Ecosystem Models as Support to Eutrophication Management in the North Atlantic Ocean (EMoSEM)

Consortium

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Introduction

A major challenge in EU marine governance is to reach the good environmental status (GES) in the North-East Atlantic (NEA). There is a link between ecological nuisances at sea (Fig.1) and anthropogenic nutrient inputs. The land-ocean continuum hosts a complex succession of processes. Nutrient inputs in river watersheds result in problematic nutrient enrichment in specific marine areas.

It is necessary to trace back the sources of marine nutrients up to the watersheds in order to control the human-driven eutrophication. **Which scenarios of inland nutrient reduction will allow to reach the GES at sea?**

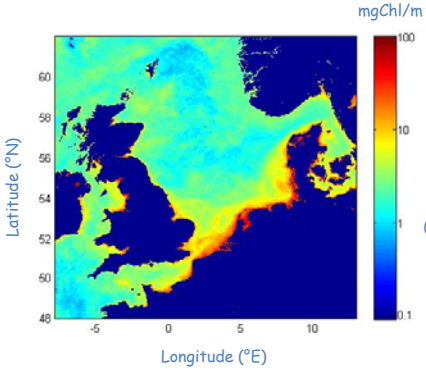

Fig. 1. Meris chlorophyll a concentration (percentile 90) in 2003. (MUMM, Marcoast)

Objectives

i. Estimate the needs to reach GES in all marine areas (distance-to-target requirement, DTTR).
ii. Identify "realistic" scenarios of nutrient reduction in the river watersheds of NEA.
iii. Assess the impact of the "realistic" scenarios in the sea, and compare to DTTR.
iv. Suggest innovative ecological indicators to account for HABs in the GES definition.

Methodology

Marine ecological models (Fig.2) will be used to track the nutrients in the sea, and trace back their riverine or oceanic sources with the transboundary nutrient transport method (TBNT). TBNT application is a prerequisite for DTTR estimates.

A generic watershed model applied to NEA rivers (Fig.2) will calculate terrestrial nutrient exports to the sea under different scenarios:

i. A past "pseudo-pristine" scenario, where natural nutrient exports are estimated in the absence of human influence.
ii. A series of future "realistic" scenarios, where different wastewater treatments and agricultural practices are combined.

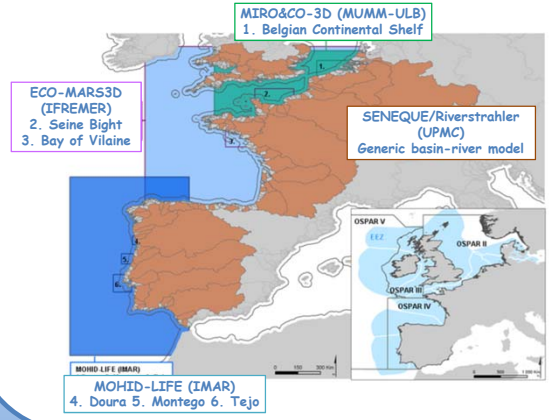

Fig. 2. Map showing the domain of the basin-river SENEQUE/Riverstrahler model and the 3 coastal marine ecosystem models and their local implementation. The superimposed line shows the 12 nm limit. Bottom right: geographical limits of the EEZ and OSPAR regions

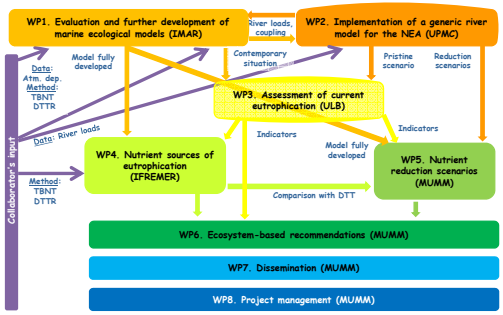

Fig. 3. Schematic description of the work packages

Expected results

This modelling work will allow to scale human vs natural influences in marine eutrophication, and to inform about appropriate future management choices with:

i. Description of eutrophication problems in NEA and their causes
ii. Comparison of the current eutrophication status with a "pseudo-pristine" status
iii. Realistic future scenarios for watershed management, and impacts at sea
iv. Innovative ecological indicators

EMoSEM's outcome will be transferred to Member States responsible for WFD and MSFD operations, and to the OSPAR Commission.

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