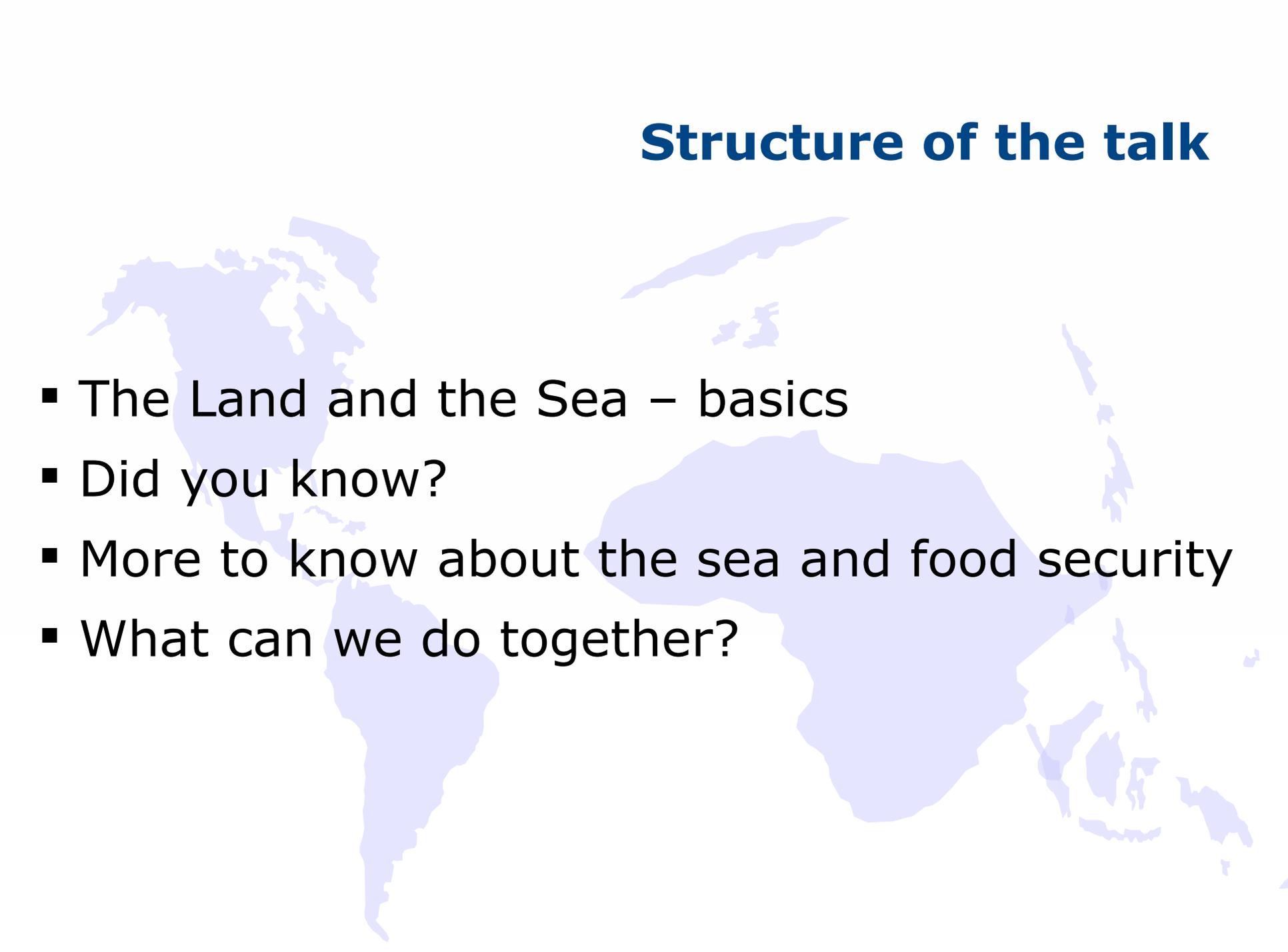


# Food Security and the Sea

Dr. Cornelia E. Nauen

Mundus maris  
Sciences and Arts for Sustainability asbl

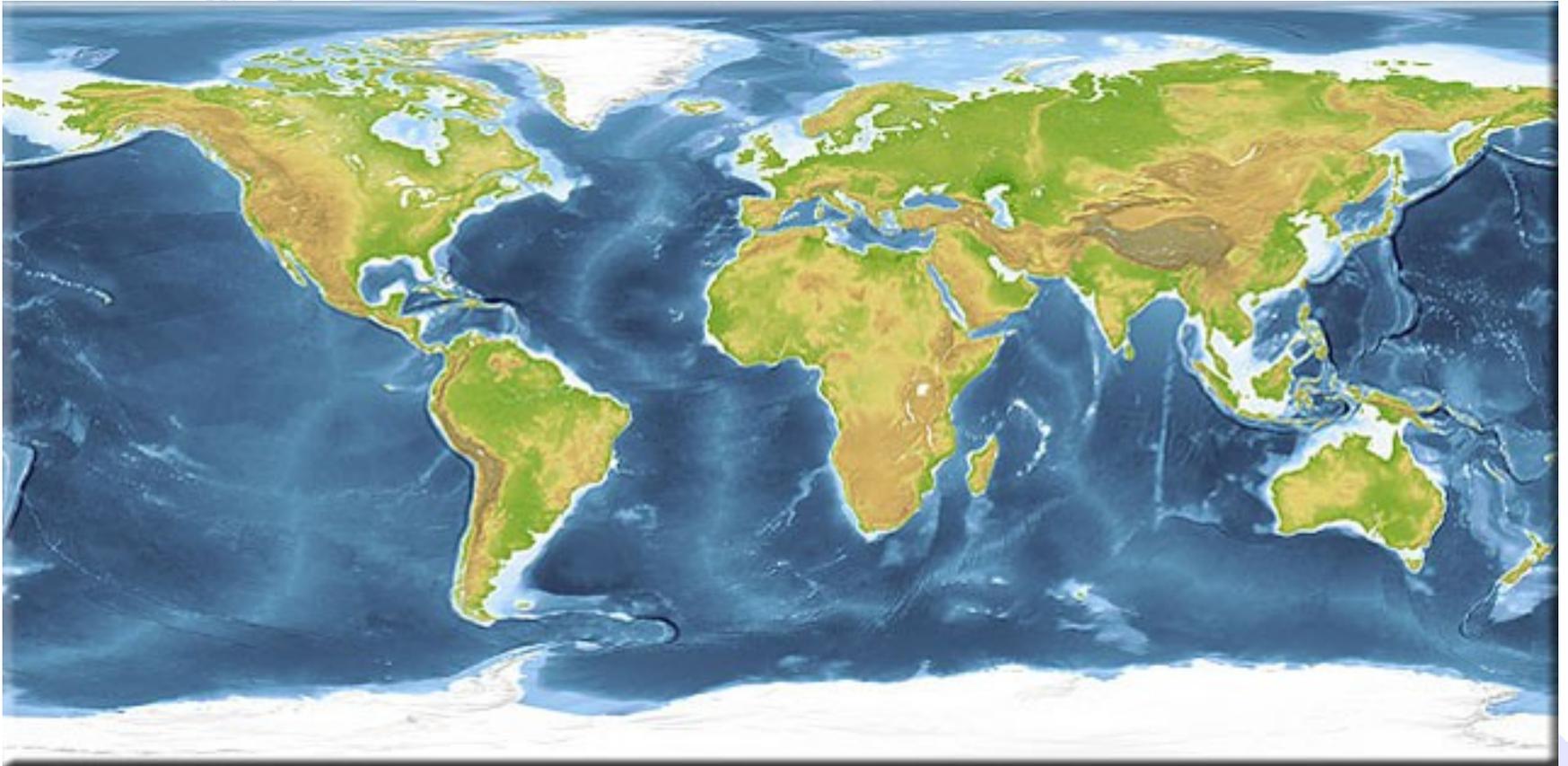
## Structure of the talk

- The Land and the Sea – basics
  - Did you know?
  - More to know about the sea and food security
  - What can we do together?
- 

# Part 1

- 
- **The Land and the Sea – basics**
  - Did you know?
  - More to know about the sea and food security
  - What can we do together?

# Bathymetry of the continents and the ocean



Source [http://www.planetaryvision.com/Texture\\_map.php?pid=4121](http://www.planetaryvision.com/Texture_map.php?pid=4121)  
Mount Everest is the highest peak at  $\sim 8.850$  m above sealevel (Tibet),  
the Mariana Trench (Challenger) has a maximum depth of 10.911 m below.

## A few basic parameters

The superface of our planet is covered by:

**Ocean:** ~71% ( $\sim 3.61 \times 10^{14} \text{ m}^2$ )

Pacific, Atlantic, Indian and Antarctic oceans.

**Fresh water:** <2,5% ( $\sim 0.007\%$  for human use)

**Land:** ~29% - distributed across 5 continents:

Africa, the Americas, Antarctica, Asia, Australia and Europe, of which 13,13% arable lands;

4,71 % permanent cultures; 26%

pastures; 32% forests; 1,5% urban zones; 30%

others.

# Land

The last 190 millions years land distribution was similar to what we experience today; modern human are around since about 200.000 years:

In 2015, 206 soverain states of which 193 in the United Nations, claim rights over these land areas (with the exception of a part of Antarctica and Bir Tawil between Egypt and Sudan). Some 59 dependent territories and autonomous areas and territories are disputed.

There has never been a global government.

## Between land and sea

The length of the coasts separating land and sea can not be determined accurately (these are fractals).

40% of humanity is estimated to live within 100 km from the coast and ~67% within 400 km: 4 billion people (Warsaw-Baltic Sea ~350 km).

The human population has increased x4 in the last 100 years to exceed 7 billion.

# What does this have to do with marine food security?

Food security is a socio-economic concept:

*“Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life.”*

We thus need to look at conditions of marine food production, its quantity, quality and how men, women and children have access

## Part 2

- 
- The Land and the Sea - basics
  - Did you know?
  - More to know about the sea and food security
  - What can we do together?

# What the ocean gives us (1)

The ocean is the biggest ecosystem and its health is essential for life on Earth.

It is at the centre of the hydrological cycle – the solar pump of nature.

About 430,000 km<sup>3</sup> water evaporate from the ocean each year, 110,000 km<sup>3</sup> fall as precipitation on land. This recharges surface and ground water and returns through rivers back into the sea to complete the cycle.

## What the ocean gives us (2)

The marine currents transport extraordinary quantities of energy – the Gulf Stream is Western Europe's central heating – at similar latitudes in the southern hemisphere you'll find glaciers.

The ocean stabilises our climate, e.g. by absorbing perhaps as much as half the CO<sub>2</sub> humans release

Marine plankton algae provide every second breath we take.

3 billion people derive part of their livelihood from the ocean

97% of fishers live in developing countries

350 million jobs depend on the ocean

## What the ocean gives us (3)

The ocean is the major transport route for many mass products and primary materials.

Maritime transport is the cheapest way to transport goods entering international trade.

Maritime transport also provokes important change in biodiversity (ballast water, etc.) - about 15,000 species of marine fish and 3,000 brackish-water fish documented in FishBase.org

The ocean, including the brackish-water Baltic Sea, offers great recreation and well-being.

It is an important route for cultural exchanges between different people and regions – think of the Baltic Sea, but also of Columbus.

# What the land gives us (1)

We are essentially terrestrial organisms

An equal distribution of land 15 years ago would have given  $\sim 1,8$  hectares to each human being to live, eat, dress, shelter and use energy for mobility and any other activity supporting a decent index of human development.

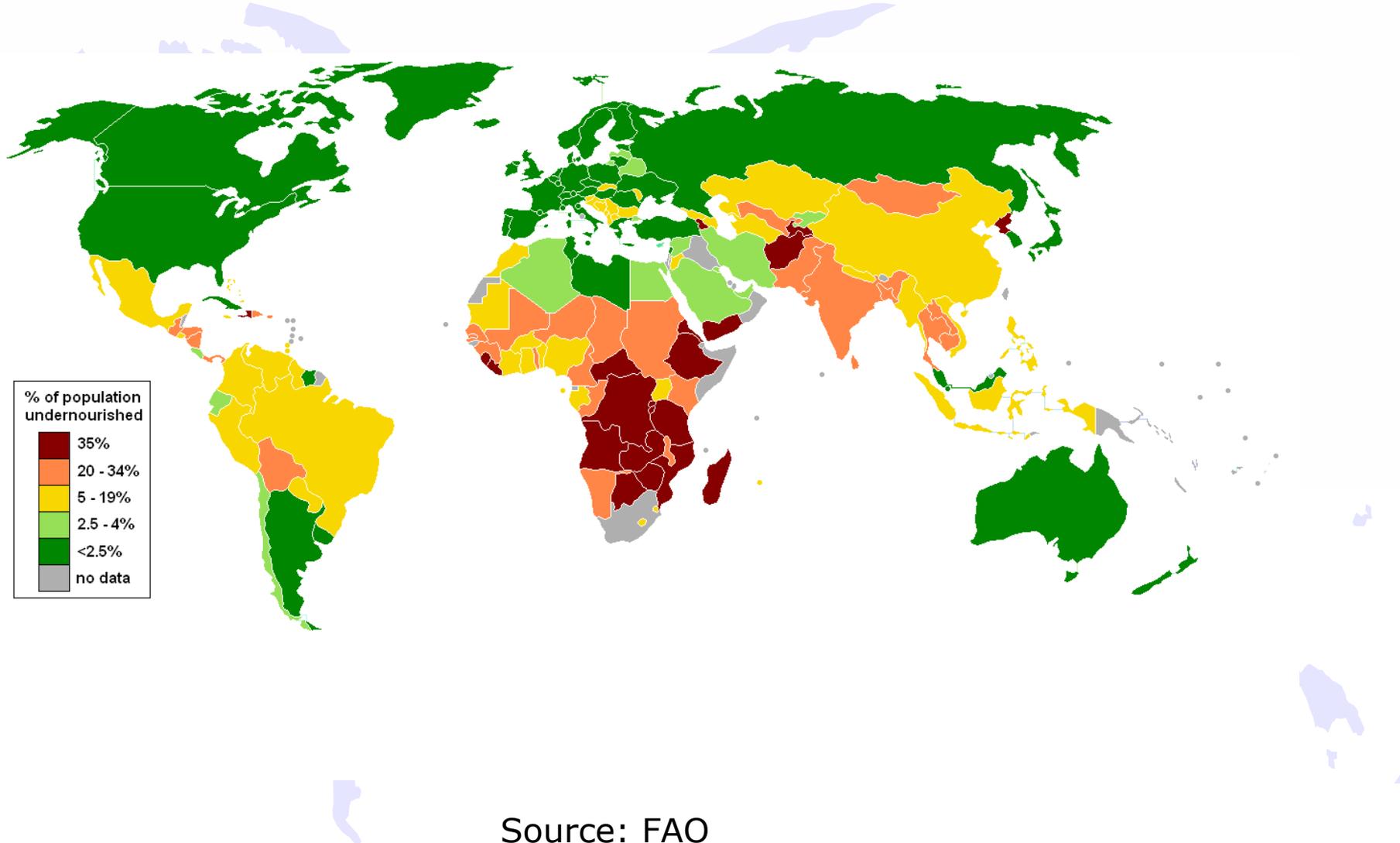
However, only  $\sim 13\%$  are arable lands ... -  $\sim 2$  billion live in semi-arid zones with a food deficit which needs to be compensated for through commerce and other ways.

## What the land gives us (2)

At the moment we produce enough food to feed 7 billion people, **but:**

- We waste  $\sim 40\%$  of what's available in Europe and the US.
- Bad distribution and differences in purchasing power leave 870 million people mal-nourished (FAO estimate, FAO 2010-2012)
- We need to accommodate in the next few decades another 2 billion people
- We need to restore the ecosystems to earlier productivity to equilibrate production and consumption.

# What the land gives us (3) and what we do with it



Source: FAO

## What the land gives us (4)

According to the International Energy Agency (IEA - 1990 à 2008), the average energy consumption per person has increased by 10%, while the global population grew by 27%.

By region: Middle East +170%, China +146%, India +91%, Africa +70%, Latin America +66%, USA +20%, EU-27 +7%. World Total +39% energy.

# Inequality ...

Access to resources is inequally distributed:

Big differences exist between countries.

Big differences exist within countries as expressed by the GINI (Data: World Bank).

- Sweden - GINI of 25
- Finland – GINI of 28
- Poland – GINI of 33
- Lithuania - GINI of 33
- USA - GINI of 41
- Brazil - GINI of 55
- South Africa - GINI of 63

# The Earth at night: cartography of electricity use

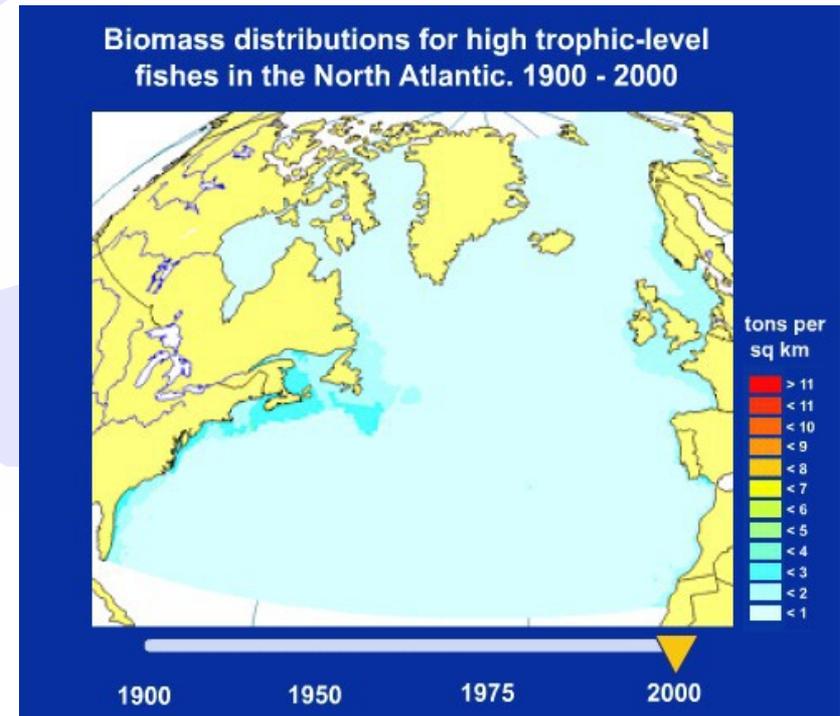
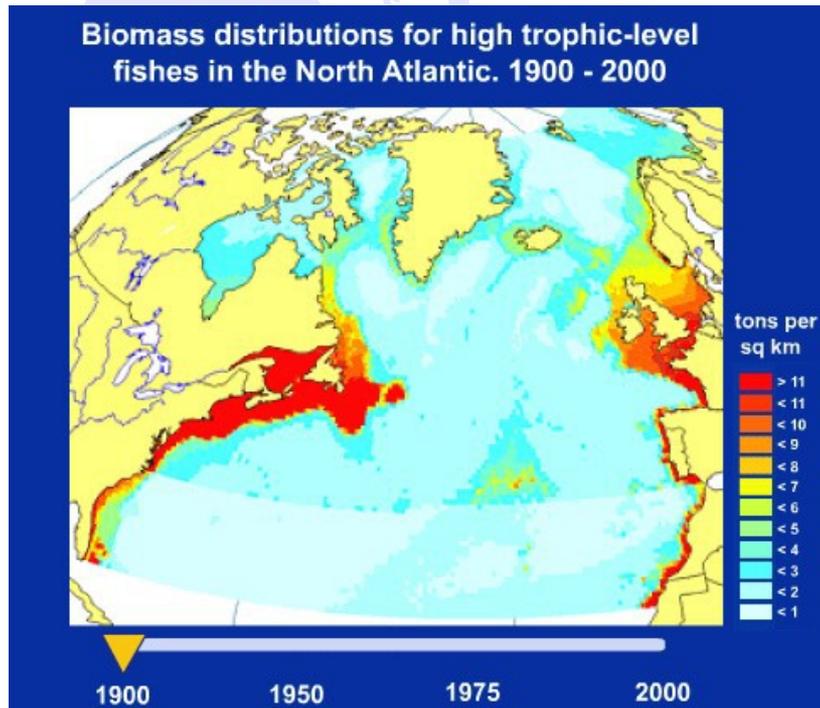


[http://www.planetaryvisions.com/Texture\\_map.php?pid=4104](http://www.planetaryvisions.com/Texture_map.php?pid=4104)

## Part 3

- 
- The land and the sea – basics
  - Did you know?
  - **More to know about the sea and food security**
  - What can we do together?

# Major threat No 1: The global fisheries crisis (1)



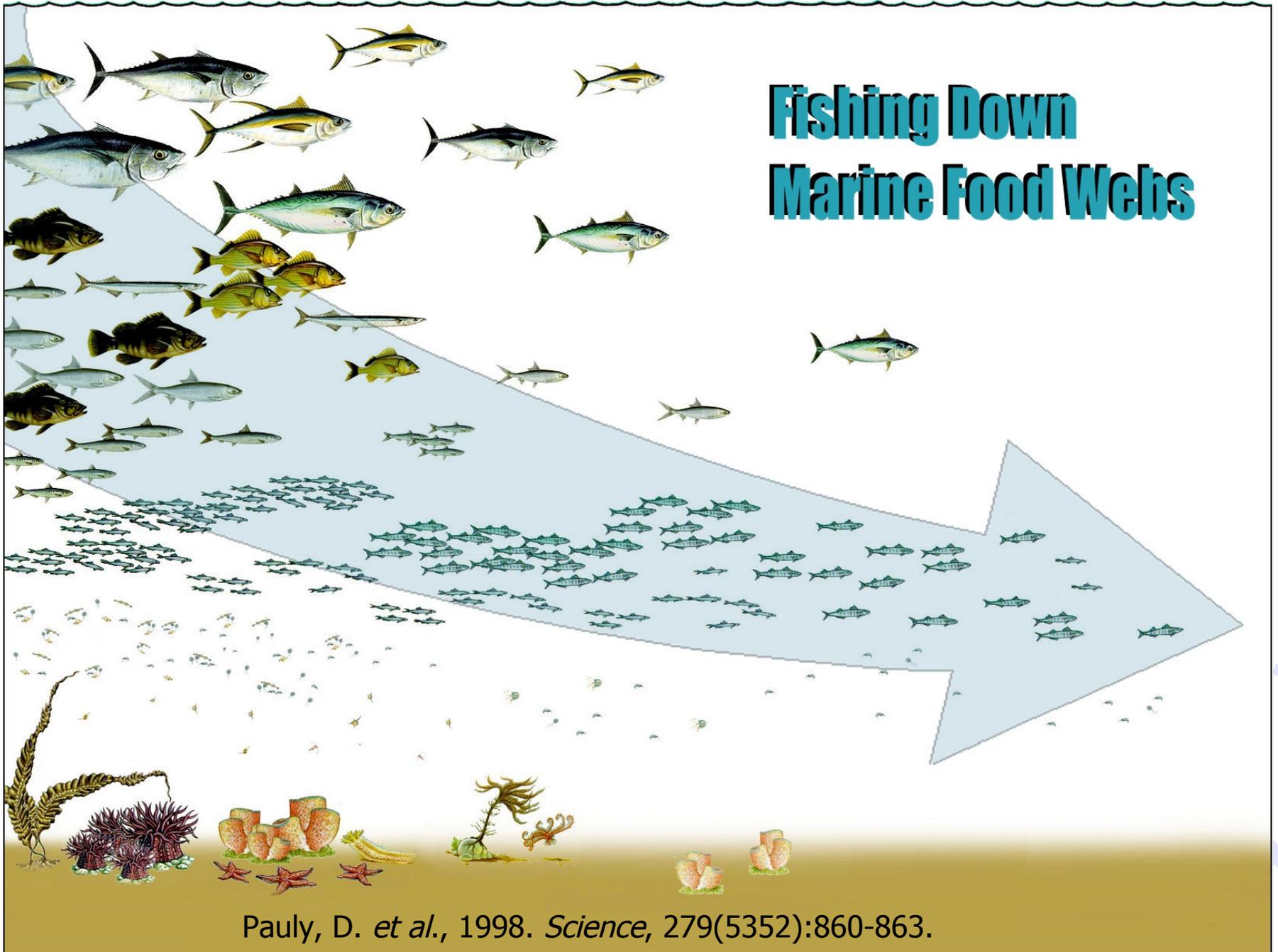
Christensen, V. *et al.*, 2003. Hundred-year decline of North Atlantic predatory fishes. *Fish and Fisheries*, 4:1-24.

# Major threat No 1: The global fisheries crisis (2)



**Same place 100 years apart**

# Fishing Down Marine Food Webs



Pauly, D. *et al.*, 1998. *Science*, 279(5352):860-863.

# Major threat No 1: Overfishing and IUU Fishing (4)

Catch reconstructions compared to official landing records in the Baltic show a serious problem in illegal, unreported and unregulated (IUU) fishing:

- Between 1950 and 2007 IUU catches were 30%
- Focus on 2000 to 2007: reconstructed catches were

Denmark	average 33% higher than reported
Estonia	average 25% higher than reported
Finland	average 24% higher than reported
Germany	average 29% higher than reported
Latvia	average 26% higher than reported
Lithuania	average 44% higher than reported
Poland	average 80% higher than reported
Russia	average 25% higher than reported
Sweden	average 20% higher than reported

## Major threat No 2: Climate change (1)

The first effects of climate change on the ocean are physical. That means:

- sealevel rise is a result of thermic expansion of the volume
- the changes in the global circulation system of ocean currents, in particular the weakening of the Gulf Stream, but also less exchange between the North Sea and the Baltic
- warmer water can hold less dissolved oxygen.

## Major threat No 2: Climate change (2)

The second effect is chemical: Acidification. This means:

- Most marine organisms have a fragile body or skeleton, which depends on the pH of seawater – it's either more acid or alkaline. The absorption of anthropogenic CO<sub>2</sub> in combination with warming increases the acidity of seawater. Initially organisms spent more energy to hold their bodies together, but progressively skeleton formation of plankton, bivalves, corals and other marine organisms becomes problematic.

## **Major threat No 3: The global marine litter crisis (1)**

The majority of marine litter is composed of plastic – estimates vary from 60 to 80% in general, up to 90% for floating debris:

Some 80% of marine litter is estimated to come from land-based sources.



# Major threat No 3: The global marine litter crisis (2)

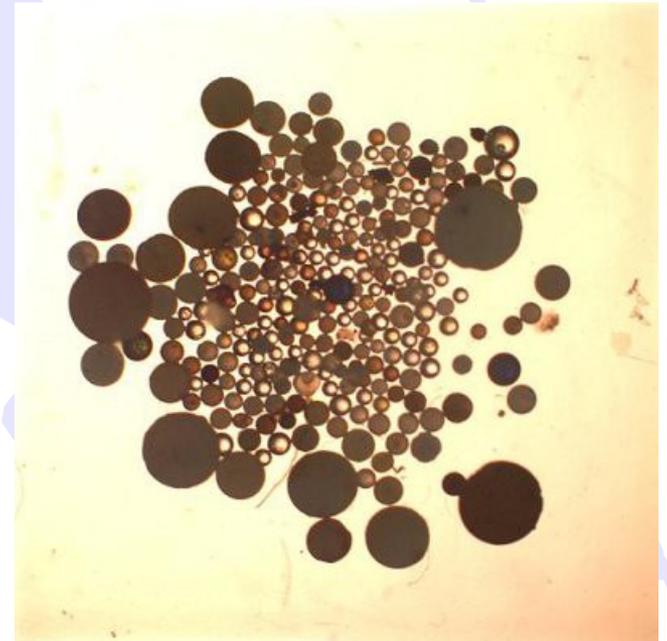


## Major threat No 3: The global marine litter crisis (3)

Over time, wave action and radiation fragment the plastic materials into small particles, which float throughout the water column.

Marine organisms take these up as food. The plastic thus enters the marine food web – this is also of direct concern for us.

During fragmentation, toxic softeners get released, which also end up in marine organisms.



# Catches are decreasing (1)

Bycatch [and discards]



**38.5 million tons / year =  
40% of all marine catches**

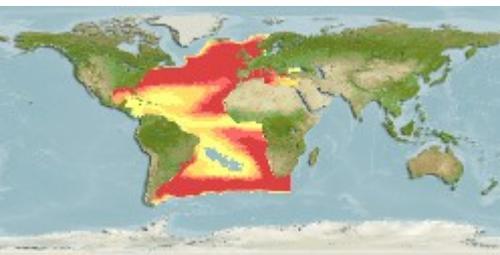
DAVIES, R.W.D., *et al.*, 2009. Defining and estimating global marine fisheries bycatch. *Marine Policy*, doi:10.1016/j.marpol.2009.01.003

## Catches are decreasing (2)

53 countries (96% of global fisheries) break the Code of Conduct for Responsible Fisheries adopted in 1995



Pitcher, T., D. Kalikoski and G. Pramod (eds.), 2006. updated April 2008. Evaluations of compliance with the FAO (UN) Code of Conduct for Responsible Fisheries. UBC, *Fish.Centre Res.Rep.*, 14(2):76 p.



## Catches are decreasing (3)

- Every second breath we take depends on marine plants – climate change and acidification disrupt marine food webs and the capacity of the ocean to stabilise our climate
- Coral bleaching is already wide-spread e.g. in the Andaman Sea. With the corals go the fish and other seafood.
- Gill-breathing animals like fish are shifting their distribution polewards as warming tropical waters contain too little oxygen. Unfortunately, the gain in cooler regions is unlikely to last.

## Catches are decreasing (4)

The acceleration of extractions of raw materials from the land is already having other effects such as:

- Overexploitation of soils, loss of top soils and organic matter through unsustainable practices and erosion – estimated public health cost: >45 billion \$/yr.
- Productivity loss of regions suffering massive erosion of top soils often affects coastal seas negatively through eutrophication. Replacement by energy-intensive artificial fertilisation can further aggravate the problem.
- Land and Sea production are intimately connected.

# Other land-sea interactions



<http://remineralize.org/blog/magazine/topsoil-loss-and-remineralization>

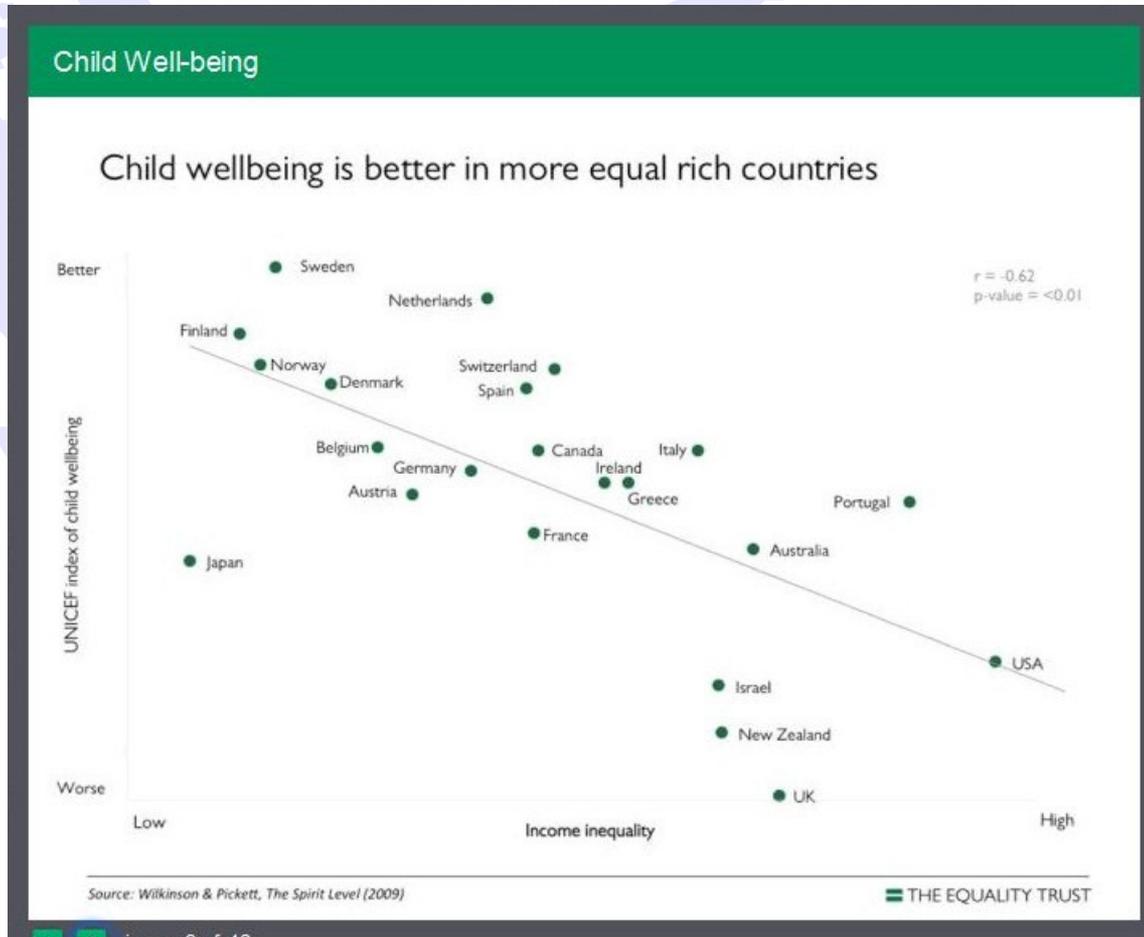
## Major threat No. 4: Inequality (1)

In 2009, Kate Pickett and Richard Wilkinson published "The Spirit Level: Why More Equal Societies Almost Always Do Better» showing the pernicious effects of societal inequalities.

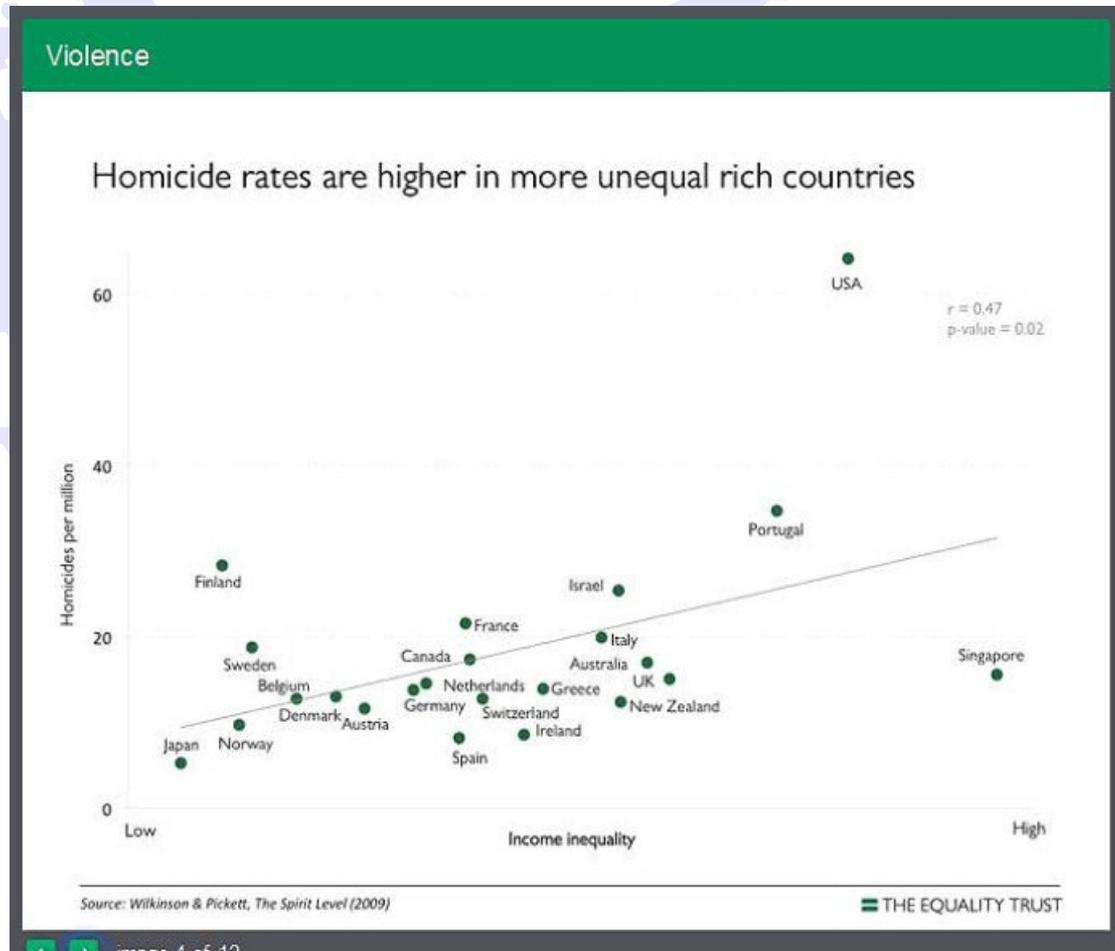
For each of 11 types of social or health problems, rich countries with high inequality had less good results, such as:

Physical health, mental health, drugs, education, imprisonment, obesity, social mobility, trust and community life, violence, adolescent pregnancies, and child well-being.

# Major threat No. 4: Inequality - Child wellbeing



# Major threat No. 4: Inequality – violence (3)



## Part 4

- 
- The land and the sea – basics
  - Did you know?
  - More to know about the sea and food security
  - **What can we do together?**

## First, avoid a common fallacy

It is the greatest of all mistakes to do nothing because (individually) you can do little.

- The interconnected issues presented are not the result of a global conspiracy, but for a good part the effects of many small -and by themselves probably harmless- decisions
- When many people stop e.g. using plastic bags and make other “small” decisions on social solidarity or environmentally responsible behaviour, in aggregate this can have big effects.

# Eight proposals for recovery (1)

1. A UN Sustainable Development Goal for the Ocean to recognise the fundamental role of the ocean for life and food security on Earth

This is now part of the draft for the September 2015 UN General Assembly as SDG 14.

2. Governing the High Seas – Promoting care and recovery: only 10 countries exploit the High Seas at the expense of all others, responsible behaviour would rebuild lost productivity and benefit all

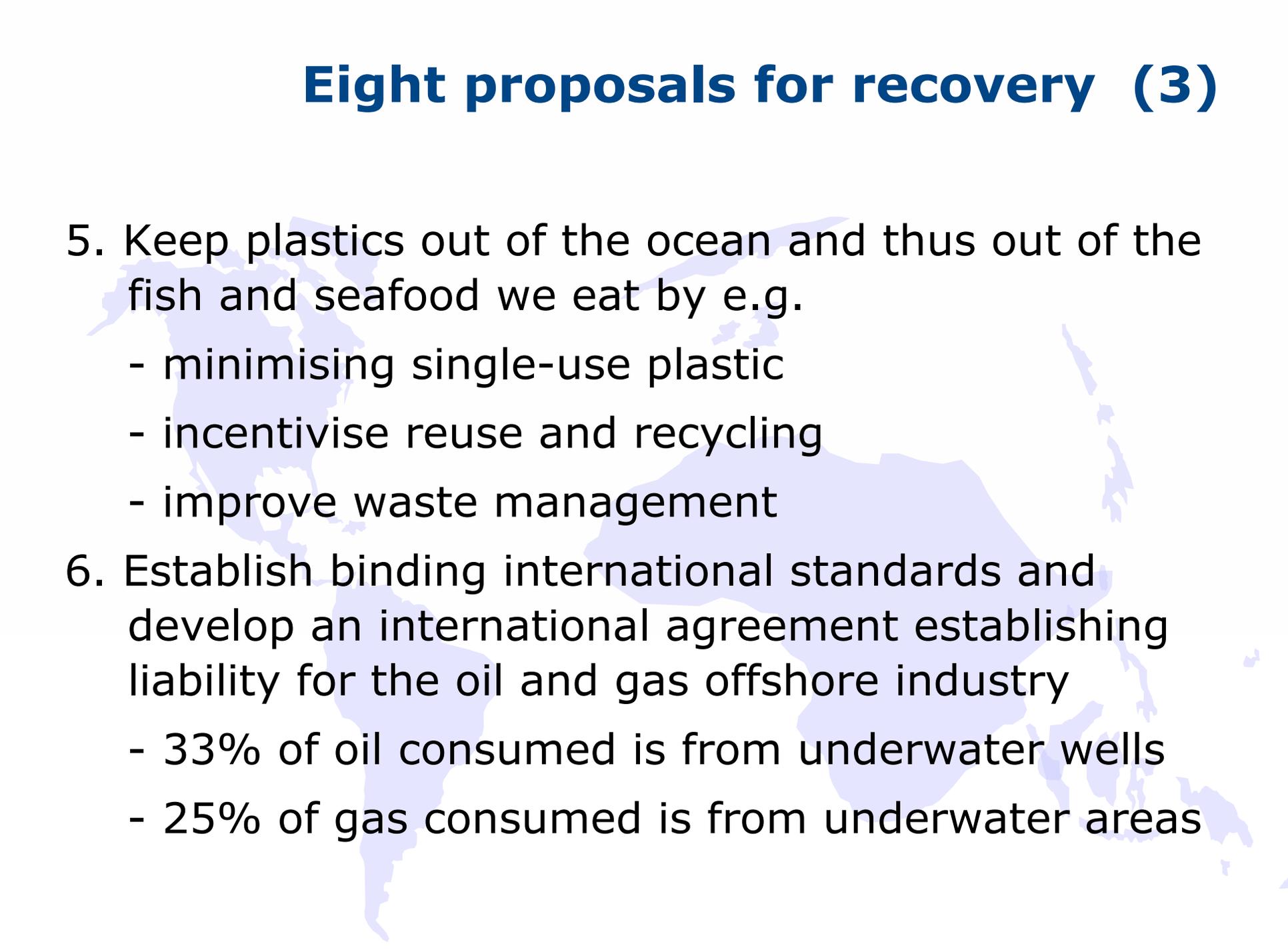
Create the office of a High Representative for the Ocean at UN to focus political attention across sectoral responsibilities.

Scrutiny by national Ocean Envoys or ministers and civil society will be crucial for enforcement of rules

## Eight proposals for recovery (2)

3. Stop overfishing and end harmful subsidies which maintain destructive High Seas fishing –  
Disclose subsidies and phase them out in the next 5 years. Civil society monitoring and active campaigning is critical e.g. for implementing fisheries reform in Europe – we import 70% of fish and fishery products we eat
4. Bring illegal, unreported and unregulated (IUU) fishing to an end by denying perpetrators the flag and access to market of their illegal catch.  
Use public information platform: fit all High Seas fishing vessels >24m with transponder, set up traceability scheme for fish to allow selective sourcing of legal catch by commerce & consumers

## Eight proposals for recovery (3)

- 
5. Keep plastics out of the ocean and thus out of the fish and seafood we eat by e.g.
    - minimising single-use plastic
    - incentivise reuse and recycling
    - improve waste management
  6. Establish binding international standards and develop an international agreement establishing liability for the oil and gas offshore industry
    - 33% of oil consumed is from underwater wells
    - 25% of gas consumed is from underwater areas

## Eight proposals for recovery (4)

7. Setting up an independent Global Ocean Accountability Board to monitor and assess progress towards recovery. Why?
  - Many governments and other actors needed
  - How to keep track
  - Keep focus on meeting responsibility and goals
8. Creating a High Seas Regeneration Zone to increase equity, economic profitability and rebuild fish stocks. (Top five “losers” Japan, South Korea, Taiwan, Spain, USA – world wins 23 million tons+)

Source: Global Ocean Commission of political and business leaders, 2014

# What else?



**Support small-scale fisheries, which has advantages over industrial fishing, but is politically and social marginalised.**

- **It uses less energy/unit**
- **It is less destructive**
- **It is more selective**
- **It creates more employment and distributes benefits**
- **It produces high quality**

**I'm still a baby,  
let me live and grow**



[www.mundusmaris.org](http://www.mundusmaris.org) [www.facebook.com/MundusMaris](https://www.facebook.com/MundusMaris)

# Thanks!

[www.mundusmaris.org](http://www.mundusmaris.org)  
[info@mundusmaris.org](mailto:info@mundusmaris.org)