The use of a variety of solutions in flood management, the Norfolk Broads - UK

1. Policy Objective & Theme

- ADAPTATION TO RISK: Managing impacts of climate change and safeguarding resilience of coasts/coastal systems
- ADAPTATION TO RISK: Preventing and managing natural hazards and technological (human-made) hazards
- SUSTAINABLE USE OF RESOURCES: Preserving coastal environment (its functioning and integrity) to share space

2. Key Approaches

- Integration
- Participation
- Ecosystems based approach
- Technical

3. Experiences that can be exchanged

Different methods of flood defences have been used in a number of areas dependent upon the circumstances.

4. Overview of the case

The Broadland Flood Alleviation Project is a long-term project to provide a range of flood defence improvements, maintenance and emergency response services within the tidal areas of the Rivers Yare, Bure, Waveney and their tributaries. The land, predominantly grazing marshes, has high environmental value and is important to the local economy through its use for farming and tourism.

5. Context and Objectives

a) Context

Situated in eastern England, Broadland comprises the Norfolk Broads, a river and lake system covering 301 km2 with seven tidal rivers, 190 km of which are navigable, and 63 broads (or lakes) mostly less than 4m deep. They originated as filled-in, mediaeval peat quarries. The area is the UK's largest protected wetland, and is a National Park (1988). Tourism drives the economy of the Broads and is key to the economy of the East of England worth about £146.6 million in 1998 supporting the equivalent of 3,107 full-time jobs (4,350 actual jobs, including part-time and seasonal workers). Agriculture remains an important part of the Broads' economy. Most of Broadland today is productive farmland and used for traditional summer livestock grazing.

The Broads are particularly exposed to the impacts of rising temperatures, sea level rise and increasing wind strengths and the main threats will be flooding from tidal surges and a break in the coastal sea defences. 300 km2 of land lies below sea level and homes, agriculture, commerce and wildlife are at risk. Such impacts will require sustainable approaches to management and, therefore, the 20-year Broadland Flood Alleviation Project has begun. It is a vital mid-term holding operation, providing flexibility during its life with time to improve knowledge about the impacts of climate change in order to plan better for the longer term. The Project Area contains around 28 sites (7000 ha.) of Special Scientific Interest which will benefit from protection under European Law, either as Special Protection Areas (SPAs) or Special Areas of Conservation (SACs).

b) Objectives

The main aim is to strengthen existing flood defences and restore them to a height that existed in 1995 and make additional allowances for sea level rise and future settlement of the floodbanks. The project must carry out these improvements within the first 12 years of its work and maintain the improved system for a further 8 years. After the Project ends, the flood defence improvements must have a further life of 7 years. The Project is not seeking to prevent all flooding but to minimise the risk of the banks breaching in the event of floodwater overtopping them.

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

a) Management

The Broads Authority has a statutory duty to manage the Broads for the purposes of: conserving and enhancing the natural beauty of the Broads; promoting the enjoyment of the Broads by the public; and protecting the interests of navigation. In 2001, Broadland Environmental Services Limited (BESL) was awarded a 20-year contract to undertake the Project. BESL is a consortium of two private companies, Edmund Nuttall Ltd (construction) and Halcrow Group Ltd (design and planning).

b) ICZM tools

The approach to flood management in Broadland consists mainly of bank strengthening and erosion protection. Improvement works are now being carried out in 40 individual flood areas. Much of the 240km of floodbanks have deteriorated because the material used for their construction was silty clay whilst others are threatened by erosion of the river edge by wind and waves, boatwash, normal river flows and the action of the tide. This will be exacerbated by sea level rise and the potential increase in frequency of storm events. Many floodbanks are at risk of being overtopped or are susceptible to seepage. Improvement works are being implemented through a phased programme by strengthening the existing floodbanks, replacing existing erosion protection that is in a poor condition using more environmentally acceptable methods wherever possible, providing new protection where erosion is currently threatening the integrity of the flood defences, and carrying out new works at undefended communities

The different solutions available are being applied dependent upon the circumstances. These are:

- Floodbank strengthening: involves strengthening the existing floodbanks in their present locations by putting material on the back and/or front slope. This is usually used where there is still a good bank between the river and the floodbank. The crest (top of the floodbank) is also raised to provide the agreed 1995 level.
- Floodbank setback: involves building a new clay floodbank inland from the river edge with the floodbank set back far enough from the existing line of flood defence so that a new bank can be created and natural vegetation established. This is usually used where the river is already hard up against the floodbank and the flood defence is protected by erosion protection, such as piling. The existing erosion protection will then be removed once the new floodbank is in place and the new bank has become established.
- Floodbank rollback: this solution is similar to setback, however, the distance the floodbank is moved inland is considerably less. It is the preferred solution when bank protection is insufficient to allow for just bank strengthening and where ground conditions do not permit full setback.

Several types of erosion protection can be used depending on local circumstances and include asphalt matting, coconut husk rolls or matting, alder poles and reed-based products. Wherever possible, the material required is found locally. A computer model of the Broadland river system has also been developed using detailed, current survey information of river channel shape, bank height etc., as well as predictions of sea-level rise. It is used to determine what effect, if any, a particular scheme of works might have on water levels, flows and the frequency of flooding in any other part of the Project area. It is an important tool to help the project decide exactly what to do, where and how their programme of works should be phased and to test other options. The Project also uses a combination of methods to inform and include stakeholders e.g. consultation documents and questionnaires, stakeholder forums & public meetings, site meetings and workshops and regular meetings with the Broads Authority. There is a website giving access to reports.

7. Cost and resources

The contract was worth in excess of £120 million over a 20 year period. However, this cost ceiling is set so that any excessive spending in one area will result in a shortfall elsewhere.

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

To date, improvement works have been completed, or are substantially complete, in 23 of the areas comprising 89.1km strengthening, 29.5km setback, 3.7km re-piling, 15.2km other protection including asphalt matting and timber poles combined with reed & 4.5km piling removal associated with setback areas. A flood event on the 9th November 2007 produced the highest recorded water levels in the Broadland river system since the devastating east coast floods in 1953. The flood defences throughout Broadland performed extremely well given the large volumes of water that spilled over many sections of bank, with only two small breaches (bank collapse). The flood defence works are providing benefit to a wide range of freshwater plants and animals that are dependant upon good water quality within the grazing marshes. There have been a considerable number of navigation benefits and enhancements. An audit of one of the sites in a national scheme resulted in the site achieving a standard beyond that of the statutory requirements and accepted best practice.

9. Success and Fail factors

Consultation with local people and organisations is a key aspect. Funding, political will and enthusiastic people willing to co-operate are others.

10. Unforeseen outcomes

The excavation of a dyke revealed a number of vertical timbers belonging to an ancient causeway dating from the Bronze and Iron Ages. Also finds from the Roman occupation up to the 4th century AD.

11. Prepared by

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12. Verified by

It has not been possible to verify this case.

13. Sources

- Broadland Flood Alleviation Project (undated) Broadlands Environmental Services Ltd & The Environmental Agency (Exhibition Boards 1 & 2)
- Broadland Flood Alleviation Project (undated) Broadlands Environmental Services Ltd & The Environmental Agency (Exhibition Boards 3 & 4)
- Review of Progress (2009) Broadlands Environmental Services Ltd
- www.bfap.org

Broadland Fllod Alleviation Project 1+2 (459.25 KB)

Broadland Flood Alleviation Project 3+4 (363.53 KB)

Review of progress 2009 (971.69 KB)