

The Impact of Marine Environmental Conditions on the Risk to Conducting Research in Offshore Projects in the Southern Baltic Sea Region

Abstract

Environmental conditions are a key and, simultaneously, the most unpredictable factor determining the success of offshore projects. Due to their variability and the limited ability to make accurate forecasts, creating a realistic work schedule for offshore projects presents a significant challenge. This doctoral thesis aims to assess the impact of hydrometeorological conditions on the implementation of survey in offshore projects in the southern Baltic Sea and to develop a method for managing weather-related risks.

The research included three main stages: (1) identification of key weather risks affecting the schedule and safety of marine operations, (2) analysis of their impact on offshore research in the context of hydrometeorological variability, and (3) development of a method for estimating the available working time at sea, considering location, project timeline, and the operational capabilities of survey vessels. The analysis was based on project data and the results of a survey conducted among offshore specialists, which helped to clarify the relationship between weather conditions and the execution of research activities. Additionally, detailed analyses of numerical data were performed, taking account of hydrometeorological parameters such as significant wave height and the duration of available weather windows.

The analysis identified five weather risks. The research showed that storm periods are a key factor affecting operational risk, significantly reducing the available time for conducting activities. The thesis also emphasises the importance of applying time reserves and considering local conditions when planning schedules. The analysis results are presented in four scientific papers and one monograph chapter, providing a comprehensive view of weather risk management in the marine environment.

The research conducted has significant practical implications, offering tools and recommendations to support decision-making in offshore projects. The thesis contributes to the development of knowledge in risk management in marine conditions, and its findings can be applied in future investments in the southern Baltic Sea region and other areas with similar environmental conditions.

Keywords: weather risk, offshore projects, significant wave height, physical oceanography, southern Baltic Sea.