

QUantification of Erosion/Sedimentation patterns to Trace the natural versus anthropogenic sediment dynamics
(QUEST4D)

Duration of the project: Phase 1: 01/01/2007 – 31/01/2009
Phase 2: 01/02/2009 – 31/01/2011

Budget Phase 1: 614.905 €

Keywords: Physical ecosystem; sea-level rise; long-term impact; erosion/sedimentation; sand/mud balance; sustainable exploitation/management criteria

Context

QUEST4D focuses on the sustainable exploitation of the EEZ for which the set-up of a strategic sediment management framework becomes real. For aggregate extraction, there is a European-wide tendency that non-renewable sediments are increasingly extracted and hence resources need a better management. Recent studies also gave evidence of the large-scale influence of dumping on the coastal ecosystem. Moreover, the high turbidity, together with the high siltation rates in harbours and navigation channels require an allocation of dumping grounds, sustainable on the long-term. Sustainability and fisheries is, in the context of QUEST4D, related to the long-term maintenance of the sandbanks; a key structuring ecosystem driver. Finally, a more holistic view on beach nourishment is needed if sea level rises faster and hence resources are increasingly needed.

Project description

Objectives

QUEST4D focuses on the quantification of erosion and sedimentation processes along the Belgian Continental Shelf. As such, the sediment state and dynamics will be studied in the space, depth and time domain (4D). The research is timely as indications of a longer-term and broader-scale physical degradation of the seafloor exist and it is unclear whether this is solely due to the increasing anthropogenic influence or to a combination with the natural evolution of the seafloor itself, including the effect of climate change. The latter processes need to be disentangled, as their impact needs to be balanced against the industry-related activities. This kind of research asks for a detailed and targeted approach; this becomes realistic as the project group can rely on recent research results and the availability of the appropriate datasets, both on the small- and large-scale. QUEST4D aims at presenting a holistic view on sediment changes mainly related to sand and mud and will try to define from this, the status of the marine environment and its future perspectives, albeit from a mere physical viewpoint.

Methodology

Generally, the methodology consists of: advanced modelling, validated with experiments; targeted observations/samplings, within the space, depth and time domain (4D); and various long-term datasets. Predictions will be made using different sea-level rise scenarios. The QUEST4D partnership can rely on the measurements and monitoring results, obtained by various government organisations. An overview of the different project components is further schematically represented including the interaction between the different partners.

Generally, the QUEST4D partnership consists of geologists/sedimentologists (RCMG/MUMM/KUL), bio-engineers (RCMG), sediment transport modellers (MUMM/KUL/FHR),

coastal engineers (FHR) and biologists (SMB/RBINS) with an equal balance between university scientists and scientists related to management bodies. Because of its multidisciplinary and the presence of 2 management related partners (MUMM/FHR), sound options for management and the sustainable exploitation of human activities will be provided, strengthened with expertise of the follow-up committee. The Belgian Marine Data Centre (BMDC) and the Flanders Marine Institute (VLIZ), respectively, will take care of the database management and the valorisation of the project results.

Link International Programmes

RCMG will validate the QUEST4D results in the COST Action 638 on 'Investigating and managing the impacts of marine sand and gravel extraction and use' (2006-2010), a European-wide network on marine aggregates. **MUMM-BMDC** is partner of SeaDataNet, a EU FP6 Integrated Infrastructure Initiative, of interest to the data management in QUEST4D. The understanding of climate change will be supported through **KUL's** involvement in the SEAMOCS Network (Applied stochastic models for ocean engineering, climate and safe transportation, EU Marie Curie RTN, 2005-2009). Also, the EU Marie Curie Transfer of Knowledge project MARIE (Modelling and Assimilation for Region of fresh water Influence Environments, 2005-2009) will provide more insight into coupled numerical prediction of wave/current and river plume hydrodynamics. **FHR** is actively involved in the elaboration of a large-scale mud model for the Scheldt estuary, funded by the Scheldt Commission. All of the partners are involved in the BeNCoRe/ENCORA network, a European-wide network on coastal research (EU FP6).

Expected results and/or Products

A Geographic Information System and **databases** containing multidisciplinary information on the seabed of the Belgian Continental shelf including the various human impacts of the last 100 years and a historic reference situation of 1900.

Models, in which the nearshore-shelf is coupled to the coast and Scheldt-estuary to address the sand and mud balance and idealised models to be used in impact assessments;

Parameters to be used in climate change studies;

Case studies on the effect of fisheries, aggregate extraction and long-term dumping;

Management tools (e.g. indicators) for a sustainable development / exploitation, including recommendations.

The main results will be published in peer-reviewed journals and presented at dedicated fora; for the public at large, leaflets, a set of animations and posters will be produced.

Partners

Activities

Chent University, Renard Centre of Marine Geology (RCMG)

Specialised in the use and validation of geo-acoustical techniques and the mapping/modelling of habitats.

Royal Belgian Institute for Natural Sciences, Management Unit of the North Sea Mathematical Models (MUMM)

MUMM follows a Management-Monitoring-Modelling strategy, respectively because of the impact of human activities, for operational forecasts and research, and as a basis of a good Management.

Catholic University of Leuven, Hydraulics Laboratory (KUL)

Specialised in wave/current modelling and behaviour of (non-) cohesive sediments. Subcontracts the Applied Geology research unit for clay mineralogical analysis.

Flanders Hydraulic Research (FHR)

Specialised in hydraulic, maritime and coastal engineering; laboratory research on sediments.

Ghent University, Section Marine Biology (SMB)

Focus on the biology of the marine benthos of soft bottoms. Subcontracts RBINS-Invertebrates for the analysis of the Gilson database (1900) and VLIZ for data valorisation.

Contact Information

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Promoters

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Follow-up Committee

External Advisory Groups are established to provide recommendations and guidance over the practicality of all project aspects. A balance is sought between governmental organisations (Flemish/Federal), industrial groups and the main users of the EEZ:

Balcaen Nathalie, Mertens Tina (Flemish Authorities, Agency for Maritime & Coastal Services, Coastal Division);
Dupont Yves (Belgian Navy, DGRM);
Mink Erik (European Dredging Association);
Roche Marc, Degrendele Koen (FPS Economy, SMEs, Self-employed and Energy, Marine Sand Fund);
Bonne Wendy (FPS Health, Food Chain Safety and Environment, Department of Marine Environment);
Hostens Kris (Institute for Agricultural and Fisheries Research, Fisheries);
Scory Serge (RBINS, MUMM);
Stalpaert Lisbeth (Flemish Environment Agency, MIRA);
Roose Frederik (Flemish Authorities, Department of Mobility & Public Works, Division Maritime Entrance);
Desaever René, Zeegra vzw.

End-users community

a.o. FPS Economy, SMEs, Self-employed and Energy, Marine Sand Fund; FPS Health, Food Chain Safety and Environment; Department of Marine Environment; Flemish Environment Agency, MIRA; Zeegra vzw; Flemish Authorities, Agency for Maritime & Coastal Services, Coastal Division / Department of Mobility & Public Works, Division Maritime Entrance; European Dredging Association; Belgian Navy, DGRM; Institute for Agricultural and Fisheries Research, Fisheries; RBINS, MUMM

