



Risks and Opportunities of Climate Change across Sectors

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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



Introduction

Fisheries and aquaculture and their dependent communities are at the forefront of climate change impacts, calling for concerted efforts in mitigation and adaptation.

FAO 2019: FAO's Work on Climate Change

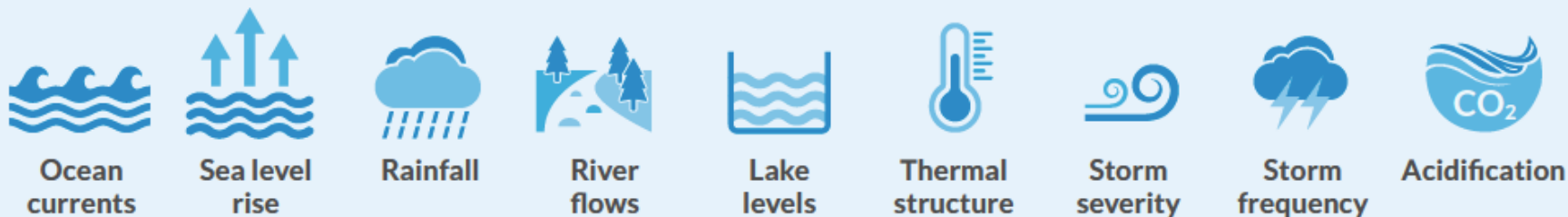


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BIOPHYSICAL CHANGES FROM GLOBAL WARMING



EFFECTS ON



IMPACTS ON FISHERIES AND AQUACULTURE



Figure 1: Impact pathways

(Source: adapted from Badjeck *et al.*, 2010)

FAO 2019: FAO's Work on Climate Change, p.5

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An interdisciplinary, science-based method to identify risks and opportunities

Impact?

Likelihood?

Risk/Opportunity?
Level?

RiskMatrix?

		Likelihood		
		Unlikely	Possible	Likely
Impact	Negligible (0)	No	No	No
	Minor (1)	Minor	Moderate	Moderate
	Moderate (2)	Moderate	Major	Major
	Major (3)	Moderate	Major	Severe
	Extreme (4)	Major	Severe	Severe

OpportunityMatrix?

		Likelihood		
		Unlikely	Possible	Likely
Impact	Negligible (0)	No	No	No
	Minor (1)	Minor	Moderate	Moderate
	Moderate (2)	Moderate	Major	Major
	Major (3)	Moderate	Major	Transformative
	Extreme (4)	Major	Transformative	Transformative



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Challenges

Using best available knowledge whilst continuing efforts to reducing gaps and uncertainties

Limited

Barriers are reduced by communicating across fields

Communication barriers



Seafood Sectors and ClimeFish Case Studies

Fisheries

Northeast Atlantic
Pelagic Fisheries

West of Scotland:
Demersal fisheries

Lakes and Ponds

Hungarian Pond
Production

Lake Garda Fisheries

Aquaculture

Northeast Atlantic:
Marine Aquaculture

Greece: Marine
Aquaculture

Shellfish production in
Galicia





MARINE FISHERIES

Shared impacts in
pelagic fisheries in the
North Atlantic and
demersal fisheries in the
West of Scotland



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Alteration of species dynamics

Species composition

Northwards shift of species

Increased stocks: Mackerel,
Whiting, Hake

Decreased stocks: Herring,
Cod

Emerging species: Seabass

Species phenology and growth


Alterations year-class

Food availability

Growth rates

Fisheries and production dynamics

Distribution and fisheries dynamics



Catch composition

Spatial distribution

Deployment of gear and catch efficiency

Production dynamics

Longer distance to fishing grounds

Reduced safety

Damaged infrastructure

Reduced fishing days / Increased costs

Quota allocation, licenses and TAC

Increased complexity in negotiations

Overfishing of shared stocks

Choke Species





FRESHWATER OPERATIONS

Shared Impacts from CC
in Italian Lake Garda -
Hungarian Ponds



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Altered natural conditions

Natural feed availability
and increased mortality

Affects fish stocks and
size

Natural recruitment /
Feed availability

Increased risk
suboptimal conditions
- anoxia

HABs, pathogens and
invasive species

Frequent outbreaks of
HABs

Harmful bacteria and
pathogens

Species replacement

Decreased ecological
balance



Water availability and costs

Decreased water quality

Water turbidity

Deterioration of water inlet

Increased Evaporation

Decreased water availability

Increased water prices

Water shortage affects region's income

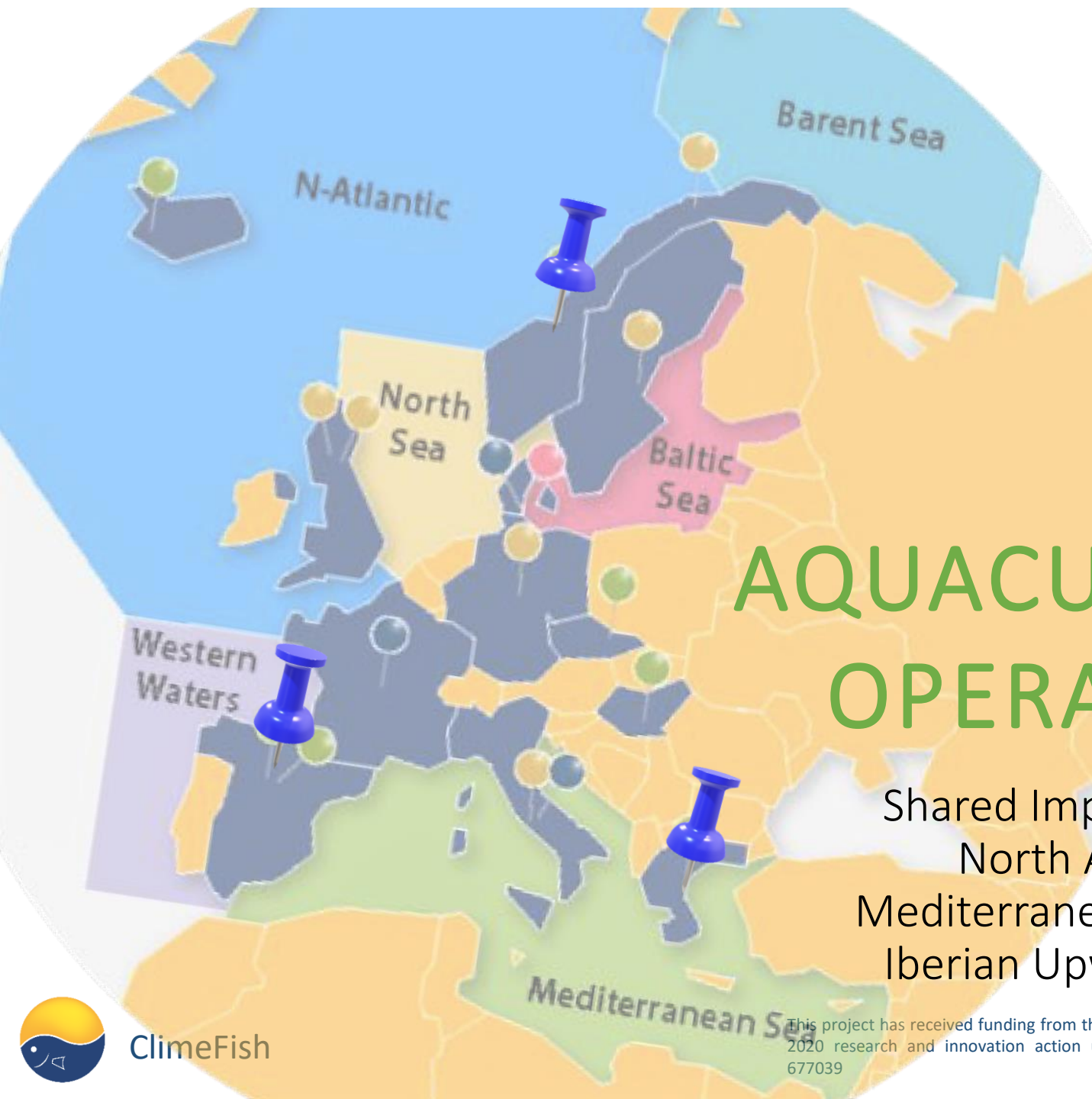
Costs and Income

Increased feed demand

Increased operational costs

More controls / systems required





AQUACULTURE OPERATIONS

Shared Impacts from CC in
North Atlantic Salmon,
Mediterranean Seabass and
Iberian Upwelling Shellfish



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Size variability and suboptimal conditions

Growth/size variability and mortality

Growth rates and yields

Increased size variability

Changes to growing season

Increased mortality

Escapees, predation and HABs

Increased Escapees / Detachment

Increased predation

HABs and jellyfish blooms

Occurrence of pathogens



Suitability of sites and productivity

Suboptimal conditions

Increased fouling

Anoxic conditions

Accessibility and human safety issues

Infrastructure deterioration

Suitability of sites

Change site productivity

Conflicts of space and farm allocation

Harvesting closures

Changes in productivity

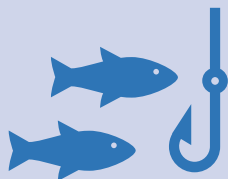
Changes in production capacity

Changes in feed conversion rates

Increased production costs



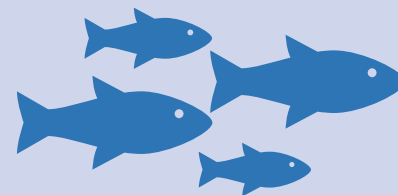
Cross-sectoral impacts



Species Composition



Food Availability and Phenology



Growth Rates



Safety



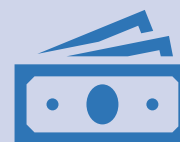
Damage and Deterioration to
Infrastructure



Water Quality



Management and Governance



Operational Costs



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WHAT DECISIONS
CAN BE MADE
TO COPE?



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