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¹ Document will be a draft until it is approved by the coordinator

² PU: Public, PP: Restricted to other programme participants (including the Commission Services), RE: Restricted to a group specified by the consortium (including the Commission Services), CO: Confidential, only for members of the consortium (including the Commission Services).

³ The initials of the revising individual in capital letters.

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Preamble: what this is and where it is going

This deliverable is a “policy brief” that reports on the background, purpose, approaches and outcomes of the 7th Framework project “Ecosystem-based Responsive Fisheries Management in Europe (EcoFishMan). The deliverable contains a draft manuscript intended for submission to a peer reviewed journal. The policy brief is “work in progress” and will be presented at the EcoFishMan final symposium⁴ and at the FAO’s Second Symposium on Fishery-Dependent Information, which will take place in Rome, Italy, 3-6 March 2014. These two events will provide additional input to this document. Additional analyses and final synthesis of the project’s outcomes will be required before the policy brief is fit for submission to a journal.

The EcoFishMan project has been devoted a theme session at the FAO symposium to communicate outcomes of the project. Presenters at this symposium are encouraged to submit manuscripts for publication in a special issue in the ICES Journal of Marine Science (IJMS), with the deadline for submission being 02.05.2014. Accordingly, this special issue in the IJMS offers a good opportunity to communicate outcomes from the project, and we intend to finalise the manuscript for this purpose.

⁴ The final symposium will be held in Rome 27-28 February 2014.

A responsive fisheries management system: policy Brief

1. Summary

This policy brief reports on the background, purpose, approaches and outcomes of the 7th Framework project “Ecosystem-based Responsive Fisheries Management in Europe” (EcoFishMan). The term Responsive Fisheries Management System (RFMS) was developed within the project to refer to the generic management system alternative that the project will propose as its main outcome. The RFMS is an adaptive management system that is results-based and ecosystem-based, and attempts to reduce micro-management by involving stakeholders. The RFMS comprises three defining features: 1) That authorities define measurable objectives for the utilization of fisheries resources; 2) that resource users are made responsible for achieving these objectives and for 3) providing documentation that allows for an audit of the extent to which they are met. Using incentive mechanisms, the RFMS grants flexibility to resource users to find cost-effective ways to achieve specific and measurable objectives. The concept of RFMS was developed and tried out in 5 case studies in Europe. The RFMS concept was adapted based on evaluations of its performance in the case studies. The resulting concept is presented and its strengths and weaknesses are discussed. To conclude, prospects and possibilities for implementing RFMS in a CFP context are addressed.

2. Introduction

Preparing for the recently completed reform of the Common Fisheries Policy (CFP), the Commission published a Green Paper (CEC 2009) that reviewed problems and set out visions for the reform. The Green Paper identified five main structural failings: fleet overcapacity, imprecise policy objectives, short-term focus, insufficient industry responsibility, and poor industry compliance. In its analysis, the Commission emphasized the vicious cycle set off by overcapacity and overexploited resources, which generate pressure on authorities to make derogations and exemptions, and leads to a demand for more regulations. The outcome is what the Commission terms “micromanagement”, a myopic management system that is becoming increasingly complex, ineffective, difficult to understand and costly to maintain. A further problem of the general bureaucratic and “top-down” management approach within the CFP is that it comes with a paternalistic flavor, which may provoke antagonism rather than stimulate constructive cooperation between industry and authorities.

The Commission suggested “results based management” (RBM) as a way to overcome the problems related to micromanagement:

“The industry can be given more responsibility through self-management. Results based management could be a move in this direction: instead of establishing rules about how to fish, the rules focus on the outcome and the more detailed implementation decisions would be left to the industry. Public authorities would set the limits within which the industry must operate, such as a maximum catch or maximum by-catch of young fish, and then give industry the authority to develop the best solutions economically and technically (CEC 2009 11-12)”.

The Commission linked RBM to a shift in the “burden of proof” from management authorities to resource users (Fitzpatrick et al. 2011; Kindt-Larsen et al. 2011; Lassen et al. 2008; Linke and Jentoft 2012) as “it would be up to the industry to demonstrate that it operates responsibly in return for access to fishing. This would contribute to better management by making the policy considerably simpler and removing the current incentives for providing false or incomplete information” (CEC 2009: 12].

Results based management represents an approach to user involvement, which combines bottom up and top-down approaches to resource management in an incentive based approach. The overarching purpose of the EcoFishMan⁵ project has been to develop and propose an alternative to the existing fisheries management systems in Europe that builds on this concept of RBM. The term Responsive Fisheries Management System (RFMS) was developed within the project to refer to the generic management system alternative that the project proposed as its main outcome.

The RFMS is an adaptive management system that is results-based and ecosystem-based, and attempts to reduce micro-management by involving stakeholders. The RFMS comprises three defining features: 1) That authorities define measurable objectives for the utilization of fisheries resources; 2) that resource users are made responsible for achieving these objectives and for 3) providing documentation that allows for an audit of the extent to which they are met. Using incentive mechanisms, the RFMS grants flexibility to resource users to find cost-effective ways to achieve specific and measurable objectives.

In RFMS, the responsibility for developing policies remain with authorities, but the responsibility for achieving specific and measurable goals can be delegated to resource user organizations provided that they provide documentation that allows an independent audit of performance with regard to the objectives. RFMS proposed an organizational process for implementing RBM arrangements.

The policy brief is structured as follows:

A methodological section introduces the overarching approach of the project. The spiral model for Software Development and Enhancement (Boehm 1986) as used to organize the research processes within the project. In accordance with the spiral model, prototypes of RFMS were developed and adapted throughout the project based on experiences with using it in four case studies.

The fourth and final prototype of RFMS is presented, and a summary of experiences made with RFMS experiments in the case studies is provided.

Strengths and weaknesses of the RFMS are discussed and a concluding section considers possibilities for implementing RFMS under the CFP.

⁵ www.ecofishman.com

2. Using the spiral model for management framework development in a case study approach

The development and evaluation, and adaptation of the RFMS in the EcoFishMan project took place in an iterative process to ensure that the RFMS will be appropriate for different types of fisheries and ecosystems. This development process was organized in accordance with the spiral model for Software Development and Enhancement (Boehm 1986). Intended for large, expensive and complicated projects, the spiral model supports a development process that combines elements of both design and prototyping-in-stages in an effort to combine advantages of top-down and bottom-up concepts. In the spiral model, documents are produced when they are required and the content reflects the information necessary at a specific point in the process. All documents were not created at the beginning of the process, nor were all at the end; the RFMS prototypes and associated documents were work in progress. This process allows a continuous stream of products to be produced and be available for user review.

Each RFMS prototype outlined a process for developing, approving and evaluating management plans. The RFMS organizes this process into a series of specific interactions between three main agents, namely the relevant authorities, resource users groups and an independent “auditor”, which evaluated the extent to which the objectives of the plan are met (see section 3.1 for a detailed description of these agents and their dynamics in RFMS).

The preferred approach of the project was to involve actual and relevant agents in this process to the extent possible. In practice, however, it proved difficult to get some agents sufficiently involved in the project and to commit them to the timelines of the EcoFishMan project⁶. To ensure the progress and timelines and of the project, it was therefore in some cases necessary that the roles and functions of these agents were performed (by role play) by separate groups of researchers within the project. This was facilitated by a work package structure that reflected the roles and dynamics of the respective agents in RFMS (Dánielsdóttir et. al 2010).

2.1 The process designing, testing and adapting RFMS prototypes

The development and adaptation of the RFMS prototypes involved the following process (Fig 2.1.):

⁶. This is a valuable lesson learnt for future research: stakeholders need to be involved within the project as partners to ensure effective and continued engagement with the project.

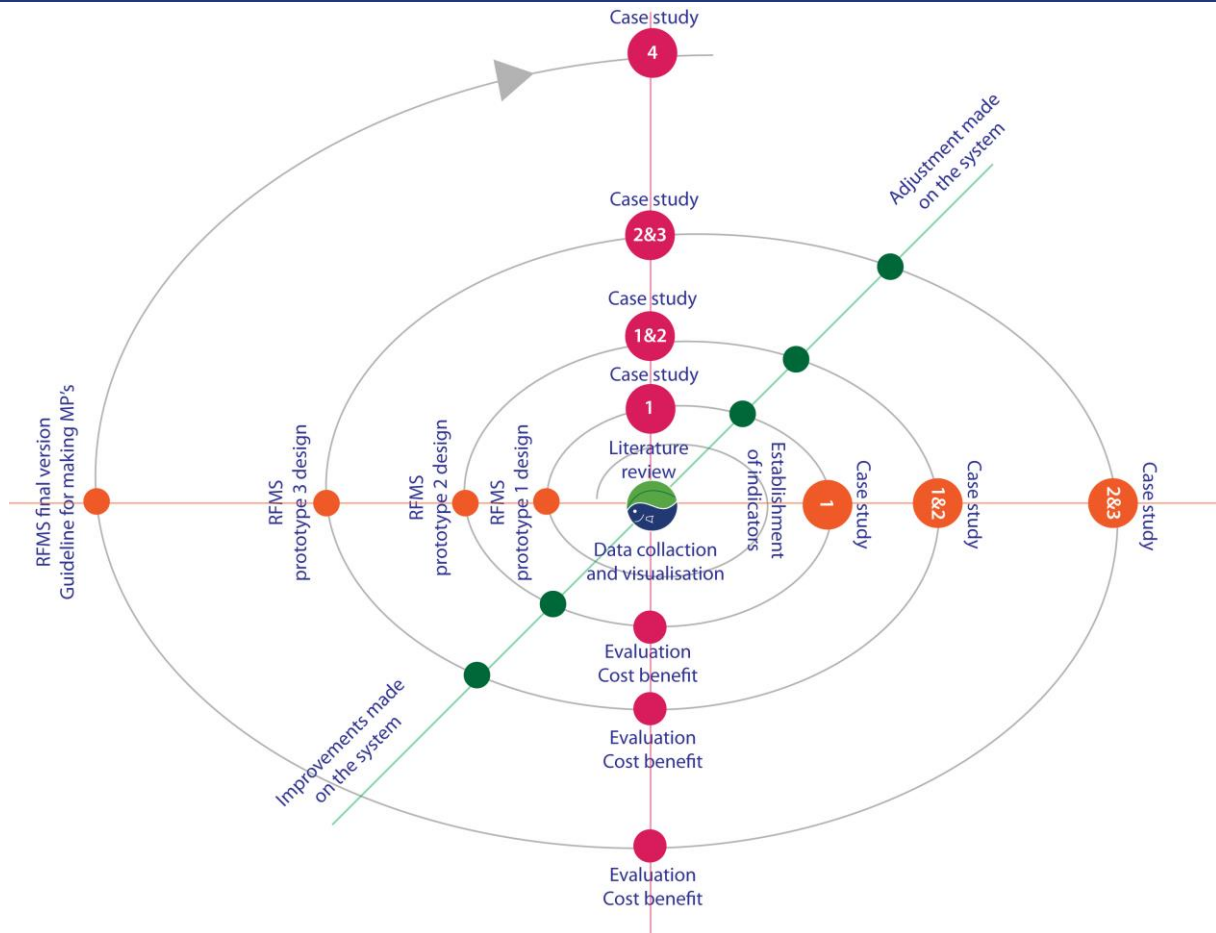


Figure 2.1: The spiral model (Boehm 1986) applied to management framework development. Prototypes of a Responsive Fisheries Management System (RFMS) were designed (left side) and tried out in cases studies (top). The performance of RFMS in the case studies was evaluated (bottom), which provided feedback for adapting the prototypes. See text for explanation.

1. RFMS Prototype design. The basic components of the RFMS were conceptualized, considering alternative approaches. This involved a framing the overall management process, describing the division of labor and manner of cooperation between involved agencies, and developing general guidelines for the authorities to invite management plans and for resource users to develop and propose them. The main resources for the RFMS prototype development include literature studies with a focus on existing fisheries management systems with aspects of results based management as well as ideas and recommendations articulated at meetings with stakeholders at EU and national level as well as expert advice.

2. Case specific “management plan invitation”. Based on the latest RFMS prototype, a Management Plan Invitation (MPI) was developed for each case study. The MPI is a document produced by relevant authorities (or by a separate group of researchers within the project representing the role of authority) that define the specific and measurable objectives (Outcome Targets) that resource users must met in a RFMS arrangement. The Outcome Targets (OTs) were defined in terms of reference levels of indicators in order to translate relevant policy goals into specific and measurable objectives.

3. Case specific management plans. Responding to the MPI, resource user organizations and researchers from the EcoFishMan project cooperated on developing a management plan (MP) for the

specific case. In the project's case studies, the plans were elaborated until they were evaluated to be acceptable by the relevant authority.

4. Evaluation of management plans and the RFMS prototype. The case specific MPs and the RFMS prototype that they resulted from were evaluated regarding functionality, applicability, risks. The evaluation was carried out as a cost-benefit analysis by a separate research group based. The evaluation was based on evaluation framework that was developed for this purpose by the same group, and which was improved between the iterations of the RFMS prototypes (i.e. the steps 1 to 4) but also benefitted from feedback and recommendations from external expertise in workshops and roundtable discussions. Recommendations for further development and adaptation of the RFMS formed an input to step 1.

2.2 The case studies

The RFMS framework was adapted based on experience with applying it in five case studies (Table 1). The case studies were selected to provide a contrast in terms of the complexity of the ecosystem, the fisheries, governance context and the availability of data.

The cases 1a and 1b are relatively simple fisheries within a closed area i.e. local stocks exploited and managed by a single authority. Environmental, economic and social data are abundant for both cases, but regarding assessment related data, case 1b is data rich while limited data are available for case 1a.

Case study 2 is more complex. This fishery includes significant bycatch of species from stocks exploited by a number of nations. Yet, the target species are relatively localised and predominantly exploited by one country. The availability of environmental, economic and social data regarding the effect of the fishery is fairly adequate and it is governed under EU/CFP jurisdiction.

Case study 3 is a very complex fishery with stocks that are utilized by many nations, has severe discard problems. The abundance of environmental and stock assessment related data is generally high, the availability and types of economic and social data varies between nations.

Case study 4 differs from the previous as the main instrument management measure is based on input limitations (effort constrains), which is in contrast to the previous three mentioned cases, where output limits (TACs) are in focus. Involving a high number of species, and being exploited by fisheries from several nations, case study 4 was considered the most complex of the selected case studies.

Assuming that it would prove more feasible to implement RFMS in simple cases (one species, one nation, one resource user organisation) than complex ones (multiple species, nations and resource user organisations), the cases were selected and to pose increasing challenges to the RFMS concept.

Table 2.1: Features of case studies selected for RFMS development.

Case features:	Case studies:				
	Icelandic lumpfish fishery (case 1a)	Icelandic mixed demersal fishery (case 1b)	Portuguese crustacean bottom trawl fishery (case 2)	North Sea mixed demersal bottom trawl fishery (case 3)	Mixed demersal trawl fishery in the Northern Adriatic Sea (GSM 17) (Mediterranean (case 4)
Nationality	Single nation	Single nation	Single nation but with allocations to other country (Spain)	Multinational	Three nations (EU: Italy and Slovenia; non-EU: Croatia ⁷)
Managed under the CFP	No	No	Yes	Yes	Yes
Complexity of fishery in terms of ecological and harvest technological interactions	Simple; one target species; Low level of bycatch	Relatively simple; Few target species in a mixed fisheries	Intermediate; some target species and a number of bycatch species	Intermediate/fairly complex; several target species and a number of bycatch species; a number of different fleets and gear-types; mixed fisheries interactions	Complex: high species diversity.
Complexity of the institutional framework	Low	Low	Medium: CFP and bilateral agreement	High: CFP	High: CFP and International
Availability of biological data for stock assessment	Data poor	Abundant data of high quality	Fair levels of data abundance and quality	Abundant data of high quality	Intermediate levels of data of relatively low quality

2.3 Other research tasks and activities in support of RBM in Europe

In addition to the central work of developing, testing, evaluating and adapting RFMS prototypes, the EcoFishMan undertook a range of complementary activities in support of the project's aim of developing a concept of RBM for application in a European context. This included the following tasks:

- Research on the legal framework for fisheries management in a CFP context with a focus on possibilities and constraints with regard to implementing RBM (Haflidadottir 2012 et. al)
- Research on the use of RBM in fisheries management and elsewhere (Haflidadottir 2012 et. al; Nielsen et al. 2013)
- Review of and selection of indicators with a potential for being used in results based fisheries management (Borges 2013 et. al)
- Creating a harmonized data base, and developing applications for data visualization and GIS based decision support (Olsen et al. 2012)

⁷ Croatia became a member of the European Union the 1st July 2013.

3. The RFMS: concepts and final prototype

Building on RBM, the RFMS proposes a process by which responsibility for specific resource management and research functions in practice can be shifted to resource users. It is outside the scope of this policy brief to provide a detailed account of the process that lead to this final prototype.⁸ The focus will be on the resulting RFMS concept, which is introduced in figure 3.1 below and the subsequent text.

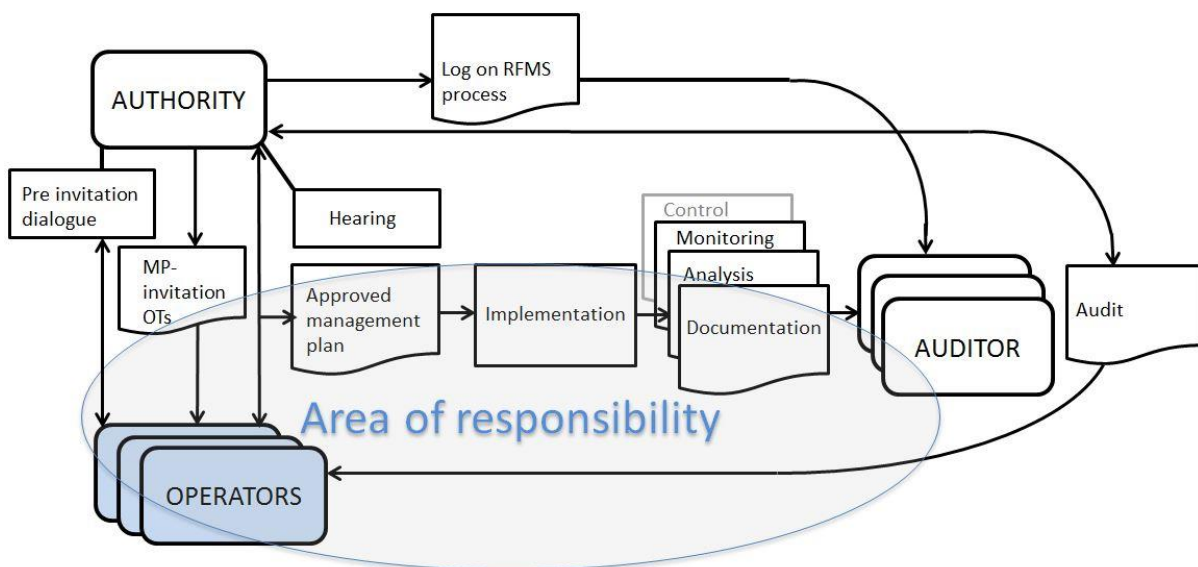


Figure 3.1. Conceptual model of the Responsive Fisheries Management System (RFMS). See text in 3.1 and 3.2 for explanation.

3.1 The roles of RFMS agents and the management plan

The RFMS conceptualises RBM as a contract between an authority and one or more operators. In practice, this contract is a plan, which is proposed by the operator(s).

The *authority* is the entity entrusted with the final responsibility for resource management, and specifies the measurable objectives (outcome targets) to be reached in a given context.

An *operator* is an organised group of resource users, for instance an association of fishermen with fishing rights in a given fishery.

The *management plan* (MP) includes the operator's strategies for achieving the requirements set by the authority, and for documenting the effectiveness of the chosen means. In a CFP context, this plan is either a management plan for a specific fishery or a plan for implementing measures under an existing multiannual management plan or discard mitigation plan. For convenience, we refer to both of the latter as the operator's management plan.

⁸ The RFMS development process can be tracked by comparing deliverables D4.1, D.4.2, D.4.3 and D.4.4.

The role of a third agent, the *auditor*, is to evaluate whether the contract between the authority and the operator has been fulfilled in the sense that the outcome targets listed in the MP have been achieved.

In the RFMS, a single authority is responsible for inviting specific MPs (see below), and for approving MP proposals of sufficient quality. However, more than one operator may cooperate in developing a common MP for a fishery. Similarly, the audit process may involve different auditors in order to cover the types of expertise required to evaluate the conformance with the plan. The cooperation and division of responsibility between multiple operators and auditors should be clearly specified in the MP.

3.2 The RFMS process

We briefly describe the process of implementing RFMS (fig. 3.1)⁹.

Step 1: Starting dialogues

The RFMS process begins with dialogues between the authority and the operator(s). The purpose of these dialogues is to create mutual understanding of the RFMS process: What does RFMS involve? What overarching goals can the operator(s) and the authority expect to achieve with RFMS, and what would it require from each party?

Step 2: The MP invitation

If the parties agree that RFMS should be pursued in the given context, the authority prepares an invitation for a management plan. The MP invitation identifies the specific and measurable requirements - outcome targets (OTs) – that are to be achieved in the given context.

Step 3: The management plan proposal

Responding to the MP invitation, the operator proposes a management plan (MP), which explains how the outcome targets can be achieved through a suggested set of management measures. The operator may cooperate with relevant scientific expertise about developing the plan. This expertise could, among other things, assist the operator with modelling the likely effect of suggested management strategies and measures. This would not only assist the operators in developing an effective plan, but also may identify relevant risks to render the plan more robust and convincing, hence making it more likely to be approved by the authority. The plan should also establish how the fisheries will be monitored and controlled and include sanctions for individual members that fail to comply with agreed measures. Finally, the proposal should include timescales for when the performance of the plan with regard to different outcome targets should be audited (see below). In most cases this is done annually, but for some outcome targets shorter or longer timescales may be appropriate.

Step 4: Management plan evaluation

The authority examines the operator's MP proposal, and may request revisions or clarifications. In this way, communication between operator and authority will ensure progress with the MP proposal.

⁹ Guidelines for operators and authority that wish to pursue RFMS can be found in Deliverable 4.4 of the EcoFishMan Project.

A complete MP draft will be “quality checked” by the authority. The purpose of this check is two-fold: 1) Does the MP present a convincing strategy for achieving the OTs? 2) Does it include an adequate strategy for obtaining information that allows the performance of the MP to be audited?

If needed, the authority may seek expert support for undertaking this quality check of the MP from a relevant scientific agent or, preferably, the auditor(s) appointed in the MP. Quality check of the biological aspects of the MP may be compared to a management strategy evaluation (Dichmont et al. 2008; Sainsbury et al. 2000; Smith et al. 1999), which often includes simulations of multiannual MPs, and this may include evaluation of other (e.g. socio-economic) aspects of the MP. For RFMS, however, the ex-ante evaluation of a MP may in practice involve the less formalised application of expert judgement. A less formalised process will be particularly relevant for RFMS in the context of small scale fisheries, low value fisheries, or data poor situations for which an intensive scientific evaluation is either impossible or economically unjustifiable.

Step 5: Management plan hearing and approval

If the authority finds that the plan is of a sufficient quality, it can approve it. Before doing so, however, it is recommended that the authority arranges a public hearing on the MP proposal, which allows comments to be raised by interested parties as well as the wider public. The purpose of this hearing is to promote transparency, public awareness and public discussions regarding the MP. The role of the hearing will be consultative as it will be up to the authority to decide if and how issues raised in the hearing should be reflected in the MP before it can be approved.

Step 6: MP implementation, control and documentation

If an MP is approved by the authority the operator can proceed with its implementation. At this stage the operator may also cooperate with the authority (the authority may for instance supply enforcement services). While implementing the plan, the operator is responsible for collecting information required for assessing whether or not the outcome targets are (or will be) achieved.

Step 7: Audit and management plan adaptation

The documentation provided by the operator during the implementation of an approved MP is reviewed by an auditor. The auditor should ideally, and to the extent possible, be institutionally independent from both operator and authority, and be trusted by both.

The auditor assesses whether or not (or the extent to which) the outcome targets are achieved. Furthermore, the auditor provides updated information about implemented management actions and their apparent consequences. An audit framework has been developed to ensure objectivity, transparency and a level playing-field in the process.

For the operator, the assessment will provide a basis for drafting modified MPs. For the authority, the assessment may be a basis for implementing sanctions or set conditions (if outcome targets were not achieved), for rewarding achievements, or for revising outcome targets.

If the audit shows that the outcome targets are achieved, the operator may continue with its MP. If the outcome targets are not met, the authority may request revisions for the MP, set stricter requirements, or implement sanctions.

The operator’s area of responsibility

The extent to which operators are made responsible for specific RFMS functions will vary between cases depending on the capacity and interests of the operators in charge. In figure 4.1 this is illustrated by the ellipse with the text “areas of responsibility”: the responsibility for the RFMS functions such as data collection, monitoring and control can in practice be divided differently between operators and the authority. The operator may for instance contract external service providers to carry out specific functions (e.g. data collection or control) or let them be carried out by the authority in the way that they are carried out in the established management system. In any case, the division of responsibility for different functions should be made clear in the MP.

The RFMS process log

To enhance transparency and other aspects of good governance, a log of key events in the RFMS process should be provided by the authority, and be made available to interested parties. Such key events include: main meetings between the operator and the authority; the submission of the MP invitation; hearing of the MP; and approval of MP. The authority should provide dates and brief minutes of such events. In addition to ensure that the RFMS is transparent to involved parties as well as external parties, the process log can be used by the auditor to provide a basis for evaluating the RFMS process (e.g. to assess the timeliness of responses from the authority).

4. Implementing RFMS in Case studies

The work and outcomes of case studies is described and analysed in (Viðarsson et al. 2014). A summary is presented in table 4.1 below. The main outcomes will be discussed in the subsequent section 5.

Table 4.1: Features of RFMS applied to case studies. Except as regards case 4, the RFMS process was carried out more than once in each case (based on an adapted RFMS prototype). Outcomes from the final management plan (MP) development process are shown.

	RFMS in specified case studies:				
Case features:	Icelandic lumpfish fishery (case 1a)	Icelandic mixed demersal fishery (case 1b): The small scale fishery	Portuguese crustacean bottom trawl fishery (case 2)	North Sea mixed demersal bottom trawl fishery (case 3): The Scottish TR1 fleet	Mixed demersal trawl fishery in the Northern Adriatic Sea (GSM 17) (Mediterranean case 4)
Authority	Icelandic Ministry of Fisheries (Represented by UiT in EcoFishMan)	Icelandic Ministry of Fisheries (Represented by UiT in EcoFishMan)	DGRM ¹⁰ (the national administration natural resources) (Represented by CCMAR in EcoFishMan)	Marine Scotland (regional administrative body for marine resources in the UK)	GFCM (General Fisheries Commission for the Mediterranean) (Represented by CNR-ISMAR in EcoFishMan)
Operator(s)	NASBO: National association of	NASBO: National association of small	ADAPI ¹¹ : Association of industrial fishing	The Scottish White Fish Producers	Producers Organizations

¹⁰ Direcção Geral de Recursos Naturais, Segurança e Serviços Marítimos.

¹¹ Associação dos Armadores da Pesca Industrial.

	small boat owners	boat owners	owners (PRT) Asociacion de Armadores de Punta del Moral (ESP)	Association (SWFPA) North East of Scotland Fishermen's Organisation (NESFO)	
Auditor	Vottunarfstofan Tún (accredited certification body) (Represented by WP6 in EcoFishMan)	Not Identified (Represented by WP6 in EcoFishMan)	IPMA and/or DOP (Represented by WP6 in EcoFishMan)	Marine Scotland Science (Represented by WP6 in EcoFishMan)	Fisheries Experts (Nisea, CNR)
Part of fishery included in RFMS process	The complete fishery	Fishery share represented by organisation of small scale fishermen (~17% of the TAC)	The complete fishery	Share of fishery represented by Scottish TR1 fleet (~63% of North Sea demersal TAC)	The complete fishery
Method for simulating MP performance	System Dynamics methodology supported by time series analysis (Dudley 2008; Madsen 2007)	System Dynamics methodology supported by time series analysis (Dudley 2008; Madsen 2007)	Rule-Based Fuzzy Cognitive Map model (Wise et al. 2012)	FishSums (Speirs et al. 2010)with FishRent (Salz et al. 2011).	Informal simulation as a role play with relevant representatives
Audit (final MP)	MP found to be Acceptable ¹² Recommendations: - improvement in the documentation system. - definition of roles among agencies	MP approved The MP reflects significant advances compared to existing system, although the potential of using the socio-economic management strategies has not been fully utilised.	Iterative process: MP1 to MP3 MP1: review MP2: accepted. Underused Socioeconomic strategies MP3: approved. Innovation in multinational cooperation tools.	Iterative process: MP1 to MP2 MP1: accepted. MP2: approved. Stakeholders fine-tuning of final strategies	Not applicable. Role play (see above)
Outcomes of MP with regard to OTs based on simulations	5 OTs included in the MP (biological, economic and social); simulation results indicated that all OTs could be reached if the MP was adhered to	18 OTs included in the MP (biological, economic and social); simulation results indicated most OTs could be reached if the MP was adhered to; performance regarding some OTs could not be evaluated in the simulation.	7 OTs identified in total (biological, economic and social). Simulation results indicated that some OTs could be reached if the MP was adhered to; performance regarding some OTs could not be evaluated in the simulation.	14 OTs were included in the MP, and the simulation indicated that some of these could be achieved with the MP. However, the MP simulation resulted in stock crash.	Not evaluated by quantitative simulations
Main constraints /problems with RFMS	No serious problems	Only a minor part of the fishery involved	Single nation fishing grounds, 2-nation fishery, only one providing data	A major part of the fishery involved, but not enough to provide operators a sufficient control potential regarding biological	Multinational, Multi stock, not all operators in CFP, registration and data availability problematic

¹² See Deliverable 6.3. Analysis and evaluation of case studies (Report). Major issues on the Management Plan were linked to the first Prototype of the RFMS and sequentially redefined until Final Prototype.

				OTs.	
Case researchers evaluation of RFMS feasibility in the case	Highly feasible	EG: RFMs for a (relatively small) part of the fishery is very problematic.	Highly feasible, however, more time and dialogues needed to solve some conflicts and get data from all operators. Involvement of all operators is crucial.	RFMS for less than a whole fishery is problematic. (limited OT control etc)	Difficult to implement RFMS, among other things due to the need for international cooperation between authorities and operators
Operators view on the RFMS process	Positive; operators were highly engaged in the process and pursue RFMS arrangements in practise after the termination of the EcoFishMan project	The operators were highly engaged in the process and are positive towards the RFMS but are sceptic that the approach can work if majority of the operators are not included	The operators were positive and look to a MP developed in RFMS context as an alternative to the present recovery plan for southern hake & <i>Nephrops</i> . However, they were sceptic or in disagreement on the discard policy included in the new CFP	The operators were engaged in the process and are positive towards the RFMS, but are sceptic about the feasibility of the RFMS approach can work some operators are not included in the process	The operators were highly engaged in the process and are positive towards the RFMS, but are sceptic that the approach can work if majority of the operators are not included
Stakeholders summary of the RFMS¹³	RFMS as an organizational tool for Icelandic small-scale fisheries - Management plans balances the biological dimension (MSY and discards), as well as economic (profitability) and social (employment opportunities) dimension		RFMS as a collaboration tool between Portuguese and Spanish fishermen/ fishing associations (1 st time in 10 years) Homogenization of harvest control rules in the management plan	Combination of Multispecies and MSY stock assessment Integration of current management measures in RFMS, including fully documented fishery	RFMS as a framework to incorporate EU and NON EU fisheries; Stepwise process to achieve a sustainable utilization of the main target species with a profitable industry and social stability

5. Discussion

The historical framing of fisheries science and management in Europe has on a fundamental level disassociated resource users from the processes of knowledge production and decision-making (Degnbol 2003). The two latest CFP reforms (i.e. in 2002 and 2013) have aimed at establishing a role for resource users in resource governance that goes beyond consultancy. Alongside many other EU Framework projects, the EcoFishMan project was funded in order to contribute to this aim. As the discourses on public engagement and public participation with science and governance have matured they have shifted from being proposed “solutions” to become practical “problems” in their own right (Delgado et al. 2011).

The overall experiences of the EcoFishMan project illustrate some of the potentials of involving resource users in participatory governance arrangements but also of the difficulties of making it work in practice.

¹³ Based on insights and reports from Stakeholders events (WP7 deliverables).

The spiral model (Boehm 1986) proved useful as an approach to organise a multi-disciplinary process of designing, testing, and adapting a RFMS framework, although committing the bulk of the research work to a serial process made the project very vulnerable to cumulative delays.

The internal organisation of the project was designed to reflect the dynamics between the agents in a RFMS framework, i.e. between authority, operator and auditor. While the project aimed at involving the relevant case specific agents in this process to the extent possible, however, it proved difficult to get these agents sufficiently involved in the project and to commit them to the timelines of the EcoFishMan project. To ensure continuation of the research process, researchers to some extent had to take over, acting in behalf of these agents. It is likely that this has had the effect of skewing outcomes towards the perspectives of the research groups involved. Actual implementation of RFMS arrangements may require longer time spans (and in some cases more political/stakeholder support) than what is possible to achieve within the normal lifespan of research project.

Although the EcoFishMan in this sense has primarily worked on a “scenario basis”¹⁴, the work of the project has been conducted in close dialogue and cooperation with the relevant agents. This has facilitated a learning process for all involved actors within the case studies, but has also enabled project researchers and the projects extended peer community to characterize strengths and weaknesses of RFMS as well as obstacles that may impede its implantation (see Table 5.1 for a summary).

Table 5.1. Summary of main advantages and drawbacks of the Responsive Fisheries Management System as compared to existing management practices in Europe.

	ADVANTAGES
Flexible	Can be adapted to different situations, depending on the locally relevant specification of management units, operator(s) and authority. The concept could be applied to relatively simple single nation and/or single species fisheries or to complex and demanding multi-species and multi-national fisheries
Responsive	Includes processing for checking management performance with regard to specific and measurable objectives. This allows an adaptive management approach (operators may revise management measures; the authority may reward operators if objectives are achieved or implement sanctions if they are not (the ultimately sanction could be to cancel the delegation of responsibility).
Compatible	Compatible with requirements of different policies and institutional settings. The RFMS is compatible with diverse right based regimes (individual, collective, common property, state owned) and degrees of co-management (Sen and Raakjaer Nielsen 1996), based on authorities and operators aims and capabilities).
Incentive based	RFMS deploys incentive logic. It grants operators flexibility of deploying cost-efficient management and implementation strategies, provided that they document that outcome targets are achieved (Fitzpatrick et al. 2011; Holmes et al. 2011; Kindt-

¹⁴ In the case of Icelandic lumpfish management, operators remain engaged with efforts of implementing RFMS arrangements.

	Larsen et al. 2011). In this way, RFMS rewards operators for innovation and for contributing to the knowledge base for fisheries management
Transparency and inclusiveness	The audit process in RFMS process ensures a high standard of transparency in the management system, and includes resource users in knowledge production and management processes. Public hearings on the management plans, and a fully transparent audit processes, ensure that all other interested parties have the opportunity to be informed and express their views on planned measures and their perceived outcomes.
Reduction / elimination of subsidies	In a fully-fledged RFMS, important indirect subsidies to the fishing industry are avoided as operators will bear the main costs of fisheries management and for collecting data for assessment purposes. The new basic regulation of the CFP enables member states to require their operators to contribute proportionally to the management and research costs in order to “ensure the involvement of concerned operators in the Union data collection and in the Union system for control, inspection and enforcement” (CEC 2013a).
DRAWBACKS	
Definition of OTs	An RFMS requires that relevant specific and measurable requirements, Outcome Targets, are defined to reflect the objectives of relevant policies, and that operators can meaningfully be made responsible for achieving these objectives and for collecting information that allows an audit of the extent to which they are achieved. In practice, it may prove difficult to define Outcome Targets with sufficient relevance and quality in these respects.
Incentives	It has proved difficult to design incentives that are strong enough to mobilize sufficient and committed participation of operators to a RFMS process. This challenge is particularly important when RFMS is introduced as a voluntary alternative (see section 4 below). The establishment of long term rights in the fisheries for resource users has proven itself to be a potential source for such incentives (Arbuckle and Drummond 2000; Breen et al. 2009; Yandle 2008; Yang et al. 2013; Yang et al. 2010). The challenge of designing appropriate incentive mechanisms lies with the authorities.
Costs	In assuming specific responsibilities for management and data collection tasks, operators are facing increased costs in RFMS (Townsend 2010). Authorities may initially expect to face increased workloads, but the public costs of research and management can be expected to be lower in RFMS because it aims at ensuring cost recovery (Stokes et al. 2006), i.e. that resource users cover basic research and management costs
Playing-field	The RFMS invites operators to design locally adapted management plans and implementation strategies. As the resulting approaches will differ between different

	fisheries/operators, this is in conflict with current aims at securing “a level playing field” between different fisheries groups.
Background	There is currently little experience with RFMS like arrangements. While the concept theoretically makes good sense in terms of incentive structures to current authorities, it will require commitment and organisational capacity (mainly relating to operators and authority) to make it work. There will be a need to build up “best practice” as relevant for different types of fisheries and organisational starting points. The novelty of RFMS is likely to result in reluctance to make civil servants, decision-makers and candidate operators initiate RFMS arrangements as these can be expected to take risk adverse stance with regard to organisational change.

The diversity of socio-economic conditions may pose additional challenges that one should bear in mind when trying to implement any new approach to fisheries management in EU. The overall objective of sustainable stocks set by the EC is not necessarily considered the most important one on the local scale and by the operators where social sustainability and employment in the fishing industry is considered more important especially under recession (experience from case studies). This conflict is underlying any policy attempt within the CFP; it does not relate specifically to the use of RFMS as an organisational device.

Also cultural diversity should be taken into account in so far culture is likely to affect the implementation of the RFMS.¹⁵ Culture may influence both the involvement of fishers in fisheries management processes and the probability of the fishers providing trustworthy documentation. Fishers from countries scoring low on power distance and high on individualism (e.g. Norway, Iceland and Denmark) generally have the highest probability of providing trustworthy documentation. In addition fishers in countries with low power distance (e.g. Germany, UK, Scandinavian countries) are, anything else equal, likely to be more engaged the operator related processes devised under an RFMS approach than in countries with a high power distance¹⁶.

6. Conclusion and recommendations for policy-makers

The Responsive Fisheries Management System (RFMS) outlines a process for transferring fisheries management responsibility to resource users, provided that they document that they can achieve specified management objectives. RFMS is based on incentive logic, and establishes incentives for resource users to participate in management and research processes. RFMS shifts focus from regulatory details to the documentation and achievement of results through user-defined means.

¹⁵ This was observed in the EcoFishMan experience with Role-Plays in Norway and Italy. See Deliverable 5.6: Acceptance test of the Role Play.

¹⁶ Borit, M., M. Aschan, K. Nielsen, and P. Holm (2014): “How national culture may influence fishers’ participation in fisheries management and their probability of providing trustworthy documentation”. Manuscript in preparation. (To be presented at the FAO Conference on Fisheries Dependent Information 3-6 March 2014).

RFMS is not a panacea for fisheries management problems. For instance, the issue of overcapacity must be addressed through other approaches. The main advantages of RFMS relate to its potential to involve resource users in management and research activities through an incentive based approach. RFMS can be pursued most efficiently as a mandatory system and combined with a fundamental shift in the “burden of evidence”, which requires that resource users justify that their practices are sustainable.

The main recommendations for policy-makers with regard to implementing RFMS arrangements have been summarized elsewhere (Nielsen et al. 2014) but are briefly recapitulated here.

Our main recommendation is that the RFMS is implemented on a voluntary basis, and supported throughout the policy period of the newly revised CFP. To implement RFMS as a general and mandatory resource management system in one go may neither be politically feasible nor likely to work well in a transition phase. Experiences have to be made with cases in the CFP area, and it will require time to establish the basic conditions that would support RFMS. A meaningful shift of responsibilities for documentation and management functions to resource users is conditioned on that the resource users have or may develop capacity for executing these functions in a reliable and efficient manner. It is worth noting that reported successful cases in which responsibilities for management functions have been gradually shifted to resource users appear to have involved long time spans.

Voluntary RFMS implementations would allow for further experiences and best practices could be developed. This in turn could provide a basis for creating a legal and regulatory basis for fully-fledged RFMS with the subsequent CFP reform in 2022.

Approaches are described for pursuing RFMS on a voluntary basis under the new CFP. In the coming years, it is likely that the most applicable RFMS approaches will involve that operators design and implement discard plans and measures under a multiannual plan. This would involve committees of member states in the role of authority, which would oversee implementation aspects and provide the formal link to the CFP institutions.

A more ambitious RFMS approach involves that operators (in addition to the above) take a main role in developing and proposing multiannual plans. As illustrated, this has happened in some cases although no such plan has yet been formally adopted by CFP institutions. The route to industry initiated and industry lead multiannual management plans in the new CFP cannot be expected to be straightforward, at least not in cases where resources are shared by several countries. Serving as role models, existing and ongoing cases of this kind may nevertheless make this operator lead approach more accessible in the future.

As a voluntary alternative, RFMS will work under non-optimal conditions, and a major challenge will be to motivate operators to participate.

A range of steps have been recommended to enable a transition to a comprehensive RFMS approach. This system would involve shifting the burden of evidence to resource users. Subjected to full cost recovery, resource users would be responsible to demonstrate that their actions are compatible with specific and measurable policy objectives. In return, they would get access to using the resources and be granted the flexibility to design a management system of that best suits their needs, e.g. in terms

of being cost-effective and acceptable. If such a fully-fledged RFMS is chosen, the legal framework to support it should be prepared in time before the subsequent CFP reform in 2022.

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