science summary

Environment Agency

www.environment-agency.gov.uk

SCHO0608BOFE-E-E

Practical aspects of executing renourishment schemes on mixed beaches

Science Summary SC030010

By conducting various experiments that involve adding shingle to beaches, Environment Agency-sponsored researchers have come up with a number of recommendations for making beach replenishment schemes more cost effective. These include ensuring that the shingle contains a high proportion of coarse material and letting the sea do the difficult work of moulding the added shingle to a defined gradient.

Mixed sand and shingle beaches are a common component of coastal defences in the UK, comprising over one-third of all beaches in England and Wales and almost all the beaches on the south coast of England. These beaches provide coastal protection by helping to dissipate wave energy and therefore prevent flooding. However, the majority of these beaches demonstrate erosive tendencies and replenishment schemes have become commonplace in order to maintain an adequate level of sea defence.

Over the next few years, given sea level rises and a predicted increase in the frequency and intensity of storms, the level of replenishment will probably have to increase. This has provided the impetus for a search for more cost-effective beach replenishment methods.

As part of this effort, the Environment Agency and the Department for Environment, Food and Rural Affairs established a research project in 2004 to investigate various methods for improving the cost-effectiveness of beach nourishment and beach management schemes. This programme was based on a detailed analysis of two ongoing beach nourishment schemes in Kent – at Tankerton and Hythe – and involved conducting various different experiments.

At Tankerton, the researchers studied the effect of renourishing beaches with different kinds of recharge material. They filled five 40m-wide groyne bays (small sections of beach separated by long coastal defence structures, known as groynes, that run perpendicular to the shoreline) with different types of shingle. These were: recycled recharge material from the shore close to the groyne bays; very fine material with an average diameter of 6–8mm; very coarse material with an average diameter of 18–20mm; standard replenishment material with an average diameter of 14–16mm; and standard replenishment material capped by a layer of coarser shingle.

By regularly sampling sediment and conducting surveys, the researchers monitored the progress of these five bays over three years. In addition, they monitored the progress of a nearby mature section of beach over the same time. They found that the fine material bay performed much worse than the other bays. It not only lost a relatively large proportion of its recharge material, especially in the first year, but also experienced various undesirable effects such as the formation of small cliffs, a reduction in stable beach gradients and seaward migration of the end of the beach.

At Hythe, the researchers investigated various strategies for physically placing the recycling material on the beach. They discovered that it wasn't worth trying to mould the recycling material to a defined gradient, as it was quickly re-worked by the sea to form a natural gradient. Furthermore, they discovered that the recycling material could often just be deposited in a single location, with the waves then naturally redistributing the shingle across the beach. However, if the beach was particularly exposed, then it was best to spread the recycling material over a defined area, otherwise it ran the risk of being washed out to sea during a storm.

From these findings, the researchers made a number of conclusions and recommendations. These included that it was usually worth incurring the extra expense to obtain coarse recharge material, because it produced better performing beaches with reduced erosion rates. However, it is not worth using machinery to mould the it to a defined gradient. Instead, the recharge material should simply be placed in one single location or spread flat over a defined area, depending on whether

science summary

www.environment-agency.gov.uk

or not the beach is exposed. This placement method should save both time and money.

Finally, the researchers concluded that it was most cost effective for beaches to be renourished twice a year: either side of winter in September and March. More frequent nourishment generated increased expense, while less frequent nourishment might reduce the level of coastal protection provided by the beaches.

Although this research project was conducted on two beaches in Kent, the researchers hope that their findings and recommendations, which have been presented in a practical guidance, will be applicable to similar beach replenishment schemes in other parts of the country.

This summary relates to information from Science Project SC030010, reported in detail in the following output(s):-

Science Report: SCHO0608BOFD-E-P
Title: Practical aspects of executing renourishment schemes on mixed beaches
ISBN: 978-1-84432-919-9 June, 2008

Internal Status: Released to all regions
External Status: Publicly available

Environment Agency Project manager:
Terry Oakes, Terry Oakes Associates Ltd
Stefan Laeger, Science Department

Research Collaborator:
Canterbury City Council
Canterbury, Kent CT1 1YS

Shepway District Council
Castlehill Avenue
Folkestone, CT20 2QY

This project was funded by the Environment Agency's Science Group, which provides scientific knowledge, tools and techniques to enable us to protect and manage the environment as effectively as possible.

Further copies of this summary and related report(s) are available from our publications catalogue on or our National Customer Contact Centre T: 08708 506506 or E: enquiries@environment-agency.gov.uk