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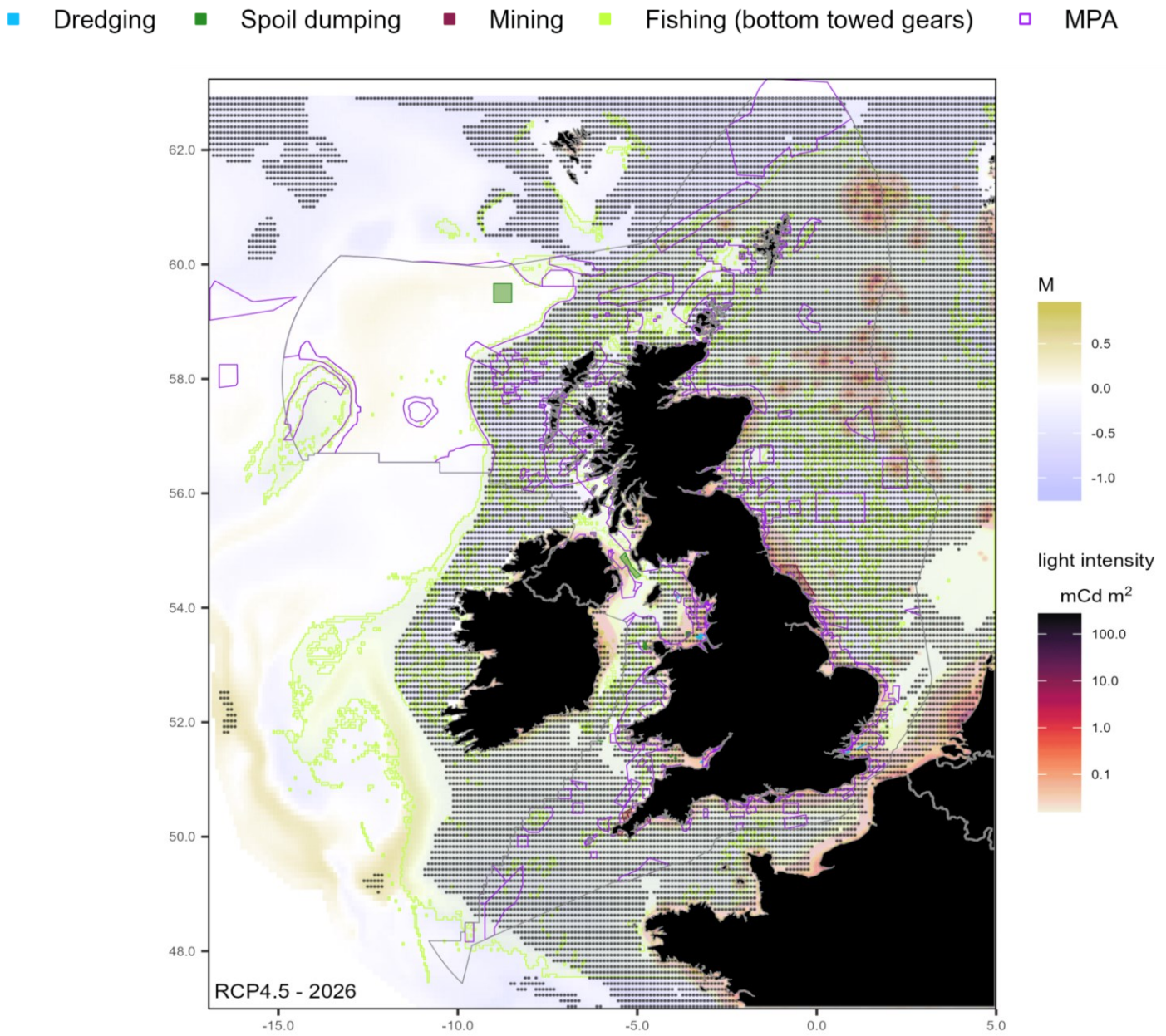
Bright spots: working with nature & people under climate change

Dr Ana Queirós

VELMU
Helsinki
14-15 March, 2023

ICES CIEM | Copernicus Marine Service | Horizon Europe | UNESCO United Nations Educational, Scientific and Cultural Organization | MaB Man and the biosphere Programme | UKRI Natural Environment Research Council | UKRI Economic and Social Research Council

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAna Queiros



MSPACE
Marine Spatial Planning
Addressing Climate Effects

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Credit: Queirós & Talbot, et al, forthcoming.

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAna Queiros

Biodiversity & sustainable blue growth under climate change are not always mutually exclusive

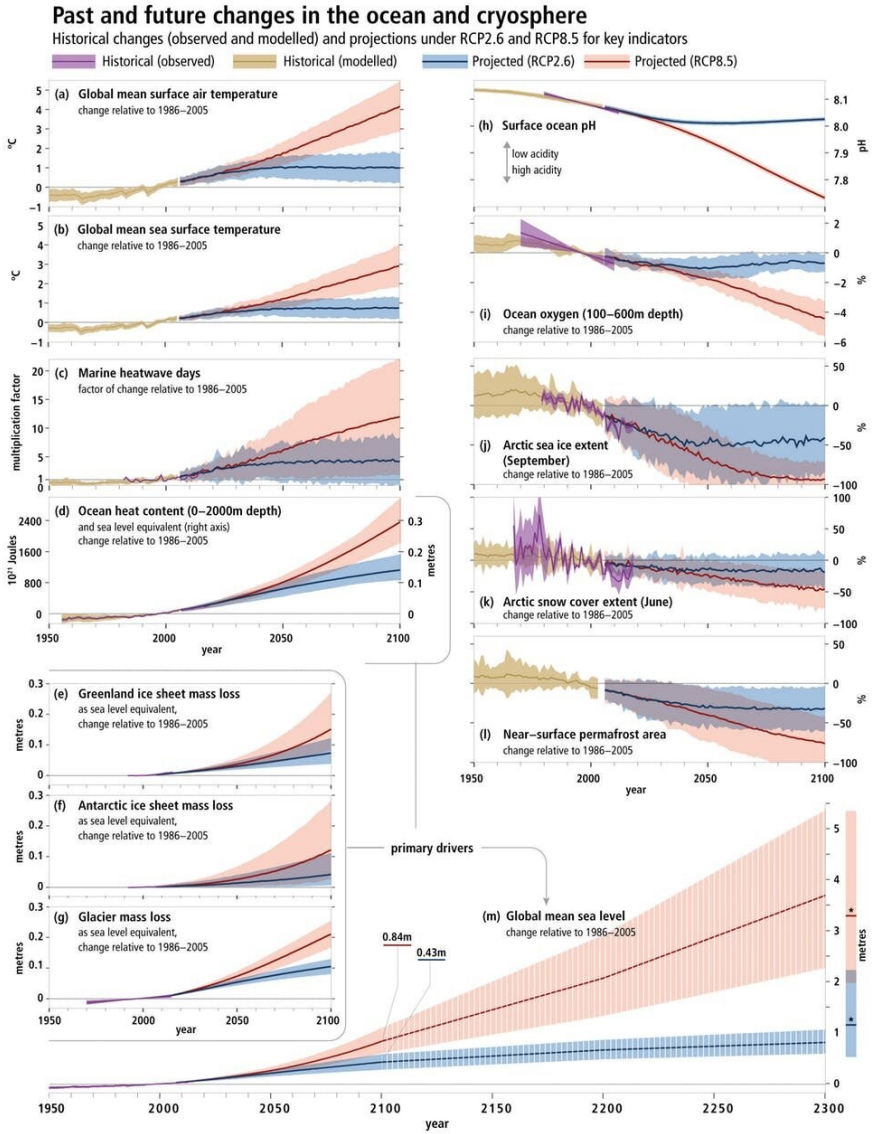
Part I: *In principle*

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAna Queiros

Understanding & responding to ocean climate change

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAna Queiros

More than warming



nature climate change
LETTERS
PUBLISHED ONLINE: 4 AUGUST 2013 | DOI: 10.1038/NCLIMATE1958

Global imprint of climate change on marine life

Elvira S. Poloczanska *et al.*†

ASLO Web Lectures

Article | Free Access

Ocean Acidification: The Other CO_2 Problem

Richard A. Feely, Scott C. Doney

Science

HOME > SCIENCE > VOL. 359, NO. 6371 > DECLINING OXYGEN IN THE GLOBAL OCEAN AND COASTAL WATERS

REVIEW

Declining oxygen in the global ocean and coastal waters

DENISE BREITBURG, LISA A. LEVIN, ANDREAS OSCHLIES, MARILAURE GRÉGOIRE, [...], AND JING ZHANG +17 authors Authors Info & Affil

Geophysical Research Letters

Research Letter | Open Access

Detectability of an AMOC Decline in Current and Projected Climate Changes

D. Lobelle, C. Beaulieu, V. Livina, F. Sévellec, E. Frajka-Williams

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Article | Open Access | Published: 10 April 2018

Longer and more frequent marine heatwaves over the past century

Eric C. J. Oliver, Markus G. Donat, Michael T. Burrows, Pippa J. Moore, Dan A. Smale, Lisa V.

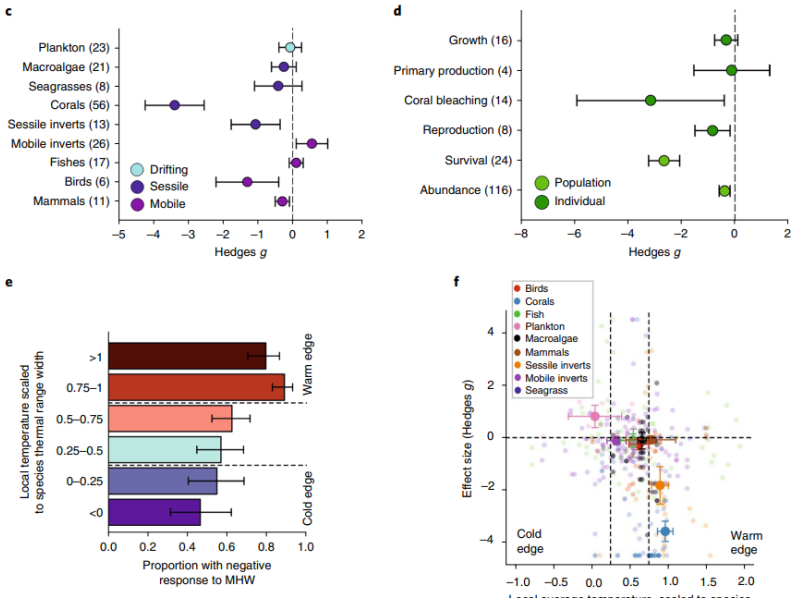
Biodiversity responses

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAna Queiros

LETTERS
https://doi.org/10.1038/s41558-019-0412-1
nature climate change

Marine heatwaves threaten global biodiversity and the provision of ecosystem services

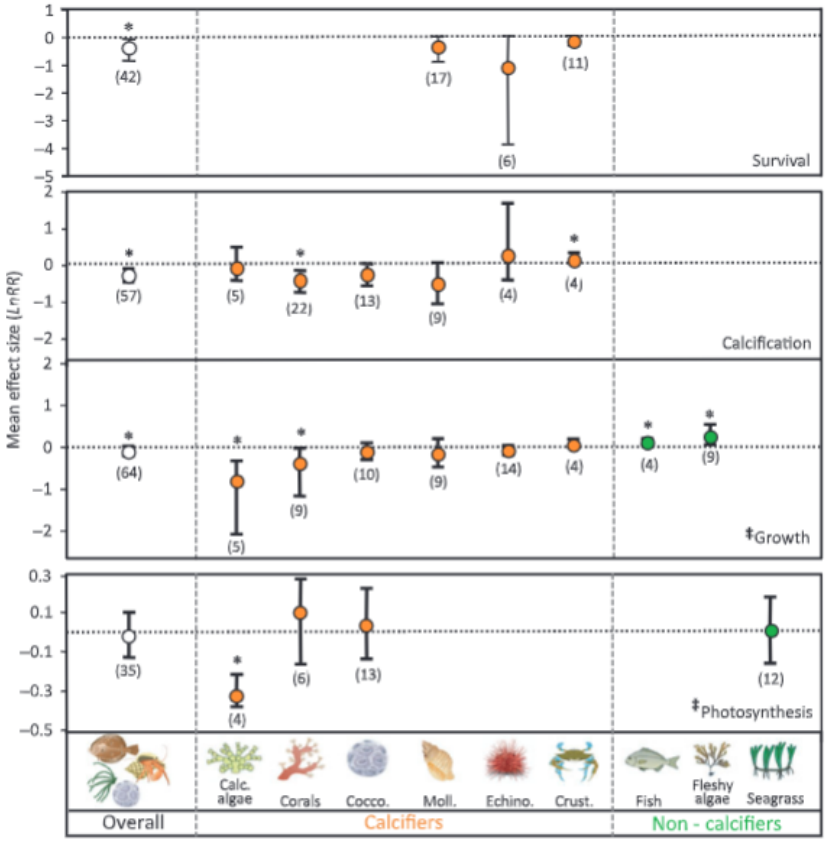
Dan A. Smale[1,2,20*], Thomas Wernberg[2,20], Eric C. J. Oliver[3,4,5], Mads Thomsen[6], Ben P. Harvey[7,8], Sandra C. Straub[2], Michael T. Burrows[9], Lisa V. Alexander[10,11,12], Jessica A. Benthuysen[13], Markus G. Donat[10,11,14], Ming Feng[15], Alistair J. Hobday[16], Neil J. Holbrook[4,17], Sarah E. Perkins-Kirkpatrick[10,11], Hillary A. Scannell[18], Alex Sen Gupta[10,11], Ben L. Payne[9] and Pippa J. Moore[7,19]



ECOLOGY LETTERS
Ecology Letters, (2010) 13: 1419–1434 doi: 10.1111/j.1461-0248.2010.01518.x

REVIEW AND SYNTHESIS

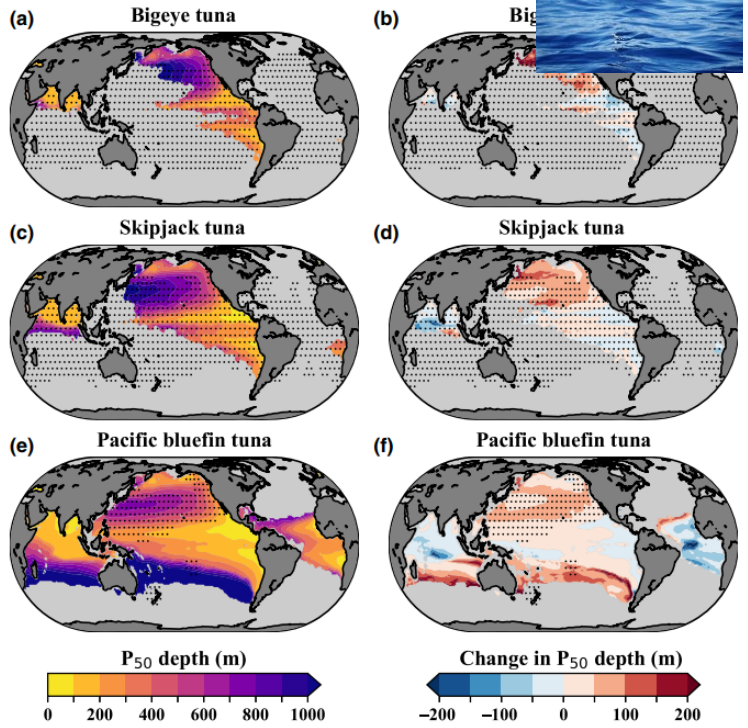
Meta-analysis reveals negative yet variable effects of ocean acidification on marine organisms



PRIMARY RESEARCH ARTICLE
WILEY Global Change Biology

Projections of climate-driven changes in tuna vertical habitat based on species-specific differences in blood oxygen affinity

K. A. S. Mislan[1,2] | Curtis A. Deutsch[1] | Richard W. Brill[3,4] | John P. Dunne[5] | Jorge L. Sarmiento[6]



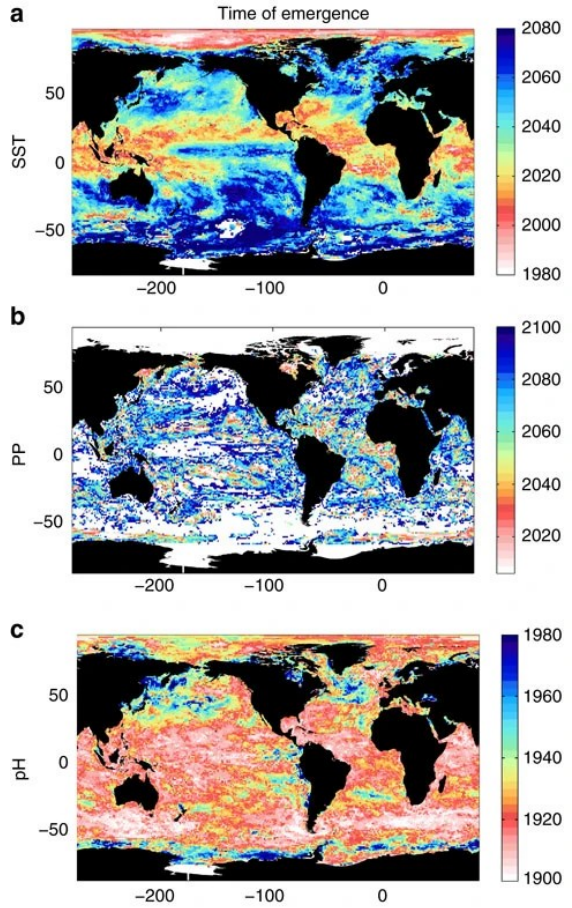
Enabling policy to respond to multiple climate stressors?

For a given ocean location (*lat, long, depth*):

Rapid emergence of climate change in environmental drivers of marine ecosystems

Stephanie A. Henson, Claudie Beaulieu, Tatiana Ilyina, Jasmin G. John, Matthew Long, R Séférian, Jerry Tjiputra & Jorge L. Sarmiento

Nature Communications **8**, Article number: 14682 (2017) | Cite this article



Responding to multiple pressures (changing at different speed locally) has been challenging

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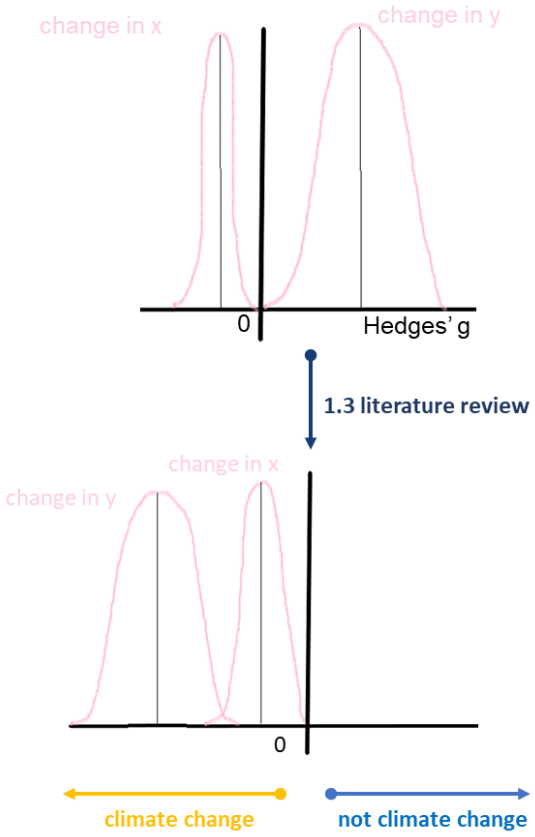
Understanding when change matters

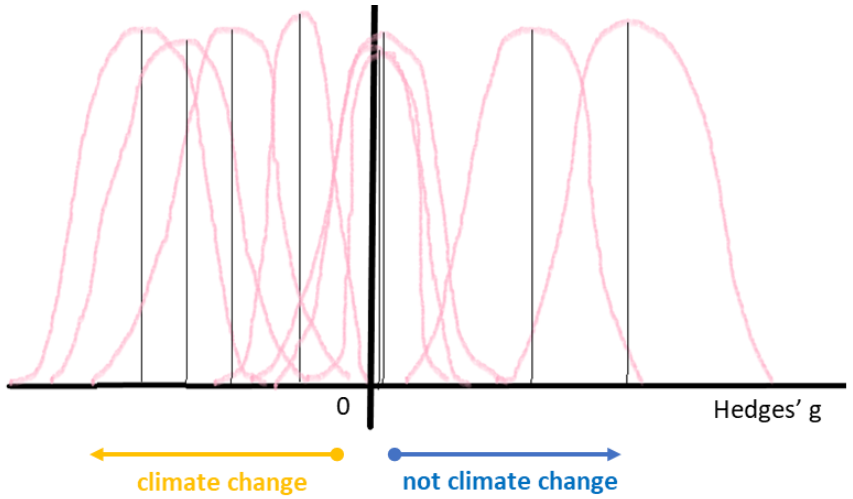
Climate signal emergence (*lat, long, depth*):

- Ocean attribute moves beyond it's natural range of historical variability



For given ocean location (*lat, long, depth*):

Allows for *whole system* estimation of strength of climate change signal (including consideration for variability).



PRIMARY RESEARCH ARTICLE

Global Change Biology WILEY

Bright spots as climate-smart marine spatial planning tools for conservation and blue growth

Ana M. Queirós[1] | Elizabeth Talbot[1] | Nicola J. Beaumont[1] | Paul J. Somerfield[1] | Susan Kay[1] | Christine Pascoe[1] | Simon Dedman[2] | Jose A. Fernandes[3] | Alexander Jueterbock[4] | Peter I. Miller[1] | Sevrine F. Sailley[1] | Gianluca Sará[5] | Liam M. Carr[6] | Melanie C. Austen[1,7] | Steve Widdicombe[1] | Gil Rilov[8] | Lisa A. Levin[9] | Stephen C. Hull[10] | Suzannah F. Walmsley[10] | Caitriona Nic Aonghusa[11]

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Ecosystem level view of conservation under climate change

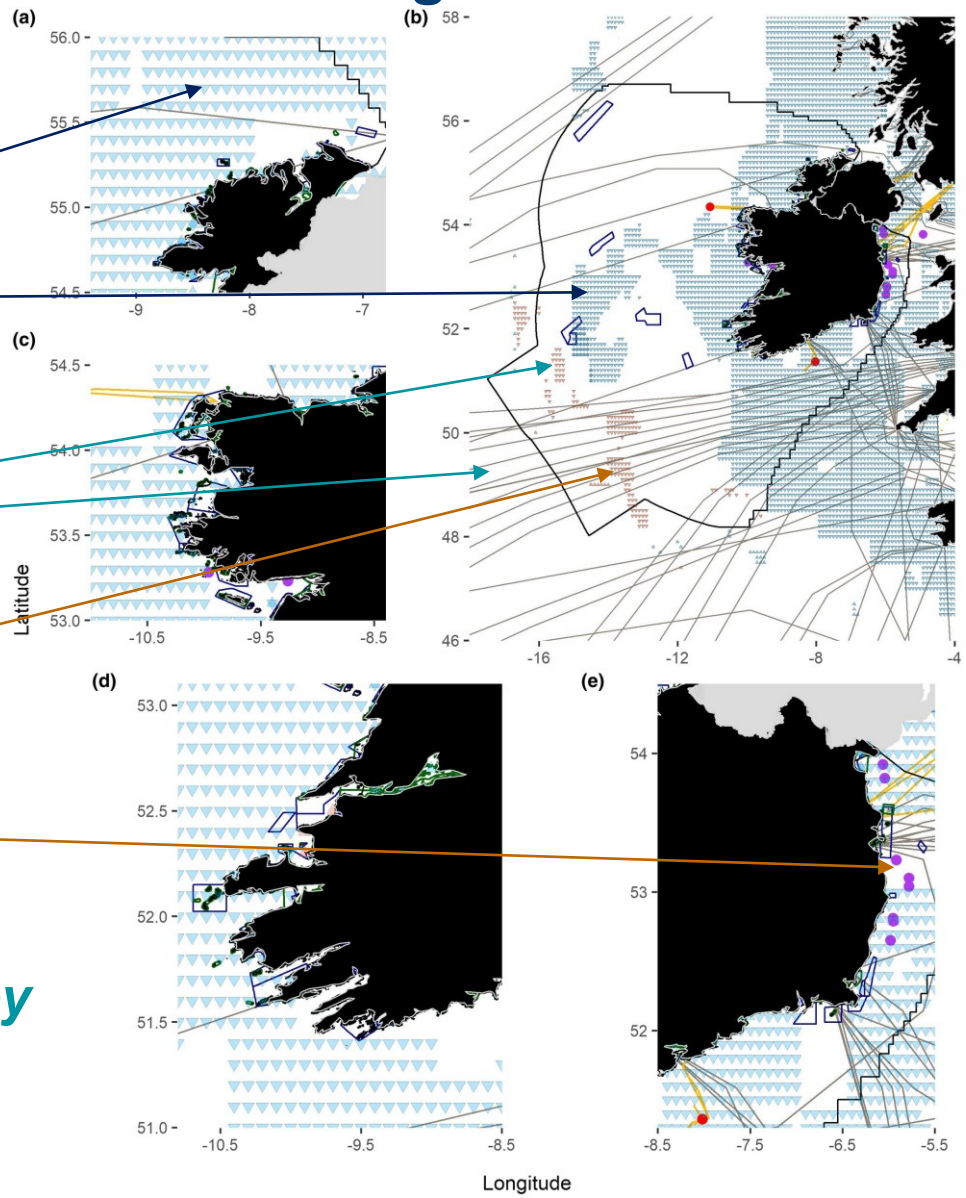
Irish "MPAs" under RCP 8.5

Vulnerabilities
Suitability of benthic habitat of conservation interest reduced by climate change (**hotspots**)

Opportunities (within sector)
Ecosystem-level climate resilient sites hosting benthic habitats of conservation value (**refugia**)

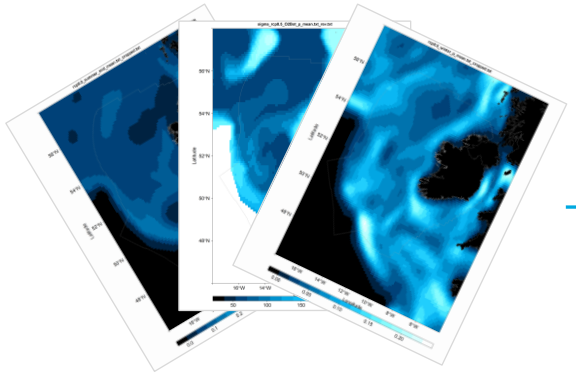
Opportunities (cross-sector synergies)
Climate resilient habitats & new habitats of conservation interest (**bright spots**) emerge in areas where some level of protection already exists
(e.g. "MPAs"; cables & pipelines; wind sector)

Reduce conservation cf. blue economy conflict by focusing on co-location & win-win scenarios



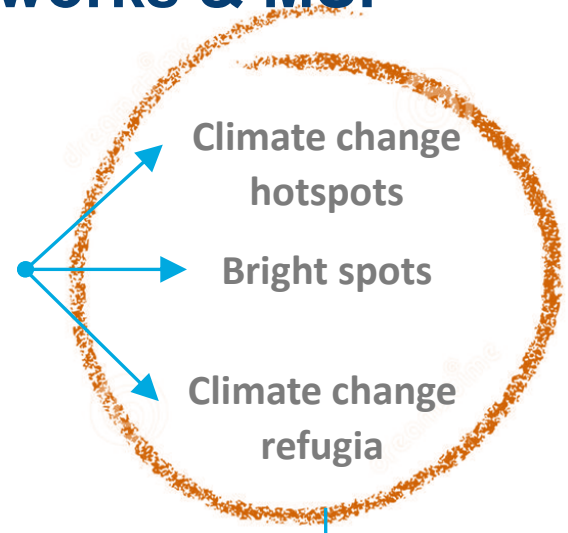
Credit: Queirós et al. 2021 GCB.

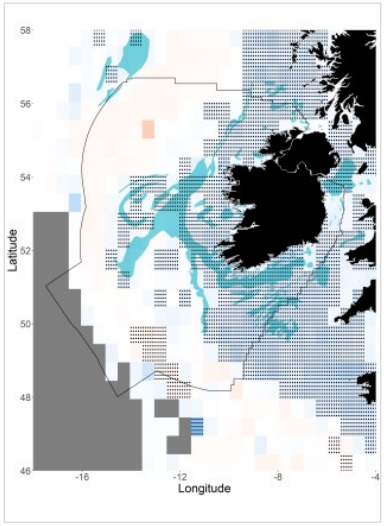
Promoting climate-resilient conservation: MPA networks & MSP



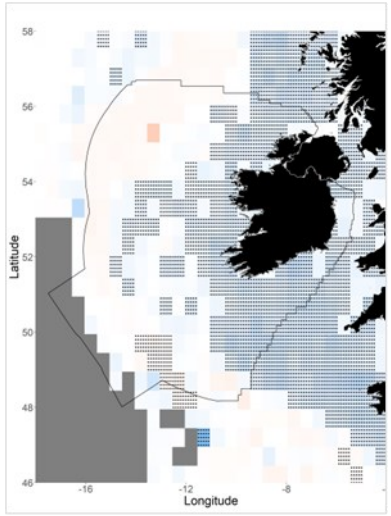
State-of-the-art ocean climate modelling represents habitats & species of conservation value

Sector-specific
spatial random-effects meta-analysis
of ocean climate modelling





Blue economy GIS data overlay allows exploration of within / cross sector interactions



Climate-resilience maps for ecosystem conditions & species underpinning conservation mechanisms

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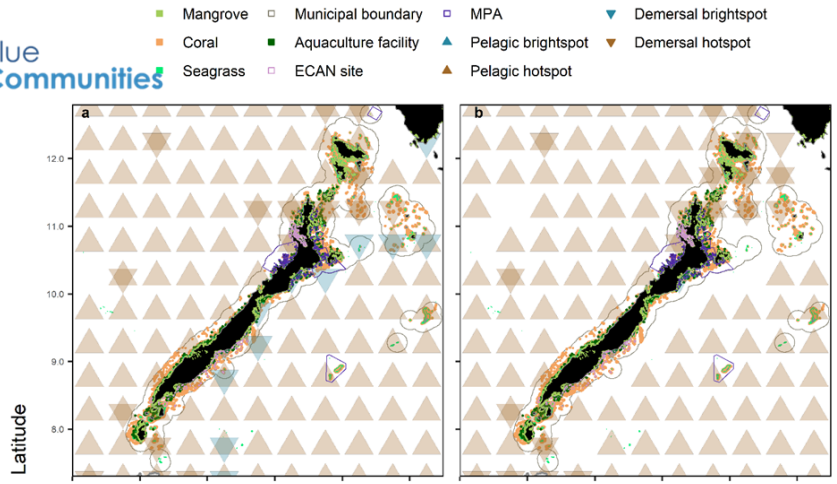
Credit: Queirós et al. 2021 GCB

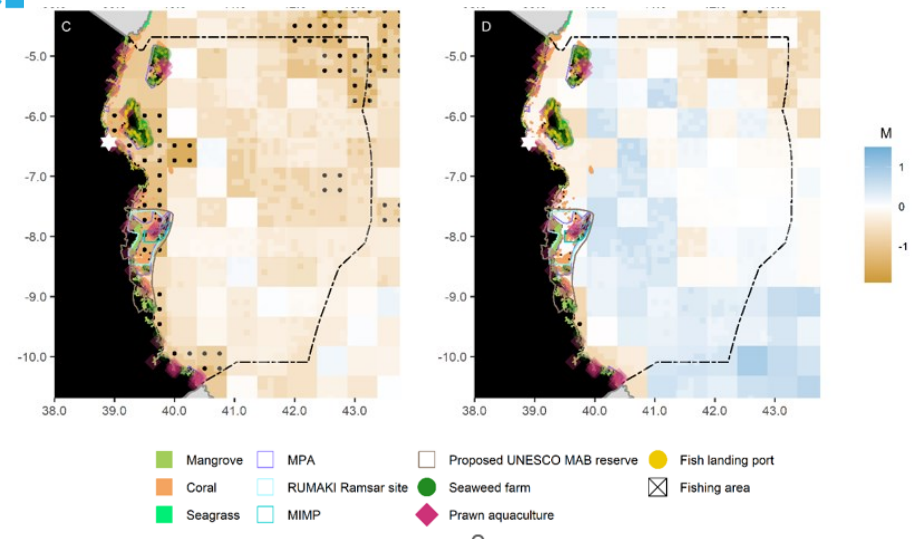
Incorporating "climate-readiness" into tropical spatial fisheries management strategies



GCRF Philippines: https: //www.blue-communities.org/

Talbot et al. in review

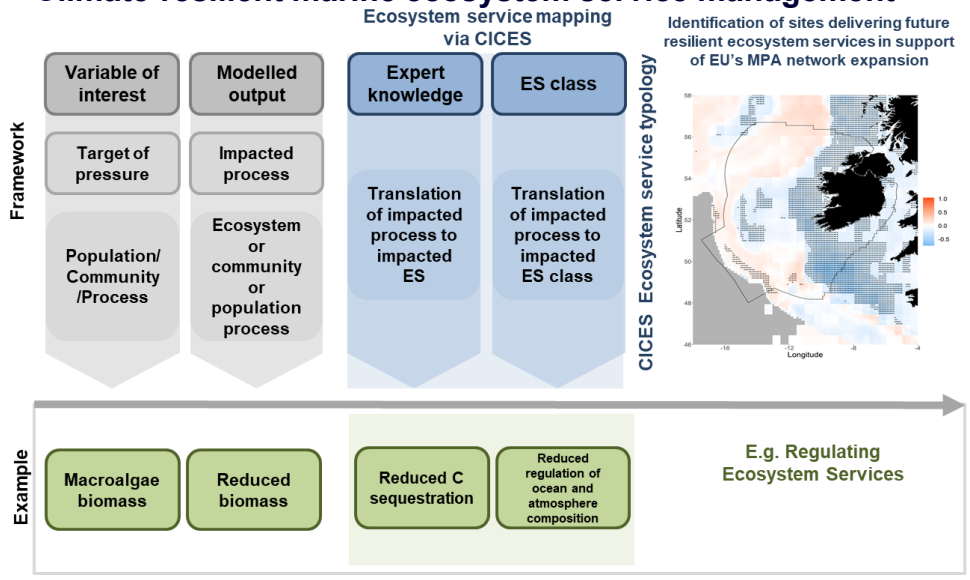
Climate-driven opportunities and challenges for the spatial use and management of Tanzania's marine environment



GCRF Tanzania: https://solstice-wio.org/

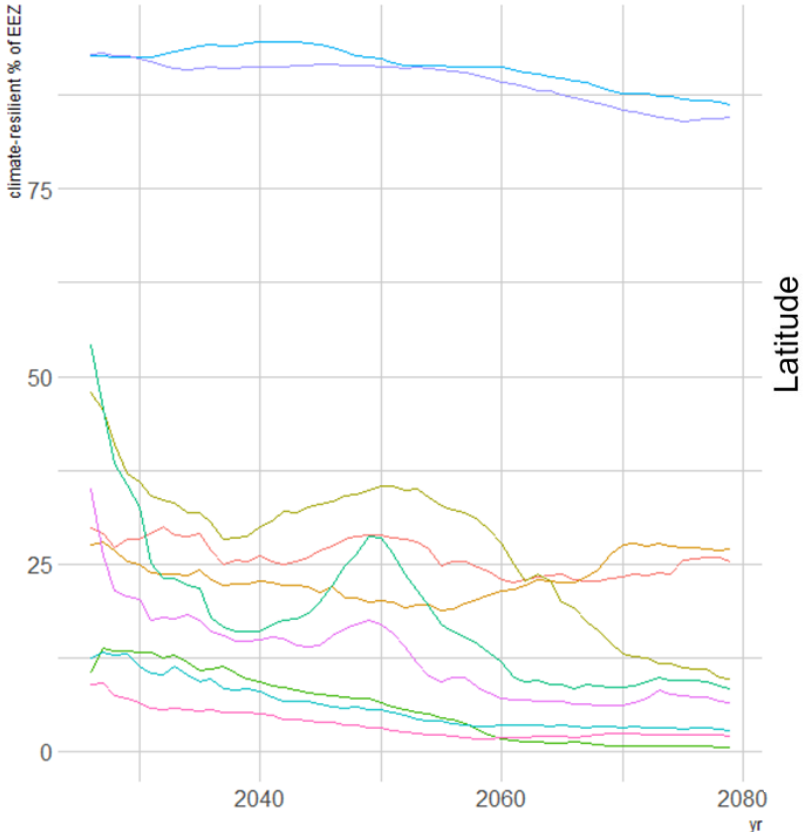
Queiros et al. in review

Climate-resilient marine ecosystem service management

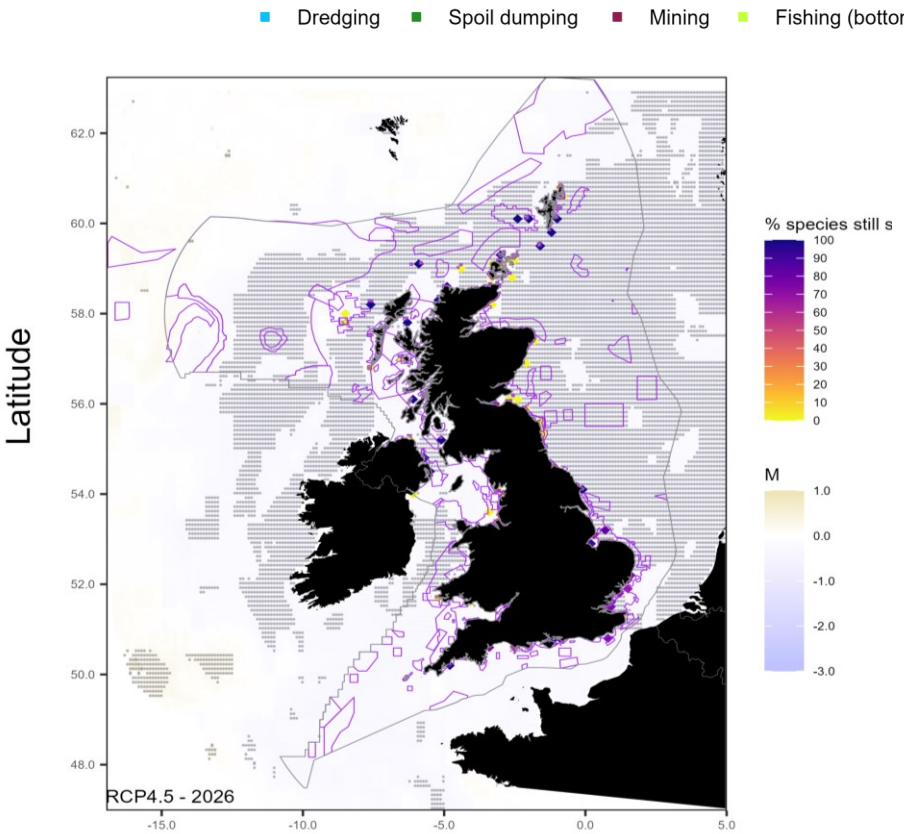


Queiros et al. 2020

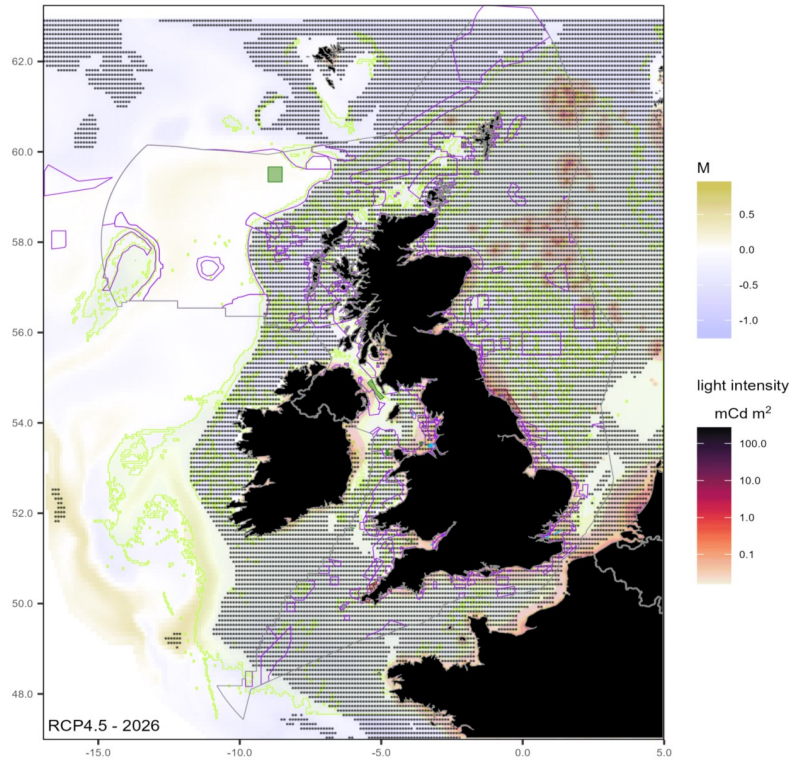
Support dynamic & climate-resilient conservation approaches within context of blue economy



30 x 30 target: when and under which conditions?



Longevity of MPAs? What fraction of designation features remain, where and when? (Prioritization)



Conservation targets met through co-location with which sectors and when? / Where not possible?

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Credit: Queirós & Talbot, et al, forthcoming.

Promoting climate-resilient conservation within context of blue economy

Analysis of climate change evidence purposely built to seek co-location solutions (win-win MSP/MPA/ spatial management scenarios)

Co-designed with planners & others in policy/industry to best fit their needs (time, space, format)

Single-metric condenses mulitple climate change stressor evidence in easy to use metric and mapped products (useability)

Provides users with information about what can be done (and not just what will be lost)

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Credit: Queirós et al. 2021 GCB

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Biodiversity & sustainable blue growth under climate change are not always mutually exclusive

Part I: *In principle*

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Biodiversity & sustainable blue growth under climate change are not always mutually exclusive

Part II: *In practice*

(making People part of the solution)

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAna Queiros

NATURE-BASED SOLUTIONS FOR THE OCEAN UNDER CLIMATE CHANGE:

(Spatial) ocean management strategies that support the natural distribution of climate resilience and adaptation potential of marine species & habitats.

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAr

NBS EMBEDED IN MODERN ENVIRONMENTAL REGULATION

"*Commitment to tackling climate and environmental-related challenges (…) No net emissions of greenhouse gases in 2050 (…) Protect, conserve and enhance the EU's natural capital (…)This transition must put people first.*" **European Green Deal**

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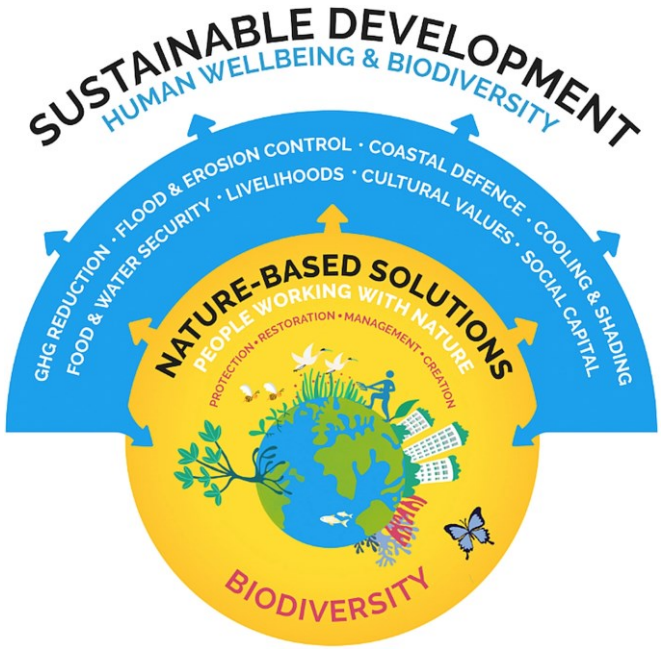
NATURE-BASED SOLUTIONS (NBS)



NbS are biodiversity-based strategies that conserve nature for people's benefit, with people being active protectors and restorers. Seddon et al. 2021 GCB.

Environmental management approaches that deliver benefits to nature whilst helping to address societal problems (*working with nature*).

Benefits for nature AND people.

Accelerating action toward the UN Sustainable Development Agenda. International Atomic Energy Agency.

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SPATIAL MANAGEMENT / PLANNING =

CONSULTATION

How do we build buy-in from stakeholders for climate-smart conservation?

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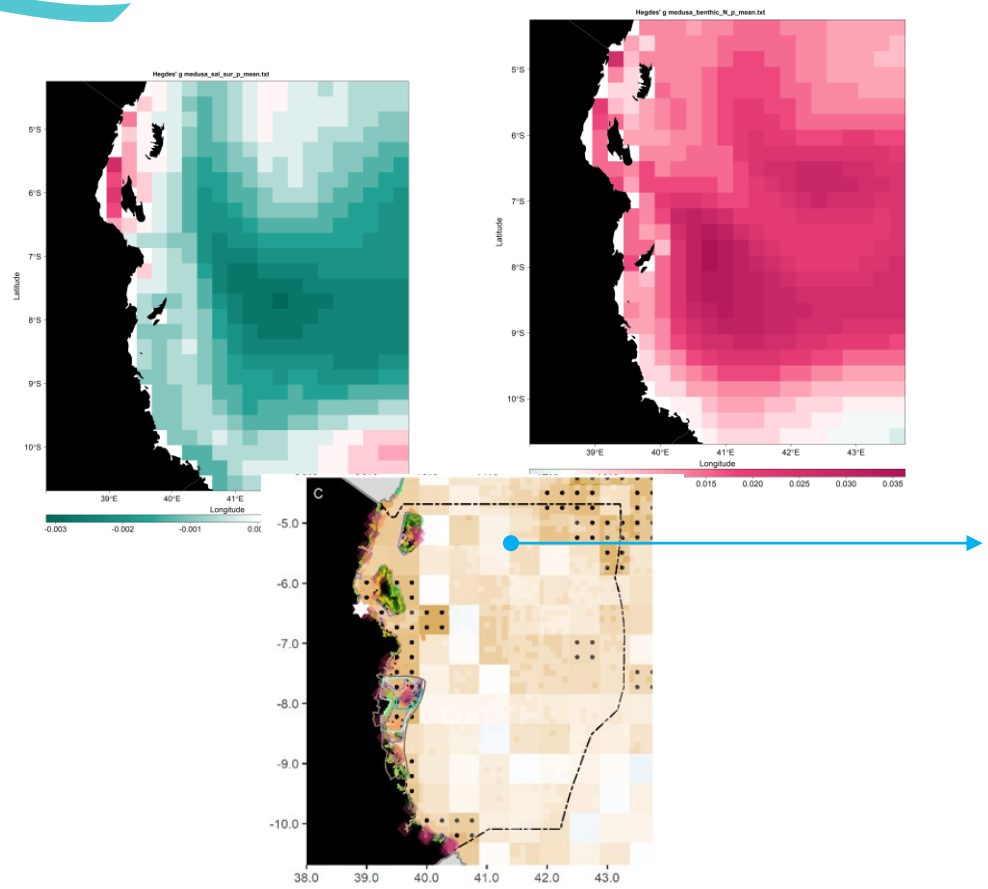


- Jobs
- Income
- CO_2 Emissions

Macro-economic approaches produce easy to understand economic indicators, contrasting implementation of climate-smart strategies against BAU (e.g. changes in spatial management of fisheries or MPA siting).

Climate change is multi-dimensional and not always tangible to stakeholders.

"*Temperature goes up.*"

"*pH goes down*"

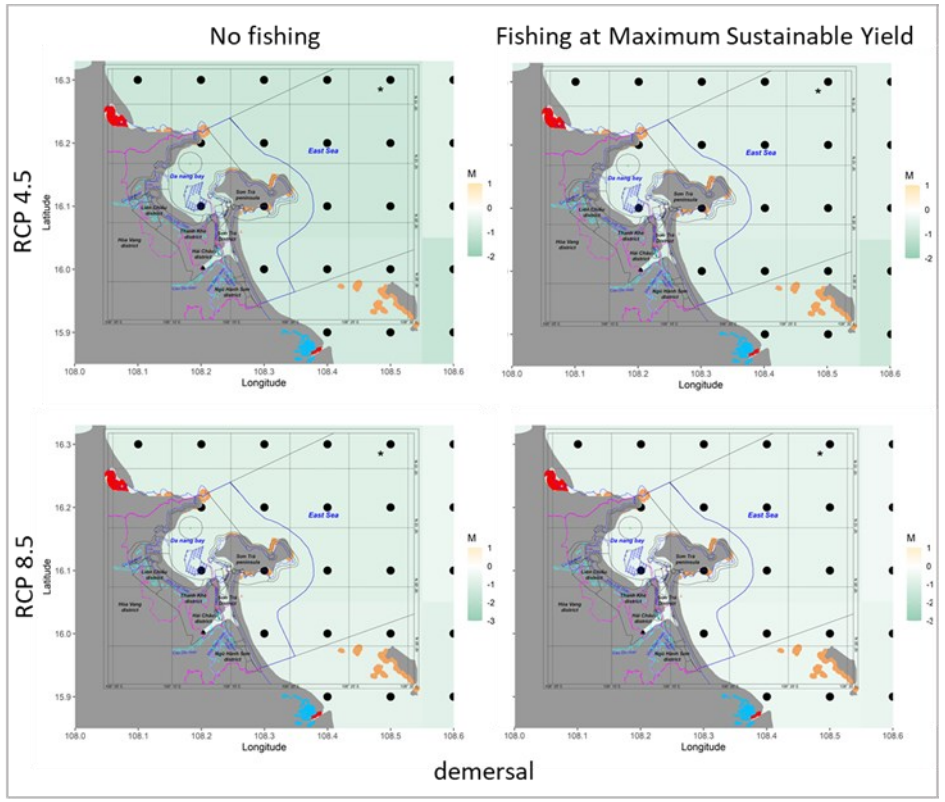
"*C uptake goes up*"

"*how does it affect my sector ?*"

"*what can I do?*"

Natural Environment Research Council
Economic and Social Research Council
SOLSTICE
MSPACE
Marine Spatial Planning Addressing Climate Effects

Speaker: Dr Ana Queiros anqu@pml.ac.uk @DrAna Queiros



Developing NBS for fisheries under climate change is not just about identifying where fishing is or is not viable under climate change.

Queiros et al. 2022. Climate-smart spatial planning assessment in support of conservation and blue growth in Da Nang city's marine environment

Social science approaches can help establish true belief systems held by stakeholders, as well as their preferences & needs.

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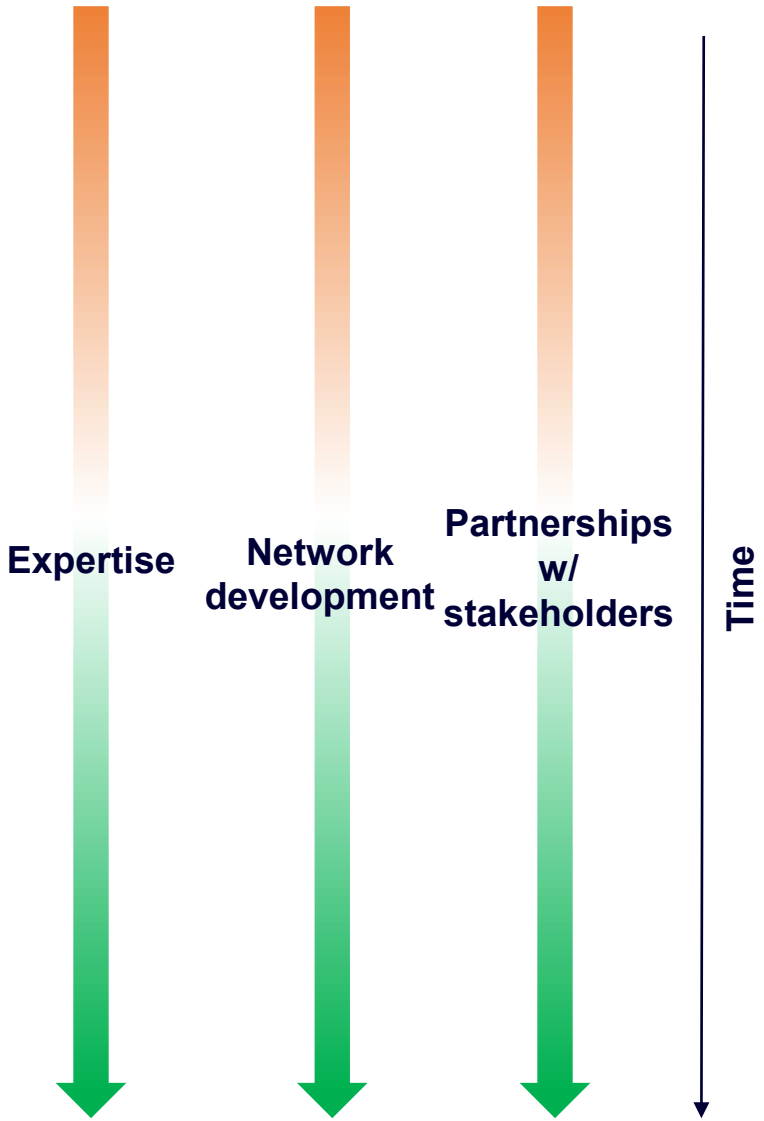
ACCORD
MSPACE Marine Spatial Planning Addressing Climate Effects



The pace of climate change makes this the time for implementation.

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Marine Spatial Planning Addressing Climate Effects

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Biodiversity & sustainable blue growth under climate change are not always mutually exclusive

(make People part of the solution)

THANK YOU!

Dr Ana Queirós

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