SUSTAINABILITY ASSESSMENT IN FISHERIES

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EAFE Workshop 2012

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OUTLINE

- Introduction. Threats to the sustainability of fisheries and the assessment of the sustainability.
- Case Study. The Basque trawl fisheries.
- Weak and strong sustainability
- Methodology. Rapfish analysis.
- Results
- Discussion

INTRODUCTION

Threats to the sustainability of fisheries worldwide:

- UN Millennium Ecosystem Assessment (2005)
- Green Paper on the reform of the Common Fisheries Policy (2009), actual proposal of the CFP (COM (2009)163 final).
- Revision of the UN Convention on the Law of the Sea (Johannesburg, 2002)

INTRODUCTION

Background of the two papers:

- ELME (EU project): links among the declining state of the marine environment and Europe's human lifestyles.
- Four environmental issues
  - habitat change
  - eutrophication
  - chemical pollution
  - fishing

Four major sea areas
- Baltic
- Mediterranean
- North-East Atlantic
- Black Sea

INTRODUCTION

- How to define and assess sustainability in fisheries (is fishery exploitation sustainable?)
- Using a **multidimensional** approach (economic, social, ecological, institutional, technological, ..)
  - how to **compare** the different dimensions
  - **compensability** and **substitutability** among dimensions

    → **weak and strong** sustainability

INTRODUCTION

- Main objectives of the two papers

  - To analyse the sustainability of fisheries exploitation by applying a technique to perform an inter-temporal and multidisciplinary analysis of the Basque trawlers.
  - To compare the implications of applying weak and strong concepts to the sustainability assessment of fisheries.
  - To analyse explicitly the trade-offs among different dimensions.
  - We introduce critical thresholds for each dimension

CASE STUDY

"Multidimensional and intertemporal sustainability assessment: A case study of the Basque trawl fisheries" (Murillas et al, *Fisheries Research*, 2008)

"Weak and strong sustainability assessment in fisheries" (Garmendia et al, Ecological economics, 2010)

Three fisheries:

1. Baka trawlers (hake, ICES division VIIIabd)

2. Pair trawlers (hake, ICES sub-areas VII and VIII)

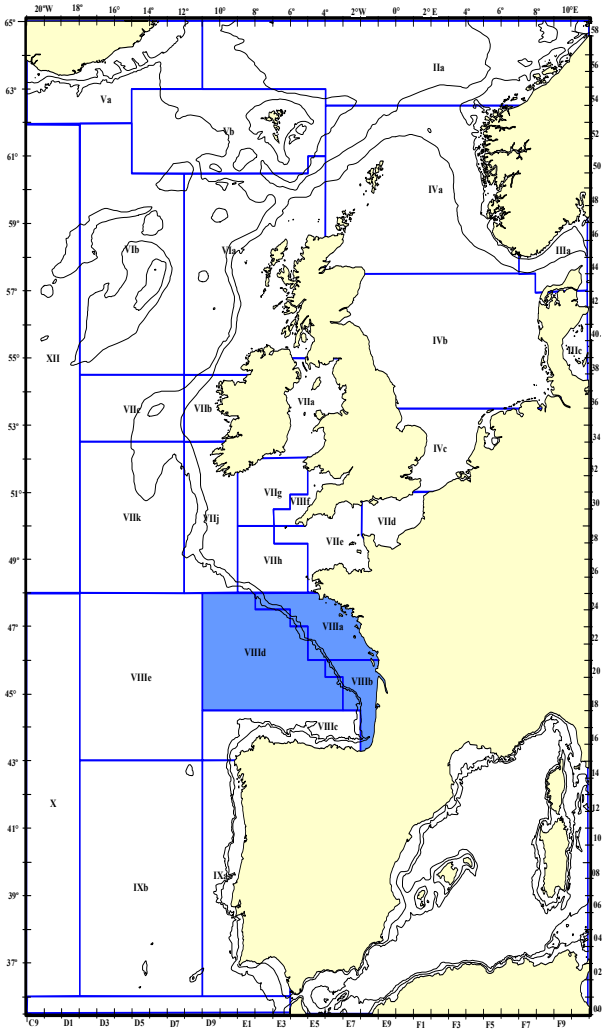
3. Baka trawlers (hake, megrim and anglerfish ICES sub-area VII)

CASE STUDY

Baka trawlers (ICES division VIIIabd)

Baka Trawler

European hake



WEAK & STRONG SUSTAINABILITY

- **Weak sustainability** assumes (Solow, 1974)
  - strong comparability (the possibility to measure all objects with the same scale (e.g., money).
  - substitution between dimensions
  - In other words: natural capital and human-made capital are interchangeable
- **Strong sustainability** assumes (Daly, 1992)
  - weak comparability
  - substitution between dimensions is constrained
  - some services provided by nature cannot be replaced by human-made capital

METHODOLOGY

- **RAPFISH** (rapid appraisal of the status of fisheries)
  - non-parametric and multi-disciplinary evaluation method
  - developed at the University of British Columbia (Pitcher and Preikshot, 2001, *Fisheries Research*)
  - tell us if a fishery is more healthy than another but not "how much better"

- Previous papers using Rapfish:
  - Alder et. al. (2000), *North Atlantic fisheries*
  - Baeta et. al. (2005), *Tagus estuary fisheries (Portugal)*
  - Tesfamichael and Pitcher (2006), *Red Sea fisheries*
  - Murillas et. al. (2008), *Basque trawlers fishing fleet in northern Spain*

METHODOLOGY

Process to apply Rapfish to fisheries data

- **Five evaluation dimensions with four attributes**

- **Score the attributes annually according to data (1996-2005)**

- **Multi-Dimensional Scaling (MDS): statistical ordination technique**
  - Reduce a matrix of N fisheries and M attributes into an Nx1

Sustainability value: index from 0 to 100

METHODOLOGY

- **Ecological dimension**
  - Status exploitation
  - Recruitment variability
  - Change in T levels
  - Change in fish size
- **Economic Dimension**
  - Price
  - Profitability
  - Average wage
  - Landings
- **Institutional dimension**
  - Limited entry (Input control)
  - Output control compliance (TAC)
  - Just management
  - Subsidy
- **Social dimension**
  - Socialization of fishing
  - Fishing community
  - Trend of employment
  - Gross Added Value
- **Technological dimension**
  - Number of vessels
  - Vessel size
  - Change in catching power
  - Selectivity gear

METHODOLOGY

Ecological dimension	Possible scores	"Bad"	"Good"	Definition :
Explotaition Status	0,1,2,3,4,5	5	0	ICES WGHAM criterion: MEY (0);Within PA values - (1); F too high (2); SSB too low (3); F too high and SSB too low (4); Probably unsustainable (5)
Recruitment variability	0,1,2	2	0	Coefficient of variability: low < 40% (0); medium 40-100% (1); high >100% (2)
Change in T levels	0,1,2	2	0	Tropic level of the catch in the ecosystem in which this fishery is embedded, decreasing: no (0), somewhat, slowly (1); rapidly (2)
Change in fish size	0,1,2	0	2	≤legal size 27 cm(0); ≤ maturity (42cm)(1); > 42 cm (2) Council Regulation (EC) 1998

METHODOLOGY

Sustainability analysis { **Rapfish** + **Critical thresholds**

- **Critical value** for each **attribute**:
  acknowledge the limits to substitution

- **Critical threshold** for each **dimension**:
  determine the limits below which assuming compensability becomes too risky
  - "dummy fishery" is estimated according to the critical values

RESULTS

Weak sustainability:

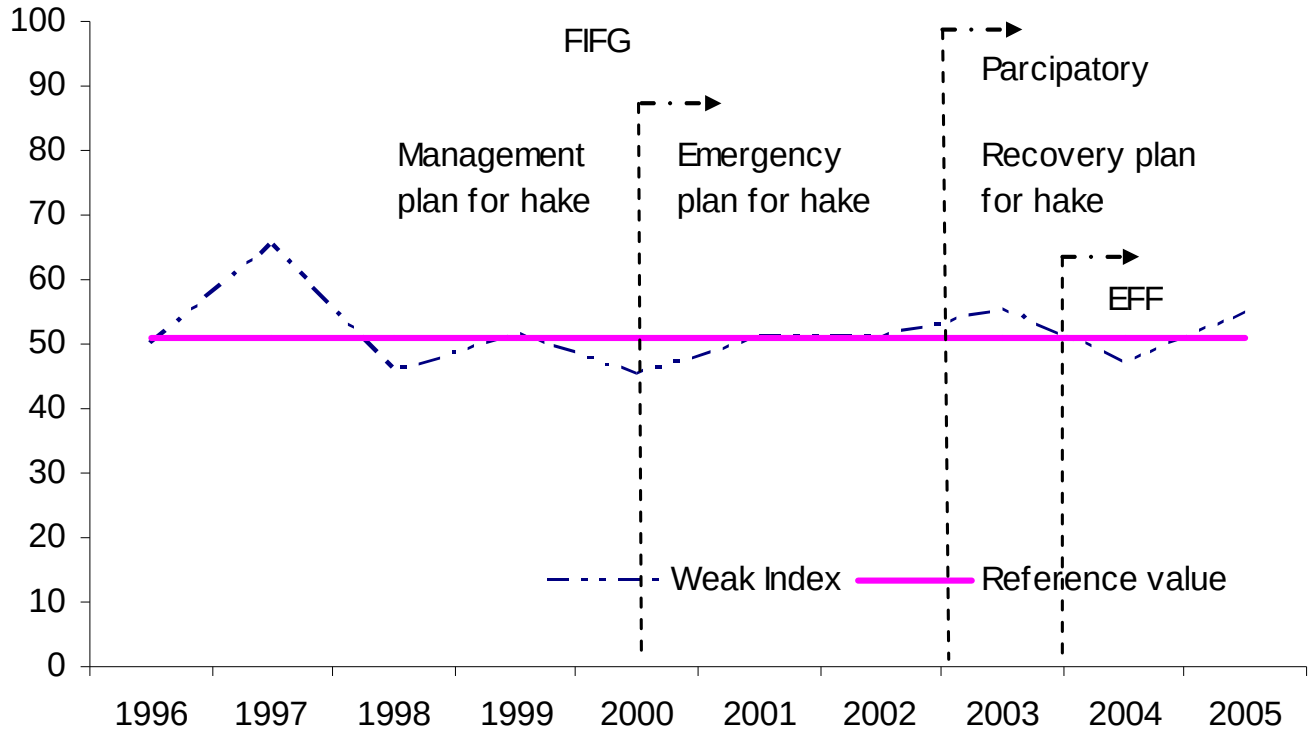
- all selected attributes are merged into a single composite indicator
- compensability among all attributes pertaining to the five dimensions is allowed

Strong sustainability:

- each dimension is considered separately
- compensability **only** among attributes pertaining to the same dimensions

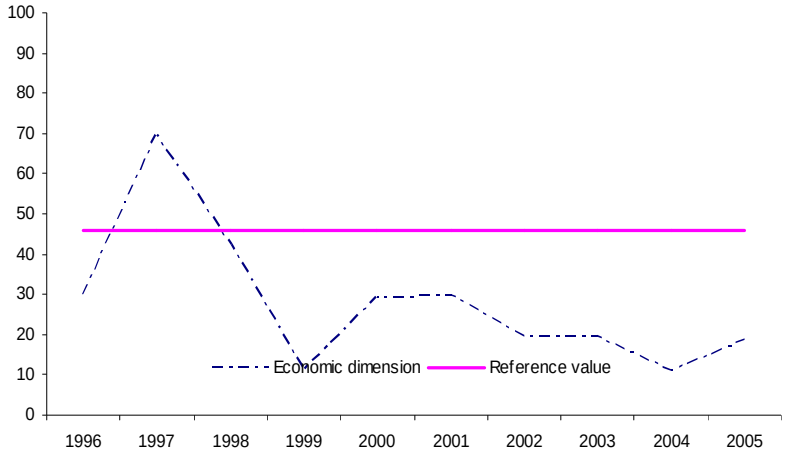
RESULTS

Weak sustainability index

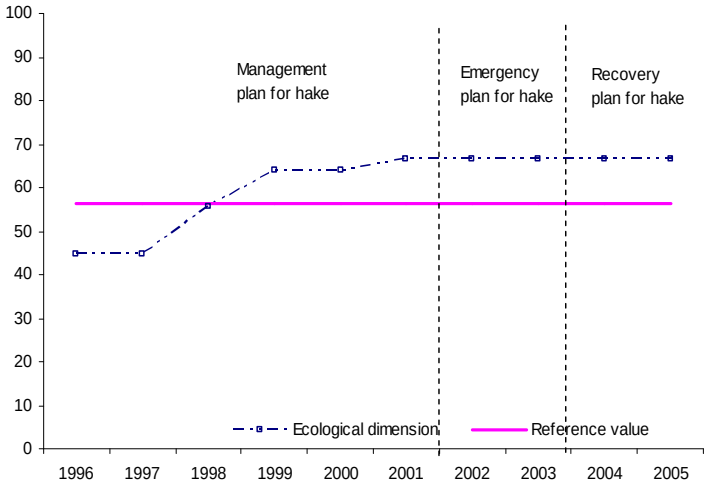


RESULTS: strong sustainability

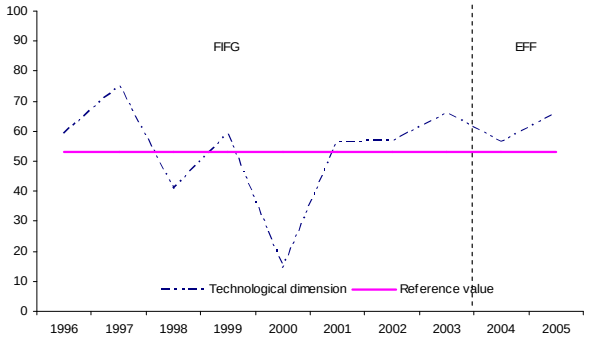
Economic



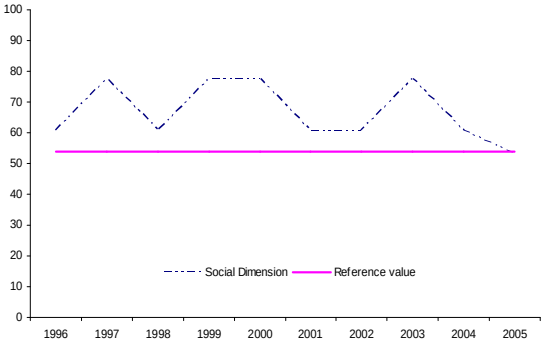
Ecological



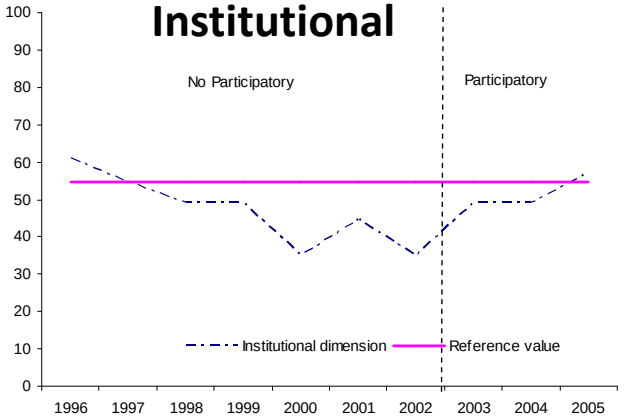
Technological



Social

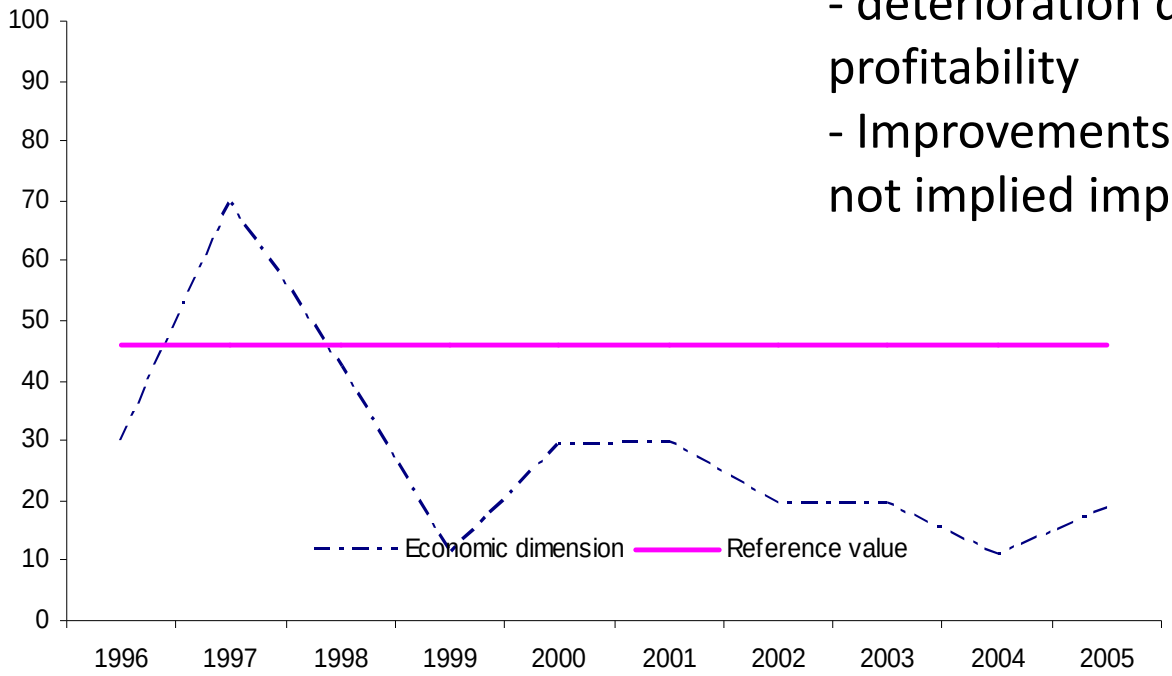


Institutional



RESULTS

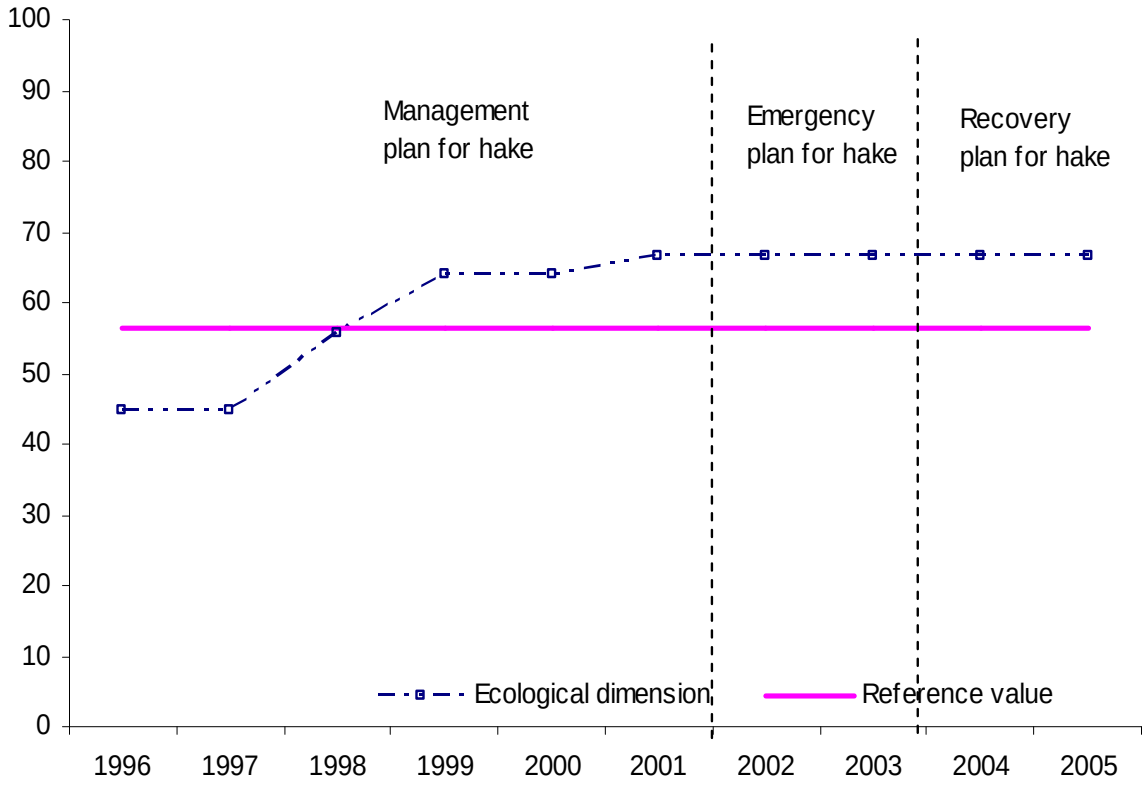
Strong sustainability index: Economic



- deterioration due to low prices and low profitability
- Improvements in other dimensions have not implied improvements here

RESULTS

Strong sustainability index: Ecological



Before 2001:

- TACs,

- technical measures

- subsidies on scrapping and new vessels

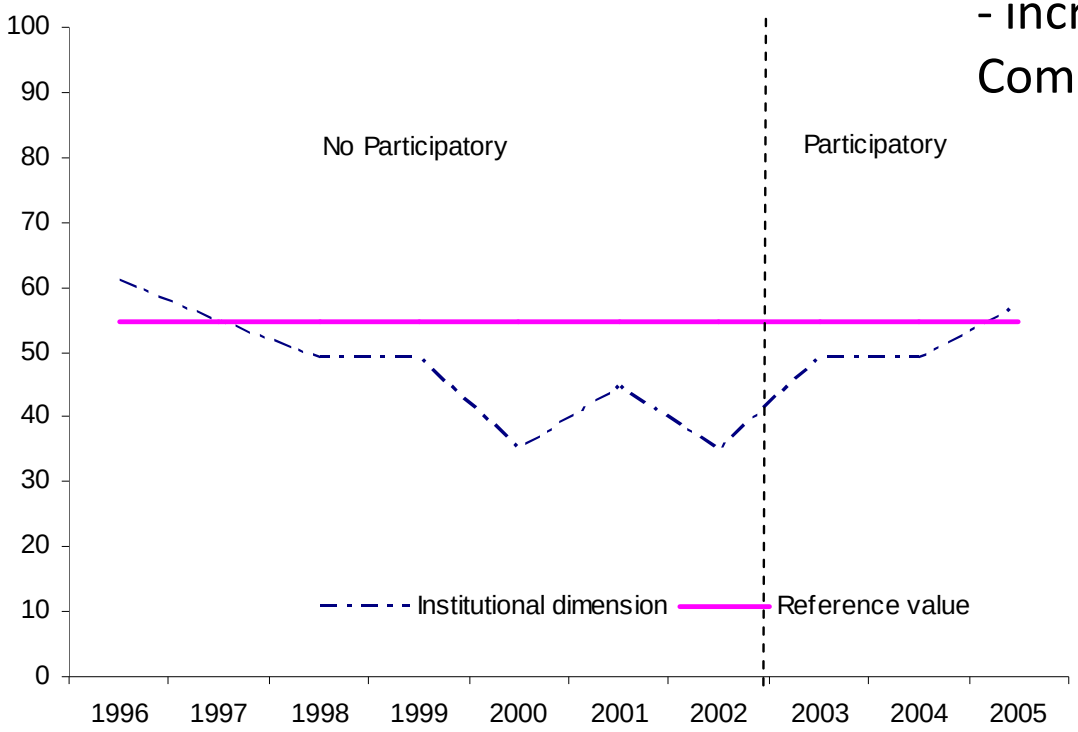
2001: emergency plan

2003: recovery plan

- no subsidies

RESULTS

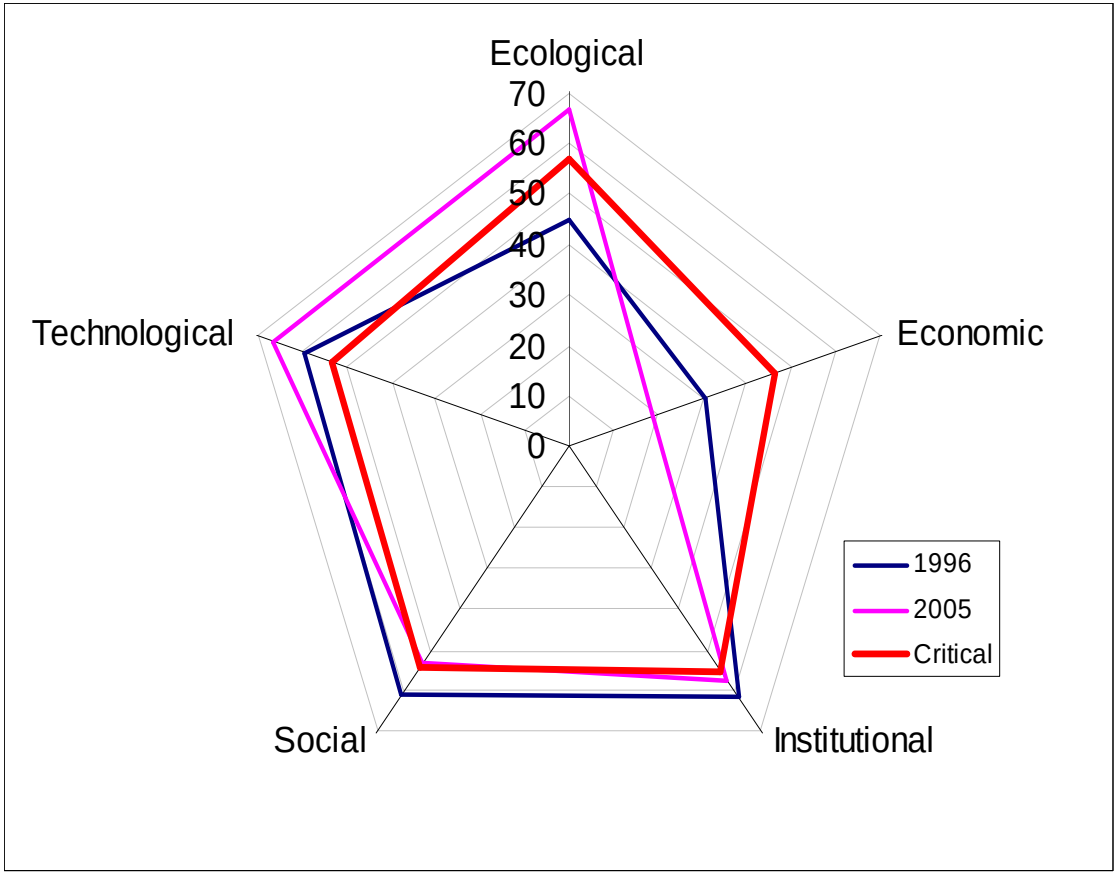
Strong sustainability index: Institutional



Regional Advisory Council (RAC)
- participatory management system
- increase stakeholder involvement in Common Fisheries Policy

RESULTS

Strong sustainability



DISCUSSION

- Sustainability assessment of fisheries requires multidimensional approach

- Including multiple dimensions in an integrated assessment:
  - **compensability** and **substitutability** among dimensions

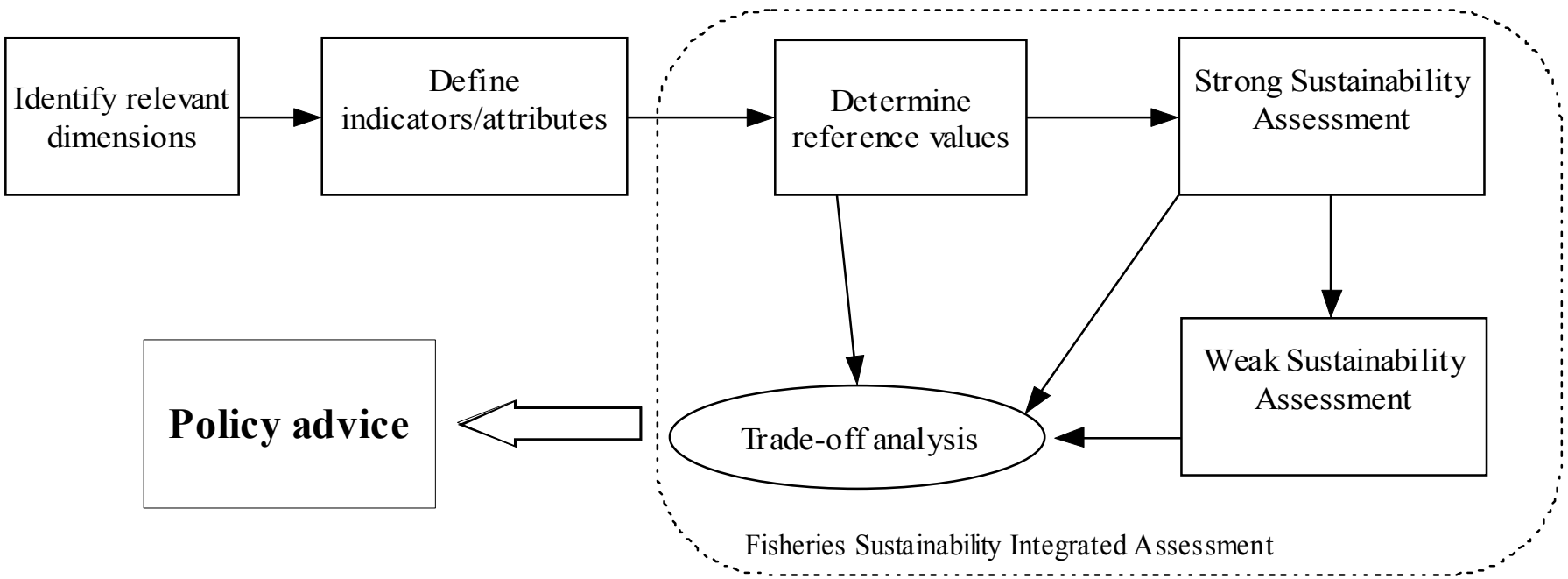
DISCUSSION

- Weak and Strong sustainability are complementary measures.

- Applying jointly both measures with the help of critical thresholds is a useful procedure for identifying trade-offs among dimensions

→ support of policy advice

DISCUSSION


Identify relevant dimensions
Define indicators/attributes
Determine reference values
Strong Sustainability Assessment
Weak Sustainability Assessment
Trade-off analysis
Policy advice
Fisheries Sustainability Integrated Assessment

Thanks

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