1.5 Broad Character: Coastal Infrastructure

1.5.1 CHARACTER TYPE: FLOOD AND EROSION DEFENCE REGIONAL PERSPECTIVE: EAST ANGLIA

Introduction: Defining/distinguishing attributes

The East Anglian coast is particularly susceptible to coastal erosion and flooding. The soft rocks and deposits which make up the coastline are easily eroded by wave action. In addition East Anglia has particularly muted topography and is 'sinking' as a result of isostatic effects following the last glaciation. As such ongoing sea level rise , increased storminess and wave heights can lead to widespread flooding. Flood defences have been constructed in the region since the medieval period to drain and reclaim marshland. Flood and erosion defences are therefore very important to the region and a subject of ongoing contention with debates over policy and the needs to adapt to climate change effects.

Much of the East Anglian coast is protected by some form of erosion or flood defences. In some areas these are hard, most notably almost the entire coastline of Essex is protected by sea walls. In other places defences are in the form of maintained shingle banks. However there are still large stretches of the coastline which are unmanaged and undefended including many of the clay cliffs (DEFRA 2002).

Fixed defences include concrete seawalls which are found all along the coast from the north of the region in Norfolk (Caister-on-Sea, Great Yarmouth, Gorleston, Hopton-on-Sea), throughout the Suffolk coast (Corton, Lowestoft, Kessingland, Southwold, Aldeburgh, Walberswick) and into Essex (Frinton-on-Sea, Jaywick). Seawalls are also found in the estuaries, most notably the Blyth, Deben and Orwell (the latter from Shotley point to Colton Creek on the south bank, Fagbury Point to Trimley on the north). Over 200 km of sea walls was recorded in the Suffolk NMP project alone (Hegarty and Newsome 2005). These features have been further reinforced with sheet piling and rock armouring (eg Lowestoft, Corton, Kessingland, Jaywick) a rock berm (California to Caister) and timber revetments (Kessingland to Benacre, Hopton-on-Sea). In some areas such as Gorleston to Hopton only timber revetments were constructed, while others possess embankments (Benacre 'cross wall', Suffolk Yacht Marina and Levington Creek in the Orwell and around the Walton end of Hamford Water).

Rock berm at California

Seawall, rock armouring and old groynes at Lowestoft Ness

Many of the beaches are further protected by breakwaters and series' of groynes, extending into the sea. These are particularly found in areas of large tourist activity such as Great Yarmouth and the Norfolk coastal resorts, Lowestoft, Southwold, Aldeburgh and Clacton. A series of four offshore reefs are situated at Caister, performing the same job. One of the largest series of recent sea defences can be found at Jaywick Sands including fishtail and offshore breakwaters with rock armouring, reinforced with sand. These stand in front of the existing concrete sea wall.

One of the more unusual forms of flood and erosion defences in this area exists in Walton Backwaters. Here in 1988 a barrage breakwater of sunken Thames barges was put in place, backfilled and reinforced with 20,000 m² of mud from Harwich dredging to protect the saltmarsh and seawall behind.

Barge barrage Walton Backwaters

In other locations along the coastline unmodified topographic features act as effective flood and erosion defences including the sand dunes at the northern part of the area around California and Great Yarmouth (the 'Denes') and from Southwold to Walberswick, with the marshes as a buffer. Between Thorpeness and the north of Aldeburgh a single beach barrier protects low lying marsh behind. Stretches such as Dunwich and Covehithe have no defences at all.

Many of the hard sea defences were originally built in the Victorian period with a further phase of construction following the 1953 catastrophic floods. Many of these defences are reaching the end of their lifespan and their ongoing maintenance and renewal is likely to be costly. Given this fact coupled with the predicted sea level rise, future management will have to include abandoning some areas to the sea and breaching former sea defences, as efforts shift to working with natural processes

rather than against them. Such decisions will be guided by flood and coastal defence policies and will lead to the influx of sea water over large areas, but will allow more effective management and investment to protect key populated or wildlife sites.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Due to its topography and position East Anglia has always had to consider flood and erosion defences. In the Fenland to the north of the region sea walls and drainage channels were constructed as early as the Roman period (Countryside Agency 1999, 16), although little evidence of early defences exist on the east coast.

Historically the eastern coastline has suffered greatly from erosion. This is best exemplified by Dunwich in Suffolk, once a thriving medieval port. Land was recorded as being lost to the sea here as early as the Domesday Book but much more dramatic erosion occurred during the 14th century. In 1300 St Leonard's Church was recorded as being washed away, by 1350 more than 400 houses, shops and windmills had been destroyed. By the 17th century, most of the town had disappeared, leaving only a small village (Williamson 2006, 115). Maps show that the coastline here has eroded by nearly quarter of a mile since 1587 (Williamson 2005, 129). Dunwich remains the largest settlement in England to have been destroyed by coastal erosion (Williamson 2006, 115).

Active cliff erosion Coverhithe

Other settlements in the area met similar fates including Covehithe, Easton Bavents and Aldeburgh. A map of 1591 shows three streets in Aldeburgh lying parallel to the beach; by 1787 only one street remained and the market place and moot hall which had been in the centre of the town were in their current position on the seafront. Much of

the historic town of Walton has also been lost to the sea including a Roman shore fort. Southwold was originally located within a bay (Sole Bay) but is now a slight promontory.

Road truncated by sea erosion near Covehithe

In many ways the presence or absence of sea defences to counter this process was, and remains, influenced by economics and technological capability. For example the harbour at Dunwich silted up in the 14th century making trade difficult. Southwold on the other hand remained accessible and could afford defences (Williamson 2005, 129).

Construction of flood and erosion defences is also intricately related to land reclamation which didn't occur extensively in this area until the post medieval period (see 'Reclaimed Land' text). During this period erection of defences became widespread in an attempt to save marginal grazing land. For example, the Blyth estuary training walls were first constructed in the 18th century and have simply been extended since. Victorian sea defences , including the 'Tamarisk Wall' (which held until 1953) were also constructed at the Naze in order to try and save the cliffs area from further erosion. It is these marginal areas where EA coastal defence policies may lead to their abandonment through withdrawal of funding.

These features can be difficult to trace as sea walls were constantly repaired and maintained and their current position or position on maps may not indicate original positions. Many have borrow pits alongside the inside of the bank where more material has been excavated, (Hegarty and Newsome 2005, 86). In some cases attempts at management have failed and massive expanses of tidal flats and reedbeds exist over former farmland with the remnants of failed banks evident in the mud (Good and Plouviez 2007, 41).

During World War II the area was mined and access restricted and the sea defences fell into disrepair. In some areas some sea defences were deliberately breached as an anti-invasion feature, such as the deliberate flooding of a large area of drained marshland at Walberswick (Williamson 2005, 147). Vast changes to flood and erosion defences eventually had to be made after the North Sea flood of 1953 destroyed what was left. This occurred on the night of 31st January and has been described as the worst peacetime disaster the UK has seen (http://www.open2.net/naturalhistory/1953.html). It was caused by a combination of high spring tide, an intense low pressure heading down the North Sea and hurricane force winds. A huge wave was pushed south creating a high tide up to 2.5 m higher than usual. In 1953 there were no flood warning systems and a poor communications network, as a result of which 307 people lost their lives in Britain and 30,000 homes were evacuated. In the Netherlands 1835 people were killed, with a further 230 lost at sea (http://en.wikipedia.org). It took nine months to drain the water and make repairs.

In Jaywick, where the housing was particularly poor 35 people were killed during the storm and 600 people made homeless, leading to the construction of massive sea defences. However the shingle beach was all but washed away by successive storms battering against the sea wall, leading to a series of beach replenishments and construction of breakwaters since the 1980s (Strachan 1998). These have recently been completed as outlined above.

Breakwaters at Jaywick

VALUES AND PERCEPTIONS

Flood and erosion defences are considered by many coastal communities to be essential. A number of organisations and groups have been set up to try and improve the coastal defences. Examples include Coastal Concern Action Group (CCAG), campaigning to save Happisburgh and the Naze protection Society who work with local and central authorities to find a way to prevent further cliff erosion.

Recently the historical value of sea defences has also been recognised in terms of informing our understanding of past efforts to hold the sea at bay, and of land reclamation. In some cases the structures themselves have become monumentalised as features of historic interest such as the Tamarisk wall at the Naze and remains of failed sea walls found within the marshes.

Occasionally sea defences are seen as inappropriate to their surrounding landscape meaning vulnerable stretches of coast can remain at risk. However, the problems in East Anglia are generally considered to be too severe for this to prevent construction of defences. In some cases the structures can be viewed with interest, such as the barge barrage in Walton backwaters. Groynes and breakwaters are a common sight on the East Anglian beaches today and are generally perceived as part of the recreational landscape.

Predicted sea level rise and higher storm surges will increase the risk of coastal erosion and flooding. Traditionally coastal protection schemes have defended the coastline with 'hold the line' policies and 'hard' defences such as walls and groynes. New policy favours the policy of 'managed realignment' which involves the breaching of hard defences when they reach the end of their lives and allowing the coastline to move inland. The main objective is to create more intertidal habitats to provide a range of benefits, including buffering wave energy and reducing hard defence costs. This policy confirms to several EU Directives which require the loss of intertidal habitats to be compensated for by creating new ones. These habitats could decline due to 'coastal squeeze' between rising sea levels and sea defences or roads, and unregulated land-use change. Coastal squeeze increases the wave energy reaching sea walls and causes maintenance costs to rise. Use of 'managed realignment' techniques to create these benefits is still however, an experimental technique with uncertain outcomes and timetables for delivery and decisions on its use would need case by case economic, cultural and environmental consideration.. (http://www.parliament.uk/documents/post/postpn342.pdf)

Recreational beach with groynes

RESEARCH, AMENITY AND EDUCATION

There is potential for research into the region's flood and erosion defences on a number of levels. There is certainly scope to study the evolution of sea defences, particularly using the data compiled by the RCZAS and NMP. This forms part of the wider research issue of man's relationship with the sea in this area and education in terms of respect for the sea.

The development of defensive structures may also be useful in obtaining information about the past landscape. Often when replaced sea defences can reveal a much earlier land surface subsequently covered by accreted material.

Past and present groynes at Southwold

CONDITION AND FORCES FOR CHANGE

The condition of flood and erosion defences along the coastline and estuaries varies dramatically. Some places have seen recent development in defences which have improved their effectiveness and contributed strongly to landscape changes in their area. (eg at Jaywick). Newer schemes are very often more aesthetically pleasing than the concrete walls they tend to replace or mask. In contrast many of the concrete walls or timber structures are in poor states of repair depending on when they were built and still require replacement or reinforcement.

Sea defences at Jaywick 2007

The main force of change for this character type is climate change. The ongoing effects of the last glaciation are still being felt here in terms of sea level rise and land subsidence. This is exacerbated by a global increase in temperature which is also expected to lead to increased storminess and accelerated sea level rise. All of this will put extra pressure on the coastline and existing defensive structures. For example, the Naze cliffs were subject to erosion at a rate of up to 0.88m/yr

Sea defences at Jaywick 2010

between 1874 and 1973, increasing to 1.45 m/yr between 1973 - 1988 (D'Olier 2002). This is being combated where possible by changes in policy and schemes to improve coastal defence. This is best exemplified by the Shoreline Management Plans (SMP) implemented by DEFRA and the Environment Agency (EA). These consider the current state of the shoreline, predicted changes and possible solutions. The first SMPs were undertaken in the mid 1990s, with a second round underway in the later 2000s. These are supported by an evidence base from projects such as Futurecoast, a system for predicting coastal behaviour. The government has also allocated £11 million to local authorities with innovative ideas for coastal change. Four of the 15 coastal change pathfinder authorities chosen are in the East Anglian region.

RARITY AND VULNERABILITY

Flood and erosion defences are clearly quite common through necessity in this region. However, some of the historic examples of sea defences which may provide information about our current landscape are under threat from ploughing as intensive arable cultivation has expanded onto many areas of reclaimed land previously used as pasture (Hegarty and Newsome 2005, 87). In addition many of the clay embankments in the area built to prevent flooding have become ecological habitats in their own right, becoming areas of natural grassland.

Much of the coastal land protected by the current defences also displays both rare and vulnerable features in its own right, including the Naze Pleistocene Red Crag cliffs, an SSSI as a result of the land and sea fossils exposed within the cliff face. To the north eroding cliffs have revealed the earliest occupation of hominins in the UK and in northern Europe as a whole.

BIBLIOGRAPHY

Countryside Agency 1999 *Countryside Character. Volume 6: East of England*. CA12. Countryside Agency, Cheltenham.

Department for Environment Food and Rural Affairs, 2002b, Suffolk Coast and Estuaries Coastal Habitat Management Plan Final Report. Defra

D'Olier, B., 2002, Appendix 10: A geological background to sediment sources, pathways and sinks, in Wallingord, H. R., CEFAS/UEA, Posford Haskoning and D'Olier, B., Souuthern North Sea Sediment Transport Study, Phase 2: Sediment Transport Report, Report EX 4526, August 2002, H R Wallingford

Good, C. and J. Plouviez. 2007. *The Archaeology of the Suffolk Coast*. Suffolk County Archaeological Service (RCZA programme).

Hegarty, C. & Newsome, S. 2005 *The Archaeology of the Suffolk Coast and Intertidal Zone. A report for the national mapping programme*. Suffolk County Council and English Heritage

Strachan, D., 1998, Essex from the Air, Essex County Council

Williamson, T., 2005, Sandlands: the Suffolk coast and heaths. Windgather

Williamson, T., 2006, England's Landscape: East Anglia. English Heritage

WEBSITES

HTTP://WWW.OPEN2.NET/NATURALHISTORY/1953.HTML

HTTP://EN.WIKIPEDIA.ORG