

Understanding and predicting beach morphological change processes associated with the erosion of cohesive foreshores.

Technical Summary FD1915

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

Background to R&D project

There are significant stretches of cohesive shore platform in the United Kingdom where variable amounts of sand and gravel overlie cohesive materials. Many stretches lie along the most rapidly eroding shorelines in the country and pose significant problems for management. The process of downcutting of the shoreline platform and the interaction between the cohesive and non-cohesive components is not well understood. The coastal community needs to be better able to manage cohesive platforms because of their value as habitats and their importance in controlling the functioning of the wider coastal system. This importance is not limited to areas in which platforms are normally visible: in other locations they may rarely be revealed but still have a significant geomorphological role, particularly in regulating recession rates.

The objectives of this work were to:

- Undertake a scoping study (to current best practice) of the processes associated with the erosion of cohesive shore platforms and interactions with the sediment budget in order to identify the research and development needs;
- Define a research project that will address the gaps in our understanding and provide detailed guidance to best practice regarding the management of these coastlines;
- Provide preliminary advice regarding the management of these coastlines.

Results of R&D project

The scoping report provides a detailed appraisal of previous research in the field of cohesive shore platform weathering and erosion and examines how these processes may affect the sustainability of the adjoining beaches, the evolution of any backing cliffs, and their influence on sediment budgets. The investigation was not restricted to the foreshore alone, but also covered the subtidal zone. This is because processes operational across the whole of the littoral zone make a significant contribution to the changing geomorphology of the shore platform.

It is now generally accepted that the rate of vertical lowering of the platform is the key control in the long-term recession of cohesive material, rate of sea-level rise, wave climate, tidal regime and the effect of beach sediment cover. These parameters control the magnitude of the complex variety of weathering and erosion processes operating on the platform.

The scoping study describes eight dominant processes relevant to the UK coast: abrasion by mobile, non-cohesive surface sediment; mechanical wave erosion; biological processes; softening of the fabric due to removal of overburden; softening of the fabric due to pressure fluctuations induced by waves; desiccation and wetting; physico-chemical effects; freeze-thaw (frost).



Weathering processes play a significant role in weakening the cohesive material prior to its erosion by marine processes but the relative magnitude of these processes is poorly understood and has been a matter of debate for many years. Even more poorly understood is the role of biological activity, both in erosive and protective capacities, on and within the cohesive clay surface.

It is recommended that further research needs to be targeted at providing a better understanding of the fundamental underlying principles that control the rate of cohesive platform erosion, providing a baseline starting point for better strategic management. The research needs to examine and improve the technical understanding of the roles of the different parameters and processes that contribute to the downcutting of cohesive shore platforms. Four areas are recommended for further investigation:

- The specifics of the weathering and erosion process (in particular the effect of downcutting rates of abrasion, and the importance of biological processes);
- The relationship between platform and beach geomorphology and the platform weathering and erosion processes (spatially and temporally);
- The relative influence of material strength on weathering and erosion rates;
- The need to test models of platform development at different sites.

Improved scientific understanding will result in better decision-making by consultants and operating authorities and enhanced management capability by the translation of science into best practice guidance and tools which enable the prediction of response to changes.

R&D Outputs and their Use

The main outputs of the project are a scoping report reviewing previous research in the field of cohesive shore platform erosion and providing preliminary management advice. This report will be used by a wide-ranging audience, from practitioners to academics, although it is targeted primarily to coastal managers. The scoping report provides an exhaustive review and should, therefore, be used as a basis for more detailed investigations.

This R&D Technical Summary relates to R&D Project FD1915 and the following R&D output:

- **R&D Technical Report FD1915/TR – Understanding and predicting beach morphological change processes associated with the erosion of cohesive foreshores.** Published April 2005.

Publication Internal Status: Released Internally External Status: Released to Public Domain

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