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

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A major challenge in EU marine governance is to reach the good environmental status (GES) in the north-eastern Atlantic (NEA). Existing approaches do not integrate the eutrophication process in space (continuum river-ocean) and in time (past, present and future status). A strong need remains for (i) knowledge/identification of all the processes that control eutrophication and its consequences, (ii) consistent and harmonized reference levels assigned to each eutrophication-related indicator, (iii) identification of the main rivers directly or indirectly responsible for eutrophication nuisances in specific areas, (iv) an integrated transboundary approach and (v) realistic and scientific-based nutrient reduction scenarios. The SEAS-ERA project EMoSEM (http://www2.mumm.ac.be/emosem/) aims to develop and combine the state-of-the-art modelling tools describing the river-ocean continuum in the NEA continental seas with the objective to: (i) suggest innovative ecological indicators to account for HABs in the GES definition, (ii) estimate the needs to reach GES in all marine areas (distance-to-target requirement, DTTR), (iii) identify 'realistic' scenarios of nutrient reduction in the river watersheds of NEA and (iv) assess the impact of the 'realistic' scenarios in the sea, and compare to DTTR. Marine ecological models 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 will calculate terrestrial nutrient exports to the sea under different scenarios: (i) A past 'pristine-like' scenario, where natural nutrient exports are estimated in the absence of human influence and (ii) a series of future 'realistic' scenarios, where different wastewater treatments and agricultural practices are combined. EMoSEM will deliver coupled river-coastal-sea mathematical models and will provide guidance to end-users (policy- and decision makers) for assessing and combating eutrophication problems in the NEA continental waters.