

Workshop on Conservation of the Sea lamprey
(*Petromyzon marinus* L.)

Falkenberg, 16-18 October 2023



**Transnational management and conservation of
diadromous fishes across the Atlantic Area: the
INTERREG AA DiadES and DiadSea projects**

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E. Pereira, A.F. Belo, I.C. Oliveira, S. Silva, G. Lassalle, P. Lambert & P.R. Almeida



DiadES - Assessing and enhancing ecosystem services provided by diadromous fish in a climate change context

Funding:



Dates:

Feb. 2019 - Jun. 2023

Budget:

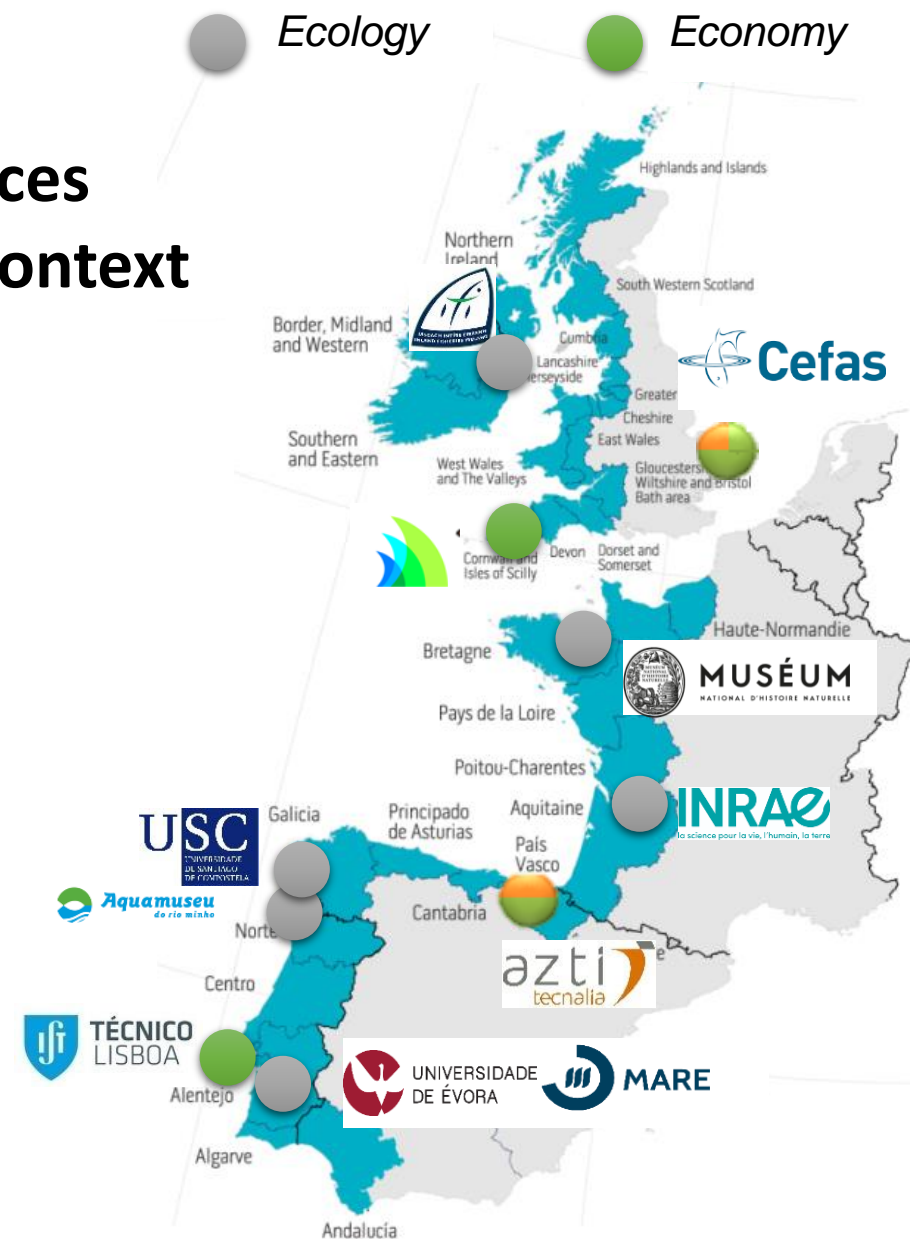
2.3 M €

Partners:

10 beneficiary partners (Lead Partner – INRAE)
20 associated partners

Objective:

Implement a transnational approach to enable a common management for the conservation and **enhancement of the ecosystem services** associated to diadromous species that includes the explicit long-term and large-scale issues related to climate change.





1

Diadromous species across the Atlantic Area

2

Ecosystem services associated with diadromous species

3

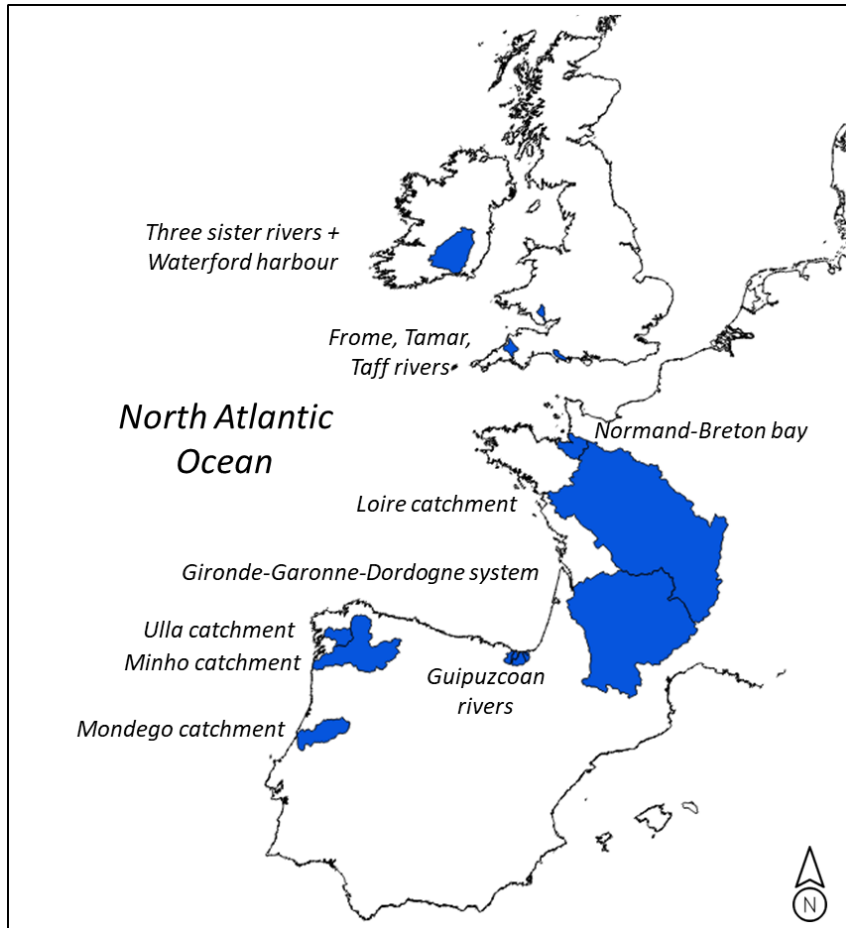
A generalized decline of these species linked with global change

4

Development of new tools and concepts

1. Diadromous species across the Atlantic Area

Nine case studies



ANADROMOUS SPECIES



CATADROMOUS SPECIES



2. Ecosystem services associated with diadromous species

Diadromous species, in the diversity of habitats they frequent, **contribute to the well-being of human communities through the provision of ecosystem services.**

- **The provisioning services** including the supply of food, or fabrics and molecules for crafts or industry;
- **The regulating services**, contributing to the proper functioning of ecosystems through the flow of nutrients from the river to the ocean and, more original since it is against the river flow, from the ocean to the rivers;
- **The supporting services**, as support to the life cycle of other species;
- **The cultural services**, which include activities related to tourism, gastronomy, recreational fishing and the symbolic value of these species.



Ecosystem services associated with diadromous species

Provisioning services



Supply of food, or fabrics and molecules for crafts or industry



Provisioning
services



Ecosystem services associated with diadromous species

Regulating services



Contributing to the proper functioning of ecosystems through the flow of nutrients among environments

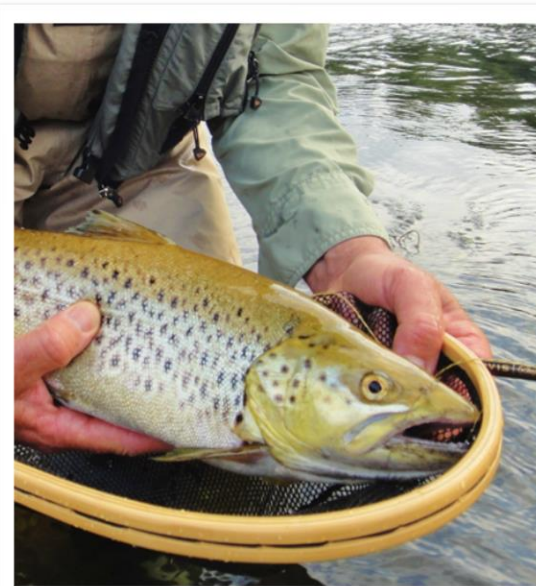


Ecosystem services associated with diadromous species

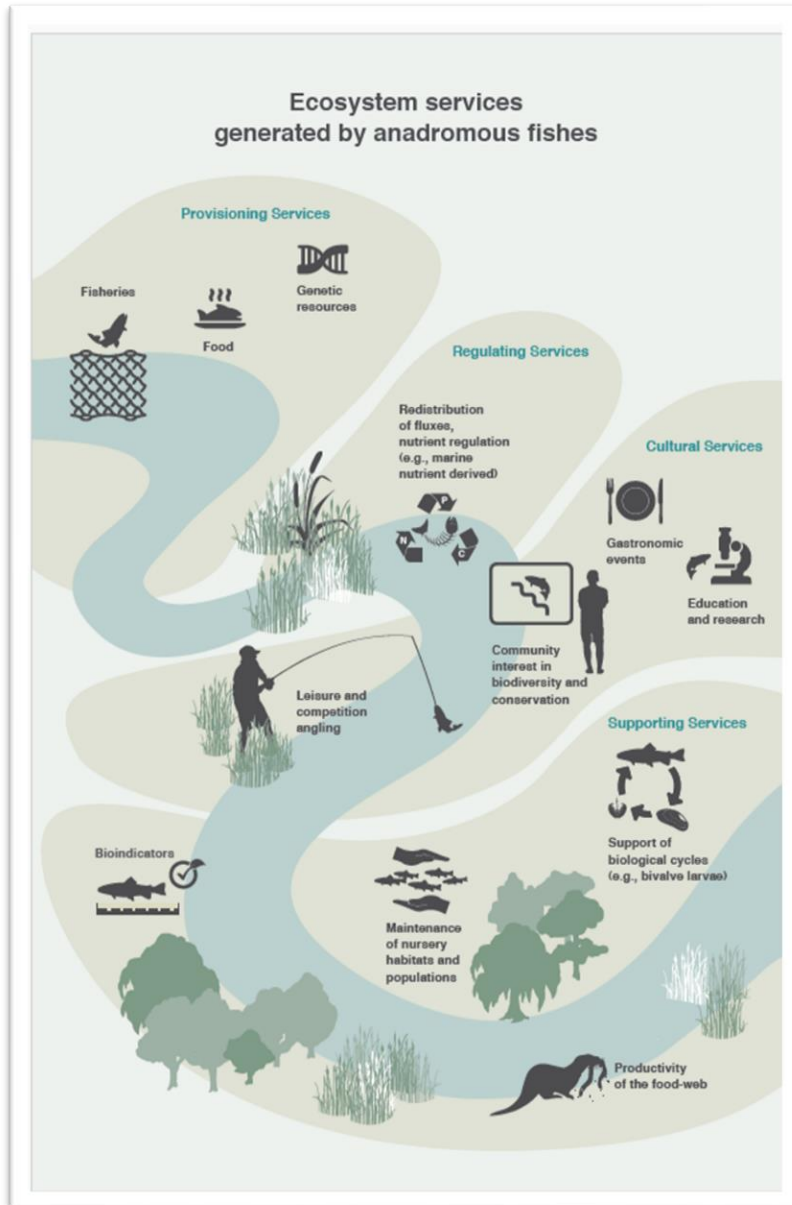
Cultural services

 Activities related to tourism, gastronomy, recreational fishing and the symbolic value of these species.

Cultural services



Ecosystem services associated with diadromous species



Hydrobiologia (2023) 850:2927–2961
<https://doi.org/10.1007/s10750-023-05179-6>

AQUATIC ECOSYSTEM SERVICES

Review Paper

The decline of the ecosystem services generated by anadromous fish in the Iberian Peninsula

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Sílvia Pedro · Joana Boavida-Portugal · Ana F. Belo · Esmeralda Pereira ·
Sara Silva · Inês Oliveira · Bernardo R. Quintella

Received: 31 March 2022 / Revised: 28 December 2022 / Accepted: 16 February 2023 / Published online: 5 April 2023
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Abstract This work aims to present an historical review of the ecosystem services provided by anadromous fish (i.e., species that migrate from the sea to the river to spawn) throughout Human time, as well as of the main related threats, focusing on the Iberian Peninsula region. Anadromous fish provide important provision, cultural, regulatory and supporting ecosystem services across their distribution range and have been extensively exploited by humans since prehis-

several river basins covering what is now Portuguese and Spanish territory. These species have suffered a severe decline across their distribution range, mainly due to habitat loss and overexploitation. Considered regal delicacies, these fishes were once a statement on the tables of the highest social classes, a much appreciated bounty for the poorer population and are still an important part of the local gastronomy and economy. Such high economic and cultural interest



3. A generalized decline of these species linked with global change



As they **share their life cycle between saltwater and freshwater**, diadromous species are subject to mortality linked to human activities in these two environments as well as in the estuary.

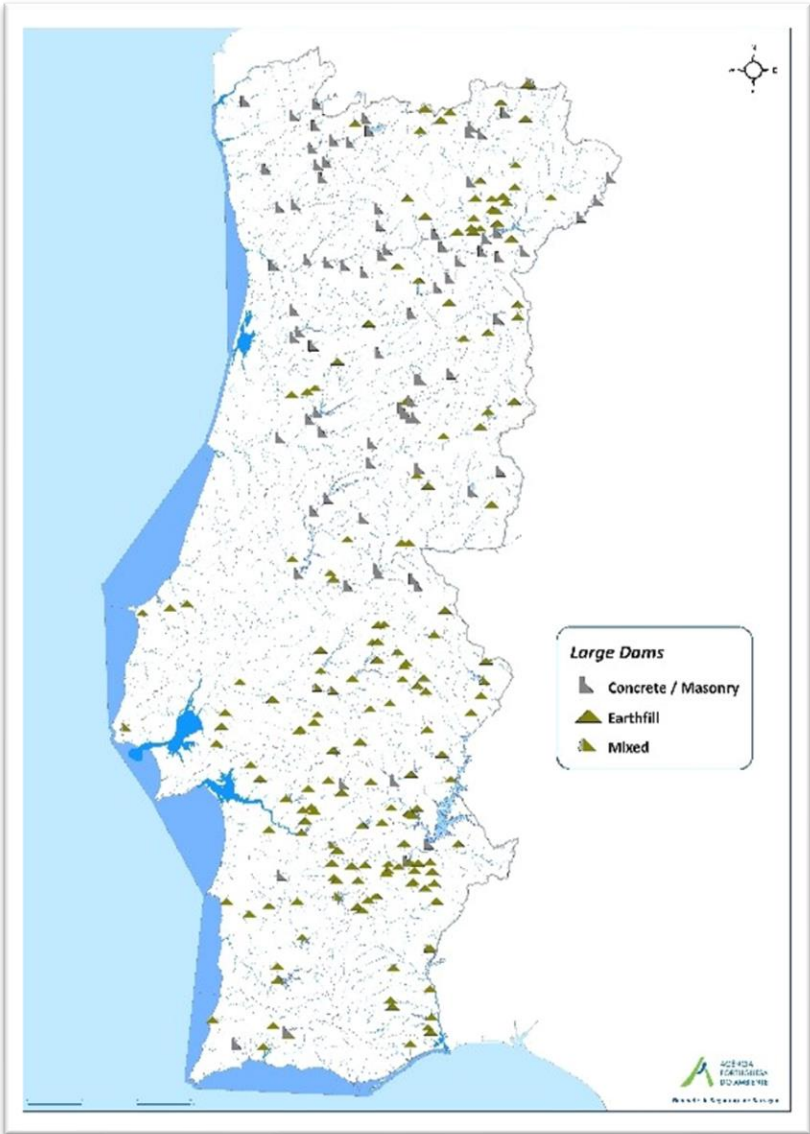


We can **group these threats** linked to human activities by considering the **five components of global change**.



A generalized decline of these species linked with global change

Dam building

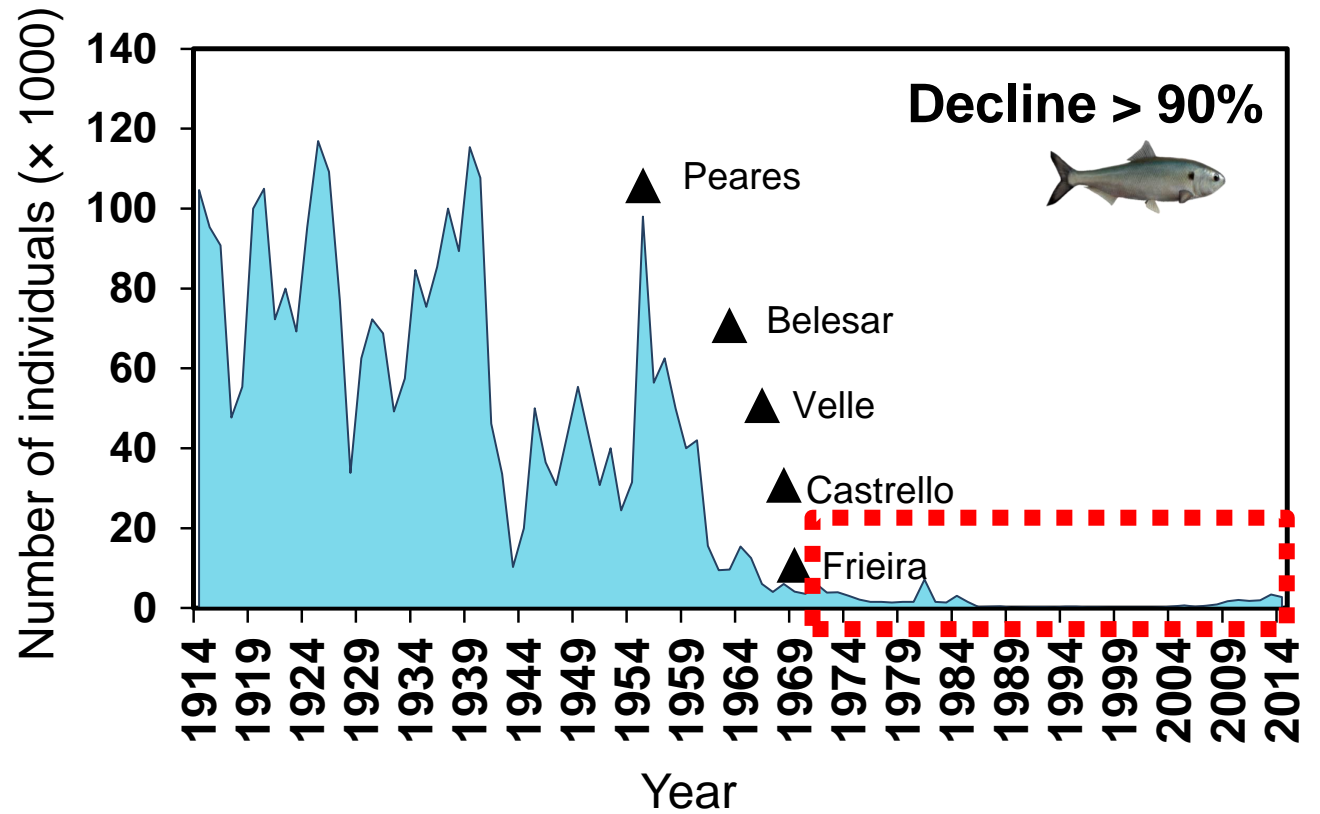


A generalized decline of these species linked with global change

Overfishing



Shad commercial fishery landings from coastal areas and estuary in River Minho (1914-2014)



▲ - Dams constructed in Spain

A generalized decline of these species linked with global change

Invasive species



***Anguillicola crassus*, eel parasite**

Crédit: //doi.org/10.4194/1303-2712-v19_11_01



Predation by catfish

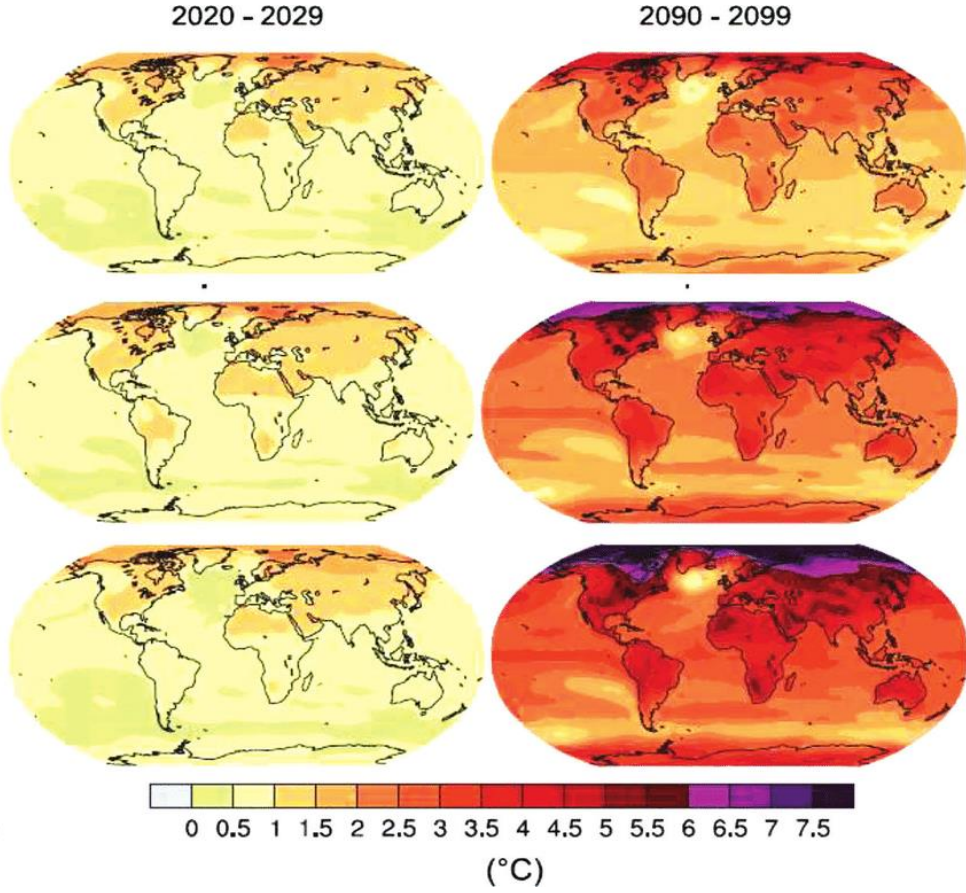
<https://www.anigaido.com>

A generalized decline of these species linked with global change

Climate change



Temperature change (air and water)



IPCC (2018)

4. Development of new tools and concepts

Three main outputs were produced to increase the capacity of policy makers and other key stakeholders to make **efficient and informed management decisions in the implementation of related policies on diadromous fishes while considering the impacts of global change.**

– **An INTERACTIVE WEB ATLAS** to explore changes in diadromous fish distributions and trends in relevant ecosystem services under climate change, promoting emerging benefits provided by these species.



– **A SERIOUS GAME**, of a role-playing form, to bring together target groups to (i) share the different knowledge they have, (ii) build a joint representation of fish population dynamics and (iii) imagine alternative management strategies in the face of climate change.



– **POLICY GUIDELINES** for a large-scale and long-term management of diadromous fishes.



INTERACTIVE WEB ATLAS

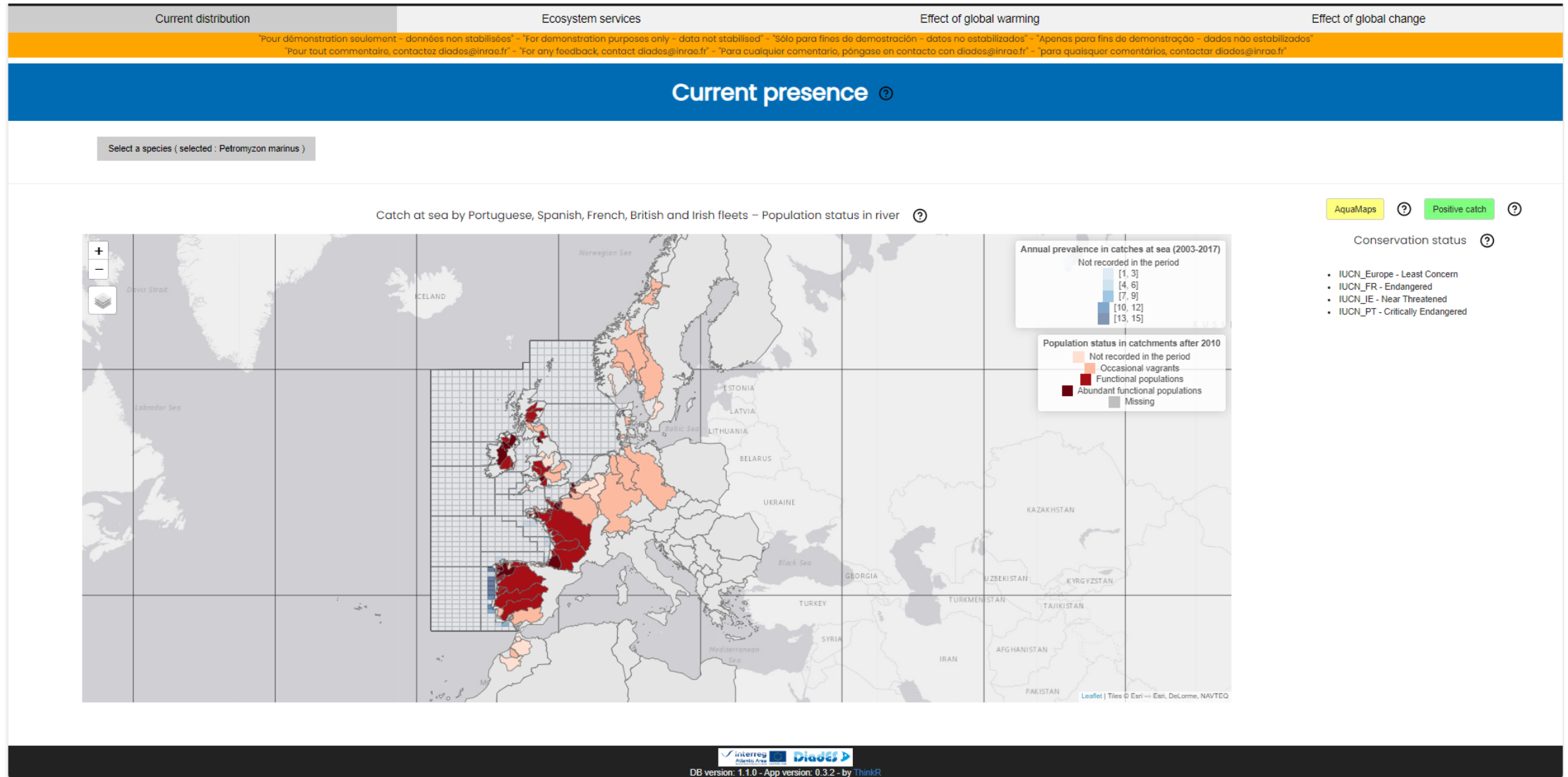


- **The current distribution of diadromous species** both at sea and in the continental environment on the European Atlantic coast;
- The identification and a first semi-quantitative **estimate of ecosystem services associated with diadromous species** in the nine case studies of the project;
- The **distribution of diadromous species up to 2100 on the Atlantic coast for two climate scenarios**, considering or not a mortality linked to human activities.

<https://iwa.diades.org/>

INTERACTIVE WEB ATLAS

Tab 1 – Current distribution



INTERACTIVE WEB ATLAS

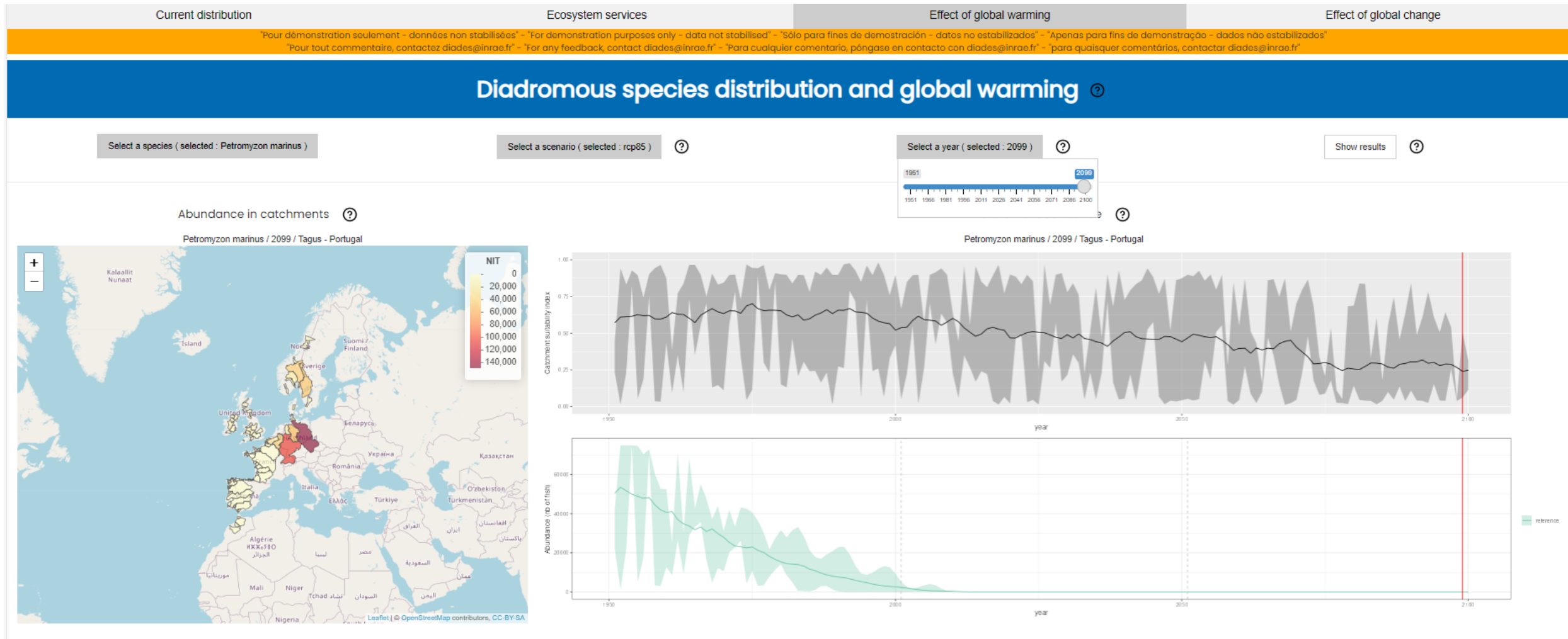
Tab 2 – Ecosystem services

Current distribution		Ecosystem services		Effect of global warming					Effect of global change				
<small>*Pour démonstration seulement – données non stabilisées* – *For demonstration purposes only – data not stabilised* – *Solo para fines de demostración – datos no estabilizados* – *Apenas para fins de demonstração – dados não estabilizados* *Pour tout commentaire, contactez diades@inrae.fr* – *For any feedback, contact diades@inrae.fr* – *Para cualquier comentario, póngase en contacto con diades@inrae.fr* – *para quaisquer comentários, contactar diades@inrae.fr*</small>													
Current ecosystem services ⓘ													
Select a species (11 selected)			Select a case study (7 selected) ⓘ			Select an ecosystem service (12 selected) ⓘ			Show results ⓘ				
Case study	Category	European smelt	European flounder	Twaite shad	Sea lamprey	European eel	Allis shad	European sturgeon	Atlantic salmon	Thinlip grey mullet	Sea trout	River lamprey	
1	Minho	[Cultural services] ALL EXISTING SUBCATEGORIES	0	0	0	€€	€€	0	0	0	0	0	
2	Waterford Harbour	[Cultural services] ALL EXISTING SUBCATEGORIES	€€	€€	€€€	€€	€	€	€€€	€€	€€€	€€	
3	Mondego	[Cultural services] ALL EXISTING SUBCATEGORIES	0	0	?	€€	0	€€	0	?	0	?	
4	Tamar-Taif-Frome	[Cultural services] ALL EXISTING SUBCATEGORIES	€€	€€	€€	€€	€€	€€€	€	€€€	€€	€€€	
5	Gipuzcoan	[Cultural services] ALL EXISTING SUBCATEGORIES	0	0	0	0	€€€	0	0	0	0	0	
6	Gironde-Garonne-Dordogne	[Cultural services] ALL EXISTING SUBCATEGORIES	0	0	€€	€€	€€	€€	€	0	€	€	
7	Ulla	[Cultural services] ALL EXISTING SUBCATEGORIES	0	€€	0	€€€	€€	0	0	€	0	0	
8	Waterford Harbour	[Cultural services] Gastronomy around species including emotional brotherhood (festival, event, and folklore)	0	€	0	0	0	0	€	€	€	0	
9	Gironde-Garonne-Dordogne	[Cultural services] Gastronomy around species including emotional brotherhood (festival, event, and folklore)	0	0	0	0	€	0	0	0	0	0	
10	Gipuzcoan	[Cultural services] Gastronomy around species including emotional brotherhood (festival, event, and folklore)	0	0	0	0	€€€	0	0	0	0	0	
11	Tamar-Taif-Frome	[Cultural services] Gastronomy around species including emotional brotherhood (festival, event, and folklore)	0	€	0	0	0	0	€	€	€	0	

Species are displayed as
 Rows
 Column

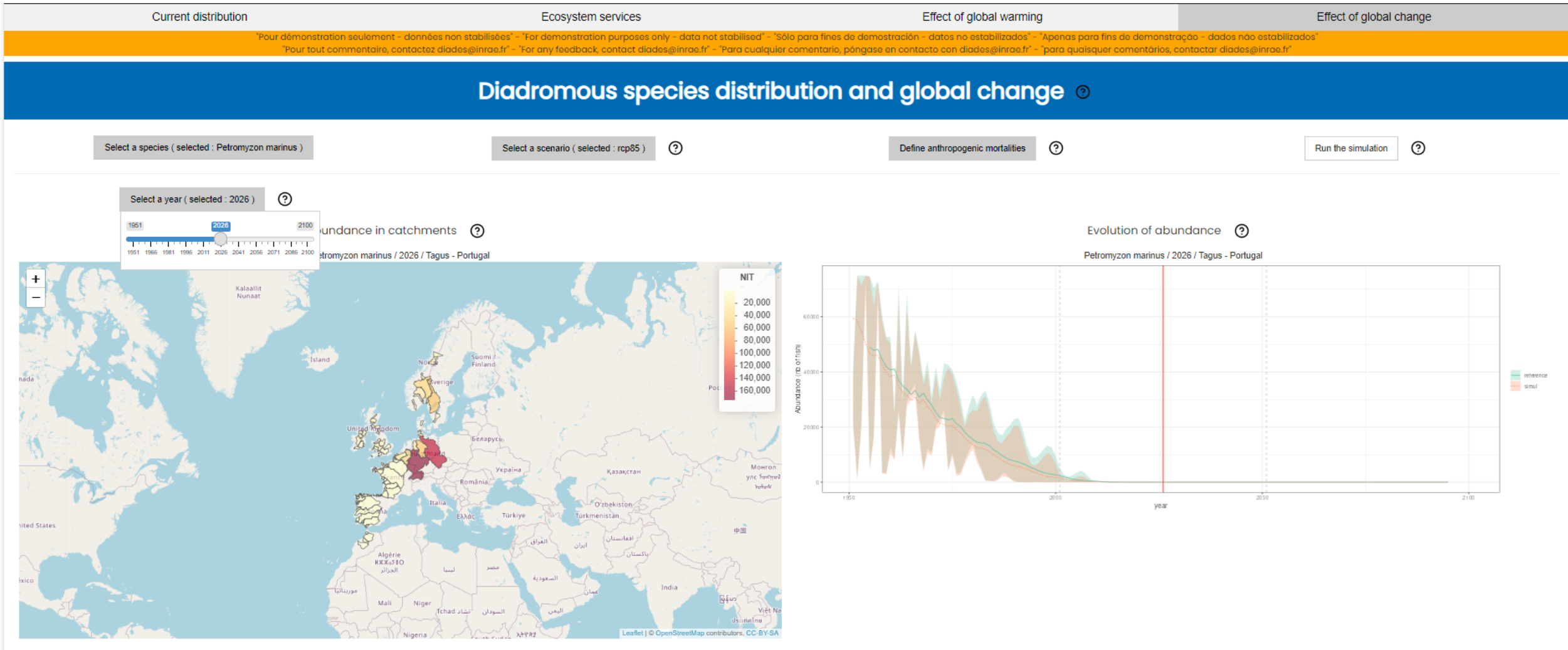
INTERACTIVE WEB ATLAS

Tab 3 – Effect of global warming (1951-2100)



INTERACTIVE WEB ATLAS

Tab 4 – Effect of global change (global warming and anthropogenic pressure)



DiadESland – a serious game to explore alternative management strategies



DiadESland is an educational role-playing game in which **players take on the role of watershed managers responsible for developing a management strategy over 60 years**, in relation to biodiversity objectives and ecosystem service levels to be achieved.



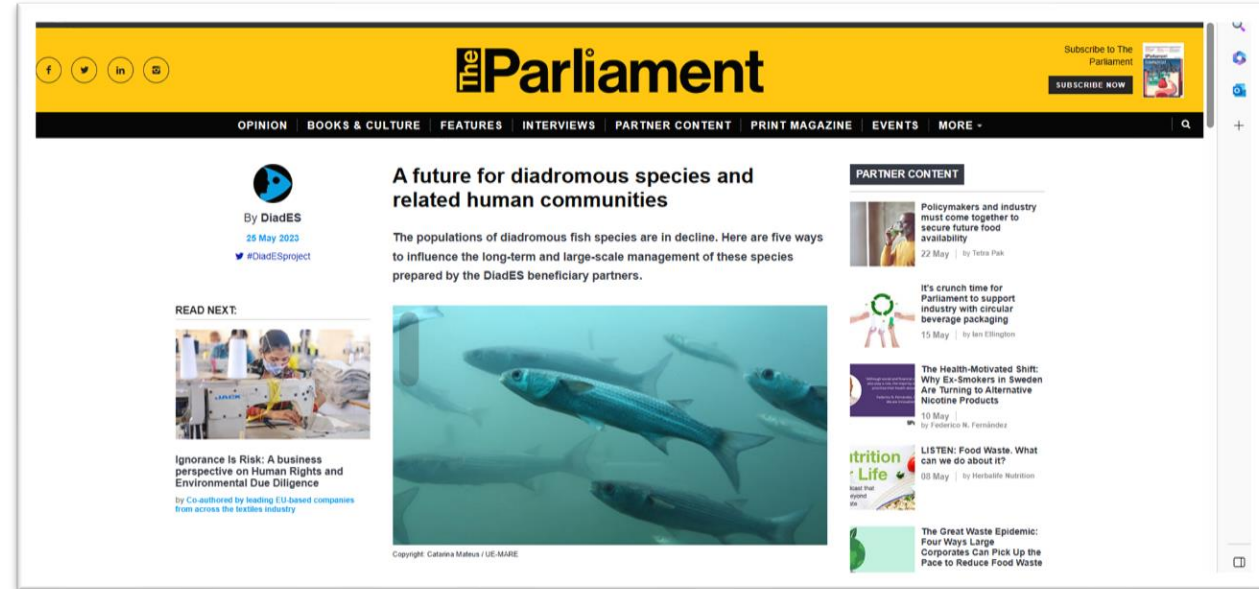
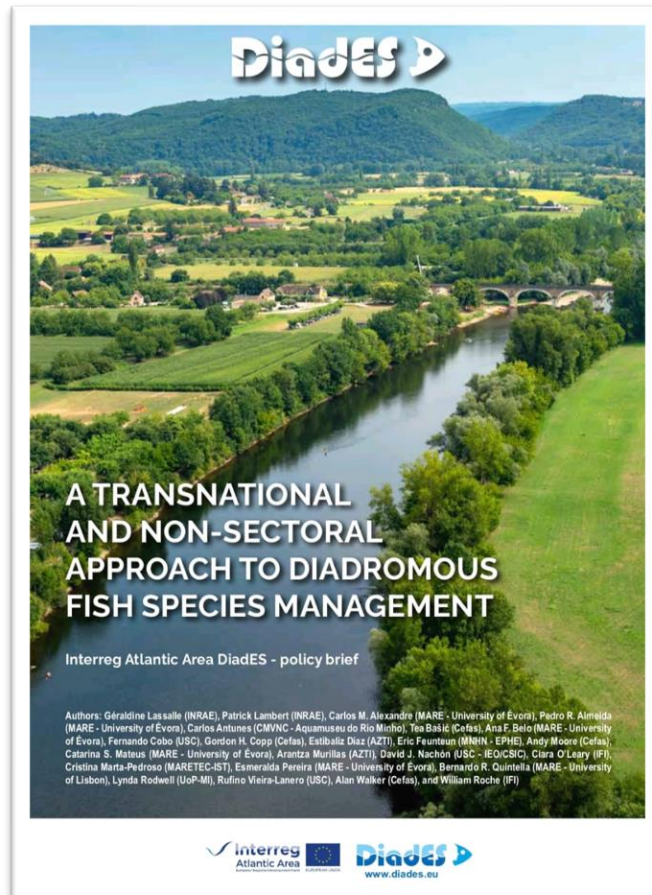
DiadESland – a serious game to explore alternative management strategies



The objective of such a mediation tool is to bring stakeholders and managers to **consider and discuss alternative management scenarios** in an environment undergoing global change, **over time and on a large scale.**

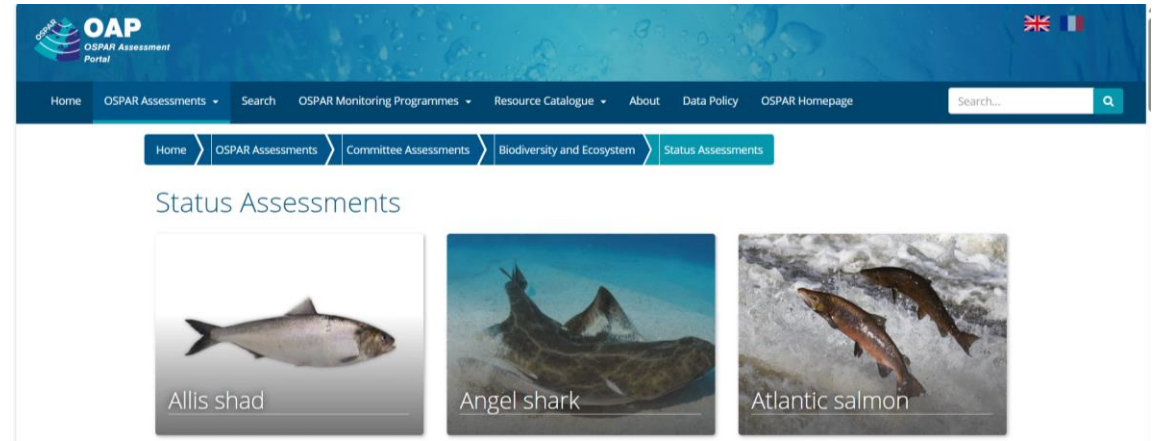
Policy guidelines

Pillar 1 - Produce joint knowledge



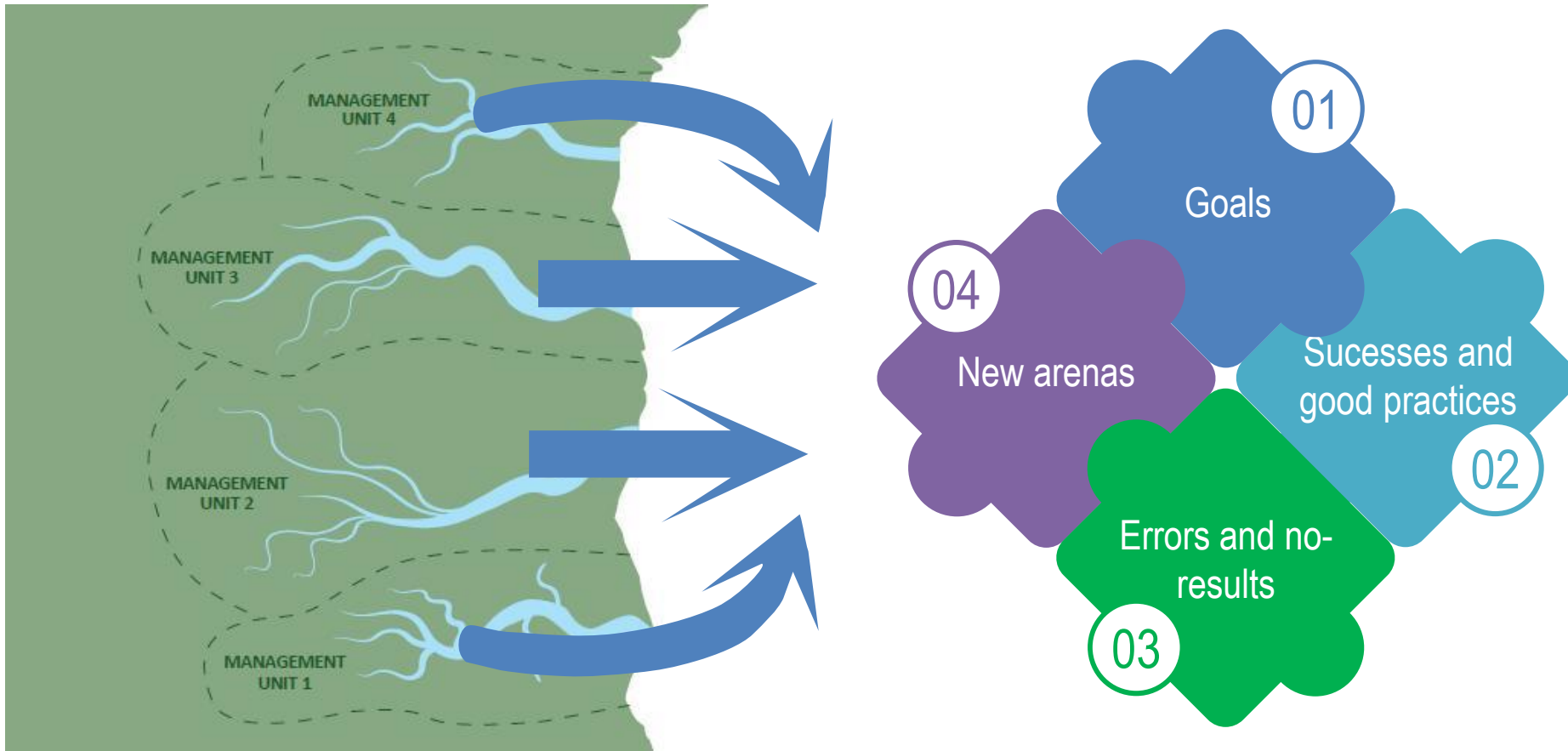
Policy guidelines

Pillar 2 - Use existing international coordination tools



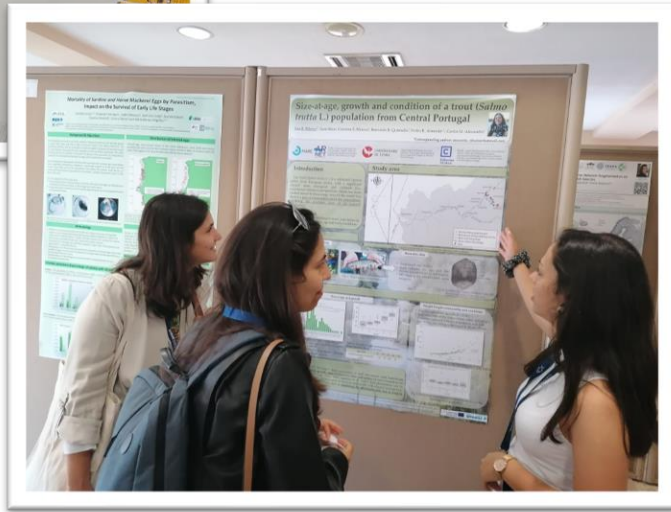
Policy guidelines

Pillar 4 - Share expertise and knowledge between stakeholders



Policy guidelines

Pillar 5 – Diadromous literacy



DiadSea - Transnational cooperation to improve the management and conservation of diadromous fish at sea (EAPA_0011/2022)



○ Loire catchment – Logrami intervention area

And now...
...the Sea



Consortium:

- 9 Beneficiary partners (Lead Partner – University of Évora)
- 28 Associated partners

Dates: November 2023 to October 2026

Total Budget:

- 3,4 M €

Interreg
Atlantic Area



Co-funded by
the European Union

Problematic and main objectives

- ❑ DiadSea will focus on the **marine environment** where there are serious **knowledge gaps and where fewer management and conservation actions directed to diadromous fish take place.**
- ❑ Diadromous fish occur along the Atlantic Area (AA) but there is a **lack of joint solutions to mitigate common threats exacerbated by climate change.**
- ❑ DiadSea will foster a **transnational cooperation in the AA**, to enhance the sustainable management and conservation of diadromous fishes in marine habitat.

Specific objectives

- 1) Identify and fill knowledge gaps in diadromous fish marine habitat;
- 2) Anticipate the distribution range shifts of diadromous fish due to climate and oceanographic changes;
- 3) Develop innovative cooperative solutions to protect biodiversity and the common resources that are diadromous fish in marine habitat and, subsequently, in freshwater habitat.

Expected results

- ❑ Foster the necessary level of **cooperation among Member States and stakeholders involved in diadromous fish exploration to enable identification and filling of knowledge gaps in marine phase**, leading to a more evidence-based management;
- ❑ Improve knowledge on diadromous fish population status and identify present and future climate-related factors affecting them. DiadSea will **analyse distribution range shifts of DF due to climate and oceanographic changes**, and **propose ways to improve the current level of marine latitudinal connectivity between AA populations** of target species;
- ❑ DiadSea will innovate from the way we currently try to ensure a sustainable management of DF populations and related fisheries through the creation of an **international observatory composed of experts in DF management and conservation**.

Project products

❑ Upgraded Interactive Web Atlas:

Atlas created in the project DiadES will be updated with information on DF distribution at sea particularly on habitat suitability and connectivity (<https://iwa.diades.org/>).

❑ Implementation of a transnational Observatory composed of experts in DF management and conservation, which would meet annually with local managers to evaluate species status and annual legislation application.

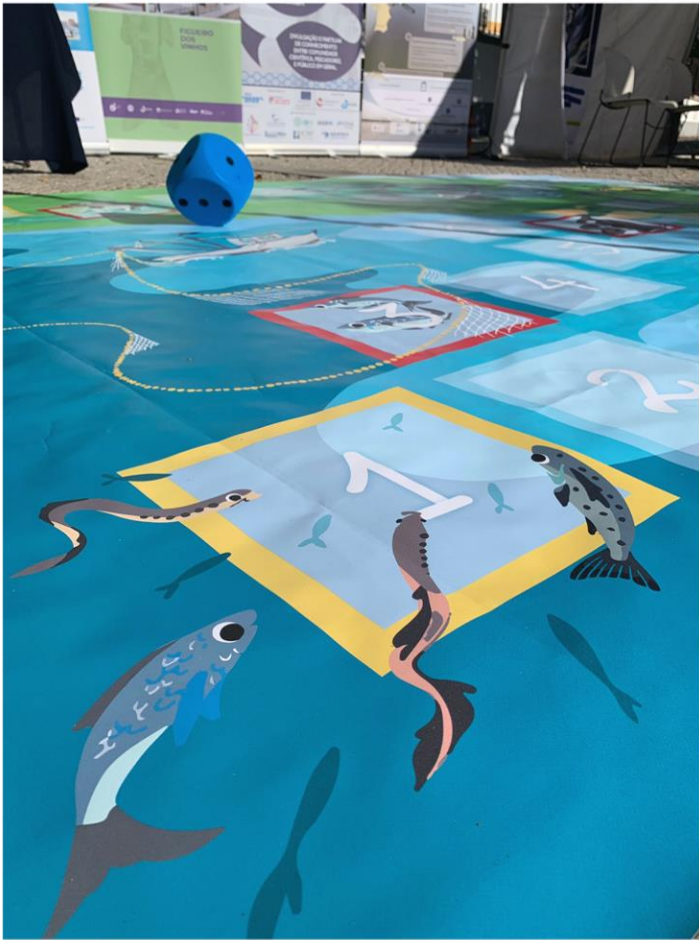


❑ Creation of an integrated label of origin system with the purpose to add value and market differentiation to the targeted DF species, while ensuring the sustainability of professional fishing in the AA.

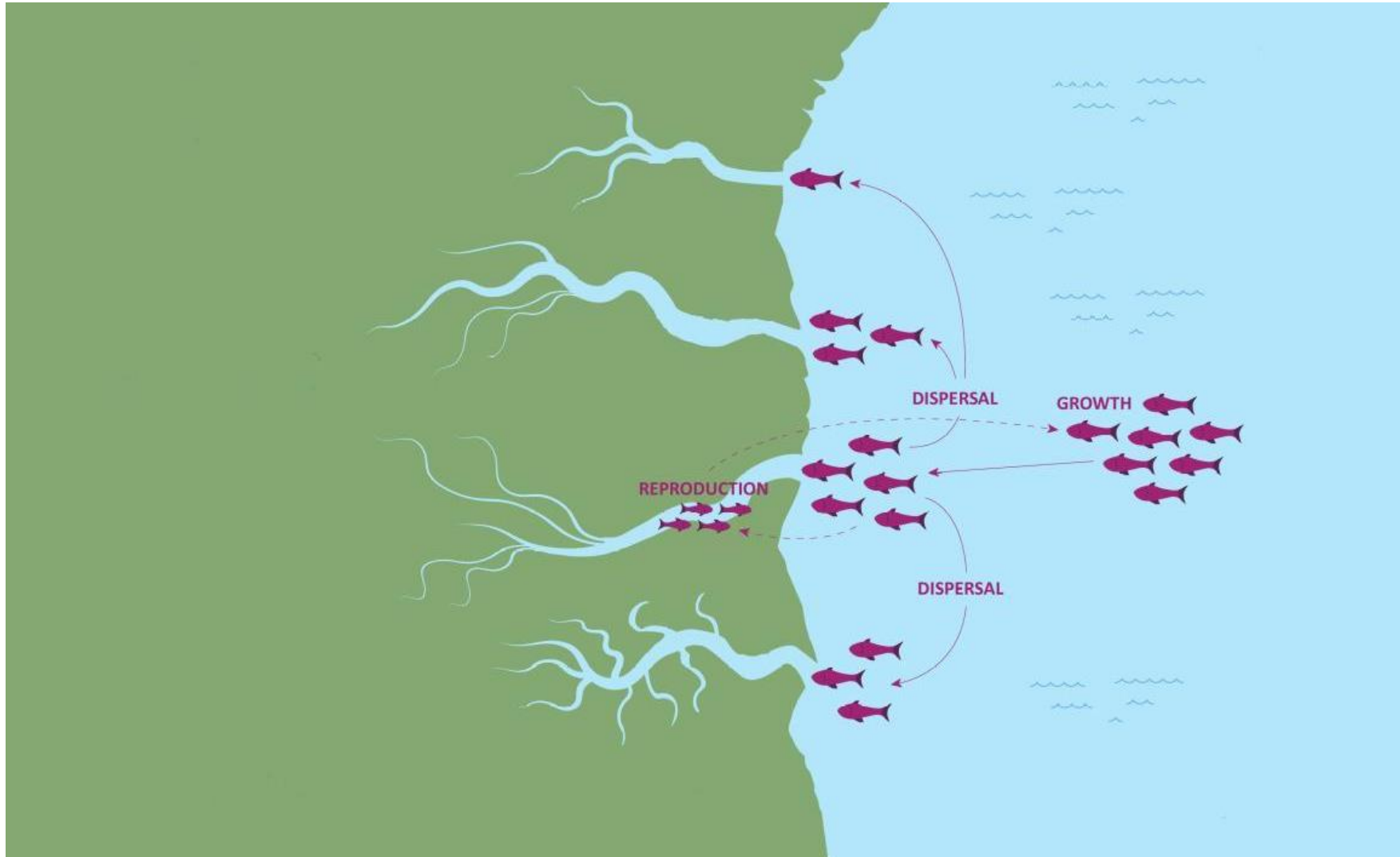


Diadromous literacy

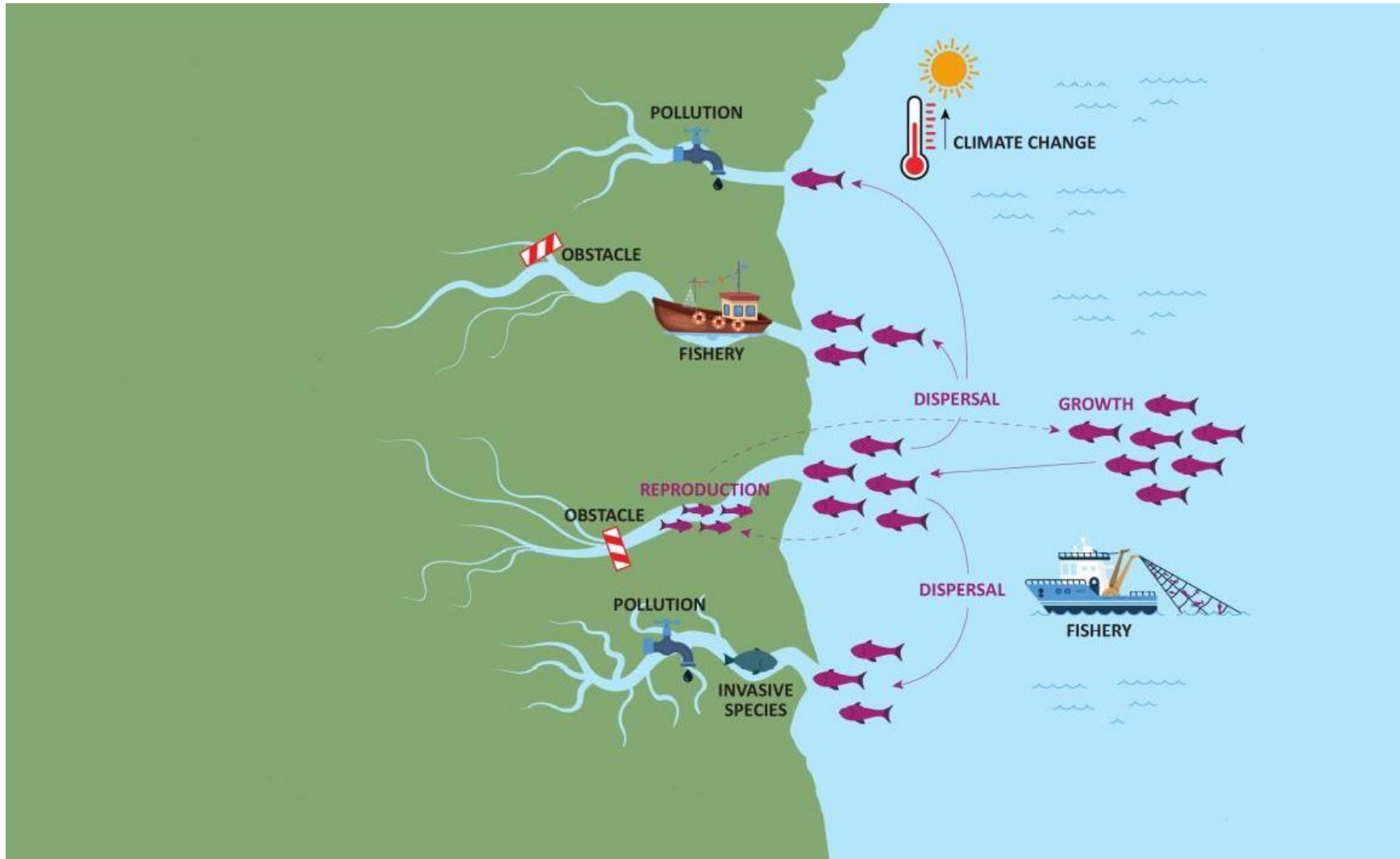
Production of game tools and a comic book



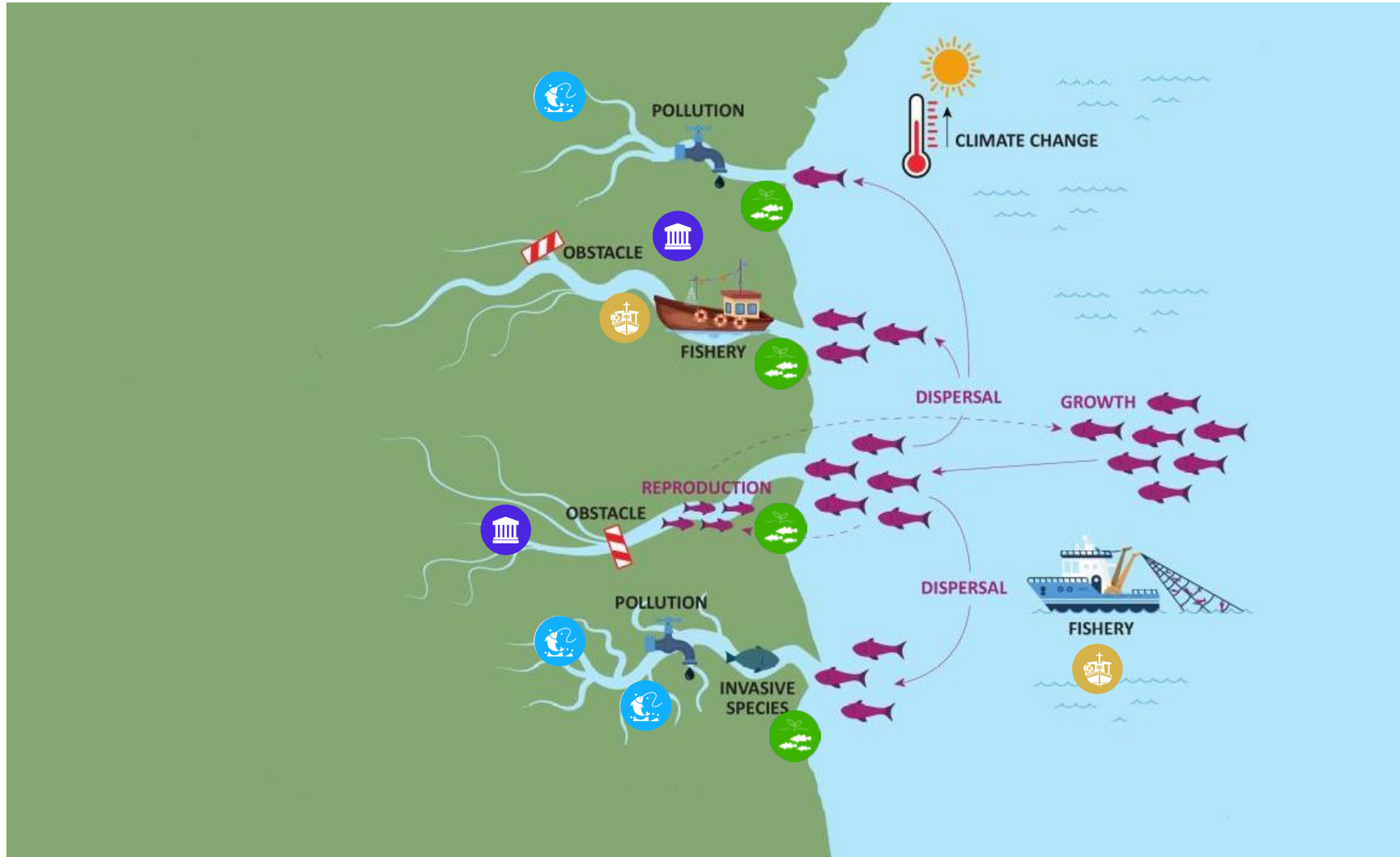
From a local management...



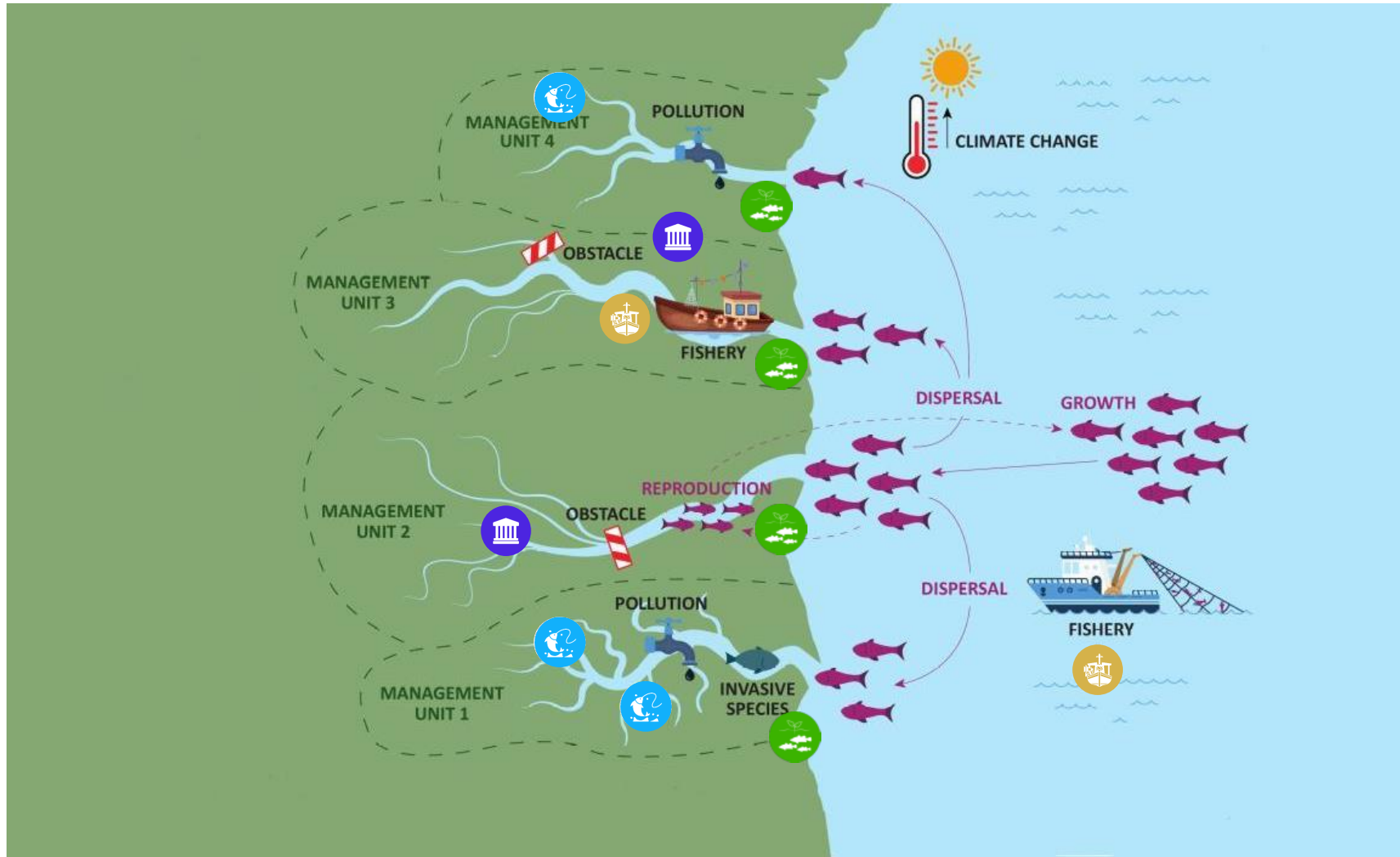
From a local management...



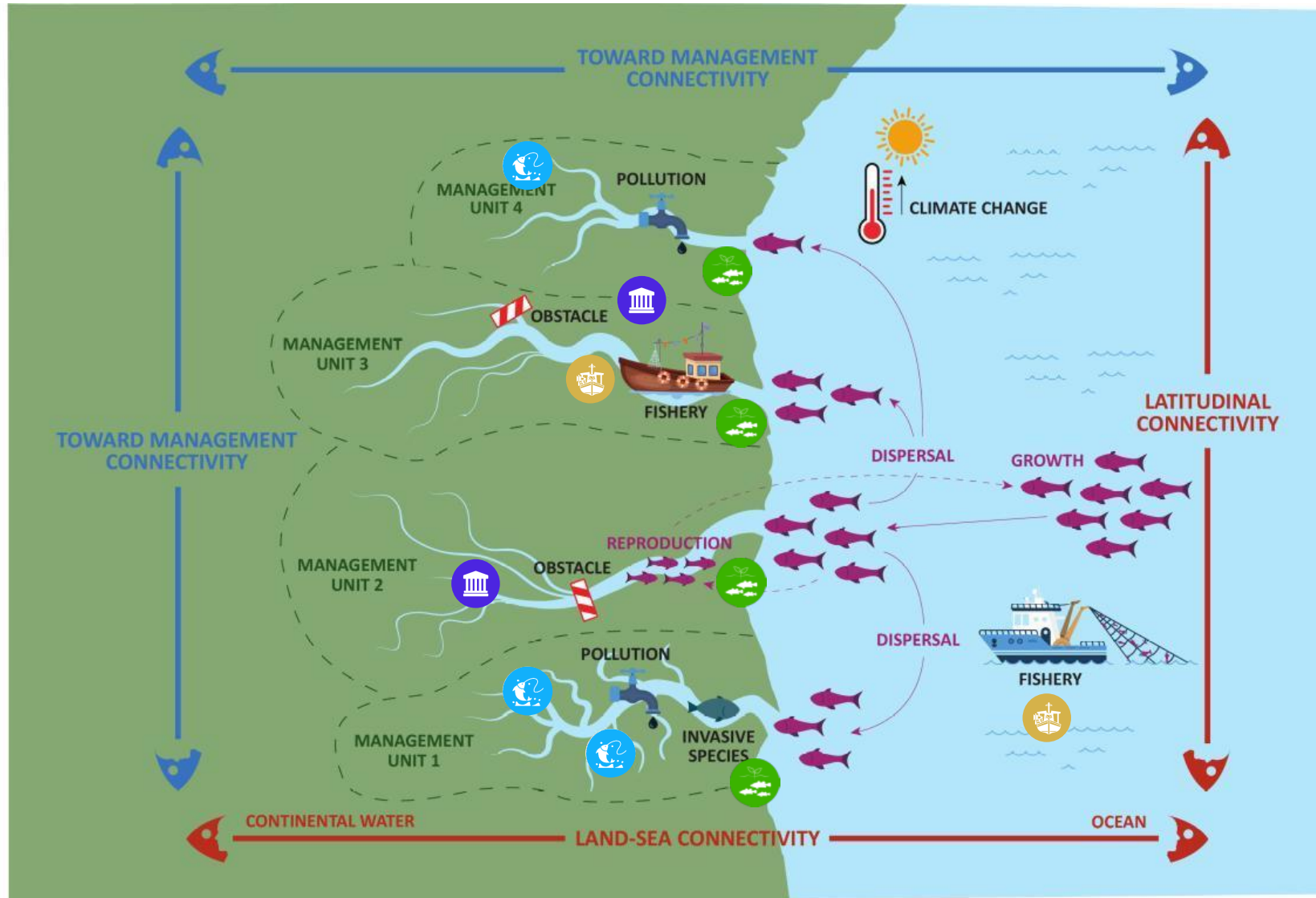
From a local management...



From a local management...



From a local management... towards a global management



Thank you

