WHERE ARE THE FISH?

Reducing climate impacts on coastal communities and marine industry

Lauren Weatherdon
Programme Officer, Marine Programme, UNEP-WCMC
@LVWeatherdon, @unepwcmc
APEC Climate Symposium, Piura, Peru | 16 - 18 September 2016

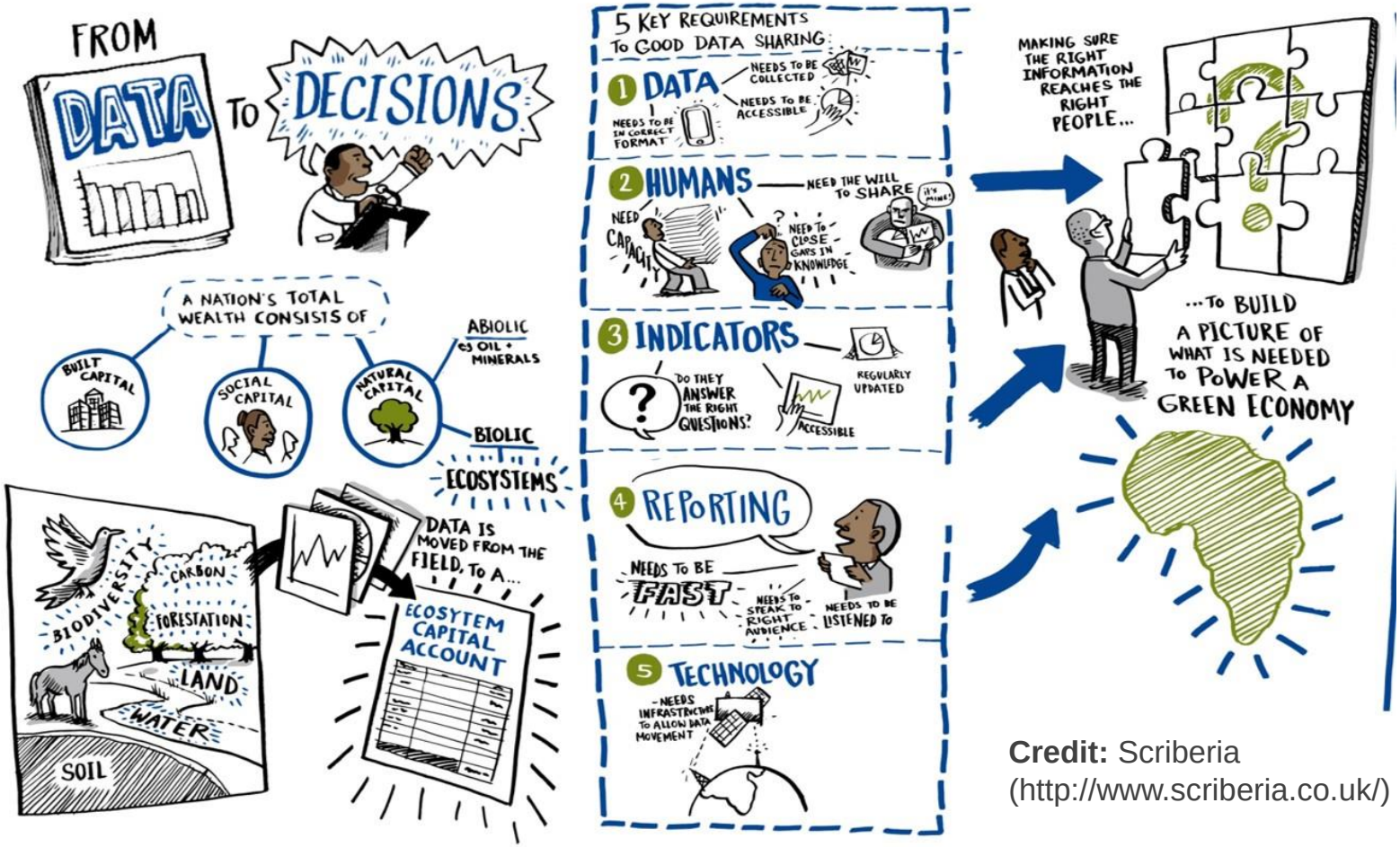
Mangrove forests of the Sundarbans | NASA Earth Observatory

UNEP WCMC United Nations Environment Programme World Conservation Monitoring Centre

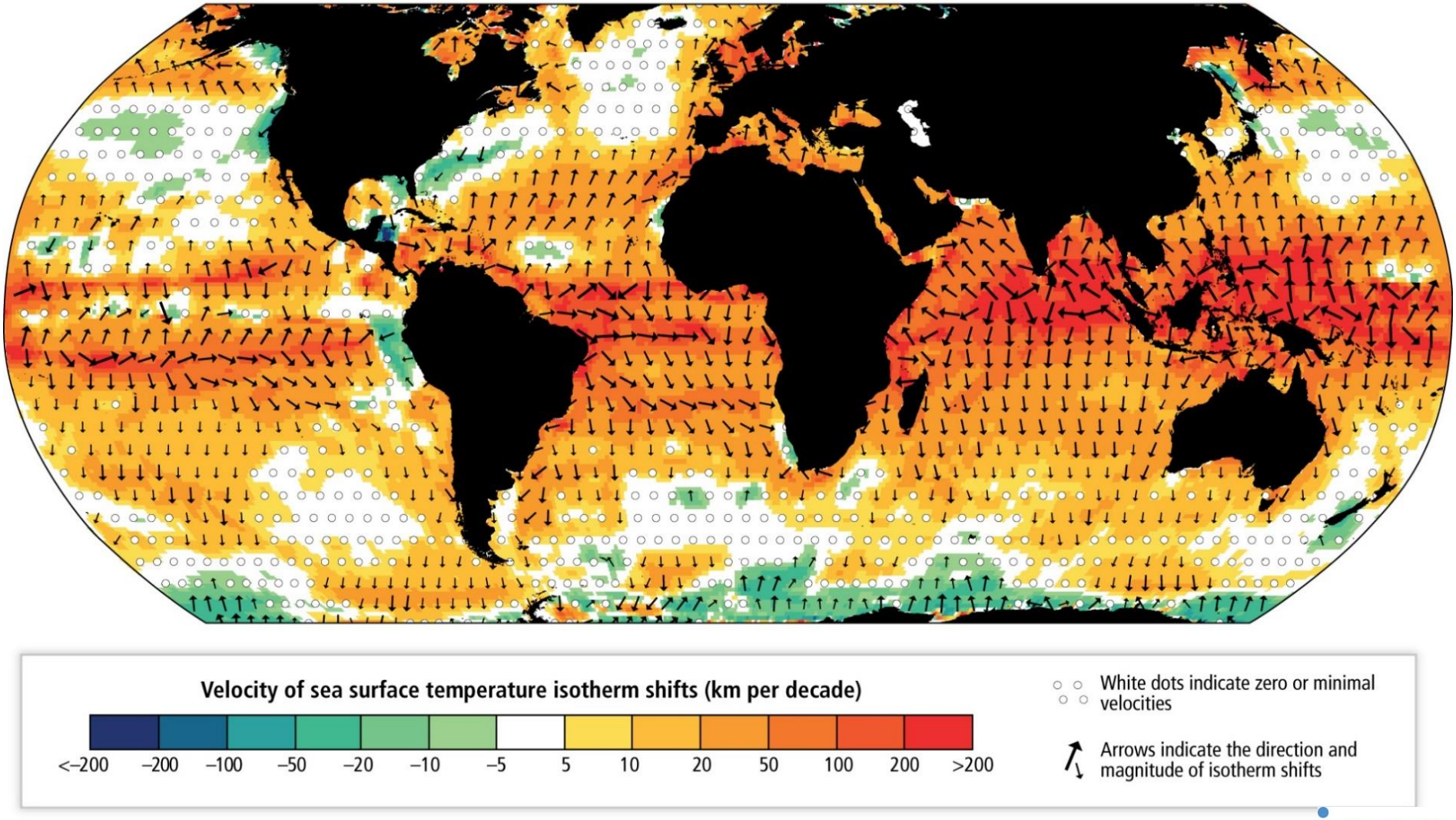
APEC PERU 2016 APCC APEC CLIMATE CENTER APEC Asia-Pacific Economic Cooperation Senamhi PERÚ Ministerio del Ambiente

UNEP-WCMC's mission?

To provide authoritative information about biodiversity and ecosystem services in a manner that is useful to decision-makers who are driving change in environment and development policy.



Credit: Scriberia (http://www.scriberia.co.uk/)



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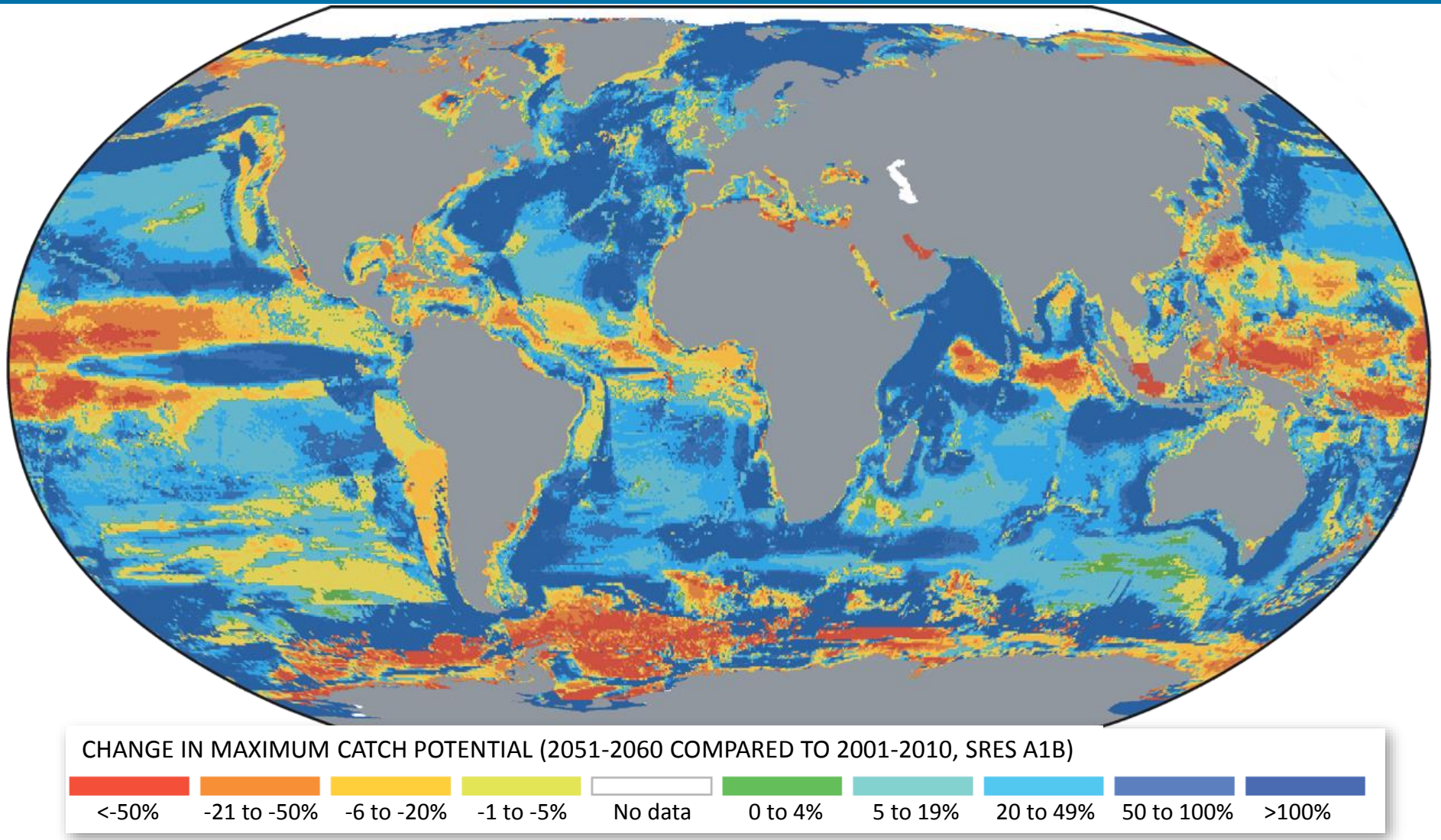
INTERGOVERNMENTAL PANEL ON climate change

Burrows et al. (2014); IPCC AR5 WGII, Chapter 30: The Ocean (2014)



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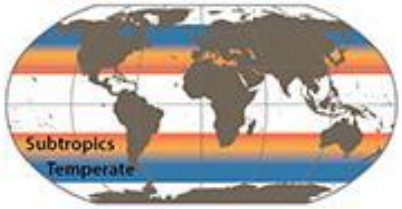
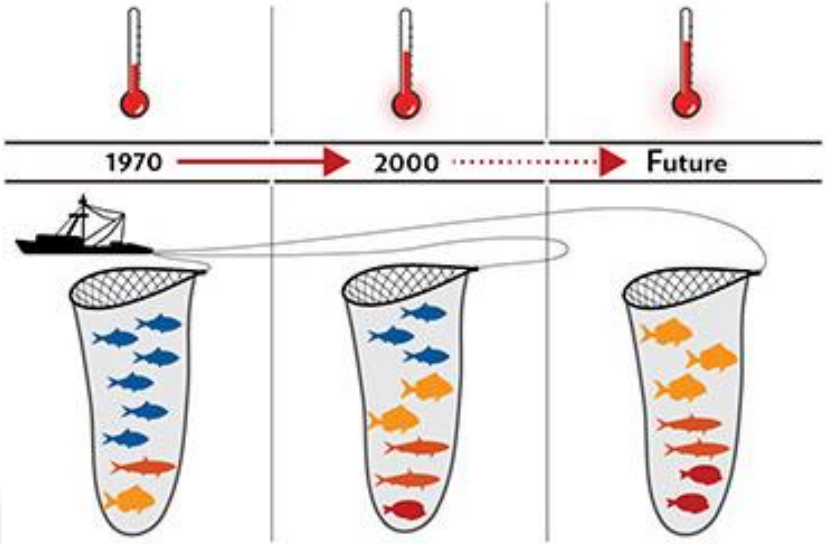
INTERGOVERNMENTAL PANEL ON climate change

Cheung et al. (2013); IPCC AR5 WGII, Summary for Policymakers (2014)

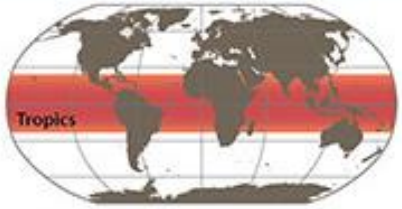
Subtropic and temperate ocean



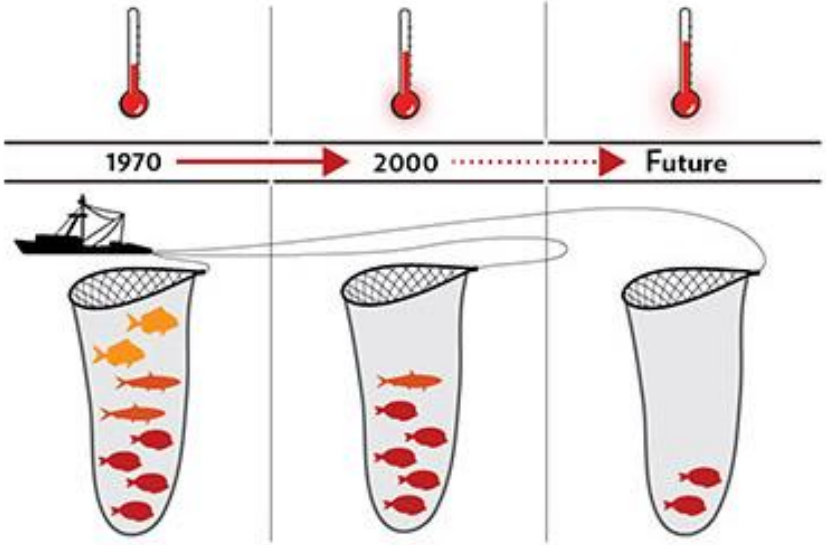
From 1970 to 2006, as open temperatures were rising, catch composition in the subtropic and temperate areas slowly changed to include more warm-water species and fewer cool-water species.



Tropics



In the tropics, the catch composition changed from 1970 to 1980 and then stabilized, likely because there are no species with high enough temperature preferences to replace those that declined.



Temperate/cool-water fish Subtropical fish Tropical/warm-water fish

THE PEW CHARITABLE TRUSTS

SEA AROUND US
FISHERIES, ECOSYSTEMS & BIODIVERSITY

UNEP WCMC

Cheung et al., *Nature* 2013; infographic by Pew Charitable Trusts

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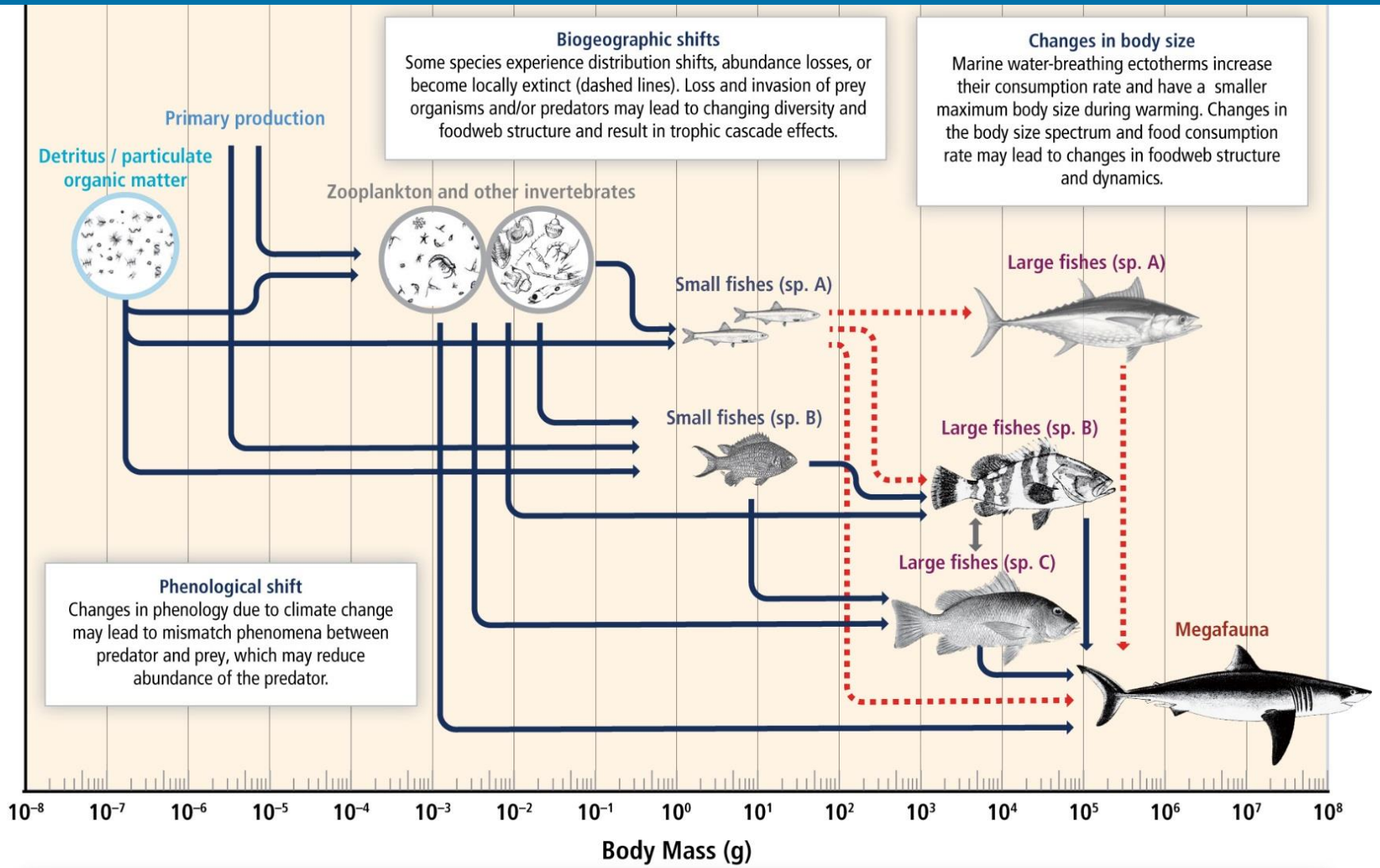


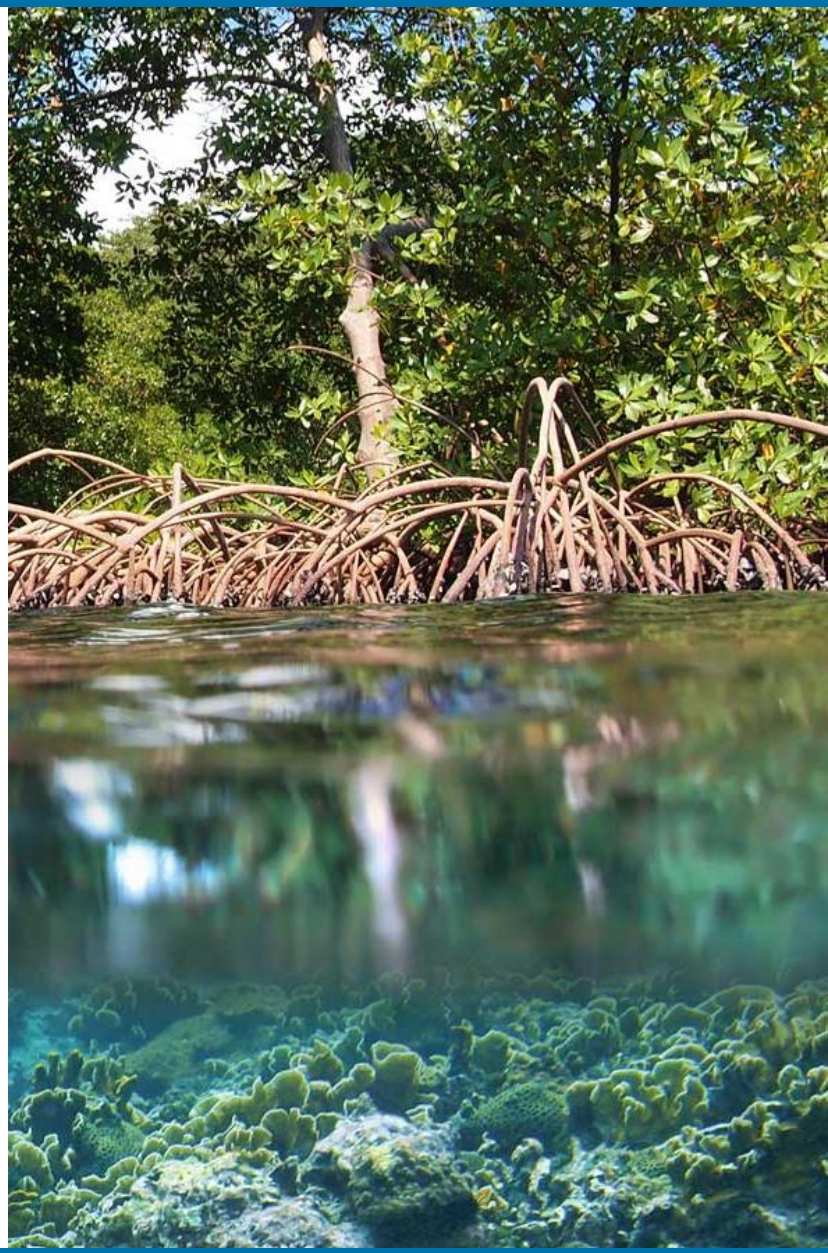
Habitat phase shifts Climate change is causing phase shifts--or the transformation of a habitat into an alternative state as a result of environmental pressures—leading to the “tropicalization” of temperate marine ecosystems.

Habitat phaseshift from a coral-dominated (**left**) to a algal-dominated coral reef (**right**).
Photo credit: Benjamin Müller, NIOZ

Summary: Weatherdon et al. (2016) DOI: 10.3389/fmars.2016.00048
@LVWeatherdon

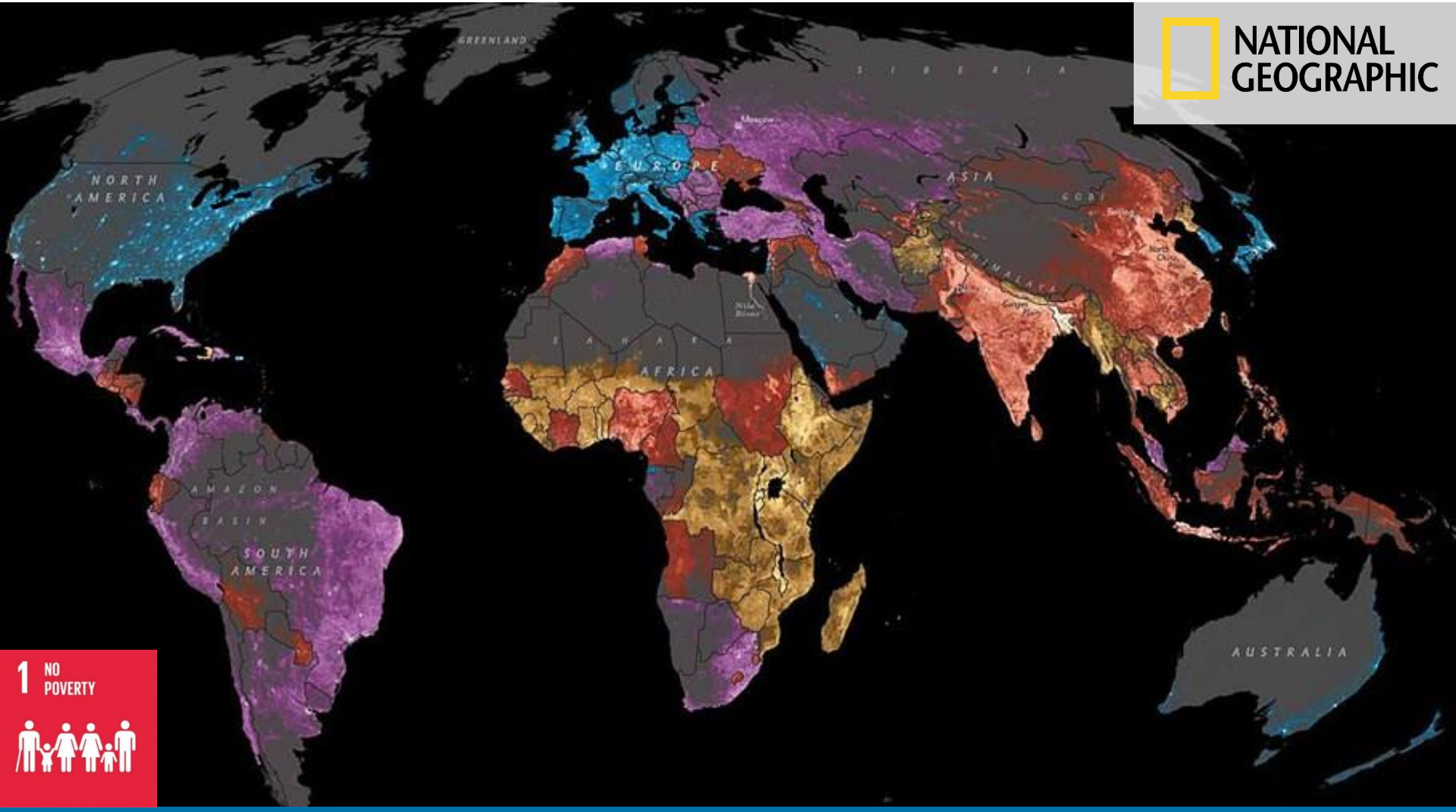
Dimensions of marine food security | Climate change is expected to affect all four dimensions of the contributions of marine fisheries and mariculture to food security:

- ***Availability*** (e.g., changes in fish habitats, fish stocks and distributions);
- ***Stability*** (e.g., changes in seasonality, ecosystem productivity, variable catches);
- ***Access*** (e.g., changes in opportunities to derive livelihoods from marine fisheries and mariculture); and
- ***Utilization*** (e.g., adjusting to species not consumed traditionally; increased frequency of disease and harmful algal blooms)



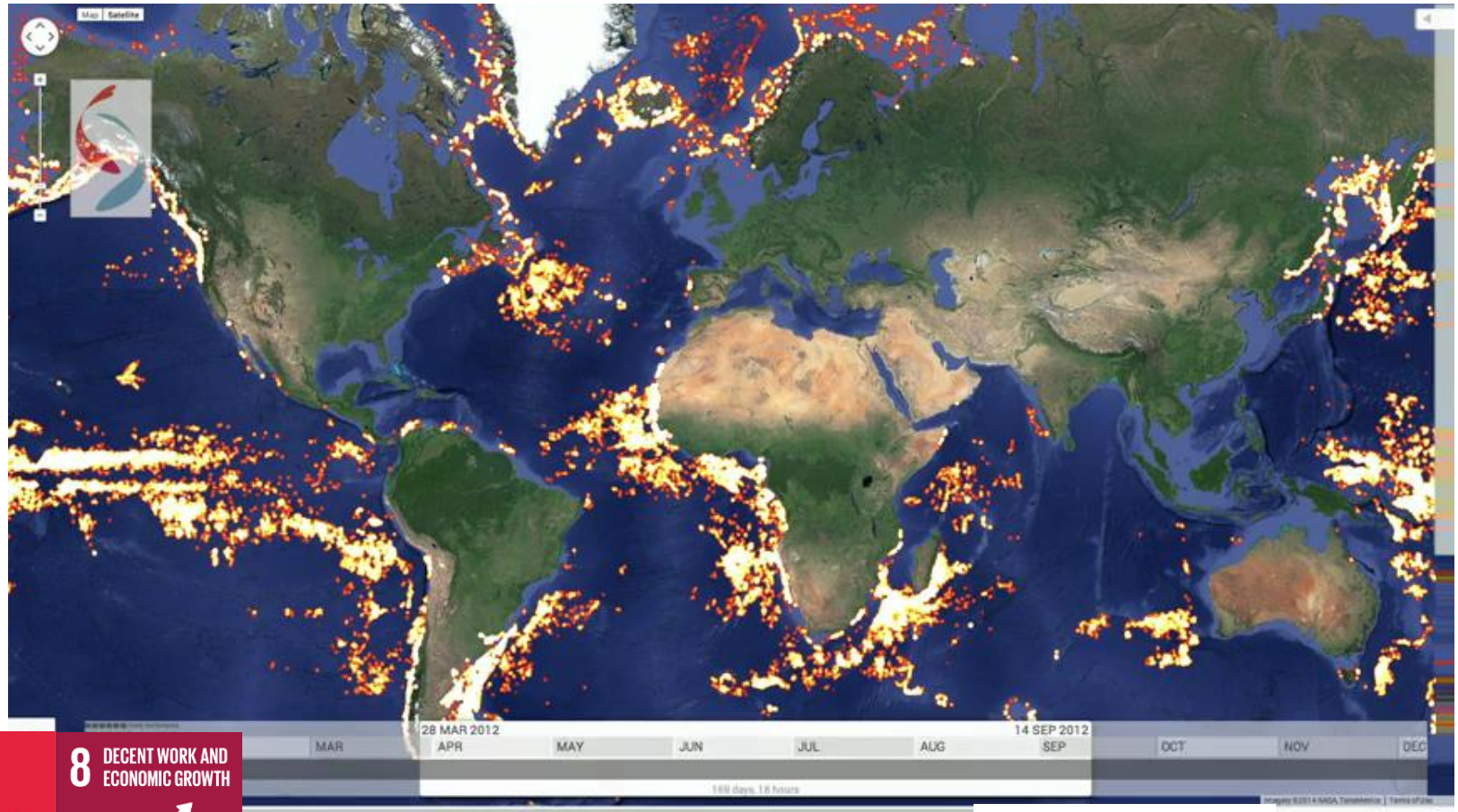
Cochrane al. (2009) FAO Technical Paper No. 530

Distribution of impacts Those with the least amount of income are likely to be hit hardest by declines in fisheries.



Global locations of fishing

Declines in and redistributions of fish are likely to have global impacts through shifts in fishing activity, loss in domestic revenue, and reduced access to fish.



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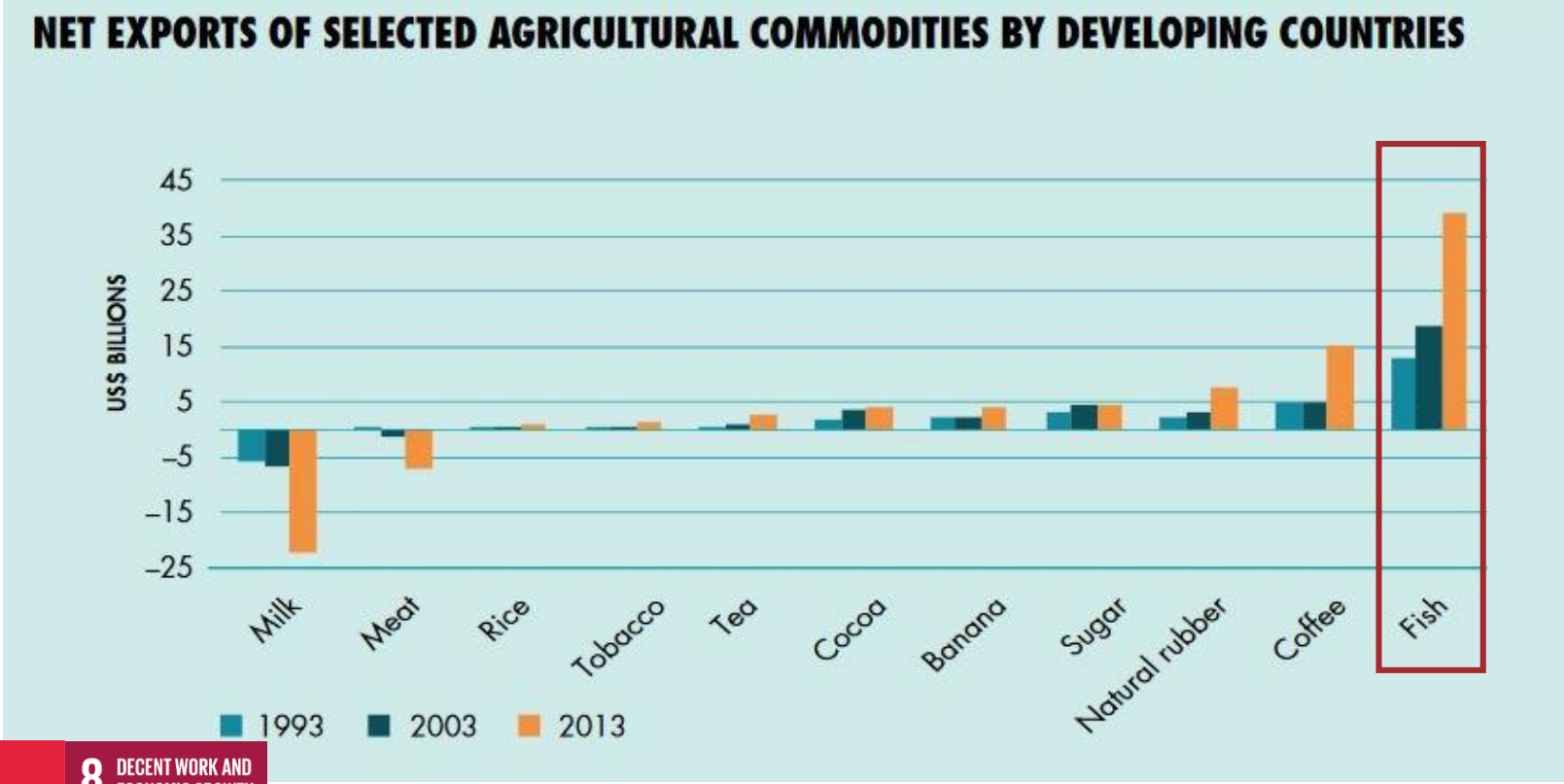
8 DECENT WORK AND ECONOMIC GROWTH

Google Earth Outreach OCEANA SKYTRUTH

Fisheries and economic development

Fish are also among the greatest source of income for many developing countries, forming more than three times the amount of revenue to the next nearest commodity, coffee.



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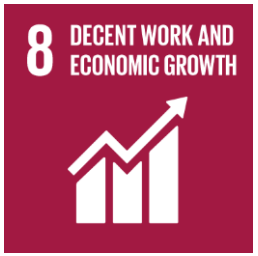
UN Sustainable Development Goals by 2030 | In September 2015, UN Member States made the commitment to adopt a set of 17 global goals with associated targets, which include:

Eradicate extreme poverty and build resilience **[1.1, 1.5]**

End hunger and all forms of malnutrition. **[2.1, 2.2]**



Improve global resource efficiency, decouple economic growth from environmental degradation, and achieve full employment **[8.4, 8.5]**

Enhance sustainable urbanization and increase adoption of climate change mitigation and adaptation measures. **[11.3, 11.b]**

Strengthen resilience to climate hazards, integrate climate change measures, and raise capacity in developing countries. **[13.1, 13.2, 13.b]**

Sustainably manage and protect marine and coastal ecosystems and increase economic benefits to Small Island Developing States. **[14.2, 14.7]**

795 million people are undernourished globally.

(FAO, 2016)

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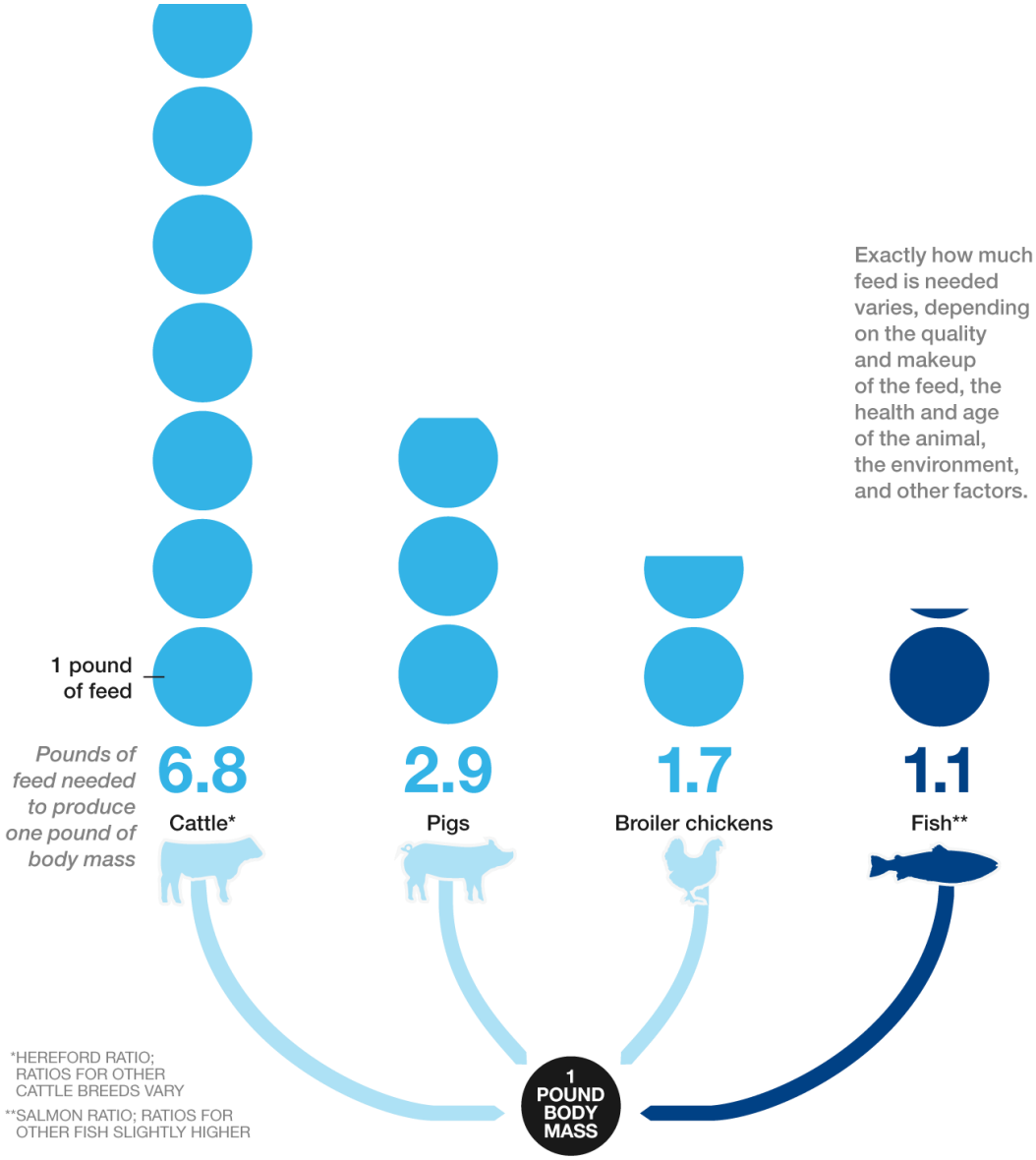

© National Geographic | “How to farm a better fish”

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Fisheries and nutrition

Seafood provides important micronutrients that are increasingly recognised as having a significant effect on development and health.

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PLANETARY HEALTH ALLIANCE

NATIONAL GEOGRAPHIC

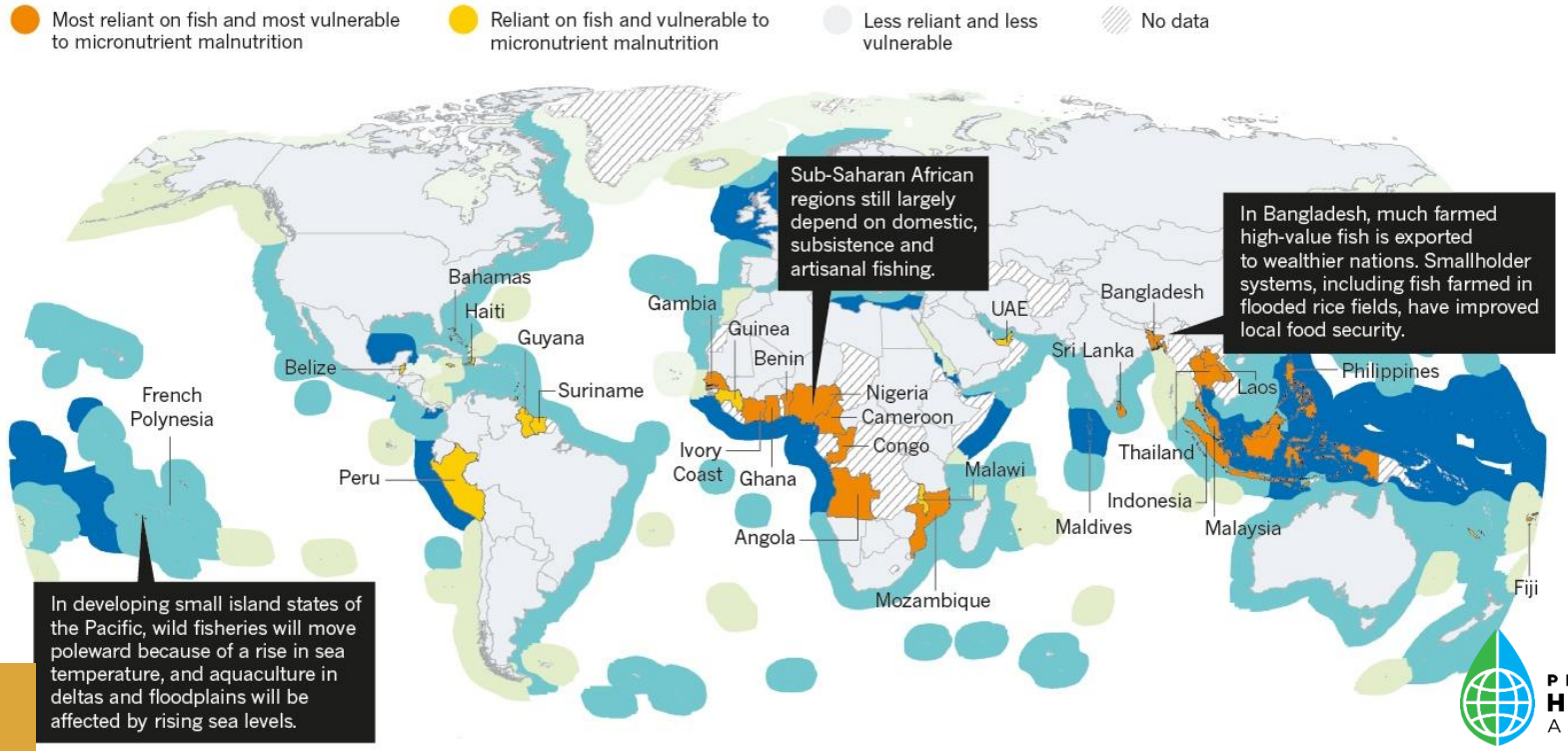
nature International weekly journal of science

Nutrition: Fall in fish catch threatens human health

Christopher D. Golden, Edward H. Allison, William W. L. Cheung, Madan M. Dey, BenjaminS. Halpern, Douglas J. McCauley, Matthew Smith, Bapu Vaitla, Dirk Zeller, & Samuel S. Myers

TROUBLED WATERS

In the low-latitude developing nations, human nutrition is most dependent on wild fish, and fisheries are most at risk from illegal fishing, weak governance, poor knowledge of stock status, population pressures and climate change. These countries urgently need effective strategies for marine conservation and fisheries management to rebuild stocks for nutritional security.



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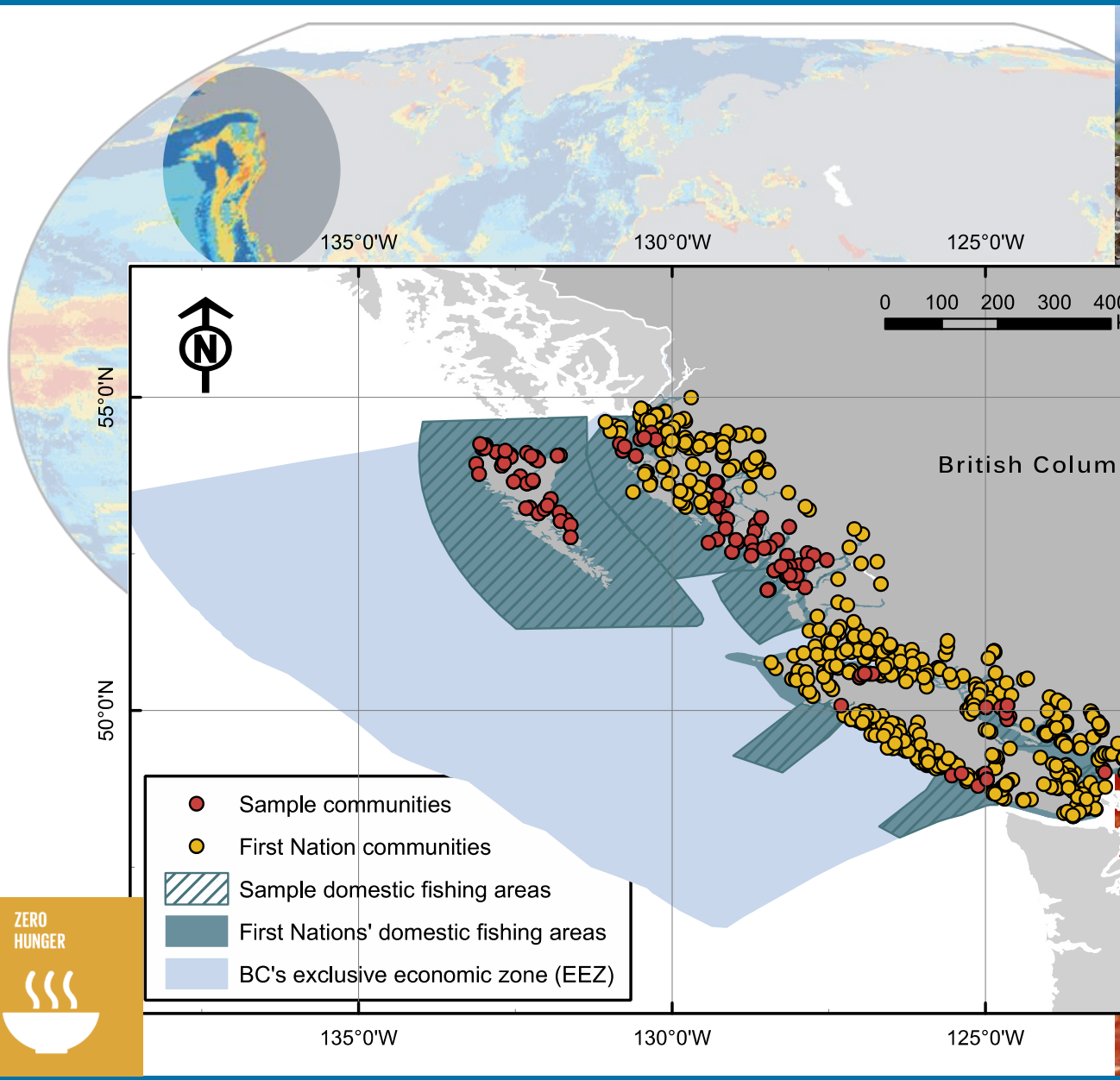
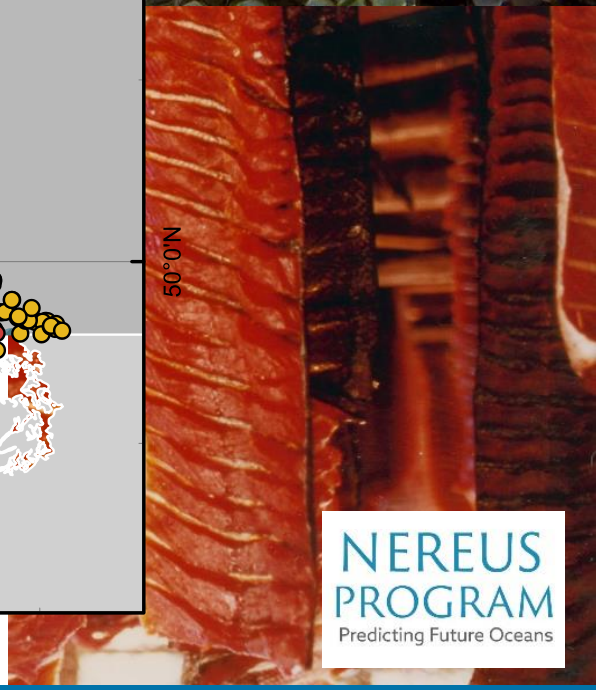
Golden et al. (2016) Nature doi: 10.1038/534317a





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First Nations' food, social and ceremonial fisheries' catch trends by region by 2050

Tsimshian First Nations
-4% -5%

Haida Nation
-5.8% -6.6%

Heiltsuk First Nation
-6.6% -7.9%

'Namgis First Nation
-7.9% -8.2%

Tla'amin First Nation
-21% -22%

Maa-nulth First Nations
-26% -28%

Tsawwassen First Nation
-15% -27%

LEGEND

Changes in the availability of catch by 2050 relative to the baseline (2000).

- **Low** emission scenario*
- **High** emission scenario*

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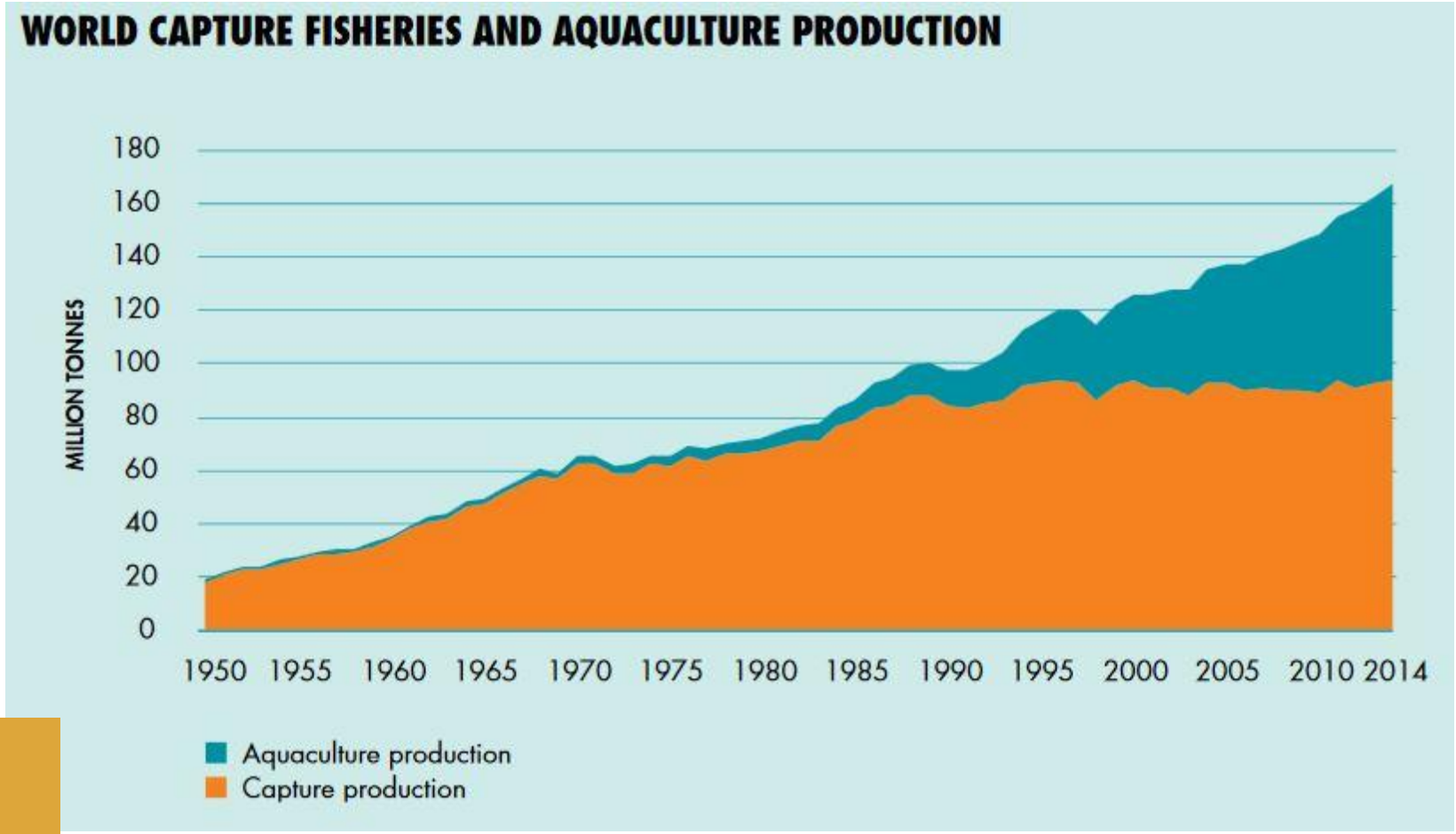
NEREUS PROGRAM
Predicting Future Oceans

Mixed impacts of climate on aquaculture

Climate change impacts on aquaculture are expected to vary by location, species, and method.



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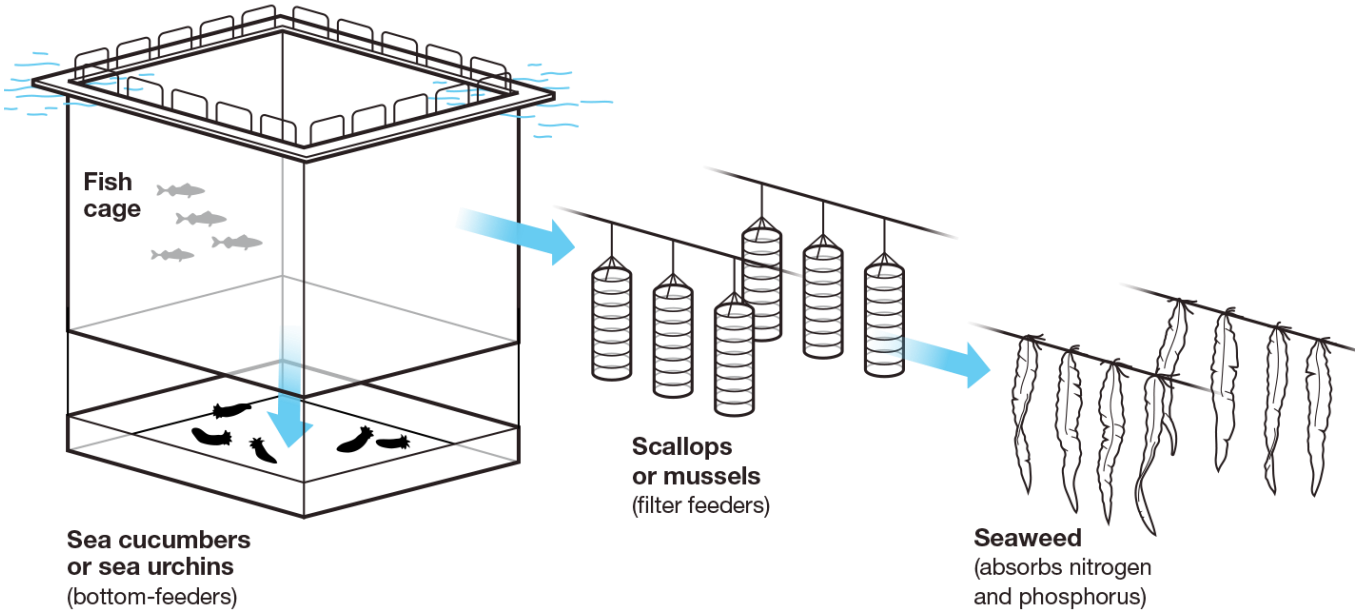
Integrated Aquaculture

More food, less pollution: waste produced by caged fish seeps into surrounding water to nourish other farmed products.



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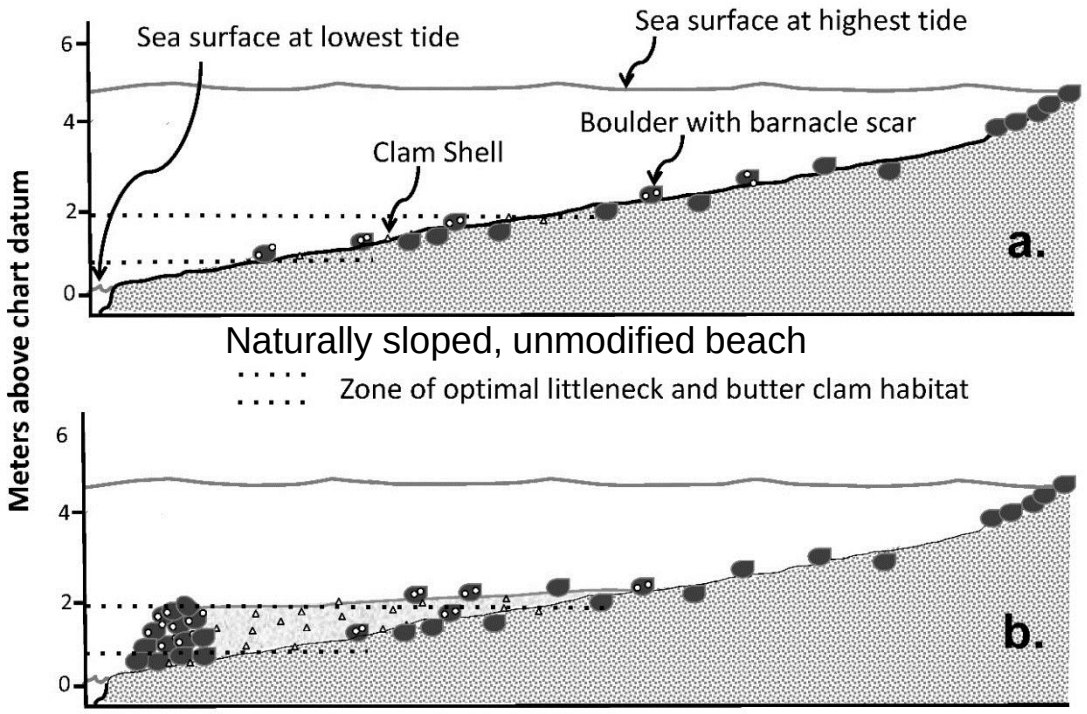
Traditional ecological knowledge

Traditional clam beds were used for millennia by coastal First Nations of British Columbia, and are being re-introduced as a means of sustainable mariculture.



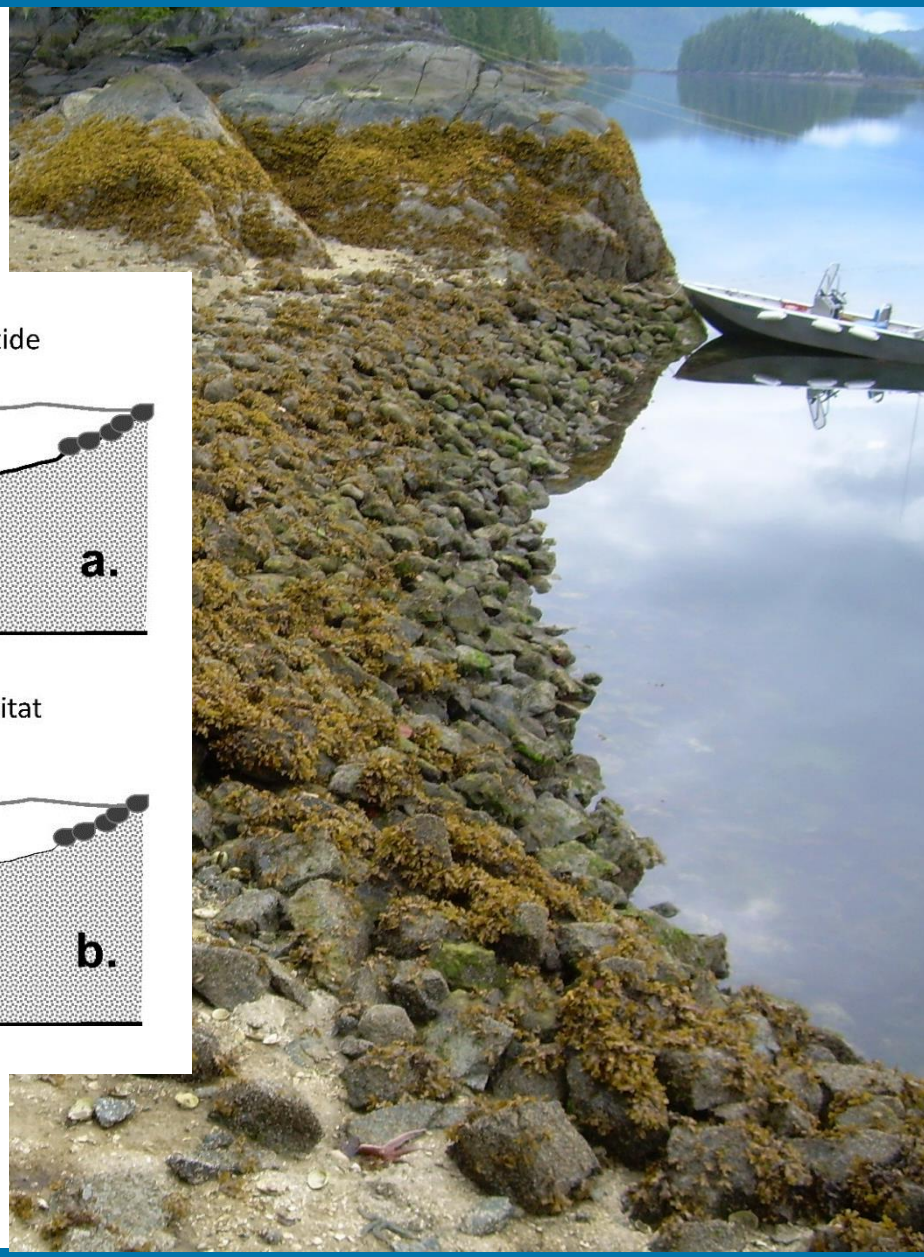


Photo credit: John Harper

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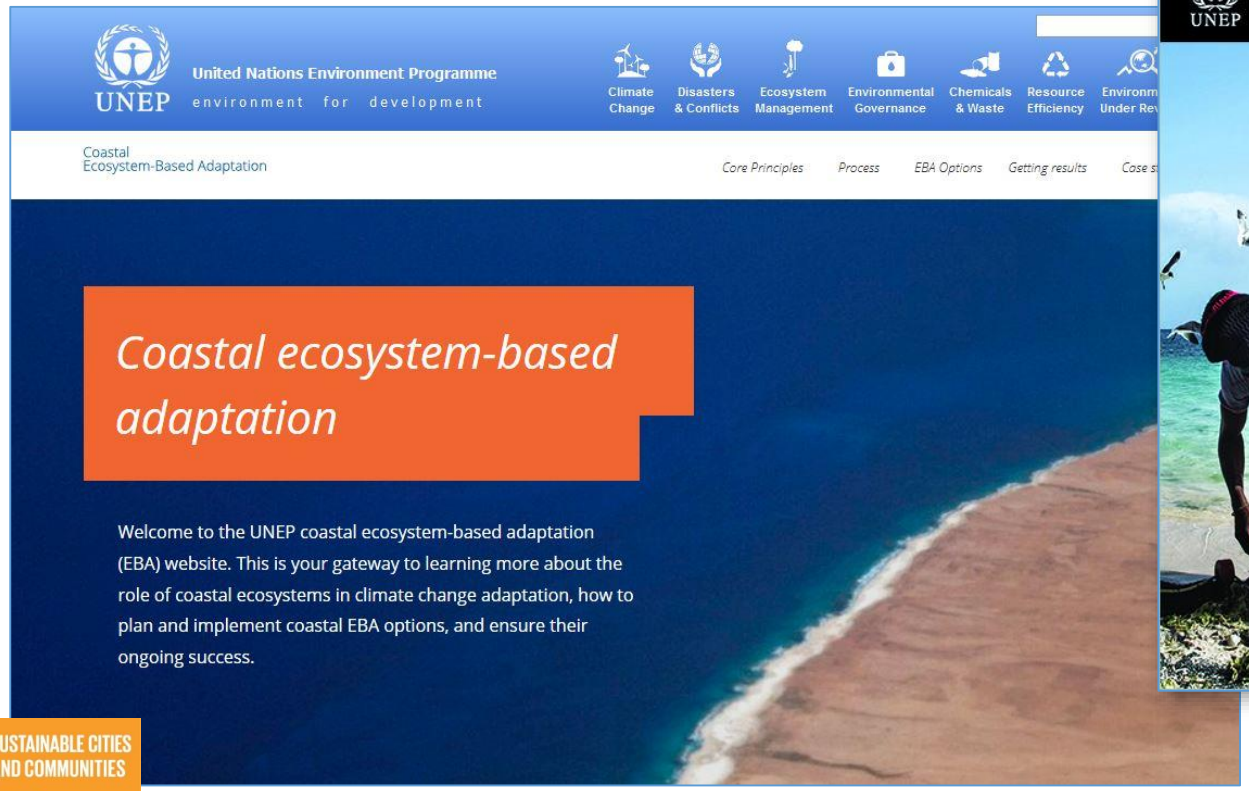
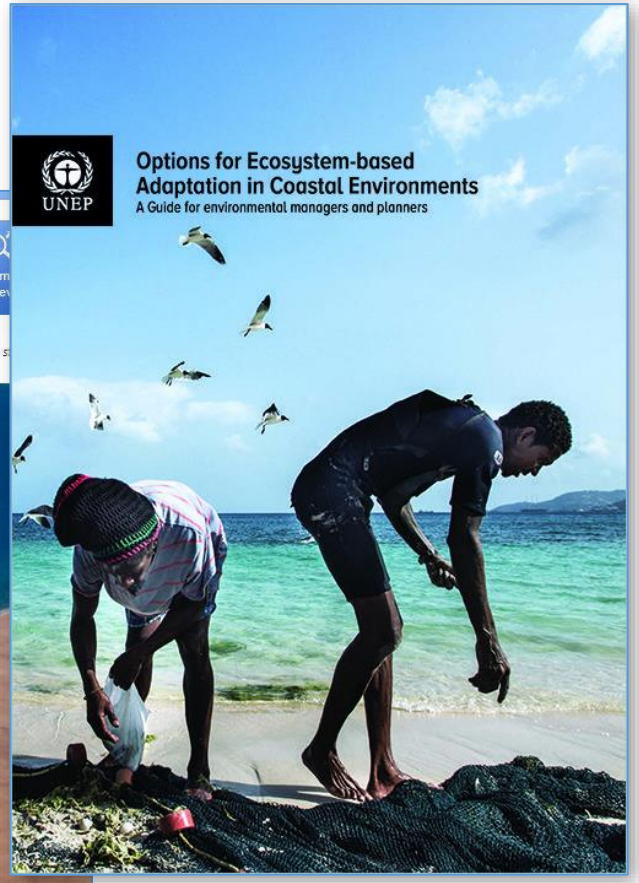
Ecosystem-based adaptation in coastal environments

Guide and website on ecosystem-based adaptation aimed at environmental and adaptation managers and planners, with a range of different coastal EBA options supported by case studies.





11 SUSTAINABLE CITIES AND COMMUNITIES

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Coastal ecosystem-based adaptation decision-support tool

The tool is designed to support coastal ecosystem-based adaptation processes, identifying key questions to address, key concepts, and useful resources.

Key questions

- Do you have a clear definition of EBA? Does one already exist in your country or do you need to establish a definition?
- Is the interconnectedness of human activities and ecosystems being considered within adaptation planning?
- Are you clear on what 'coastal' means in your context?
- Are the links between EBA and other adaptation approaches in your country clear?

Explore the sections below for more information and guidance on these questions.

- STEP 1: UNDERSTANDING EBA
- STEP 2: UNDERSTANDING THE PLANNING CONTEXT
- STEP 3: UNDERSTANDING THE ADAPTATION CONTEXT

Step 3: Understanding the adaptation context

- Step 3.a: Understanding climate change hazards
- Step 3.b: Understanding vulnerability
- Step 3.c: Identifying adaptation options

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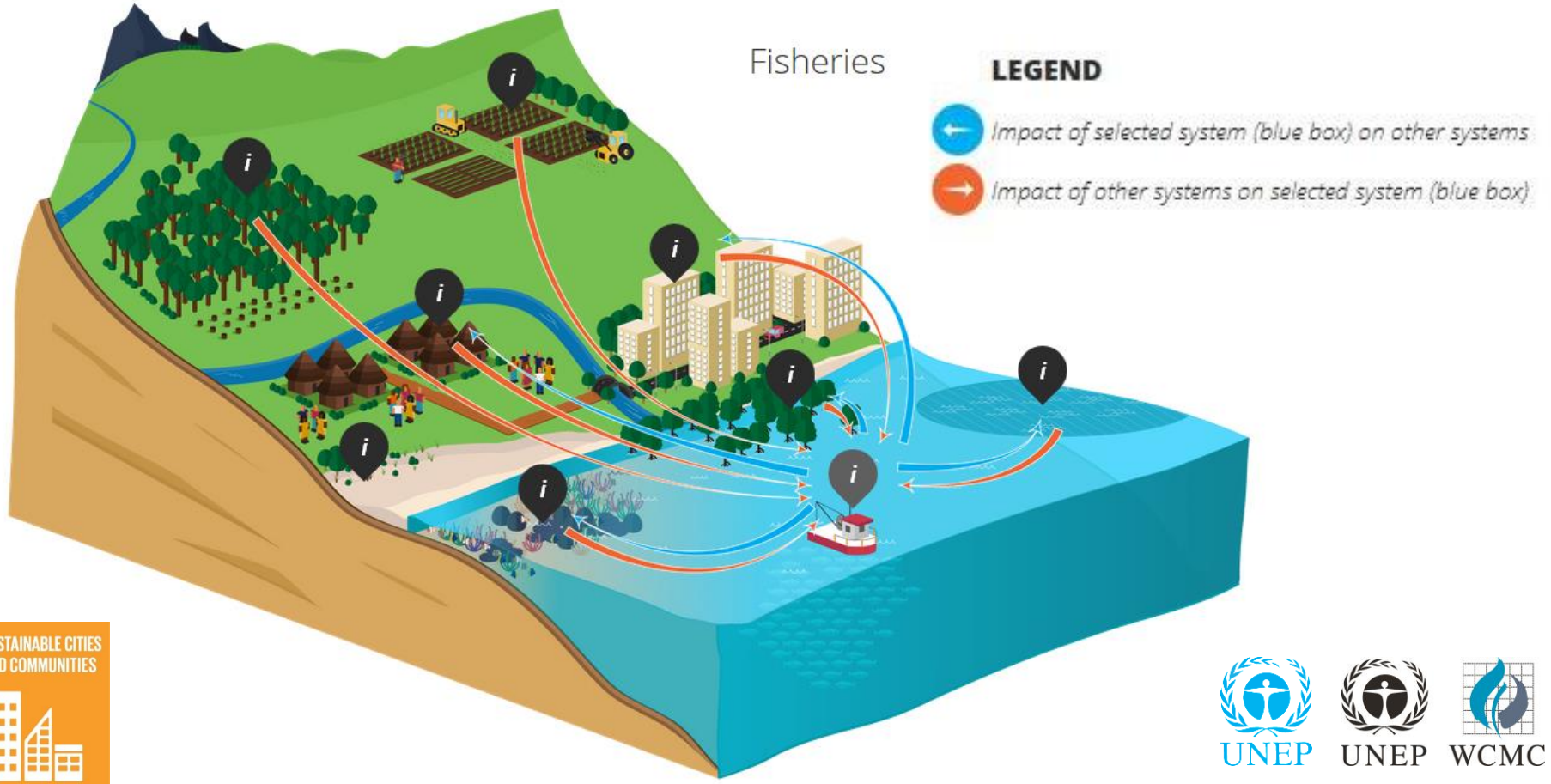
Interdependencies of fisheries, ecosystems, and coastal communities

The interdependence of ecosystems, such as coral reefs and seagrasses, as well as the ecosystem services they provide in terms of coastal protection and food provision, are important considerations in ensuring climate resilience (Saunders *et al.* 2014; Marques et al. 2014).



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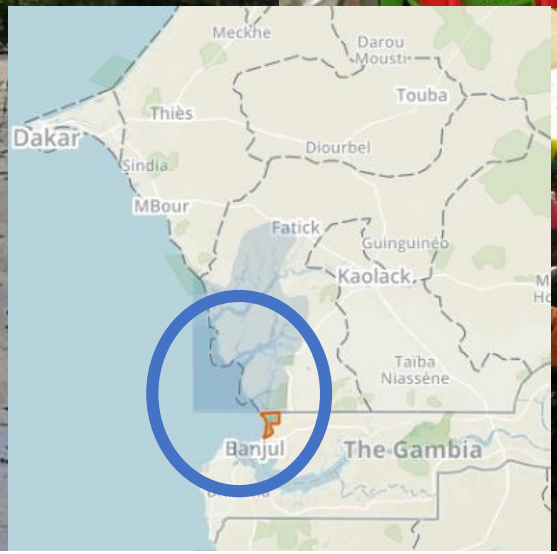
Climate-resilient communities and protected areas

Enhancing livelihoods and increasing socio-ecological resilience in West African coastal protected areas to the negative effects of climate change.



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PRCM
Partenariat Régional pour la Conservation de la Zone Côtière et Marine en Afrique de l'Ouest

enda énergie environnement développement

rampao
Réseau Régional d'Aires Marines Protégées en Afrique de l'Ouest

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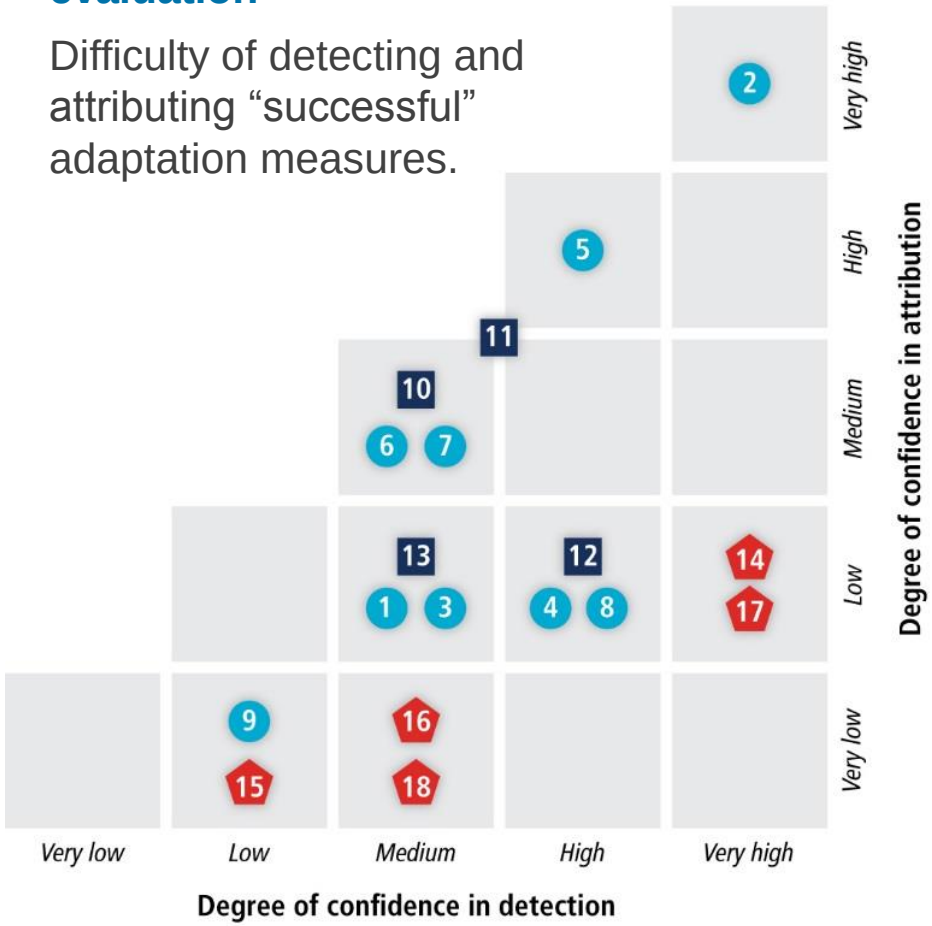
MAVA FONDATION POUR LA NATURE

Monitoring and evaluation

Difficulty of detecting and attributing "successful" adaptation measures.



Coastal systems

1. Greater rates of sea level rise relative to global means
2. Sea level rise consistent with global means
3. Marine inundation of low-lying areas
4. Shoreline erosion
5. Coral bleaching in small island marine environments
6. Increased resilience of coral reefs and shorelines in the absence of direct human disturbance
7. Acidification of surface waters
8. Degraded coastal fisheries
9. Degradation of mangroves and seagrass

Terrestrial systems

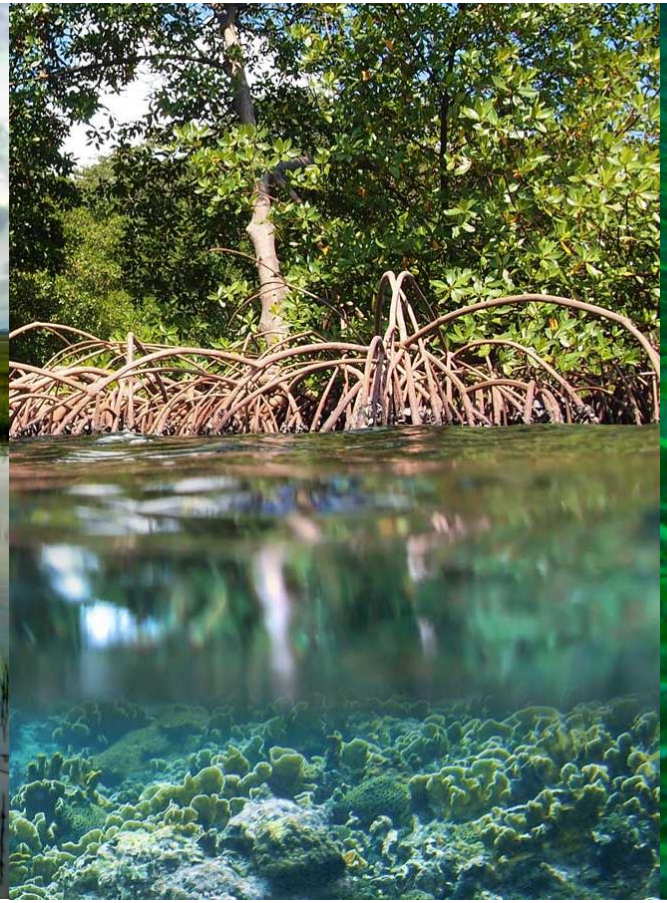
10. Saline incursion degrading ecosystems
11. Altitudinal species shift
12. Incremental degradation of groundwater quality
13. Island marine overtopping and rapid salinization of groundwater

Human systems

14. General environmental degradation and loss of habitat in urban locations
15. Reduced tourism
16. Human susceptibility to climate-induced diseases
17. Casualties and damage during extreme events
18. Re-location of communities/migration

ipcc
INTERGOVERNMENTAL PANEL ON climate change

What are ‘blue forests’? Ecosystems, including mangrove forests, seagrass meadows and saltwater marshes, that are noted for their ability to store and sequester atmospheric carbon, thereby helping to address the global climate challenge.

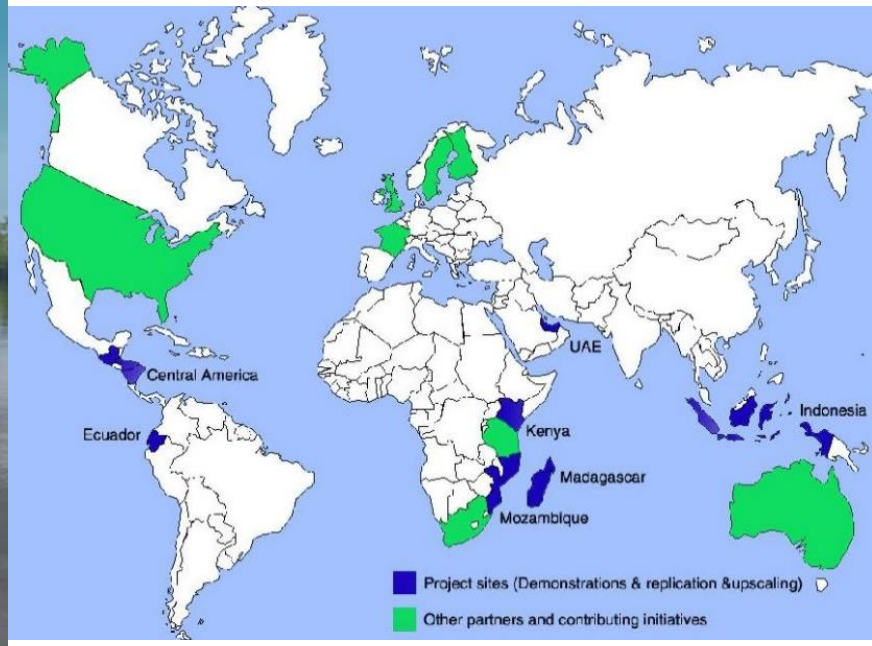




blueforests

COASTS • COMMUNITIES • CLIMATE

Promoting better coastal ecosystem management by harnessing the values associated with carbon and ecosystem services.

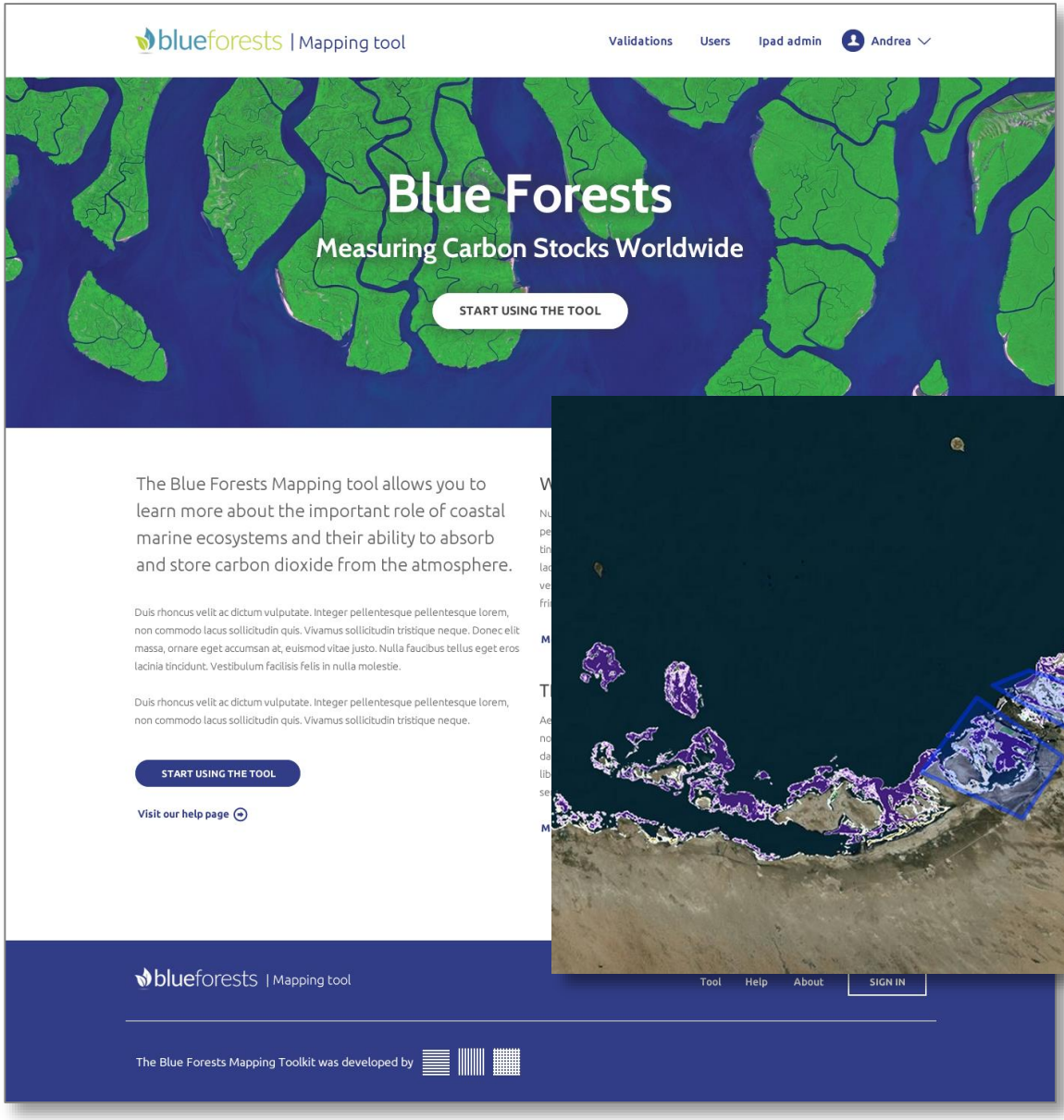


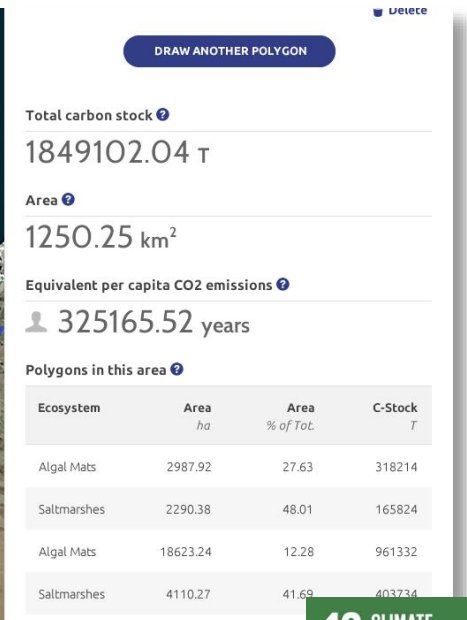
UNEP gef GRID-ARENDAL AGEDI Blue Climate Solutions blue ventures beyond conservation CHARLES DARWIN UNIVERSITY CONSERVACIÓN INTERNACIONAL Ecuador Duke UNIVERSITY

IUCN THE OCEAN FOUNDATION SOUTH AFRICAN INSTITUTE OF INTERNATIONAL AFFAIRS Stockholm University UBO UNEP WCMC WWF

13 CLIMATE ACTION

14 LIFE BELOW WATER

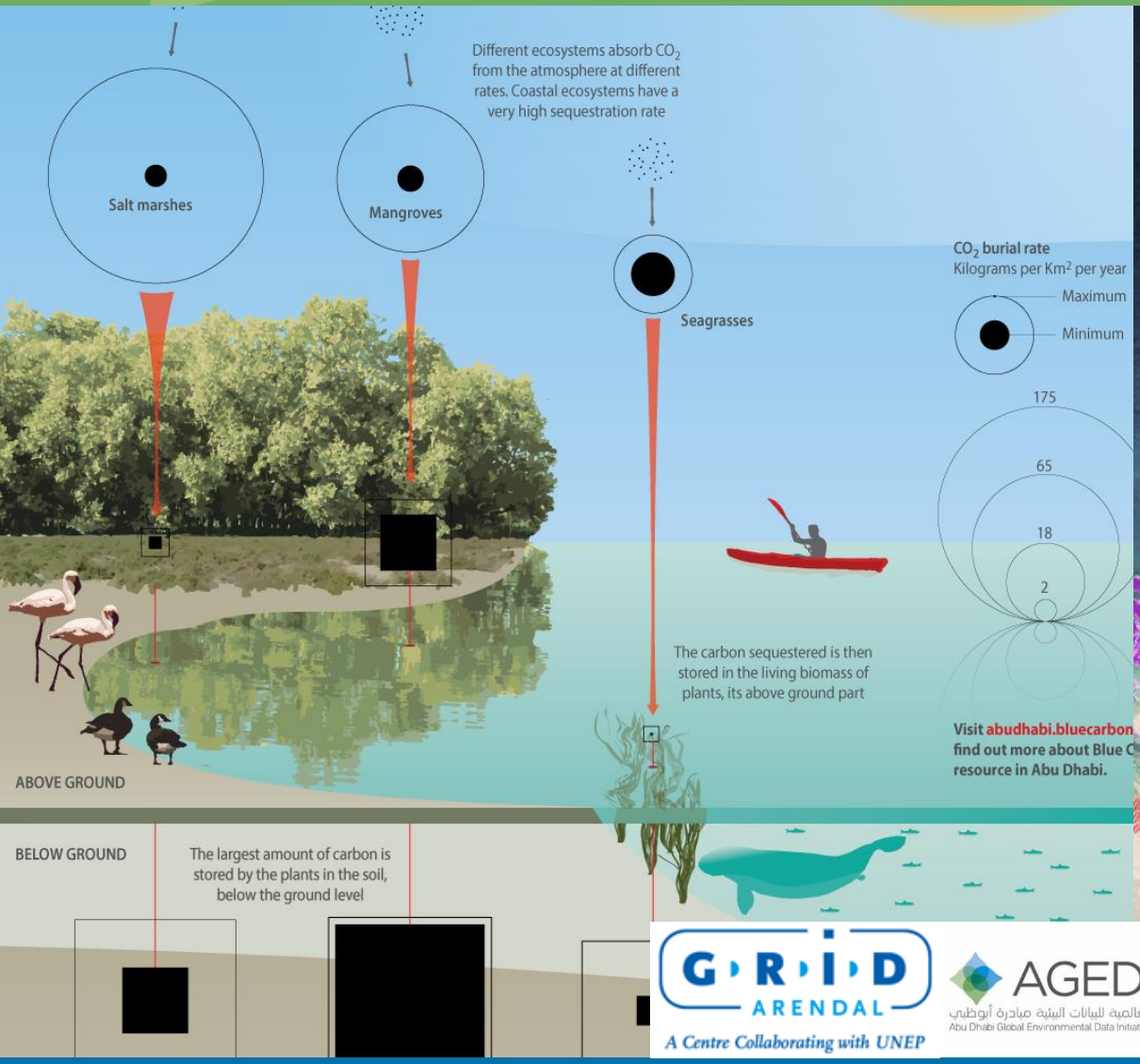




Improved knowledge and management of carbon sequestration, storage, and ecosystem services in ‘blue forest’ ecosystems, including mangroves, seagrasses, and saltmarshes.

UAE BLUE CARBON PROJECT
Blue Carbon Mapping Tool

http://bluecarbon.unep-wcmc.org/



هيئة البيئة - أبوظبي
Environment Agency - ABU DHABI

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العالمية للبيانات البيئة مبادرة أبوظبي
Abu Dhabi Global Environmental Data Initiative

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AGEDI مبادرة أبوظبي العالمية للبيانات البيئية Abu Dhabi Global Environmental Data Initiative

an initiative of UNEP

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The Nature Conservancy

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AMURE UMR CENTRE FOR THE LAW AND ECONOMICS OF THE SEA

13 CLIMATE ACTION

8 DECENT WORK AND ECONOMIC GROWTH

> *We need another language. We need to get out of these acronyms and technical terms.* ***We need to speak in a plain language.***
>
> - **Erik Solheim** | Head of UN Environment

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14 LIFE BELOW WATER

Thank you for listening!

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UNEP WCMC United Nations Environment Programme World Conservation Monitoring Centre

Floreana, Galapagos Islands | Google Maps Street View & XL Catlin Seaview Survey

Resources

- Neumann C, Bryan T, Pendleton L, Kaup A, Glavan J (eds.) *The Ocean and Us.* AGEDI Abu Dhabi, UAE/GRID-Arendal, Arendal, Norway. URL: http://wcmc.io/OceanAndUs
- Cheung et al. (2013). Signature of ocean warming in global fisheries catch. *Nature.* DOI: 10.1038/nature12156
- Howes et al. (2015). An updated synthesis of the observed and projected impacts of climate change on the chemical, physical and biological processes in the oceans. *Frontiers in Marine Science.* DOI: 10.3389/fmars.2015.00036
- Weatherdon *et al.* (2016). Observed and projected impacts of climate change on marine fisheries, aquaculture, coastal tourism, and human health: an update. *Frontiers in Marine Science.* DOI: 10.3389/fmars.2016.00048
- Planetary Health Alliance: http://planetaryhealthalliance.org/
- UNEP Coastal Ecosystem-based Adaptation: http://web.unep.org/coastal-eba/
- UNEP (2016). Options for Ecosystem-based Adaptation (EBA) in Coastal Environments: A Guide for
- environmental managers and planners. UNEP, Nairobi. URL: http://wcmc.io/coastal_EBA-guide
- GEF Blue Forests: http://www.gefblueforests.com/
- Weatherdon *et al.* (2016). Projected Scenarios for Coastal First Nations' Fisheries Catch Potential under Climate Change: Management Challenges and Opportunities. *PLOS ONE.* URL: http://wcmc.io/PLOS_2016.