

Long-term monitoring programmes for more effective coastal planning, Bournemouth - UK

1. Policy Objective & Theme

- ADAPTATION TO RISK: Managing impacts of climate change and safeguarding resilience of coasts/coastal systems
- ADAPTATION TO RISK: Integrating coherent strategies covering the risk-dimension (prevention to response) into planning and investment

2. Key Approaches

- Knowledge-based
- Technical

3. Experiences that can be exchanged

A long term monitoring programme to provide relevant data required for effective coastal risk management. This management relies heavily on an understanding of coastal processes at work and the effects that these processes have on shoreline evolution for which accurate data is required.

4. Overview of the case

Shoreline management methods have changed significantly during the past 10 years with a departure from hard engineering. This presents a complex risk management scenario that requires high quality information to support effective management.

5. Context and Objectives

a) Context

Beach monitoring projects within the UK have often been confined to short stretches of coastline, usually established in conjunction with individual beach re-charge schemes. Effective planning and implementation of shoreline management requires high quality, long-term, time-series data sets, at appropriate spatial and temporal resolution, to predict long-term coastal evolution and to determine design conditions for coastal protection and flood defence projects.

The exposed coastline of southeast England is characterised by soft sedimentary geology that is vulnerable to erosion, and extensive areas of low-lying land and high coastal urbanisation that are vulnerable to flooding. Approximately 10% of the population and billions of pounds of infrastructure are at risk from flooding in southeast England, within a vulnerable area that exceeds 480km². The Bournemouth coast lies on the South Coast of the UK between Poole in the west and Christchurch in the east. It has been designated as a World Heritage Site and is now known as the Jurassic Coast. Bournemouth Borough Council currently operates coastal protection policies established after many years of practical experience and maintenance. A vital part of any coastal defence scheme is accurate monitoring data that allows for an understanding of current and past patterns in coastal evolution. This information is essential to inform shoreline management planning and design conditions for operational flood and coastal defence strategies.

b) Objectives

The primary aim is to provide up-to-date, relevant information in a format that can be understood by coastal managers to

implement shoreline management.

6. Implementation of the ICZM Approach (i.e. management, tools, resources)

a) Management

Bournemouth Borough Council is responsible overall for the management of the Bournemouth Coast. In 2002, the Regional Strategic Coastal Monitoring Programme (RSCMP) was assigned the task for the planning and implementation of the monitoring programme. The RSCMP aims at providing a more holistic approach to coastal monitoring by creating a region wide policy and a standardised methodology that each local authority or the lead authority should follow.

b) ICZM tools

The Bournemouth coastline has experienced a progression of protection measures to control erosion and safeguard the sandy beaches that are so vital to its tourist economy. A shift from a 'hard' engineering approach to a 'soft' engineering approach occurred in the 1970s and between 1970-2000 almost 2 million m³ of sand has been used to replenish the beaches at Bournemouth and Poole. Sand was pumped from sites over 400m offshore from the position of mean low water. The coincidental dredging of the Poole Harbour entrance at the same time as the need for beach replenishment material at Bournemouth and Poole substantially reduced the costs as the dredged material was used. The beach was intensively monitored thereafter by beach profiling, which extended up to 450m offshore. Surveys were undertaken at frequent intervals along 38 survey lines.

Additional monitoring was carried out with regards to particle size testing, aerial survey, real-time tide and wave data and particle size testing of the beach material, twice annually to match the topographic surveys undertaken at Bournemouth between 1974 and 2002. Annual aerial surveys from 1987 have also formed part of the monitoring of coastal evolution at Bournemouth. These aerial surveys are now undertaken as part of the RSCMP and also include photogrammetric profiling along the South-East coast. Real-time tide data and wave data are collected by both the tide gauge on Bournemouth Pier and the directional wave rider buoy located at Boscombe. Tidal data at Bournemouth has been recorded since 1974 although the original gauge fell into disrepair in about 1990 and was replaced by the present Proudman Oceanographic Laboratory (POL) gauge in 1995. Daily weather records have been kept by hand from 1974 until 1999, when electronic stations were installed. Finally, the littoral drift direction at each groyne in Poole Bay has been recorded from 1993 to date in order to try and understand some of the complex responses of sediment transport in the area. Data collection from topographic surveys is collected using Global Positioning Systems. Kinematic GPS provides the opportunity to capture data with a vertical accuracy of approximately +/-2-3cm and horizontal positioning at approximately double the accuracy making it ideal for beach surveys. A minimum of two GPS receivers linked by a radio are used: one receiver acts as a base station, providing corrections, the other is a mobile station used for collection of data. Subsequent surveys are determined by spatial and temporal factors. The profile interval varies from 100m-500m depending on the risk-based analysis of the area. Data is downloaded and stored in a software programme known as SANDS (Shoreline and Near shore Data System). This programme provides a powerful facility through which input data can be analysed to establish links between forcing and response. It also allows weather and shore condition data to be entered, stored, inspected and compared. By analysing both climatic and beach profile data, trends in coastal response can be detected. A daily diary is kept online on the website:

www.poolebay.net

7. Cost and resources

Capital project investment on defences within the region exceeds an average of £30 million per year and annual maintenance costs exceed £4.3m/yr.

8. Effectiveness (i.e. were the foreseen goals/objectives of the work reached?)

Predictions of the state of the future coastline as a reaction to the changes in climate have lead to revisions in the future coastal protection policies necessary to protect the Bournemouth coastline. In optimising the most economic solutions for the future protection of the coastline, alternative defences have been examined and costed, together with an assessment of the

level of benefits if such defences were to be implemented. With regards to the specific replenishment schemes at Bournemouth, these have been extremely successful, so much so that residents and tourists now take Bournemouth's excellent sandy beaches for granted. Annual damages averted by maintaining present levels of coastal protection and sea defence are estimated at £203m/yr, a "profit" of nearly £190 m/yr. These results have also collectively indicated that a further 3 million m³ of sand will be required over the next 50 years in order to maintain protective beach levels and widths, thus aiding long-term financial and management planning.

9. Success and Fail factors

The advantage of beach replenishment is that it can be adjusted to cope with unforeseen situations provided that adequate monitoring is undertaken. The monitoring data collected since 1974 in Bournemouth has provided an invaluable data source for coastal scientists and engineers alike. The availability of such a long-term monitoring record for Bournemouth both prior to the RSCMP and now within this programme is very rare and must be considered a valuable asset. The use of dredgings from Poole harbour also kept the costs down.

Not all future replenishments will coincide with the dredging of Poole Harbour, so an alternative replenishment source must be found. If the cost of, and demand for, beach fill increases in the future, emphasis will move towards more efficient conservation or other sediments, with beach monitoring as a critical component of this strategy.

10. Unforeseen outcomes

Long-term local coastal monitoring programmes as operated by Bournemouth Borough Council, have demonstrated considerable cost-savings, allowing greater confidence in efficient design of coastal works. The need for future replenishment schemes can now be predicted using the long-term monitoring data that is available, changing the management philosophy from a reactive to a pro-active one.

11. Prepared by

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12. Verified by

It has not been possible to verify this case.

13. Sources

- A Case Study Documenting Monitoring and Modelling Techniques used at Bournemouth, U.K – A Local-Specific Approach to Coastal Monitoring (2005) Isle of Wight Council.



A case study documenting monitoring and modelling techniques (686.94 KB) 