

Danmarks
Meteorologiske
Institut

Marine Climate Services

Where do we go from here?



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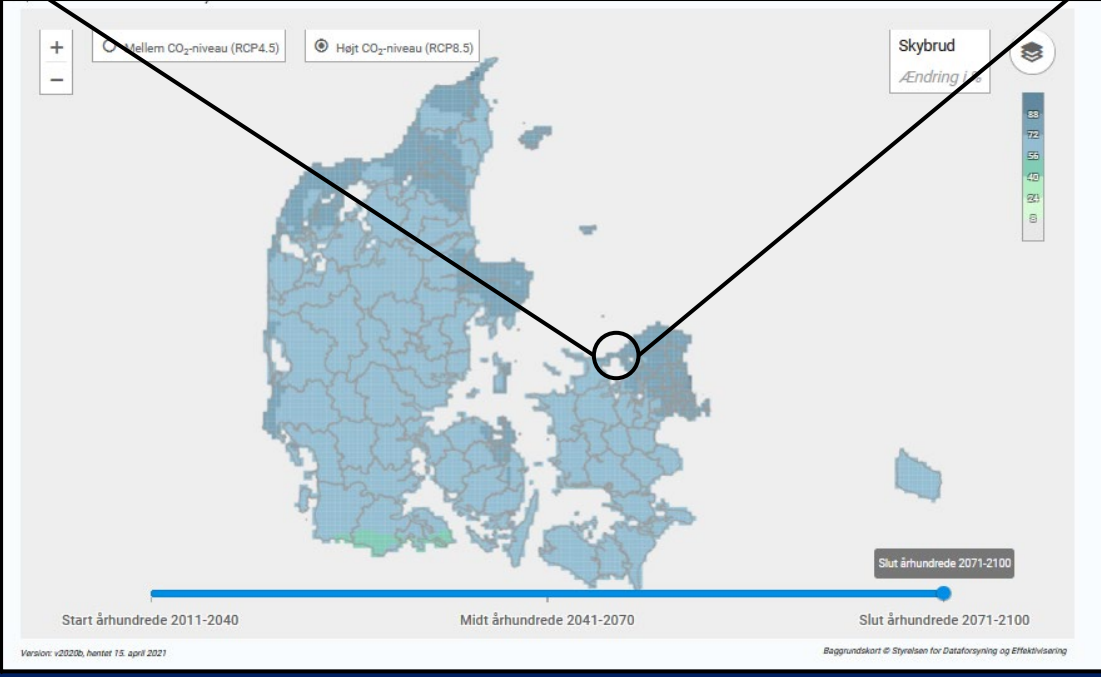
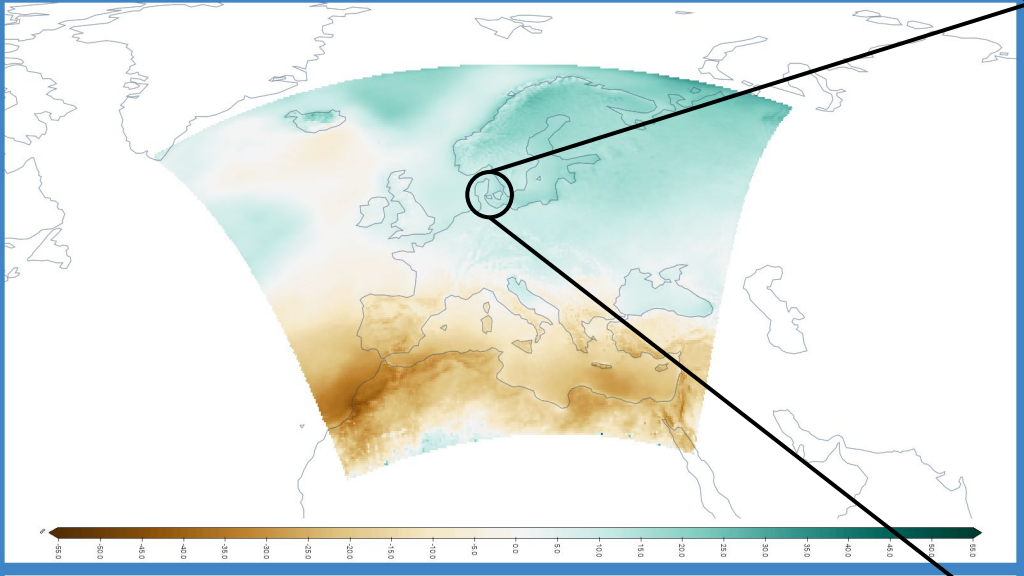
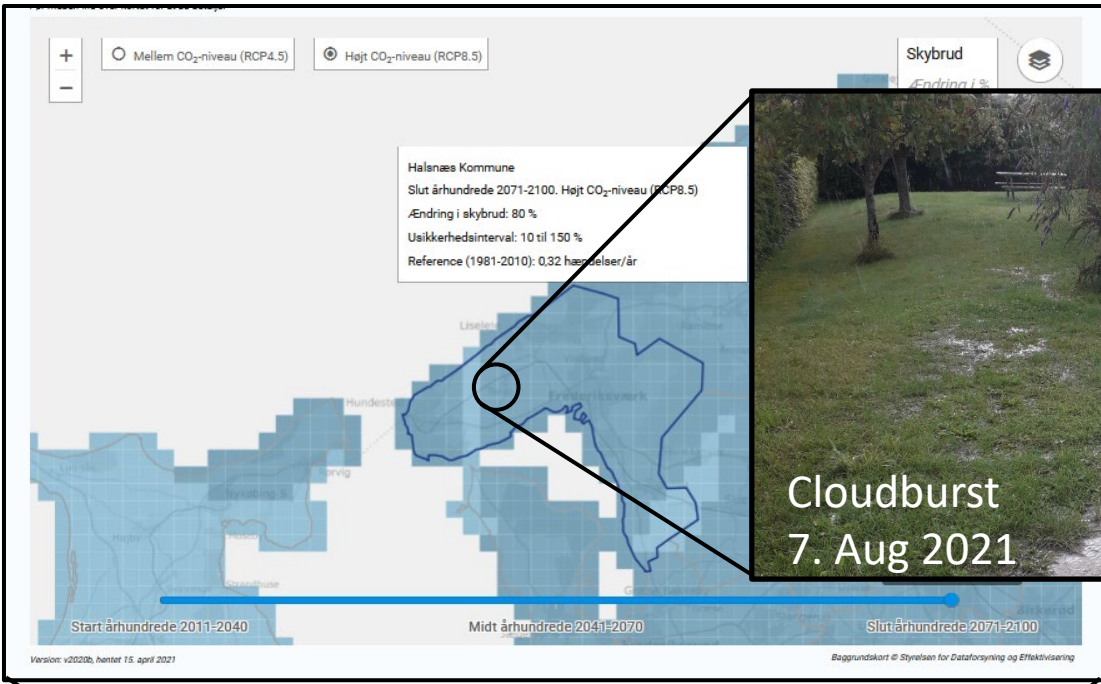
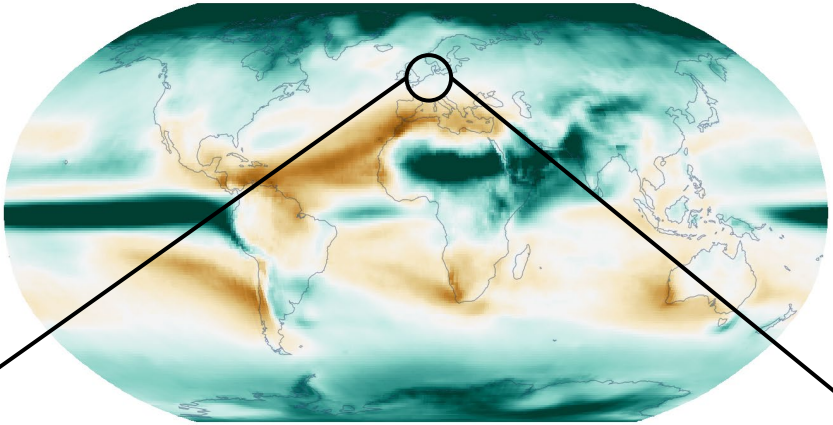
🐦 [@MarkPayneAtWork](https://twitter.com/MarkPayneAtWork)





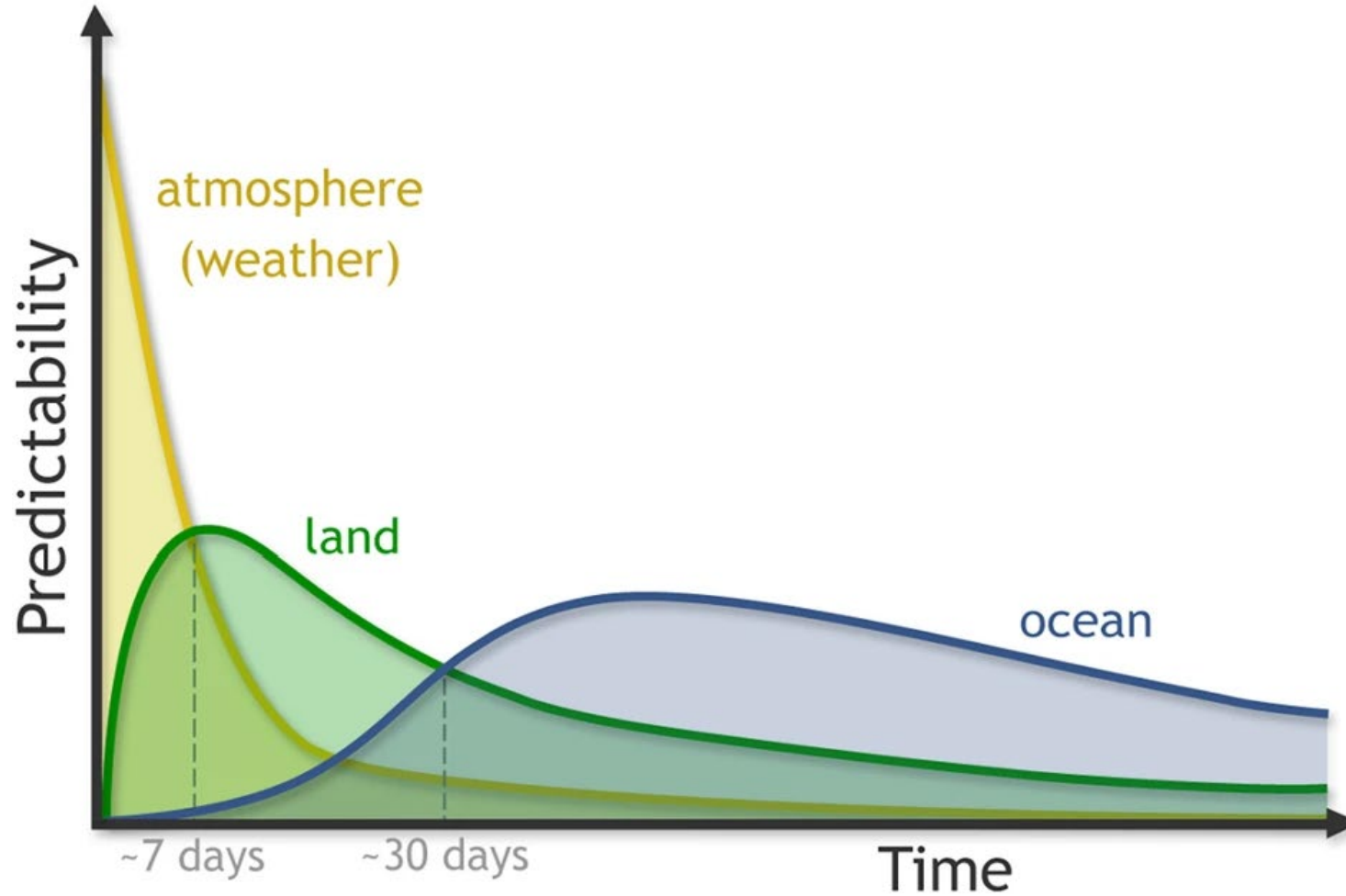
Klimaatlas

Danish National Climate Atlas





The ocean is the most predictable part of the Earth System...

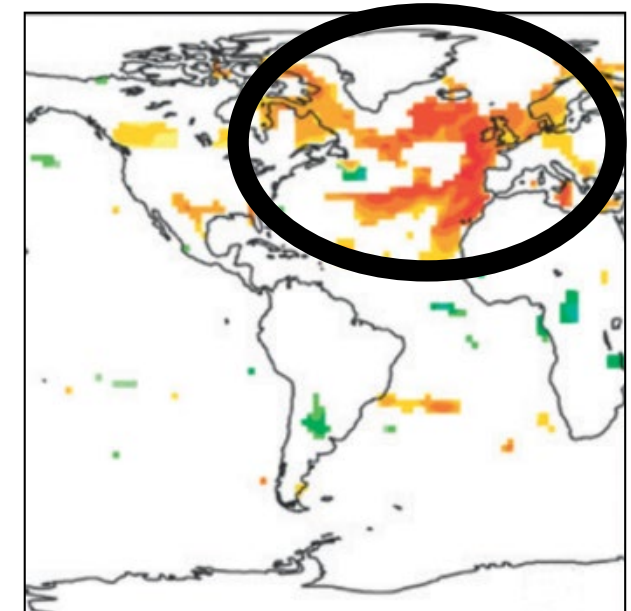
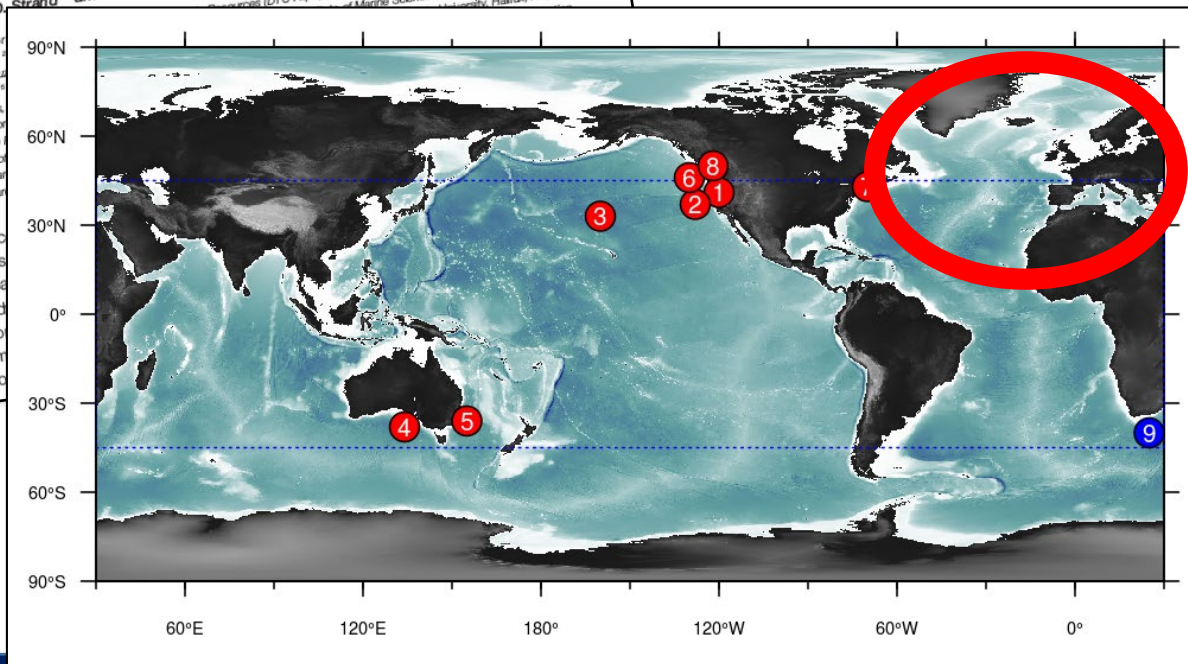
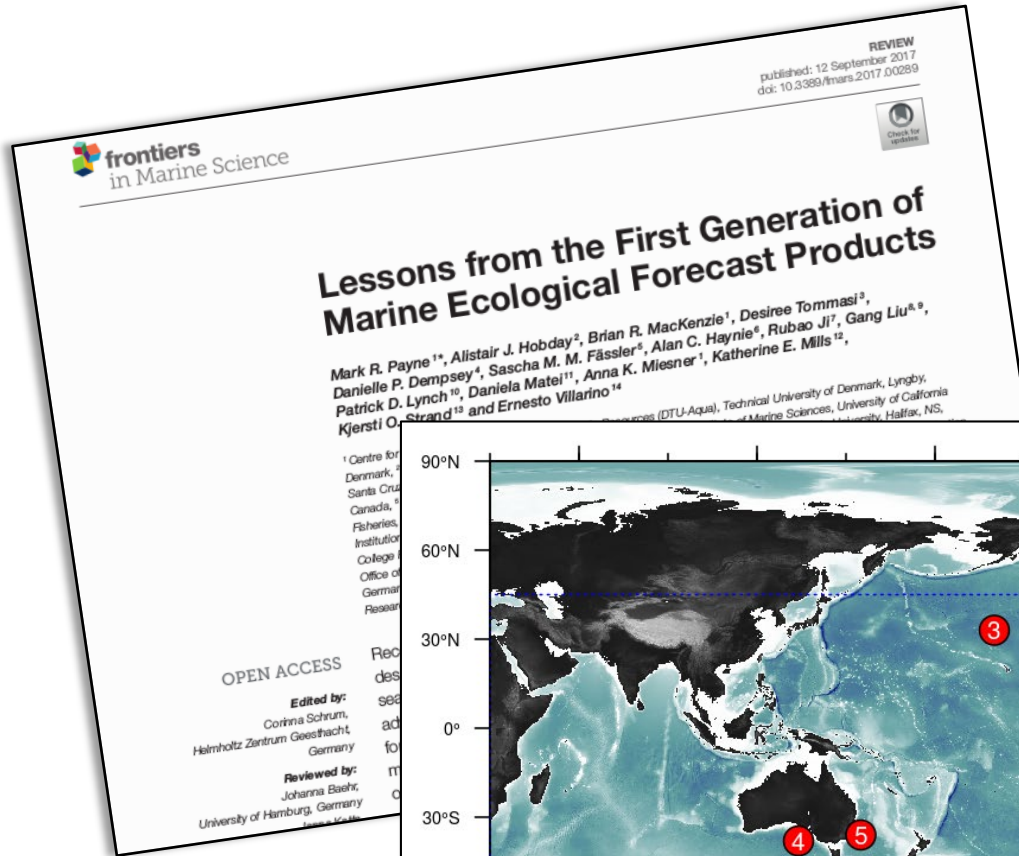


Merryfield et al 2020 BAMS



Review of existing marine ecological forecast systems /climate services

In Europe we have the oceanic predictability....



...but no predictions!



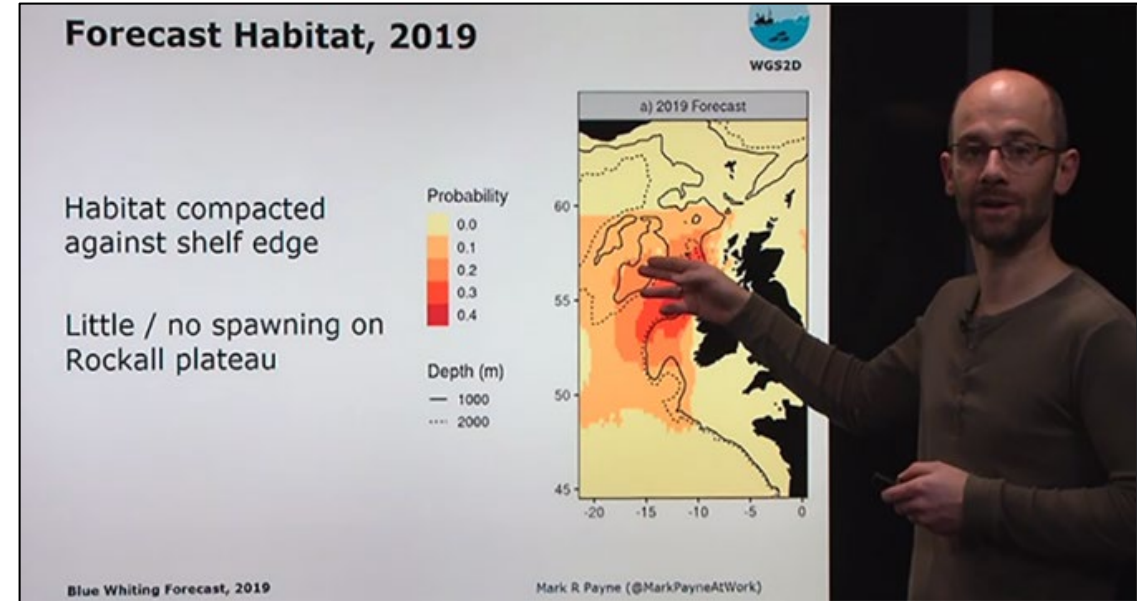
Decadal-scale marine climate services



Bluefin Tuna



Mackerel



Habitat-forecast climate service

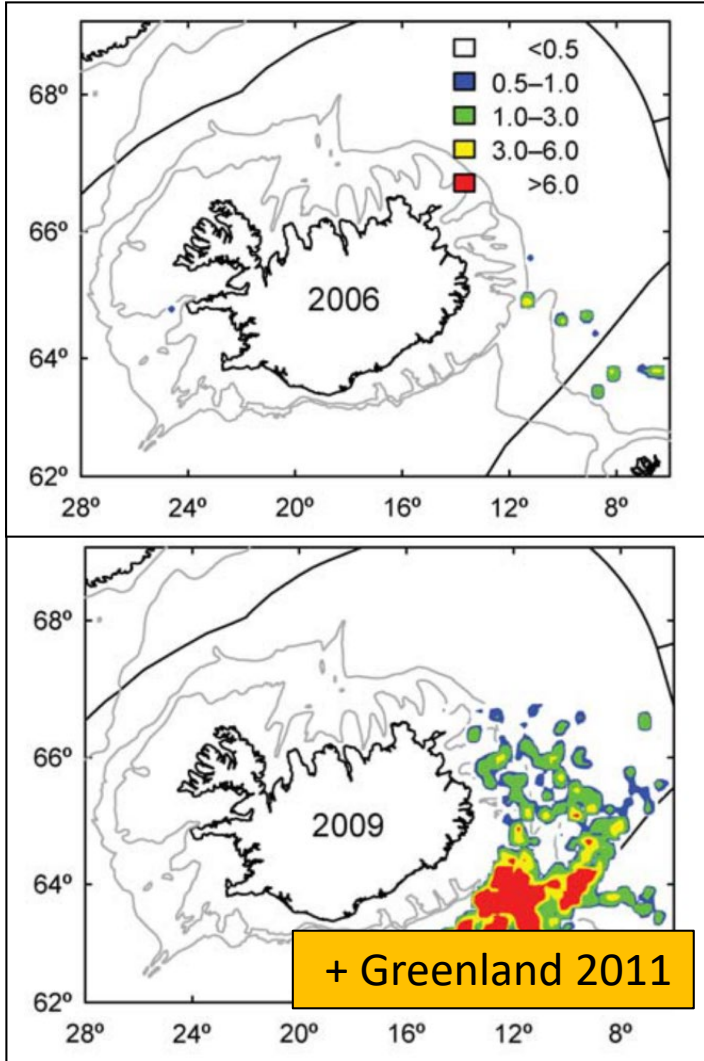
Skillful decadal-scale habitat prediction shown

Payne et al 2021 BioRxiv



The Great "Mackerel War"

Climate change enables a shift in fish distributions



BBC NEWS NE SCOTLAND, ORKNEY & SHETLAND

3 February 2013 Last updated at 18:29 GMT

Iceland goes it alone on mackerel quota

The Icelandic government has announced that it is lowering its mackerel fishing quota for 2013 by 15%.

It said the move is part of the country's commitment to the "long-term sustainability" of stocks.

The European Commission has said it "regrets" Iceland's announcement of a unilateral quota.

The Commission said it remained committed to

The European Commission said it is still seeking a multilateral agreement on mackerel

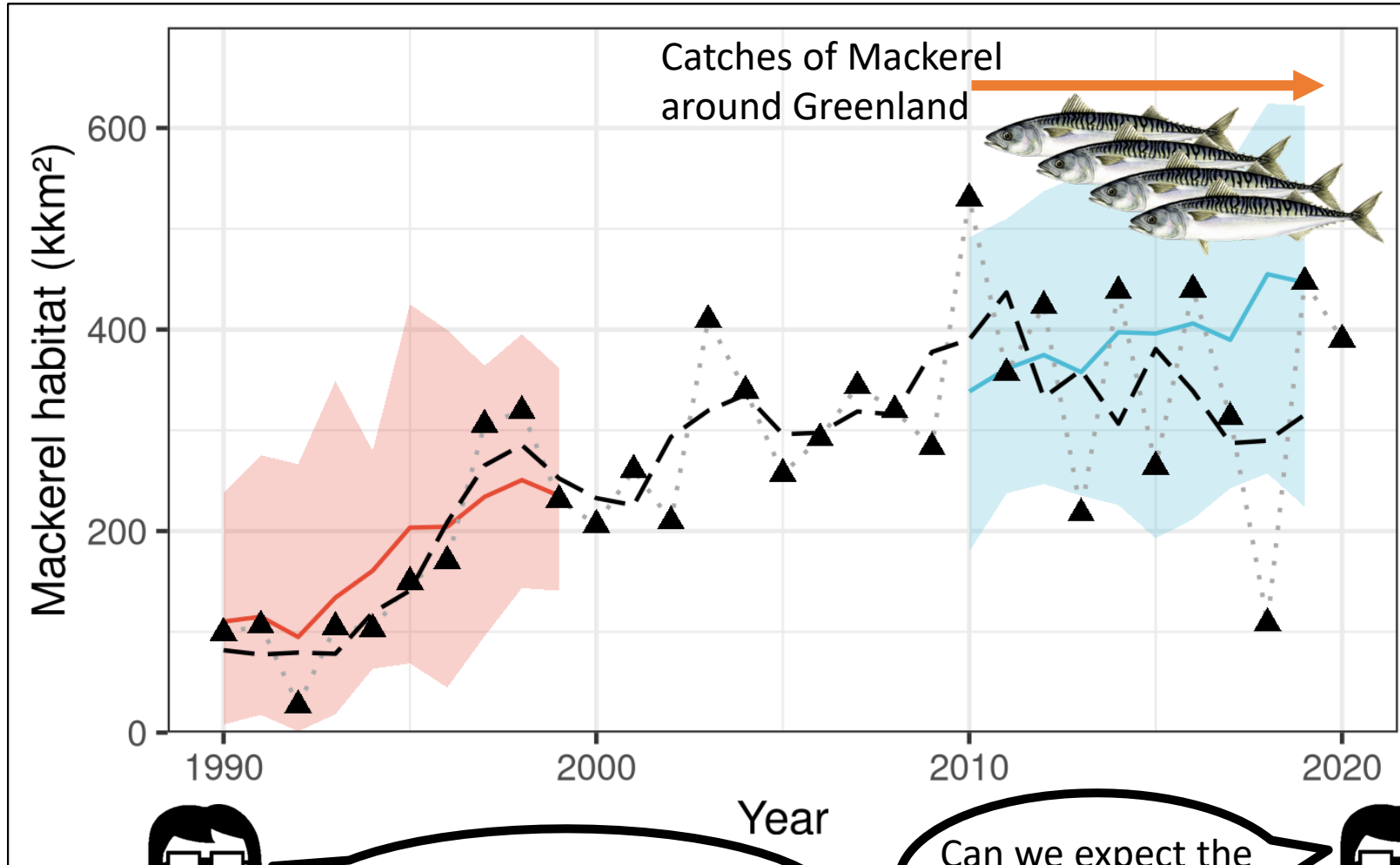
THE WALL STREET JOURNAL.

Iceland's Mackerel-Fishing Quota

With Norway, Faroe Islands

State TV: Mali's President Names New Pr...

Prediction of Mackerel Habitat Shifts



Observations

- ▲ Habitat
- - Rolling mean

Forecast

- 1990
- 2010



There's no mackerel now. What about the future?

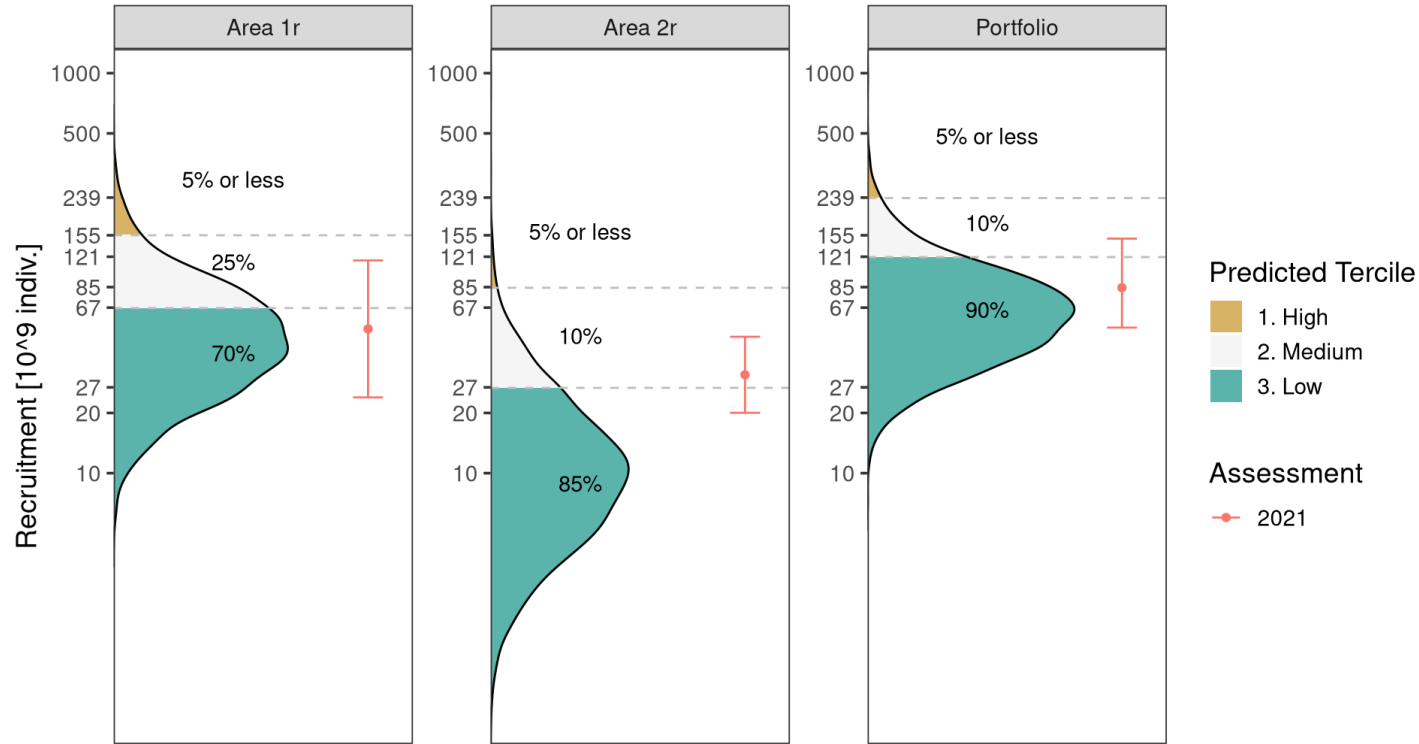
Can we expect the Mackerel to remain?



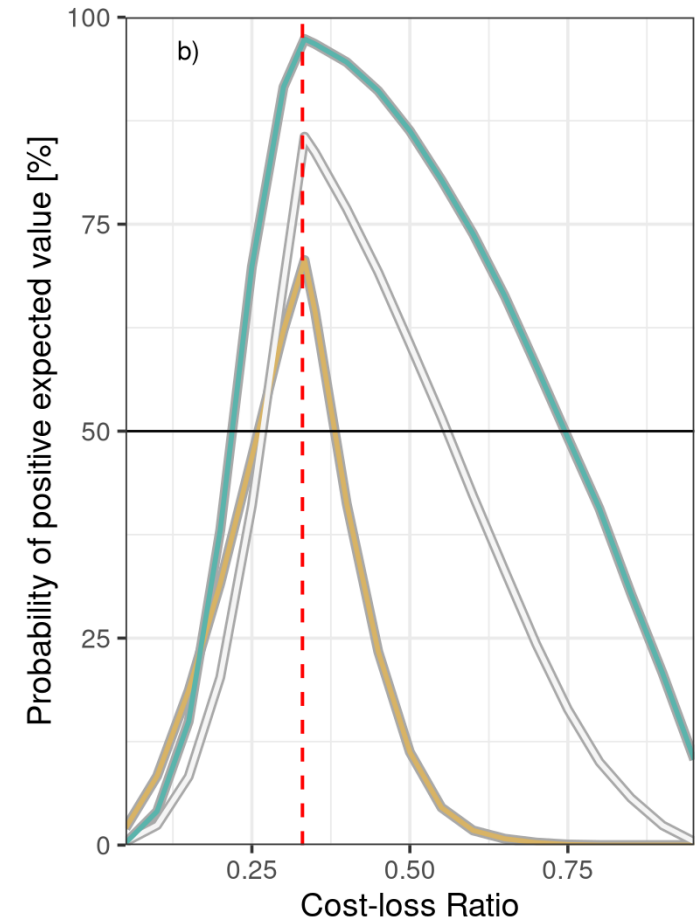
Ecological forecasts can support decision making in a changing climate



Sandeel fish-stock productivity forecasts



Productivity forecasts



Assessment of economic forecast value

A photograph of a dirt path in a dense forest. The path starts from the bottom center and splits into two paths that lead into the woods. The trees are tall and thin, with a thick canopy of green leaves. The ground is covered in grass and small plants. The overall scene is peaceful and natural.

Where do we go from here?



Where do we need the information?



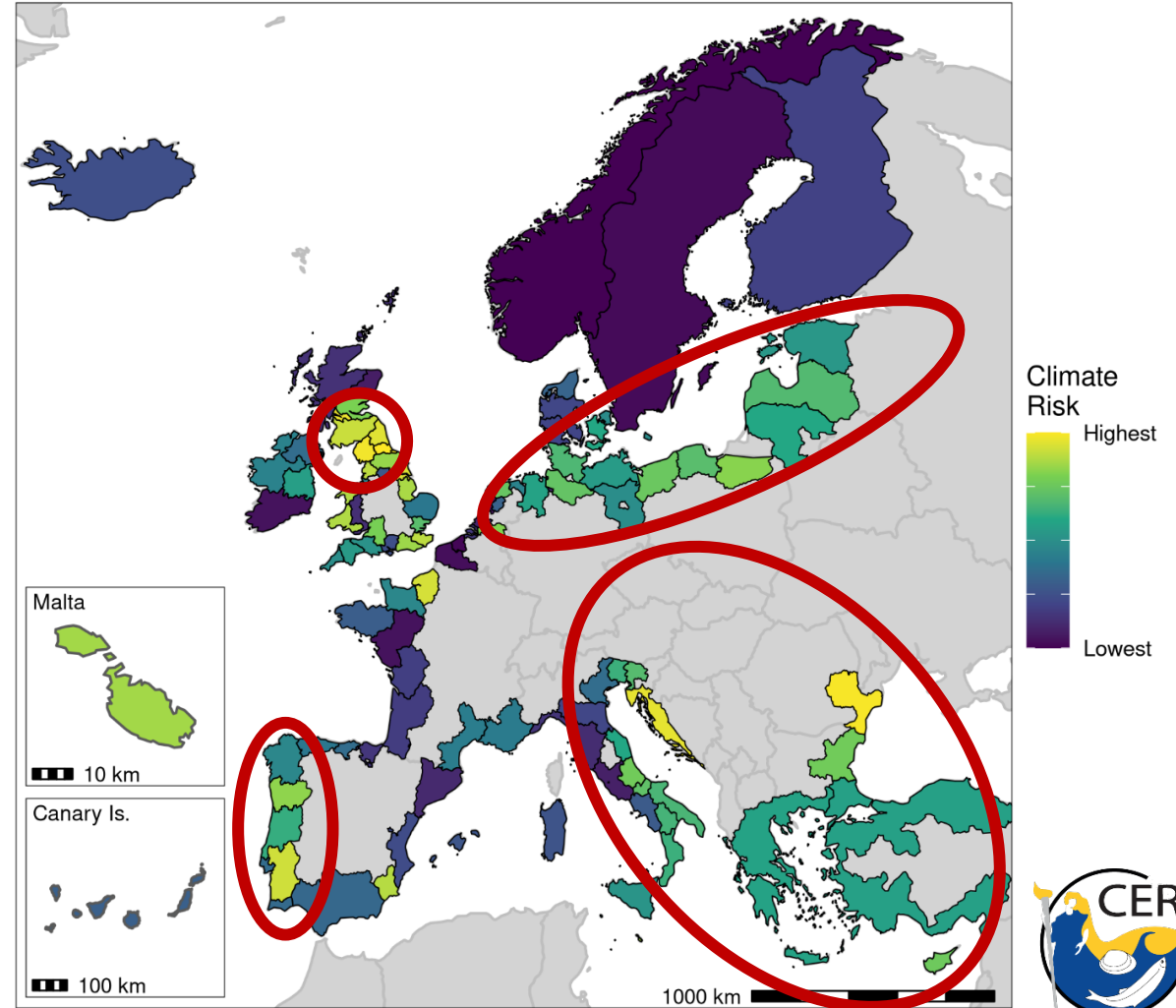
North Sea

Baltic Sea

Societal Needs

Predictions need to align with needs of decision makers

Risk to coastal regions due to climate impacts on fish resources



Payne et al 2021 PNAS





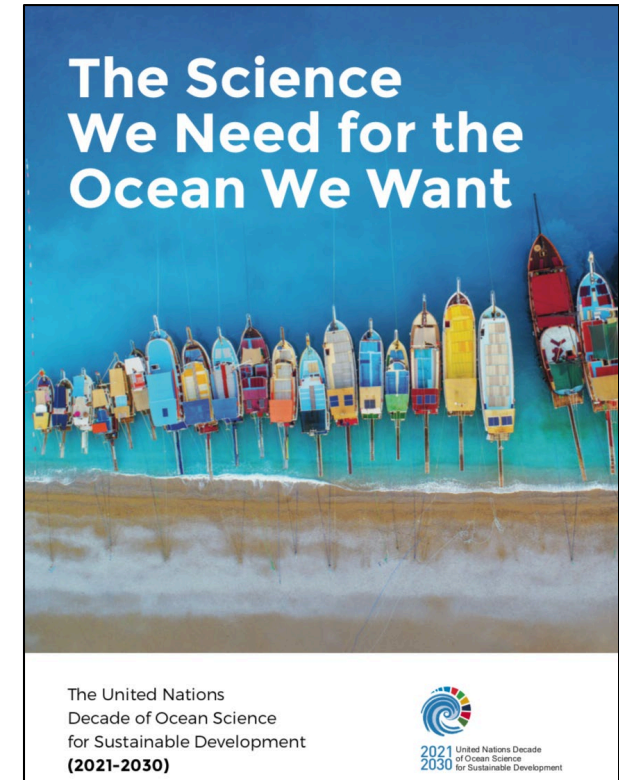
Look to the South

- Small Island Developing States



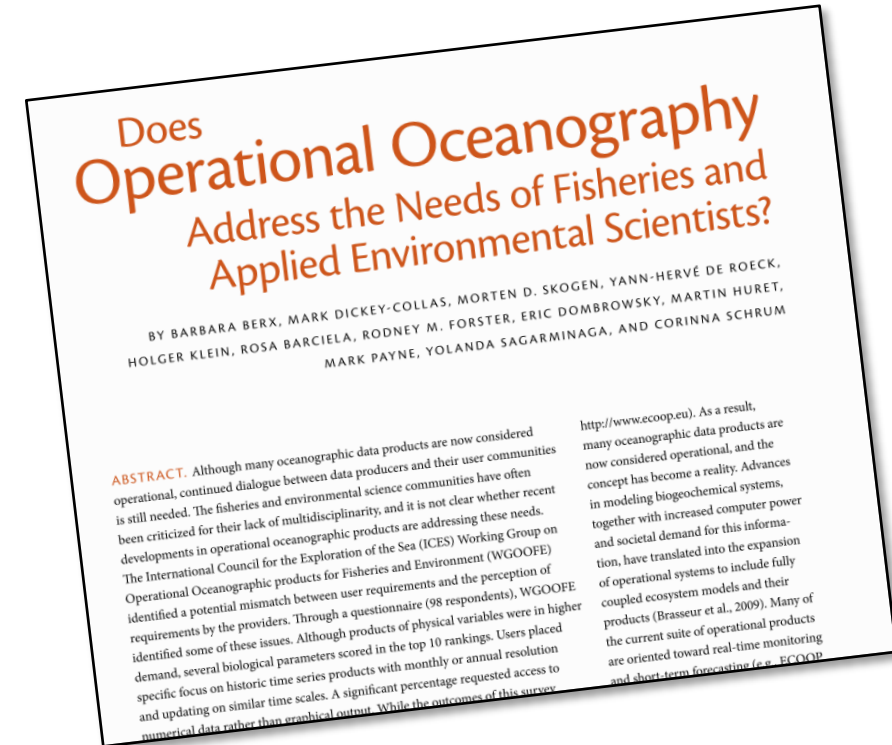
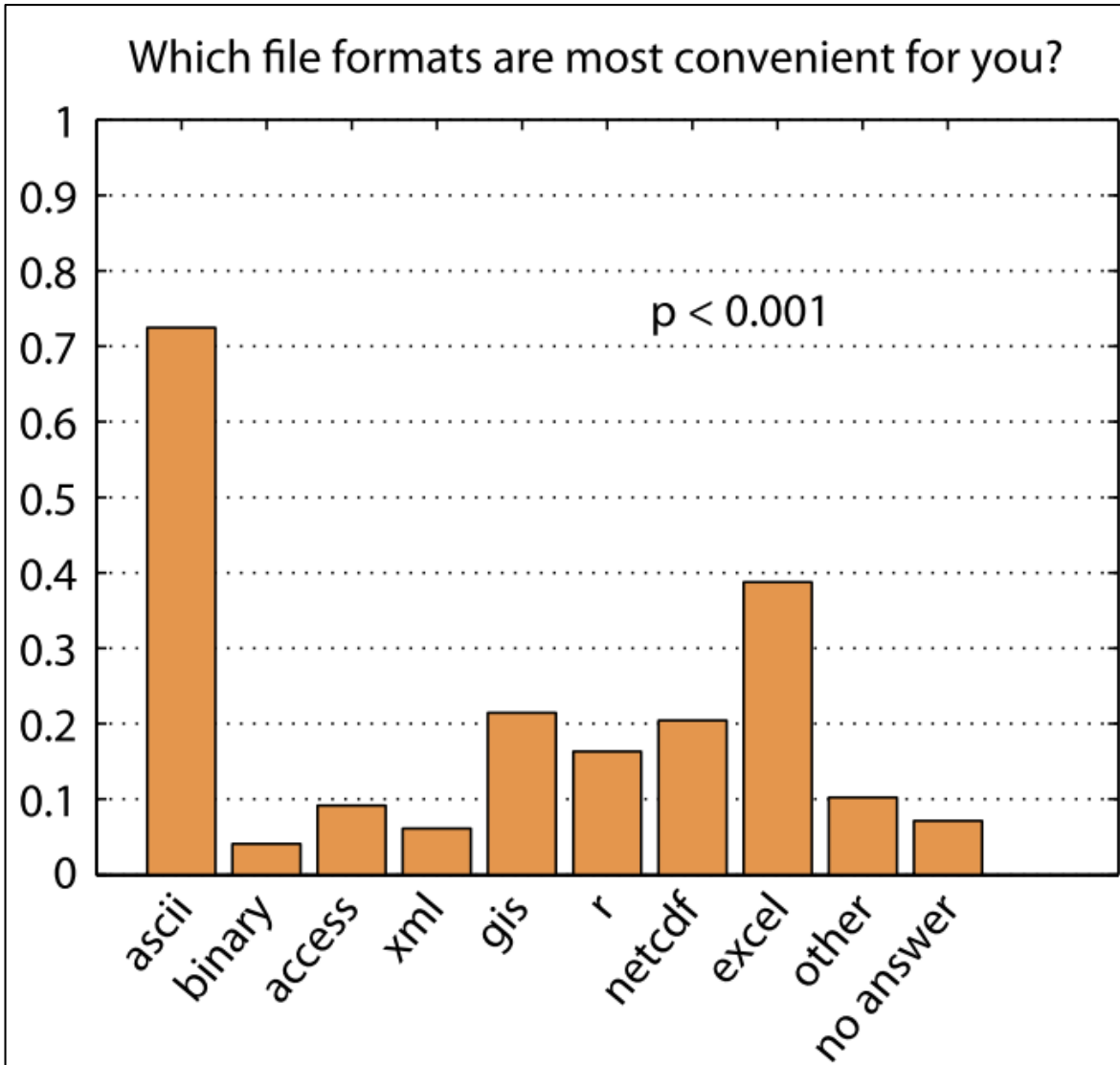
Need to understand where ocean predictions can have the greatest impact

- “A Predicted Ocean”



2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development

User base is a limitation



Berx et al Oceanography 2011

Need tools to facilitate working with decadal predictions (also for biologists)



Environmental information is rarely used at the moment

FISH and FISHERIES



FISH and FISHERIES

Ecosystem processes are rarely included in tactical fisheries management

Mette Skern-Mauritzen¹, Geir Ottersen^{1,2}, Nils Olav Handegard¹, Geir Huse¹, Gjert E Dingsør¹, Nils C Stenseth^{2,3,4} & Olav S Kjesbu¹

¹Institute of Marine Research and Hjort Centre for Marine Ecosystem Dynamics, P.O. Box 1870 Nordnes, NO-5817, Bergen, Norway; ²Centre for Ecological and Evolutionary Synthesis, Department of Biosciences, University of Oslo, P.O. Box 1066 Blindern, NO-0316, Oslo, Norway; ³Institute of Marine Research, P.O. Box 1870 Nordnes, NO-5817, Bergen, Norway; ⁴University of Agder, PO Box 422, NO-4604, Kristiansand, Norway

Skern-Mauritzen et al, Fish Fish. 2015

Just 15 out of 1250 fish stocks incorporate environmental information into setting quota

Fisheries management needs to learn how to use this information



Climate Service value chain needs multiple stages

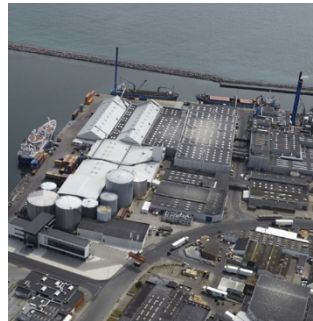
Climate
Data



European Climate Prediction system



Decision
Makers



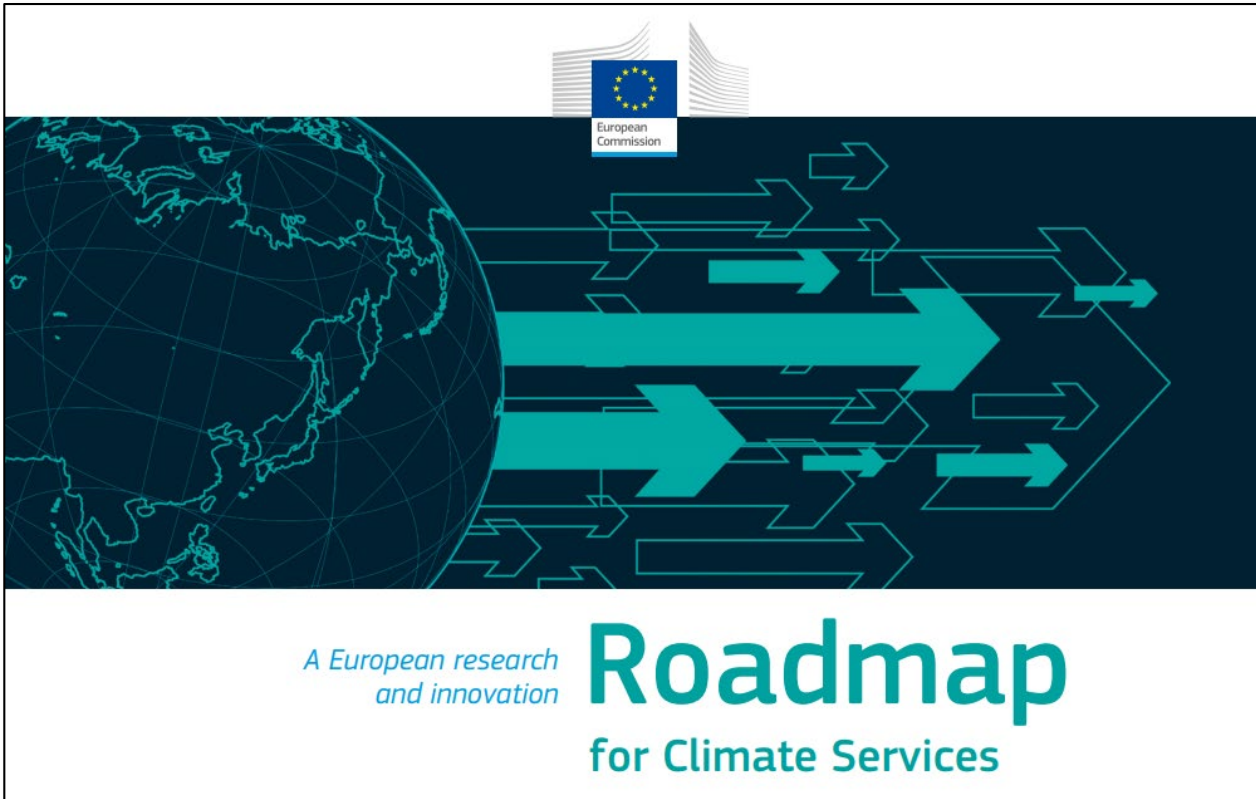
Need to link many disciplines
and expertise together



Who pays for this?

An new industry?

Or a public service?



NIWA
Taihoro Nukurangi

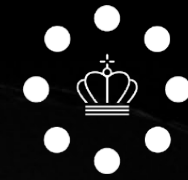


Demand is the limiting factor



Marine Climate Services

Where do we go from here?



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- Decadal-scale climate services are possible in the ocean
- Need to align predictions with where information is needed
- Many bottlenecks beyond climate prediction



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