The 10th Annual Marine Economics and Policy Research Symposium

MOSES

Maritime, Ocean Sector and Ecosystem Sustainability: Fostering Blue Growth in Atlantic Industries

Maritime, Ocean Sector and Ecosystem Sustainability (MOSES)

The impact of marine sectors´activities on the marine environment

Galway, 28th November 2019

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Introduction

- Following the initial assessments under the MSFD, the European Environment Agency (EEA) has highlighted the need to improve our understanding of the linkages between marine economic activities and the pressures and impacts exerted on the marine environment.

- **One of the main goals of the MOSES project is to implement an inter-regional comparative analysis of:**
  - **The quantification of the Atlantic maritime economy;**
  - **The environmental impact of the blue economy across the Atlantic Arc.**

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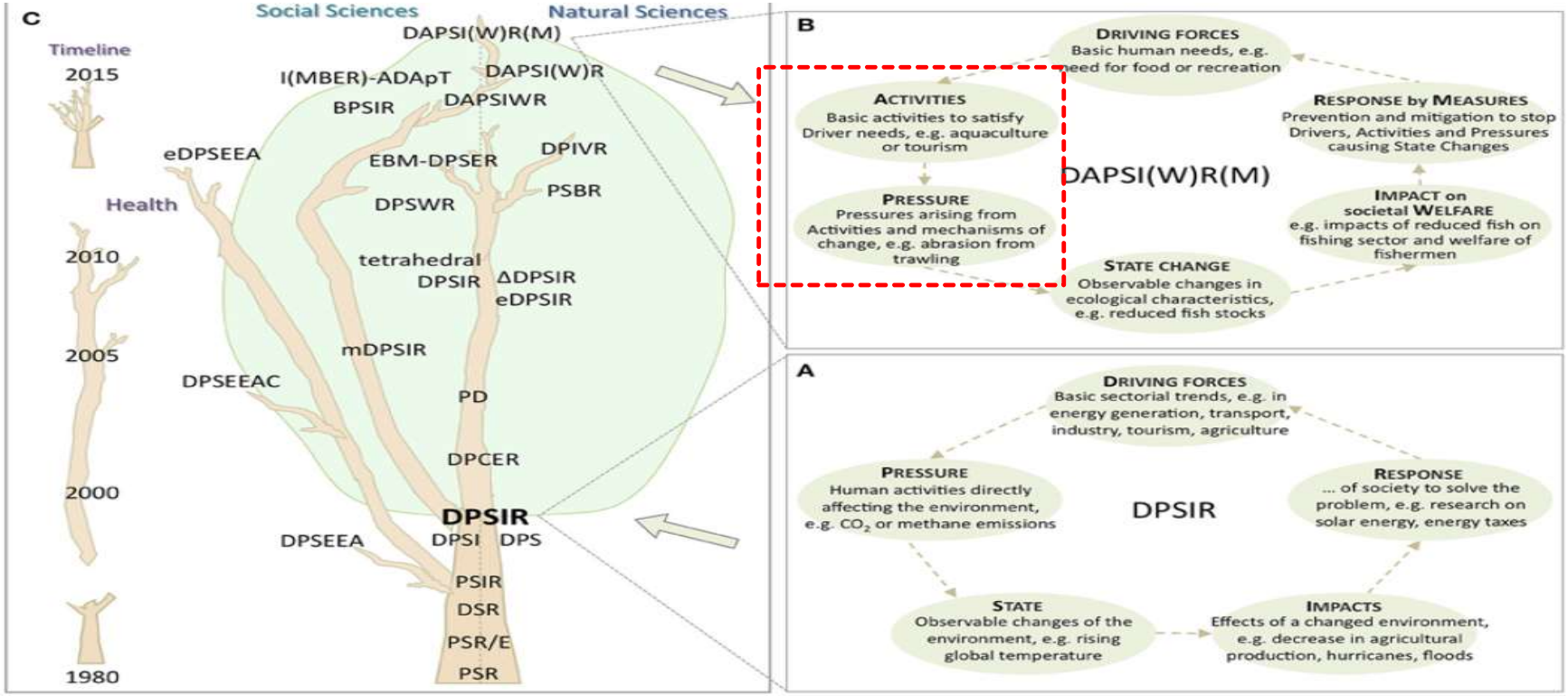
Literature (over) view

- This analysis uses an extension of the DPSIR framework to DAPSI(W)R(M) in which (D)rivers of basic human needs require (A)ctivities which lead to (P)ressures (Elliot et al. (2017))
- The analysis tries to explicitly link economic (A)ctivities with (P)ressures



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Methodology?

- The **proposed method translates (A)ctivities to (P)ressure on ecosystem services (ES) of the marine environment** by combining impact weights and economic activity indicators associated (directly or indirectly) to activities (i) on ecosystem service *k*.
- We can compute the aggregated pressure of economic activities on ecosystem service *k* (*Pk*) by country (*c*)/ region (r) as:

$$P_{k,c} = \sum_{i=1}^{n} \sum_{k=1}^{m} w_{ik} \mu_{ik} A_{ik}$$

$$\sum_{i=1}^{n} \sum_{k=1}^{m} w_{ik} = 1$$

Economic indicator (business, proxy,…) + carbon footprint + Frecuency + habitat extent

Provisioning ES (food (fish) selective extraction)

Regulating ES (affected by nutrient pollution, food control, water treatment, poor waste management of the water, underwater noise, among others

Supporting ES (affected by habitat modification, biodiversity, changes in the food webs,…)

Cultural ES (recreation and tourism, affected both positively (linked to the more traditional activities and sectors) and negatively (due to increasing water turbidity,…).

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Data – Measuring the blue economy

Table A1
Theoretical and applied framework.

Marine sector: Boat and ship building		NACE	Group	NUTS 0						NUTS 3					
Marine industry	**Marine activity**			**NPE**	**NE**	**GVA**	**X**	**To**	**Proxies**	**NPE**	**NE**	**GVA**	**X**	**To**	**Proxies**
Fishing	Marine fishing.	03.11	1	Y	N	Y	N	N	LV;NV;LTON	Y*	Y*	Y*	N	N	LTON*,LV*,NV
Aquaculture	Marine aquaculture.	03.21	1	Y	Y	Y	N	Y	PV;PTON	Y*	N	Y	N	N	PV*PTON*
Seafood processing	Processing and preserving of fish, crustaceans and molluscs.	10.20	1	Y	Y	Y	Y	Y		Y*	Y*	Y	Y	Y*	
Seafood markets	Wholesale sale of fish, crustaceans and molluscs.	46.38	1	Y	Y	Y	Y	Y	PV	N	N	N	N	N	
	Retail sale of fish, crustaceans and molluscs.	47.23	1	Y	Y	Y	N	Y	PV	N	N	N	N	N	
Animal production	Land-based catching of sea mammals.	01.70	4												
Other food products	From fish and marine mammals: processing of meat, manufacture of oils and fats, prepared dishes and others.	10.11	4												
	From fish and marine mammals: manufacture of oils and fats.	10.41	4												
	From fish and marine mammals: manufacture of prepared meals and dishes.	10.85	4												
	From fish and marine mammals: manufacture of other food products.	10.89	4												
Marine sector: non-living resources															
Oil and gas exploration and production	Offshore extraction of crude petroleum.	06.10	2	Y	Y	N	NF	NF	PTON	0	0	0	NF	NF	
	Offshore extraction of gas.	06.20	2	Y	N	N	NF	NF	PV;PTON	0	0	0	NF	NF	
	Offshore extraction: support activities.	09.10	2	Y	Y	N	N	N		0	0	0	0	0	
Mining of metal ores	Mining of iron ores from seabed.	07.10	4												
	Mining of other non-ferrous metal ores from seabed.	07.21	4												
	Mining of metal ores from seabed and support activities.	07.29	4												
	Support activities.	09.90	4												
Extraction of gravel and sand	Extraction and dredging from sea of industrial sand and gravel.	08.12	2	Y	N	N	N	N	PTON;PV;LA	0	0	0	0	0	PTON*
Extraction of salt	Salt production by evaporation of sea water.	08.93	2	Y	Y	N	Y	Y		0	0	0	0	0	
Renewable energy	Production of electricity from renewable marine sources.	35.11	3	Y	Y	N	N	NF	ICAP	Y*	Y*	N	N	NF	ICAP*
	Transmission of electricity.	35.12	3	NF	Y	NF	NF	NF	ET; ICAP	NF	Y*	NF	NF	NF	
Water collection	Desalting of sea water to produce water.	36.00	4												
	Sewerage	37.00	4												
Waste and decontamination	Collection of waste from ships.	38.12	4												
	Remediation activities in oceans and coastal areas.	39.00	3	Y	Y	N	NF	NF	NOPER	Y*	Y*	N	N	N	
Marine sector: Boat and ship building															
Ship building	Building of commercial vessels, warships, fishing boats, hovercraft, drilling platforms and floating structures.	30.11	1	Y	Y	Y	Y	Y		N	N	N	N	N	
Boat building	Building of pleasure and sporting boats.	30.12	1	Included in 30.11						Included in 30.11					
Repair and maintenance	Repair and maintenance of ships and boats.	33.15	1	Y	Y	Y	N	N		N	Y	N	N	N	
Manufactures for shipbuilding	Manufacture of sails.	13.92	4												
	Manufacture of ropes, nets and fenders.	13.94	4												
	Manufacture of wood and of products of wood and cork.	16.00	4												
	Manufacture of paints, varnishes.	20.30	4												
	Manufacture of rubber and plastic products.	22.00	4												
	Manufacture of glass fibres.	23.14	4												
	Manufacture of iron and steel, tubes.	24.00	4												
	Manufacture of metal products, tanks.	25.00	4												
	Manufacture of communication equipment.	26.30	4												
	Manufacture of instruments for navigation.	26.51	4												
	Manufacture of lighting equipment.	27.40	4												

J. Fernández-Macho et al. / Marine Policy 60 (2015) 49–61

Spatial Extent

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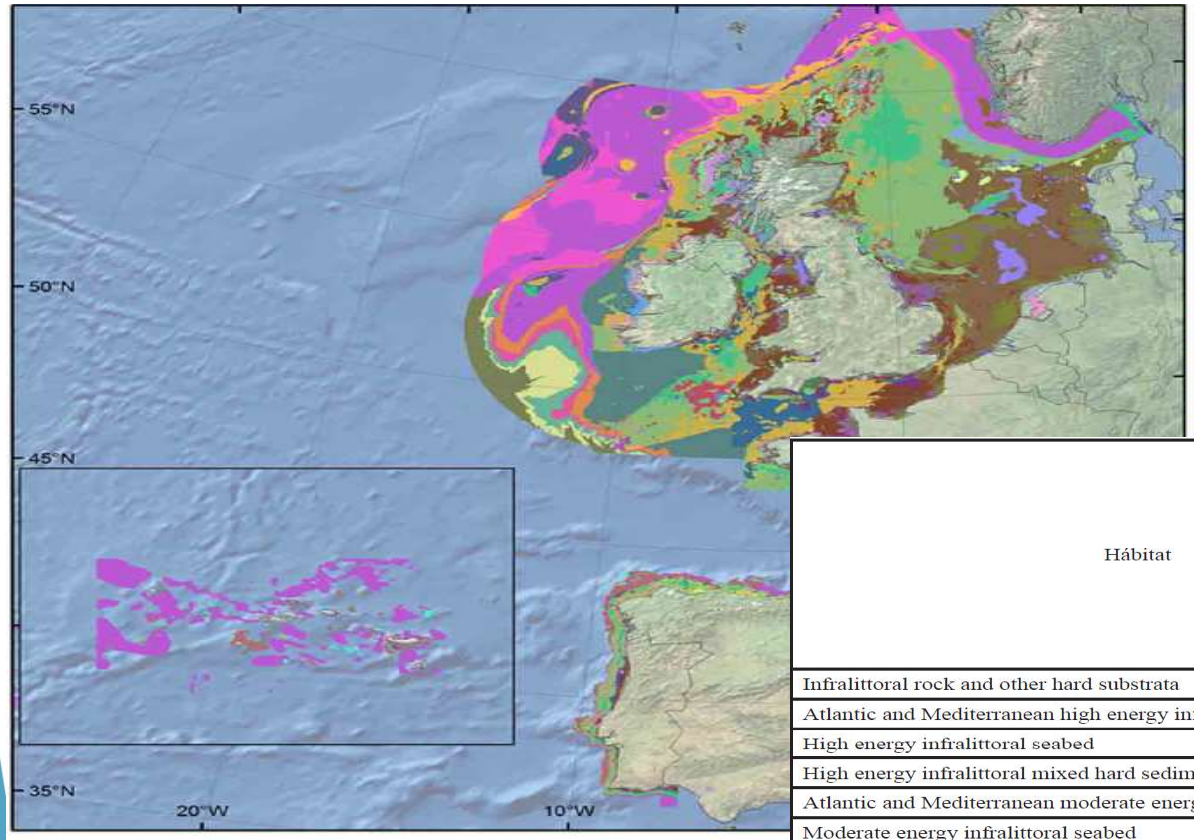

Habitat type

- Abyssal Seabed
- Atlantic and Mediterranean high energy circalittoral rock
- Atlantic and Mediterranean high energy infralittoral rock
- Atlantic and Mediterranean low energy circalittoral rock
- Atlantic and Mediterranean low energy infralittoral rock
- Atlantic and Mediterranean moderate energy circalittoral rock
- Atlantic and Mediterranean moderate energy infralittoral rock
- Brachiopod and ascidian communities on circalittoral rock
- Circalittoral coarse sediment
- Circalittoral fine mud
- Circalittoral fine sand
- Circalittoral mixed sediments
- Circalittoral muddy sand
- Circalittoral rock and other hard substrata
- Circalittoral sandy mud
- Deep Circalittoral Seabed
- Deep Circalittoral mixed hard sediments
- Deep circalittoral coarse sediment
- Deep circalittoral mixed sediments
- Deep circalittoral mud
- Deep circalittoral sand
- Deep sea coarse sediment
- Deep-sea bedrock
- Deep-sea mixed substrata
- Deep-sea mud
- Deep-sea muddy sand
- Deep-sea rock and artificial hard substrata
- Deep-sea sand or Deep-sea muddy sand
- Faunal communities on deep low energy circalittoral rock

Hábitat	Código EUNIS	Pesca	Acuicultura	Vertidos	Dragado	Construcciones e infraestructura submarina	Minería	Transporte marítimo	Explotación de gas y petróleo	Turismo y ocio	Mediana total
Infralittoral rock and other hard substrata	A3	3	2	2	2	3	3	2	2	2	2
Atlantic and Mediterranean high energy infralittoral rock	A3.1	2	1	1	2	2	3	2	2	2	2
High energy infralittoral seabed		2	1	1	2	2	2	2	2	2	2
High energy infralittoral mixed hard sediments		2	1	1	2	2	2	2	2	2	2
Atlantic and Mediterranean moderate energy infralittoral rock	A3.2	3	2	2	2	2	3	2	2	2	2
Moderate energy infralittoral seabed		3	2	2	2	2	2	2	2	2	2
Moderate energy infralittoral mixed hard sediments		3	2	2	2	2	2	2	2	2	2
Atlantic and Mediterranean low energy infralittoral rock	A3.3	3	3	2	2	3	3	3	2	2	3
Low energy infralittoral seabed		3	3	2	2	3	2	3	2	2	2
Low energy infralittoral mixed hard sediments		3	3	2	2	3	2	3	2	2	2
Silted kelp on low energy infralittoral rock with full salinity	A3.31	3	3	2	2	3	3	3	2	2	3
Circalittoral rock and other hard substrata	A4	1	2	2	1	3	3	2	3	1	2
Atlantic and Mediterranean high energy circalittoral rock	A4.1	1	2	1	1	1	3	2	3	1	1

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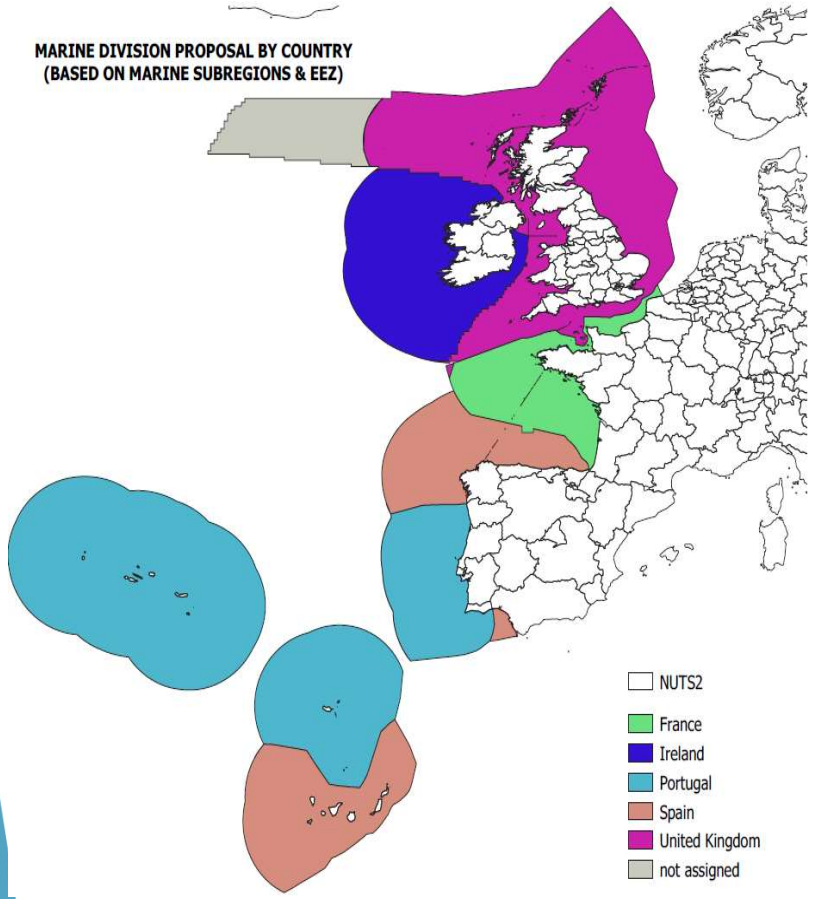

- **Pilot Case Study: SPAIN**
- **Spain Nuts 2** (Basque Country, Cantabria, Asturias, Galicia, Andalucía and Canary Islands)
- **2013, 2014 and 2015 YEARS**
- **5 sectors and 19 activities**
  - Fishing sector
  - Aquaculture
  - Marine energy
  - Transport
  - Tourism

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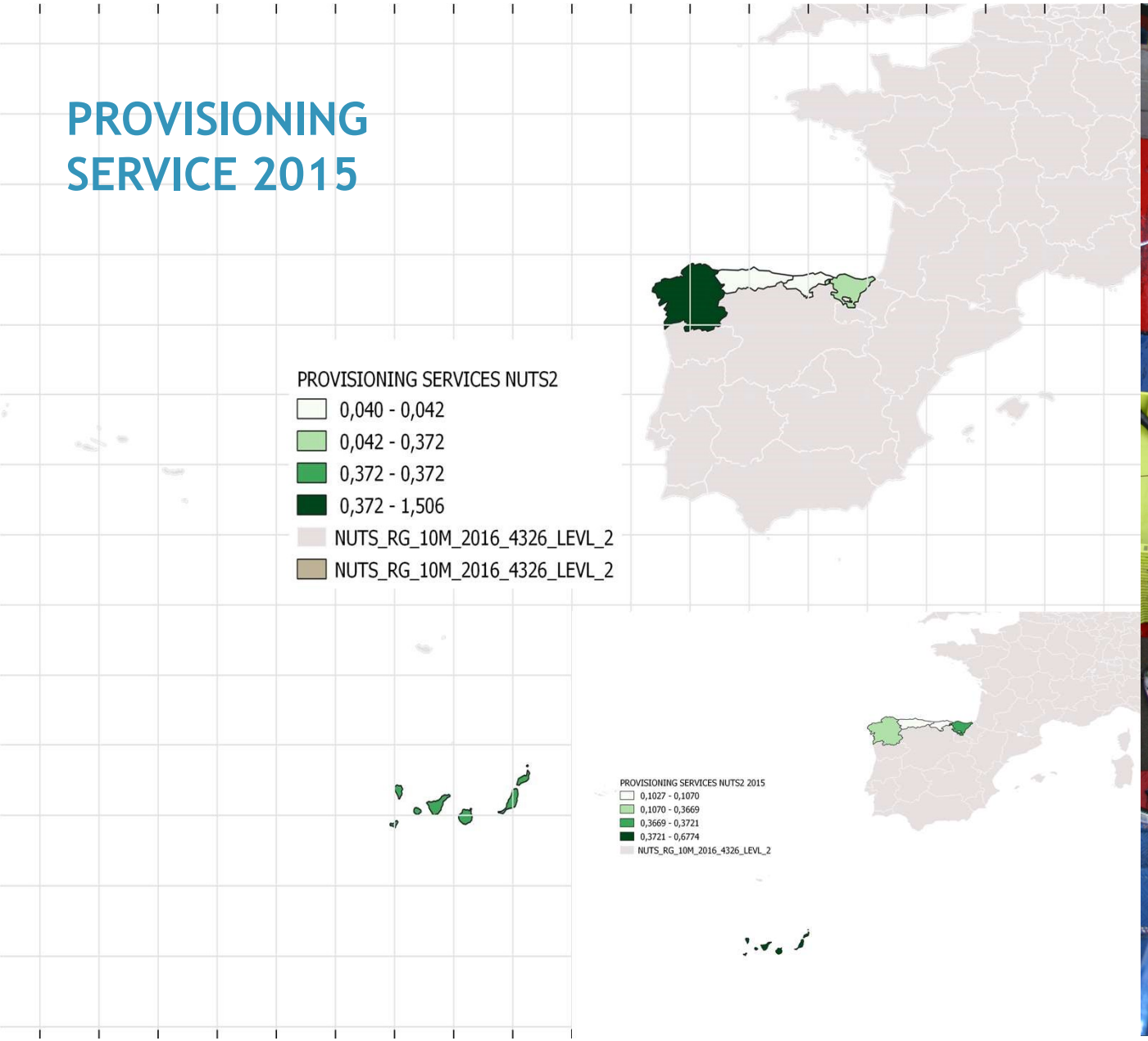
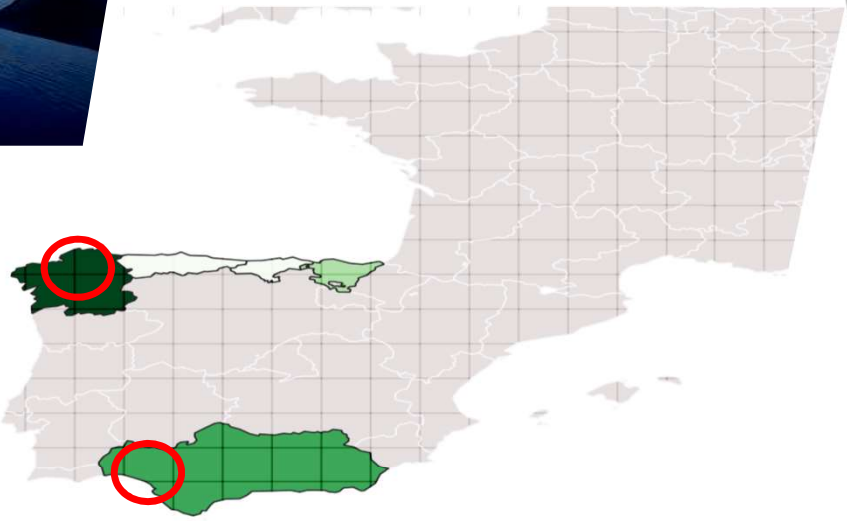
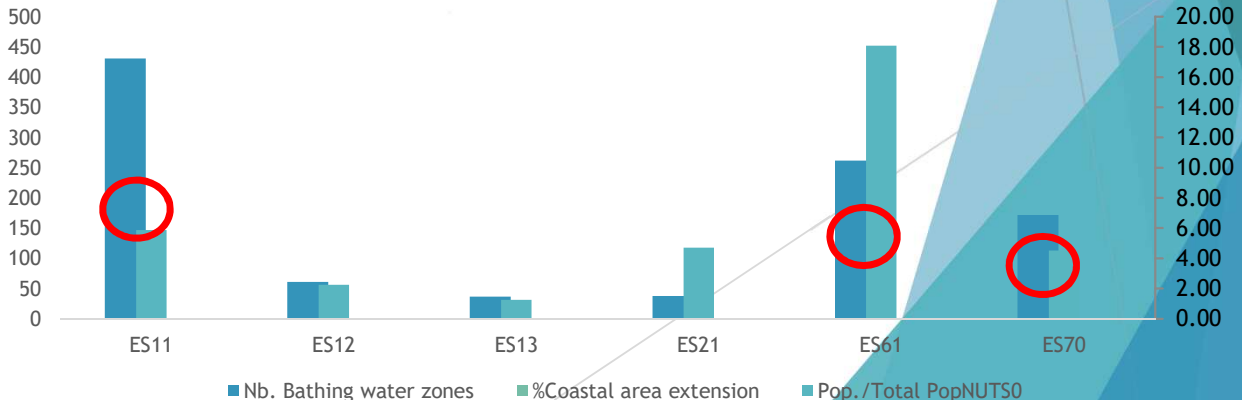
PROVISIONING SERVICE 2015



CULTURAL SERVICES 2015

. SERVICES NUTS2 2015
11 - 0,1355
55 - 0,3553
553 - 0,5209
209 - 0,8367
TS_RG_10M_2016_4326_LEVL_2





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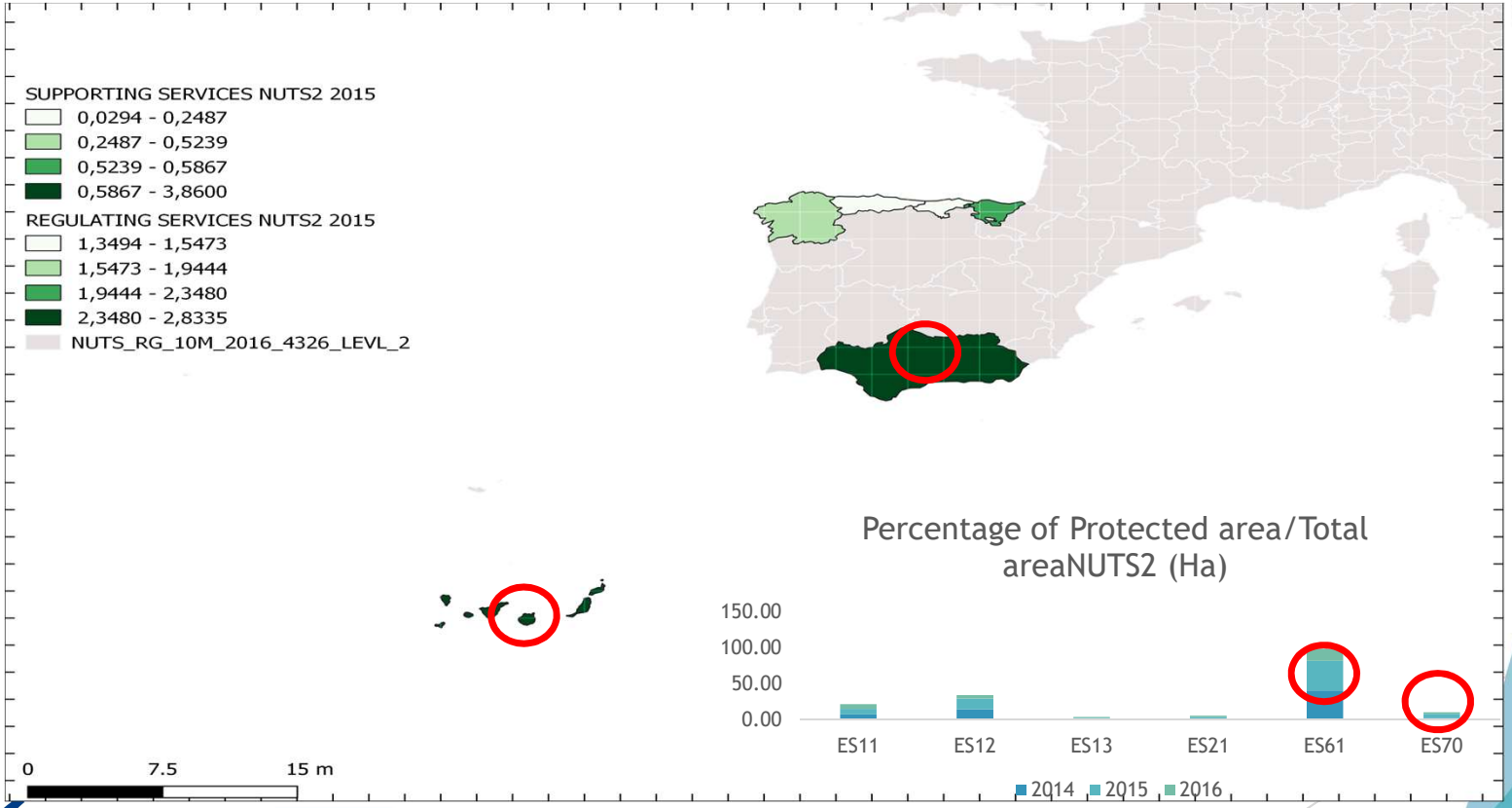
REGULATING +SUPPORTING SERVICES 2015



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Towards the BLUE GROWTH understanding
To give answer MSFD, MSP

- Business indicators
- Proxies
- More than Added value and employment

Fully maritime economy assessment needed

Impacts on marine environment Operative index

- Other indicators are needed
  - Consider the linkage between economic indicators and ESs
  - Habitat extent
  - Activity frequency
  - Combine initial business/proxies indicators to arrive to new ones: overexploitation of fishing resources
  - Risk factors attached to human activities
  - General factors: Taxes, land prices,…

- To combine assessment and impacts on environment.
- To share common data across countries
- Common analysis in the Atlantic – strategies designed to stimulate the blue growth

Towards the Blue Growth

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