Socio-economic effects of management measures of the future CFP

Grant agreement no: 289192

Deliverable D2.1

Definition of high-level EU-wide fisheries sustainability objectives

Due date of deliverable: M6

Actual submission date: M8

Start date of the project: 03/2012

Duration: 36 months

Organisation name of lead contractor: MI

Revision: V1

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)

<table>
<thead>
<tr>
<th>Dissemination Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU Public</td>
</tr>
<tr>
<td>PP Restricted to other programme participants (including the Commission Services)</td>
</tr>
<tr>
<td>RE Restricted to a group specified by the consortium (including the Commission Services)</td>
</tr>
<tr>
<td>CO Confidential, only for members of the consortium (including the Commission Services)</td>
</tr>
</tbody>
</table>

Dissemination Level: X
# Table of Contents

1. Introduction ..................................................................................................................... 3
2. Background ....................................................................................................................... 3
3. Literature review ............................................................................................................ 4
4. Common Fisheries Policy ............................................................................................... 9
5. Prioritised variants of MSY from the Myfish project .................................................... 12
6. Providing a short list of overarching ecological, economic and social objectives .......... 13
   Ecological/biological objectives ....................................................................................... 13
   Economic sustainability objectives .................................................................................. 13
   Overarching social sustainability objectives .................................................................... 14
7. Summary and Outlook .................................................................................................... 15
8. References ..................................................................................................................... 16
1. Introduction

As one of the first tasks in the SOCIOEC project, a list of overarching, generic, fisheries management objectives which are easily understood was developed. These objectives should be broadly supported across a range of stakeholder groups. This was done by a workshop together with the MYFISH project and a literature review. After the description of the background, the results of a literature review will be presented. Within the basic regulation of the Common Fisheries Policy and other relating documents, explicit and implicit objectives are included. This can form part of the basis for the development of the overarching objectives. At the workshop with the MYFISH project, a prioritization of ecological, economic, and social objectives were discussed in regional subgroups. For the discussions in the first stakeholder interaction on prioritization of the overarching sustainability objectives on a regional level, a shorter list is provided with a description of possible indicators.

2. Background

The report is not a description of how to manage or negotiate trade-offs between objectives. There are numerous techniques including *inter alia* Analytic Hierarchy Process, Multi-Criteria Decision Analysis and Choice Experiments. These techniques may be applied in Step 2 of WP2, “Definition of operational sustainability objectives at the local level” where the high level objectives list will be tailored, further specified and prioritized for individual fisheries.

**Definitions:**

Sustainable development has been defined by the UN in the Brundtland Report as “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

The following definition of fisheries sustainability from the FAO Code of Conduct on Responsible Fisheries, although detailed, is more informative for our purposes and serves as a useful entry point into the multi-objective arena of fisheries management (FAO., 1995):

“A sustainable fishery protects the natural environment and the species which live in it, whilst allowing the responsible capture or production of fish for food.

*Target fish populations are at healthy levels, sometimes having recovered from being depleted in the past.*

*Protection of the natural environment and of non-target species, such as sea-birds, coral and marine mammals are required.*

*Good management will ensure a long-term future not just for the fishery and its environment, but also for the related fishing industry and all those who depend upon it for their livelihoods.*

We also need to draw a clear distinction between Objectives, Goals, Management Measures and Management frameworks or approaches. There is some confusion in the literature about these terms. O’Boyle and Jamieson (2006) produced a conceptual map in order to clarify what is intended by different authors using the same terms when discussing fisheries policy. The FAO Fisheries Managers Guidebook (Cochrane and Garcia, 2009) uses the term ‘goal’ to describe a broad aim and ‘objective’ to mean “the object of an action, or what is intended to be achieved”. O’Boyle and Jamieson use the term ‘conceptual objective’ to describe the same concept. They define conceptual...
objectives as "general statements that are uniformly accepted by all stakeholders as desirable. They are specific enough that everyone will interpret them the same way, but do not specify how they will be measured". For clarity this report will use the term “objectives” and will specify whether they are conceptual or operational throughout.

O’Boyle and Jamieson describe an operational objective as having “a direct and practical interpretation in the context of management and against which performance can be evaluated quantitatively. A specific statement that consists of a verb (e.g., maintain), a specific measurable indicator (e.g., estimated biomass), and a reference point (e.g., 50,000 t), thus allowing an action statement for management (e.g., maintain estimated biomass of a given forage species greater than 20,000 t biomass)”.

The FAO specify that operational objectives should be SMART, i.e. Specific, Measurable, Achievable, Relevant and Time-bound. More specific objectives, satisfying the SMART requirement outlined above, will be defined within the case study fisheries in Step 2 in collaboration with a broad stakeholder group.

We have tried, as far as possible to not include management measures or approaches which can sometimes creep in to the literature as if they were objectives themselves rather than the means by which to hopefully achieve them. Certain management measures, such as Marine Protected Areas, ITQ’s or Co-management may be seen by some as the end, the means and the overall management philosophy. In our case excluding measures and approaches on the grounds that they are not strictly speaking objectives was not always possible. Elimination of discards is included as an objective due to its prominence in the CFP reform agenda and Inclusive Governance due to its high ranking at the joint SocioEc and Myfish workshop on MSY variants.

3. Literature review

There has not been a major review of fisheries objectives and how they have evolved since Mardle et al (2002). Unclear objectives have been identified by many authors as the source of conflict and associated poor management outcomes (Crutchfield, 1967; Larkin, 1977; Cochrane, 2000; Commission, 2009). Crutchfield traces the lack of objectives back to the 1958 Geneva convention on fishing and living resources of the high seas. In 2009 the EU Commission identified unclear objectives as one of the 5 key problems contributing to management failure under the Common Fisheries Policy (CFP). This section is an analysis of selected key journal and policy papers on fisheries objectives which considers how objectives have evolved from an emphasis on biologically defined MSY to incorporate sustainability, ecosystem approach, governance and integration factors.

Table 1 below summarises the objectives under the three sustainability pillars. Generally all of the objectives expressed are conceptual with very few examples of specific objectives. Even the objective prioritisation papers (Leung et al., 1998; Mardle et al., 2002; Soma, 2003; Pascoe et al., 2009) which have worked within specific case study fisheries have avoided well-specified operational objectives.

Gulland (1977) is one of the first to include ecosystem, social and economic objectives to the biological MSY objective prevalent at the time. His paper presents a critique of the MSY concept, particularly in relation to its shortcomings in dealing with species interactions, natural variability, conflict between long-term versus short-term yields.
Colin Clark produced one of the first comprehensive lists of fisheries objectives in his 1985 book “Bio-Economic Modelling and Fisheries Management”, and his list is still widely cited (Jennings et al., 2001; Cochrane and Garcia, 2009). Clark divided objectives into three categories of sustainability, efficiency and equity which did not require much amending to fit to our three conventional pillars.

Charles (1989) attempted to model the impact of inclusion of social and labour-force objectives in addition to the more regularly modeled bio-economic factors with a “multi-objective optimisation framework”. His work found that if positive labour force benefits were part of the objective function then harvesting levels should be slightly higher than with simple rent maximization as the main objective. Charles also used biological sustainability as a firm constraint on harvest management options.

Parsons (1993) in describing objectives in Canadian fisheries management also critiques the MSY objective. He describes it as being useful as a first cut or “first index of production potential” but that neither it nor MEY deal with equity or social issues so neither should be considered as stand-alone targets for fisheries management. He describes Optimum Sustainable Yield (OSY) which was an attempt at defining a composite objective which would integrate biological, economic and social targets.

The 1995 FAO Code Of Conduct objectives are, like most global policy statements, extremely high level and are more like principles of good management than objectives. They would require at least another order of specification to be useful for this review.

Sainsbury et al (2000) gives examples of Management Strategy Evaluations which were useful in evaluating the effect of management measures on ecosystem objectives.

Mardle and Pascoe et al in 2002 published a paper on fisheries objectives as part of the EU 5th framework project “Multiple Objectives in the Management of EU fisheries”. They initially define an objective hierarchy tree for each of their 4 case study fisheries. Despite the fact that they were operating at specific fishery level within their case studies the objectives chosen are very general or conceptual e.g. optimize profits, and certainly do not satisfy either O’ Boyle and Jamieson or the FAO’s (SMART) definition of what operational objectives should do. Also broader ecosystem objectives do not feature strongly in the list.

The Ecosystem Approach has been described as sustainable development for fisheries (Parsons, 2005) and is described in both the current and proposed CFP documents as their overarching framework. Accordingly a statement of the conceptual objectives of the Ecosystem Approach is relevant to this review (FAO, 2003).

Hall & Mainprize (2004) in reviewing the application of fisheries objectives found that despite the fact that many fisheries objectives are explicitly economic or social the process of management focuses totally on biological reference points. Conversely when the final decision is made “social objectives such as maximizing employment or maintaining the status quo have frequently taken precedence over biological and economic considerations” despite the fact that they could find no example of such social objectives being codified as formal performance measures.
Table 1: Summary of the objectives under the three sustainability pillars

<table>
<thead>
<tr>
<th>Reference</th>
<th>Ecological / Biological objectives</th>
<th>Economic objectives</th>
<th>Social objectives</th>
<th>Governance or cross cutting objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gulland, 1977</td>
<td>Precautionary MSY based on long-term stable catches</td>
<td>MEY based on combined consumptive and non-consumptive value of all marine animals</td>
<td>Optimise food supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintain marine habitats</td>
<td>Optimise employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protect Marine mammals</td>
<td>Minimise conflict</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base management on good biological science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kendall, 1984</td>
<td>Conserve preferred stocks</td>
<td>Reduce overcapitalisation</td>
<td>Minimise conflict</td>
<td>Enhance standard of living for group or area</td>
</tr>
<tr>
<td></td>
<td>Utilise non-target fish</td>
<td>Improve fishers incomes</td>
<td>Maintain employment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ensure stable supply of fish to processors</td>
<td>Increase cost-effectiveness</td>
<td>Increase recreational fishing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clark, 1985</td>
<td>Maximise catches</td>
<td>Maximise profit</td>
<td>Provide employment</td>
<td>Improve foreign relations</td>
</tr>
<tr>
<td></td>
<td>Conserve fish stocks</td>
<td>Increase fishers incomes</td>
<td>Reduce conflicts</td>
<td>Reduce overcapacity</td>
</tr>
<tr>
<td></td>
<td>Stabilise stock levels</td>
<td>Maintain low consumer prices</td>
<td>Protect sports fisheries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stabilise catches</td>
<td>Increase cost-effectiveness</td>
<td>Increase women participation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintain healthy ecosystem</td>
<td>Increase exports</td>
<td>Reserve resources for local fishers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improve quality of fish</td>
<td>Increase foreign exchange</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevent waste of fish</td>
<td>Provide government revenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exploit under-utilised stocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charles, 1989</td>
<td>Conservation of the resource as overarching constraint</td>
<td>Generate economic wealth</td>
<td>Optimise food production</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generate reasonable incomes for fishermen</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintain well being and viability of fishing communities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAO Code of Conduct, 1995</td>
<td>MSY constrained by environmental and economic factors</td>
<td>Fishing must be economically viable</td>
<td>Account for fishers interests</td>
<td>Avoid excess fishing capacity</td>
</tr>
<tr>
<td></td>
<td>Conserve biodiversity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protect endangered species</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Restore depleted stocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimise adverse environmental impacts by human activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Account for species interactions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sainsbury, 2000</td>
<td>Protect rare or fragile ecosystems, habitats and organisms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conserve genetic, species and ecosystem biodiversity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sustainable manage incidental catches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Account for food chain interactions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------</td>
<td>------------------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Optimise catch</td>
<td>Optimise profit</td>
<td>Minimise catch &amp; discards</td>
<td>Maximise efficiency</td>
</tr>
<tr>
<td></td>
<td>Optimise stock</td>
<td>Minimise cost</td>
<td>Maximise ecosystem disruption</td>
<td>Minimise conflict</td>
</tr>
<tr>
<td></td>
<td>Minimise bycatch &amp; discards</td>
<td>Maximise efficiency</td>
<td>Stabilise supply to processors</td>
<td>Maximise employment</td>
</tr>
<tr>
<td></td>
<td>Minimise ecosystem disruption</td>
<td></td>
<td>Maximise employment</td>
<td></td>
</tr>
</tbody>
</table>

**WGECO report 2011**

- Halt the loss of marine biodiversity
- Secure marine capacity to provide goods & services
- Sustainable use biodiversity components
- By 2020 10% of marine areas to be protected areas

**FAO, 2003**

- Reduce fishing effort
- Increase the contribution of fishing to the national economy
- Maintain fish landings of commercially valuable species
- Maintain profit of the harvesting sector to that of similar industries
- Maintain spawning stock biomass of key retained species above a predefined limit
- Increase exports
- Maintain the level of fishing mortality for key retained species
- Maintain or increase economic contribution to community
- Reduce discards to the extent practical
- Reduce fleet capacity
- Reduce discards of high-risk species to predefined level
- Maintain / increase level of activity of indigenous community
- Reduce number of deaths of vulnerable or protected species
- Reduce the dependence of community on fishing
- Maintain same area of the fishery impacted by gear
- Increase amount of habitat protected by MPAs
- Increase ratio of large fish in the community
- Maintain ecological balance

**Kjaersgard, 2007**

- Optimise catch
- Optimise stock
- Minimise bycatch & discards
- Minimise ecosystem disruption

**Hilborn, 2007**

- Maximise biological production (MSY)
- Protect non-target species particularly charismatic ones
- Protect ecosystems

**WGECO report 2011**

- Halt the loss of marine biodiversity
- Equitable share the benefits of marine genetic resources

**FAO, 2003**

- Reduce fishing effort
- Increase the contribution of fishing to the national economy
- Maintain fish landings of commercially valuable species
- Maintain profit of the harvesting sector to that of similar industries
- Maintain spawning stock biomass of key retained species above a predefined limit
- Increase exports
- Maintain the level of fishing mortality for key retained species
- Maintain or increase economic contribution to community
- Reduce discards to the extent practical
- Reduce fleet capacity
- Reduce discards of high-risk species to predefined level
- Maintain / increase level of activity of indigenous community
- Reduce number of deaths of vulnerable or protected species
- Reduce the dependence of community on fishing
- Maintain same area of the fishery impacted by gear
- Increase amount of habitat protected by MPAs
- Increase ratio of large fish in the community
- Maintain ecological balance

**WGECO report 2011**

- Halt the loss of marine biodiversity
- Equitable share the benefits of marine genetic resources
Hilborn expressed the view that agreement on objectives was difficult to achieve due to there almost always being some conflict between them (Hilborn, 2007). He charts the trend of increasing emphasis on ecosystem preservation objectives and describes how this in some cases can result in foregoing a large proportion of the potential short-term yield. He outlines how many fisheries ‘failures’ could be classified as successes when measured against other objectives. His solution to this conflict lies in “eliminating open access and Olympic systems that provide incentives for high exploitation rates” through dedicated access programs. Only then will it become possible for stakeholders to agree on objectives and to move from the zone of traditional management to what he calls the zone of new consensus characterized by lower effort and employment but higher ecosystem preservation and profit.

Pascoe et al. (2009) provide a good example of more highly specified objective setting from an Australian fishery with use of various decision-making techniques which assist prioritization or trading off between conflicting objectives. The objective hierarchy developed is shown below in Figure 1.

The ICES WGECO Report from 2011 contained some additional detail on sub-objectives relevant to the objective of maintaining biodiversity (ICES., 2011). These are included in Table 1.

---

**Figure 1. Management objective hierarchy tree Australian Commonwealth fisheries, Pascoe et al, 2009**
4. Common Fisheries Policy

The European Commission in 2010 published a report summarising responses to a public consultation on their 2009 Green paper on CFP reform. In relation to objectives the report found general agreement that “ecological sustainability creates the basis for a viable fishing sector, with little long-term conflict between ecological, social and economic objectives”. However this is somewhat contradicted by the finding of some resistance to any a priori prioritization of objectives with the balance between the three legs of the sustainability stool being emphasized by industry. MSY is emphasized as a desirable objective with industry again looking to have all three pillars included under the definition of ‘sustainable’ while environmental groups sought to have wider ecosystem impacts of fisheries included within the concept. There is some diversity in perspectives on a discard ban ranging from total support to views that discards are an inherent aspect of mixed fisheries.

The 2011 Commission proposal documents on discards, MSY, regionalization, the social dimension and transferable fishing concessions contained a large number of either explicitly expressed or implicit objectives. These are summarised in Table 2 along with objectives contained in the 2012 basic CFP regulation proposal. The discards document gives no objective or rational justification for its position of banning discards in all European fisheries. So a discards ban is obviously viewed by the Commission as an end in itself rather than a measure to achieve a broader objective.

The MSY document attaches a large number of associated benefits or objectives to the achievement of managing fisheries at MSY level. These include stabilisation of catches, preservation of stocks, reduction of fishing pressure, increase in average size and hence value of fish, maintenance of economic resilience of fleets, increased profits and return on investment, increased CPUE, reduced costs, decreased carbon emissions, positive contribution to GES and increased consumer choice of fish from healthy stocks.

The regionalisation document discusses management approaches such as increased industry responsibility and an associated move away from micro-management and tailoring of rules to specific fisheries rather than objectives in the strict sense of the definition.

The document on the Social Dimension of the CFP (ref) lists the following explicit objectives:

- reversing the decline in employment in the fisheries sector, particularly in catching;
- increasing the attractiveness of the fisheries sector and turning it into a source of high quality jobs;
- ensuring the viability of coastal communities by promoting economic growth and jobs;
- facilitating the transition to a sustainable fishing;
- unlock the potential of European aquaculture to expand and create new jobs in inland as well as in marine aquaculture.

This document also emphasizes support for small-scale fisheries as an implicit objective.

The Transferable Fishing Concessions (TFC) document, like the MSY one, attaches a wide range of desirable outcomes or objective achievements to the successful implementation of a TFC system for over 12m vessels in all EU fisheries. These positives include: reduction of overcapacity; an enhanced capacity for vessels to maximise economic returns by planning their operations and fishing for for the market, increased industry responsibility, reduction of discards and facilitating the leaving of fishing for those inclined.
### Table 2: CFP Objectives from proposed basic and other regulations

<table>
<thead>
<tr>
<th>Ecological / Biological objectives</th>
<th>Economic Objectives</th>
<th>Social Objectives</th>
<th>Cross-cutting or Governance Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precautionary approach, fishing at MSY by 2015</td>
<td>Through the use of Transferable Fishing Concessions (for vessels over 12 m) reduce overcapacity &amp; improve profits</td>
<td>Contribute to a fair standard of living for those dependent on fishing</td>
<td>Enhance data Collection</td>
</tr>
<tr>
<td>Apply ecosystem approach to minimise ecological impact of fisheries</td>
<td>Increase incomes</td>
<td>Increase consumer choice of fish from healthy stocks</td>
<td>Improve policy through regionalisation and industry participation</td>
</tr>
<tr>
<td>Integrate other EU environmental legislation</td>
<td>Increase CPUE</td>
<td>Provide transparent Info to consumers</td>
<td>Adapt rules to regional and local fisheries</td>
</tr>
<tr>
<td>Eliminate discards gradually</td>
<td>Increase P.O.’s capacity to promote market-led fishing plans</td>
<td>Improve employment especially in the catching sector</td>
<td></td>
</tr>
<tr>
<td>Multi-stock, multi-annual mgmt. Plans</td>
<td>Increase sector attractiveness through improved economic and working conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base mgmt on sound scientific advice and improve science-industry partnerships</td>
<td>Ensure viability of coastal communities</td>
<td>Facilitate transition to sustainability through targeted funding</td>
<td></td>
</tr>
<tr>
<td>Improve data reliability</td>
<td></td>
<td>Support small-scale fisheries</td>
<td></td>
</tr>
<tr>
<td>Decrease carbon emissions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The 2012 EU Commission proposal for a basic regulation on the CFP lists the following general and specific objectives in Articles 2 and 3.

“Article 2 - General Objectives.
1. The CFP shall ensure that fishing and aquaculture activities provide long-term sustainable environmental, economic and social conditions and contribute to the availability of food supplies.
2. The CFP shall apply the precautionary approach to fisheries management, and shall aim to ensure, by 2015, that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield.
3. The CFP shall implement the ecosystem-based approach to fisheries management to ensure that the impacts of fishing activities on the marine ecosystem are limited.
4. The CFP shall integrate the Union environmental legislation requirements.

Article 3 - Specific objectives.
For the purpose of achieving the general objectives set out in Article 2, the CFP shall in particular:
(a) eliminate unwanted catches of commercial stocks and gradually ensure that all catches of such stocks are landed;
(b) provide conditions for efficient fishing activities within an economically viable and competitive fishing industry;
(c) promote the development of Union aquaculture activities to contribute to food security and employment in coastal and rural areas;
(d) contribute to a fair standard of living for those who depend on fishing activities;
(e) take into account the interests of consumers;
(f) ensure systematic and harmonised data collection and management.”

The basic regulation wording is still being debated and thousands of amendments have been tabled. It is to be hoped that these basic objectives are unlikely to change radically although some of the specifics on how objectives such as a discard ban can be achieved (Article 15) may undergo some significant changes. In any case these will be overarching objectives that our objectives list must be consistent with.

The following MSFD environmental objectives (slightly paraphrased to read as objectives rather than descriptors, see Table 3) are also strong constraints on our list of fisheries sustainability objectives (European Council and Parliament, 2008).

Table 3: MSFD / GES fishery related objectives

| Descriptor 1 | Maintain biological diversity in line with prevailing conditions |
| Descriptor 3 | Maintain commercially exploited fish stocks within safe biological limits with an age and size distribution indicative of healthy stock |
| Descriptor 4 | Maintain all marine food web elements at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species |
| Descriptor 6 | Ensure sea-floor integrity supports the structure and functions of the ecosystems, especially benthic ecosystems. |
5. Prioritised variants of MSY from the Myfish project

At a joint workshop for the SocioEc and Myfish projects an inclusive list of different variants of MSY were discussed and prioritised as to their suitability as fisheries management objectives. The list included a total of 24 variants covering traditional biologically (MSY) and economically (MEY) defined variants and also variants which accounted for social factors (MSOY), resilience or risk factors (MSUS) and ecosystem biomass (MESY). A list of sustainability constraints was also defined at the joint workshop. Some of these, such as discard reduction or areas with fishing restrictions, are relevant to our list of objectives also.

These variants were assessed by a diverse panel of 58 participants from 12 universities, 14 fisheries research institutes, 8 industry organisations, 3 NGOs and 3 management organisations. Participants were split into groups based on regional seas and assessed the variants, constraints and management measures on the criteria of data availability, responsiveness to management actions and likely performance. The results of the prioritisation exercise are given in Table 4. We are using this prioritisation of MSY variants as proxies for suitability of fisheries objectives. Accordingly the list has also been re-ordered in Table 5 under the three pillars. The MSY variants, when expressed as objectives are typically more specific than most examples from the literature or from policy. I have tried to use this specificity to our advantage in drawing up the final shortlist of objectives by giving options or guidance in how a high level objective could be further specified in individual fisheries.

Table 4: Ranking of MSY variants from Myfish workshop, April, 2012

<table>
<thead>
<tr>
<th>Rank</th>
<th>Variant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maximise inclusive governance</td>
</tr>
<tr>
<td>2</td>
<td>Maximise yield in value of key commercial species</td>
</tr>
<tr>
<td>3</td>
<td>Maximise Gross Value Added</td>
</tr>
<tr>
<td>4</td>
<td>Maximise yield in value</td>
</tr>
<tr>
<td>5</td>
<td>Maximise Net Present Value</td>
</tr>
<tr>
<td>6</td>
<td>Maximise yield in tonnes of key commercial species</td>
</tr>
<tr>
<td>7</td>
<td>Minimise risk of falling outside constraints</td>
</tr>
<tr>
<td>8</td>
<td>Maximise Resource Rent</td>
</tr>
<tr>
<td>9</td>
<td>Maximise health benefit/CO₂</td>
</tr>
<tr>
<td>10</td>
<td>Maximise yield in tonnes</td>
</tr>
<tr>
<td>11</td>
<td>Maximise present yield for human consumption</td>
</tr>
<tr>
<td>12</td>
<td>Maximise useful knowledge</td>
</tr>
<tr>
<td>13</td>
<td>Maximise willingness to invest in the future fisheries</td>
</tr>
<tr>
<td>14</td>
<td>Maximise stability</td>
</tr>
<tr>
<td>15</td>
<td>Maximise employment on viable fishing units</td>
</tr>
<tr>
<td>16</td>
<td>Maximise catch in tonnes</td>
</tr>
<tr>
<td>17</td>
<td>Maximise Social Yield</td>
</tr>
<tr>
<td>18</td>
<td>Maximise consumer welfare/happiness</td>
</tr>
<tr>
<td>19</td>
<td>Maximise fisher welfare/happiness</td>
</tr>
<tr>
<td>20</td>
<td>Optimize number of fishing units</td>
</tr>
<tr>
<td>21</td>
<td>Maximise fishing community viability</td>
</tr>
<tr>
<td>22</td>
<td>Maximise resilience</td>
</tr>
<tr>
<td>23</td>
<td>Maximise GVA over the entire value chain</td>
</tr>
<tr>
<td>24</td>
<td>Maximise community biomass</td>
</tr>
</tbody>
</table>
Table 5: MSY variants ranked in order per sustainability pillar

<table>
<thead>
<tr>
<th>MSY</th>
<th>MEY</th>
<th>MSOY</th>
<th>MSUS &amp; MESY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximise yield in value of commercial species</td>
<td>Maximise Gross Value Added</td>
<td>Maximise inclusive governance</td>
<td>Minimise risk of falling outside constraints</td>
</tr>
<tr>
<td>Maximise yield in value</td>
<td>Maximise Net Present Value</td>
<td>Maximise health benefit / CO₂</td>
<td>Maximise stability</td>
</tr>
<tr>
<td>Maximise yield in tonnes of key commercial species</td>
<td>Maximise Resource Rent</td>
<td>Maximise useful knowledge</td>
<td>Maximise resilience</td>
</tr>
<tr>
<td>Maximise yield in tonnes</td>
<td>Optimize number of fishing units</td>
<td>Maximise willingness to invest in the future fisheries</td>
<td></td>
</tr>
<tr>
<td>Maximise present yield for human consumption</td>
<td>Maximise employment on viable fishing units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximise catch in tonnes</td>
<td>Maximise Social Yield</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximise community biomass</td>
<td>Maximise consumer welfare / happiness</td>
<td>Maximise fisher welfare / happiness</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximise fishing community viability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximise GVA over the entire value chain</td>
<td></td>
</tr>
</tbody>
</table>

6. Providing a short list of overarching ecological, economic and social objectives

Ecological/biological objectives
For ecological/biological objectives we have already a political consensus following the WSSD in Johannesburg which is likely to be adopted in the new CFP. Until 2015 the fishing mortality of all stocks shall be at the level of Fmsy for stocks were Fmsy is calculated. Although the WSSD defined MSY on a stock level instead of agreeing on Fmsy as the target the agreement will be to reach Fmsy as the stock level is influenced by many factors outside of fisheries management while F is changeable by management actions.

For the discussion with the stakeholders we propose the following overarching principles:

At the societal level (owner of the resource):
- Maximize yield in tonnes of commercial species
- Gradually eliminate discards on a case-by-case basis
- Minimizing bycatch of vulnerable and protected species
- Minimizing negative impact on seabed habitats

Economic sustainability objectives
During the joint workshop between the SOCIOEC and MYFISH projects in Vigo a mixed group of scientists, stakeholders, RAC representatives and regional managers discussed economic concerns regarding objectives, targets, etc. with respect to future fisheries management.

One of the basic results was to distinguish between the level of society (owner of the resource) and that of companies (or individual fishermen). As sustainability is on the long term development also this has to be taken into account.
The first discussion on ‘what to maximise’ dealt with the long-term objectives and the level of society. At the societal level the following objectives were discussed:

- **Rent/MEY**: What is beyond normal profits (explained later) we call rent. The rent and profits depend on many variables managers and fishermen are not able to control like market prices. This makes MEY a complicated target.

- **Value chain**: whole value chain of a fishery -> problem to optimize every part of it. The indicator for that may be Gross Value Added (GVA) also including the fish processing and auxiliary industry.

- **Utility**: In economics we often talk about maximizing utility, and then we also measure this utility in money units (calculating the so-called ‘total economic value’). In the case of fisheries we can also think about maximizing utility by taking other parts of utility into account and valuing them (e.g. ecosystem services, amenity values). Through an impact assessment or a Life Cycle Analysis as not all components of the value chain are positive: there are also externalized costs that need to be valued. This is also an issue when comparing societal interests and the interest of an individual fisherman (Gross Value Added in the interest of society, profit/making a living in the interest of an individual (small scale) fishermen).

At the company level several objectives/targets and indicators are possible:

- **GVA**: In this case on a company level as defined in the Annual Economic Report (AER) of the STECF. It would be the contribution of the firm to society.

- **Profit**: This is the typical maximization target on a company level. Two cases are to be distinguished: 1) The owners of larger companies will try to have at least a ‘normal profit’ of zero as then all costs (including capital costs and some kind of personal payment for the owner) are paid. This means rent on a company level. 2) Small-scale fishermen where ‘normal profits’ may not be the basic aim, more to make a living from fishing.

From this discussion and other sources we draw the following conclusion in form of three overarching objectives for economic sustainability:

*Long term societal interest*: maximization/optimization of present value

*Short term societal interest*: maximization/optimization of gross value added (or rent)

*Company level*: maximization of profits (within ecological and social constraints).

We will start discussions with stakeholders on the acceptability of these three objectives and where agreement is reached how to define them on a regional/local level.

**Overarching social sustainability objectives**

From the discussion at the workshop in Vigo we draw the following conclusion for three overarching principles.

Long term societal interests: Ensure viable coastal communities
Long term societal interests: Improve policy and decision making through improved inclusive governance structures.

Long term individual interest: Ensure fair living standard, improved working and security conditions on board of fishing vessels.

7. Summary and Outlook

This is a preliminary list of indicators relevant to our overarching objectives – these will more than likely be amended based on local discussions and data availability considerations.

**Ecological/biological:**
Maximize yield in tonnes of commercial species: In order to monitor success or failure in achieving this objective we would require scientific data which would allow the calculation of yield corresponding to Fmsy and also landings data for those species. This is a relatively straightforward objective and for most major European fisheries this data should be available.

Gradually eliminate discards on a case-by-case basis: the indicator for this objective is the species discard level per fishery. However there are numerous practical issues with monitoring this indicator at the level of individual vessels.

Minimizing bycatch of vulnerable and protected species: The indicator for this objective is Bycatch/Mortality levels per fishery for the relevant species. This data may be available for some fisheries and species but overall is patchy.

Minimizing negative impact of bottom habitats: The likely indicator for sea floor integrity at a general scale will be to use mapped fishing effort (by gear and size) combined with empirical and modelled relationships between gear type and habitat type to develop a habitat impact metric. So for example a dredge might have high impact on natural reefs and little on sand. The overall management goal would be to manage effort on vulnerable habitat/gear combinations.

**Economic objectives:**

Maximization/optimization of present value:

Maximization/optimization of gross value added (or rent):

Maximization of profits (within ecosystem and social constraints):
Social Objectives

Ensure viable coastal communities: The indicator for this objective would be a composite one based on factors such as employment and opportunities for young fishermen. In many cases data may not be available for monitoring this indicator and would have to be gathered by survey.

Improve policy and decision making through improved inclusive governance structures: The indicator for this objective is the presence of a co-management or self-management process which includes a range of stakeholders and where responsibility for management actions is shared. At the level of presence or absence of a management forum the data should be available but surveys may be required to assess how inclusive the governance framework is in reality.

Ensure fair living standard, improved working and security conditions on board of fishing vessels: The indicator for this objective is also a composite one, including factors such as wage levels of skippers and crew, hours spent working and the number of accidents. In many cases at least some of this data will not be available and will have to gathered for each relevant fishery.

8. References


