INDECO

DEVELOPMENT OF INDICATORS OF ENVIRONMENTAL PERFORMANCE OF THE COMMON FISHERIES POLICY

Project no. 513754

INDECO

Development of Indicators of Environmental Performance of the Common Fisheries Policy

UTILITY AND USES OF SOCIO-ECONOMIC INDICATORS ON THE ENVIRONMENTAL IMPACT OF FISHING ACTIVITES

CASE STUDIES:

THE FRENCH MEDITERRANEAN TRAWLER FLEET
THE DANISH PELAGIC FISHERIES IN THE NORTH SEA

Specific Targeted Research Project of the Sixth Research Framework Programme of the EU on ‘Modernisation and sustainability of fisheries, including aquaculture-based production systems’, under 'Sustainable Management of Europe's Natural Resources'

Project deliverable Number 14a

Dissemination Level: Public

Due date: June 2006

Start date of project: 1 December 2004 Duration: 24 months

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The INDECO project

The purpose of this Co-ordination Action is to ensure a coherent approach to the development of indicators at EU level, in support of environmental integration within the CFP and in the context of international work on indicators. The principal objectives of INDECO are:

1. to identify quantitative indicators for the impact of fishing on the ecosystem state, functioning and dynamics, as well as indicators for socio-economic factors and for the effectiveness of different management measures;
2. to assess the applicability of such indicators; and
3. to develop operational models with a view to establishing the relationship between environmental conditions and fishing activities.

A consortium of 20 research organisations from 11 EU Member States is implementing INDECO. An Advisory User Group will provide a link between the researchers and policy makers, managers and stakeholders.

More information on INDECO can be found on the project's website: http://www.ieep.org.uk/research/INDECO/INDECO_home.htm

This report has been carried out with the financial support of the Commission of the European Communities, under the specific RTD programme 'Specific support to policies, SSP-2004-513754 INDECO'. It does not necessarily reflect its views and in no way anticipates the Commission's future policies in this area.

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1 INTRODUCTION

The first report generated under INDECO Work Package 6 (WP6, D8)[1] concluded that there are few socio-economic indicators used on a routine basis in fisheries management, specifically in relation to the social and institutional aspects.

The process of identifying socio-economic indicators has not followed the same path in biology and social sciences. This relates to the uses driving their development and the supporting research. Three phases in the process of establishing indicators can be distinguished: 1) reflection on a sustainable development framework, 2) analysis of mechanisms and processes impacting on sustainability with a disciplinary approach, and 3) analysis of mechanisms and processes impacting on sustainability with a multi-disciplinary approach.

Biology and other natural science research started to develop (very comprehensively) the phase 1 and are now developing the phase 2. Socio-economic research has focussed more on the phase 2, especially in relation to other research areas (e.g. ICZM and river basin management) whereas the phase 1, the sustainable development framework, hasn't been completed and still needs further consideration. In consequence phases 1 and 2 need to be further developed to progress toward the integration of natural and social sciences in phase 3. The INDECO project is intended to coordinate this type of integration.

This second Deliverable (D14a and b) under the WP6 presents two case studies to evaluate the utility and future possibilities for the use of socio-economic indicators in order to assess the CFP environmental performance. One case study (D14a) is the French Gulf of Lions trawl fishery in the Mediterranean Sea and the second case study (D14b) the Danish pelagic fisheries in the North Sea. The two case studies have been selected to provide insights into the availability of relevant socio-economic indicators and the utility of such information for fisheries management in two very different EU fisheries settings.

The methodological approach taken in the two cases studies are not identical but intended to be complementary. Both case studies deal mainly with "state" indicators and the Mediterranean analysis also give some insights about the use of process and response indicators. The Danish pelagic fisheries case takes the international, European and national fishery policy objectives as the starting point and assess the availability of indicators on the achievements of/towards these objectives at the specific fisheries (metier) level, in this case the Danish pelagic fisheries . The Gulf of Lions trawl fishery case focuses on the adaptation of the Australian ESD framework to the European scene. The methodological positioning of the two case studies is illustrated in Figure 1.

[1] INDECO Project Deliverable No. 8: Review of the Usage of Socio-economic Indicators on the Environmental Impact of Fishing Activities, May 2005.

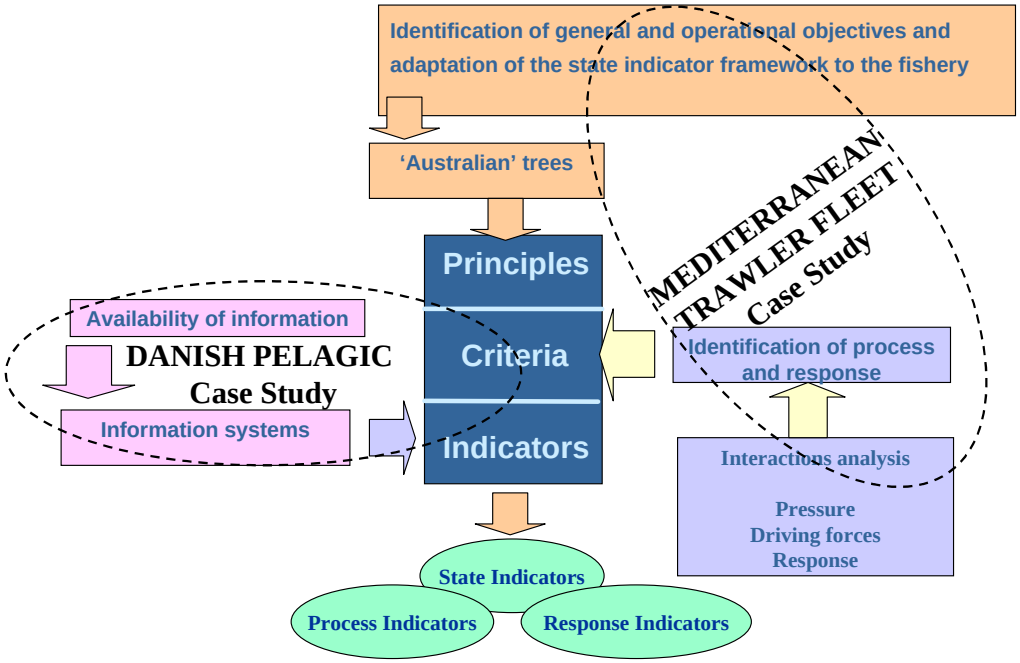


Figure 1 **Positioning of the case studies in relation to the methodological approach**

The third and final component (Deliverable 18) of the WP6 will draw upon the previous review (Deliverable D 8) and the present deliverable (D14a and b) to identify and analyse important gaps in the usage of socio-economic information for the study of fishing on ecosystems. The outcome of that analysis will be a series of recommendations to increase the utility of socio-economic information through appropriate and innovative methods and their applications. Particular attention will be given to the need to broaden the perspective on socio-economic analysis into the key domains of policy development and institutional change (with reference to fisheries management systems), and how this might be brought about by appropriate stakeholder participation and feedback.

2 REFLECTION ON A GENERIC EU FRAMEWORK FOR PSR INDICATORS BASED ON THE WEST MEDITERRANEAN CASE STUDY

2.1 SCOPE OF THECASE STUDY

INDECO agreed to identify in indicators within the Pressure State Response (PSR) framework and the Australian ESD trees (refer to INDECO background paper on Indicators). The PSR approach is a contracted form of the DPSIR approach (driving force, pressure, state, impact, response). For analytical reasons detailed in the section 4, we retained in this analysis the important distinction between pressure and driving forces indicators which is only subjacent in the 'P' of the PSR approach.

The potential uses of indicators are well described through the PSR/DPSIR framework (table 1). They can be used for describing state of a system, and can be used to monitor and measure process at the origin of pressures on the system for improved management, they can be used to assess the capabilities of the management system to perform its task. Indicators can also be used to improve the governance system by improving data accessibility to multi-stakeholders.

For each of these PSR areas, (i) driving forces/pressure ('process'), (ii) state and (iii) management responses, a proper framework/approach needs to be tested. The purpose of these frameworks/approaches is to allow the correct identification of criteria for which indicators need to be developed.

The Australian ESD tree approach is suitable to identify state/impact indicators. It facilitates the necessary interpretation of broad EU objectives to set operational objectives and criteria for which indicators will be developed and identified.

At this stage, the INDECO project has not made specific suggestions of suitable approaches for process and response indicators. Nevertheless, frameworks that facilitate quick identification of few key process and response indicators adapted to a specific fishery are needed to facilitate the use of indicators in the management process (Table 1).

Table 1: PSR/DPSIR framework and related nature of indicators

PSR	**Pressure**		**State**		**Response**
DPSIR	**Driving force**	**Pressure**	**State**	**Impact**	**Response**
Types of indicators	Indicators related to process, behaviours and indicators measuring pressures		Follow-up indicators of ecosystem and socio-system states		Indicators feeding back on management measures and management capabilities
Framework to select & develop indicators	To be developed		Australian ESD trees		To be developed

The scope of this case study is thus to :

- Adapt and test the Australian ESD framework as a tool to develop and define pertinent state indicators in the EU context on the basis of general economic theory and case studies;
- Exploring the conceptual framework for the development of robust and relevant driving force and pressure indicators ;
- Exploring the conceptual framework for the development of a robust and relevant response indicators.

It should be noted that considering the remaining research effort needed on the development of a generic framework suitable to the EU to select relevant state, process and responses indicators, the French Mediterranean case study is only used, when needed or possible, to support an analysis of the specific needs.

Thus the Mediterranean case is consistently used for the identification of state indicators, partly applied to support the reflection on pressure indicators. Comments on driving forces and responses indicators stands most of the time at a more general level.

GENERAL CHARACTERISTICS OF FISHING IN THE MEDITERRANEAN

Fishing activity in the French Mediterranean reaches, depending on sources, between 5% and 10% of national production (Table 2). It should be pointed out that catch statistics are not considered particularly reliable in this area because of the importance of small-scale fishers, whose most catches are unrecorded. Estimations suggest that real landings would be closer to 50,000 tonnes.

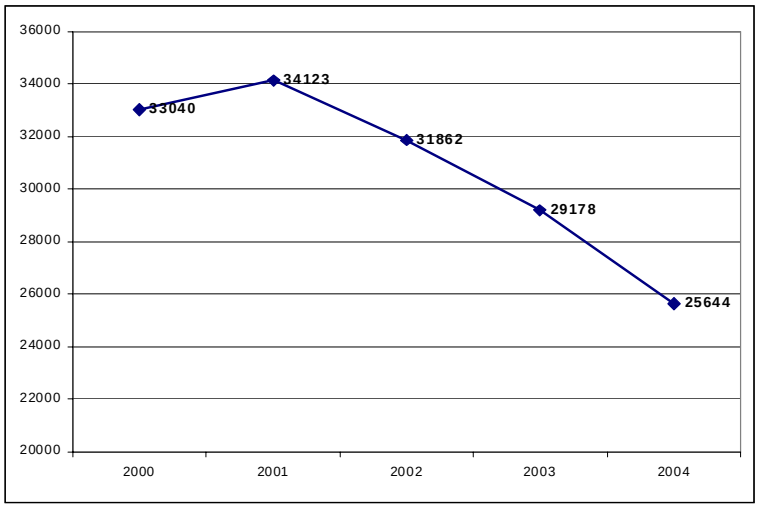
Table 2 - Landings in 2004 (round fish, cephalopods and associated)

Languedoc-Roussillon		Provence Alpes Côte d'Azur		Total France	
Landings (tons)	% of the total	Landings (tons)	% of the total	Landings (tons)	% of the total
20 200	7%	5444	2%	281 114	100%

Source: OFIMER

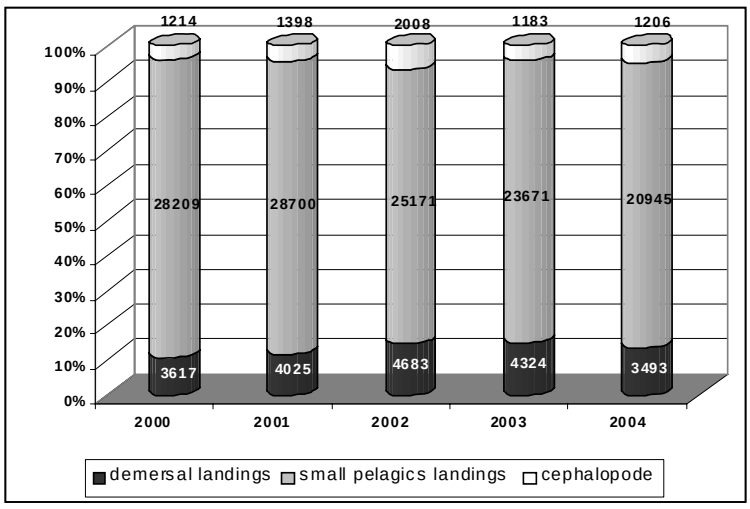
Landings are very diversified with around eighty commercial species noted by FAO. However, excluding tuna, three species dominates catches (in volume): sardines (47%), anchovies (28%) and hake (5%).

Figure 1 - Evolution of Mediterranean Landings, 2000 -2004



Source: OFIMER

Figure 2 : Specific distribution of landings in the Mediterranean Sea, 2000-2004



Source: OFIMER

These catches are realised by a fleet comprising around 1500 vessels, mainly small-scale fishing vessels using a variety of fishing methods (pots, traps, nets, etc.)., purse seiners, bottom and mid-water trawlers.

The largest fleet is the small scale fleet. In catch volume, it is the trawler fleet, which is used as example in this paper.

Table 3 - Composition of the Mediterranean fleet in 2003

	Languedoc-Roussillon		Provence Alpes Côtes d'Azur		Total Mediterranean
	Nb	% / total	Nb	% / total	Nb
Trawlers	97	75%	33	25%	130
Tuna Boats	32	91%	3	9%	35
Multi-gear (with lamparos)	709	53%	629	47%	1338
Total	838	56%	665	44%	1503

Source: IFREMER

Table 4- Mediterranean Trawlers 18-25m, composition of landings, 1997-2002

Major	Value (mEUR)						Volume (1000 t)					
Species	1997	1998	1999	2000	2001	2002	1997	1998	1999	2000	2001	2002
Hake	4.8	7.1	7.0	6.3	8.6	9.4	1.0	1.7	1.5	1.3	1.9	2.2
Sardine	1.8	3.6	2.8	6.0	6.2	5.9	3.6	4.7	4.1	10.2	10.2	7.9
Anchovy	2.9	5.3	4.2	6.8	5.6	5.6	3.1	5.2	3.4	5.3	4.3	6.2
Octopus	2.2	2.6	3.0	2.9	3.2	4.2	0.9	1.1	1.4	1.5	1.4	1.9
Bass	1.7	1.7	2.3	2.8	3.0	2.8	0.2	0.2	0.2	0.2	0.2	0.2
Monkfish	1.3	1.2	1.3	2.5	2.7	1.9	0.3	0.2	0.3	0.5	0.4	0.2
Sole	2.0	2.0	1.4	2.0	2.2	2.3	0.2	0.2	0.1	0.2	0.2	0.2
Squid	1.0	0.9	0.9	1.5	1.6	1.8	0.2	0.1	0.1	0.2	0.2	0.2
Other	10.2	10.5	10.9	12.8	14.6	14.9	5.2	4.9	5.3	6.7	6.5	6
Total	28.0	34.8	33.8	43.5	47.7	48.8	14.6	18.4	16.4	26.0	25.1	25

Fishing in the French Mediterranean occurs mainly in the Gulf of Lion. The Gulf of Lion bordered by flat coasts and numerous ponds and lagoons, has a continental shelf of 13,000 km² with depths between zero and the 150 metres. The existence of this gently sloping shelf has favoured the development of trawling and other towed gears. The coastline covered by two French regions (Languedoc-Roussillon and Provence-Alpes-Côte-d'Azur) and 4 maritime districts (Port-Vendres, Sète, Martigues and Marseille).

Table 5 - Administrative limits, geographical units and the fishery

Geographical Units	Mediterranean Coast **Gulf of Lions**							
NUTS II	Languedoc-Roussillon	Provence-Alpes-Côte d'Azur					Corsica	
Maritime Districts	**Port Vendre**	**Sète**	**Martigues**	**Marseille**	Toulon	Nice	Ajaccio	Bastia

THE MEDITERRANEAN TRAWLER FISHERIES (LANGUEDOC-ROUSSILLON TRAWLERS)

The Gulf of Lion provides 80 to 85% of the landed volume in the Mediterranean. Three quarter of the fleet is based in the Gulf's ports, among which 90% of the Mediterranean trawlers. The trawler fleet is responsible for 3/4 of demersal landings and around 80% of catches small pelagic in the area. Most of the fleet (75%) is situated in the Languedoc-Roussillon Region.

Table 6 - Characteristics of the Trawler Fleet in Languedoc Roussillon (2005)

Size	Nombre	KW	Tjb
Sète			
12 – 18 m	2	527	44
18 – 25 m	69	18 206	6 163
>25 m	3	948	290
Total	74	19 681	6 496
Port Vendres			
12 – 18 m	1	172	28
18 – 25 m	25	7878	2642
Total	26	8050	2670
Région Languedoc-Roussillon			
12 – 18 m	3	699	72
18 – 25 m	94	26084	8895
>25 m	3	948	289
Total	100	27731	9166

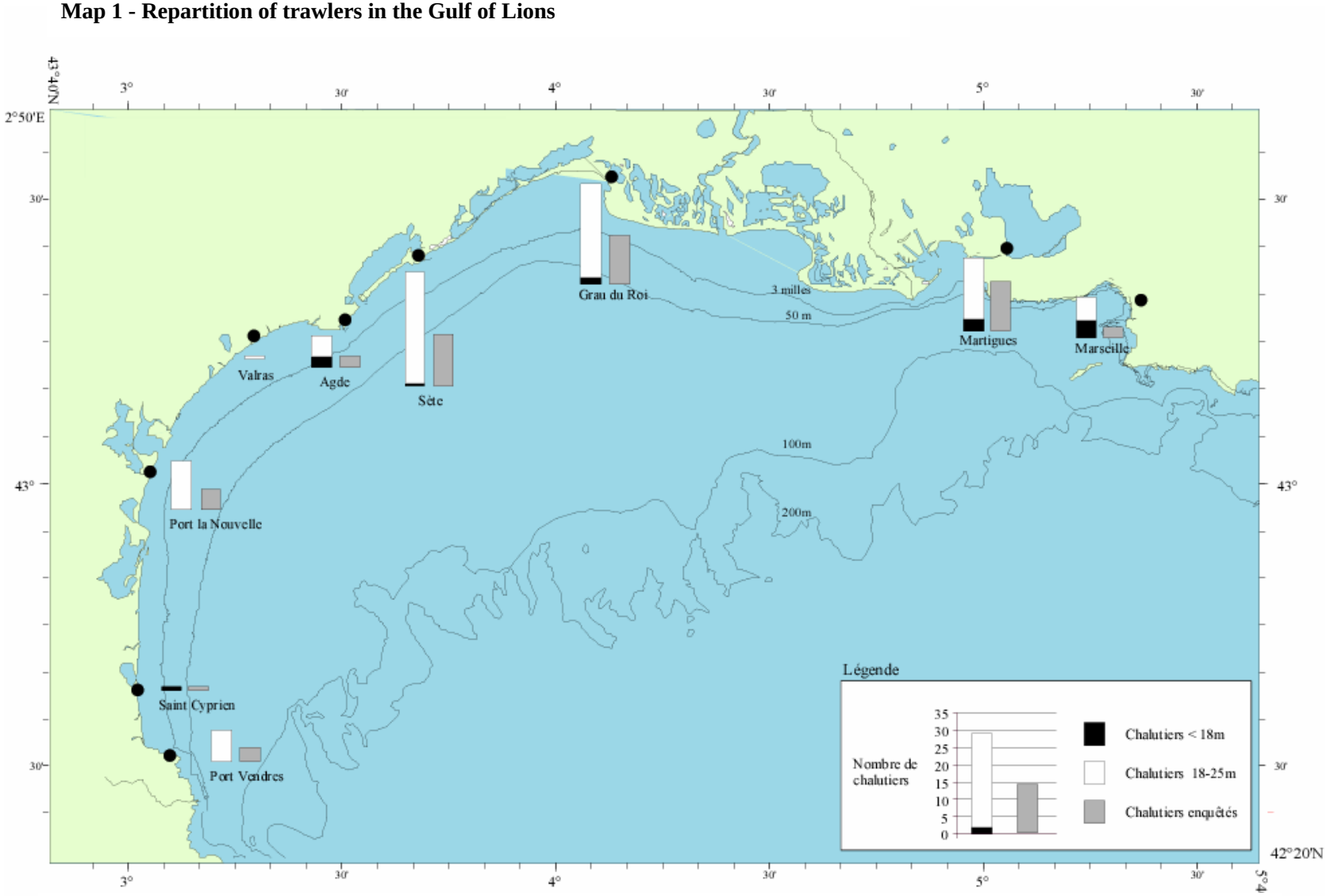
Table 7 - France, Mediterranean Trawlers 18-25m, composition by age, 2002

Age class	Number	GT (1000)	KW (1000)
Before 1980	80	3 636.62	23 892
1980 – 1984	29	2 043.84	9 164
1985 – 1989	6	385.72	1 896
1990 – 1994	4	469.78	1 264
1995 – 1999	3	245.78	837
2000 – 2004	7	724.82	2 212
Total	129	7 506.56	39 265

Trawling has been a traditional fishing technique in the Mediterranean for centuries, but, in the last 30 years, it considerably developed, integrating numerous technological innovations. Trawling was a limited activity until the beginning of the 1960s both in terms of number of vessels and in terms of their technical characteristics, notwithstanding a substantial fleet modernisation after the Second World War. The management system for this fishery was developed along with the increasing fishing effort. In 1975, the licensing system which controlled the number of vessels was supplemented with a ban on engines over 430 HP (316 kW).

Trip lengths are limited to a day. Landings are sold to fish auction markets every day, except the week-end. Thus fish are marketed fresh and consumed in the region or exported mainly to Mediterranean countries.

Map 1 - Repartition of trawlers in the Gulf of Lions



Source: Bodiguel, C, Cunningham S, Rey-Valette H., *Fishery regulation and the economic responses of fishermen: perception and compliance, Mediterranean Case Study*, FISHREG, EU project QLK5-CT1999-01405

98% of landings of trawlers are marketed and recorded through two channels:

- The Sète fish auction market created in 1967;
- The SA.THO.AN (Producer Organisation SA.THO.AN (Sardine, tuna (thon), and anchovy (anchovy) is a producer organisation (PO) created by Sète fishers in 1975, to sell catch of small pelagic. Currently, the PO represents practically 100% of small pelagic landings, comprising principally sardines and anchovies and coming exclusively from trawlers.

The following table sums the main indicators of economic performance of the trawlers fleet calculated for the concerted action on EU fishing fleet performance (Concerted Action, 2004).

Table 8 - Mediterranean Trawlers 18-25m, economic and capacity indicators,1997-2002

	1997	1998	1999	2000	2001	2002
Costs and earnings (mEUR)						
Value of landings	63.9	61.6	64.9	61.9	69.3	62.4
Fuel costs	9.5	6.6	7.8	10.7	9.3	8.9
Other running costs	6.1	7.9	8.5	4.8	5.0	4.2
Vessel costs	9.6	5.6	5.2	7.9	10.9	11.3
Crew share	25.3	25.2	26.2	23.0	30.0	25.9
Gross cash flow	13.4	16.3	17.2	15.5	14.1	12.1
Depreciation	8.5	7.9	9.1	7.4	8.9	6.4
Interest	2.1	2.0	2.0	1.5	2.1	1.3
Net profit	2.8	6.4	6.1	6.6	3.1	4.4
Gross value added	38.7	41.5	43.4	38.5	44.1	38.0
Other economic indicators						
Employment on board (FTEs)	775	714	716	694	659	659
Invested capital (mEUR)	28.7	23.8	23.3	24.8	39.1	26
Effort (1000 days at sea)	32	28	26	27	26	30
Capacity indicators						
Volume of landings (1000 t)	14.6	18.4	16.4	26.0	25.1	25.0
Fleet - number of vessels	172	148	147	148	141	141
Fleet - total GRT (1000)	8.7	7.8	7.8	7.6	7.6	7.9
Fleet - total kW (1000)	49	44	44	42	41	41.5

Source: IDDRA

THE TRAWLER FISHERY: A SIMPLE AND ILLUSTRATIVE EXAMPLE

The choice of the trawler fleet to test the INDECO framework is rooted in three main reasons:

- This fishery is the most homogeneous, both in terms of vessels characteristic, fishing strategies and fishery organisation. The vessels are using the same fishing techniques (pelagic or demersal trawl) and has similar fishing activities (e.g. similar trip length). The only difference is that tow time is more specific to each unit. Main economic determinants are common to the entire fleet (e.g., financing conditions, energy cost) and vulnerability to at sea weather conditions are also very close.

- This fishery is the best known in the French Mediterranean. The reduced number of vessels, the geographical concentration of the fishery and the limited marketing channels facilitate access to statistics.
- This fishery is the most important fishery in terms of volume of fish and value and this trawl fishery has also a 'structuring effect 'both on the coastal zone and the overall fishery sector. As such stakes, related to this fishery can be measured at several levels, local, regional, national, or even international in relation to the exportation of its products.

2.2 STATE INDICATORS

2.2.1 Adaptation of the Australian framework to the European context

ADAPTATION OF THE AUSTRALIAN TREES

State indicators measures progress towards meeting objectives. To assess the state of a fishery in relation to identified objectives, the INDECO project suggest to test the Australian framework (ESD well-being trees) which has three dimensions, ecological, socio-economic and institutional. These trees illustrate objectives assigned to a fishery and indicators demonstrating trends towards those objectives.

The adaptation of the Australian trees is supported by the following hypothesis: the environmental performance of the CFP partly depends on the capability of the system to perform well at the level of the three sustainability pillars: socio-economic, environmental and institutional. The trees were thus adapted to take into account the main EU objectives including socio-economic, environmental and good governance objectives.

This case study is used to test in what measure the Australian framework can be used to and/or need to be adapted to be efficient in the EU context. Starting from the original trees developed in Australia, the first phase of the work consisted in an assessment of branches and components that need to be adapted considering the characteristic and the specific objectives of the EU. The logic pursued to adapt the trees has been to define the tree branches and branch's components in relation to the EU macro goal objectives. Thus the scale of the branch components do not relate to the scale of objectives but to the scale of the indicator itself. For example, indicators related to the objectives of social cohesion and regional development ("structural fund objectives") are calculated at regional and community levels. Indicators of sustainable economic efficiency can be calculated at European scale (e.g. ecosystem level or cross national fishery level) as well as at national or regional level depending on the scale of the fishery.

The second part aims at testing the practicality and efficiency of these trees on a specific case study.

The third phase will consist in integrating the results of this test into recommendations for the use of a state indicators framework (INDECO deliverable 18).

Following the PCI approach presented in the project document n°8 (Rey Valette & al, 2005), trees indicate criteria for which indicators will be developed. Examples of indicators and related methodological issues are given as often as possible. Those examples are used to illustrate certain criteria and the process of selection. They do not necessarily constitute a 'best choice'.

All criteria (and indicators) are not discussed in this document. Further work on specific branches or criteria would be required as the system is developed (e.g. International well-being tree and external durability).

The trees can be used in the decision-making process to discuss the relevance of EU objectives and to interpret objectives through a participatory process in order to develop operational objectives to identify the relevant and useful criteria for follow-up indicators.

METHODOLOGICAL ISSUES REGARDING THE IDENTIFICATION OF OBJECTIVES

Identification of socio-economic and institutional objectives is not a straightforward process. Existing objectives related to sustainable development of fisheries are numerous (Annex 1) and are formulated at different scale: international, European, national, regional and community levels.

It also should be noticed that EU objectives are generally macro goals and not operational objectives. Thus they contain wide margin of interpretation depending on the context. Definition of operational objectives in line with those macro objectives depends on many variables :

- Scale (international, national, regional, or community level objectives),
- Understanding of fishery management,
- Institutional participatory framework and stakeholders (depending on institutional and political culture at national levels, plus European institutional level),
- Fishery (ies) considered (fleet, area, species, market...), etc.

Depending on the context (country, fishery, region...) and the objective, different indicators per context might be developed for the same objective or the same indicator to describe a trend toward one objective might need to be interpreted differently. Moreover it might be in many cases preferable to develop indicators indicating trends without necessarily setting target limits that can be different from one country (or fisheries) to the other.

Furthermore the tree can be used to develop indicators related to specific concerns, which hasn't been yet turned into regulation or specific objective. For example, indicators on the level of heavy metal in fish in certain sensitive areas such as river mouth and surrounding sea waters or on the trend of fishing boats energy consumption.

Thus the question will arose: how operational objectives should and could be defined to develop criteria and then indicators? Is the Australian model transferable to the EU in this matter?

Not all branches are relevant to all fisheries. In the case of the French Mediterranean trawler fishery, the international branch of the tree was the least relevant and the

calculation of sustainable economic efficiency at fishery level might be considered more relevant at national than at European level. On the basis of the Australian model, the trees are to be used to identify key components relevant to a fishery that should be followed-up. Thus this selection should be an opportunity for the stakeholder participation in the fishery management process. This discussion on components should also lead to precise the operational objectives related to the broad EU objectives. In other words, this process should lead to identify for each selected components the relevant criteria to select indicators, integrating as well objectives set at lower scales (national, regional or local depending on the fishery context).

For example, to assess the state of employment in relation to regional development objectives, it can be discussed what would be the most relevant criteria to follow-up: total number of employment ("equivalent full time employment"), quality of employment ("real full time employment" in region characterised by part time or seasonal employment for example), employment multiply (for fisheries with a strong land-based local industries and services), etc.

Such discussions should be held within a legitimate stakeholder platform. What this forum could be is open to debate, but could include Regional Advisory Councils (RACs).

In this document, for the purpose of testing the Australian trees, the selection of the box to be fulfilled as been done on an expert basis. The selected boxes are highlighted in blue and bold characters. Many boxes were kept to illustrate as many criteria as possible. In practice a smaller number of indicators would certainly be retained to follow-up the fishery.

2.2.2 European and national well-being

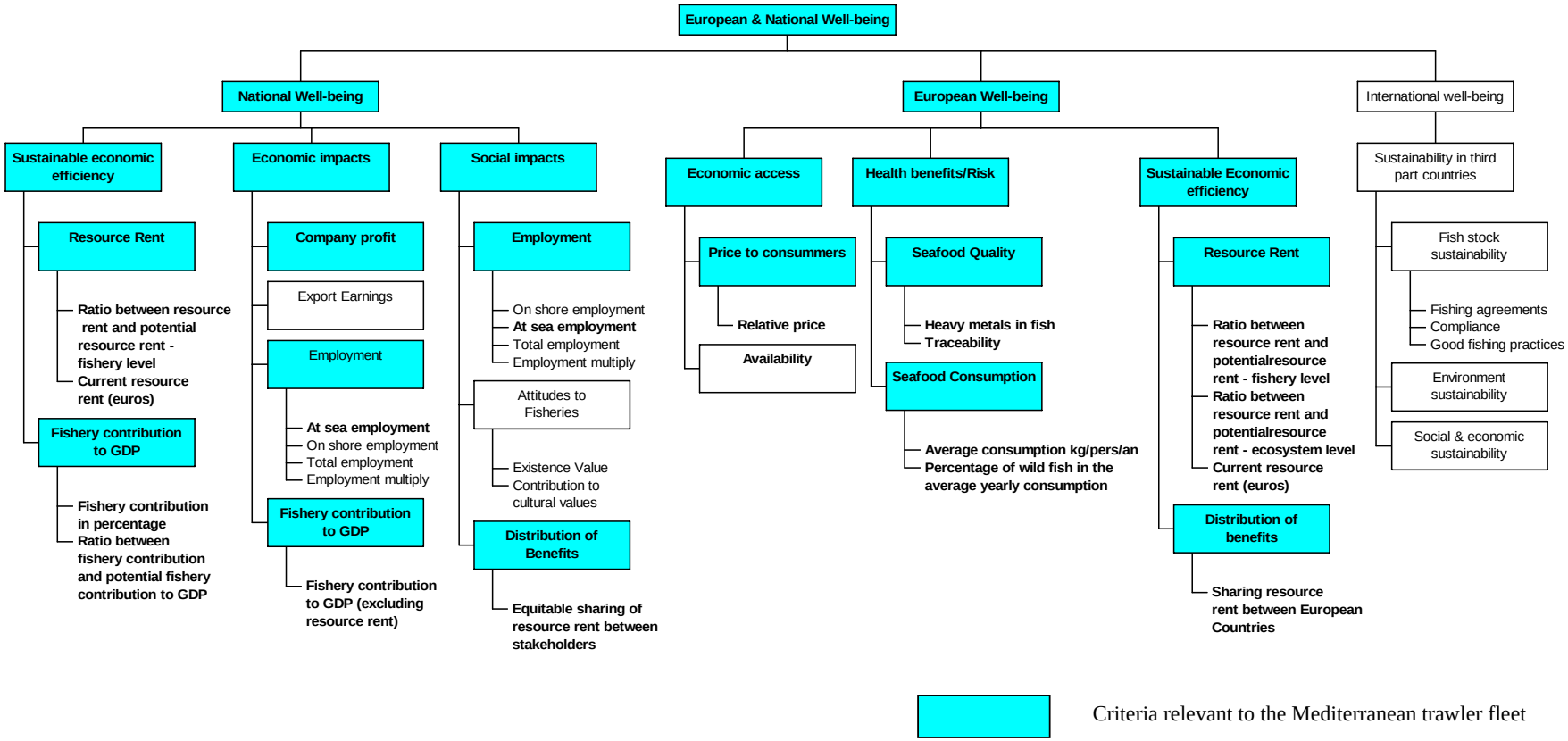
The National socio-economic tree was first adapted by adding two branches : a European well-being branch and an International well-being branch in line with specific objectives of external durability (Figure 2, p. 17).

INTERNATIONAL WELL-BEING

The International branch has been added to fit the European engagement towards international agreements (Law of the Sea, Code of Conduct for Responsible fisheries, Johannesburg MSDD plan of action, ect...) and the external coherence of the CFP. In particular, the EU committed itself to :

- *"Increase its contribution towards sustainable development in its environmental, economic and social aspects,*
- *Improve global good governance at political and financial levels,*
- *Contribute to the eradication of poverty in line with the objectives of sustainable development and the gradual integration of the ACP States into the world economy, including the WTO Doha Development Agenda negotiations trade in fisheries products"* (COM 2002 / 637).

Figure 2: European & National Sustainability Tree applied to the French Mediterranean Trawler Fishery



The international well being branch has not been developed further for the purpose of applying the framework to the case study. The activity of French Mediterranean trawler fleet is limited to day trip within the Gulf of Lion, thus not strongly affected by international fishing agreements. The fish products from the trawler fleet are commercialised within the European Union, mainly in Mediterranean countries (France, Spain and Italy). In the French Mediterranean Sea, only the tuna seining fleet strongly relies on international issues and context.

EUROPEAN WELL-BEING

The European branch contains objectives that can be described at European level. Three main under-branches has been developed,

- One on *economic access* linked with the objective of fish supply available to EU consumer at reasonable price ;
- One on *health risk/benefice* linked with the previous objective, plus seafood quality concerns ;
- One on *sustainable economic efficiency* linked with the objective of ensuring exploitation of living aquatic resource that provide sustainable economic, environmental and social conditions.

Most products from the trawler fleet are consumed fresh in France or exported mainly fresh in other European Mediterranean countries. The two criteria related to health benefits/risk and economic access seems pertinent to the case study.

Health benefice / risk : seafood quality

Two main criteria has been identified, seafood quality and seafood consumption.

Seafood quality relates to sanitary norms of seafood market chain and commercialisation. Interesting indicators could be developed in relation to current general and local concerns and issues.

Indicator 1:

An interesting criteria for the Mediterranean Sea could be trends in level of heavy metals bioaccumulation on fish as the issue of pollution stands high in the Mediterranean sea. In French Mediterranean Sea, this issue is especially acute in some part of the Gulf of Lion because of the effluent from the Rhone river charged pollutant particles from upstream human activities.

Indicator 2:

Another interesting criteria to consider could be the traceability of fish product. Stakes of traceability are economic, informative and related to human health. Improvement of product traceability is a driving trend within the EU but also internationally. It would then be interesting to develop indicators to follow the capacity and the use of traceability of a fishery.

Health benefice / risk : seafood consumption

Indicator 1 & 2:

- Simple indicators such average consumption (kg/per/year)
- Percentage of wild fish in the average consumption

Such indicators are already available at least at national level in France

Economic access : Price to consumers

Indicator 1:

Seafood consumption is an important part of the Mediterranean food habits. To calculate if fish reach citizen at "reasonable price" an indicator could be the relative price of fish calculated as follow :

$$\text{Relative price} = \frac{\text{Variation of average fish price}}{\text{Variation of national retail price index (alimentation)}}$$

This indicator would give the trend of fishing price compared to other consumables. Using a national retail price index would be more pertinent to asses the economic access to fish at citizen level.

Another indicator could be built at European scale using the European retail price index (alimentation) and global average fish price. It would give a overall picture of price to consumer.

Economic access : availability

Indicator 1:

Availability of fish supply is another aspect of economic access. This indicator is more likely to have a strong geographic component. It may then be more pertinent to calculate it per region at national level. It would imply that availability would move from the European to the regional and community tree.

For example, in France, it can be noted that fresh fish are commercialised at two levels: (1) Large and middle size super stores and (2) Open market and fish shop. Fish from aquaculture are much more represented in large and middle size super stores (the top 1 and 2 of the top 5 fishes) than in open market and fish shop. Large and middle size super stores are also much more represented in inland region, when open market and fish shop are concentrated in coastal areas and Paris. It means that the overall availability of fresh wild fish is more important in coastal areas than in inland region in France.

Sustainable Economic efficiency : resource rent

To calculate the sustainable wealth extracted from fisheries, the most appropriate indicator is the resource rent. The resource rent is a value for the use of a scarce or limited resource. The calculation of the rent of an exploited resource allows to evaluate both:

- economic efficiency of natural resource usage (ratio between the current economic rent and the potential resource rent) and,
- economic sustainability of natural resource usage because the optimum economic potential in terms of level of exploitation is almost always situated below the biological optimum.

This type of indicator is particularly pertinent in term of sustainable management.

Indicators 1:

A possible indicator could then be the ratio between the current resource rent and the potential resource rent at fishery scale (in euros). This indicator may be calculated at European level for transboundary fishery or at national level for strictly national fishery.

Indicator 2:

A similar indicator to the indicator 1 could be calculated at ecosystem level. A resource rent indicator at ecosystem level appears not yet to have been developed and would require a specific research effort.

A main research question would be to investigate if the potential resource rent of an ecosystem equals the sum of potential resource rents of the fisheries belonging to this ecosystem. It would be particularly interesting in terms of management progress to go forward the development of such indicator.

NATIONAL WELL-BEING

The national well-being branch relates more directly to strictly national objectives. At national level, three main paths can be considered: objective linked with sustainable economic, efficiency, objectives linked with employment and objectives linked with economic development.

Social impacts : employment

Employment can be a pertinent criterion to follow at national level when a specific fishery accounts for a significant part of the total amount of fishery employment in the country. This importance are related specifically to at sea employment or indirect on shore employment when at sea and on shore employment are clearly related.

In the case of Mediterranean trawler fishery, we suggest to follow at sea employment indicators.

In fact, the part of ‘at sea’ employment in the Mediterranean trawl fishery is very low when compared to the national ‘at sea’ employment figure. However this fleet has a notable impact on overall at sea employment in the French Mediterranean coast which would justify its consideration at national level.

However this fleet has also a structuring impact on port and fishery service (auction hall, fish traders, boat building,...). This structuring impact/effect has a positive impact on maintaining small scale fishing units, particularly in medium size port. In fact, removal of the trawler fleet

would induce diminishing or disappearing services and infrastructure, what would be a main constraint on maintaining small scale fishing units.

Thus to evaluate fishery employment, it might be more appropriate to use three indicators:

Indicator 1:

A direct fishery employment indicator such as the number (or evolution) of at sea employment of the trawler fleet.

Evaluating at sea employment for a segment such as Mediterranean trawlers is relatively easy. The fishing units fish relatively regularly though the year and the number of crews per unit is known and relatively homogenous.

Indicator 2:

An indirect at sea employment indicator which would integrate the number (or evolution) of at sea employment of both the trawler fleet and small scale fishery units.

Other possible indicators:

Other indicator related to employment can be used depending on the fishery context such as:
- Employment multiply,
- Number of upstream and down stream fishery employment.

The regional socio-economic studies on employment and level of dependency of fishing are a good basis to select the most appropriate indicator (MegaPerca Lda and Centre for Agriculture Strategy, 2000).

It must be noted that these indicators measure only employment directly related to fishery at sea and on shore activities. Overall employment induced by the wealth extracted from the fishery and re-injected in the national economy can notbe captured by an indicator of employment. It is therefore important to introduce indicator of wealth (resource rent indicators) which introduces a more global picture of fishery management and economy.

Social impacts : distribution of benefits

Benefits distribution can be looked thought two levels:
- at fishery level, the distribution of benefice within the sector.
- at general level, the equitable sharing of resource rent between stakeholders,

Indicator 1:

An possible indicator could be the repartition of the rent between the different stakeholders. For example, the Gini curves can be used to follow up the level of revenue concentration by categories.

Indicator 2:

The issue of equitable sharing of resource rent between stakeholders (fishery sector stakeholder, state and citizens) is more challenging. The underlying fundamental question is how the wealth extracted from a common pool (fishery) resource is shared or how equitably it is shared.

This issue is particularly important in terms of management because there are evidences that the way resource rent is extracted and shared influences directly sustainability and efficiency of management.

Economic Impacts: employment

The same indicators may be used for economic and social impacts (cf. Social impacts: employment).

Economic Impacts: company profit

Profitability of fishing enterprises can be evaluated through the brut economic profit. Net economic profit would be an even more acute approach, however data on depreciation are lacking and methods of calculation insufficiently standardised to evaluate it.

Economic Impacts: contribution to GDP

Traditionally the fishery contribution to GDP is calculated on the basis of the added value which does not include the value of the resource rent. This indicator is generally widely and world-wide used. However this calculation has two disadvantages:

- It indicates a partial image of fishery contribution to GDP (as the resource rent is not included);
- It does not give any indication on the fishery contribution compared to potential fishery contribution to GDP.

Moreover theoretical and practical evidences have shown that trying to increase contribution to GDP (as management objective) without including the issue of resource rent extraction have a strong tendency to lead toward policies favouring overexploitation and unsustainability.

Sustainable economic efficiency: resource rent

Indicator of sustainable economic efficiency can be developed at national scale and at European scale.

The same indicators than at European level can be developed, in particular the ratio between the current resource rent and the potential resource rent at fishery scale (in euros) (cf. Sustainable economic efficiency: resource rent, p.16).

Sustainable economic efficiency: part of the Fishery in the GDP

There are several methodologies to calculate the fishery contribution to GDP. A major difference is to integrate or not the resource rent in the calculation.

Integrating the resource rent in the calculation has two main advantages:

- a more precise valuation of the fishery contribution to national economy;
- a possibility to calculate an indicator of ratio between the current contribution of the fishery to GDP and the potential contribution of fishery to GDP.

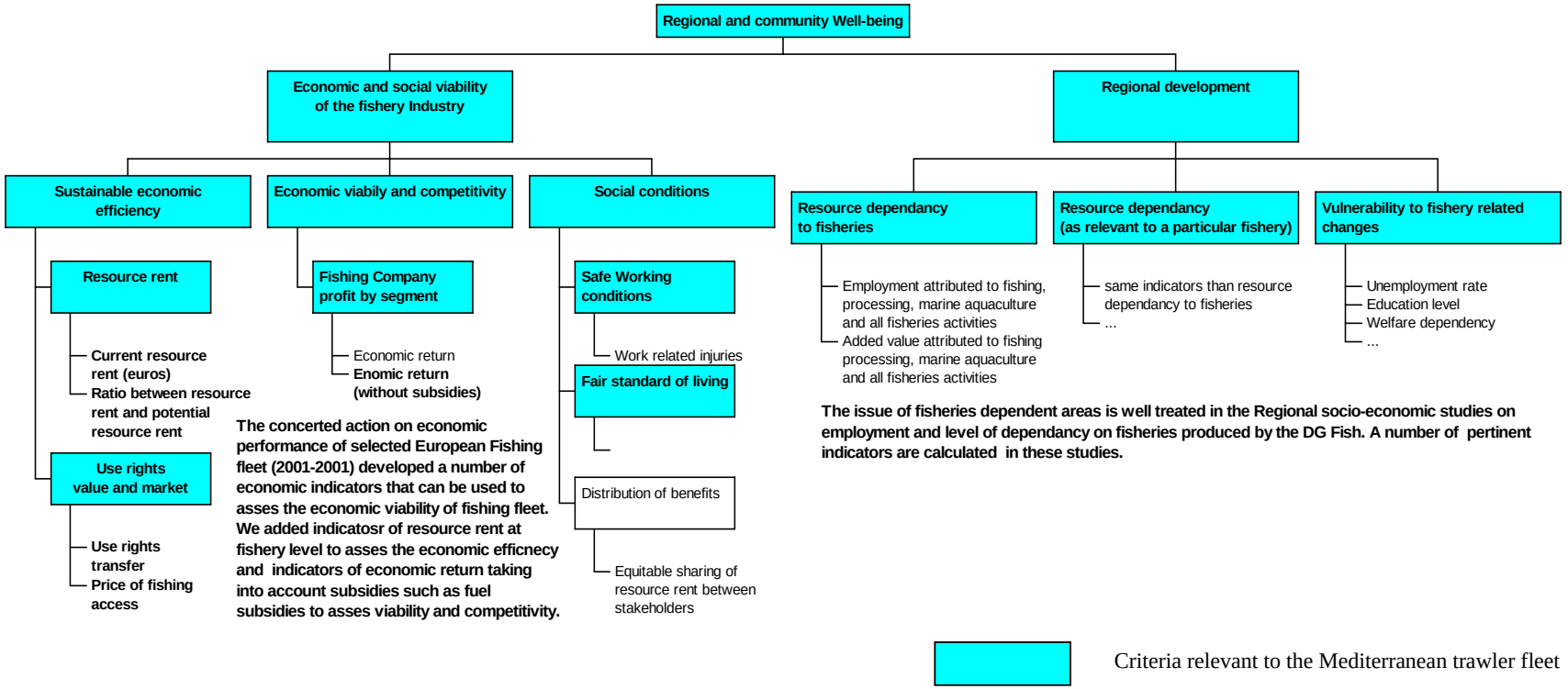
Indicator 1:

Contribution of the fishery to GDP (%)

Indicator 2:

Ratio between the current contribution of the fishery to GDP and the potential contribution of fishery to GDP

Figure 3: Regional and Community Sustainability Tree applied to the French Mediterranean Trawler Fishery



2.2.3 Regional and community well-being

A number of criteria and indicators are common between the national and European tree and the regional and community tree. The selection of boxes to be fulfilled (at national, European or/and regional levels) mainly depends on the considered fishery (cf. Figure 3).

The two main branches of the regional and community tree relate to structural funds objectives and economic and social viability of the fishery industry.

REGIONAL DEVELOPMENT

The regional development tree relates to structural fund objective for which indicators has been produced in the framework of the Regional economic studies on employment and level of dependency on fisheries produced by the DG fish in 1991 and 2000 (figure 2).

These indicators can continue to be produced on a multi annual basis to give an overview of the level and evolution of employment and dependency at regional level.

Indicators pertaining to a specific fishery may be added, particularly when the weight of one specific fishery is preponderant in an already dependant area.

ECONOMIC AND SOCIAL VIABILITY OF THE FISHERY INDUSTRY

The economic and social viability of the fishery industry particularly relates to the objectives of fair standard of living, safe and appropriate working and living conditions, sustainable economic, environmental and social conditions and economically viable and competitive fisheries industry (Annexe 1).

The economic and social viability contains three complementary aspects :

1 *Sustainable economic efficiency* : as at national and European levels, these indicators give information on the performance of the sector management both in strictly economic terms (wealth extracted from the resource) and in terms of sustainability of exploitation (sustainable level of exploitation).
2 *Economic viability and competitivity*: These indicators give information on the economic viability and competitivity of the different segment of fleets.
3 *Social conditions*: These indicators give information on working and living conditions and on sharing of wealth extracted from the resource.

Sustainable economic efficiency: resource rent

The same indicators than at national level can be developed, in particular the ratio between the current resource rent and the potential resource rent at fishery scale (cf. p.22).

Indicator 1:
Current value of the resource rent for a particular fishery (in euros)

Indicator 2:
economic efficiency of natural resource usage (ratio between the current economic rent and the potential resource rent) and,

Indicator 3:
economic sustainability of natural resource usage because the optimum economic potential in terms of level of exploitation is almost always situated below the biological optimum.

Sustainable economic efficiency: use rights value and market

Use rights value and market indicators are important indicators of economic and management performance. The precise type of indicators to be developed and their interpretation depends on many factors such as formal rights existence or type of rights. For example, the value of use rights can be captured within the selling price of fishing boat.

Further investigation are needed on this particular criteria to develop indicators adapted to multiple European fishery contexts.

Economic viability and competitivity : standard economic return

Indicators of economic viability of fishing fleet per segment have been developed in the *Concerted Action on economic performance of selected European fishing fleet* (2001-2004). These indicators can be used to asses the current viability of fleets (e.g. net and brut economic return, etc.).

Economic viability and competitivity : corrected economic return

It is strongly suggested to complete these indicators by others integrating the issue of subsidies. This would readjust the picture of competitivity and viability between the different fishing fleets.

For example, it would be particularly interesting to calculate what would be the economic return without current subsidies on fuel. Two indicators would be particularly pertinent :

- Fuel consumption (available in the concerted action) ;
- Corrected Economic Return (reintegrating real fuel cost without subsidies).

Social conditions: safe working conditions

Indicators of working condition need to be further developed. However simple indicators can already be suggested like :
- Number of work related injuries and,
- Indicators on gravity of work injuries.

Social conditions: fair standard of living

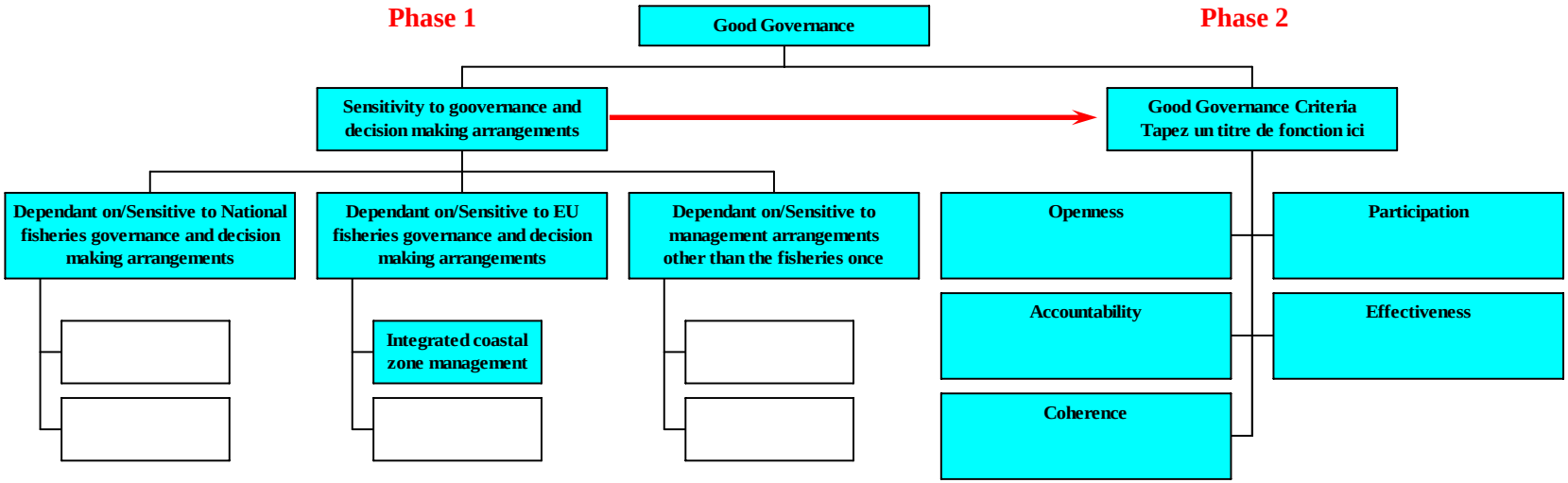
Ensuring fair standard of living is an objective if the EU Common Agriculture policy. However measuring an indicator of fair standard of living raises serious issues.

The first and the most important is the significance of “fair”. Without this fundamental piece of information which is closely related to State politics, it is not possible to propose a pertinent indicator measuring fair standard of living. Thus further investigation would be required to see conditions to develop such indicators.

Social conditions: distribution of benefits

Cf. European and national tree / *Social impacts : distribution of benefits*, p.21

Figure 4: Good Governance Tree - Skeleton of tree to be further developed



2.2.4 The specific case of the Good Governance tree

The governance tree needed the most adaptation to be useful in the EU context. The EU system is made of an higher number of levels involved in fisheries management (local, regional, national, Euro-regional, European, international). More significantly, the EU system is both made of and facing an high diversity of institutional and political systems at national level.

The adaptation was done on the basis of the Forward Unit work, of the White Paper on European governance (COM (2001) 428) and of the 2002 Regulation of the Council on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy (CE 2371/2002).

The Governance tree requires thus to be adapted to the different systems when keeping common components related to the EU general framework and principles. The proposed approach consist in two phases:

- *Phase 1: Identification of sensitivity to/dependence of the assessed fishery on decision-making arrangements*. This phase consists of an initial assessment of decision-making arrangements that apply to a fishery and the identification of related stakeholders at the different phases.
- *Phase 2: Development of indicators of good governance.* Indicators would be developed to evaluate the key decision-making arrangements and phases identified for the assessed fishery on the basis of good governance criteria set by the European Union (openness, participation, accountability, effectiveness, coherence).

For phase 2, three major levels of decision-making arrangements were identified: (i) dependence on EU fishery decision making arrangements, (ii) dependence on national fishery decision-making arrangements, (iii) dependence on management arrangements other than fisheries arrangements (in relation to the "coherence" criteria).

Further work needs to be done to refine the phase 1 components of the tree in relation to major decision-making arrangements (e.g. TAC setting, RAC, ACFA advises, etc at EU level).

WHAT GOVERNANCE?

When assessing a particular fishery, the scope of the governance system should be identified. It requires to examine three main elements:

- the EU governance and decision-making arrangements related to fisheries management and pertinent to this fishery ;
- the national governance and decision-making arrangements related to fisheries management and pertinent to this fishery ;
- The decision-making arrangements other than the fishery-related management once impacting on the considered fisheries and occurring at European or national levels.

For each political and institutional system, relevant pattern of interactions, structures and stakeholders should thus be identified to built a coherent generic component governance tree adapted to the context.

The development and identification of follow-up indicators of institutional sustainability should also be driven, when pertinent, by orientations and trends of public policy regarding areas other than fisheries management impacting on the fishery sustainability and/or management such as coastal management, sustainable development and governance arrangements. In the case of France, it would be necessary to take into account the following documents:

- The orientation law on fisheries (1997),
- The national strategy of sustainable development (2003),
- The Law of democracy of proximity (2002),
- The Law relative to solidarity and urban areas (Loi SRU, 2000),
- Etc.

For example, it can be noticed that both the EU and the French government are preparing a directive for integrated coastal zone management.

The institutional set-up related to French fisheries management in which the Mediterranean trawler fishery is embedded is overviewed in the Figure 5. This figure shows structures involved in the management system at the three main levels, European, national and regional/local. To assess the system, the status of structure involved should also be assessed (Status: Structure with devolved power, Structure under state control, De-concentrated structure, etc. ; types of representation: public administration, sector, civil society, etc.).

As underlined above, environmental and social sustainability is increasingly conditioned to an integrated approach of resource and land use (cf. integrated coastal zone management). As a consequence, stakeholder schemes are also evolving. New once intervene directly or indirectly, certain acquire more voice. In the French context, it can be cited:

- Representatives of associations and environmental NGOs (environmental, birds, flora, fauna protection, biodiversity etc.) ;
- Citizens groups, consumers associations and more generally associations related to cultural or social matters (e.g. protection of maritime patrimonies, actions for women integration....).

The composition of RAC also illustrates this trend towards more diversified stakeholder groups associated to fisheries management.

CRITERIA OF GOOD GOVERNANCE AND RELATED INDICATORS

Confronted to the low level of confidence and interest of European citizen and challenged by the ongoing enlargement process, the European Commission put the transformation of European governance on the 2000 Agenda. In the White Paper on European Governance (CEC, 2001), the EU Commission highlighted the main weakness of the present decision-making system, set broad objectives and set criteria of good governance, in addition to the proportionality and subsidiarity principles, on which to evaluate the governance system. They are:

- Openness,

- Participation,
- Accountability,
- Effectiveness,
- Coherence.

As for all EU policies, the Common Fisheries Policy has to integrate a critical analysis of its governance performance and the opportunities for improvement. The 2002 regulation on the conservation of fishery resources[2] made a first interpretation of this transposition of good governance criteria into the CFP:

"the CFP shall be guided by the following principles of good governance:
(a) Clear definition of responsibilities at the Community, national and local levels;
(b) A decision making process based on sound scientific advice;
(c) Broad involvement of stakeholders at all stages of the policy from conception to implementation;
(d) Consistency with the other Community policies, in particular with environmental, social, regional, development, health, and consumer protection policies."

The EU project on Sharing responsibilities in fisheries management[3] underlined the limitation of this interpretation compared to the scope of the White Paper on EU Governance and the necessity of a more comprehensive understanding of governance issues within the CFP (Hoof et al, 2005).

It also underlined the non relevance of "scoring" countries against each other when assessing the state of management in relation to good governance criteria considering the diversity of political and institutional systems within the European Union.

The FAO technical guidelines on indicators for sustainable development of marine capture fisheries also suggested four criteria to assess the institutional dimension of sustainability which can be crossed with the EU good governance criteria that are not specific to fisheries (FAO, 1999). This criteria are: Compliance regime, Property rights, Transparency and participation, Capacity to manage.

As example, potential type of indicators related the criteria effectiveness/efficiency are given below.

EFFECTIVENESS/EFFICIENCY:

Dehousse (2001) identified two interpretations of the concept of 'efficiency' particularly relevant to the EU problematic: (i) decision-making efficiency, the ability to take decisions when needed and (ii) substantive efficiency, the ability to take the 'right' decisions and to reach satisfacting outputs.

Decision-making efficiency is related to the degree to which policy process are timely delivered and adapted to their objectives. Examples of potential types of indicators:

[2] Regulation (CE) n°2371/2002 of the Council on the Conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy (20 December 2002)
[3] The EU Project on Sharing responsibilities in fisheries management assessed the current governance system of fisheries management at EU and national levels based on good governance criteria, stressed weaknesses and proposed options to improve governance of fisheries management.

- Indicators of decision-making time lag

In a communication on scientific advice, the European Commission stresses the weaknesses of the system, among others the issue of management response timing. An average of 15 months time lag separates specific requests to management response, what is considered too long in emergency cases (EU, 2003)[4]. Proposal-decision time lag has been analysed in relation to the introduction of qualified majority voting (Schulz and König, 2000 & Golub, 1999). Such analysis could be adapted to the CFP context to built an indicator for example the evolution of proposal-decision time lag pertaining to the type of decisions (decision, regulation, emergency measures...) or related to a particular fishery.

- Indicators of management cost effectiveness

The OECD (2003) has developed an analysis and calculation of management cost and management cost/efficiency that can be used as a basis to develop indicators produced on a more regular basis (e.g. deliverable 8 of INDECO). The indicators suggested in this study can also be used to foreseen issues related to cost assessment of different management options.

It can be noted that the concept of management cost needs to be reviewed and clarified. Mainly because of lack of data, management cost calculation often integrated only voted budget but not functioning cost (with included salary of personnel).

- Indicators of implementation

Indicators of implementation could be developed in relation to extended impact assessments that are still little developed for fisheries regulations. A least three points could be interestingly followed:
a. Issues like the type of measures assessed by impact assessments,
b. Quality (scientific and informative) of these impact assessments,
c. How foreseen impacts of a given measure were taken into account in the implementation of the assessed measure.

- For a fishery under quotas, recurrence of TAC set over the scientific advice

Substantive efficiency is assessed on the basis of management success at reaching its goals. It also concerns the extent to which policies are founded on the rational principles based on past experiences, research and impact assessments. Possible types of indicators:

- Indicators of compliance

- Gaps between objectives and outputs

[4] The communication stresses three other critical points to be improved to reinforce the good governance of fishery management scientific advice: (i) close workshop procedure; (ii) lack and liability of data; (iii) use of standardised criteria not suitable to take into account specificity of certain fisheries.

The gap between attended objectives and outputs is a criteria classically used in the evaluation of the institutional efficiency of public policies. As such it may be applied to assess fishery policy. Two difficulties however need to be pointed out, time lag (that can be long) between a measure and its outputs and ambiguity in the formulation of certain objectives.

The type of analysis should integrate qualitative appreciation to understand the meaning of the observed gaps. For example, the low level of fishermen's wife that have taken the specific status of producer's wife[5] does not reflect the level of appropriateness of this measure, but reflects a state of mentalities and the fragility of economic situations of fishing enterprises.

One of the most used indicators to describe these gaps is currently the level of standing rate of allocated budgets.

Numerous initiatives were launched at international or sectored levels to identify follow-up indicators of governance. They are facing the same difficulties: difficulties of quantification considering the very qualitative nature of variables or the non availability (or accessibility) of relevant information or data to construct those indicators (in particular internal data on the functioning of institutions). A number of recent studies can be cited. The PNUD study (2002) selected 44 indicators (11 fields) qualified as subjective as most are built on an expert base. The Eurostat (2005) report on indicators of sustainable development identified 5 main indicators that pertain to three categories: Level of citizen's confidence in EU institutions, policy coherence & public participation.

A number of sectorial approach listed relevant information to collect and potential type indicators, but not fully built and measurable. The UNESCO Guide (2006) for ICZM, Gallagher et al. (2004) can be cited. Ehler (2003) also proposes a classical measurement of governance performance based on output impact and evaluation.

Those studies are often founded on a specific representation of the regulation system. Certain are implicitly referring to representation such as Rudd (2004) developed. He distinguished a representation based on the distinction of different types of capital (social, manufactured, financial...).

Other representations (Hezri et Dover, 2005) underlines the various levels mobilised in function of the concerned object or decisions (operational aspects, collective decisions, constitutional decisions...).

GOOD GOVERNANCE TREE APPLIED TO THE FRENCH CASE

A first attempts to apply the good governance tree to France is presented below. In the phase one, the different stakeholders needs to be identified as well as their patterns of interactions within the key steps of the decision-making system. The figure 5 represents the structures involved in French fisheries management as well as their status.

[5] Status which offers additional social rights to fisher's wife involved in the family enterprise.

In the second phase, criteria of good governance are used to score the key steps of the decision making. The table 9 illustrates few general indicators selected on an expert base relevant to the French context.

Figure 5 : French fisheries management structures by type

	Political structure	Administrative structures	Professional structures			
European	Council of fishery ministers Fisheries commission of the European Parliament	European Commission DG of fisheries	EAOP	Europêche	COGECA	
National	Government Minister National Parliament	MAP-DPMA OFIMER	ANOP	Confederation CMCM FEDOPA SCCMM CGPA	CNPMEM	
regional	Regional Council CRIPA	Regional prefect DRAM COREMODE CORECODE		Regional Funds of Maritime Mutual credit	CRPMEM	Co-operative, syndicates
local	General Council Municipality	DDAM QAM	Local sections of FROM	Local agencies Local co-operatives	CL	

FROM and other producer's organisations

legend

EAOP : European association of producer's organisation
COGEPA : General council of agricultural co-operation
MAP : Minister of Agriculture and Fisheries
DMFA : Direction of marine fisheries and aquaculture
OFIMER : Inter-professional office of marine products and aquaculture
ANOP : National association of producer's organisation
CMCM : maritime Funds and mutual credit
FEDOPA : Federation of artisanal producer's organisation
SCCMM : central society of maritime mutual credit
CGPA : Management centre of artisanal fisheries
CNPMEM : national committee of marine fisheries and aquaculture
CRPMEM : regional committee of marine fisheries and aquaculture
CL : Local committees
CRIPA : regional commission of investment in artisanal fisheries and aquaculture
DRAM : Regional direction of maritime affairs
DDAM : departmental direction of maritime affairs
QAM : quarter of maritime affairs
FROM : Regional Funds of market organisation

In blue : Political structured with devoluted power from central state
In red : Structure under state control (de-centralised structure or under state financial and juridical supervision)
In green : De-concentrated structure

The following table indicates the scope of good governance criteria applied to European fisheries management and indicative variables or indicators based on the case study.

Table 9: Selection of potential indicators to follow-up institutional sustainability of marine fisheries management applied to the French context

Good Governance Criteria*	**Types of variables to develop indicators at national level**
The **Openness** of management institutions is a quality that affects the transparency of decision-making processes. This feature is multifaceted and is related to the degree of public access to documentation and the communication techniques used in the management system. This criteria also address the issue of at what extend civil society interests are represented aside of the fishery sector interests in the decision-making process.	1. Access to information (Information management tools like observatory, communication tools...); 2. Relative weight of the different types of stakeholders in RACs and management structures; 3. % of rotation of professional representatives 4. Availability of regular evaluation report on the sector; 5. Number of derogation and resorts; 6. % of regional representative in national structures 7. Weight of regional representatives in national structures and decisions (difference among regions)
The concept of **Participation** is related to the form of inclusion of the participants in the policy chain. This points to the complex problem of who should be eligible to participate in the policy process in the first place. In a democracy, elected representatives are assumed to manage the possessions of a nation in the best interests of the people. In most countries, it is however accepted that those who utilise a resource should be more involved in the management of a resource than the general public due to the perception that users have a higher stake in the resource than the general public.	1. Relative weight of the different types of stakeholders in RACs and management structures; 2. % of representative from the civil society in the management and research structures. 3. % of fishers in municipals councils and ICZM patterns of arrangements; 4. Types of actions conducted by professional organisations to support their participation to decision-making; 5. Frequency and nature of links between the fishery sector and the civil society (school visit to fish auction, prof. organisation, etc.)
The **Accountability** of a fisheries management system is related to the degree to which responsibilities, tasks and roles are clearly defined among the participants in the management process. This means that the interests of the parties involved must be clearly stated in order to avoid conflicts of interests that may put the legitimacy of the entire management system at risk. The accountability of a management system is also related to the degree to which the actors in the system must take the responsibility of their actions, and that the system as such represents a legal entity that can be prosecuted.	1.

The **Effectiveness** of a fisheries management system concerns the degree to which policy processes are timely and adapted to their objectives. It also concerns the extent to which policies are founded on the rational principles based on past experiences, research and im-pact assessments. In addition, the effectiveness of fisheries management system must also be assessed on the basis of its past success at reaching it goals.	1. Existence of quantifiable objectives regularly assessed; 2. Level of reached objectives; 3. Level of subvention distributed (amount and relative weight/ economic return). Comparison with other sectors; 4. Frequency and types of crisis; 5. Delay and nature of reactions facing a crisis; 6. % of social insurance and aids in the sector; 7. Cost of management mechanisms.
The **Coherence** concerns the degree to which objectives and policies are consistent and the degree to which sectoral policies are consistent with each other. The coherence of fisheries management systems may concern several different dimensions of the system. For in-stance, the degree to which the different measures of the system are consistent with each other represent an important issue which especially fishers are concerned with. On the other hand, the extent to which the fisheries policy is consistent with other sectoral policies, for example regional policies, is another and equally important issue.	1. Number of derogations and resorts; 2. % of fishers in municipals councils and ICZM patterns of arrangements; 3. Level of integration of social aspects in politics; 4. % of research programme in human sciences

Source:

* Final Report of the EU project on Sharing responsibilities (Part I, Chapter 6)

2.3 PROCESS INDICATORS

Process indicators are used to capture and monitor key processes within the fishery system ; they give relevant information on significant trends, on intensity and nature of driving forces and pressures. The aim of process indicators is to give information on the processes in action between a decision and its outputs taking into account the network of other forces that are acting within a given system.

They are thus useful (i) to assess if the trend is in the desired direction before awaiting the ex post evaluation of a decision outputs ; (ii) to improve the understanding of levels and processes on which to intervene to drive the system in the desirable direction.

There was common agreement within INDECO to use the PSR approach rather than the DPSIR[6] for convenience and simplicity. Nevertheless this should not alter the fact that the "Pressure" of the PSR approach is composed of two main inter-linked components that can be decomposed for analytical purpose:

a) Pressure indicators related to the understanding of relationships between direct fishing pressures (fishing effort indicators) and ecosystem state and responses ;
b) Driving force indicators that capture critical processes of the fishery system impacting on the nature and intensity of direct pressures on the ecosystem, and more critically on the overall sustainability of the system.

[6] PSR: State-Pressure- Response ; DPSIR: Driving force, Pressure, State, Impacts, Response

To make this distinction, the P of "pressure" has been replaced in this document by the P of "process" which integrates more explicitly both direct pressures and driving forces. To support the management system, both types of indicators need to be identified and developed.

2.3.1 Process Indicators

Direct interactions (pressures and impacts) can not be fully identified through a common generic model as they are a function of:

- Characteristics of the ecosystem (depths, habitat, substrate, food chain, climatic zone, etc.);
- Types of fishery comprising: (i) Fishing techniques (including competence of the crew), (ii) Fishing strategies (including market strategies, etc), (iii) Type of regulations (no take zone, technical measures, etc.) and level of compliance.

To precisely quantify interactions between fishing effort and ecosystem state and responses, key issues still require further work such as:

- Availability and reliability of fishing effort indicators to test hypotheses on the relationships between fishing effort and fishing impacts on the ecosystem;
- Methods to discriminate more precisely fishing impacts from impacts due to other sources even though ecosystem indicators sensitive to fishing are selected;
- Better understanding of time scale issues between direct pressures and response from the ecosystem.

Time scale issues are also very important the development of useful pressure indicators in the management context. There are two types of time scales to be taken into considerations:

- Time scales related to the functioning of the fishery system: pressures, ecosystem responses to pressures, management time;
- Time scale related to technical capacity to identify significant trends in pressure and ecosystem responses (related to power analysis for examples).

To develop useful process indicators, several areas need to be further investigated. First, what are the relationships between time scales of fishing pressures and time scales of ecosystem responses. In another words, when a change is detected in the ecosystem, to what nature and timing of events can it relate to? Is change related to a punctual event or long term pressures? These issues largely remain to be investigated. Second for certain types of ecosystem indicators, long time series are required to detect significant trends (cf. statistical power analysis). Pressures related to the identified trends are likely to be found before and during the long time series. It means that the indicators will feed back information on pressure (so on measures) that occurred at least 10 year previously. This has a direct implication on the possibility to use those indicators in a management context. The timing of each indicator would need to be identified in relation to management time (yearly management, multi-annual management, decennial reform). Identically, certain types of socio-economic indicators that require specific calculation, analysis and heavy data requirement would be more cost-efficient if produced on a 5 or 10 years basis.

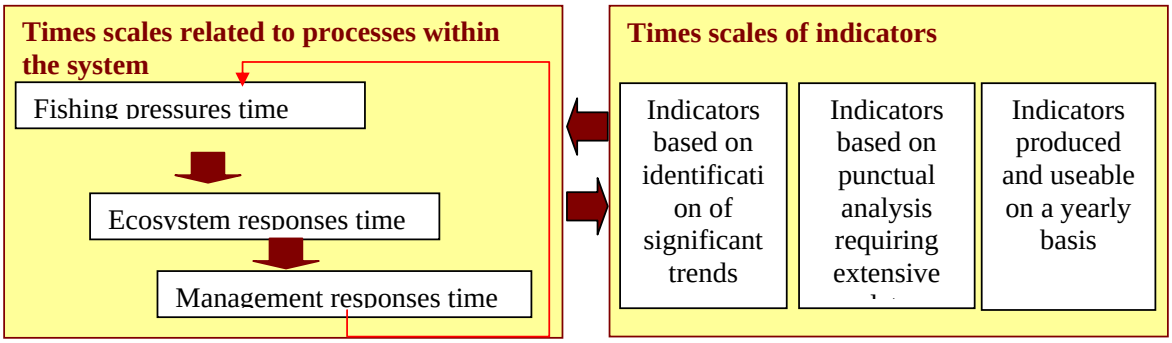


Figure 6 **Time scales issues in the identification of useful pressure indicators in a management context**

In the case of the Mediterranean Sea which EU management system is strongly based on fishing input control, the availability, quality and reliability of fishing effort indicators need to be considerably improved. At this stage, indicators such as fishing power are insufficiently reliable. Despite the fact that engine power (the most used and available indicator) doesn't reflect the traction capacity of the vessel (thus the fishing capacity), data on real engine power are also unreliable (cf. Table 3) and data on real fishing power are unavailable. Trawling is however the main and most used fishing technique in Mediterranean responsible for the major part of marine capture.

Table 10 : Evolution of estimated equivalence between engine power and T at bollard pull taking account technical improvement - French Mediterranean Sea

Years	Engine Power		Propeller ø (mm)	T at bollard pull
1974	430 ch (316kW)	Compatible pitch	1600	5.200
1976	430 ch (316kW)	Idem + nozzle	1550	7.240
1978	430 ch (316kW)	Idem + nozzle	1760	7.800
1981	430 ch (316kW)	Idem + nozzle	2180	9.100

+ 75 %

From R. Derrives Doc. Moteurs Baudouin

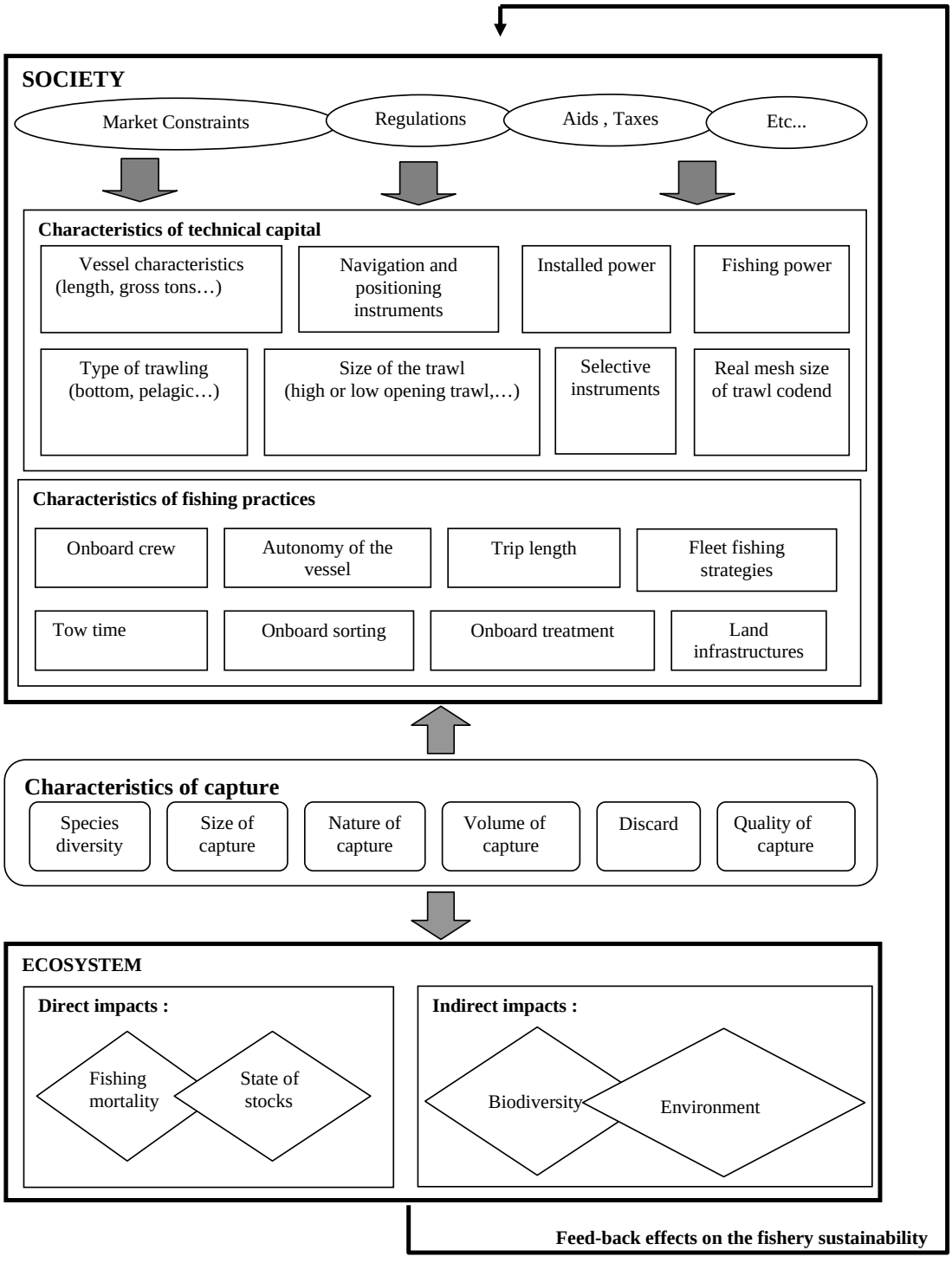
The Figure 7[7] illustrates interactions between technical aspects of trawling and the ecosystem. This figure is a basis to identify relevant criteria and indicators to measures direct pressures and impacts on the ecosystem associated to the activity of trawling vessels. It also helps to visualise current gaps between needed/potential indicators and available indicators.

To complete the representation of impacts and pressures, other indicators are required measuring interactions between the ecosystem and the activity of the entire trawling fleet as this aspect is only suggested in the figure 5. Such indicators are in particular

[7] See also Tudela S, 2004, *Ecosystem effects of fishing in the Mediterranean Sea: an analysis of the major threats of fishing gear and practices to biodiversity and marine habitats*, Study and Review No 74, General Fisheries Commission for the Mediterranean, Rome, FAO, 44 p.

those of cumulated impacts such as total fishing power, total fishing effort, number of passage of bottom trawls on one specific area, etc.

Figure 7 : Interactions (pressures and impacts) between trawl fishing and the ecosystem



2.3.2 Driving force Indicators

Understanding relationships between ecosystem state and response, and direct fishing pressure is not sufficient to support fisheries management toward desirable outputs. Fishing pressures are results or consequences of incentives and driving forces coming from the societal environment (economic, social, cultural and institutional). This understanding of the causal chain underpins the PSR/DPSIR approach and, as another example, the transboundary approach which distinguishes immediate, underlying and root causes.

The identification and selection of relevant driving forces indicators requires 5 key steps:

1- The development of a generic model of understanding of economic, social and institutional dynamics of the fishery system ;
2- The adaptation of the model to the particular characteristics of a given fishery ;
3- The identification of key processes, in particular at the interaction of the management and the productive sub-systems, for which driving forces indicators should be developed ;
4- The identification of criteria and target or desirable trend (related to management objectives) for each identified key processes
5- The development and participative selection of indicators to ensure their applicability and their appropriation by the users.

The characterisation of driving forces indicators should be based at first place on a comprehensive systemic representation of the fishery. The economic theory already identified the search for resource rent as a main driving force in system exploiting scarce natural resource. However other forces, in particular social once, apply. Those forces need to be inter-related more formally to built a global framework that facilitates the identification of driving forces indicators that describe well a particular fishery system.

The systemic approach gives a framework of representation which focuses on dynamic and interactions. The fishery system is thus defined as « a co-ordinated network of components in dynamic interactions, implying several hierarchic decision making levels, organised by Human beings in order to valorised marine resources» (translated from Rey & al., 1997). Several representations have been developed. Certain are simplified overview such as the once proposed by S. Pascoe (pers. com.) or Garcia (2003) (cf. Annexe 2). Rey & al (1997) and Charles (2001) developed more comprehension and complete representations of the fishery system and its interrelated components, which models for the selection of process criteria and indicators could be based on.

Rey & al (1997) distinguish at the interface of the nature-society system, two hierarchic sub-systems, the productive system and the regulation system and one transversal sub-system, the management system. Charles (2001) articulates the fishery system on three main components, what are: the natural system (fish, ecosystem, biophysical environment), the human system (fishers, post harvest sector and consumers, fishing households and communities, social/economic/cultural environment), the fishery

management system (fishery policy and planning, fishery management, fishery development, fishery research).

An understanding of the fishery in its systemic representation is a first needed but not sufficient step to develop process indicators. Further work needs to be done to refine these models with the underlying objective of develop a specific tool to facilitate the identification and selection of driving force indicators.

2.4 INSTITUTIONAL RESPONSE INDICATORS

Response indicators aim at measuring the capacity of a management system to take appropriate decisions in relation to the state of the system.. As such, these indicators aim at measuring the capacity of the system to orient driving forces and/or control nature and intensity of pressures on the system. Response indicators informs on the management in terms of human, institutional & financial capacities, coherence, and right incentives to reach objectives. To be useful, the indicators need to be fishery specific.

To be developed in a focused manner, response indicators require both the achievement of the good governance tree (analysis of main pattern of interaction and identification stakeholders) and the identification the main pressure and driving forces. As such, it is difficult to develop indicators without a fully covered case study and this was not possible in this INDECO project.

Intervening appropriately is a cultural & political concept that support many interpretations. As such, the nature of response indicators are guided by governance principles underlying a given system.

In the European Union, the general guidance is given by the four governance principles (Openness, participation, accountability, effectiveness, coherence) plus the subsidiarity and proportionality principles.

The literature review (Rey et al, 2005) underpinned the rather weak development of institutional indicators including responses indicators. There are generally limited to a evaluation of policy efficiency through the evaluation of management cost[8] (OCDE, 1997, 2003a & 2003b).

Developing response indicators requires an analysis of the functioning of the decision-making system what differs from following-up the state of the governance (cf. 2.2.4 The

[8] The OCDE estimates management cost at 2.5 millions USD, shared between control and monitoring (39,6%), management (26,4%) and research (34%). These costs represents a low share of the landing value (6% in 1997) and mainly depend on the landing volume, the size of the fleet and the regulation and management system. The lowest cost are experienced by countries using a output control system (regardless of the efficiency of the system in term of achieved objectives).

specific case of the Good Governance tree), even though certain indicators may be used for both purposes.

Institutional state indicators give information on the properties & quality of the regulation system. Institutional response indicators give information on the intervention capacities of this system. Institutional response indicators are thus related to a structural analysis of the system, which focuses on pattern of interactions on the main identified drivers.

The basis to develop relevant response indicators is thus provided by the good governance tree (the phase one for the analysis of pattern of interactions, the phase 2 for guiding good governance indicators) and by the identification of driving force and pressures on the system.

As such the development of response indicators is directly linked with:

(a) Indicators and principles of good governance guiding the overall analysis ;

(b) Process indicators which infer that main pressures on the ecosystem and relevant drivers of the fishery sustainability has been identified.

Response indicators should aim at following-up the capacity of the system to intervene on those pressures and drivers. As pressures are consequences of driving forces, response indicators coupled with process indicators should also help to evaluate at what level to intervene to correct an undesirable change. Acting at pressure level when strong driving forces push toward another direction is very likely to exacerbated tensions in the system at implementation and compliance levels with a loss of efficiency and an higher risk of unsustainability.

Generically, the capacity of response is a function of several variables related to two main categories:

i) Variables and properties related to the functioning of regulation institutions

- The **delay** of reaction between the observation of undesirable change and the implementation of measures aiming at correcting this change ;
- The **flexibility** of measure understood as the capacity of targeted actions depending on nature of the issue and concerned population ;
- The **adaptation** of measures to identified issues. This variable is related to the proportionality, coherence and subsidiarity principles ;
- The **level of implementation** of taken measures, which strongly depend on their adaptability, legitimacy and on the control and monitoring system.
- The mobilised **budget**.

ii) Variables and properties related to the information system on which information are based:

- Quality of interactions with the relevant research institutions or other institutions providing the necessary information ;
- Existence of fishery observatory focussed on economic, social and institutional aspects ;

- Adaptation of statistic collection of data to the relevant management and decision-making scales (hierarchic and geographic).

The development of response indicators taking into account the various elements and issues identified in this section requires further specific research. These researches would also lead to develop specific system of data collections, unavailable at this time.

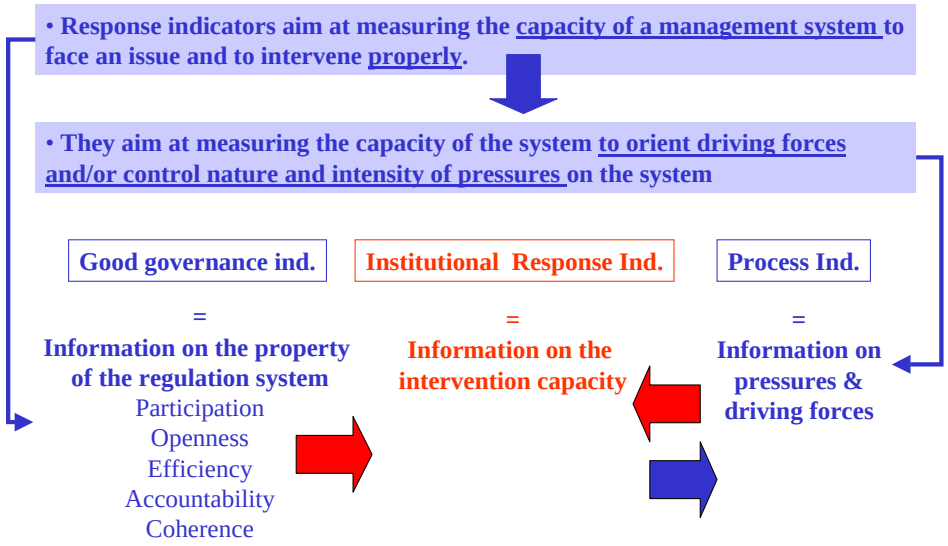


Figure 8 Requirements to develop institutional response indicators

2.5 CONCLUSION

The case study aimed at testing the applicability of a protocol to build relevant and useable socio-economic indicators of CFP environmental performance.

The case study (Mediterranean trawler fishery) was chosen for its homogeneity and the abundance of available information, which facilitates the testing process. Overall the test shows that the conceptual framework is pertinent and 'implementable'.

This test also highlights the different needed steps related to the type of indicators.

Step 1: In any case, the protocol starts by the identification of general and operational objectives at the different scales relevant to the fishery.

Step 2: To apply the framework to the fishery. At first, the state indicator framework needs to be adapted to the fishery. The sustainability trees allow the identification of pertinent stakes, objectives and the selection of relevant criteria for a given scale and a

given fishery within a general common framework. For socio-economic aspects, two categories of tree can be distinguished: the sustainability follow-up trees at different scales and the governance tree.

Step 3: To identify criteria and indicators related to process within the fishery system (pressure and driving forces). This requires a deep analysis of interactions what demands underlying robust frameworks, an adaptation fishery by fishery and an interdisciplinary approach.

Step 4: Response indicators has specificity that need to be taken into account in the identification process. They are highly qualitative in nature and difficult to quantify. Moreover scale differentiation is far less pertinent as scales are strongly cross-linked (so called 'spill over' phenomenon in economy).

This protocol and its different frameworks need further work to be finalised. In any case, it shouldn't be considered as a formal and definitive tool to apply but as a reference framework to adapt at each implementation to a different fishery. It should also be considered as a communication tool between the different stakeholders of management. It facilitates the appropriation process depending on scales and places.

This property of non identical reproducibility of an analysis and results should be underlined in regard to the accumulated experiences of developing sustainable indicators in various fields. It appears that the phase of establishing list of indicators per area of sustainability (economic, social, institutional) is passed behind. To be applicable, the elaboration of indicators requires a common definition of stakes and objectives, which they relate to and that condition main themes (e.g. rent, employment...).

Thus the scientific basis and the operationality of the protocol in which principle, criteria and indicators are articulated, are illustrated by this case study.

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3 ANNEX 1 - IDENTIFIED EU OBJECTIVES

3.1 GENERAL PRINCIPLES AND OBJECTIVES UNDERLYING REGIONAL AND COMMUNITY WELL-BEING

a) Objectives directly related to CAP/CFP

- Ensure fair standard of living (Objectives of the EU Common Agriculture Policy as set out in Article 33)
- The Common Fisheries Policy shall ensure exploitation of living aquatic resources that provides sustainable economic, environmental and social conditions. (CFP Council Regulation 2371/2002)
- Economically viable and competitive fisheries industry (CFP Council Regulation 2371/2002)
- Address the overall fishing pressure by adapting the EU fishing effort to the level of available resources, taking into account the social impact and the need to avoid over-fishing' (*Gothenburg EU Sustainable Development Strategy* - June 2001).
- "To guarantee equitable, safe and appropriate working and living conditions on board vessels" (*European Code of sustainable and responsible fisheries practices*).
- "To contribute to the conservation of fish stocks while promoting the continuation of professional fishing activities in Community, international and third-country waters" (*European Code of sustainable and responsible fisheries practices*).
- To develop a culture of good fishing practice and to provide standards of conduct for all persons involved in the fisheries sector wherever they fish, including in international or third-country waters (*European Code of sustainable and responsible fisheries practices*).
- To assure the availability of supplies and to ensure that supplies reach consumers at reasonable prices (*the EU Common Agriculture Policy* as set out in Article 33)
- Reduce conflicts at sea to enhance economic potential of the sea. The Communication suggests an integrated approach will be taken, involving coordination and collaboration on global and regional levels to boost the economic potential of the sea, as it would avoid conflicts and enhance synergies between various industrial, technological and commercial sea-related activities (COM 'Towards a Future Integrated Maritime Policy' March 2005).

b) Equality of chances and social cohesion

- Pursue an integrated European approach guaranteeing positive interplay between Economic, social and employment policies;
- Promote quality – of employment, social policy and industrial relations –, which, in return, should make it possible to improve human and social capital;
- Modernise systems of social protection by adapting them to the current requirements of our societies, on the basis of solidarity and by strengthening their role as a productive factor (*Communication on the social agenda COM(33)2005*);

- Take account of the "cost of the lack of social policy".

In particular the focus two high points may be related to fisheries:

- An intergenerational approach: chances for young people
- Promoting equity between men and women (*Communication on the social agenda* COM(33)2005)

c) Regional development

- Promotes the development and structural adjustment of regions whose development is lagging behind the rest of the community (per capita GDP < than 75% of the Community average over the past 3 years) (*structural fund objective 1*)
- Converting the regions or parts of regions seriously affected by industrial decline. There are three key eligibility criteria: (i) an unemployment rate above the Community average ; (ii) a percentage share of industrial employment higher than the Community average ; (iii) a decline in this employment category. This objective may also be flexibly defined according to specific needs, and include areas adjacent to Objective 1 regions, as well as other areas such as urban districts facing the threat of worsening unemployment, or indeed fisheries dependent areas which are suffering the impact of restructuring. (*Structural fund objective 2*)
- "To contribute to the creation of wealth and employment in fishery-dependent regions under conditions of sustainability." (*European Code of sustainable and responsible fisheries practices*)

3.2 GENERAL PRINCIPLES AND OBJECTIVES UNDERLYING NATIONAL REGIONAL AND EUROPEAN COMMUNITY WELL-BEING

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a) Market

- To stabilise markets;
- To assure the availability of supplies;
- To ensure that supplies reach consumers at reasonable prices (*the EU Common Agriculture Policy* as set out in Article 33)

b) Food security and Health

- Protecting human health (*EU Environment Policy* as set out in Article 174) ;
- "To promote the contribution of fisheries to food security and the provision of high-quality fish" (*European code of sustainable and responsible fisheries practices*).

c) External durability

- "Promoting measures at international level to deal with regional and global environmental problems" (*EU Environment Policy* as set out in Article 174) ;
- "To contribute to the conservation of fish stocks while promoting the continuation of professional fishing activities in Community, international and third-country waters" (*European Code of sustainable and responsible fisheries practices*) ;
- "To develop a culture of good fishing practice and to provide standards of conduct for all persons involved in the fisheries sector wherever they fish, including in

international or third-country waters" (*European Code of sustainable and responsible fisheries practices*).

d) Examples of possible country related objectives

- Export earning
- Global level of employment
- Existence and cultural value

3.3 GENERAL PRINCIPLES AND OBJECTIVES UNDERLYING GOOD GOVERNANCE

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a) Generic Goals

- Promote international collaboration ;
- Apply precautionary approach ;
- Apply ecosystem-based approach (Council Regulation 2371/2002).

b) Good Governance

- Good Governance: openness, participation, accountability, effectiveness, coherence reinforcing subsidiarity and proportionality (*European governance, a White Paper*, COM (2001) 428 Final)
- Good Governance applied to Fisheries:
- To promote Clear definition of responsibilities ,
- Broad stakeholder engagement,
- Decision making based on sound science and delivering on time (*Council Regulation* 2371/2002).
- "Policy coherence the participation and cooperation of stakeholders in the implementation of the common fisheries policy" (*European Code of sustainable and responsible fisheries practices*).

Box 1 : Good Governance Criteria

Openness. Institutions should work in an open manner. They should actively communicate about actions and decisions it takes, using a language that is accessible and understandable for the general public.

Participation. The quality, relevance and effectiveness of (EU) policies depend on ensuring wide participation throughout the policy chain – from conception to implementation. Improved participation is likely to create more confidence in the end result and in the Institutions that deliver policies. Participation crucially depends on central governments following an inclusive approach when developing and implementing (EU) policies.

Accountability. Roles in the legislative and executive processes need to be clearer. Each of the EU Institutions must explain and take responsibility for what it does in Europe. But there is also a need for greater clarity and responsibility from Member States and all those involved in developing and implementing EU policy at whatever level.

Effectiveness. Policies must be effective and timely, delivering what is needed on the basis of clear objectives, an evaluation of future impact and, where available, of past experience. Effectiveness also depends on implementing EU policies in a proportionate manner and on taking decisions at the most appropriate level.

Coherence. Policies and action must be coherent and easily understood. The need for coherence in the Union is increasing: the range of tasks has grown; enlargement will increase diversity; challenges such as climate and demographic change cross the boundaries of the sectoral policies on which the Union has been built; regional and local authorities are increasingly involved in EU policies. Coherence requires political leadership and a strong responsibility on the part of the Institutions to ensure a consistent approach within a complex system.

Each principle is important by itself. But they cannot be achieved through separate actions. Policies can no longer be effective unless they are prepared, implemented and enforced in a more inclusive way. The application of these five principles reinforces those of *proportionality* and *subsidiarity*. From the conception of policy to its implementation, the choice of the level at which action is taken (from EU to local) and the selection of the instruments used must be in proportion to the objectives pursued. This means that before launching an initiative, it is essential to check systematically (a) if public action is really necessary, (b) if the European level is the most appropriate one, and (c) if the measures chosen are proportionate to those objectives. (*European governance, a White Paper*, COM (2001) 428 Final).

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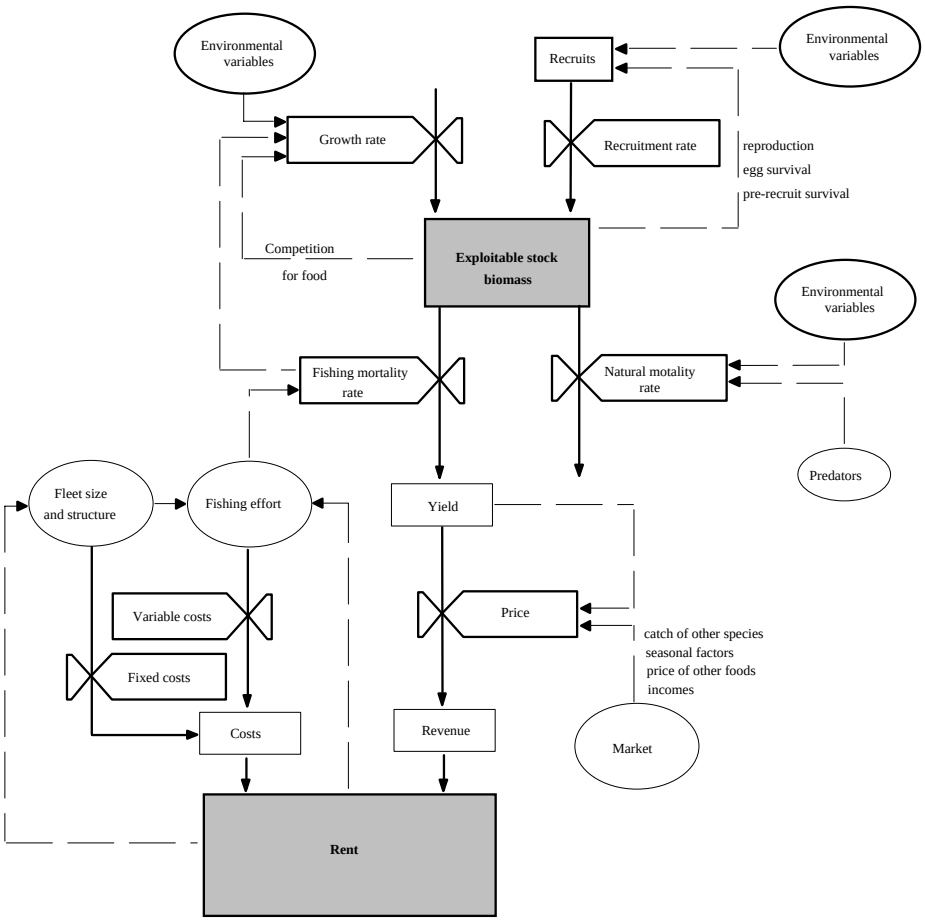
4 ANNEX 2 - SIMPLIFIED REPRESENTATION OF THE FISHERY SYSTEM



Source: S. Pascoe (pers. com.)

Ecosystem components and interactions addressed by ecosystem approach to fisheries (EAF) (modified from Garcia et al, 2003)