TILES

Transnational and Integrated Long-term Marine Exploitation Strategies

PROJECT DESCRIPTION

Mineral and geological resources can be considered to be non-renewable on time-scales relevant for decision-makers. The sustainable management of these invaluable resources requires a thorough and careful balancing of available quantity and quality versus rapidly changing societal and economical needs. The need for such an approach is recognized in the EU's **Raw Materials Initiative**, which highlights the optimization of the geological knowledge base as a key element in ensuring sustainable supplies from within the EU borders. Comprehensive knowledge on the distribution, composition and dynamics of geological resources therefore is the backbone of long-term strategies for resource use in a rapidly changing world.

During the last decade, socio-economic demands for marine aggregate resources in the North-East Atlantic or OSPAR region have increased at an unprecedented pace. During the past few years, hundreds of millions m3 of offshore sand and gravel have been extracted for coastal maintenance, harbour extensions and onshore industrial use. For two reasons, future aggregate demands will be even higher. First, increasing volumes of nourishment sand are needed as accelerating **sea-level rise** will leave our coastlines ever more vulnerable. Secondly, vast quantities of sand and gravel will have to be extracted to realize the **large infrastructural works** that are the key components of many visions on **coastal zone and offshore development**. Some of these resource demands are already incorporated in **Marine Spatial Plans**. The feasibility of these plans depends on the availability and sustainable supply of sand and gravel.

The ambition of TILES is to:
(1) Develop a **4D resource decision support system** containing *tools* that link 3D geological models, knowledge and concepts to numerical environmental impact models. Together they quantify natural and man-made changes to define sustainable exploitation thresholds. These are needed to ensure that recovery from perturbations is rapid and secure, and that the range of natural variation is maintained, a prerequisite stated in Europe's **Marine Strategy Framework Directive**, the environmental pillar of Europe's **Maritime Policy**.
(2) **Provide long-term adaptive *management strategies*** that can be used for all non-hydrocarbon geological resources in the marine environment, locally and more globally.
(3) Propose **legally binding *measures*** to optimize and maximize long-term exploitation of aggregate resources within sustainable environmental limits. These proposed measures feed into policy plans that are periodically evaluated and adapted (e.g., Marine Spatial Planning and the Marine Strategy Framework Directive, being Federal Authority's strategic priorities).
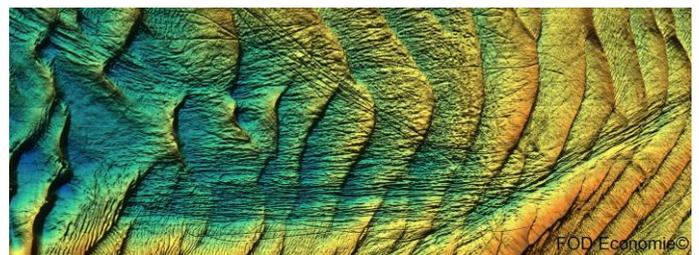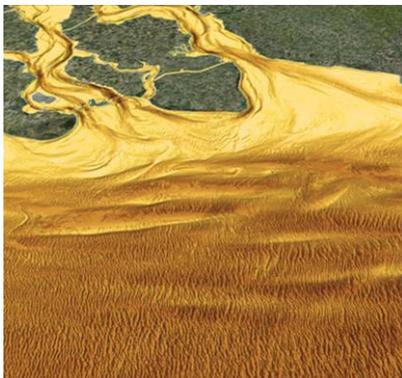
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For the Belgian and southern Dutch part of the North Sea, state-of-the-art **transnational 3D geological models** will be developed by transforming a layer model, defining stratigraphic unit boundaries, into a so-called **voxel model** (consisting of 'tiles' or volume blocks) and assigning to each voxel lithological or other characteristics. The data that are added to the voxels will be subjected to uncertainty analyses, a necessary step to produce data products with confidence limits, and critical to detect 'true' seabed changes in environmental monitoring.

The consortium consists of geologists, physical modellers and IT professionals and is regarded **essential to develop effective resource decision support systems that can cope with data** imperfections and uncertainties and that are driven by real-world requirements.

Long-term adaptive management strategies for the exploitation of geological resources will be provided, within the context of **marine spatial planning**, the **Marine Strategy Framework Directive** and **integrated coastal zone management**. **The transnational, harmonized geological knowledge base** will function as a critical platform for the exchange of data, information and knowledge, also allowing for assessments of cross-border impacts of exploitation activities, e.g., with relevance to Europe's **Marine Strategy Framework Directive**.

Users will be able to visualize the 3D model using a dedicated subsurface viewer, allowing easy interaction and invaluable for outreach and educational purposes. Results will be incorporated into **scenario analyses and forecasts**, using a newly developed multi-criteria **decision support system** (DSS). The DSS will allow specifying **flexible criteria** for geological, environmental and socio-economical parameters. Information will be visualized in series of tailor-made **suitability maps** that assist in resource assessments.

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