Department for Environment Food & Rural Affairs

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Environment Agency

Flood and Coastal Erosion Risk Management Research Programme

Trialling a new approach to beach replenishment in Poole Bay

Project Summary SC130035/S

The trial tested a new approach to beach replenishment at Poole Bay. Locally dredged sediment was deposited close to the shore and the rate that natural processes transferred this material to the beach was studied. After 15 months, some material had replenished the beach but both a larger quantity of source material and more time would be needed demonstrate long-term viability of this technique. The success of the technique elsewhere would depend on site-specific conditions.

What was the purpose of the trial?

The trial tested a new approach to beach replenishment in Poole Bay. The concept was to make use of locally dredged sediment and place it near the shore, allowing the prevailing waves and tidal currents to move material toward and along the beach. A similar approach has been used widely in the Netherlands and more recently in Denmark. The trial was the first of its kind in the UK.

What are the benefits of this approach?

- It is cheaper. The sand taken from a nearby navigation channel can be deposited directly to the seabed from the dredger to enable natural replenishment over a period of time.
- No beach pipeline or operations are needed, making it safer and not interrupting public use of the beach.
- The dredged sediment is closer to natural beach material. Small quantities will continue to be available in the future.
- The sediment source is sustainable – the trial made use of 30,000 m^3 maintenance dredgings that would have otherwise been taken to disposal site.
- Poole Bay is a relatively closed system and therefore any recycling of native sediment is useful.
- It aligns the interests of stakeholders – coastal engineers, Crown Estate, Defra, Marine Management Organisation (MMO) and dredging industry – in promoting sustainable and beneficial use of dredgings.
- It supports the Environment Agency's ambition to work more with natural processes.

What was monitored and how?

In February 2015, 30,000 m^3 was deposited on the seabed 300-400 m off Sandbanks beach in water between 5-8 m deep. As part of the trial, 15 months of intensive monitoring was carried out at a cost of £150,000. The monitoring programme was designed to help understand:

- what forcing conditions the material had been exposed to
- how the material had moved in terms of both space and time

Monitoring was also required as part of the MMO licence conditions to ensure that the material did not have an adverse effect on the Poole Rocks Marine Conservation Zone (MCZ), located approximately 1 km seaward of the deposition zone.

Summary of monitoring programme

What	How	% of budget	Lessons learnt
Waves, currents and turbidity	Acoustic wave and current meter (AWAC) 3 months before deposition to one year afterwards	41%	Expensive, but produced vital hydrodynamic information and filled a huge gap in understanding sediment transport
Turbidity	Optical backscatter sensor (OBS)	2%	Cheap add on to AWAC but prone to biofouling
Beach change	GPS Laser scan surveys (×6) and profile surveys (×2)	7%	Effective but survey timing can smooth out short-term sediment transport events
Seabed change	Swath (multibeam) bathymetric survey (×7) and single beam survey (×1)	12%	Expensive, but crucial to track movement of sediment; difficult to quantify small volumes of change

Key findings

- Some 14 months later, the mounds of deposited material remained distinct features, approximately 2 m high. The sediment has remained in situ, with net loss of only ~1,000 m^3 (~3%) since deposition. Between late December 2015 and April 2016, the mounds rolled forward in a similar manner to the shoreward translation of an offshore bar but, as yet, it is impossible to predict whether the 'bar' will remain as a semi-fixed feature or will migrate onshore.
- Wave-driven sediment transport rather than tidal currents was principally responsible for the shoreward translation of the deposition mounds. Deposition at this site should be as close inshore as practical for sediment to be transported to adjacent shoreline. Deposition at 5m water depth can be transported toward the shore but deposition at around 8m depth is unlikely to be moved shoreward
- A tracer study demonstrated that there is a sediment transport connection between the nearshore and the adjacent beach, but it is difficult to assess the long-term progress of the material to beneficial onshore position.
- Any increase in the cloudiness of the water from suspended sediment (turbitidy) as a result of the placement of the material was short-lived and highly localised. Turbidity did not exceed naturally occurring levels.
- The deposition had no discernible or detrimental impact on the Poole Rocks MCZ.

Lessons learnt for carrying out similar sediment monitoring

- The benefits of swath bathymetry results far outweighed the cheaper single beam surveys.
- Absolute measurements of turbidity are instrument-dependent.
- Small net volumes of sediment change are difficult to identify, even from high precision bathymetric and topographic surveys.
- If hydrodynamic conditions are needed (for example, to calibrate a sediment transport model), a short-term AWAC deployment is likely to be sufficient.
- The site-specific results are thought likely to be representative of much of Poole Bay, making extensive further monitoring of subsequent nearshore replenishment (particularly of turbidity) unnecessary.

Did it work?

This was a first trial and no-one knew what to expect and although some nearshore deposition did move shoreward onto the beach, it is difficult to assess the long-term fate of the stockpile material. It is likely that both a larger quantity of material and more time are needed for sediment dispersal at this site to demonstrate long-term viability of nearshore replenishment as an alternative to traditional methods. However, there are currently licensing restrictions on depositing large amounts of material in the nearshore. The study did show that there is a connection from the nearshore to the beach and that there were no negative impacts on local marine conservation sites in depositing the maintenance dredgings there.

Is the approach transferable?

The success or otherwise of the technique of nearshore replenishment will depend on a wide range of site-specific conditions, where even subtle differences in tidal currents, wave period and direction can have a significant influence on net sediment transport in the nearshore region. It is therefore not appropriate to extrapolate the results from this study to other coastlines or draw conclusions on the transferability of the method to other sites. If this approach was to be trialled elsewhere, however, the preference for shallower deposition (that is, closer to the surf zone) is likely to apply widely.

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This summary relates to information from project SC130035, reported in detail in the following output(s):

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