Adapt or lose: How to manage the socioeconomic impact of climate change in the Spanish blue mussel aquaculture

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THE EFFECTS OF CLIMATE CHANGE ON THE WORLD'S OCEANS
Wednesday 6th June at 15:00 h
Session 15 in Columbia 3&4

ClimeFish

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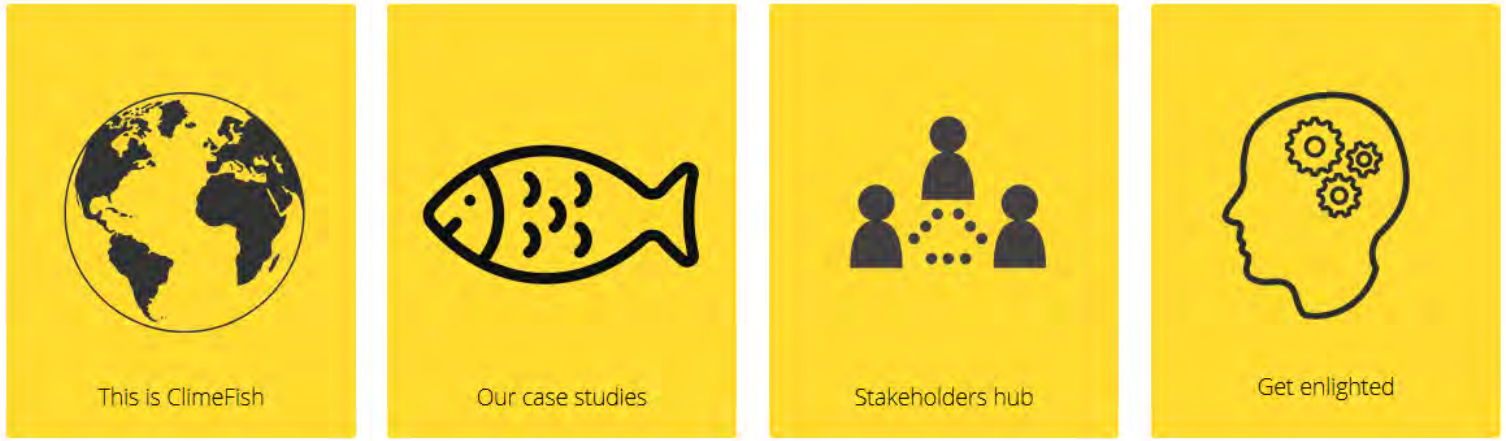
This project has received funding from the European Union´s Horizon 2020 research and innovation action under grant agreement no. 677039

Framing the case study – ClimeFish project

Co-creating a decision support framework to ensure sustainable fish production in Europe under climate change

H2020 EU project

Started April 1st 2016 – 4 years



www.climefish.eu

ClimeFish – Adapting to a changing world

"ClimeFish will support sustainable fisheries, enable an increase in European aquaculture production, facilitate employment and regional development in the sectors, and develop forecasting and management tools for adapting to climate change; all in co-creation with stakeholders"

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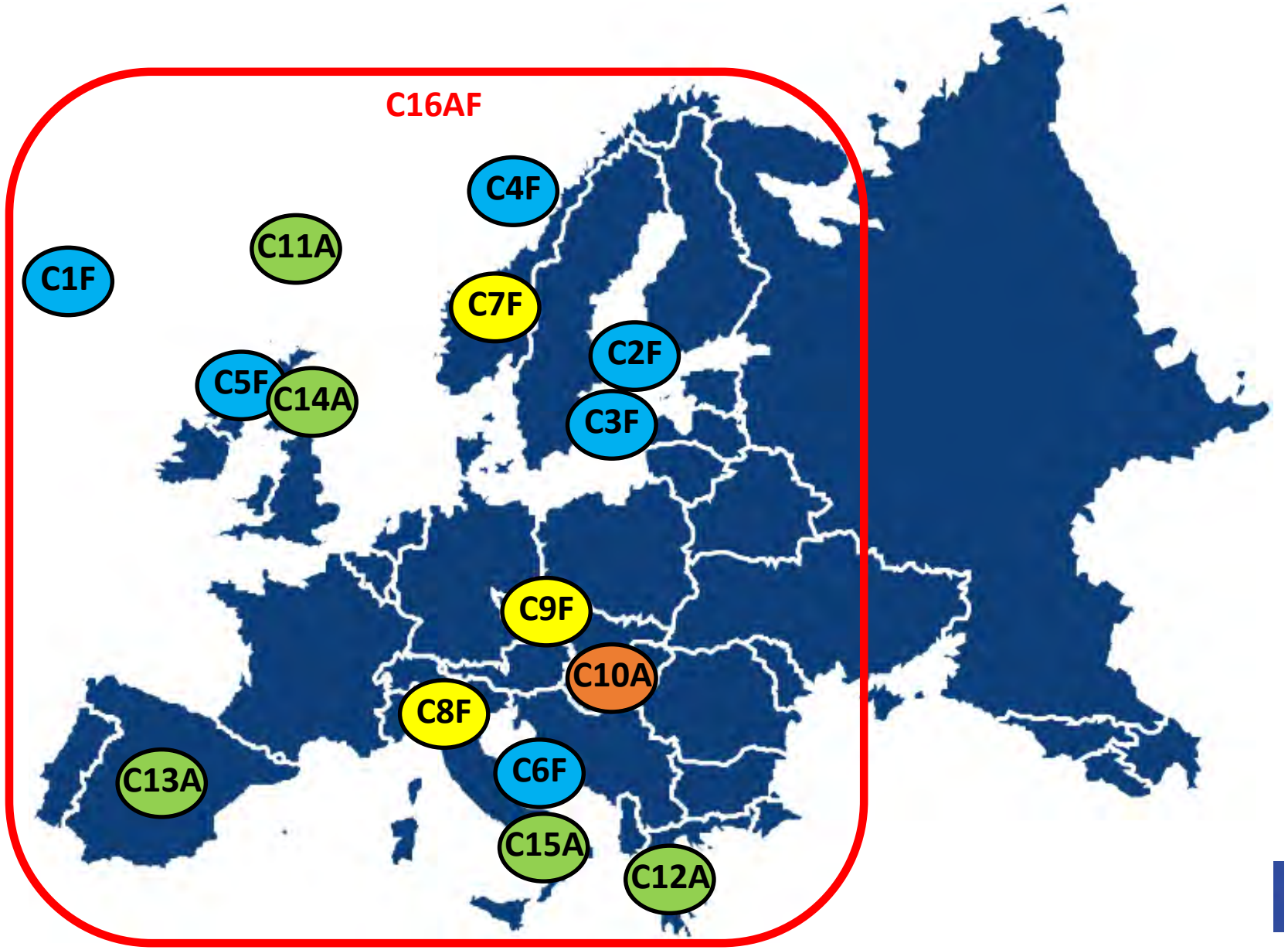
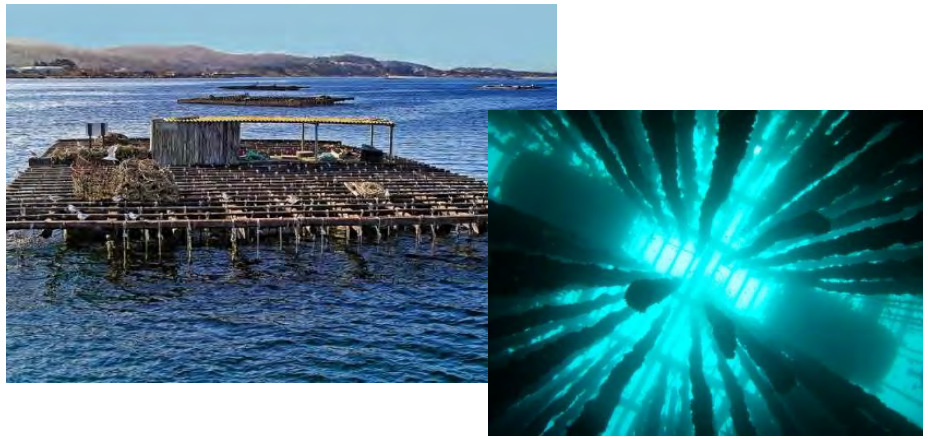
ClimeFish case studies

16 case studies

2 feedback loops



Spanish blue mussel aquaculture



Blue mussel culture on hanging ropes

Industrial
220,000 tons / year
90% of aquaculture in Spain
50% of mussel production in Europe
20% of mussel production in the World

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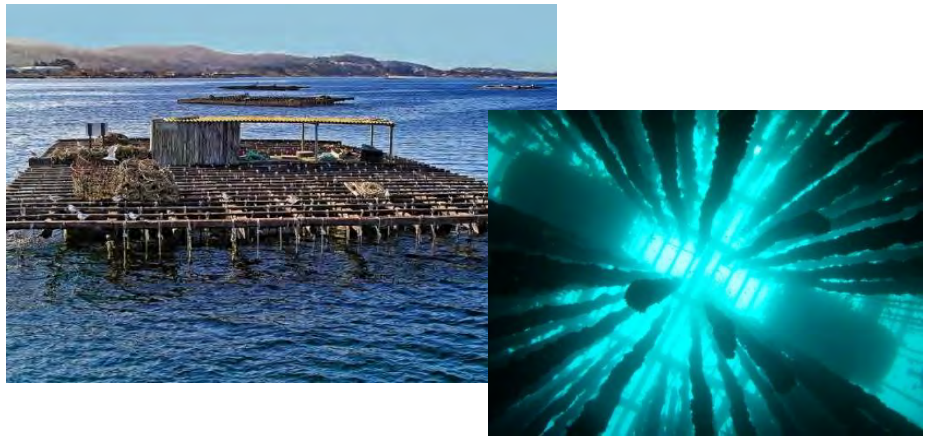

Blue mussel culture on hanging ropes

Industrial
220,000 tons / year
90% of aquaculture in Spain
50% of mussel production in Europe
20% of mussel production in the World

multi-species harvesting in beach grounds

artisanal
6,000 tons / year
Cokle (the most abundant)
Manila clam (the most rentable)
Wedge shell (the most expensive)

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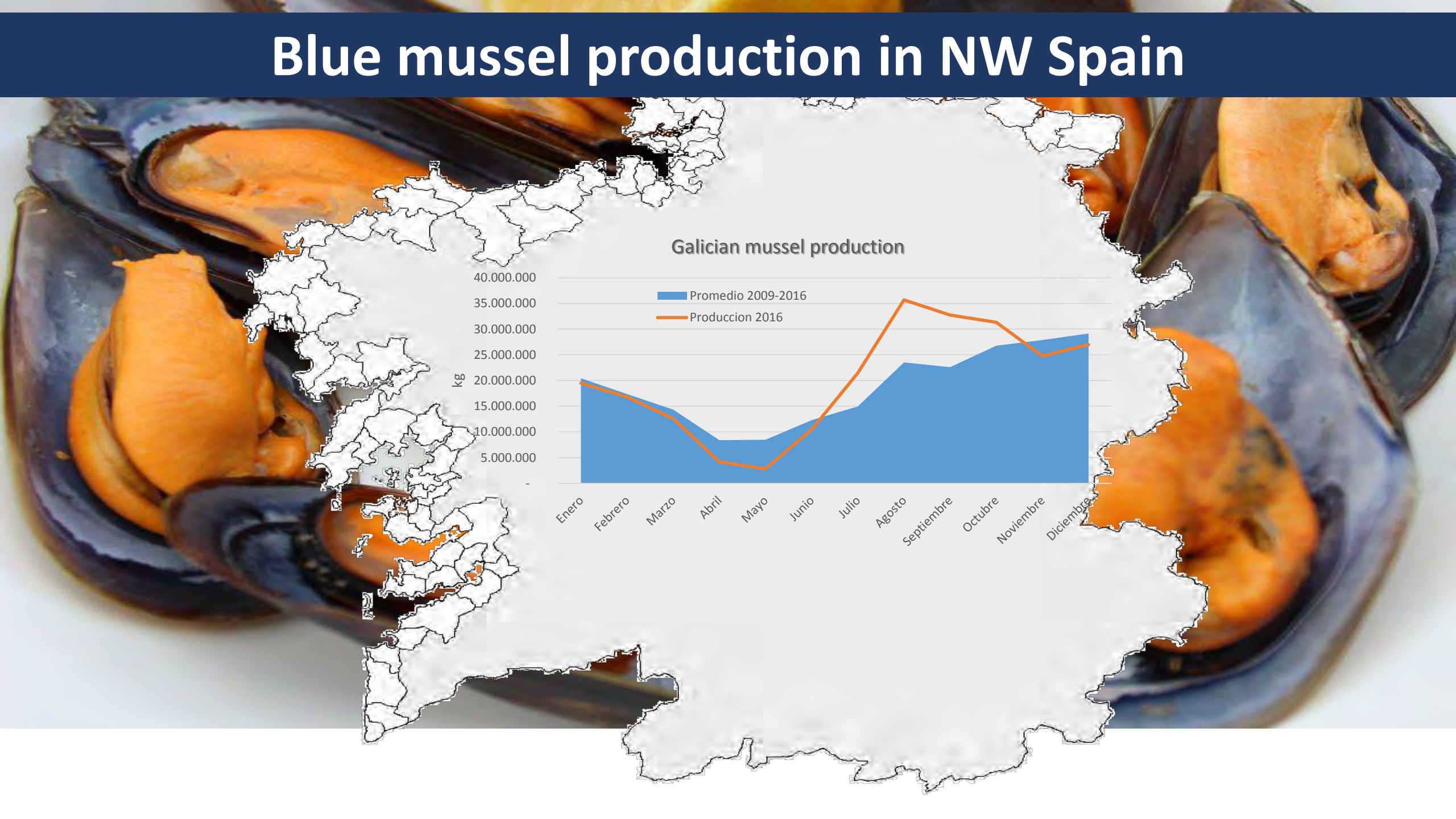
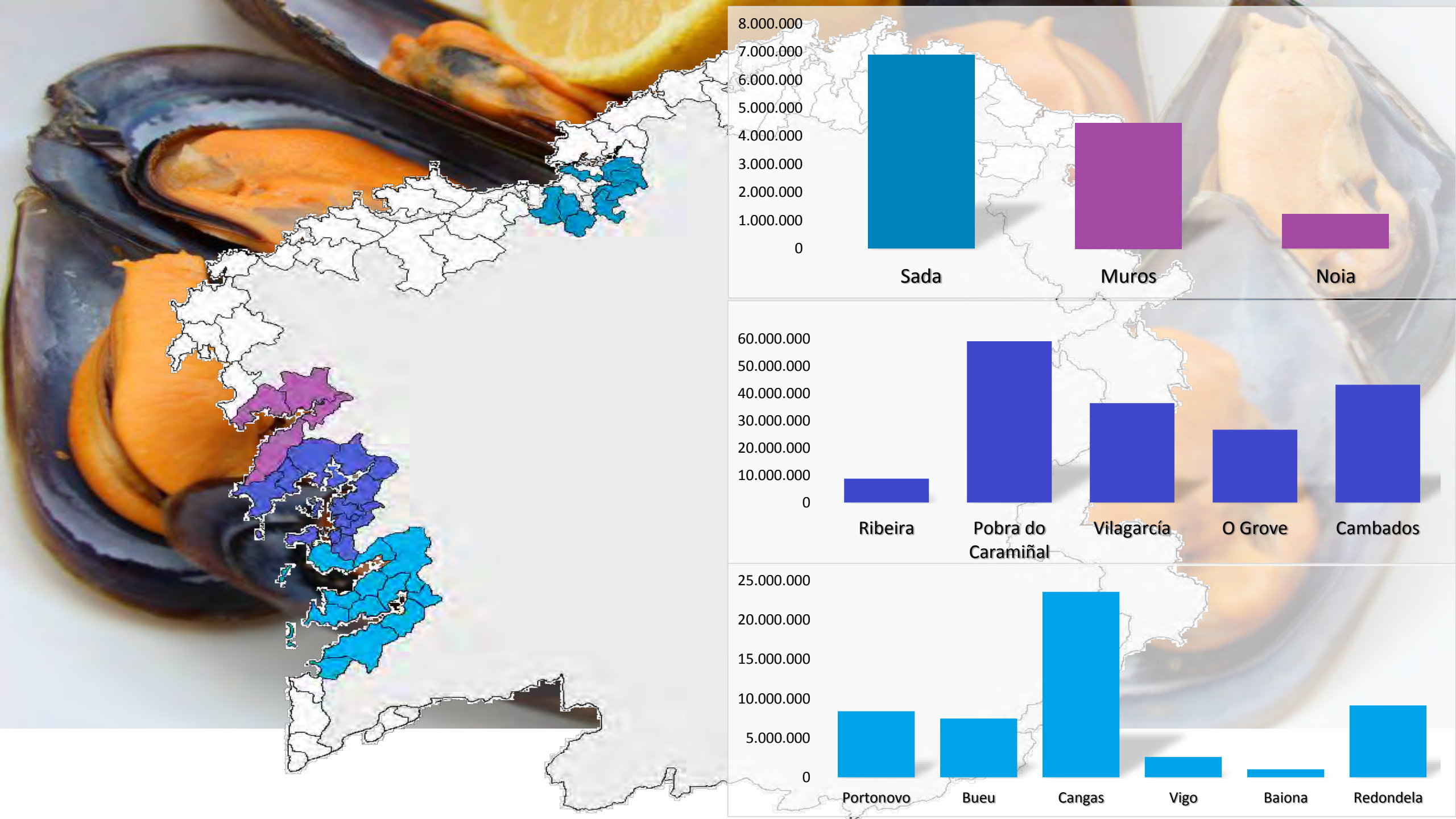
Blue mussel production in NW Spain

Blue mussel production in NW Spain

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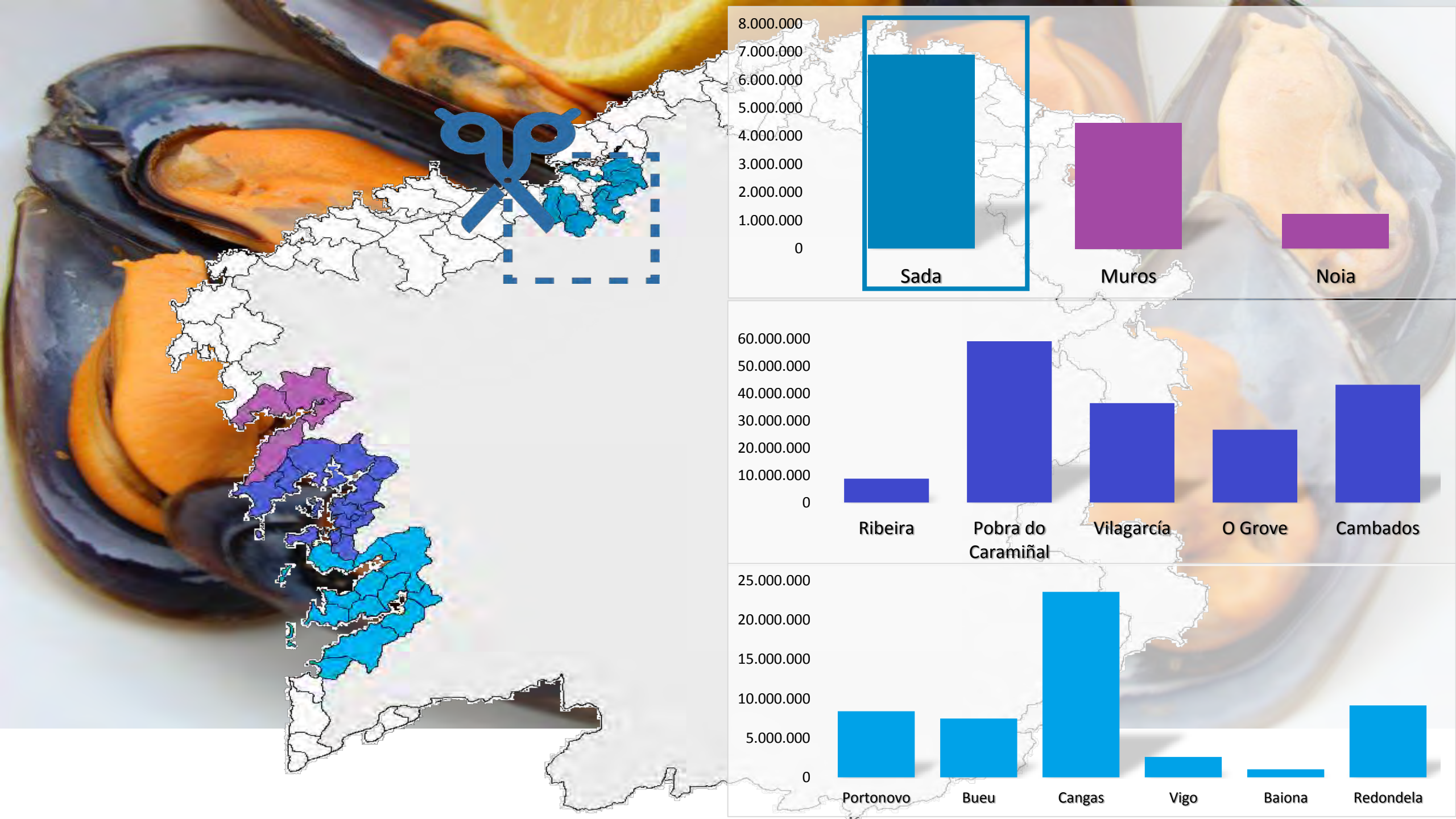
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Zoom in blue mussel aquaculture

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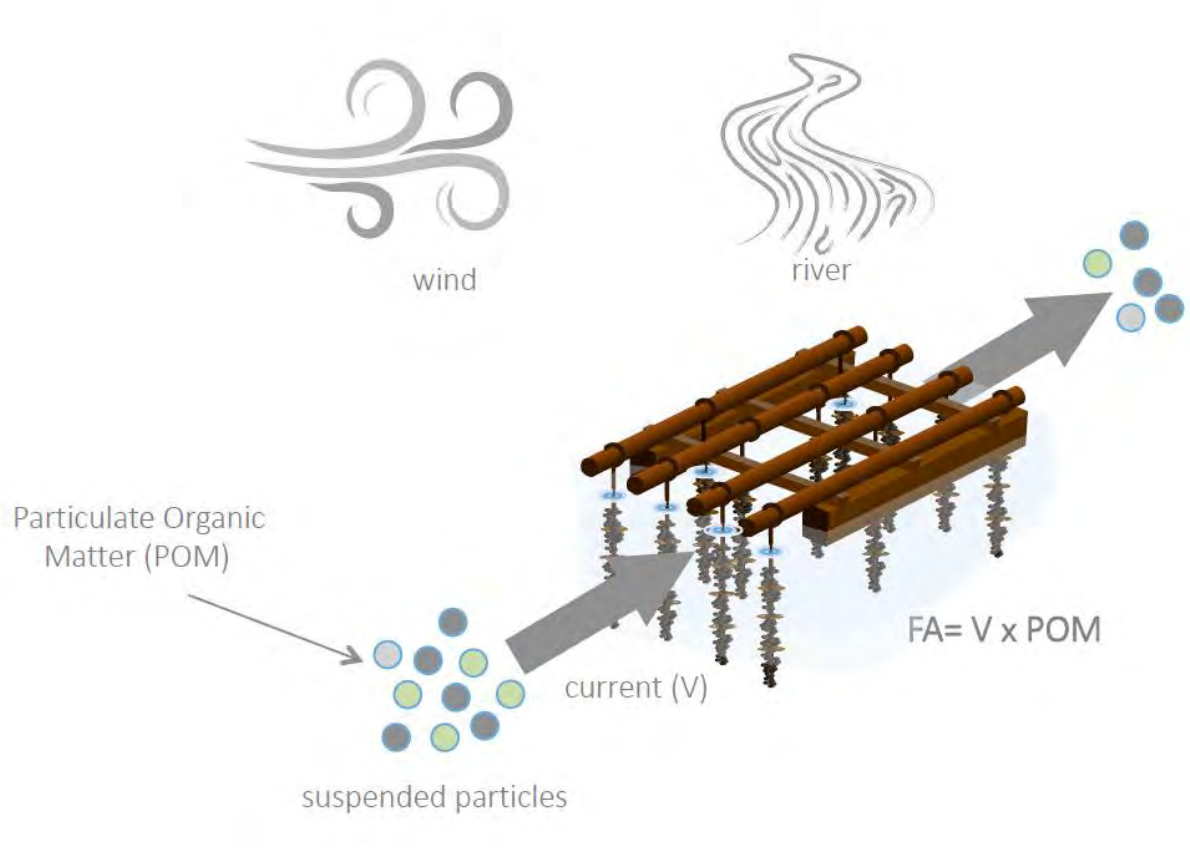
Zoom in blue mussel aquaculture



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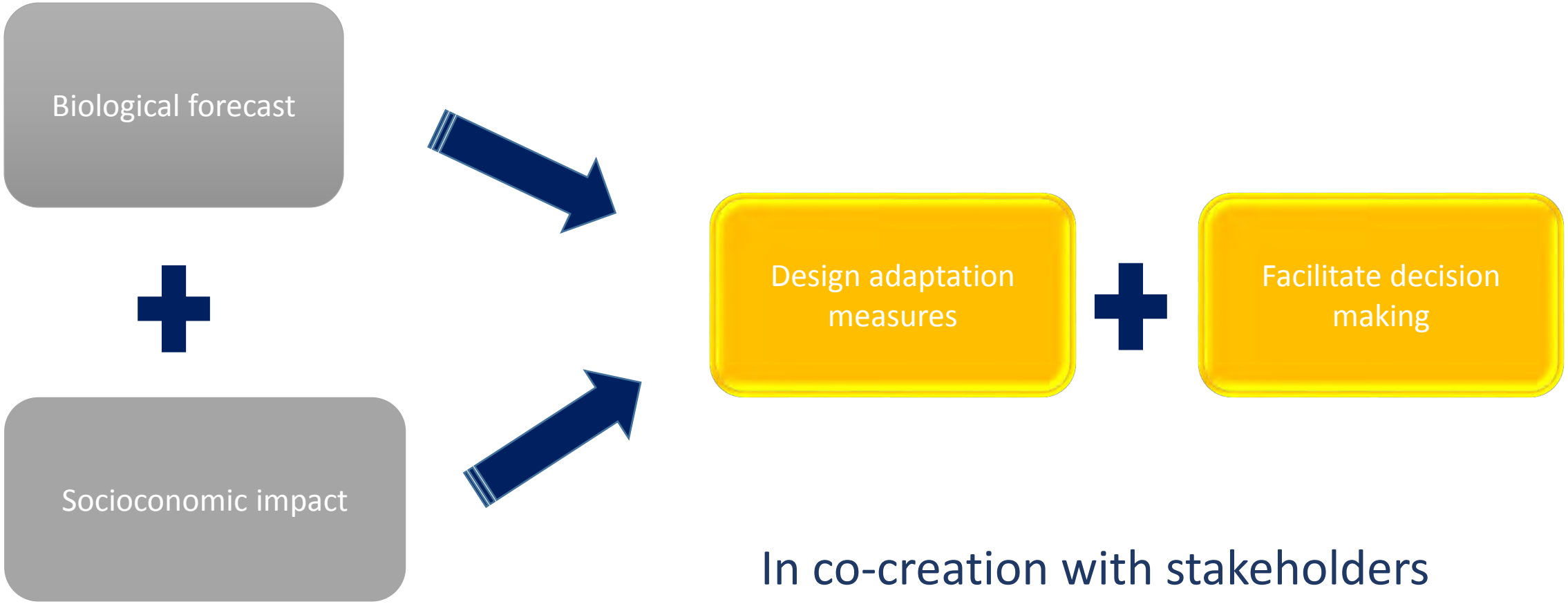
The process



In co-creation with stakeholders

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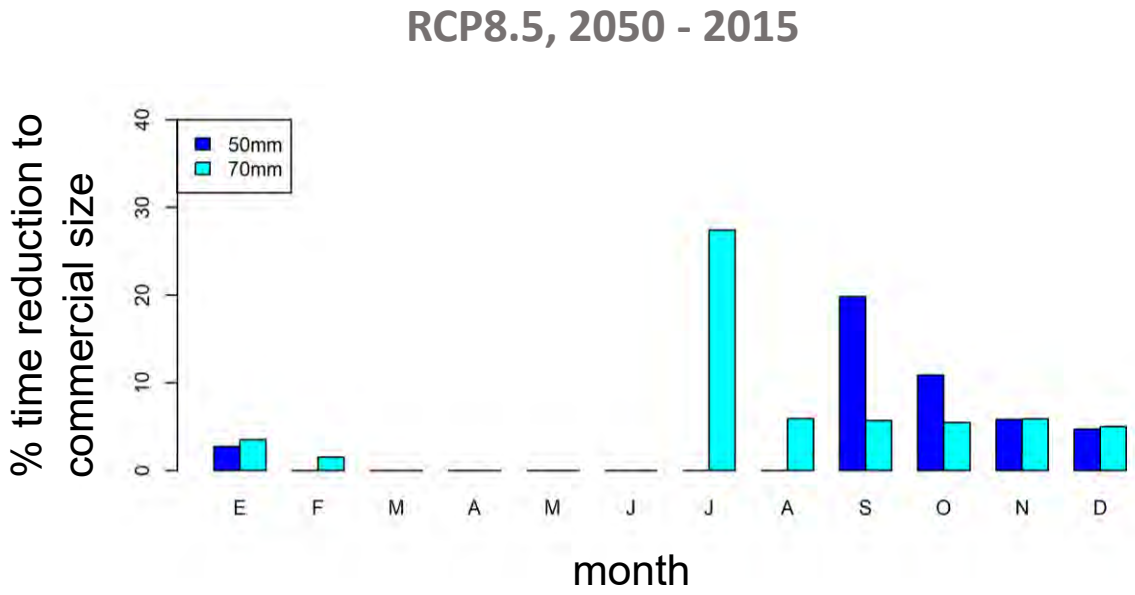
Forecasting mussel growth

The combination of increasing sea surface temperature and increasing coastal upwelling by 2050 results in a reduction of the time needed to achieve the commercial size (50 mm or 70 mm), which depends on the seeding month.

<u>Average reduction of the time to achieve the commercial size is around 10%.</u>



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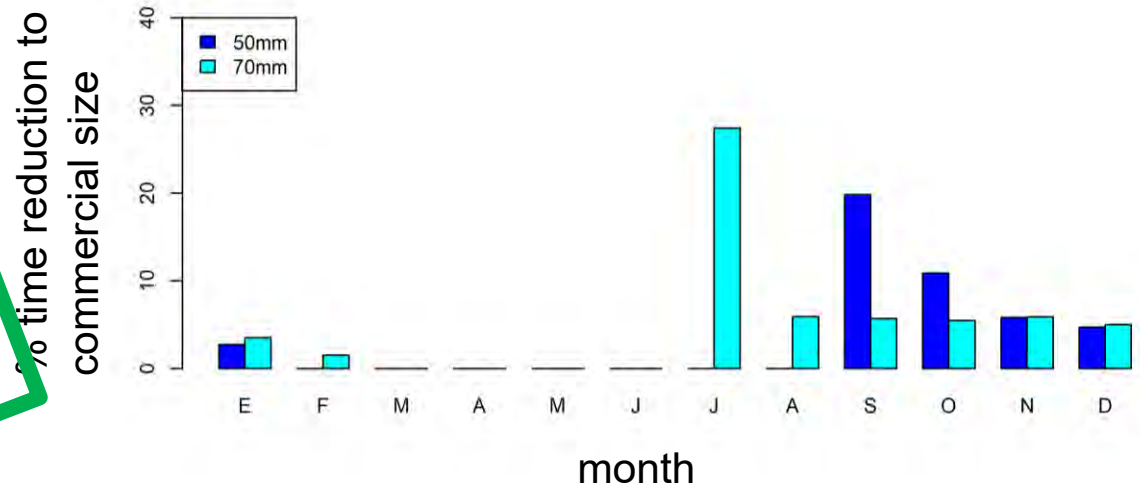
OPPORTUNITY

RCP8.5, 2050 - 2015



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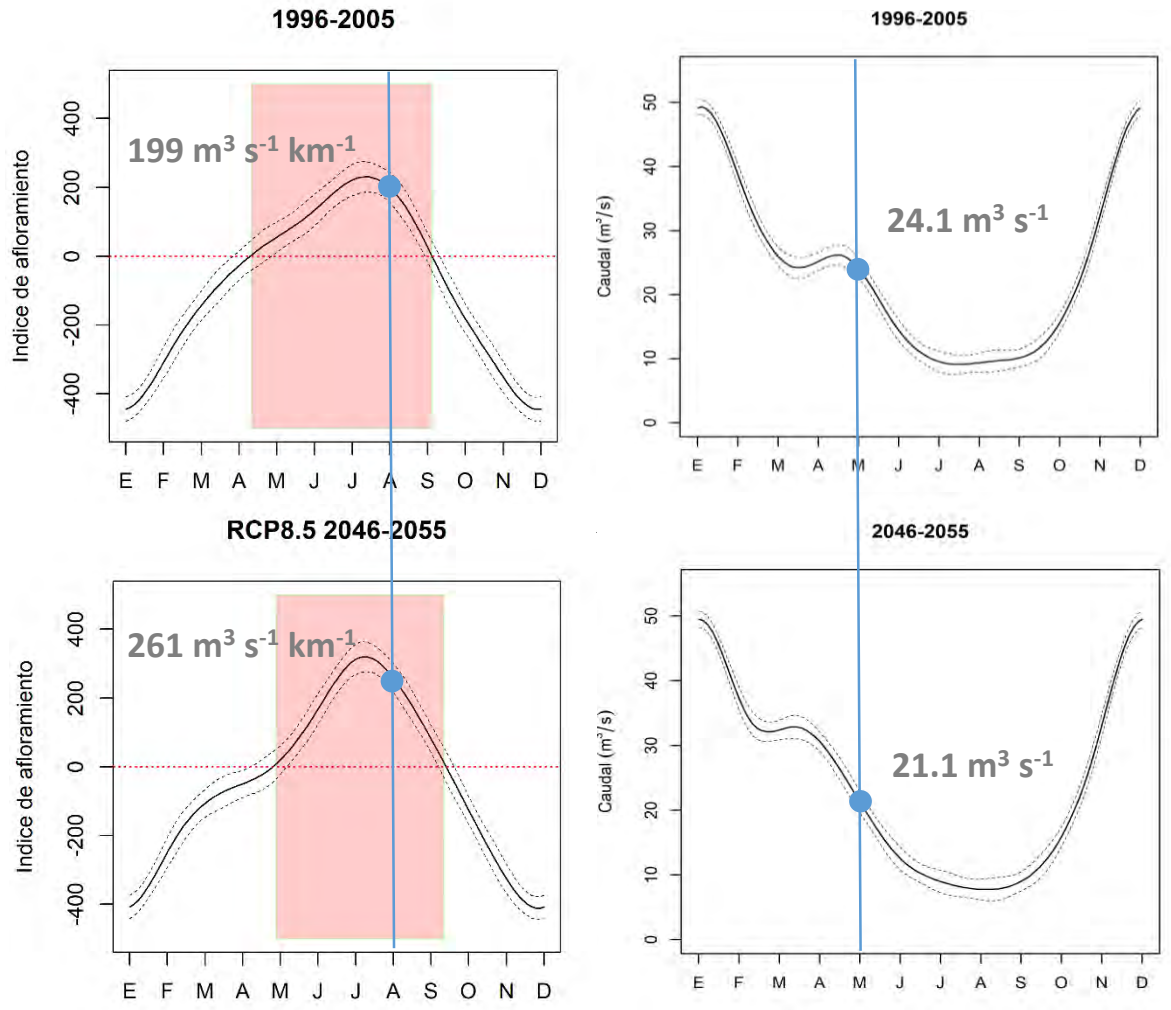
Forecasting mussel growth

The closure of mussel cultivation areas in summer is predicted from the continental runoff in May and in autumn from the intensity of northerly winds in August

On basis of the differences in the annual cycles of continental runoff and coastal wind intensity between 2015 and 2050, it is predicted that closures in summer will decrease by 5% and in autumn will increase by 5%.



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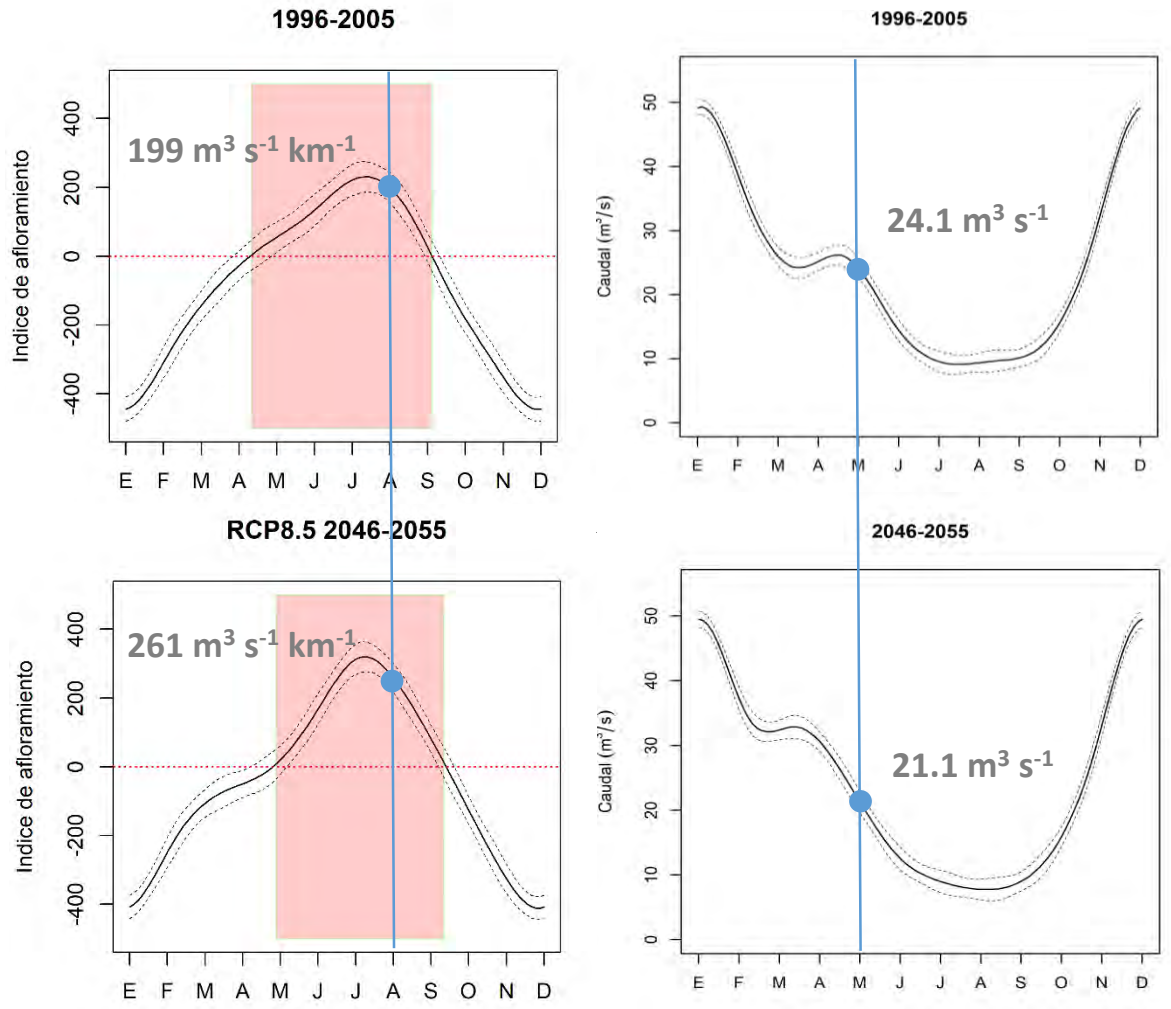
RISK



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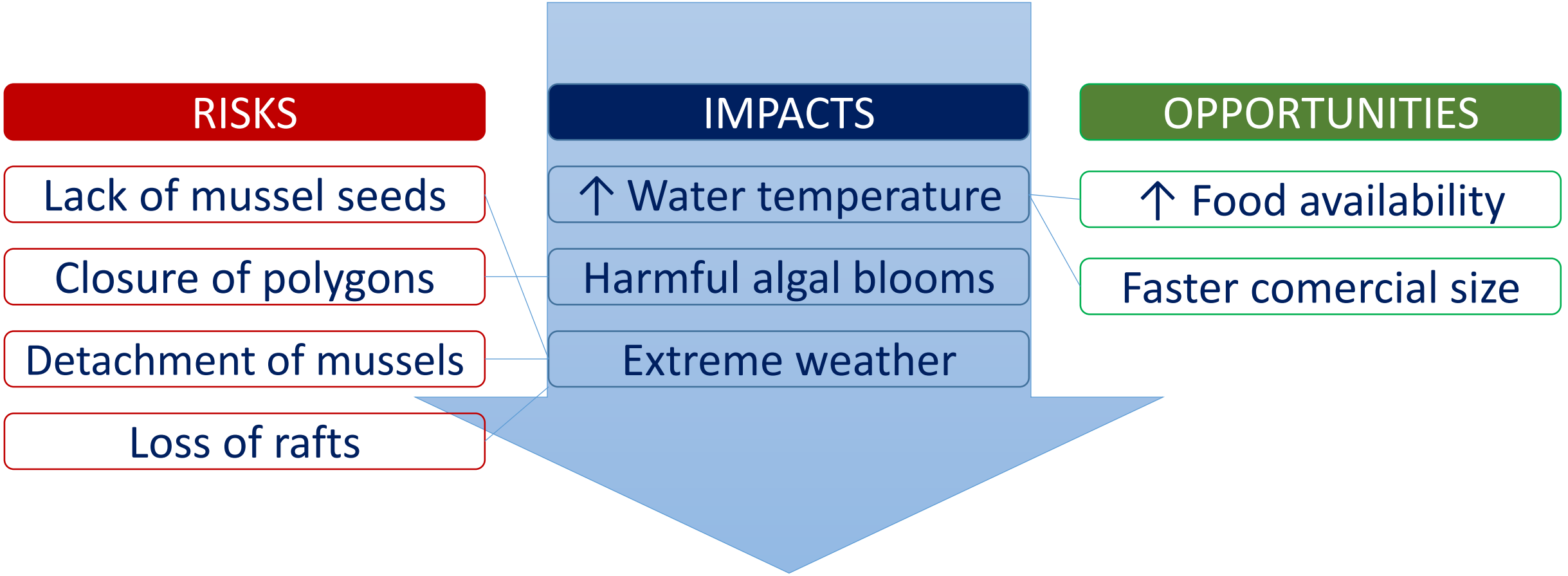
Climate change impacts



VARIATIONS ON THE MUSSEL PRODUCTION

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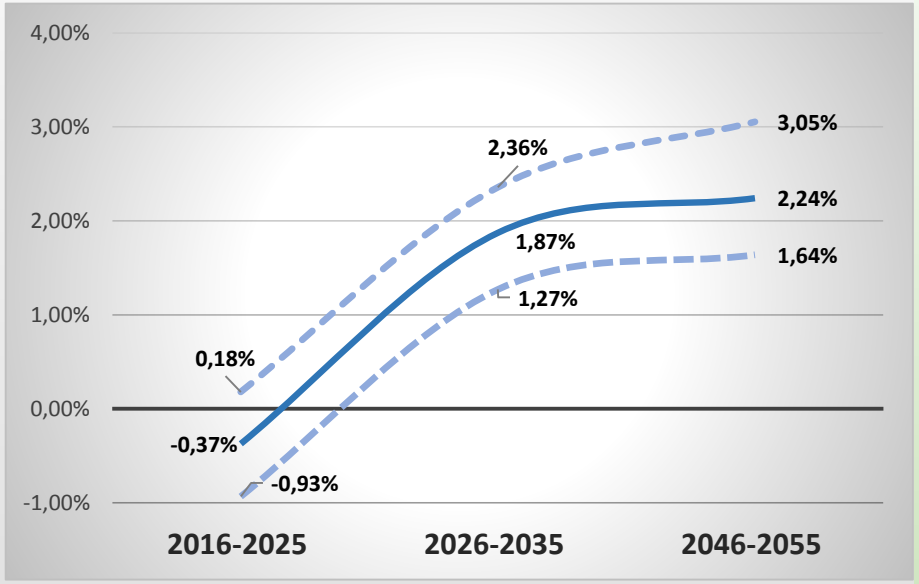
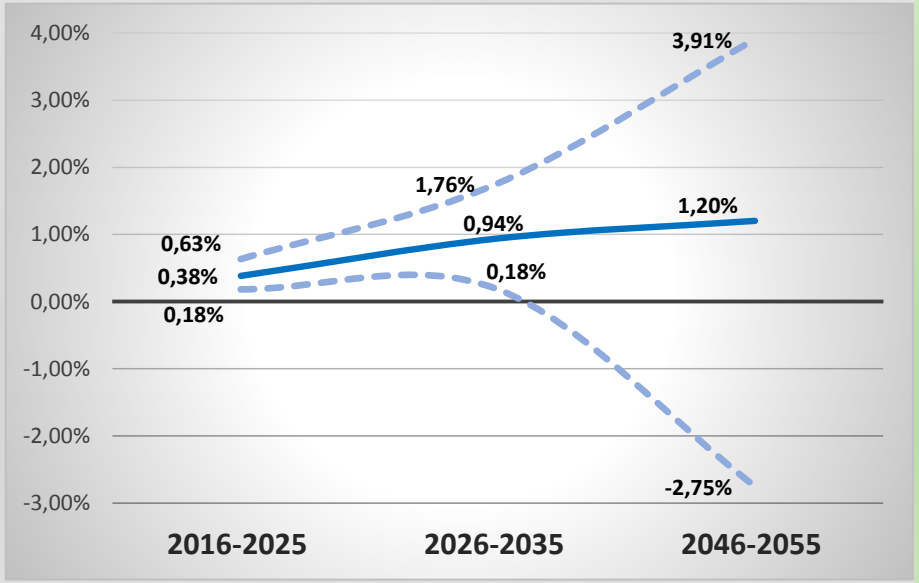
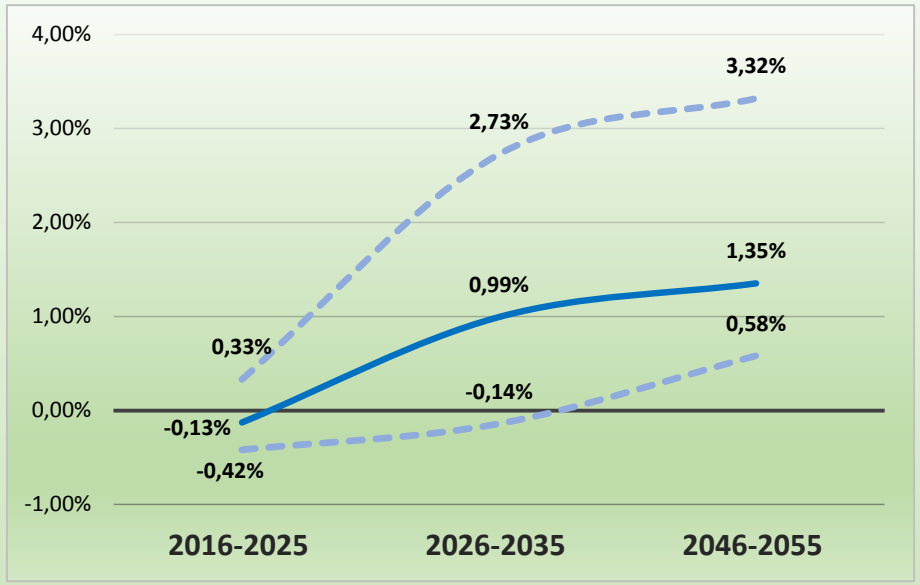
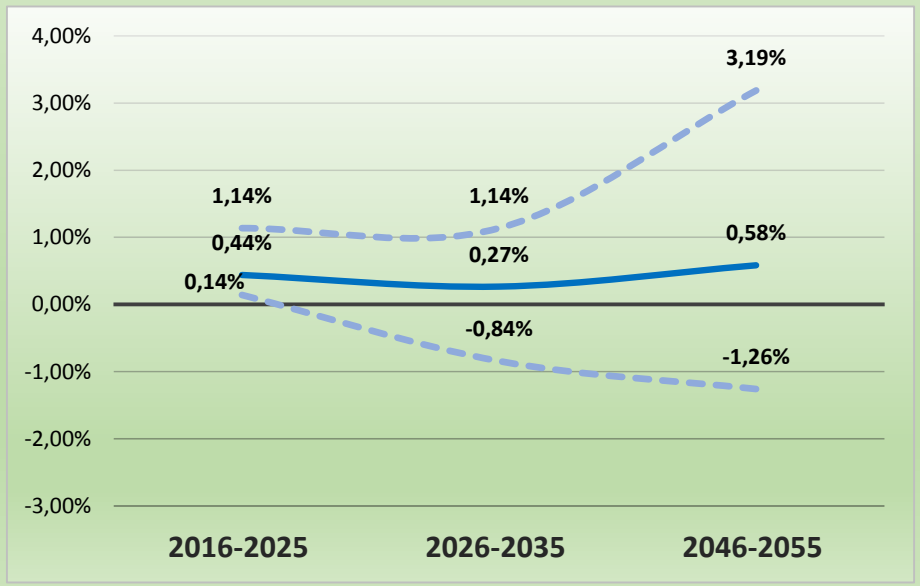
Impact of climate change in the strategy of reach a mussel of 70mm





Impact of climate change in the strategy of reach a mussel of 10 gr flesh yield





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Socioeconomic impacts

% of the intermediate consumptions of mussel sector	BACKWARD LINKAGES		FORWARD LINKAGES	% of the intermediate output by mussel sector
		FISHING		
4%		AQUACULTURE		**2%**
		AGRICULTURE, FORESTRY AND MINING		
		MANUFACTURE OF FOOD PRODUCTS		**88%**
5%		MANUFACTURE OF TEXTILES, WEARING, WOOD AND PAPER		
24%		MANUFACTURE OF PETROLEUM, CHEMICAL, PLASTIC AND OTHER NON-METALLIC PRODUCTS		
9%		OTHER MANUFACTURES		
25%		REPAIR AND SUPPLIES		
		CONSTRUCTION		
		WHOLESALE AND RETAIL TRADE		
1%		TRANSPORTATION AND STORAGE		
		ACCOMMODATION AND FOOD SERVICE ACTIVITIES		**9%**
31%		SERVICES TO COMPANIES AND INDIVIDUALS		
		ADMINISTRATION AND PUBLIC SERVICES		
1%		OTHER SERVICES		

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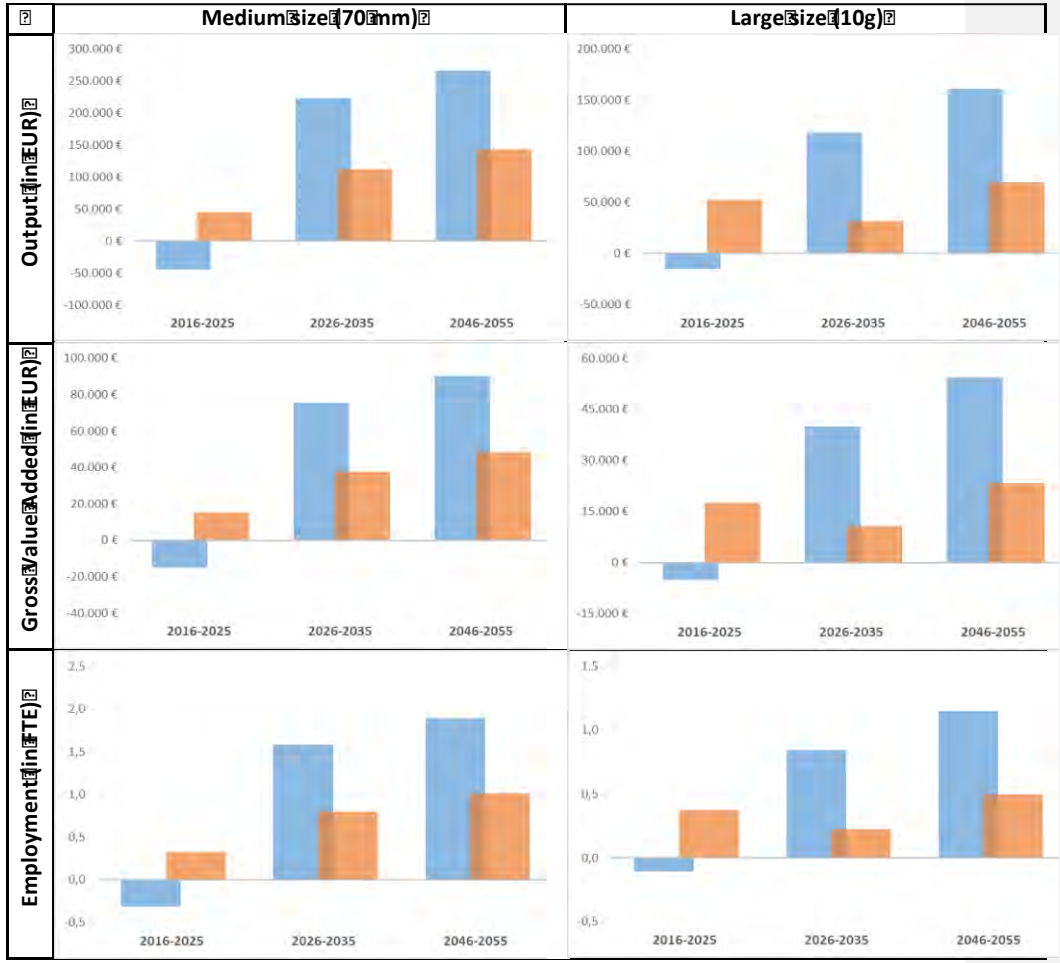
Socioeconomic impacts

For RCP4.6, the short-term effects are negative but they change to positive in the medium and long-term. An increase of more than EUR 250,000 of output, around EUR 90,000 in GVA and around 2 jobs at FTE.

For RCP8.5, trends are similar for the medium and long-term but with slight intensity (EUR 150,000 in output, around EUR 50,000 in GVA and 1 additional job). Slight positive effects are remarkable at the short time. These trends are similar for the large-size mussel production but with a decrease in the medium-term

Potential effects of climate scenarios on mussel production



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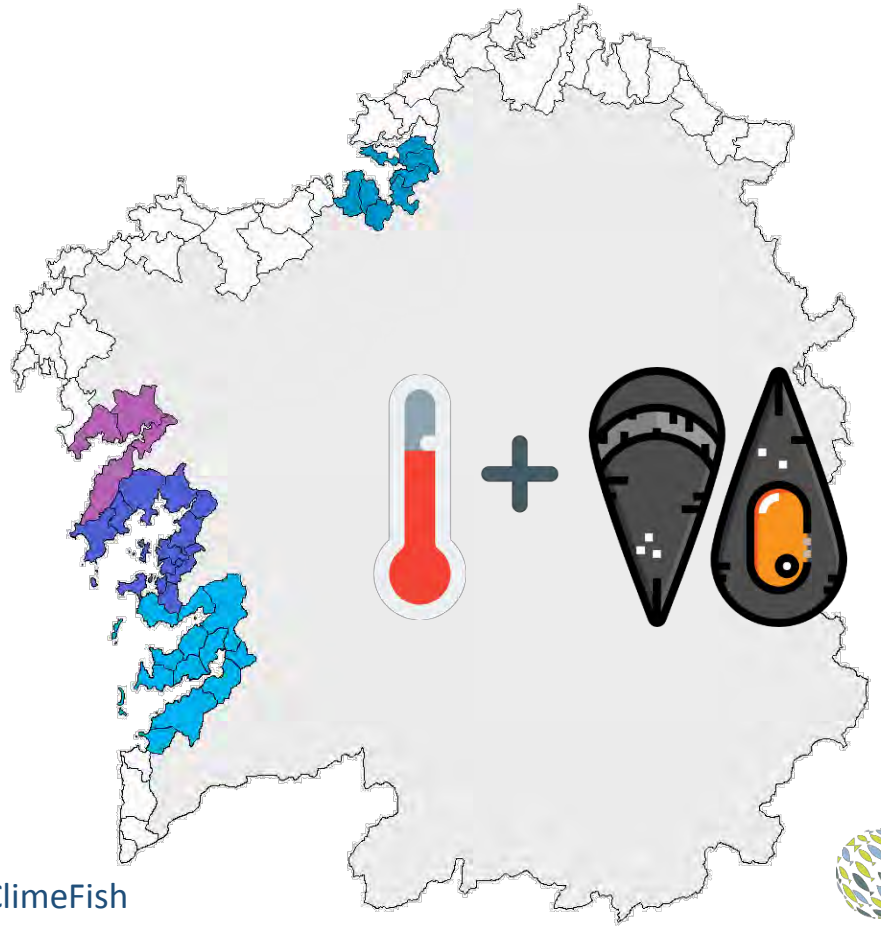
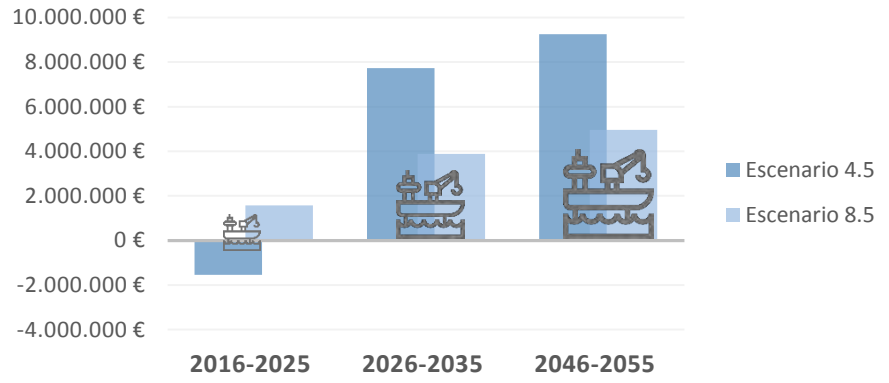
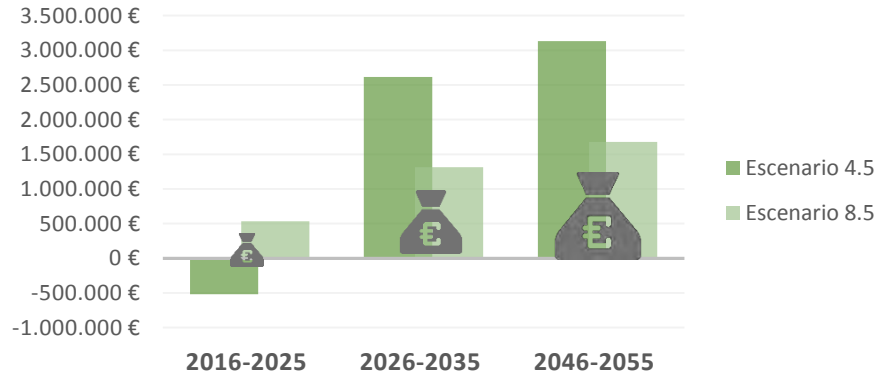
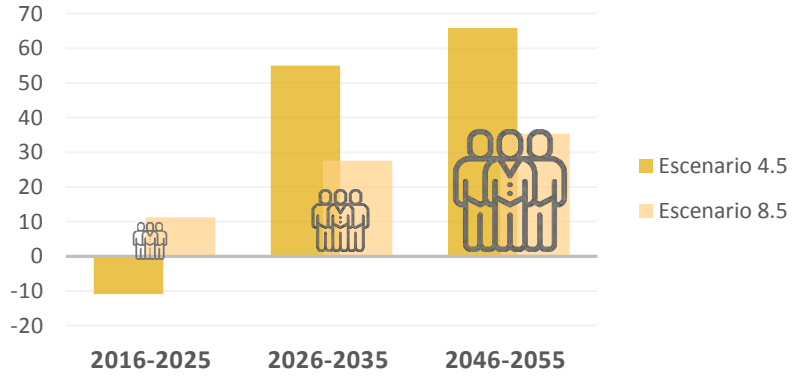
Socioeconomic impacts

What if the Climate Change affects equally to the rest of production?









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Stakeholder interaction: Challenges ahead

- Communication of uncertainty
- Work in a long term scenarios framework
- Build consensus between stakeholders and scientists to develop the MPs and DSF
- Align interests from the different groups of producers
- Buy-in from stakeholders
- Visualization on how policies are formulated
- Boost stakeholders' awareness by connecting impacts to their well-being
- Improve policy frameworks for challenges but also opportunities
- Combine strategies in the public and private realm

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Stepwise framework

We propose a stepwise framework to improve the understanding of these effects in a community dependent on mussel cultivation (i.e. aquaculture) and how it supports the decision-making of management and production strategies.

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Trust building is involved in the framework

Through….

- Sharing information
- Asking stakeholders what they need
- Build relevant outcomes for stakeholders and show them in a way that can be useful for them

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Sharing information

1st interaction

Involving stakeholders from the very beginning:

Co-creation approach

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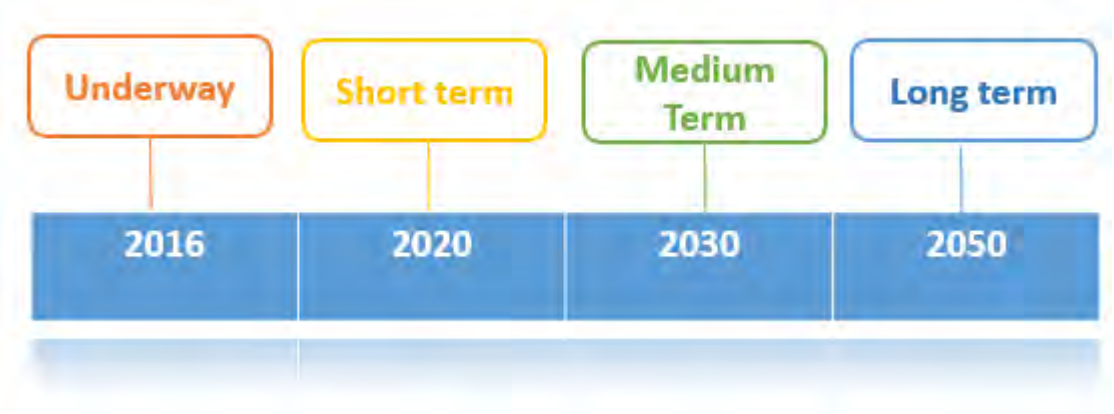
Asking people what they need

1st interaction

Involving stakeholders from the very beginning:

Co-creation approach

Consensus and validation of temporal horizons



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Build relevant outcomes

1st interaction

Involving stakeholders from the very beginning:

Co-creation approach

2nd interaction

Survey

- To get stakeholders' perception on climate change and their ideas for adaptation
- To gather data on employment, production and commercialization)

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Show useful outcomes

1st interaction

Involving stakeholders from the very beginning:

Co-creation approach

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Survey

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3rd interaction

Stakeholder event

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Show useful outcomes

1st interaction

Involving stakeholders from the very beginning:

Co-creation approach

2nd interaction

Survey

- To get stakeholders' perception on climate change and their ideas for adaptation
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3rd interaction

Stakeholder event

- Stakeholder consultation to match the needs detected
- Stakeholders contributions
- Co-creation

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Adapting to stakeholders

Stakeholder interaction is also about adaption, first to each CS needs and then to its stakeholders needs to ensure successful stakeholders engagement

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Adaptation beyond climate change

Stakeholder interaction is also about adaptation, first to each CS needs and then to its stakeholders needs to ensure successful stakeholders engagement

There is no one size fits all!!!

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Stakeholder meeting – goals

- To understand stakeholders views and needs on climate change
- Present the biological forecast for the mussel sector
- Identify risks and opportunities of climate change and prioritize them
- Explore feasible adaptation measures

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When science meets reality - challenges

Unexpected reaction – high concern about climate change

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When science meets reality - challenges

Unexpected reaction – high concern about climate change

Predators

Lack of mussel seeds

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When science meets reality - challenges

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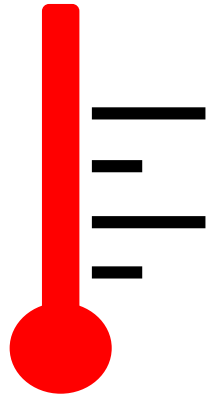

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Lack of mussel seeds

Scientists should find a solution!

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When science meets reality - challenges

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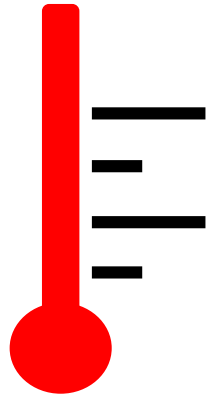

Predators

Lack of mussel seeds

Scientists should find a solution!

Long term CC impacts are not a current problem for the industry

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Stakeholder meeting – bridging the gap

Main Concerns:

- Rainfall pattern
- Extreme weather episodes
- Lack of mussel seeds on hanging ropes

Adaptation measures:

- Administrative extension for collecting seeds
- Use of nets to protect ropes from predators
- Control of predators by fishing

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Preliminary results

- **The preliminary results show how this analytical framework provides an accurate assessment of the socioeconomic impacts caused by the climate change by considering the backward and forward effects simultaneously.**
- The proposed framework improves the decision-making process, in particular its capacity to anticipate the effects of climate change by comparing in advance different scenarios.
- Therefore, the sectors and communities are able to react and propose adaptation and mitigation strategies in a participatory way, enhancing more holistic and sustainable management systems.

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Keeping on the loop

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Adapting or losing?

Climate forecast for 2050

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Consequences of not adapting

Climate forecast for 2050

Maladaptation

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And successful adaptation

Climate forecast for 2050

Adaptation

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You always have a choice

Climate forecast for 2050

Adaptation

Maladaptation

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Thanks!

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