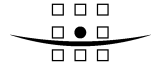


3 BASIS FOR DEVELOPMENT OF THE PLAN

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3 BASIS FOR DEVELOPMENT OF THE PLAN

This section aims to set the scene on how the SMP has been developed. It provides an overview of information contained in the appendices on aspects such as the physical behaviour of the coast, some of the key issues that have been identified and explains how the coast has been broken down so that these issues, and their interaction with the coastal processes, can be examined in better detail. It also provides the background to more general issues, such as the concern over dredging and the approach taken to achieve sustainability, which are issues that have been raised during consultation and are discussed in the following sub-sections.

However, there are other more fundamental questions that have been raised, about the way in which the plan interacts with other plans being developed for the area, how economics have been addressed in developing policy and how this relates to ensuring that the plan for delivering shoreline management can realistically be achieved. The latter point also relates to the timescale over which the plan is considering; 100 years is a long time and it can be questioned whether it is really possible to predict coastal behaviour and attitudes to use of the coast over this time period. These aspects of the plan are discussed below so as to provide a background for understanding how the plan has been developed.

The coast is a highly dynamic, complex environment with interaction between one section of the coast and another, both in terms of how the coast works and how different interests in the coast interrelate. This is why the SMP needs to consider the full 72km of the Suffolk Coast and why it needs to co-ordinate policy with adjacent SMPs. It is also why the SMP needs to look to the long term, as the way in which we manage the coast today can establish the pattern of how we will be managing the coast into the future. The SMP brings together an understanding of how the coast behaves; its physical behaviour. It develops an understanding of the issues, in terms of what is valued and how the coast is used. This process has relied strongly on the consultation that has been undertaken and makes full use of the existing landuse and spatial plans that have been or are being developed. It then examines how we may manage the coast into the future to sustain these values without imposing an increasing burden on future generations. Although there has to be uncertainty in both of these areas, it is possible to understand long term trends, both in use and behaviour, which allows the process to predict how these may influence decision making in the future.

In the major towns, it may not be possible to predict in any detail how the coastal area may be used, even in 50 years time, but it is reasonable to assume that the sea front and core aspects of the town, associated with the coast, will still play an important role in sustaining economic growth. In an area such as Southwold, for example, it is reasonable to predict that its sandy beach will still be a significant feature in attracting tourism; that the value placed on its harbour will still be important; that the historic landscape

integral to the town will still be valued and that the natural landscape, within which the town is located, will still contribute to the town's overall well being.

In a similar way, it may not be possible to predict precisely how the physical behaviour of the coast will evolve but, irrespective of the uncertain influences such as sea level, the rapid erosion of the cliffs at Covehithe will continue, the slower but persistent pressure for erosion between Aldeburgh and Orford Ness will persist and the cyclical behaviour of nearshore banks at Lowestoft or at the mouth of the Alde/Ore are likely to continue. Indeed it is possible to predict many of these patterns of change well beyond the 100 year period.

It is then possible to understand that certain patterns of shoreline management will either support or constrain the way in which the coast behaves and the way in which the coast can be used in the future. In developing the SMP, this pattern of change or the general way in which it is seen that the coast could be managed are described as scenarios. For example, if we manage in a certain way, or if the coast responds to sea level rise in a certain way, then these are the probable consequences. In many ways, the short to medium term policies can be seen as quite specific, some medium to long term policies reflect far more the intent of where we aim to be in 100 years.

All this has to recognise the role of the SMP. Over the last decade there have been significant changes to the way in which we look at our use of areas. In the case of the SMP there has been a substantial shift, both in timescales and in approach, and this is reflected in the change in attitude from the first round of SMPs through to guidance on preparing the SMP2. This change also reflects the change from landuse planning; looking quite specifically at individual areas, to spatial planning; considering the broader aspects of landuse and their interactions. As set out in *Section 1* of this document, the SMP is not a statutory plan and its prime function is in identifying risk from erosion and flooding and in developing policy for nothing other than the management of this risk. It has to take account of how such management may influence all the other broader interests of the coast and in this way it has, also, to provide guidance to plans addressing these broader interests. In particular, the SMP should not attempt to usurp the statutory role of the planning process. It does, however, have an important role in providing guidance to the planning process. It informs the development of the statutory plans on risk and this is considered through the planning process in terms of PPS 25 on flood risk and through PPG20 and the emerging planning policy towards coastal change.

This is not a simple relationship. Because of the complex behaviour of the coast, it is very much in identifying and explaining the consequences of actions or non-intervention on the coast that is important, so that correct broader balances can be achieved and understood in the processes of forward planning and planning regulation and control.

None of this is static. Just as coastal management continues throughout the development of the SMP, through monitoring, strategies and scheme development, so there is a necessary continuing process of review and development of other plans. In the case of the Suffolk coast the SMP has been developed alongside strategies that were looking in more detail at the estuaries and alongside work being undertaken at places such as Felixstowe. The SMP has fed into and has taken advice from these various studies. Both processes have benefited from this in gaining more detailed appreciation of issues and through the higher level view being taken by the SMP.

One major initiative that has been established within the Suffolk coastal area since the start of the SMP has been that of Integrated Coastal Zone Management (ICZM). This initiative, which is being developed initially for the Alde/Ore and Aldeburgh area, has come in part from the recognised need of the SMP to have stronger guidance on how the coast and its hinterland interact. This initiative is a partnership approach being taken by East of England Development Agency, the Environment Agency, GO-East, Natural England, Suffolk County Council, Suffolk Coastal District Council and Waveney District Council. The approach being taken goes beyond the remit of the SMP process. However, it requires the input of the SMP to make important decisions in taking this broader perspective in ensuring integration of shoreline issues. The SMP also provides valuable advice in identifying where, in other areas of the coast, this broader perspective may be required to resolve issues in the future. It is not the case, therefore, that these are two separate processes. Rather, each process is essential in developing long term sustainable integrated management for the area.

It is clearly stated in the SMP that the SMP policy in the area of Aldeburgh will be reviewed once the Alde/Ore Futures project has developed its initial conclusions. This review will also take account of the Aldeburgh Coast and Estuaries Strategy (ACES) as this element of the larger planning process is complete. This review is anticipated to be within the next two years.

As the ICZM initiative evolves, and as further information is gathered about the coast, so the SMP will also evolve through formal review in some 10 years time. This more general review is not expected to be quite as significant a shift in approach as between SMP1 and SMP2 but rather an opportunity to incorporate new information and to further clarify the long term vision for the area. Indeed, the SMP process should be considered as something that is continuously developing, with SMP2 providing the initial framework.

The complex nature of management of the coastal zone, cannot be over emphasised. In the past, the process in some areas has been criticised for being undertaken in a very narrow sectorial manner. This problem has become more acute as pressure on the coast and estuaries has grown, with increasing understanding of the impact of management, increasing development of the coast and, in many areas, increasing pressure from

erosion and increasing flood risk. SMP1 was the first real approach from a technical standpoint to try to address this; SMP2 takes this a stage further in developing stronger ties with the planning process as discussed above. However, as also discussed above, it is important to recognise the clear distinctions made between planning processes. In many ways the SMP can be seen as a bridge between the technical approach of coastal engineering, taken forward through strategies and schemes, and the broader based emerging integrated coastal zone management.

As this more integrated approach has been developed so the issue of funding and valuation of coastal interests has also been highlighted. This is a consideration identified in Defra's strategy "Making Space for Water" (Defra 2005). It is recognised that there is increasing pressure on national funding for coast protection and flood defence. With anticipated sea level rise and the potential for other aspects of climate change, the cost of managing the coast, with the present management, will increase substantially over the next few decades and over the next century. This does not imply that, as a nation, we should be turning away from management of the coastal area but it does require that money is spent effectively in protecting and sustaining essential features of the coast. Priority areas will need to be identified around English and Welsh coastlines. This also means from a more local perspective that there is a need to understand what it is that is valued and what benefits will be derived from management. There has to be an increasing understanding, therefore, of where the nation can and needs to provide funding for coastal engineering and flood and coastal erosion risk management and where alternative funding streams, multiple objectives, or private funding can contribute to achieve sustainable outcomes.

In developing the SMP and policy, the economic appraisal process comes initially from the perspective of risk management, identifying those aspects of the coast that may be lost due to flooding or encroachment of the sea through erosion. These economic values have been broadened considerably over the last 10 to 20 years to include aspects such as amenity and recreation, the cost implications in managing designated habitats and consideration of direct impact on individuals; considering this very much from a national standpoint in relation to loss to the nation. The SMP takes quite a high level approach to this and this is what is reported in the document in the preliminary assessment of each area. Where possible, further detailed information provided by studies or scheme appraisals is included in assessing the overall impact of different scenarios.

However, within the SMP guidance, the point is strongly made that in considering specific management of the coast the SMP should not be solely determined from this economic perspective. The SMP has to be guided by the longer term principles of sustainability, in that:

- What may be economically justified in the short term may in reality set a course of management for the future that would be technically difficult to sustain.
- Action or in-action in one area may have implications for management elsewhere on the coast.

Also, the guidance states that the SMP should be guided by the objectives set nationally, through policy; regionally, through the spatial and regeneration plans; and locally, through understanding the values attached to individual areas and communities. It is at the regional and local scales, in particular, that the emerging ICZM initiative will be most important in the future. For the present the SMP has had to develop these values through consultation.

The SMP does, therefore, take account of, and is in areas driven by aspects of coastal aspiration. These are valid but often aspects to which monetary economic value cannot be sensibly derived at present. Such an approach has, however, to be based on reality. There is no benefit in putting forward policy that is technically inappropriate or where there is no realistic expectation of funding. The corollary of this is that the SMP also has to identify where, through collaborative funding approaches, and where it is sustainable to do so, policy can be set which goes beyond the opportunities provided purely in relying on national funding for Flood and Coastal Erosion Risk Management. Where this is the case, the SMP clearly states this and also identifies the alternative consequence and policy which would apply if funding is not available. These are seen as key areas where an ICZM approach would be of particular benefit.

In valuing aspects of the coast, as tangible or intangible assets, there are certain areas which are difficult. This applies to such values as community and community cohesion but, in particular, to the historic environment and landscape and the more general landscape and appreciation of the coastal environment. In the first of these, it is acknowledged that historic assets and their contextual landscape, by their nature, are not something that can adapt. In many cases there is no full mitigation for loss. There is also concern that the funding mechanisms for what mitigation is possible, such as investigation or relocation, are poorly defined. In the second, it is recognised that, while the need for mitigation for loss of internationally important nature conservation sites is defined, the impact on more general bio-diversity and landscape in general can be subjective. While the approach taken within the SMP is largely driven through consultation, these again are areas that needed a more integrated approach to be developed alongside the continuously developing process of shoreline management.

These issues are discussed in more detail in the following sub-sections and are developed with regard to specific areas within the rest of the SMP.

3.1 Historic and Current Perspective

3.1.1 Physical Structure

A detailed discussion of the Geology and Coastal Processes is presented in Appendix C.

Geology

Prior to the glacial events that have so shaped the North Sea, the area was largely dominated by marine conditions with large rivers bringing sediment in from much of England and the Continent (Gibbard 1988; Rose 1999 & 2002).

Following this period, two glaciations can be identified from deposits both on the North Sea floor and within mainland England. The former, the Anglian glaciation, covered all of Norfolk and Suffolk and parts of Essex. At the time of the last glacial maximum some 18,000 years B.P. the ice front lay within the Wash and extended northeastwards into the central North Sea. Between these two glacial events there might have been a third, and in addition a whole series of interglacial periods, where sediments were deposited. The result is that at the present time, the sediments of the seabed off this coast and the sediments of the cliffed coastal sections, are of very mixed provenance and type. It is from these that the mobile sediments within the present marine environment are being largely derived by erosion.

Much of the shoreline is covered by areas of shingle and sand, derived from past periods of rapid erosion. The natural coast is characterised by its major shingle features: at Benacre Ness and Orford Ness, but also by the narrower ridges of shingle in front of large low lying areas such as at the Kessingland Levels, the Broads, Walberswick, Minsmere and Hollesley Bay. In front of other areas of the coast the shingle and sand provides a near continuous beach form over the whole SMP frontage. There are complex shoreline bank systems at the mouth of the estuaries and in the nearshore area important sand and shingle banks.

There is little truly hard geology along the SMP frontage. The main cliffed sections of coast continue to erode, with the cliffs of Pakefield and Kessingland, Covehithe and Easton Bavents and Dunwich and Minsmere continuing to supply sediment to the beaches along the coast. This supply is much reduced from earlier times, when the main shingle features were formed. Over the southern section of the coast there is little new sediment being provided. The section of the shore south of Orford Ness through to Felixstowe is fed almost exclusively from the large shingle reserve of the Ness.

The harder cliffs do, however, provide some control both on sediment supply and the shape of the coast, particularly in areas such as Dunwich, Thorpeness and Cobbold's Point. The nearshore banks at Lowestoft, at

Minsmere and Aldeburgh and at the mouth of the Alde/Ore and the Deben also influence this coastal behaviour. These bank systems work through cyclical patterns of behaviour, over periods ranging from 20 to 100 years, strongly influencing the release of sediment to the adjacent sections of the shore, creating periods of increased erosion and periods of relative stability.

Influence of Manmade Defences

Much of the Suffolk coast functions quite naturally and this is seen as an important value of the shoreline. There are however, significant sections of the coast where man has intervened in this process. At Lowestoft, the behaviour of the coast is dominated by such intervention. The defences to the north of Lowestoft Harbour are constructed over the old shingle ness. These defences hold the position of the coast, influencing the behaviour of the coast to the south.

At Southwold, defence of the town reinforces the natural harder geological headland, shaping the coast to the north and forming the main headland to the bay through to the natural cliff headland at Dunwich.

At Felixstowe much of the coast now has hard defence, controlling the movement of sediment and resisting erosion of the coast. To the south of Felixstowe, Landguard Point is formed by the navigation structure influencing the development of the Felixstowe frontage and fixing the entrance to the Stour and Orwell Estuary.

There are areas of more local important influence, particularly at the entrance to the Blyth Estuary, at Aldeburgh in protecting against the creation of a new entrance to the Alde Estuary, at East Lane, forming the southern headland to Hollesley Bay, and at the mouth of the Deben.

In other areas, defences, particularly linear flood defences, are emerging as significant constraints on coastal behaviour as the coast erodes. Most evident are the defences for the Kessingland Levels. These were previously set back behind Benacre Ness and to the north of Southwold, over the Easton Marsh frontage. Management of the natural shingle ridges has also had an influence, with the ridge to the south of Walberswick having been rebuilt and becoming progressively more vulnerable to breach and breakdown.

Within the estuaries management and defences now dominate the natural regime. Defences have been put in place over centuries. This has excluded natural tidal volume, influencing the flows into and out of the estuaries, influencing, in turn, the development of the coast.

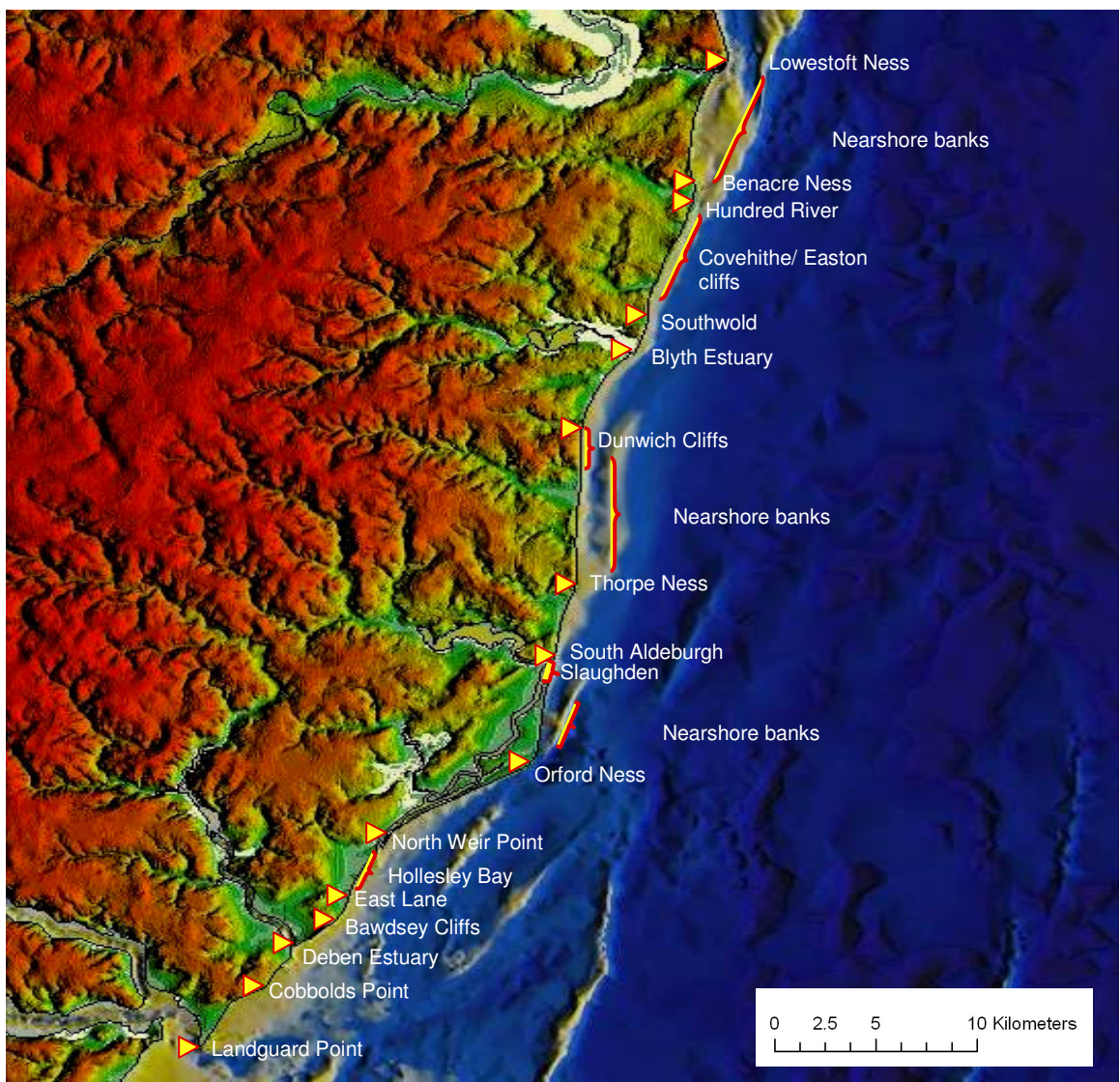
Physical Interaction

The main interaction along the coast is in terms of sediment movement. Such interaction is determined in part in terms of sediment source, sediment

sinks and in part by the manner in which features described above modify the behaviour of the coast:

- Directly in terms of sediment movement, acting as a down drift control point allowing the coast up drift to realign to a stable but regulating sediment down drift (down-drift headland),
- Directly in terms of determining the position of the coast (restraint), restraining movement of adjacent sections of the coast,
- Indirectly influencing coastal forces, modifying direction or energy at the shoreline (Up-drift headland),
- Indirectly acting as a barrier modifying forces acting at the shoreline,
- Indirectly through influence on coastal forces, redirecting forces in the nearshore area (interruption).

Figure 3.1: Principle features influencing the Suffolk coast.



Lowestoft Ness, the harbour and Pakefield, have a significant influence on the coast in this area. The beach at Lowestoft has stabilised with protection provided by the nearshore banks to the south.

Benacre Ness is a potential barrier to direct movement of sediment to south, limiting direct interaction with coast to the south. This feature also acts to protect the shoreline at Kessingland, although northward movement of the Ness exposes the frontage to the south while increasing protection of the cliffs to north.

Higher sections of cliff at Covehithe act as a restraint on retreat of the shingle banks across the Broads, allowing the backshore barriers to develop. This influence however is effectively a local constraint.

Southwold maintains the alignment of the coast and provides sediment retention to the coast to the north and acts to anchor the coast to the south, without acting as a significant headland. However, if the influence of the Blyth Estuary were diminished then Southwold would act as a headland influencing development of the shore to the south.

The harbour structures at the Blyth Estuary act as a strong influence on the coast between the harbour and Southwold, with little influence further north. This critically depends on the management within the Blyth Estuary, determining the sustainability of control of the estuary mouth.

The Dunwich and Minsmere Cliffs anchor the coast to the north, limiting sediment drift to the south. The significance of this depends on policy driven by issues to the north. The nearshore banks to the south of Dunwich act to protect the erosion of the shoreline between Dunwich and Thorpeness.

Thorpeness controls the orientation of the coast to north and influences sediment feed to nearshore banks protecting the Sizewell and Minsmere frontages. The southern section of Aldeburgh retains sediment to the north in front of Aldeburgh and controls the development of the bay to the north as far as Thorpe Ness.

Despite the limited sediment drift from the north of Orford Ness, erosion of this sediment source feeds material to the south. The nearshore banks to the immediate north act to protect and hold alignment of the southern section of Orford beach.

North Weir Point acts as a temporary sediment sink, retaining and releasing sediment in a cyclic manner. This periodically protects and exposes the Shingle Street frontage. Hollesley Bay primarily acts as an area where there is a through-put of sediment. To the south, East Lane maintains Hollesley Bay as a sediment reserve effectively acting as a forward surrogate down-

drift headland, in place of the cliffs to the south. The Bawdsey Cliffs act to maintain a retreated shoreline along Hollesley Bay, however also provide an up drift control for the bay centred on the Deben Estuary.

The Deben maintains sediment to the northern Bawdsey frontage, although acting within a larger bay formed between the Bawdsey Cliffs and Cobbold's Point. The Knolls, which have to be seen as an integral part of the mouth of the estuary, influence protection at the mouth of the estuary as well as the behaviour of the coast through to Cobbold's Point.

Cobbold's Point behaves in a limited manner as a control on the orientation of the coast to North Felixstowe. The headland only tends to have a limited control of sediment, dependent on release of sediment from the Knolls system. This headland also controls the shoreline to the south.

At the southern boundary of this SMP, Landguard point acts as a down drift control to the shoreline of Felixstowe Bay, principally in terms of shingle. The Bay is identified as a substantially closed system with significant transfer of finer sediment between the nearshore zone and the shoreline. This feature also has significant role in maintaining the entrance to the estuaries.

Sediment Supply

The primary source of the sediments for the northern section of this coastline has been the cliffs that lie between Cromer and Happisburgh. The southerly drift of this sediment is partially retained at Lowestoft Ness, but also feeds the nearshore banks at Pakefield. These nearshore banks are a potential source of material to Benacre Ness, but only provide a limited supply to the south of here. Benacre Ness is a potential barrier to direct movement of sediment to the south, limiting direct interaction with coast to the south.

Covehithe Cliffs are the predominant source of material for this sub cell, providing both a sand and shingle and fine sediment to shoreline to the south. This supply is critically and directly affected by the controlling headland at Southwold, although a nearshore sand sediment pathway has been identified. The slightly prominent headland at Southwold retains sediments from the north, which limits direct movement of sediment to south. At the mouth of the Blyth Estuary, nearshore sediment is retained as an ebb tide delta, limiting sediment movement to south. This critically depends on the management within the Blyth Estuary, determining the sustainability of control of the estuary mouth.

Although Dunwich cliffs are thought to be a source of material, there appears to be a limited sediment drift south of these cliffs. This is however considered an important local supply to the Minsmere frontage.

Erosion of Orford Ness is the primary source of material to the south. The volume of material is such that this source is likely to continue to provide sediment over the period of the SMP and beyond. This supply of material

from the Ness, together with the apparent sink at North Weir Point, feeds material south towards Hollesley Bay. Sediment is retained here at Shingle Street, which influences the supply of material to East Lane.

Further south, Bawdsey cliffs provide a limited source of material to feed the Deben estuary system.

Offshore Dredging

There has been concern that dredging carried out within the region has had an influence on coastal behaviour. This issue was considered specifically by the Southern North Sea Sediment Transport study.

The study provided a review of existing dredging approval process. The aim of the existing process of assessing the environmental effects of dredging before it is licensed, is to ensure that environmental effects are minimised in general and that effects on the coastline are insignificant. As a result of this, and given the very conservative methods used to predict effects on the coastline when an application is considered, it is not surprising that no convincing evidence of any changes along the coastline following such extraction has been presented. Nevertheless, since much of the coastline of eastern England continues to erode, and aggregate dredging also takes place, there are still some individuals and organisations that link the two processes and claim a “cause and effect” relationship.

Because of these and other concerns, it is now standard practice to require dredging companies to carry out monitoring of their activities. For all recent extraction licenses (i.e. those issued in the last 10 years or so) there is a requirement for:

- The dredgers to be equipped with a “black box” recorder (Electronic Monitoring System) that records the position and activities of the dredger. The information from this system is returned to the Crown Estate who check that the dredging is taking place in the agreed area (and at the correct times of year in some circumstances). It is this data that allows the production of the very detailed information, showing where, and for how long, dredging operations have taken place;
- The licence holders also undertakes regular (usually annual) bathymetric surveys of the seabed in and around the dredging area, at an agreed maximum spacing of survey lines. These and other surveys (see paragraph 3 below) are undertaken at the licence holder’s expense by an independent surveying company, acceptable to all parties;
- In addition, extra monitoring conditions are imposed on some licences, requiring, for example, surveys of the seabed sediments, benthic flora and fauna or side-scan sonar recording of the seabed. Such extra monitoring requirements are normally carried out after the extraction of a specified amount of aggregate, rather than at fixed time intervals;
- As well as surveys carried out on behalf of the licence holders, some independent research projects investigating the effects of dredging have

also been carried out. So far these have largely been related to the biological consequences of dredging, i.e. on recovery and re-colonisation rates of dredged areas, and on the effects of such dredging on adjacent areas of the seabed. Such studies have been commissioned both by the Crown Estate, and by DEFRA, and are often carried out by CEFAS, based in Burnham-on-Crouch and Lowestoft;

- Finally, it is not uncommon for dredging companies to carry out, on a voluntary basis, their own surveys of the seabed. This is partly to manage the “resource”, i.e. the remaining deposits of sand and gravel, partly to provide potential evidence for use in future studies, for example if they wish to apply for further dredging in the same or nearby areas. Such monitoring results, however, are normally commercially confidential and will not therefore necessarily be available to other organisations.

Where monitoring surveys are required as a condition of the licence (reflecting the Government View) then the results are in the public domain. Copies of the surveys are sent to the Crown Estate, Department for Transport, Local Government and the Regions (DTLR), Department for Environment, Food and Rural Affairs (DEFRA), Natural England and, for some areas, to the Ministry of Defence (MDD) (Hydrographic Office) and the Environment Agency. Research reports, for example carried out by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) on behalf of DEFRA, are also in the public domain.

It is sometimes a requirement of an extraction licence, however, for the licence holders to carry out or commission an independent review or interpretation of the survey results. It is possible that this will become a responsibility of DTLR when the present “Government View” procedure is replaced by a statutory system. At present, therefore, there is not normally any routine interpretation or research into the results of the annual bathymetric surveys, for example. However, from time to time, this survey information is reviewed, for example when new dredging licence applications are being considered in, or close to areas that have already been dredged. At present, a Coastal Impact Study for an extension of an existing licence for Area 254, off Great Yarmouth, is being prepared (for UMD Ltd.). As part of this study, UMD have made available two surveys of this area approximately ten years apart; analysis of the changes in bed levels in and around this area have shown that the total change in volumes of seabed sediments equates remarkably closely to the amount of sediment dredged. In addition, there is no evidence of bed changes outside the dredged area. This therefore indicates that there has been no infilling of the dredged depression, for example by sand, and that the changes to waves and tidal currents have not affected even the seabed immediately adjacent to the licensed area. Such observations lend weight to at least the conclusions of Coastal Impact Studies that dredging will not affect sediment transport over the seabed (or cause beach drawdown).

Further to this particular study, there has also been a more general review of dredging of Great Yarmouth carried out by the University of Southampton (Gao, Ke & Collins, 1993). This was largely based on an analysis of Admiralty charts and previous study reports. It concluded that the changes in bed levels in and around the dredging areas were not distinguishable from natural variations in level, and hence the dredging up to that time was not likely to have caused any adverse effects on the coast.

The review and analysis of surveys of the seabed that are carried out to fulfill one of the conditions under which a licence is issued may be an interesting area for further (academic) research. This information may shed light on numerous aspects of seabed and coastal sediment processes, and any connections between the two. The research might complement similar research into the effects of dredging on the biological environment of the seabed, for example as undertaken by CEFAS.

The Southern North Sea Sediment Transport Study examined the relationship between all dredge areas and their potential association with coastal change. The study concluded that there was no evidence that dredging was having a significant impact on the behaviour of the coast.

Coastal Change

The coastal zone is a dynamic environment, reliant on natural processes to form the boundary between land and the sea. On the Suffolk coast the main pressure for change has been erosion. In the past this erosion has produced large quantities of sediment which has, as described earlier, allowed the development of the sand and shingle shoreline seen today. Associated with this erosion and the subsequent sediment supply, the coast has seen significant change. In addition to the retreat of much of the coast, there have been the changes in position and shape of natural features of the shoreline.

To the north, the most evident change has been the movement of Benacre Ness, which in moving north has exposed the shore of Covehithe and Benacre Broad to rapid erosion. This has resulted in the loss of a substantial extent of the Broad. It also resulted in the loss of the harbour area of Covehithe. South of here there was the loss of most of Dunwich, formerly a major town and port, and, associated with this, the changes in the position of the outlet to the Dunwich River.

At Aldeburgh there was loss of several rows of property, forward of the present shoreline line. The development of Orford Ness and Orford Spit closed direct access to the sea from the town of Orford. These natural changes have been accompanied by changes brought about by man in the way in which the estuaries function, in fixing the position of Lowestoft Ness and the creation of the entrance to Lowestoft Harbour or through diversion of the entrance to the Blyth and in constraining the entrance to the Deben.

Change continues through to the present day. Erosion continues, although generally at a much lower rate than in the past. This has reduced the supply of sediment such that in areas such as Orford Ness, the coast to the south still feeds off the erosion of the massive earlier accumulations of sediment.

The Lowestoft frontage goes through periods of accretion and erosion, linked to the long term cyclical behaviour of the nearshore banks. Benacre Ness continues to move north, exposing new sections of coast to erosion. As a result of this adjustment of the coast, south of Benacre Ness becomes more exposed, leading to some of the most rapid areas of erosion over the whole frontage.

In other areas, the coast, though still changing, is evolving far less rapidly. Over much of the coast between Southwold and Aldeburgh, more stable bays and beaches have formed. These sections continue to roll back and this process will increase with rising sea levels. This process of roll back is evident in the increasing frequency of overtopping to the shingle ridge south of the Blyth Estuary and is affecting the whole length of the coast. Further south, the area between the shingle ridge, to the Minsmere Valley exhibits some of the lowest rates of retreat, historically, and this is also true of the area north of Aldeburgh.

At Aldeburgh and to the south of the town the pressure of erosion is relatively slow, but persistent and this is potentially an area of dramatic change to the coastal system, with a possible breach developing a new entrance to the Alde Estuary.

The existing entrance to Alde/Ore Estuary undergoes change on almost a daily basis, with more fundamental change predicted over a longer term 100 year cycle. This will impact the whole of Hollesley Bay. Similar changes occur over a shorter 20 year cycle at the mouth of the Deben, influencing sediment supply and erosion behaviour of the coast to north and south.

The Felixstowe frontage, with its higher and harder nearshore geology has undergone less significant overall change but is sensitive to specific wave directions, moving sediment around the shoreline.

Confidence and Uncertainty

The study of coastal behaviour and processes is far from being an exact science. Records and data can be assessed to determine particular trends to gain an understanding of how the coastline is changing. However, due to the highly sensitive and responsive nature of coastal process, there are uncertainties when predicting erosion rates and sediment movement. The Suffolk coastline has one of the most extensive coastal monitoring records in the UK, dating back some 20 years; however, this is still regarded as limited data when considering the longer term, particularly where cyclical processes are involved. The erosion zones presented within the SMP are to be treated as indicative lines, as they are predictions based on present day scenarios.

This information should therefore be regarded as supporting data for policy development and not as absolute lines of coastal erosion. For the purpose of planning 100 years in advance, a large number of uncertainties remain.

Nonetheless, such uncertainty is far more related to the timing of events. For example, the extent and timing of erosion is more of an uncertainty than understanding where erosion and change will occur. One such obvious uncertainty is in the rate of sea level rise, which strongly influences erosion rates.

At a more local scale there is uncertainty surrounding the response of the estuaries to sea level rise. At this scale, there is also uncertainty as to when local systems such as the bank systems at Weir Point and at the Knolls will change; when additional sediment may be released into the coastal system and how these bank systems will reconfigure themselves.

Conclusions

Considering the importance of the coastline, from both a natural and human perspective, there is a clear need for management in order to sustain this environment for future generations. The SMP is essentially a mechanism for creating a plan of intent, such that future strategies and schemes can consider the broader scale of the coastal zone. The plan has largely achieved a balance between human aspirations and natural processes, in such a way where there is opportunity for sustainable management for the next 100 years.

The coast is changing and over the whole length of the coast there will be continued pressure from erosion. There is no major hard geology which, over the long term will dominate coastal behaviour. In some areas such as the Covehithe frontage this pressure to erode is rapid. There are, however, sections of the coast where more resistant high ground or major geomorphological features such as the nearshore shore banks and the nesses have allowed the coast to develop relatively stable alignment to the dominant wave energy so that change is far slower.

Notwithstanding the uncertainties, the SMP can project forward the behaviour of the coast in the short term and in many areas through to the medium term. The SMP can also predict with a degree of confidence the longer term general behaviour of the coast, identifying where there is evident long term change and pressure. However, the uncertainties are recognised to be important and the SMP has to recognise this, particularly with respect to timescales. In several areas this has to be reflected in policy development from one epoch to the next in terms of rates of change rather than in terms of specific periods of time. This projection forward is important, as management decisions made now will influence these longer term trends and the influence the long term sustainability of management.

The SMP is putting forward a plan for managing change in a sustainable way taking account of the overall physical structure of the coast and man's influence on this structure and behaviour.

3.1.2 The Purpose of the SMP in Relation to the Physical Structure and Processes

The aim of the SMP is to ensure that a proper account is taken of the impact or interaction between areas, such that management in one area does not have a detrimental impact elsewhere. Typically this implies the need to consider the reliance of defences or erosion rates and cliff stability, on secure beach levels. From this and from the broader picture of the sediment supply (potentially from the nearshore and offshore areas and from erosion of the land), there is the need to consider the potential sediment pathways, the possible interruption of those pathways and the potential for erosion or retention of sediment. At the same time the SMP has to provide flood and erosion risk policy guidance to a level of information that may feed practically into local planning and management of specific defence lengths. In developing this, therefore, the SMP has to maintain a perspective at a broad level while still addressing local interactions.

3.1.3 Natural and Cultural Heritage

Appendix D (Thematic Review) provides a detailed definition of the natural heritage, landscape, historic environment and land use. The following paragraphs draw this together in a general appreciation of the values of the area.

Geology

The SMP shoreline is highly diverse in terms of its natural and cultural heritage; those aspects of the coastline that give an essential and important quality and backdrop to the current use and appreciation of the area. With respect to geology, this has already been discussed (Section 3.1.1) in terms of the physical structure. However, the Suffolk coast has been described as an area where geological processes may be seen to be happening. The developing behaviour of Orford Ness, or more particularly the movement of Benacre Ness are examples of this. It should be noted that a number of key geologic sequences along the Suffolk coastline are also significant for their associated Palaeolithic remains. The frontage also contains important records of past evolution, in the cliffs of Pakefield or those of Easton Bavents. Such structures are significant for research, in understanding the very long term perspective of change, for education, in awakening and developing an appreciation of this change, and for sheer enjoyment of the varied landscape, habitats, flora and fauna. In addition to this broader landscape view, which reflects the diversity over the whole coastline, there are specific sites, which are recognised in an extensive range of designations at international, national, regional and local levels.

Heritage

As significant as the geological history is the long term human association with the coastline and the historic imprint it has left. The exploitation and occupation of this dynamic area has yielded physical remains, such as buildings and archaeology, but it should also be noted that many aspects of the landscape have already been lost to the sea through erosion and coastal processes. The historic assets of the Suffolk coastline represent a continuous association between humans and the coast. The first evidence of human occupation that we have in this area is from the Palaeolithic era and represents some of the earliest and most important archaeological remains in the whole of the British Isles. Our evidence base then extends through all prehistoric and historic eras as an important and irreplaceable record of human interaction with the environment.

There is important evidence of Roman settlement in many areas of the coast from the possible high status building at Pakefield through to the Roman and Saxon town, cemetery and shore fort at Brackenbury. The area includes important Medieval sites with numerous sites showing agricultural activity and Medieval development. A notable example from this period is the former town and major port of Dunwich (though Roman finds indicate a possible earlier settlement), now lost to the sea through erosion. Greyfriars Monastery and Hospital of the Holy Trinity are significant sites associated with the old town. Many of the present settlements such as Aldeburgh or Southwold also date back to Saxon and Medieval times.

This evidence of man's use of the coast continues through to modern times and the coast contains records of land use, coastal trade and military defences. An important aspect of the latter record is the development of defences and defence related activity; this is most visibly demonstrated through the suite of Martello Towers from Felixstowe through to Aldeburgh, and the many World War II structures (gun emplacements, anti-tank blocks, pillboxes, etc) along the coast of Suffolk. The direct association between humans and the coast is evident in the ports and lighthouses along the coast, and in the small as well as large coastal settlements.

This history is important in understanding the area and its development. Particularly along this section of the coast, the way in which man's use and values have adapted to or been altered by the changing coastline are clearly evident. In addition to the important cultural and educational context, the varied range of heritage assets supports a significant tourism industry.

In some areas, historic assets are at risk from erosion or flooding. Although sea level rise is expected and more sites will be eroded and lost, it is not possible to protect every historic asset as many lie in dynamic coastal areas. A static coastline is not a 'requirement' for the protection of the historic environment. As an overall approach within SMPs, the objective is not to defend every designated historic asset, but to identify those which are most at risk and then protect and enhance them whenever economically,

technically and environmentally sustainable. All historic assets and landscapes have to be considered individually and within their wider historical and social contexts. The overall historic landscape character of the coast should be maintained where possible. While an underlying principle of the SMP as a whole is to minimise reliance on defence, the SMP also has to consider the historic environment as a unique, important and irreplaceable resource.

Natural Environment

The Suffolk coast contains some of the largest areas of undeveloped coastline in the UK, being characterised by low-lying marshes, reedbeds, sand and shingle beaches, reclaimed tidal land, heathland, forest and farmland. Each of these habitats in turn supports a range of species of high conservation value, including those listed on Annex II of the Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora). The high conservation value is reflected in the fact that the majority of the coastline is subject to statutory nature conservation and landscape designations, which have had important implications for the Suffolk SMP.

The Suffolk coastline possesses several areas of International and European conservation importance, with these designations being underpinned by national legislation. Areas of conservation importance with pertinence to the SMP process are presented in **Table 3.1**.

Table 3.1 Areas of conservation importance with pertinence to the Suffolk SMP2 process

International & European		
Ramsar ¹	SAC ²	SPA ³
Broadland	The Broads	Broadland
	Benacre to Easton Bavents Lagoons	Benacre to Easton Bavents
Minsmere-Walberswick	Minsmere to Walberswick Heaths and Marshes	Minsmere-Walberswick
		Sandlings
Alde-Ore Estuary	Alde-Ore and Butley Estuary	Alde-Ore
	Orfordness – Shingle Street	
Deben Estuary		Deben Estuary
Stour and Orwell Estuaries		The Stour and Orwell

National	
SSSI ⁴	NNR ⁵
	Suffolk Coast
Barnby Broad and Marshes	
Pakefield to Easton Bavents	Benacre
Minsmere-Walberswick Heaths and Marshes	
Sizewell Marshes	
National	
SSSI ⁶	NNR ⁷
Leiston-Aldeburgh	
Alde-Ore Estuary	Orfordness-Havergate
Sandlings Forest	
Bawdsey Cliff	
Landguard Common	
Sprats Water and Marshes, Carlton Colville	
Orwell Estuary	
Stour Estuary	

The variety of habitats fringing the Suffolk coastline has presented paradoxes for shoreline management; many areas of freshwater habitat were of a coastal nature prior to reclamation, with these areas now being located at a

¹ Ramsar sites are wetlands of international importance designated under the Ramsar Convention.

² Special Areas of Conservation are sites designated under EC Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

³ Special Protection Areas are sites designated under EC Council Directive 79/409/EEC on the conservation of wild birds.

⁴ Sites designated under the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000 (in England and Wales).

⁵ Sites designated under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981.

⁶ Sites designated under the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000 (in England and Wales).

⁷ Sites designated under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981.

level either at or below mean sea level. As such, the development of an SMP policy for these areas has attempted to provide for the most sustainable future management of these areas, with the effects of policy having been assessed through both the Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) processes.

Landscape

All the above interests contribute to the exceptional landscape value of the coastline. The Suffolk coast conjures up images of sand and shingle beaches, shingle ridges and features, low cliffs, heathland, woodland and open estuaries. This character is reflected in the designation of much of the coast through the Suffolk Coast and Heaths AONB, as well as designated lengths of Heritage Coast. Essential features of the coast are the villages such as Shingle Street or Felixstowe Ferry, which are quite literally 'living on the edge'. The relationship between the historic and natural environments is complex, with the present-day landscape revealing the influences of many different historic and social periods. An example of this can be seen at Southwold Harbour where the Conservation Area includes a wide variety of different buildings.

In many ways the landscape reveals the many aspects and activities associated with the coastline. For example, the quality of towns such as Aldeburgh is determined by their setting and historic landscape. Aldeburgh, with its historic buildings such as the moot house, is situated within a landscape of long shingle beaches, the Estuary of Alde/Ore and the National Nature Reserve of Orford Ness. The rising headland of Southwold, capped by its lighthouse, provides the setting for important beach use and has economic value to the town. The historic patterns of settlement along the coast, are a significant feature of Suffolk's landscape. There are distinct links between the towns and villages and the historic natural environment, such as the monastic creation of freshwater grazing marshes.

This landscape provides a valuable asset both to local residents and to the regional economy through tourism.

3.1.4 Human (Socio-Economic) Environment and Activity

The Suffolk coastline has a unique and dynamic nature, underpinned by the diversity of assets found along the coast. These assets and their significance, provide the fundamental building blocks in determining the intent of the management plan. The assets range in both scale and function, from the major urban centres in Felixstowe and Lowestoft, to large areas of open space used for both agriculture and recreation. Other key features comprise the thousands of homes and businesses that are situated along the coast, together with a heavy dependency on tourism for communities such as Southwold and Aldeburgh. These are some examples of how people are interacting with the coastal environment both at present, but also historically

through the numerous heritage assets and scheduled ancient monuments along the coast. One core aspect of many existing settlements is the presence of clusters of listed buildings, which often form part of wider Conservation Areas. The historic context of the existing built environment forms part of the character of the Suffolk Coast and contributes to, amongst other things, tourism. These features and issues can be found within Appendix E. Although each asset is specific, many features share common ground; whether it is proximity to one another, or multiple functions/interests of individual features, which appeal to a variety of stakeholders. In developing the SMP it has been important not just to capture the mass of individual features but to acknowledge the manner in which these assets and interests interact. This has been attempted in defining the broad level Stakeholder Objectives, which form the basis of the policy development process. These are found within the Policy Development Documents within Section 4 of this report.

In considering these objectives it is important to appreciate that these values are not fundamentally in conflict but act to support the overall socio-economic aspect of the area.

There are specific important activities essential to the welfare of the area. At Felixstowe and at Lowestoft, the major port activities are important. Each of these major towns also rely heavily on the tourism of the area and both commercial and recreational activities are essential to the economic welfare of the towns. Tourism, supported by traditional fishing activities is important to the towns of Southwold, Aldeburgh and to the villages of Felixstowe Ferry and Kessingland. The agricultural industry is also important to other villages and the regional economy. In many of these areas there are significant risks associated with the potential loss of beaches squeezed up against the defences providing protection to settlements. The port of Felixstowe and that of Lowestoft lie within the tidal flood plain. The long term erosion of the coast also threatens loss of agriculture land and in some areas the existence of communities.

These settlements rely on infrastructure of the road network, regionally in terms of the main A12 and more locally through the road linking communities on the coast. In several areas these roads are at risk from flooding. There is less evidence of other services specifically at risk but at Southwold the sewage works lies within the potential tidal flood plain and there is risk of disruption to the water supply due to flooding.

The SMP process has to consider all such aspects balancing the possible difficulty of maintaining the socio-economic structure against the continuous change and erosion along the frontage. An important role of the SMP is to examine how these various communities can be sustained in the context of an eroding coast. Equally important, however, is to reflect what it is about each centre that is important, so that in maintaining defence to an area, or in considering the need for change in defence policy, the values of the coastal

frontages are equally maintained. This requires a long term view to be taken, considering how management of defences may be best adapted to longer term changes and the threat of sea level rise and climate change.

3.2 Sustainable Policy

An SMP therefore, has to identify how the coast can be managed in a sustainable way in terms of managing and adapting to flood and coastal erosion risk in the light of future climate change and sea level rise. In addition to this, it also aims to deliver wider environmental and social benefits as part of the SMP policies.

As an overall principle it is adequate to take the definition provided by the original 1987 statement of sustainable development: *“development which meets the needs of the present without compromising the ability of future generations to meet their own needs”*, subsequently amended and adopted in the Defra SMP guidance, in relation to defence management policy as avoiding: *“tying future generations into inflexible and expensive options for defence.”*

While this provided an initial intent, encapsulating the long term view being taken by the first review of the Shoreline Management Plan, it has to be realised that such a definition lacks (quite correctly, given its context) specific guidance as to the day to day, area by area management of individual sections of the coast or of risk. It is essential, therefore, to interpret this in relation to the actual situations that exist and the future that is envisaged.

There are two aspects to sustainability:

- the effort needed to deliver an outcome – such as pressure resulting from changing the coastal form, such as resisting erosion
- the harm or benefit resulting from the outcome - the vision of what is wanted of the coast

These have to take account of the issues in a particular area, for example: natural processes, ecology, homes, businesses, navigation or recreation.

The issues along the Suffolk coast have been identified from the following sources of information:

- earlier studies, such as the first SMP, strategies and scheme studies,
- the first stakeholder meetings and discussions with the Representative Members Forum (RMF) and Client Steering Group (CSG); and
- a review of policy documents, structure and local plans

Ideally, the most sustainable approach is not to intervene on the coast and to let it respond in a dynamic way to natural processes occurring in the North Sea. There is an increasing need to manage flood and erosion risk through alternative methods, such as flood warnings and improving the resilience of individual properties, in an attempt to adapt to climate change and sea level rise.

This fits with the intentions of the European Water Framework Directive, which aims to restore water bodies (including coastal areas) to their natural state, unless there is a good reason not to. This can be done where there are no issues that need managing. However, the coast and hinterland are home to a wide variety of activities, features and issues often with complex interactions.

There are parts of the coast that people would not wish to change as the impact would have a detrimental effect on the sustainability of other issues or features elsewhere on the coast. These may be natural, man-made or social features that the present generation wants to pass on to future generations.

The right balance needs to be achieved between these two extremes, whilst also making sure inflexible and expensive management plans are not passed on to future generations. Even where the coast is currently managed, future intervention may not be the right choice if it is likely that on-going management will have a detrimental effect on natural processes or impact on other parts of the coast long-term. It is likely that management in these places will increase in the future as the coast evolves or because of climate change. Careful consideration would therefore be needed to decide whether it would be sustainable to continue existing management practices rather than letting the coastline behave more naturally.

3.2.1 Natural Processes

The geological exposures of the coast, certainly over the northern section of the frontage, provide clear evidence of how sea levels in the area have changed. Over the last 2,000 years, this change has been quite minimal (averaging less than a millimetre per year). However, we are now entering a period of anticipated accelerating sea level rise that will most likely impose greater pressure on the coast to erode and could in some areas, particularly where the shoreline is dependent on natural protection provided by beach material, result in significant change. There is also the potential for changes in sediment supply. This problem has been exacerbated at some locations in the last century due to human intervention reducing the contemporary sediment supply from cliff erosion by the construction of coastal defences and harbour arms. Although attention is focussed upon the shoreline position, this process also has the potential to produce a deepening of the seabed at any particular point. This is a feature that has been potentially identified within a number of areas on the coast where there is evidence of

the low water contour moving closer to the shoreline. We have to plan for this change. In general terms we have to expect greater energy against the coast and against defences coupled with a potential reduction of sediment along sections of the shoreline. If we choose to continue to defend our shorelines in the same locations that we do at present, then the size of the defences may need to increase. We need, therefore, to be looking to create width where this is possible, either through setting back defences or through modifying the approach we take. Equally, we need to be recognising the importance of the geomorphological control that exists on the coast, working with this to sustain the shape of the coast and thus to retain and maximise the use we make of the sediments which are available.

As discussed earlier, there are areas of quite significant transfer of sediment along the shoreline. This is a coast where action in one area can have major impact elsewhere. In considering the sustainability of managing areas of the coast we have to understand the significance of these impacts such that we are able to maximise the use of sediment without creating problems elsewhere. A sustainable shoreline sediment system is one that is allowed to behave as naturally as possible, without significant further intervention.

3.2.2 Economic Sustainability

One of the difficulties facing us, as a nation, is the cost of continuing to protect shorelines to the extent that we do at present. Many of the defences that exist today have been the result of reactive management with often limited understanding (or perhaps knowledge) of the long-term consequences, including financial commitment. Studies over the past few years have established that the cost of maintaining all existing defences is already likely to be significantly more than present expenditure levels. In simple terms this means that either more money needs to be invested in coastal defence, defence expenditure has to be prioritised, or funding has to come from other sources based on the benefit they bring. Whilst the first option would clearly be the preference of those living on or owning land along the coast, this has to be put into context of how the general UK taxpayer wishes to see their money used. Given that the cost to provide defences that are both effective and stable currently averages between £2million and £5million per kilometre, the number of privately owned properties that can be protected for this investment has to be weighed up against how else that money can be used, for example education, health and other social benefits.

Furthermore, because of the climate changes being predicted, which will accelerate the natural changes already taking place, these recent studies have also established that the equivalent cost of providing a defence will increase during the next century, possibly in some areas to between 2 and 4 times the present cost. Consequently those areas where the UK taxpayer is prepared to continue to fund defence may well become even more selective and the threshold at which managing an area becomes economically viable. Whilst it is not known how attitudes might change, it is not unreasonable to

assume that future policy-makers will be more inclined to resist investing considerable sums in protecting property in high risk areas, such as the coast, if there are substantially cheaper options, such as constructing new properties further inland. It is extremely important that the long-term policies in the SMP recognise these future issues and reflect likely future constraints. Failure to do so within this Plan would not ensure future protection; rather it would give a false impression of a future shoreline management scenario which could not be justified and would fail to be implemented once funding was sought. The implications of these national financial constraints are that protection is most likely to be focussed upon larger conurbations and towns, where the highest level of benefit is achieved for the investment made, i.e. more properties can be protected per million pound of investment. The consequence is that more rural communities are more likely to be affected by changing financial constraints, but from a national funding perspective, i.e. best use of the taxpayer's money, this makes economic sense.

However, sustainability cannot only be judged on the effort necessary to defend areas. There has also to be consideration of what values, what heritage may be passed on to future generations. This is not just in the bricks and mortar that are being defended but is the character and vitality of the coastal communities. As a result, there has to be a sensible balance achieved between those areas where the increasing pressure from the changing shoreline will make defence unacceptable in reality and those where defences can be maintained but at increased cost. The SMP has to consider this in terms of:

- What is the value that is being defended, whether this is in terms of a viable community or merely from the economic perspective of a hard asset.
- Whether defences themselves are causing a further deterioration in conditions which makes their maintenance increasingly difficult.
- How management practice will itself evolve. For example in moving down one course of action will this lead to further defence, and further resource being put into defence.

In the latter case the SMP attempts to identify where there is a need to possibly take earlier action to support existing natural structures or to take advantage of existing width, so as to provide a more sustainable defence system in the future.

In many respects sustainability and the balance which we are attempting to achieve may be considered in terms of how the consequence of our action now will be considered in the future. Either in terms of these consequences or in deciding to defend or not defend, a simple test of sustainability is the degree of regret that might be felt in the future of the decision which is being made now. Will we wish that we had taken a different course of action?

3.2.3 Natural and Historic Environment

Nature Conservation

The forces of nature have created a variety of landforms and habitats along the Suffolk coastline. The special quality of the natural habitats and geological/geomorphological features on this coast is recognised in a number of national and international designations, protected under statutory international and national legislation, as well as regional and local planning policies. There is a legal requirement to consider the implications of any 'plan' or 'project' that may impact on a Special Protection Area (SPA) or Special Area of Conservation (SAC), through the European Union Habitats Directive (Council Directive 92/43/EEC) and Birds Directive (Council Directive 79/409/EEC). The Defra High Level Target for Flood and Coastal Defence (Target 9 – Biodiversity) also requires all local councils and other operating authorities to:

- Avoid damage to environmental interest
- Ensure no net loss to habitats covered by Biodiversity Action Plans
- Seek opportunities for environmental enhancement

A key requirement for the SMP is therefore to promote the maintenance of biodiversity or enhancement, through identifying biodiversity opportunities. Coastal management can have a significant impact on habitats and landforms, both directly and indirectly. In places, coastal defences may be detrimental to nature conservation interests, e.g. producing coastal squeeze, but in other locations defences may protect the interest of a site, e.g. freshwater sites. Coastal habitats may also form the coastal defence, e.g. the shingle ridge along Hollesley Bay. Therefore, coastal management decisions need to be made through consideration of both nature conservation and risk management. Although the conservation of ecological features in a changing environment remains key, in terms of environmental sustainability, future management of the coast needs to allow habitats and features to respond and adjust to change, such as accelerated sea level rise. It is recognised that true coastal habitats cannot always be protected in situ because a large element of their ecological interest derives from their dynamic nature and this is important to ensure the continued functionality of any habitat. Similarly in terms of many of the geological designations many of these rely on fresh exposure of the cliffs. This poses a particular challenge for nature conservation and shifts the emphasis from site 'preservation' to 'conservation'. Therefore, accommodating future change requires flexibility in the assessment of nature conservation issues, possibly looking beyond the designation boundaries to consider wider scale, or longer term, benefits. The SMP also needs to consider opportunities for enhancing biodiversity throughout the SMP area, not just at designated sites.

Historic Environment

Man's interaction with the coast has both shaped the coastline we see today and its associated uses; the opportunities provided and constraints imposed

have shaped the development of existing settlements and coastal activity. The significance of this heritage value is recognised through individual designations, such as scheduled monuments, listed buildings, registered parks and gardens and conservation areas. Each designation marks that a building, monument or landscape has special significance in a national context. An important function of the SMP is to identify heritage assets at risk, taking account not only the designated features themselves but also the context within which they are located. The aim within the SMP is to avoid damage to the historic environment and cultural heritage, recognising that historic assets are a finite and non-renewable resource. However, in developing the SMP, the potential economic, technical and environmental constraints associated with direct protection of all sites also have to be acknowledged. It is therefore appreciated that there will be a need for mitigation of losses. The SMP aims to provide an assessment of risk and this information can subsequently be used to work out how best to mitigate those pressures and to calculate the resources required.

It is recognised that there may be substantial cost associated with the mitigation process and ultimately, there is no effective mitigation for historic landscapes.

The natural and historic environment of the Suffolk coastline, quite apart from its intrinsic value, is acknowledged to be of exceptional importance to tourism and the way of life of people living in the area. In looking to sustain this environment, therefore, the SMP has to consider how the natural and historic environments co-exist on this dynamic coastline.

3.2.4 Social Justice

A number of stakeholders have raised the issue of 'Social Justice' in relation to an aspiration for coastal protection during the consultation phase on the draft Shoreline Management Plan 2 (SMP2). Throughout the SMP process, the approach to 'Social Justice' has been discussed in detail with the CSG and RMF, but also put forward for review during key stakeholder and public consultation.

Social Justice refers to conceptions of justice applied to an entire society. It is based on the idea of a just society, which gives individuals and groups fair treatment and a just share of the benefits of society. The term 'Social Justice' itself tends to be used by those who believe that present day society is unjust in some aspect.

In the context of Shoreline Management Planning, Social Justice has been used by some to justify intervention in terms of proactively managing the coast and, more particularly, an expectation that the public purse should fund defence against erosion, inundation and/or loss of property arising there from.

In terms of the SMP2 it is interpreted that Social Justice refers to the provision for compensation for property lost to the sea. Firstly, that compensation should be paid for total loss of property due to failure to defend against coastal erosion on a hitherto defended coast. This infers a change in the preferred policy over the epochs of the SMP2. Secondly, if the policy is to not defend properties at all, then the owners of properties that will be lost, should receive compensation.

In response to these interpretations it must be remembered that the premise upon which coast protection is provided is under permissive powers. Coast Protection Authorities operate under permissive powers to act; there is no statutory right to be protected.

The SMP2 when developing policies takes into account technical, environmental, social and economic factors in line with the Government's strategy for managing floods and coastal erosion. The SMP2 is realistic, uses existing legislation and accounts for likely future Coastal Risk Management funding. The SMP2 has developed policies based on current legislation.

Management of the coast has to be addressed in relation to the different aims, duties and responsibilities of society and individuals and this is reflected in the existing funding and regulations. There is a requirement on the operating authorities to regulate development on the coast and shoreline to ensure that the actions of individuals or groups of individuals do not cause damage to others or to those features of the coast valued in some way by society. The SMP2 provides an essential role in advising on this, through being able to examine the coast and interactions at a suitably broad scale. In exercising permissive powers, operating authorities are able to undertake works to reduce the risk from flooding and erosion where such action is seen as being to the overall benefit of the nation and society. This is most frequently judged in terms of economic benefits but can also be driven by other factors such as cultural, heritage or environmental issues; but always in relation to the overall community, not specifically in relation to individuals. The SMP2 is an essential tool in considering the overall risk and, judged against the various objectives identified, identifies policy which balances the achievement of these objectives in a sustainable manner. Addressing the risks at an individual level, where there is not seen to be specific national or overall community benefit, remains the responsibility of the individuals, acting always within the regulatory framework discussed above. Even at this level, the SMP2 provides an important function, setting out the anticipated risk and providing guidance on the coastal processes influencing this. Furthermore, the SMP2 identifies where there are potential constraints in relation to the possible impacts any individual action may have on other sections of the coast.

Within the current legal framework, the SMP2 provides a valuable overview of the various issues which might arise from specific action or inaction in terms of coastal defence and flood and erosion risk management.

The SMP2 has raised the importance of Social Justice and its application to the delivery of long term sustainable solutions for coastal management. Stakeholders' concerns have been brought to Defra's attention. Defra has recognised within the Making Space for Water project SD2: Adaptation toolkit, that Social Justice and Flood and Coastal Erosion Risk Management (FCERM) are now inextricably linked.

An action plan will be developed within the Final SMP2 document. This action plan will consider site-specific issues in relation to adaptation.

3.3 The Scale of SMP2 Review

It is evident from section 3.1 above and Appendix D that there is a high degree of diversity over the SMP2 coastline, in terms of the physical processes, natural and cultural heritage and socio economic drivers; and in considering sustainability (section 3.2) that there is significant interaction within each theme and between the different themes or individual sectors of interest. Furthermore, depending on the scale at which the coast is considered there are different interactions. Nominally, for example, it may be appropriate to say that over the whole SMP2 coastline there is a north to south sediment drift. At a high level this might be valid but ignores, at a slightly more detailed level, the fact that Benacre Ness appears to be migrating northwards, or at an even more detailed level, that there is a tendency for material to move offshore at Cobbold's Point. Similarly in terms of transport or coastal footpaths, or indeed the contribution that Lowestoft or Southwold have on the economic welfare to the region, there are many interactions at differing levels of detail.

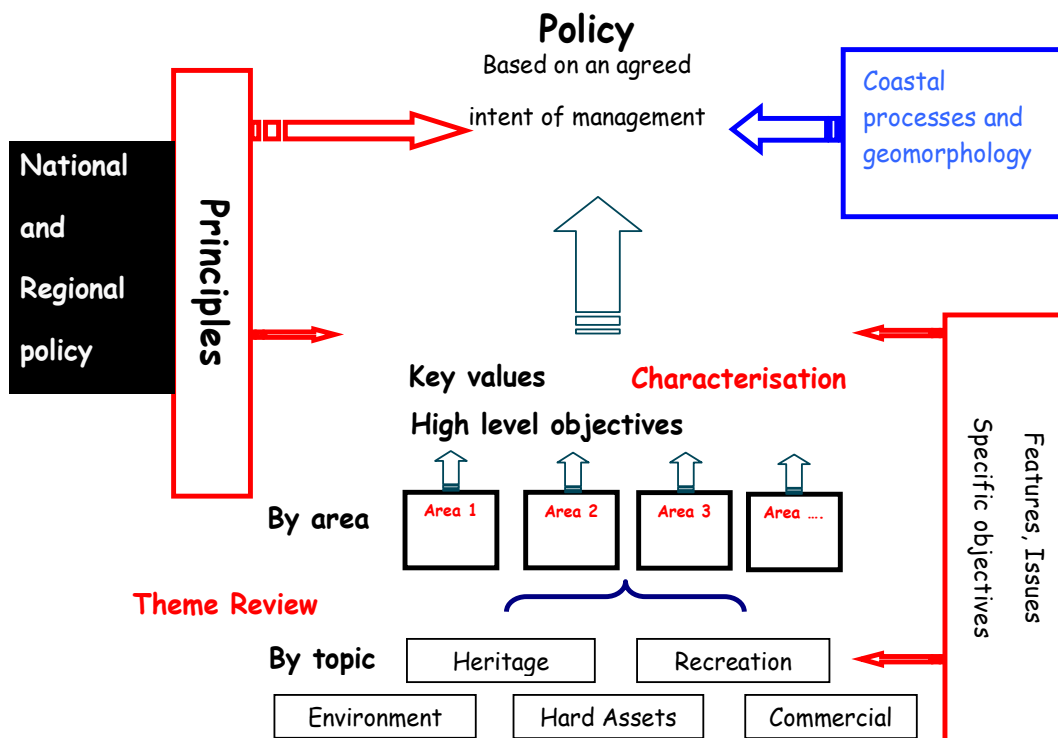
The aim of the SMP is to provide an assessment of flood and erosion risk at the national level and, associated with this, an indication of the overall level of commitment to defence in these areas. Equally, the SMP aims to provide a general assessment of appropriate policy for risk management at a level that will assist direct management of defences in a manner which will support other management objectives for the areas. To address both levels there clearly needs to be a layered approach to the SMP analysis. To achieve this, despite maintaining a clear awareness of the broader levels of interactions between areas, it is necessary, to allow focus on all issues. This allows for consideration for sections of the coast in detail and within which individual policy units can then be derived. In taking such an approach consideration has also to be given to the higher level issues, such that the interaction between these is not lost.

The consultation undertaken at the start of the SMP2 allowed issues to be identified for individual features within the area, providing an insight to what

the public regard as the key values of their coastline. This was used to develop an overall characterisation of the coast, which in turn assisted in agreeing specific objectives for management. Consideration of this overall characterisation allows the coast to be divided into sections, through which more detailed consideration could be given to the development of policy. This process is discussed in Section 3.4.

Figure 3.2 below illustrates the approach and understanding of the development of policy for SMP2, incorporating all the aspects of work detailed in the previous sections.

Figure 3.2: Derivation of SMP Policy process



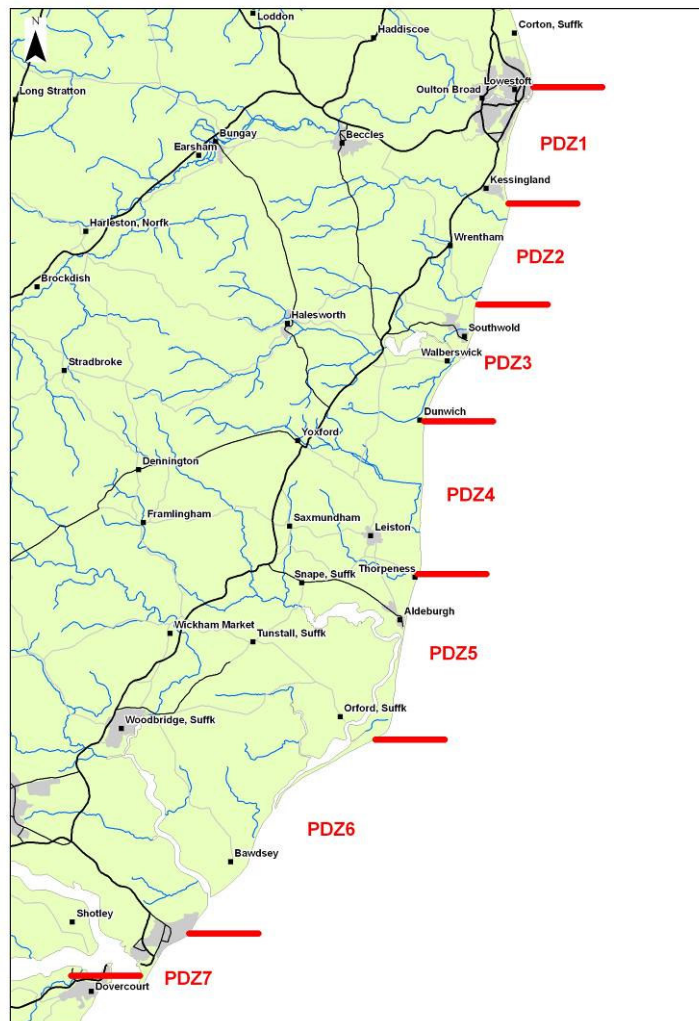
3.4 Development of Policy

3.4.1 Derivation of Policy Development Zones

From this process, it is evident that no single issue dominates the development of policy on the coast. From whichever perspective the coast is viewed, there are always overlapping issues and interests between sections. Considering the manageability of developing policy in sufficient detail, the coast has to be divided. This has been done in such a manner as to minimise the residual linkages between one section of the coast and the adjacent section, but also to ensure that in developing and discussing policy, all major interactions across all themes are able to be considered. It is within these sections or zones that individual policy units may be developed. The high level division is shown in the figure below. This division is not intended to define hard barriers, but to think about the coast as a whole to provide a practical means of examining the coast in detail. “Policy Development Zones” (PDZ) have been created to breakdown the coast, as a matter of labelling and convenience, and are not to be confused with the final policy units. This breakdown of zones are shown in **Figure 3.3**.

- PDZ1: Lowestoft Ness to Benacre Ness
- PDZ2: Benacre Ness to Easton Broad
- PDZ3: Easton Broad to Dunwich Cliffs
- PDZ4: Dunwich Cliffs to Thorpeness
- PDZ5: Thorpeness to Orford Ness
- PDZ6: Orford Ness to Cobbold’s Point
- PDZ7: Cobbold’s Point to Felixstowe Port (south)

Figure 3.3: Policy Development Zones for Suffolk



3.4.2 Identification of Policy Units

Within each PDZ different scenarios are considered; always starting with the policy for “No Active Intervention” (NAI) for all locations within the PDZ. This provides the baseline for considering the need or the sense in actively managing the coast. The second scenario is based on the policy developed from SMP1, taking into account further detail or modification which may have been developed during strategy studies undertaken since SMP1. These are termed “With Present Management” (i.e. that policy which the SMP2 is reviewing⁸) and provides the starting point for considering future management. This Present Management scenario sets out a series of policies for individual lengths of coast within each PDZ. Within any PDZ these individual policies may be different for specific lengths along the

⁸ It is recognised that the purpose of the SMP is to review this present management, making recommendations where necessary for these policies to be updated. As such the SMP2, on completion and approval, will define present management for the future.

shoreline, such that one length may be to “hold the line” (HTL), in a different length the policy may be for managed realignment (MR)

The two initial scenarios are compared and the way in which they allow the coast to develop and the manner in which they meet or fail to meet objectives defined within the SMP2 is considered. For some sections of coast the scenarios may in effect be the same. In other areas one scenario may address certain issues but fail to address others. In this comparison, therefore, there may be the opportunity to introduce adaptation which will move forward to a more sensible approach to long term management. In such cases new scenarios are then considered, looking how best to deliver the objectives of the SMP.

From this approach, the “With Present Management” policies are either confirmed or new policies are developed for individual sections of the shore. A preferred defence policy is then defined for a specific section of the coast. This section of coast is the policy unit. This defines how that section of coast should be managed over the life time of the SMP.

There is appreciation that there may be a need for transition from present management through to the long term policy. This may be a result of a new policy being recommended or it may be in recognition of the way in which the coast is likely to evolve. To allow adaptation there is scope within the SMP for changes in policy over time. Policy for each unit is therefore defined over time periods; from now to 2025 (short term), from 2025 to 2055 (medium term) and from 2055 to 2105 (long term).

The aim of developing policy for individual units of the coast within the framework of the PDZ is to ensure the broader implications of managing one policy unit with respect to another unit is considered; hence the scenario approach. These implications are discussed in the process of developing policy within Section 4. Inevitably, there are dependencies between policy units, the intent being to manage groups of policy units to best deliver objectives for management of areas of the coast. This is discussed below.

3.4.3 Management Areas

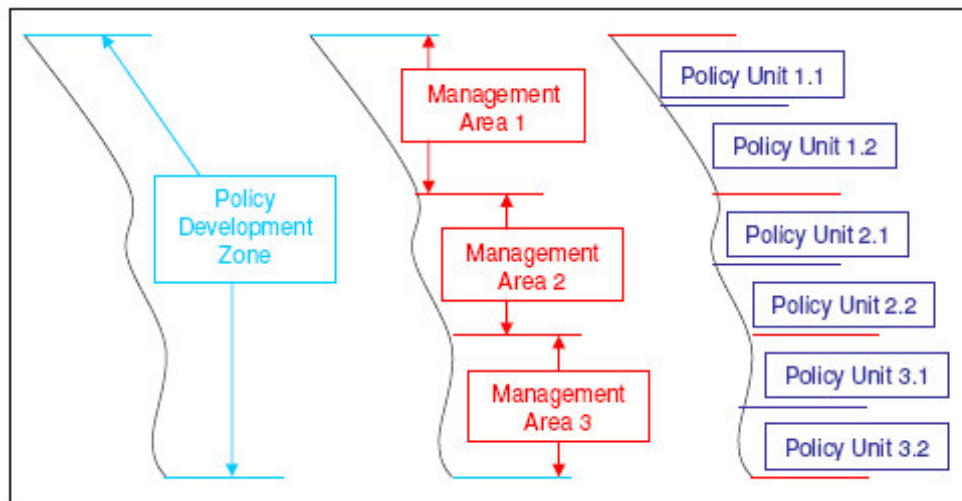
Policy Development Zones, as described above, are merely a convenient mechanism for ensuring that policy is developed over appropriate lengths of the coast to ensure interactions are taken into account. Policy units are then sections of the coast for which a specific defence management policy (No active intervention, Hold the Line, Managed Realignment) are defined. However, as discussed above there may be dependencies between Policy Units (to justify a policy of realignment in one area may be on the assumption that an adjacent section of coast is held). Having defined these policies, therefore, it is equally important to group policy units where there is this dependency. Such groups of policy units are defined as “Management

Areas” (MA). It is within these Management Areas that the overall intent of management of the coast can best be described.

The definition of the Management Area is only at the end of the policy development process. A statement can then be produced providing the understanding of why a specific area of the coast is to be managed in this way and how individual policies work to deliver that intent.

Within each ‘Policy Development Zone’ the coast has been further sub-divided into a series of ‘Management Areas’ and within each of these management policies have been selected for a series of ‘Policy Units’, as schematised below:

Figure 3.4: Sub-divisional structure of coastline



3.5 PDZ Analysis

The analysis and discussion for each zone aims to provide an understanding of the issues and nature of the area in such a manner which is logical and rigorous but also in a manner that may referred to and understood by both coastal managers and people who use or live on the coast. Each PDZ is presented as a series of reports in Section 4. Each zone is presented in a standard approach, in line with the SMP guidance. Within each report information has been set out in three sections:

- Description,
- Physical Characteristics
- Management.

These are explained below.

DESCRIPTION

The initial section provides a brief overview of issues relating to the coast. Within this first section is a list of Stakeholder objectives quite specific to the zone. These objectives and principles attempt to summarise the overall aim derived from the more detailed list of objectives in Appendix E.

This section merely describes where things are and what they are, in terms of: the underlying physical nature of the coast, together with the use being made of specific areas. This section aims to set the scene, starting to pull together the overall picture. More detail on the physical processes is provided in Appendix C.

PHYSICAL PROCESSES

Basic Parameters

These provide direct information on wave climate and water level within each zone, together with a synopsis of rates of erosion for different sections of the coast within the zone.

Existing Processes

A brief description of how the coast is behaving is provided, aiming to explain exposure conditions and where the coast is attempting to change. From this may be understood where there may be pressure developing in relation to the use of the coast and an initial appreciation of what may or may not be sustainable in the long term.

Unconstrained Evolution

Although recognised to be a totally theoretical scenario where there has been or is still major modification of the coast, this section briefly examines what would happen if all man's influence were suddenly removed. The aim of this is to provide a better understanding of how we are influencing the coastal behaviour and therefore the stresses and broader scale impact that are introduced. This assists in assessing first how the coast might wish to

change but also in defining the limits of interaction which the SMP should be considering.

MANAGEMENT

Present Management

Current management is summarised in terms of the policies developed during SMP1 and with respect to subsequent strategy studies.

Scenarios

The section provides a more detailed description and assessment of the two base line scenarios for the whole zone. This starts with the No Active Intervention Scenario and then considers the current management scenario (With Present Management). In many cases strategies have only looked over a period of 50 years. The SMP2 extends the implication and intent of the current management policy over the full 100 years and comments, where appropriate, on the further implications of this beyond this period of time. The aim of the No Active Intervention, is to identify what is at risk if defences were not maintained. In a similar way, With Present Management aims is to examine how the coast may develop, identifying where there are benefits in this management approach and where there may be issues arising in the future. Associated with each scenario is a brief summary of the key risks based on the MDSF and strategy findings. This provides a headline assessment of how each scenario achieves the key objectives set out in section one above.

Discussion and Detailed Development of Policies

This sub-section uses the two baseline scenarios to consider specific issues in more detail, looking at both the long term implications of the current policies and stepping back from the more local strategy development areas to consider any impacts on the coast as a whole. The discussion also considers any detailed proposals put forward in strategies and comments on these from the broader perspective. Where it is felt that the current policy fails to address some of the issues being identified, further scenarios are developed. Typically this has been found to be a variation within one of the baseline scenarios, rather than a scenario with such wide reaching impacts that the influence of management affects area outside the development zone being considered. From this discussion and from the analysis of different approaches and their consequences, recommendations are made for the SMP policy. This principally starts with where management would take the coast in the long term, working back to how policy should therefore be adapted over the short and medium term periods.

Management Areas

Policy units are grouped as Management Areas, providing coherent intent as to the management and dependencies over the area.

3.6 Management Area Policy Statements

The policy units and Management Areas are developed in the analysis described above. A summary or statement is presented for each management area. This is set out in the following manner.

SUMMARY OF POLICY

The format for this summary is based on the Policy Unit summary suggested by the procedural guidance. However, because of the nature of the coast and in many cases because distinct policy units have an association and cannot really be managed independently, the policy summaries have been developed by Management Area. A brief overview of the preferred plan recommendations is presented together with an overview of implementation for the short and medium term, followed by the long term intent. Finally the specific policies are identified. These summaries should be read together with the more detailed information given in the main body of the PDZ report.

CHANGES FROM PRESENT MANAGEMENT

The essential changes from current management are highlighted.

IMPLICATIONS

For each management area a summary is provided of the potential impacts these policies will have in terms of the various specific themes and in term of residual risk and risk reduction. This assessment summarises the findings of the Strategic Environmental Assessment and Appropriate Assessment.

MANAGEMENT AREA ACTION PLAN

The Management Area action plan would be developed following the consideration of responses to the draft plan. (These actions will be drawn together for the whole of the Lowestoft Ness to Landguard Point SMP2 coastline in Section 7, together with an explanation of the requirement for monitoring.)

