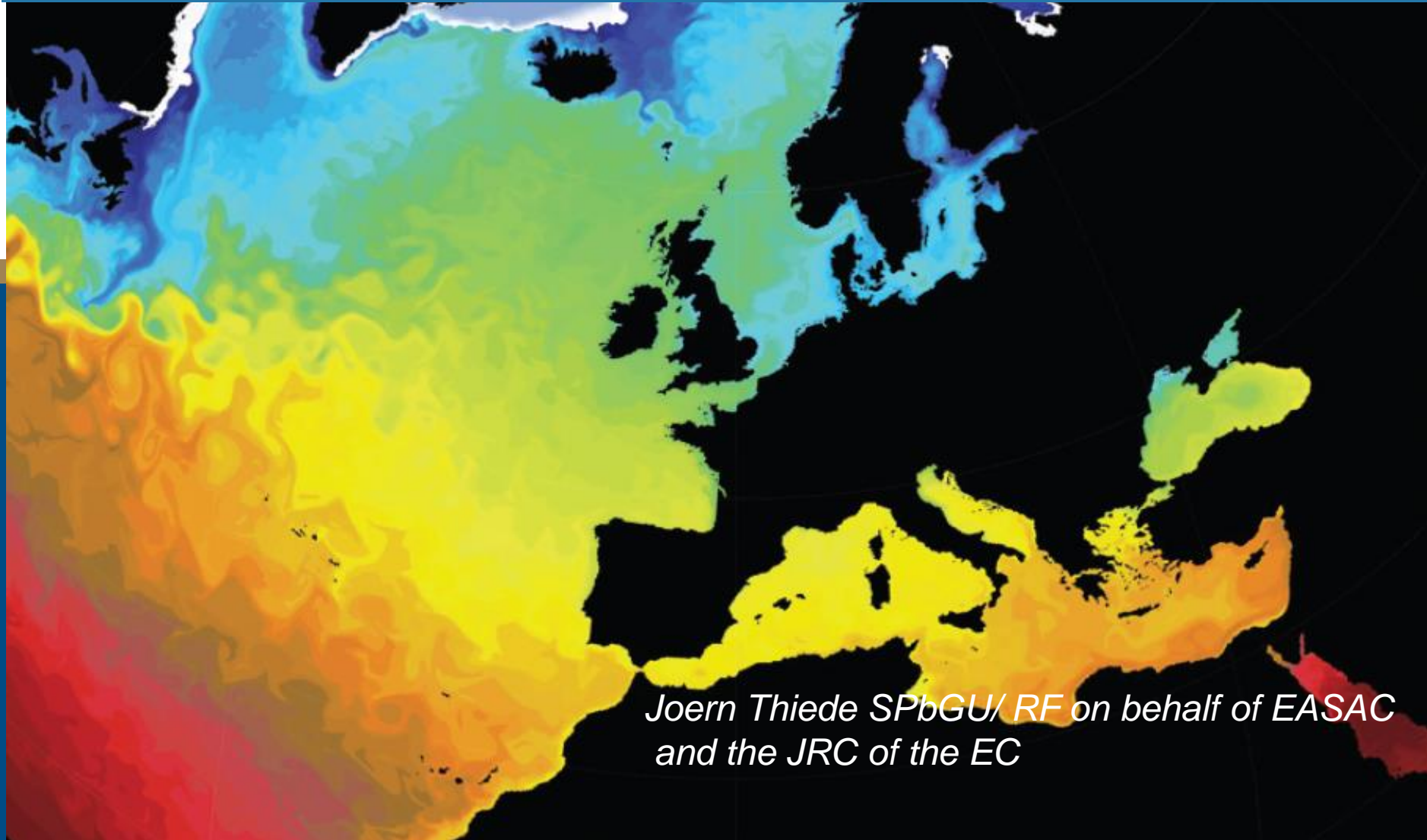


# Marine sustainability in an age of changing oceans and seas



# What is EASAC?

- Collective voice of the National Academies of Science of the EU member states
- Source of independent scientific advice for policy-makers in the European institutions
- National Science Academies in the EU:
  - Networks of scientific excellence
  - Shared task of science-based policy advice

## EASAC membership

- 25 National Academies of Science (there are no national science academies in Malta, Luxemburg or Cyprus)
- Also, by explicit vote, the national science academies of Norway and Switzerland (which are not EU member states)
- The pan-European Academy of Science, *Academia Europaea*
- The association of all academies in geographical Europe, ALLEA

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- ✓ Observer status of **FEAM**, the association of EU Academies of Medicine



# EASAC part of global network of science academies, the IAP *(The InterAcademy Partnership)*



Asia



Europe

America

Africa

# EASAC - What does it do ?

- “Science for policy”: use of scientific evidence to guide EU policy making (i.e. not “policy for science”)
- Detailed analysis and recommendations from Europe’s most respected scientists (mostly in the format of EASAC reports and statements)
- Publications are designed for a policy-oriented audience, not only other scientists
- Efficient and timely manner of offering science-based analysis and advice for policy and the public



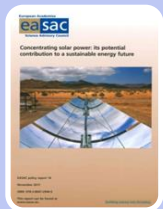
# Addressing *global* challenges



**Biosciences** (e.g. *Using crop genetic improvement technologies for sustainable agriculture*)



**Environment** (e.g. *The current status of biofuels: their environmental impacts and future prospects*)



**Energy** (e.g. *Concentrating solar power: potential contributions to a sustainable energy future*)

# Recent journal publications

- «Frankenvirus», bientôt l'épilogue?, Le Monde, April 2016
- Genetic gain of function, Nature, October 2015 
- Antimicrobial Innovation, Nature Reviews, Oct 2014
- Time to settle the synthetic controversy, Nature, May 2014
- How should we tackle the global risks to plant health?   
Trends in Plant Science, April 2014 **THE LANCET**
- What do we need to do to tackle antimicrobial resistance?  
The Lancet Global Health, November 2013 
- Europe should rethink its stance on GM crops,  
Nature, June 2013
- Academies urge action on carbon capture,  
Research Europe, June 2013 



# Some recent EASAC output

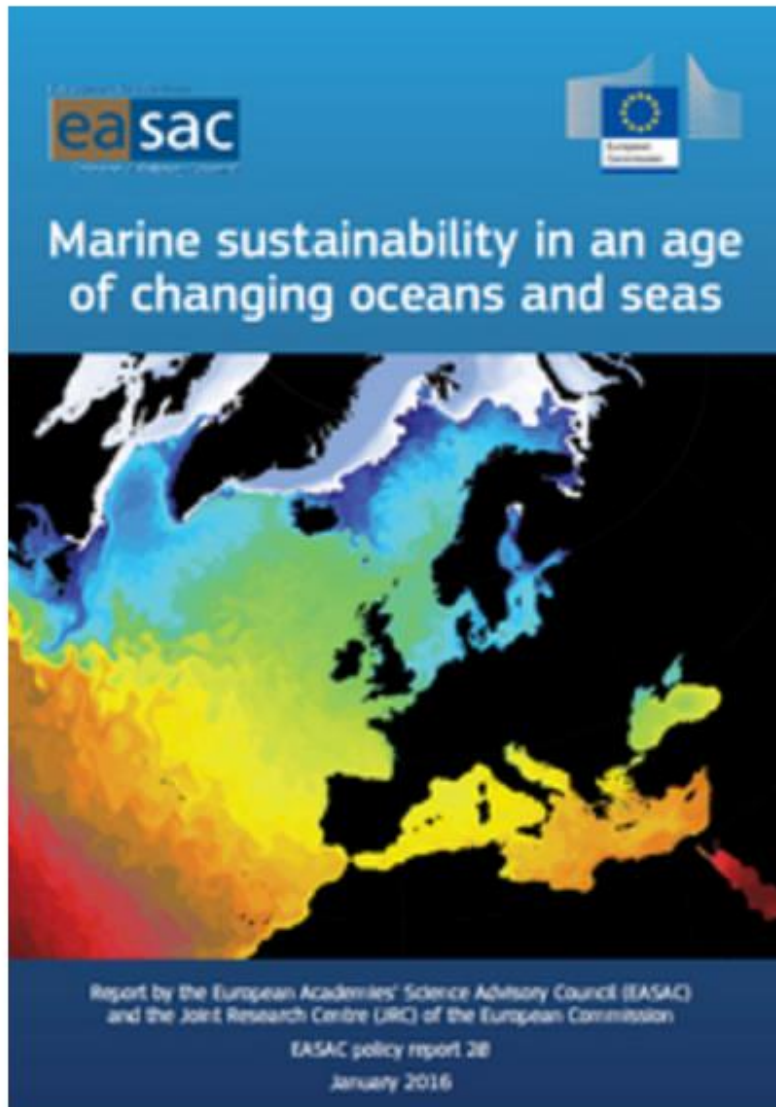
- Greenhouse gas footprints of different **oil feedstocks** (April '16)
- **Marine sustainability** in an age of changing oceans and seas (Jan '16)
- Commentary on "**Circular Economy**" (Nov '15)
- "**Gain of Function**" (in virology) (Oct '15)
- **New Breeding Techniques** (July '15)
- Ecosystem services, agriculture and **neonicotinoids** (March '15)
- **Shale gas extraction**: issues of particular relevance to the European Union (Nov '14)
- **Antimicrobial drug discovery**: greater steps ahead (Oct '14)
- European **Space Exploration**: Strategic Considerations of Human versus Robotic Exploration (September '14)



# Marine Sustainability

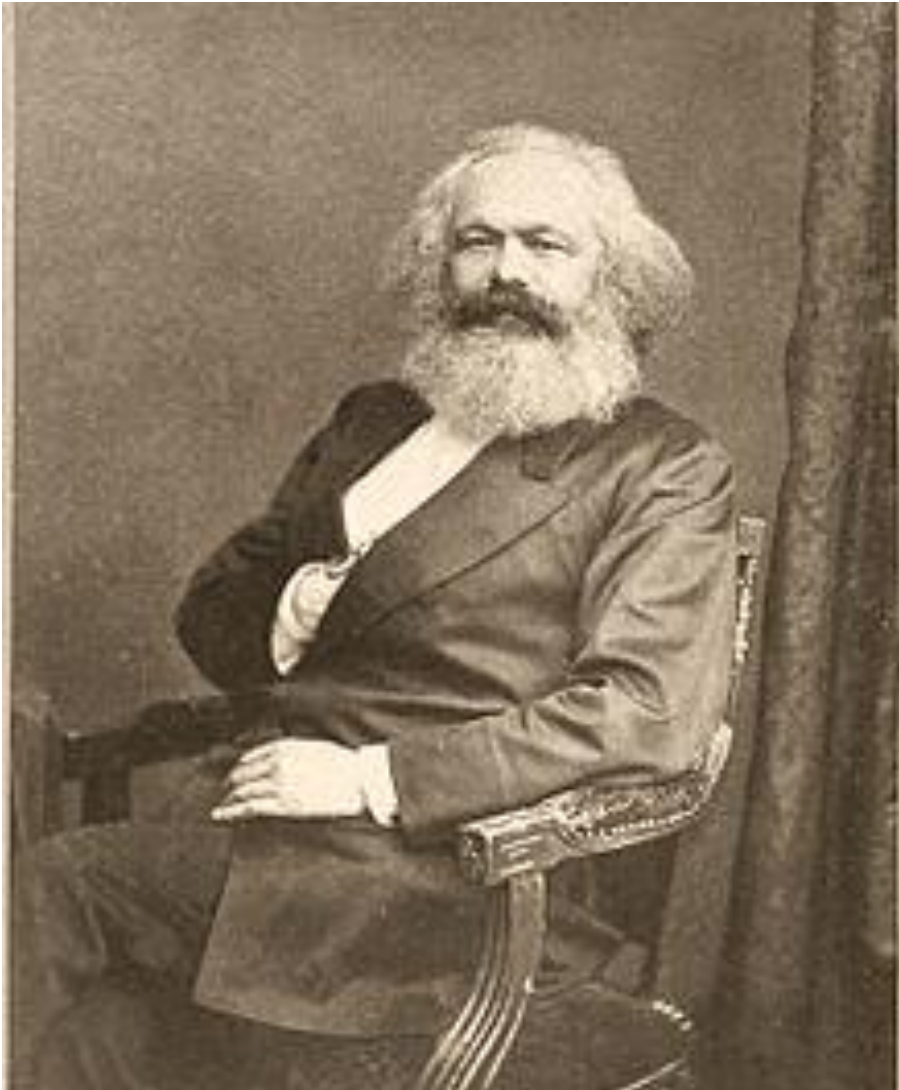
## Membership of the Working Group

- Professor Jörn Thiede – Germany/Russia (Chair)
- Gerhard Herndl - Austria
- Ondrej Prášil - Czech Republic
- Tarmo Somere - Estonia
- Jorma Kurparinen - Finland
- Philippe Cury - France
- Ulrich Bathmann - Germany
- Ferdinando Boero - Italy
- Algimantas Grigelis - Lithuania
- Costas Synolakis - Greece
- Maoz Fine - Israel
- Peter Herman - The Netherlands
- Dag Aksnes - Norway
- Ferdinando Boero - Italy
- Algimantas Grigelis - Lithuania
- Ricardo Serrão Santos - Portugal
- Mata Estrada - Spain
- Geoff Boxshall - United Kingdom
- Maria Betti - Joint Research Centre



Launch event in Brussels

25 January 2016



Even an entire society, a nation, or all simultaneously existing societies taken together, are not the owners of the earth. They are simply its possessors, its beneficiaries, and have to bequeath it in an improved state to succeeding generations

Capital Vol III Part VI  
Transformation of Surplus Profit into  
Ground-Rent

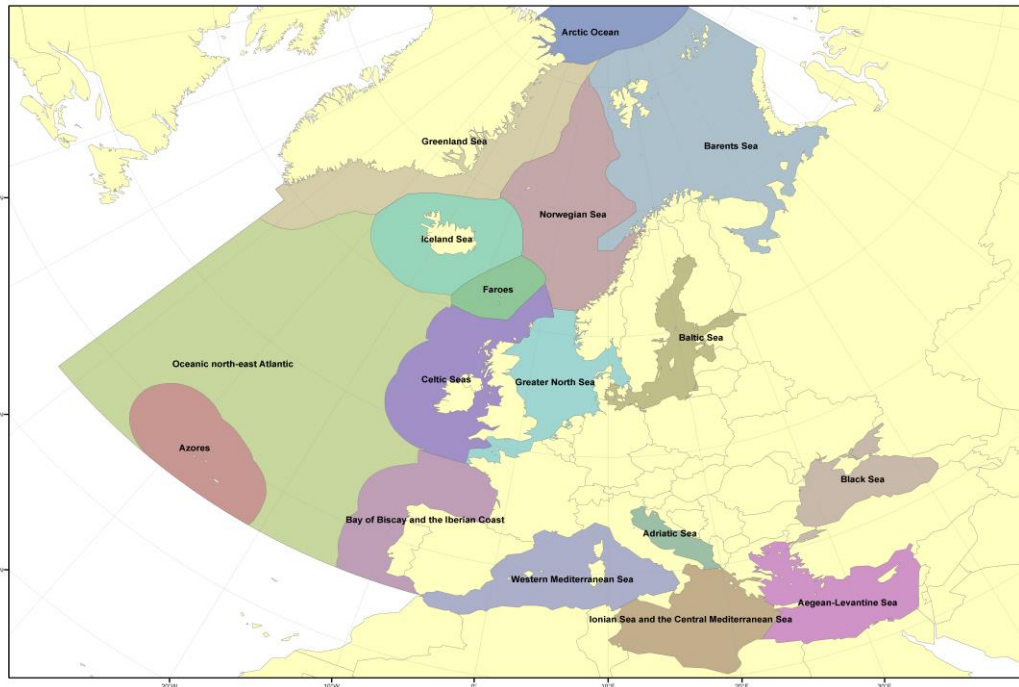


And the Lord God took the man and put him into the garden of Eden to dress it **and to keep it.**

*Genesis 2:15*

# Science for policy

- Ensuring ecosystem-based management
- Impact assessment and spatial planning
- Increased and sustainable ocean harvest
- Connecting MPAs



## Policy for science

- Building integrated knowledge
- Human capacity building
- Research set-up
- Science for society

Mitigation of climate change is essential!

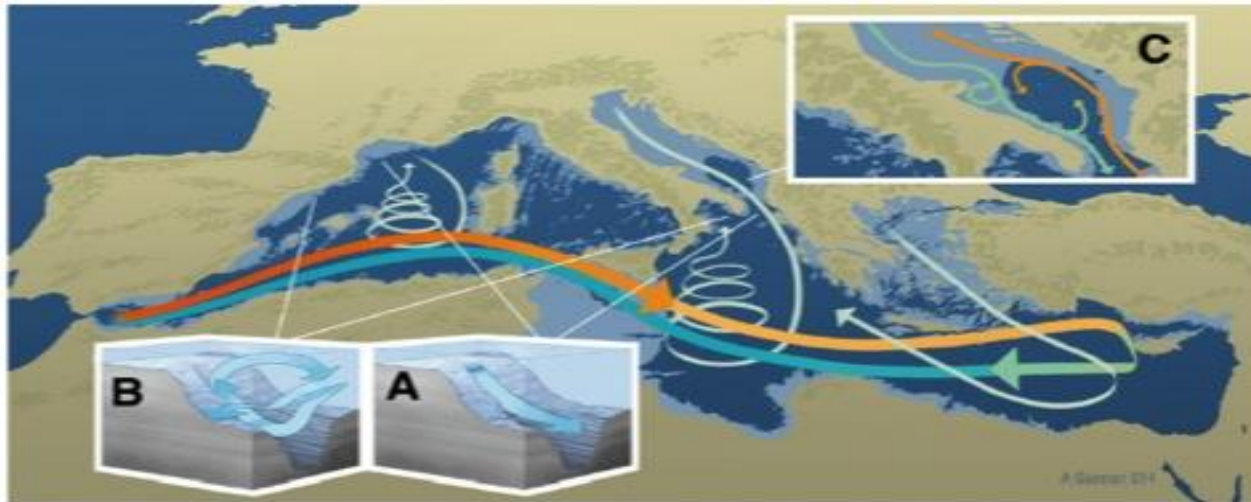
# Effective ecosystem-based management 1

- a **ecosystem-based management of human use of the sea**
- MSFD seeks to apply this but sets a new benchmark for science support

How to characterise marine ecosystem health **consistently**

A more integrated scientific understanding of marine ecosystem structure and function and ecological connectivity proper

Ecosystem modelling can provide scenarios and probabilities

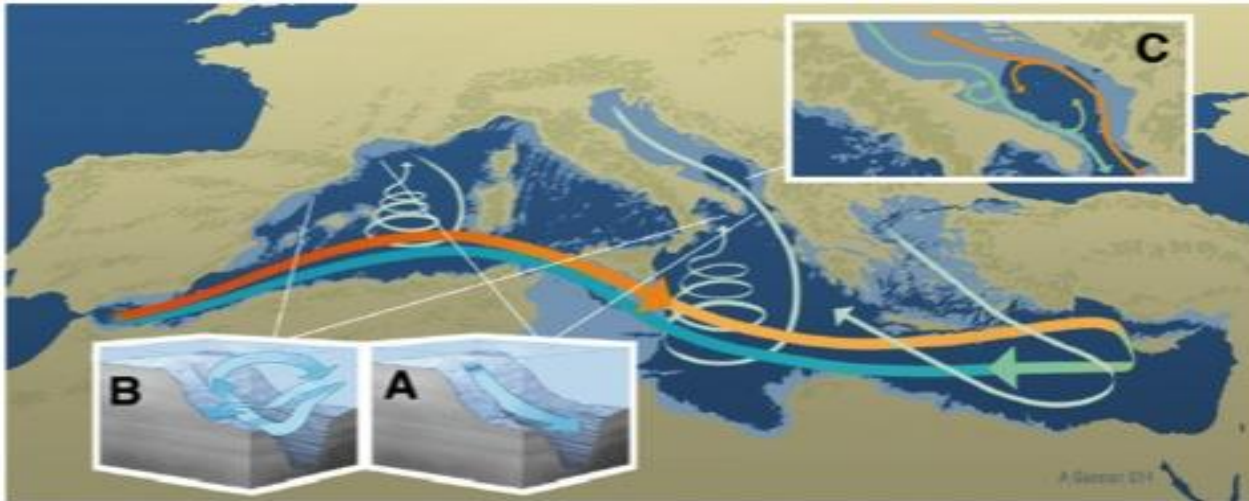


More attention to the role of pelagic systems in generating change



# Effective ecosystem-based management 1

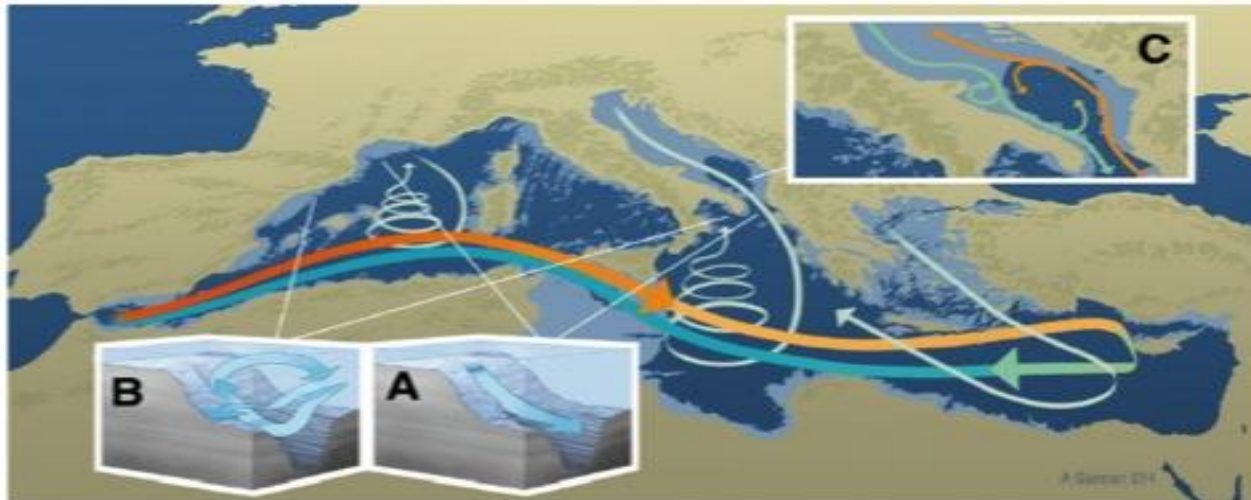
- a proper **ecosystem-based management of human use of the sea**
- MSFD seeks to apply this but sets a new benchmark for science support
- how to characterise marine ecosystem health in a **consistent** way
- a shift towards an integrated scientific understanding of marine ecosystem structure and function and ecological connectivity
- more attention to the role of pelagic features in generating change
- Ecosystem modelling can provide scenarios and probabilities



# Effective ecosystem-based management 2

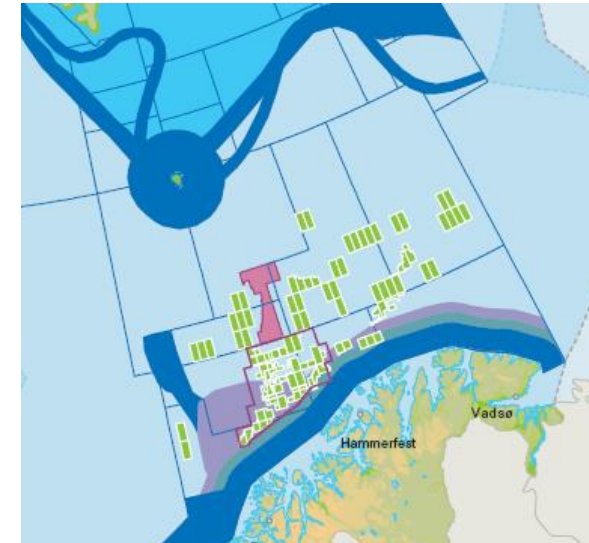
policymaking must

- recognise complexity and interconnections
- recognise scientific uncertainties,
- support efforts to develop integrated knowledge and capacities, and
- be agile enough to be **adaptive** in the light of new science

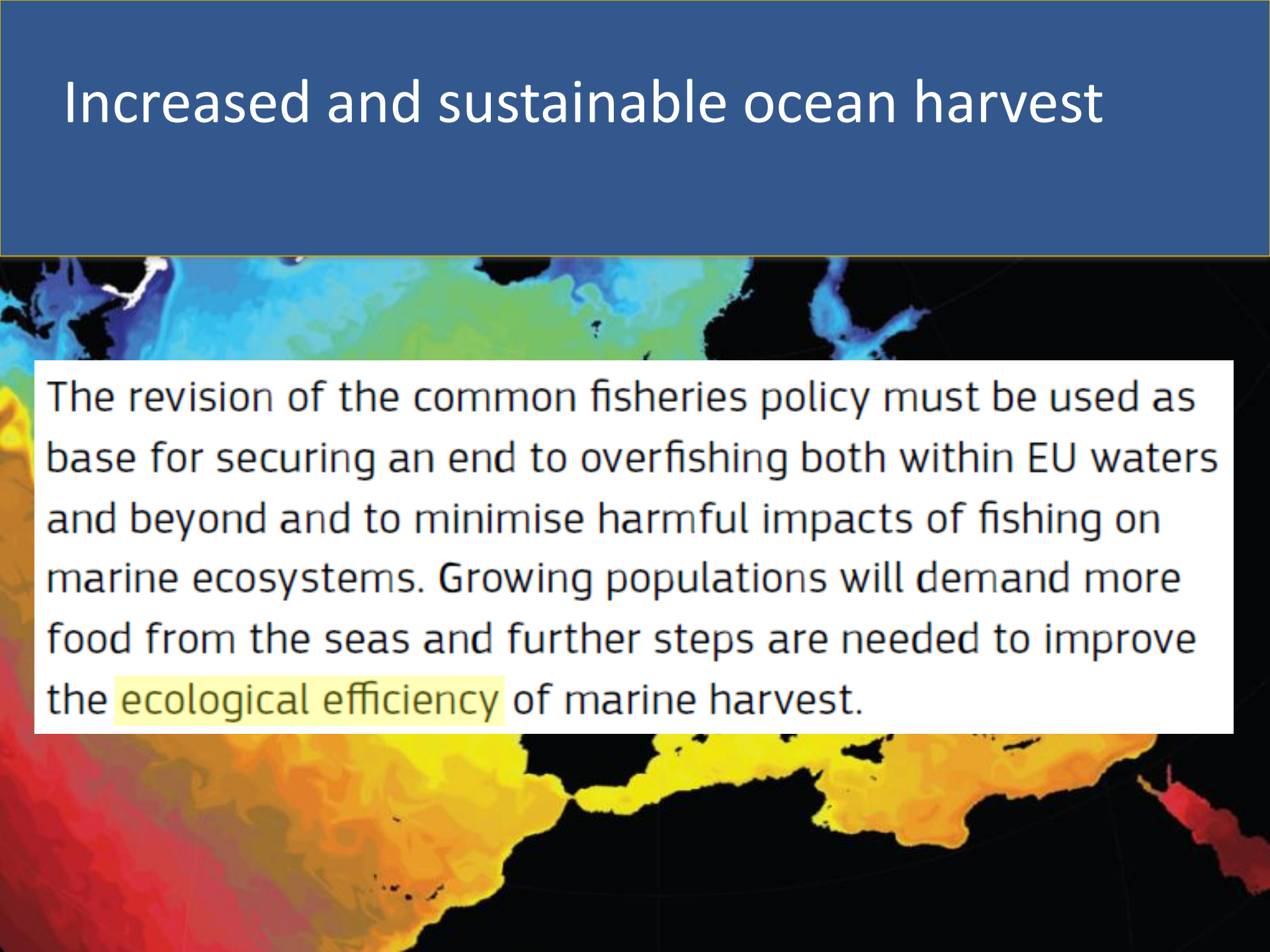


# Impact assessment and maritime spatial planning

- policymakers and scientists need to define clear goals for ecosystem health identifying what level of disturbance is unsustainable
- cross-sectoral management must use these goals as the framework for planning and management across **all** activities
- improved independent early-warning assessment of the impacts of policy choices in particular where these favour particular resource uses or promote societal behaviours
- delicate balance between facilitating technology and understanding impacts

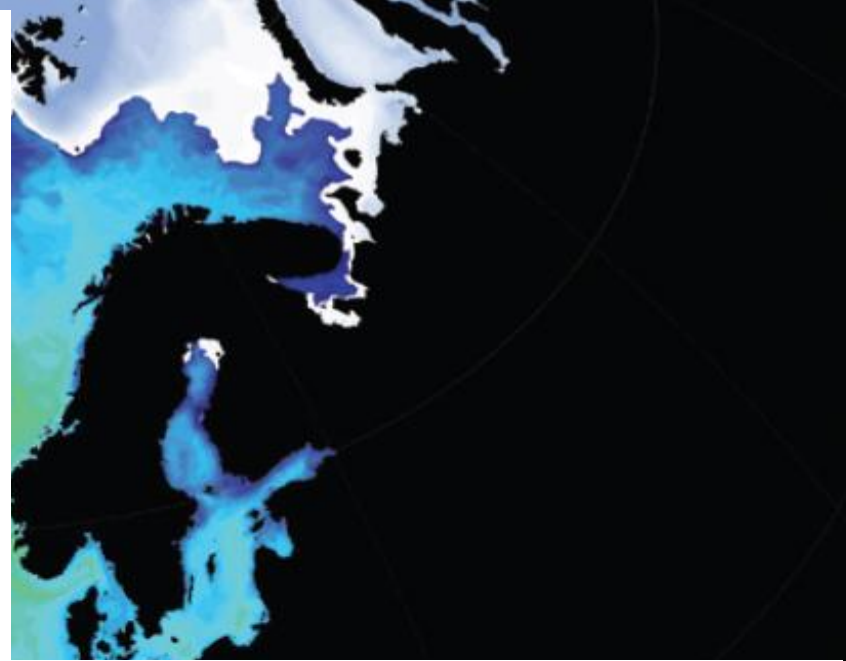
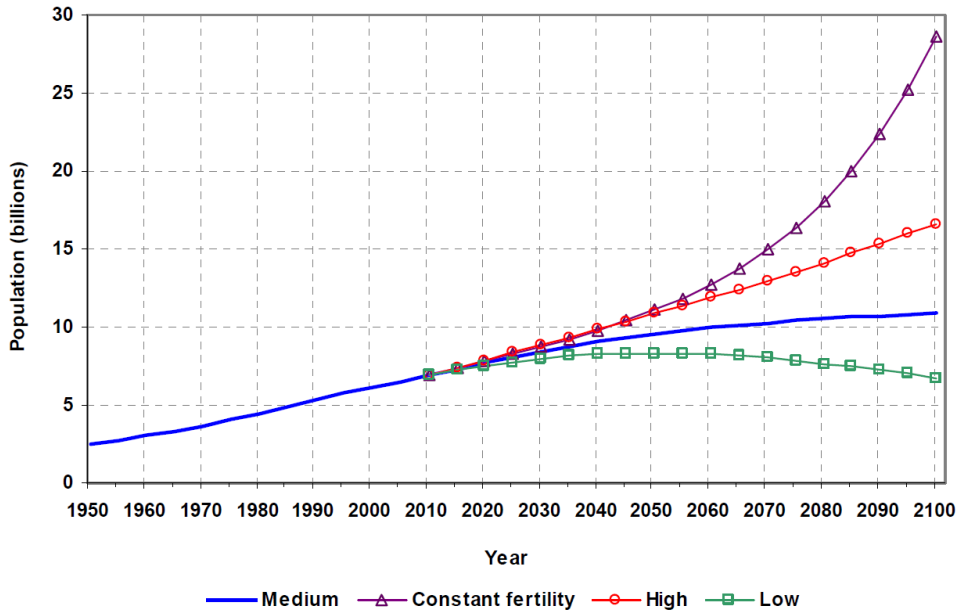


# Increased and sustainable ocean harvest

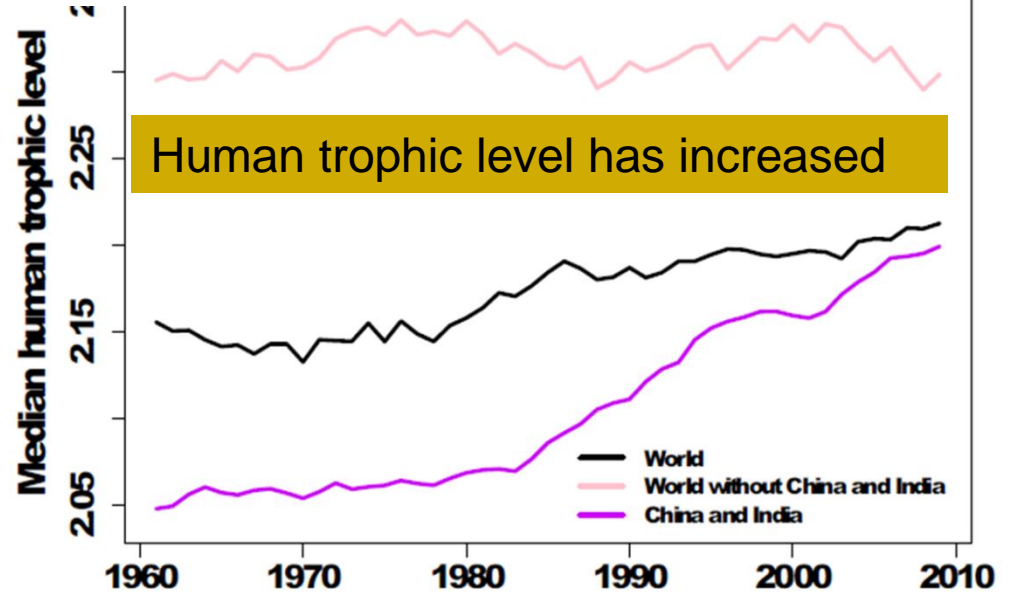


The revision of the common fisheries policy must be used as base for securing an end to overfishing both within EU waters and beyond and to minimise harmful impacts of fishing on marine ecosystems. Growing populations will demand more food from the seas and further steps are needed to improve the ecological efficiency of marine harvest.

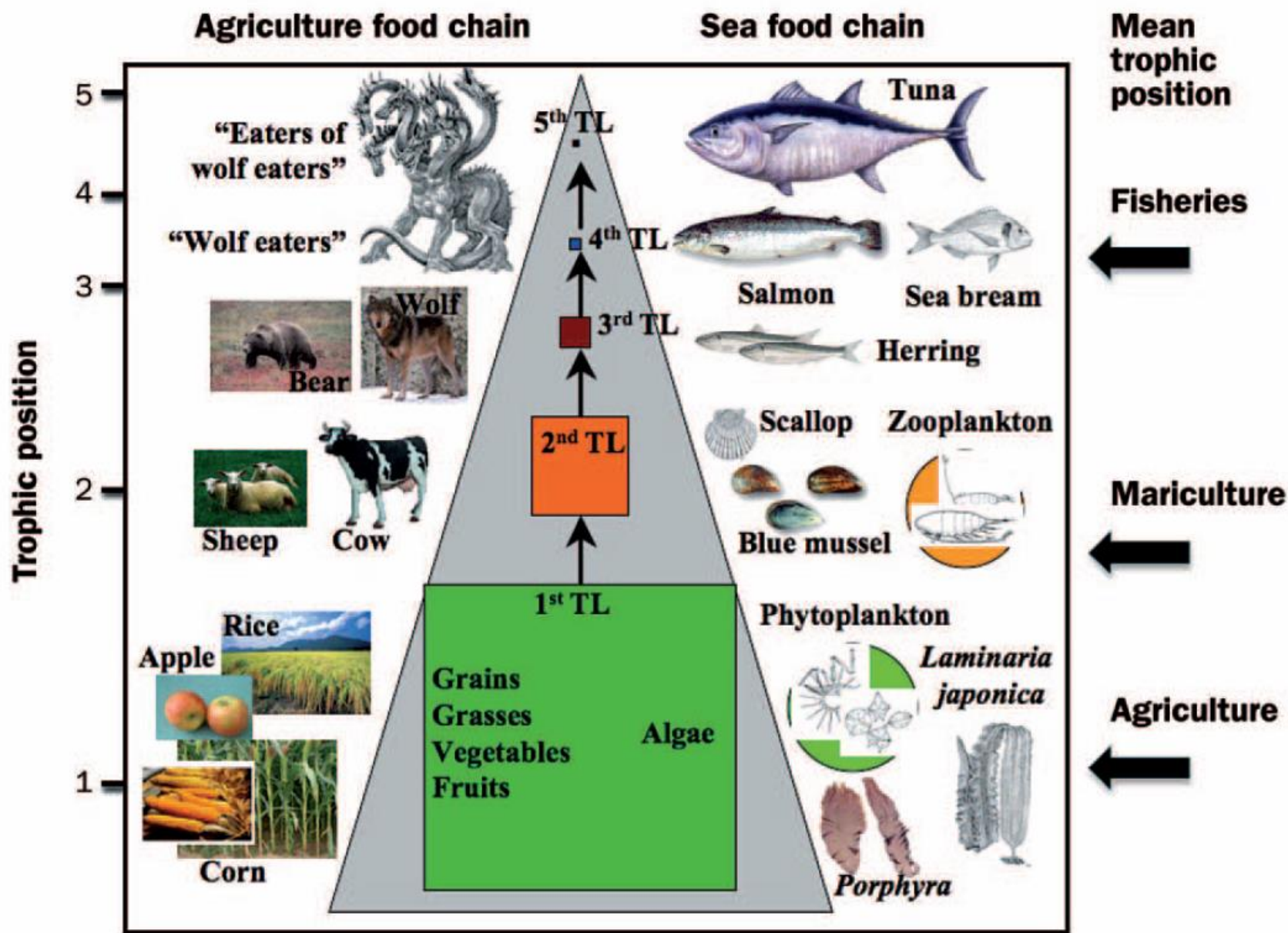
Figure 1. Population of the world, 1950-2100, according to different projections and variants



United Nations 2012



Bonhommeau et al. 2013, PNAS



3



Carnivore



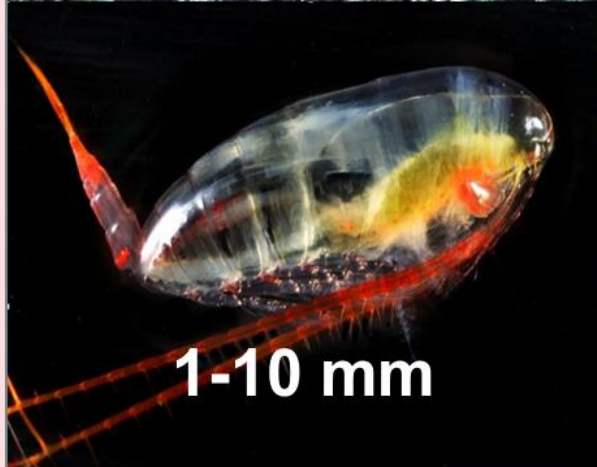
1-10 cm



2



Zooplankton



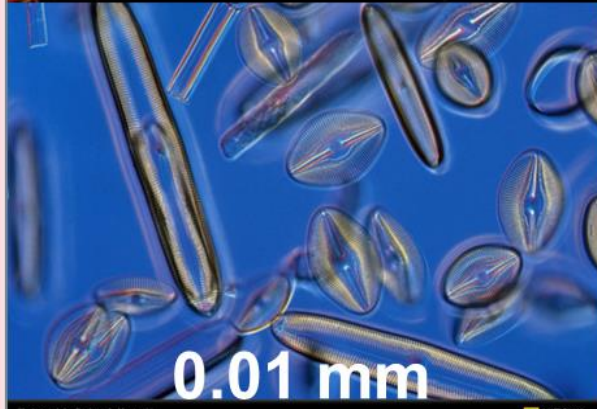
1-10 mm



1

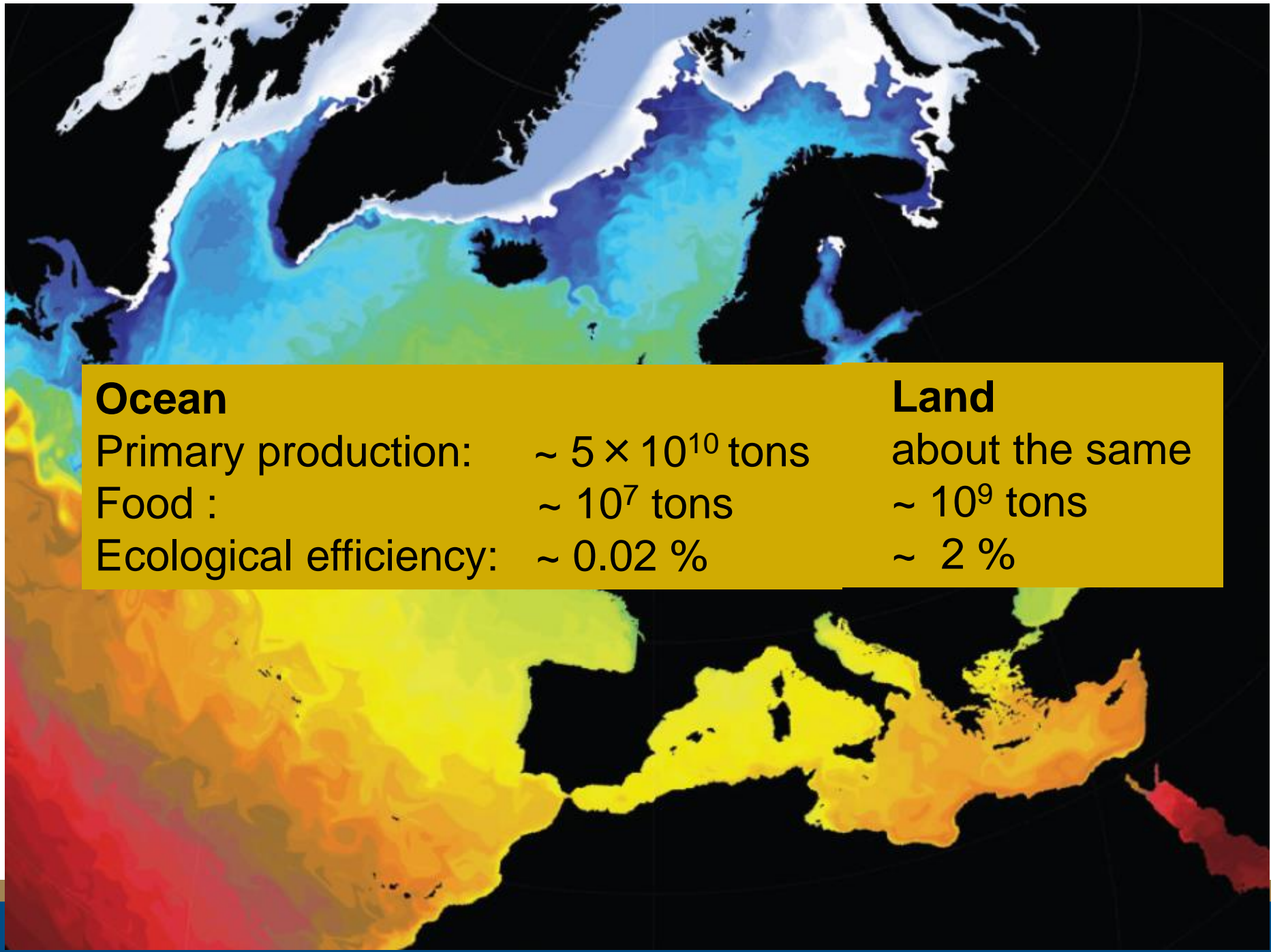


Phytoplankton



0.01 mm





## Ocean

Primary production:  $\sim 5 \times 10^{10}$  tons  
Food :  $\sim 10^7$  tons  
Ecological efficiency:  $\sim 0.02 \%$

## Land

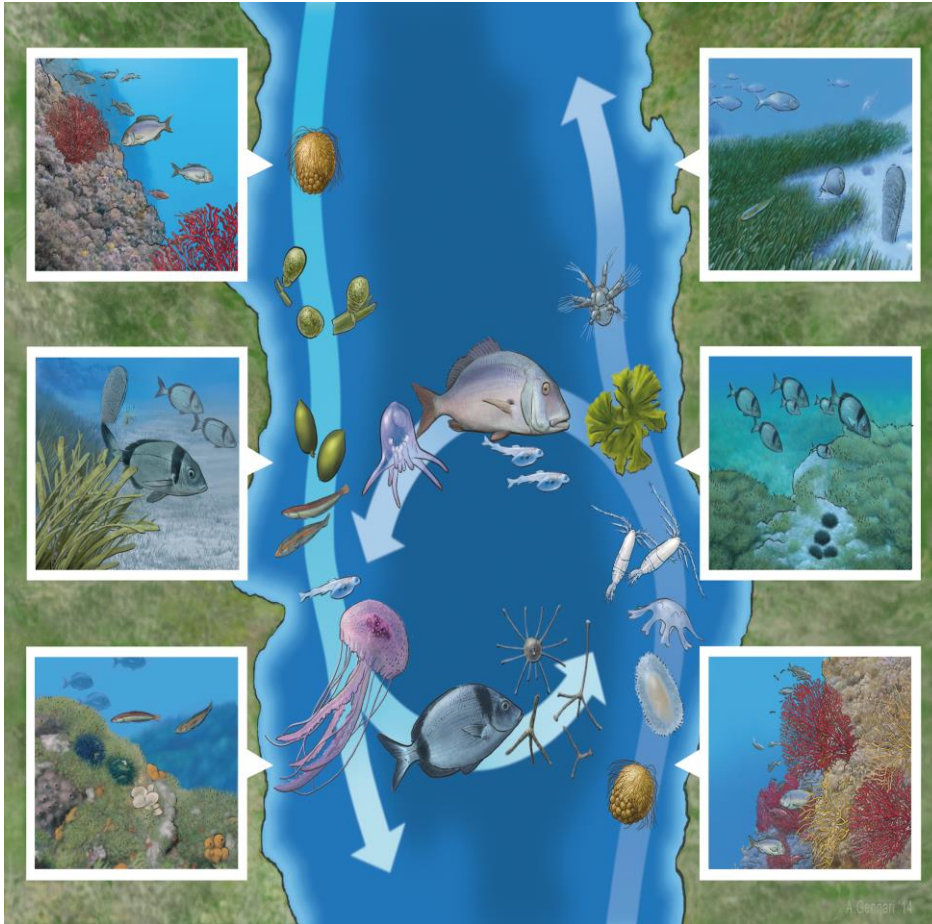
about the same  
 $\sim 10^9$  tons  
 $\sim 2 \%$



# Increased and sustainable ocean harvest

- revised Common Fisheries policy must be used to end overfishing and minimise harmful impacts from fishing in the short term
- greater commitment to policy and knowledge building on improving the ecological efficiency of ocean harvest
- major research need is to build knowledge on
  - potential for ecologically efficient aquaculture
  - potential for harvesting of species groups from lower trophic levels

# Connecting MPAs



- increase attention on networking of MPAs within ecosystem-based management
- **Connectivity:** improved understanding of water movements and ecological connections between MPAs
- marine habitat mapping needs to take into account habitats in the water column and their dynamics

# Building an integrated knowledge base

- implement a sustained European strategy for ecosystem observation
- incorporate biological monitoring with on-going physical and chemical programmes as prescribed by MSFD
- base biological observations on a sustained, long-term network of time series
- test the datasets assembled by EU marine data infrastructures
- open-up access to marine data

# Scientific support for marine sustainability



- Human capacity building
  - sustain and expand capacities in marine science
  - develop capacities in integrative marine science
  - **a virtual European Marine University** to lead development of the necessary curriculum
- Research set-up
- Recommended science needs for an ecosystem approach
- From science to society



Thank you for your interest and attention  
[www.easac.eu](http://www.easac.eu)  
Joern Thiede, Institute of Earth Science  
SPbGU, Saint Petersburg/RF