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UNITED NATIONS UNCTAD | The Commonwealth | IOI International Ocean Institute

Oceans economy and trade:
Sustainable fisheries, transport and tourism

Large Marine Ecosystems (LMEs): Preserving ocean biodiversity, and marine genetic resources
An approach for sustainable resource and ecosystem management

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The use of the ocean

.... is described to be threefold (Steinberg 2001):

- Exploitation of resources
  - Earliest evidence of human capture of marine fish in Polynesia 32000 y ago (Allen et al 1989)
- Surface for transport of people and goods
  - Mediterranean Sea - e.g. Phoenicia since 1000 BC
  - China ??
- Battlefield
  - Battle of Salamis was fought between an Alliance of Greek city-states and the Persian Empire in 480 BC
- I would add:
  - Dump site for waste
  - Construction/settlement area

Providing resources

In the Baltic since 13th century important fisheries concentrated around Skaane (South Sweden) and built the basis for the Hanseatic League

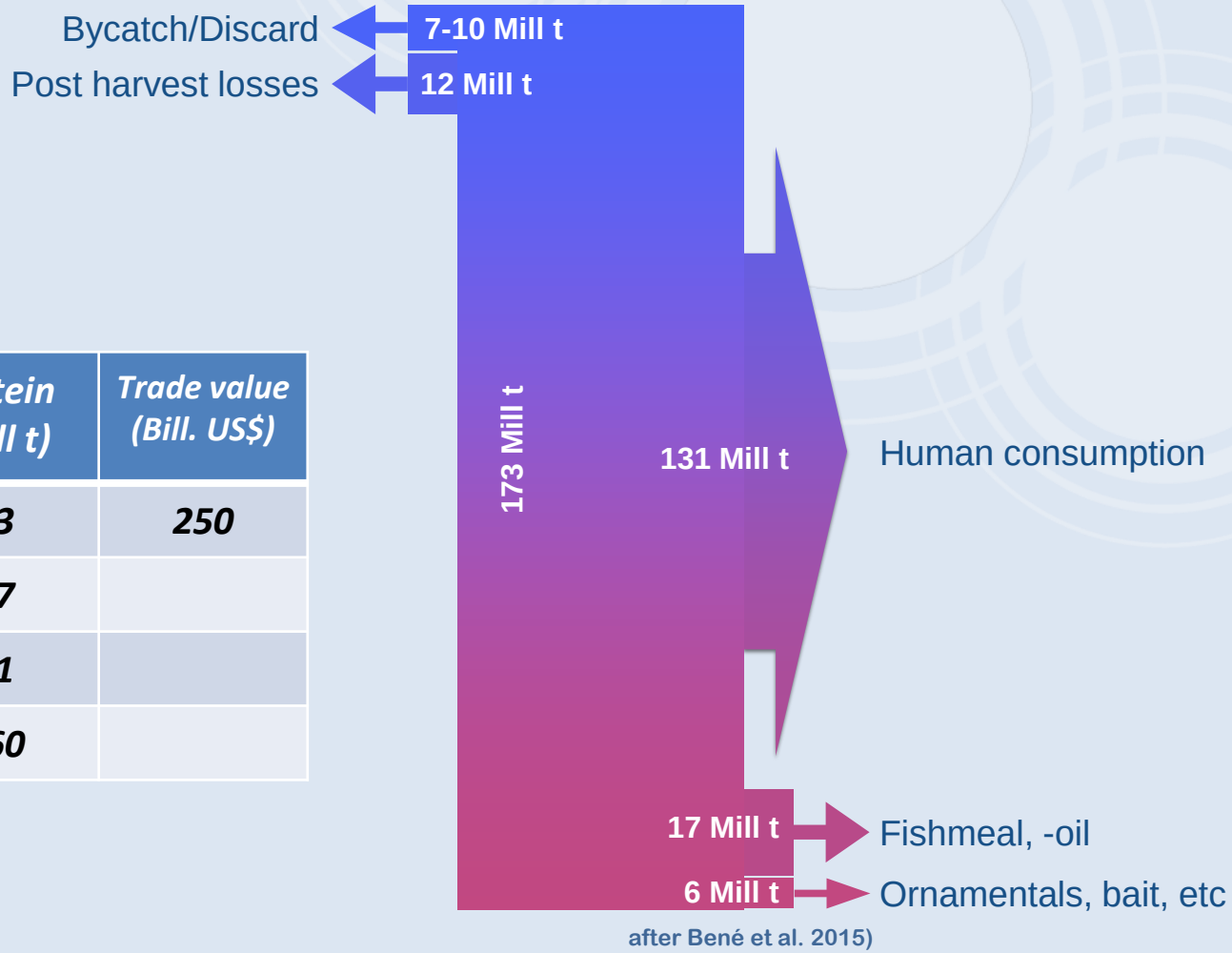
Dutch herring fisheries off England increased during 16th century and enabled building Amsterdam („Built on herring bones“) and funding the independence wars late 16th and 17th century.

In 17th century salted and dried cod of less quality was sold in the Caribbean area as food for slaves: A triangle of trade was established between Boston, Caribbean Islands and Canary Islands

Major point of peace negotiations between the New England states and England were fishing rights on the Grand Banks, but US excluded from trade to colonies in the West Indies: Result were 15000 dead slaves in 1780-85 because of hunger.

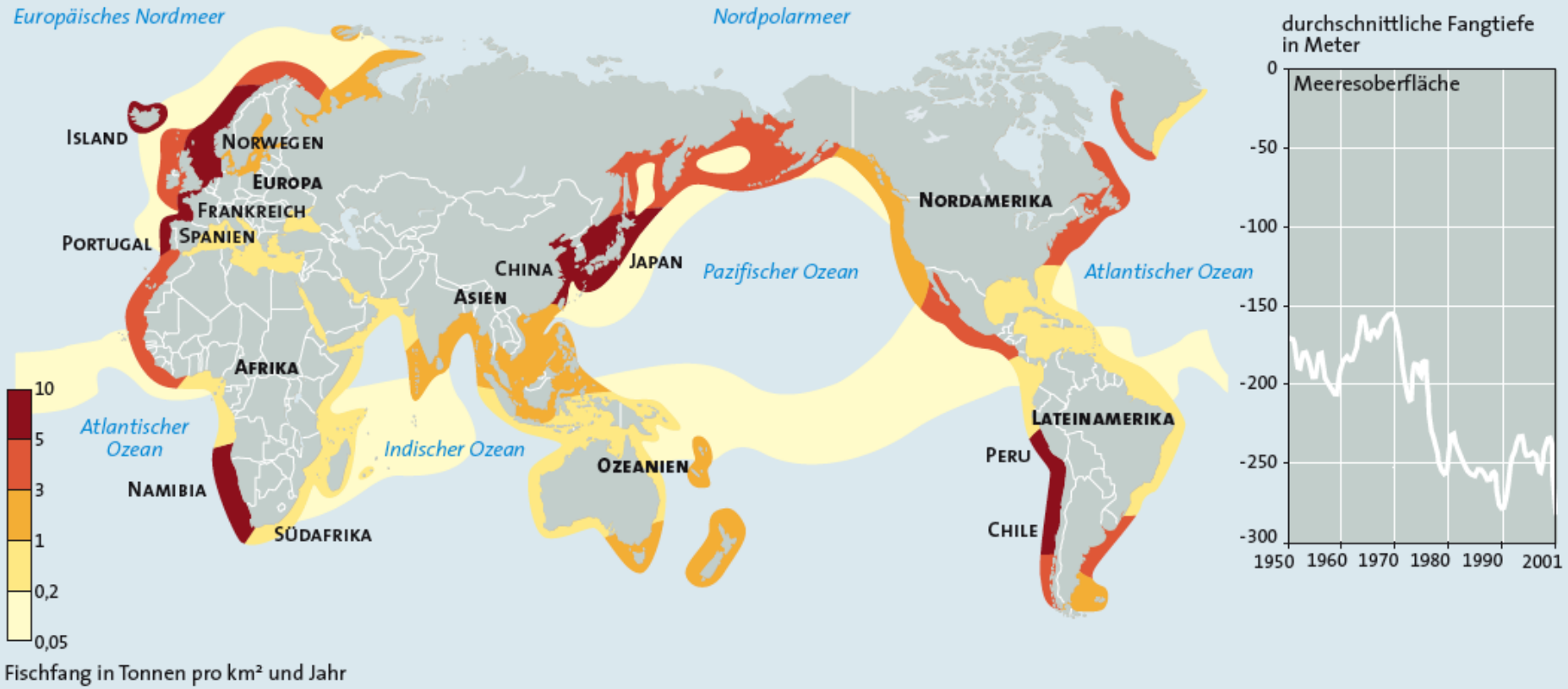
World fish utilization

	Total (Mill t)	Protein (Mill t)	Trade value (Bill. US$)
Fish	131	33	250
Bovine	67	17	
Poultry	103	11	
Grain	2370	260	



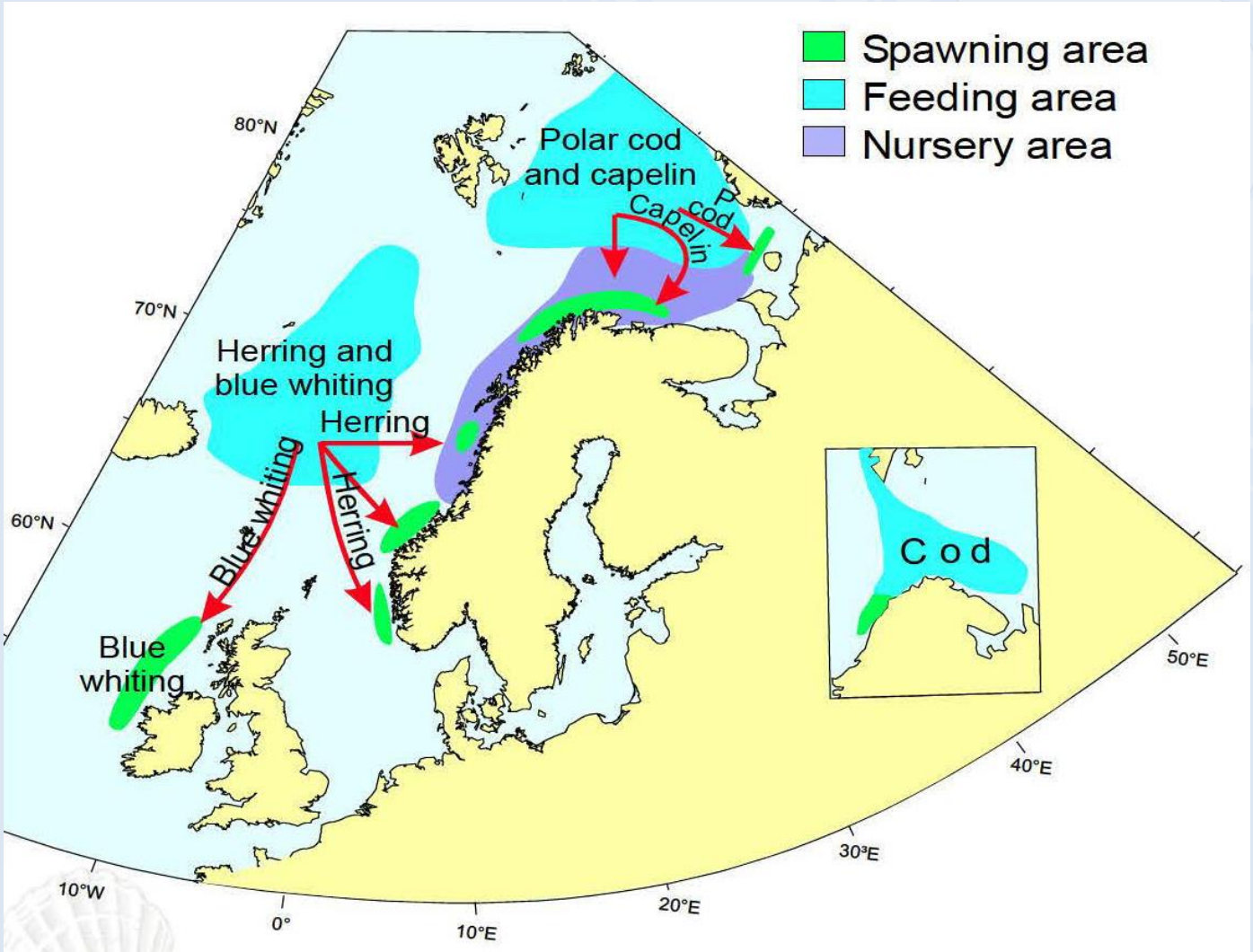
after Bené et al. 2015)

World fish catch



Werner Ekau - IOI/ZMT

An example from the North Atlantic



The origin of the LME concept

1902 Foundation of the International Council for the Exploration of the Sea - ICES in Copenhagen for the management of the Northeast Atlantic (Area 27 FAO)

1970ies :

- Heavy overfishing of North Sea herring stocks
  - 1975, ICES (International Council for the Exploration of the Sea) convened a multi-disciplinary symposium on the North Sea
- Upcoming UNCLOS; Conflicts between fisheries nations:
  - 1976 British-Islandic cod war because of 50nm

1980ies :

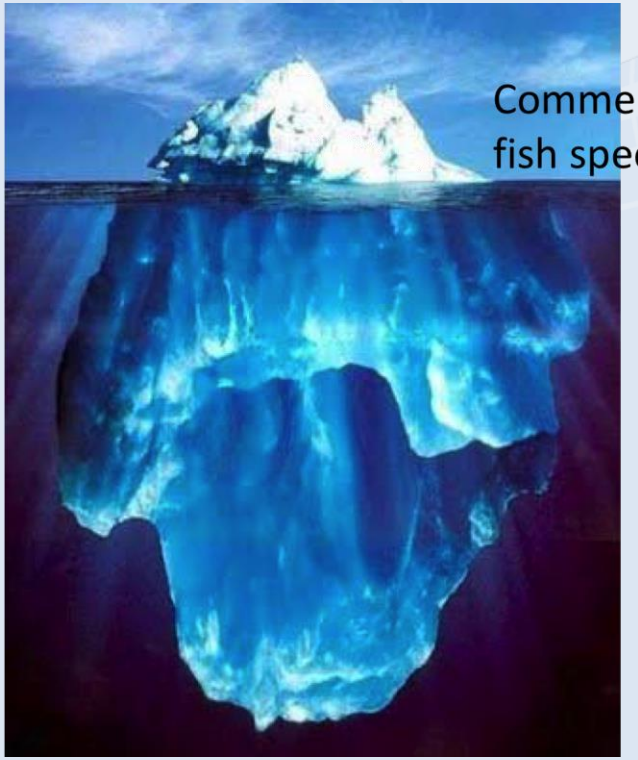
- Signing of and preparation for UNCLOS
- In 1984 start of a series of LME symposia to draft LME concept

1990ies :

- 1991 - First IOC-UNESCO LME Meeting with recommendation to
  - …. overcome the sectoral approach to marine resources management
  - …. overcome UN agencies' sectoral approaches

We normally just focus on what we like !

The rest of the fish community – what's happening beneath the surface?



Kozlov 2014

Fisheries has an impact on the ocean

- Impact on societies
  - Development in the Middle Age in Northern Germany, Sweden
  - Norway and tropical countries are depending on fish
- Impact on economies
  - Fish is a globally important trading good
- Impact on the environment
  - Trawling may destroy sea floor
  - Dynamite fishing destroys coral reefs
- Impact on other species
  - Fishing as such changes biodiversity
  - Species are diminished, others enhanced

Fisheries has an impact on the ocean

Following Crutzen (2002) who defined the term „Anthropocene“, “Human dominance of biological, chemical and geological processes on Earth is already an undeniable reality. It’s no longer us against 'Nature.' Instead, it's we who decide what nature is and what it will be.“

This is true for fisheries!

Ecosystem Approach to Fisheries (EAF) is to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems.

Paul Crutzen, the Nobel Prize--winning atmospheric chemist who first popularized the term Anthropocene

What does that mean for biodiversity and genetic resources?

Biodiversity:

- High diversity provides more resilient/stable ecosystems
- Species may substitute others to maintain functioning
- Ethical/cultural reasons for maintaining diversity
- Tourism based on healthy ecosystems

Genetic resources

- Keep genetic diversity in species to adapt to changes
- Keep genetic reservoir for aquaculture
- Potential for Biotechnology (pharmaceutics, industrial glues, etc)

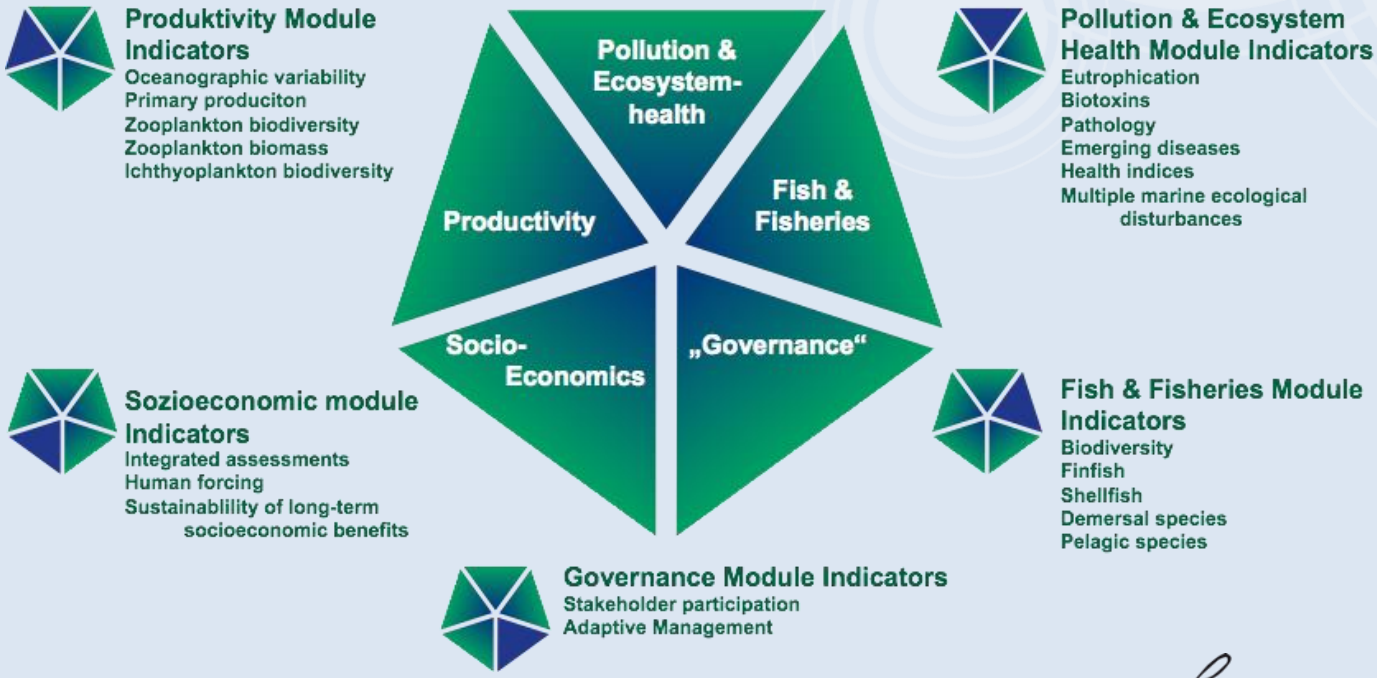
Characteristics of an LME

…. develop a transboundary LME multi-sectoral and multidisciplinary ecosystem-based strategy

Size: >> 200 000 sqkm

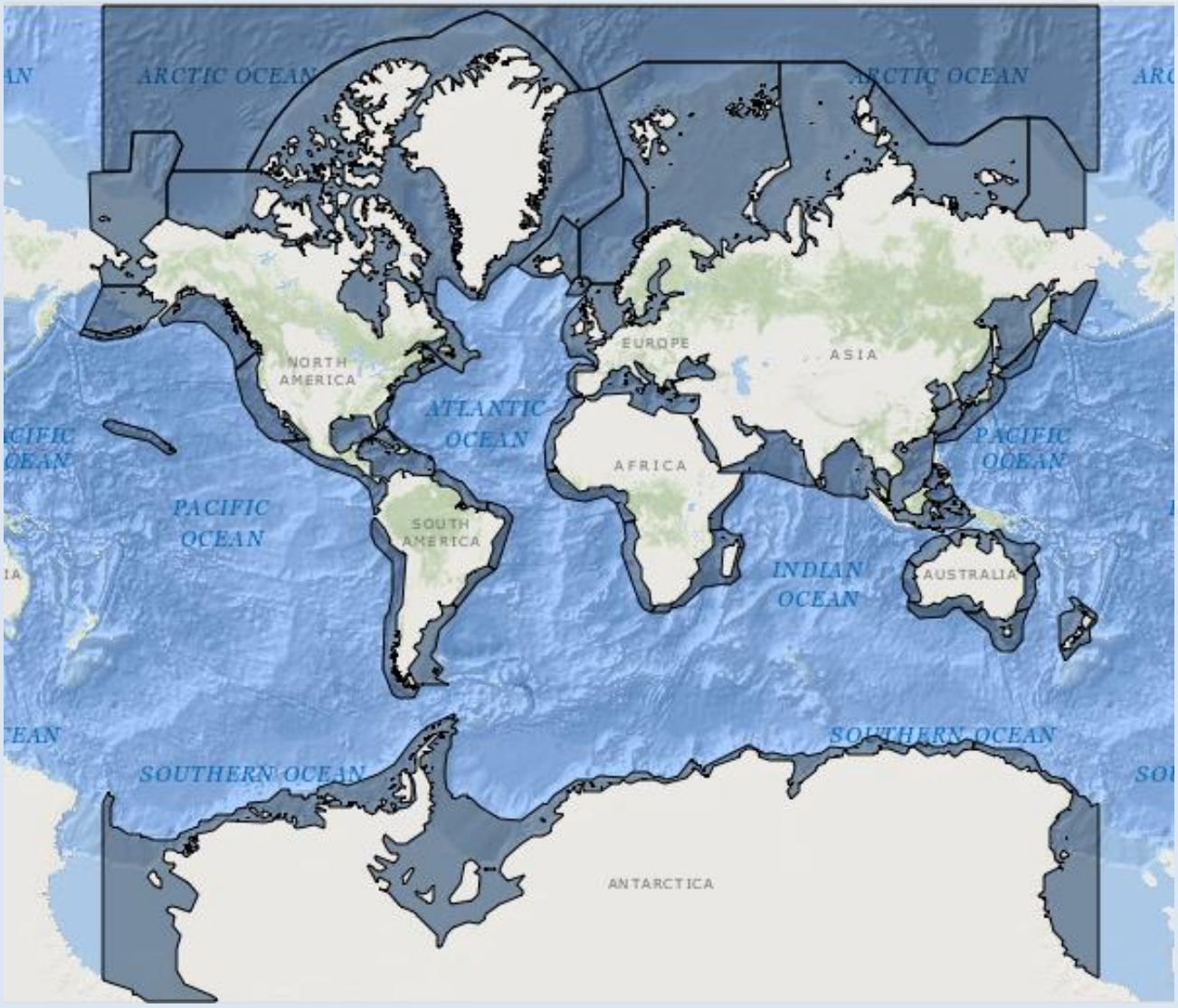
Topographical/morphological/hydrographical boundaries

Based on ecological characteristics



Alexander, 1993

LMEs today: 66 defined



90% of fisheries from shelf areas

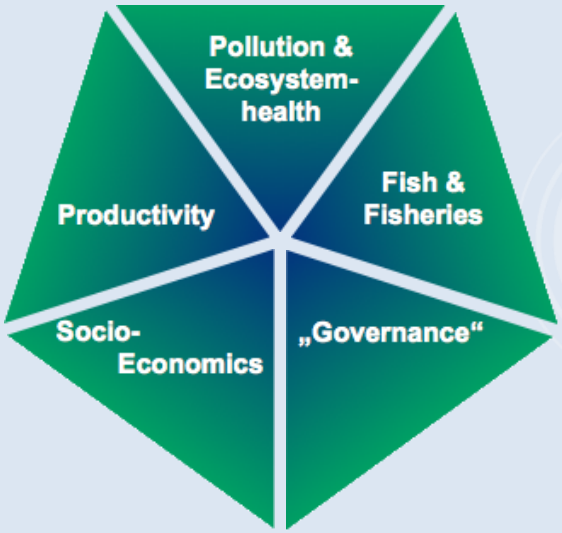
80% of fisheries from LMEs

Goods and Services contribute $12.6 trillion (Costanza et al. Nature 1997)

Goods and services marine (Costanza et al. 1997)

	Ecosystem service	Ecosystem functions	Examples
1	**Gas regulation**	Regulation of atmospheric chemical composition.	$C0_2/0_2$ balance, 0_3 for UVB protection, and SO, levels.
2	**Climate regulation**	Regulation of global temperature, precipitation, and other biologically mediated climatic processes at global or local levels.	Greenhouse gas regulation, DMS production affecting cloud formation.
3	**Disturbance regulation**	Capacitance, damping and integrity of ecosystem response to environmental fluctuations.	Storm protection, flood control, drought recovery and other aspects of habitat response to environmental variability mainly controlled by vegetation structure.
	Waste treatment		
8	**Biological control**	Storage, internal cycling, processing and acquisition of nutrients.	Nitrogen fixation, N, P and other elemental or nutrient cycles.
9	**Refugia**	Recovery of mobile nutrients and removal or breakdown of excess or xenic nutrients and compounds.	Waste treatment, pollution control, detoxification.
11	**Food production**	Trophic-dynamic regulations of populations.	Keystone predator control of prey species, reduction of herbivory by top predators.
12	**Refugia**	Habitat for resident and transient populations.	Nurseries, habitat for migratory species, regional habitats for locally harvested species, or overwintering grounds.
	Genetic resources		
13	[illegible]	That portion of gross primary production extractable as food.	Production of fish, game, crops, nuts, fruits by hunting,gathering, subsistence farming or fishing.
14	**Raw materials**	That portion of gross primary production extractable as raw materials.	The production of lumber, fuel or fodder.
15	**Genetic resources**	Sources of unique biological materials and products.	Medicine, products for materials science, genes for resistance to plant pathogens and crop pests,ornamental species (pets and horticultural

Goods and services marine (Costanza et al. 1997)



Waste treatment	Recovery of mobile nutrients and removal or breakdown of excess nutrients and compounds.
Biological control	Keystone predator control of prey species, reduction of herbivory by top predators.
Refugia	Nurseries, habitat for migratory species or locally harvested species, overwintering grounds.
Food production	Production of fish, gathering, subsistence fishing.
Genetic resources	Medicine, products for materials science, ornamental species

How does the LME concept consider these issues?

After application and approval of the project funded by GEF:

Funding agreement for first 5 years:

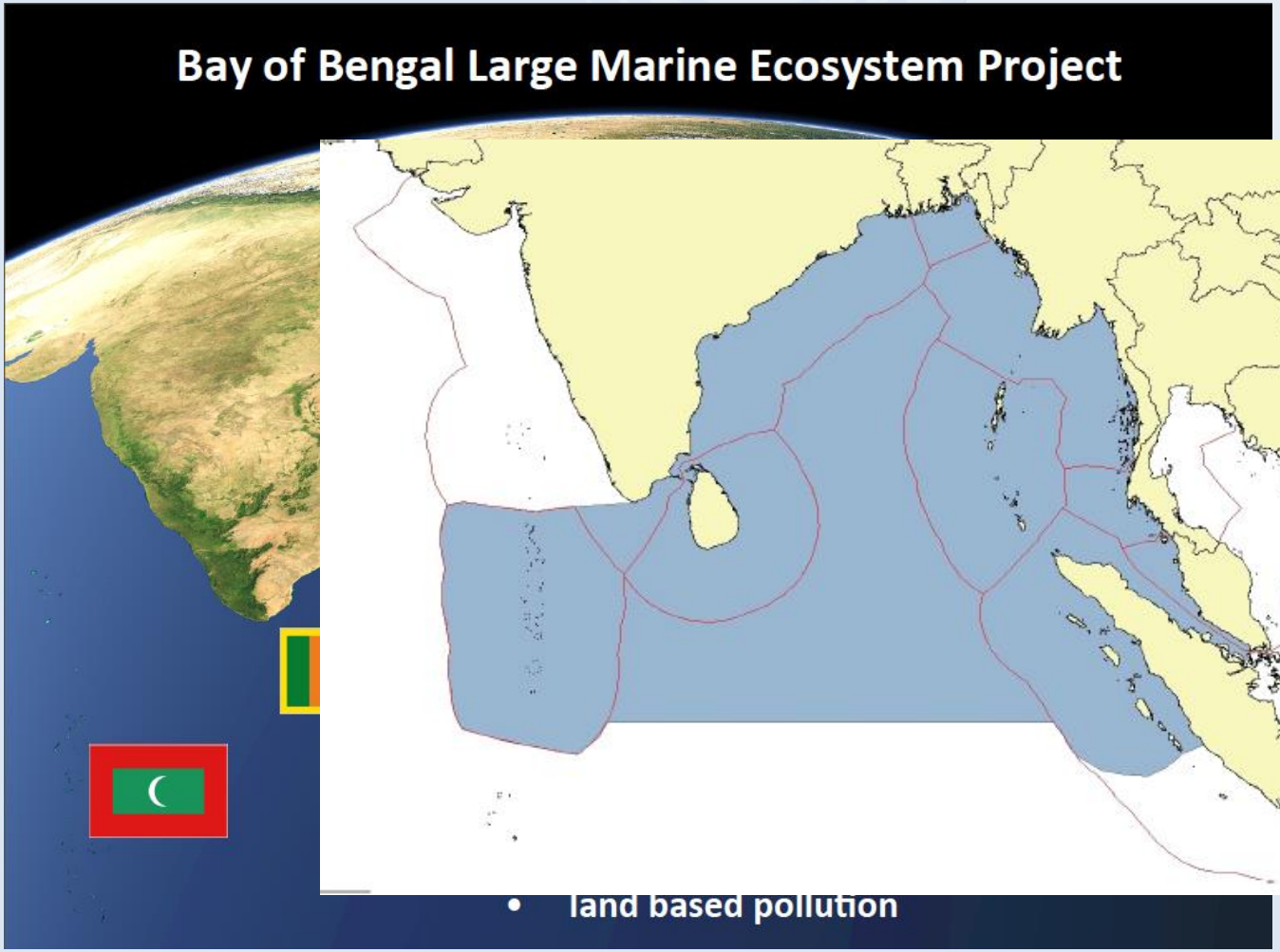
TDA Transboundary Diagnostic Analysis

SAP Strategic Action Programme

Goal to establish a regional Commission for the LME and to implement a Convention

The Bay of Bengal LME as an example:

Example: BoBLME

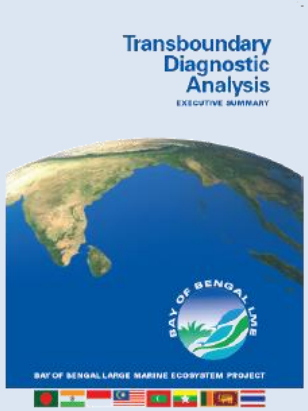


Courtesy R. Hermes, BoBLME

Example: BoBLME

Two major outputs

1. **A Transboundary Diagnostic Analysis - TDA**
   - ***A report on the major transboundary issues and their causes***
2. **A Strategic Action Programme - SAP**
   - ***A (strategic action) plan for addressing the major transboundary issues and their causes***



www.boblme.org

Courtesy R. Hermes, BoBLME

Example: BoBLME

BOBLME SAP Implementation: selected planned interventions (fisheries)

Overall SAP Vision:

A healthy ecosystem and sustainable use of marine living resources for the benefit of the people and countries of the Bay of Bengal LME

SAP Objective (EcoQO)

Fisheries and other marine living resources are restored and managed sustainably

Objectives:

- Restore fishery resources that have declined
- Restore and maintain species composition
- Reduce the proportion of juvenile fish caught and/ or retained
- Restore biodiversity status level of 1980 by 2020

Conclusion

- Large Marine Ecosystem Approach is a valuable instrument to
  - address transboundary issues
  - manage living resources and keep resource use on a sustainable level
  - manage and preserve biodiversity on natural level
  - consider (and include in management) other goods and services from the sea such as
    - genetic resources
    - tourism, coast protection, transport
  - Include all stakeholders
- Prerequisites:
  - Scientific basis for action
  - Capacity Development on all levels

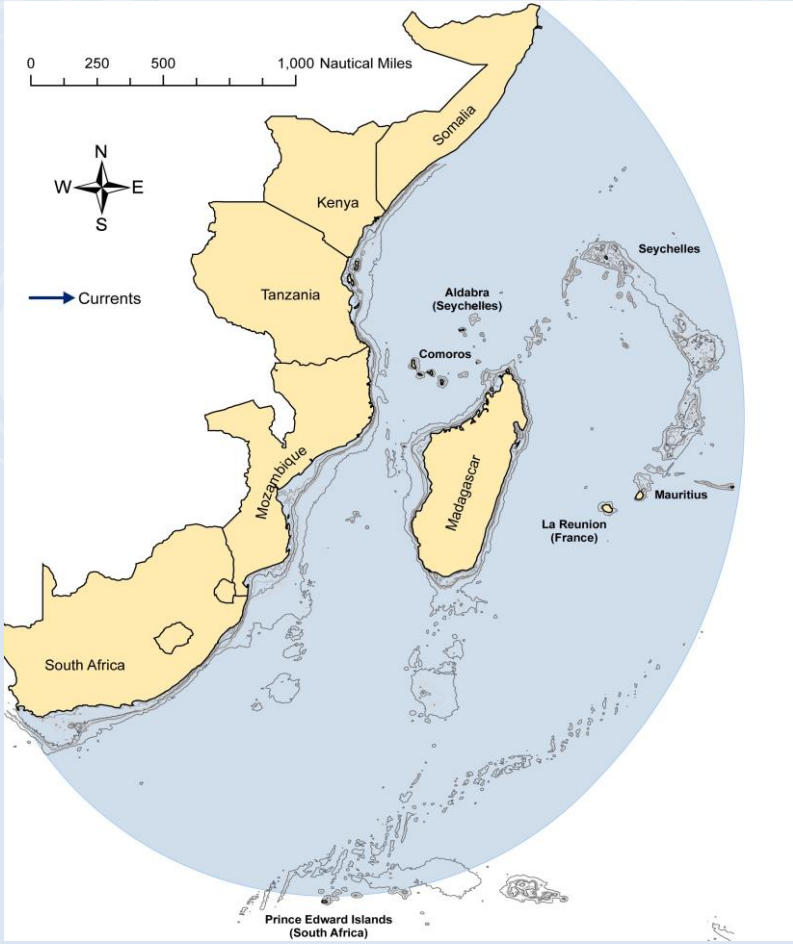

Thank you
for your attention

The ASCLME concept

9 COUNTRIES: Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa, Tanzania

FUNDING: GEF = US$12.2 Million + Co-funding = US$20 Million (primarily in-kind and from countries)

TIMEFRAME: 5 Years (2nd phase)



Courtesy D. Vousden, ASCLME

The ASCLME concept

The ASCLME Project has captured and collected data for the TDA process relating to:

Coastal Habitat Types: (particularly nursery and spawning areas or those supporting rare/threatened species)

Coastal Livelihoods Mapping and Assessment: Small-scale, artisanal and subsistence fisheries; mariculture activities; coastal tourism

Invasive Species: (esp. from ballast waters and international transport movements)

Marine Pollution: e.g. shipping discharges, oil/chemical spills, exploration/extraction of natural resources

Courtesy D. Vousden, ASCLME