- A key challenge is assess the impact and spread of diffuse pressures, which can be addressed using bioindicators.



Seagrass accumulated pressure index: SEAGRAPI

Principle of additivity of pressures (Halpern et al. 2007, Batista et al. 2014)



Based on *Posidonia oceanica* responses

- ↳ Broadly used as bioindicator
- ↳ High sensitivity and rapid response

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Conceptual framework



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Estuarine, Coastal and Shelf Science

journal homepage: www.elsevier.com/locate/ecss



Rapid tool for assessing potential ecological changes in littoral rocky shores

Marc Terradas-Fernández^{a,1,*}, Pedro Clemente Navarro-Martínez^{b,c,1},
Aránzazu Ramos-Segura^c, José Jacobo Zubcoff^a, Ana Belén Jódar-Pérez^d,
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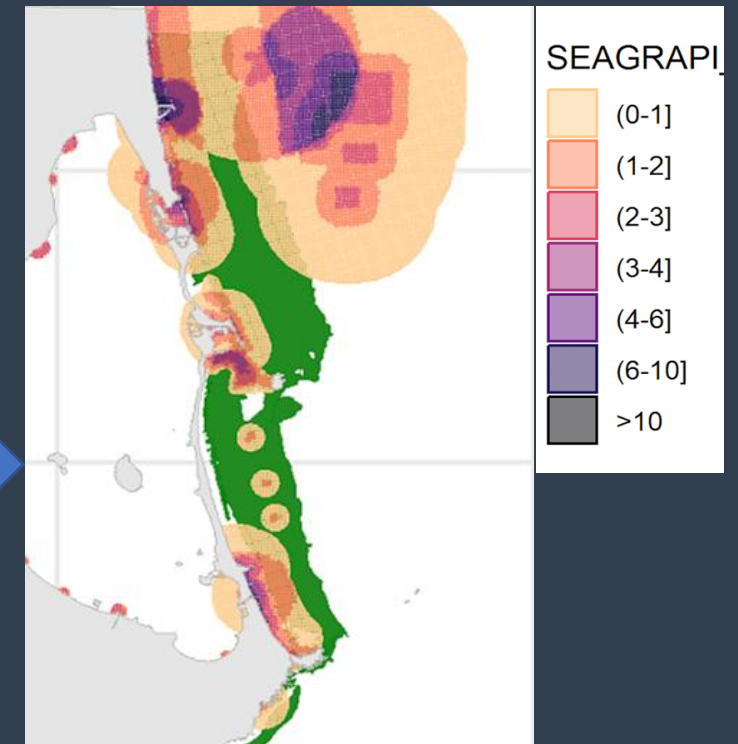


Seagrass accumulated pressure index: SEAGRAPI

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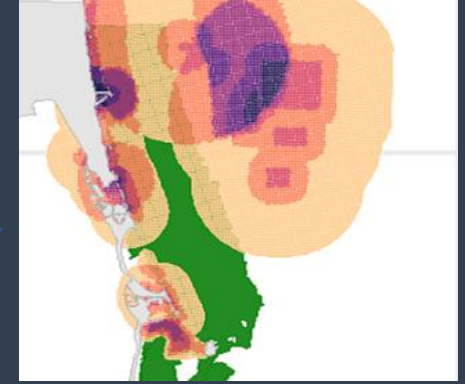
SEAGRAPI



Map that visualizes the cumulative pressure on a specific area



SEAGRAPI procedure



1 Inventory and mapping of relevant pressures

2 Characterization of each pressures

3 Determine spatial extent and intensity

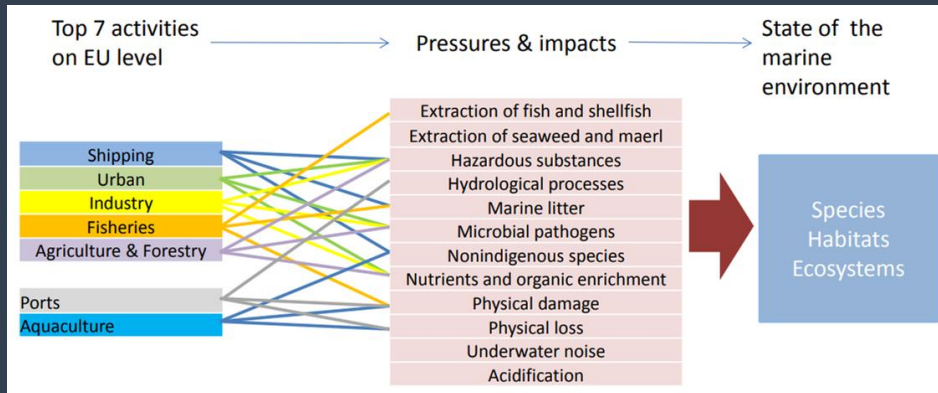
4 Calculation of the Cumulative Pressure Value

Study case: Región de Murcia (SE Spain)

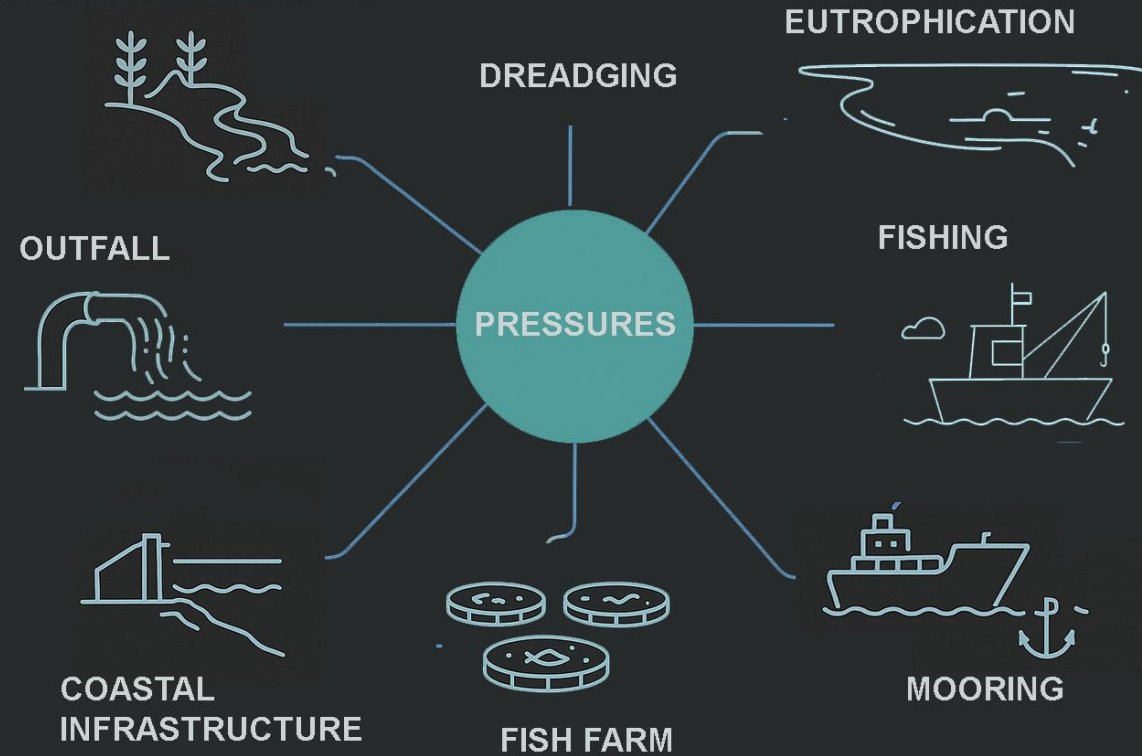
5 Validation and applications

1 Inventory and mapping of relevant pressures

MSFD



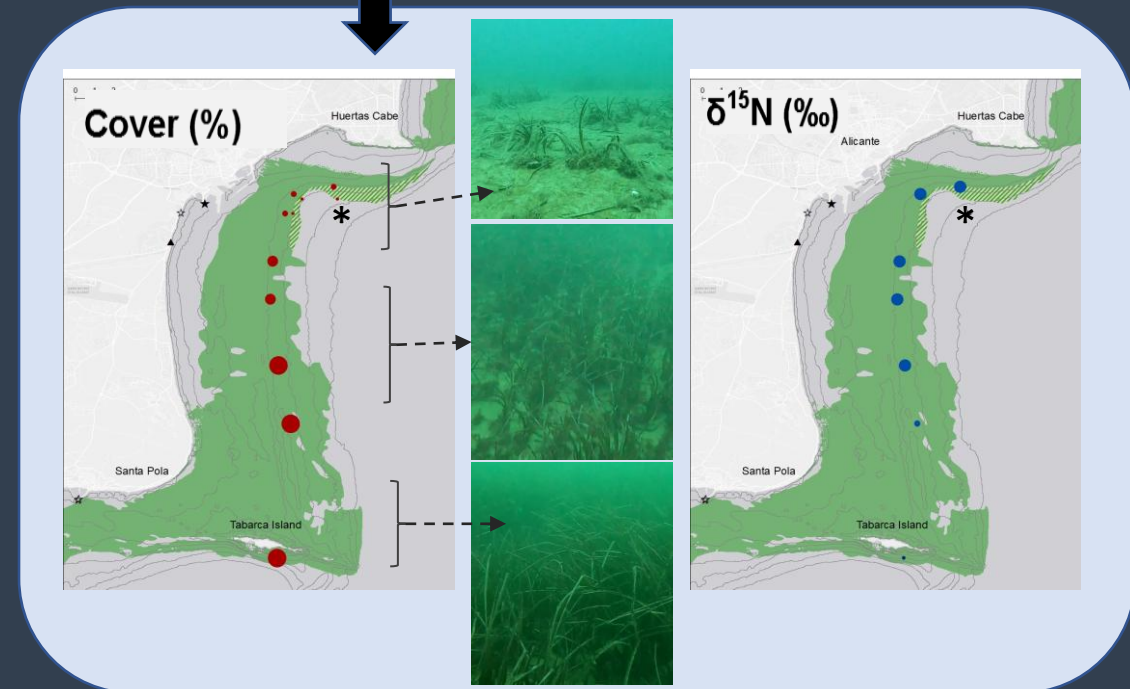
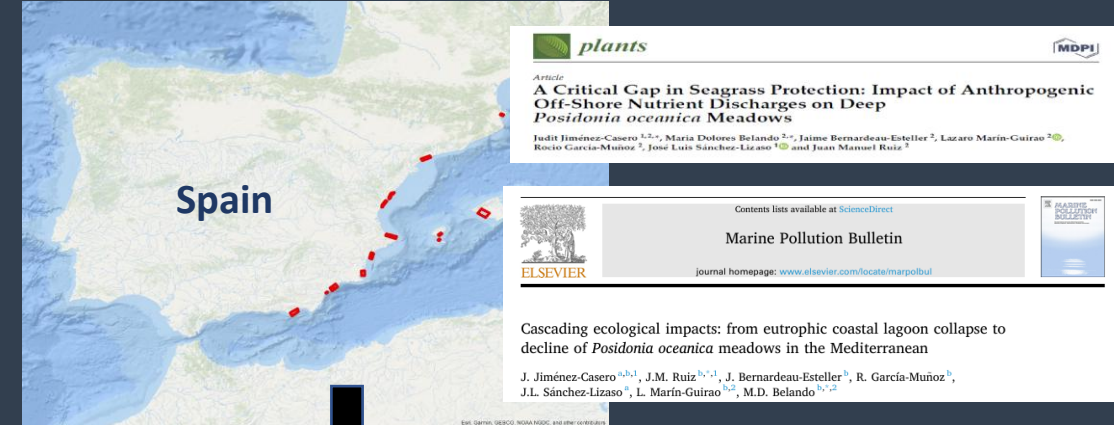
HYDROLOGICAL PROCESS



- A) Bibliography, online viewer layer, companies, $\delta^{15}\text{N}$ data, other contaminants...

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B) Study cases. Pressure gradients

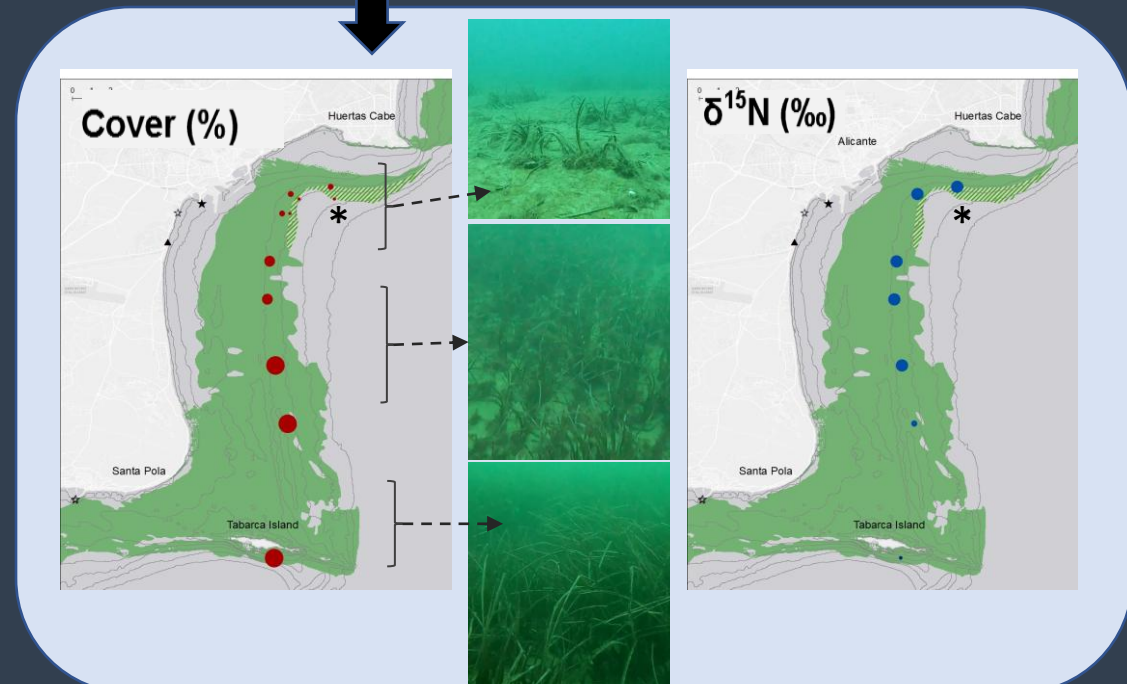
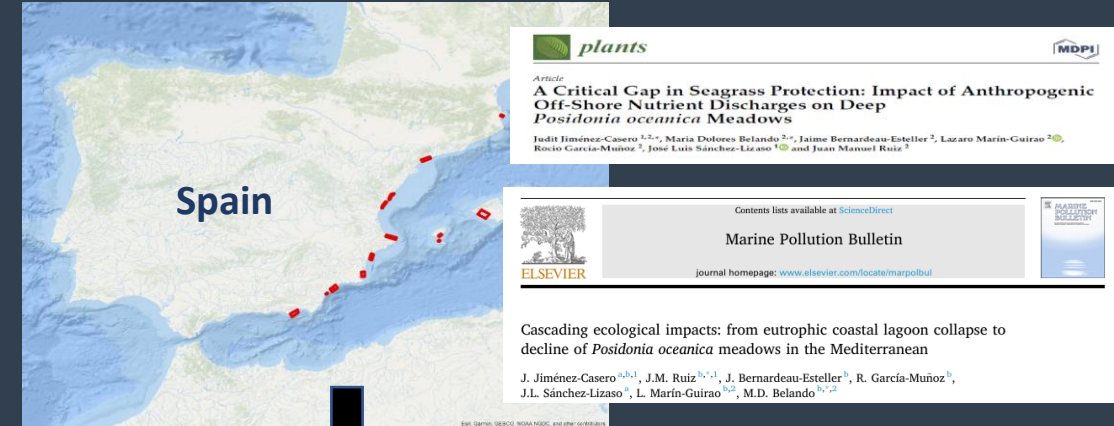


A) Bibliography, online viewer layer, companies, $\delta^{15}\text{N}$ data, other contaminants...

C) Characterization with **spatial extend** and **score**

Pressure categories	Subcategory	Spatial extend (m)	Pressure score
Hydrological process	Land uses- Wadis	150-1400	3
	Groundwater(bad state and high permeability)	150, 1500	3
Outfalls	WWTP type A, B,C,D (m ³ /year)	1,000,2000,4000,5000	3
	Industrial (m ³ /year)	1000	2
	Urban (m ³ /year)	500	3
	SWPO (hm ³ /year)	1000-3000	3
Acuaculture	Sea farms type A,B,C (Tn/year)	500, 1000, 3000	3
	Nursery	500	3
Mooring	Polingone size		2
	Artificial beaches	50	3
Coastal infrastructure	Fishing, military and commercial ports	1000-2000	3
	Recreative ports	250	2
Dredging		100	3
Fishing		100	3
Coastal eutrophication		1500	3

B) Study cases. Pressure gradients



2 Characterization of each pressures

Land uses - *Wadi discharges*

Spatial extend (*Mateos-Molina et al. 2015*):

Distance $\sim$ watershed size + LUSI*

* LUSI (*Flo, 2019; Nikolić, 2013*)

Category	Subcategory (CLC 18)	Surface (%)	Score
LAND USES	Urban (A)	<10	0
		10-33	1
		33-66	2
		>66	3
	Comercial or industrial (B)	<10	0
		10-33	1
		>33	2
	Agriculture (C)	<10	0
		10-40	1
		40-60	2
		>60	3
LUSI Pressure Score = A + B + C			

2 Characterization of each pressures

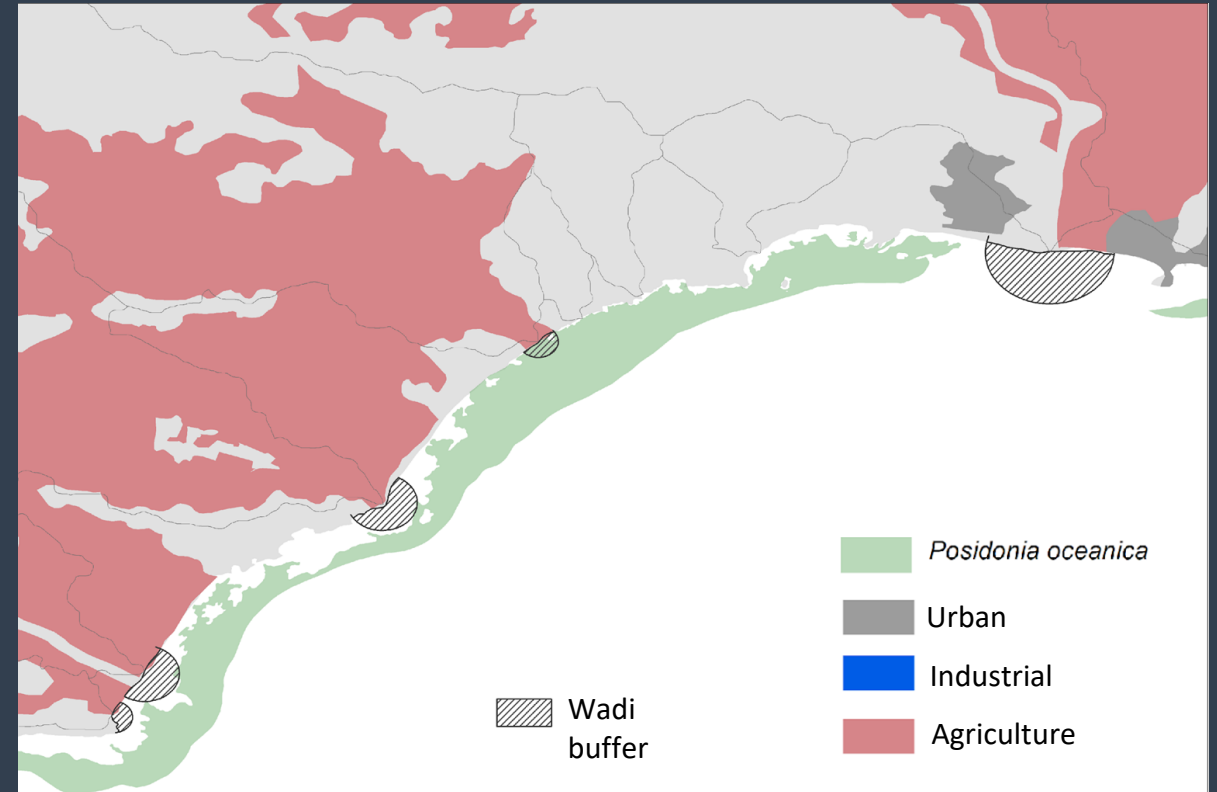
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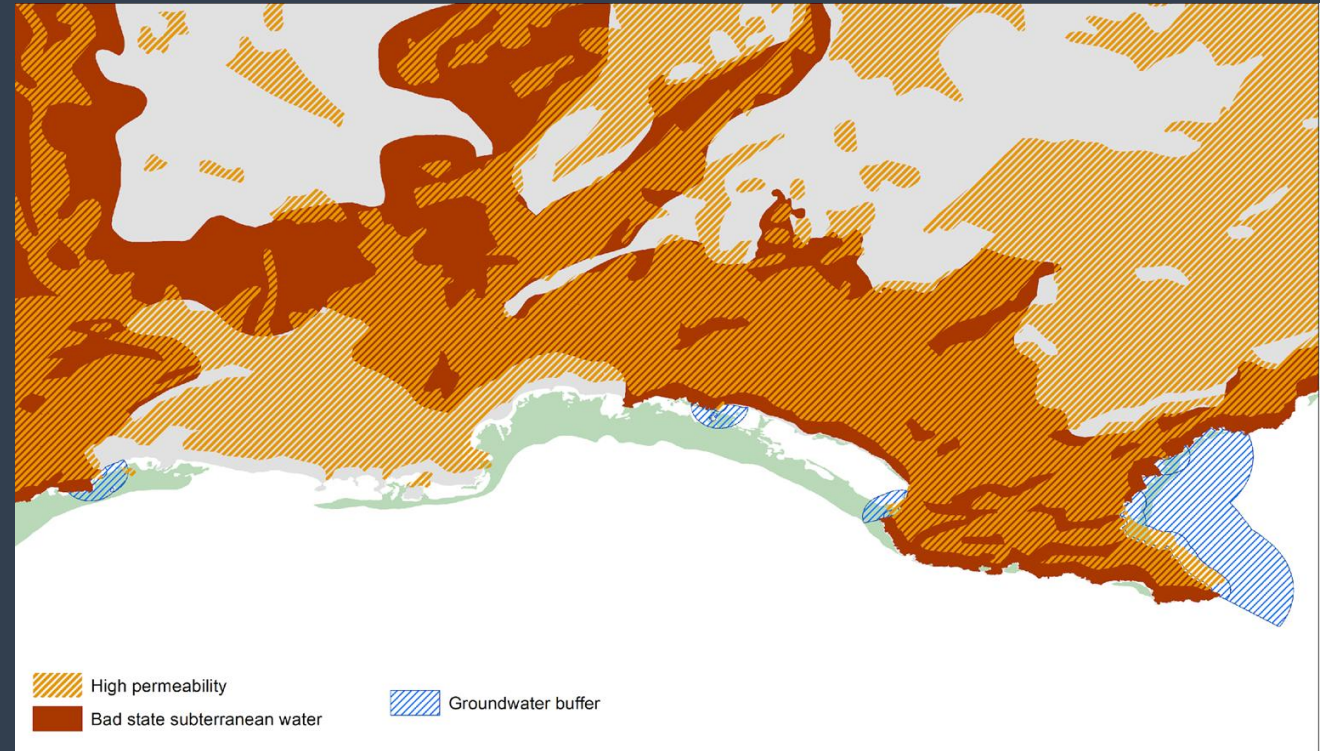
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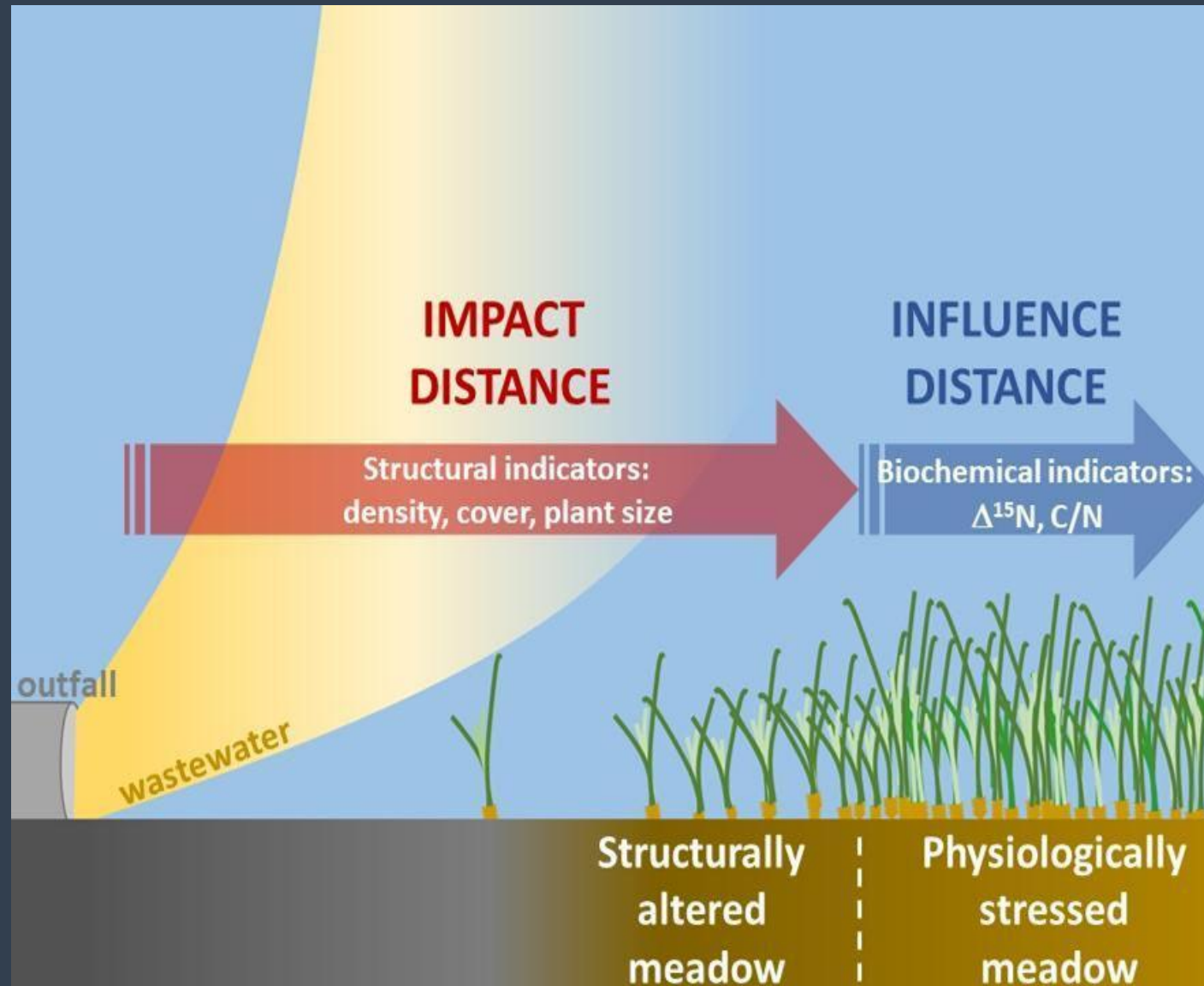


2 Characterization of each pressures Groundwater

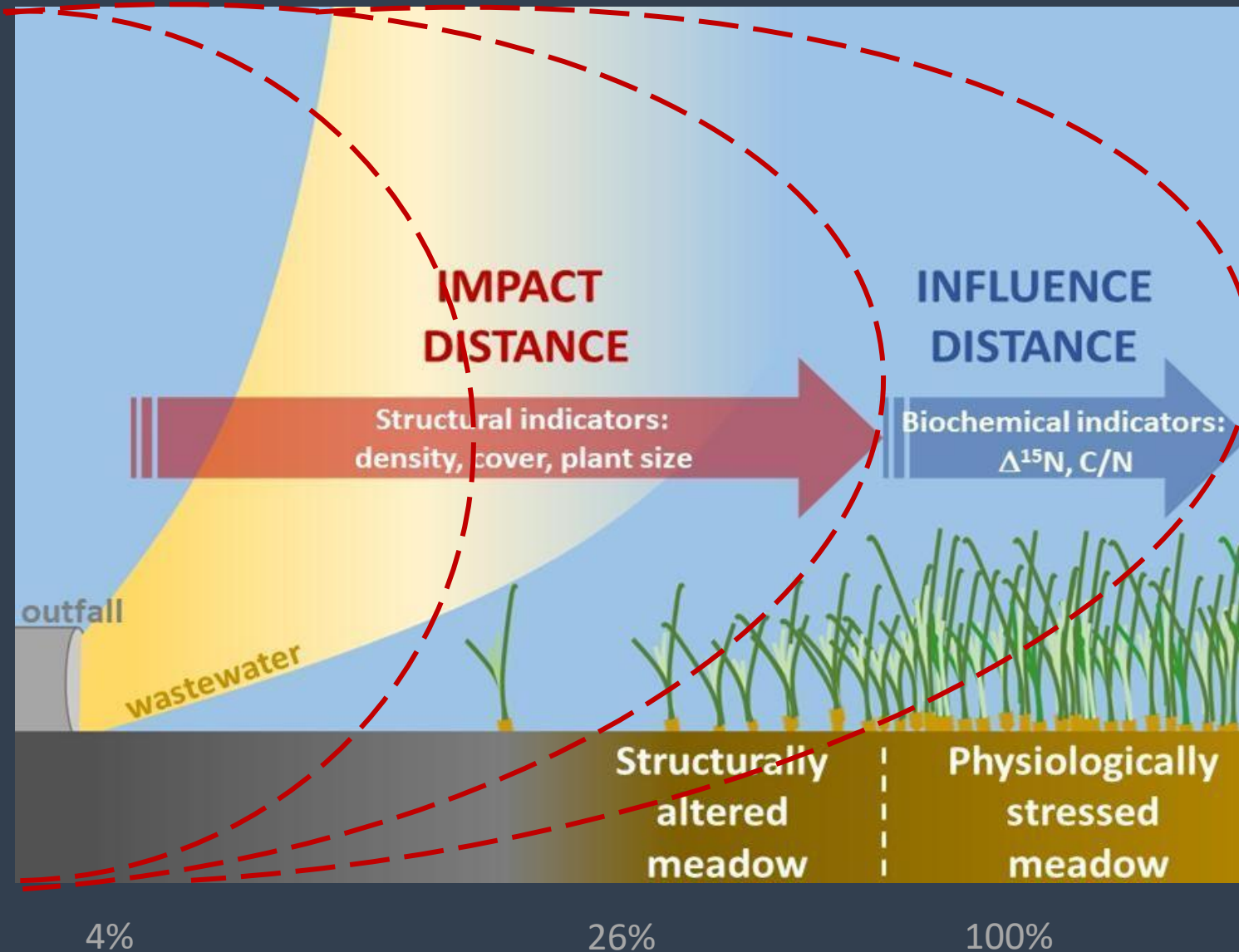
1. Subterranean water status- River Basin Hydrological Plan
2. Permeability (IGME, Spain)
3. Intersection distance with coastline
(150, 1500 m)



3 Determine spatial extent and intensity

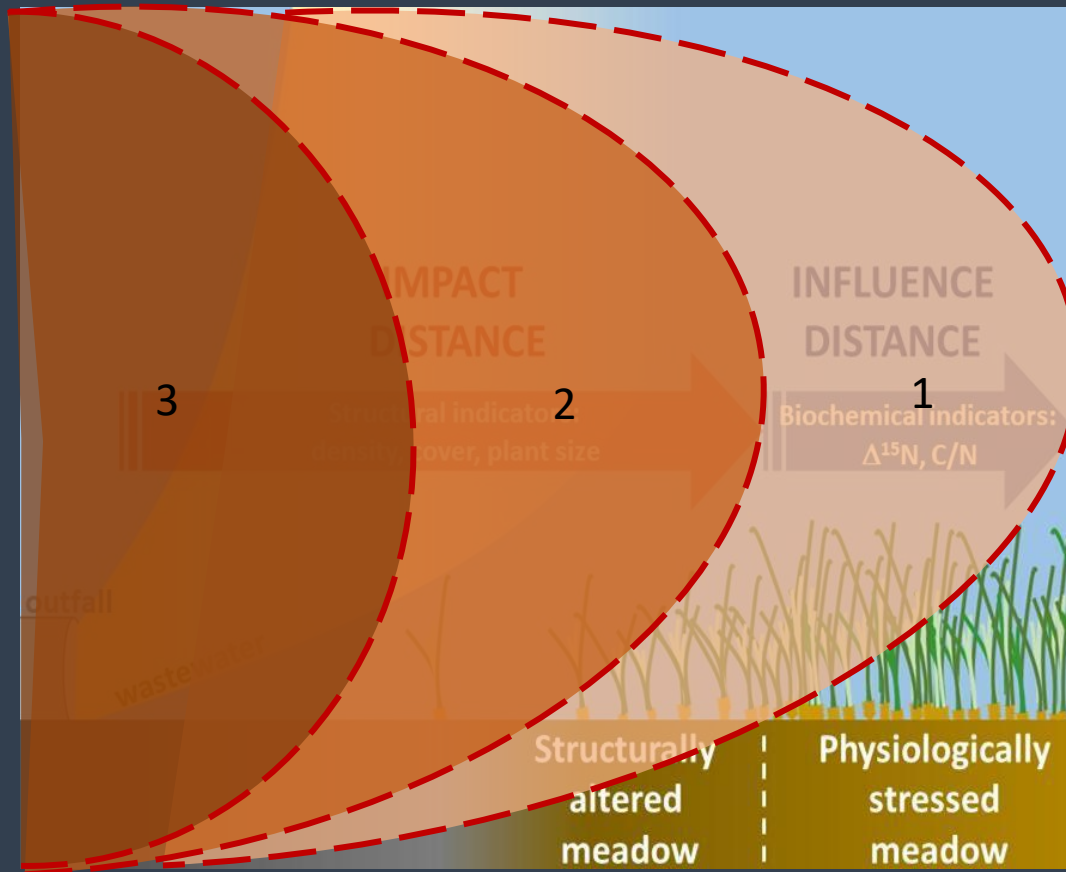


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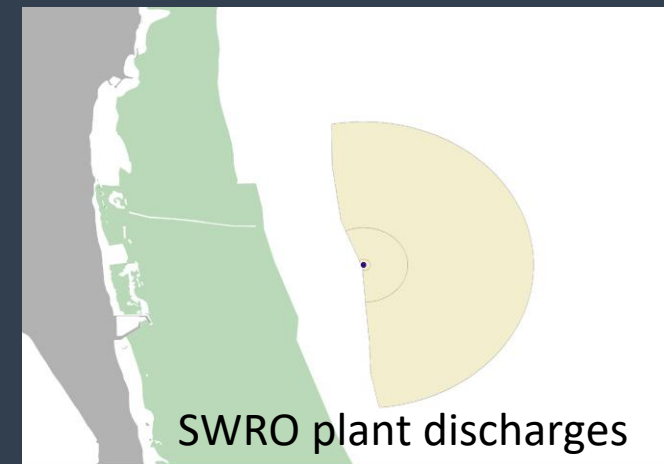
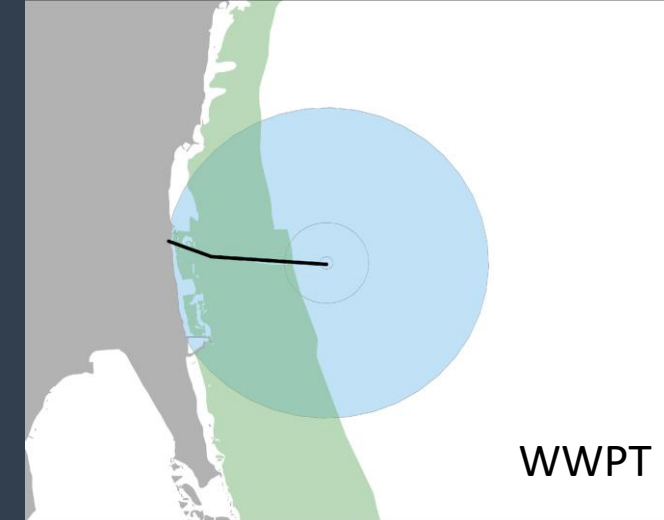


Exponential decrease of influence with distance

3 Determine spatial extent and intensity

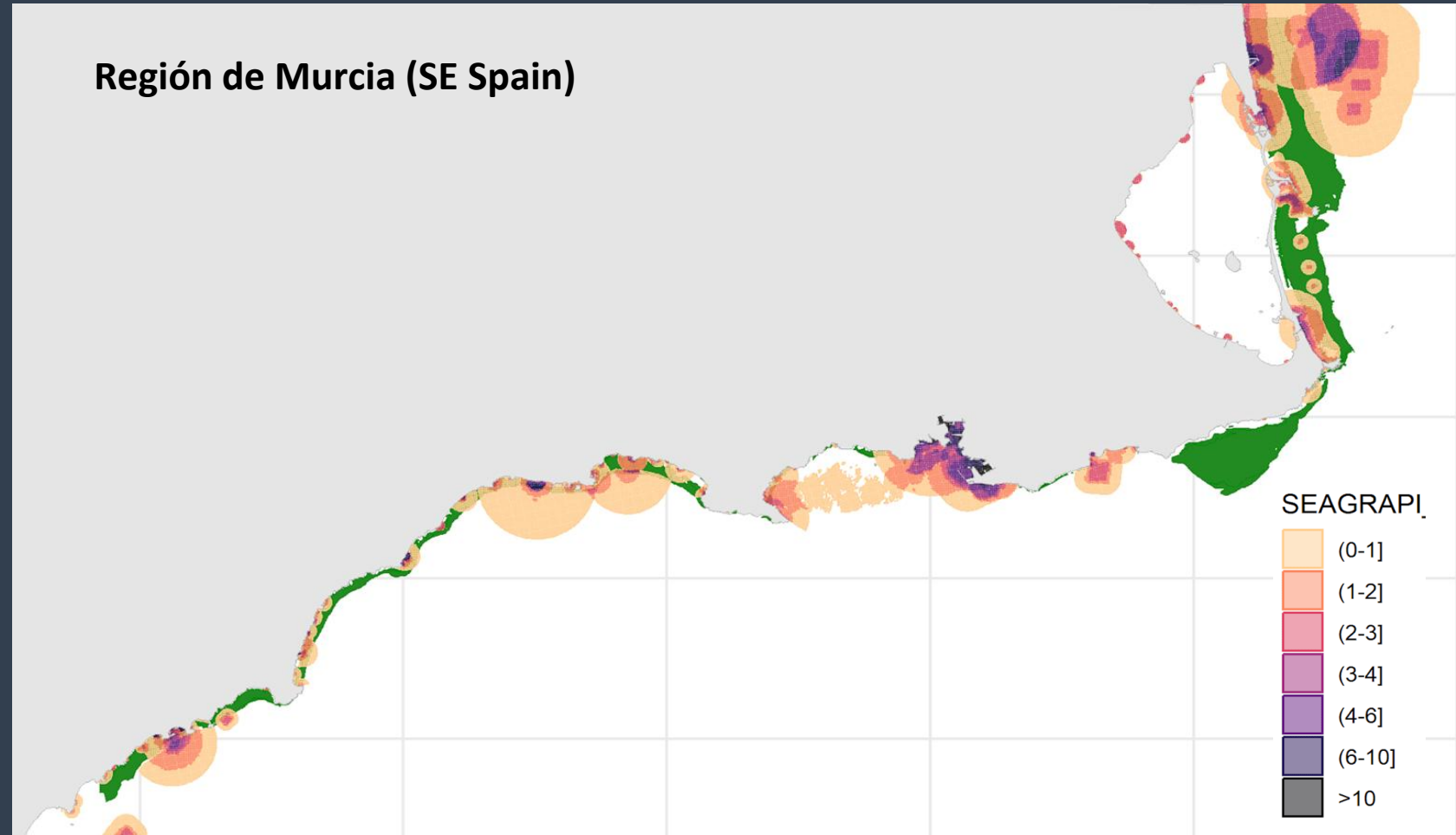
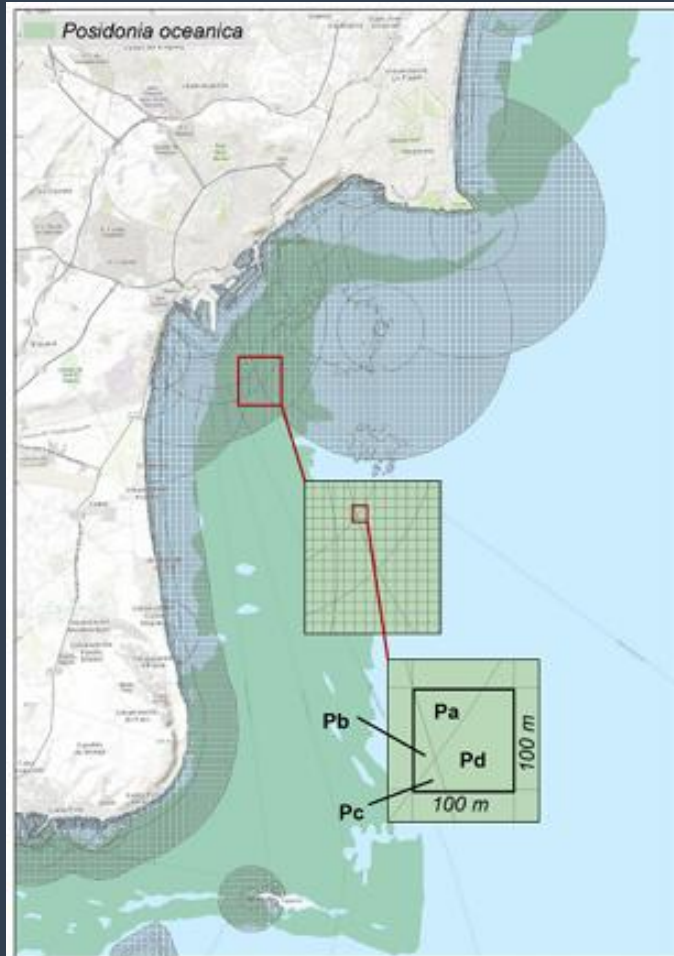


Score values decreasing with distance

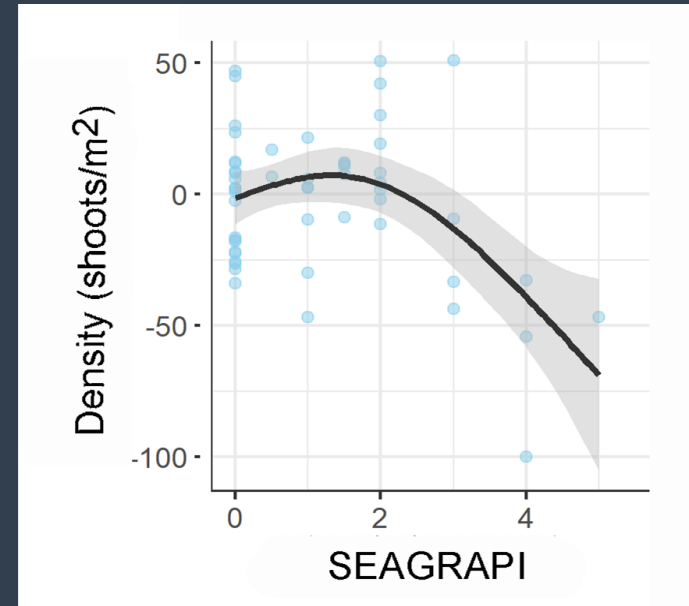
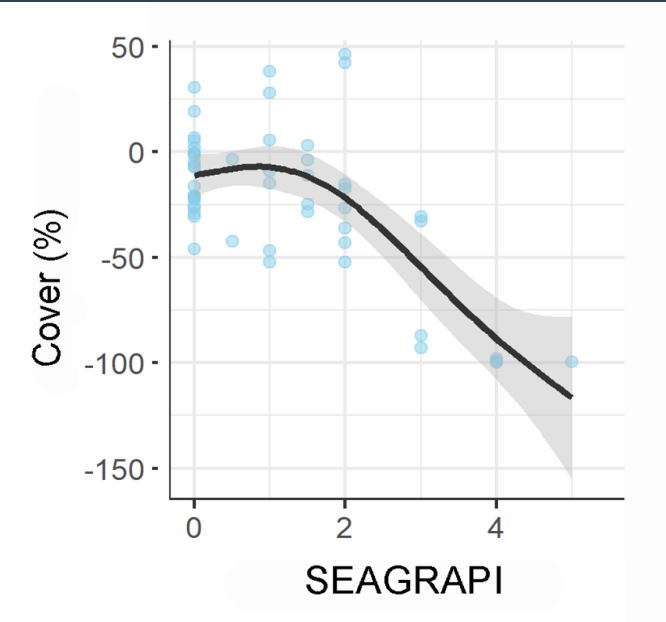
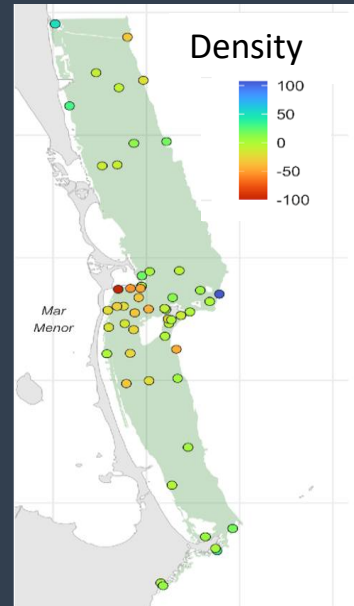
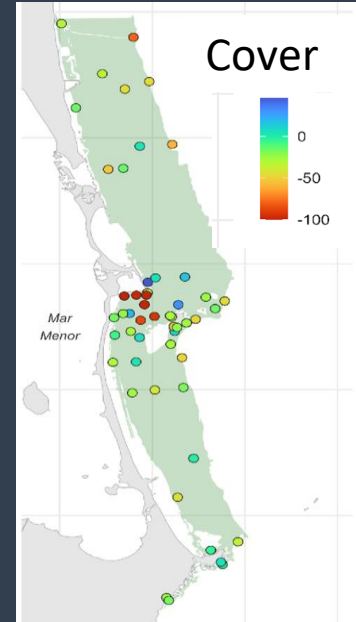
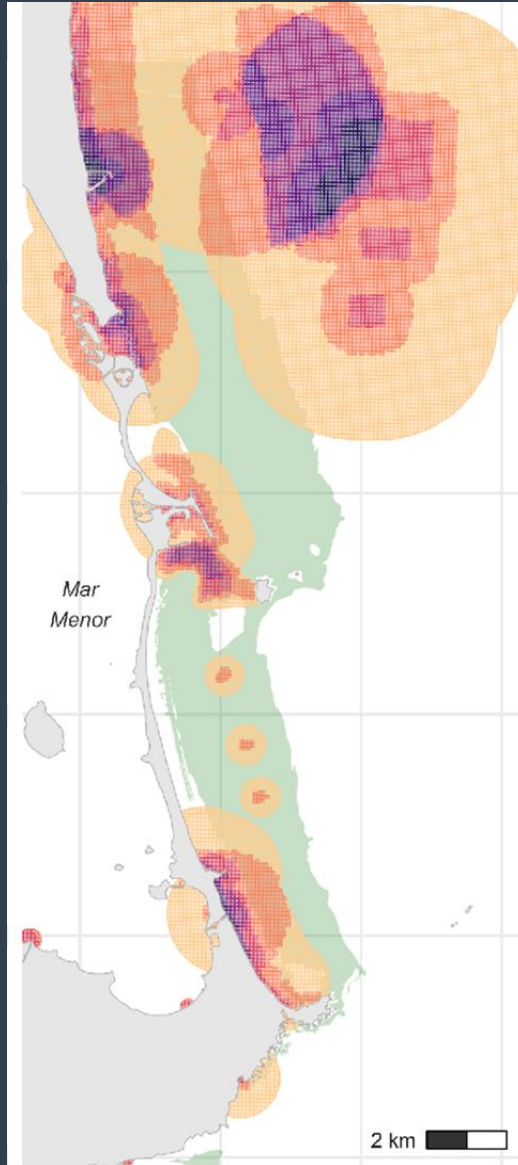
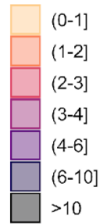


4 Calculation of the Cumulative Pressure Value

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SEAGRAPI:



Thank you

