North Sea

Fisheries Ecosystem Plan

Piet, G. J. ; Bloomfield, H. ; Rockmann, C. ; Miller, D. ; van Hal, R. ; Raakjær, Jesper; Christensen, A. S. ; Aanesen, M. ; Armstrong , C. ; Frid, C.

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MEFEPO

Making the **E**uropean **F**isheries **E**cosystem **P**lan **O**perational

North Sea : 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).

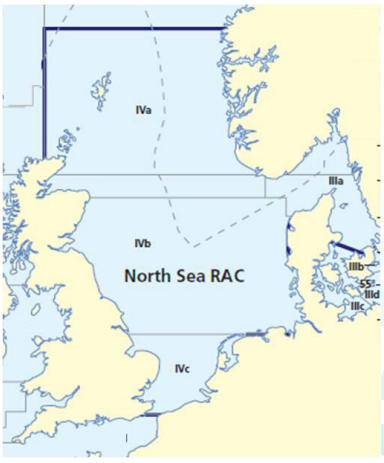
Central to the FEPs is a management strategy matrix which presents an overview of the potential impacts of different combinations of management measures on the ecological, social and economic status of the system. The FEPs also describe an operational model for regionalisation of European fisheries management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

INTRODUCTION TO THE NORTH SEA REGION

The North Sea is a marginal, shallow sea on the European continental shelf. It is more than 970 km long and 580km, wide, with an area of around 750,000 square km. The North Sea RAC area is larger as it includes the Skagerrak and Kattegat. The North Sea is surrounded by England, Scotland, Norway, Denmark, Germany, the Netherlands, Belgium and France. In the southwest, beyond the Straits of Dover, the North Sea becomes the English Channel connecting to the Atlantic Ocean.

The dominant seabed feature of the North Sea is the Doggerbank, a large sandbank in the middle of the North Sea. It extends over approximately 17,600 km^2, 260km long and 97km wide. It is clearly shallower than the surrounding water, ranging from 15 to 36 metres. Another dominant feature is the Norwegian Trench in the northern part of the North Sea along the coast of Norway, with a width of 20 to 30 km and a maximum depth of approximately 725m.

Over 230 species of fish occur in the North Sea; 11 are main targets of fisheries for human consumption, three other species are the target of industrial fisheries. The predominant pressures acting on the marine environment of the NS region are fishing and climate change.



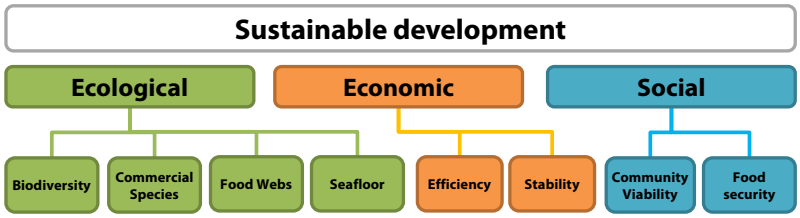
North Sea RAC region

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 European 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 MEFEPO "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 MEFEPO 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 NS 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

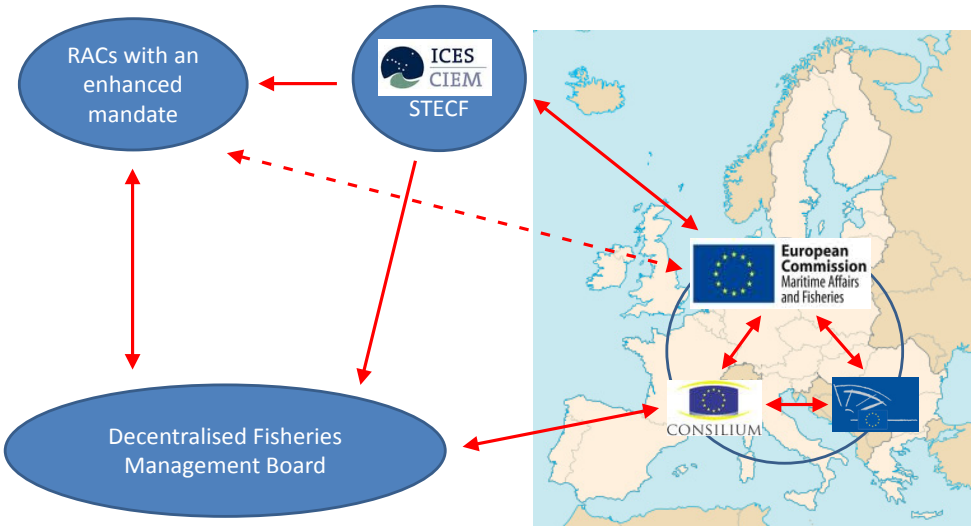
The suite of management strategies comprised of "business as usual" (BAU) and alternative strategies applying different management tools, to explore how the objectives of EBFM may be most effectively achieved. Trade-offs associated with different management approaches were examined. Management strategy 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 (FMB) 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: BEAM TRAWL

Introduction to the fishery

This case study focuses on the demersal beam trawl fisheries targeting sole and plaice. The distributions of these two stocks differ, with plaice being generally more widespread while sole is located primarily in the southern North Sea. Beam trawlers centred on the southern North Sea using mesh sizes of 80-89mm take the majority of the catches of plaice and sole. However, the large beam trawls (mesh size >100mm) used in the north are most efficient for capturing plaice.

State of the stock

The most recent assessments of the North Sea sole and plaice stocks show fishing mortality (F) to be well below the precautionary reference levels. Spawning stock biomass (SSB) of plaice is currently at its highest observed level.

In recent years sole too has seen an increase in SSB and is currently above precautionary reference levels. These assessment results show that for the last two consecutive years both stocks have been within safe biological limits.

Current management (Business as usual)

The following tools are currently being employed for beam trawl fishery management in the North Sea:

- Total allowable catch (TAC)
- Area closures
- Seasonal closures
- Subsidies for decommissioning of vessels
- Mesh size restrictions (reduction of by-catch)
- High-grading ban

BAU performance

- The current healthy state of the sole and plaice stocks in the North Sea suggests that current management has been effective for these target species.
- Single species success is not necessarily indicative of success at the ecosystem level:
- Discarding rates remain high and by-catch is common.
- The predominant gears used have a considerable effect on the benthic habitats that are fished.

Alternative management strategies

Six future management scenarios were considered. Where possible, full quantitative evaluations were conducted using the best available models.

Strategy A: TAC management for MSY

This scenario has the potential benefits of exploiting the plaice and sole stocks at levels considered to provide high long term yields with low risks to the stocks.

Strategy B: Effort control

Effort limitation would be most effective if the effort required to land the smallest/easiest TAC in the mixed fishery is limiting, otherwise some species could still be overfished.

Strategy C: Mesh size regulations

Increasing the minimum legal mesh size is a simple measure to reduce discarding of commercial fish as well as non-commercial fish and invertebrates.

Strategy D: Spawning ground closures

Spawning ground closures would be a further spatial measure, in place only during the peak spawning seasons of sole or plaice.

Strategy E: Catch Quota Management (CQM)

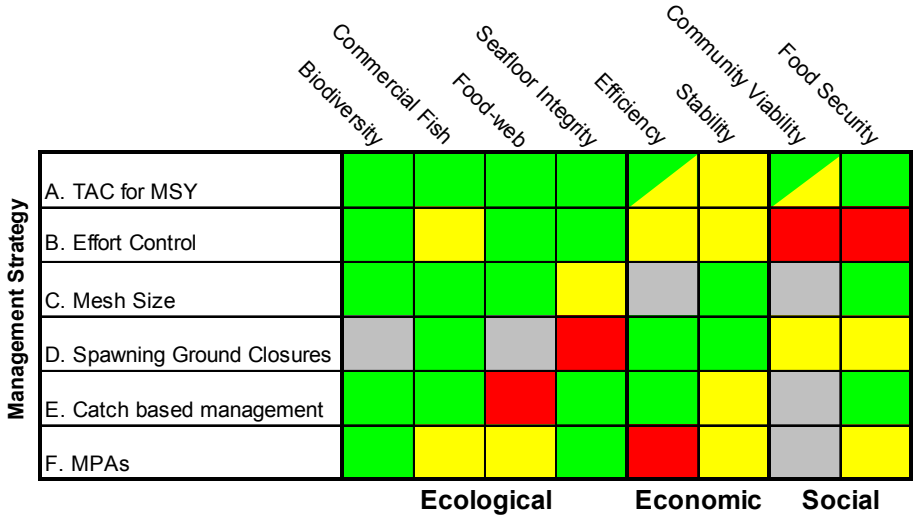
CQM aims to encourage less discards and a potentially more efficient fishery by shifting the management output regulations to be based on catch rather than landings.

Strategy F: Marine Protected Areas

Marine protected areas (MPAs) will be introduced in the North Sea in the near future (i.e. Natura 2000). These are primarily aimed at addressing concerns about benthic habitats and demersal organisms.

Management strategies matrix

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



Management guidance

If the overarching management objective is to work towards GES in the context of the MSFD, then BAU can be slightly improved upon, or at least remain unaffected, by most of the suggested strategies. In this case, not implementing catch quota management (potential negative impacts on the food web descriptor) or spawning ground closures (increase seafloor impact in surrounding areas) is recommended.

Almost all proposed strategies are predicted to have a positive impact on the long term prospects of the ecological descriptors; this reflects the current high-impact nature of this fishery. The impact on economic efficiency of almost all new regulations is expected to be negative in the short term as the fishery adapts to the new changes. The values shown above are the expected medium term benefits, once the fishery has adapted to the new regulation. From an economic point of view, spawning ground closures are likely to have the greatest positive impact. If economic factors are most important, MPAs should be avoided. However, the current management of this fishery is already considered to be reasonably stable, so there is limited scope for improvement in this regard. It is expected that stability can be improved by implementing management strategies that dampen the fluctuations in the strength of incoming year classes, as current TACs vary in response to these.

If social factors are of primary concern, then modification of the current management plan to more suitable MSY targets is likely to have the greatest positive impact. Food security can also be enhanced through appropriate mesh size regulations and catch quota management.

Of the proposed new management strategies, scenario A is the closest to the current management regime. This approach alone is likely to show improvements in the descriptors, although potentially further improvements could be achieved by incorporating additional management measures.

TAC for MSY is expected to improve the status of all ecological descriptors and has no expected negative impacts on other descriptors. Mesh size regulations and effort control are also expected to perform very against ecological criteria. However, effort control, like catch based management and MPAs, has some potential negative impacts on economic and/or social descriptors. From an economic standpoint spawning ground closures are expected to have the greatest positive impact, though this is traded off against minimal social impact and potential damage to seafloor integrity. In terms of overall performance with the least negative impacts, TAC for MSY is expected to perform best. This could be applied together with mesh size restrictions for improved all-round performance.

CASE STUDY FISHERY 2: HERRING

Introduction to the fishery

The North Sea herring fishery is a multinational fishery that seasonally targets herring in the North Sea. The fishery takes place in the Shetland-Orkney area and northern North Sea in the spring and summer, and in the English Channel in the late autumn and early winter. The main fleets come from Norway, Denmark, UK, The Netherlands, France, Germany, and Sweden (in decreasing order by landings). An industrial fishery which catches juvenile herring as by-catch in the summer and early autumn, operates in the Skagerrak, Kattegat and in the central North Sea.

State of the stock

The stock is exploited well below MSY. The exploitation of juveniles is now the lowest in the last 40 years. ICES classifies the stock as being at full reproductive capacity and as being harvested sustainably and below management plan and F_{msy} targets. The stock is currently considered to be in a low productivity phase as the recruit to spawner ratio is very low.

Current management (business as usual)

The following tools are currently being employed for herring management in the North Sea:

- Fishing mortality is set separately for adult and juvenile herring.
- Trigger spawning biomass of 1.3 million tonnes
- TAC for the human consumption fishery
- By-catch maximum limit for the industrial fishery
- Minimum landing size
- Sub-TAC for Downs spawning component
- Closed areas to protect either spawning or juveniles
- Ban on high grading

BAU performance

- The current healthy state of the herring stock in the North Sea suggests that current management is effective.
- No protection of the diversity of spawning beds and the maintenance of sub-stock structure.
- The by-catch ceiling has regulated the impact of fisheries.
- Downs herring have recovered since the 1990s.
- Areas with active fisheries at spawning time appear sustainable.
- ITQs have worked well in rationalising the exploiters and increasing their profitability.
- Some of the measures to reduce area misreporting have worked well.

Alternative management strategies

Strategy A: Removing sub-TAC

Removal of the separate sub-TAC for the southern North Sea. It is feasible that the impact of the fishery could be managed by limiting fishing mortality alone.

Strategy B: Removing seasonal local fishing closures

Removal of the seasonal closures of the herring and sprat fisheries, i.e., in the Firth of Forth and around the Banks spawning ground and to the west of Denmark.

Strategy C: Maintain sub-stock structure

Considers the introduction of mechanisms to protect, sustain or even encourage the phenotypic diversity of NS herring. Such mechanisms would involve more science, monitoring and/or more flexible management.

Strategy D: Introduce MPAs

Pelagic fisheries may be impacted by MPAs if they were closed to all fishing, e.g. to ensure protection of food for birds. This scenario considers the introduction of MPAs for wider environmental concerns in which all fishing activity is prohibited.

Strategy E: Close spawning beds

Considers closure of all herring spawning habitats to all anthropogenic activities. This scenario does not constitute a fisheries management scenario as such; it is rather a marine spatial planning management action that would have an impact on the herring fisheries.

Strategy F: Prey for predators

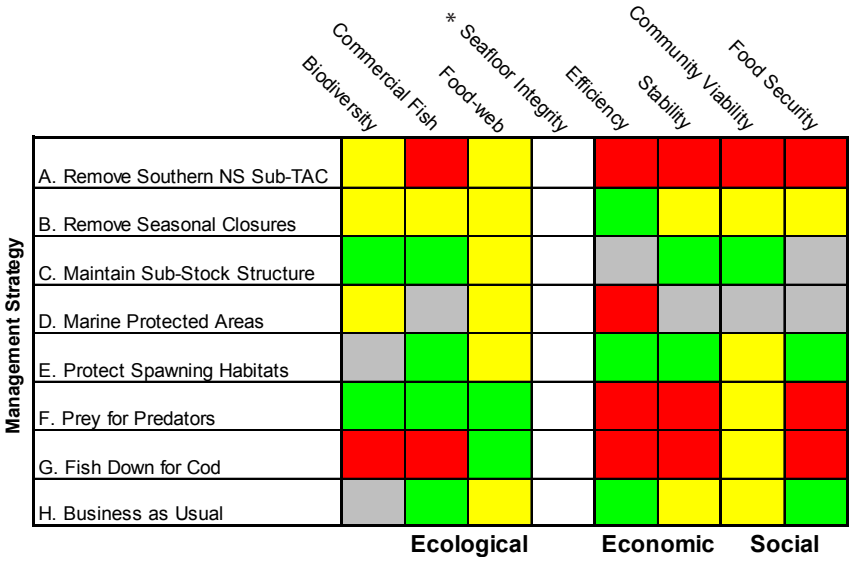
Management of the fishery so that herring biomass increases to such an extent that it can be considered a sufficiently abundant prey source for predators.

Strategy G: Fish down to allow cod to recover

Considers fishing down the herring population to such an extent that it is expected that there will be much lower predation by herring on cod eggs. This bio-manipulation approach is high risk.

Management strategies matrix

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



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

Management guidance

The proposed new management strategies, which incorporate a range of ecological, economic and social objectives, all show benefits and disadvantages. Some are fairly benign (such as removal of the small localised seasonal closures) and some have only expectations of stability or improvements (protect spawning habitats from development or disruption) although other non-fisheries related industries will be more deleteriously effected. Maintaining the current management approach also shows improvements in the descriptors. Complex strategies show the greatest variability in terms of improvement and deteriorating descriptors. The strategy with the greatest risk of deteriorating the marine system and the fisheries is strategy G.

It is best to consider any other strategies as additions to the existing management plan for North Sea herring (or future amended plans). The plan has successfully delivered a fishery that exploits at or below F_{MSY}, it allows the fishery and managers to respond to changes in the productivity of the stock and it ensures that the juvenile herring are not unsustainably exploited. It also keeps the spawning biomass well above the 800,000 tonnes biomass limit thus maintaining the stock at full reproductive capacity.

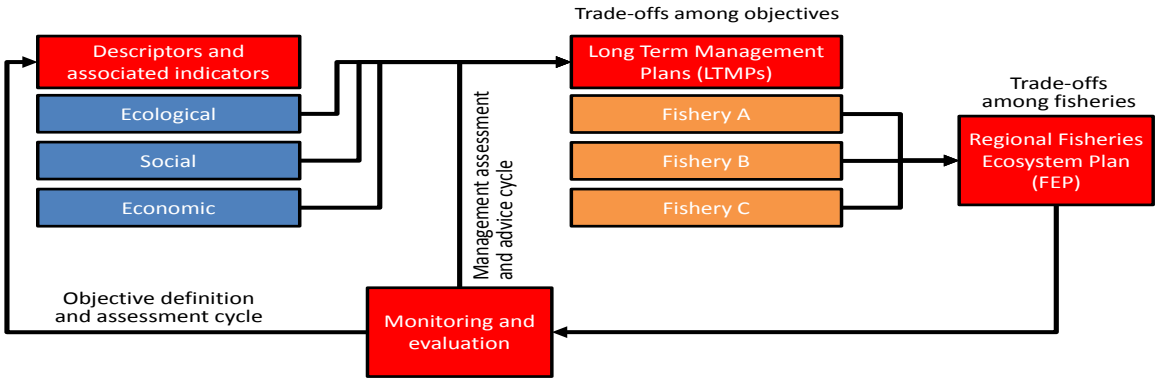
North Sea herring catch © Sytze Ybema

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: North Sea* (Piet et al. 2011) available to download from the MEFEPO website from October 2011, www.liv.ac.uk/mefepo/Reports_and_outputs.htm

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SEVENTH FRAMEWORK PROGRAMME