**Title**

A probabilistic approach for optimizing the resurvey frequencies of the Netherlands Continental Shelf

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**Abstract**

Bathymetric surveying of the Netherlands Continental Shelf (NCS) is taken care of, by the Dutch Hydrographic Office and Rijkswaterstaat. The survey frequencies vary from location to location depending on a set of factors defined by the authorities. These are the minimum depth, draught (the difference between seafloor depth and ship’s keel), shipping intensity, human interventions and seafloor dynamics that are taking place in an area. The project is about developing a methodology using the available time-series of bathymetric data to automatically make a well-informed decision on the survey frequency of critical areas of the NCS. This study aims to contribute to the decision-making by performing a risk-based analysis using a probabilistic approach. The main objectives are to estimate and map the risk that the seafloor is changing significantly. Risk severity should be measured and the probability of risk's consequence to occur should be estimated and mapped in temporal and spatial scale indicating if possible, the optimal surveying frequency. Firstly, the accuracy, quality and reliability of the prediction values were defined and computed. This was a necessary step to realize how powerful are the predictions used as an input dataset for the risk assessment of the seafloor to change significantly. As a step further, the risk's impact and probability to occur should be determined. Hence, it was necessary to define quantities related to seabed dynamics that express the evolution of the seafloor. These are mentioned as risk indicators and are the Relative Depth Change (RDC), the Rate of Change (RoC) and the direction of change. The RoC was used for probability estimation and the rest of it as informative variables for the analysis. Finally, an adjustment of the method used here with the Netherlands Hydrographic Office (NLHO) standards was done and conclusions were made regarding the survey frequency of the chosen study areas. The analysis was applied for two study areas: West IJmuiden and West Rotterdam, as these areas according to the NLHO are highly prioritised (should be resurveyed every 2 years) and thus, they are critical areas of the NCS. The method applied and the results can be used as an informative tool in designing a successful, reliable and cost-effective bathymetric survey plan of the NCS.