Case study 6

Medmerry managed realignment - West Sussex

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1. Catchment summary

Study location

Medmerry, Chichester, West Sussex

Catchment summary

The area around Medmerry is low lying and flat land, and has flooded in recent years. The shingle defences were not providing insufficient protection at larger scale flood events. In addition, EU legislation requires compensation for loss of wildlife habitat through development in other areas around the Solent; for example, coastal defences which protect larger communities in Portsmouth and Southampton. The Medmerry project enabled development of a scheme to reduce flood risk locally while compensating for habitat lost elsewhere in the Solent.

Study summary

The Environment Agency has carried out work to reduce flood risk on the south coast of England at Medmerry via managed coastal realignment (Figure 1). This project created a large lagoon/salt marsh in place of the current coastal defences. The objective was to increase the standard of flood protection for the surrounding properties by absorbing the wave energy in a newly built wetland. Approximately 7km of new defences have been built inland and the current sea wall has been dismantled. Along with the increase to the standard of flood defences, the scheme forms a large area for wetland habitat and a recreational area which has the potential to bring tourists and holidaymakers into the region.

Community involvement

Environment Agency, RSPB and Medmerry Stakeholder Advisory Group

Figure 1: Medmerry managed coastal re-alignment site 10 October 2013

Source: © Environment Agency and John Akerman ABPmer

2. Data summary

Datasets and analysis techniques used

The following data were used:

- light detection and ranging (LiDAR) – historic data, creek analysis
- bathymetric survey
- fish surveys
- archaeological surveys
- freshwater modelling
- tidal boundary data
- laser scans
- wave data
- core samples
- weather station data
- geochemical analysis
- bed elevation monitoring
- turbidity monitoring
- weather data
- acoustic Doppler current profile (ADCP) and conductivity, temperature and depth (CTD) datalogging within the site

There are also plans to conduct drone monitoring.

Data restrictions

This was a major scheme with government partners and data licensing was not an issue.

3. Model summary

Catchment processes investigated

This study investigated the following catchment processes:

- sediment sources, pathways and receptors,
- coarse grained sedimentation sources and sinks
- land use change
- mobilisation and inputs of diffuse pollutants from the land

Model assumptions

Previous studies of the area were examined to estimate the longevity of the existing defences and their existing level of protection. The old defences were deemed inadequate and expensive to maintain. It was considered that the shingle beach could easily be wiped out in large storm events, causing flooding to a number of properties in the surrounding flat land. A local holiday park which lies below sea level has a history of flooding.

Every aspect/element of the scheme was assessed in great detail; if any assumptions were made they were based on local knowledge and advice from the Medmerry Stakeholder Advisory Group.

A Mike 21 Flexible Mesh (FM) model was constructed; Figure 2 shows some example model outputs.

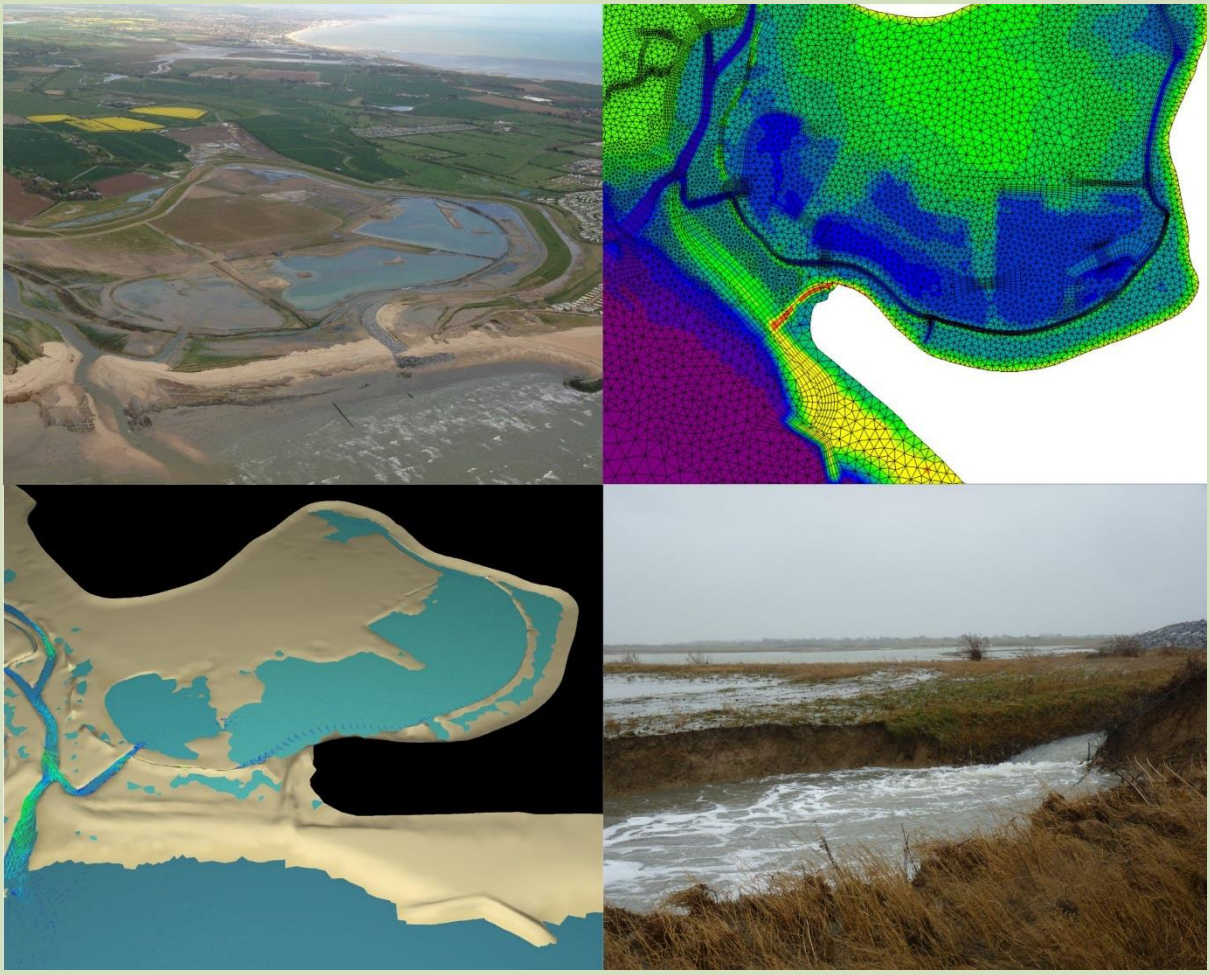

Figure 2: Eastern side site aerial model outputs, January to February 2014

Source: © Environment Agency and John Akerman ABPmer

This model was updated following the breach of the old defences to analyse the impacts of tidal locking. Mass balance equations and empirical relationships were also used to check calculations.

The management measures put in place needed to exceed the level of protection provided by the old defences. The new management measures also needed to provide wetland habitat and so performance and fragility were considered closely and simultaneously.

Data and model outputs

Important data and model outputs included:

- analysis of existing case studies and modelling and data reports
- scheme visualisation
- archaeological investigations
- habitat mapping
- breach and tidal inlet stability assessments
- coastal process investigations
- hydrodynamic and sediment modelling

Model performance

The specialised nature of this study is unlikely to help generate generic performance criteria, though some aspects of the study may be beneficial. A failure mode of tidal blocking was also investigated with the MIKE 21 model following the breach of the old defences.

4. Lesson learnt

Choice of tools

The Medmerry scheme is now constructed and has received the Prime Minister's Better Public Building Award for excellence in construction. The flood defences are gold standard in the UK and the scheme is estimated to save £300,000 of taxpayers' money each year. The success of this scheme is likely to influence the choice of tools for similar investigations (other managed realignment projects) in the future.

This study gives a high level of confidence when using the tools implemented in this scheme. Overall the scheme was a big success and acted as expected when the shingle barrier was breached.

Catchment scale and typology

Spatial scale was not a particular issue for the project as it involved modelling the domain of the entire realignment. The scheme performed as expected and was effectively a larger scale, managed version of the Porlock Gravel Barrier Breach in Somerset (Online Marine Registry 2015).

Wider benefits

This scheme seeks to reduce flood risk in the local area, create new intertidal habitat and offset losses across the shoreline of the northern Solent. The impacts of storm events and the rate of habitat creation/development will be closely monitored to protect and secure a long-term future for the area. There has been a large involvement from local residents and businesses to maximise the benefits and opportunities created by the scheme.

Since the scheme's implementation, there has been considerable research and development at the Medmerry site. Researchers from the University of Brighton are studying the physical and chemical changes in the sediment morphology alongside related water parameters. The RSPB is using push–pull management techniques to influence habitat creation and increase diversity.

Because local residents had concerns about the impacts of tidal locking, the MIKE 21 FM model was adapted post scheme to study the possibilities/impacts of a tidal locking scenario.

Future research needs

This case study adds to other research into managed realignment in that it is becoming a more accepted and sustainable approach to coastal management. The Medmerry scheme itself is the largest managed realignment scheme in England. After the scheme was completed it withstood a flood event which would previously have caused flooding.

Luciana Esteves from Bournemouth University has questioned the long-term sustainability of managed realignment, assessment of costs/benefits and decision making (Esteves 2013). She raises the question of public confidence in managed realignment, especially when privately funded coastal protection works have been permitted adjacent to the Medmerry scheme. However, the reports on the Medmerry scheme suggest that there was a large amount of public consultation and compromises or solutions were found to accommodate as many opinions as possible.

5. Bibliography

Images from the Medmerry project are available from the Online Marine Register (OMReg): http://www.omreg.net/gallery/?album=Managed%20Realignment/103_Medmerry_MR_UK

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Project background

This case study relates to information from project SC120015 'How to model and map catchment processes when flood risk management planning'.

It was commissioned by the Environment Agency's Evidence Directorate, as part of the joint Flood and Coastal Erosion Risk Management Research and Development Programme.

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