OceanICU
Understanding Ocean Carbon

VIRTUAL OCEAN PAVILION

Managing and protecting ocean spaces for climate, biodiversity and people by 2030

Seminar facilitated by OceanICU

COP28 VIRTUAL OCEAN PAVILION
Connecting All on Our Incredible Blue Planet

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

OceanICU
Understanding Ocean Carbon

Managing and protecting ocean spaces for climate, biodiversity and people by 2030

Mary S. Wisz, Professor, Marine Science

WORLD MARITIME UNIVERSITY

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

Triple crises

- Climate
- Biodiversity
- Food

Triple crises | **The Ocean = our Greatest Ally**

OceanICU

- Climate → Cycles and stores carbon, regulates climate, offers coastal protection
- Biodiversity → Rich in Biodiversity (most is undescribed)
- Food → Fisheries and aquaculture

Triple crises

The Ocean = our Greatest Ally

- Climate → Cycles and stores c… regulates clima… …tection
- Biodiversity → Rich in … …ndescribed)
- Food → F…

THREATENED by human activites

Our growing population is moving into the ocean. Blue economies and/or sustainability?

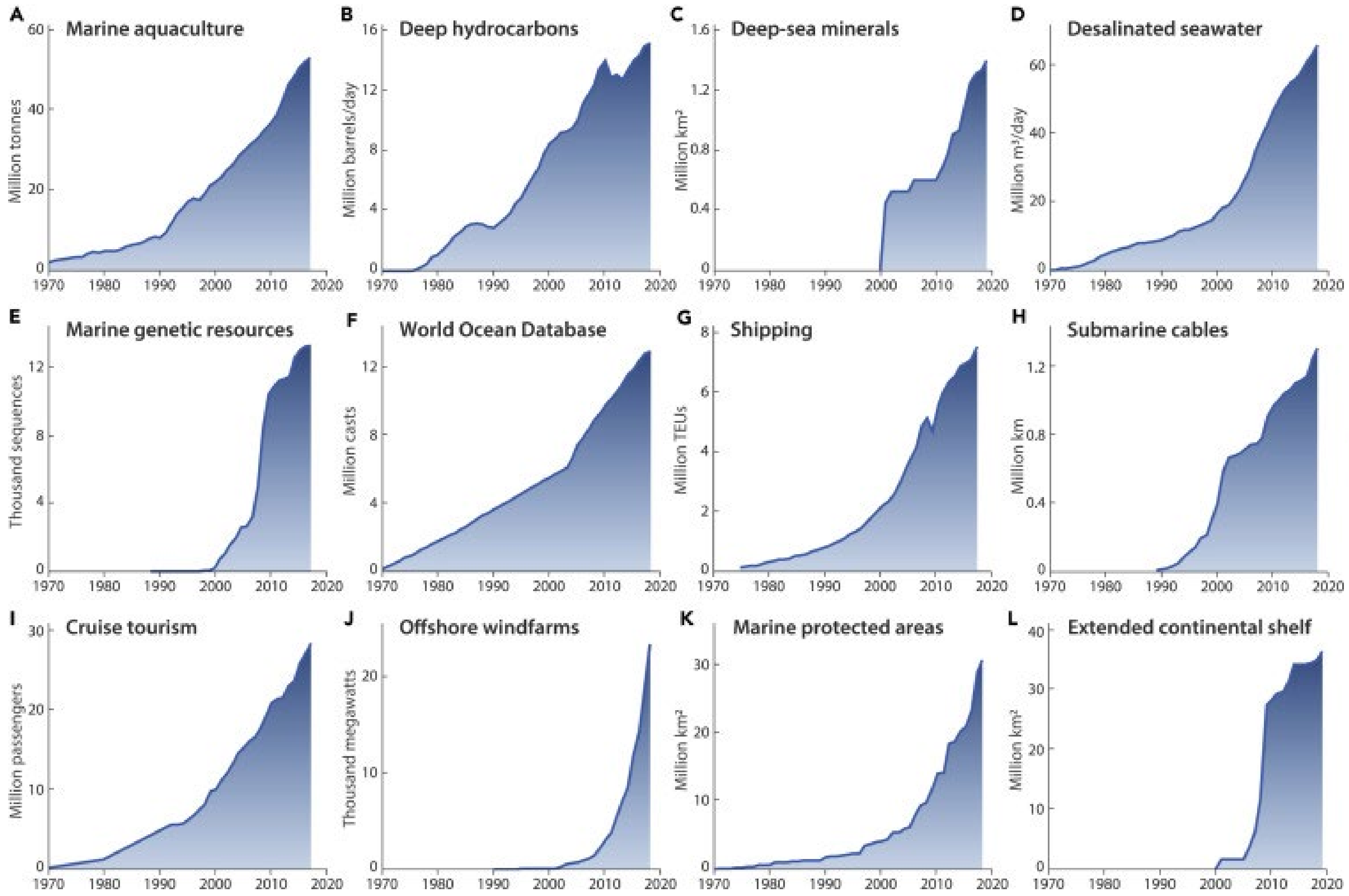


Image from: Azote for Stockholm Resilience Centre, Stockholm University CC BY-ND 3.0.

Jouffray, et al. "The blue acceleration: the trajectory of human expansion into the ocean." One Earth 2.1 (2020): 43-54.

The benefits of co-locating management objectives

ceanICU

Article

Protecting the global ocean for biodiversity, food and climate

https://doi.org/10.1038/s41586-021-03371-z

Received: 19 December 2019

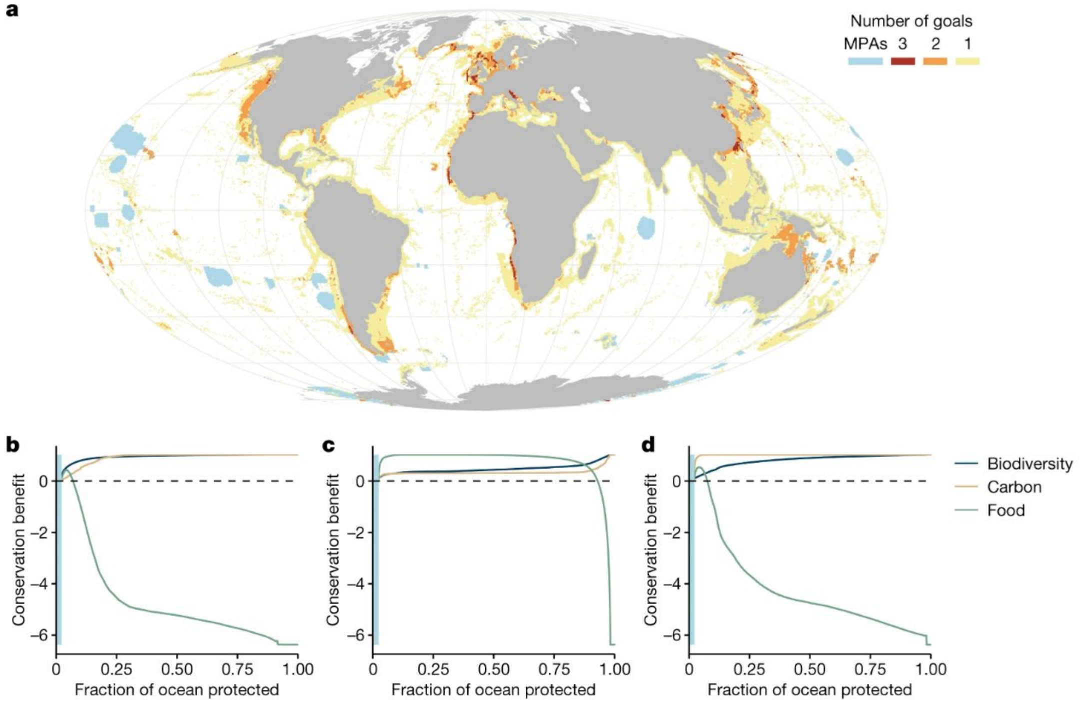
Accepted: 18 February 2021

Published online: 17 March 2021

Check for updates

Enric Sala[1✉], Juan Mayorga[1,2], Darcy Bradley[2], Reniel B. Cabral[2], Trisha B. Atwood[3], Arnaud Auber[4], William Cheung[5], Christopher Costello[2], Francesco Ferretti[6], Alan M. Friedlander[1,7], Steven D. Gaines[2], Cristina Garilao[18], Whitney Goodell[1,7], Benjamin S. Halpern[9], Audra Hinson[3], Kristin Kaschner[8], Kathleen Kesner-Reyes[10], Fabien Leprieur[11], Jennifer McGowan[12], Lance E. Morgan[13], David Mouillot[11], Juliano Palacios-Abrantes[5], Hugh P. Possingham[14], Kristin D. Rechberger[15], Boris Worm[16] & Jane Lubchenco[17]

- Effective ocean protection can yield climate, biodiversity and food security benefits, but where are the most important areas to protect? How do key climate and biodiversity areas overlap in space and time?



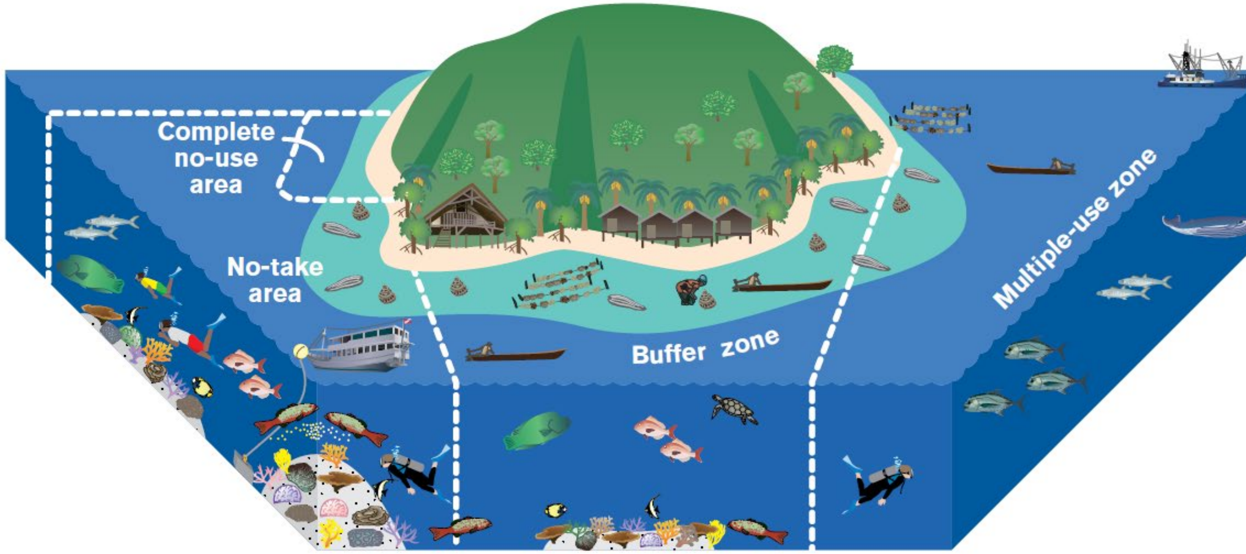
a, Priority areas to achieve 90% of the maximum benefits for one (yellow), two (orange) and three (red) simultaneous conservation objectives (biodiversity conservation, carbon stocks and food provisioning). Existing fully protected areas are shown in light blue. **b**–**d**, Cumulative co-benefits for each goal under a single-objective prioritization of biodiversity (**b**), food provisioning (**c**) and carbon (**d**). The blue bar in the benefit curves denotes the current 2.7% of the global ocean that is included in fully protected areas.

Image: (Sala et al., 2021)

Management Tools to help:
Area Based Management (ABM)

ABM= regulation of human activity in a specified area to achieve conservation or sustainable resource management objectives

- Marine protected areas (MPAs)
- Marine spatial planning (MSP)
- Environmental Impact Assessment (EIA)



Orbach M, Karrer L. 2010. Marine Managed Areas: What, Why, and Where. Science and Knowledge Division, Conservation International, Arlington, Virginia, USA

OceanICU

2020 UN BIODIVERSITY CONFERENCE

COP 15 / CP-MOP 10 / NP-MOP 4

Ecological Civilization-Building a Shared Future for All Life on Earth

KUNMING – MONTREAL

Area Based Management plays a central role in delivering The Kunming- Montreal Global Biodiversity Framework

Kunming- Montreal Global Biodiversity Framework (GBF)- 23 targets

https://www.cbd.int/gbf/targets/

Reducing Threats

Target 1 : All areas (eg. the entire territory of each country) are to be under effective spatial planning to bring the loss of areas of high biodiversity importance close to zero by 2030

Target 2: By 2030 at least 30% of degraded areas (land, inland waters and sea) are under effective restoration

Target 3: 30 % in protected areas (e.g. Marine Protected Areas)

Target 4: Management action to halt extinctions

Target 5: Harvest and trade of wild species is sustainable, safe and legal, while protecting and respecting the needs of indigenous peoples and local communities

Target 6: Manage, eradicate, control and prevent invasive alien species

Target 7: Reduce pollution risks

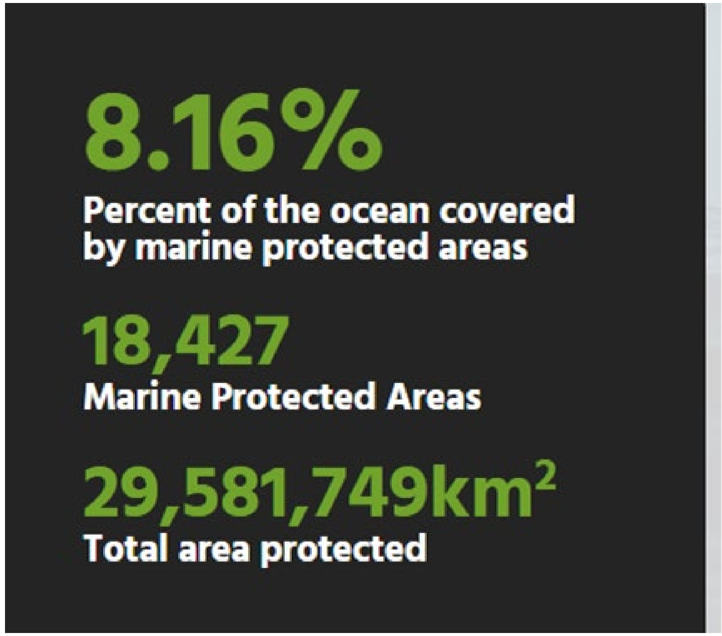
Target 8: Minimise climate change and ocean acidification impact- bolster nature based solutions and ecosystem based approaches

Rationale for MPAs

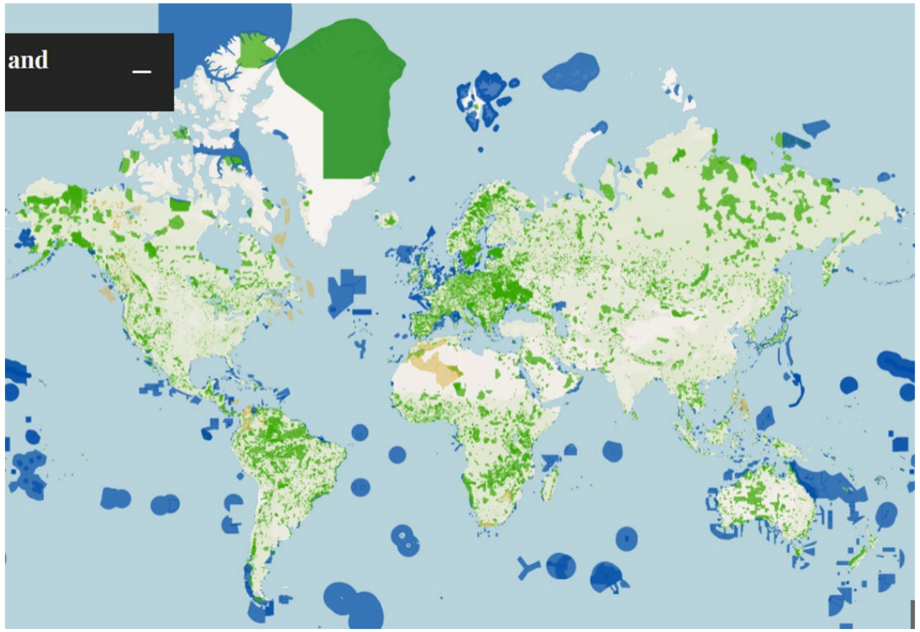
- MPA= any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment. - IUCN
- MPAs benefit nature and people.
- Removal of sources of impact leads to improvement of the system over time (unless damage is irreversible).

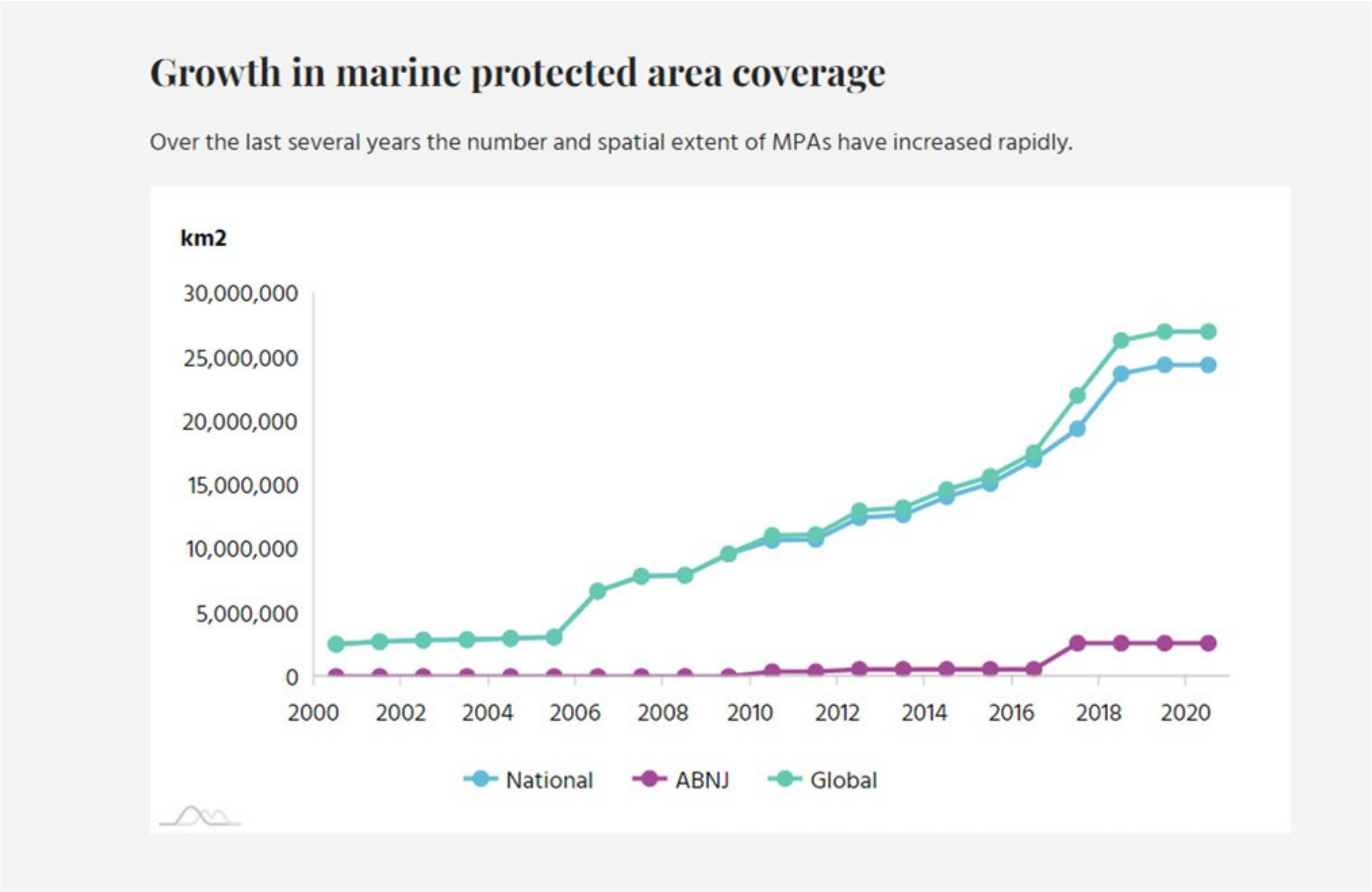
Pexels. Retrieved from https://www.pexels.com/photo/underwater-photography-of-fish-3361052/

Greenpeace. Retrieved from https://www.greenpeace.org/philippines/story/1378/hope-amid-devastation-in-one-of-the-worlds-best-marine-sanctuaries/



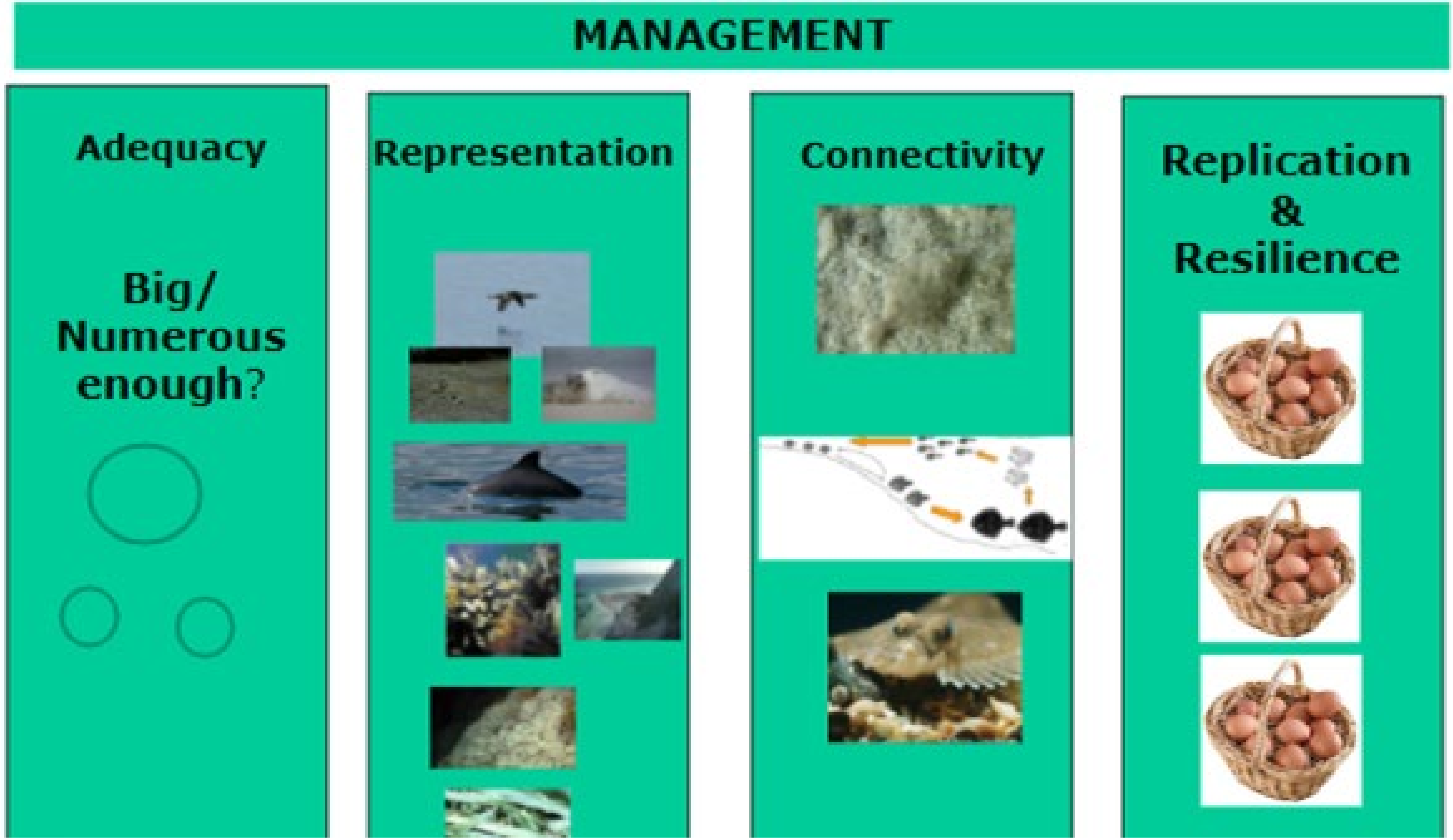
How much is under protection?
protected planet ocean.net
About 8.16 percent as of 8 Dec 2023

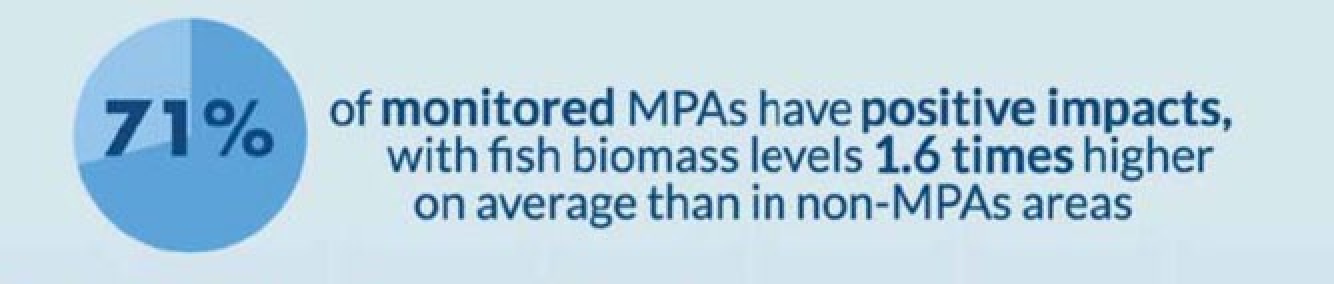


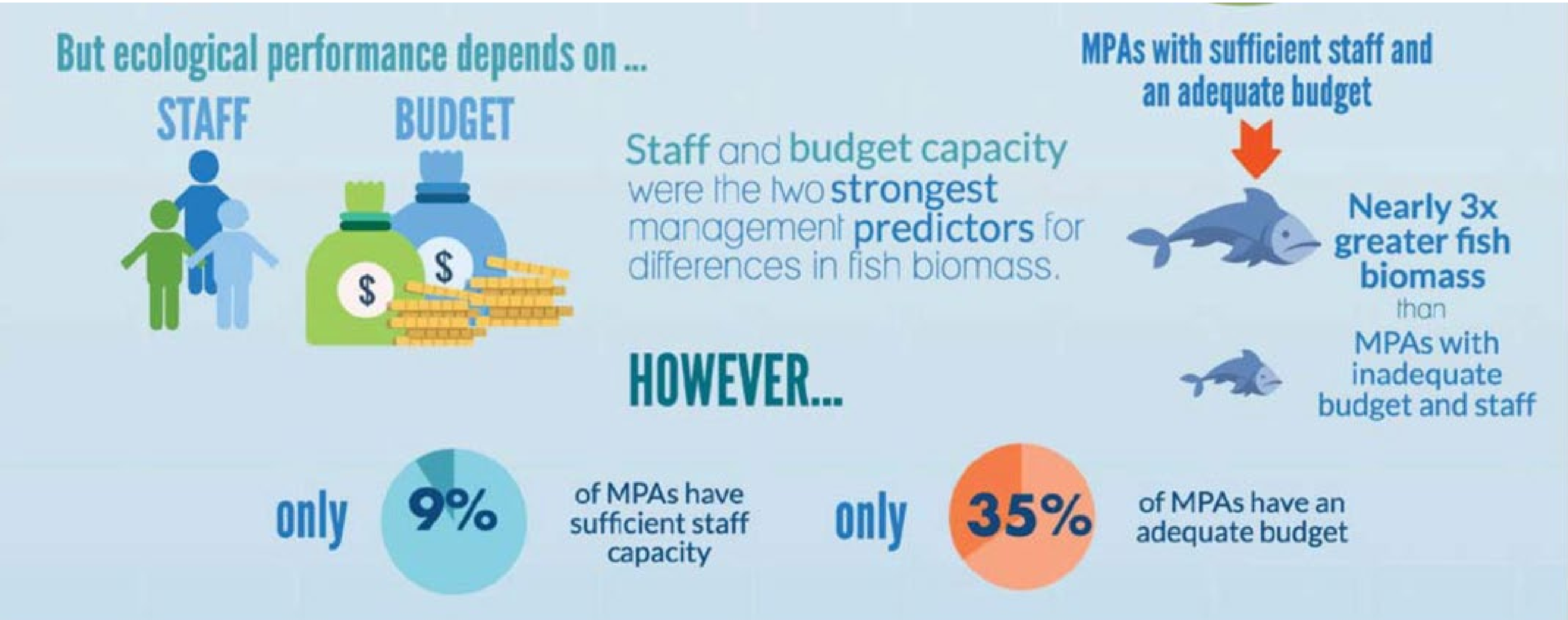


All images retrieved from: Protected planet.net

Considerations for MPA success from Convention on Biological Diversity scientific, governance and management challenges







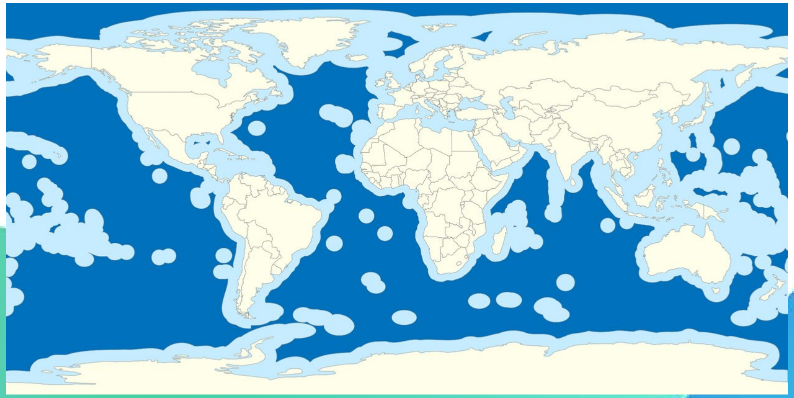
"Paper parks" do *not* help.

Effective management is essential e.g.
staff,
monitoring,
resources,
enforcement

Gill et al 2017 *Nature* **doi:10.1038/nature21708**

Biodiversity Beyond National Jurisdication Agreement- Article 7- General Principles & Approaches

- (f) An **ecosystem approach**;
- (g) An **integrated approach** to ocean management;
- (h) An approach that builds ecosystem resilience, including to adverse effects of climate change and ocean acidification, and also maintains and restores ecosystem integrity, **including the carbon cycling services that underpin the role of the ocean in climate**;
- (i) The use of the best available science and scientific information;
- (j) The use of relevant traditional knowledge of Indigenous Peoples and local communities, where available;

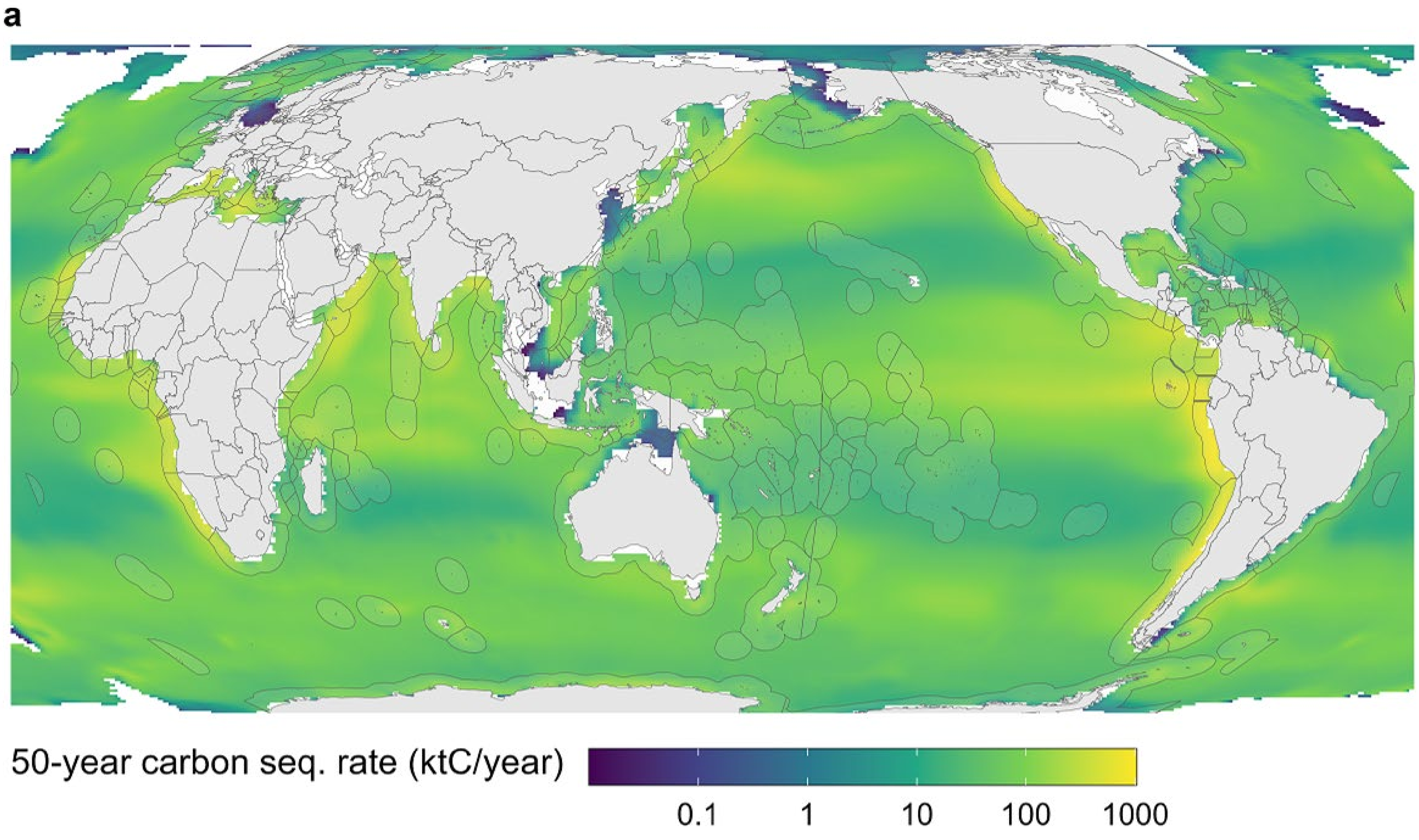


Protected Planet.net

Carbon stored for at least 50 years & showing EEZ boundaries

30% x 2030?

How do we balance protection of biological carbon pump, biodiversity, and fisheries?



Berzaghi et al., *submitted*

Managing ocean spaces for biodiversity, climate and people: meeting multiple objectives

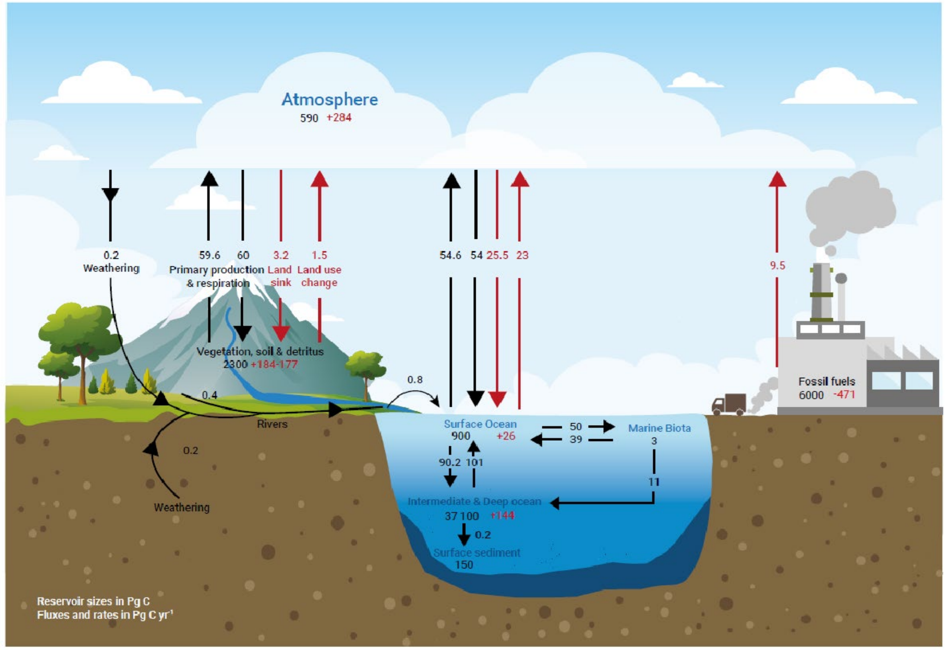
- Science to support decisions?
- Dynamics in space and time?
- Management?
- Co-location of biodiversity, climate and food security benefits?
- Capacity sharing and building?
- Governance, policies, regulatory and non-regulatory options
- Conservation finance
- others…

OceanICU
Understanding Ocean Carbon

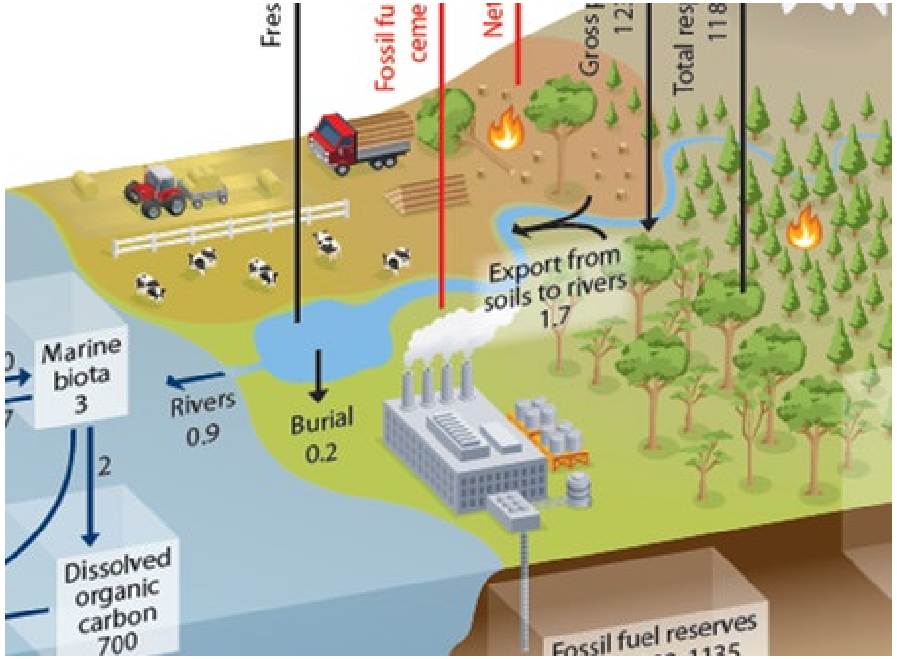
The Science we need to evaluate role of MPAS in the Ocean C cycle

Dr. Richard Sanders
NORCE

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation



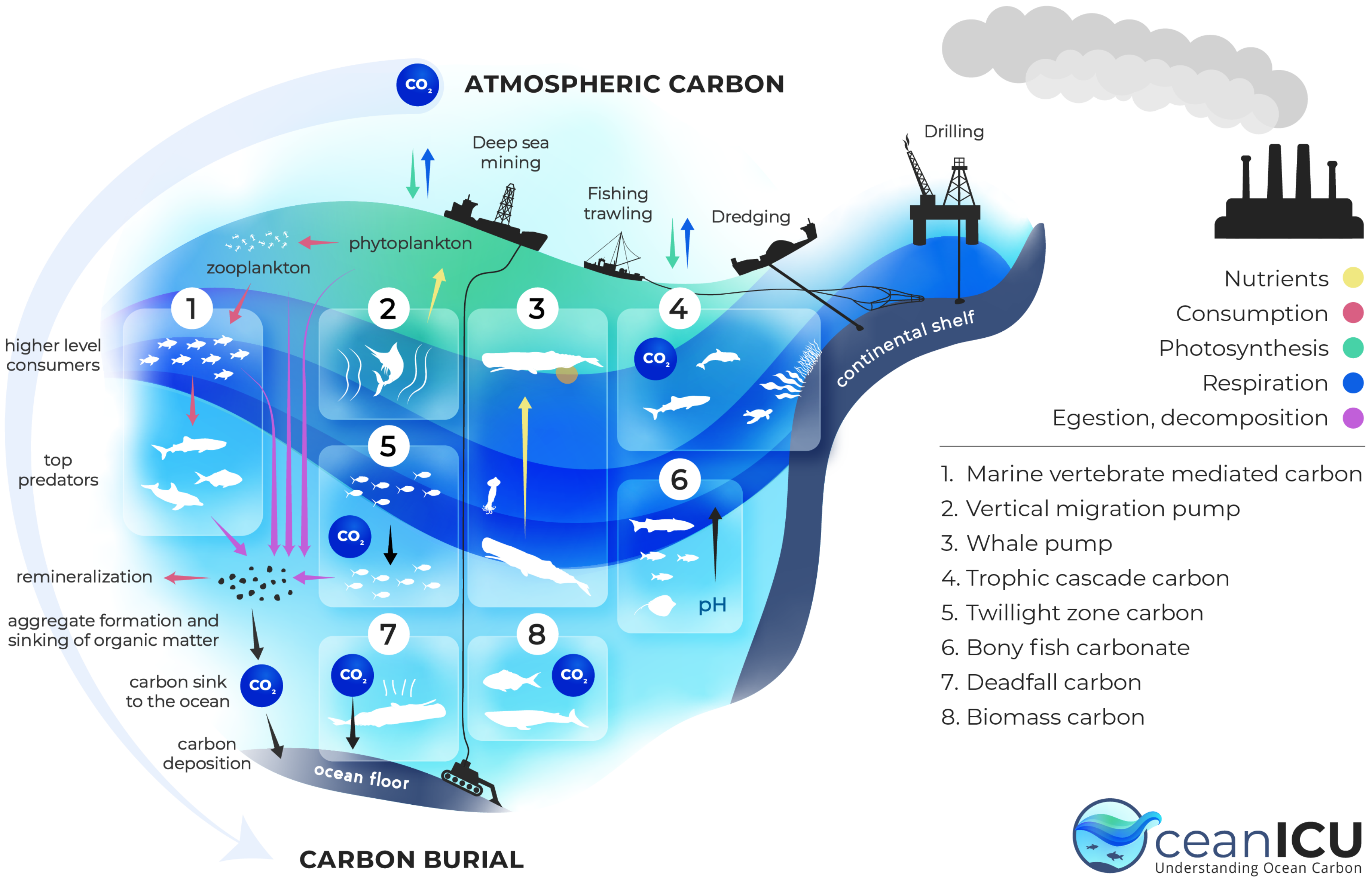
IOCR, 2022



IPCC, 2013

Current perspective is that biological and coastal C cycles are unaffected by human activity

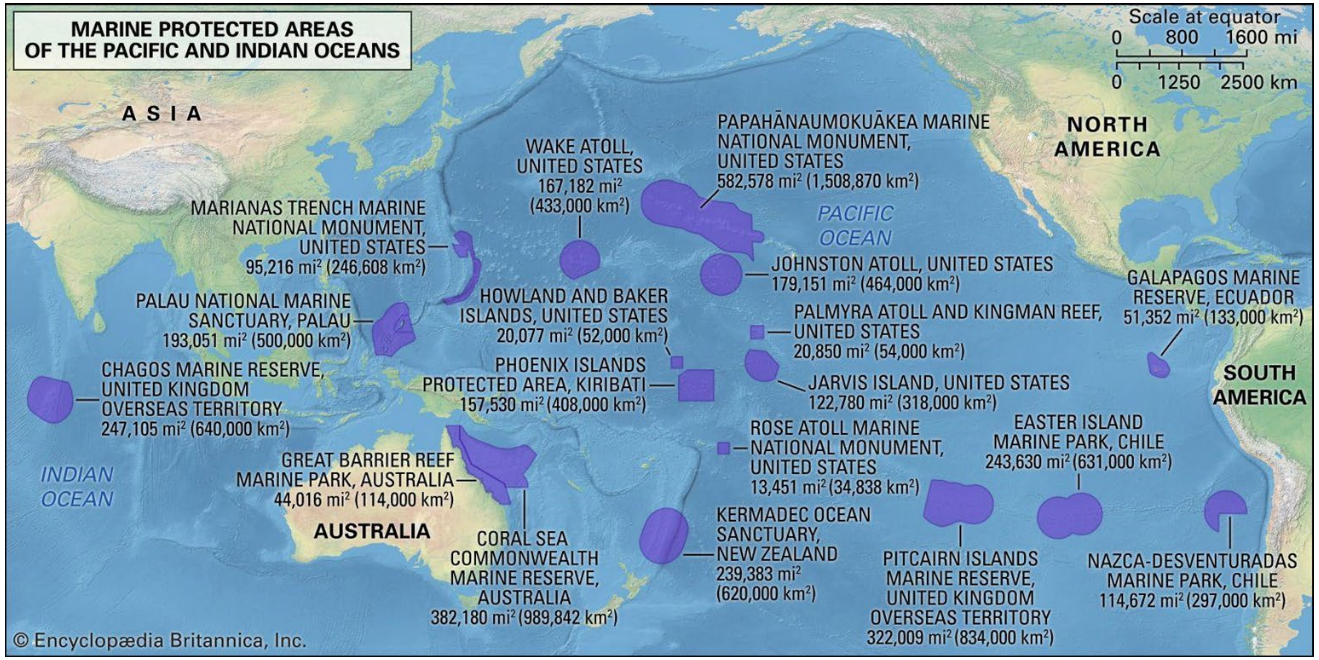
Key Issue



Infographic created by Seascape Belgium for the OceanICU Horizon Europe project, adapted from Lutz and Martin 2014, Figure 2. A conceptual diagram of marine vertebrate carbon services | Version 1.3

What is a Marine Protected Area?

- The purpose of an MPA is to protect marine ecosystems from human activities
- E.g commercial fishing, aquaculture, mining,
- MPA serves as a retreat or a safe zone for predators and other important species that live both within the MPA and in nearby areas,
- Helps to reinforce and stabilize the structure of the ecosystems they inhabit.



From www.britannica.com

So Question becomes

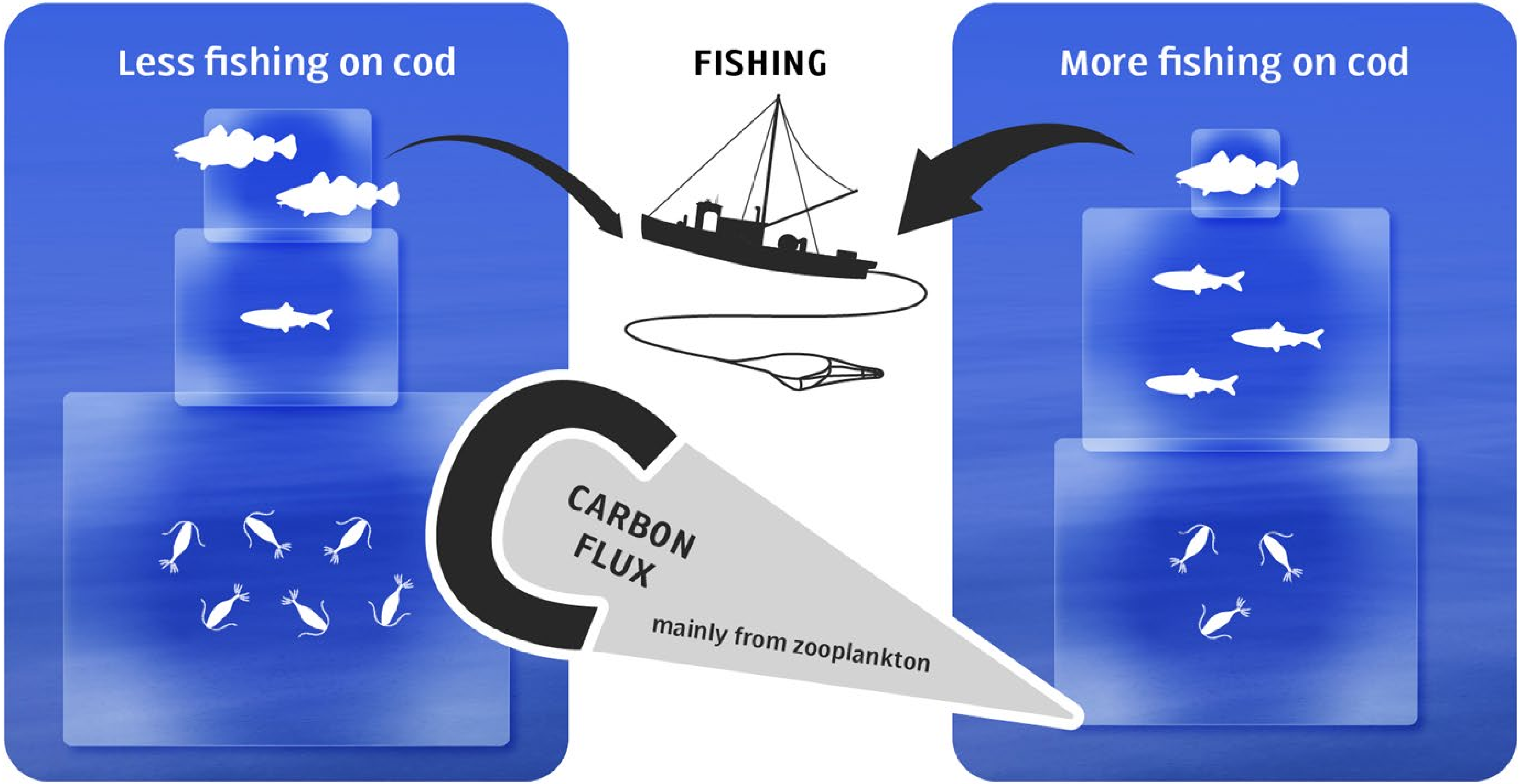
What effects do key processes in the ocean that MPAS regulate have on Ocean C cycle

<u>Fishing</u>,

- Biomass extraction
- Ecosystem restructuring
- Deadfalls

<u>Mining</u>,Trawling, Dredging and Drilling

- Sediment Generation



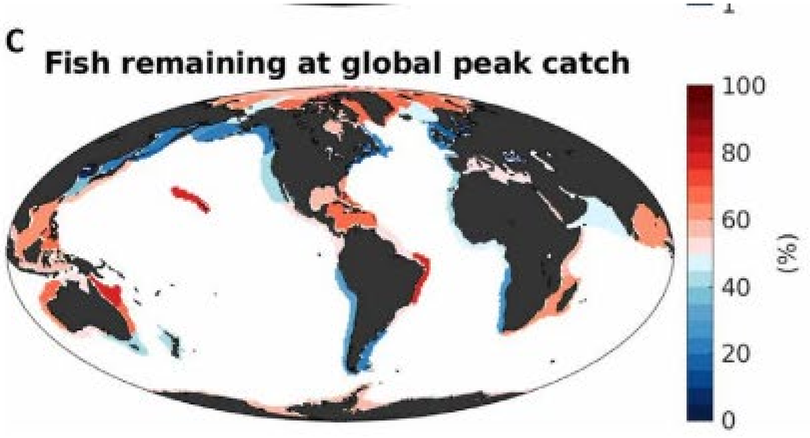
Illustrative concept on how an alteration in fishing pressure (black arrows) may result in disturbance of the Ocean carbon flux. **Left figure:** Cod grazing on herring, herring grazing on zooplankton. Difference in grazing pressure is represented by the size of the box. **Right image:** Cod grazing on herring, herring grazing on zooplankton. Difference in grazing pressure is represented by the size of the box.. High fishing pressure may cause a higher disturbance in the food chain resulting in a lower amount of zooplankton available to contribute to the burial of atmospheric carbon .

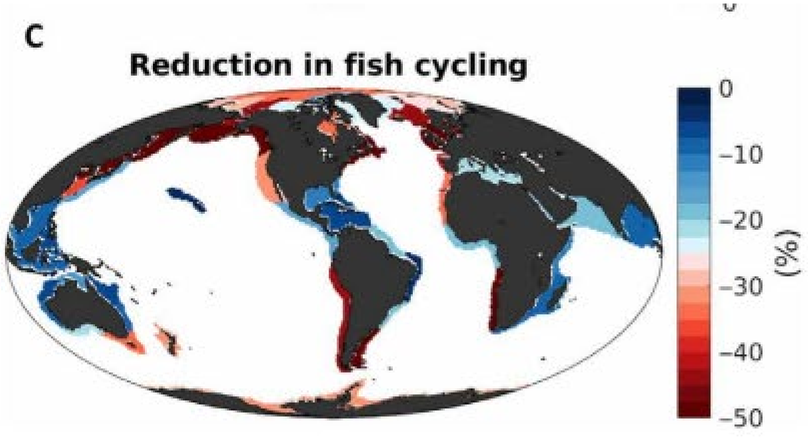
RESEARCH ARTICLE | ENVIRONMENTAL STUDIES

Estimating global biomass and biogeochemical cycling of marine fish with and without fishing

DANIELE BIANCHI, DAVID A. CAROZZA, ERIC D. GALBRAITH, JÉRÔME GUIET, AND TIMOTHY DEVRIES Authors Info & Affiliations

cycling rates. The pre-exploitation global biomass of exploited fish (10 g to 100 kg) was 3.3 ± 0.5 Gt, cycling roughly 2% of global primary production (9.4 ± 1.6 Gt year^{-1}) and producing 10% of surface biological export. Particulate organic matter produced by exploited fish drove roughly 10% of the oxygen consumption and biological carbon storage at depth. By the 1990s, biomass and cycling rates had been reduced by nearly half, suggesting that the biogeochemical impact of fisheries has been comparable to that of anthropogenic climate change. Our results highlight the importance of devel-





Effects of sediments in ocean C cycling

- Adding density to sinking material
- Altering light fields
- Remobilisation of exisitng sedimentary Carbon stocks
- Disrupting feeding behaviour of key organisms

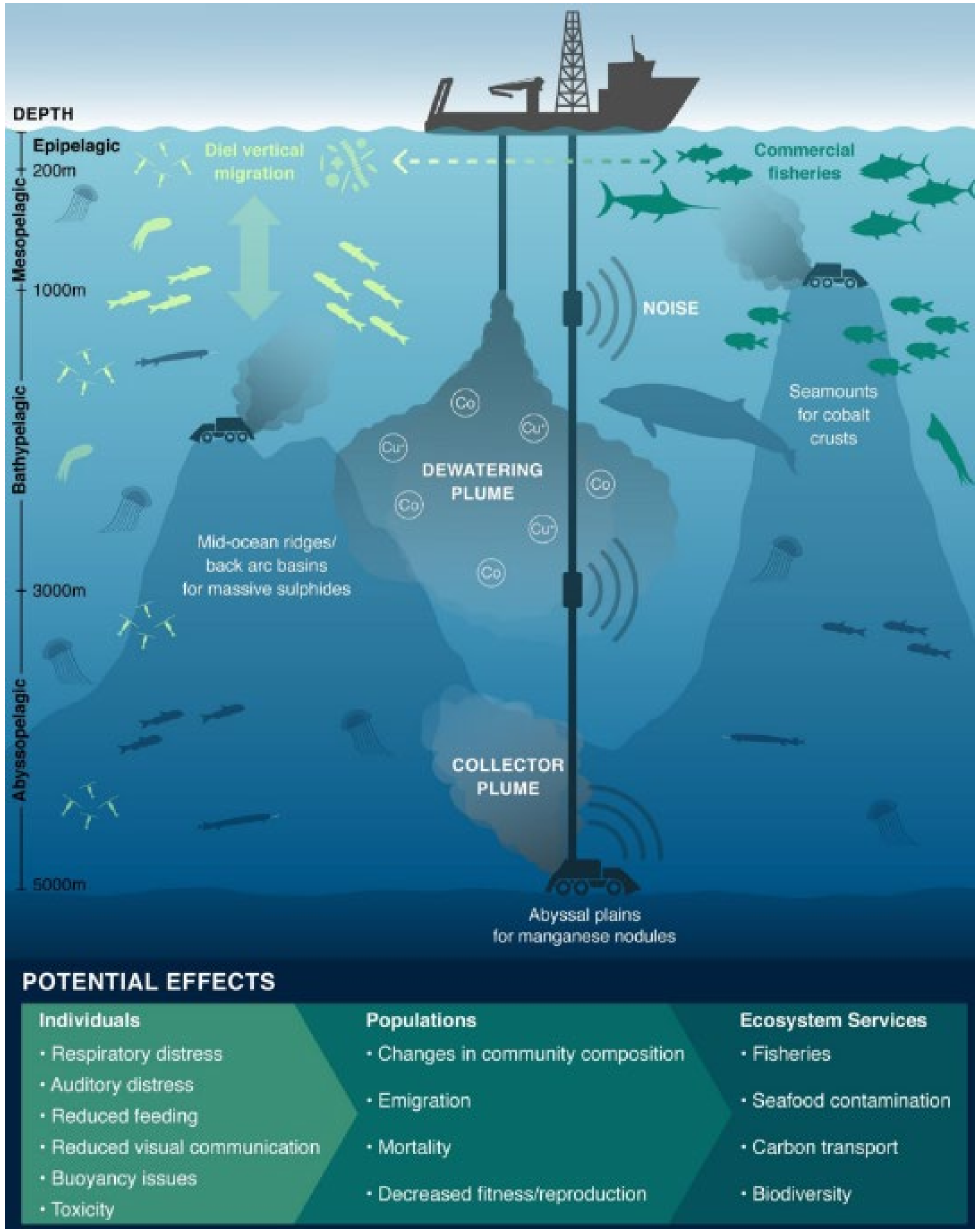
Industrial processes

OPINION | BIOLOGICAL SCIENCES |

Midwater ecosystems must be considered when evaluating environmental risks of deep-sea mining

Jeffrey C. Drazen, Craig R. Smith, Kristina M. Gjerde, +15, and Hiroyuki Yamamoto Authors Info & Affiliations

July 8, 2020 | 117 (30) 17455-17460 | https://doi.org/10.1073/pnas.2011914117



OceanICU
Understanding Ocean Carbon

Ecosystem-based approaches for Marine Spatial Planning

Marinez Scherer, Professor, UFSC
ICZM and MSP Coordinator

MINISTÉRIO DO MEIO AMBIENTE E MUDANÇA DO CLIMA
GOVERNO FEDERAL BRASIL UNIÃO E RECONSTRUÇÃO

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

By: **Mike Bartick**/ Ocean Image Bank

OceanICU

The ocean and coastal zones support life and provide the necessary ecosystem services

Ecosystem services are the benefits people obtain from ecosystems

- By: Ellen Cuylaerts/ Ocean Image Bank

Marine provisioning services
(Food, Water, Minerals)

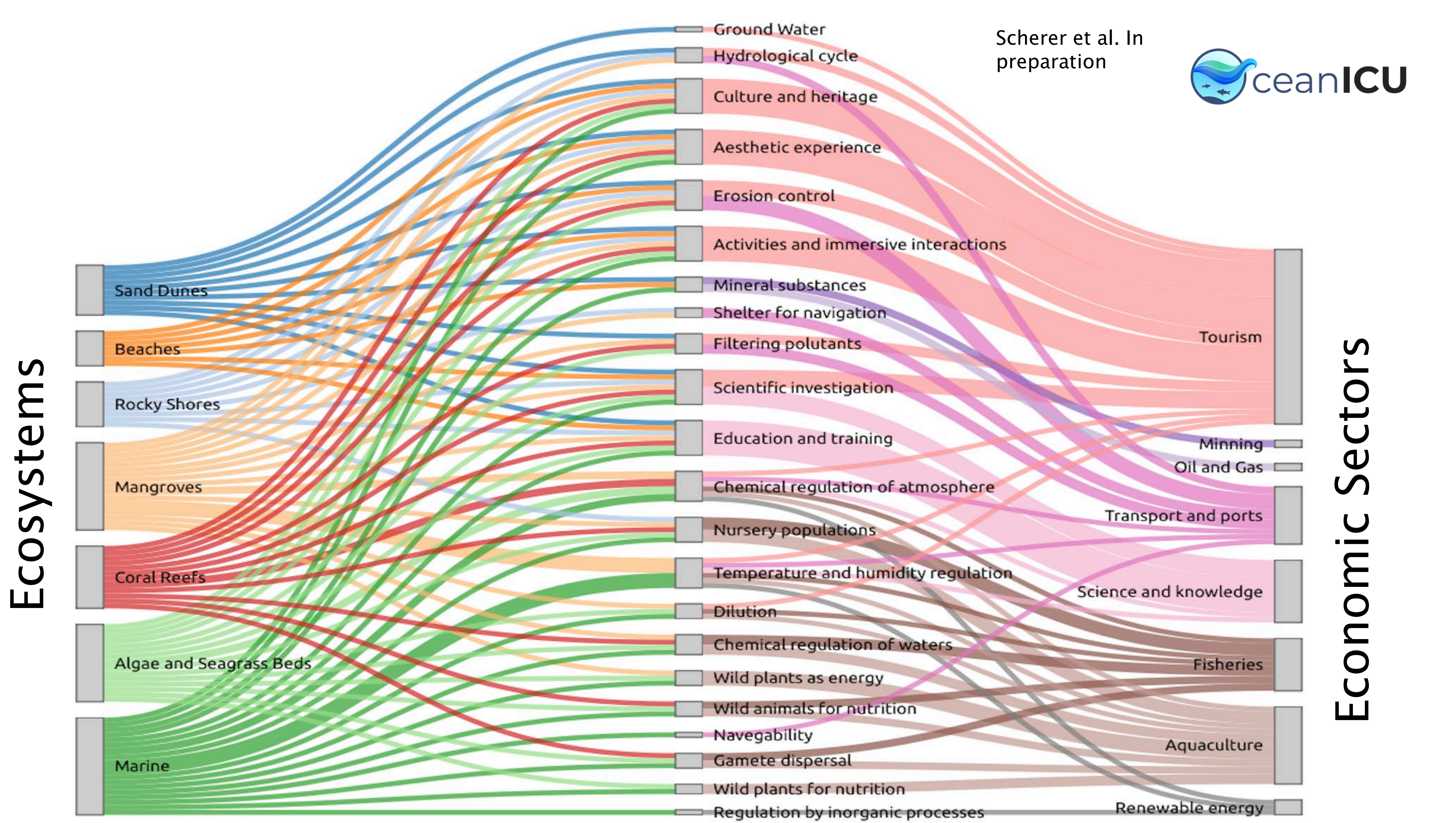
Marine regulating services
(Climate regulation, erosion control)

Marine supporting services
(Nutrient cycling, Primary Production)

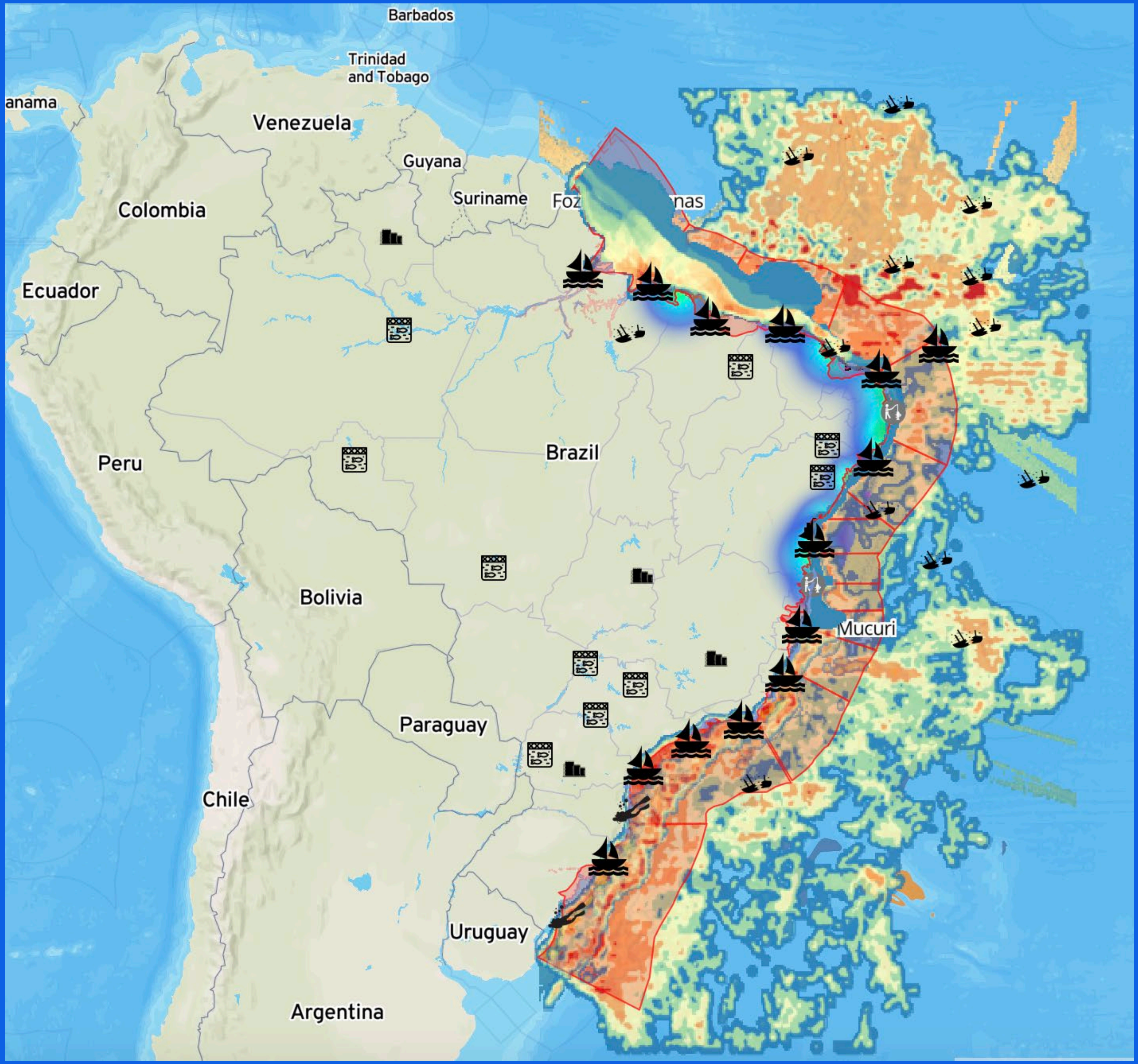
Marine Cultural Services
(Aesthetic**, Recreational, Spiritual)**

OceanICU

BLUE SOLUTIONS



Ecosystem Services



Source: SeaSketch Brazil

Main Impacts of Human Uses and Activities at Sea

OceanICU

- Climate Change
- Overfishing
- Urban and industrial contamination
- Solid waste (plastics)
- Habitat suppression and degradation
- Non (or not well) planned tourism and urbanization
- Impacts arising from the extraction of natural resources - oil and gas, minerals
- Emissions from maritime transport and port structure
- Unplanned Offshore Wind Power Generation

In: Iwanicki (2020)

https://pixabay.com/pt/photos/internet-segura-esp%C3%ADrito-rede-3289548/

OceanICU

What's the Problem?

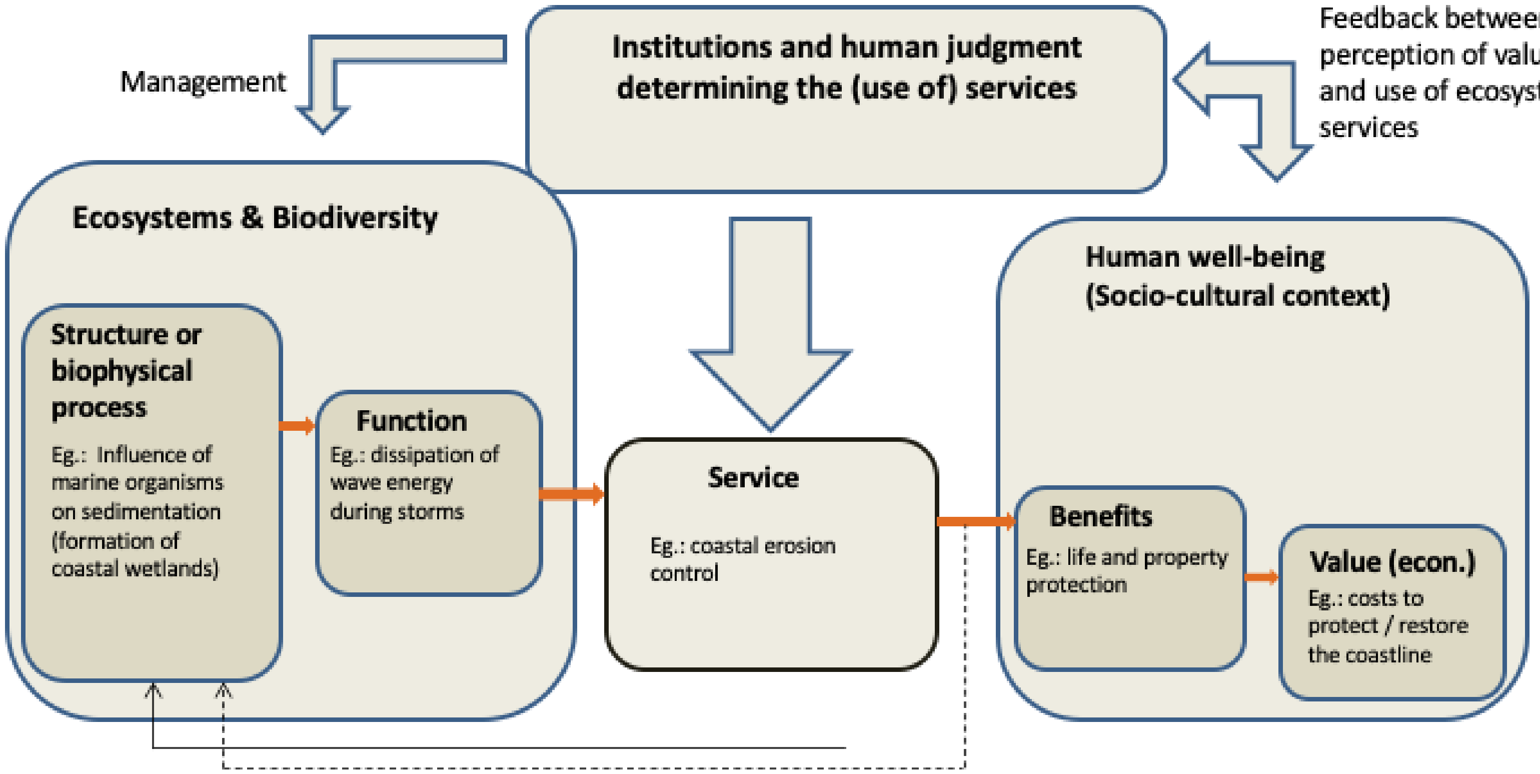
RISK OF LOSING ECOSYSTEM SERVICES (ecosystem health and social well-being)

MINISTÉRIO DO MEIO AMBIENTE E MUDANÇA DO CLIMA

GOVERNO FEDERAL BRASIL UNIÃO E RECONSTRUÇÃO

Links between biodiversity, ecosystem services and human well-being

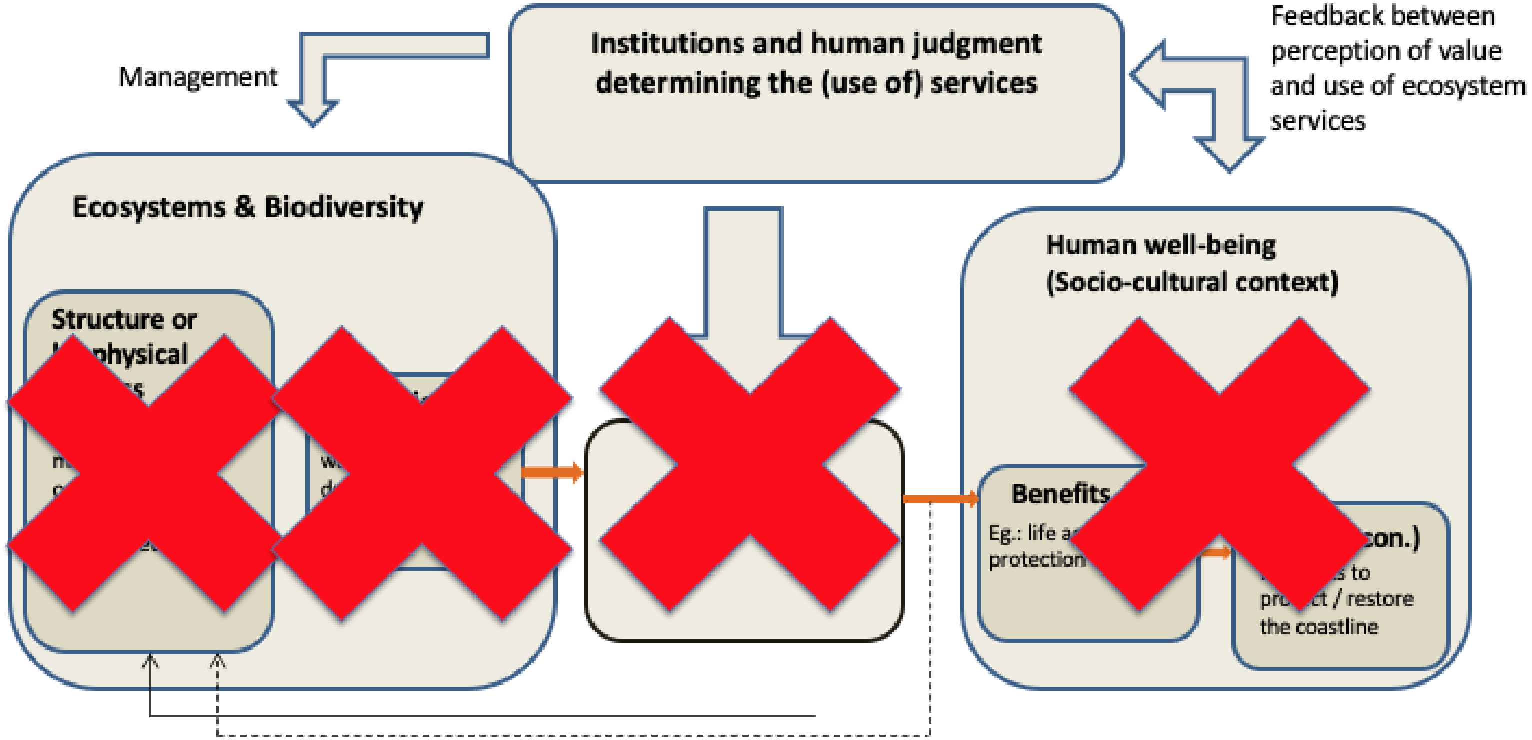
- Biodiversity, ecosystem services and human well-being influence each other.



Based on: HAINES-YOUNG, R., POTSCHIN, M. The links between biodiversity, ecosystem services and human well-being. Ch 7. In: Raffaelli, D., Frid, C. (Eds.), Ecosystem Ecology: A New Synthesis. BES Ecological Reviews Series, CUP, Cambridge, 2009.

Links between biodiversity, ecosystem services and human well-being

- **What happens when one of the links is broken?**

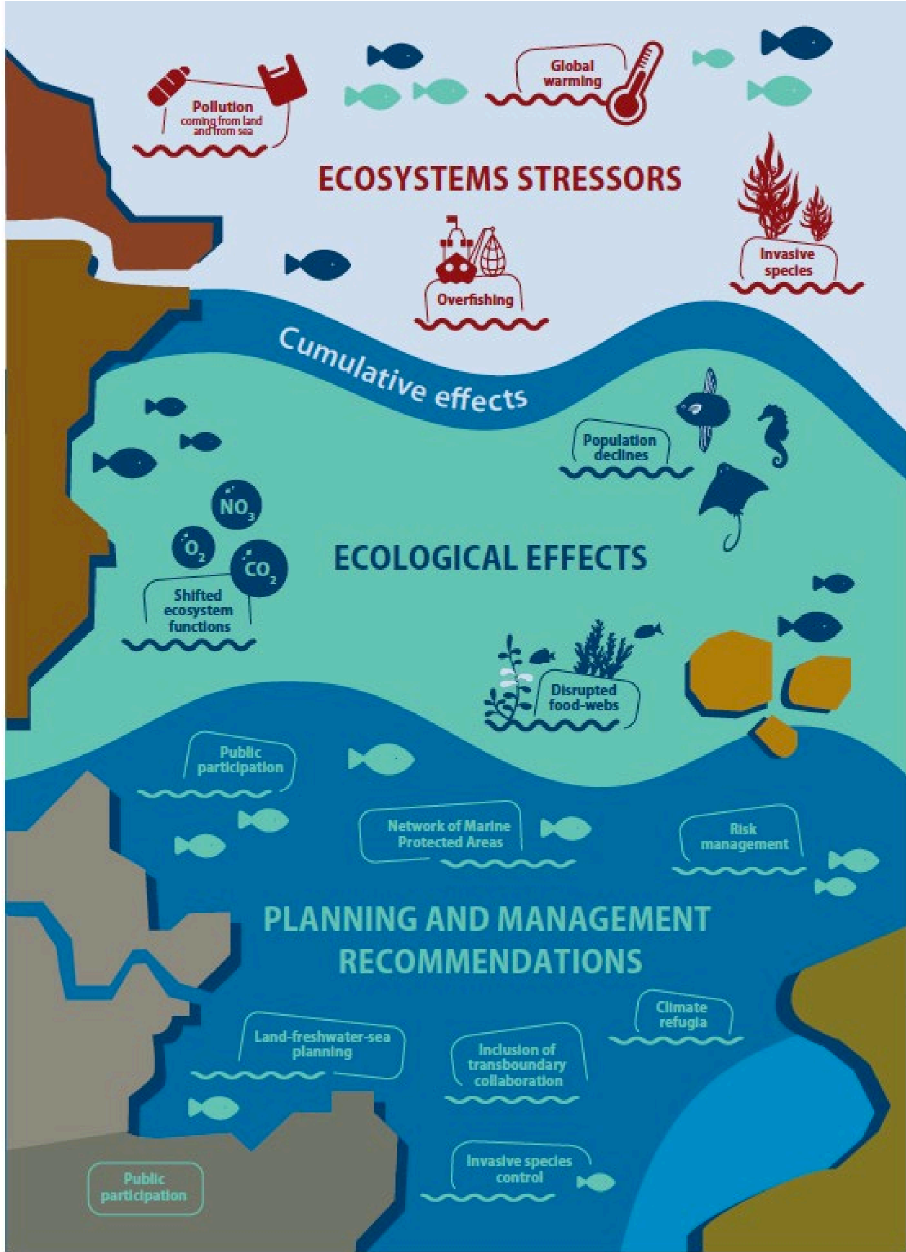


Based on: HAINES-YOUNG, R., POTSCHIN, M. The links between biodiversity, ecosystem services and human well-being. Ch 7. In: Raffaelli, D., Frid, C. (Eds.), Ecosystem Ecology: A New Synthesis. BES Ecological Reviews Series, CUP, Cambridge, 2009.

MSP need to be Ecosystem-based

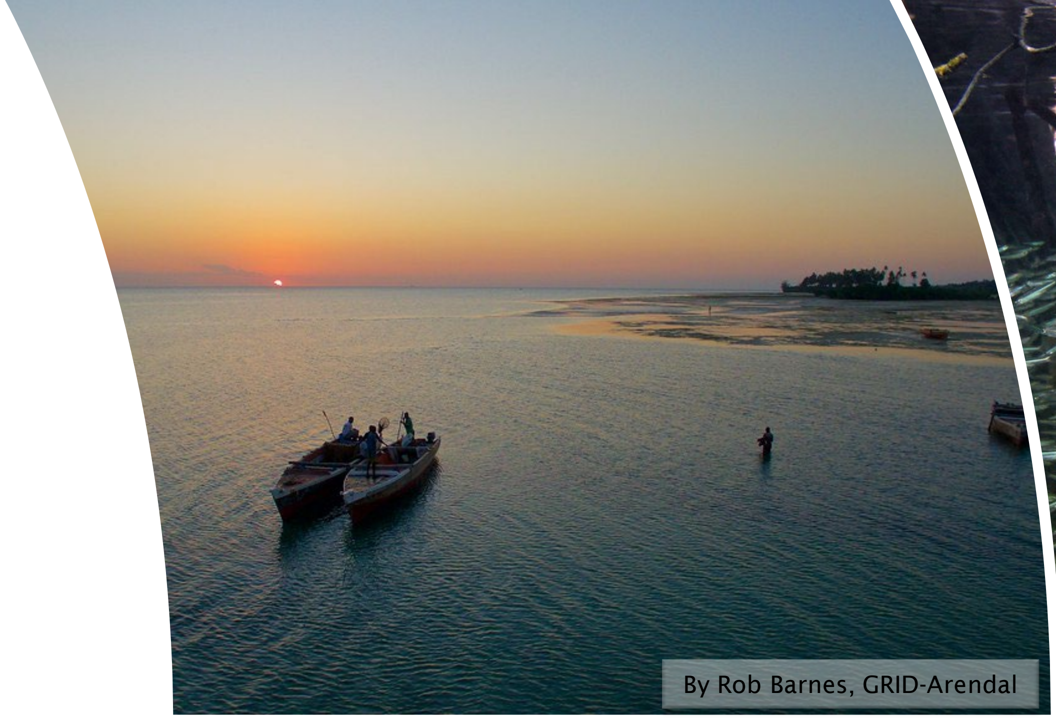
Principles of MSP

1. **Based on ecosystems**, balancing ecological, economic and social goals and objectives towards sustainable development
2. **Integrated**, across sectors and agencies, and across levels of government
3. **Based on location or area**
4. **Adaptable**, able to learn from experience
5. **Strategic** and **anticipatory**, with a focus on the long term
6. **Participatory**, stakeholders actively involved in the process



(Charles and Douvere, 2009 / UNESCO).

Ecosystem service information must be incorporated into MSP



By Rob Barnes, GRID-Arendal

By Christian Perthen, GRID-Arendal

By Yannick Beadoin , GRID-Arendal

By Lawrence Hislop, GRID-Arendal

BLUE SOLUTIONS

Different countries, regions and cultures use ES in MSP differently

- Increase **public recognition** of value of ocean and coasts.
- Identify **key areas** needing protection.
- Help **guide** development/Sustainable **Ocean Economy**.
- Allow decision-makers to **understand trade-offs**.
- **Monitor the health of the environment** (and our own well-being).

By Ju Yung Ki, GRID-Arenda

OceanICU

BLUE SOLUTIONS

Dr. Marinez Scherer – MMA/DOceano

MINISTÉRIO DO
MEIO AMBIENTE E
MUDANÇA DO CLIMA

GOVERNO FEDERAL
BRASIL
UNIÃO E RECONSTRUÇÃO

OceanICU
Understanding Ocean Carbon

Questions & Answers

Visit ocean-icu.eu | hello@ocean-icu.eu
Stay up-to-date with the latest news

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

OceanICU
Understanding Ocean Carbon

International Marine Protected Areas in the High Seas – How and Why?

Dr. Patrick Lehodey
Senior Climate Fisheries Scientist
Mercator Ocean international www.mercator-ocean.eu
The Pacific Community www.spc.int

MERCATOR OCEAN INTERNATIONAL

Pacific Community
Communauté du Pacifique

Marine Protected Areas (MPAs) Role in Meeting Climate Change Goals: Investigating and Protecting Blue Carbon in MPAs

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

Context

Human activity has strong impacts on the Ocean

- Pollutions
  climate change (CO_2 and other GHG); plastic; oil spills; noise; radionuclides; heavy metals

- Habitat destruction
  Deep sea trawling; sea-bed mining

- Exploitations by High Sea fisheries

Can High Seas MPAs help to reduce this impact?

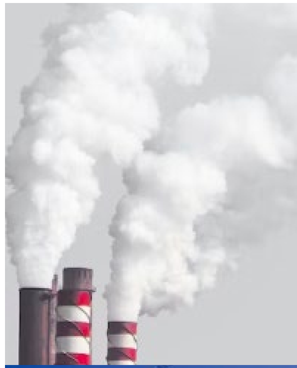
High Sea Fisheries: the case of tunas

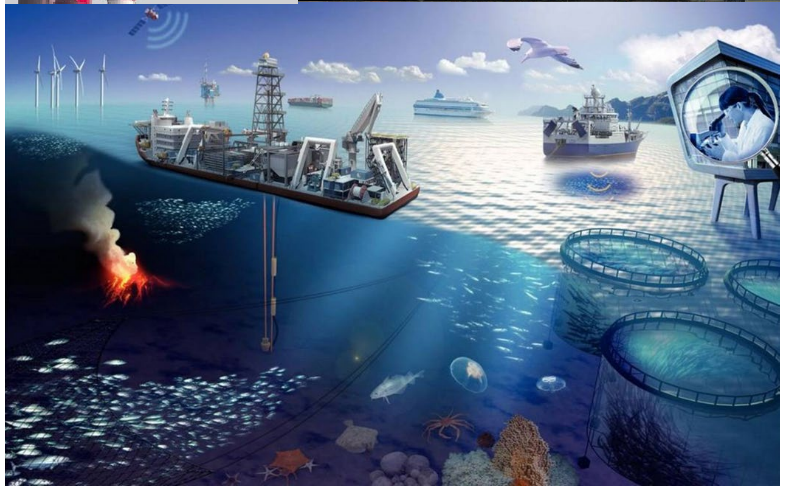
unesco

With the "High Seas Treaty" on biodiversity signed, what do we need to do next?

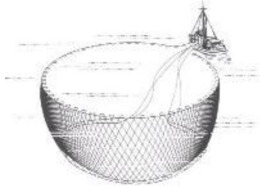
Representatives of over 80 countries have already signed the long-awaited Biodiversity Beyond National Jurisdiction (BBNJ) Agreement, or the "High Seas Treaty". But what is needed to ensure that this historic agreement actually brings desired results?

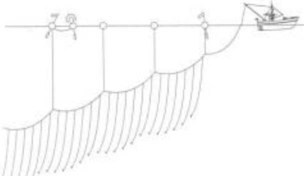
Shutterstock



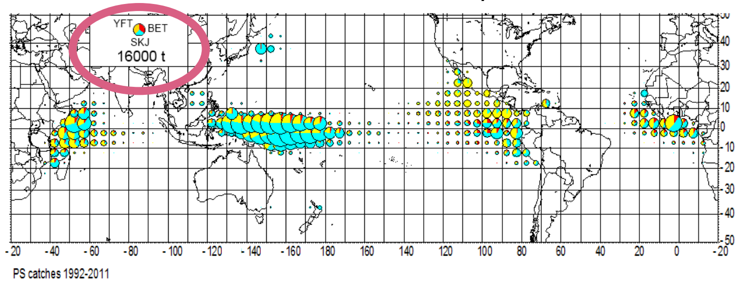


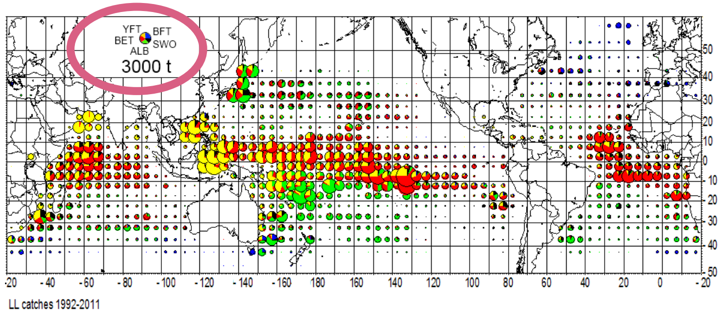
High Seas Tuna fisheries

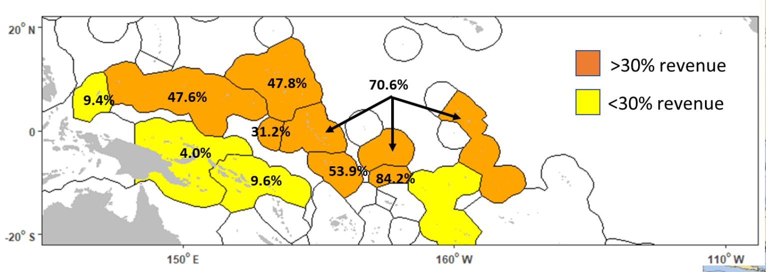




Kindly from A. Fonteneau







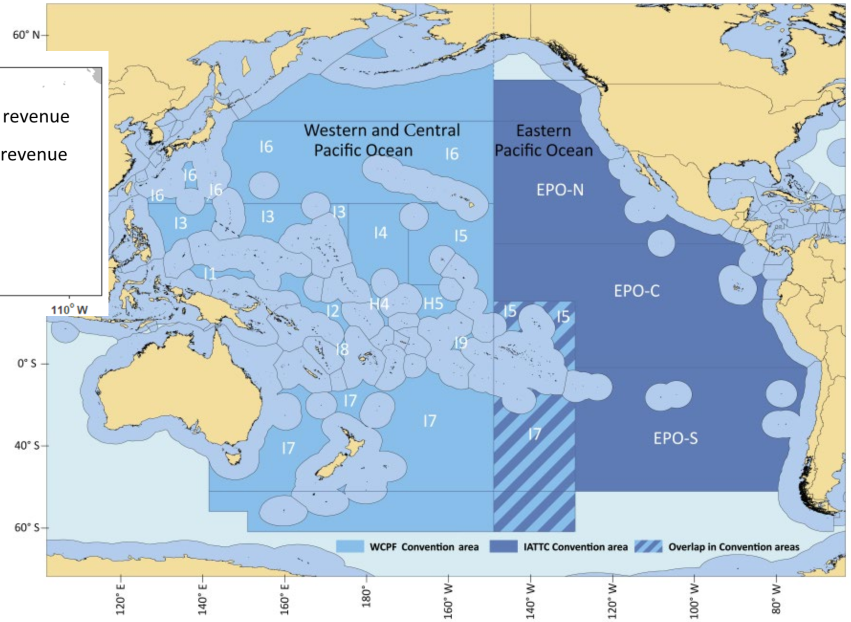
nature sustainability

ANALYSIS

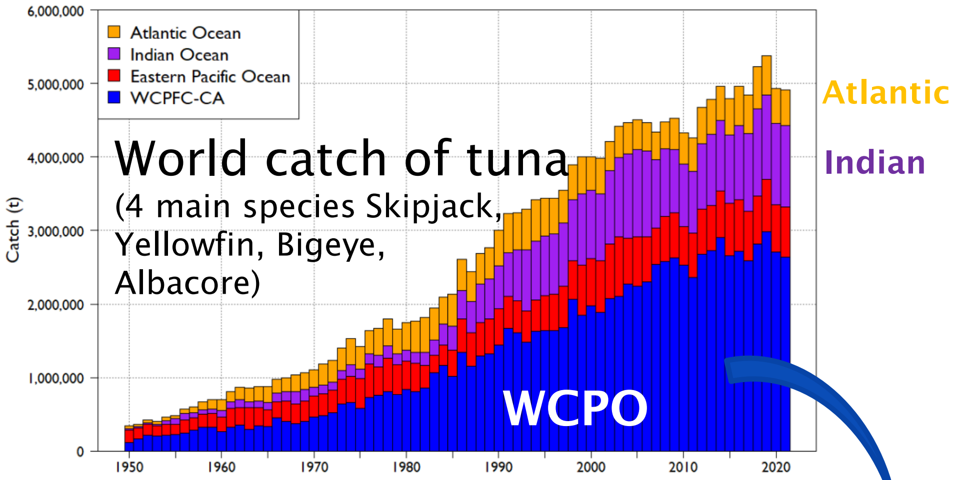
https://doi.org/10.1038/s41893-021-00745-z

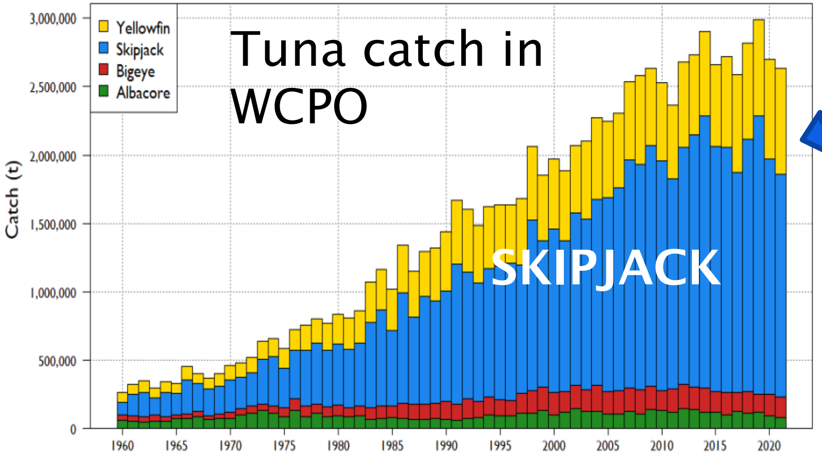
OPEN

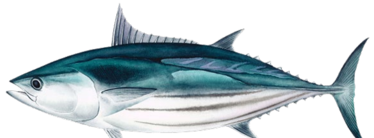
Pathways to sustaining tuna-dependent Pacific Island economies during climate change



World largest tuna fishery



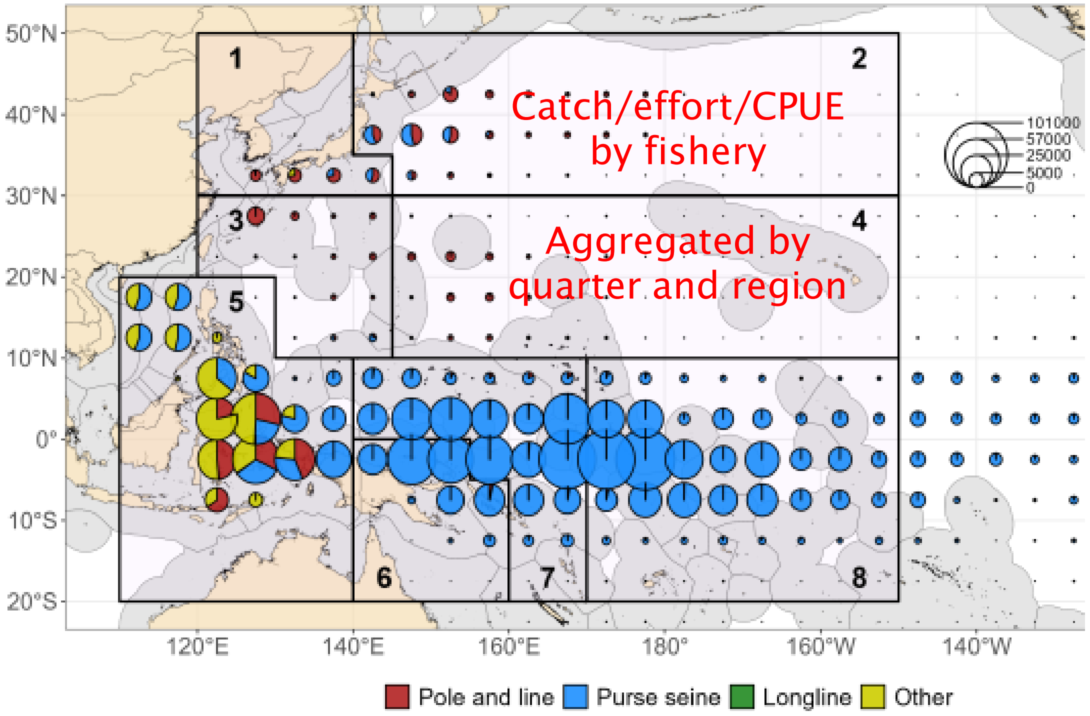


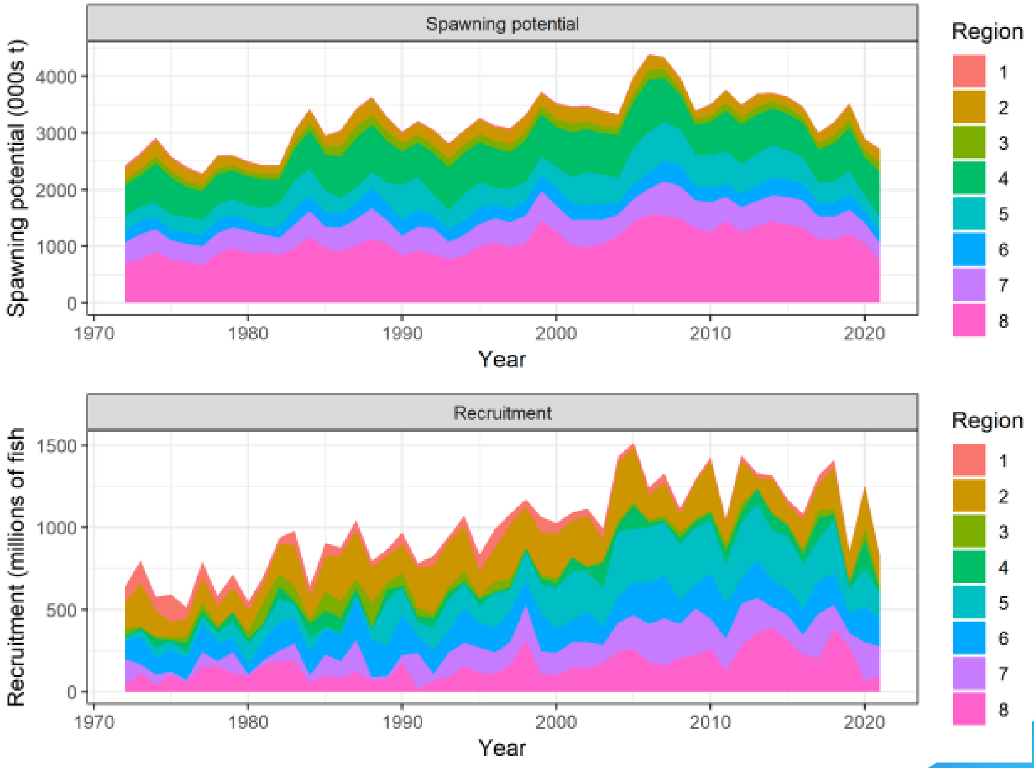


In MPA, there is … AREA

Introducing Spatial Management Measures is a challenge!
How to measure the impact?

- Standard stock assessment models use one or a few large regions
- There is no spatially-explicit dynamics in these models
- Some have bulk transfer between boxes
- No environmental drivers



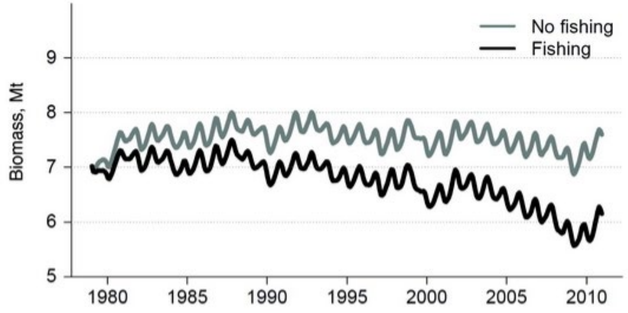


Standard stock assessment (e.g., MULTIFAN-CL; Stock Synthesis)

New tools

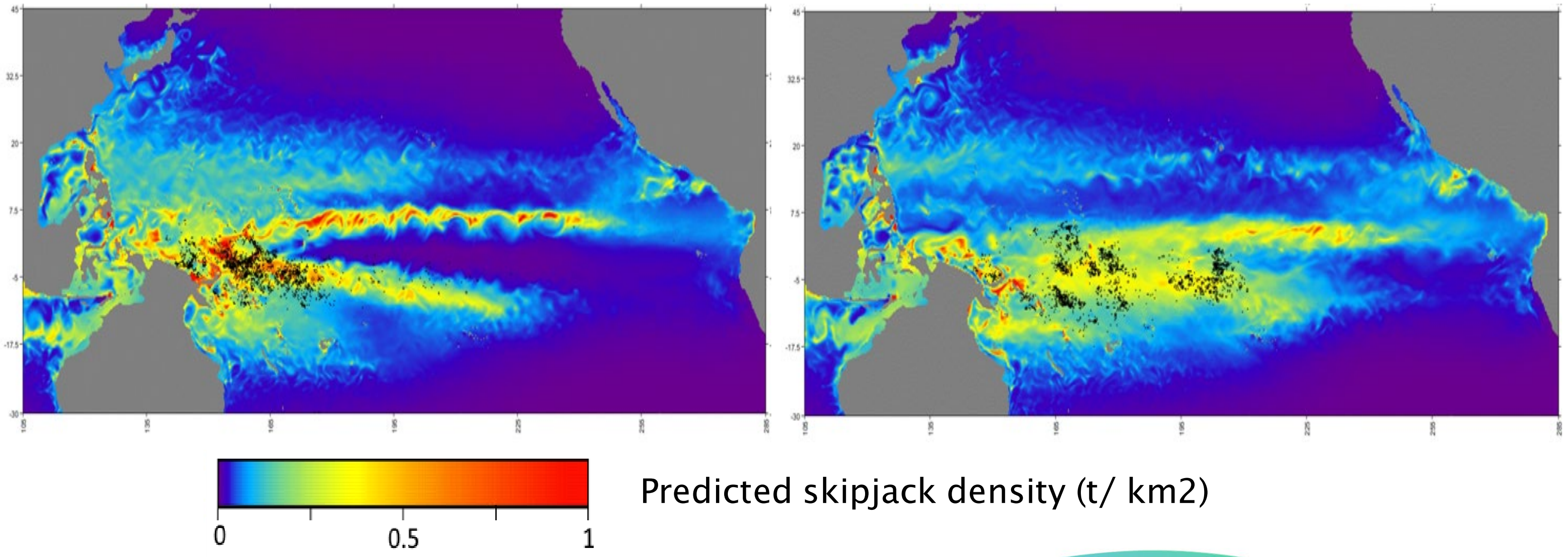
Spatial Ecosystem And Population Dynamics Model (SEAPODYM)

A different approach to simulate spatial fish dynamics predicting distribution and movement of each cohort by taking into account the relationships between the species (by age) and the environnement (temperature preference, presence of food …)



Mid-Dec 2007 (La Niña)

Mid-Dec 2015 (El Niño)



Predicted skipjack density (t/ km2)

Density (t/km²) of skipjack (exploitable stock : 30-70 cm FL) and total observed monthly catch (black circles)

Senina I., Lehodey P., Sibert J., Hampton J., (2020) Improving predictions of a spatially explicit fish population dynamics model using tagging data. Canadian Journal of Aquatic and Fisheries Sciences, 77(3): 576-593, https://doi.org/10.1139/cjfas-2018-0470

Testing High Seas MPA scenarios

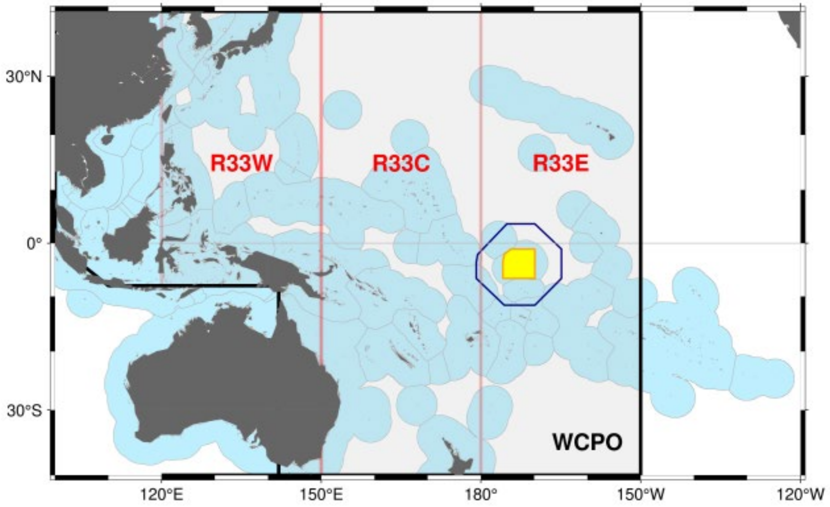
Real MPA implementation

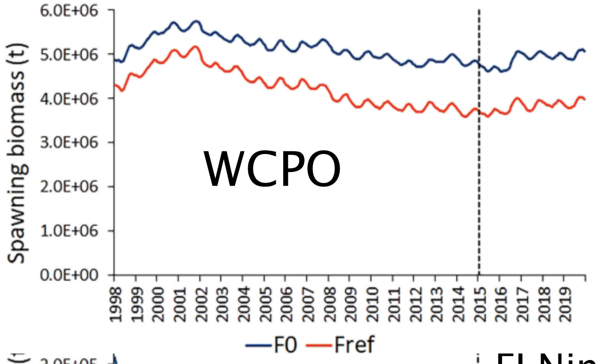
We tested the conservation benefits of the fishing closure in the **Phoenix Islands Protected Area (PIPA)** by comparing change in spawning biomass due to fishing impact using 2 simulations:

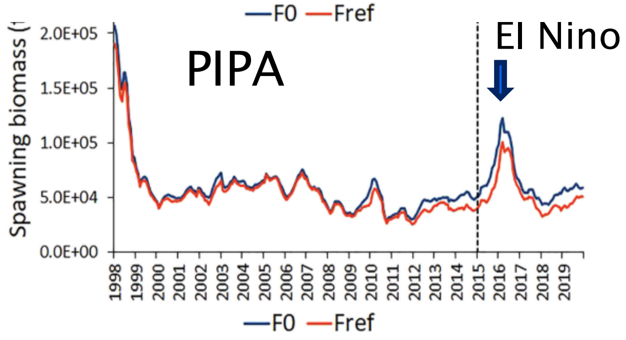
1- reference using all observed fishing efforts (Fref)

2- same configuration but without fishing at all (F0).

Name	Size (km²)	Date declared	Designation	Prior tuna catch level (t)
Marae Moana	1,900,000	13 Jul 2013	Multiple-use MPA	~12,000
Papahānaumokuākea National Marine Monument	1,508,870	15 Jun 2006	Commercial no-take	~3,000
Pacific Remote Islands Marine National Monument	1,282,534	1 Jan 2009, extended 2014	Commercial no-take	~4,000
Natural Park of the Coral Sea	1,270,000	23 Apr 2014	Multiple-use MPA, with no-take zones	~2,000
Coral Sea Marine Park	989,836	1 Jul 2018	Multiple-use MPA, with commercial no-take zones (238,400 km²)	<1,000
Pitcairn Islands Marine Reserve	840,000	18 Mar 2015	Commercial no-take	<100
Palau National Marine Sanctuary	475,077	1 Jan 2020	Commercial no-take	~9,000
Phoenix Islands Protected Area	405,755	1 Jan 2015	Commercial no-take	~100,000







Impact of fishing on skipjack tuna SB in the PIPA:

increasing from -7% in 1998 to -22% in 2014

An average of -19% during the closure period 2015-2019 despite no fishing in the area.

frontiers | Frontiers in Marine Science
TYPE Original Research
PUBLISHED 10 January 2023
DOI 10.3389/fmars.2022.1060943

Limited conservation efficacy of large-scale marine protected areas for Pacific skipjack and bigeye tunas

John Hampton[1*], Patrick Lehodey[1,2], Inna Senina[1], Simon Nicol[1,3], Joe Scutt Phillips[1] and Kaon Tiamere[4]

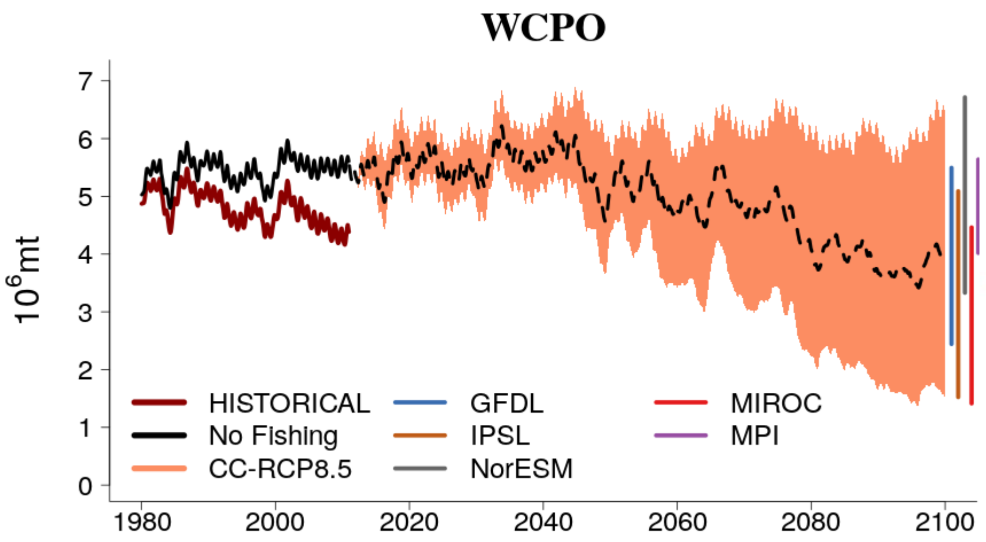
[1]Oceanic Fisheries Programme, Pacific Community, Noumea, New Caledonia, [2]Mercator Ocean International, Toulouse, France, [3]Centre for Conservation Biology and Genomics and the Institute for Applied Ecology, University of Canberra, Bruce, ACT, Australia, [4]Ministry of Fisheries and Marine Resources Development, Bairiki, Kiribati

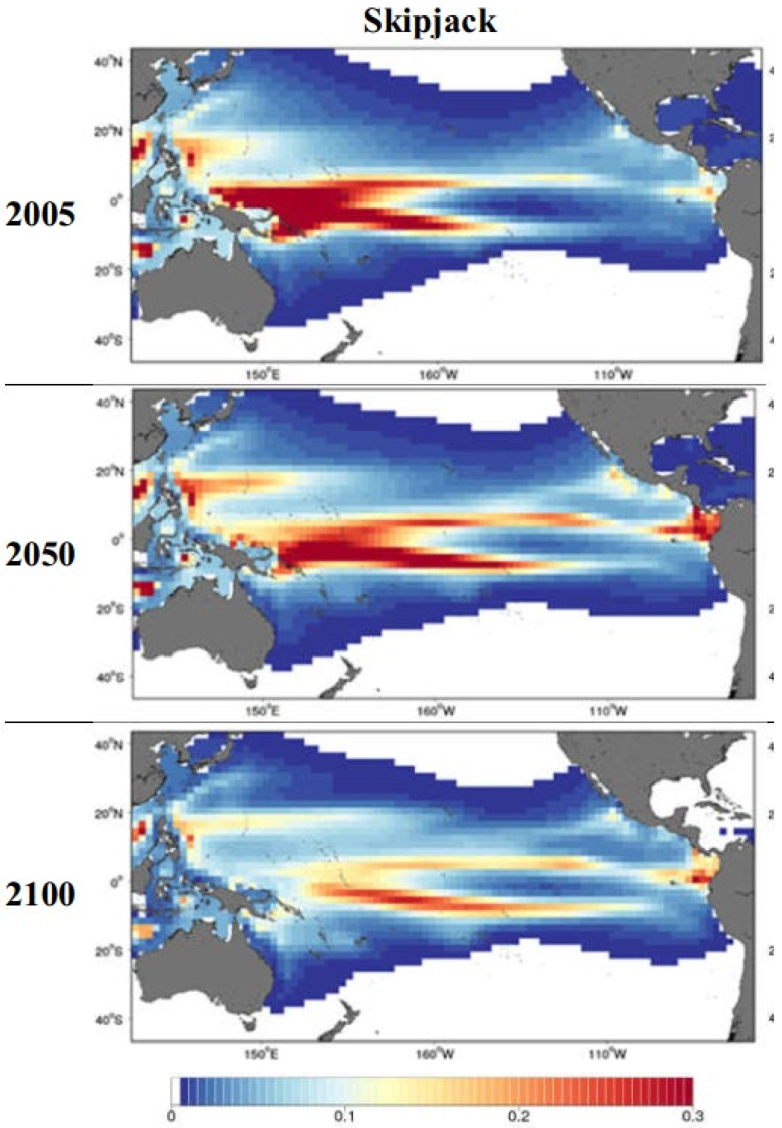
Testing High Seas MPA scenarios

Area Closure(s) under Climate Change scenarios

We use atmospheric forcings from climate models developed for IPCC studies, using IPCC future scenarios of greenhouse gas release) to drive our ocean (physical-biogeochemical) model and then seapodym.

<u>Domain</u>: Pacific O.
<u>Resolution</u>: 2 deg x month
<u>No fishing</u>
<u>Species</u>: skipjack
(yellowfin, bigeye, albacore)





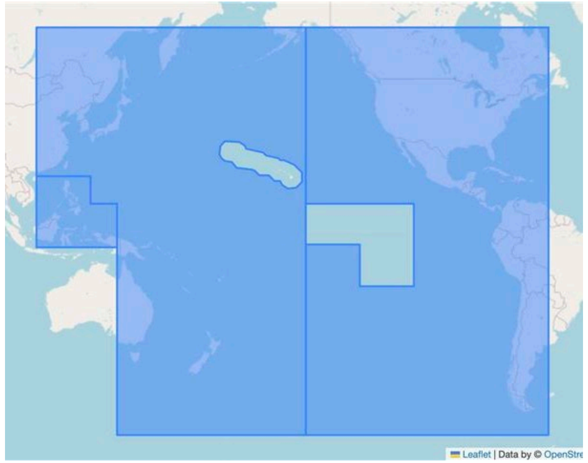
Key result:

- Decreasing in the west
- shift to central and eastern Pacific;
- more in High Seas & less in EEZs
- Fishing still the highest impact at least until 2050

Testing High Seas MPA scenarios

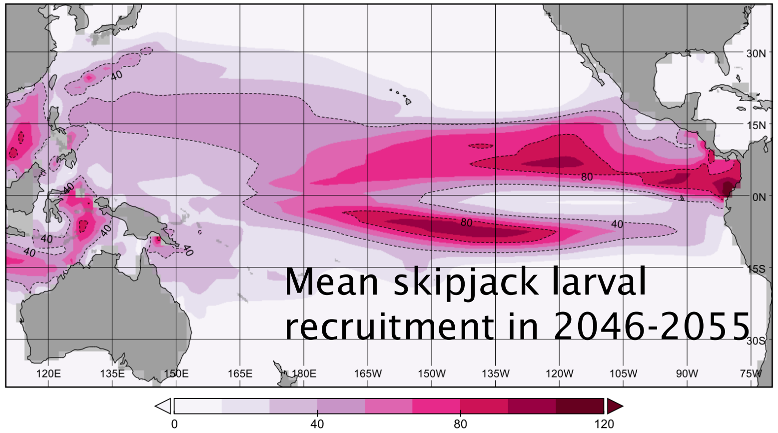
Area Closure(s) under Climate Change scenarios

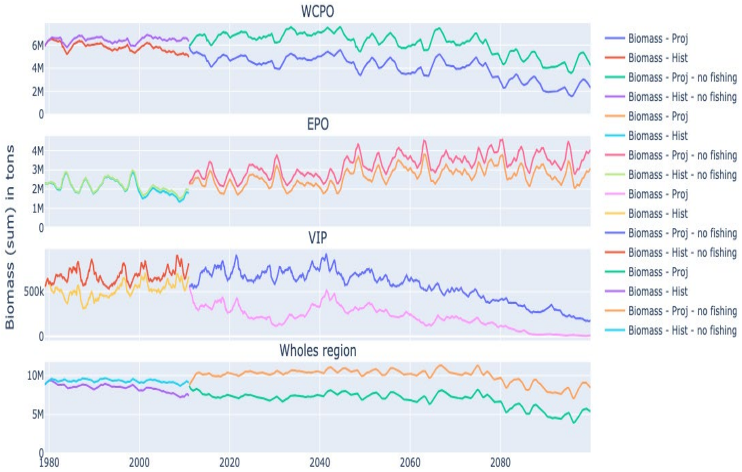
A simple fishing scenario tool is developed including CC scenarios, target annual catch by large region and fishing closure area options



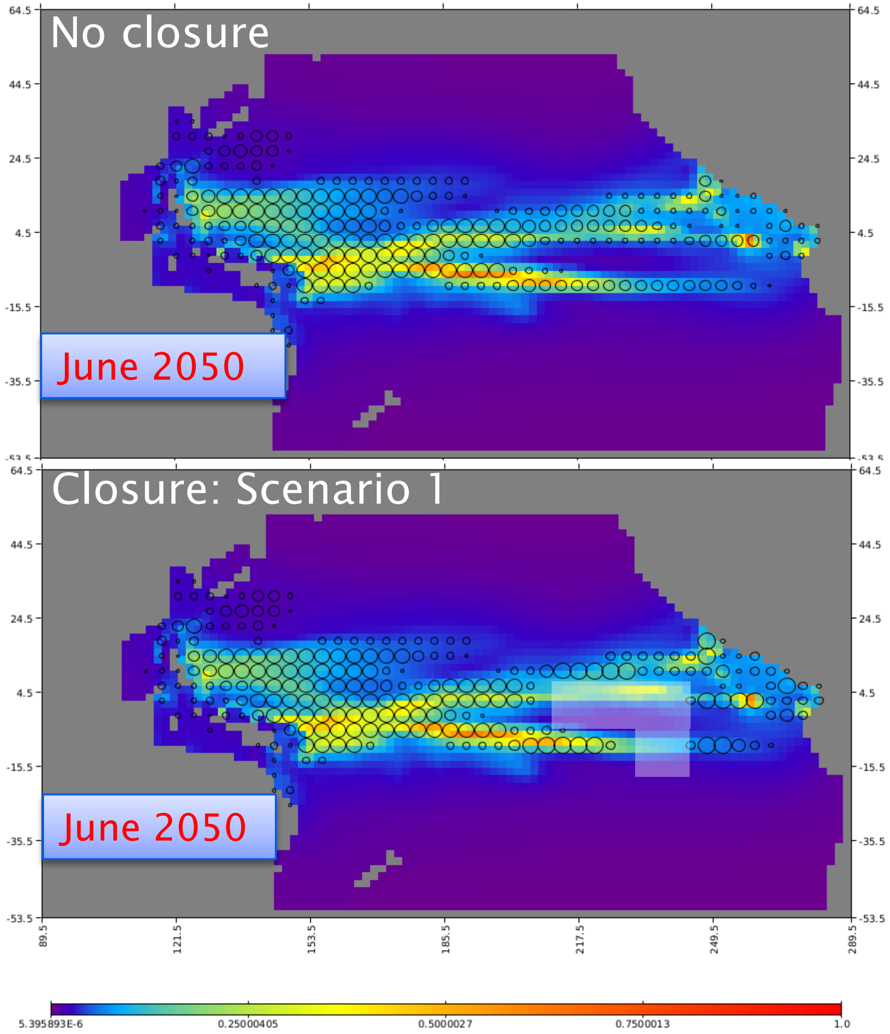
- ❑ RCP 2.6
- ❑ RCP 4.5
- ✓ RCP 8.5

- ❑ IPSL
- ✓ GFDL
- ❑ MPI
- ❑ NORESM





Predicted Pacific skipjack catch (circles) over total biomass



Conclusions

Benefit of High Seas MPA for tuna conservation

- Limited in the absence of control of (displaced) fishing effort, due to highy-migratory nature and wide-distribution of these species
- Key uncertainties to improve our understanding and tools to test HS MPA:
  - Environmental factors controling the Reproduction, Spawning grounds and Behaviour
  - How they are changing and will change in the future with Climate Change

Other potential Benefits of HS MPA

- Can help to monitor and control fishing effort in remote areas
- A way to maintain fishing activity in Pacific Islands EEZs, allowing to:
  - Keep the economical revenue of small developing Pac. Is. Countries
  - Limit fuel consumption by limiting access to remote HS areas
- Can be designed in regards of other key conservation issues:
  - Reducing impact on by catch and protected species in high biodiversity spots/corridors
  - Reducing pollution
  - Limiting impact in subsurface (seamounts and other habitats related to topographic features)

OceanICU
Understanding Ocean Carbon

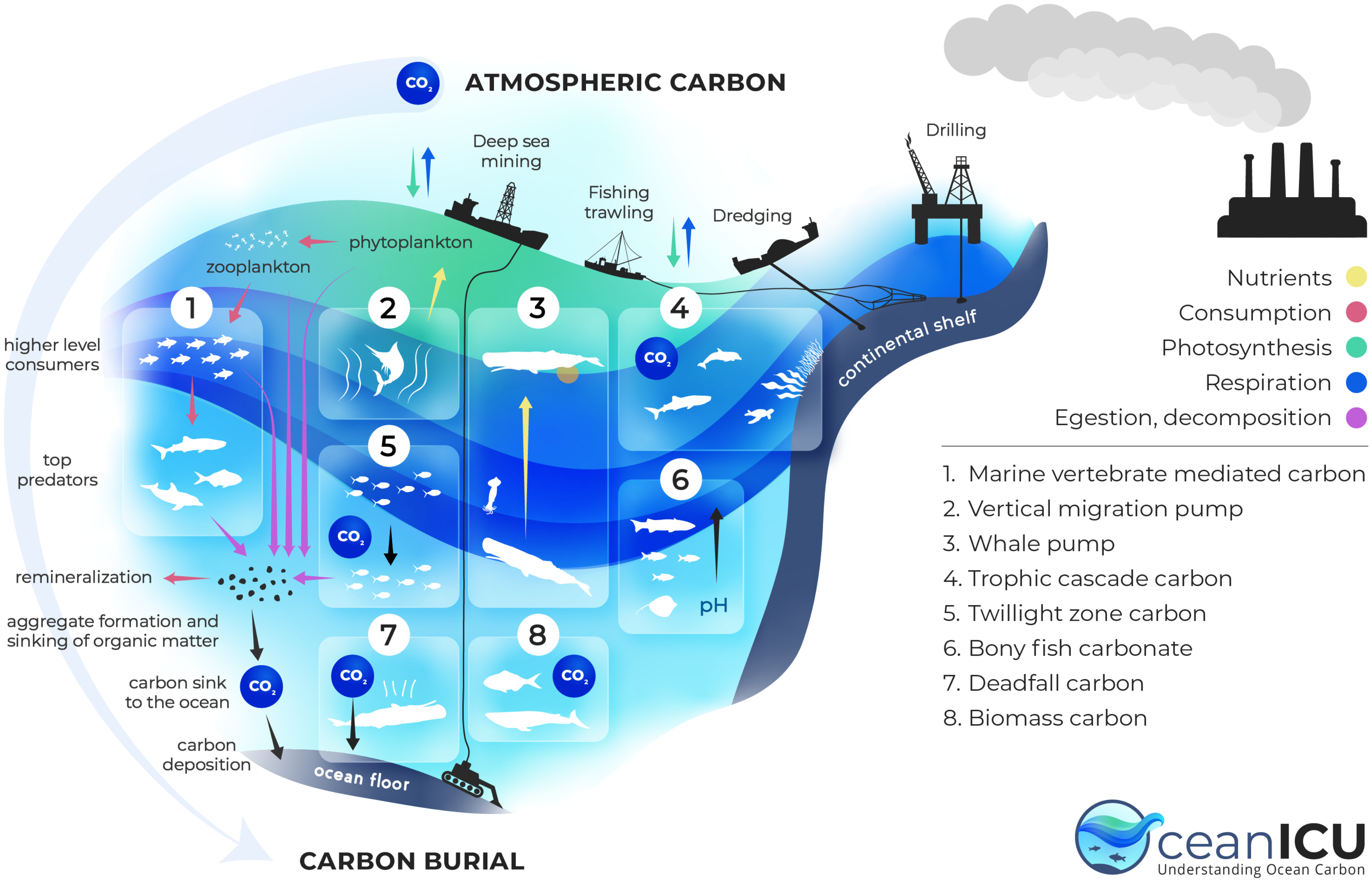
The biological carbon pump and its carbon sequestration: Implications for management and climate finance

Dr. Fabio Berzaghi - fab@wmu.se

WORLD MARITIME UNIVERSITY

MEESO
Ecologically and Economically Sustainable Mesopelagic Fisheries

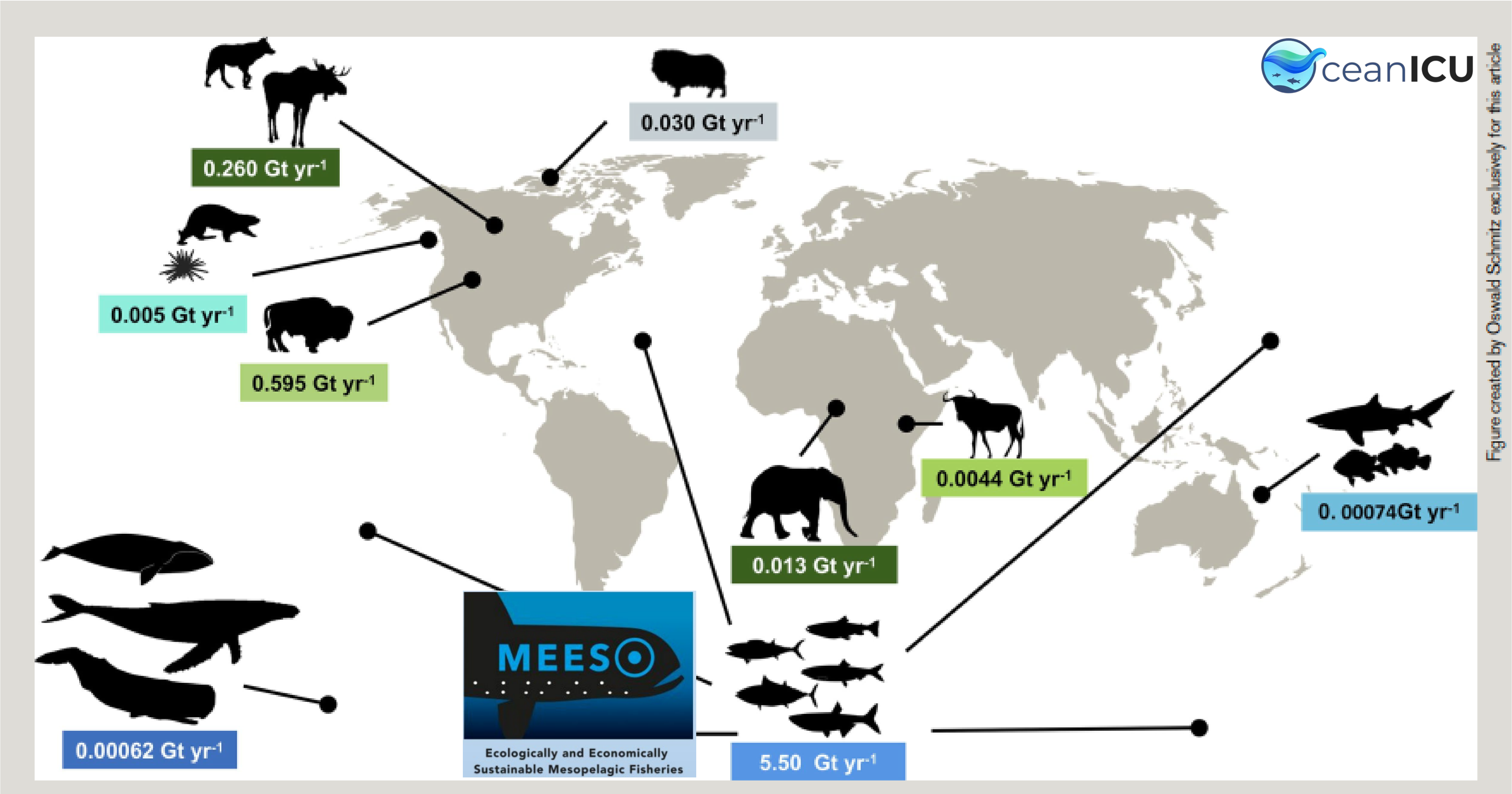
OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation



Infographic created by Seascape Belgium for the OceanICU Horizon Europe project, adapted from Lutz and Martin 2014, Figure 2. A conceptual diagram of marine vertebrate carbon services | Version 1.3

Marine organisms fit in biodiversity and climate policy?

Nature-based Solutions



Schmitz et al., *2023*

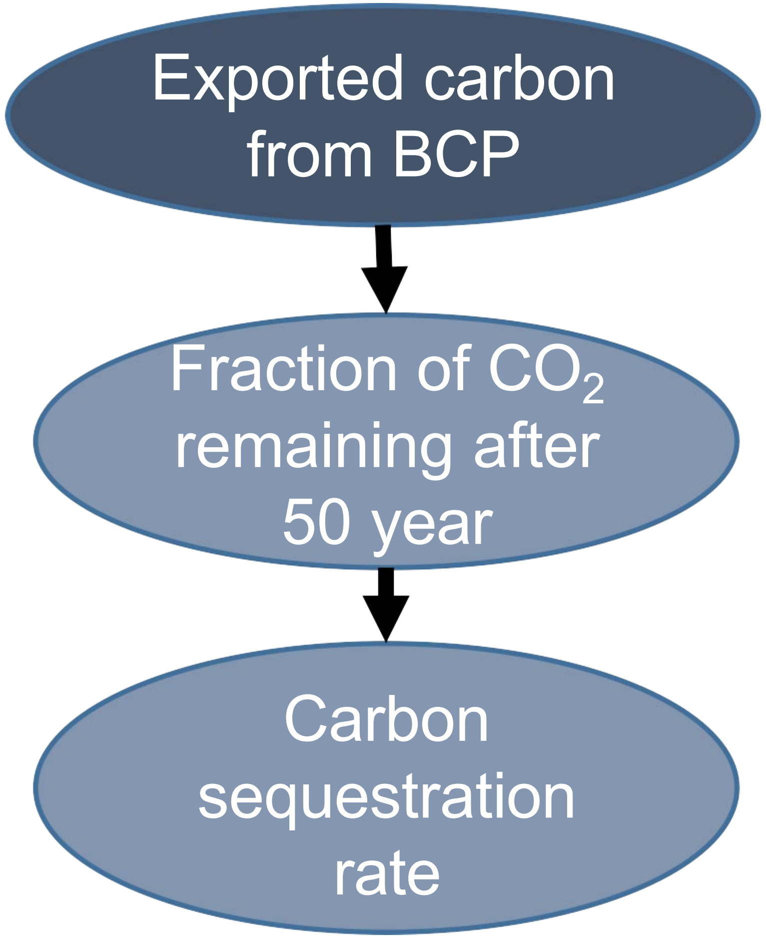
Financing climate change adaptation and biodiversity conservation

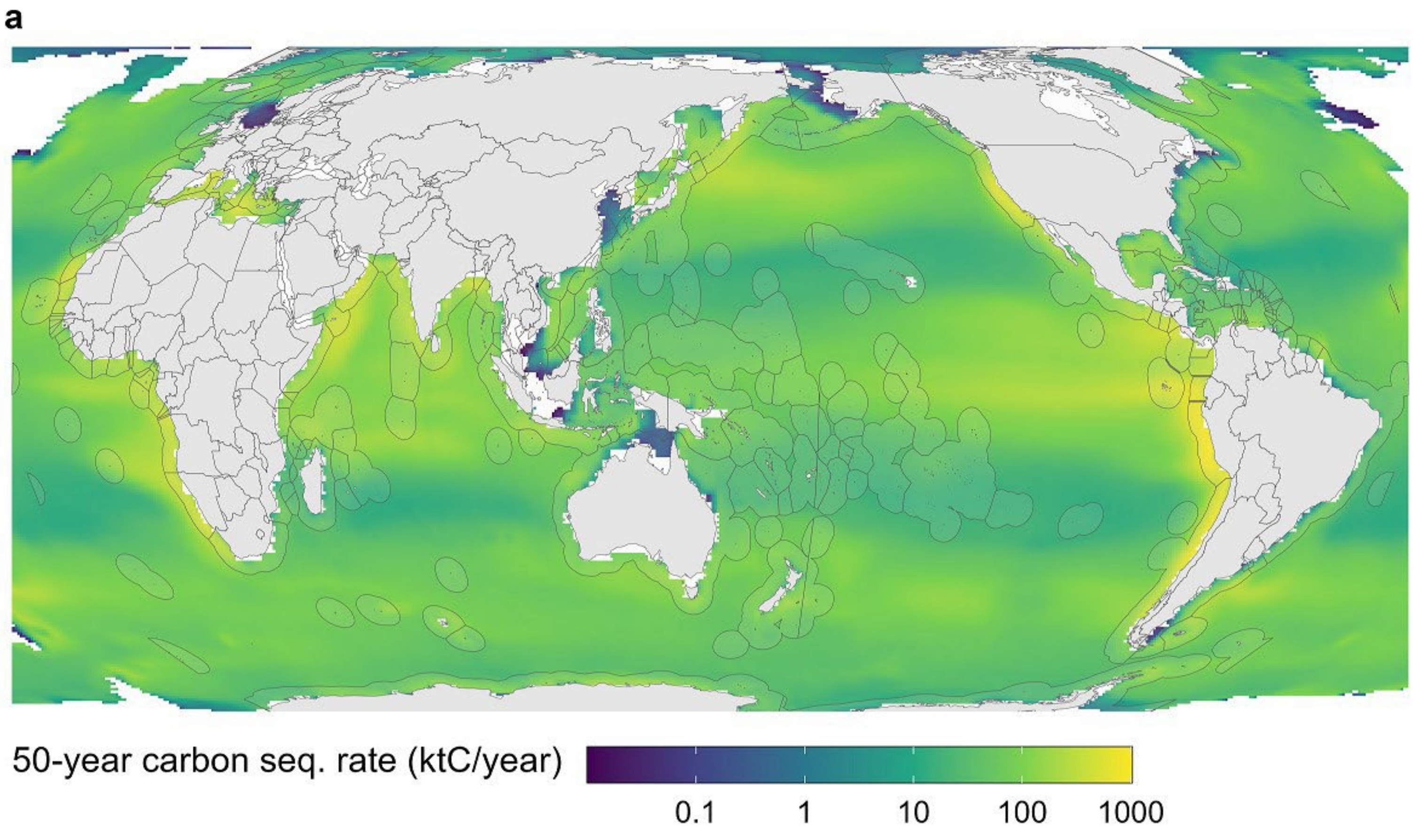
- We need nature to reach net-zero 2050 target
- Global carbon offset market $909 billion in 2022
- **$1 trillion** each year to finance biodiversity conservation

Location and valuation of biological carbon pump

- Spatial distribution of carbon storage across geopolitical and management boundaries?
- Global value of biological carbon pump?
- What's the importance for national economies and climate finance?

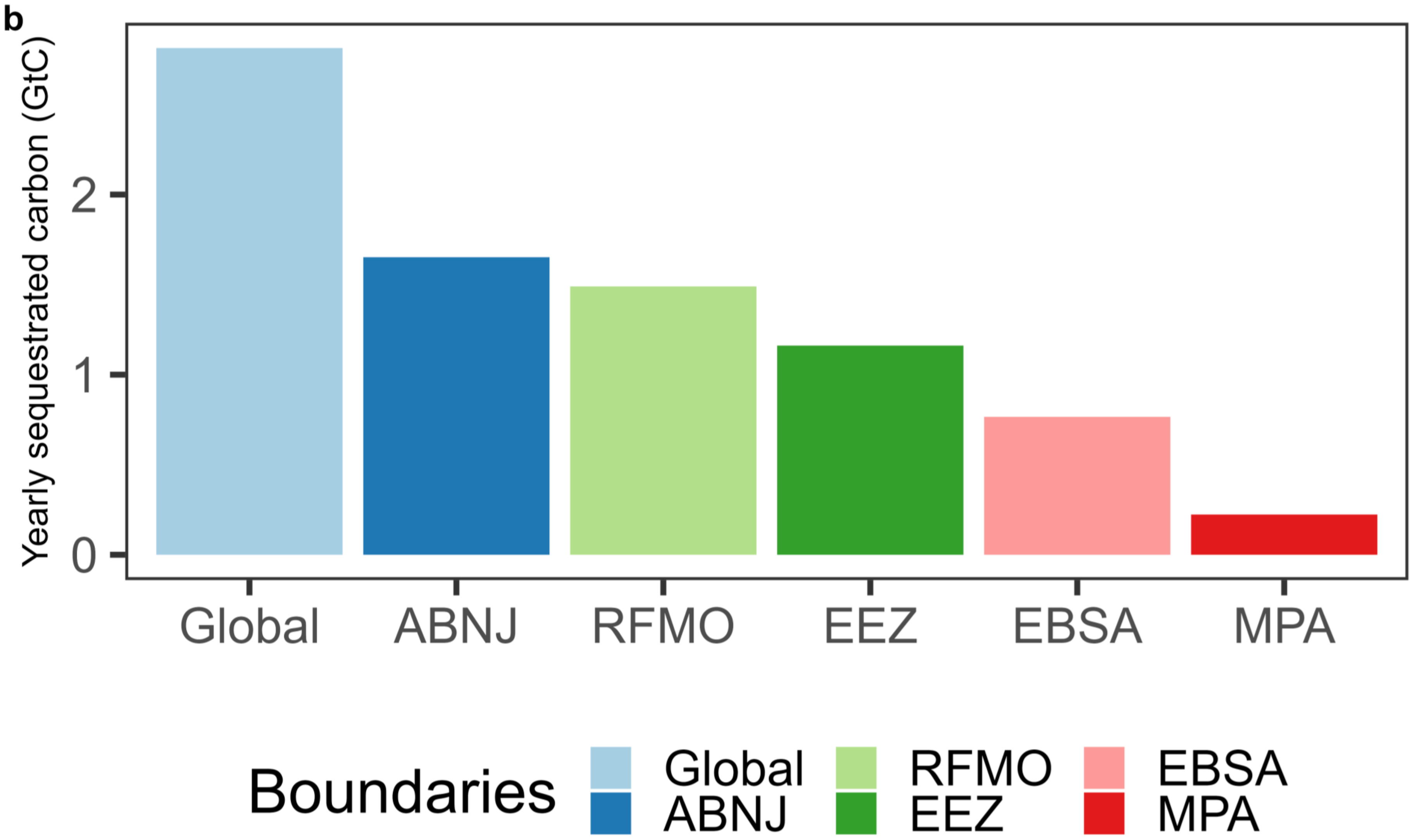
Carbon stored for at least 50 years



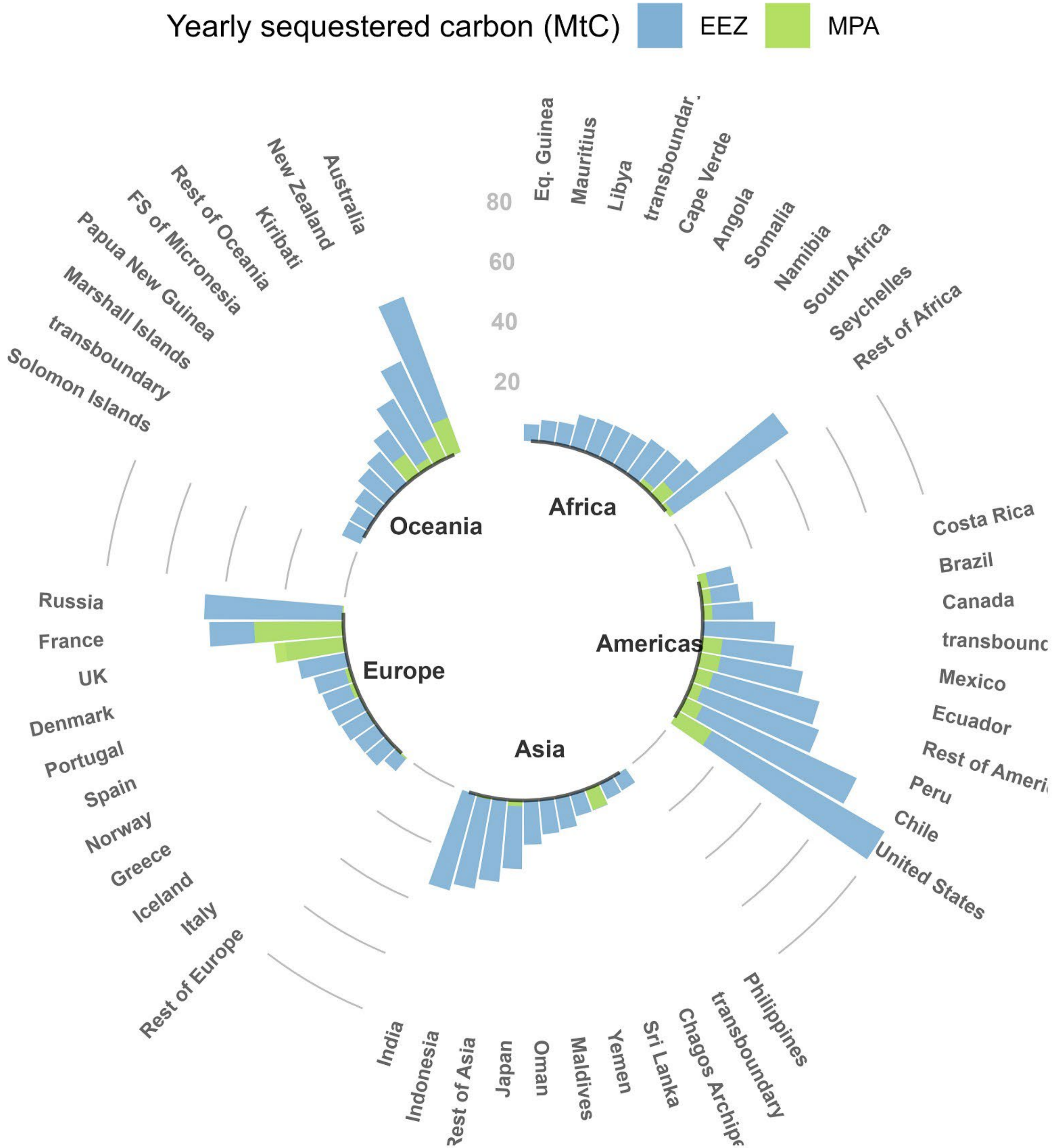


Berzaghi et al., submitted

Spatial analysis across management and political boundaries



Berzaghi et al., *submitted*


Yearly sequestered carbon (MtC)
EEZ
MPA
80
60
40
20
Oceania
Africa
Americas
Europe
Asia
Eq. Guinea
Mauritius
Libya
transboundar..
Cape Verde
Angola
Somalia
Namibia
South Africa
Seychelles
Rest of Africa
Costa Rica
Brazil
Canada
transbounc
Mexico
Ecuador
Rest of Ameri
Peru
Chile
United States
Philippines
transboundary
Chagos Archipe
Sri Lanka
Yemen
Maldives
Oman
Japan
Rest of Asia
Indonesia
India
Rest of Europe
Italy
Iceland
Greece
Norway
Spain
Portugal
Denmark
UK
France
Russia
Solomon Islands
transboundary
Marshall Islands
Papua New Guinea
FS of Micronesia
Rest of Oceania
Kiribati
New Zealand
Australia

Value of biological carbon pump

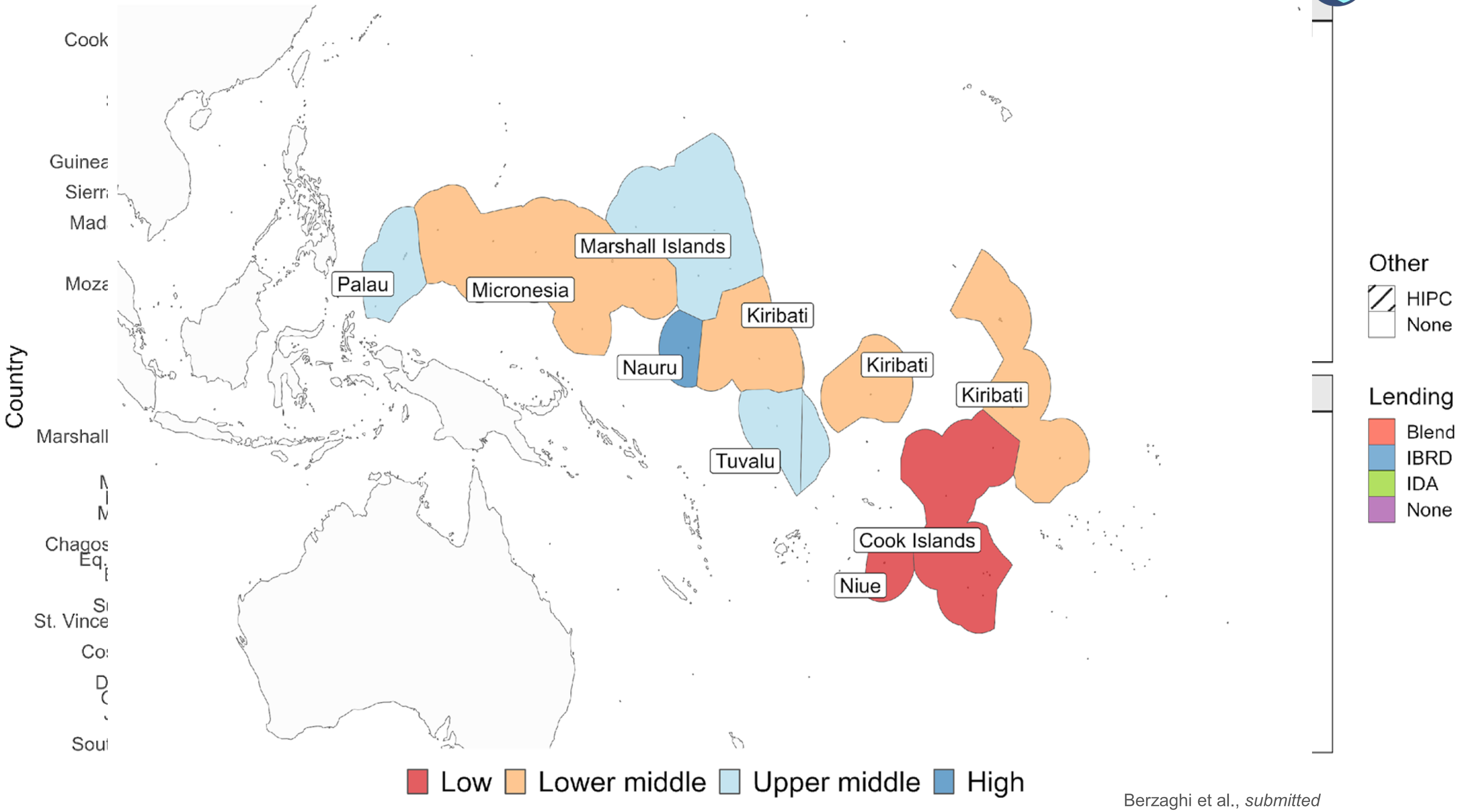
- The BCP carbon services are worth US$383 billion/year domestically

- US$545 billion/year in areas beyond national jurisdiction

- US$2.2 trillion integrated through 2030

Berzaghi et al., *submitted*

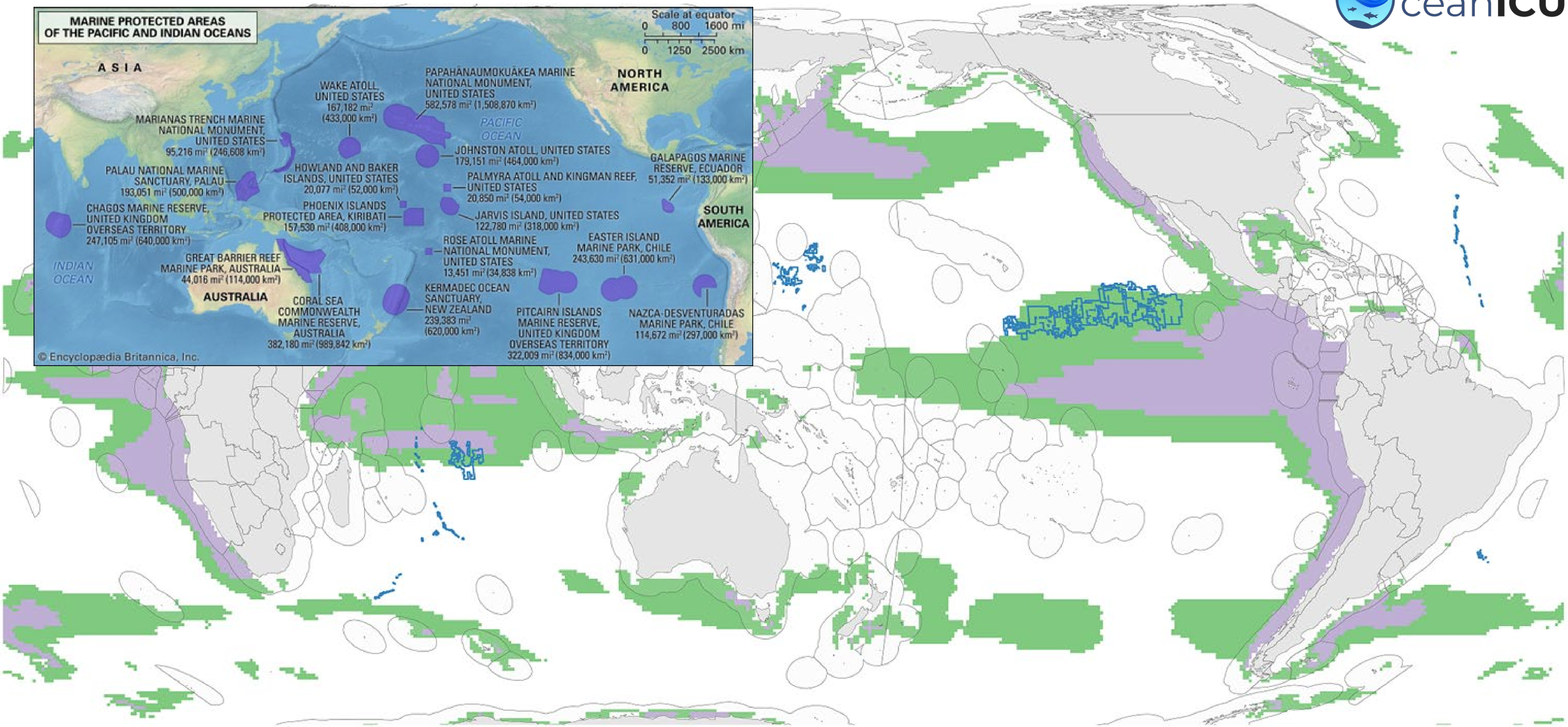
Importance for national economies



Berzaghi et al., *submitted*

Importance for management and conservation

OceanICU



30% coverage - 58% of global seq. 10% coverage - 30% of global seq. Mining areas

Berzaghi et al., *submitted*

OceanICU
Understanding Ocean Carbon

Acknowledgments

- Mary Wisz, Jerome Pinti, Olivier Aumont, Olivier Maury
- Thomas Cosimano, Connel Fullenkamp, Ralph Chami

WORLD MARITIME UNIVERSITY

MEESO
Ecologically and Economically Sustainable Mesopelagic Fisheries

MARIE CURIE ACTIONS

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

How can scientific research support sustainable ocean management and development?

Dr. Natalya Gallo

UNIVERSITY OF BERGEN

BJERKNES CENTRE for Climate Research

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

How can scientific research support sustainable ocean management and development?

OceanICU


Natalya Gallo

"Co-design"
"Fit-for-purpose"

AP Photo/Peter Dejong

ECOP
Early Career
Ocean Professionals

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

UN Ocean Decade:
"The Science We Need for the Ocean We Want"

Scientists need an understanding of the policy and management frameworks their research fits into and active stakeholder partners

Where can we look for guidance within the UNFCCC process?

- Nationally Determined Contributions (NDCs)
- National Adaptation Plans (NAPs)
- Ocean and Climate Change Dialogue Submissions
- SBSTA Research and Systematic Observations
- Ocean Workstream (https://unfccc.int/topics/ocean)

nature climate change | ARTICLES
PUBLISHED ONLINE: 30 OCTOBER 2017 | DOI: 10.1038/NCLIMATE3422

Gallo et al. 2017

Ocean commitments under the Paris Agreement

Natalya D. Gallo[1,2*], David G. Victor[3,4,5] and Lisa A. Levin[1,2]

Under the Paris Agreement nations made pledges known as nationally determined contributions (NDCs), which indicate how national governments are evaluating climate risks and policy opportunities. We find that NDCs reveal important systematic patterns reflecting national interests a
and adaptation, we created a quantitative marine
In contrast to the past, when oceans received m
include marine issues. The percentage of the p
influences the MFF, but negotiating group (Annex I
motivations are crucial to NDC development. The a
on ocean deoxygenation, which is barely mention
climate priorities.

IDDRI SUSTAINABLE DEVELOPMENT & INTERNATIONAL RELATIONS

Gattuso et al. 2019

SciencesPo

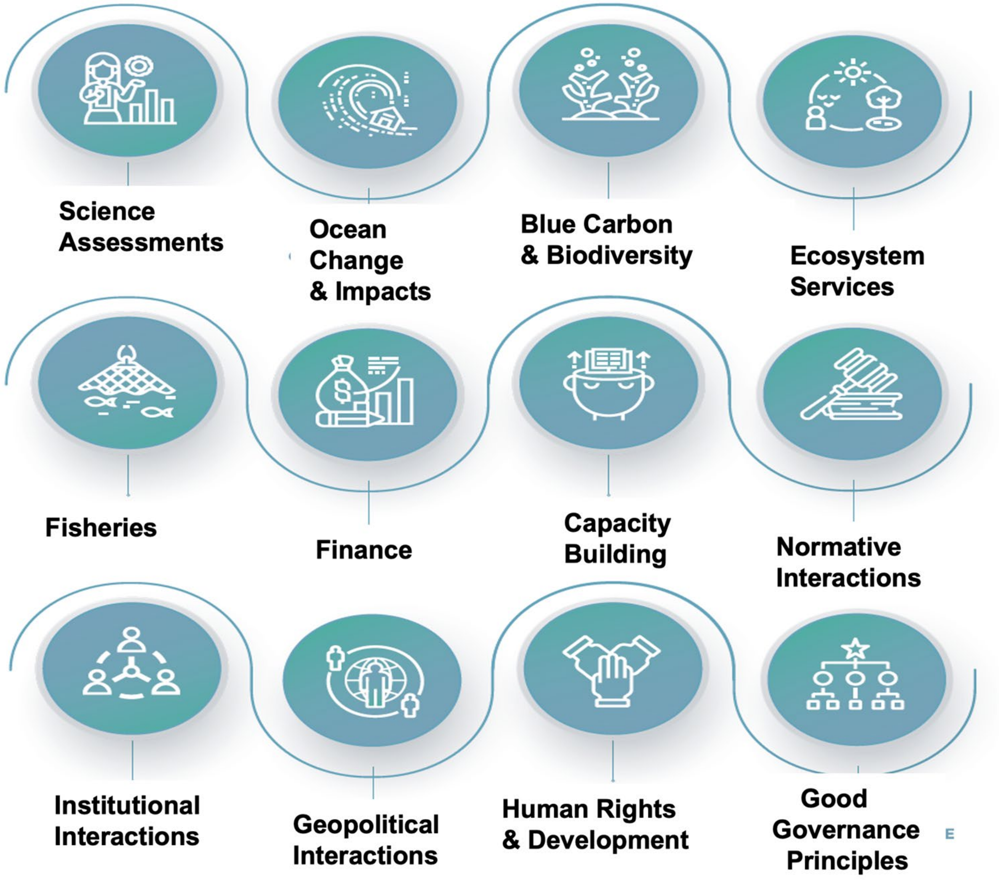
PRINCE ALBERT II OF MONACO FOUNDATION

Fondation VEOLIA

Opportunities for increasing ocean action in climate strategies

Jean-Pierre Gattuso (CNRS, Sorbonne University, Iddri), Alexandre K. Magnan (Iddri), Natalya D. Gallo (Scripps Institution of Oceanography, University of California San Diego), Dorothée Herr (IUCN), Julien Rochette (Iddri), Lola Vallejo (Iddri), Phillip Williamson (University of East Anglia, NERC)

Priorities in Ocean and Climate Change Dialogue

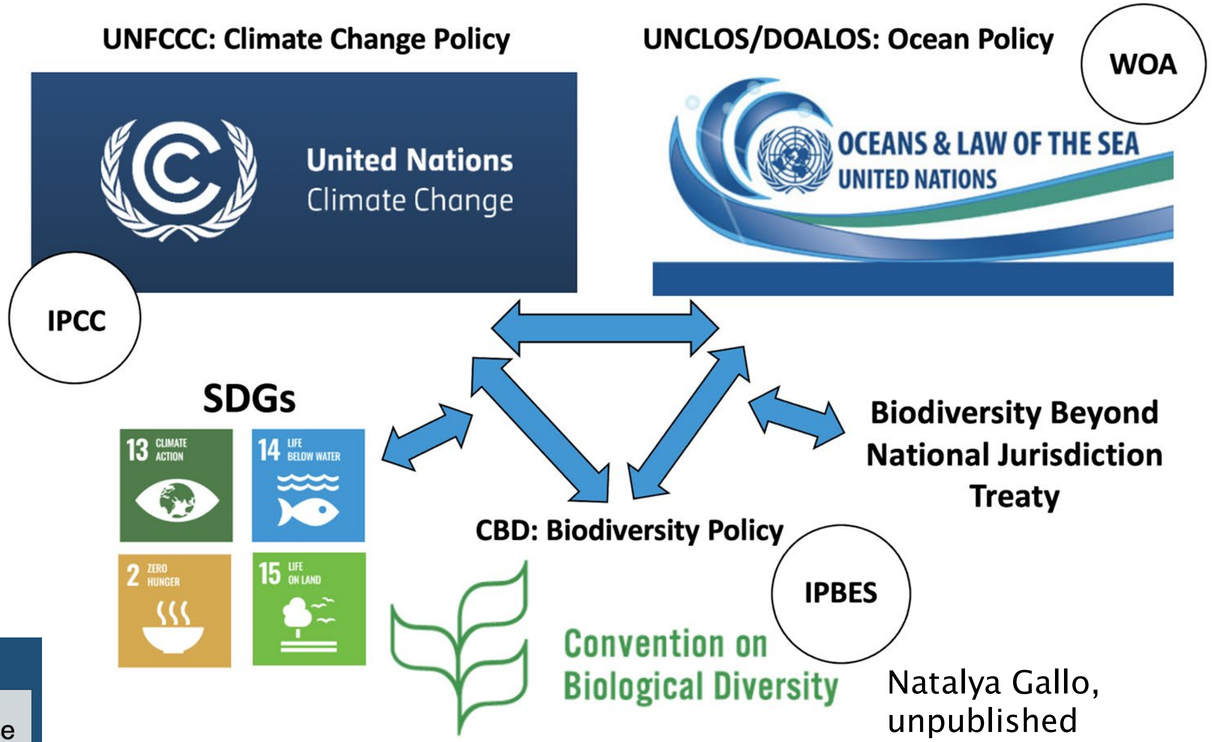


Dobush et al. 2020, 2021

Where do our research themes and outcomes fit into the broader ocean and climate agenda?

OceanICU

Look at the world through multisolving glasses



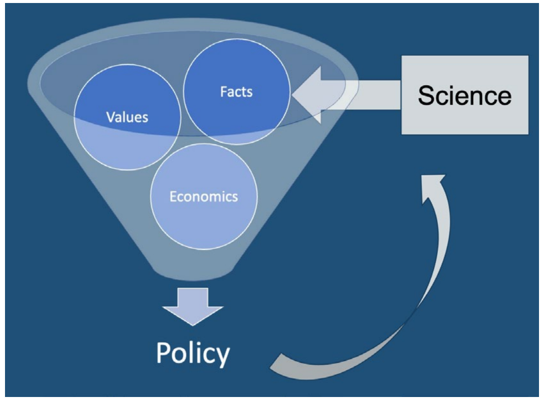
Natalya Gallo, unpublished

Don't forget about lessons learned from terrestrial scientists

United Nations Educational, Scientific and Cultural Organization

Man and the Biosphere Programme

MAB: 50+ years of experience;
700+ biosphere reserves

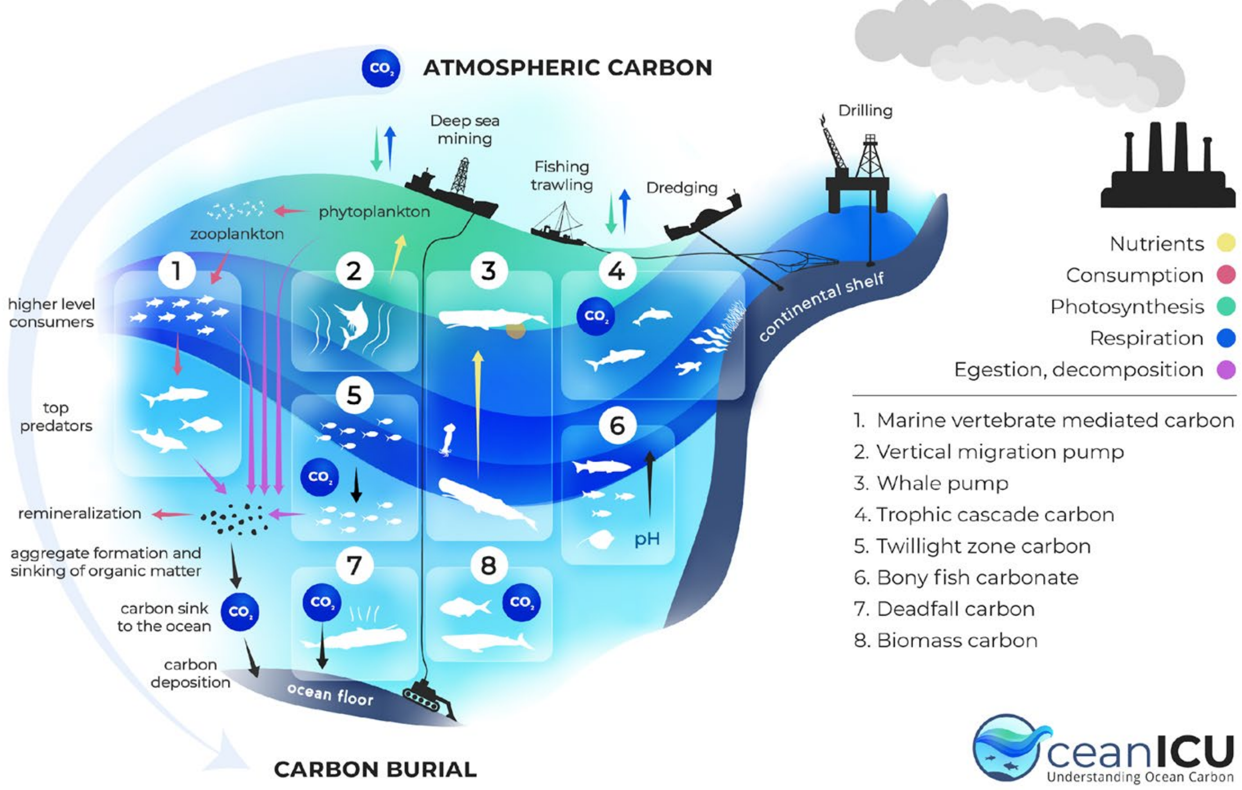


Lauren Linsmayer, unpublished

Key to consider tradeoffs as this will affect uptake of scientific recommendations

Making scientific outcomes useable

- Can we put our results within the framework of decision support tools?
- Identify potential impacts of different actions, tradeoffs, and uncertainties
- Translate knowledge into societal value
- Empower and motivate key stakeholders to make use of the knowledge (engage early and often)



Infographic created by Seascape Belgium for the OceanICU Horizon Europe project, adapted from Lutz and Martin 2014, Figure 2. A conceptual diagram of marine vertebrate carbon services | Version 1.3

Thank you for your interest
natalya.gallo@uib.no

ocean-icu.eu

Project leader Dr. Richard Sanders

OceanICU
Understanding Ocean Carbon

Questions & Answers

Visit ocean-icu.eu | hello@ocean-icu.eu
Stay up-to-date with the latest news

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation

OceanICU

Understanding Ocean Carbon

Thank You!

Visit ocean-icu.eu | hello@ocean-icu.eu

Stay up-to-date with the latest news

OceanICU is co-funded by the European Union, Horizon Europe Funding Programme for research and innovation under grant agreement No.101083922 and by UK Research and Innovation