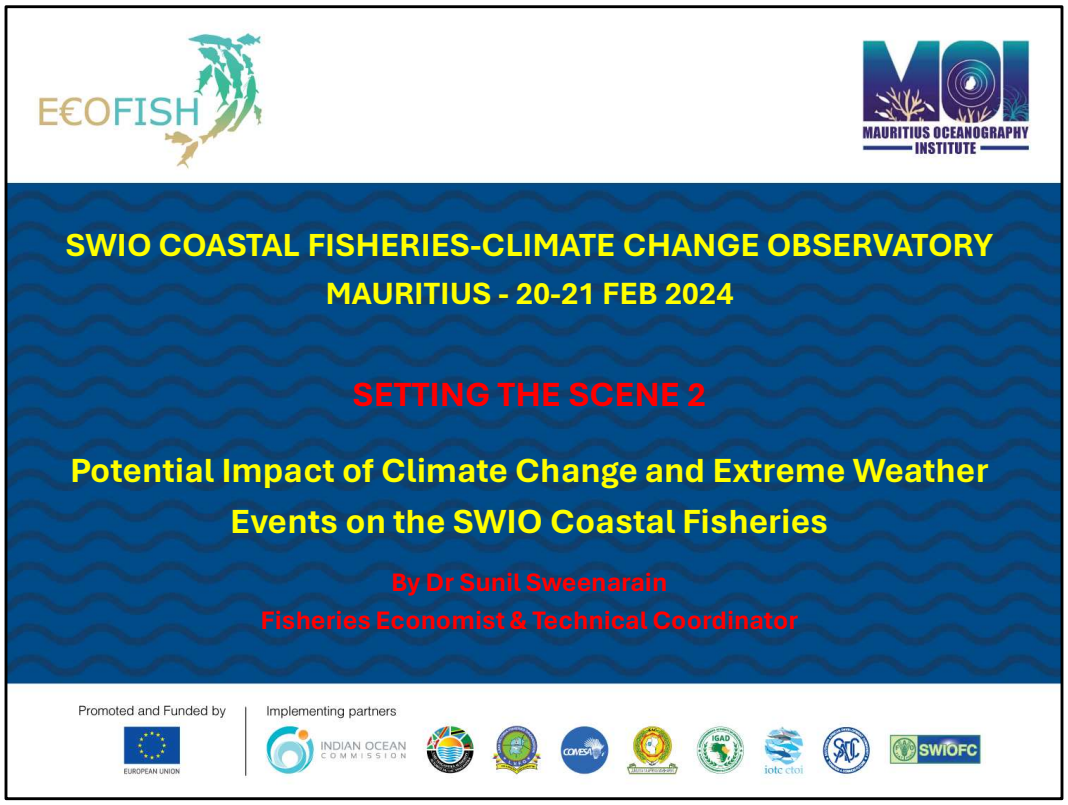


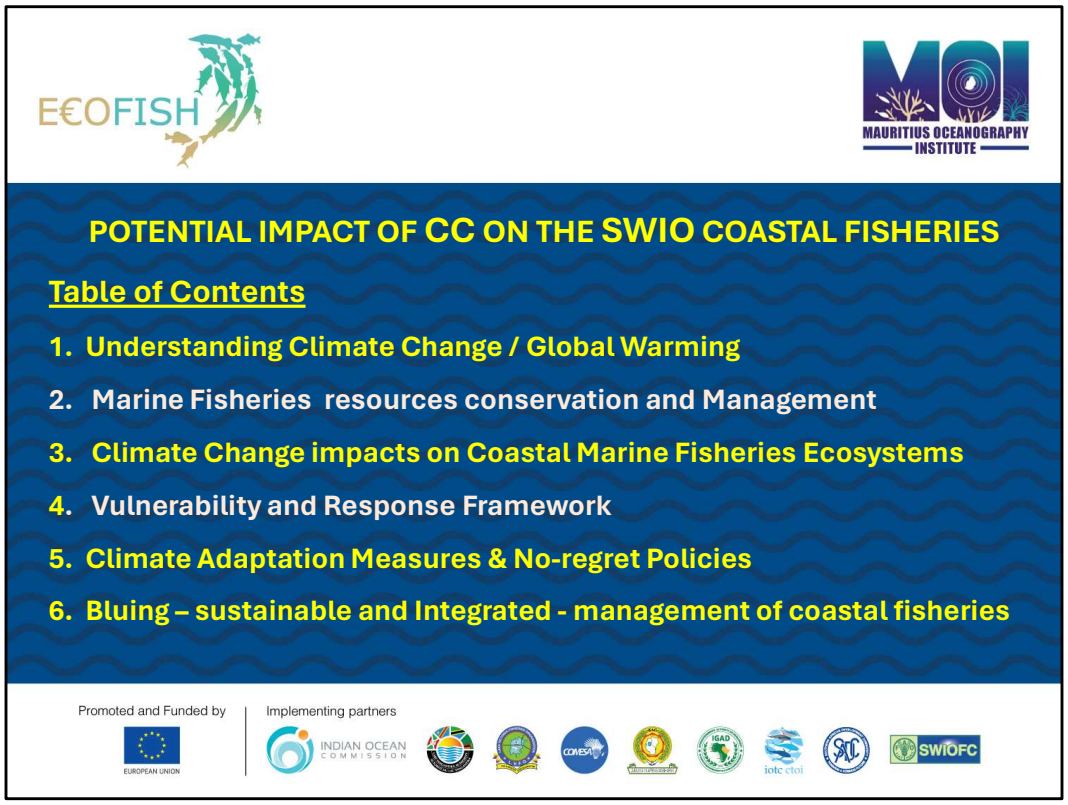
Climate change is now a reality and worse than any of Spielberg's fiction even imagined.

Since the dawn of industrialisation, humanity has waged a war with Nature.

Newton's Law of Gravitation. How the apple went on the tree?

Climate change is consequence of by free-market and ultra-liberal capitalism.
Profit, greed and selfishness in not Society and Nature.

Since the dawn of industrialisation, humanity has been at war with Mother Nature.



Climate change is weaponised as a geopolitical instrument by developed countries.

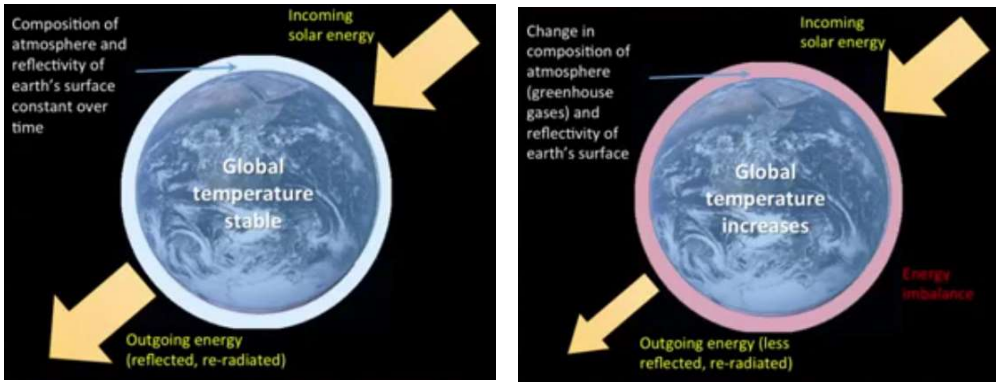
Countries that have contributed to the least CC are facing Survival threats.

The developed countries are not doing enough the save the Planet.

Our focus will be on the coastal fisheries, and these are the areas of interest.

1.1 – Understanding Climate Change

Planetary temperature results from the ratio between incoming and outgoing radiation and energy absorption by land, sea, and atmosphere. At equilibrium, incoming and outgoing radiation to the earth should be equal, and if so, the temperature will be stable. Change the magnitude of any one of these arrows, and planetary temperature will change.

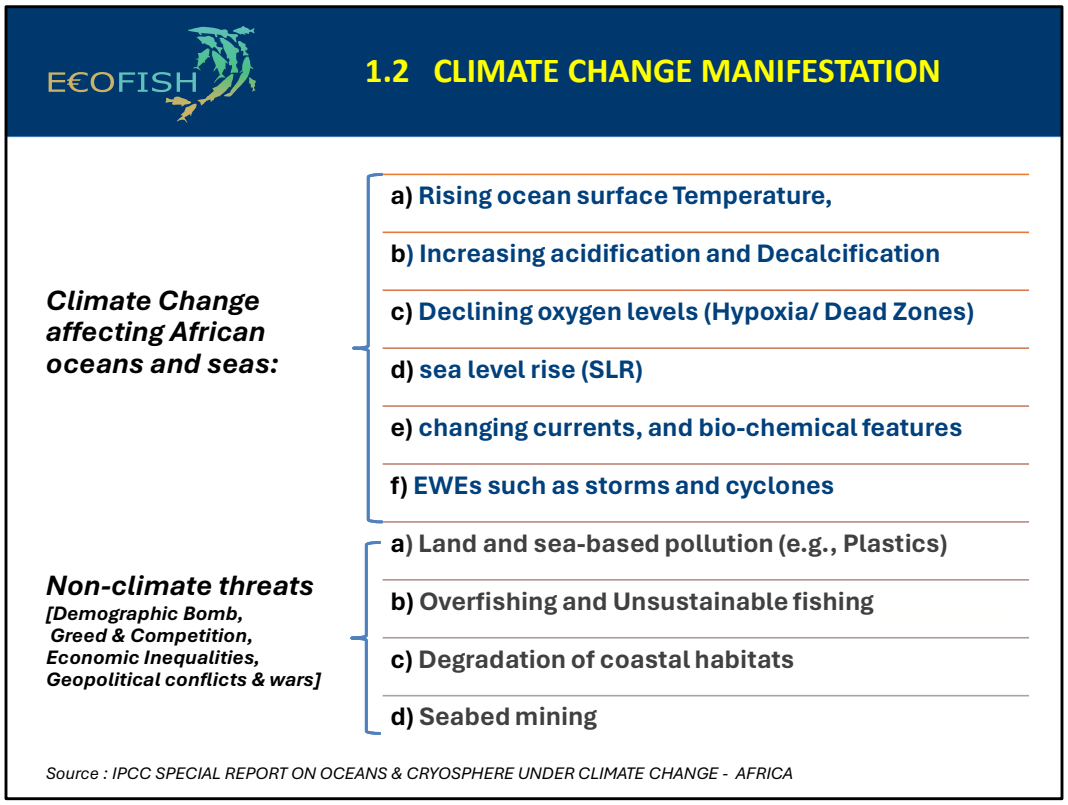


***Greenhouse gases** (GHGs) trap heat in the Earth's atmosphere, causing global warming. The main ones are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), ozone (O3), and water vapour (H2O). They come from various sources, such as fossil fuel burning, deforestation, agriculture, and industrial processes.*

1. A stratosphere is enveloped in a blanket of GHG, which regulates the outgoing solar energy and radiation. The perfect tuning of the layer of GHG has been disrupted due to an overload of GHG, mainly CO2? ***Osmotic Filter / Regulator***

2. Analogy to the Ozone layer depletion – Success of the Montreal Protocol.

3. Contextual blindness.

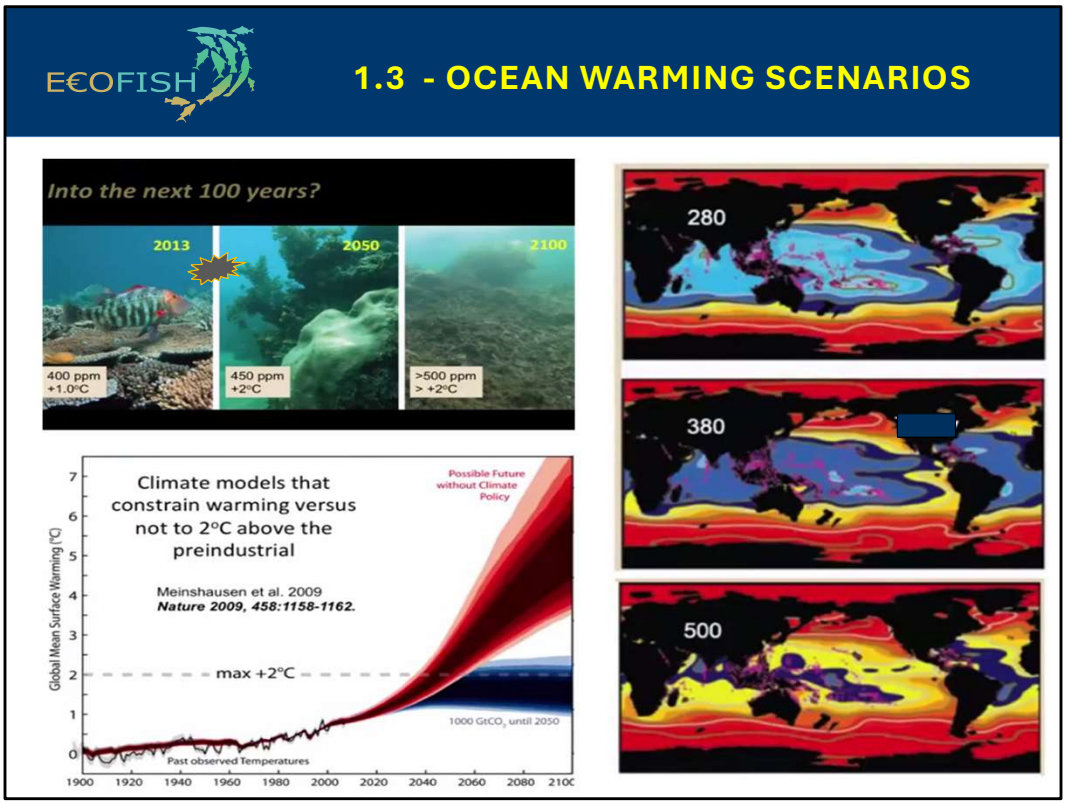


The manifestation or pathways of Climate change

Amplified by non-climate and human-induced threats – a cocktail for disaster.

Human-induced Curable and non-curable diseases inflicted on Nature.

More to come and understand the Human-Environment Relationship



To summarise Climate Change and Environment Health.

PPM: (Part Per Million) of Carbon in the Atmosphere.

Pre-industrial Era: Perfect climate/ Heaven of Earth

The world has passed + 1.5°C! Climate disruption can be felt by all.

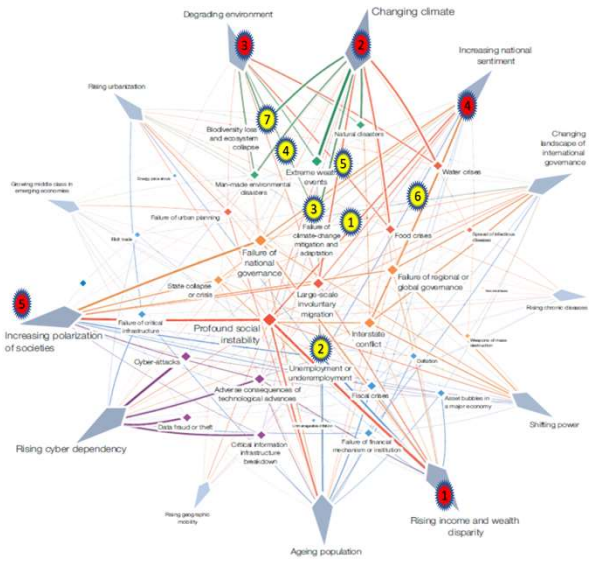
1.4 - GLOBAL RISKS REPORT 2020
[Human-Being & Polarisation]

For the tropical Developing countries

RISKS
1. *Food crises*
2. *Unemployment & Underemployment*
3. *Climate Adaptation & Mitigation measures* ★
4. *Extreme Weather events (Floods & Droughts)*
5. *Natural Disasters*
6. *Water crises*
7. *Biodiversity loss & Ecosystem collapse*

TRENDS
1. *Rising Income & Wealth Disparity*
2. *Climate Change* ★
3. *Environmental Degradation*
4. *Decline of multilateralism*
5. *Polarisation of Societies*

→ The political, social, economic and environmental risks are interconnected and mutually reinforcing.



POVERTY – HUNGER – INEQUALITIES

Poverty anywhere is a threat to peace and prosperity everywhere – Nobody is safe if all are not safe !!

Let's look at the perceived global risks. Nature – Society - Economy

The demand and supply of political commitment

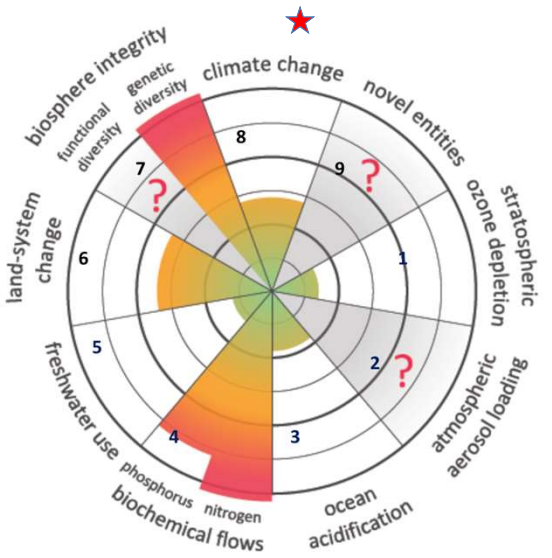
A world full of contradictions and double standards.

The world needs a holistic and integrated approach to leave in peace with Nature.

1.5 THE PLANETARY BOUNDARIES
[Interconnectedness]

OBSERVATION

1. Ozone Depletion in the Stratospheric : HFCL, Methane … [Recovering , Montreal Protocol]
2. Aerosol Loading: other gases used in deodorants and other sprays harmful to atmosphere. [Not documented to-date]
3. Ocean Acidification: CO2 absorption causing decalcification of coral reefs & shell-bearing creatures.
4. Phosphorus & Nitrogen Cycles – land-based chemical and industrial effluents & run-offs [Eutrophication & Dead Zones]
5. Fresh water: 0.7 % of the volume of water; essential for life. Polluted by intrusion of seawater / SLR. Water stressed region due to Climate change.
6. Land-system change: Deforestation, alteration of coastal areas, diversion from food crop to cash crops.
7. Biodiversity and Ecosystem: Still not well documented
8. Climate Change: COP 21. Urgency to adopt decarbonisation pathways / zero carbon growth to avoid + 1.5 – 2.0 degree Celsius.
9. Other components not yet identified.



Source : Stockholm Resilience Centre

Humanity is at war with Nature, and it is suicidal!

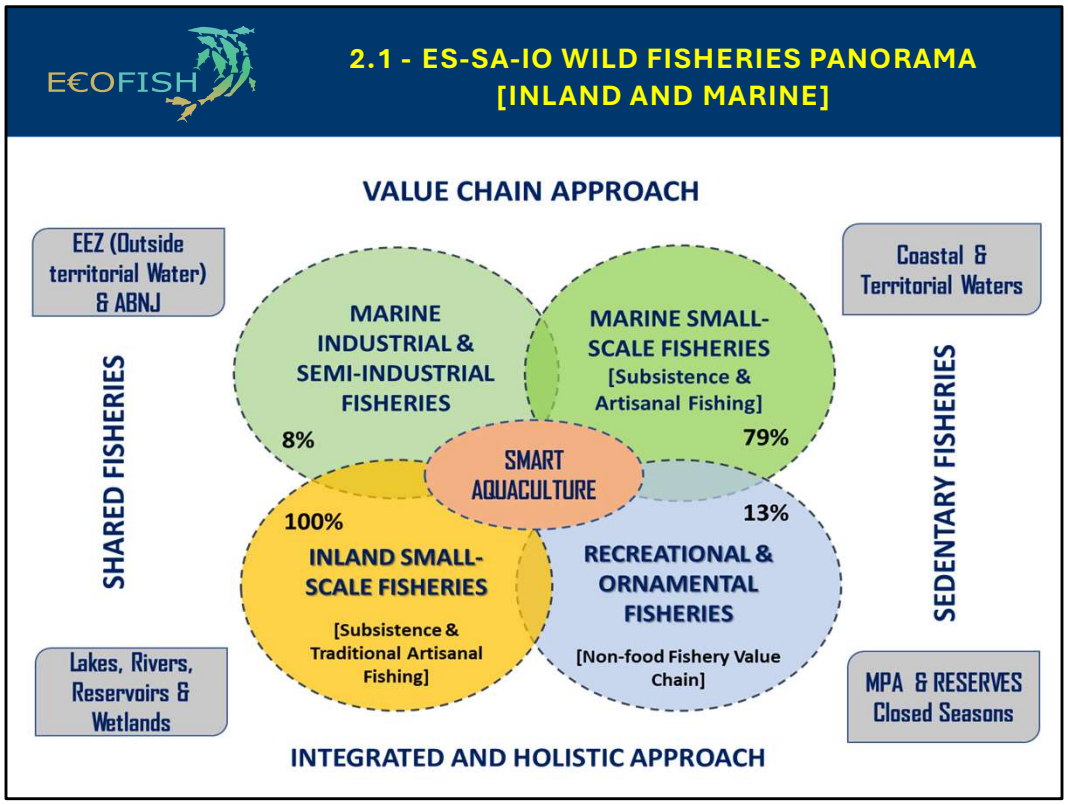
A holistic approach (Earth – Ocean – Space)

Climate Change is not the only challenge.

Humanity has trespassed several planetary boundaries.

And they are mutually reinforcing.

Too many concepts but no concrete action!



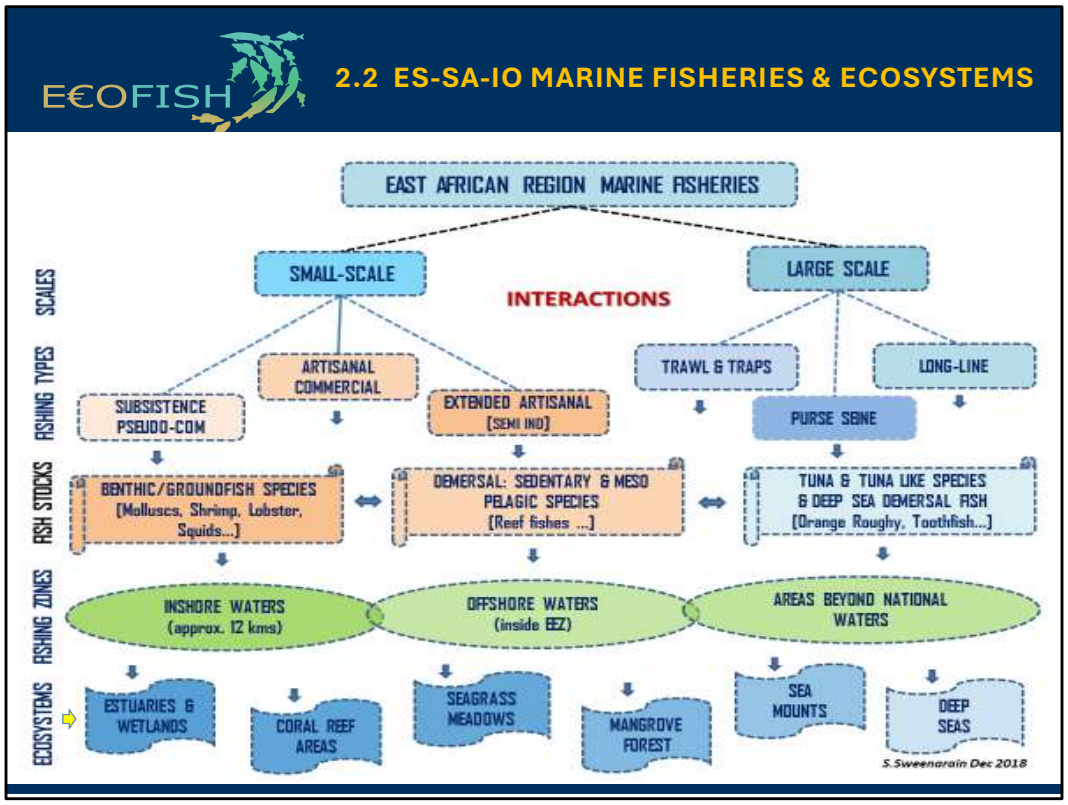
Policy biases

We always looked at the fisheries sector in piecemeal.

It is one of the most prominent renewable natural resource sectors to sustain life.

Some countries consider it a social sector.

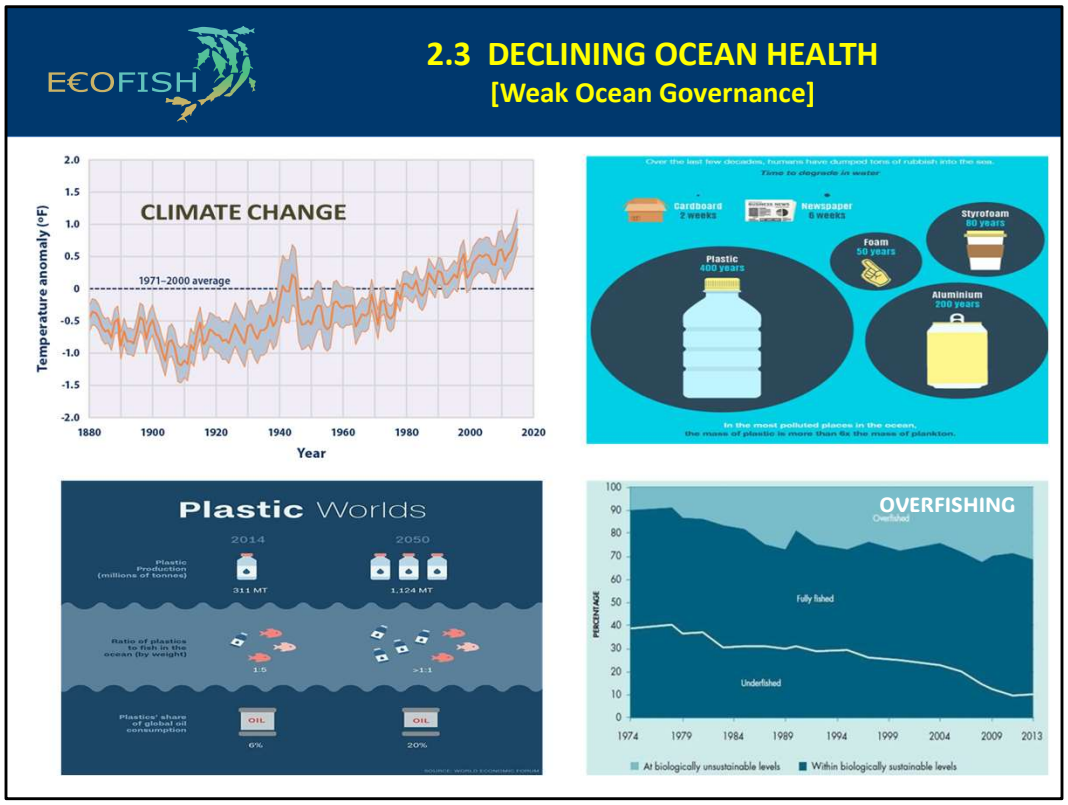
It is inextricably linked with the marine and aquatic systems.



Mapping of the wild marine fisheries.

Three broad types of species are nurtured by six main habitats

Predominance of small-scale fisheries operating in open access and informal settings.



The main challenges affecting the coastal and offshore oceans.

Climate change pathways

Land-based and maritime pollution

Dumping at sea

Overfishing and unsustainable fishing practices.

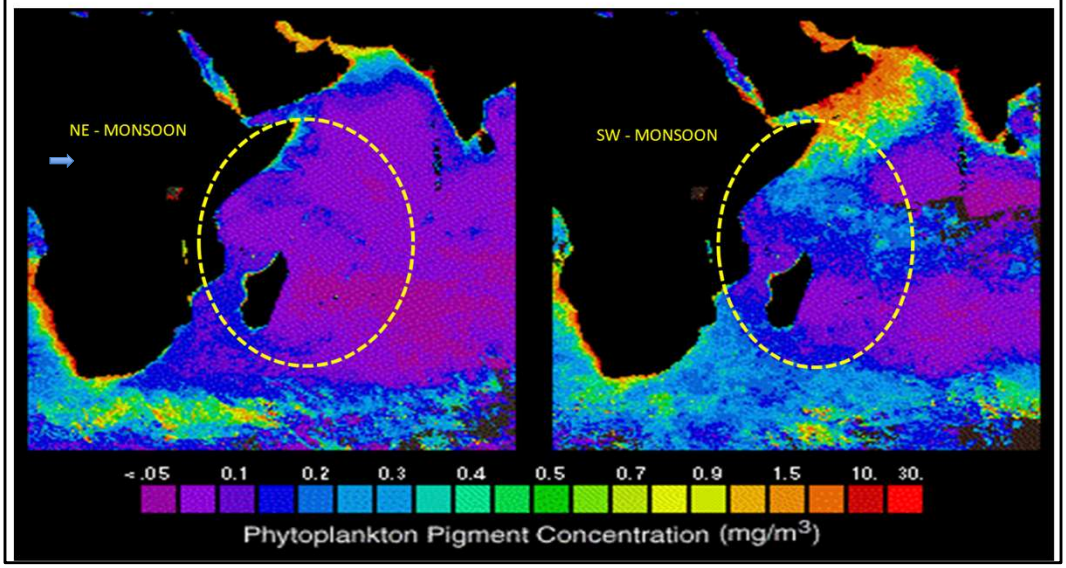
No excuse for coastal and island countries.

90 % of world fisheries resources are within the EEZ.

Focus on the high seas, the Common Heritage of Humankind!

2.5 PRODUCTIVITY INDICATORS - INDIAN OCEAN

Phytoplankton concentration in two seasons [Productivity of the Indian Ocean]:
Source: NASA SeaWiFS Ocean Colour Project

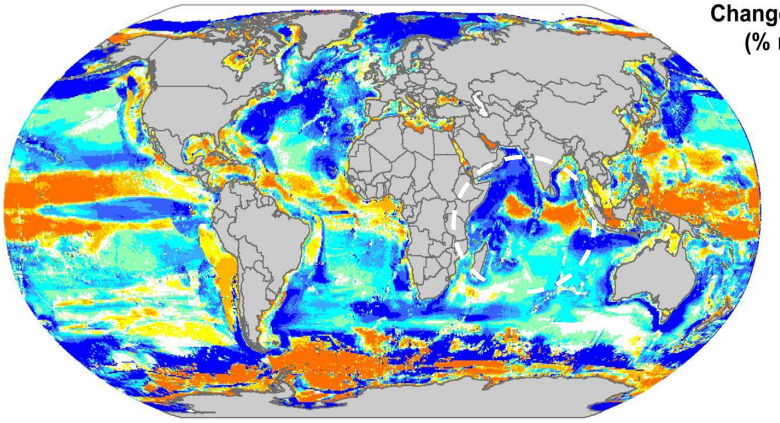


Primary Productivity Indicators - The ocean is relatively barren in fisheries resources.

With patches of high productivity in coastal areas and high seas.

The richest zone of high productivity.

3.1 Climate Change Impacts on World Fisheries
[Source: Sea Around us – 2009]



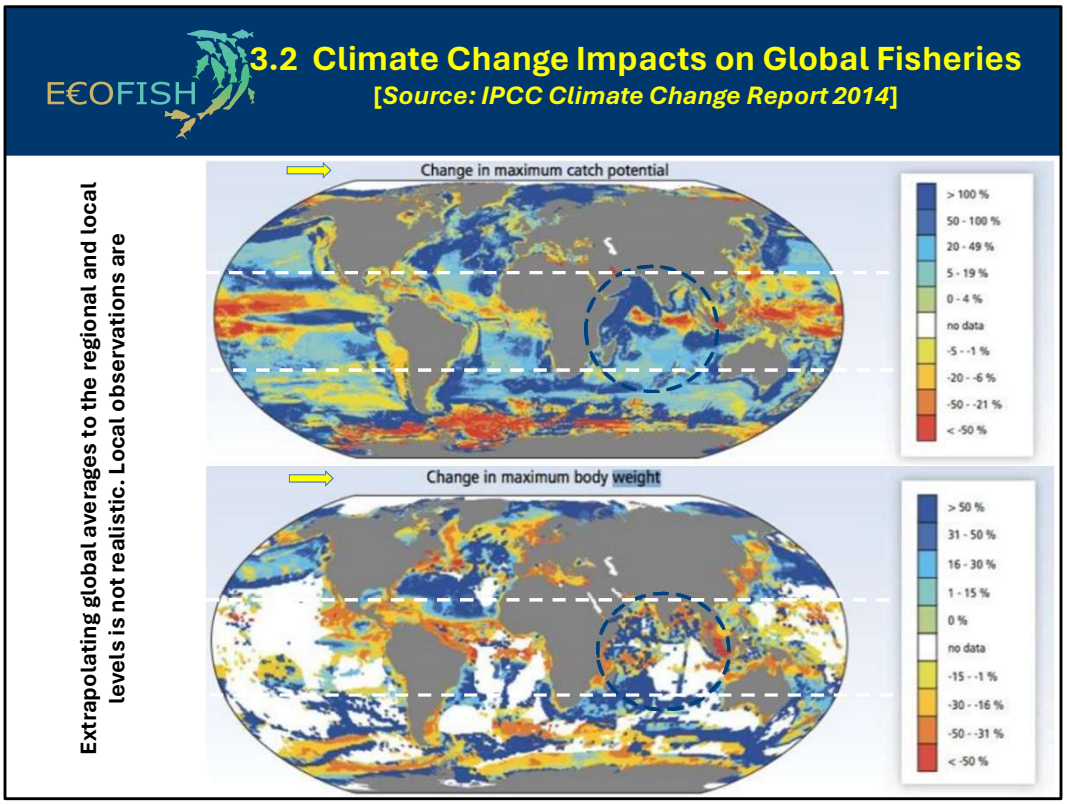
1. ***Predicted change in fisheries potential induced by global warming and a relationship linking distribution and potential catches.***
2. ***It predicts that some countries will gain and lose from these changes (Cheung et al. 2009b). The Tropical regions, or the Global South, are among the losers, and the winners will be the Southern and Northern Hemispheres.***
3. ***Note that these predictions do not account for changes in oxygen distribution and acidification of the oceans and hence represent an optimistic scenario.***

Impact of global warming on fisheries ecosystems and fish production

The Tropical and Subtropical regions are most affected.

Indian Ocean is most affected (enclaved ocean) (15 to 40 %)
How to make policy sense at the national and local levels ?

The impact of acidification and sea level rise is not included.

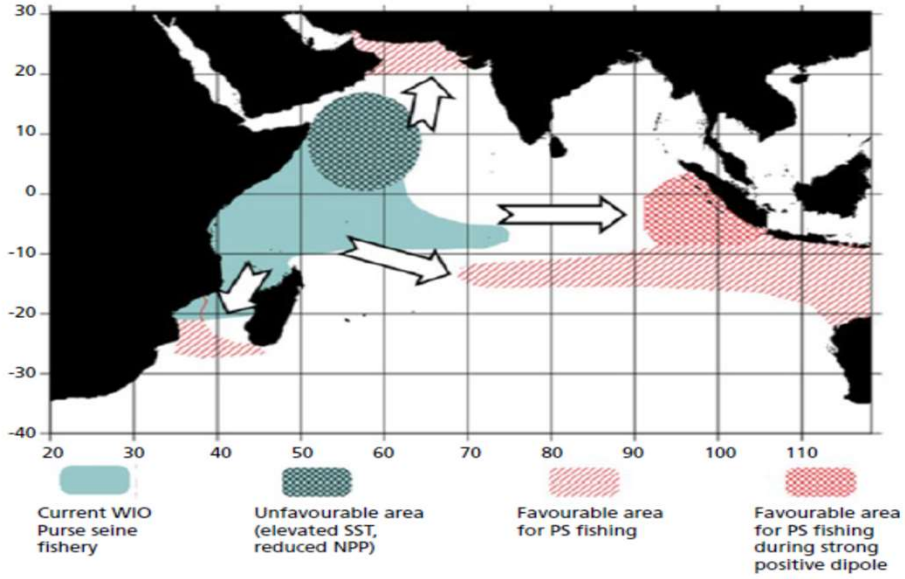


An emphasis of maximum catch potential and size of fish (stunting)

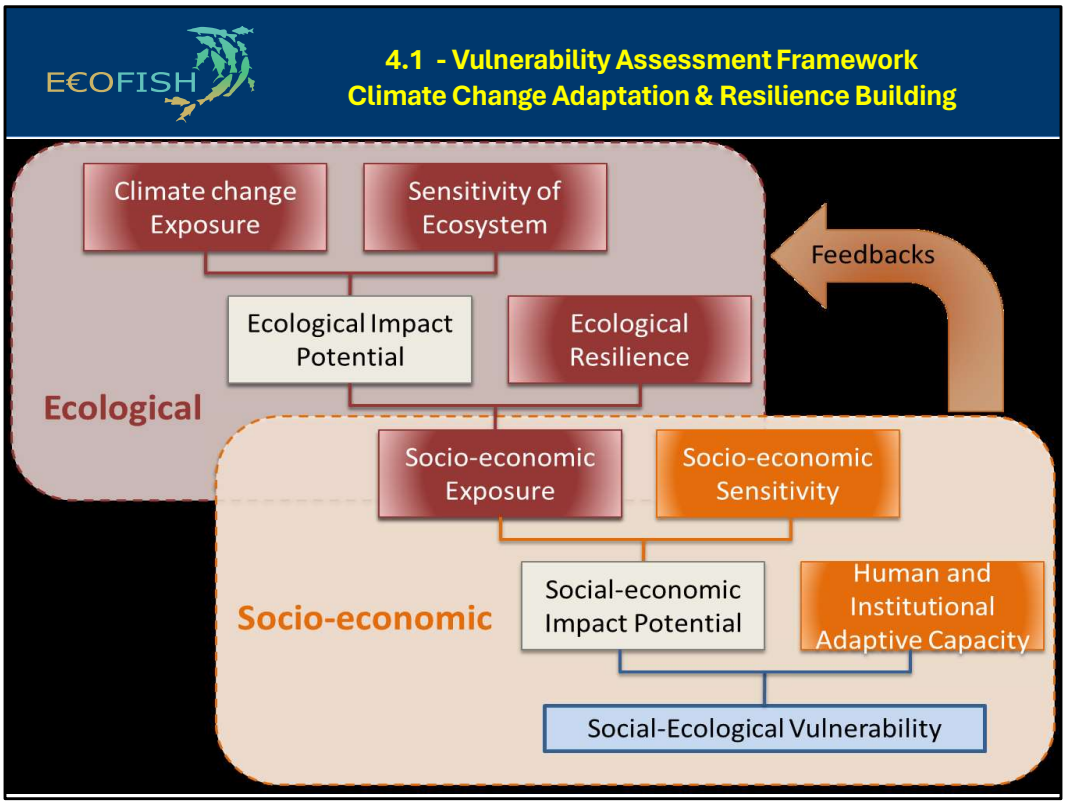
3.3 – EXAMPLE OF THE WIO PURSE SEINE FISHERIES

[Source: FAO Report 2016 Climate Changes – Fisheries case studies]

Synoptic sketch of possible spatial shifts of the purse seine fleets operating for tropical tuna in the Western Indian Ocean by 2100, under the highest CO_2 scenario (RCP8.5)



A projection of the displacement of the purse seine tuna fisheries in the Indian Ocean (by FAO)

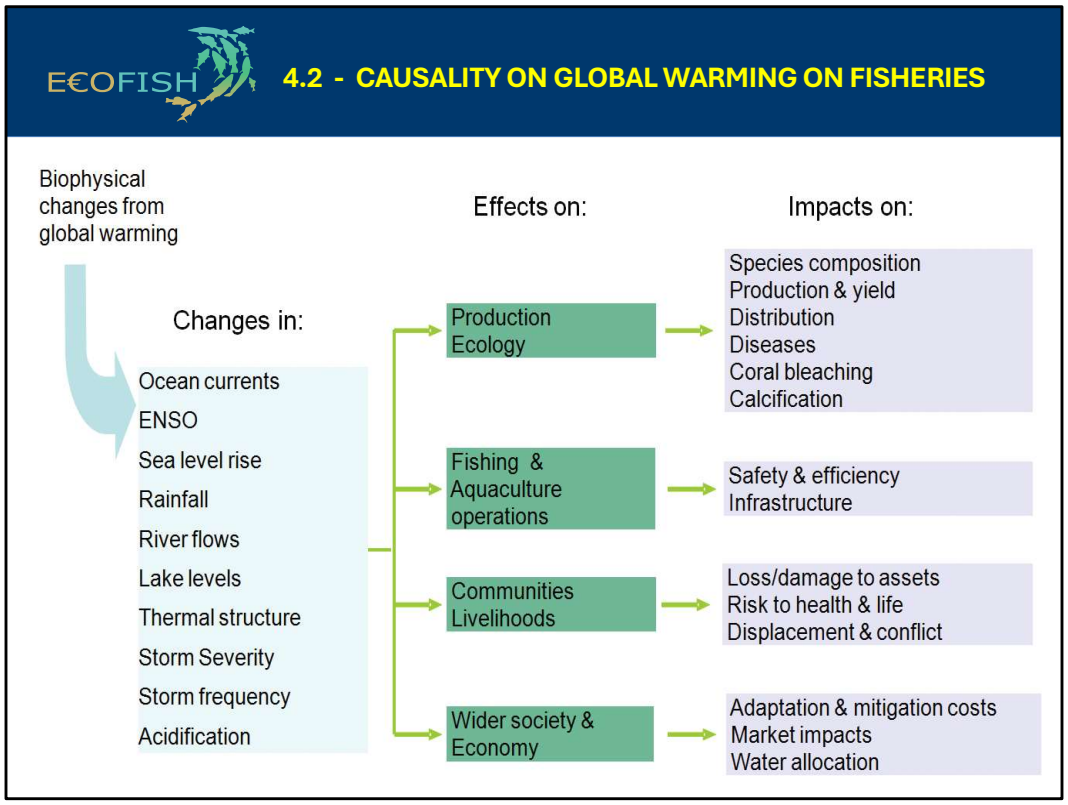


Vulnerability Framework

Understand the CC impact and Responses in Coastal Fisheries:

An intersection of bio-ecological and socio-economic factors.

Methods applied by the Observatory.

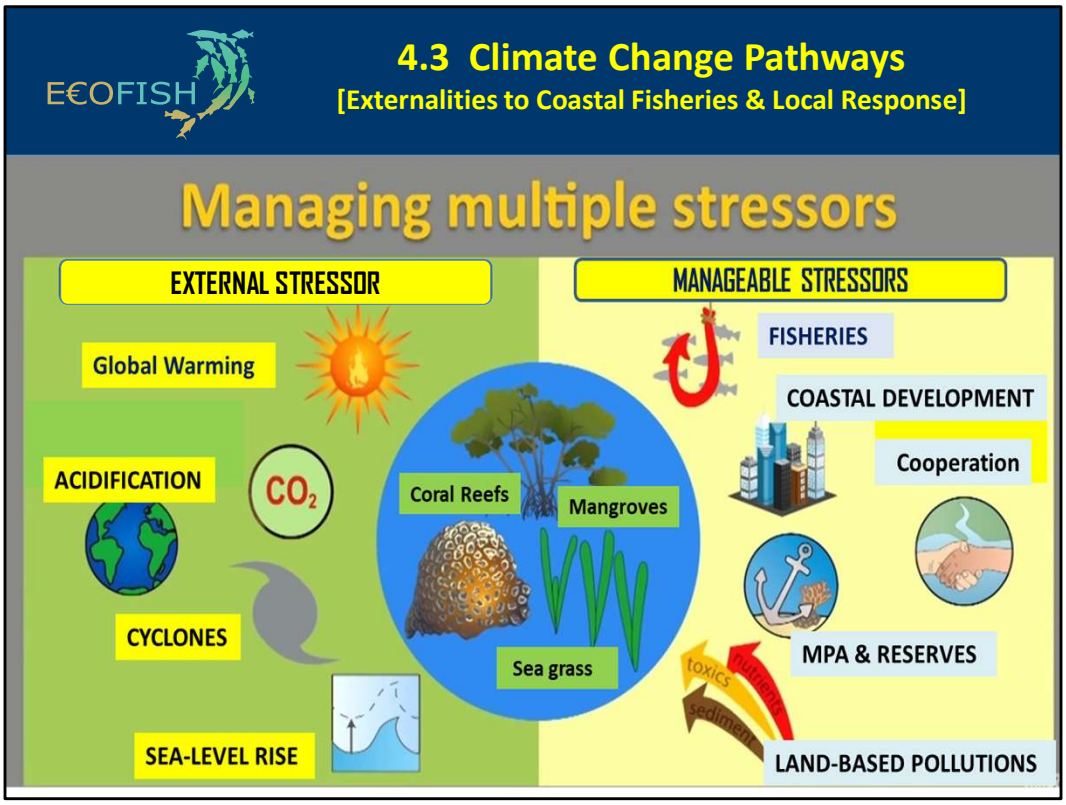


To sum up: (Causality and feedback loop)

The causes and effects of climate change on marine fisheries:

a) Fisheries ecosystems
b) Fish production/fishing operations
c) Livelihoods and well-being
d) Society and Economy

Regional and local diversities and refugia.
No one-size fits all. Global averages are potentially misleading.

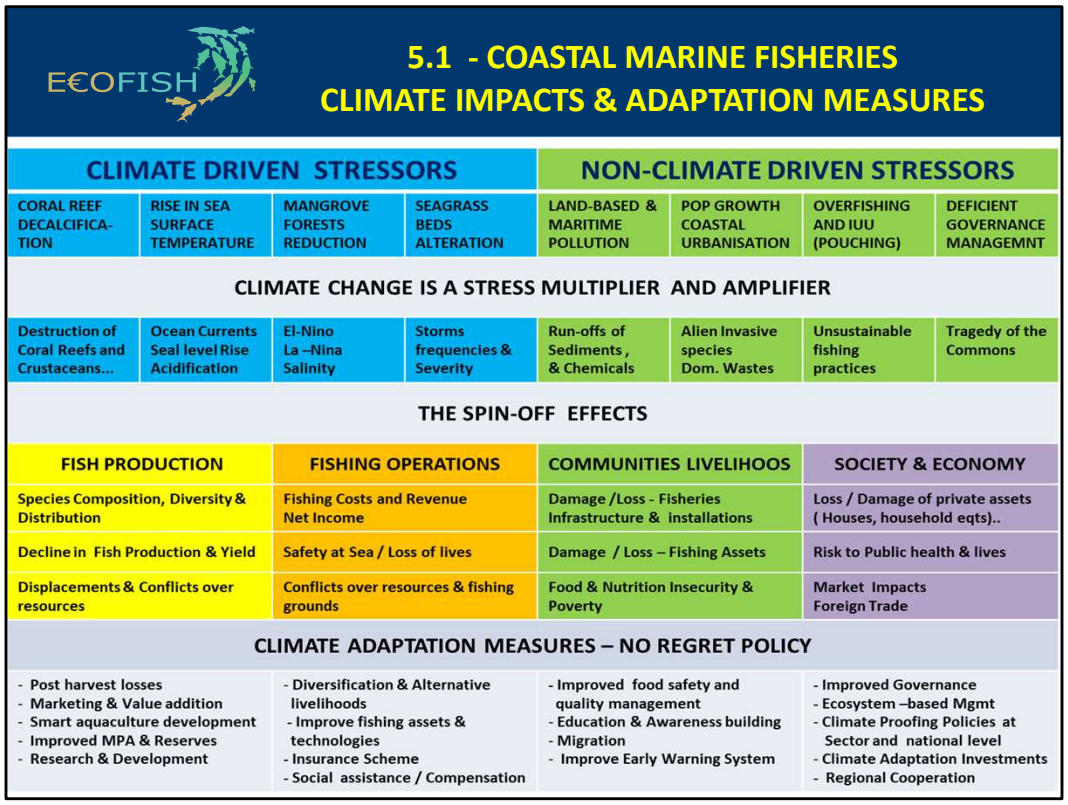


CC is like cancer. It has long-lasting effects.

Multiple stressors

Good practices / Adaptation measures.

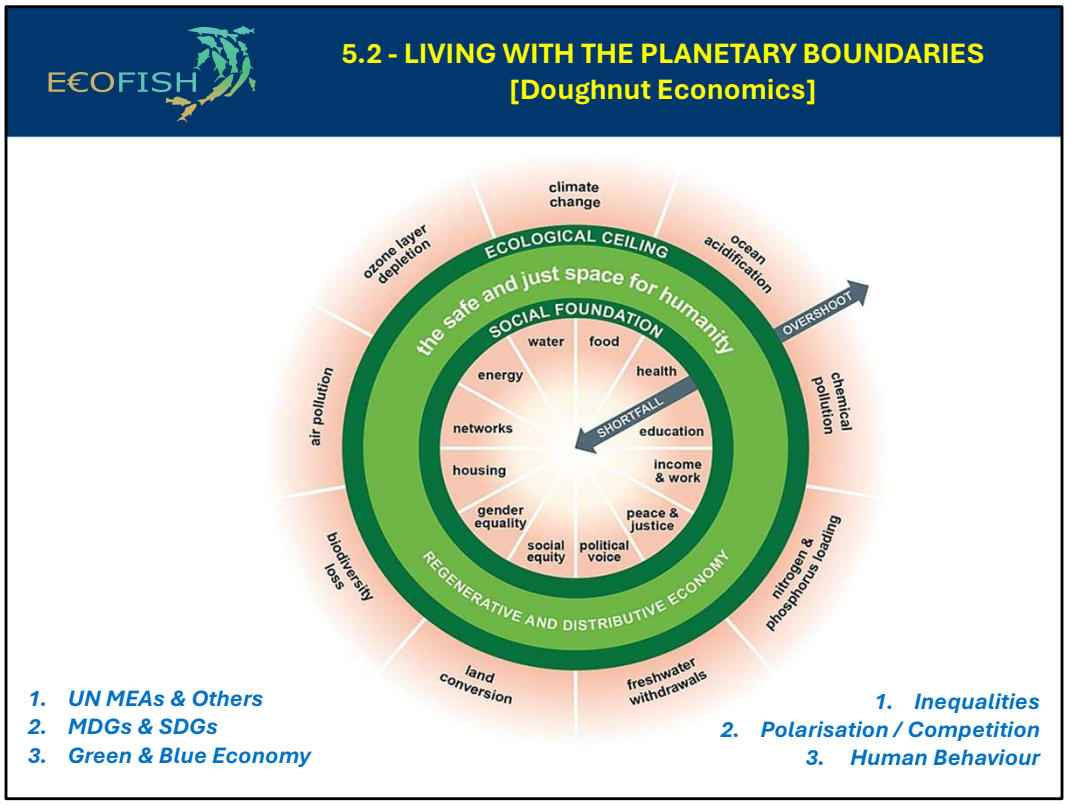
Refugia (MEAs) CC BD DD



Focus on adaptive measures and no-regret policies.

Coming close to the socio-ecological realities of the SWIO region.

Reviewing the fisheries economics and management in the CC era.



Living within the planetary boundaries

Every individual can contribute – Sustainable Consumption – Sustainable Production

A Bottom-Up approach.

*Take care of the planet's health, and the **dis-ease** will take care of itself.*

Globalisation with a human face – Strong global institution within the Rules of Law.

Bluing the fisheries sector with a human face.

The generalisation of the global average of the climate pathways is inappropriate.

The planet is not flat, and the in-situ data is needed to cross-check.

Awareness-raising and informed policy and management decisions.