

Publishable summary



“If we don’t understand how the ecosystem will respond to multiple drivers in the future we will find it very difficult to manage marine ecosystems. Multiple driver assessment may provide the secret to managing coastal marine ecosystems, and the goods and services they provide, in a holistic and effective manner.”

MEECE was launched in September 2008 (Figure a) to investigate the sensitivities and potential responses of marine ecosystems to both climatic change and the direct effects of human activity. By studying the key drivers of change set by the European Union’s Marine Strategy Framework Directive (MSFD) the project aims to gain a better understanding of the direct and interactive effects of these factors on marine ecosystems. MEECE uses predictive models that consider the full range of drivers to elucidate the responses of the marine ecosystem in a holistic manner, rather than driver by driver as has been done in the past. The project follows a logical process starting with targeted data synthesis, experimentation, model parameterisation and development, followed by model exploration through a range of scenarios addressing the full set of drivers which then feed into a suite of decision making tools. Recognising the need for structured, coherent databases on observational and experimental information on ecosystem-driver interaction and response, a meta-database for ecosystem drivers containing information on Climate and Ocean Acidification, Pollution, Fishing, Invasive Species and Plankton Metabolic Rates has been created and meta-analysis is now being undertaken to provide new parameterisations and scenarios. One of the challenges is to integrate the response of ecosystems to multiple drivers across a range of trophic levels by developing coupled models. MEECE has made significant progress towards creating an integrated model structure following a modular approach and employing couplers by developing a generic programming framework for ecosystem models which serves as “glue” between different models (Figure b). As a result, both physical and biogeochemical models only need to be developed or modified once to interface with the general framework; after that, arbitrary combinations of physical and biogeochemical models can be made without requiring any code change.



Figure a. The MEECE Community

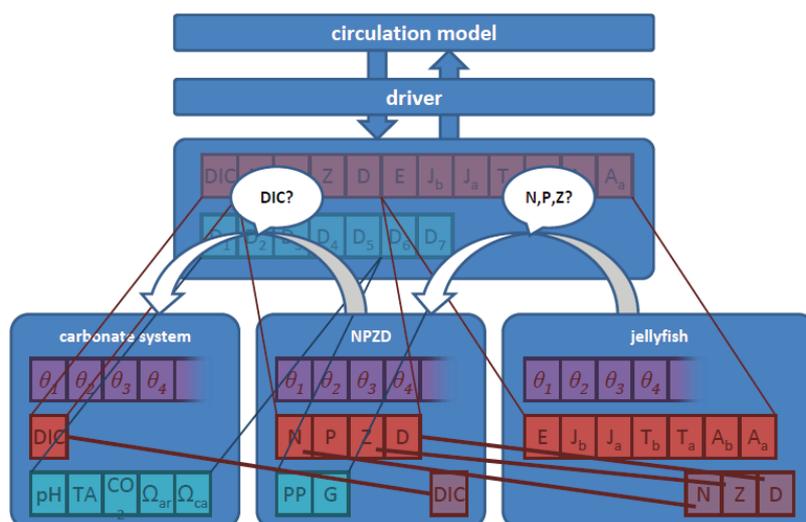


Figure b. Schematic diagram of the generic model coupler.

Underpinning this progress is the creation of a biological model library as a community resource, containing in a ‘stand alone’ state with all necessary documentation, technical guides and metadata so that any competent programmer unfamiliar with models, can use them. MEECE aims to develop decision support tools, which assess key

vulnerabilities and risks of global change for the marine ecosystem. The main focus of this work is the MSFD which distinguishes 11 qualitative descriptors that together determine the characteristics of Good Environmental Status (GES). Underpinning this activity is the requirement for a range of scenarios which take account of the impacts of multiple climatic and anthropogenic drivers on marine ecosystems. MEECE has simulated present and future primary production states in several regions and this will be expanded to include simulations with coupled plankton fish models during the next phase of the project. In order to make this an integrated assessment we linked human activities to the MSFD descriptors through the MSFD Annex III pressures and impacts.

MEECE places a strong emphasis on knowledge transfer to society, through the dissemination of research-based knowledge, expertise and skills to stakeholders. Led by two MEECE partners (IRD & UCT) the Working Group, Indiseas, has worked jointly to evaluate the status of world marine ecosystems by providing a generic set of synthetic ecological indicators to accurately reflect the effects of fisheries on marine ecosystems, to facilitate effective dissemination of these effects to, stakeholders. The second phase of MEECE involves exploiting our modelling tools to simulate the response of marine ecosystems to combinations of climate change and anthropogenic drivers along with developing the management strategy evaluation tools to exploit them. The great challenge is to ensure the outputs of MEECE contribute to the process of both defining and evaluating indicators of Good Ecological Status.

Contact Details

To receive further information and updates about the MEECE project join the mailing list by sending your contact details to meece@pml.ac.uk

Project Coordinator:

Icarus Allen

Tel: +44 (0) 1752 633441

Email: JIA@pml.ac.uk

Project Manager and Webmaster:

Jessica Heard

Tel: +44(0) 1752 633401

Email: jessh@pml.ac.uk