

Technical Workshop on Selecting Indicators for the State of Regional Seas
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Indicators for sustainable fisheries: FAO's work and perspective

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Fisheries and Aquaculture: Socio-economic contribution

34 million



10 million



132 million



Employment

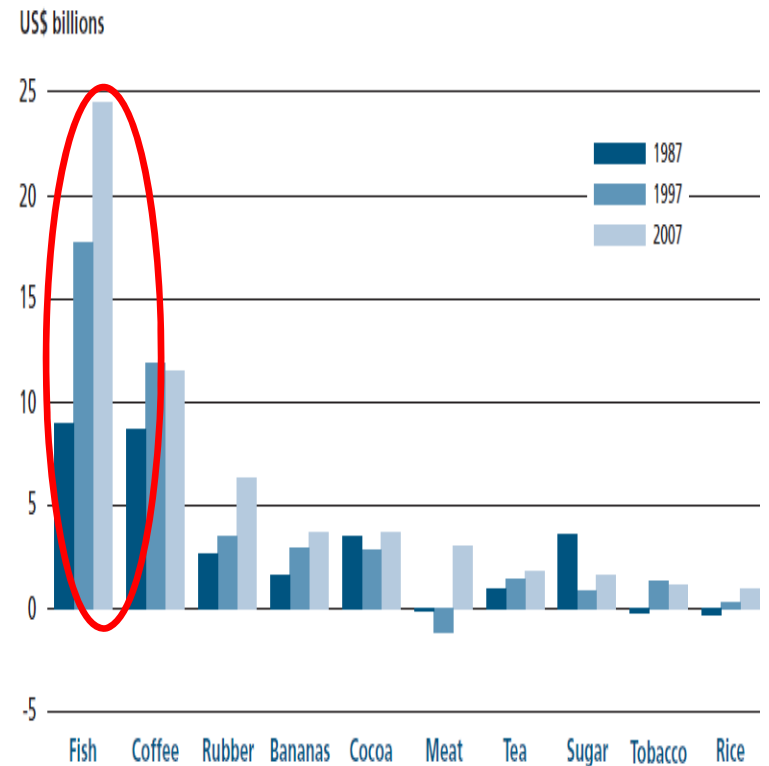


Average annual per capita supply: 17kg

- East Asia: 30.1kg
- Southeast Asia: 29.8
- Africa: 8.5g

Fish consumption

Net exports of selected agricultural commodities by developing countries



Foreign exchange



Definition of EAF



An Ecosystem Approach to Fisheries strives to **balance diverse societal objectives**, by taking account the knowledge and uncertainties about **biotic, abiotic and human components of ecosystems** and their interactions and applying an **integrated approach** to fisheries within **ecologically meaningful boundaries**.

Two main levels of indicator work

- 1) Reporting on stock status at regional and global levels; global trends in various statistics relevant to fisheries
- 2) Providing advice on use of indicators for EAF management

FAO's fish stock status indicator



The State of World
Fisheries and Aquaculture

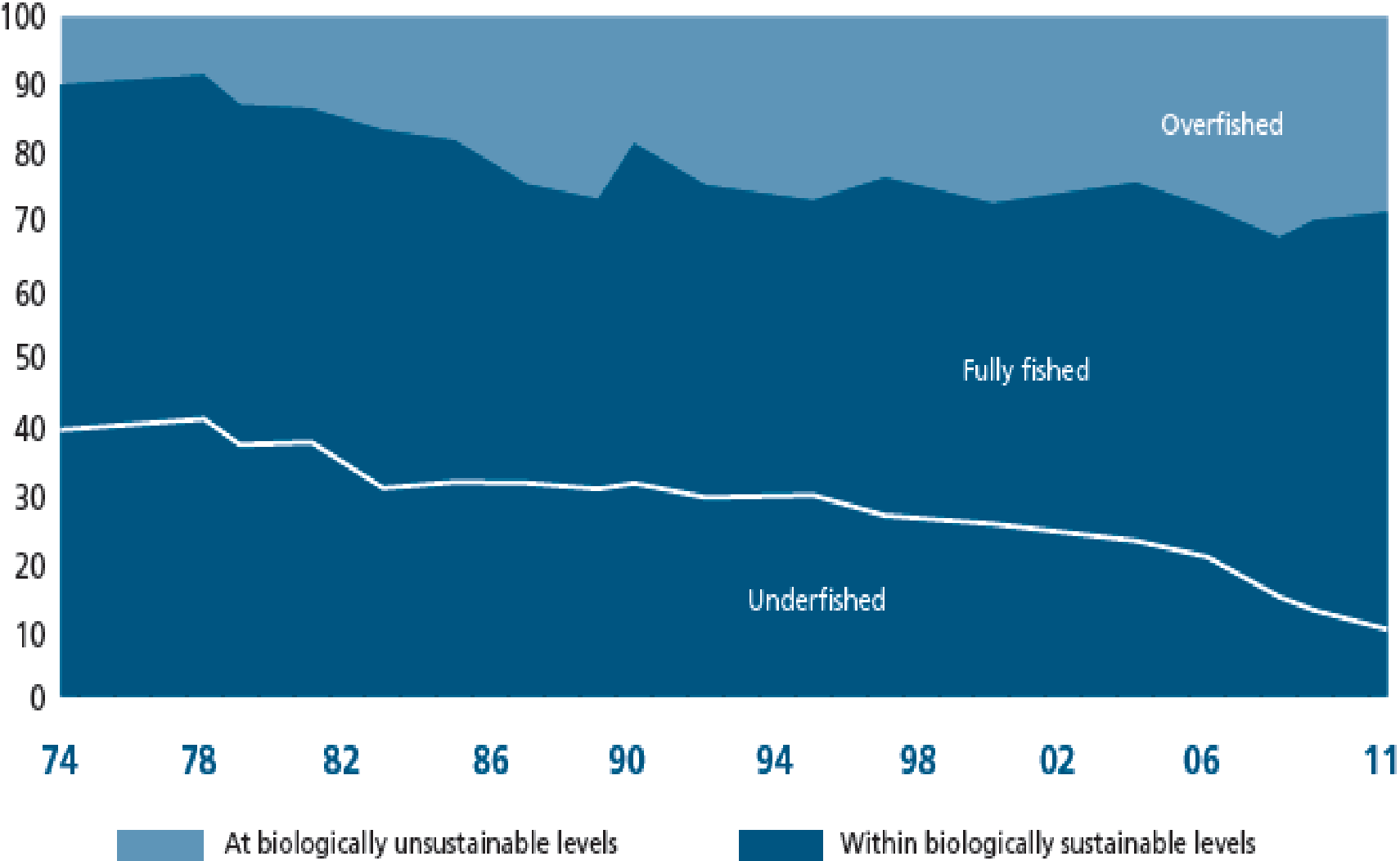


- % stocks within safe biological limits
- Updated every 2nd year
- Calculated by FAO fishing areas (coinciding in several case with RFBs)
- Based on formal and informal assessments



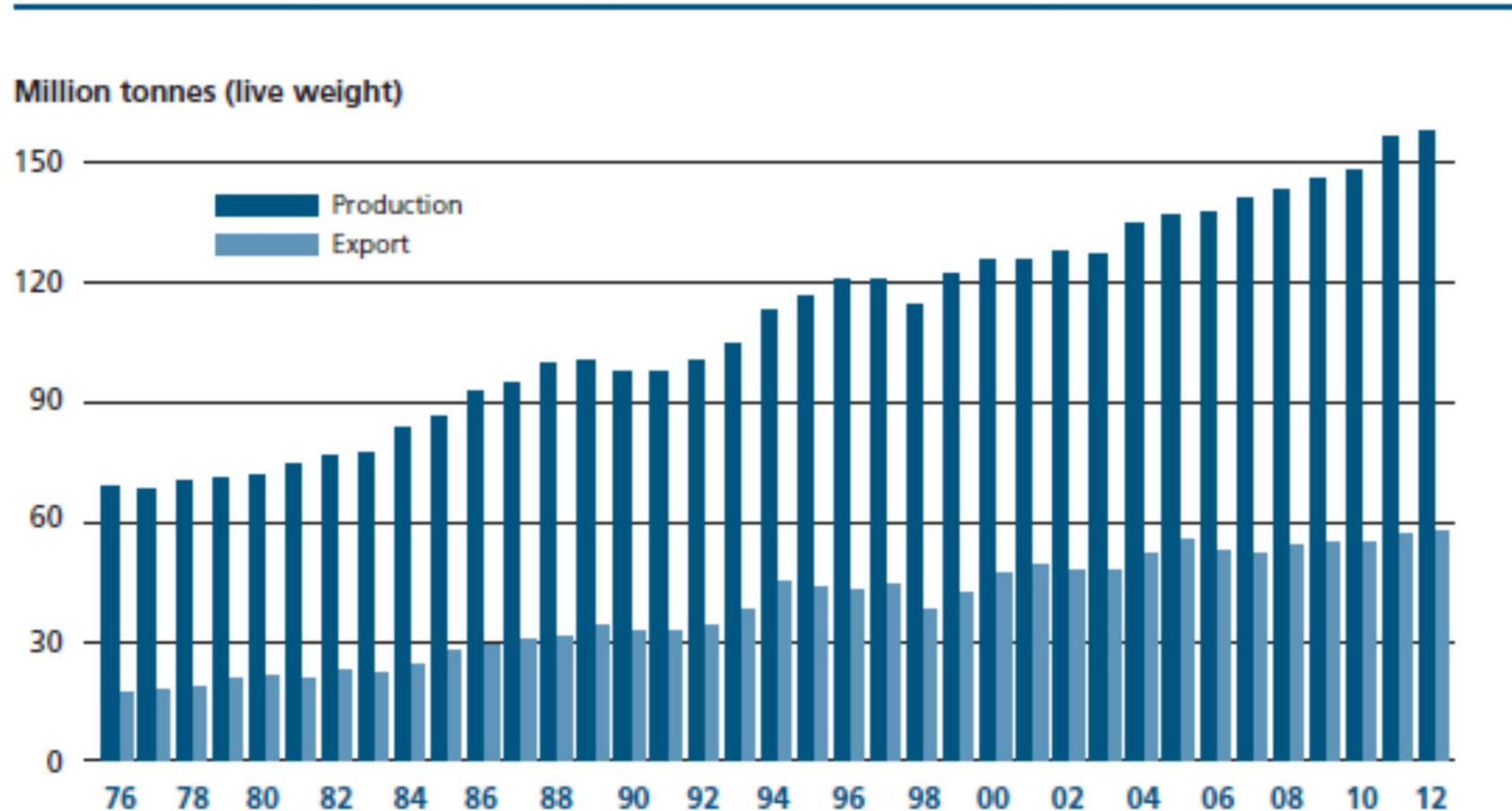
Global trends in the state of world marine fish stocks, 1974–2011

Percentage of stocks assessed



Trade (% of fish for export)

World fisheries production and quantities destined for export



Indicators for EAF

Indicators are needed to:

- Describe
 - the **Pressure** affecting ecosystems
 - the **State** of the ecosystem
 - the **Response** of managers
- Support management decision making
- Track progress towards meeting management objectives
- Communicate to a non specialist audience

Multi-(cross-)sectoral

(e.g. EA, EBM, IOM, LMEs, ICAM)

- Develops integrated plans for a given region/ecosystem
- Sets common conservation and development objectives
- allocates rights across sectors

Sectoral

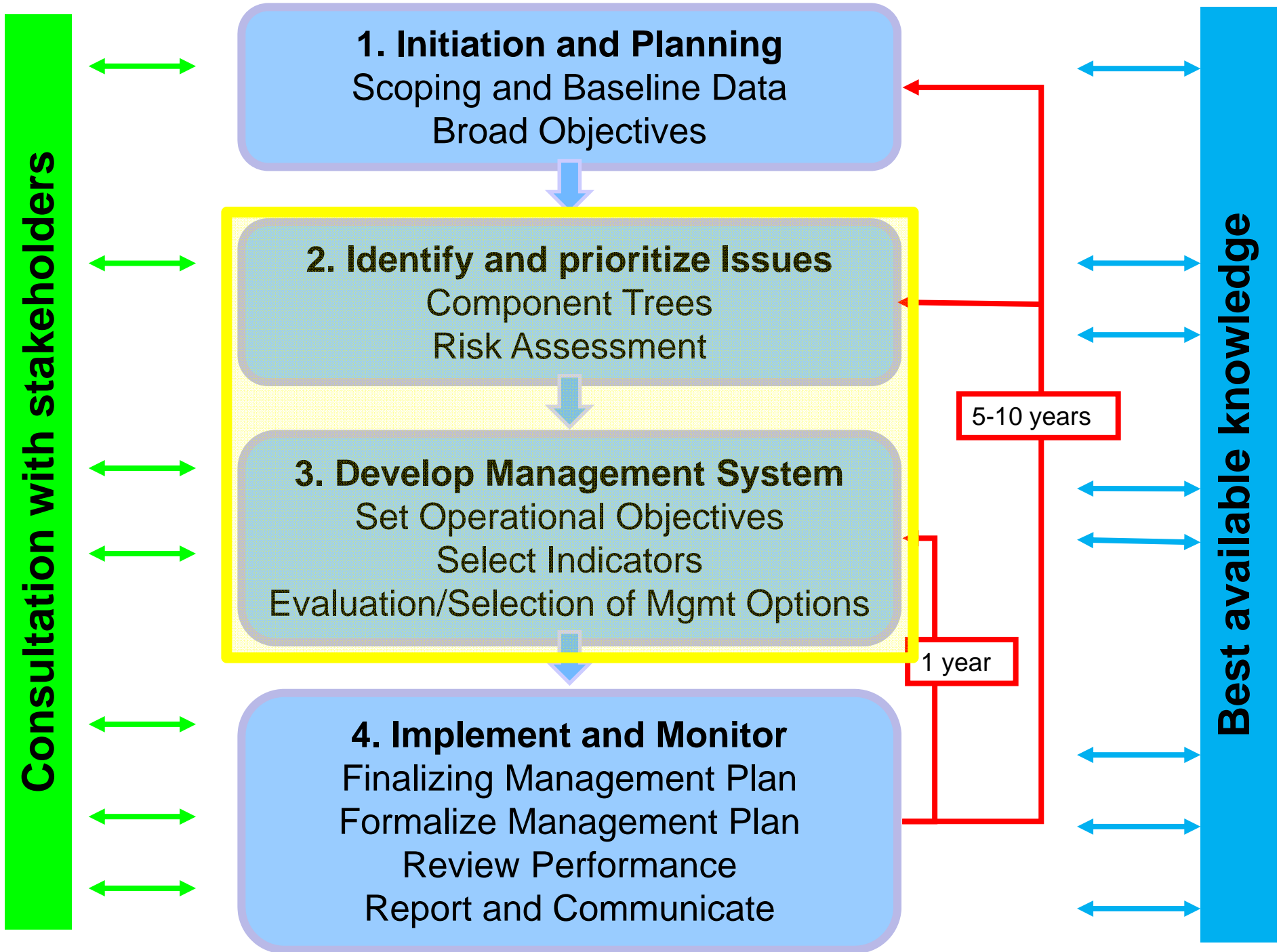
EAF/EAA

Ecosystem Approach to Tourism

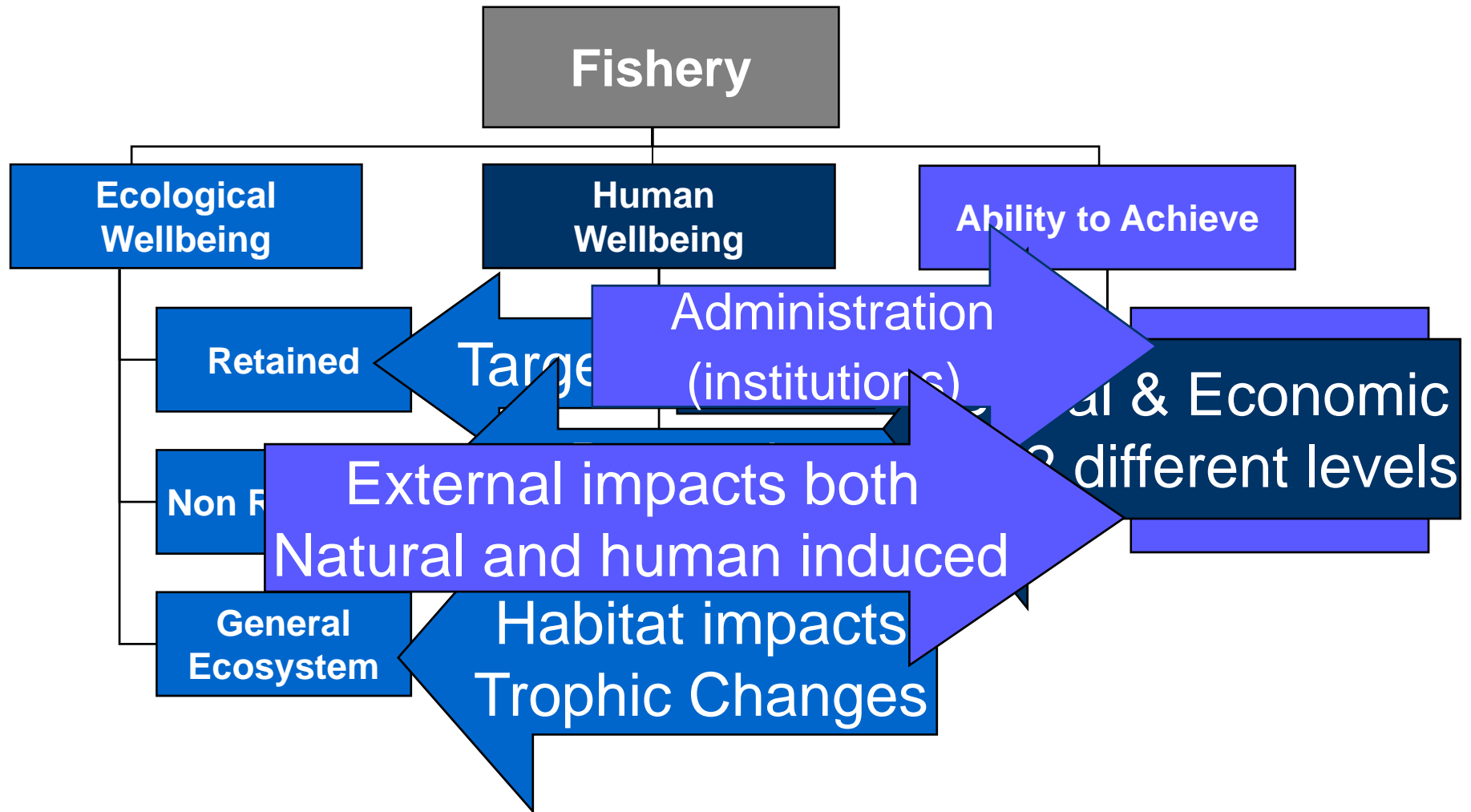
Ecosystem Approach to energy and oil

OTHERS

- Each sector is managed in a way that is consistent with overall principles and broad objectives set for the given region



EAF components



Key Activities

Determine Operational Objectives

a set of clear and appropriate operational objectives covering each of the issues that requires direct management

Indicator and Performance Measure Selection

indicators and their associated performance measures that can be used to monitor the performance of each objective

Management Option Evaluation and Selection

most cost effective set of management arrangements designed to generate acceptable performance for objectives

Hierarchy of objectives



Policy goal
(international)

Policy goals
(regional)

Policy goal national

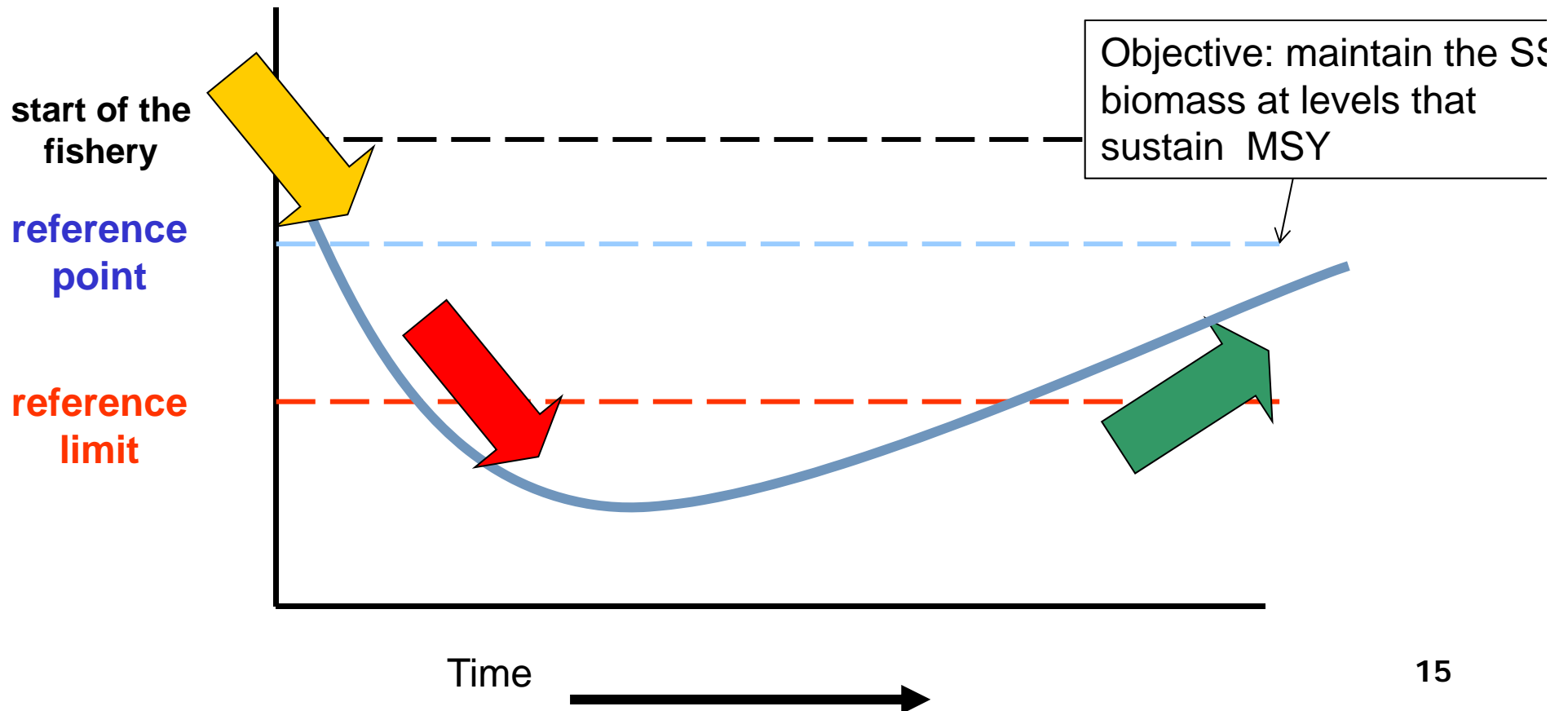
Global objective for the fishery

Specific (operational) objectives

Indicators

Example of indicators:

- SS Biomass
- Catch rates (CPUEs)
- Income/fisherman
- # fishermen involved



Hierarchical tree for developing operational objectives

➤ broad issue

Ecological well-being
(healthy ecosystem)

➤ broad objectives

maintain TS within
ecos. viable stock
levels

maintain bycatch/
vulnerable species

maintain ecosystem
functioning/biodiv./
habitat

➤ issues

TS 1

TS 2

TS 3

BCS 1

BCS 2

trophic
levels

diversity

➤ operat.
objectives (ref.
points or limits)

spawning stock
biomass above a
ref. p. or limit

Population of
species BCSn
above ref.p. or limit

Trophic
level
balance

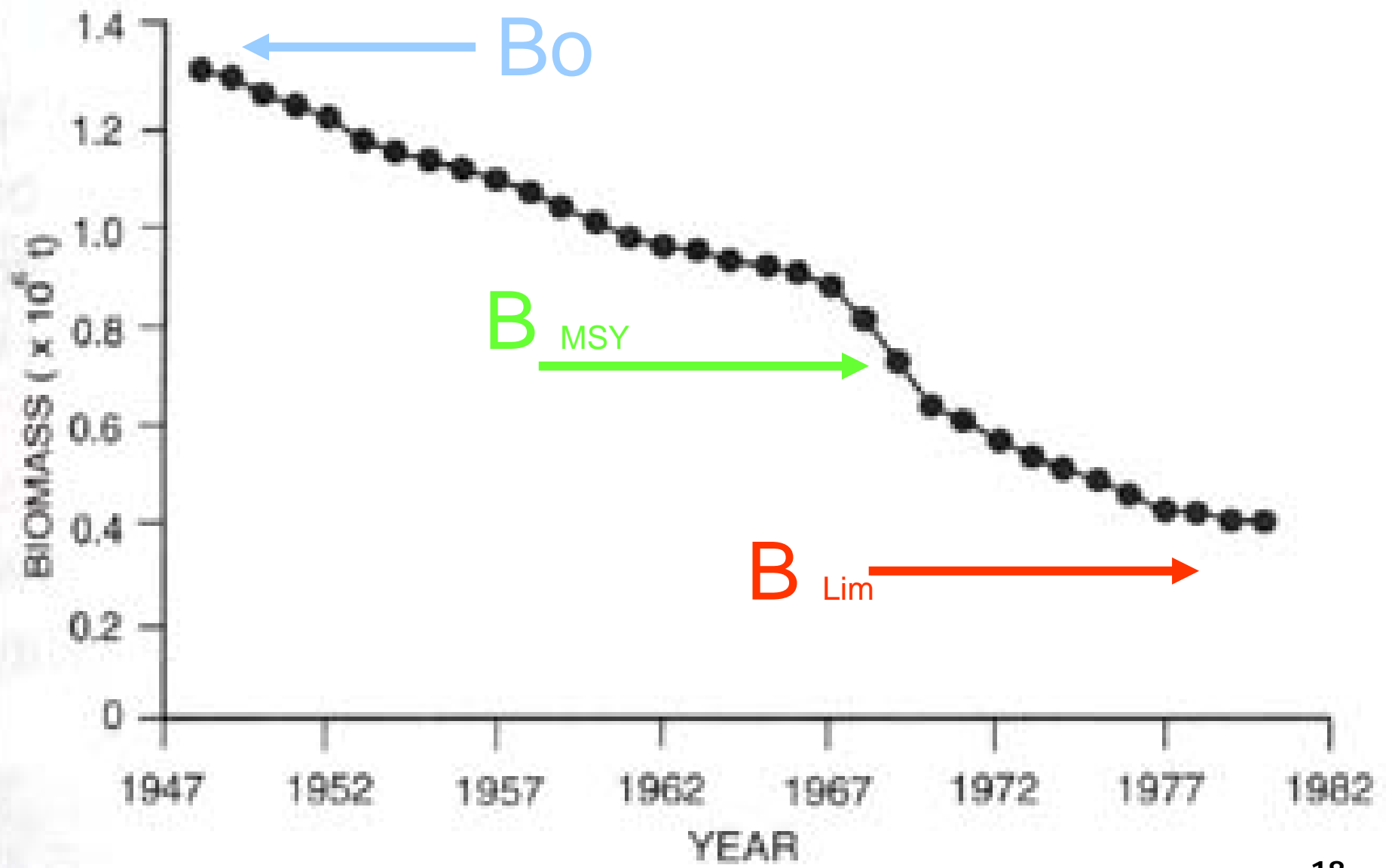
species
richness
and or
Even.
above
given limits

➤ indicator: SSB, B, R, L mean

Data requirements/availability

- In the lack of data (consistent/reliable time series), other sources should be considered (e.g. traditional and local knowledge)
- Semiquantitative descriptions of “states”
e.g. average size of fish caught, can be used.
- Methodologies available for inferring possible state of the fishery based

BIOMASS DECLINE IN MANILA BAY

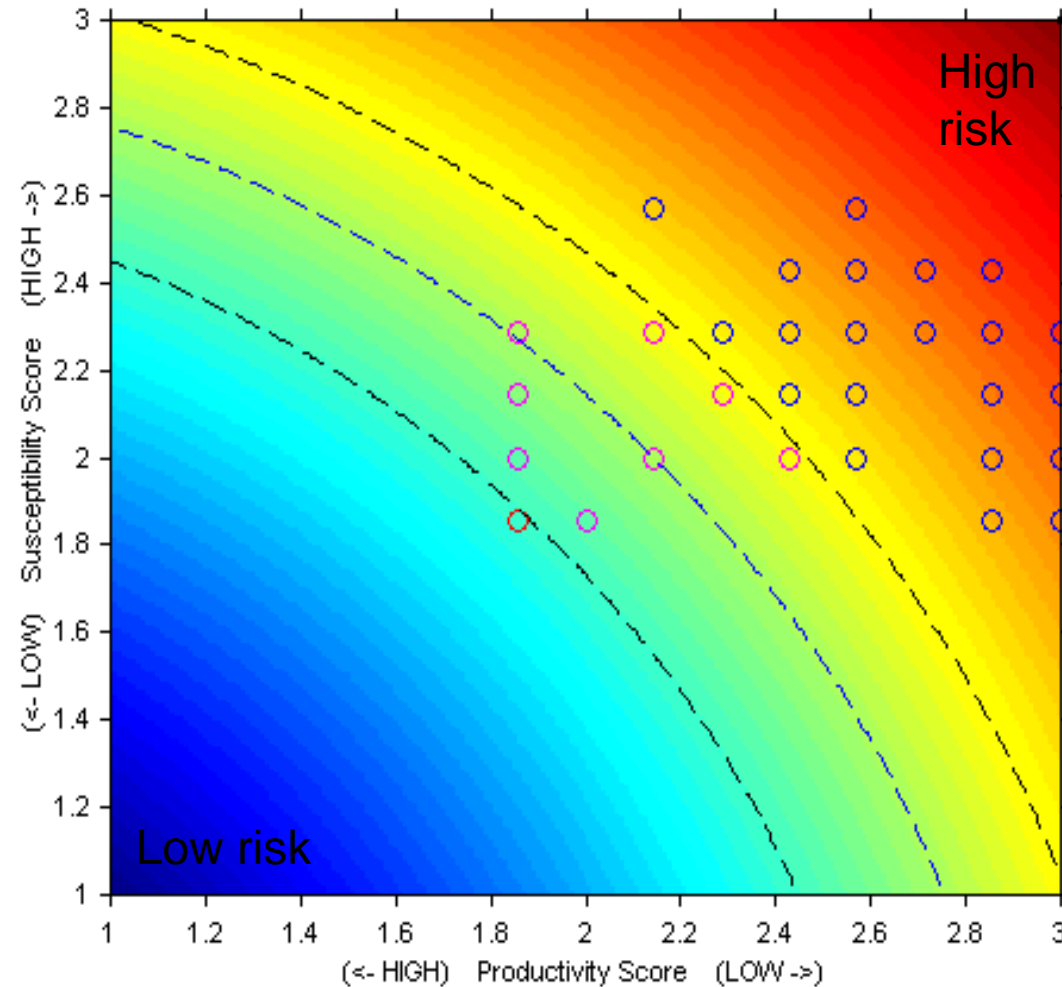


Indicators for ecological wellbeing: community

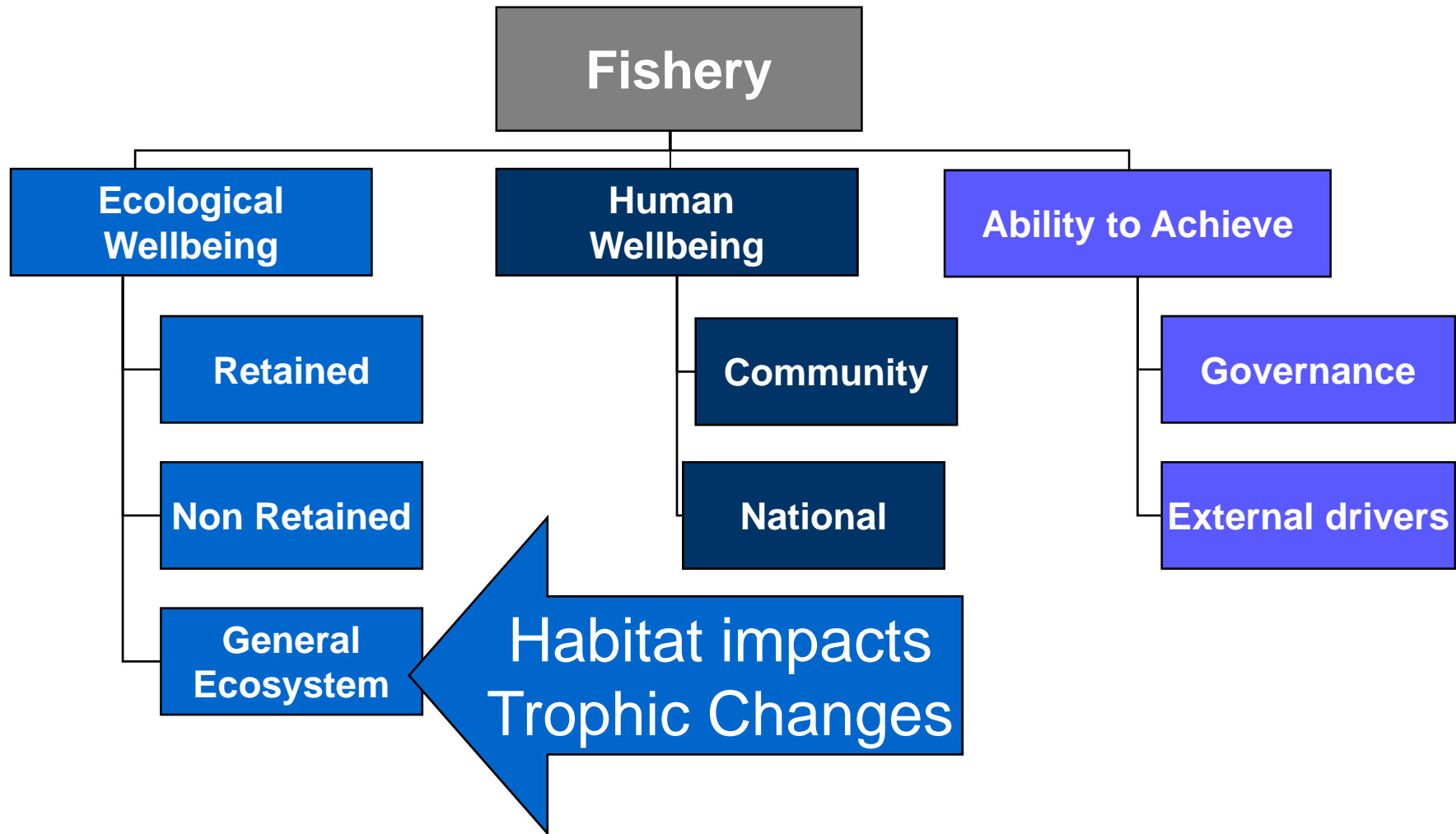
- Size-based indicators (slope of the size spectrum)
- Mid-length height (intercept of the centered spectrum)
- Mean weight or mean length (per haul)
- K-dominance, ABC curves
- Diversity indices (richness, diversity, evenness)
- Elasmobranch / bony fish ratio

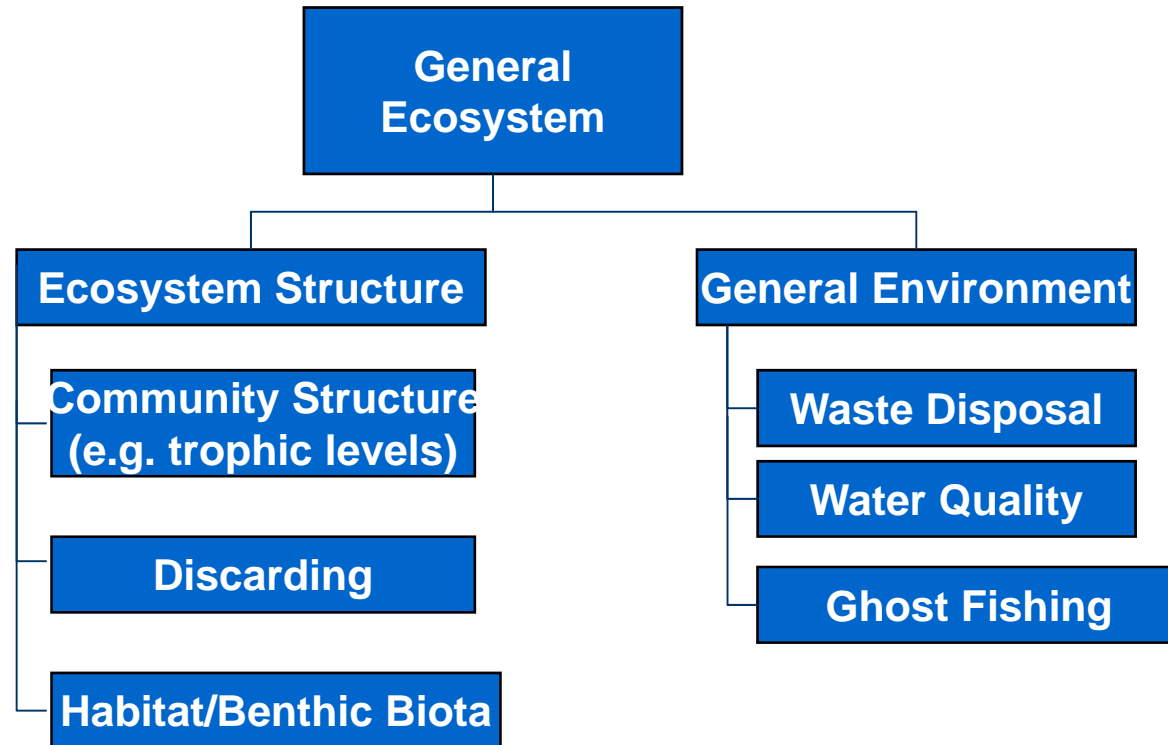
Susceptibility and productivity by species

By-catch species in a demersal seine fishery



Issue Identification





Indicators of habitat size/quality

- Size of the habitat (% area covered by a given habitat)
- Proportion of area fished



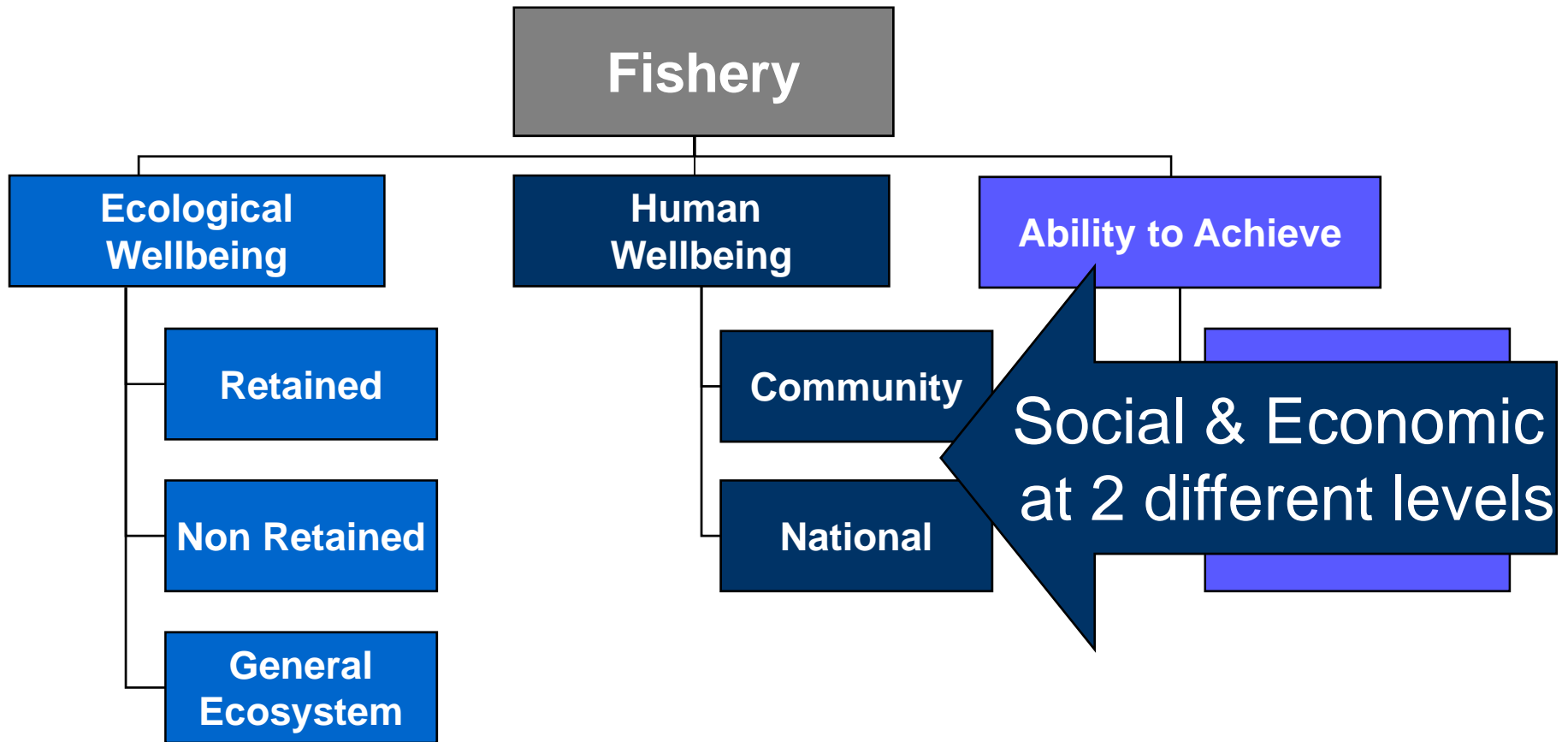
Indicators at Ecosystem Level

- Mean trophic level (by size classes)
- Mean trophic level in the catches (Marine Trophic Index, MTI)
 - estimated from trophic models (ECOPATH)
- Indicators derived from EwE (Connectance, System Omnivory, primary production required, Ascendency, FiB etc...)

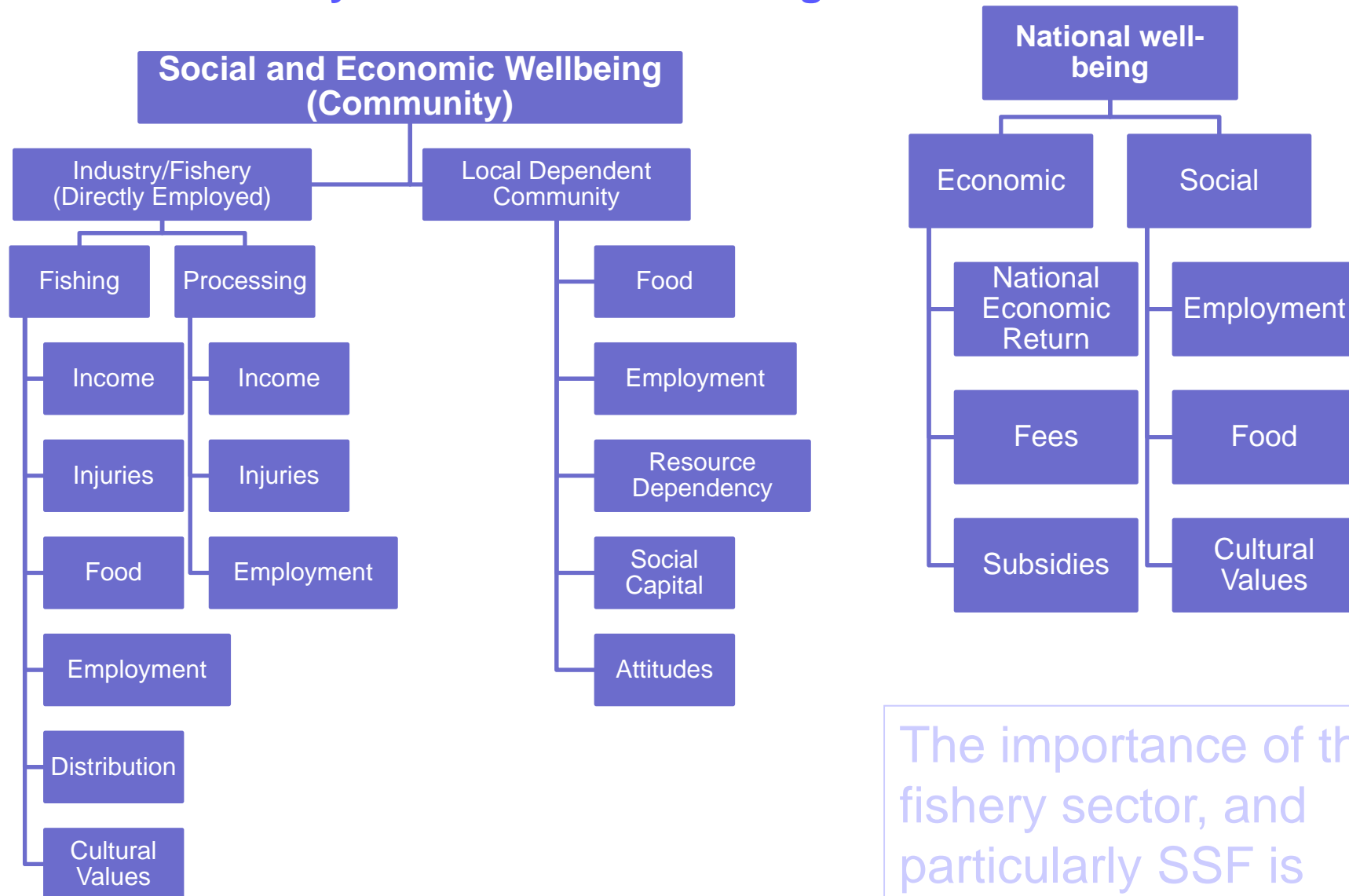
Ecosystem Indicators

- Empirical indicators perform very well in tracking ecosystem level changes (Fulton *et al.*, 2004b, 2005)
- For example:
 - relative biomass of pelagic fish, demersal fish, piscivores, scavengers, planktivores, plankton, key fishery target species,
 - charismatic or sensitive groups at the top of the food-web
 - the proportionate cover of seabed habitats
 - simple diversity indices
 - indices based on fish length in catches and the community
 - aspects of the physical environment (e.g. temperature, turbidity and chlorophyll)

Issue Identification

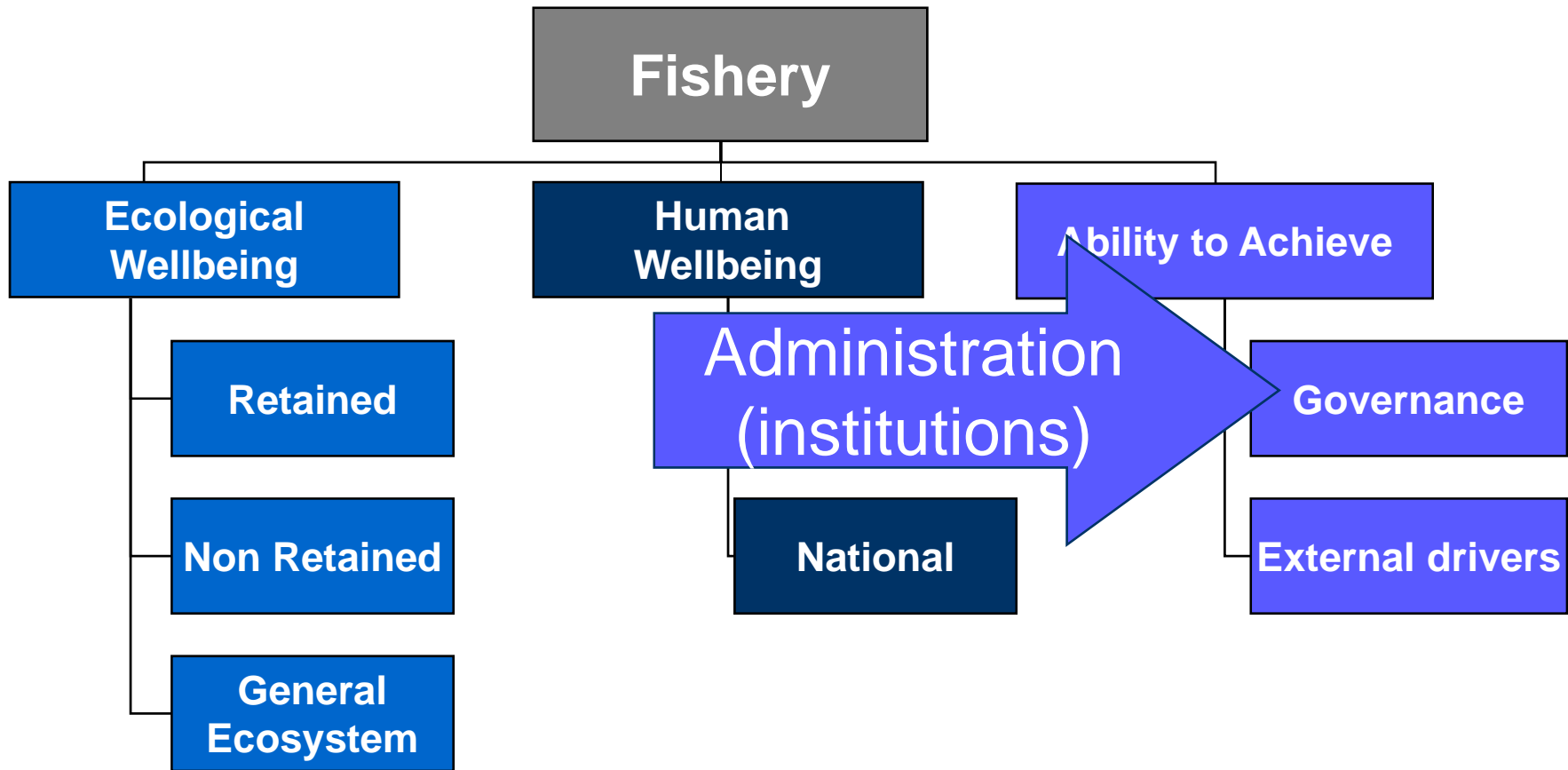


Generic Community and National Wellbeing Trees

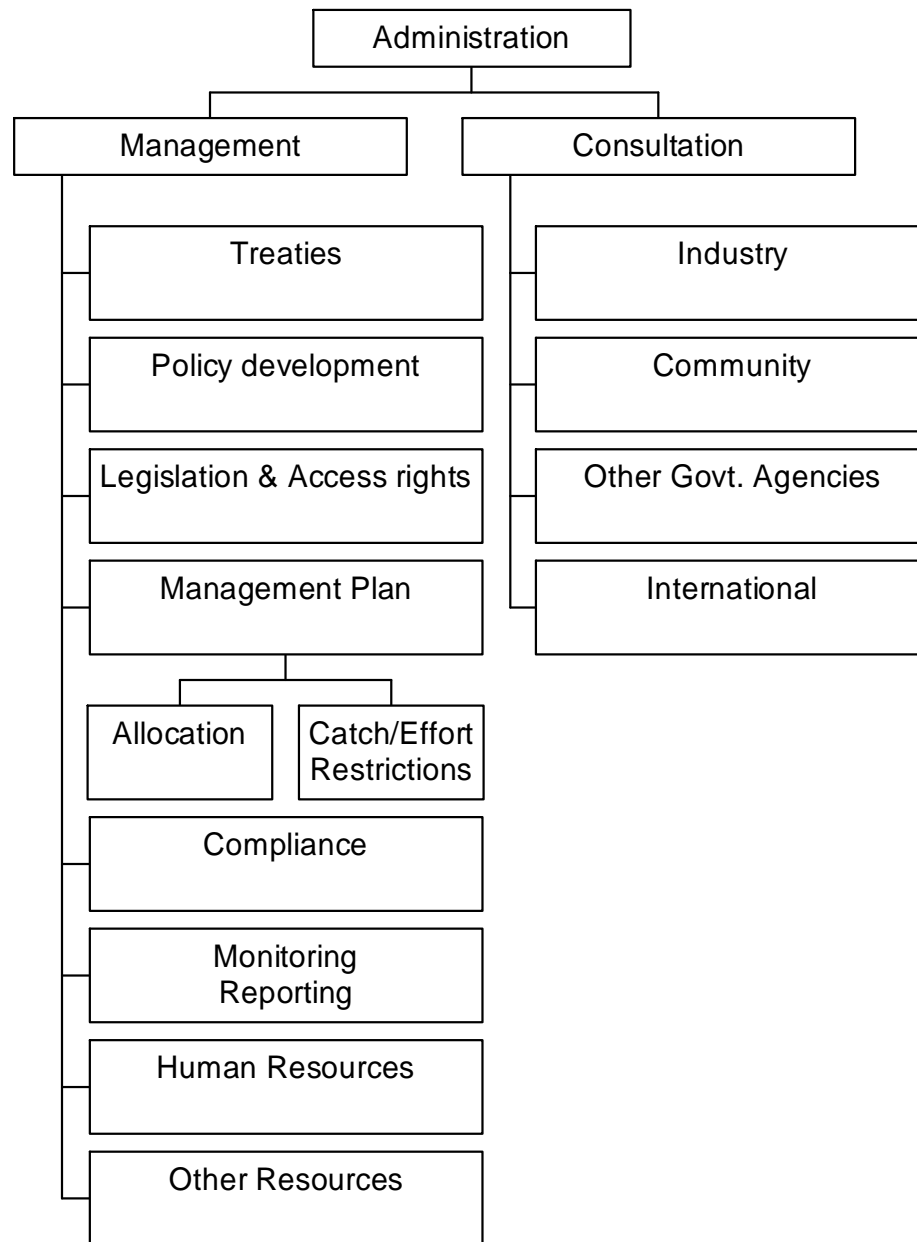


The importance of the fishery sector, and particularly SSF is often undervalued! **27**

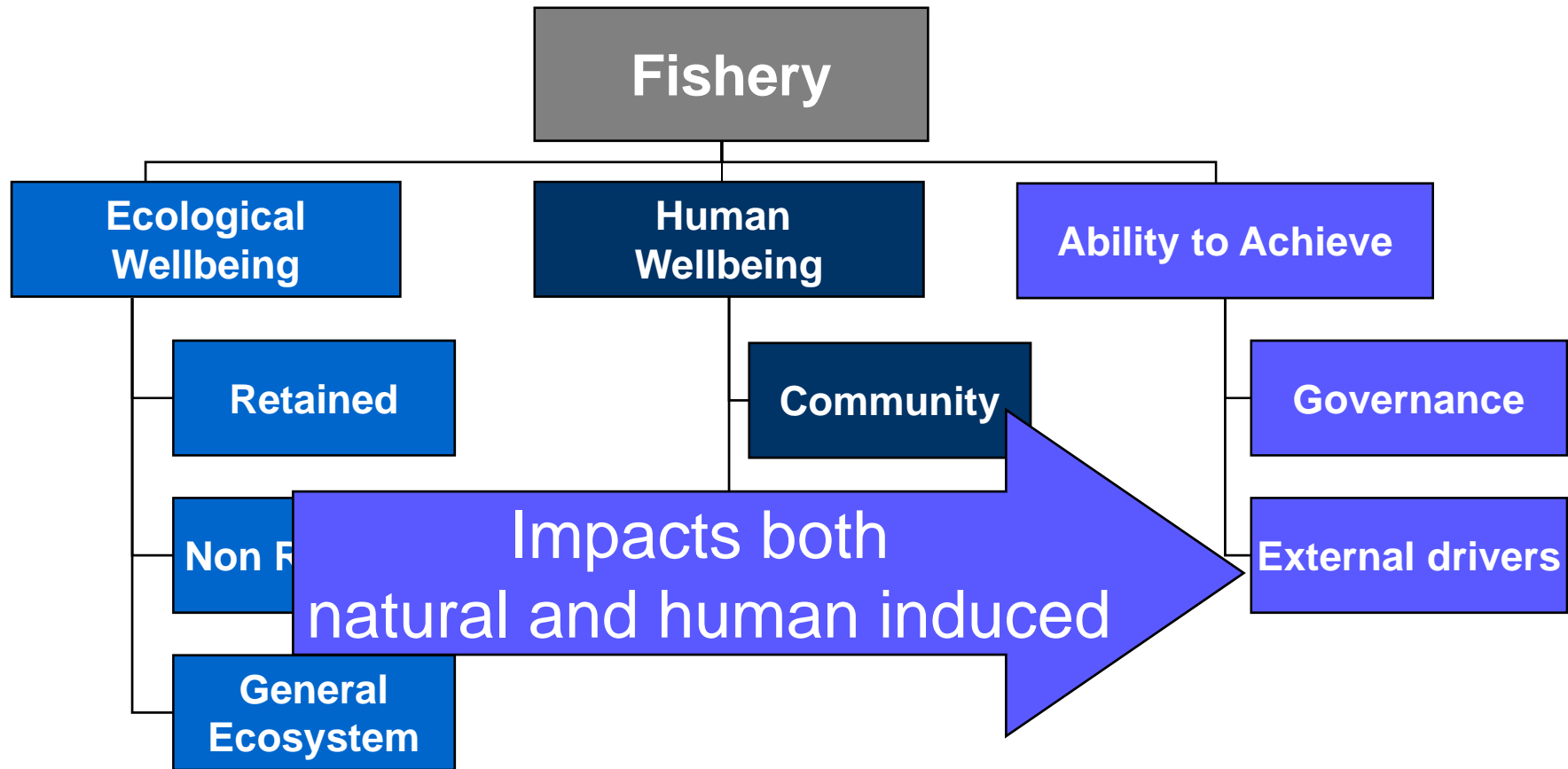
Issue Identification



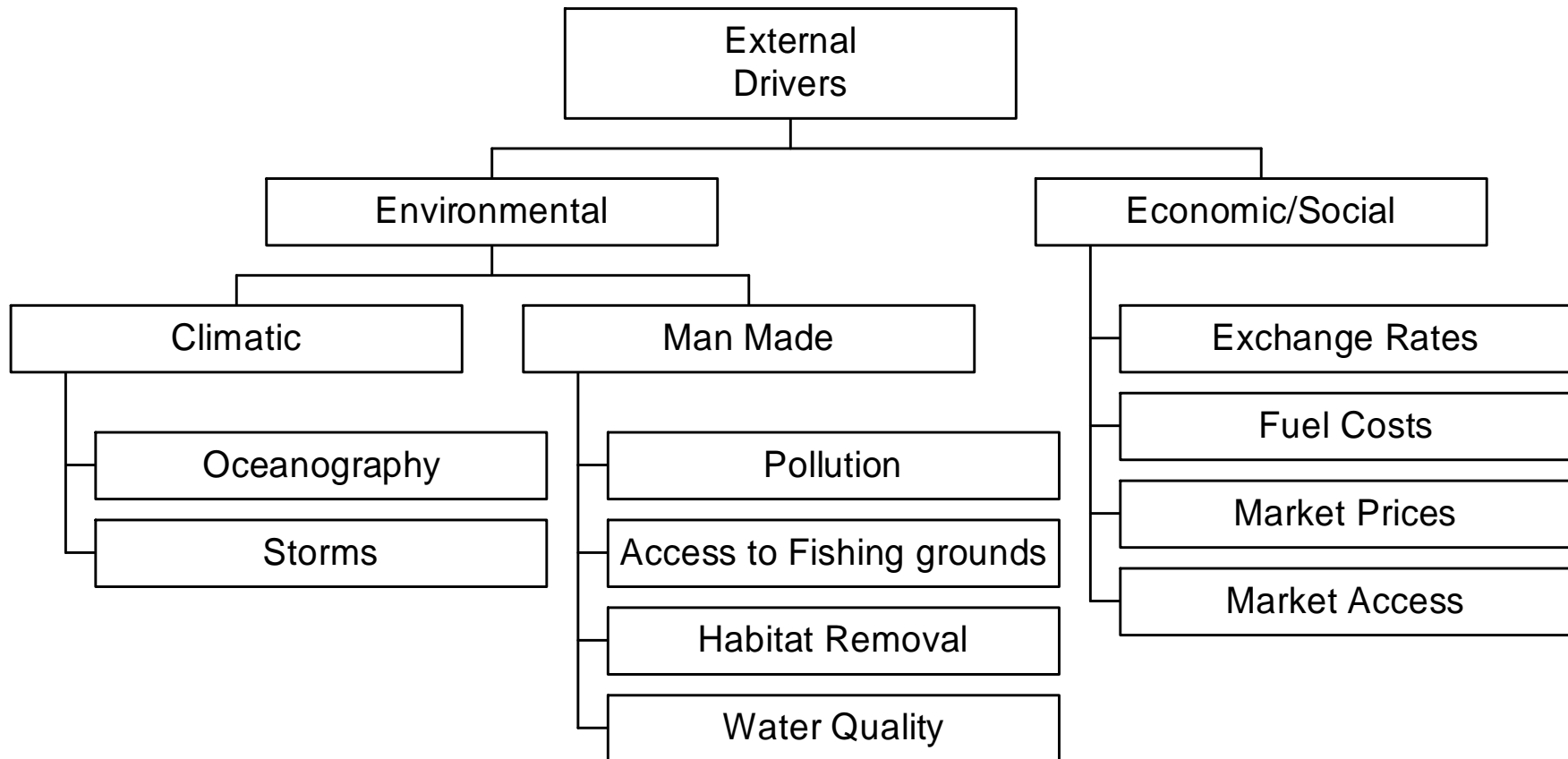
Generic Governance Trees



Issue Identification



Generic External Driver Tree



Final comments

- Indicators for management and decision making have to be identified together with setting objectives, through a participatory process and having clear in mind to what policy/management cycle they will be used for
- There is a wide range of indicators. Identify ecosystem components/attributes and pressures and put together a set of indicators that RSPs and others can use
- FAO is finalizing a review on indicators for EAF (ecological, social, economic and governance)

Main thematic pillars of the new Nansen Programme



In collaboration with national and international partners

Sustainable fisheries

- Resources
- Ecosystem structure and functioning, including human aspects
- Habitats biodiversity (EBSAs/VM Es)
- Fisheries management

Climate change

- Establishing baselines
- Biophysical processes
- Assessing local potential impacts
- Developing adaptation to climate change
- Ocean acidification

Pollution/oil/mining

- Monitoring and baseline studies
- Benthos, bottom habitat studies
- Pollution from land-based activities (contaminants, litter, fertilizers etc.)