SOCIOEC – SOCIO-ECONOMIC EFFECTS OF MANAGEMENT MEASURES OF THE FUTURE CFP – OVERVIEW ON A NEW EUROPEAN FP 7 PROJECT[1]

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ABSTRACT

The EU FP 7 project 'SOCIOEC' started in March 2012 and this paper gives an overview on the main research questions and first results.

SOCIOEC is an interdisciplinary project bringing together scientists from several fisheries sciences with industry partners and other key stakeholders to work on solutions for future fisheries management that can be implemented at a regional level. The first step will be to develop a coherent and consistent set of management objectives, which will address ecological; economic and social sustainability targets. The objectives should be consistent with the aims of the CFP, MSFD and other EU directives, but they should also be understandable by the wider stakeholder community and engage their support. This will then lead to the proposal of a number of potential management measures, based on existing or new approaches. The second step will be to analyze the incentives for compliance provided by these measures examining fisher's responses and perceptions based on historical analysis as well as direct consultation and interviews. This project part will also examine how the governance can be changed to facilitate self- and co-management to ensure fishers buy-in to promising management measures. Finally, the project will examine the impacts of the management measures that emerge from this process, particularly in terms of their economic and social impacts. The IA analysis will be integrated by evaluating the proposed measures against the criteria of effectiveness, efficiency and coherence. Special attention will be paid to the evaluation of the proposed management measures' performance in terms of their ability to achieve the general and specific ecological objectives.

Keywords: Socio economic impact assessment, SOCIOEC research project, EU fisheries policy

Introduction

The EU Commission issued a call for a project on the socio-economic effects of fisheries management measures of the revised CFP. The new CFP basic regulation should be in force from January 2013 but the process of adoption by EU Council and Parliament is delayed and the regulation will probably be adopted in June 2013. The project is organised in seven workpackages to answer the main research question of the call: overall objectives of the CFP, incentive structure of management measures, better governance and integration of stakeholders and improvement of methods for socio-economic impact assessment. The paper gives, firstly, an overview on the project and describes the research plans for the four main work packages. Secondly, as the project just started, only the results of the first general discussion on economic sustainability objectives can be included. In a focus group discussion during a joint workshop with the MYFISH project possible objectives were identified with Maximum Economic Yield (MEY) appearing most prominently, as it is an objective in the Australian fisheries policy. The paper finishes with an outlook on the future research in the SOCIOEC project.

Overview on the SOCIOEC-project

The Common Fisheries Policy (CFP) is actually under revision. The EU-Commission published an analysis of the current basic regulation (EU 2371/2002) in 2009 and stated that there are still great structural problems in the implementation of a sustainable exploitation of fish stocks. The EU-Commission then published within the 7th framework research program a call for a project to address some of these structural problems by analyzing the overarching objectives of the CFP (WP 2), the incentive structure in actual and future management measures (WP 3), the possible governance structure for a better integration of stakeholders and fishermen in the management process (WP 4) and improvement of the methods for socio-economic impact assessment of management measures (WP 5). The consortium set up the following project structure (see Fig. 1).

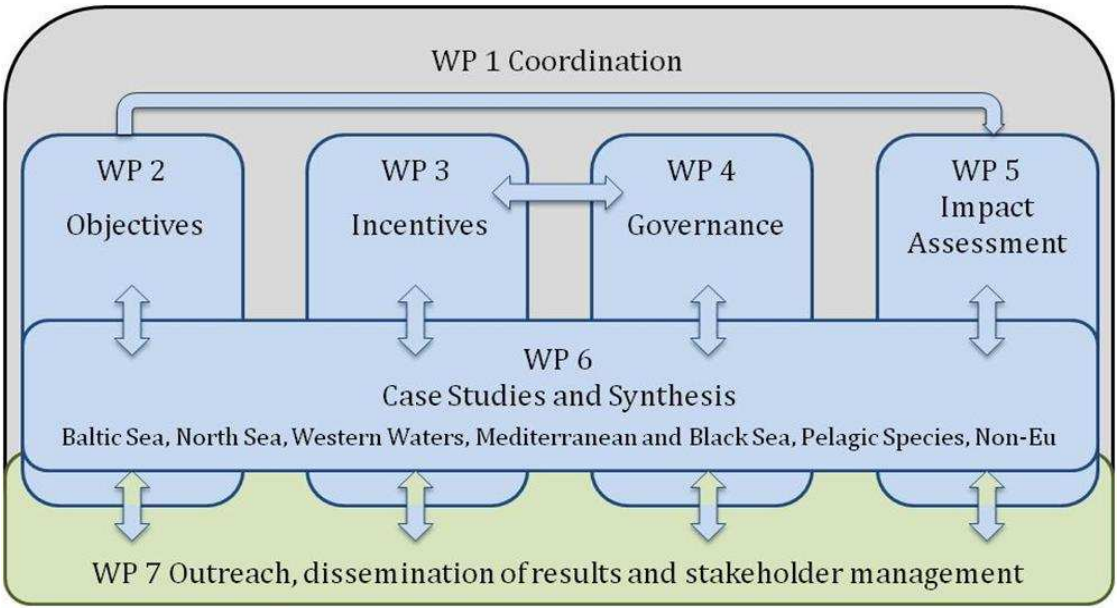

Fig. 1: Overall structure of the SOCIOEC project

The work has been organized along Case Studies which will follow a regional seas context (e.g. Baltic or North Sea) very similar to the defined areas of the Regional Advisory Councils (RAC). Within these areas several fisheries will be analysed with actual (blue) and possible future (red) management measures. Table 1 (see next page) gives an overview on the planned case studies and management measures.

As Council and Parliament are still debating the new basic regulation it is at this point necessary to be flexible and possibly adjust the research program. It seems clear that at least for the discard ban we may have to adjust the research program a bit as the Council changed the COM proposal from a species to a fisheries approach. Discards would then be banned first in pelagic fisheries, then demersal fisheries and from 2018 on in all fisheries. In the same way, it seems at this point that the EU wise ITQ system in the proposal will shift to a voluntary scheme to be decided at national level. This would also require the adaptation of the research programme, for example with respect to governance issues as the focus shifts now towards national governments.

Overarching principles of the CFP

In general there is a broad agreement that a sustainable exploitation of resources has to be the central premise of future fisheries management [1]. Sustainable development has then been defined by the UN (Brundtland-Report 'Our Common Future' ([2]) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (http://www.un-documents.net/ocf-02.htm). Sustainability can be considered in terms of the three pillars of sustainability developed by the UN at the 2002 Johannesburg Summit and elaborated by the EU in terms of environmental, economic and social sustainability (see [3]). Therefore, the sustainability concept has strong ecological and ethical roots – without ignoring the necessities for exploitation (industry and well being of people, see [4]). Within WP 2 we will start with an analysis of the basic concepts to define the overarching principles of sustainability within the three pillar concept. However, as background we draw also on the sustainability debate within a socio-economic context.

In the new field of sustainability economics two basic sustainability concepts are distinguished: weak and strong sustainability ([5]). The concept of weak sustainability is based on the work of Solow ([6]) on the substitutability of natural resources (especially non-renewable). If natural capital (NC, resources) are perfectly substitutable with man-made capital, then non-declining utility per capita over time can theoretically be maintained by a constant overall capital stock of a society and it doesn't matter what capital (natural or man-made)[2] delivers the benefits. In the marine fishery context this would imply that reduction in stocks could be balanced by economic gain, regardless of other impacts e.g. on the ecosystem ([7]).The concept of strong sustainability assumes that there is limited substitutability between natural and man-made capital, and this leads to the obligation of preserving natural capital for future generations - according to the Constant Natural Capital Rule ([8]). Moreover, since natural capital is not homogeneous even the substitutability within the natural capital itself is limited ([9]). The limited substitutability of NC (basically fish stocks and the supporting ecosystems) is in fisheries almost a given, as the fishing activity itself needs a fish stock. Moreover, especially in fisheries the three dimensions of

sustainability are intimately connected. How these different definitions and understandings of sustainability influence the outcome of the definition of clear objectives in fisheries management must be elaborated and the reference indicators and levels associated to this.

Table 1: Overview on the planned analysis of management measures within the Case Study Areas (blue refers to current management measures while red refers to potential future measures) [2]

Management / Case studies			Baltic Sea	North Sea	West. Waters	Med. & Black Sea	Pela-gic	non EU
Measures	Conservation	TAC						
		Catch quota						
		Effort regulation						
		Long-term plans						
		Technical measures						
		Over-quota landing tax [3]						[4]
	Access	IQ						
		ITQ						
		ITE						
		TURF						
	Others	MPAs						
		Certification						
		Subsidies						
Processes	Regionalisation		Partly Helcom					
	Co-management							
	Self-management							
Issues	Mixed fisheries		[5]					
	Small scale fisheries							[6]

One of the main research activities of the project will be to develop a series of broad, generic objectives that encompass the three sustainability dimensions, and focus on their application in any future revision of the CFP. This will be done, firstly, through a literature review. The overview from the literature will include both conceptual studies and real-world experiences, including examples outside Europe. In many cases the three objectives have been present in fisheries management policies for many years, both at EU (CFP) and national levels. Therefore, the review should also include an appraisal of how these objectives were addressed in the past, particularly in the CFP. The review should in particular identify failures, successes, and where possible their raison d'être. From a research perspective, the analysis of objectives considered by SOCIOEC will include examples covering a wide range of management approaches discussed in the project, as technical measures, command and control instruments (e.g. quota management), market instruments, structural programme instruments and social instruments.

In April 2012 the FP 7 projects MYFISH and SOCIOEC had a common workshop with high level stakeholders (e.g. RAC representatives, NGOs on the European level) regarding the overarching principles of the CFP. The focus for MYFISH was more the longer term perspective on the main targets of fisheries management (beyond simply achieving MSY). For SOCIOEC the discussion was slightly more focused on how to interpret the actual principles in the CFP for ecological, social and economic sustainability. Following from that discussion, first results from the economic discussion will be presented later in this paper. The next step will be to organize focused group discussion in the case study areas to fine-tune the overarching principles into a set of targets/indicators on the regional/company level. This will include the consideration of obstacles to the

implementation of sustainable fisheries management, with results from the literature review, and the development of a list of objectives that would be applicable more locally, but still comply with the overarching objectives. It is likely that there may need to be some adjustment of the overarching objectives subsequently, where for example, a synthesis of the regional responses indicate that an overarching objective has little or no currency at any regional level. With clearer objectives on the regional as well as the broader EU level, we will then interpret these objectives in the context of the individual case study fisheries, and present second level objectives that are consistent with those on the EU and regional level, and appropriate for the fishery in question.

Incentives of existing and future management measures

The EU Commission itself and many others have already analysed the structural failures and the problems of the current CFP ([10], [11], [12]). There is a general understanding that these structural failures have to do with wrong incentives leading to fishers' behavioral responses which conflict with the aim of the CFP (encouraging sustainable exploitation of natural resources) and that stakeholder influence and involvement on a regional basis is not strong.[7] However, for some of the general perceptions concerning the wrong incentives we have relatively little empirical evidence (e.g. how fishers value future gains and losses with implicit discount rates). Additionally, we only have limited knowledge on fishers' behavioural responses to certain frame conditions and incentives.

We draw here also on the WP 2 discussion on social sustainability as the social background of fishermen influences the incentive structure. The concept of sustainable development in a social context includes concepts such as employment, food security and worker safety among others, but can also include a cultural dimension. This can comprise the issues of ethical orientation and action-leading values, lifestyle debates, cultural diversity, traditional knowledge and skills, local and regional space of reasoning and acting, gender issues etc. ([13]). So, the social and the cultural context can also play a crucial role in informing fisheries management. This is particularly the case with coastal, small-scale fisheries, in which locally rooted knowledge and traditional skills are still maintained and passed on, and the concept of a sustainable management might still interact with traditional values that we seek to maintain. In Canada, for example, fisheries management decisions include the spiritual role of salmon in first nation cultures. Moreover, the role of the fishing sector for coastal communities in a time of huge changes in societies, the positive effects on tourism, and generally on the local culture can play a significant role for regional development. Therefore from a management perspective the cultural perception of fishing as an activity needs to be taken into account when developing new or existing measures, as in many areas of Europe, fishing is concentrated in marginal areas where the local cultural ethos (as well as economic viability) is strongly linked to fishing. These aspects are clearly connected not only to social or cultural themes, but also to economic and ecological issues and will be given an outstanding consideration.

The cultural and social dimensions for the local community will be examined with particular attention to gender issues in this project. As a working hypothesis to be verified, one can plausibly suggest that the working conditions in the fisheries sector have led to a traditional division of labour (men out at sea, women working in the processing sector) due not only to the physically hard work but also to the problems of reconciling child care (mothering and more recently fathering) with the necessity of spending long periods or at least the whole week away from home. This might also explain the recently diminishing interest of the young generation (both men and women) in a career in the fisheries sector. Attempts to meet these needs and consider such impasses are currently being addressed ([14]). Competitive wages are also needed to attract new entrants into fishing, while decreaseing job opportunities in other sectors might be making fisheries more attractive in certain local communities.

The incentive structure and associated behavioral responses of fishers will be analysed using several methods within the case study research design. Each case study follows the same line of thinking in order to be able to make generalizations that will serve for the management toolbox afterwards. Overall four methods will be used to assess the incentive structures behind fisheries management measures in a way that adapts to the qualitative differences of the targeted populations and also to the available resources for data collection and contact stakeholder.

The first method is the collection and evaluation of existing literature in the area, specifically related to incentives. Much research has already been done on incentives, and presenting different viewpoints/disciplines ([15], [16], [17]) These interdisciplinary data that digs into the potential causes of the different performance of management measures will have our specific attention, as these were usually lacking in previous studies. We will review this research, use what is appropriate and add new elements to it as for example those referring to the specific evolution of the CFP and the challenges that are presented at the set out of any of our project case studies.

The second basic method will consist of conducting interviews with fishers, complemented with interviews with people surrounding fishers, such as crew members, relatives, bank employees, etc. who possibly influence fishers' decisions. This method will be applied e.g. to the Irish component of the Western Waters fisheries in a first stage, and to other fisheries/CS wherever possible. The interviewing technique ([18], [19]) is used to collect qualitative data by setting up a situation (the interview) that allows a respondent the time and scope to talk about their opinions on a particular subject. It is a very simple, efficient and practical way of getting data about things that cannot be easily observed, quantified and that are complex, such as reasons behind behaviour. The interview questions will focus on incentives. We will give particular attention to technical measures (e.g. mesh sizes), command and control instruments (e.g. TACs and quotas, effort), market instruments (e.g. transferability of collective or individual rights), and social instruments in the way they influence fishers' (compliance) behaviour. In addition to these instruments, we will also give attention to incentives created by non-instrumental factors, such as market factors (prices, certification, alternative employment), biological factors (fish stock abundance, availability, distribution, growth, recruitment, etc.), and social factors (peer pressure, succession issues, and gender aspects).

During the interviews we will also reserve time to use choice experiments (CE) to analyze which management measures and at what organization level, create the right incentives to tackle the main structural failings in one or more of the case study fisheries ([20] and [21]). In a CE framework, choices are broken down into component attributes, which are presented to respondents normally as a combination set of the attributes. Respondents are then presented with a sequence of these choice sets, each containing alternative descriptions of the fisheries management choices, differentiated by attributes and levels. Respondents are then asked to state their preferred alternative within the choice set ([22] and [19]). By observing and modelling how respondents change their preferred option in response to the changes in the levels of the attributes, it is possible to determine how fishers trade-off between the different management options. By including change in landings revenue or income as one of the attributes of each option, the monetary welfare impact of moving from the status quo fishing policy today to an alternative fishing policy with attribute levels set to be representative of what would result under alternative management strategies (representing perhaps in our case a change in CFP as represented by different levels of the management attributes) can be calculated. To date, no paper in the literature has considered the use of CEs based on the theoretical framework of random utility models, to examine the preferences of fishers for alternative management options in their respective fisheries. This project proposes to fill this gap in the literature.

The third method will investigate the impact of various forms of rights-based management (RBM) on short-term fleet dynamics. The methodology will build on discrete-choice models (Random Utility Models, RUM), which have been widely used in the fisheries literature ([23], to evaluate the impact of closed areas ([24], [25]), and also of Individual Transferable Quota (ITQs) ([26]). This method will primarily build on Western Waters mixed fisheries, but the code developed will be made adequately generic to be applied to other case studies using the standard data exchange format delivered by WP6 (integration and information flow across case studies). A challenge here will be to apply this method, building on data-driven RUMs, to fisheries where RBM have not been implemented formally until now (the great majority of EU fisheries), as it is one of the aims of the project to analyse not only current management measures but also potentially useful ones. To overcome that challenge, we propose a dual approach. First, we will ask the participating Producer Organisation representatives to provide quantitative information on the catch portfolios allotted to their members. We will then combine these quantitative inputs with effort data given in log-books to calibrate discrete choice models. Because a risk exists that such data will not be available, a second approach will be to consider that the changes brought about by RBM are mainly technical and information-related, in which case effort allocation could in principle be estimated as a measure of polyvalence and mobility of fleets in the case study.

As a fourth method we propose the game table approach "ecoOcean" see also [27]) basically for the Baltic and North Sea case study. This is a graphical interface presenting a cellular based projection of an ocean with fish stocks, where up to four players/users (representing different stakeholders) can navigate their vessels and trawls. The representation will be designed in a participatory manner, such that the user would agree on the general dynamics of stocks and of their exploitation. Different management measures, e.g. closed areas, TAC, ITQs, can be simulated to play through socially interacting groups with stakeholders in a focus group like situation and to analyse incentive structures and responses. Furthermore, this allows the researchers to observe behaviour in a different context than a one-to-one interview, including for example cooperative behavior or peer pressure. We plan to use this game table additionally to simulate management measures fishers propose for the future and to simulate results. For this the software of the game table has to be further developed and may also be adjusted to be used on PCs to make it useable for a wider set of stakeholders outside of the specific game table.

These four methods will enable us to describe interactions between social and economic issues given ecological frame conditions. Two of these issues shall also be those gender and organizational aspects which influence the future of the fishing sector. It is fundamental to capture adequately the functioning of incentives in the different

geographical areas and fleet segments in order to analyse in a thorough way the links between the objectives set and the management measures designed to attain them, as this has been a weak link in the current CFP whose solution relies heavily on the quality of participation, an issue belonging to the less researched area of social studies that is now specially under need of robust analysis.

Improved governance and improvement in self- and co-management

Once the objectives and incentives regarding the fisheries policies have been analysed, the institutional constraints existing or predictable in the European fisheries management framework and their effect upon the detected incentive structures and elaborated objectives that constitute the findings of the previous work packages will be the next target of analysis. From the management point of view the European Commission makes in its Green Paper ([28]) the European Commission makes a number of important suggestions regarding the future decentralisation of the CFP as well as the introduction of management structures that encourage the industry to take greater responsibility for the implementation of the CFP. In particular, the Commission believes that decentralization which gives fisher and fishers' representatives a stronger voice in the policy decision-making process has the potential to engender a culture of greater compliance with the regulatory requirements underpinning the policy.

Although the link between compliance and participation in management decisions are well documented ([29]; [30]), this approach has not been fully exploited so far in the CFP, which continues to implement a top down command-control paradigm in the regulation of European fisheries. However, the FP6 COBECOS, led by IoES, focused on the potential economic benefits which might accrue from proper enforcement of the management measures. Significantly, in the CFP reform debate to date, public servants from Denmark, the Netherlands, Germany and the UK have shown particular interest in remote sensing technologies by means of cameras on board vessels with a view to monitoring compliance with regulatory requirements such as the TAC and quota regulation. This suggests that there is still a strong leaning towards traditional control and enforcement approaches in the Member States rather than creating incentive structures facilitating voluntary compliance by the industry.

Another argument in favour of improved governance is the integration of fisheries management as a core element in the EU's Integrated Maritime Policy. Strongly related as it is to the environmental pillar of this policy, many other instruments such as the Marine Strategy Framework Directive and the Habitats Directive will continue to have a major influence on the future direction and pace of development of the fishing industry. In addition, the competition policy, state-aid rules and the free movement of persons and establishment provisions under the Treaty on the Functioning of the European Union as well as the settled case law of the European Court of Justice clearly constrain the type of management measures that may be adopted under the CFP. In this context more decentralized management with more direct involvement of fishers may facilitate finding solutions to regional and local management issues. Without undermining the need for proper control and enforcement, this project seeks to further investigate the possibilities of decentralization and inclusion of fishers as a way to deliver on the diverse objectives presented by both the CFP and the environmental pillar of the Maritime Policy.

In addition to the already mentioned multiplicity of policies the Lisbon Treaty has made the decentralization of fisheries management a more pressing issue in so far that it has introduced the co-decision procedure for the adoption of fisheries legislation apart from the allocation of fishing opportunities ([31]). This will slow down the decision-making process in the European institutions. The project will explore how questions of competence, subsidiarity, proportionality and delegation under the Treaty on the Functioning of the European Union can both enhance and constrain greater stakeholder participation in fisheries management under the CFP. An interesting question is thus the legal and practical limits of decentralization/stakeholder inclusiveness of the CFP.

The CFP as it is now remains basically a top-down hierarchical system with the Fisheries Council adopting the basic regulation, which is then implemented and enforced primarily by the Member States under the auspices of the Commission. With the introduction of Regional Advisory Councils (RACs) the CFP has taken a major step towards the enhancement of the role of stakeholders in the advisory and decision-making process. This however only puts in place an additional consultation mechanism in the system at present. However, decentralized fisheries management systems already exist at a local or regional level in several EU member states which go well beyond mere consultation structures. We will analyse, for example, the experience of real co-management of the clam fishery in Venice, from which we will have first hand information thanks to the inclusion of the cooperative CLODIAMARE as one of the SME partners of the project. In SOCIOEC we seek the analysis of such examples on the case study level while also reviewing the CFP in the context of the overall Maritime Policy. In this respect, it is highly relevant to look at the possibility of taking the CFP from the current 'government consultation of stakeholders' to true 'partnership between government and stakeholders' in management. At this stage we will also broaden the horizon of the analysis by including fisheries management

systems outside of the EU with particular emphasis on fisheries in Australia and New Zealand where stronger degrees of industry involvement by co- and self-management as well as cost-recovering schemes have been successfully implemented.

In WP 4 the semi-structured interviews with Commission management staff (DG MARE and DG Environment) will allow us to get a broader understanding on how the Commission envisions the possibilities for decentralization within the complex set of EU policy frameworks influencing fisheries management. On the case study level representatives of broad stakeholders/user groups will be interviewed to investigate what type of co-management (or indeed self-management) appears most applicable to each of the case studies.

The risk exists of strong involvement of fishers in the process affecting the performance of the system and pushing it in a direction which is questionable from the perspective of the objectives of the CFP and overall Maritime Policy. It is, therefore, necessary to include the results of WP 2 in the discussions with stakeholders on the regional and local level in evaluating this process. In this way the project gives stakeholders the opportunity to be consulted over different stages of the development process of policy inside the life of the same project with the scientists getting the chance to obtain feedback on the articulation of fishermen objectives and incentives with external incentives and governance structures. Additionally, with the simulation of impacts of management measures we will give the stakeholders an insight into the potential consequences of decisions in the context of the overall direction of the reformed CFP.

Impact assessment – methodological improvements

The analysis of impacts of policy proposals is a legal obligation in the EU, introduced by the European Council (Göteborg and Laeken councils in 2001) and part of the Lisbon strategy for jobs and growth. Every proposal for new management measures/regulations must go through a process of impact assessment (IA) following the overall EU general IA framework (EU impact assessment guidelines of 15 January 2009 ([32])). In this context the evaluation in SOCIOEC will also draw on previous experiences with IAs for long term management plans already done in the ICES and STECF (e.g. STECF SGMOS reports) building on a methodology developed in a long row of previous EU research projects (e.g. EU FP6 RECOVERY and EFIMAS) and following the most recent developments on this issue and methodology used there.

The stakeholder opinion is considered to be a crucial step in the IA according to the EU guidelines. This aspect has also been addressed by the STECF (and ICES) subgroups focusing on IA. In particular the STECF subgroups have been asked to develop a standard procedure for stakeholder involvement in the IA analysis by using a stepwise approach (scoping, management evaluation, and impact assessment). Using experience from this, the aim of the project is to take into account the stakeholders' opinions in a feedback loop and e.g. participatory evaluation processes (as in EU FP6 projects EFIMAS and AFRAME). Consultation with stakeholders will happen in different phases of the analysis and management scenario evaluations. As far as the core of the IA is concerned, the main actors of the sector (from individual fishers to PO representatives, from multi-disciplinary fishery scientific experts to fishery managers) will be consulted to identify and evaluate the potential social, economic and ecological (stock) effects of the proposed management measures at the case study level. Subsequently, after the simulations involved in many of the scenario evaluations have been carried out (see below), they will be asked to discuss and give feed-back on results and possible adjustments to the future management measures using a cyclic feed-back management evaluation process.

One technique of analysis that the project will use to take into account stakeholders opinion is the *focus group* ([33]; [34]), which is a well known methodology also used in previous EU research projects. The focus group approach is a social science technique largely used in qualitative research in which a selected group of people representing different stakeholders are asked about their perceptions, opinions, beliefs and attitudes towards a product, a service, a concept or specific scenarios of management evaluations. In this project the focus group will be used in the IA analysis with different objectives:

a) to identify, in a general framework, all the potential social, economic and ecological effects of the proposed new policy options using a scenario approach;
b) to identify the most important social, economic and ecological potential effects and assign to them a probability and a magnitude with the help of the relevant actors;
c) to discuss and draw some conclusions about non quantifiable impacts (mainly relating to social aspects);
d) to discuss inputs and results to/from the quantitative simulation phase in a participatory modelling approach constituted by cyclic feedback loop process, as described below.

The above qualitative analyses will be integrated with quantitative analyses to infer on the ecological and socio-economic impacts. The aim of the quantitative analysis will be to develop *projections* based on the scenarios defined within each case study.

The impacts of the new (proposed) management measures will be measured based on a set of indicators (social, economic and ecological; see e.g. the EU FP6 IMAGE project) that will be defined in relation to specific objectives set and defined in WP2 for the selected fisheries, industry and stocks.[8] The indicators used according to objectives will consist of state indicators (e.g. fleet capacity, value added, employment, stock biomass, etc.), and pressure or impact indicators (regulations, world market prices, environment, fishing mortality, technological efficiency increase and creeping, etc.) and will be measured against reference points or levels for these indicators. The most recent advance on this issue (including STECF working groups, DG MARE CFP impacts studies and EU Research Projects, as EU FP6 IMAGE, will be taken into account in defining the list of the most appropriate state and pressure (impact) indicators. In addition, RACs will be directly involved to define and discuss descriptors especially on the social impacts (as for example the dependency of local communities on the fishery or the acceptability of multi-annual management plans).

The SOCIOEC consortium will be using a range of existing bio-economic models to evaluate through stochastic simulations, the future impact on the natural resources and human benefit of current and alternative management measures, options and strategies based on the different indicators and descriptors identified above (see e.g. [35]; EU Lot5 Tender on Review of Bio-Economic Models, EU FP6 projects EFIMAS and FP 7 ECOKNOWS). Alternatively, some of these models could be used in an optimization or maximization fashion to evaluate optimal management in relation to stocks, fisheries and industry (bio-economic optimization models) as in the mentioned EU projects EFIMAS and ECOKNOWS.

Some of these bio-economic models are spatially and seasonally explicit and are as such particularly suited to evaluate the spatial effects of management, as ws requested in the EU call to which SOCIOEC belongs. These include e.g. the ISIS-Fish modeling platform ([36]; [37]), and the extensive spatial FLR model ([38]) which can integrate detailed knowledge on high resolution information on catch and effort by use of developed advanced methods on coupling of VMS and Logbook data (see the EU Lot2 Coupling of Logbook and VMS Data; [39]), which will here respectively be applied to the Western Waters and Baltic Sea fisheries. These latter tools are multi-stock and multi-fleet based covering important EU international métiers and fisheries and can as such deal with mixed fisheries aspects which also include the FL-Cube-model used for advanced HCR evaluation in mixed fisheries ([40]; [41]) and evaluation of Long Term Management Plans (e.g. [42]). Using the spatial explicit models will enable the evaluation of socio-economic and spatial effects of the management measures with special attention to fishers' behavioural responses to the range of management measures (e.g. incentives) and to the potential links of management measures with the uncertainties and external factors included (e.g. oil price, interest rates, fish market price variations). In relation to energy use in the fishery and other related factors individual based models (IBM) with high spatial and temporal resolution of catch and effort have been developed for the Danish and Dutch fishing vessels (e.g. [43]).

Other models are specifically designed to estimate the likely effects of management measures primarily based on effort restrictions in the short and medium term. As an example, the BIRDMOD model ([44]) is a multi-species and multi-fleet simulation model specifically developed to simulate the main management measures (effort restrictions and technical measures on selectivity) applied in the Mediterranean Sea. Simulations are conducted step-by-step at regular time intervals through the period defined for prediction. In this sense, BIRDMOD is a dynamic model. The model is organized in a biological and an economic module. The biological module simulates the evolution of the biomass and the fishing mortality for each of the target species included in the model. Based on biomass and fishing mortality, landings are estimated by species and fleet segment. Given the level of landings and assumptions on price and costs dynamics, the economic module simulates the evolution of a number of economic and social variables providing an assessment of the status of the fisheries from a socio-economic point of view. The model output consists of the historical series simulated for the biological and socio-economic variables included in the logical-conceptual pattern of the model. As the BIRDMOD biological component is very data demanding, new versions of the model have been recently developed to simulate the effects of management measures on fisheries where biological data are poor.

For those (quantifiable) indicators whose full magnitude cannot be projected by means of bio-economic models (e.g. management costs, dynamics of fisheries costs, etc.), alternative quantitative estimation techniques will be applied, e.g. extrapolation based on previously derived coefficients through statistical inference on the basis of similar impacts and occurrences elsewhere.

For a good quality impact assessment any model development and ex-ante evaluation should take care of the role that externalities and uncertainties can play in determining final impacts (see e.g. review in [45]). This aspect will be taken into account by carrying out uncertainty assessments and *sensitivity analyses* through scenario modeling involved in risk assessment within the simulation or optimization phase described above. This helps us

to evaluate the robustness of alternatives for each of the processes involved herein as well as to estimate rates of changes or identify switching points. The sensitivity analysis and the participatory modeling approaches will be crucial in the identification of the preferable option in achieving the specific objectives defined in collaboration with stakeholders in WP2. If different policy options are proposed in order to achieve the specific objectives defined at case study level, an evaluation of the most appropriate option will be carried out by comparing options on the base of the general evaluation criteria of effectiveness, efficiency and coherence.

The simulations according to ecological, economic and social indicators and their relative performance and results in relation to reference points for those indicators will give a direct efficiency evaluation according to the assessed uncertainty and sensitivity at the lovel of fishery, industry, stock, etc. The basic instrument to evaluate the economic effectiveness with respect to e.g. optimization is the Cost Benefit (CB) or Cost-Effectiveness analysis ((OECD [32]). The CB analysis is generally used when the most significant part of both costs and benefits can be quantified. An option is considered to be justified when it promises the greatest net benefits (total benefits-total costs). On the other hand, the CE analysis (see above) is generally used as an alternative to cost-benefit analysis in cases where it is difficult to value benefits in monetary terms. It requires calculating the cost needed to achieve the objectives, and then comparing the costs of the different proposed options. Alternatively, uncertainty analysis can be carried out using optimal experimental designs derived from statistical models ([46]). Management strategies that are robust to uncertainties may then be identified ([47], [48]). Additionally, information gap-theory ([49]) provides another method for evaluating the robustness of model-based decisions. In this way, SOCIOEC closes the cycle of analyzing a management measure right from its inception as a tool to achieve an objective until the prediction of its overall consequences, following the whole process with an emphasis on incentives and governance (participation) in an exercise that aims at filling a gap identified by the process of revision of the current CFP.

First results: economic sustainability to clarify one of the overarching principles

In a joint workshop with another European FP 7 project (MYFISH) for defining medium and long term objectives of fisheries policy a focus group to define economic sustainability was assembled. Participants were scientists, stakeholders, RAC representatives and regional managers. In the discussion it became obvious that there is a need to distinguish between the level of society (owner of the resource) and that of the individual fishermen (company). On a 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.

- ***Value chain*:** whole value chain of a fishery, the challenge being 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. This utility we then also measure in money units. In case of fisheries we can also think about maximizing utility by taking also other parts of utility into account and valuing it (e.g. ecosystem services, amenity values). 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 or small scale fisherman).

In Australia, one of the cases where SOCIOEC focuses in order to find contributions for management measures beyond the current local experiences in the EU, MEY is the agreed target for fisheries management. Therefore, this could seem to be the first candidate objective for the CFP as for biological sustainability MSY has been decided. However, it is necessary to define how to measure MEY. The group was not able to go deep into detail about such a definition but rent defined as ‘earnings beyond normal profits’ seemed to be a reasonable candidate. Several participants expressed their support for a broader definition of economic sustainability. Possible candidates are GVA for the whole value chain or overall utility generated by the fishing sector. In this case it was also not possible to go more into detail but from the perspective of data availability GVA for the whole value chain seems a possible objective/target. Overall utility would also include e.g. negative external effects of fishing on ecosystems/non-target species and would require a much more comprehensive cost-benefit estimation which seems unachievable at the moment.

The group then also discussed possible objectives/targets and indicators for the company level:

- ***GVA***: In this case on a company level as defined in the Annual Economic Report (AER) of the STECF
- ***Profit***: This is the typical maximization target on a company level. The owner of the company (or in most cases individual fishermen) 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.

As more data is available on company level it seems possible to calculate GVA and profits and set objectives/targets for them. It was, however, not possible to discuss how this may look like in the practice of fisheries management. It may be reasonable to argue that profitable companies are the backbone of a sustainable exploitation of resources. Nevertheless, the well-being of individual shareholders or company owners does not seem to be the objective of fisheries management even assuming that a profitable fishing sector benefits society overall. In the discussions in the regional focus groups of the case study areas the project partner will discuss this issue further to see how far the stakeholder want to go in looking on individual companies.

Summary and Outlook

The EU FP 7 project SOCIOEC is the only fisheries project at the moment with a clear socio-economic focus. It begun March 1st with a duration of three years. The project addresses the following main research questions: overall objectives of the CFP, incentive structure of management measures, better governance and integration of stakeholders and improvement of methods for socio-economic impact assessment. The specificity of the project lies on its framework of analysis (objectives-incentives-governance-impact) and the possibility to pretest it in an integrated way with a set of case studies that at the same time approach the main issues in the coming CFP and are designed to be compatible with the latest developments in the current CFP, e.g. the Regional Advisory Councils. This framework would allow for example to test how different stake holders view a switch between MSY, GVA or MEY as objectives, and give a toolbox to managers that allows them to have an integral perspective on the impact of management measures.

As the CFP reform is under way but the new regulation not adopted yet adjustments in the research agenda may be necessary. The discard ban, for example, will probably be introduced via a fishery instead of a species approach. Additionally, it is unclear if Transferable Fishing Concessions will be mandatory in the member states or not. Therefore, the specific research agenda can be adjusted. The next steps will be interviews and focus group discussion on objective/targets on a regional level and incentive structures in existing management measures.

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Endnotes

[1] The research project is receiving funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 289192.
[2] Ott & Döring ([4]) distinguish between six categories: man-made capital, natural capital, cultivated natural capital (like farmland), social capital, knowledge capital, and human capital.
[3] A tax imposed to every kg of fish landed above quota allowance. This tax is currently implemented to manage New Zealand fisheries (one of the non-EU fisheries being investigated), where it is referred to as the deemed value.
[4] Referred to as the deemed value in New Zealand
[5] Mixing of western and eastern cod stocks
[6] Icelandic fisheries
[7] With regard to this issue WP 3 and 4 will work closely together.
[8] It is obvious that in cases where useable we draw on biological/ecological indicators which are already defined in the CFP or other regulations (MSFD) like the objective to reach MSY by 2015.