

Understanding the Lowering of Beaches in Front of Coastal Defence Structures, Stage 2

Technical Summary: FD1927

Joint Defra / EA Flood and Coastal Erosion Risk Management R&D programme

Background to R&D project

A research scoping study (Project FD1916) reviewed the whole subject of beach lowering in front of coastal structures and identified the generic elements and processes involved. It also highlighted key shortcomings in the available knowledge for which substantive progress could be made in the short term. Project FD1927 was the direct follow on to the scoping study and addressed a number of the identified shortcomings. The Technical Report for Users, FD1927/TR, reports on the advances made during the project (2005-2006).

The objectives of this research project were to:

1. Synthesise existing information and approaches to predicting general beach lowering and clearly summarise the implications for beach monitoring. See Section 3 of FD1927/TR.
2. Screen existing scour prediction methods and produce an improved method resulting in less uncertainty. The scour prediction method should be suitable for use both in design and in a risk-based methodology of asset management. See Sections 4 and 6 of FD1927/TR.
3. Provide information on mitigation schemes. Information has been collected on a number of mitigation schemes to assess how well they performed. See Section 5 of FD1927/TR.
4. Assess liquefaction potential of the sediment in front of coastal structures. See Section 7 of FD1927/TR and the new tool developed to assess the potential for momentary liquefaction.

Results of R&D project

Methods for monitoring beach levels at the toe of a structure and for analysing the outputs have been reviewed and tools developed for determining prediction horizons and analysing seasonal and long-term trends. Recommendations for monitoring have been made, both covering when surveys should be made during the year and the differences arising from taking different numbers of surveys per year. Methods for predicting shoreline retreat have been reviewed and suitable tools for predicting the response of coastlines at different scales are suggested. The errors in determining shoreline retreat rates from OS tidelines have been analysed, as they are commonly used in predicting long-term retreat rates. An improved beach toe scour predictor was developed for sandy beaches. The predictor takes beach slope as well as relative toe depth into account and is the result of integrating existing research with the analysis of new experiments.



An analytical tool for undertaking preliminary screening for liquefaction potential at the toe of coastal structures has been developed and used to identify significant factors. Mitigation to reduce existing or future erosion risk may be warranted, when the local strategy allows and depending on local circumstances. Options for mitigation have been reviewed, split into the following four categories, based broadly on increasing cost: (i) monitoring and accommodating scour, (ii) ancillary works, (iii) adjustments to the existing structures, and (iv) major beach improvements. FD1927 has demonstrated how its results can be integrated into existing reliability analysis methods used to determine the performance of coastal structures. Recommendations have been made for future research (academic and applied) and for the development of a toe-scour manual that would include guidance on the prediction of scour and the development and selection of mitigation options.

R&D Outputs and their Use

The main R&D output from FD1927 was the Technical Report for Users:

Sutherland, J., Brampton, A.H., Obhrai, C., Dunn, S. and Whitehouse, R.J.S., 2008. Understanding the Lowering of Beaches in front of Coastal Defence Structures, Stage 2. Joint Defra/EA Flood and Coastal Erosion Risk Management R&D Programme, R&D Technical Report FD1927/TR.

The report includes new information on the behaviour of beaches in front of coastal defence structures at a range of time and space scales. This will enable better informed decisions to be made about data collection, monitoring and intervention. Moreover, it will assist in the appropriate design, construction and maintenance of coastal defence assets. The report also provides cross-referencing to HR Wallingford Technical Notes CBS0726/01 to CBS0726/09, which were prepared during the project and provide additional details that can aid in understanding the summary information in FD1927/TR. These are: CBS0726/01 Beach lowering and recovery at Southbourne (2005), CBS0726/02 Design of physical model scour tests, CBS0726/03 Assessment of beach lowering and toe scour, CBS0726/04 Scour monitor deployment at Blackpool, CBS0726/05 Integrating scour research into reliability analysis of coastal structures, CBS0726/06 Medium scale 2D physical model tests of scour at seawalls, CBS0726/07 Wave-induced liquefaction of sediment in front of coastal structures, CBS0726/08 Mitigation methods and CBS0726/09 An improved scour predictor for sand beaches.

This R&D Technical Summary relates to R&D Project FD1927 and the following R&D output:

R&D Technical Report FD1927/TR –Understanding the Lowering of Beaches in front of Coastal Defence Structures, Stage 2. Published August 2008.

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The above outputs may be downloaded from the Defra/EA Joint R&D FCERM Programme website (www.defra.gov.uk/environ/fcd/research).



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