Variable voxel size as indicator of uncertainty in 3D subsurface models of sand and gravel resources

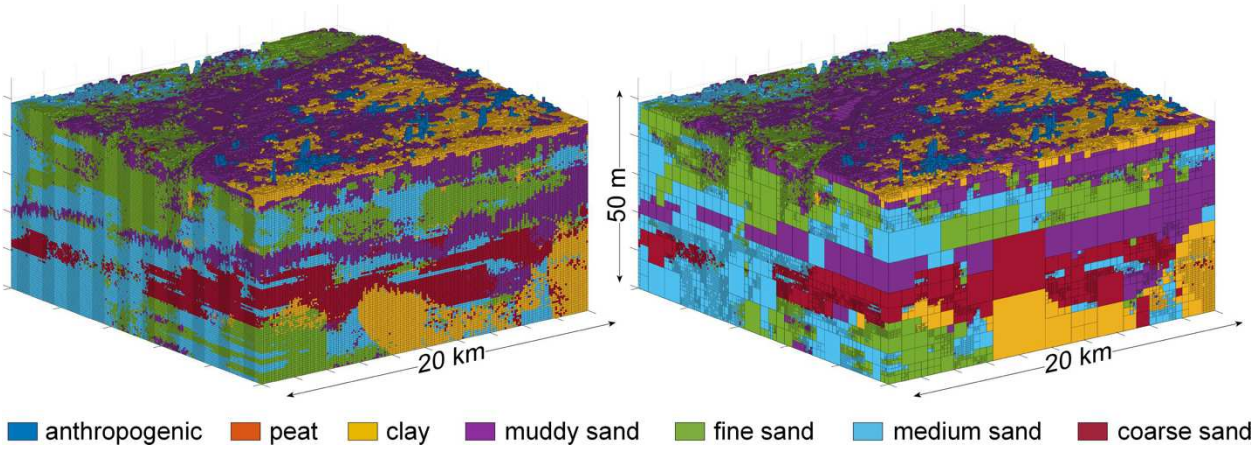
Dr. Peter-Paul van Maanen, TNO Geological Survey of the Netherlands;

Dr. Sytze van Heteren, TNO Geological Survey of the Netherlands;

Dr. Jan Stafleu, TNO Geological Survey of the Netherlands;

Drs. Denise Maljers, TNO Geological Survey of the Netherlands

In support of a sustainable management of marine geological resources, a geological knowledge base is being built for the Belgian and southernmost Dutch part of the North Sea. Various voxel models of the subsurface are created to understand and predict changing sand and gravel quantities and qualities, and thus to ensure their long-term use. Each voxel is attributed with geological data from boreholes and seismic lines. By generating data products that also include various aspects of model uncertainty, scientists will optimize policy-related decision making. In a key step to increase transparency, issues related to low and high model uncertainty are being addressed by generating irregular grids, composed of voxels of differing resolution. Creating smaller voxels where uncertainty is low and larger voxels where uncertainty is high provides more model detail only where appropriate. Many interpolation algorithms, as well as their implementations in geostatistical software packages, do not support irregular grids. In a temporary solution, such grids are generated by post-processing model output (see Figure). When proven successful, irregular-sized voxel models may be integrated in a decision-support system optimized for user-friendliness and online visualization.



Comparison between a standard- (left) and irregular-sized voxel model (right).