

MEFEPO

Making the European Fisheries Ecosystem Plan Operational

South Western Waters : Fisheries Ecosystem Plan

WHAT IS MEFEPO?

The Making the European Fisheries Ecosystem Plan Operational (MEFEPO) project is an EU-FP7 funded project designed to further development of a framework, and the supporting evidence base (natural and social science), required to integrate the Marine Strategy Framework Directive (MSFD) objectives within a reformed Common Fisheries Policy in the context of sustainable ecosystem based fisheries management (EBFM).

The transition to EBFM has considerable implications for the knowledge base required to support management, and requires new approaches to integrate and combine data on the ecological, social and economic pillars of sustainability. This transition also requires appropriate institutional structures to enable successful implementation.

The aim of MEFEPO is to demonstrate an operational approach to European EBFM and a description of how it can be delivered.

WHAT ARE FISHERIES ECOSYSTEM PLANS?

Fisheries Ecosystem Plans have been developed as a tool to assist managers and stakeholders simultaneously consider the ecological, social and economic implications of management decisions within a framework supporting EBFM.

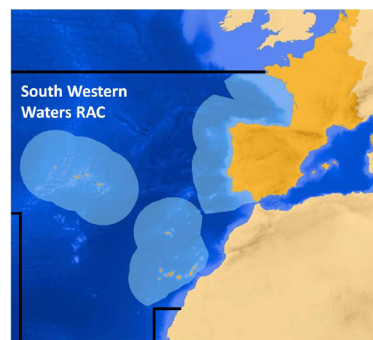
Through structured interaction with stakeholders, the MEFEPO project has developed Fisheries Ecosystem Plans (FEPs) for three major European marine regions (North Sea, North Western Waters and South Western Waters Regional Advisory Council (RAC) regions).

Central to the FEPs is a management strategy matrix which presents an overview of the potential impacts of different combinations of management measures on the ecological, social and economic status of the system. The FEPs also describe an operational model for regionalisation of European fisheries management in support of EBFM. This document is a summary of the North Western Waters FEP, and is supported by a more detailed technical report (see back page for details).

INTRODUCTION TO THE SOUTH WEST WATERS REGION

The South Western Waters (SWW) RAC region covers the north east Atlantic Ocean from the point of Brittany in the north to the Straits of Gibraltar in the south, as well as the ultra-peripheral regions of Madeira, Azores and Canary Islands. From the ultra-peripheral regions only the Azores Archipelago region is considered in the MEFEPO project. The SWW covers approximately 3 million km² and comprises ICES zones VIII, IX, X, COPACE divisions 34.1.1., 34.1.2, 34.2.0 and OSPAR regions IV and V. Parts of the EEZ (Exclusive Economic Zone) of France, Spain and Portugal make up the SWW. The SWW RAC area has a diverse range of depths from the broad shelf in the French area, to the narrow and steep shelf with numerous canyons in the Cantabrian Sea. The Iberian Basin has numerous sea mounts that arise from the deep sea to the mid Atlantic Ridge.

The SWW region is highly productive and supports large populations of pelagic fish. During spring, blooms of algae on the Iberian coast attract huge shoals of sardines and other pelagic fish. There are many important prey fish species; sardine, anchovy, mackerel, and horse mackerel have all been found in the diet of predatory fish. These species are under pressure from fishing activity. Organisms that prey on them such as mammals, birds and larger predatory fish are also affected by fishing activity as they are in direct competition with fisheries for food.



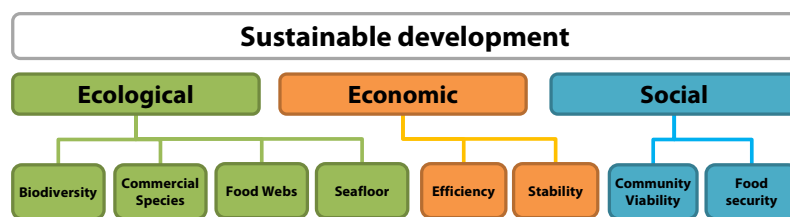
South Western Waters (SWW) region

DRIVERS OF CHANGE IN EUROPEAN FISHERIES MANAGEMENT

The Green Paper on the Reform of the Common Fisheries Policy (i) identified the need for EBFM taking account of the ecological, social and economic pillars of sustainability, (ii) stated an intention to move towards a longer term approach to fisheries management, and (iii) made commitments to greater stakeholder involvement in management. The Marine Strategy Framework Directive (MSFD) defines environmental objectives for European seas, based on sustainable utilisation of healthy marine ecosystems in support of sustainable development. The Integrated Maritime Policy specifies that individual sectors (e.g. fisheries) need to support MSFD objectives. These commitments have shaped the development of the MEFEP Fisheries Ecosystem Plans (FEPs).

DEVELOPING THE FEPs FOR REGIONAL SEAS

'Descriptors' for the ecological, social and economic status of the fisheries were developed to enable simultaneous consideration of the potential impacts of different management strategies on the three pillars of sustainability. Stakeholders supported the MEFEP "three pillar" approach to explore potential impacts of different management strategies on multiple objectives for the marine environment.







MEFEPO approach to the development of regional Fisheries Ecosystem Plans (FEPs).

Ecological descriptors, drawn directly from the MSFD, were selected at a MEFEP stakeholder workshop as those most impacted by fishing activities (biodiversity, commercial fish, food-webs and seafloor integrity). Social and economic descriptors were defined to monitor the main aspects of fishing contributing to the economic and social wellbeing of society, in particular coastal communities. Economic descriptors focus on fishers' ability to maximise economic efficiency of fishing operations (efficiency) and minimising fluctuations in harvesting possibilities over time (stability). Social descriptors monitor employment opportunities within the catching sector (community viability) and securing catch potential for human consumption (food security).

CASE STUDY EXAMPLES

Preliminary case studies of selected fisheries have been developed to demonstrate practical application of the management strategies matrix approach. In each case, the potential performance of a limited number of management strategies was evaluated; two of the four NWW case studies are included in this summary. The efficacy of the management strategies was considered in the context of high level management objectives for European fisheries. The predicted change in the descriptor status associated with implementation of each management strategy was assessed.

 Expected improvement in the status of the descriptor  Stable (i.e. no change in the status of the descriptor)  Expected deterioration in the status of the descriptor  Outcome unknown

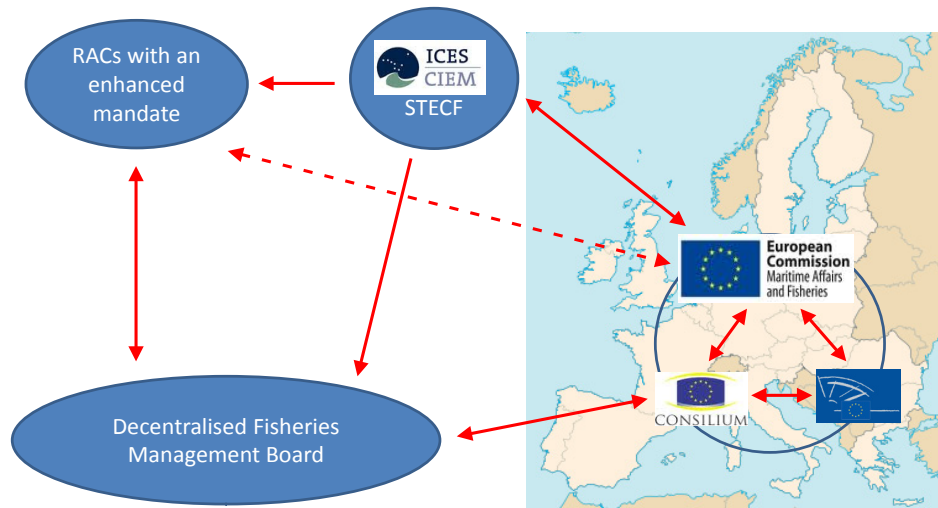
The suite of management strategies comprised of "business as usual" (BAU) and alternative strategies applying different management tools, to explore how the objectives of EBFM may be most effectively achieved. Trade-offs associated with different management approaches were examined. Management strategy matrices were completed based on the best available evidence (modelled, empirical and expert judgment) under the following assumptions:

- Timeframe: descriptor responses considered against a 5-10 years timeframe; other effects may take place in the shorter or longer term.
- Partial assessment: predictions based on changes in one (or a few) selected measures whilst assuming all other measures remain constant.
- Constant surroundings: all external factors were assumed to remain constant (e.g. price of fish, fuel prices, water temperatures).

OPERATIONAL MODEL FOR REGIONALISING THE COMMON FISHERIES POLICY

Appropriate institutional structures to facilitate stakeholder participation in management at appropriate regional scales are considered a prerequisite for successful implementation of EBFM within Europe. The institutional framework below was developed by the MEFEPO project through structured interaction with stakeholders (key-informant interviews, observation of RAC/international meetings discussing the CFP reform, large survey and workshops).

The model is based on a decentralised management structure with decision-making power devolved to Member States (MS) co-ordinated at the regional level, enhanced Regional Advisory Councils (RACs) with appropriate scientific support, and a more collaborative approach between MS, RACs and science to develop long term management plans (LTMPs).



Governance model for regionalisation of the Common Fisheries Policy developed by stakeholders at the MEFEPO workshop in Haarlem, April 2011. Decentralised Fisheries Management Board (DFMB) similar to the 'Cooperative Member State Council' model put forward by Raakjaer et al. (2010) but supported by RACs with an enhanced mandate.

KEY COMPONENTS

- The institutional structure and formal distribution of powers remains largely unchanged.
- Voluntary agreements, soft law and *de facto* authorities rather than *de jure* authority to make decisions. Based on informal regional politico-administrative structures.
- MS with fishing interests in a regional sea area establish Decentralised Fisheries Management Board (DFMB) to deal with fisheries management issues specific to that area.
- The DFMBs put forward their recommendations for formal approval to the overall EU Fisheries Council
- RACs become a working group for the DFMBs.
- RACs represented as observers at DFMBs.
- Regions can calibrate the institutional model to meet regional needs.

This model provides a high degree of flexibility within the present legal structures. However, this freedom comes at the expense of its scope given that it relies upon voluntary agreements, soft law and *de facto* authorities based on quality of input rather than *de jure* authority to make decisions.

More details on the operational model for regionalising the Common Fisheries Policy can be found in the MEFEPO *Key operational challenges to the introduction of an ecosystem approach to fisheries management: Workshop report* (van Hoof et al. 2011) on the project website: http://www.liv.ac.uk/mefepo/Reports_and_outputs.htm

CASE STUDY FISHERY 1: IBERIAN MIXED DEMERSAL TRAWL FISHERY

Introduction to the fishery

Several bottom trawl fleets operate in ICES Divisions VIIIc and IXa. From the North to the South this area includes the Spanish part of the Bay of Biscay (VIIIc East) the Galician coast (VIIIc West and IXa North), the Portuguese coast (IXa Centre and South) and the Gulf of Cadiz (IXa Southeast). Several stocks are caught by these trawl fleets depending on the area where they operate. This case study focusses on the trawl fleets licensed to catch demersal fish, The main target species are hake, horse mackerel, monkfish, megrims and blue whiting.



State of the stocks

Four out of seven fish stocks caught in Iberian mixed demersal trawl fishery were fished above Fmsy in 2009 and 2010.

Southern Hake recruitment in Divisions VIIIc and IXa has been improving since 2005 and fishing mortality reduced to 0.5 in 2010 (ICES, 2011). White anglerfish biomass in Divisions VIIIc and IXa is estimated to be approximately 30% of Bmsy and the fishing mortality (in 2010) is estimated to be below Fmsy. Black-bellied anglerfish recruitment in Divisions VIIIc and IXa has been around average since 2000. During the last decade, fishing mortality has been stable and above Fmsy. Megrin in Divisions VIIIc and IXa were fished below Fmsy in 2010.

Southern Horse mackerel recruitment in ICES Divisions IXa is generally stable with occasional large peaks like the latest that occurred in 2010. Blue whiting (in Sub-areas I-X XII, and XIV) fishing mortality in 2009 was estimated above Fmsy and Spawning stock biomass was below MSY Btrigger (ICES, 2010).

Current management (Business as usual)

The following tools are currently being employed for the Iberian mixed demersal trawl fishery management in SWW:

- Recovery plan for hake
- Total allowable catch (TAC)
- Effort (Kilowatts days at sea)
- Minimum landing sizes (MLS)
- Mesh size restrictions (reduction of by-catch)
- Seasonal closures
- Permanent closures to trawlers

BAU performance

- TAC for hake has been effective in the southern area (Portugal) of the stock but not in the northern area (Spain) where they have been consistently over TAC. In Portugal individual vessel catch limits were used in accordance to the quota (Portaria 187/2009).

- Effort (Kilowatts days at sea) control has been effective since 2005 for both Spain and Portugal (STCEF/SGMOS 10-06).
- MLS for hake promotes discarding in the trawl fishery because the legal MLS (27cm) does not correspond to the length expected to be retained using the legal trawl mesh sizes.
- Permanent and seasonal closures performance are likely to have contributed positively to the conservation of resources, aiming at CFP and MSFD guidelines.

Alternative management strategies

Strategy A: Spatial management with increased closed areas

In some geographic locations hake nurseries overlap with the blue whiting distribution. In other locations there is a more complex mixture of species. This strategy considers a detailed spatial management plan with closed areas differentiated by geographic fish ecological assemblages.

Strategy B: Ban/minimize discards

Currently discards seem to be mainly caused by the MLS of the species caught. MLS for hake does not correspond to the legal common bottom trawl mesh size selectivity of 65 mm (common in all areas). Revision of the MLS for hake and other species in the trawl fishery is necessary to reduce discards. Alternative gear design, square mesh panels or selection grids are necessary.

Strategy C: Individual Catch Limits/ITQs

One of the governance issues in this fishery is the frequency of hake global TAC over-passing. Individual/group vessel hake catch limits are already in place in the Portuguese area of the stock and have been effective in controlling the quota. The implementation of Individual Transferable Quotas (ITQs) should be explored to increase the efficiency and potentially encourage others to increase responsible fishing.

Management strategies matrix

The matrix examines expected outcomes from the alternative management strategies over a 5-10 year horizon.

Management Strategy	Ecological				Economic		Social	
	Biodiversity	Commercial Fish	Food-web	Seafloor Integrity	Efficiency	Stability	Community Viability	Food Security
A. Spatial Management	Green	Green	Green	Green	Red	Green	Yellow	Green
B. Ban/Minimise Discards	Green	Green	Green	Yellow	Red	Green	Yellow	Green
C. Individual Catch Limits	Yellow	Green	Yellow	Yellow	Green	Green	Yellow	Green
D. Business as Usual	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Management guidance

If the overarching management objective is to work towards Good Ecological Status (GES) in the context of the MSFD, then strategy A is considered to be the most appropriate given that a reduction in trawling in some geographical areas is considered to provide improvement across all four ecological descriptors (biodiversity, commercial fish, food webs and seafloor integrity). Introducing closed areas improves the overall ecological status and sustainability of target species and is predicted to provide improvement in terms of stability of catches and food security. However, closed areas are likely to have a negative effect on employment and will also limit choice on where fishers can fish on. Improvements in target stock status may however lead to improve efficiency and thus maintain community viability.

Strategy B is ecologically sound, with biodiversity improving and commercial fish stock status also improving. The more suited selectivity and improved fishing technology in trawl gears across the region will require that individual fishers and fishers organisations invest in new gears to adapt to changes in legal mesh sizes and fishing devices with improved selectivity. Thus, a negative impact in terms of efficiency and community viability is expected in the short term.

The proposed reform of the CFP includes plans for the introduction of individual fishing quotas for assessed stocks. A similar system using individual vessel quotas is already in use for hake in a regional part of the fishery. The introduction of Individual catch limits over the whole area of the fishery (Strategy C) is not much different from the existing TAC system for assessed stocks. However, potential improvement in catch and fishing effort regulation is expected to lead to improvements in efficiency, stability and commercial fish status by facilitating catch/quota and effort control at the individual vessel level, leading to a more efficient response and adjustment at particular stock levels.

If the management objective is to improve the state of the demersal fish stocks any of the three strategies presented could be chosen because they all lead to improvements in the commercial fish descriptor. The examination of the considered alternative management strategies indicates that it is possible to modify management in the mixed demersal trawl fishery to provide improvement in the ecological descriptors. The choice therefore depends on the trade off with other descriptors. The implementation of Strategy A is believed to have an expected improvement in all ecological descriptors without significant deterioration in the social and economic aspects of the fishery, potentially improving some of them as well.

CASE STUDY FISHERY 2: IBERIAN PURSE SEINE FISHERY

Introduction to the fishery

Purse seine is an important fishery in the SWW exploiting mainly sardine, anchovy, horse mackerel and mackerel. The fishery occurs mainly in inner shelf waters off the Iberian Peninsula, in the Gulf of Cadiz, along Portugal and Galicia, the Cantabrian Sea and the Basque Country shelf. The fleet uses seine nets in the water column and the gear does not touch the seafloor. They usually operate close to the home port, on short (daily) trips where the net is set once or twice. A large part of a typical fishing trip is spent searching for schools with echo-sounders and sonars. This method of fishing is considered to be the least damaging to benthic communities and habitats.

State of the stocks

Two out of the five main pelagic stocks exploited by the purse seine fishery currently have low recruitment rates.

MSY reference points have not been established for sardine in Divisions VIIIc and IXa. The stock in 2010 was in poor state due to lack of strong recruitments since 2005. The 2010 year class is estimated as the lowest in 32 years.

F_{msy} reference points have not been established for anchovy in the Bay of Biscay, Subarea VIII. B_{msy} was established as $B_{escapment}$ of 33 thousand tonnes. This stock has been closed to fishing for the last five years following a recruitment failure. The spawning stock biomass (SSB) has recovered since, and a strong recruitment for 2010 has been estimated. Anchovy in the Gulf of Cadiz, Subarea IX is in a poor state. Recent scientific survey biomass indices show a decline up to the year 2010.

Horse mackerel (southern stock, in Division IXa) seems to be in a good state. SSB and fishing mortality have been stable. Recruitment is rather stable with occasional large peaks like the latest that occurred in 2010.

Mackerel (NE Atlantic stock) fishing mortality rate is at precautionary levels and SSB has increased considerably since 2002 to levels above B_{par} though a slight decrease has been observed following high catches recently.

Current management (business as usual)

The following tools are currently being employed for the Iberian purse seine fishery management in SWW:

- Total allowable catch
- Vessel daily catch limits for sardine, similar to ITQs.
- Effort control (number of days)
- Minimum landing size
- Mesh size restrictions (reduction of by-catch)
- Seasonal closures

BAU performance

- Current management does not respond quickly enough to the highly variable dynamics of short-lived species such as anchovy.
- Sardine seasonal closure of two months seems to work well during the spawning period, and should be complemented by a seasonal closure during the recruitment season.
- To control sardine total catch, the daily limits by vessel currently in place (similar to ITQs but not transferable) seem to work well.
- Discards are mainly due to market price variations.

Alternative management strategies

Strategy A: Avoid discards

Discard avoidance is considered to be relatively simple to implement in this fishery as this fishery captures mainly the target species and has already has a low discard rate of non-target species.

Strategy B: Limit GRT and vessel size

Gross Registered Tonnage (GRT) and engine power have been demonstrated as important predictors of purse-seine CPUE (kg per fishing day). This strategy considers restrictions on vessel size and power, with emphasis on smaller rather than larger vessels.

Strategy C: In season management

The stocks targeted by the SWW purse seine fishery are highly dependent on the strength of incoming recruits. In season management will be able to improve the management of anchovy and sardine by making the best use of the latest recruitment and biomass indices information.

Management strategies matrix

The matrix examines expected outcomes from the alternative management strategies over a 5-10 year horizon.

Management Strategy	Commercial Fish Biodiversity	* Seafloor Integrity Food-web	Efficiency	Community Viability Stability	Food Security
	Ecological	Economic	Social		
A. Avoid Discards	Yellow	Green	Yellow	Red	Green
B. Limit GRT and Vessel Size	Green	Green	Green	Red	Yellow
C. In Season Management	Yellow	Green	Yellow	Green	Yellow
D. Business as Usual	Yellow	Red	Yellow	Yellow	Red

* This column blank as this fishery is not considered to impact upon seafloor integrity.

Management guidance

The proposed reform of the CFP includes plans for the introduction of individual fishing quotas for assessed stocks. A similar system using individual daily landing limits by vessel is already in use for sardine in this region and is considered as the current management in 'business as usual'.

Avoiding or banning discards (Strategy A) is relatively simple measure to implemented in this fishery. Avoiding discards is expected to reduce fishing mortality of target and non target species, thus leading to improvement in the status of the commercial fish and food security descriptors, and increasing stability of catches. However, banning discards may reduce profitability by restricting fishers ability to respond to market deman and prices.

Reduction in vessel size is predicted to decrease fishing mortality due to reduced fishing capacity and Strategy B is considered to be the most appropriate if the overarching management objective is to work towards GES in line with the MSFD. Strategy B is expected to reduce economic costs for a given catch due to lower fuel consumption and crew requirements, and thus may increase profitability. Stability is likely to improve if the total capacity of the fleet is adjusted to stock size. However, reductions in harvest may also lead to an increase in the cost per unit harvest, and thus reduce efficiency. Reducing GRT, vessel size and crew size would have a negative effect on community viability.

Strategy C allows an adaptive response to variations in the stock size. This avoids overexploitation of the stock and would help to maintain the stock within safe biological limits, thus improving stability of catches and long term profitability. Regulations which respond to variations in the stock are predicted to increase both efficiency and stability if they are implemented and react appropriately to the state of the stock.

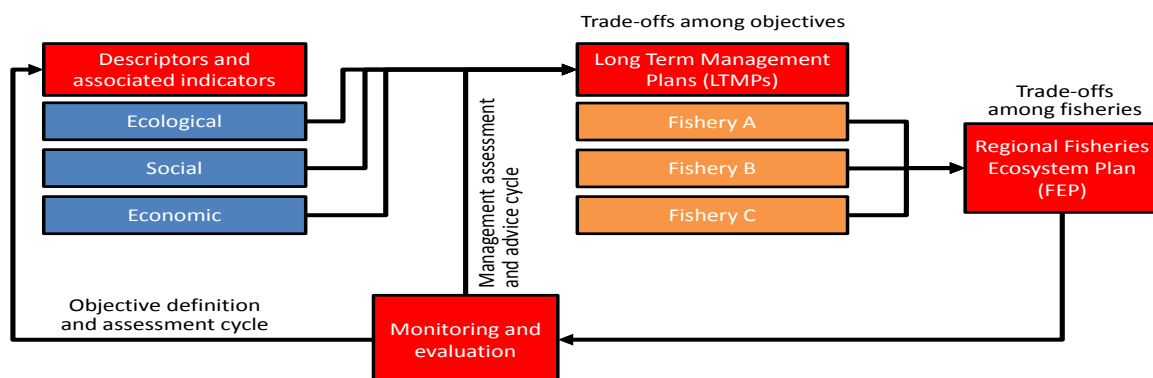
A combination of the alternative management strategies including the current individual daily landing limits by vessel, complemented by seasonal juvenile boxes and in-season management, would be an improvement from the current system based on fixed quotas that are not able to respond rapidly to fluctuations in recruitment. Nevertheless, this fishery and catches would still depend on the strength of target pelagic recruitments and a succession of low recruitments could lead to a reduction of the stock, affecting TACs and catches. Where this occurs, fishing effort should be quickly reduced and measures such as closed areas should also be considered.

SUMMARY

We have demonstrated the application of a management strategy evaluation matrix approach to the development of regional Fisheries Ecosystem Plans (FEPs) to help decision-makers to simultaneously consider ecological, social and economic implications of decisions, and to inform the development of EBFM for European fisheries. The case study fisheries examined should be seen as heuristic examples and not definitive assessments of the potential effects of different management strategies.

To make EBFM a reality, the next steps are:

- To develop long-term management plans (LTMPs) for each of the region's fisheries considering the ecological, economic and social implications for ecosystem components. LTMPs should be integrated into regional FEPs.
- To develop closer integration among stakeholders, fisheries scientists, ecologists, social scientists and economists to develop effective management advice for LTMPs. Social and economic descriptors, and appropriate (region specific) indicators, require further scrutiny and development.
- The development of management strategy matrices requires additional information to support management advice, much of which is "new" to the formal fishery advisory process. Qualitative assessments and expert judgement will be required to supplement analytical modelling to meet the increased data requirements of LTMP development to make them operational in the short term.
- To ensure that the management framework is adaptive and able to respond to new information and understanding to allow decisions based on the best available evidence.
- To implement appropriate governance mechanisms that facilitate true stakeholder engagement to generate credibility in the management process and foster stakeholder support, this includes both definition of objectives and indicators as well as the development and evaluation of LTMPs.



Ultimately management decisions will be made on the basis of overarching objectives. Trade-offs are required both between the pillars of sustainability in the development of LTMPs, and between individual fisheries when integrating LTMPs into regional FEPs. Due to the nature of the trade-offs, it may not be possible to satisfy all stakeholder groups simultaneously. Resolution of these trade-offs is not a technical scientific decision, however development of decision support frameworks such as the management strategy evaluation matrices can aid managers in making appropriate decisions on the basis of the best available information.

This document complements a technical report entitled *Fisheries Ecosystem Plan: South Western Waters* (Borges et al. 2011), available to download from the MEFEP website from October 2011 www.liv.ac.uk/mefep/Reports_and_outputs.htm

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