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Presentation:

DEFINING CRITERIA AND INDICATORS TO COMPARE THE SOCIETAL COST OF FISHING ACTIVITIES IN MARINE PROTECTED AREAS AND IN UNPROTECTED ZONES

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The definition of criteria and indicators may contribute to the comparison of the societal cost induced by fishing activities in free-access zones with the societal cost induced by fishing activities in marine protected areas, so as to confirm or invalidate the idea that the societal cost involved in the status of marine protected area is decreasing and to suggest modes of fishing management that can lower this cost (*cf.* "Technical annex", ECOST, 2006). First of all, this definition requires clarification of the choice of criteria and indicators in a sustainable development reference system, and review of the necessary qualities of indicators. In this context, defining criteria and indicators requires an analysis of the complex relationship between societal cost and sustainable development, which will emphasise that constructing indicators depends substantially on the approach adopted (by field as well as in terms of resources, welfare and standards) and will bring to light the main types of indicators. Secondly, this definition cannot ignore the reference system of the sustainable development of fisheries, which puts certain specific objectives before others and highlights the need to find indicators that can determine how these goals are pursued and whether these specific objectives are achieved. Defining criteria and indicators requires listing and describing each criterion and indicator. Finally, for each selected indicator, data source, task and output are specified.

1. From criteria to indicators

One can define the term "criterion" as "components of the sustainable development reference system whose behaviour can be described via indicators, proxy-indicators and reference points. For example, *fishing capacity* is a criterion relative to fishing pressure, *spawning biomass* is a criterion related to the well-being of the stock and *total income* (in cash and in kind), a criterion related to the well-being of humans in the fishery" (from "Glossary", FAO, 1999).

One can define "indicator" as "a variable, pointer, or index related to a criterion. Its fluctuations reveal the variations in those key elements of sustainability in the ecosystem, the fishery resource or the sector and social and economic well-being. The position and trend of an indicator in relation to reference points or values indicate the present state and dynamics of the system. Indicators provide a bridge between objectives and actions." (from "Glossary", FAO, 1999).

From concept to criteria. The first stage consists in identifying the various criteria which validate the concept, with the assumption that this is always multidimensional.
The concept of poverty, for example, can be appreciated, using social criteria (exclusion, marginalisation) or cultural criteria (educational level, means of expression). Material criteria are multiple: they include financial elements (returns, debt level, expenses) and non-financial elements

(health, housing, rights). Each one of these material criteria is itself more or less composite. Income, for example, can be monetary or non-monetary. Moreover, in addition to the level of income at a given time, the most important aspect is sometimes the regular or precarious character of this income.

From criteria to indicators. The various criteria are then broken down into variables, some of which can be retained as an indicator, either because they appear particularly relevant or because they are easy to measure. Although the selection of the indicators is often based on an appreciation of the observation and measurement constraints, it nevertheless always remains within a theoretical range. For example, in connection with poverty, it is a theoretical question which will condition the nature of the income indicator, namely the absolute or relative character of poverty. In the first case, it will be necessary to establish a poverty line by calculating the sums necessary to cover essential needs, to be defined as a preliminary. In the second case, it will be necessary to fix a reference level (average or median of income distribution) and a variation compared to this reference (40%, 50% or 60%) and to define the scale (household or individual) appropriate to the measurement of poverty (in this case).
These first two stages result in a criterion being more conceptual and thus valid whatever the scale and time, while an indicator relates to a certain scale and a certain time step.

From indicators to measurements. Once, the indicators have been defined, they must be measured. The level of precision and exactitude as well as the space and temporal scales and their units must be chosen. Generally, the indicators will not have the same degree of accuracy and will not be measured in similar units, which obviously complicates pooling measurements in an aggregative index. The social status criterion becomes operational through indicators such as length of schooling, educational level, income and profession, mixing purely quantitative (income), semi-quantitative (educational level) and purely qualitative (the profession) information. It is often necessary to reduce measurement units and scales to the most elementary and the least demanding level, albeit with serious implications in terms of information loss.

From measurements to the index. The last operation, essential to empirically test a scientific concept and, in particular, to establish comparisons, consists in incorporating the various indicators in an aggregative index. This requires the indicators to be expressed in a common unit, which is obviously the case for the monetary indicators such as GDP, a price index, etc. However, if the currency does not ensure commensurability, the various indicators must be standardised. This standardisation can, for example, be implemented by expressing the current value of the indicator as a percentage of variation compared to an initial value or by giving a 0 (Min) value to the observation considered as worst and a 1 (or 10 or 100) value to the best score (Max), with the intermediate values then calculated according to the formula $Y = X - Min/(Max - Min)$ to remain within the limits of a scale from 0 to 1 (or 0 to 10, 0 to 100, etc.).

2. Definitions and indicator quality

"An indicator is […] an observable variable used to give an account of an unobservable reality" (Boulanger, 2004). These indicators do not necessarily have physical reality, but represent (directly or indirectly, and, generally, quantitatively) a characteristic of an object or a concept. The choice of indicators is particularly essential for any comparative study (between two countries, two areas, two zones with different protection statuses), since the comparison cannot be made on all of the observable reality.

To play this role validly, an indicator must have a certain solidity reflecting its scientific qualities, namely that it must be specific, sensitive and reliable.
•An indicator must be ***specific*** and reflect only the changes which have occurred in the factor being studied and not those of other factors.
•An indicator must be ***sensitive*** (i.e. monotonous, variable but with low dispersion) so that its tendencies are detectable over time and on its scale. A sensitive indicator is able to reveal all the

changes concerning the factor. It is unfortunately not possible to have very sensitive and very specific indicators at the same time, because these two characteristics follow opposite orientations. A compromise between the two will therefore always be necessary.
•An indicator must be ***reliable***, i.e. it should not give false-positive or false-negative signals. It must give the same value if it is measured again in the same manner in the same place and almost at the same time.
•An indicator must be ***accessible*** (i.e. easily reproducible and at lower cost) for regular use and easy updating;
•An indicator must finally remain ***comprehensible*** (i.e. clearly defined and sufficiently simple to be handled).

3. Societal costs and benefits, sustainable development: the main types of indicators

The objective of the ECOST project is to determine the societal costs of fishing activities and policies. Societal costs mean the sum of all monetary and non-monetary costs imposed on society by fishing activities and policies. These costs maintain a complex relationship with the concept of sustainability. Applied to fishing activity, sustainability first of all means that the relationship is viable over time, i.e. its long-term trajectory is non-decreasing (in terms of production, income, profit and maintenance of the fishing resource): this is the sustainability of fisheries. But it also means that the macroeconomic activity, and generally speaking the society in which this activity is carried out, are themselves sustainable: this is the sustainability of the development of the economy and the society into which the fisheries fit. Whatever level is considered, the costs the society bears because of the existence of the fisheries can be divided into two parts. First, they are the costs resulting from the non-sustainability of the dynamic trajectory of the fishery itself (and/or the economy and the society as a whole). These are the costs of non-sustainability. In addition, they are costs of the corrective policies possibly followed to find a sustainable trajectory. These are the costs of reaching sustainability.
The societal cost thus includes the cost of non-sustainability and the cost of reaching sustainability, and its evaluation thus necessarily includes that of sustainability. Therefore, any exercise of international comparison between societal costs of fishing activities and policies requires the use of sustainability indicators.

As regards sustainable development, the construction of indicators remains strongly dependent on the approach adopted, which can be divided into four main types:

- the approach by field (economic, ecological and social)
- the approach in terms of resources
- the approach in terms of welfare
- the approach in terms of standards.

The approach by field (economic, ecological and social) to sustainable development is that which inspired the greatest number of sustainable development indicator definitions. It is limited to three dimensions of sustainable development - economic, social and environmental - regarded as separate fields. This approach is centred on sustainability, assumed to be a balance between the progress in these three fields. On the other hand, the development dimension is rarely analysed and is, in fact, comparable to economic growth accompanied by certain social (absence of social rupture) and environmental (air and water quality, pollution, harmful effects) conditions. This concept of sustainable development has stayed closest to the dominant political and ideological concepts. In addition, it ratifies traditional distinctions into disciplines (economics, social sciences, natural sciences), as well as the divisions of institutional democracy with employer representatives, employee representatives and environmental organisations, the first identified with economics, the second with social sciences and the third with environmental concerns. The social construction of systems of indicators organised in this fashion is also greatly facilitated, because it results from negotiations between these three social forces with the assistance of experts and scientists. Such procedures

generally result in balanced panels of economic, social and environmental indicators. They are often heterogeneous, because it is not possible to incorporate all the dimensions in an aggregative index, since, by definition, it is the balance between the three dimensions that matters. National studies usually follow this pattern, such as, in France, "Forty-five indicators of sustainable development, a contribution of the IFEN" (IFEN 2003), even if a skilful presentation tends to mask the reference to the three fundamental disciplines.

The approach in terms of resources is also turned towards sustainability, understood either in the restricted sense of the sustainable use of natural resources, or in the broader sense of transmission of an aggregate stock of productive capital per capita that is sufficient for future generations to produce the goods and services necessary to their well-being. Nearly all of the environmental synthetic indicators can be classified in the first category: the ecological stamp (Chambers, Simmons and Wakernagel, 2000), the Environmental Sustainability Index (ESI) (World Economic Forum, 2002), the Ecosystem Well-being Index (EWI) (Prescott-Allen, 2001), etc. The majority of these indices adopt a prospect known as strong sustainability, i.e. low substitutability between natural capital and produced capital. They reduce the problems of sustainability to the sole use of natural resources, and assume that they do not have a possible substitute or only within very narrow limits. To the second category belongs an indicator known as "genuine savings", which is based on a radically contrary assumption.
It is monetary and partly founded on the national accounting index, which is linked to attempts to modify the national accounts for environmental reasons and seeks to measure the degree of real enrichment of a national economy by withdrawing from the GFCF[1], as can be found in the national accounts, the depreciation of the capital produced, removing natural resources and the cost of damage to the environment, as well as the foreign debt, but by adding to it healthcare and education expenditures, considered as an investment in human capital. A positive genuine savings means that the present generations do not consume an excessive share of the national product and transmit a productive inheritance that is sufficient for future generations. The genuine savings is thus primarily an indicator of inter-generational equity, which does not indicate whether the requirement for intra-generational equity is satisfied, which is normal insofar as the approach in terms of resources is not focused on development problems. Moreover, in accordance with the prospect for low sustainability, this indicator assumes a perfect substitutability between the three types of capital taken into account[2]: natural capital, produced (or manufactured) capital and human capital. Also raised is the prospect for low sustainability, the Z sustainability indicator suggested by Pearce and Atkinson (1993). On the basis of the Hicks-Hartwick-Solow rule, according to which the condition of sustainability can be represented by $S(t)-\delta_k(t) \geq 0$, an expression in which S(t) is the saving in t, δ the rate of capital depreciation and K(t) the capital in t, which, if one distinguishes the natural capital Kn, the produced (or manufactured) capital Km and the human capital Kh and their respective rates of depreciation δ_n, δ_m and δ_h, can be written:

$$S(t)-\delta_n Kn-\delta_m Km-\delta_h Kh \geq 0$$

By dividing by Y (national income) and ignoring the human capital Kh[3], the indicator of sustainability Z can be drawn as:

$$Z = S(t) / Y(t) - \delta n \, Kn/Y(t) - \delta m \, Km/Y(t) \geq 0$$

If $Z > 0$, there is sustainability, the savings can finance depreciation as well as manufactured capital such as natural capital, if $Z = 0$, there is sustainability at the margin, and if $Z < 0$, there is no

[1] Gross fixed capital formation (GFCF) is a macroeconomic concept used in official national accounts. This statistical aggregate is a measure of the net new investment by businesses in the domestic economy in fixed assets during an accounting period.

[2] One could distinguish a fourth form of capital, social capital, but this is not yet integrated into the genuine savings, because it is yet operational

[3] More precisely, by assuming $\delta h = 0$, human capital (education, culture) does not depreciate with time, but quite the contrary.

sustainability (in this case, in general, either the savings is insufficient, or the depreciation of the natural capital is too great).

The approach based on welfare is largely centred on development problems insofar as it concerns an approach centred on human beings, their needs and their welfare, "development" understood here as the increase in welfare for the greatest possible number of human beings, today and tomorrow[4]. In this case, the most relevant indicator is consumption per capita, which, traditionally, in neoclassical economics, is used as a welfare criterion. From this point of view, a sustainable development trajectory will imply the non-decrease of consumption per capita.
Taking efficiency as an evaluation standard requires raising the question of the goals and objectives of any social action, but also of the institutions. If the object of the evaluation is a mode of production and/or consumption, which is in the middle of the sustainable development, the efficiency standard brings us back to the question of welfare, needs, etc. Ultimately, a socio-economic system can be judged only in reference to well-being, in the meaning defined by Sen (1990) of individuals who make up the system and/or whose well-being depends, directly or indirectly, on it. However, there is no welfare theory that can make the savings in value judgments necessarily located on the more or less desirable character of a given state of society (Pérret, 2002, p. 25).

The approach in terms of standards. The first three approaches of sustainable development adopt a definition which corresponds to the exercise of a substantive rationality, in Simon's (1976) sense[5]. It is nevertheless possible to prefer a design based more on a procedural rationality[6] and to consider sustainable development in normative terms. From this point of view, any form of social action satisfying standards and/or procedures would be regarded as sustainable development. These normative aspects can relate to (inter-generational and intra-generational) equity, caution (prevention and precaution), participation and freedom. As for participation, it should be noted that this does not limit itself to exercising voting rights within a constitutional political system, but that it implies that the citizen has the means of making his voice heard in all the decisions likely to affect him, on all levels and in all fields. Sustainability standards include both forms of intra-generational and intergenerational equity that make up sustainable development, meaning that development going against intra-generational equity cannot be regarded as more sustainable than development exhausting the resources that future generations will need.
Admittedly, it is not easy to translate such a normative prospect into measurable and observable indicators. That undoubtedly explains why it is seldom used to prepare lists of indicators. Whereas many experiments on the matter refer to some of the standards mentioned here, such as equity or participation, examples of systems of indicators built firstly in normative terms do not exist.
In spite of the difficulties raised by its implementation, the normative approach presents some advantages, in particular being based on relatively solid theories of justice, such as Rawls's theory

[4] As opposed to what this formulation may lead one to think, the approach in terms of well-being does not necessarily mean adhering to the utilitarian program dominating in welfare economics. Indeed, if one adopts the theory of A. Sen (1990), which bases welfare on both the capacity to act (agency) and on the felt satisfaction (well-being) which distinguishes skills and functioning, the philosophical context is quite distant from utilitarianism. What for Sen contributes to the well-being of an individual is not the shopping cart of consumer goods accessible to him but what he can make taking into account the characteristics of these goods themselves, his own personal as well as physical, mental and social characteristics and external circumstances. A. Sen can also be credited with having been the first economist recognised by his peers to propose a multidimensional vision of the development centred not on economic growth or the increase in monetary income but on the extension of real freedom for humans to find self-fulfillment.

[5] For H. Simon (1976), a behaviour is substantively rational when it is appropriate to the achievement of given goals within the limits imposed by given conditions and constraints. Economic rationality is a good example of substantive rationality.

[6] For H. Simon (1976), procedural rationality concerns the choice or development of procedures for making decisions when the decision-maker has effectively limited capacities to process information and calculate appropriate outcomes.

(1971). The normative approach focuses on the players, projects and policies involved in development and, more precisely, on their fundamental requirements for justice and equity[7].
Of the four last prospects in review, only the standards can be regarded as complete, since it provides information on both development and sustainability standards. The resources aspect of this approach ends development and the well-being aspect retracts the problems of sustainability. However, one can consider that they are purely ideal types and that, in reality, the various approaches combine. From this point of view, a foundation representing a combination of the approaches based on well-being and resources seems to be the best compromise to guide a process that will construct a set of sustainable development indicators.

4. Indicators of the sustainable development of fisheries

The reference system of sustainable development of fisheries cannot be abandoned given the present situation of local and worldwide fisheries, which raises doubts regarding the contribution of this sector to sustainable development. Indeed, on the one hand, the fact that many fisheries overexploit or fully exploit the resources in fish hinders the potential future economic benefits of this activity. In addition, changes in the ecosystems caused by human activities, and in particular those stemming from fishing, compromising the livelihoods of present and future generations.
The need to choose suitable indicators to describe these phenomena is obvious in the reflection on the societal costs of fishing activities and policies, the core of the ECOST project. Comparing the same eco-region between its marine protected areas and unprotected zones, on the one hand, and then comparing various eco-regions, on the other hand, reinforces this need.
To place the fisheries in a sustainable context of development, fishery policies must aim to find a balance between the present and the future with regard to the reduction in fish stocks, as well as the disturbing effects of fishing activity (or other economic activities), coastal urban areas and waste dumping in the marine ecosystems. These general objectives of the sustainable development of fisheries can be divided into particular objectives:

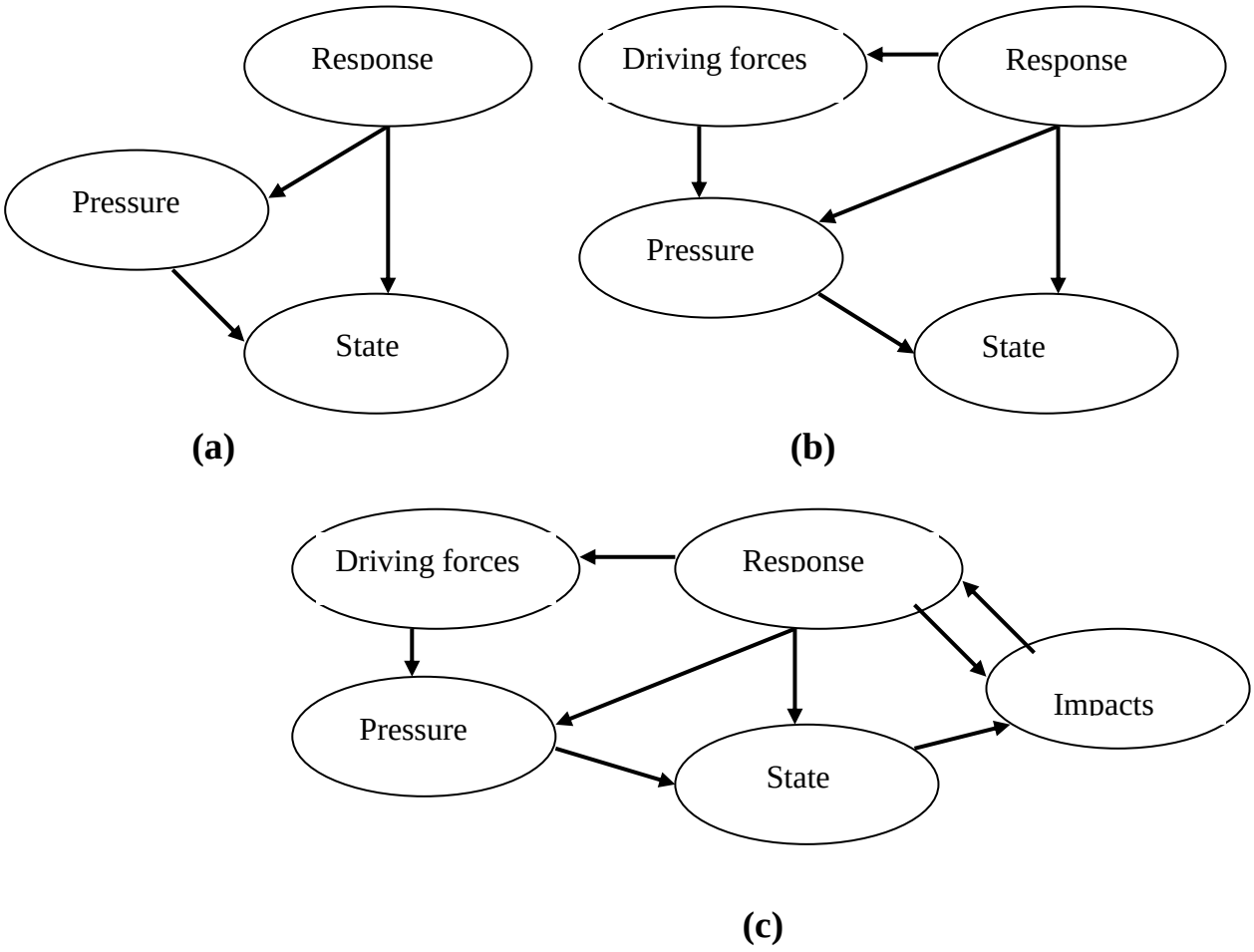
- to support fishing and processing activities based on specified and identifiable marine ecosystems
- to ensure the long-term viability of the resource underlying these activities
- to ensure the livelihood of workers employed in the fisheries sector within a community and in a broader economic context
- to preserve the health and the integrity of the marine ecosystems for other uses and other users, in particular from the following points of view: biodiversity, scientific interest, intrinsic value, trophic structure, and other economic uses (e.g. tourism, recreation).

Thus, it is necessary to find indicators to determine how these particular goals are actually pursued and whether the more general objectives of sustainable development are achieved. Consequently, in the preliminary determination of the field of all the sustainable development indicators of the fisheries, it must be made clear whether the key point is the contribution of fisheries to the general objectives of sustainable development or the sustainable development of the fisheries themselves.
Some of the general objectives of sustainable development are obviously compatible with the objectives of the fisheries sector such as the conservation of fish stocks and the safeguarding of their habitats. But others will limit the way in which the fisheries sector works towards its own ends. F or example, the need to protect seabirds can lead to restrictions on specific fishing methods and/or force the sustainable development of a group of industries. A policy of development aimed at particular groups of the population can affect the regulation of the access to fishery resources. Fishing can be restricted or completely excluded in some protected areas with an objective of nature conservation or because the priority is granted to another activity such as mining, aquiculture or tourism.
Thus, the limits of the system on which one plans to define indicators of sustainable development raise a number of questions:

[7] If one analyses the origin of the idea of sustainable development, there is no doubt that it stems more from a concept of fairness than from a concept of the good life. Cf Forsé and Parodi (2004), and the anthology of Berten, Da Silveira and Pourtois (1997) on the debate between liberals and communitarians.

- Which human activities should be considered (for example, fishing exclusively, other uses of fishery resources, other uses of the zone considered, upstream activities)?
- What problems should be taken into account (for example, surplus production capacity, pollution dumped into the marine environment, species threatened by extinction)?
- What are the exact geographical limits of the system considered, established from identification of all fisheries and their characteristics, in particular the types of boat, machines used, species exploited (inn French called *métier*), commercial or subsistence fishing?
- What are the habitats that are critically important to the resource?
- What are the existing interactions between fisheries?

Once the extension and the limits of the fisheries and the objectives of establishing indicators have been defined, it is necessary to organise the latter within a perspective of sustainable development. In this respect, several solutions have been proposed for example, the Pressure-State-Response (PSR) diagram, initially developed by OECD (1993, 1997), for environmental indicators. The PSR diagram takes into account the pressure exerted by human activities on certain aspects of the system, the state of the aspect considered, and the present or desired reaction of society. It may be advantageous to define pressure indicators or the main constraints exerted because in fact such forces are often installation measurements. Alternatives to the PSR diagram have been worked out to take into consideration impacts and the main constraints: Driving forces --- Pressure --- State-Response (DPSR) or Driving forces --- Pressure --- State --- Impact --- Response (DPSIR).



<u>Diagram 1:</u> (a) Pressure --- State --- Response (PSR); (b) Driving forces --- Pressure --- State --- Response (DPSR); and (c) Driving forces --- Pressure --- State --- Impact --- Response (DPSIR) diagrams

If one retains the five elements of a DPSIR diagram, the most complete cited above, the direction of each one of these elements, which all are connected by causality bonds, is as follows: a driving force, i.e. a human activity, causes a pressure on the environment, which results in a modification of the general state of the environment, which can have an impact on the natural inheritance or the well-being of humans. Depending on the seriousness of the impacts[8], this will react and cause a response on a part of civil society. This fifth element, the response, gathers the all measurements and instruments of the policies implemented in the field considered (here fishing) by the civil society.
These measurements and policies can relate to the four other elements: one then implements preventive measures directed towards the driving forces, from curative measurements towards the pressures and the state and of palliative measurements towards the state and the impact.
If we return to the central problem of the ECOST project, the societal cost of fishing activities and policies, we can advance that, in relation to the categories which have just been defined in accordance with the DPSIR diagram, this cost is equal to the sum of the costs of impacts (economic impacts, ecological impacts and social impacts) and of the costs of responses (of fishing policies and measures of fisheries management). However, it is necessary to carry out the comparative exercise, which is central in the WP8 of the ECOST project, on the early stages of the causal chain of DPSIR (i.e. "driving forces" "pressures" "state"), because the political answers are not only directed on the "impacts" and "response" stages but also on the earlier stages
We propose to list criteria and indicators connected to both the reference system of the sustainable development of fisheries and to the DPSIR diagram approach.

5. Proposal of economic, socio-economic and governance criteria and indicators

5.1. Preliminary indicators

Before proposing economic, socio-economic and governance criteria and indicators for comparison, it seems necessary to point out one criterion and two indicators relating to the structure of the fishing activity.

Criterion I: **Structure of the fishing activity**

Under the term "structure of the fishing activity", we intend to describe both the intra-fishing and extra-fishing occupational structure of fishermen. For intra-fishing, the concept of a "metier" is used, which is defined as being the use of one boat, of one's fishing gear to catch one or several species targeted during a particular season in a given area. Several "metiers" can be carried out using the same vessel or fleet: this is a multi-*métier* fishery. For extra-fishing, the occupational structure measures the distribution of productive activities (occupation, both monetary and non-monetary income sources) across households and social groups (by age, gender, ethnicity, religion) in a fishing community. Other activities could be, for example, farming, fish trading or marine carpentry. Multi-activity in fishing is a mean to reduce the risks of the fishing activity and to lower dependence on markets. The existence of multi-*métier* fisheries and the multi-activity and mono-activity rates will give a general idea of the reality of modes of fisheries or modes of exploitation (multiple activities) that minimise risks.

- *Indicator 1*: Existence of "multi-*métiers*"
For each *métier* defined by the fishing gear, the target species, the strategy of the fishing operation, the fleets involved and their ports of origin, it is possible to note the complementary activities with other *métiers* and possible substitutions in the event of activity in one *métier* being curtailed, under the form of multi-*métiers* interactive models which give for each *métier* the nature of interactions with other metiers, especially competition for resources and/or fishing grounds.

[8] In general, changes in human welfare involved the response, but it can also be altruistic considerations concerning the environment or the natural inheritance (which is why education on the environment is important).

- *Indicator 2*: Multi-activity and mono-activity rates

Multi-activity and mono-activity rates measure the distribution of productive activities between the members of a household and for each individual. In many developing countries, members of three or four generations live together in the same household. Under these conditions, each member of the household contributes to the total income, each one having a specific role and participating in one or several activities, particularly in subsistence activities. The nature of the activities must be specified for determining whether or not each household is specialised (fishing and transformation, for example), The list and the classification of the activities must apply to an entire year, which is particularly important when seasonal variations exist.

5.2. Economic and socio-economic criteria and indicators

Criterion II: Value of fishery production and influence of globalisation

The value of fishery production will confirm the reality of target species with a high market price on international, regional or even domestic markets. The value of fisheries production will also demonstrate the level of connection to export markets and the national economy. Appraising this value requires a description of the nature of markets (qualitative and quantitative data) and the relative importance of each market. This criterion is useful in determining the level of access to markets (including the MPA residents' access) which contributes to livelihood opportunities, but also the increasing (or decreasing) dependence on export markets, and in determining food security.

One aspect of globalisation is the growing interdependence between markets and fisheries. This occurs mainly through three channels: trade in fish and fish products, foreign direct investments in harvesting and processing (localisation) and through fisheries services. International trade in fish and fish products has increased substantially over the past decades: there is an important trade flow from developing countries (including from some MPAs), which own fishery resources, to the developed countries that constitute the principle market for fish.

- *Indicator 3*: Market prices

For major marine products, the average fish prices by species group and by size category will be given by statements of prices surveyed in fish halls or at landing sites.

- *Indicator 4*: Number and nature of markets

The number and nature of markets is a measure of the access to markets where marine products are sold and purchased. These markets represent the existing connections between producers (fishermen) and consumers (residents, wholesale fish merchants and other commercial intermediaries, hotel owners, tourists).

- *Indicator 5:* Share of the fish exported to the regional or world markets

Data on the exported share of fish production by species will give a rough view of the participation of a fishery in the world market and fish globalisation.

Criterion III: Monetary costs and fishery profitability

The sum of monetary costs which are part of the overall societal costs requires an appraisal of fishery profitability (at least of the métiers taken into account). Indeed, in a context of an open or quasi open access to the fish resource, profit remains the main indicator for entering and exiting the fishery. The existence of subsidies has to be taken into account because they appear as a hidden monetary cost. Although the issue of subsidies to the fishery sector with the focus on both trade and environmental consequences has been the subject of national and international debate for some years (Porter, 2004), it has not been considered as a part of the societal cost.

- *Indicator 6*: Distribution by type of cost per *métier*

The cost data represent the full annual harvesting costs of an average boat in each *métier*. Handling costs, operating costs (expenditures for fuel, ice, repair and maintenance, other materials and food), crew remuneration as shares of the catch, fixed costs (interest on debt, depreciation, opportunity cost of one's own capital), license fees, investment costs, fishery management costs, and opportunity costs of labour will all be taken into account.

- *Indicator 7*: Financial analysis, government budget and economic analysis per *métier*. In terms of financial analysis, the net cash flow per type of *métier* will be calculated from the catch value, the costs of effort, the effort tax, the cost of landing, crew remuneration, fixed costs, and licence fees. The net cash flow of the government budget per *métier* will be calculated from the management costs, the effort tax, and licence fees. In terms of economic analysis, the net cash flow will be calculated from the gross revenue, the cost of effort, the cost of landings, the crew opportunity cost, and the management cost.

- *Indicator 8*: Level of subsidies
Comparing MPAs versus unprotected zones will be particularly enlightening insofar as the level of subsidies seems to be paradoxically lower in the MPAs. Based on the literature (OECD, 2000; WTO, 2003), eight main subsidy categories will be considered: fisheries infrastructure, management services, subsidies for access to foreign countries' waters, decommissioning of vessels and licence retirement, subsidies to capital costs, subsidies to variable costs, income support and unemployment insurance, and price support subsidies.

Criterion IV: Non-monetary benefits

In addition to monetary profits, a fishery can generate non-monetary benefits. Non-monetary benefits correspond to non-market values, i.e. the economic value of activities that are not traded on any market, which includes direct uses such as aesthetic or cultural values, or indirect uses such as ecological services values, and to non-use values, which represent values that are not associated with any use of the fish resource such as the existence value (the value of knowing that the resource exists in a certain condition), the option value (the value of being able to use the resource in the future) and the bequest value (the value of ensuring the resource will be available for future generations). Like monetary profits, non-monetary benefits are distributed within social structures, between social groups and geographical areas.

- *Indicator 9*: Perception and distribution of non-monetary benefits
Economic valuation methods such as the travel costs method, the contingent valuation method, or attribute-based methods are often difficult or complex to carry out. But surveys can be used to obtain community members' perceptions of non-monetary benefits. In such surveys, respondents are asked to indicate the degree of their agreement or disagreement with a series of statements (on the beauty of the marine landscape, on the sea for their children's children or on enjoying time on the water, etc.).

Criterion V: Distribution of income and wealth

Distributional aspects of both income and wealth may contribute to the identification of societal costs of fishing activities in determining the social or geographical inequalities and even in some cases the impoverishment of some social groups (called socially unsustainable development). This distribution takes place within economic structures and between social groups and geographical areas. Two indicators have been chosen: the percentage of the fishing rent redistributed in the upstream downstream structure and the household income distribution by source. These indicators will contribute to understanding the way people combine the resources and assets available to them to make a living for themselves and their families. In particular, the understanding of the fishing rent redistribution and income sources will provide an opinion on the results of MPAs.

- *Indicator 10*: Percentage of the fishing rent redistributed in the upstream/downstream structure (ship-owner, fisherman, captain, wholesale fish merchant, others)

Fishing rent matches profit only if the owner or the manager of the resource cannot influence the market prices of fish and fishing inputs, which is the case for the majority of the small-scale fisheries. The percentage of the fishing rent (or profit) redistributed in the upstream/downstream structure depends on the ratio of employment in fishing and employment in the upstream/downstream structure (gender distribution, etc.) and on the economic status and relative wealth of coastal residents or resource users, their access to the capital market, etc. Particular attention will be given to the distribution of the fishing rent within and outside the area where the fishery is located.

- *Indicator 11*: Household income distribution by source

To determine the main sources of income for households, secondary data must first be collected: economic status (ownership of key assets such as fishing boats, etc.) and aspects of social status (membership in formal organisations) and sources of livelihood of the community members. In some cases, primary data may need to be collected using a survey to gather data from a sample of households in the community on different sources of household income and different sources of livelihood for households.

Criterion VI: Food security

Based on a FAO definition, household food security can be defined as "that state of affairs where all people at all times have physical and economic access to adequate, safe and nutritious food for all household members, without undue risk of losing such access" (quoted from Pomeroy and al.). The availability of locally caught seafood for public consumption is an element of food security and may be appreciated at the local level. It is important to check whether this stated objective of the MPAs to improve local nutrition and availability of local seafood has indeed been achieved.

- *Indicator 12*: Perceptions of seafood availability

Several questions must be asked of households in the MPA and unprotected zone community to measure perceptions of seafood availability. A self-anchoring scale can be used with a five-point ladder scale. The respondent can be asked to specify on the ladder scale the situation at the present time and the situation at some time period in the past. The number of and direction of changes in the steps is a measure of the perceived change (Pollnac and Crawford, 2000).

5.3. Policy and governance criteria and indicators

Criterion VII: Effective management structures and strategies

This criterion may include the implementation and effectiveness of management planning and processes, the definition and social acceptance of rules for resource uses and access, the effectiveness of decision-making and management bodies, the effectiveness of human and financial resources,
The recognition of a local or informal governance system and their incorporation into management planning, and the periodicity of monitoring and evaluation. The assessment of this effectiveness will need a survey encompassing a sample of households inside MPAs and outside.

- *Indicator 13:* Effectiveness of decision-making and management bodies

This effectiveness implies the existence of a decision-making and management body as well as the existence and adoption of a management plan (fishery management plan or MPA management plan), the availability and allocation of administrative resources, and of course the local understanding of rules and regulations.

Criterion VIII: Effective legal structures and strategies

This criterion embraces the existence of adequate legislation, the compatibility between legal and local arrangements, the effectiveness of the incorporation of rights and obligations set out in international legal instruments in national or local legislation, and the enforceability of these arrangements.

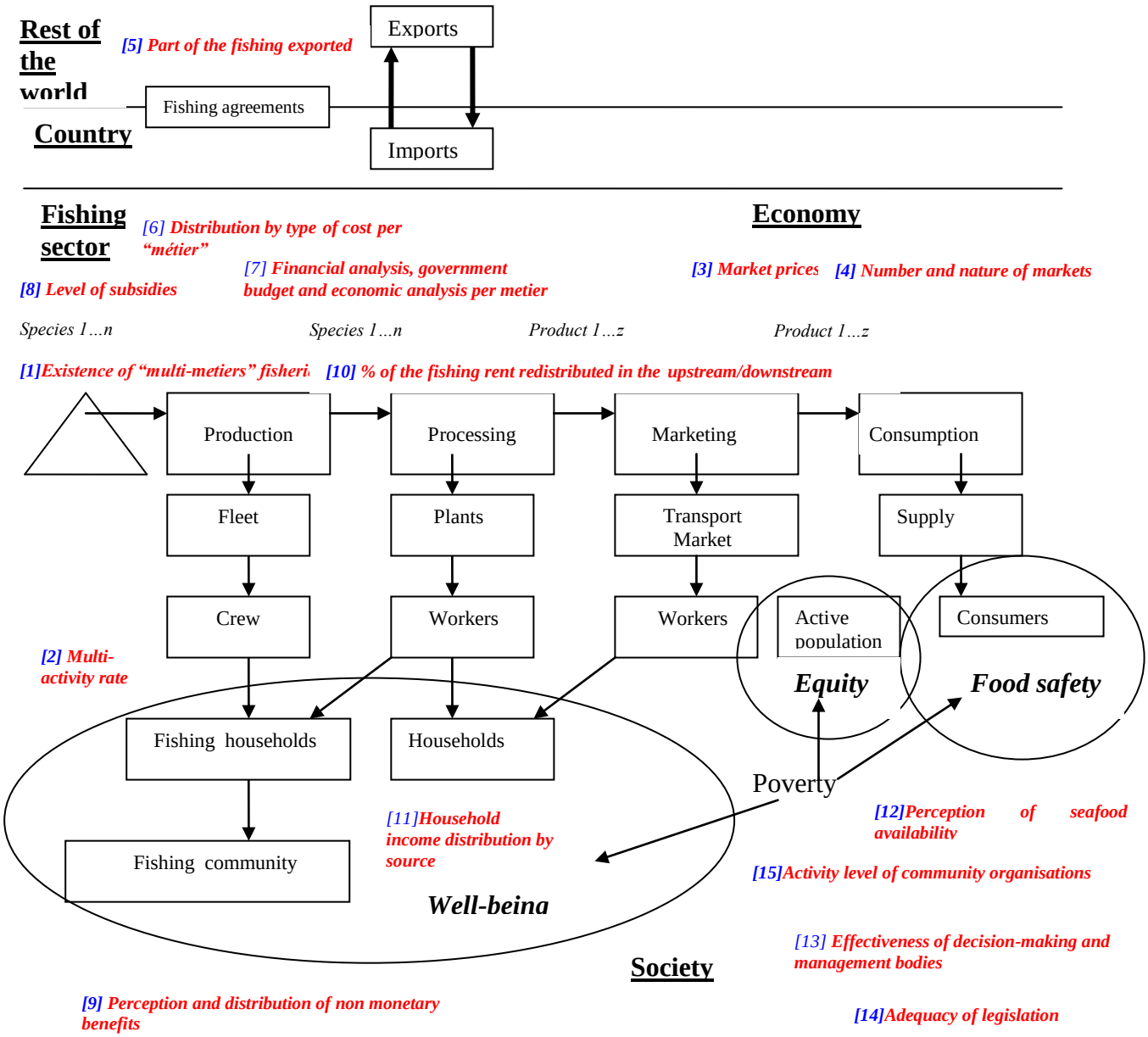
- *Indicator 14:* Adequacy of the legislation
This indicator obviously presupposes an enabling legislation, clearly defined enforcement procedures, a high level of stakeholder involvement in surveillance, monitoring and enforcement.

Criterion IX: Effective stakeholder participation and representation

This criterion relates to the representativeness, equity and efficacy of collaborative management systems, the resource user's capacity to effectively participate in co-management, community organisation and participation.

- *Indicator 15:* Activity level of community organisations
This indicator will measure whether a community organisation exists and whether it is effectively organised to participate in management. Investigations will focus on the equity and efficacy of these organisations and more generally on collaborative management systems.

Diagram 2: Structure of the ECOST Model and Socio-economic or Policy Indicators



VI. Data source, tasks and outputs

The comparative analysis within the eco-regions and between the eco-regions requires (for each indicator) data collection from the ECOST database, from secondary data and material on each subject, and from sample surveys or interviews in the case of marine protected areas. To reduce the field investigations, a single and similar sample survey could be conducted.

For logistic reasons, an example of a sample survey might be tested on the South East Asian ecosystem (Gulf of Thailand and *Mu Ko Chumphon* National Park, Mekong Delta and Mui *Ca Mau* National Park), before implementing it on Caribbean (Dominican Republic and *Parque Nacional del Este*) and West African ecosystems (Guinea Bissau and Biosphere Reserve of Bolama Bijagos Archipelago).

In accordance with the technical annex, the national coordinators will be responsible for the collection of secondary data and material as well as for conducting the sample surveys.

Data source and outputs for each indicator

Indicator	**Data source (unprotected zones)**	**Data source (MPAs)**	**Output**
1. Existence of "multi-*métiers*"	ECOST data base (secondary data)	Sample survey (primary data)	Table of complementary activities per *métier* with other *métiers*
2. Multi-activity and mono-activity rates	ECOST data base (secondary data)	Sample survey (primary data)	Table of the distribution of productive activities
3. Market prices	ECOST data base (secondary data)	Sample survey (primary data)	Table of market prices
4. Number and nature of markets	Secondary data	Sample survey (primary data)	Table of market characteristics of each product
5. Part of the fish exported to the regional or world markets	ECOST data base (secondary data)	Sample survey (primary data)	Table of the distribution of fish exported
6. Distribution by type of cost per *métier*	ECOST data base (secondary data)	Sample survey (primary data)	Table of costs per *métier*
7. Financial analysis, government budget and economic analysis per *métier*	ECOST data base	Sample survey (primary data)	Table of net cash flows per *métier* (financial analysis, government budget, economic analysis)
8. Level of subsidies	Secondary data	Secondary data	Table of subsidies per *métier*
9. Perception and distribution of non-monetary benefits	Secondary data	Sample survey (primary data)	Table on percentage distribution of scale values
10. Percentage of the fishing rent redistributed in the upstream/ downstream structure	Secondary data	Sample survey (primary data)	Table on percentage distribution of the fishing rent by main operator
11. Household income distribution by source	ECOST data base	Sample survey (primary data)	Table of the income distribution by source
12. Perceptions of seafood availability	Secondary data	Sample survey (primary data)	Table of seafood availability
13. The effectiveness of decision-making and management bodies	Secondary data	Management plans, interviews	A narrative on the effectiveness of decision-making and management bodies
14. The adequacy of the legislation	Secondary data	List of rules and regulations, interviews	A narrative on the adequacy of the legislation
15. The activity level of community organisations	Secondary data	List of community organisations interviews	A narrative on the activity level of community organisations

Indicative research activities plan

Activity	May 07 - July 07	August 07 - Nov 07	Dec 07 – March 08	April 08 – June 08	July 08 – Sept 08	Oct 08
Content and design of the sample survey	X					
Secondary data collection (Gulf of Thailand and Mekong Delta)		X				
Test of the sample survey and carrying out of interviews in *Chumphon* MPA (Gulf of Thailand) and *Ca Mau* MPA (Mekong Delta)		X				
Secondary data collection (Guinea Bissau)			X			
Carrying out of the sample survey in Bijagos Archipelago MPA (Guinea Bissau)			X			
Secondary data collection (Dominican Republic)				X		
Carrying out of the sample survey in *Parque nacional del Este* MPA (Dominican Republic)				X		
Data processing			X	X	X	
Final report						X

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