

An Index to assess the

Vulnerability of ocean planning and the blue economy to global climate change

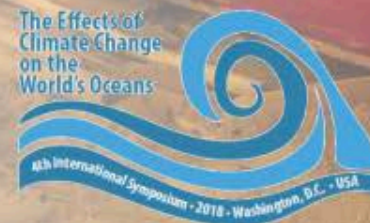
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Manuel Barange, **Larry Crowder**, **Charles Ehler**,
Michael Orbach & **Rui Rosa**



Food and Agriculture
Organization of the
United Nations



SOUND SEAS
Scientific and Social Solutions



Session 14 | June 6, 2018

What is Ocean Planning and why is it important?

Marine Spatial Planning – MSP

Practical way to **organize the use of the ocean space**, and the **interactions between uses**, to balance needs for development and environmental protection



WWF (2010)

BALTIC SEA
USES & CONFLICT MAP

Legend

- Shipping route //
- Fishing site ●
- Biodiversity site ■
- Wind power area ▲
- Conflict area/zone ⚡



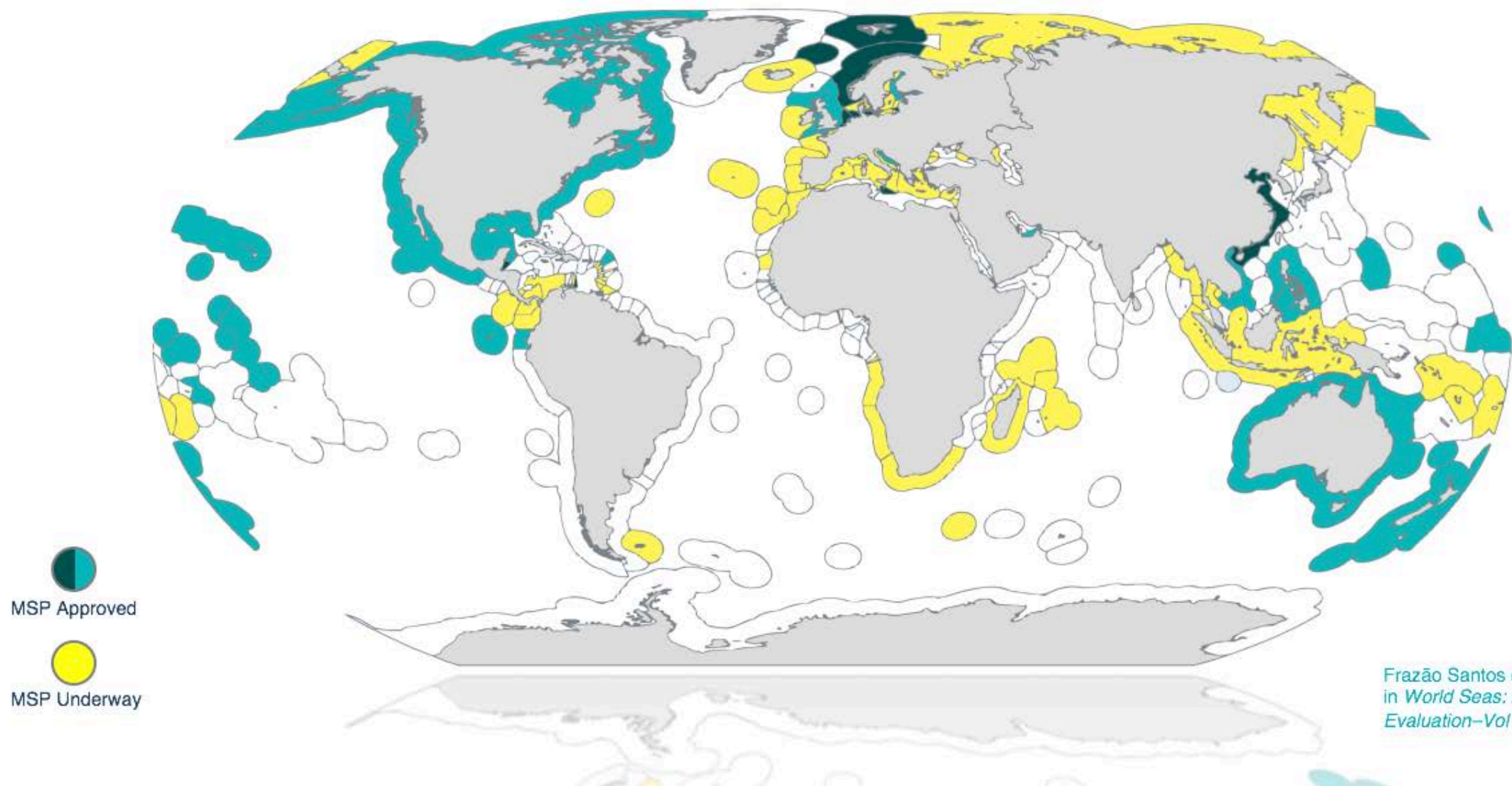
What is Ocean Planning and why is it important?

MSP has been recognized as a tool with high potential to ensure **sustainability in the use of the oceans**

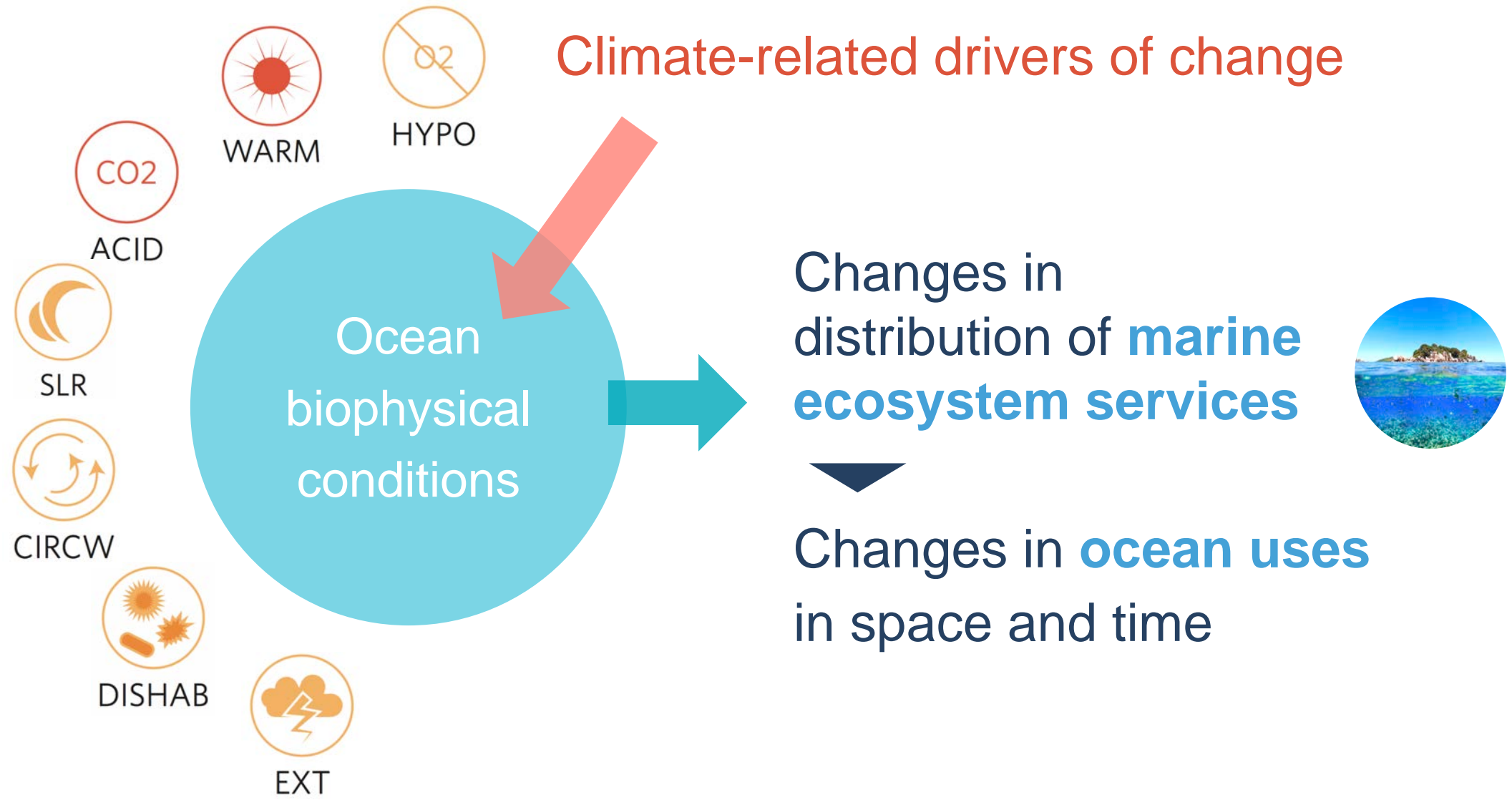


What is Ocean Planning and why is it important?

Globally widespread



How can climate change affect MSP?



How can climate change affect MSP?

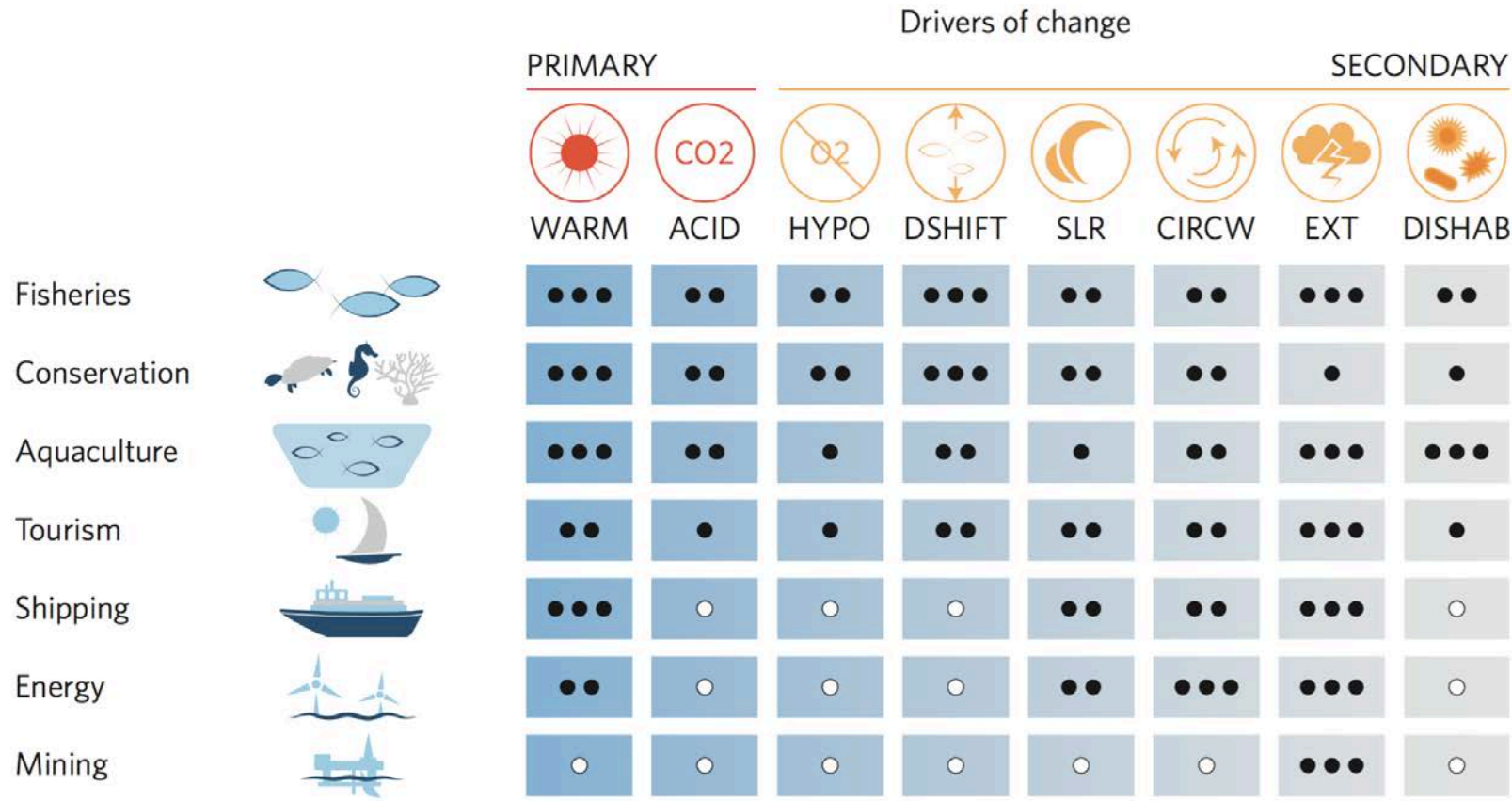


Uses of the
ocean space



How can climate change affect MSP?

Not all ocean uses will be affected the same way...



Nature Geoscience
Frazão Santos et al. (2016)

How can climate change affect MSP?

Potential consequences...

Relocation



Use-use conflicts



Cumulative impacts



... MSP **will be affected** by a changing climate!

How can climate change affect MSP?

We argued in Workshop 4 that vulnerability assessments were needed in climate-smart ocean planning

Ocean planning vulnerability index

What to do?

Deepen the analysis of climate change impacts on ocean
Analyze **local contexts** (MSP management area)

What **uses exist**?
Their **importance**?
Likelihood of **climate hazards**?



1 Vulnerability and Risk assessments

EUROPE MAP
WITH COUNTRIES



EU + Norway

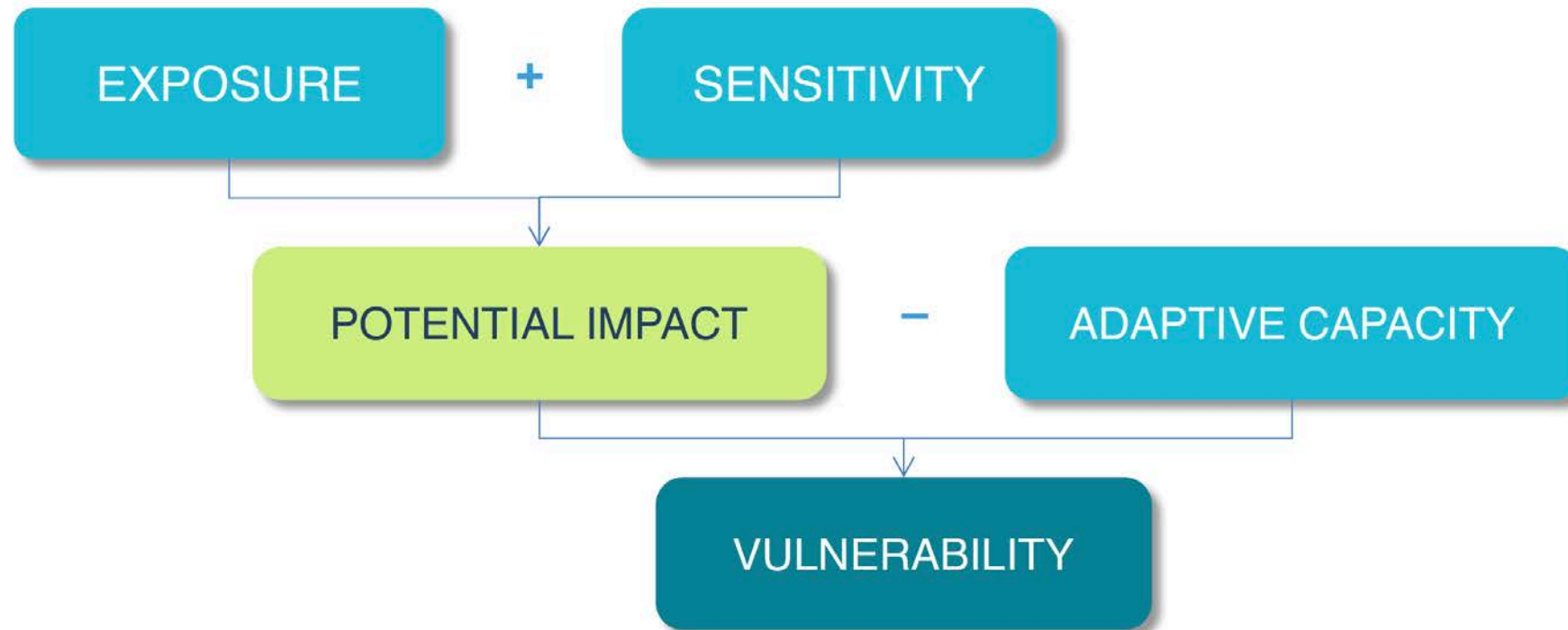
Vulnerability assessment

Many definitions...



Vulnerability assessment

IPCC model of vulnerability (AR3)



Vulnerability assessment

IPCC model of vulnerability (AR3)

EXPOSURE

Presence/intensity of ocean uses

Importance of ocean uses



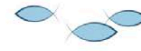
What can be affected?

Vulnerability assessment

IPCC model of vulnerability (AR3)

SENSITIVITY

Fisheries



Conservation



Aquaculture



Tourism



Shipping



Energy



Mining



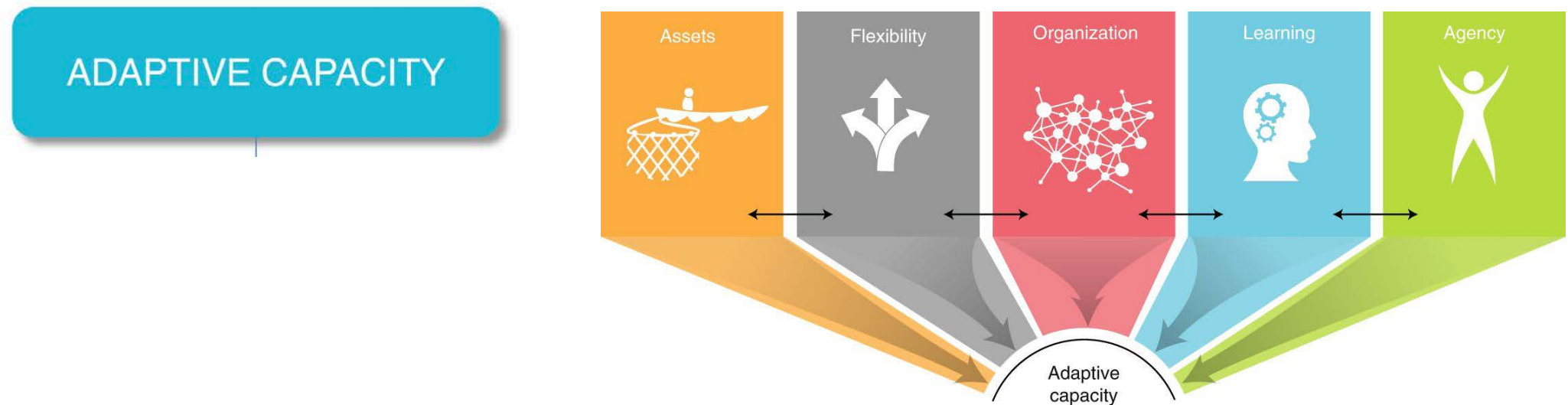
Drivers of change

	PRIMARY		DRIVERS OF CHANGE				SECONDARY	
	WARM	ACID	HYPO	DSHIFT	SLR	CIRCW	EXT	DISHAB
Fisheries	●●●	●●	●●	●●●●	●●	●●	●●●●	●●
Conservation	●●●	●●	●●	●●●●	●●	●●	●	●
Aquaculture	●●●	●●	●	●●	●	●●	●●●●	●●●●
Tourism	●●	●	●	●●	●●	●●	●●●●	●
Shipping	●●●	○	○	○	●●	●●	●●●●	○
Energy	●●	○	○	○	●●	●●●●	●●●●	○
Mining	○	○	○	○	○	○	●●●●	○

How much can it be affected?

Vulnerability assessment

IPCC model of vulnerability (AR3)

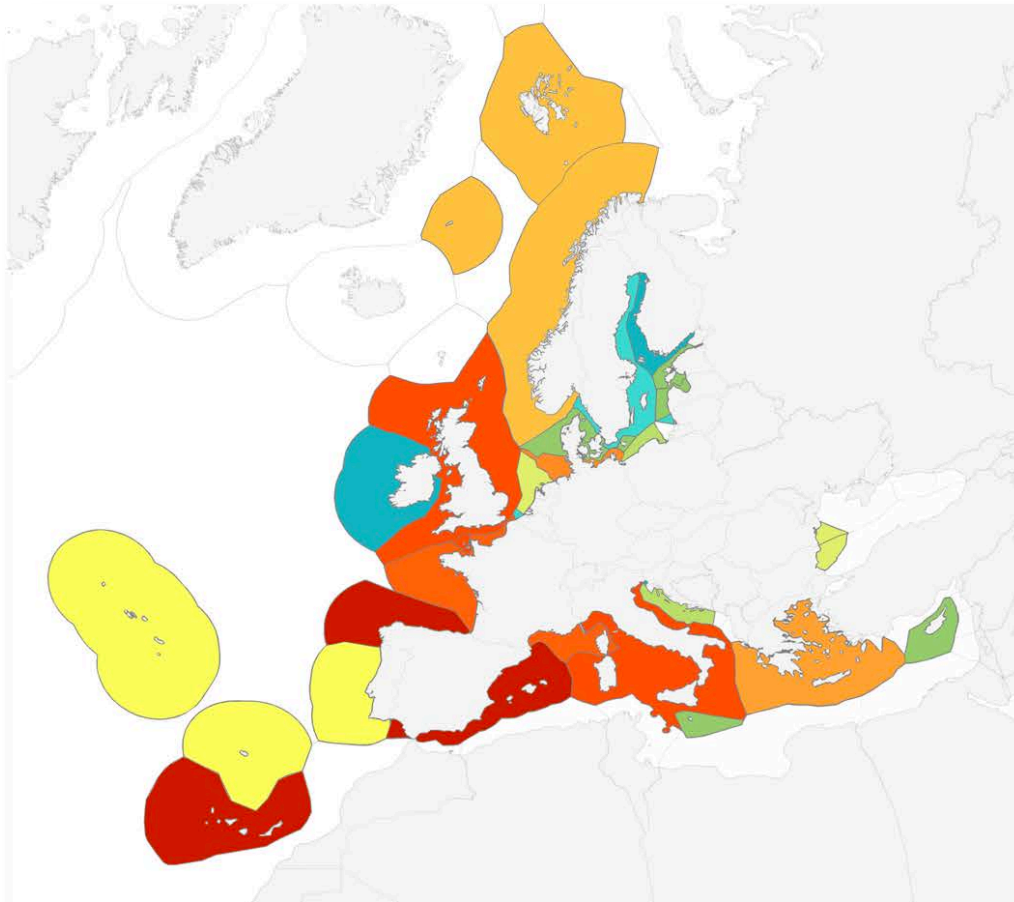


Nature Climate Change
Cinner et al. (2018)

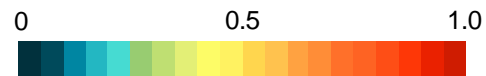
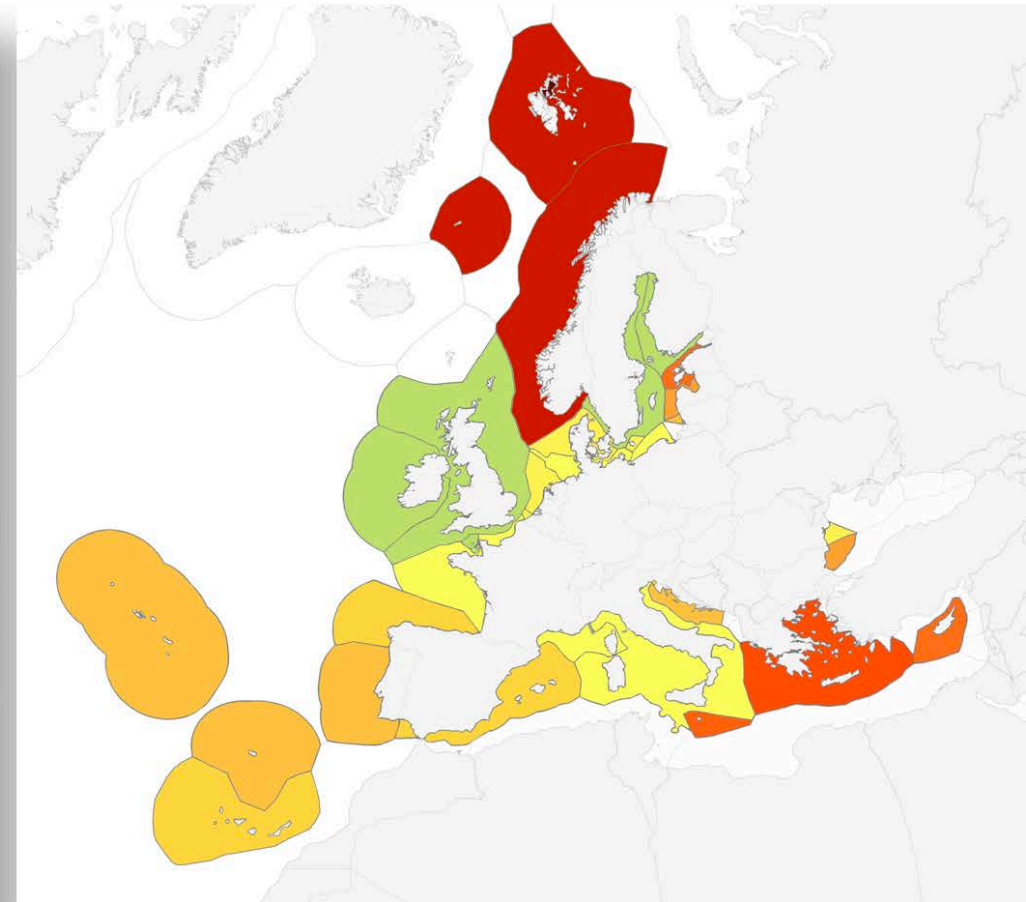
How can nations respond?

Vulnerability assessment

Presence of uses



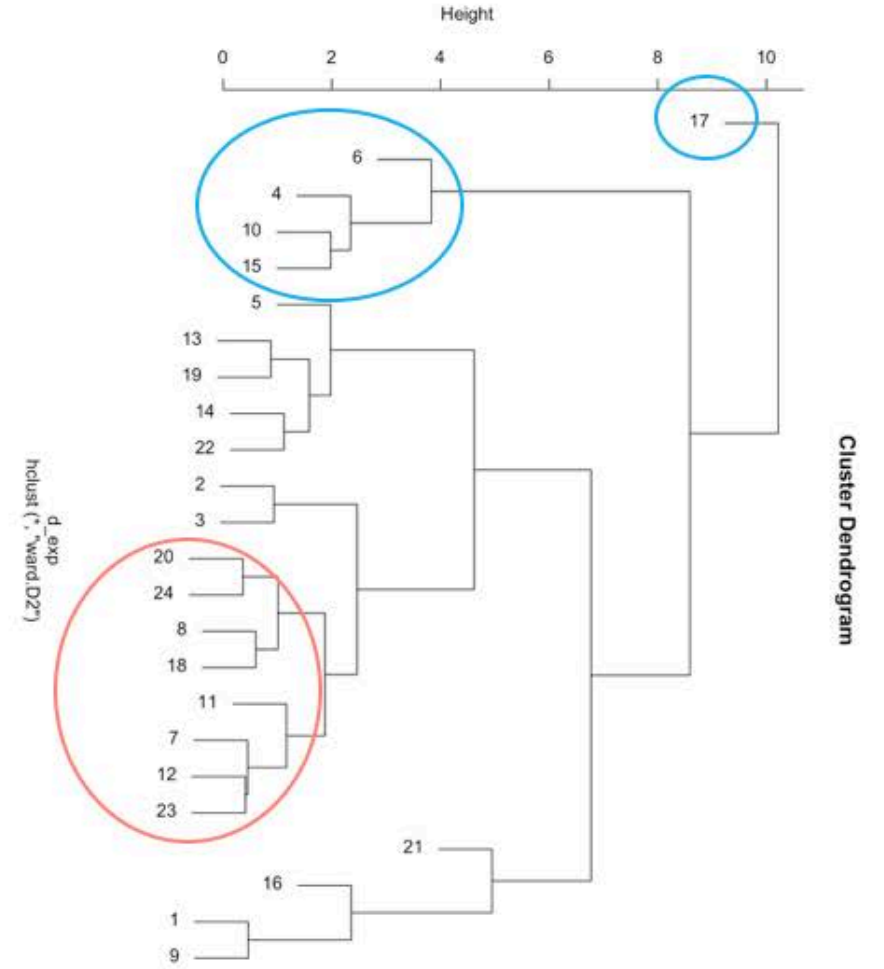
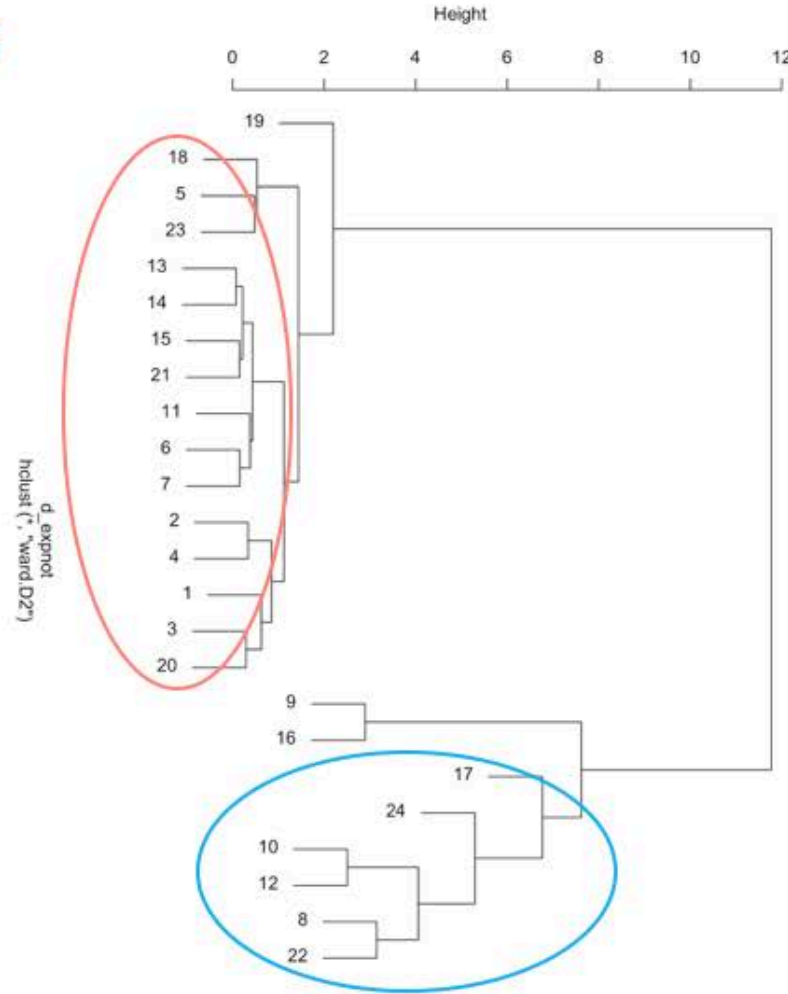
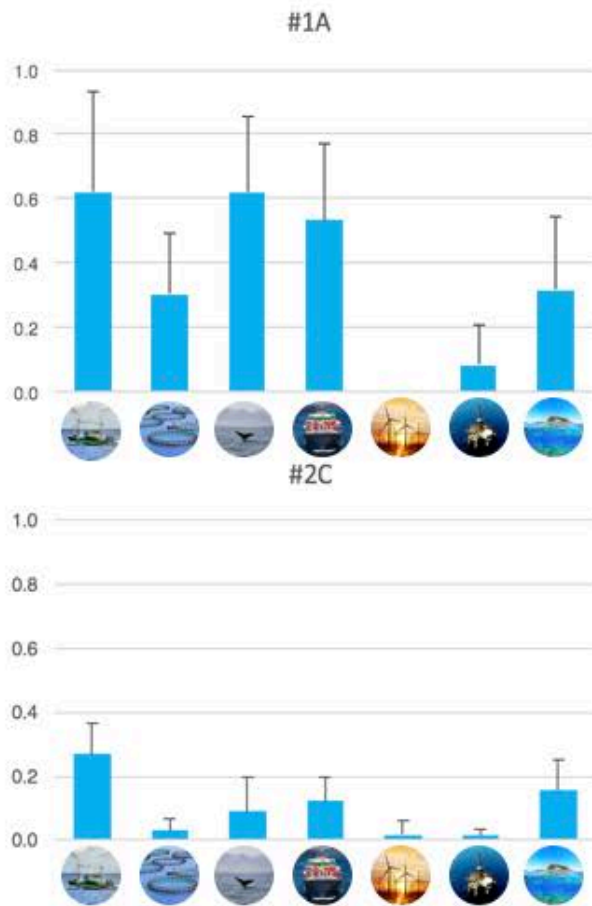
National importance of uses



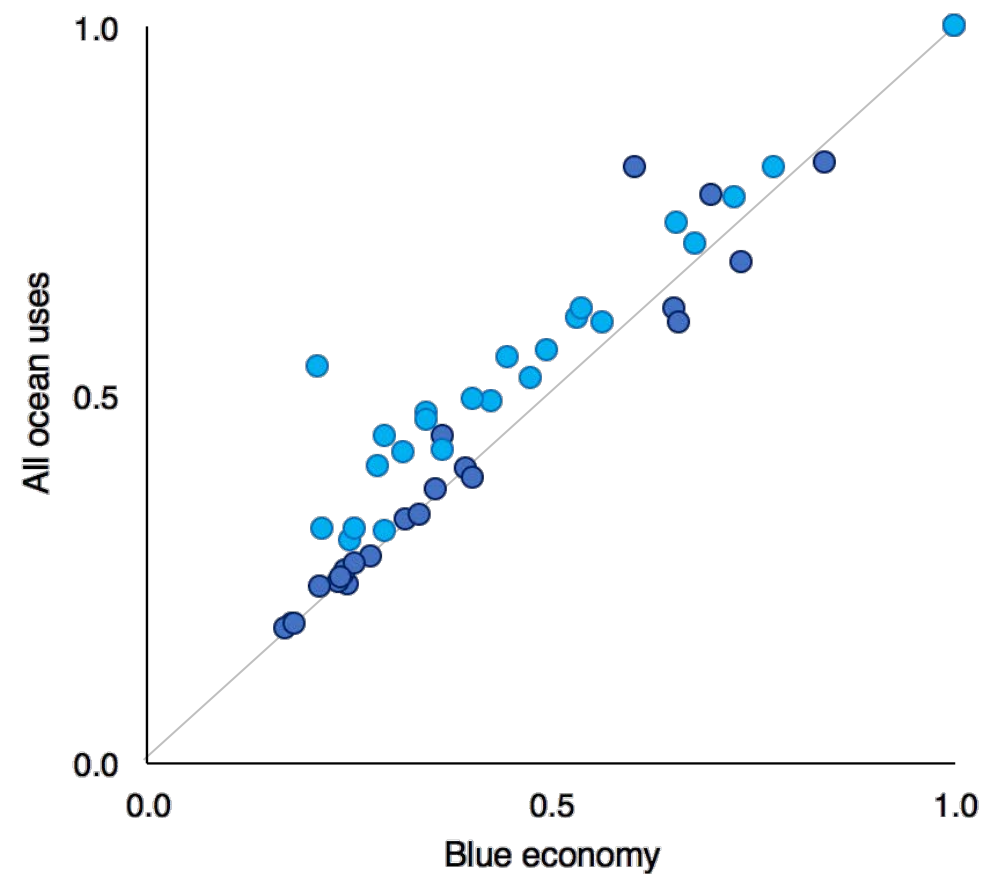
Vulnerability

Vulnerability assessment

Exposure patterns



Blue economy vulnerability (minus conservation)



Vulnerability assessment

Limitations... 

Sensitivity as a **weighting factor**, not a real variable
(national-level studies on sensitivity??)

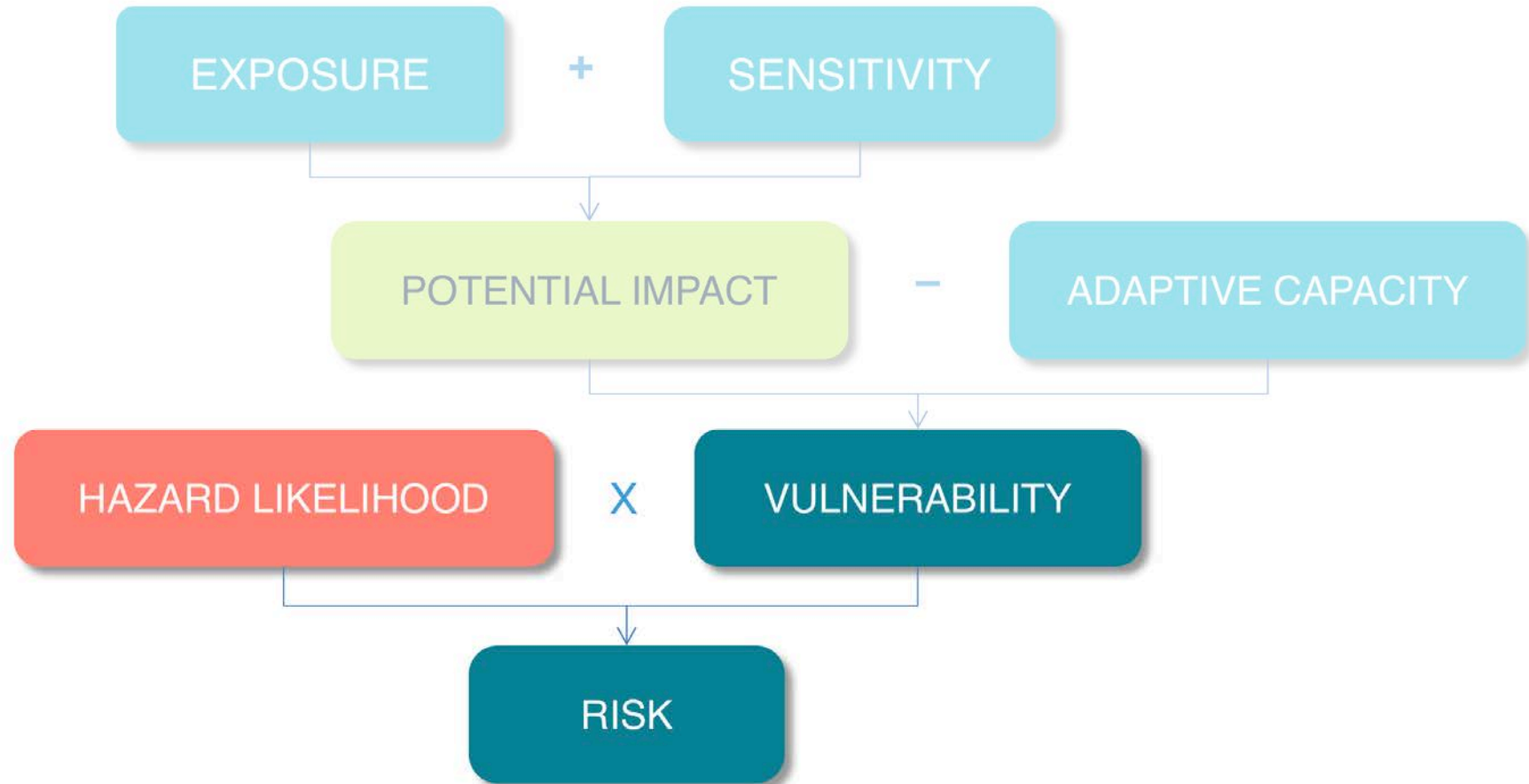
Overestimation and **underestimation** of economic data
(fine scale studies?? small economic activities??)

Importance of **marine conservation** \neq MPA coverage
(ecosystem services valuation??)

Only one adaptive capacity variable is **marine specific**

Risk assessment

Hazard and Risk



Hazard and Risk

HAZARD LIKELIHOOD



WARM



ACID



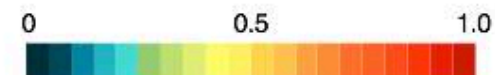
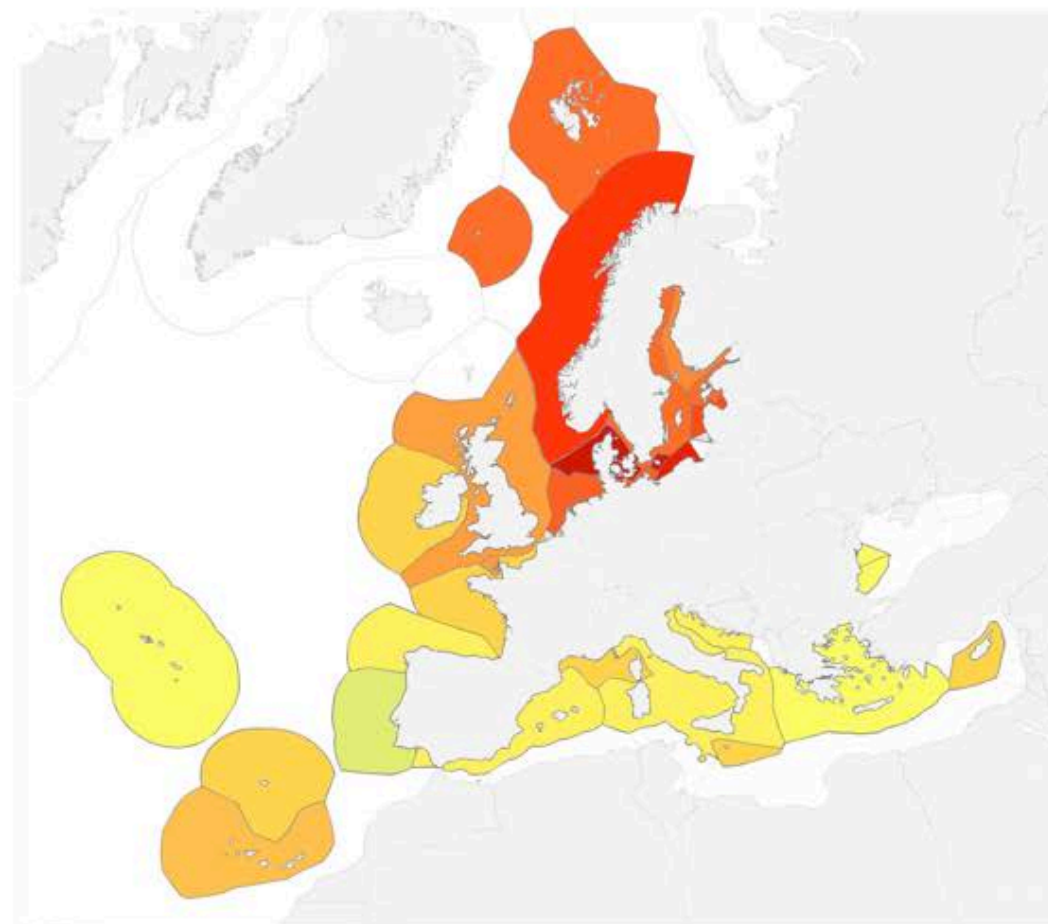
SLR



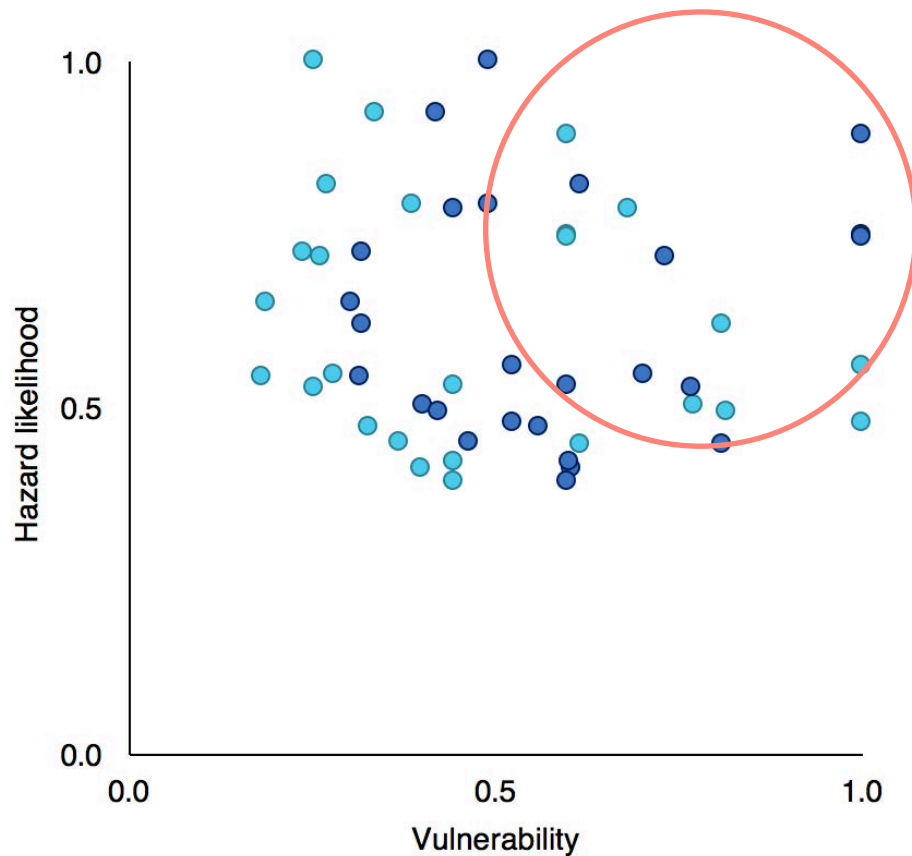
HYPO

RCP 8.5

Δ 2050



Vulnerability and Hazard potential

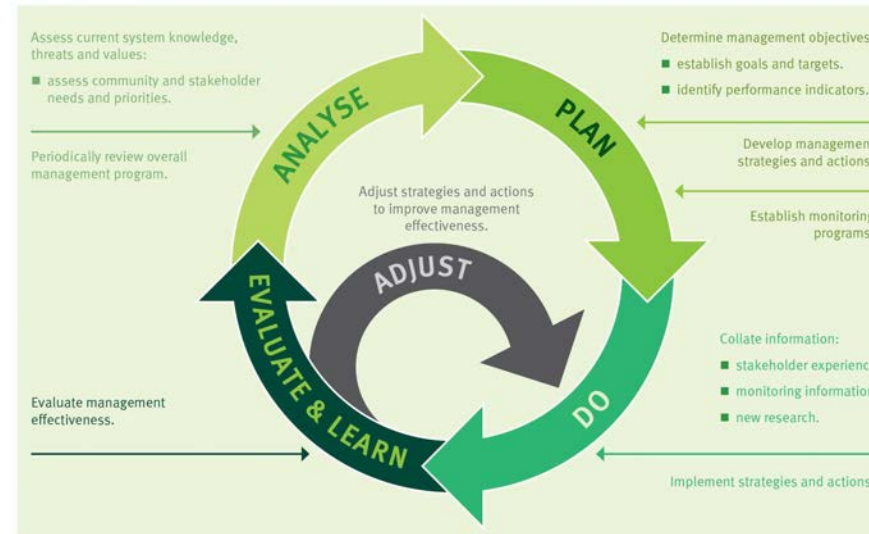


...Higher need for adaptation!

MSP **cannot** anticipate **every possible scenario**, and plan for all potential cases

Ensure mechanisms to **adapt** to an **uncertain** and **dynamic future**

Adaptive management cycle



N.B. Adapted from CSIRO Marine and Atmospheric Research 2009

Climate-smart ocean planning initiatives!

Thank you!

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More info:

www.researchgate.net/project/OCEANPLAN-MSP-under-a-Changing-Climate

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PARA O DESENVOLVIMENTO

