How can ecosystem models be used to support marine management and policy?

What's the problem?

Marine ecosystem-based management – as specified by the Marine Strategy Framework Directive and Common Fisheries Policy – will require decision tools to support marine management, assessment, and policy development. Ecosystem models are computer simulations that help us to understand ecosystems and provide insight into the potential impacts of human activities (Figure 1). They allow assessment of the biological, social, and economic impacts of different management strategies, so are an important tool to support ecosystem-based management (Figure 2). The UK is at the forefront of scientific development of ecosystem models and have developed many different models. However, there is limited uptake and use of these models by decision-makers in the UK and Europe. This is a contrast to other countries where they are routinely used (e.g. Australia and USA). As a result, it is important to identify how to increase the use of UK ecosystem models to support marine management and policy development.

What are the aims of the project?

The overall aim of the project is to identify how best to use UK ecosystem models to support decision-making.

- To achieve this goal, we will review existing UK ecosystem modelling capability and identify how existing ecosystem models have been used to support marine management and policy development.

- By bringing together the UK marine ecosystem modelling and policy-making communities at a workshop, we will build a shared understanding of the future potential for use of UK ecosystem models.

- A roadmap for the future of UK ecosystem modelling capability will be developed and included in the UK marine strategy.
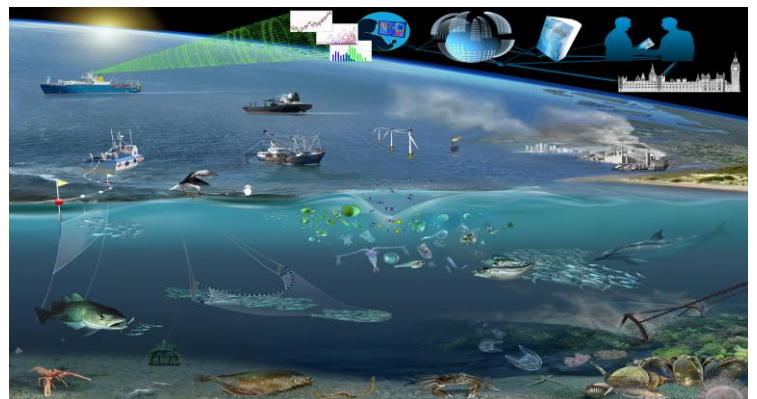

Figure 1 The interactions between marine organisms, their physical environment, and human pressures. Ecosystem models support the provision of advice on the conservation and exploitation of the marine environment (top right). © Crown Copyright, created as part of the Fizzyfish Project (MF1228).

Which policy areas will the research inform?

The research will inform how ecosystem models can be used in support of delivering key challenges identified in the Defra Marine, Biodiversity and Climate Change evidence plans. It will also help identify how to increase the use of ecosystem models to support marine management, assessment, policy and regulation. The roadmap will be used to inform the UK marine strategy through the Marine Science Coordination Committee (MSCC) and the Marine Alliance for Science and Technology in Scotland (MASTS).

What are the results from the project and how will they be used?

The main approach to address the potential of ecosystem modelling and set a roadmap for the future of UK ecosystem modelling capability was to hold a workshop that brought together around 60 academics, government scientists and policy makers. To realise the potential of UK ecosystem modelling, we have the developed following common vision:

"To deliver world-class ecosystem modelling that supports our understanding, use, and management of the marine environment through impact on policy and regulatory decision making."

To achieve this vision, the UK ecosystem modelling community needs to adopt 5 core principles:

1. Maximise policy and regulatory impact – ensure policy makers know where and how ecosystem models can be used, and maximise the impact of existing models on policy and regulatory decisions.

2. Build multidisciplinary communities – build multidisciplinary communities of policy makers, observationalists, modellers, data scientists, and socio-economists. These will speak a common language, have regular contact, share new policy requirements, and co-deliver ecosystem modelling.

3. Deliver novel policy-relevant science through ecosystem modelling – maintain the UK at the forefront of ecosystem model development, horizon scan new science to maximise pull through of new techniques, and put in place programmes to fill existing knowledge gaps that could be addressed using models.

4. Ensure quality and availability of model-derived products – define and employ rigorous quality standards to satisfy legal challenge in policy and regulatory decisions, and ensure that model-derived products are available and robust.

5. Produce people with the right skills – assess existing UK ecosystem-modelling capacity and develop training programmes for new personnel with the right skills to ensure that the utility of ecosystem modelling is optimised in future.

These outputs have been widely disseminated to the scientific and decision making communities, and a roadmap for UK ecosystem model development that has been produced that will be used to inform that UK marine strategy.
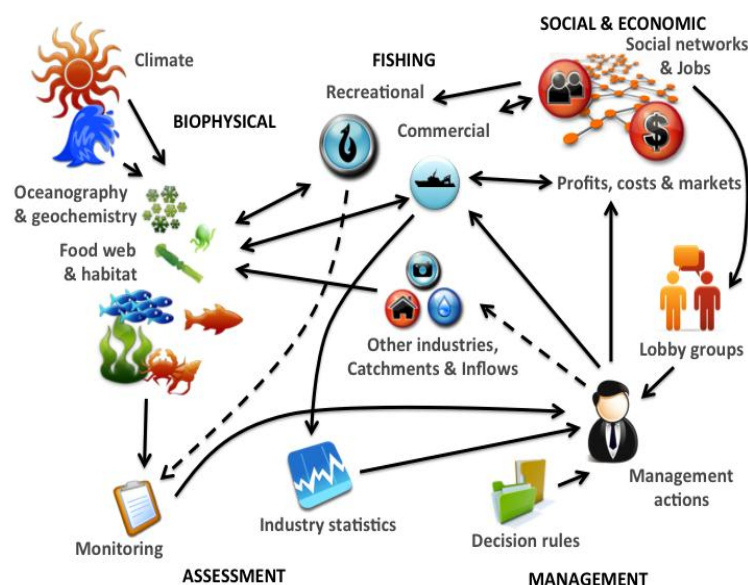

Figure 2: Components that can be included in ecosystem models and potential interactions (©Beth Fulton, CSIRO, Australia).

Where can I find further information about this and related research?

For more information, please contact Kieran Hyder at Cefas (kieran.hyder@cefas.co.uk)

Alternatively, please contact Defra's Marine Evidence Team: marinescience@defra.gsi.gov.uk

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