

Sand Dune Processes and Management for Flood and Coastal Defence

Technical Summary: FD1302

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

Background to R&D project

Sand dune systems can provide an important natural coastal flood defence and are also of great importance from nature conservation, recreation and tourism perspectives. This project was based on a recognition that (a) considerable information exists about the ecology of coastal dune systems in England and Wales but geomorphological, sedimentological and engineering management aspects have been relatively neglected, and (b) recent changes in coastal management philosophy towards adaptation and risk management mean that there is increasing interest in developing new methods of managing coastal dunes as dynamic natural defences. To this end a better understanding of the physical nature of sand dune systems, and of sand dune processes, is required.

Results of R&D project

Coastal dunes in England and Wales presently occupy an area of approximately 200 km². A total of 158 individual dune localities, grouped into 112 dune 'sites', were identified. Coastal Cell 9 has the largest total area of dunes (c. 48 km²) followed by Cell 11, Cell 8 and Cell 1. The largest single system is located on the Sefton Coast (c. 20 km²), but there are few systems larger than 5 km² and more than 50% of the sites are <1 km² in size. The largest systems occur on the west coasts of England and Wales but smaller systems in eastern and southern England are also locally of considerable flood risk management significance. Their importance in this regard lies primarily in their function as barriers to coastal flooding, and is dependent on the asset value of the land behind and the existence or otherwise of other flood defences. Dune systems are especially important where they protect high density residential or industrial developments, high-grade agricultural land or habitats of international conservation importance. Compared with many other forms of defence, dunes are less visually intrusive, have greater value for wildlife and recreation, and are able to respond more readily to changes in environmental forcing factors (e.g. climate and sea level change, sediment supply conditions).

Wherever possible, coastal dune and beach systems should be allowed to respond naturally to changes in forcing factors and sediment supply conditions. Where accommodation space exists and conditions are favourable, frontal dunes should be allowed to roll back to establish a new equilibrium. However, in areas of low wind energy or strongly negative beach sediment budget,



dune dissipation is likely to occur unless nourishment with fine-grained sand and artificial dune profiling are undertaken. It is recommended that a detailed Geomorphological Evaluation Study should be undertaken at each dune site, or group of sites, to assess the requirements and to identify the most appropriate management strategy. This will require nature conservation and other interests to be taken into account. Where not in existence, systematic monitoring programmes should be set up to provide early warning of dune change. Data should be obtained in a standardised format which can be exported for centralised analysis.

R&D Outputs and their Use

The results are summarised in a report which consists of five parts. Part 1 provides an overview of the project, the main issues addressed, the approaches used and the main conclusions. Part 2 presents a review of sand dune processes and the significance of coastal dunes for coastal flood risk management. Part 3 describes the methods used to obtain data and presents brief descriptions, location maps and database summaries for each dune site. Part 4 reviews available methods to manage and modify coastal dunes, and Part 5 discusses the problems and management options at the five example sites (Sefton Coast, Spurn Peninsula, Brancaster Bay, Studland, and Kenfig Burrows). The report is available both in hard copy and pdf format, as individual parts and in combination. The pdf versions are available via the DEFRA web site and on CD. The principal intended users of the report are DEFRA, Environment Agency and Local Authority engineers, consultants, and representatives of other relevant organizations (especially those concerned with habitat conservation).

Other related outputs of the project include an article in the international journal *Geomorphology* (Saye *et al.*, 2005) and a PhD thesis (Saye, 2003).

This R&D Technical Summary relates to R&D Project FD1302 and the following R&D output:

R&D Technical Report FD1302/TR – Sand Dune Processes and Management for Flood and Coastal Defence.
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The above outputs may be downloaded from the Defra/EA Joint R&D FCERM Programme website (www.defra.gov.uk/envirion/fcd/research). Copies are also available via the Environment Agency's science publications catalogue (<http://publications.environment-agency.gov.uk/epages/eapublications.storefront>) on a print-on-demand basis.

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