

A group of divers in a submersible, looking at documents on a table. The scene is underwater, with blue lighting and bubbles visible. A nameplate on the table reads "Dr. Antje Boetius".

IMPACTS
WORLD
2017

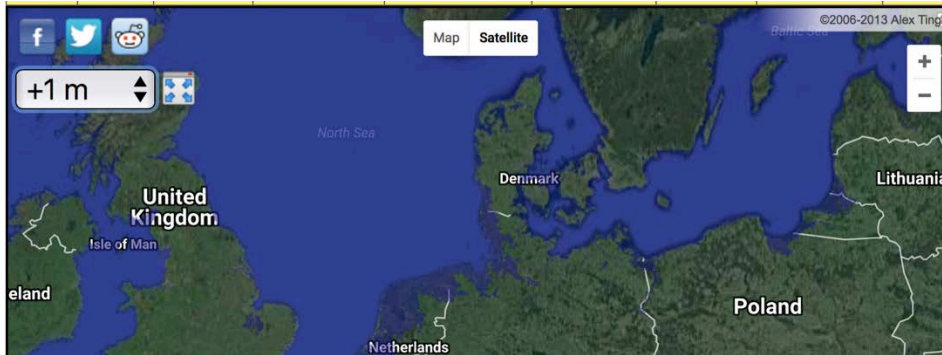
Human impacts on polar and deep seas: Knowing the unknown (*true costs*)

Antje Boetius

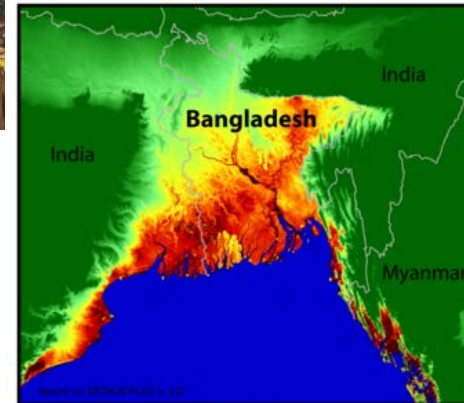
Alfred Wegener Institute for Polar and Marine Research Bremerhaven
Max Planck Institute for Marine Microbiology ♦ MARUM University Bremen

„True“ costs of *ocean* change?

Sea-level rise

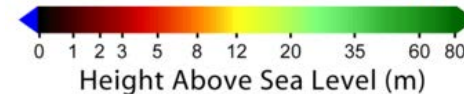


Sea Level Risks - Bangladesh



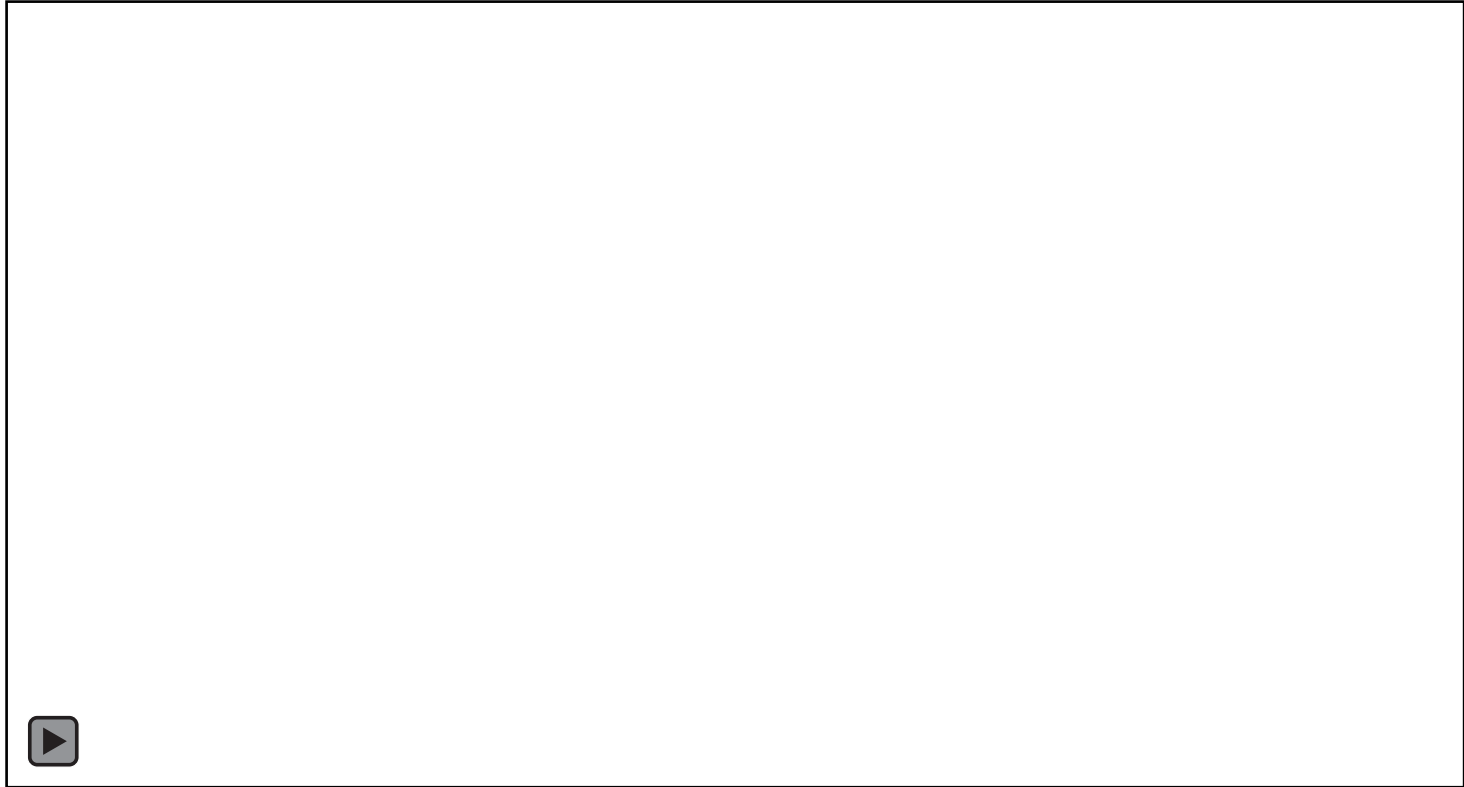
„Damage increases faster than the sea level rise itself“

Boettle et al. 2016



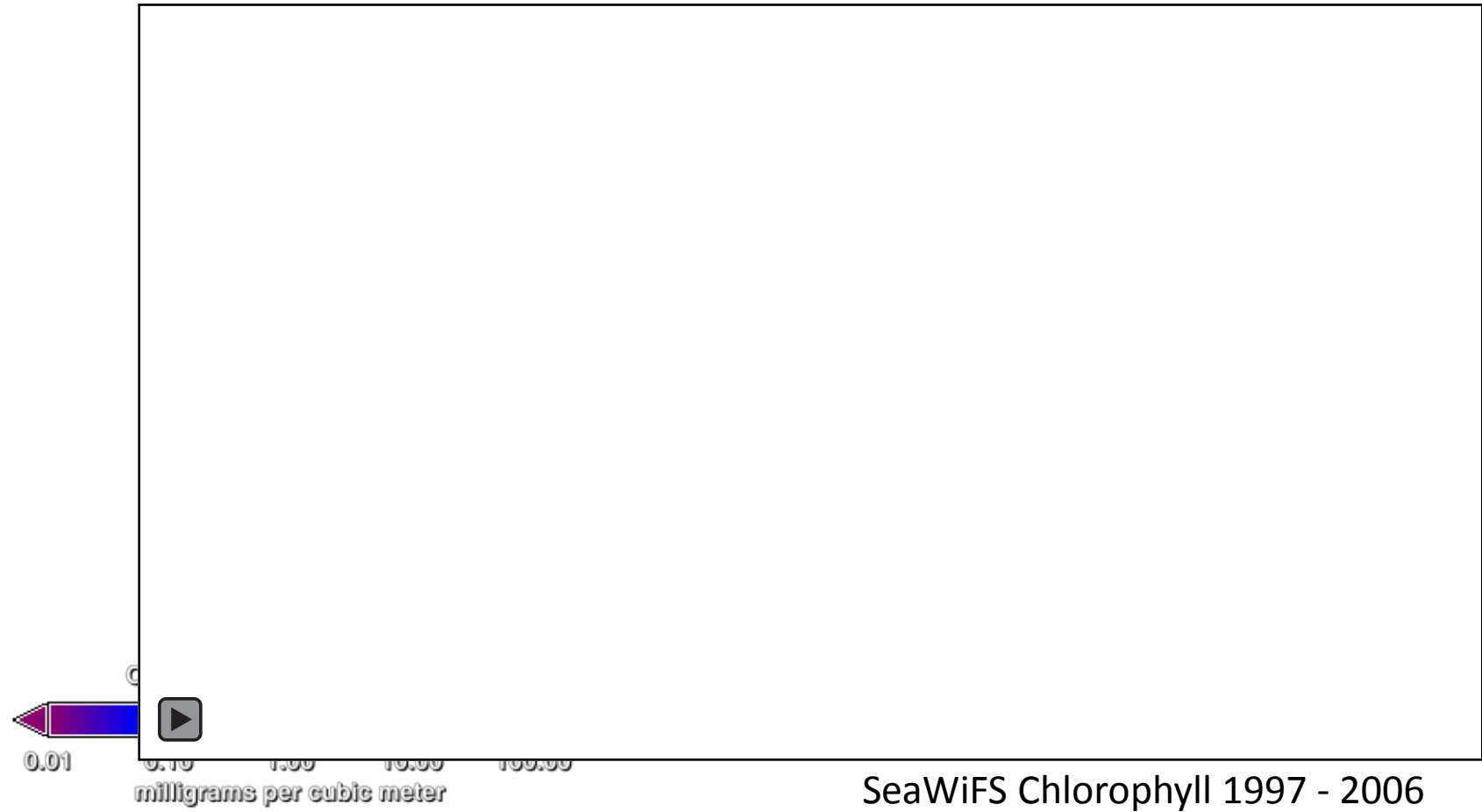


The true values and costs of ocean warming and CO₂ uptake ?





The true value of ocean productivity?





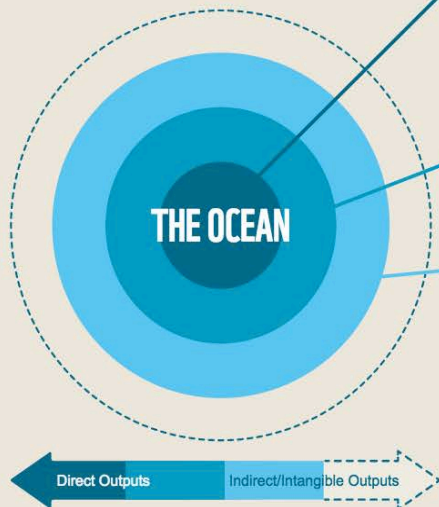
REVIVING THE OCEAN ECONOMY

The case for action - 2015

„The economics of ecosystems and biodiversity“

FIGURE 1 - GLOBAL OCEAN ASSET VALUE

The ocean provides wide-ranging value, from food and tourism to coastal protection and much more.



OCEAN-RELATED ACTIVITIES AND ASSETS

TOTAL VALUE

Direct output of the ocean from:



Marine fisheries



Mangroves



Coral reefs



Seagrass

US\$ **6.9**tn

Trade and transport:



Shipping lanes

US\$ **5.2**tn

Adjacent assets:



Productive coastline

US\$ **7.8**tn



Carbon absorption

US\$ **4.3**tn

Direct Outputs

Indirect/Intangible Outputs

2.5T USD at stake

Solution: Environmental Protection and end of non-sustainable practices

Ove Hoegh-Guldberg et al. 2015. WWF

14 LIFE BELOW WATER

Conserve and sustainably use the oceans, seas and marine resources for sustainable development

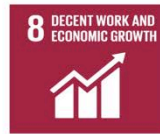


BY 2030 WE'LL
HAVE REDUCED THE
POLLUTION IN OUR
OCEANS

#GlobalGoals



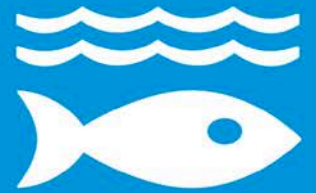
SUSTAINABLE DEVELOPMENT GOALS



[sustainabledevelopment](#) in a new tab

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Conserve and sustainably use the oceans, seas and marine resources for sustainable development



By 2020... - Effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices

- Conserve at least 10 per cent of coastal and marine areas

By 2025... - Prevent and significantly reduce marine pollution of all kinds

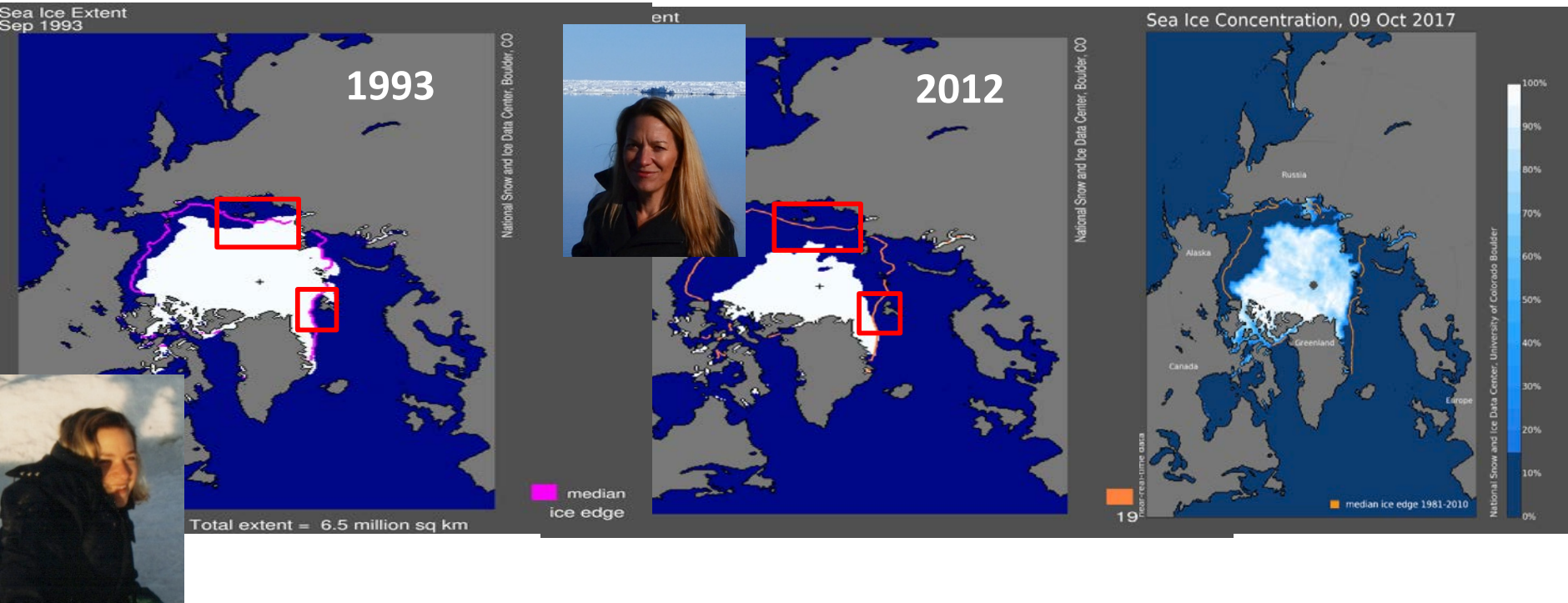
Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation



Counting the true costs of climate change
- Knowing the unknown

Counting the economic costs of climate change
Climate change and human migration
Climate change and human health
Climate change and the Sustainable Development Goals

Case study 1: Observing Arctic Ocean ecosystem change



The melting cryosphere

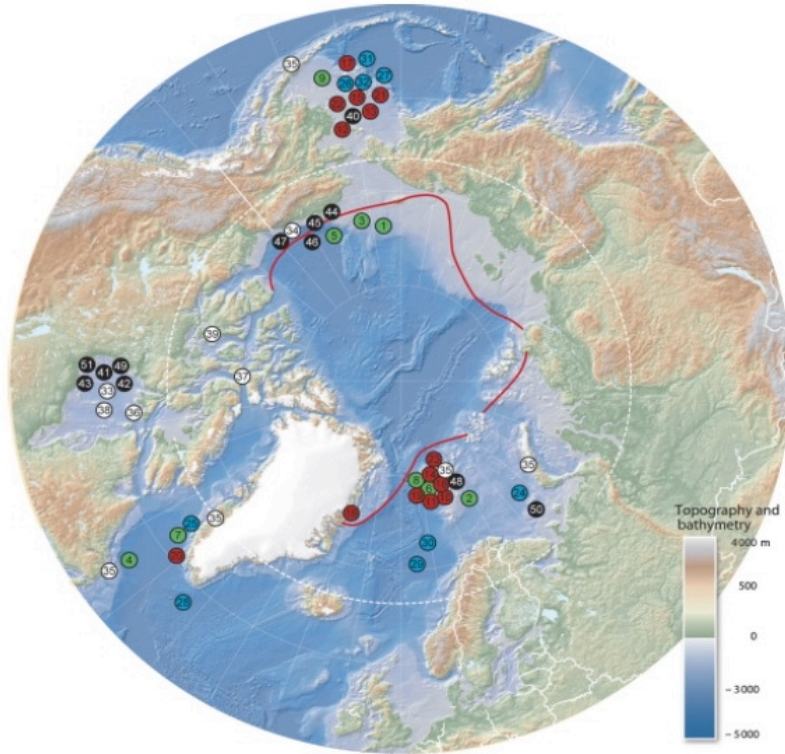


Sea ice

Permafrost

Glaciers & ice sheets

Observing Arctic ecosystem change



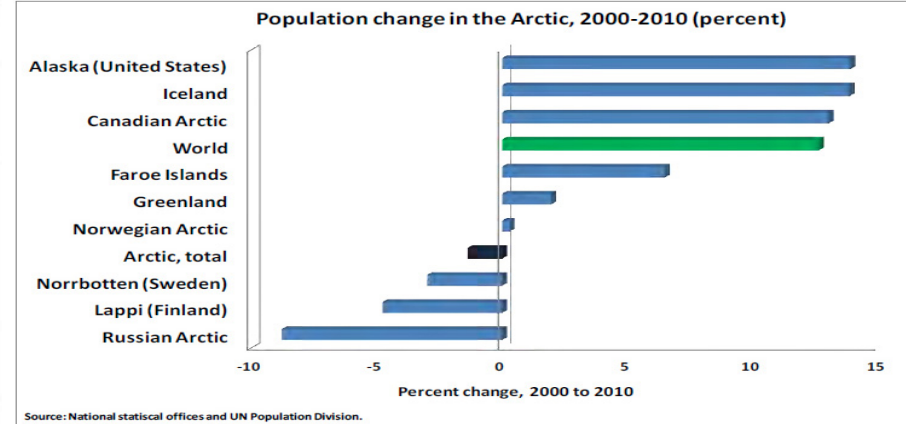
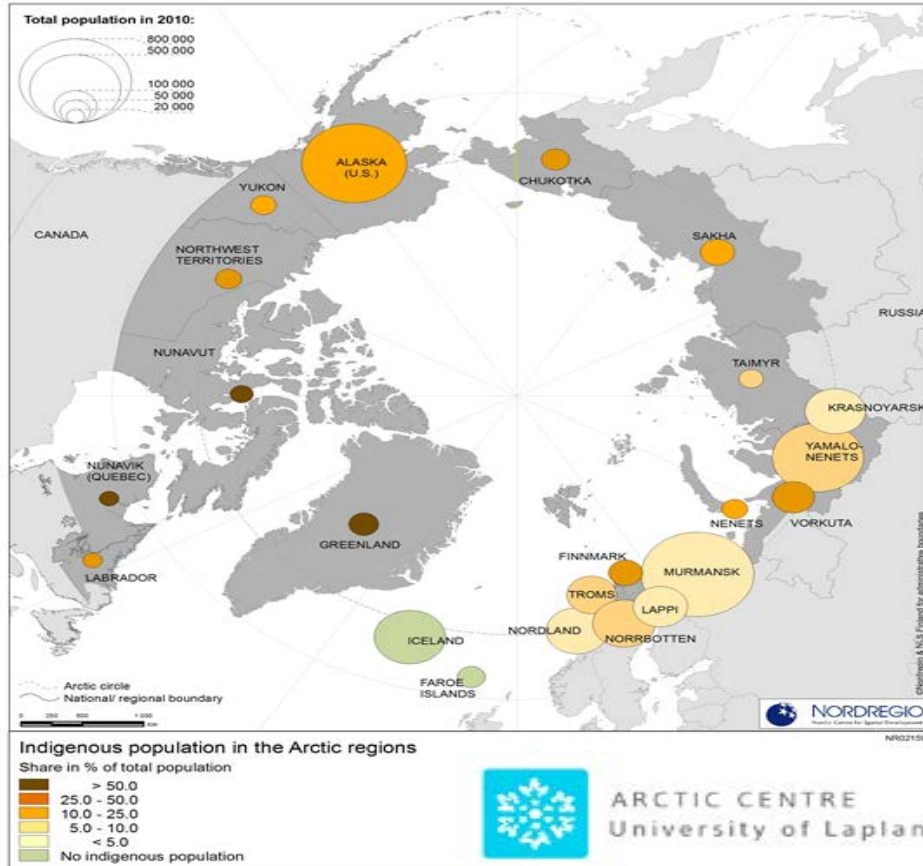
Ecosystem indicators

- Cryosphere state
- Warming & Light availability
- Winds & Mixing
- Acidification
- Productivity
- Foodweb Structure and Timing
- Biodiversity Pollution/Mortality
- *Birds & Mammals*

Map of the Arctic showing the locations where footprints of climate change impacts on marine biota have been reported

Wassmann et al. 2011

Observing Arctic livelihood change



Source: Arctic Human Development Report, 2014. <http://dx.doi.org/10.6027/TN2014-567>

Arctic social indicators:

- health and demography
- material well-being
- education
- cultural integrity
- contact with nature
- fate control

The Arctic Council



leading intergovernmental forum
promoting cooperation among the Arctic
States, Arctic indigenous communities and
other Arctic inhabitants on issues of
**sustainable development and
environmental protection in the Arctic.**

Economic assets:

30% of future gas reserves

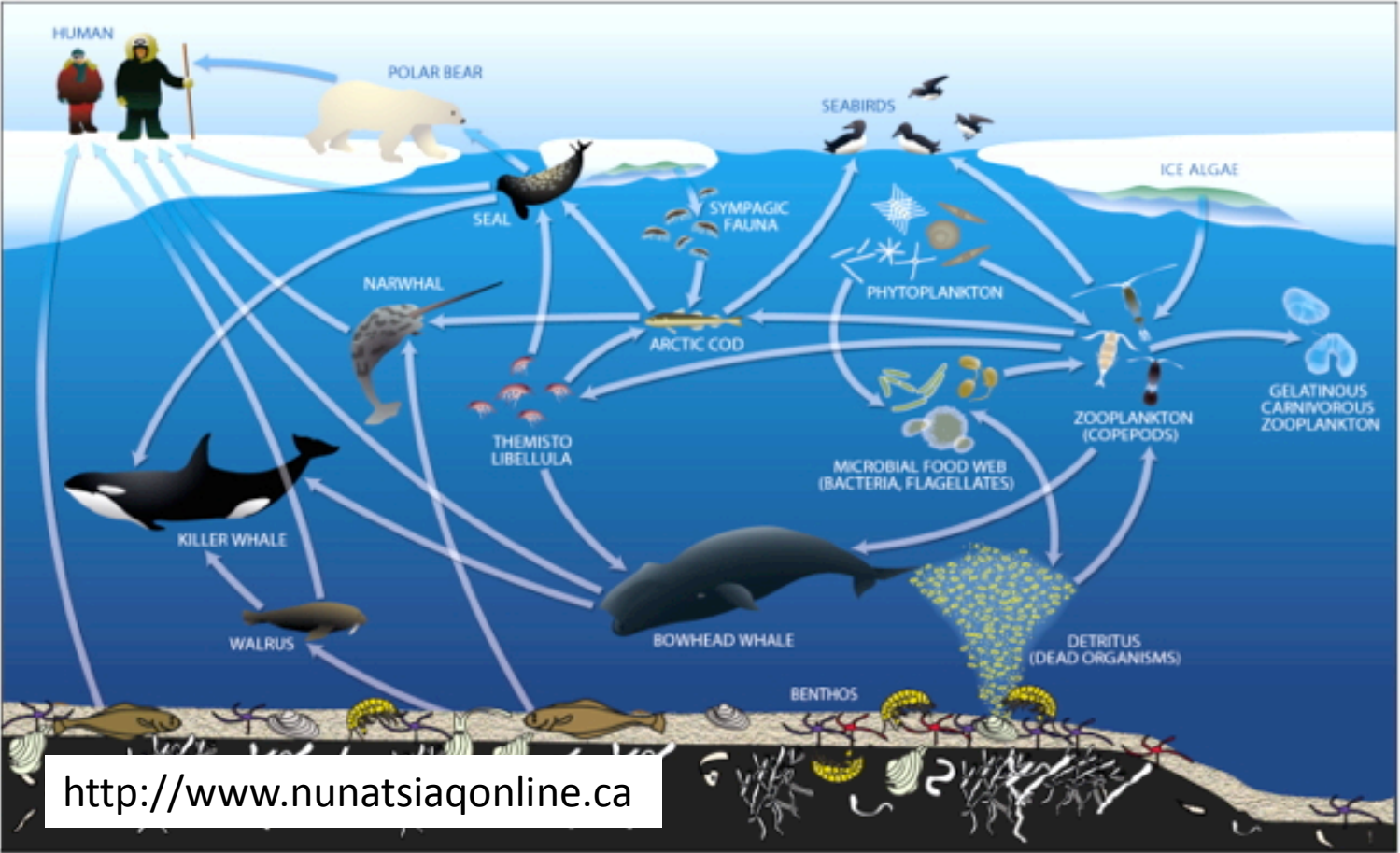
Traffic, infrastructure, internet

Potentially some valuable metals

Tourism

Not much more fish

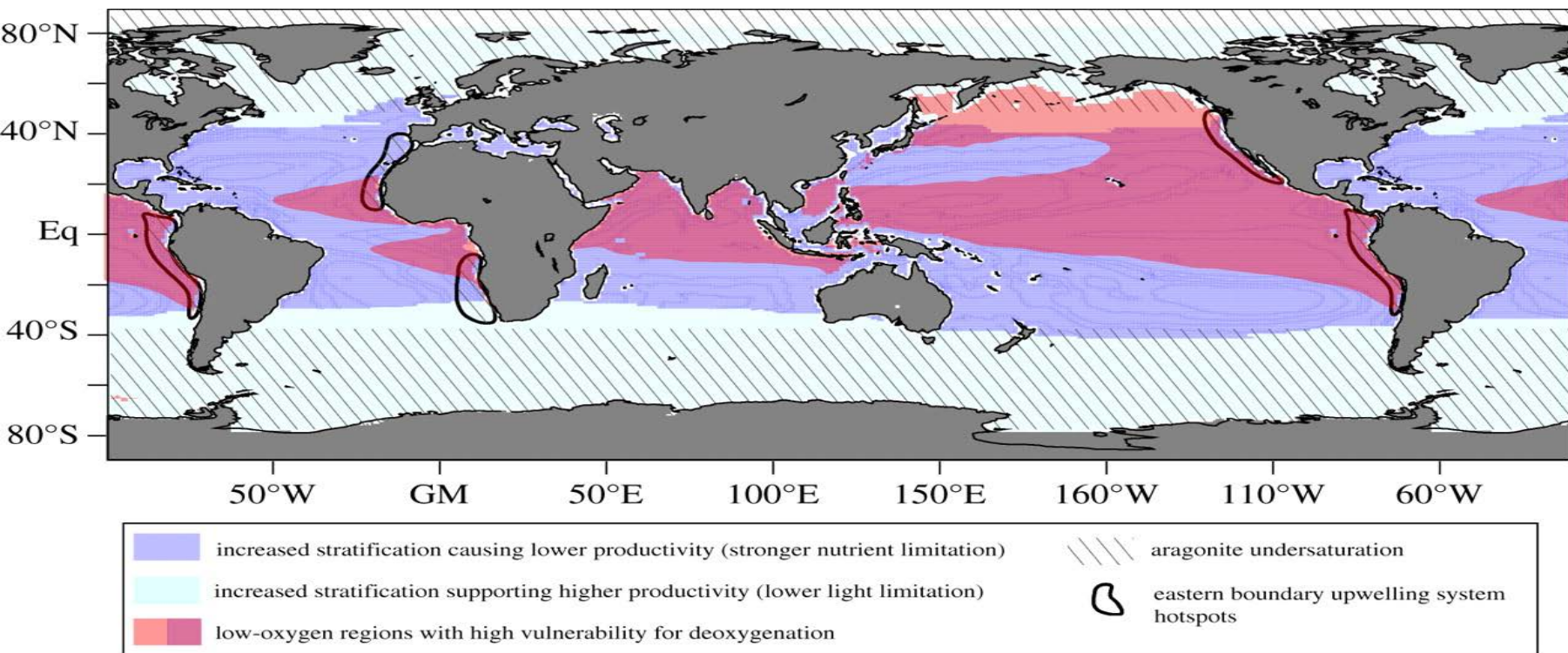
Case study 2: Valuing deep-sea ecosystems



<http://www.nunatsiaqonline.ca>

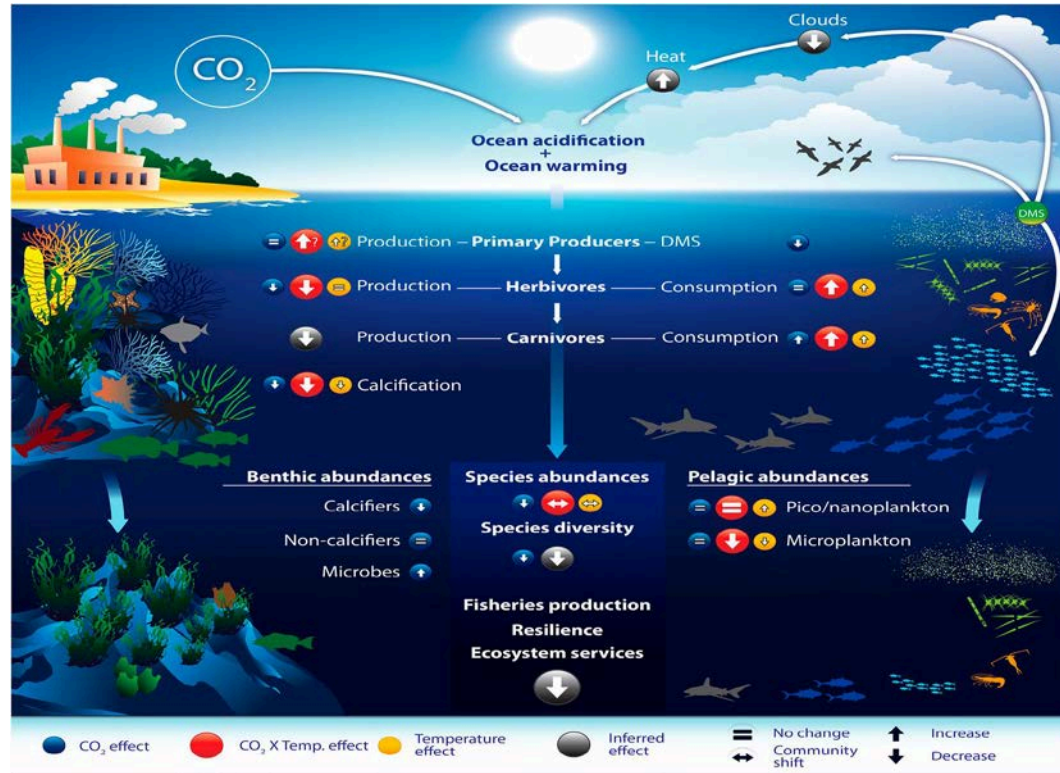


Climate change impact on the oceans: Warming up, turning sour, losing breath



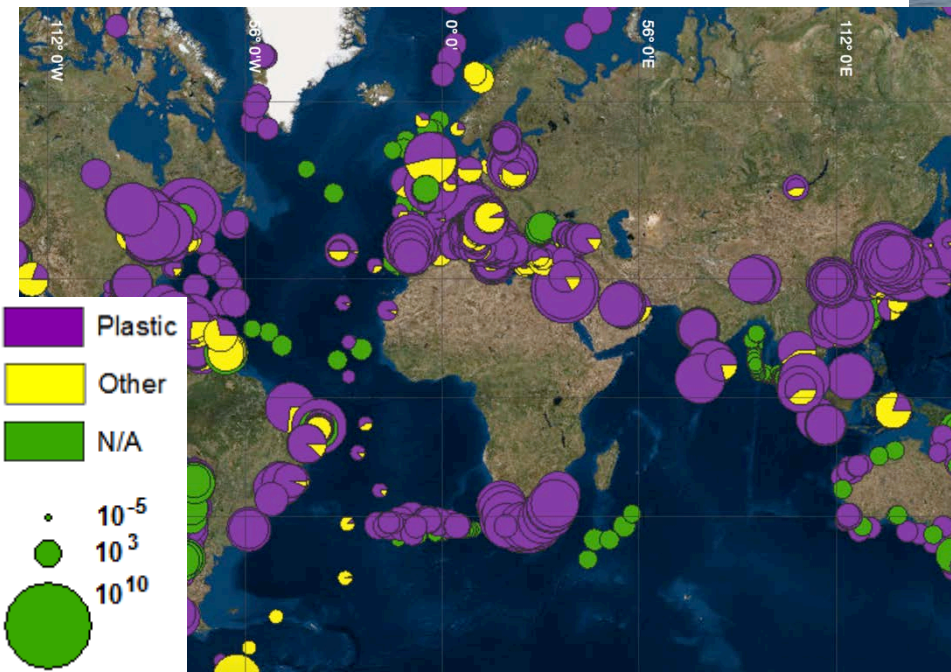
Global map showing regions of particular vulnerability to the three main stressors, i.e. ocean warming, acidification and deoxygenation. Nicolas Gruber Phil. Trans. R. Soc. A 2011

Main effects of ocean acidification, warming, and their combination on ecosystem processes and species groups.

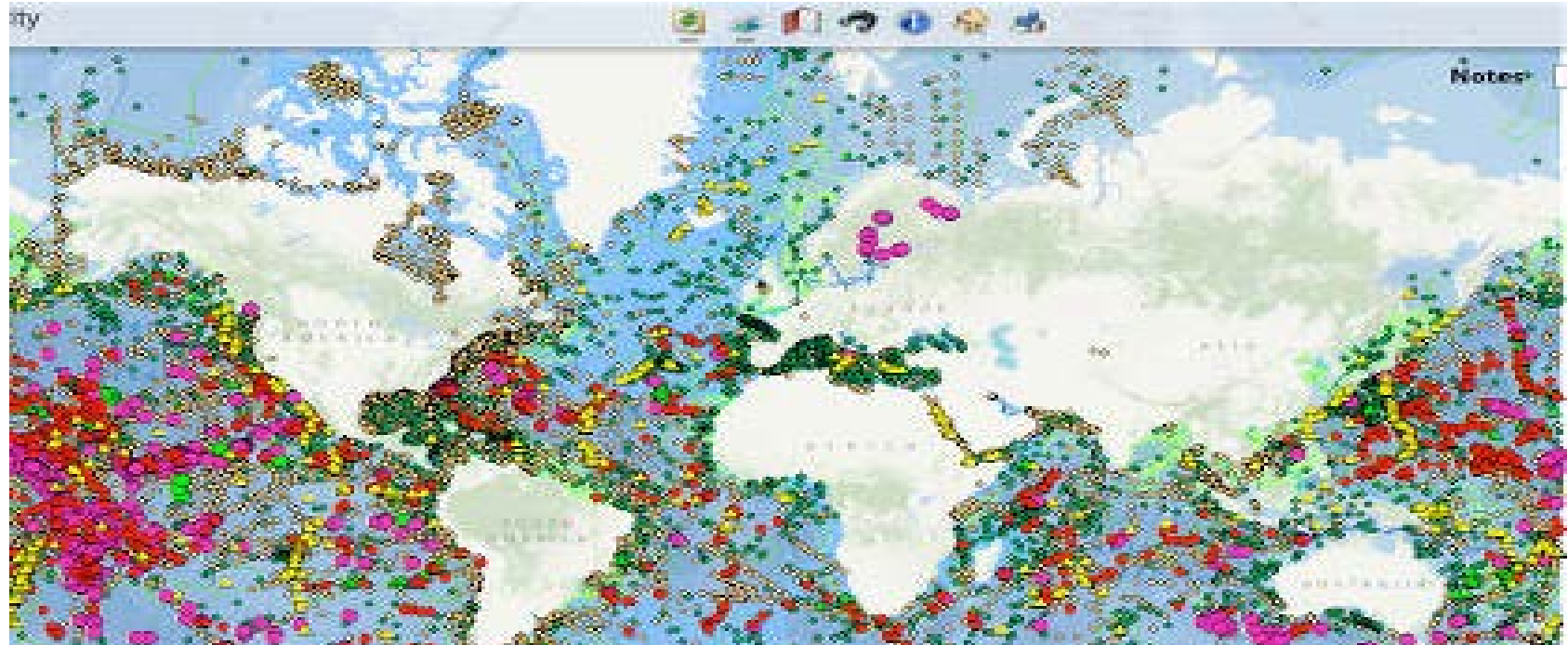


Ocean littering

<http://litterbase.awi.de/>



Ocean bed mining



International Seabed Authority ISA:
5000 Trillion USD in nodules, crusts, sulfides
Tech. Report #1 (2000), <http://www.isa.org.jm>



Case study 2: The richness of deep-sea life



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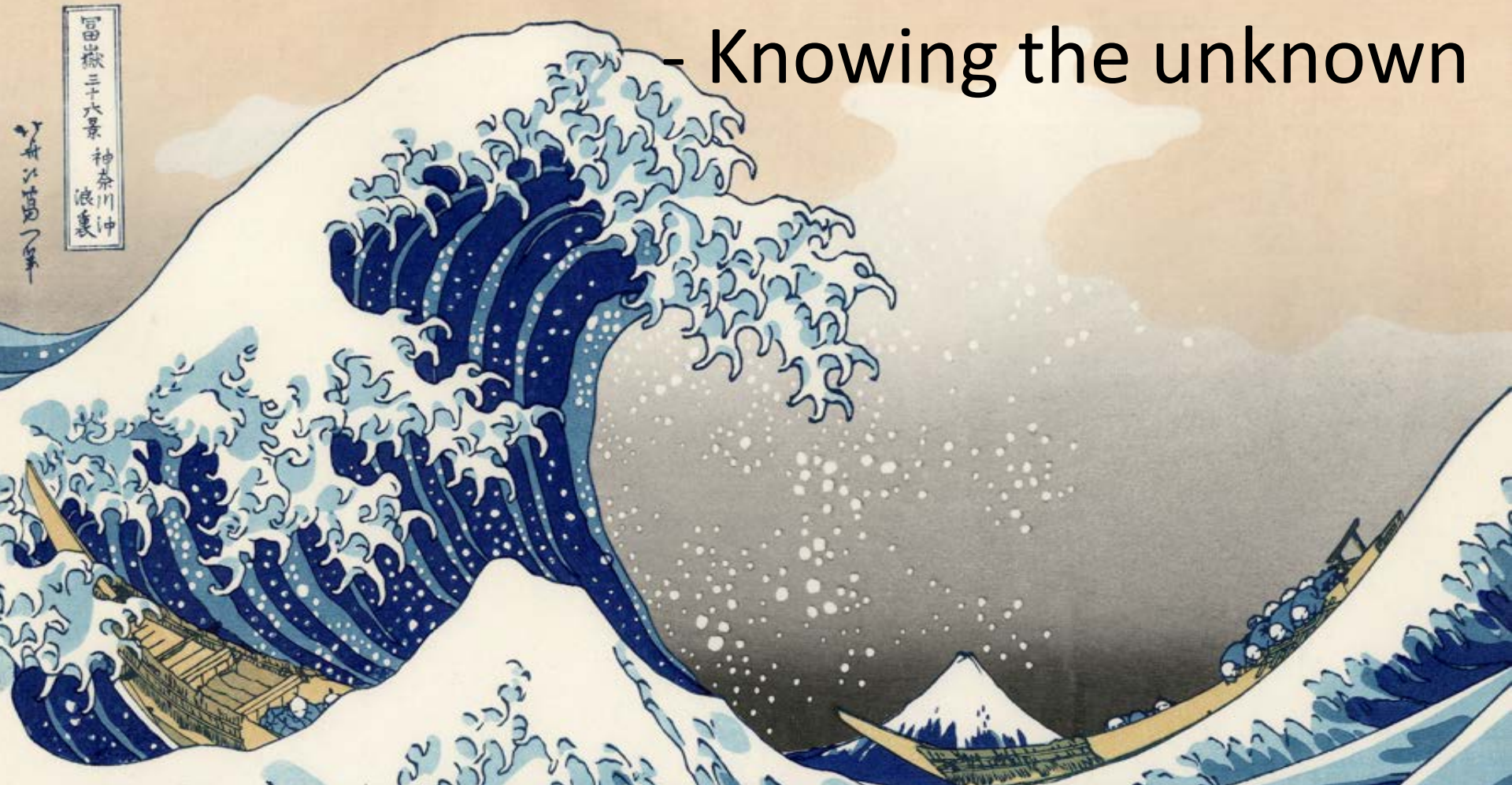


Increase scientific knowledge

Enhance the conservation and sustainable use of oceans and their resources by implementing international law



Counting the true costs of *OCEAN* change - Knowing the unknown



What the ocean means to us



<http://hongkong.coconuts.co>

900 school kids standing together on Repulse Bay Beach to celebrate Kids' Ocean Day