# Appendix E

# Policy development and appraisal

# Appendix E
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# E1 The policy development and appraisal process

## E1.1 Principles/values and objectives

The policy development and appraisal process was undertaken as part of stage 3 of the SMP, after defining policy appraisal criteria as part of stage 2. The objective-setting process used a combination of the key values and principles developed as part of a stage 2 task. Details of the objective-setting process are provided in section E2.

## E1.2 Define policy packages

The first stage 3 task associated with developing and appraising policies was to define the policy packages, which are the options that go into the appraisal. This was effectively a streamlining process, firstly identifying the obvious and unrealistic policy choices for certain frontages and epochs (defining the playing field). This allowed the identification of policies that would need full appraisal. Secondly, policy packages were identified that spanned the playing field and that were sufficiently distinct to represent the fundamental choices the SMP has to make. The alignment of these policy packages was then defined. These tasks were collectively undertaken under the 'define policy packages' task and are described in detail in section E3.

## E1.3 Policy package appraisal

Once the policy packages were defined, the shoreline responses and interactions under each policy package for the three epochs were assessed. Based on that information, each policy package was assessed against the policy appraisal criteria as defined in stage 2. The policy assessment method was developed and agreed with the CSG through the 'test baseline scenarios' task undertaken as an additional task at the beginning of stage 2. A broad assessment of economic viability, based on existing strategies, and the sensitivity of the policy packages was also considered as part of this policy package appraisal task. This ensured that the policy selection was robust, despite the uncertainties. The full policy scenario assessment is provided in section E4.

An iterative process of fine-tuning with the CSG followed. This saw the definition of scenarios, assessment of coastal processes and testing against principles tasks repeated. The final policy decision was then made by the EMF. At this stage there were a number of key issues that needed resolving to translate from the intent of management to the policy package. This is discussed in section E4.1.

## E1.4 Confirmation of preferred scenario

Following these additional assessments and investigations, the final preferred policy packages for the defined policy development zones were

agreed. This is discussed briefly in section E4.3 and full appraisal results are provided in appendix G.

Figure E1.1 provides an overview of the policy development and appraisal process discussed above. This figure highlights the two main inputs to the appraisal process - defining a policy package, alignments of these policy packages and assessing shoreline response and developing principles, values and appraisal criteria. Figure E1.2 also provides an overview of the stage 3 tasks and the order in which they were carried out. This figure also provides the location in this document of the description of the outcome of the tasks.

## E1.5 Post-public consultation

The responses to the public consultation have had a significant impact on the data used and also some effect on the resulting SMP policies. It has also had some effect on the appraisal process. However, for this appendix, which tells the story of policy development and appraisal, it was considered preferable to leave intact the draft version of the appendix that explains how the draft SMP was developed and to add a separate section at the end (section E5) to explain explicitly the changes that were made after consultation.

**Figure E1.1 Overall approach to policy appraisal**

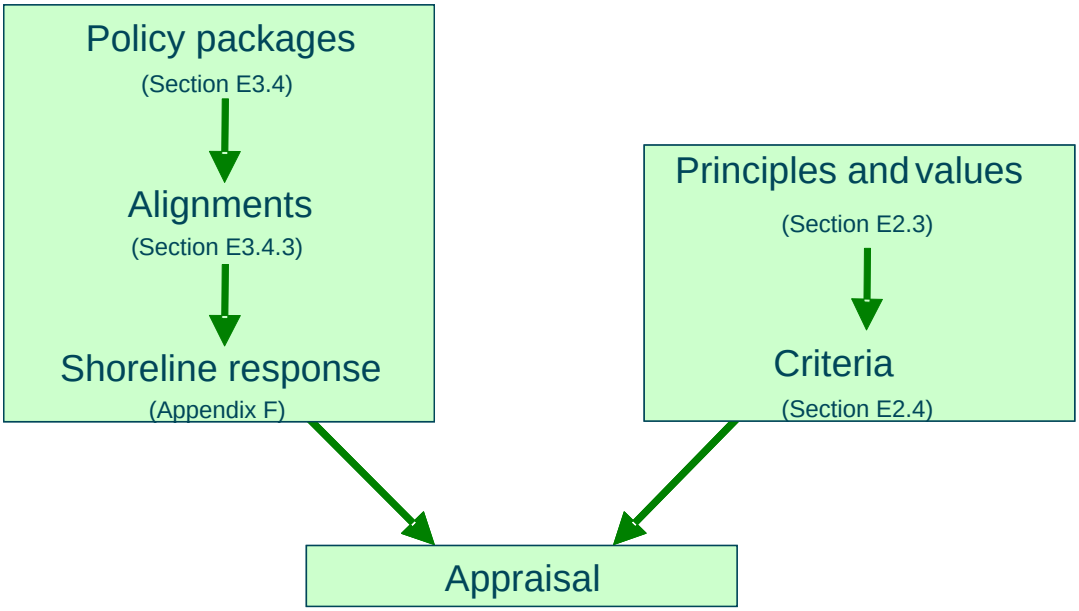
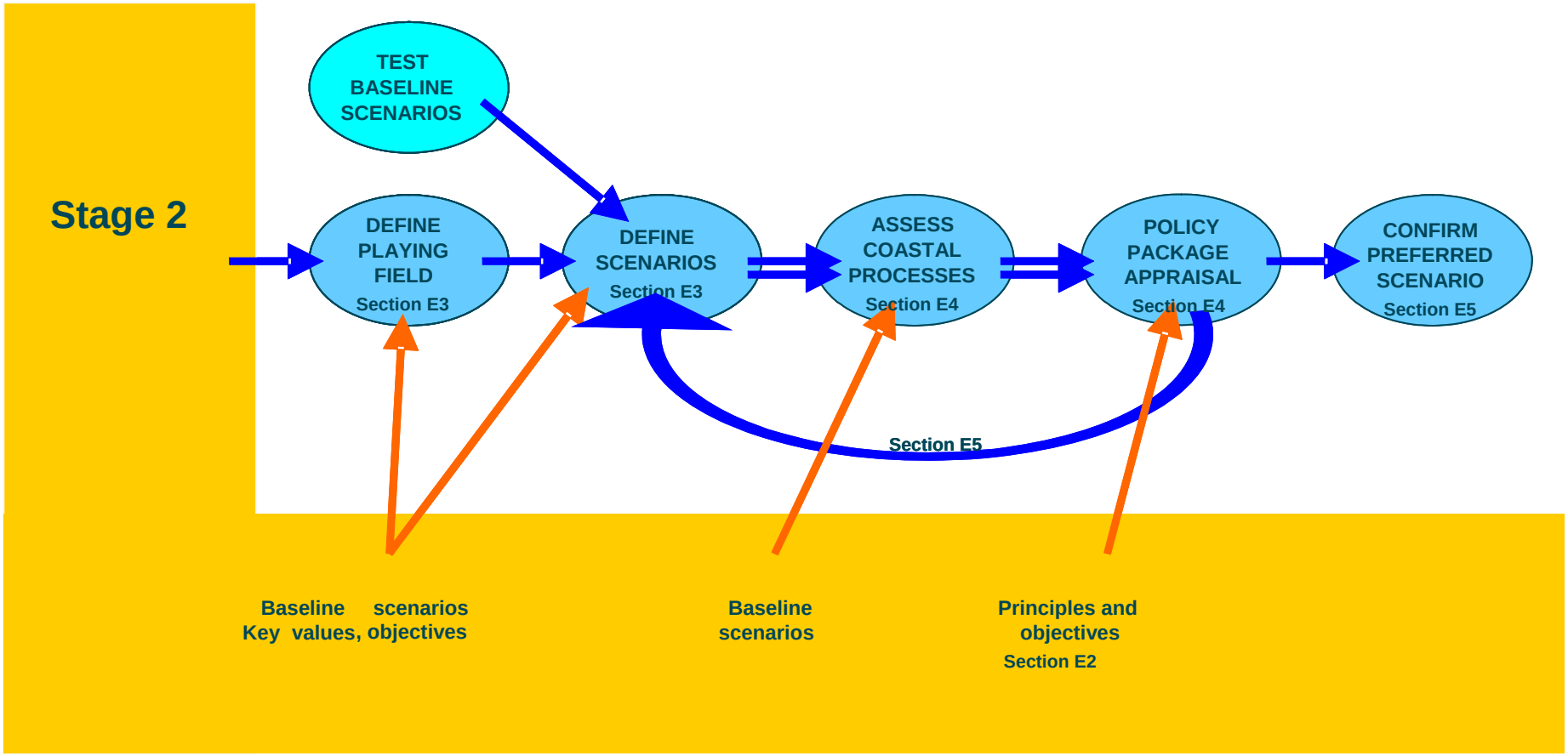


**Figure E1.2 Stage 3 tasks and timings**



**Glossary:**

These terms will be used frequently throughout this appendix. Definitions for reference are given below.

**Policy**
This describes the way in which a shoreline is managed. In line with SMP guidance, four policies are available:

- No active intervention (NAI)
- Active intervention:
  - Hold the line (HtL): keep the existing line (even if changing the standard of protection)
  - Advance the line (AtL): build new defences on the seaward side of the existing defences
  - Managed realignment (MR): allowing the shoreline to move backwards or forwards, with management to control or limit movement. In practice, and for clarity, we suggest to use this policy only for movement of the defence further inland. Any seaward movement can be defined as AtL

**Policy scenario/package**
These are scenarios defined in the SMP guidance as a full set of policies for the whole SMP frontage and for the three epochs. We have developed baseline scenarios that use only one policy for the whole area and all epochs, but a scenario can consist of any combination of policies in space and time. Note that this use of the word 'scenarios' does not relate to possible future developments of external factors such as climate change or economic development. To avoid confusion, this SMP uses the word 'policy package' instead of policy scenario.

**Intent of management**
This is a vision for the future of shoreline management in a certain frontage for all epochs. We introduced this concept in the early stages of the SMP because there is a risk that policy development and appraisal is too strongly focused on, and therefore restricted by, the defined policies and that it is developed at the level of (sub) frontages. Especially for north Norfolk, the SMP needs to make decisions that take into account all longshore interactions. This is not possible at the level of sub-frontages. In addition, we feel that decision-making should have a basis in a spatial and integrated vision, which can then be translated to the specific policies for management.

# E2 Objectives

## E2.1 Introduction

The approach for setting objectives was agreed with the Client Steering Group (CSG) and a set of principles for the SMP policies was subsequently agreed with the Elected Members' Forum (EMF). Section E3.2 outlines the approach, while section E3.3 details the principles, used to develop the objectives. Section E3.4 contains a characterisation of the coastal zone along the frontage, with the key values from this characterisation being illustrated in a set of cross-sections. For each area, we have combined the key values and the principles to develop a set of policy appraisal criteria.

## E2.2 Approach

### E2.2.1 Introduction

This chapter sets out the approach for establishing the policy appraisal criteria, as agreed with the Client Steering Group (CSG) on 28 January 2008.

### E2.2.2 Objective-setting in the SMP guidance

The Shoreline Management Plan (SMP) guidance indicates the following process for setting objectives:

- develop objectives for each feature in the theme review
- prioritise objectives within themes - specific approach at the discretion of the CSG
- identify key policy drivers - features with associated objectives likely to have over-riding influence.

The theme review for north Norfolk has led to developing a set of objectives for all identified features. This information is used to feed into developing the objectives for policy appraisal using a method that is appropriate for this particular SMP. The SMP guidance does not present a fixed method for developing objectives, but allows the CSG to develop an appropriate approach.

### E2.2.3 Agreed approach

Based on experience with the Wash SMP2, we have developed a slightly different approach for developing policy appraisal objectives. This was presented to, and discussed with, the Client Steering Group and has led to an agreed approach appropriate to the North Norfolk SMP. The approach is to follow a logical process in four steps:

- use the outcome of earlier tasks (theme review, baseline scenarios) to develop a 'characterisation' of the shoreline
- determine a set of 'key values' based on the characterisation
- identify the 'principles' (on an appropriate geographic scale) that should govern shoreline management, based on the key values and on local and national ambitions
- combine the key values and the principles to identify the 'policy appraisal criteria'.

In general, the nature of the values, principles and criteria determines their geographic scale, so there is no pre-defined unit size. However, for practical purposes, we will use units at an appropriate geographic scale.

Typical elaboration of suggested approach

The approach of identifying key values and the associated criteria is carried out at a local level along the entire shoreline. This section sets out the typical outcomes for all four steps: characterisation, key values, principles and criteria for policy appraisal.

Characterisation

The characterisation is based on earlier tasks in stage 2 of the SMP: the theme review (summary text in section E3.4), the baseline scenarios task (which incorporates coastal processes and coastal defences) and identifying flood and erosion risks. This characterisation covers the whole area that could be affected by shoreline management, so this concerns the whole area at risk of flooding and erosion (up to the higher ridge).

Key values

Key values offer a clear definition of the key or core values that underpin the entire range of values that both communities and society attach to the north Norfolk coastal area (both coastline and hinterland). The key values provide a short account of the key assets that support the range of activities in or around the shoreline of north Norfolk that are enjoyed or used by society. Ecological values (specific habitat for example) have an inherent value, but also contribute towards tourism, commercial activity and the overall experience of visiting specific coastal areas. These key values have been developed for each unit, based on the characterisation. Typical key values will be:

- communities of people and associated range of economic activities (agriculture, tourism etc.)
- landscape
- freshwater, brackish and saline habitats
- recreation (beaches and caravan parks along eastern frontage, footpaths along the entire coastline)
- roads (the A149).

The key values have been shown in cross-sections and presented in section E3.5. Each cross-section represents a certain part of the SMP shoreline and covers the whole zone relevant to the SMP. The cross-sections provide a summary of the key values of each area of coast and make it clear how values 'sit together' and interact. The coast is a highly complex and dynamic socio-economic environment. The cross-sections intend to show an intelligent and insightful representation of the core structure of each coastal area. They are not intended to be complete, but show the main values and relationships in a specific area. The cross-sections are a stylised account so they are not to scale. The images are sometimes deliberately distorted to illustrate features and relationships rather than being spatially or topographically accurate. The cross-sections should therefore be readily understandable by different groups of people.

Principles

In the context of the SMP, principles are defined statements that provide a clear expression of position that will inform and guide the decision-making process in the SMP. For example, a possible principle could be expressed as:

- 'To maintain and enhance biodiversity' or
- 'To support social and economic well-being of communities'

These statements offer a concise account of the specific guidance that will focus the formulation of policy. Principles therefore provide an expression of the 'rules' within which appraisal criteria will be developed and policy formulated. Principles can be in competition. It is important to realise that the SMP will probably not be able to fulfil all principles, but will need to find the right balance between the principles ('balanced sustainability', as the SMP guidance calls it).

It is preferable to develop one set of principles for the whole SMP, but it is possible that different areas require different principles.

Policy appraisal criteria and indicators

The principles set the framework, but the appraisal also requires a set of more specific criteria to measure how well each policy option performs against each principle. These criteria bring together the overall principles and the more locally-defined key values. They will therefore be specific to each location, even though in practice particular criteria can be valid for more than one area. The criteria need to be accompanied by indicators, if possible quantifiable. However, the assessment of how well a policy option performs against the principles will always be based on judgement, supported by indicators and a narrative.

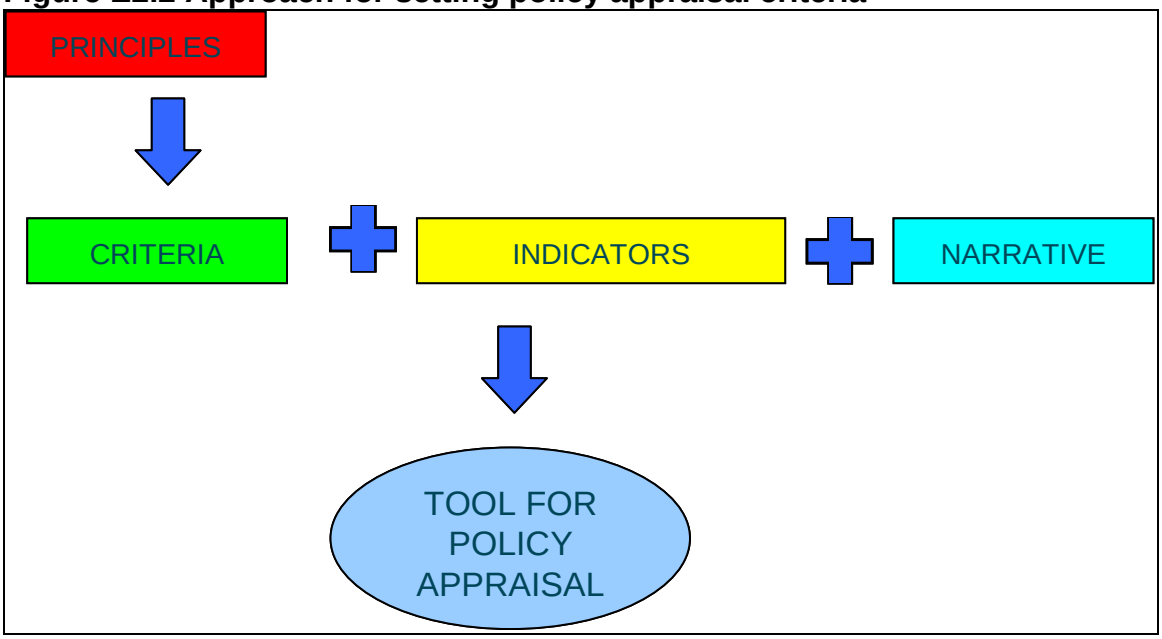
A principle such as
'To maintain and enhance biodiversity'

Would be accompanied by a criterion such as
'Extent and quality of habitat XXXX in frontage YYYY in relation to Biodiversity Action Plan targets'

Which would be supported by an indicator such as
'Area of habitat type X in each epoch'

The actual performance of the policy against the principle ('extent and quality of biodiversity') requires judgement, but this is supported by a calculated value for the indicator, combined with a narrative that puts the outcome in perspective. Figure E2.1 illustrates the approach.

**Figure E2.2 Approach for setting policy appraisal criteria**




## E2.3 Principles

The set of principles for the North Norfolk SMP was developed in a number of steps with active involvement from the CSG and EMF. It was finalised and agreed in the Elected Members' Forum of 12 March 2008:

Sustainable flood and coastal erosion risk management

1. To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations.

Interaction with coastal processes

2. To ensure that local policy decisions do not adversely affect wider natural coastal processes.

3. To work with coastal change to take account of uncertainty about the future in the timing of policies.

Community well-being

4. To consider social and economic well-being and allow communities and individuals to adapt to coastal change.
5. To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.)

Value of the area to wider society (rest of the region, UK and international)

6. To take account of the value of the North Norfolk coast area to wider society.

Interaction with land use planning

7. To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences.

Wildlife

8. To contribute to maintaining and enhancing protected sites and species, subject to natural change.
9. To support maintenance and enhancement of biodiversity in the wider coastal zone.

Landscape

10. To contribute to maintaining and enhancing the character of the coastal landscape.

Historic environment and cultural heritage

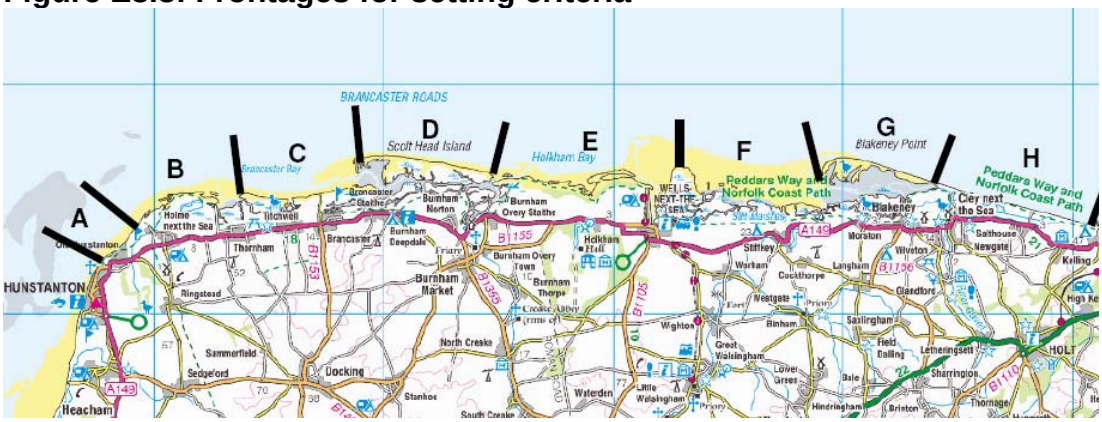
11. To have regard for the historic environment and its value for the heritage, culture and economy of the area.

## E2.4 Setting of criteria

### E2.4.1 Introduction

This section describes the characterisation and key values along the north Norfolk coastline and how they combine with the principles from section E3 to set policy appraisal criteria. This section distinguishes eight areas - see figure E3.2. As previously described, these areas are convenient for the characterisation and for setting criteria, but they are not necessarily policy units.

**Figure E3.3: Frontages for setting criteria**




Characterisation

The characterisation starts with a description of coastal processes and flood and coastal defences. It then describes land use and environment, generally from the shoreline in an inland direction.

Key value graphics

The cross-sections illustrate the key values for each of the areas. Note that the graphics do not represent specific real cross-sections. They are intended to represent the whole area from offshore up to the ridge of higher ground that borders the north Norfolk coastal zone. These graphics are also included in appendix D and in the main SMP document.

Criteria

As described in section E2.2, the policy appraisal criteria are typically linked to one or more of the principles and to one or more of the key values. Each principle may have more than one criterion, or one criterion may serve a suite of principles. Most of the criteria are supported by quantifiable measurements (for example, the length of defences is a factor in assessing the reliance on flood defences). For all criteria, a level of judgement is needed to test to what extent each SMP policy fulfils the associated principles. To make this transparent, each criterion is accompanied by indicators. Their assessment is illustrated by a narrative that will further explain the decision-making process and will inform judgement on overall policy scoring. Through this approach, the principles and criteria will be used explicitly for policy appraisal.

As many of the key values and characteristics of the north Norfolk coast are found throughout the SMP area, the general structure and content of the criteria are similar for all frontages. The first column of table E3.1 gives an overview. However, the indicators will be largely frontage-specific and relate to particular features. The second column of table E3.1 gives a generic description. This table is repeated for each frontage in this chapter, but with the indicators made specific. There are cases where particular criteria are not relevant for a frontage so this is also mentioned.

**Table E3.1 Generic criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **Proportion of hard elements relative to total defences**<br>• **Role of hard elements protecting houses and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has been applied by defining policy packages on an appropriate scale (for example super-frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Effect on neighbouring sections (judgement)** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle was tested by the sensitivity check (task 3.4) as part of appraisal. The results were incorporated into the appraisal.** | |
| | |
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Effect of shoreline management on the economic viability of communities through its effect on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features**<br>• **Impact on fisheries**<br>• **Impact on area and grade of agricultural land** |
| **Effect of shoreline management on the social viability of communities through its effect on public services and infrastructure.** | • **Type and number of services affected**<br>• **Impact on A149 and local roads**<br>• **Impact on river drainage**<br>• **Type and number of utilities affected** |
| **Adequacy of time available for communities and individuals to adapt.** | • **Time (in epochs) available for each required process of adaptation** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Effect on socio-economic features of regional, national or international significance.** | • **Impact as a percentage of regional / national / international availability** |
| | |
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Changes needed during epoch 1** |
| | |
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Effect of shoreline management on achieving management objectives for international, national and locally-important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | • **Area of designated land lost/gained for each epoch and scenario**<br>• **Changes in condition of designated land for each epoch and scenario** |
| | |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Effect of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets within designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Effect of shoreline management on the dynamic character of the coastal landscape, including considering geological, geomorphological, historic environment and cultural features and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To have regard for the historic environment and its value for the heritage, culture and economy of the area. | |
| **Effect on historic environment and its wider value.** | • **Type and number of scheduled monuments affected**<br>• **Listed buildings affected**<br>• **Registered parks and gardens** |

### E2.4.2 Frontage A - Old Hunstanton

**Characterisation**

Coastal processes and flood defences

This frontage is characterised by successive lines of shingle and sand ridges, running in a south west to north east direction, ranging from the oldest dune ridges at the landward edge to the newest dunes at the seaward edge. The oldest dune ridges form the Old Hunstanton golf course, while the newest dunes are generally protected by gabion basket groynes. To the south west of the frontage are the Old Hunstanton cliffs (themselves part of the neighbouring Wash SMP) which gradually diminish in a north-easterly direction up to the beginning of this frontage, where they are no longer visible. At low water there is a large width of sandy beach exposed (about 500 metres) and at high water this beach is covered again up to the seaward end of the groynes. Offshore there is a large sand bank, made up of Sunk Sand and Silver Sand, which is about 3.5 kilometres from the shoreline. The bank is usually uncovered at low water.

The area between Hunstanton cliffs and the golf course is typically low-lying and fronted by dunes. The golf course lies within the tidal flood zone and currently has natural sand dunes with gabion basket protection at the toe of the dunes as flood defence. Old Hunstanton is defended from erosion by a number of gabion groynes.

Land use and environment

Coastal strip

Properties in Old Hunstanton are mainly sandwiched between the A149 to the south and the golf course to the north east. Some of these are within the tidal flood zone as is the golf course and some arable land. A network of minor roads runs through Old Hunstanton. The A149 is the only major road and enters the tidal flood zone outside Old Hunstanton. The Peddars Way and Norfolk coast path (a long distance coastal footpath) runs along the coast at Old Hunstanton before turning inland around the golf course.

The area forms part of the North Norfolk Coast Special Area of Conservation (SAC), the North Norfolk Coast Ramsar site, the North Norfolk Coast Special Protection Area (SPA) and the Wash Special Protection Area (SPA)[1]. As all Natura 2000 (SPA and SAC) sites are also underpinned by the SSSI designation, this national legislation also applies to the area. European Annex I priority habitats[2] found along this length of coastline are coastal lagoons and fixed dunes with herbaceous vegetation ('grey' dunes).

Hinterland

Outside the tidal flood zone are areas of Old Hunstanton and Hunstanton Park. Inland of this, Ringstead and Holme-next-the-Sea are major aggregations of properties. Infrastructure in the hinterland consists of a couple of minor roads leading to Ringstead. The tidal flood zone crosses the A149 near Hunstanton Park, although most of Old Hunstanton is outside the tidal flood zone as it is on higher ground.

The landscape of the unit is characterised by arable agriculture, parkland and areas of woodland. Within the parkland is Hunstanton Park Esker SSSI (geological). Hunstanton Park esker is a good example of a glacio-fluvial landform that is relatively uncommon in central and southern England and is the only one of Devensian age in the area. Hunstanton Hall is a grade II registered park and garden. There are some listed buildings in Old Hunstanton.

Sea level rise will increase the area of the tidal flood zone. However, for this frontage the increase in area is small and contains few features (mainly Hunstanton Park).

The key values are visualised in section E3.5.

## Indicators

The SMP will need to select the policies that provide the best balance between the key values for each stretch of the shoreline, taking account of the established principles. The indicators have been set up to reflect the values and the principles. For this area, the SMP will need to find the right balance between the following potentially competing factors:

[1] Special Protection Areas (SPA) are designated under European Council Directive 79/409/EEC on the Conservation of Wild Birds ("Birds Directive"), Special Areas of Conservation (SAC) under Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora ("Habitats Directive") and Ramsar sites under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention).

[2] Certain Annex I habitats are defined as being 'priority' because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union (Article 1d). The importance of these priority habitat types is emphasised at several places in the Directive (Articles 4 and 5 and Annex III), not only in terms of the selection of sites, but also in the measures required for site protection (Article 6) and surveillance (Article 11).

- communities and infrastructure: Old Hunstanton coastal community and the A149
- species and habitats, including designations: the Wash Ramsar site, SPA and SSSI; North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC (all seaward of the dunes)
- tourism and amenity features and public access to and along the coast, including the national trail, the beach and the golf course
- landscape features, including the AONB designation (foreshore, dunes and land)
- the need for flood and erosion risk management.

In addition, other factors including transport routes, historic environment features, drainage and agriculture have to be taken into account.

The criteria and indicators for frontage A are provided in table E3.2.

**Table E3.2 Frontage A criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **Proportion of hard defences relative to the dunes in the defence function of Hunstanton dunes**<br>• **Role of hard defences in protecting houses in Old Hunstanton and Holme-next-the-Sea and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 150 in and around Old Hunstanton and Holme-next-the-Sea)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages at an appropriate scale (for example super-frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Effect on Holme dunes and beyond**<br>• **Effect on Hunstanton cliffs and beyond** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle was tested by the sensitivity check (task 3.4) as part of appraisal. This has fed into fine-tuning the final set of policies.** | |
| | |
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Effect of shoreline management on the economic viability of communities through its effect on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on grade 3 agricultural land**<br>• **Impact on golf course and beach, including beach huts** |
| **Effect of shoreline management on the social viability of communities through its effect on public services and infrastructure.** | • **No services affected**<br>• **No utilities affected**<br>• **Impact on A149 and local roads**<br>• **Impact on drainage function of River Hun** |
| **Adequacy of time available for communities and individuals to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Effect on socio-economic features of regional, national or international significance.** | • **No relevant features** |
| | |
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Changes needed during epoch 1** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To contribute to maintaining and enhancing protected sites and species, subject to natural change | |
| **Effect of shoreline management on achieving management objectives for international, national and locally-important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **Protected sites and species (Ramsar site, SPA, SSSI, SAC) are all seaward of the dunes:**<br>• **area of designated land lost/gained for each epoch and scenario**<br>• **changes in condition of designated land for each epoch and scenario** |
| | |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Effect of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets within designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Effect of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historic environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |
| To have regard to the historic environment and its value for the heritage, culture and economy of the area. | |
| **Effect on historic environment and its wider value.** | • **Hunstanton Hall grade II registered park and garden**<br>• **Listed buildings in Old Hunstanton**<br>• **No scheduled monuments** |

### E2.4.3 Frontage B – Holme-next-the-Sea and Thornham

#### Characterisation

Coastal processes and flood defences

The extensive (around 250 hectares) saltmarshes in the area of Thornham are separated from the reclaimed Holme marshes by an embankment along the Thornham harbour channel. The tidal discharge from the harbour channel (not constrained by training walls) has resulted in a large tidal delta whose ramparts form a dune ridge that encloses the Thornham marshes (to the east of the frontage) and the Holme dunes (to the west). The Peddars Way and Norfolk coast path follows the coast along part of this frontage to Thornham where it turns inland.

This tidal delta forms Gore Point, which acts as a barrier island (similar to Scolt Head Island) albeit more closely attached to the shore. There is a smaller tidal inlet at the western side of Gore Point that cuts through the dune ridge, forming a slight discontinuity in the dunes. This small inlet tends to hold the western end of Gore Point slightly seaward. Although still within the overall low-lying area of the River Hun, there appears to be a slight ridge of higher ground running north from Holme. Only at the eastern end is the barrier of dunes recurved, forming a degree of shelter to the embankment and fixed outfall of the River Hun. The River Hun discharges into the saltmarsh along this frontage through a tidal outfall sluice on the eastern side of Gore Point.

The land seaward of Holme and towards Thornham lies in the tidal flood zone, with various flood defences throughout the unit. Many of the defences around Holme are natural and include vegetated sand dunes and dunes separated by marshland. Around the sluice outfalls the defences tend to be man-made vegetated earth flood banks. Areas of this frontage were inundated during the flood event of 1953.

Land use and environment

Coastal strip

The settlements in this unit typically avoid the tidal flood zone, which skims around Holme-next-the-Sea and Thornham. This unit is mainly rural in character and has little development. The only infrastructure is a handful of minor roads around the settlements.

Land in this unit is largely agricultural (mostly grade 3 land in the tidal flood zone, grade 2 land around the edge of the tidal flood zone), with a small area being dedicated to orchards. There is saltmarsh and sand dunes along the shoreline. These form part of Holme Dunes NNR, a well-preserved amenity area with a small amount of shingle and backed by marram grass-covered dunes. Other European or national habitats in this area include sandflats,

sand dunes, dune grassland, saltmarsh, reedbed and grazing marsh. There is also a saline lagoon, but this is less saline than others in the SMP area, being about 10 parts in 10,000.

The area is designated a Ramsar site (North Norfolk Ramsar), SPA (North Norfolk Coast SPA) and SAC (North Norfolk Coast SAC and the Wash and North Norfolk Coast SAC), with these designations all underpinned by SSSI designation (North Norfolk Coast SSSI). United Kingdom Biodiversity Action Plan (UKBAP) habitats known to be present include mudflat, saltmarsh, coastal sand dunes, lowland dry acid grassland, coastal and flood plain grazing marsh and purple moor grass and rush pasture. There are also coastal lagoons and fixed dunes with herbaceous vegetation ('grey' dunes), which are European priority Annex I habitats in this area.

Hinterland

The area inland and just outside the tidal flood zone contains the settlements of Holme-next-the-Sea and Thornham, but otherwise there are almost no properties. The only infrastructure is the A149 and a couple of minor roads. An area of the A149 just outside Holme is at risk of flooding, but the campsite and main amenities are outside the tidal flood zone.

Land use is almost entirely arable with small areas of woodland and a Roman signal station, a historic environment feature. Other heritage assets include bronze age peat beds on the foreshore and World War two heritage inland. The land is typically flat with a peak of 50 metres around Beacon Hill. Sea level rise will increase the area of the tidal flood zone, with this being particularly relevant for Holme-next- the-Sea and Thornham. At present, only a small part of these settlements is in the tidal flood zone (and protected by flood defences), but with sea level rise the area at risk may extend significantly.

The key values are visualised in section E3.5.

**Indicators**

For this area, the SMP will need to find the right balance between the following potentially competing factors:

- communities and infrastructure: Holme-next-the-Sea coastal community
- species and habitats, including designations: Holme Dunes NNR, North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC
- tourism and amenity features and public access to and along the coast, including the national trail, the NNR visitor centre and car park
- landscape features, including the AONB designation
- the need for flood and erosion risk management.

In addition, other factors including transport routes, agriculture and cultural heritage have to be taken into account.

The criteria and indicators for frontage B are provided in table E3.3.

**Table E3.3 Frontage B criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **The defence function of Holme dunes**<br>• **Role of hard defences in protecting houses (in Holme and Thornham) and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 150 in and around Old Hunstanton and Holme plus about 50 in and around Thornham)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages at an appropriate scale (for example super- frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Impact on Old Hunstanton dunes and beyond**<br>• **Impact on Brancaster bay and beyond** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle has been tested by the sensitivity check (task 3.4) as part of appraisal. The results have fed into fine-tuning the final set of policies.** | |
| | |

| Criterion | Indicator(s) |
|---|---|
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Effect of shoreline management on the economic viability of communities through its impact on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features: Peddars Way and Norfolk coast path**<br>• **Impact on fisheries**<br>• **Impact on grade 3 and 4 land in the tidal flood zone and grade 2 land around the edge of the tidal flood zone plus small area of orchards** |
| **Effect of shoreline management on the social viability of communities through its impact on public services and infrastructure.** | • **No services affected**<br>• **No utilities affected**<br>• **Impact on A149 and local roads** |

| | |
|---|---|
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for adaptation for communities and individuals.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Impact on socio-economic features of regional, national or international significance.** | • **No relevant features** |
| | |
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for adaptation for planning system.** | • **Time (in epochs) available for each process of adaptation required** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Impact of shoreline management on achieving management objectives for international, national and locally-important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **For each of the designations (Holme Dunes NNR, North Norfolk Coast Ramsar site, SAC, SPA and SSSI, the Wash and North Norfolk SAC):**<br>• **Area of designated land lost/ gained for each epoch and scenario**<br>• **Changes in condition of designated land for each epoch and scenario**<br>• **Impact on saline lagoons and grey dunes (priority habitats)** |
| | |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Impact of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets, within both designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario (BAP habitats present are mudflat, saltmarsh, coastal sand dunes, lowland dry acid grassland, coastal and flood plain grazing marsh and purple moor grass, rush pasture and saline lagoons)** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Impact of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historic environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |
| To have regard to the historic environment and its value for the heritage, culture and economy of the area. | |
| **Impact on historic environment and its wider value.** | • **Roman signal station (SM)**<br>**Listed buildings in Holme-next-the-Sea and Thornham** |
| | |

### E2.4.4 Frontage C - Titchwell and Brancaster

**Characterisation**

Coastal processes and flood defences

This frontage is split into two by a vegetated earth flood bank that runs north to south and starts to the west of Brancaster village. This bank separates the Titchwell RSPB reserve from Brancaster marsh and the Royal West Norfolk golf course. In general, the physical characteristics of both sections of this frontage are similar, with a line of sand dunes at the seaward edge, backed by saltmarsh (more than one kilometre wide) and the villages of Titchwell and Brancaster at the landward edge.

Brancaster bay itself has a number of spit-like features at its western and eastern ends, potentially indicating a divergence of transport paths along the beach. The land along this frontage is low-lying and areas around Titchwell lie in the tidal flood zone. There are various man-made vegetated earth flood banks in this unit, focused around the settlements. Areas of this frontage were flooded in 1953.

Land use and environment

Coastal strip

This unit is one of the more populated parts of the SMP area with a number of small settlements in the tidal flood zone, including Titchwell, parts of Brancaster and the outskirts of Brancaster Staithe. Also at risk of flooding are the network of minor roads that serve these settlements, along with sections of the A149.

Brancaster harbour provides recreational and amenity value, while contributing to the local and regional economy. The car park at the beach at Brancaster is outside the tidal flood zone. The road connecting the beach to the A149 is in the tidal flood zone. This could restrict access to the beach during flood events.

Seaward of the A149 there is a small amount of arable land, although most of the land is saltmarsh and dunes. Amenity benefits in the nature reserve and the conservation value are high. North of Brancaster there is a golf course next to the beach that provides further amenity value. The Peddars Way and Norfolk coast path runs along the coast and behind the golf course in this area.

The area is designated a Ramsar site (North Norfolk Ramsar), SPA (North Norfolk Coast SPA) and SAC (North Norfolk Coast SAC and the Wash and North Norfolk Coast SAC), with these designations all being underpinned by SSSI designation (North Norfolk Coast SSSI). UKBAP habitats include mudflat, saltmarsh, coastal sand dunes, lowland dry acid grassland and

coastal and flood plain grazing marsh. Fixed dunes with herbaceous vegetation ('grey' dunes) are an Annex I priority European habitat.

Mow Creek (north of Brancaster) is an important route for recreational boating traffic as it provides access to waterside properties. The Roman fort at Brancaster Staithe is a scheduled monument. Wildfowling is a popular activity along this frontage, especially around Brancaster, where gun clubs shoot on common rights land. This contributes to the local economy. The economy along the shoreline is also particularly important in this area, with trades such as reed-cutting, bait-digging and mussel and oyster farming being practised.

Hinterland

The only settlements along this frontage are Titchwell, Brancaster and Brancaster Staithe. A couple of isolated properties are dotted around the hinterland, including Brancaster Hall, and these are all connected with a network of minor roads. The B1153 runs from Brancaster down to Docking and passes through this area. Land use is mainly arable agriculture with little conservation value. There are several scattered areas of woodland, but no important historic environment features.

The increase in the area of tidal flood zone due to future sea level rise is limited in this area, but could include some properties in Brancaster (which are currently behind flood defences). The key values are visualised in section E3.5. For this area, there are two separate cross-sections, one from Titchwell to Brancaster and the other from Brancaster to Brancaster Staithe.

**Indicators**

For this area, the SMP will need to find the right balance between the following potentially competing factors:

- communities and infrastructure: communities of Thornham, Titchwell, Brancaster and Brancaster Staithe
- species and habitats, including designations: North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC
- tourism and amenity features and public access to and along the coast, including the RSPB reserve, long distance footpath, Brancaster harbour, Branodunum Roman fort, golf club, beach and car park and boating
- landscape features, including AONB designation
- the need for flood and erosion risk management.

In addition, other factors including transport routes and cultural heritage have to be taken into account.

The criteria and indicators for frontage C are provided in table E3.3.

**Table E3.4 Frontage C criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **The defence function of the dunes and saltmarshes**<br>• **Role of hard defences in protecting Royal West Norfolk golf club, the RSPB reserve at Titchwell and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 10)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages on an appropriate scale (for example super- frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Impact on Holme dunes and Thornham sea bank**<br>• **Impact on Scolt Head Island and beyond** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle has been tested by the sensitivity check (task 3.4) as part of appraisal. The results have fed into fine-tuning the final set of policies.** | |
| | |

| Criterion | Indicator(s) |
|---|---|
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Impact of shoreline management on the economic viability of communities through its impact on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features, including Royal West Norfolk golf club, Titchwell RSPB reserve, Peddars Way and Norfolk coast path, car park and beach at Royal West Norfolk golf club, Brancaster harbour**<br>• **Impact on fisheries**<br>• **No agricultural land affected** |
| **Impact of shoreline management on the social viability of communities through its impact on public services and infrastructure.** | • **No services affected**<br>• **No utilities affected**<br>• **Impact on A149 and local roads** |

| | |
|---|---|
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Impact on socio-economic features of regional, national or international significance.** | • **Royal North West Norfolk golf course**<br>• **RSPB reserve at Titchwell** |
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Impact of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **For each of the designations (North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC):**<br>• **area of designated land lost/ gained for each epoch and scenario**<br>• **changes in condition of designated land for each epoch and scenario.** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Impact of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets, within both designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario. (BAP habitats present are mudflat, saltmarsh, coastal sand dunes, lowland dry acid grassland and coastal and flood plain grazing marsh)** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Impact of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |
| To have regard to the historic environment and its value for the heritage, culture and economy of the area. | |
| **Impact on historic environment and its wider value.** | • **Roman fort at Brancaster Staithe (SM)**<br>• **Listed buildings in Brancaster Staithe** |
| | |

## E2.4.5 Frontage D - Scolt Head Island

### Characterisation

Coastal processes and flood defences

Scolt Head Island is around 6.5 kilometres long and is irregular in shape. It consists of a main shingle beach with dunes running parallel to the incident wave crests. The island is separated from the mainland by Norton Creek, which runs through extensive marsh areas. Both the western and eastern extents of Scolt Head are marked by tidal deltas. To the west the tidal delta is formed by the combined tidal discharge from Norton Creek and Brancaster marsh. To the east it is formed by the discharge from the Burnham harbour channel.

Near Burnham Norton there is a section of reclaimed marsh that extends into the Scolt Head Island National Nature Reserve (NNR). This is separated from the natural marsh by a well-vegetated earth flood bank. The River Burn discharges onto the saltmarsh to the east of Burnham Norton through a tidal outfall.

The land in this frontage is low-lying, with large areas in the tidal flood zone. There are coastal defence structures along the whole frontage. In this area the flood defences are typically man-made vegetated earth flood banks, with the exception of a couple of man-made seawalls in Burnham Overy Staithe. Areas of this frontage were flooded in 1953.

Land use and environment

Coastal strip

Up to the outfall of the River Burn at Burnham Norton the tidal flood zone includes settlements at Brancaster Staithe, Burnham Deepdale, areas of Burnham Norton and Burnham Overy Staithe. Minor roads, as well as sections of the A149 between Burnham Norton and Burnham Market, would be affected by flooding.

There is some arable land in this frontage, but most of the land is included in the Scolt Head Island NNR. This provides a large area of land useful for its conservation, recreation and amenity value. The NNR is composed of large areas of saltmarsh, sand dunes and mudflats with a number of creeks and drains feeding through.

Burnham harbour is popular with recreational boaters and local fishermen and is beneficial both from an amenity and economic standpoint. The larger creeks are also used by recreational boating traffic and fishermen for access to Brancaster harbour. The coastal economy is particularly important along this frontage, with trades such as reed-cutting, bait-digging and mussel and oyster farming being practised, while wildfowling is also a popular activity. The Peddars Way and Norfolk coast path provides access through the saltmarsh area, while the River Burn feeds into the creek system around Overy marsh, which flows in from the south east.

The area is designated a Ramsar site (North Norfolk Ramsar), SPA (North Norfolk Coast SPA) and SAC (North Norfolk Coast SAC and the Wash and North Norfolk Coast SAC), with these designations being underpinned by SSSI designation (North Norfolk Coast SSSI). UKBAP habitats include mudflat, saltmarsh, coastal sand dunes, lowland dry acid grassland, reedbed, coastal and flood plain grazing marsh, lowland meadow and purple moor grass and rush pasture. There are fixed dunes with herbaceous vegetation (‘grey’ dunes) along this frontage, an Annex I priority European habitat.

Hinterland

The River Burn runs through this area and flows to the east of Burnham Market. Outside the SMP study area, the fluvial flood zone of the River Burn includes areas of Burnham Market and Burnham Overy town. The land level increases to around 40 metres near Burnham Market, while the area to the west of Burnham Market is outside the fluvial flood zone.

Burnham Market is the only major settlement, with smaller settlements including Burnham Overy town, Burnham Thorpe and isolated farm properties. There are a number of roads across the area leading towards Burnham Market, including the B1155 and B1355, and minor roads that connect the outlying properties and coastal villages. Land use in this area is mainly arable agriculture. There are some historic features in this frontage, including church remains at Burnham Market, the remains of a friary and a non-Roman mound.

The increase in the area of tidal flood zone due to projected future sea level rise is limited here and will only affect land currently behind flood defences. The increased area could include some properties in the settlements along the A149 and the A149 itself in some places.

The key values are visualised in section E3.5.

**Indicators**

For this area, the SMP will need to find the right balance between the following potentially competing factors:

- communities and infrastructure: coastal communities of Burnham Deepdale, Burnham Norton and Burnham Overy Staithe
- species and habitats, including designations: Scolt Head Island National Nature Reserve, North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC
- tourism and amenity features and public access to and along the coast, including the national trail, sailing at Overy Creek and bird watching
- landscape features, including the AONB designation
- the need for flood and erosion risk management.

Also, other factors including transport routes, drainage, agriculture and the historic environment have to be taken into account.

The criteria and indicators for frontage D are provided in table E3.5.

**Table E3.5 Frontage D criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **The defence function of saltmarshes and Scolt Head Island**<br>• **Role of hard defences in protecting houses in Brancaster, Brancaster Staithe and Burnham Norton, the River Burn valley and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 200 in total)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages on an appropriate scale (for example super- frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Impact on Brancaster bay and beyond**<br>• **Impact on Holkham dunes, the Wells frontage and beyond** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle has been tested by the sensitivity check (task 3.4) as part of appraisal. The results have fed into fine-tuning the final set of policies.** | |
| | |

| Criterion | Indicator(s) |
|---|---|
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Impact of shoreline management on the economic viability of communities through its impact on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features: sailing at Overy Creek, bird watching, Peddars Way and Norfolk coast path**<br>• **Impact on fisheries**<br>• **Impact on grade 4 agricultural land in Deepdale and Norton marsh and River Burn valley** |
| **Impact of shoreline management on the social viability of communities through its impact on public services and infrastructure.** | • **No services affected**<br>• **No utilities affected**<br>• **Impact on A149 and local roads**<br>• **Impact on drainage of River Burn** |

| | |
|---|---|
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Impact on socio-economic features of regional, national or international significance.** | • **No relevant features** |
| | |
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Impact of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **For each of the designations (Scolt Head Island National Nature Reserve, North Norfolk Coast Ramsar site, SAC, SPA and SSSI, the Wash and North Norfolk SAC):**<br>• **area of designated land lost/ gained for each epoch and scenario**<br>• **changes in condition of designated land for each epoch and scenario** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Impact of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets, within both designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario. (BAP habitats are mudflat, saltmarsh, coastal sand dunes, lowland dry acid grassland, reedbed, coastal and flood plain grazing marsh, lowland meadow and purple moor grass and rush pasture)** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Impact of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historic environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |
| To have regard to the historic environment and its value for the heritage, culture and economy of the area. | |
| **Impact on historic environment and its wider value.** | • **Listed buildings in Burnham Deepdale** |
| | |

## E2.4.6 Frontage E - Holkham bay

### Characterisation

Coastal processes and flood defences

The frontage between Burnham and Wells-next-the-Sea is characterised by an extensive area of reclaimed saltmarsh fronted by planted dunes and a wide beach. Reclamation began around 1660 and continued until 1860, by which time 800 hectares of former saltmarsh had been enclosed. The line of sand dunes (Holkham Meals / Meols) at the seaward edge of the reclaimed area was planted with conifers along most of its length between 1853 and 1891. Before reclamation, it has been suggested that this frontage would have resembled that of Scolt Head Island, with the present day Holkham Meals being sand islands or offshore bars.

Lodge marsh (located in area F) forms the ramparts of the Wells harbour tidal delta, which is the largest of five deltas along the north Norfolk coast. This tidal delta forms the extensive sand waves and sand flats apparent between Lodge marsh and Holkham Gap. The land in this frontage is low-lying. In the tidal flood zone there are several natural sand dunes that act as flood defence structures, along with a number of man-made defences in the form of raised tracks, embankments and walls. In Wells there are two clay embankments that form a flood defence and are partially enforced with concrete revetment blocks. Areas of this frontage were flooded in 1953 and 1978.

Land use and environment

Coastal strip

The area in the tidal flood zone includes the settlements of Burnham Overy Staithe, Holkham and Wells-next-the-Sea. There is a flood embankment that runs along the harbour from Wells to the coast, although the south west of Wells is in the tidal flood zone. Parts of the A149 run through the tidal flood zone around Holkham and there are a few minor roads towards Wells that are also under threat of flooding. Outside Wells, in the north-east of the area, is a campsite with beach access and associated facilities providing amenity value.

Land in this unit is partly agricultural (grade 3 land in the tidal flood zone), while large parts are set aside for nature conservation. The pinewoods and scrub of Holkham Meals form part of Holkham NNR, which also contains saltmarsh and sand dunes. The beach at Wells-next-the-Sea is designated under the EU bathing waters directive which is important for the local and regional economy. There is an iron age fort in this frontage - a valuable tourist attraction and scheduled monument. Footpaths and car parks are situated throughout the area, allowing public access to both the beach and the NNR.
The area is a designated Ramsar site (North Norfolk Ramsar), SPA (North Norfolk Coast SPA) and SAC (North Norfolk Coast SAC and the Wash and North Norfolk Coast SAC), which is also underpinned by SSSI designation

(North Norfolk Coast SSSI). UKBAP habitat types include mudflat, saline lagoons, coastal sand dunes, lowland dry acid grassland, reedbed, saltmarsh, coastal and flood plain grazing marsh, lowland meadow and purple moor grass and rush pasture. European Annex I priority habitats in this frontage are coastal lagoons and fixed dunes with herbaceous vegetation ('grey' dunes).

Hinterland

Generally the area inland of the A149 is outside the tidal flood zone, but areas close to the River Burn and the lake at Holkham Hall are in the fluvial/tidal flood zone. Settlements in the hinterland include Burnham Thorpe, Holkham Hall, New Holkham and parts of Wells-next-the-Sea. Holkham Hall covers a large area of land with woodland, a lake and grassland and a deer park.

Infrastructure in this frontage includes roads connecting the villages and those leading towards Fakenham. The more significant roads include the B1155, B1105 and the B1355. Land use in the area is mainly arable agriculture with areas of woodland including several orchards. The area has several historic environment features including abbey remains, Roman barrows, a temple and the site of Nelson's birthplace. The increase in the area of tidal flood zone due to future sea level rise is limited in this area and will only affect land behind flood defences.

The key values are visualised in section E5.

**Indicators**

For this area, the SMP will need to find the right balance between the following potentially competing factors:

- communities and infrastructure: Holkham and Wells-next-the-Sea coastal communities, Wells-next-the-Sea fishing port and coastguard and RNLI stations
- species and habitats, including designations: Holkham National Nature Reserve, North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC
- tourism and amenity features and public access to and along the coast, including the national trail, Wells caravan park, campsite and iron age fort
- landscape features, including the AONB designation
- the need for flood and erosion risk management.

Also, other factors including transport routes, agriculture and cultural heritage have to be taken into account.

The criteria and indicators for frontage E are provided in table E3.6.

**Table E3.6 Frontage E criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **Defence function of Holkham dunes**<br>• **Role of hard defences in protecting houses in Wells-next-the-Sea and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 470 in total)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages on an appropriate scale (for example super- frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Impact on Scolt Head Island and beyond**<br>• **Impact on Stiffkey marshes and beyond** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle has been tested by the sensitivity check (task 3.4) as part of appraisal. The results have fed into fine-tuning the final set of policies.** | |
| | |

| Criterion | Indicator(s) |
|---|---|
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Effect of shoreline management on the economic viability of communities through its impact on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features: (Wells caravan park and campsite, Wells beach, iron age fort, Holkham dunes and car park, Wells pitch and putt golf course, Peddars Way and Norfolk coast path)**<br>• **Impact on fisheries from Wells-next-the-Sea**<br>• **Impact on grade 3 agricultural land throughout the area behind Holkham dunes** |
| **Effect of shoreline management on the social viability of communities through its impact on public services and infrastructure.** | • **Impact on A149 and local roads**<br>• **Impact on drainage of River Burn**<br>• **Coastguard look-out and RNLI station at northern end of Wells flood bank**<br>• **Sewage treatment works at Wells-next-the-Sea** |
| **Adequacy of time available for adaptation for communities and individuals.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Impact on socio-economic features of regional, national or international significance.** | • **Holkham/Wells beach** |
| | |
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Impact of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **For each of the designations (Holkham National Nature Reserve, North Norfolk Coast Ramsar site, SAC, SPA and SSSI, the Wash and North Norfolk SAC):**<br>• **area of designated land lost/ gained for each epoch and scenario**<br>• **changes in condition of designated land for each epoch and scenario** |
| | |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Impact of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets within both designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario. (BAP habitats are mudflat, saline lagoons, coastal sand dunes, lowland dry acid grassland, reedbed, saltmarsh, coastal and flood plain grazing marsh, lowland meadow and purple moor grass and rush pasture)** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Impact of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historic environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To have regard to the historic environment and its value for the heritage, culture and economy of the area. | |
| **Impact on historic environment and its wider value.** | • **Iron age fort behind Holkham dunes (SM)**<br>• **Roman barrow near Leath House (SM)**<br>• **Listed buildings in Burnham Overy Staithe, Holkham, Wells-next-the-Sea and the River Burn valley**<br>• **Holkham Hall registered park and garden** |
| | |

## E2.4.7 Frontage F - Stiffkey and Warham marshes

### Characterisation

Coastal processes and flood defences

This frontage is a typical open coast frontage dominated by a large dissipative sand beach that naturally becomes saltmarsh and then higher ground behind. The marshes (Stiffkey and Warham) make up one of the most extensive and important intertidal marsh areas in the country. One of their most important attributes is that they merge with the rising ground along the Stiffkey and Warham Greens and form a transitional habitat that has been lost to reclamation elsewhere. The marshes are generally protected from severe wave action by the large beach, which has a shallow slope. At the western edge is Lodge marsh, which was formerly reclaimed but has now largely been restored to saltmarsh.

The shape of the eastern edge of this frontage is dominated by the outfall of the River Stiffkey, which is currently managed with a tidal outfall. This outfall protects the River Stiffkey and the surrounding areas from tidal flooding during extreme events. After flowing out onto the saltmarsh, the River Stiffkey has its confluence with the River Glaven in Blakeney harbour channel before flowing out to sea around the distal end of the spit. There is therefore a clear and important interaction between this frontage and frontage G. Areas of this frontage were flooded in 1953 and 1978.

Land use and environment

Coastal strip

In this area the land within the tidal flood zone is fairly sheltered so there are few man-made flood defences. The tidal flood zone includes Stiffkey and sections of the A149, while the River Stiffkey fluvial/tidal flood zone extends towards Morston.

Land in the coastal reach is split between arable agricultural land close to the A149 and saltmarsh and sand dunes towards the coast, with the coastal land being of high conservation value. The Peddars Way and Norfolk coast path effectively marks the line between arable land and marsh.

The area is designated a Ramsar site (North Norfolk Ramsar), SPA (North Norfolk Coast SPA) and SAC (North Norfolk Coast SAC and the Wash and North Norfolk Coast SAC). These are all underpinned by SSSI designation (North Norfolk Coast SSSI). UKBAP habitat types include mudflat, coastal sand dunes, lowland dry acid grassland, saltmarsh, coastal and flood plain grazing marsh and lowland meadow. The only European Annex I priority habitat in this frontage is fixed dunes with herbaceous vegetation (‘grey’ dunes).

Hinterland

Some of the area in the hinterland is within the River Stiffkey fluvial flood zone, particularly around the River Stiffkey waterfront.

There are a number of smaller settlements in this frontage including Warham, Wighton, Great Walsingham, Little Walsingham, Hindringham, Binham and Cockthorpe, with a network of minor roads connecting them. Other infrastructure includes the Wells and Walsingham light railway which runs from Wells to Great Walsingham.

Land use in this area is dominated by arable agriculture with occasional areas of woodland and two orchards around Warham. There are three SSSIs in this area namely Cockthorpe Common, Stiffkey Valley and Wells Chalk Pit. The River Stiffkey also runs through this area, discharging onto the Stiffkey saltmarsh. There are a couple of sites of historic interest in this frontage including a fort at Warham, a medieval settlement and a bowl barrow. Also, the tumulus on Warborough Hill is a scheduled monument.

The potential increase in the extent of the tidal flood zone arising from projected sea level rise is limited within this frontage.

The key values are visualised in section E5.

**Indicators**

For this area, the SMP will need to find the right balance between the following potentially competing factors:

- communities and infrastructure: Stiffkey coastal community and commercial fishing activity
- species and habitats, including designations: North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC
- tourism and amenity features and public access to and along the coast, including the national trail, bird watching
- landscape features, including the AONB designation
- the need for flood and erosion risk management.

Also, other factors including transport routes, agriculture, drainage and cultural heritage have to be taken into account.

The criteria and indicators for frontage F are provided in table E3.7.

**Table E3.7 Frontage F criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **Defence function of Stiffkey marshes**<br>• **Role of hard defences in protecting river valleys (Stiffkey and east of Wells) and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 200)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages on an appropriate scale (for example super- frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Impact on the Wells frontage, Holkham dunes and beyond**<br>• **Impact on Blakeney Spit and beyond** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle has been tested by the sensitivity check (task 3.4) as part of appraisal. The results fed into fine-tuning the final set of policies.** | |
| | |

| Criterion | Indicator(s) |
|---|---|
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Effect of shoreline management on the economic viability of communities through its impact on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features: bird watching, Peddar's Way and Norfolk coast path**<br>• **Impact on fisheries**<br>• **Impact on grade 3 agricultural land behind Wells east bank and grade 4 land on edge of higher ground and Stiffkey valley** |
| **Effect of shoreline management on the social viability of communities through its impact on public services and infrastructure.** | • **No services affected**<br>• **No utilities affected**<br>• **Impact on A149 and local roads**<br>• **Impact on drainage of the River Stiffkey** |

| | |
|---|---|
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for communities and individuals to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Impact on socio-economic features of regional, national or international significance.** | • **No relevant features** |
| | |
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Impact of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **For each of the designations (North Norfolk Coast Ramsar site, SAC, SPA and SSSI, the Wash and North Norfolk SAC):**<br>• **area of designated land lost/ gained for each epoch and scenario**<br>• **changes in condition of designated land for each epoch and scenario** |
| | |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Impact of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets both within designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario. (BAP habitats present are mudflat, coastal sand dunes, lowland dry acid grassland, saltmarsh, coastal and flood plain grazing marsh and lowland meadow)** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Impact of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historic environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To have regard for the historic environment and its value for the heritage, culture and economy of the area. | |
| **Impact on historic environment and its wider value.** | • **Listed buildings in the Stiffkey valley**<br>• **Stiffkey Old Hall registered park and garden**<br>• **Tumulus on Warborough Hill (SM)**<br>• **Bowl barrow near Fiddler's Hill (SM)**<br>• **Warham camp fort (SM)**<br>• **Medieval settlement near Grove Farm (SM)**<br>• **Hales Manor moated site (SM)** |
| | |

## E2.4.8 Frontage G - Blakeney Spit

### Characterisation

Coastal processes and flood defences

The general orientation of Blakeney Point is in a west north-westerly direction, with the geomorphologically active section of the spit being largely contained within this frontage (a small part of the active section continues into frontage H). The spit itself consists of a number of recurved features that indicate the former extent of the spit. These are the Marrams, the Hood and the Headland. Between the limbs of the recurves and inland of the spit itself, saltmarshes have developed in the shelter of the ridges and spit. This frontage also contains Blakeney Freshes marshes, a series of freshwater marshes formed in the 17th century. They consist of around 168 hectares of freshwater grazing marshes, with small areas of reedbed and numerous drainage ditches. The freshwater marshes are protected from tidal flooding to the west, north and east by earth embankments and to the south by higher ground.

The lower reaches of the tidal River Glaven flow out onto the saltmarsh behind the spit to the east of this frontage. The course of this river has gradually been pushed southwards by the natural rollback of Blakeney Point and has recently moved towards the south. This realigned the embankment to provide continued drainage of the freshwater marshes and the fluvial reaches of the river. The River Glaven meanders from behind the spit, along the Cley channel, before joining the Blakeney channel.

The land in the tidal flood zone in this frontage is located around Blakeney Eye and includes part of the fluvial flood zone of the River Glaven. The existing flood defences are all man-made vegetated earth flood banks (around Blakeney and Morston), while there is also some natural higher ground at Blakeney Eye. Areas of this frontage were flooded in 1953.

Land use and environment

Coastal strip

The only settlements in the tidal flood zone are Morston and a small part of Blakeney. Blakeney is the larger of the two settlements and extends back past the A149. Infrastructure in the tidal flood zone includes a section of the A149 and minor roads at Morston. Blakeney harbour provides recreational value as well as economic value, as does the harbour and visitor centre at Morston marshes.

The area is designated a Ramsar site (North Norfolk Ramsar), SPA (North Norfolk Coast SPA) and SAC (North Norfolk Coast SAC and the Wash and North Norfolk Coast SAC). These designations are all underpinned by SSSI designation (North Norfolk Coast SSSI). UKBAP habitat types include mudflat, coastal sand dunes, lowland dry acid grassland, saltmarsh, coastal

and flood plain grazing marsh, reedbed, coastal vegetated shingle, lowland heathland, saline lagoons, undetermined grassland and lowland meadow. European Annex I priority habitats along this frontage are coastal lagoons and fixed dunes with herbaceous vegetation ('grey' dunes).

The land is mainly arable agricultural land. Towards the coast there are areas of conservation importance which include saltmarshes and sand dunes. Blakeney NNR, owned by the National Trust, is in this unit and has a high conservation, educational and amenity value. Morston Cliff SSSI and Wiveton Downs SSSI are sites of geological interest consisting of ice age features and esker material respectively.

Agar, Blakeney and Cley channels, Great Barnett Lake and Blakeney Spit provide conservation value as well as recreational value for small boating traffic. The Peddars Way and Norfolk coast path run the length of the area providing amenity value.

Hinterland

The hinterland includes settlements such as Langham, Field Dalling, Saxlingham, Glandford and Wiveton. There is a network of roads around the area, with the B1156 leading from Blakeney to Langham and then towards Sharrington. All other roads in the frontage are minor. Built features include the Farmland Bird Centre at Glandford which provides recreational and economic value.

Land use in the area is, as with most other units, arable agricultural land interspersed with woodland. Areas of conservation importance include Wiveton Downs SSSI and LNR, which runs from Morston to Glandford. Wiveton Downs consists mainly of grazing land and is designated for the geological value of the esker. The rivers Stiffkey and Glaven run through the area and provide conservation, as well as some recreational, value (including angling). There is a disused airfield near Morston that is of limited conservation and recreational value. Areas of historic environment interest include the Guildhall at Blakeney.

The potential increase in the area of tidal flood zone due to predicted future sea level rise is limited in this area and only really affects land behind flood defences. The increased tidal flood zone has the potential to affect a number of properties in Morston and Blakeney, as well as the A149.

The key values are visualised in section E3.5.

**Indicators**

For this area, the SMP will need to find the right balance between the following potentially competing factors:

- communities and infrastructure: Morston, Blakeney and Wiveton coastal communities, Blakeney harbour
- species and habitats, including designations: Wiveton Downs SSSI and LNR, North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC
- tourism and amenity features and public access to and along the coast, including the national trail, bird watching at Blakeney Point, sailing and Blakeney seal colony
- landscape features, including the AONB designation
- the need for flood and erosion risk management

Also, other factors including transport routes, agriculture, drainage and cultural heritage have to be taken into account.

The criteria and indicators for frontage G are provided in table E3.8.

**Table E3.8 Frontage G criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **Defence function of Blakeney Spit**<br>• **Role of hard defences in protecting houses in Morston and Blakeney and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 130)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages on an appropriate scale (for example super- frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Impact on Stiffkey marshes and beyond**<br>• **Impact on Cley to Salthouse shingle ridge and beyond** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle has been tested by the sensitivity check (task 3.4) as part of appraisal. The results have fed into fine-tuning the final set of policies.** | |
| | |

| Criterion | Indicator(s) |
|---|---|
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Effect of shoreline management on the economic viability of communities through its impact on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features: bird watching, Peddars Way and Norfolk coast path, sailing from Blakeney, seal trips from Morston**<br>• **Impact on fisheries**<br>• **Impact on grade 3 agricultural land on the edge of higher ground (including behind Morston sea bank) and grade 4 agricultural land in Blakeney Freshes** |
| **Effect of shoreline management on the social viability of communities through its impact on public services and infrastructure.** | • **No services affected**<br>• **No utilities affected**<br>• **Impact on A149 and local roads**<br>• **Impact on drainage of River Glaven and River Stiffkey** |

| | |
|---|---|
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for communities and individuals to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Impact on socio-economic features of regional, national or international significance.** | • **No relevant features** |
| | |
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Impact of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **For each of the designations (Wiveton Downs SSSI and LNR, North Norfolk Coast Ramsar site, SAC, SPA and SSSI, the Wash and North Norfolk SAC):**<br>• **area of designated land lost/ gained for each epoch and scenario**<br>• **changes in condition of designated land for each epoch and scenario** |
| | |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Impact of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets both within designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario. (BAP habitats present are mudflat, coastal sand dunes, lowland dry acid grassland, saltmarsh, coastal and flood plain grazing marsh, reedbed, coastal vegetated shingle, lowland heathland, saline lagoons, undetermined grassland and lowland meadow)** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Impact of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historical environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To have regard for the historic environment and its value for the heritage, culture and economy of the area. | |
| **Impact on historic environment and its wider value.** | • **Medieval undercroft known as the Guildhall at Blakeney, remains of Blakeney chapel, two bowl barrows on Blakeney Downs, Wiveton Bridge (SMs)**<br>• **Listed buildings at Morston, Blakeney, Wiveton Hall, Cley-next-the-Sea and in the Glaven valley.** |
| | |

## E2.4.9 Frontage H - Cley and Salthouse

### Characterisation

Coastal processes and flood defences

The section between Blakeney Eye and Kelling Hard is a post-glacial feature with a steep profiled shingle beach and few bar features. The steep berm face of these beaches reflects incoming wave energy back offshore.

The Cley-Salthouse marshes are internationally recognised freshwater marshes stretching along most of this frontage. They consist of around 310 hectares of freshwater grazing marshes, with reedbeds and saline lagoons towards the back of the ridge. These marshes have an earth embankment (Cley west bank) and the Glaven estuary to the west, to the north the shingle ridge and to the east and south areas of higher ground. There is a small fluvial flow through the marshes that is fed by springs to the east.

The land in the tidal flood zone is fairly unique compared to the other units, as it is all low-lying and contains hardly any agricultural land. The shingle bank acts as a natural flood defence in this area. Since its management regime was changed, the profile has been left to develop through natural processes. However, there are also other man-made defences in the area, particularly around Cley. These include concrete flood walls around the promenade and vegetated flood banks along the roads. Parts of this frontage were flooded in both 1953 and 1978.

Land use and environment

Coastal strip

There are no built properties in the tidal flood zone and the A149 is the only major infrastructure. A couple of minor roads lead to the coast and in and around the settlements. Large sections of the A149 are in the tidal flood zone.

Agricultural activity is limited to a small area around Kelling, leaving the rest of the land mainly as areas of conservation importance. Shingle banks run the entire length of this frontage, with the land being of high conservation and recreational value. The Peddars Way and Norfolk coast path provides further recreational and amenity value. There is an Elizabethan fort at Cley. Weybourne Cliffs, a geological SSSI, lies to the east.

The area is designated a Ramsar site (North Norfolk Ramsar), SPA (North Norfolk Coast SPA) and SAC (North Norfolk Coast SAC and the Wash and North Norfolk Coast SAC). These designations are underpinned by SSSI designation (North Norfolk Coast SSSI). UKBAP habitat types include mudflat, coastal sand dunes, lowland dry acid grassland, saltmarsh, coastal and flood plain grazing marsh, reedbed, coastal vegetated shingle, lowland heathland, saline lagoons, maritime cliffs and slopes, undetermined grassland

and lowland meadow. European Annex I priority habitats in this frontage are coastal lagoons and fixed dunes with herbaceous vegetation ('grey' dunes).

Hinterland

Areas outside the tidal flood zone include properties at Cley-next-the-Sea, Newgate, Salthouse, Glandford, Letheringsett and Kelling. Holt is the largest settlement in the area. Infrastructure includes the A149 and the A148, as well as some minor roads that run through the settlements towards Holt.

The land in this area is mainly arable agriculture with several areas of woodland. Wiveton Downs SSSI and LNR reaches into this section from area G. However, despite this, the conservation value of this area is limited so sustained access to the coast is important. The Hangs, north of Holt, is a large area of woodland and lakes that provides recreational and amenity value. Historic environment value comes from church remains, a handful of tumuli and a bridge in Wiveton. Numerous footpaths run through the area providing amenity value.

The potential increase in the area of the tidal flood zone due to the predicted increase in future sea level rise is limited in this area and only really affects land behind flood defences. The increased area could, however, include a number of properties in Cley-next-the-Sea and Salthouse.

The key values are visualised in section E3.5.

**Indicators**

For this area, the SMP will need to find the right balance between the following potentially competing factors:

- communities and infrastructure: Cley-next-the-Sea and Salthouse coastal communities
- species and habitats, including designations: North Norfolk Coast Ramsar site, SAC, SPA and SSSI and the Wash and North Norfolk SAC
- tourism and amenity features and public access to and along the coast, including the national trail, bird watching and the Elizabethan fort at Cley
- landscape features, including AONB designation
- the need for flood and erosion risk management

Also, other factors including transport routes and cultural heritage have to be taken into account.

The criteria and indicators for frontage H are provided in table E3.9.

**Table E3.9 Frontage H criteria and indicators for each principle**

| Criterion | Indicator(s) |
|---|---|
| To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations. | |
| **Extent of reliance on hard defences and flexibility of coastal management.** | • **Defence function of the Cley to Salthouse shingle ridge**<br>• **Role of hard defences in protecting houses in Cley-next-the-Sea and the A149** |
| **Level of flood and erosion risk to people and properties.** | • **Number of properties in the tidal flood zone compared to the current number (about 100)** |
| | |
| To ensure that local policy decisions do not adversely affect wider natural coastal processes. | |
| **This principle has also been applied by defining policy packages on an appropriate scale (for example super- frontages) instead of local frontage scale.** | |
| **Effect on neighbouring frontages.** | • **Impact on Blakeney Spit and beyond**<br>• **Impact on neighbouring SMP area** |
| | |
| To work with coastal change to take account of uncertainty about the future in the timing of policies. | |
| **This principle has been tested by the sensitivity check (task 3.4) as part of appraisal. The results have fed into fine-tuning the final set of policies.** | |
| | |

| Criterion | Indicator(s) |
|---|---|
| To consider social and economic well-being and allow communities and individuals to adapt to coastal change. | |
| To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.) | |
| **Effect of shoreline management on the economic viability of communities through its impact on economic activities (tourism, recreation, agriculture, fisheries).** | • **Impact on tourism and recreation features: bird watching, Peddars Way and Norfolk coast path, Elizabethan fort at Cley**<br>• **Impact on fisheries**<br>• **No agricultural land affected** |
| **Effect of shoreline management on the social viability of communities through its impact on public services and infrastructure.** | • **No services affected**<br>• **No utilities affected**<br>• **Impact on A149 and local roads**<br>• **Impact on drainage of River Glaven** |

| | |
|---|---|
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for communities and infrastructure to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |
| To take account of the value of the north Norfolk coast area to wider society. | |
| **Impact on socio-economic features of regional, national or international significance.** | • **No relevant features** |
| | |
| To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences. | |
| **Adequacy of time available for planning system to adapt.** | • **Time (in epochs) available for each process of adaptation required** |
| | |

| Criterion | Indicator(s) |
|---|---|
| To contribute to maintaining and enhancing protected sites and species, subject to natural change. | |
| **Impact of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change.** | **For each of the designations (North Norfolk Coast Ramsar site, SAC, SPA and SSSI, the Wash and North Norfolk SAC):**<br>• **area of designated land lost/ gained for each epoch and scenario**<br>• **changes in condition of designated land for each epoch and scenario** |
| | |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | |
| **Impact of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets both within designated sites and the wider coastal countryside.** | • **Area of BAP habitats for each epoch and scenario. (BAP habitats present are mudflat, coastal sand dunes, lowland dry acid grassland, saltmarsh, coastal and flood plain grazing marsh, reedbed, coastal vegetated shingle, lowland heathland, saline lagoons, maritime cliffs and slopes, undetermined grassland and lowland meadow)** |
| | |
| To contribute to maintaining and enhancing the character of the coastal landscape. | |
| **Impact of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historic environment and cultural features, and the role of settlements in the landscape.** | • **Qualitative judgement** |
| | |
| To have regard for the historic environment and its value for the heritage, culture and economy of the area. | |
| **Impact on historic environment and its wider value.** | • **Listed buildings in Cley-next-the-Sea and Salthouse** |
| | |

# E3 Policy development

## E3.1 Introduction

## E3.2 Policy appraisal terminology

The terms used in this section of the report are summarised in the text box at the beginning of section E2.

## E3.3 Playing field

### E3.3.1 Introduction

This section is about identifying policy options that are sufficiently relevant and realistic to justify the effort of full appraisal. This 'streamlining' process is needed because otherwise there would be an almost infinite number of combinations of policies in space (frontages) and time (epochs). This task therefore helps to make the SMP process more efficient. Also, following a stepped approach helps everyone involved to develop an understanding of the issues and to prepare for the level of decision-making needed in the SMP.

The aim of this task is to identify:

- **obvious** policy choices for certain frontages and epochs. This will streamline the process by avoiding having to go through detailed appraisal for that frontage and epoch
- **unrealistic** policy choices for certain frontages and epochs. This will streamline the process by limiting the number of options that need appraising.

It is also important to note that this task does not yet make decisions about policy. It is only intended to identify policies that need full appraisal.

### E3.3.2 General issues

<u>Role of current legislation for future epochs</u>
An important issue at this stage of the SMP is the role of current legal restrictions for future epochs. This is particularly relevant for European sites (SACs and SPAs). These cover the whole of the North Norfolk SMP frontage and impose a legal requirement to avoid deterioration of habitats. These legal requirements mean that any negative effect (if not compensated fully within the SMP area) is only legally possible in case of 'imperative reasons of overriding public interest' (IROPI). Section 4.4.3 explains this process. For most designations, these 'imperative reasons' can be about social and economic issues. For particular habitats and species, however (so-called

Annex I habitats), the only acceptable IROPI concerns health and safety. These priority habitats are present in part of the North Norfolk SMP area, especially grey dunes and coastal lagoons. Taking the 'IROPI' route is an option, but it is not an easy option and it has not happened much yet. This also means that there is no clearly-developed good practice yet. An issue to consider is whether, in this situation, flood risk can be treated as a health and safety issue.

The SMP guidance (volume 1) indicates that SMPs should take full account of the need to meet current legal obligations such as the Habitats regulations. This also applies to policies for epochs 2 and 3. The Appropriate Assessment (AA) we have carried out in parallel with the SMP will check the policies against these requirements and we intend to use the AA to make the right decisions.

The question is to what extent these requirements should limit the 'playing field' at this stage of the SMP process. The SMP needs to develop realistic policies that provide the best balance of all values and interests. For epoch 1, current legal constraints mean that policies that clearly lead to designated habitats deteriorating (that is, advance the line and managed realignment in some cases) are not realistic. However, for later epochs the drivers may be different and they may need to be balanced against habitat interests.

The 'easy way' in the short term would be to rule out any policy that leads to loss of priority habitat based on the SMP guidance for all epochs. However, we are concerned that a decision like this needs more thorough justification, possibly through full policy appraisal.

Drivers and constraints for policies

All policies have drivers (reasons for) and constraints (reasons against). It is useful to start considering these at this stage, as we start the policy appraisal process. They are listed here (table E4.1) for all four policies as applied to the North Norfolk SMP.

A very important aspect in making decisions for north Norfolk is interactions along the shoreline. Depending on the place, this can be either a driver or a constraint for particular policies. We have not listed this in the table, but it is an essential element of the analysis for each frontage in section 3 of this note. See section 4 for a summary of general interactions along the shoreline.

**Table E4.1: Drivers and constraints for SMP policies**

| Policy | Drivers | Constraints |
|---|---|---|
| No active intervention | Flood risk management budget.<br>Habitats. | Existing land use: communities, infrastructure, agriculture, designated historic features. |
| Advance the line | None for epoch 1. | Habitats (designations, requirement of IROPI procedure).<br>Flood risk management budget. |
| Hold the line | Existing land use: communities, infrastructure, agriculture, designated historic features. | Flood risk management budget.<br>Habitats. |
| Managed realignment | Habitat.<br>Flood risk management budget (in case of realignment to more effective location). | Existing land use: communities, infrastructure, agriculture, designated historic features.<br>Flood risk management budget (in case of realignment to less effective location). |

### E3.3.3 The Habitats Directive and the possible pursuit of policy for imperative reasons of over-riding public interest (IROPI)

What happens if SMP policy will have an adverse effect on internationally designated sites?

Where it is not possible to decide that SMP policy will not have an adverse effect on the integrity of a European or Ramsar site, alternative solutions must be looked for. If alternatives are not possible, the SMP policy can only proceed on the basis of imperative reasons of over-riding public interest (IROPI). Basically, this is where it can be shown that, even though the policy will adversely affect the site, there are reasons in the public interest (social or economic reasons for example) that are of such importance that the policy should still be implemented.

The process for pursuing a policy under IROPI

Pursuing proposals or policy under IROPI is not common practice. It is typical for alternative options to be established that would not have an adverse effect on site integrity as the way to resolve this problem. Given the nature of SMP policy however, where social and economic issues need to be addressed alongside the conservation objectives of international sites, the prospect of using the IROPI route cannot be ruled out.

SMP policy options are fairly limited and alternatives may not be readily available. In this scenario, and after a full evaluation of all available options has taken place, the only remaining course of action may be implementing the policy under IROPI.

If the only feasible course of action is pursuing a policy under IROPI, this would need the agreement of the Secretary of State for the Environment.

Compensatory habitat?
Policy can only be pursued under IROPI if it is accompanied by a programme that outlines a process for providing compensatory habitat equivalent in area and quality to that lost or affected by the policy. The degree and type of compensatory habitat would need to be agreed with Natural England and the Secretary of State.

An important distinction
Habitats listed in annex 1 of the directive fall into two categories: priority and non-priority. This distinction is particularly important in the matter of IROPI. The difference is as follows:

Priority habitat (in the north Norfolk area, this is confined to grey dunes and coastal lagoons)
IROPI for priority habitat can only be claimed if the public interest relates to health and safety.

Non-priority habitats
IROPI for non-priority habitats can be claimed for social or economic reasons or in the interests of public health and safety.

Simply, policy can only be pursued for priority habitat where it can be shown that the policy is essential (and there are no alternatives) to protect public health and safety.

North Norfolk SMP provision and IROPI
In the course of producing policy for the SMP, every effort will be made to avoid adverse effects on the integrity of international sites (a key element of this is using the Appropriate Assessment to evaluate policy). Where adverse effects cannot be ruled out, alternatives and preventative measures will be developed and assessed. If, having followed this process, alternatives are not available or preventative measures are not possible, the process above will need to be considered as a course of action.

### E3.3.4 Playing field

This section contains the description of the suggested playing field for policy appraisal: discussion of all four SMP policies, leading to a suggested definition of the playing field. The analysis is described for each of the three

super-frontages (as defined in the baseline scenarios) - the sections of the shoreline that have limited or no shoreline interaction between them.

Within each super-frontage the analysis follows the logic of the coastal processes, starting with the (sub)frontages that have an influence on other (sub)frontages within the super-frontage. Note that the numbering is based on the frontages A to H developed earlier, with sub-numbering within the frontages from west to east (for example, sub-frontages B1 and B2). The sub-frontages largely coincide with the policy development zones (PDZs) that were used in appraisal and are presented in the main SMP. The analysis confirms that shoreline interaction will be essential for developing policy. The links are identified in this note and will then be used in the next step when we move on to develop basic options for each super-frontage.

The analysis is based on the baseline scenarios (for the influence of policies on coastal processes) and on the objectives report and associated cross-section graphics (for key features and values and their interactions).

The analysis in this section starts to bring together all the different tasks from stage 2. It is quite long and detailed because the north Norfolk shoreline varies so much and the interactions are complex. Most of the sub-frontages belong to a limited set of five shoreline types, for which the local issues and the shoreline interactions are similar. Section E3.4 summarises these types with their typical considerations and suggested playing field.

Super-frontage 1: Old Hunstanton to Thornham

This super-frontage contains frontages A and B. The existing defences largely consist of natural vegetated dunes. Man-made defences are gabion groynes at Old Hunstanton golf course (stabilising the beach), limited soft dune protection at Holme dunes, a vegetated flood defence sea bank east of Gore Point and local defences at Thornham.

Our analysis of coastal processes shows that policy decisions for the sea bank may affect the processes further west, but that there is no shoreline effect in the other direction. The frontage is therefore discussed from east to west, starting with the sea bank. For the next step, this means we will need to define policy packages for this super-frontage as a whole.

The vegetated **Thornham sea bank (sub-frontage B2)** provides flood protection up to 1:10 year tidal flooding to the area around Thornham and to the grazing marshes east of Holme-next-the-Sea. It provides little or no protection to properties in Thornham as these are all above the 1:10 year sea level. In the current situation there are a few properties in the 1:200 year tidal flood zone, but this will increase to over 20 by epoch 3. There may also be a potential flooding pathway to the properties in Flaxley (near Holme), and even to Old Hunstanton through the River Hun valley, but these are on higher ground as well.

No active intervention would lead to failure of the defences towards the end of epoch 1. This would be uncontrolled but would have only limited effect on properties and on risk to life. It would have a large effect on land use (grade 3 and 4 agricultural land) and habitats (designated grazing marsh) in the currently-defended area. Also, it is likely to have a significant physical effect on a larger scale by increasing tidal volumes and an associated return of natural processes. This could influence the position of Gore Point and its role as a control point for frontage A. This policy clearly has benefits and disadvantages, but none of these are in principle overriding. Whether it is realistic for epoch 1 depends on whether it is realistic to adapt the defended features during epoch 1. We assume it is, so we suggest that this policy needs to be appraised for all epochs.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area.

Hold the line will mean that agricultural land and habitats remain defended. It will, however, also have a wider effect on coastal processes in response to sea level rise, although this will be less dramatic than NAI. As the dunes roll back, the connection with the natural defences will come under threat so the defences will need to be extended. As sea level rises, intertidal habitats in front of the defences will start to be squeezed, affecting habitats but also increasing wave attack on the defences. Again, these aspects are important but none are overriding, so this policy needs to be appraised.

Managed realignment can mean various things. In this case the most obvious interpretation would be to move the defence further inland or even remove it, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but it has the benefit of giving more control over when the consequences described under NAI (effect on defended area, effect on harbour channel and shoreline impact on Gore Point and Old Hunstanton dunes) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 will have to take account of the need to adapt.

The next section is **Holme dunes (sub-frontage B1)** (around Gore Point). This is currently functioning as a mainly natural system, apart from the short section of soft defences at the Norfolk Wildlife Trust's visitor centre, which prevents local dune erosion. No active intervention initially means continuing the currently-observed limited erosion and rollback. In the longer term, when the soft defences have failed, this process would speed up. Also in the longer term, the natural development would be strongly influenced by a MR or NAI policy for the sea bank at Thornham. This in turn would influence the role of

Gore Point as a control for frontage A. In any case, NAI for this section is realistic and needs appraising.

A hold the line policy for this section would consist of continued and, in the longer term increased, protection measures to keep the dune lines where they are now. This would partly ensure their flood defence function but would mainly stabilise Gore Point to reduce effects on frontage A. This is relevant for the stretch that currently has soft defences. For the sub-frontage as a whole it may become relevant in later epochs, as a MR or NAI policy for Thornham sea bank would have had significant shoreline effects to the west. So we suggest for epoch 1 that hold the line is only relevant for the currently-defended part of the frontage. For later epochs it is sufficiently realistic to appraise this for the whole sub-frontage.

For advance the line and managed realignment, we suggest that large-scale managed changes of the shoreline are not realistic, even for the later epochs. The exact alignment of a hold the line policy could be slightly seaward or landward of the current line, but we suggest treating this as detailed implementations of a hold the line policy.

The westernmost section of the SMP is **Old Hunstanton dunes (frontage A)**, consisting of vegetated dune lines with gabion groyne protection. No active intervention would lead to the groynes failing around the end of epoch 1. This would then allow natural processes to create a slight embayment anchored by Hunstanton cliffs and Gore Point. This has the benefits of promoting natural processes, but there could be effects on the golf course and the flood defence function that the dunes perform for some low-lying properties in Old Hunstanton. NAI therefore needs appraising, taking into account policy decisions for Thornham sea bank and Holme dunes and their influence on the role of Gore Point as a control for the Old Hunstanton dunes.

Advance the line for this section would go against natural processes and there are no obvious reasons for it, even in the long term. We therefore suggest not appraising this policy.

Hold the line would keep protecting the assets in and behind the dunes. For this section it would not have a significant negative shoreline effect. However, it is likely to need further investment and maintenance as time goes on, both to keep the flood defence tied in with the more natural dune line at Holme dunes (depending on policy there) and to compensate for increased hydraulic loading in later epochs. Hold the line is sufficiently realistic to need appraising, again taking account of the policy options for Holme dunes and Thornham sea bank.

Managed realignment could be an option in which the shoreline is allowed to develop a more natural shape, but with extra measures to protect inland features against erosion or flooding. This could consist of fixing the dunes at

a certain position further inland or providing a flood defence to protect the houses. This option needs appraising. MR could also mean actually taking away the groynes to achieve an earlier re-naturalisation process. We see no drivers that could justify this additional investment, so we suggest not appraising it.

Finally, there is a section of **local flood defences at Thornham (sub-frontage B3)** which protects a small area in front of the village. The defended area partly consists of grade 3 agricultural land and there are no low-lying properties. This defence line could have a local effect on coastal processes. The large-scale processes of the development of Brancaster bay (see super-frontage 2) will have an effect on this section. They will influence how the foreshore develops which determines wave loading and toe stability. No active intervention and hold the line are sufficiently realistic to need appraising. Advance the line is not realistic as there is no reason for it. Managed realignment could be realistic and needs appraising for all epochs because the seaward half is low-lying and non-agricultural while the landward half is higher and agricultural.

Super-frontage 2: Brancaster bay to Stiffkey marshes

Introduction

This super-frontage contains frontages C, D, E and F. The existing defences are (from west to east):

- RSPB flood defence embankments at Titchwell (C2)
- Environment Agency flood defences inland of the golf course at Brancaster (C4)
- flood defences and erosion protection works at the golf course at Brancaster (C5)
- local flood defences at Brancaster and Brancaster Staithe (D2)
- flood defence embankments at Deepdale and Norton marsh (D3)
- River Burn outfall (D4)
- local flood defences at Burnham Overy Staithe (E1)
- flood defence embankment at Overy marshes (E2)
- partly-protected dunes at Holkham (E3)
- flood defence embankment at Wells harbour channel (E4)
- local flood defences at Wells quay (E5)
- Wells east bank (F1)
- River Stiffkey outfall (F3)

In the remaining sections, the shoreline consists of intertidal area running into higher ground (between Thornham and Brancaster and most of frontage F at Stiffkey). Scolt Head Island (D1) and the dunes at Brancaster golf course (C6) are also not defended.

Our analysis of coastal processes shows that policy decisions for the defended areas behind Scolt Head Island will influence how Scolt Head Island and hence the neighbouring frontages (Brancaster bay and Holkham bay) develop, but that there are no effects along the shoreline the other way around. So the analysis starts with the Scolt Head frontage (section 3.2.2), then proceeds towards the west (section 3.2.3) and finally returns to the frontages east of Scolt Head (section 3.2.4).

Scolt Head Island and defended areas behind (frontage D)
The long-term development of Scolt Head Island is uncertain, but will be influenced by the size of the tidal area behind it. This could be increased by changing how the defences of Deepdale and Norton sea banks, Burn River outfall and Overy marshes are managed. These three areas are discussed first, followed by Scolt Head Island itself.

The **Deepdale and Norton sea banks (sub-frontage D3)** provide flood protection up to 1:10 year tidal flooding to the area around Burnham Deepdale and Burnham Norton, including the grazing marshes of Deepdale marsh (grade 4 land) and Norton marsh (designated as part of the SPA / Ramsar / NNR). The Peddars Way runs on top of the banks, which provide limited flood protection to about 10 properties in Burnham Norton around the 1:10 year sea level.

No active intervention would lead to the defences failing towards the start of epoch 2. This would be uncontrolled and would have some effect on properties and possibly on risk to life. It would have a large effect on land use (grade 4 agricultural land) and habitats (designated grazing marsh) in the currently-defended area. Also, it is likely to have a significant physical effect on a larger scale by increasing tidal volumes and an associated return of natural processes. This could influence how Scolt Head Island develops and the role that its ends play as control points for frontages C and E. This policy clearly has benefits and disadvantages, but none of these are in principle overriding. Whether it is realistic for epoch 1 depends on whether the defended features (especially residential properties) can be adapted during epoch 1. We assume not and suggest that this policy needs to be appraised for epochs 2 and 3 only.

Advance the line is not realistic as there are no reasons to reclaim more land in this area.

Hold the line will mean that agricultural land and habitats remain defended. It will, however, also have a wider effect on coastal processes in response to sea level rise and increase the likelihood of Scolt Head Island (especially its western end) reattaching to the land. For this particular area, a hold the line policy is not likely to cause local coastal squeeze and related increased wave loading. It will instead contribute to local siltation which will reduce loading.

None of these aspects are overriding, so this policy needs to be appraised for all epochs.

The most obvious interpretation of managed realignment in this case would be to move the defence further inland or remove it, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but it has the benefit of giving more control over when the consequences described under NAI (effect on defended area, effect on Scolt Head Island and neighbouring frontages) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 will have to take account of the need to adapt.

The **River Burn outfall (sub-frontage D4)** and associated earth embankment protect the valley from tidal flooding. The tidal flood zone consists of grade 4 agricultural land. On the edge of the tidal flood zone, mostly above the 1:10 year tidal water level, there are some residential properties and the designated remains of a friary. In Burnham Market there are more properties that would come into the tidal flood zone (1:200 year) with predicted sea level rise. The A149 and the B1155 cross the valley in the flood zone at levels below the 1:1 year water level.

No active intervention for this section would lead to the defences failing near the start of epoch 2. The meaning of NAI for the tidal outfall is not straightforward. We assume this would involve leaving in a flap-gate to avoid direct tidal exposure. Defence failure would turn the river valley into a tidal estuary, which is likely to require adaptation for the properties on the edge of the flood zone and for the A149 and B1155. This would also affect the remains of the friary. Beyond the defended area, this policy would have a significant effect on Burnham harbour and associated channels and possibly on the development of Scolt Head and other frontages. These effects are very significant and complicated and so need appraising. Whether it is realistic for epoch 1 depends on whether adapting the defended features (especially residential properties and A149) is realistic during epoch 1. We assume it is not so we suggest that this policy needs appraising for epochs 2 and 3 only.

Advance the line is not realistic as there are no reasons to reclaim more land in this area.

Hold the line will mean that the River Burn valley remains fluvial and properties remain protected. It will, however, also have a wider effect on coastal processes in response to sea level rise and increase the likelihood of Scolt Head Island (especially its western end) reattaching to the land. For this particular area, a hold the line policy is not likely to cause local coastal squeeze and related increased wave loading. It will instead contribute to local

siltation which will reduce loading. None of these aspects are overriding, so this policy needs to be appraised for all epochs.

The most obvious interpretation of managed realignment in this case would be to remove the defence, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but it has the benefit of giving more control over when the consequences described under NAI (effect on defended area, impact on Scolt Head Island and neighbouring frontages) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 will have to take account of the need to adapt.

**Scolt Head Island (sub-frontage D1)** itself is currently not managed. Its development in the longer term is uncertain. In epochs 1 and 2 its current movement towards land and westward extension will continue. In epoch 3 the question is whether or not the western and/or eastern ends will become attached to the land. This process will be influenced (but not determined) by the policy for Deepdale and Norton sea banks. In itself, this will influence neighbouring frontages. The question is whether it is realistic to consider direct human intervention for Scolt Head itself through some form of hold the line. We suggest this is not realistic even in the long term. It seems more obvious to manage some of the drivers of Scolt Head's development (Deepdale and Norton sea banks) and to deal locally with its consequences on the neighbouring bays. We therefore suggest that no active intervention is the only possible policy for Scolt Head Island for all three epochs.

West of Scolt Head (frontage C)

The analysis proceeds first towards the west. The **local flood defences at Brancaster and Brancaster Staithe (sub-frontage D2)** protect a narrow strip of land that rises from +4 metres OD (around the 1:1 year level) to the higher ground. Most properties are outside the tidal flood zone. This defence line has no significant effect on coastal processes so the policy can be based on local benefits and disadvantages. The neighbouring sections will, however, have an effect on this section. They will influence the development of the foreshore which determines wave loading and toe stability. No active intervention and hold the line are sufficiently realistic to need appraising. Advance the line is not realistic as there are no reasons for it. Managed realignment is not realistic because the defended strip is very narrow.

At the **Royal West Norfolk golf course (sub-frontage C5)** there is erosion protection at the clubhouse and at the toe of the dunes just east of the clubhouse (about 250 metres long). Also, an embankment protects a practice area. Most of the golf course is in the natural dunes towards the east (**sub-frontage C6**). The development of this area is strongly influenced by how Scolt Head Island develops. In particular, it is possible that the western end

of Scolt Head could attach to the dunes in epoch 3. The defences around the clubhouse themselves act as a control for the eastern end of Brancaster bay.

A no active intervention policy would initially mean continuing current trends: general rollback of dunes, but with local accretion in the lea of Scolt Head. The flood defences of the practice area would fail during epoch 1, while the protection of the clubhouse is expected to fail towards the beginning of epoch 2. This would lead to a re-establishment of the natural shape of Brancaster bay. The specific effect on this section depends on the location of the western end of Scolt Head (which, as explained earlier, is influenced by how Deepdale and Norton sea banks are managed). If Scolt Head merges with the dunes around the golf course, this could become a natural feature within the realigned coast. If Scolt Head remains detached, the dunes are likely to be cut off temporarily from the shore and then disappear or merge with the saltmarsh. These potential (long-term) developments are significant, but there are no overriding benefits or disadvantages, so this policy needs appraising (within integrated packages with the neighbouring sections).

Advance the line is not realistic as there are no reasons for it.

A hold the line policy for this section is relevant for the currently-defended stretches. It is likely to create an artificial promontory (acting as a control for Brancaster bay) in the first epochs, coming under increased pressure in epoch 2. In the third epoch, depending on how Scolt Head's western end develops, it may turn into a natural promontory again, but it could also become more artificial (and so under more pressure). A separate question is whether hold the line is realistic for the dunes that are not currently defended. We suggest that there is no driver for fixing the dunes (as the golf course can be adapted to the alignment of the dunes), which means it does not need appraising.

Managed realignment for this section could mean removing any or all of the existing defences, allowing a more controlled development. This could be relevant if the golf course becomes more artificial and if this has a negative effect on Brancaster bay. This is not relevant for epochs 1 and 2 and for epoch 3 we don't see a situation where this would be needed. We therefore suggest not appraising this option. Another interpretation of managed realignment could be realignment of the flood defences for the practice area. However, as the effect of those defences by themselves is only local, this would still function as a hold the line on the larger scale, so we suggest that this does not need appraising separately.

The **Environment Agency defences at Brancaster (sub-frontage C4)** protect grazing marsh that is designated as part of the SPA/Ramsar site.

No active intervention would lead to failure of the defences towards the start of epoch 2. This development would be uncontrolled, but it would have no

effect on properties or risk to life. It would have a large effect on habitats (designated grazing marsh) in the currently-defended area. It is also likely to have an effect along the shoreline through increasing tidal volumes and an associated return of natural processes. This could have an effect within Brancaster bay and also on the development of the golf course behind the dunes. This policy clearly has benefits and disadvantages, but none of these are overriding for any of the epochs. So we suggest that this policy needs to be appraised for all epochs.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area.

Hold the line will mean that the habitats remain defended. Depending on policies for the golf course, the north-westerly end of the area is likely to become more and more exposed, so hold the line could need increased investment. Still, it is sufficiently realistic for appraisal.

Managed realignment could mean either removing the defences or moving them further inland, costing more than NAI but providing more control. This is sufficiently relevant for appraisal.

There is an **undefended area between Brancaster and Titchwell (sub-frontage C3)** where the intertidal area runs into the higher ground. Continuing the current no active intervention policy is certainly realistic. Introducing some form of defence is unlikely for epoch 1. For the later epochs it might have to be considered as part of mitigation for freshwater habitats lost elsewhere, but this seems unlikely. We suggest that no active intervention is the obvious policy for all epochs for this section.

The **RSPB defences at Titchwell (sub-frontage C2)** protect freshwater and brackish habitats of the reserve. RSPB is currently finalising plans for managed realignment which will move the defence around 100 metres further inland. The intention of the scheme is that the new alignment will not constrain natural processes along the shoreline up to the end of epoch 2. As this realignment is probable but not certain, this analysis looks at the situation with and without the realignment.

No active intervention would lead to the defences failing during epoch 1. This development would be uncontrolled, but it would have no effect on properties or risk to life. It would have a large effect on the designated freshwater habitats in the currently-defended area and probably a related economic effect on the reserve. It is also likely to have an effect along the shoreline through increased tidal volumes and associated return of natural processes, but this is limited to directly neighbouring sections. This policy clearly has benefits and disadvantages, but none of these are in principle overriding. It is less likely in the short term because of its effects on designated habitats and

economic activity, but we suggest that appraisal is needed to show this. So we suggest that this policy needs appraising for all epochs.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area.

Hold the line in this section could mean either the current line or the new alignment that will probably be realised in the coming years. This policy keeps protecting the habitats and the associated value of the reserve. Our analysis of coastal processes has confirmed the RSPB's analysis that the realigned defences are not likely to have a significant effect along the shoreline until the end of epoch 2. For epoch 3, physical developments strongly depend on what happens to Scolt Head's western end (as influenced by the policy for Deepdale and Norton sea banks) and the policy for the golf course. The north-east end of the reserve could become an artificial headland (which means strong hydraulic pressure) or it could become part of a natural headland (with reduced pressure). For both the current and the planned alignment, this policy is sufficiently relevant to need appraising for all epochs.

We suggest that managed realignment is not used in the SMP's policy appraisal for the currently-planned realignment. Once this is certain, the SMP has to treat it as the current defence line. MR would mean either removing all defences or some form of further realignment. This costs more than NAI but provides more control. Again, it is unlikely during epoch 1 but we suggest appraising it for all epochs anyway.

The **undefended area between Titchwell and Thornham (sub-frontage C1)** consists of intertidal area running into higher ground. Continuing the current no active intervention policy is certainly realistic. Introducing some form of defence is unlikely for epoch 1. For the later epochs it might have to be considered as part of mitigation for freshwater habitat lost elsewhere, but this seems unlikely. We suggest that no active intervention is the obvious policy for all epochs for this section.

<u>East of Scolt Head Island</u> (frontage E)

The **local flood defences at Burnham Overy Staithe (sub-frontage E1)** protect a very narrow strip of land that rises to higher ground. Most properties are outside the tidal flood zone. This defence line has no significant effect on coastal processes so the policy can be based on local benefits and disadvantages. Note that the neighbouring sections will have an effect on this section. They will influence how the foreshore develops which determines wave loading and toe stability. No active intervention and hold the line are sufficiently realistic to need appraising. Advance the line is not realistic as there are no reasons for it. Managed realignment is not realistic because the defended strip is very narrow.

North east from Burnham Overy Staithe, the **Overy Marshes flood embankment (sub-frontage E2)** connects the mainland to Holkham dunes. It provides flood protection up to 1:10 year tidal flooding, in principle to the whole area behind Holkham dunes up to the Wells embankment. This mainly consists of grazing marshes (mostly grade 3, some grade 2 agricultural land). The western side is also designated for its habitats. There are a few properties in this area, but they are all on higher ground around Holkham village. The A149 makes a short crossing of the tidal flood zone at Dale Hole and then runs in the tidal flood zone for longer near Wells. Also, the recreational access and facilities are in this flood zone.

No active intervention would lead to the defences failing during epoch 1. This would be uncontrolled and is likely to need the properties on the edge of the flood zone and the A149 to adapt. It would have a big effect on land use (mainly grade 3 agricultural land) and habitats (designated grazing marsh) in the currently-defended area. Also, it is likely to have a significant physical effect on a larger scale by increasing tidal volumes and an associated return of natural processes. Especially into epoch 3, this could influence how Scolt Head Island develops and the role that its ends play as control points for frontages C and E. This would also stabilise the position of Holkham dunes. This policy has complex effects and clear benefits and disadvantages, but none of these are in principle overriding. Whether it is realistic for epoch 1 depends on whether the defended features (especially residential properties and A149) can realistically be adapted during epoch 1. We assume they cannot so we suggest that this policy needs appraising for epochs 2 and 3 only.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area.

Hold the line will mean that all features remain defended. It will, however, also have a wider effect on coastal processes in response to sea level rise and increase the likelihood of Scolt Head Island (especially its western end) reattaching to the land. For this particular area, a hold the line policy is unlikely to cause local coastal squeeze and related increased wave loading. It will instead contribute to local siltation which will reduce loading. None of these aspects are overriding, so this policy needs to be appraised for all epochs.

The most obvious interpretation of managed realignment in this case would be to realign or even remove the defence, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but it has the benefit of giving more control over when the consequences described under NAI (effect on defended area, effect on Scolt Head Island and neighbouring frontages) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types

of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 will have to take account of the need to adapt.

**Holkham dunes (sub-frontage E3)** is currently functioning as an almost natural system, although the presence of the planted trees has some effect. They are another chain in the flood protection of Overy marshes, with the features described above.

No active intervention initially means continuing the currently-observed limited front-face erosion (but no rollback as the dunes are kept where they are now). Over the longer term, the development will strongly depend on the tidal estuaries on both sides, which are influenced by policy decisions in neighbouring sections. The dunes could grow naturally, but they could also come under threat towards epochs 2 and 3. In any case, continuing NAI for this section is realistic and needs appraising.

A hold the line policy for this section would consist of protection measures to keep the dune lines where they are now, mainly to ensure their flood defence function. This may become relevant in later epochs. If the tidal deltas don't strengthen (which could be stimulated by defence realignment in Overy marshes or the areas behind Scolt Head), sea level rise will cause increased pressure on the dune lines. So we suggest that hold the line is not relevant for epoch 1, but is sufficiently realistic for epochs 2 and 3 to need appraising.

For advance the line and managed realignment, we suggest that large-scale managed changes of the shoreline location are not realistic, even for the later epochs. The exact alignment of a hold the line policy could be slightly seaward or landward of the current line, but we suggest treating this as detailed implementations of a hold the line policy.

The **Wells flood embankment (sub-frontage E4)** runs along the Wells harbour channel and connects the mainland to Holkham dunes. It is another chain in the flood protection of Overy marshes, with the features described above.

This is the only defence in this SMP area where no active intervention is not expected to lead to failure before epoch 2. The consequences to the defended area are similar to those for the Overy flood embankment. Some properties, the A149, land use and habitats and recreation/tourism are at risk. Also, it is likely to have a significant physical effect on a larger scale by increasing tidal volumes and the associated return of natural processes. Especially into epoch 3, this could influence how Holkham dunes develop. As for the Overy flood embankment, we suggest that this policy needs appraising, but only for epochs 2 and 3.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area

Hold the line will mean that all features remain defended. It will, however, also have a wider effect on coastal processes in response to sea level rise, leading to the tidal delta reducing and increasing pressure on Holkham dunes in later epochs. These effects are complex but none of these aspects are overriding, so this policy needs to be appraised for all epochs.

The most obvious interpretation of managed realignment in this case would be to move the defences further inland or even remove them, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but it has the benefit of giving more control over when the consequences described under NAI (effect on defended area, effect on Scolt Head Island and neighbouring frontages) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 will have to take account of the need to adapt.

The **local flood defences at Wells quay (sub-frontage E5)** protect a very narrow strip of land that rises to higher ground. Most properties are outside the tidal flood zone. This defence line has no significant effect on coastal processes so the policy can be based on local benefits and disadvantages. The neighbouring frontages will have an effect on this section. They will influence how the foreshore develops which determines wave loading and toe stability. No active intervention and hold the line are sufficiently realistic to need appraising. Advance the line is not realistic as there are no reasons for it. Managed realignment is not realistic because the defended strip is very narrow.

**Wells east bank (sub-frontage F1)** is a short embankment that protects about 60 properties in Wells, various stretches of the A149 and other roads and an area of grade 3 agricultural land.

No active intervention for this section would lead to the defences failing towards the start of epoch 2. This would be uncontrolled. It would have a significant effect on properties and possibly on risk to life and would therefore require adaptation. It would also have a significant effect on infrastructure. Beyond the defended area, this policy would have an effect on Wells harbour and associated channels. It would increase the tidal prism which will increase the likelihood of Wells harbour channel staying open. This in turn could influence the development of Holkham bay, which is potentially beneficial. However, whether NAI is realistic depends on whether the defended features (especially residential properties and the A149) can be adapted. This is very unlikely for epoch 1. For later epochs it is doubtful, given that the benefits of NAI could also be achieved by some form of managed realignment with more acceptable community impact. We suggest therefore that NAI does not need appraising for this sub-frontage.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area

Hold the line will mean that the properties, infrastructure and agricultural land remain protected. It will also have a wider effect on coastal processes in response to sea level rise and increase the likelihood of Wells harbour channel silting up. For this particular area, a hold the line policy is unlikely to cause local coastal squeeze and related increased wave loading. It will instead contribute to local siltation which will reduce loading. None of these aspects are overriding, so this policy needs to be appraised for all epochs.

The most obvious interpretation of managed realignment in this case would be to remove the defence, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but has the benefit that it gives more control over when the consequences described under NAI (effect on defended area, effect on Wells harbour channel) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 will have to take account of the need to adapt.

Most of **Stiffkey bay (sub-frontage F2)** is not defended and consists of intertidal area running into higher ground. Continuing the current no active intervention policy is certainly realistic. Introducing some form of defence is unlikely for epoch 1. For the later epochs it might have to be considered as part of mitigation for freshwater habitat lost elsewhere, but this seems unlikely. We suggest that no active intervention for all epochs is the obvious policy for this sub-frontage.

The **River Stiffkey outfall (sub-frontage F3),** and associated earth embankment, protects the valley from tidal flooding. The tidal flood zone contains a number of properties in Stiffkey village. Outside Stiffkey, the flood zone mostly consists of grades 3 and 4 agricultural land. The A149 crosses the valley near the outfall and skirts along the tidal flood zone around Stiffkey village. Further upstream, near Warham, there are three scheduled monuments on the edge of the flood zone.

No active intervention for this section would lead to the defences failing towards the start of epoch 2. As before, we assume that NAI for a tidal outfall involves leaving in a flap-gate to avoid direct exposure to the tides. Failure of the defence would turn the river valley into a tidal estuary. This would mean that properties and the A149 would have to adapt to this change. It would affect agricultural land use and the historic features. Beyond the defended area, this policy affects Blakeney harbour and associated channels, increasing the tidal prism and so strengthening the channels. This may influence the western end of Blakeney Spit, but is unlikely to influence

whether or not Blakeney Spit stays detached from the mainland. These effects are very significant and complicated and so need appraising. Whether it is realistic for epoch 1 depends on whether the defended features (especially residential property and the A149) can realistically be adapted during epoch 1. We assume they cannot so we suggest that this policy needs appraising for epochs 2 and 3 only.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area

Hold the line will mean that the Stiffkey valley remains fluvial and that properties remain protected. It will also have a wider effect on coastal processes in response to sea level rise, but this influence is likely to be local. For this particular area, a hold the line policy is not likely to cause local coastal squeeze and related increased wave loading. It will instead contribute to local siltation which will reduce loading. None of these aspects are overriding, so this policy needs appraising for all epochs.

The most obvious interpretation of managed realignment in this case would be to remove the defence, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but it has the benefit that it gives more control over when the consequences described under NAI (effect on defended area, effect on Blakeney harbour) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are realistic enough to need appraising. Any MR policy for epoch 1 will have to take account of the need to adapt.

<u>Super-frontage 3: Blakeney Spit to Kelling Hard</u>
This super-frontage includes frontages G and H. Blakeney Spit is a natural feature. There are man-made flood defences in front of Morston and Blakeney, an earth embankment that protects Blakeney Freshes and along the western edge of Cley marshes, with the River Glaven outfall in between. Finally, Cley and Salthouse marshes are protected by a shingle ridge.

Our analysis of coastal processes shows that policy decisions for frontage H will influence how Blakeney Spit develops, but that there is no effect along the shoreline the other way around. So the analysis starts with the Cley and Salthouse frontage and then proceeds towards the west.

The **Cley to Salthouse shingle ridge (sub-frontage H2)** protects an important area of freshwater marshes with associated habitat designations and recreational value. A number of properties in both Salthouse and Cley-next-the-Sea villages are on the edge of the tidal flood zone, down to around the 1:10 year water level. The A149 is just seaward of the higher ground, mainly around the 1:1 year water level. The current policy for this area is no active intervention for the shingle ridge itself (to protect the habitat of the

shingle ridge). At the same time the policy is for the marshes to keep their characteristic gradient from saline water at the ridge to fresh water at their landward edge (to be achieved by ensuring drainage of excess salt water that overtops the ridge). The Environment Agency and Natural England have agreed this policy for the medium and long term. We suggest taking this agreement into account in policy appraisal, but still to go through the normal policy appraisal process.

Note that this analysis (and SMP policy development) is only about managing the shingle ridge, not managing the water for the marshes. There is a strong link between the two. Also, how the marshes are managed has a physical influence on frontage G (Blakeney Spit).

No active intervention is the current policy for this sub-frontage. This is expected to lead to gradual rollback combined with lowering and widening of the shingle ridge, with lower sections where overwash has been focused. This will increase the frequency of salt water flooding of the freshwater marshes, so there will need to be increased drainage (possibly including pumping) to maintain the salinity gradient of the marshes. Also, the frequency of flooding of the A149 and the properties along it is likely to increase. NAI is the current policy so it needs to be appraised for all epochs.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area

Hold the line would mean reverting to the recently-abandoned practice of re-profiling the shingle ridge. This would protect the freshwater habitat and the A149, but would be at the cost of the designated shingle ridge habitats. It is very unlikely for epoch 1, but we still suggest appraising it for all epochs.

Managed realignment for this section would be to realign or even remove the defence, either keeping some of the features defended or not. There is no obvious reason for selecting this policy. The current NAI policy is already based on habitat considerations and a MR policy would involve removing or moving the rare and desirable shingle ridge. We suggest not appraising MR for this frontage.

This analysis does not look at Cley east bank, which divides Cley and Salthouse marshes. Even though this bank has a flood defence status, its main function is not shoreline management but habitat management. So we suggest that the policy for this bank is decided based on habitat management considerations.

**Cley west bank (sub-frontage H1)** protects the same area and features as the shingle ridge. Also, it acts as a barrier to the River Glaven's meandering.

No active intervention would lead to the defences failing towards the end of epoch 1. This would have a big effect on the habitats (designated grazing marsh) in the currently-defended area. Opening up the marshes from this side would also have an effect along the shoreline. It would increase tidal volumes which would increase the likelihood of Blakeney channel staying open and Blakeney Spit remaining detached. We suggest that this policy needs appraising for all epochs.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area

Hold the line would mean that the habitats remain defended. It would also have a wider effect on coastal processes in response to sea level rise and increase the likelihood of Blakeney channel silting up. For this particular area, a hold the line policy is unlikely to cause local coastal squeeze and related increased wave loading. It will instead contribute to local siltation which will reduce loading. None of these aspects are overriding, so this policy needs appraising for all epochs.

Managed realignment could mean either removing or realigning the defences, costing more than NAI but providing more control. This is sufficiently realistic for appraisal.

The **River Glaven outfall (sub-frontage G6)** and associated earth embankment protect the valley from tidal flooding. The tidal flood zone consists of grade 4 agricultural land. On the edge of the flood zone there are some residential properties, mostly above the 1:10 year tidal water level. The A149 and two roads further upstream cross the valley in the flood zone.

No active intervention for this section would lead to the defences failing towards the start of epoch 2. As before, we assume that NAI for a tidal outfall involves leaving in a flap-gate to avoid direct exposure to the tides. Failure of this defence would turn the river valley into a tidal estuary. This would probably mean that the properties on the edge of the flood zone, the A149 and other roads would need adapting. Beyond the defended area, this policy would have a significant effect on Blakeney channel and Blakeney Spit. These effects would be very significant and complicated and so need appraising. Whether it is realistic for epoch 1 depends on whether the defended features (especially residential properties and the A149) can realistically be adapted during epoch 1. We assume they cannot so we suggest that this policy needs appraising for epochs 2 and 3 only.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area

Hold the line would mean that the Glaven valley remains fluvial and properties remain protected. It will, however, also have a wider effect on

coastal processes in response to sea level rise and increase the likelihood of Blakeney Spit reattaching to the land. For this particular area, a hold the line policy is unlikely to cause local coastal squeeze and related increased wave loading. It would instead contribute to local siltation which would reduce loading. None of these aspects are overriding, so this policy needs appraising for all epochs.

The most obvious interpretation of managed realignment in this case would be to remove the defence, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but has the benefit of giving more control over when the consequences described under NAI (effect on defended area, effect on Blakeney Spit) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 would have to take account of the need for properties and infrastructure to adapt.

The **Blakeney Freshes sea banks (sub-frontage G5)** provide flood protection to the designated grazing marshes. The Peddars Way runs along the top of the banks.

No active intervention would lead to the defences failing towards the end of epoch 1. This would be uncontrolled, but it would have no effect on properties or risk to life. It would have a large effect on the habitats (designated grazing marsh) in the currently-defended area. It is also likely to have an effect along the shoreline by increasing tidal volumes and an associated return of natural processes. This would increase the likelihood of Blakeney harbour staying open and Blakeney Spit remaining detached from the mainland. This policy clearly has benefits and disadvantages, but none of these are overriding for any of the epochs. So we suggest that this policy needs appraising for all epochs.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area

Hold the line would mean that the habitats remain defended. It would, however, also have a wider effect on coastal processes in response to sea level rise and increase the likelihood of Blakeney Spit reattaching to the land. For this particular area, a hold the line policy is unlikely to cause local coastal squeeze and related increased wave loading. It would instead contribute to local siltation which would reduce loading. None of these aspects are overriding, so this policy needs appraising for all epochs.

Managed realignment could mean either removing the defences or moving them further inland, costing more than NAI but providing more control. This is sufficiently realistic for appraisal.

The **local flood defences at Blakeney (sub-frontage G4)** protect a very narrow strip of land that rises to higher ground. Most properties are outside the tidal flood zone and there is some grade 3 agricultural land. This defence line has no significant effect on coastal processes so the policy can be based on local benefits and disadvantages. The neighbouring sections will have an effect on this sub-frontage. They will influence how the foreshore develops which determines wave loading and toe stability. No active intervention and hold the line are sufficiently realistic to need appraising. Advance the line is not realistic as there is no reason for it. Managed realignment is not realistic because the defended strip is very narrow.

The **local flood defences at Morston (sub-frontage G3)** protect about 20 properties in Morston, a stretch of the A149 and an area of grade 3 agricultural land.

No active intervention for this section would lead to the defences failing towards the end of epoch 1. This would be uncontrolled. It would significantly affect properties and possibly increase risk to life and so would need adaptation. It would also have a significant effect on infrastructure. Beyond the defended area, this policy would have some effect on the channels through Morston marshes and further offshore into Blakeney harbour channel. It would increase the tidal prism which will increase the likelihood of the channel to Morston staying open. It would have a similar but smaller influence on Blakeney channel and this in turn could influence the development of Blakeney Spit. This is potentially beneficial, but whether NAI is realistic depends on whether the defended features (especially residential properties and the A149) can be adapted. This is very unlikely during epoch 1. For the later epochs it is doubtful, given that some of the benefits of NAI could also be achieved by some form of managed realignment with more acceptable effects on the community. We suggest, therefore, that NAI does not need appraising for this sub-frontage.

Advance the line is not realistic as there are no reasons for reclaiming more land in this area.

Hold the line would mean that the properties, infrastructure and agricultural land remain protected. It would also have a wider effect on coastal processes in response to sea level rise and increase the likelihood of Blakeney channel (west of Morston) silting up. For this particular area, a hold the line policy is unlikely to cause local coastal squeeze and related increased wave loading. It would instead contribute to local siltation which will reduce loading. None of these aspects are overriding, so this policy needs appraising for all epochs.

The most obvious interpretation of managed realignment in this case would be to remove the defence, either keeping some of the features defended or not. Removing the defences is more expensive than NAI, but it has the

benefit that it gives more control over when the consequences described under NAI (effect on defended area, effect on Blakeney channel) might happen. A partial realignment would have some of the benefits and disadvantages of no active intervention with the need to build and maintain the new defence. Both types of MR are sufficiently realistic to need appraising. Any MR policy for epoch 1 would have to take account of the need for properties and infrastructure to adapt.

The **undefended area between Stiffkey and Morston (sub-frontage G2)** consists of an intertidal area running into higher ground. Continuing the current no active intervention policy is certainly realistic. Introducing some form of defence is unlikely for epoch 1. For the later epochs it might have to be considered as part of mitigation for freshwater habitats lost elsewhere, but this seems unlikely. We suggest that no active intervention is the obvious policy for all epochs for this section.

**Blakeney Spit (sub-frontage G1)** is not currently managed. Its development in the longer term is uncertain. In epochs 1 and 2 its current movement towards land and extension towards the west will continue. In epoch 3 the question is whether or not the channels will silt up and whether or not the eastern end will become detached from the land (due to misalignment with the shingle ridge). These processes will be influenced (but not determined) by the policies in the rest of this super-frontage. This will determine the tidal prism and river discharge through the River Glaven and Blakeney channel and the course of River Glaven. The question is whether it is realistic to consider direct human intervention for Blakeney Spit itself through some form of hold the line. We suggest that this is not realistic, even in the long term. It seems more obvious to manage some of the drivers of Blakeney Spit's development. We therefore suggest that no active intervention is the only possible policy for Blakeney Spit for all three epochs.

### E3.3.5 Summary

As indicated in the introduction to section E3.3, most of the sub-frontages belong to a limited set of five shoreline types, for which the local issues and the interactions along the shoreline are similar. This section summarises the issues and suggested playing field for those five types. Note that some of the sub-frontages do not belong to these generalised types (A, B1, C5, E3, H2). Please refer to section E3.3 for their specific analysis.

**Undefended land (C1, C3, F2, G2)**
These are sections where the intertidal area runs into the higher ground. Continuing the current no active intervention policy is certainly realistic. Introducing some form of defence is unlikely during epoch 1. For the later epochs it might have to be considered as part of mitigation for freshwater habitats lost elsewhere, but this seems unlikely. We suggest that no active intervention is the obvious policy for all epochs for these areas.

**Barrier island/spit (D1, G1)**
This concerns Scolt Head Island and Blakeney Spit. They are both currently undefended and their development over the longer term is uncertain. In epochs 1 and 2 their current movement towards land and extension to the west will continue, while in epoch 3 the question is whether or not they will become attached to the land. This process will be influenced (but not determined) by the policy for the sub-frontages behind the island/spit through their influence on the tidal prism. The question is whether it is realistic to consider direct human intervention for the island/spit itself through some form of hold the line. We suggest that it is not, even in the long term. It seems more obvious to manage some of the drivers of their development (Deepdale and Norton sea banks) and deal locally with their consequences on the neighbouring bays. We therefore suggest that no active intervention is the only possible policy for all three epochs.

**Reclaimed marsh protected by embankments (with habitats, in some cases also with other features) (B2, C2, C4, D3, E2, E4, G5 and H1)**
These embankments provide flood protection to freshwater marshes. All these marshes have designated habitats. Some of them also contain residential properties, infrastructure, grade 3 or 4 agricultural land and recreation/tourism facilities. A change in how these defences are managed to allow flooding would have significant effects on the defended area. It would turn freshwater habitats into intertidal, but it would also affect the other features or require their adaptation. In all these sub-frontages, such a change would also have a significant effect along the shoreline. The increase in tidal prism would increase the likelihood of the tidal channels staying open, with the associated benefits (tourism, fisheries, landscape). For this type of sub-frontage, hold the line is an option that needs appraising. No active intervention and managed realignment are also realistic options, but only if the defended features can be adapted, especially if this concerns residential properties. In some cases, this means that NAI is not realistic for epoch 1 and that any MR policy needs to have an alignment and timing that allows for adaptation.

**River outfalls (D4, F1, F3, G3, G6)** with associated embankments protect river valleys from tidal flooding. The protected area usually has properties on the edge of the flood zone, is crossed by the A149 and other roads and contains grade 3 or 4 agricultural land. As for the reclaimed marshes, changes in how the defences are managed not only has a local effect but can also have a significant effect along the shoreline. It would increase the tidal prism and so increase the likelihood of the channels staying open. Compared to the reclaimed marshes, the issues are similar but with a different balance. There would be smaller effects along the shoreline, no designated habitats or tourism facilities and more residential properties and infrastructure at stake. For this type of sub-frontage, hold the line is an option that needs appraising. No active intervention and managed realignment can also be realistic

options, but only if the defended features can be adapted, especially if this concerns residential properties. This means that NAI is not considered realistic for epoch 1. For frontages with many residential properties in the tidal flood zone, this is not realistic for the later epochs either. Also, any MR policy needs to have an alignment and timing that allows for adaptation.

**Local defences (B3, D2, E1, E5, G4)** typically protect a narrow strip of land that rises to higher ground. Most properties are outside the tidal flood zone. For this type of sub-frontage, the defence has no significant effect on coastal processes so the policy can be based on local benefits and disadvantages. The neighbouring sections usually do affect this type of sub-frontage. They will influence how the foreshore develops which determines wave loading and toe stability. No active intervention and hold the line are sufficiently realistic to need appraising. Advance the line is not realistic as there is no reason for it. Managed realignment is not realistic because the defended strip is very narrow.

## E3.4 Defining policy packages

### E3.4.1 Introduction

This section contains the definition of the playing field and associated confirmed policy packages for appraisal, as agreed with the CSG and EMF. There were two main tasks associated with defining the policy scenarios. Firstly, it was necessary to define the options for appraisal. Secondly, the alignments of these defined policy packages were outlined 'on the ground'.

### E3.4.2 Defining options for appraisal

General considerations

As identified in earlier stages of the SMP, the North Norfolk SMP area can be divided into three areas with negligible coastal processes interactions along the shoreline. We refer to these as super-frontages:

- Super-frontage 1: Old Hunstanton to Thornham
- Super-frontage 2: Thornham to Stiffkey
- Super-frontage 3: Stiffkey to Kelling Hard

Within each super-frontage, the policy decisions for one area can influence the appraisal of another area. This means that developing and assessing shoreline management policies has to be done at that level (even though a more detailed approach may be needed for the actual appraisal). Policy development at a more detailed level (frontages or sub-frontages) would make it more difficult to take account of interactions along the shoreline properly.

Generally, the following two extreme fundamental options can be distinguished within the playing field:

- Sustain current land use in defended areas. This intent of management is one extreme end of the playing field. It will usually need the defences to remain where they are, with increased maintenance to resist future pressures. This is equal to the 'with present management' baseline scenario.
- Maximise natural processes. This intent of management is the other extreme end of the playing field. It consists of protecting currently-defended features long enough to allow adaptation or relocation (where needed). This is then followed by managed realignment. In some sub-frontages this would involve removing defences. In others (especially for river outfalls that protect significant numbers of houses), of moving the defences further inland but continuing to protect the houses. Compared to the 'no active intervention' baseline scenario, this option provides time to adapt where needed. In some sub-frontages, however, it can actually be more extreme than no active intervention because it can involve removing defences.

The subsequent analysis for each super-frontage assesses whether these extremes are sufficiently realistic to justify appraisal. Even though they are within the playing field for each sub-frontage, it may not be realistic to suggest 'extreme' policies for all sub-frontages within a super-frontage. Obviously, only having realistic policy packages will improve the effectiveness and efficiency of the appraisal process. In any case, the further options for appraisal will lie between these extremes and need to be defined for each super-frontage. These will be identified and defined on the basis of particular drivers and a related intent of management.

Super-frontage 1: Old Hunstanton to Thornham

This super-frontage contains frontages A and B. Existing defences are mainly natural vegetated dunes. There are also man-made defences of gabion groynes at Hunstanton golf course (stabilising the beach), limited soft dune protection at Holme dunes, a vegetated sea bank to the east of Gore Point and local defences at Thornham. Analysis of coastal processes indicates that policy decisions for the Thornham sea bank may affect the processes for Holme dunes/Gore Point and Old Hunstanton dunes. There is no significant effect along the shoreline in the other direction.

For **Thornham sea bank (sub-frontage B2)**, we propose three options:

1. Sustain current use of defended land. This involves continuing current defence management with increased maintenance to resist future pressures.

2. Managed realignment. This involves breaching Thornham sea bank but only after providing defences where needed to protect all houses. The main reasons for this option would be to create a large area of intertidal habitats, reduce pressures on Holme dunes and Old Hunstanton dunes and increase the tidal prism (with associated benefits for channel stability).
3. Enhance saline lagoons. This would be achieved by limited realignment and increased overtopping.

For **Holme dunes (sub-frontage B1)** the intent of management is clear. The flood defence function needs to be continued, but preferably through no intervention or as little as possible. The level of intervention needed depends on coastal processes and is determined by the policy for Thornham sea bank (increasing the tidal prism there reduces the intervention needed).

For **Old Hunstanton dunes (sub-frontage A)** the appraisal will be influenced by the decisions at Thornham sea bank, but a separate appraisal is still needed. The suggested options are:

1. Maintain flood defence function by maintaining the dunes where they are now.
2. Maintain flood defence function but allow natural change.

Finally, the **local flood defences at Thornham (sub-frontage B3)** can be treated independently and need a local decision between hold the line and no active intervention.

Super-frontage 2: Brancaster bay to Stiffkey marshes

Introduction

This super-frontage contains frontages C, D, E and F. It is a pattern of undefended and defended frontages, with a wide range of features and values. Analysis of coastal processes indicates that policy decisions for the defended areas behind Scolt Head Island will influence how it develops, which in turn influences the neighbouring frontages (Brancaster bay and Holkham bay). There is no significant effect along the shoreline the other way around.

Scolt Head Island and defended areas behind

The long-term development of Scolt Head Island is uncertain, but will be influenced by the size of the tidal area behind it. This could be increased by changing how we manage the defences of Deepdale and Norton sea banks, Burn River outfall and Overy marshes. Also, the appraisal for these five areas will consider local issues. We therefore propose two options for Scolt Head Island and the defended marshes behind it:

1. Sustain current use of defended land. This involves continuing the current management regime, with increased maintenance to resist future pressures.
2. Managed realignment. This would have to consist of a gradual progression of realignments further inland, likely to start with the Deepdale and Norton sea banks and/or the Overy marshes flood embankment in epoch 1 or early epoch 2 (taking into account the need for adaptation, especially for the houses). Further increases in the tidal prism by further realignment in Overy marshes, or even the River Burn outfall, would only have to be considered for later epochs and only if there is a need to find more intertidal habitat.

The only realistic policy for **Scolt Head Island** itself is no active intervention.

The **local flood defences at Burnham Overy Staithe (sub-frontage E1)** can be treated independently and need a local decision between hold the line and no active intervention.

West of Scolt Head Island

The various sub-frontages in this area are related through coastal processes and also through social and economic patterns. Also, they each have their own particular set of issues. This means they need appraising separately, while making sure that the influence of Scolt Head and other links are taken into account.

The **local flood defences at Brancaster and Brancaster Staithe (sub-frontage D2)** can be treated independently and need a local decision between hold the line and no active intervention.

For the **Royal West Norfolk golf club (sub-frontages C5 and C6)** the main decision for the SMP concerns whether there are any reasons to suggest or enforce a change of the hold the line policy that the golf club is currently applying to the clubhouse and practice area. There is no need for the SMP to consider economic viability as a criterion here because the defences are funded privately. Reasons for a change of policy could be a direct negative effect of the defences (for example on UKBAP habitats due to coastal squeeze) or an indirect negative effect through processes along the shoreline. However, the most likely reason for generating other options is the role of the defended clubhouse as a promontory, which could start functioning as a control for Brancaster bay. In the current situation, this effect along the shoreline is limited because the western end of Scolt Head is the control. However, this is likely to change during epoch 1 as Scolt Head keeps rolling back. For the later epochs this development is uncertain and will be influenced by the potential increase in the tidal prism behind Scolt Head. It must be noted that this potential role for the defended golf course as a control is not necessarily negative. While it is artificial, it will reduce the

pressure on defended areas in Brancaster bay, such as the RSPB reserve at Titchwell. Based on this, the options for the golf club are:

1. Sustain current use of defended land. This involves continuing the current management regime, with increased maintenance to resist future pressures.
2. Maximise natural processes by removing defences. Whether this means removal or gradual degradation will have to be determined at a more detailed level, depending on timescales.

The **Environment Agency defences at Brancaster (sub-frontage C4)** protect grazing marsh that is designated as part of the Special Protection Area (SPA) / Ramsar site. Policy choices for this sub-frontage could have an effect along the shoreline, but only on directly neighbouring sub-frontages. The extreme realistic options for this frontage are:

1. Sustain current use of defended land. This involves continuing the current management regime, with increased maintenance to resist future pressures.
2. Managed realignment. The main drivers for this option would be to create intertidal habitat and increase the tidal prism. The option could be implemented to benefit the stability of Mow Creek (the channel to Brancaster).

Like the golf course, the **RSPB defences at Titchwell (sub-frontage C2)** are funded privately, with the owners applying a hold the line policy (in this case at the soon-to-be realigned defences). So the main SMP decision is about whether the current policy has negative effects that need a change of management. Such effects are absent or insignificant. This means that the appraisal will not consider other options for this sub-frontage than hold the line (in the realigned position).

<u>East of Scolt Head Island</u>

For **Holkham dunes (sub-frontage E3)** the analysis of coastal processes has shown that the current functions of the dunes (flood defence for Overy marshes, but also habitats and tourism/recreation) could come under threat during epochs 2 or 3. This will be influenced by the development of the eastern end of Scolt Head. Decisions related to the flood defence function have to be made in conjunction with sub-frontages E2 (to the west) and E4 (to the east) as these protect the same area. For epoch 1, the only realistic policy is no active intervention, while for later epochs there may be a need to consider hold the line. At that stage, the effect on designated habitats could be a reason to suggest or enforce a certain policy, but this would require specific assessment once the issues and effects are clear.

The **Wells flood embankment (sub-frontage E4)** is another chain in the flood protection of Overy marshes. Realignment would increase the tidal

prism and could therefore benefit the channel, but the associated negative effects on the features right behind the defence make this an unrealistic option. Therefore, the only realistic policy for Wells flood embankment is hold the line for all epochs.

The **local flood defences at Wells quay (sub-frontage E5)** can be treated independently and need a local decision between hold the line and no active intervention.

**Wells east bank (sub-frontage F1)** is a short embankment that protects about 60 properties in Wells, various stretches of the A149 and other roads, as well as an area of grade 3 agricultural land. The extreme realistic options for this frontage are:

1. Sustain current use of defended land. This involves continuing the current management regime, with increased maintenance to resist future pressures.
2. Managed realignment. The main driver for this option would be to create intertidal habitat and increase the tidal prism, which could help to sustain the Wells harbour channel. This option would have to include adequate flood defence for the houses in Wells. It would also have to make sure that the transport connection that the A149 provides continues (through road realignment, reconstruction or local defences).

**Stiffkey bay (sub-frontage F2)** is currently undefended and no active intervention is the only realistic policy for all epochs.

Super-frontage 3: Blakeney Spit to Kelling Hard

This super-frontage includes frontages G and H. Blakeney Spit is a natural feature. There are man-made flood defences in front of Morston and Blakeney, an earth embankment protecting Blakeney Freshes and running along the western edge of Cley marshes with the River Glaven outfall in between. Cley and Salthouse marshes are protected by a shingle ridge, which is a continuation of Blakeney Spit. Analysis of coastal processes shows that policy decisions for frontage H will influence the development of Blakeney Spit, but that there is no longshore effect the other way around.

The long-term development of Blakeney Spit is uncertain. It is influenced by the size of the tidal area behind it, which could be increased by changes in management of the defended areas behind (Blakeney Freshes, Cley marshes, River Glaven outfall, the local defences at Morston and River Stiffkey outfall). Also, the appraisal for these five sub-frontages will have to consider local issues.

The extreme realistic options for the Blakeney Spit frontage are:

1. Sustain current use of defended land. This involves continuing the current management regime in all five sub-frontages, with increased maintenance to resist future pressures.
2. Managed realignment. This would have to consist of a gradual progression of realignments further inland, likely to start with Blakeney Freshes sea banks, the Morston defences and/or the River Stiffkey outfall (while making sure that houses at Morston and Stiffkey remain protected, that the transport function of the A149 is sustained and that enough time is provided to adapt other features). Further increases in the tidal prism in later epochs could be found in Cley marshes through realignment or removal of Cley west bank (possibly through a gradual process starting with no active intervention in earlier epochs). This would require measures to protect lower-lying houses in Cley (and possibly Salthouse) and to sustain the transport function of the A149. Finally, the River Glaven and River Stiffkey valleys could in principle be made intertidal (but only if accompanied by measures to defend houses and other features). This would only have to be considered for later epochs and only if there is a further need to find intertidal habitats.

The only realistic policy for **Blakeney Spit** itself is no active intervention.

The current policy for the **Cley to Salthouse shingle ridge (sub-frontage H2)** is no active intervention for the shingle ridge itself (to protect the habitat of the shingle ridge). The policy for the marshes is to keep the characteristic gradient from saline water at the ridge to fresh water at the landward edge (to be achieved by ensuring drainage of excess salt water that overtops the ridge). The Environment Agency and Natural England have agreed this policy for the medium and long term. We suggest taking this agreement into account in policy appraisal, but still to go through the normal policy appraisal process. For epoch 1, it is not realistic to change the policy. For later epochs, however, there may be a need to consider an option to maintain the flood defence function through intervention (in whatever form). This leads to the following options for this sub-frontage:

- epoch 1: continue no active intervention policy
- later epochs:
    - continue no active intervention
    - maintain flood defence function of the ridge.

Finally, the **local flood defences at Blakeney (sub-frontage G4)** can be treated independently and need a local decision between hold the line and no active intervention.

## E3.4.3 Defining alignment of policy packages

Introduction

The agreed policy packages to be appraised are described in detail along the north Norfolk shoreline from Old Hunstanton to Kelling Hard. In earlier stages we have identified three sections of the shoreline that have limited or no shoreline interaction between them and have referred to these as super-frontages:

- Super-frontage 1: Old Hunstanton to Thornham
- Super-frontage 2: Thornham to Stiffkey
- Super-frontage 3: Stiffkey to Kelling Hard

Within the super-frontages the policy decisions for one area can influence the appraisal elsewhere. Within the super-frontages, policy development zones (PDZs) have been defined to separate the coast into decision-making frontages. In some cases these are the same as the sub-frontages already defined, but in certain instances we had to group sub-frontages where a wider decision needed to be made. Each PDZ has potential policy packages that have been taken forward to appraisal.

Super-frontage 1 - Old Hunstanton to Thornham

**PDZ 1A (Old Hunstanton dunes)**

**(a) – Maintain flood defence function by holding the dunes where they are now**

**Definition:**
Maintain the current line of natural defence provided by the dune system for all three epochs, protecting the assets in and behind the dunes.

**Alignments:**
No need to discuss further – as for current defence lines.

**(b) – Maintain flood defence function but allowing natural dune development**

**Definition:**
The intent of this policy package is to promote natural dune development while continuing to provide flood defence to the houses and the A149. However, all of epoch 1 is needed to provide time to adapt land use and to increase understanding of long-term dune development. This policy package therefore continues present management (dune toe protection) during epoch 1. Epoch 2 is likely to include removing man-made dune protection,

combined with providing (if and when needed) local defences for the houses and the A149.

**Alignments:**
The intention in epoch 1 is to hold the dunes where they are now and allow time for adaptation. With natural dune development in epochs 2 and 3, the dunes are expected to roll back at a rate of one metre a year as determined in the baseline scenario of no active intervention. The dunes may roll back onto Old Hunstanton golf course and begin to approach houses in Old Hunstanton. The need for defences (and related alignments) depends on the actions taken in PDZ 1C and the subsequent development of Gore Point as a control for Old Hunstanton dunes, as discussed in the shoreline response analysis. Monitoring would be needed as part of this policy package. If defences were needed, they could be local defences for properties and infrastructure.

**PDZ 1B (Holme dunes)**

**(a) – Maintain flood defence function through minimum intervention**

**Definition:**
The flood defence function of the dunes to the low-lying land behind will be maintained. Within that constraint, natural development of the dunes will be allowed and the flood defence function will be maintained through the minimum amount of intervention necessary. This partly depends on policy decisions in PDZ 1C.

**Alignments:**
Holme dunes will be maintained where they are now with spreading of the dune system being an acceptable process.

**PDZ 1C (Thornham sea bank)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss further – as for current defence lines.

**(b) – Maximise tidal exchange to create intertidal habitat and support dune systems**

**Definition:**
The intent of this policy package is realignment to obtain the maximum possible area of intertidal habitat, increase channel stability and increase the

tidal prism for the River Hun (within the constraint of intending to protect all houses). However, all of epoch 1 is needed to provide time to adapt land use and to increase understanding of long-term shoreline response to realignment. This policy package therefore holds the current sea bank alignment during epoch 1. The intent for epoch 2 would involve removing part of Thornham sea bank after defences have been provided for houses at risk, or adaptation has occurred, in epoch 1.

**Alignments:**
During epoch 2 part of Thornham sea bank would be removed opening up the area behind the bank and Holme dunes to tidal influence (figure E4.1). The breach would be situated to maximise the positive effect on the harbour channel. The maximum extent of the tidal influence in this scenario is defined by the 1:10 year extreme water level. For Holme this is 5.11 metres at the end of epoch 2, accounting for sea level rise and will increase to 5.77 metres by the end of epoch 3. This is limited by the need to protect the properties that would be situated on the newly-created flood plain. Defences would need to be built around Whitehall Farm and then across the low-lying land to the dunes protecting the properties on Broadwater Road. The most suitable location for this defence would be linking the areas of slightly higher elevation north of the caravan park at Holme.

**(c) – Managed realignment to create intertidal habitat and support dune systems while sustaining the saline lagoons.**

**Definition:**
The intent of this policy package is to improve the saline lagoon priority habitat by limited realignment and increased overtopping of the defence. However, all of epoch 1 is needed to provide time to adapt land use and to increase understanding of long-term shoreline response to realignment. This policy package therefore holds the current sea bank alignment during epoch 1. The intent for epoch 2 would involve partly removing Thornham sea bank after defences have been provided, or adaptation has occurred, in epoch 1.

**Alignments:**
Realignment would be undertaken to create a new defence line along the northern side of the River Hun channel to the sluice where a drain enters from the south (figure E4.2). The line would then follow this drain south to the higher land and the topography would form the natural limit of tidal influence at the 1:10 year extreme water level.

**PDZ 1D (Thornham)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss further – as for current defence lines.

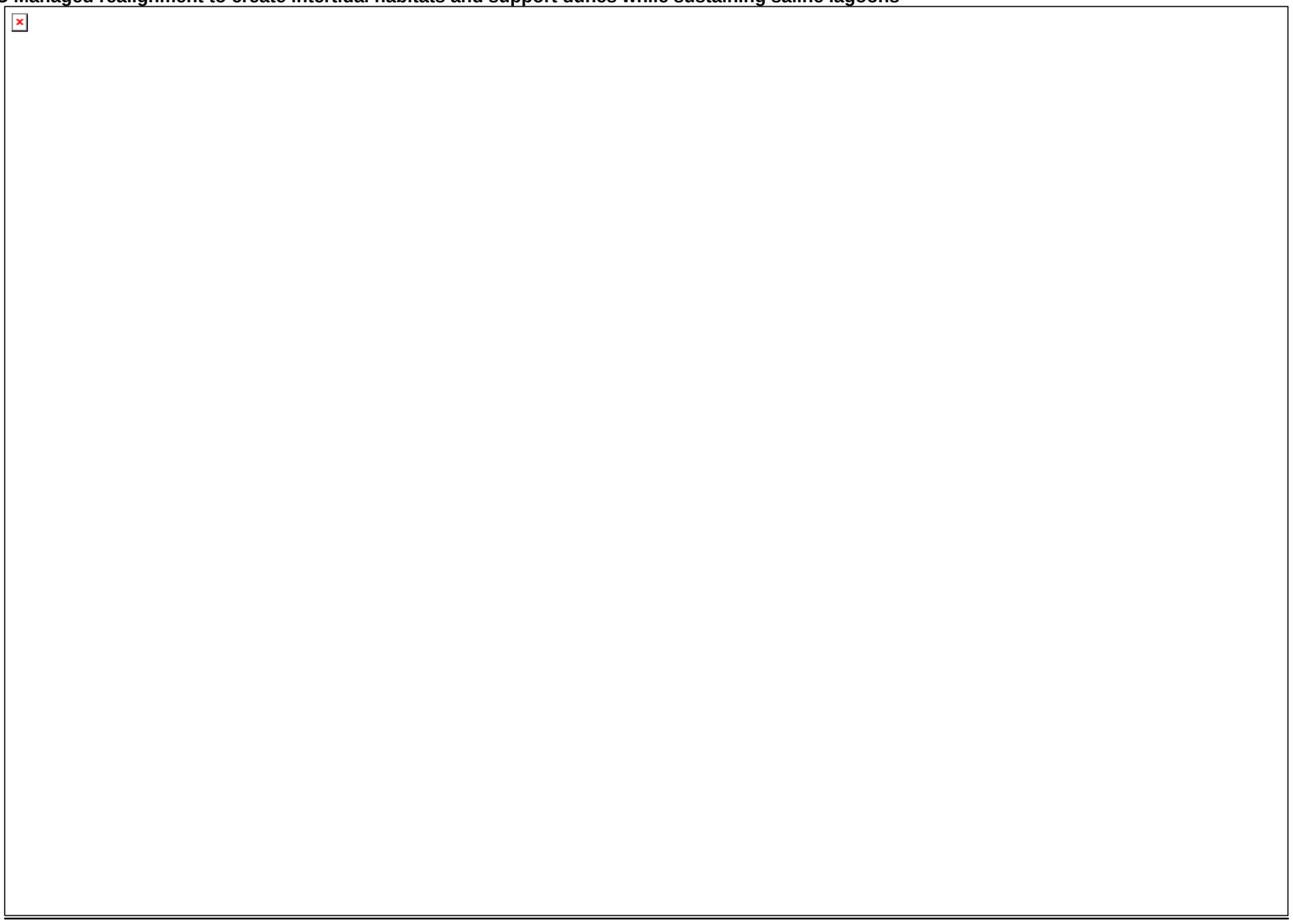
**(b) – No active intervention after time for adaptation**

**Definition:**
This scenario assumes that the defences are held in epoch 1 to allow time for properties and infrastructure to adapt. This would be followed in epochs 2 and 3 by a policy of no active intervention.

**Alignments:**
The alignment remains as it is now. The defences fronting the reclaimed land at Thornham would fail in epoch 1 under no active intervention (assessment of coastal defences). Continued maintenance in epoch 1 would therefore lead to failure towards the end of epoch 2.

**Figure E4.1 PDZ 1C Managed realignment to create intertidal habitat and support the dunes**

**Figure E4.2 PDZ 1C Managed realignment to create intertidal habitats and support dunes while sustaining saline lagoons**



Super-frontage 2 - Thornham to Stiffkey marshes

**PDZ 2A (Thornham to Titchwell)**

**(a) – No active intervention**

**Definition:**
PDZ 2A is not currently defended and it looks like there will be no reasons for introducing defences in the future.

**Alignments:**
No need to discuss further. The baseline scenarios report discusses coastal evolution in future epochs. During epoch 1 the saltmarshes will continue to experience vertical accretion at an average rate of 0.84 metres a year (EA Coastal Trends Analysis, 2007). The dunes in front of the saltmarsh are expected to roll back at a rate of 0.33 metres a year through all three epochs.

**PDZ 2B (Titchwell)**

**(a) – Hold the line at the realigned position**

**Definition:**
Keep the existing alignment of the frontage for all three epochs.

**Alignments:**
Managed realignment of the outer defences is currently underway and the defences will be held at the new position. For PDZ 2B hold the line has been identified as the only realistic policy option.

**PDZ 2C (Titchwell village)**

**(a) – No active intervention**

**Definition:**
PDZ 2C is not currently defended and it is expected that there will be no reasons for introducing defences in the future.

**Alignments:**
No need to discuss further. The baseline scenarios report discusses coastal evolution in future epochs. The dunes in front of the saltmarsh are expected to roll back at a rate of 0.33 metres a year through all three epochs

**PDZ 2D (Reclaimed grazing marsh at Brancaster)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss the extents as this will be the current defence lines.

**(b) – Partial removal of defences to increase intertidal habitat**

**Definition:**
The intent of this policy package is maximum landward realignment of defences to increase the area of intertidal habitat. However, all of epoch 1 is needed to provide time for land use to adapt and to improve understanding of the shoreline response to realignment. The sea bank defending the grazing marsh will therefore be held in epoch 1. The intent for epoch 2 would involve removing the east sea bank, including providing continued access to the golf course and beach.

**Alignments:**
The line would be held during epoch 1. During epoch 2 the eastern defences would be breached in the south eastern sector beyond the golf club practice ground increasing the tidal prism of Mow Creek (see figure E4.3).

**PDZ 2E (Royal West Norfolk golf club)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss as this will be the current defence lines.

**(b) – Remove defences**

**Definition:**
Defences are removed followed by a policy of no active intervention.

**Alignments:**
At PDZ 2E, one option is to remove the defences in epoch 3, then move to a policy of no active intervention. The reason for this policy would be the potential negative effects of defending this frontage from a coastal processes standpoint, which is not likely to happen before epoch 3. Under no active

intervention for the dunes, they are predicted to roll back at a rate of 0.3 metres a year impinging on the golf course and car park.

**PDZ 2F (Brancaster and Brancaster Staithe)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss as this will be the current defence lines.

**(b) – No active intervention after time for adaptation**

**Definition:**
This scenario assumes that the defences are held in epoch 1 to allow time for properties and infrastructure to adapt. This would be followed in epochs 2 and 3 by a policy of no active intervention.

**Alignments:**
The alignment remains as it is now. Most of the defences would fail in epoch 1 under no active intervention with defences at Brancaster Staithe lasting into epoch 2 (assessment of coastal defences). Continuing maintenance during epoch 1 would delay this failure until towards the end of epoch 2.

**PDZ 2G (Reclaimed areas behind Scolt Head Island)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss as this will be as for the current defence lines.

**(b) – Gradual increase of tidal exchange to create intertidal habitat**

**Definition:**
The intent of this policy package is realignment of defences further inland to increase the area of intertidal habitat. Epoch 1 is needed to allow for time to develop further understanding of channel response to realignment. This policy package therefore holds the current alignments during epoch 1. It assumes realignment of Deepdale and Norton marshes in epoch 2 and of Overy marshes in epoch 3, but continued defence of the River Burn valley at the river outfall.

**Alignments:**
The alignment in epoch 1 remains as it is now. If realignment were to occur, it would begin with Deepdale and Norton sea banks in epoch 2. This would need to take account of adaptations needed for the houses (see figure E4.4). At Deepdale and Norton marshes defences for the properties at Burnham Deepdale and Burnham Norton, including Marsh Farm, would be needed. Also, a flood bank would be needed west of Marsh Farm to protect the A149 which falls within the 1:10 year water level (4.63 metres at Burnham Overy Staithe at the end of epoch 2). There is the potential for realignment of Overy marshes during epoch 3. This would require new defences at Marsh Farm and Marsh House Farm. The proposed limit of the realignment would be to build a flood embankment between Marsh House Farm and the dunes to the north.

**PDZ 2H (Burnham Overy Staithe)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss as this will be the current defence lines.

**(b) – No active intervention after time for adaptation**

**Definition:**
This scenario assumes that the defences are held in epoch 1 to allow time for properties and infrastructure to adapt. This would be followed in epochs 2 and 3 by no active intervention.

**Alignments:**
The alignment remains as it is now. The defences fronting the reclaimed land at Burnham are predicted to fail in epoch 1 under no active intervention (assessment of coastal defences). Maintaining these during epoch 1 would therefore lead to failure towards the end of epoch 2.

**PDZ 2I (Holkham dunes)**

**(a) – Maintain flood defence function through minimum intervention**

**Definition:**
The flood defence function of the dunes to the low-lying land behind will be maintained and erosion will not be allowed to occur. This will be achieved through the minimum amount of intervention needed.

**Alignments:**
The current function of Holkham dunes may come under threat in epochs 2 or 3 due to the development of Scolt Head Island. However, for epoch 1 no active intervention is the only realistic policy, while hold the line may be needed for later epochs. The current trend of shoreline evolution is erosion at an average rate of 1.05 metres a year (EA Coastal Trends Analysis, 2007).

**PDZ 2J (Wells flood embankment)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
At Wells flood embankment hold the line has been identified as the only realistic policy option. No need to discuss the extents as this will be the same as the current defence lines.

**(b) – No active intervention in epoch 3**

**Definition:**
This scenario assumes that the defences are held in epochs 1 and 2. This would be followed in epoch 3 by a policy of no active intervention.

**Alignments:**
The alignment remains as it is now. The defences of Wells flood embankment are predicted to fail in epoch 1 under no active intervention (assessment of coastal defences). Maintaining these would therefore lead to failure towards the end of epoch 3.

**PDZ 2K (Wells quay)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs. There may be a sub-option to increase the standard of flood defence for the quay. This does not need a separate alignment definition but will be assessed separately in policy appraisal.

**Alignments:**
No need to discuss as this will be the current defence lines.

**(b) – No active intervention after time for adaptation**

**Definition:**
This scenario assumes that the defences are held in epoch 1 to allow time for properties and infrastructure to adapt. This would be followed in epochs 2 and 3 by a policy of no active intervention.

**Alignments:**
The alignment remains as it is now. The defences at Wells quay are predicted to fail in epoch 1 under no active intervention (assessment of coastal defences). Maintaining these would therefore lead to failure towards the end of epoch 2.

**PDZ 2L (Wells east bank)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss as this will be the current defence lines.

**(b) – Partially remove defences to create intertidal habitat**

**Definition:**
Maximum landward realignment of defences to increase the area of intertidal habitat and the tidal prism while continuing to protect Wells and the A149. The realignment would be carried out as soon as possible after providing the defences needed. In addition to its direct benefits on intertidal habitats and channel navigability, this realignment would function as a pilot to develop understanding to feed into decisions about other realignments in later epochs.

**Alignments:**
Under this option there is a need to build defences to the east of Wells across the new flood plain (potentially using a bank that is already there) and in front of the A149 at Halfway House. These would need to be in place before the bank is breached as early as possible during epoch 1. The 1:10 year extreme water level at Wells is 4.54 metres at the end of epoch 1 taking account of sea level rise (see figure E4.5).

**PDZ 2M (Stiffkey bay)**

**(a) – No active intervention**

**Definition:**
Stiffkey bay is not currently defended and there should be no reasons for introducing defences during epoch 1. In later epochs defences may be introduced as part of a scheme to mitigate against loss of freshwater habitats elsewhere

**Alignments:**
No need to discuss further. The baseline scenarios report discusses coastal evolution in future epochs. Currently the trend is of accretion on the upper saltmarsh in epochs 1 and 2 and erosion of the seaward edge of the saltmarsh at 2.87 metres a year across all epochs (EA Coastal Trends Analysis, 2007). Andrews *et al.* (1999) measured saltmarsh accretion of 4.03 millimetres a year.

**Figure E4.3 PDZ 2D Managed realignment to create intertidal habitat**

**Figure E4.4 PDZ 2G Managed realignment to create intertidal habitat**

**Figure E4.5 PDZ 2L Managed realignment to create intertidal habitat**

Super-frontage 3 - Blakeney Spit to Cley-next-the-Sea

**PDZ 3A (Reclaimed areas behind Blakeney Spit)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss as this will be the current defence lines.

**(b) – Managed realignment to create intertidal habitat**

**Definition:**
The intent of this policy package is to move the defences further inland to increase the area of intertidal habitat. The realignment at Morston would happen at the earliest opportunity after providing defences for the houses and the A149. As well as its direct benefits on intertidal habitats and channel navigability, this realignment would function as a pilot to develop understanding to feed into decisions about further realignments in later epochs. The policy package assumes realignment of Blakeney Freshes in epoch 2 and of Cley west bank in epoch 3, with continued defence of River Glaven and River Stiffkey valley at both river outfalls.

**Alignments:**
The reclaimed areas behind Blakeney Spit would be realigned taking account of the need for properties and infrastructure to adapt. This would be a gradual process beginning to the east of Morston. It would need to be accompanied by a new defence line to protect the properties and the A149 to the east of the village. The 1:10 year extreme water level is 4.31 metres for Blakeney at the end of epoch 1.

During epoch 2 the realignment could be implemented at Blakeney Freshes sea banks, the defences being breached just north of Blakeney at the western limit of the Freshes (see figure E4.6). The 1:10 year extreme water level is 4.35 metres for Blakeney at the end of epoch 2 which puts the grounds of Wiveton Hall at risk.

During epoch 3 further increases in tidal prism could be obtained at Cley marshes by removing Cley west bank. At the end of epoch 3 the 1:10 year extreme water level reaches 5.01 metres. This would require protection for the low-lying houses and road in Cley and Salthouse, as well as for the A149.

**PDZ 3B (Stiffkey to Morston)**

**(a) – No active intervention**

**Definition:**
PDZ3B between Stiffkey and Morston is not currently defended. It is unlikely that there will be any reasons for introducing defences during epoch 1. In later epochs defences may be introduced as part of a scheme to mitigate against loss of freshwater habitat elsewhere

**Alignments:**
No need to discuss further. The baseline scenarios report discusses coastal evolution in the future epochs.

**PDZ 3C (Blakeney)**

**(a) – Sustain current use of defended land**

**Definition:**
Keep the defences where they are now for all three epochs.

**Alignments:**
No need to discuss as this will be the current defence lines.

**(b) – No active intervention after time for adaptation**

**Definition:**
This scenario assumes that the defences are held in epoch 1 to allow time for properties and infrastructure to adapt. This would be followed in epochs 2 and 3 by no active intervention.

**Alignments:**
The alignment remains as it is now. The defences at Blakeney are predicted to fail during epoch 1 under no active intervention (assessment of coastal defences). Continuing maintenance in epoch 1 would therefore lead to failure towards the end of epoch 2.

**PDZ 3D (Cley to Salthouse shingle ridge)**

**(a) – Maintain flood defence function through minimum intervention**

**Definition:**
This policy package continues the existing policy. In principle there is no active intervention on the shingle ridge itself, but this is combined with drainage of overtopping sea water from the marshes. It includes the intent to intervene if the shingle ridge were to breach and cause unacceptable flood risk. The need for interventions depends on the shoreline response.

**Alignments:**
Based on the shoreline response assessment, it is unlikely that intervention will be needed during epoch 1 to maintain the flood defence function. In later epochs it may be necessary to do some work. Even if interventions are carried out, it is assumed that the natural alignment of the ridge will be allowed to develop. The ridge is expected to roll back at a rate of one metre a year through all three epochs.

**(b) – No active intervention**

**Definition:**
This scenario assumes that there is a policy of no active intervention for the shingle ridge throughout all epochs. Defences would be provided for properties at Cley and Salthouse, as well as adpatation of the A149.

**Alignments:**
The shingle ridge is expected to roll back at a rate of one metre a year through all epochs allowing natural alignment of the ridge.

**Figure E4.6 PDZ 3A Managed realignment to create intertidal habitat**

# E4 Policy appraisal

## E4.1 Development of policy appraisal method

### E4.1.1 Baseline scenarios testing

In order to develop and test the method for policy appraisal, an additional task was introduced to this SMP. This task aimed to assess the agreed principles and criteria (see section E2) for the two baseline scenarios (no active intervention and with present management) discussed in appendix F. This additional task provided an assessment of the two baseline scenarios. This was partly relevant for the actual policy scenarios and also helped in developing realistic scenarios. This task allowed the CSG to comment on the method and format/presentation of the results.

Following this task, the agreed method, as detailed in section E4.1.2, was used to assess the performance of the policy packages against the objectives. The full results of this assessment for one example frontage are provided in section E5. The full appraisal results for the preferred policies are included in appendix G.

### E4.1.2 Agreed method

Inputs
The appraisal uses outcomes of a number of preceding tasks.

Framework for appraisal:
Based on the report 'Objectives for policy appraisal', draft versions were discussed in Spring and Summer of 2008. The principles were agreed in March 2008. The approach for setting criteria and indicators to allow appraisal against the principles was agreed in July 2008. Based on that a set of (SMP-wide) criteria and (frontage-specific) indicators were developed, as reported in the objectives report.

Options being appraised:
The options for appraisal for each area (policy packages) were developed in close consultation with the CSG and EMF. The final list is set out in the note 'Defining options for appraisal' of October 2008. This note describes the confirmed options for appraisal, based on discussions with CSG and EMF. The options for appraisal are also listed in chapter E3.4.2 (for each of the policy development zones).

Alignment of policy packages:
The suggested alignments for this second cycle of the appraisal are described in the note 'Defining alignment of policy packages' (second cycle), February 2009. This note also introduces the policy development zones

(PDZs). These are the frontages for which the playing field and policy options have been defined.

Shoreline response to policy packages:
The assessment for the second cycle was described in a report 'Shoreline response for appraisal (second cycle)'. This report and associated graphics were developed at the same time as the appraisal. The main outcomes are included in the appraisal summary in section E4.2 of this appendix.

Assessment
The task assessed the policy packages against the criteria. The results of that assessment were then combined into a score for each principle.

**Assessment for each criterion**
For this part of the task, each individual criterion is assessed against the predicted shoreline evolution (discussed in appendix F, section F3) and results are indicated by a combination of a number/colour. As a result, each criterion is given a score out of 9 and the appropriate colour is assigned to the criterion for easy reference. Table E5.1 shows the scoring system.

**Table E5.1 Assessment for each criterion**

| Decreasing fulfilment of criteria ↓ | Score | Description | Associated colour |
|---|---|---|---|
| | 9 | **Good** performance of the policy package against the criterion | |
| | 8 | | |
| | 7 | | |
| | 6 | **Average** performance of the policy package against the criterion | |
| | 5 | | |
| | 4 | | |
| | 3 | **Poor** performance of the policy package against the criterion | |
| | 2 | | |
| | 1 | | |

For each PDZ, this assessment is undertaken for each agreed policy package and for all three epochs (present day to 2025, 2026 to 2055 and 2056 to 2105).

A narrative is included for each criterion to explain further the effect of the policy package on the specific criterion. This narrative describes the judgement behind the score based on the indicators (quantifiable as far as possible) as identified in the objectives report. An example table is included in section E4.5.

In the next step, the results for each criterion are aggregated to assess the performance of each policy package against each principle. The score for

each criterion (within a PDZ) will be averaged, giving an overall score and associated colour for each epoch.

The aggregate assessment is the tabulated end product of the appraisal and is shown schematically. These figures provide an overview for each PDZ for each policy package and use a symbol to represent each principle. The symbol is then shaded green, amber or red to show how the policy package scores against each principle. The graphics (section E4.6) are intended to provide decision-makers with a transparent overview of the advantages and disadvantages of each of the policy packages. This should support them in their decision to choose the policy package that will deliver the best balance of values.

As part of the method, an iterative process of fine-tuning was included. This involved producing a 'first-cycle' of full assessment tables and graphics for each policy package for each PDZ, acceptance by the Environment Agency and then presenting these results at the following CSG. A 'second-cycle' followed that incorporated the relevant CSG comments and the results were presented at the next EMF meeting.

## E4.2 Results of the appraisal

The appraisal was carried out according to the agreed approach as discussed in the previous section (section E4.1), using qualitative scores for each principle supported by a narrative and aggregated to scores for each aspect. These were then presented graphically to show the balance of values that each policy package achieves.

The appraisal was carried out by policy development zone and for policy packages. Each reflects an 'intent of management' for the PDZ.

This section focuses on the final outcomes of the policy appraisal process.

Due to the size of the appraisal tables, there would be no benefit in including the full set of appraisal tables in this section. As a result this section will only present the assessment tables for one policy package for one PDZ for illustration (PDZ2G).

The results are described and analysed in section E5.4, which also incorporates information from the initial sensitivity check.

## E4.3 Initial sensitivity analysis

This section discusses some of the main uncertainties that are likely to have an effect on policy selection. What is the uncertainty? What is the potential effect on the performance of policy packages against the principles? How could this uncertainty be managed in the SMP process?.

Climate change

Sea level will continue to rise but the rates are uncertain, especially for epoch 3. The rate of sea level rise influences the speed of morphological developments and, for more complex processes (for example, development of the area behind barrier islands), whether they are accreting or eroding. SMP policy development is very sensitive to this direction of the processes. The predicted potential reattachment of the barriers to the land in later epochs is an important driver for selecting policies.

The UK Climate Impacts Programme published an update of its projections in 2009 (UKCP09). This emphasised the importance of the issue and also highlighted the uncertainty about the actual rates by presenting a range of possible futures with associated likelihoods. The rates used in the SMPs fall within the range that UKCP09 predicts, but UKCIP indicates that slower or faster rates are also realistic (although less likely).

This uncertainty should be managed by choosing 'no-regret' policies for the short term, combined with reviewing the SMP policies as new sea level rise information becomes available. This can be tied to the SMP process by including monitoring in the action plan.

The main issue for policy appraisal concerns policy packages with management changes in epoch 1 that cause large irreversible effects. If the drivers are not robust enough, a no-regret approach may be preferable.

Another aspect concerns the (small) likelihood of dramatic speed-up of sea level rise. UKCP09 describes this through its high ++ scenario, with an upper limit of sea level rise of two metres in the 21st century. The appropriate response to this uncertainty would not consist of physical changes/SMP policy, but rather of awareness. We could consider including an action in the action plan to analyse 'thresholds' for sea level rise that are likely to cause particular effects (such as the approach that Thames Estuary 2100 adopted or the recently-developed '2nd Delta Plan' for the Netherlands).

Behaviour of coastal processes

Coastal geomorphology is a complex science that typically deals with large uncertainties. The main ones for the North Norfolk SMP are:

- **Development of the barrier islands and dunes**. Data currently available indicate the predicted rates of rollback of the barrier islands and dune systems. However, these are only consistent into epoch 1. The development into later epochs is much more uncertain, particularly when looked at in combination with climate change. It is possible to predict the large-scale responses, an important driver for policy selection, but not the exact extent of what may occur.

- **Effect of tidal prism increase on the stability of navigation channels**. Navigability of channels is an important driver for realignment. It is thought that the increase in tidal exchange in an area that widens the area for water movement can reduce the overall pressure on a navigable channel and reduce siltation. However, the exact response of the channel is unknown as SMP policy is not sensitive enough to such developments. Allowing realignment in one area will enable monitoring of a channel response to improve this understanding. The degree that the channels may be stabilised relies on designing and implementing strategies and schemes where necessary.
- **Longshore effect of barrier islands and spits**. As control points for the north Norfolk coastline, the reactions of these areas are important for developing policies at the SMP scale. Consultation has led to more detailed knowledge of how Blakeney Spit and Scolt Head Island progress naturally. There appears to be some cyclic progression of growth and erosion of the distal end of Blakeney Spit, further altering the effects along the shoreline. The uncertainty of the shoreline in responding to the natural progression of these areas increases with distance. It also depends on the policy option chosen for the area where the longshore effect is being defined.
- **Development of the shingle ridge between Cley and Salthouse**. Our analysis is based on the evaluation by Hardy (1964), which predicted a one metre a year rollback of this shingle ridge. It is assumed that the ridge will respond to sea level rise and increased storminess. The SMP policies are not very sensitive to the extent of this rollback beyond epoch 1, although they do respond to the ridge development overall.

Future land use/future habitat needs

The future socio-economic structure of the north Norfolk coast (the basis for the driving role of the navigation channels) and future habitat needs (brackish versus saline, role of natural processes) are important uncertainties that can change the balance between these values and will therefore have significant effects on policy appraisal. The SMP guidance suggests it is not appropriate to speculate about changes in social attitudes or policy. Still, this uncertainty is a fact that the SMP has to deal with.

At a more specific level, the broad-scale economic viability analysis in appendix H does not include a quantitative assessment of the benefits for, or costs of, land use (agriculture, navigation, tourism and recreation), accepting this as an uncertainty in the resulting benefit cost ratios.

## E4.4 Overview and analysis of appraisal results

This section summarises the appraisal results. For each policy development zone the policy packages are described and assessed and then compared. This leads to the preferred policy package as recommended by the CSG. If

relevant, the text contains suggestions for final fine-tuning of the policy packages. Both the recommended preferred policy packages and the suggestions for fine-tuning were confirmed by the EMF.

### E4.4.1 PDZ 1A: Old Hunstanton dunes

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Maintain flood defence function by holding the dunes where they are now
- b – Maintain flood defence function but allow natural dune development

**A: Maintain flood defence function by holding the dunes where they are now**

Description of the policy package

The current line of natural defence provided by the dune system will be maintained for all three epochs, protecting the assets in and behind the dunes.

Shoreline development for the policy package

As sea level rises and storminess increases, the need for measures to hold the dunes where they are now increases. In addition, interventions may be needed to reduce overtopping. There is likely to be erosion of the foreshore in front of the dune line. The need for interventions partly depends on how Gore Point develops, which is partly influenced by policy decisions for Thornham sea bank.

**B: Maintain flood defence function but allow natural dune development**

Description of the policy package

The intent of this policy package is to promote natural dune development while continuing to provide flood defence to the houses and the A149. However, all of epoch 1 is needed to provide time to adapt land use and increase understanding of long-term dune development. This policy package therefore continues present management (dune toe protection) during epoch 1, while epoch 2 is likely to include removing the man-made dune protection. If natural dune development leads to a situation with not enough flood protection, intervention will be needed to provide defences for the houses and infrastructure. The intervention is likely to consist of local defences, but beach recharge could also be an option (to be assessed when needed based on monitoring and more detailed study).

Shoreline development for the policy package

The dunes will naturally roll back at a rate of one metre a year. During epochs 1 and 2 this will pass many of the beach buts at Old Hunstanton and the dunes will start to impinge on Hunstanton golf course. In epoch 3 the

dunes will have rolled back to the houses at Old Hunstanton and more of the golf course will have been lost. It is uncertain if and when there would be a need for intervention to secure flood defence, but this is assumed to happen towards the end of epoch 2. The need for interventions partly depends on how Gore Point develops, which is partly influenced by policy decisions for Thornham sea bank.

**Comparison of the policy packages**

Both options are the same for epoch 1. For the later epochs, both options keep protecting the houses, infrastructure and other features behind them.

The key difference between the policy packages is the reliance on man-made defences and their management and the associated effect on the beach and the dunes (including the golf course). Holding the dunes where they are now requires more man-made defence and is likely to squeeze the beach, but it will sustain current land use in the dunes. Allowing natural processes will lead to increased variability of the shape and width of both the beach and the dunes and will require more flexible land use in the future. Towards the later epochs there is increasing uncertainty about what work will be needed to maintain flood protection.

There is no difference in epoch 1. The differences are limited in epoch 2, but are likely to become more and more significant during epoch 3.

Recommended preferred policy package

The recommended preferred policy package is option B: maintain flood defence function but allow natural dune development. This includes holding the existing line in epoch 1 to provide time for adaptation and to develop the knowledge of shoreline processes needed to assess realignment in later epochs. This knowledge needs to be generated during epoch 1 by continued monitoring and research.

### E4.4.2 PDZ 1B Holme dunes

The intent of management for this frontage has been agreed in the preceding stage, so there is no need to go through full appraisal. The agreed option is ‘maintain flood defence function through minimum intervention’.

Description of the policy package

The flood defence function of the dunes to the low-lying land behind will be maintained. Within that constraint, the dunes will be allowed to develop naturally. Their flood defence function will be maintained through the minimum amount of intervention necessary, which partly depends on policy decisions for Thornham sea bank. The policy decisions for Thornham sea bank could also reduce the need for flood protection from the dunes.

This policy requires monitoring of the dune system. At strategy level, the interventions needed to maintain the flood defence function could consist of local works on the dunes themselves, beach recharge, landward widening of the dunes or local defences inland of the dunes.

Shoreline development for the policy package
Holme dunes are likely to continue to roll back. Sea level rise and increased storminess are likely to increase the need to intervene in later epochs.

### E4.4.3 PDZ 1C Thornham sea bank

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – Managed realignment to create intertidal habitat and support the dunes
- c – Managed realignment to create intertidal habitat and support the dunes while sustaining the saline lagoons

**A: Sustain current use of defended land**
Description of the policy package
Keep the existing alignment of the frontage for all three epochs.

Shoreline development for the policy package
Sea level rise and possible increased storminess is likely to increase loading on the defences throughout the epochs. For epochs 1 and 2 this is to some extent counteracted by the accretion of the intertidal area causing increased wave dissipation. Into epoch 3, however, coastal squeeze is likely to occur which will further increase loading. Siltation of Thornham harbour channel is likely to increase.

**B: Managed realignment to create intertidal habitat and support the dunes**
Description of the policy package
Managed realignment to create the maximum area of intertidal habitat and obtain the maximum tidal prism for the River Hun. This is likely to strengthen the tidal channel to Thornham and the outer estuary (which could strengthen Holme dunes and Hunstanton dunes). The realignment involves removing part of the Thornham sea bank in epoch 2. This will happen after defences have been provided for houses that would be at risk and the features outside the new defence line have been adapted during epoch 1.

Shoreline development for the policy package

During epoch 2 part of Thornham sea bank is removed opening up the area behind the bank and Holme dunes to tidal influence. This will increase the tidal prism and the associated flows in the harbour channel by about 90 per cent which will help to sustain the channel. It will extend the intertidal area by about 240 hectares. The breach would be situated to maximise the positive effect on the harbour channel. In line with the principles, the intent is to continue to protect all houses in the area. Defences would need to be built around Whitehall Farm and then across the low-lying land to the dunes protecting the properties on Broadwater Road. The most suitable location for this defence would be to link the areas of slightly higher ground north of the caravan park at Holme.

**C: Managed realignment to create intertidal habitat and support the dunes while sustaining the saline lagoons**

Description of the policy package

Realignment further inland to create intertidal habitat and increase the tidal prism, but continue protection for the saline lagoons. This has similar but smaller effects to policy package B - some strengthening of the tidal channel to Thornham and the outer estuary and hence Holme and Old Hunstanton dunes. The realignment involves removing part of Thornham sea bank in epoch 2, after providing defences for houses that would be at risk and adapting the features outside the new defence line during epoch 1.

Shoreline development for the policy package

During epoch 2 part of Thornham sea bank is removed opening up the area behind the bank and Holme dunes to tidal influence. This will increase the tidal prism and the associated flows in the harbour channel by about 50 per cent. It will extend the intertidal area by around 130 hectares. The breach would be situated to maximise the positive effect on the harbour channel. The alignment of the defence would be along the northern side of the River Hun channel to the sluice where a drain enters from the south. The line would then follow this drain south to the higher land. In line with the principles, the intent is to continue to protect all houses in the area. Defences would need to be built around Whitehall Farm. All other houses are inland of the saline lagoons.

## Comparison of the policy packages

All three options intend to keep protecting the houses behind them. Also, all options are the same for epoch 1, in which the existing defence line would be held.

Into the later epochs, the key difference between the options concerns the effect on habitats and agricultural land in the currently-defended area, balanced against creating new habitats and the likely positive effect to

sustain Thornham harbour channel and Holme dunes. The length and extent of defences also varies between the options. In summary:

- The two realignment options are negative for agriculture but likely to be positive for navigation and fisheries that use Thornham harbour channel
- The two realignment options are likely to have a positive effect along the shoreline
- For habitats, the appraisal is complicated because of the interaction of different habitats and their values:
  - the two realignment options create intertidal habitat and are likely to support Holme dunes (a priority habitat)
  - the saline lagoons (also a priority habitat) are lost under option B, sustained by holding the line and potentially enhanced by option C
  - the decision may be influenced by the overall effect of SMP policies on habitat losses and gains at SMP scale or higher. This will have to be developed through the parallel Appropriate Assessment process and ongoing communication at national level
- The length and extent of defences is smallest for option B, but this does mean building new defences. Holding the current line leaves a long and relatively exposed defence, but without the need for construction. Realignment up to the saline lagoons will require significant work and leave a long defence line.

The preferred policy should reflect the right balance between these aspects. It should also take into account the uncertainty, especially around the positive effect of the increase in tidal prism on Holme dunes and possibly on navigation.

Recommended preferred policy package

The recommended preferred policy package is option B: maximise tidal exchange to create intertidal habitat and support the dunes. This includes holding the existing line in epochs 1 and 2 to provide time for adaptation and to develop the knowledge of shoreline processes needed to consider realignment in epoch 3. This knowledge needs to be generated during epochs 1 and 2 by continued monitoring and research.

### E4.4.4 PDZ 1D Thornham

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – No active intervention
- c – Realign defences to create intertidal habitat

**A: Sustain current use of defended land**

Description of the policy package

Keep the defences where they are now for all three epochs.

Shoreline development for the policy package

Sea level rise and possible increased storminess are likely to increase loading on the defences throughout the epochs. For epochs 1 and 2 this is counteracted to some extent by the accretion of the intertidal area causing increased wave dissipation. Into epoch 3, however, coastal squeeze is likely to occur which will further increase loading.

**B: No active intervention after time for adaptation**

Description of the policy package

This scenario assumes that the defences are held in epoch 1 to allow time for adaptation. This would be followed in epochs 2 and 3 by no active intervention.

Shoreline development for the policy package

The defences are predicted to fail during epoch 2. This would lead to exposure of this frontage back to the higher ground. This exposure will increase with sea level rise and increased storminess, likely to be made worse into epoch 3 due to coastal squeeze.

**C: Realign defences to create intertidal habitat**

Description of the policy package

This scenario assumes that the existing defences would no longer be maintained, allowing the gradual conversion of the currently-defended areas to intertidal habitat. In time, a limited number of properties may become at risk of flooding due to climate change and they may then need adapting or local defence.

Shoreline development for the policy package

The movement of the current defence line during epoch 1 would cause coastal processes that are equivalent to those at present, although allowing a more natural landscape to develop. There would be continued erosion of the foreshore and overwashing of the dunes. The old embankments are likely to have completely failed. Saltmarsh is likely to have developed by the end of epoch 2. There would be pressure on any defences built during epoch 3. Processes will, however, remain much the same with continued rollback of the dunes allowing more natural habitat to develop.

**Comparison of the policy packages**

This defence protects a narrow strip of land and there is no significant effect along the shoreline. So the decision for this PDZ in the first instance revolves around the question whether it is worthwhile to keep maintaining the defence.

The testing of economic viability informs whether this is likely to be affordable for the Environment Agency. Even if this is not the case however, the SMP has not identified any overriding reasons why other parties would not be allowed to continue to maintain the defences.

Through the assessment, there is the possible alternative option of small-scale realignment, which has its own particular benefits and disadvantages. Assuming that flood defence will continue to be provided, a realignment would have the benefit of creating intertidal habitat on a site that is currently not designated, combined with reducing the length and exposure of the new defence. The main disadvantages are the cost of realignment and the loss of agricultural land.

Recommended preferred policy package
For now, the recommended preferred policy package is option C: realignment of defences to create intertidal habitat.

Following on from this initial recommendation, further work was carried out to assess the existing flood defence and what it protects. Based on this the policy was changed to no active intervention for all three epochs. The policy statement in the main SMP document sets out the reasoning and implications.

### E4.4.4 PDZ 2A Thornham to Titchwell

The intent of management for this frontage has been agreed in the preceding stage, so there is no need to go through full appraisal. The agreed option is no active intervention.

Description of the policy package
This frontage is not currently defended and there are unlikely to be any reasons for introducing defences in the future.

Shoreline development for the policy package
The dunes in front of the saltmarsh are expected to roll back at a rate of 0.33 metres a year through all three epochs. During epoch 1 the saltmarshes will continue to increase in height at an average rate of 0.84 metres a year (EA Coastal Trends Analysis, 2007). Continued accretion is expected during epoch 2, but into epoch 3 horizontal erosion from the seaward edge is expected.

### E4.4.5 PDZ 2B Titchwell RSPB reserve

The intent of management for this frontage has been agreed in the preceding stage, so there is no need to go through full appraisal. The agreed option is hold the line at the realigned position.

Description of the policy package
A managed realignment scheme is currently underway at the RSPB reserve. Once this has been completed, a policy of hold the line at this new position will be implemented.

No alternative options are appraised. The reserve's defences are privately funded, so the main decision for the SMP concerns whether there are any reasons to suggest or enforce a change of the hold the line policy that the owners are currently applying. Reasons for a change of policy could be a direct negative effect of the defences (for example on UKBAP habitats due to coastal squeeze) or an indirect negative effect through processes along the shoreline. This is not expected to be the case for the reserve over all three epochs, so the SMP policy is to accept that a third party intends to hold the existing line.

Shoreline development for the policy package
The development of the foreshore, and the related pressure on the reserve's defences, strongly depend on coastal processes and (especially for the later epochs) on policy decisions around Scolt Head Island and for the golf course. On a large scale, as long as there is a control point for the eastern end of Brancaster bay (either the western end of Scolt Head or the golf course), overall pressure on the reserve will be limited, even though it will gradually increase due to sea level rise. On a more local scale, the development of tidal channels may threaten the defences over time.

### E4.4.6 PDZ 2C Titchwell village

The intent of management for this frontage has been agreed in the preceding stage, so there is no need to go through full appraisal. The agreed option is no active intervention.

Description of the policy package
PDZ 2C is not currently defended and there are unlikely to be any reasons for introducing defences in the future.

Shoreline development for the policy package
The dunes in front of the saltmarsh are expected to roll back at a rate of 0.33 metres a year through all three epochs. During epoch 1 the saltmarshes will continue to increase in height. Continued accretion is expected during epoch 2, but into epoch 3 horizontal erosion from the seaward edge is expected. These developments will be influenced by the large-scale processes of Brancaster bay in relation to policy decisions around Scolt Head Island and the golf course, especially for epoch 3.

## E4.4.7 PDZ 2D Brancaster west grazing marsh

### Policy packages for appraisal

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land.
- b – Managed realignment to create intertidal habitat.

**A: Sustain current use of defended land**

Description of the policy package

Keep the defences where they are now for all three epochs.

Shoreline development for the policy package

As for the neighbouring Titchwell frontage, the dunes in front of the saltmarsh are expected to roll back through all three epochs. During epoch 1 the saltmarshes will continue to increase in height. Continued accretion is expected during epoch 2, but into epoch 3 horizontal erosion from the seaward edge is expected. The pressure on the embankments is likely to increase due to sea level rise, which will be partly counteracted in the early epochs by the accretion. These developments will be influenced by the large scale processes of Brancaster bay in relation to policy decisions around Scolt Head Island and the golf course, especially for epoch 3.

**B: Managed realignment to create intertidal habitat**

Description of the policy package

Maximum landward realignment of defences in epoch 2 to create intertidal habitat and increase the tidal prism in order to strengthen Mow Creek. .

Shoreline development for the policy package

The eastern defences would be breached in the southern sector inland of the golf club practice ground increasing the tidal prism of Mow Creek. This will increase the tidal prism and the associated flows in Mow Creek by around 15 per cent during epoch 2 and 50 per cent in epoch 3. It will extend the intertidal area by about 25 hectares. The defence would be breached during epoch 2 to allow for adaptation as works would be needed to maintain access to the Royal West Norfolk golf club and the car park. The reasons for this policy are to increase the area of intertidal habitat and increase the tidal prism and hence flow in Mow Creek.

### Comparison of the policy packages

Both options are the same for epoch 1, in which the existing defence line would be held where it is now.

Into the later epochs, the main difference between the options concerns the loss of freshwater habitats in the currently-defended area, balanced against the creation of new intertidal habitats and the likely positive effect of realignment to sustain Mow Creek. In addition, the realignment requires work to maintain access to the golf course and beach, but reduces reliance on defences.

The decision may also be influenced by the overall effect of SMP policies on habitat losses and gains at the SMP scale or higher. This will have to be developed through the parallel Appropriate Assessment process and ongoing communication at national level.

The preferred policy should reflect the right balance between these aspects, but should also take into account the uncertainty, especially surrounding the positive effect of an increase in tidal prism on navigation in Mow Creek.

Recommended preferred policy package

The recommended preferred policy package is option B: managed realignment to create new intertidal habitat. This includes holding the existing line in epoch 1 to provide time for adaptation and to develop the knowledge of shoreline processes needed to allow realignment in the later epochs. This knowledge needs to be generated during epoch 1 by continued monitoring and research.

### E4.4.8 PDZ 2E Royal West Norfolk golf club

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – Re-instate natural processes to limit future effects along the shoreline

As for the RSPB reserve, the golf course's defences are privately funded. The main decision for the SMP therefore concerns whether there are any reasons to suggest or enforce a change of the hold the line policy that the owners are currently applying. Reasons for a change of policy could be a direct negative effect of the defences (for example on UKBAP habitats due to coastal squeeze) or an indirect negative effect through processes along the shoreline. Due to the seaward position of the golf course, it is possible that there will be a significant effect along the shoreline in epoch 3, depending on how Scolt Head Island develops. This longshore effect could be positive or negative and therefore needs to be explored in the appraisal.

**A: Sustain current use of defended land**

Description of the policy package

Keep the existing alignment of the frontage for all three epochs.

Shoreline development for the policy package

The development of the foreshore, and the related pressure on the golf course's defences, strongly depend on coastal processes and (especially for the later epochs) on policy decisions around Scolt Head Island. On a large scale, as long as the western end of Scolt Head functions as a control point for the eastern end of Brancaster bay, overall pressure on the defences will be limited, even though it will gradually increase due to sea level rise. On a more local scale, the continued process of sediment pulsing from Scolt Head will lead to periods of erosion and accretion, combined with the ongoing long-term rollback of the dunes.

**B: Re-instate natural processes to limit future effects along the shoreline**

Description of the policy package

If it turns out that the golf course's defences are starting to have a negative effect along the shoreline (which may occur in epoch 3), the defences would be removed.

Shoreline development for the policy package

The background processes are as described for policy package A: sheltering from Scolt Head Island, possible increased pressure in later epochs, temporary accretion and erosion due to sediment pulsing and ongoing long-term rollback of the dunes. Following removal of the defences in epoch 3, assuming an exposed position with little shelter from Scolt Head Island, the area around the clubhouse and practice ground would rapidly transform and roll back. This is likely to increase pressure on Brancaster bay and also on the dunes. The dunes are predicted to roll back at a rate of 0.3 metres a year impinging on the clubhouse, golf course and car park.

**Comparison of the policy packages**

Both options are equal for epochs 1 and 2: the golf course's defences are not expected to have a negative effect locally or elsewhere, so the SMP policy is to accept that a third party intends to hold the existing alignment.

For epoch 3, a change of policy would only be needed if continuing to hold the line would have a negative effect. The extent of effects along the shoreline depends on larger-scale coastal processes. In any case, continuing to hold the line is likely to limit pressure on Brancaster bay (especially the defences of the RSPB reserve).

Recommended preferred policy package
The recommended preferred policy package is option A: sustain current use of defended land. It is important to note that, in effect, the intent of management is to allow the private defence owner to hold the existing line.

### E4.4.9 PDZ 2F Brancaster and Brancaster Staithe

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – No active intervention after time for adaptation

**A: Sustain current use of defended land**
Description of the policy package
Keep the defences where they are now for all three epochs.

Shoreline development for the policy package
Despite sea level rise, the loading on the defences is likely to reduce due to expected siltation behind Scolt Head Island. To an extent, this is influenced by policy decisions for the other areas behind Scolt Head and for Brancaster west grazing marsh. Realignments in those PDZs are likely to reduce siltation.

**B: No active intervention after time for adaptation**
Description of the policy package
This scenario assumes that the defences are held in epoch 1 to allow time for adaptation. This would be followed in epochs 2 and 3 by no active intervention.

Shoreline development for the policy package
The defences are predicted to fail in epoch 2. This would lead to exposure of this frontage back to higher ground. This exposure will reduce as a function of siltation behind Scolt Head Island, despite sea level rise.

**Comparison of the policy packages**

This defence protects a narrow strip of land and there is no significant effect along the shoreline. So the decision for this PDZ revolves around the question whether it is worthwhile to keep maintaining the defence.

Recommended preferred policy package
The recommended preferred policy package is option A: sustain current use of defended land. These defences are currently maintained by a number of owners so the economic viability is not relevant at present.

## E4.4.10 PDZ 2G Reclaimed areas behind Scolt Head Island

**Policy packages for appraisal**

This PDZ includes the defences of Deepdale and Norton sea banks, River Burn outfall and Overy marshes. The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – Managed realignment to create intertidal habitat

**A: Sustain current use of defended land**

Description of the policy package

Keep the defences where they are now for all three epochs.

Shoreline development for the policy package

Scolt Head Island is expected to continue to roll back during epochs 1 and 2, while the saltmarsh behind it continues to accrete. Sea level rise would increase pressure on the defences, but this is partly counteracted by the accretion. Into epoch 3, its development depends on the complex interaction between accelerating sea level rise and development of the intertidal area. This will determine how the tidal prism develops which in turn determines the morphological response of the intertidal area. It is possible that Scolt Head Island will attach to the mainland (strongly reducing pressure on the defences), but it is also possible that it will remain detached.

**B: Managed realignment to create intertidal habitat**

Description of the policy package

The intent of this policy package is to move the defences further inland to increase the area of intertidal habitat and increase the tidal prism. Epoch 1 is needed to allow for time to develop further understanding of channel response to realignment. The policy package therefore keeps defences where they are now during epoch 1. It assumes realignment of Deepdale and Norton marshes during epoch 2, including providing flood defence for properties at Burnham Deepdale and Burnham Norton and the A149. The next step of realignment, in epoch 3, is assumed to be at Overy marshes, limited by a new flood embankment between Marsh House Farm and Holkham dunes to the north. The policy package assumes continued defence of the River Burn valley at the river outfall.

Shoreline development for the policy package

During epoch 1 Scolt Head Island is expected to continue to roll back, while the saltmarsh behind it continues to accrete. Sea level rise would increase pressure on the defences, but this is partly counteracted by the accretion.

During epoch 2 Deepdale and Norton sea banks would be breached in two places (after ensuring protection/adaptation of all defended features, where possible). This would open up the marshes to tidal influence and increase the tidal prism and the associated flows behind Scolt Head Island by about 50 per cent in total, which will help to sustain the channels. It would extend the intertidal area by about 120 hectares.

During epoch 3, the flood defence of Overy marshes would be breached (after ensuring protection/adaptation of all defended features, where possible), increasing the tidal prism by about 80 per cent and creating about 200 hectares of intertidal area. The breaches would be sited to maximise the positive effects on the channels.

**Comparison of the policy packages**

Both options intend to keep protecting the houses behind them. Also, both options are the same for epoch 1, in which the current defence line would be held.

The key difference between the options concerns the effect on habitats and agricultural land in the currently-defended area. This is balanced against creating new habitats and the likely positive effect to sustain the channels behind Scolt Head and the control function of Scolt Head on Brancaster bay and Holkham bay. The length and extent of defences also varies between the options. In summary:

- The realignment option is negative for agriculture but likely to be positive for navigation and fisheries that use the channels
- The realignment option is likely to have a positive effect along the shoreline
- For habitats:
  - the realignment option creates intertidal habitat but leads to loss of (partly designated) grazing marsh habitat
  - the decision may be influenced by the overall effect of SMP policies on habitat losses and gains at SMP scale or higher. This will have to be developed through the parallel Appropriate Assessment process and ongoing communication at national level
- The length and extent of defences is much smaller for the realignment option, but this does require new defences to be built. Holding the current lines leaves a long and relatively exposed defence, but without the need for construction until epoch 3

The preferred policy should reflect the right balance between these aspects. It should also take into account the uncertainty, especially around the positive effect of the increase in tidal prism on navigation and on Scolt Head Island and its subsequent effect on Brancaster bay and Holkham bay.

Recommended preferred policy package
The recommended preferred policy package is option B: managed realignment to create intertidal habitat. This includes holding the existing line in epochs 1 and 2 to provide time for adaptation and to develop the knowledge about shoreline processes needed to allow realignment in the later epochs. This knowledge needs to be generated during epochs 1 and 2 by continued monitoring and research.

### E4.4.11 PDZ 2H Burnham Overy Staithe

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – No active intervention after time for adaptation

**A: Sustain current use of defended land**
Description of the policy package
Keep the defences where they are now for all three epochs.

Shoreline development for the policy package
Scolt Head Island is expected to continue to roll back during epochs 1 and 2, while the saltmarsh behind it continues to accrete. Sea level rise would increase pressure on the defences, but this is partly counteracted by the accretion. Into epoch 3, its development depends on the complex interaction between accelerating sea level rise and development of the intertidal area. This will determine how the tidal prism develops, which in turn determines the morphological response of the intertidal area. It is possible that Scolt Head will attach to the mainland (strongly reducing pressure on the defences), but it is also possible that it will remain detached.

**B: No active intervention after time for adaptation**
Description of the policy package
This scenario assumes that the defences are held in epoch 1 to allow time for properties and infrastructure to adapt. This would be followed in epochs 2 and 3 by no active intervention.

Shoreline development for the policy package
The defences are predicted to fail during epoch 2. This would cause exposure of this frontage back to higher ground. This exposure will reduce because of siltation behind Scolt Head Island, despite sea level rise.

**Comparison of the policy packages**

This defence protects a narrow strip of land and there are no significant effects along the shoreline. The decision for this PDZ therefore revolves around the question whether it is worthwhile to keep maintaining the defence. The test of economic viability will inform whether this is likely to be affordable for the Environment Agency. Even if it is not, the SMP has not identified any reasons why other parties would not be allowed to continue maintaining the defences.

Recommended preferred policy package

The recommended preferred policy package is option A: sustain current use of defended land. The assessment of economic viability informs the likely source of funding.

### E4.4.12 PDZ 2l Holkham dunes

The intent of management for this frontage has been agreed in the preceding stage, so there is no need to go through full appraisal. The agreed option is to maintain flood defence function through minimum intervention.

Description of the policy package

The flood defence function of the dunes to the low-lying land behind will be maintained. Within that constraint, the dunes will be allowed to develop naturally and the flood defence function will be maintained through the minimum amount of intervention necessary. This partly depends on policy decisions for the area behind Scolt Head Island and Wells harbour channel. The policy decisions for Wells sea bank could also reduce the need for flood protection from the dunes.

This policy requires monitoring of the dune system. At strategy level, the interventions needed to maintain the flood defence function could be local works on the dunes themselves, beach recharge, landward widening of the dunes or providing local defences inland of the dunes.

Shoreline development for the policy package

The general response expected of the dunes to sea level rise is to roll back gradually. The rate of rollback is limited by the fir tree plantation. The rollback would be accompanied by an overall process of gradual erosion of the beach. Policy decisions in the neighbouring frontages could strengthen the outer estuaries at both ends of the dunes, which is likely to reduce pressure on the dunes.

## E4.4.13 PDZ 2J Wells flood embankment

### Policy packages for appraisal

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – No active intervention in epoch 3

**A: Sustain current use of defended land**

Description of the policy package

Keep the defences where they are now for all three epochs.

Shoreline development for the policy package

Sea level rise and possible increased storminess are likely to increase loading on the defence throughout all epochs. For epochs 1 and 2 this is counteracted to some extent by the intertidal area accreting and causing increased wave dissipation. Into epoch 3, however, coastal squeeze is likely to occur which will further increase loading.

**B: No active intervention in epoch 3**

Description of the policy package

As in the other option, the flood embankment will be maintained throughout epochs 1 and 2. From epoch 3, a no active intervention policy will be implemented. Given the current strength of the embankment, this is likely to fail towards the end of epoch 3.

Shoreline development for the policy package

Shoreline response is the same as for option A until the second half of epoch 3, when the embankment will start to deteriorate significantly. Sea level rise and possible increased storminess are likely to increase loading on the defence throughout the epochs. For epochs 1 and 2 this is to some extent counteracted by the intertidal area accreting and causing increased wave dissipation. Into epoch 3, however, coastal squeeze is likely to occur which will further increase loading. Following failure of the embankment, much of the area behind Holkham dunes up to Overy marshes would come under tidal influence.

### Comparison of the policy packages

Both options are the same for epochs 1 and 2.

From the start of epoch 3, option B would need the recreational features behind the embankment to adapt, including access to Holkham beach.

Recommended preferred policy package
The recommended preferred policy package is option A: sustain current use of defended land. The assessment of economic viability informs the likely source of funding.

### E4.4.14 PDZ 2K Wells quay

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – No active intervention after time for adaptation

**A: Sustain current use of defended land**
Description of the policy package
Keep the defences where they are now for all three epochs.

Shoreline development for the policy package
Sea level rise and possible increased storminess are likely to increase loading on the defences throughout all epochs. For epochs 1 and 2 this is to some extent counteracted by the intertidal area accreting and causing increased wave dissipation. Into epoch 3, however, coastal squeeze is likely to occur which will further increase loading.

**B: No active intervention after time for adaptation**
Description of the policy package
This scenario assumes that the defences are held in epoch 1 to allow time for adaptation. This would be followed in epochs 2 and 3 by no active intervention.

Shoreline development for the policy package
The defences are predicted to fail in epoch 2, which would have a big effect on the use of the quay. The exposure will increase because of sea level rise and increased storminess. This is likely to be made worse into epoch 3 because of coastal squeeze.

**Comparison of the policy packages**

This defence protects a narrow strip of land and there are no significant effects along the shoreline. The decision for this PDZ therefore revolves around the question whether it is worthwhile to keep maintaining the defence. The testing of economic viability will inform whether this is likely to be affordable for the local authority in its coastal protection role. Even if it is not, the SMP has not identified any reasons why other parties would not be allowed to continue maintaining the defences.

Recommended preferred policy package
The recommended preferred policy package is option A: sustain current use of defended land. The assessment of economic viability informs the likely source of funding.

### E4.4.15 PDZ 2L Wells east bank

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – Managed realignment to create intertidal habitat

**A: Sustain current use of defended land**
Description of the policy package
Keep the defences where they are now for all three epochs.

Shoreline development for the policy package
Sea level rise and possible increased storminess are likely to increase loading on the defences throughout all epochs. For epochs 1 and 2 this is to some extent counteracted by the intertidal area accreting and causing increased wave dissipation. Into epoch 3, however, coastal squeeze is likely to occur which will further increase loading.

**B: Managed realignment to create intertidal habitat**
Description of the policy package
Maximum landward realignment of defences in epoch 1 to increase the tidal prism to strengthen Wells harbour creek and create intertidal habitat. The bank cannot be breached before defences are provided for the part of Wells in the tidal flood zone and before the transport function of the A149 is secured (by defence or realignment).

Shoreline development for the policy package
Wells east bank would be breached which should increase the tidal prism in Wells harbour channel. This will increase the associated flows in Wells harbour channel by about 10 per cent. It will extend the intertidal area by around 70 hectares.

**Comparison of the policy packages**

Both options intend to keep protecting the houses behind them.

The key difference between the options from epoch 1 is the cost of the realignment (including new defences) and the loss of agricultural land in the currently-defended area. This must be balanced against creating new

intertidal habitats and the likely positive effect of realignment on Wells harbour channel.

The preferred policy should reflect the right balance between these aspects. It should also take into account the uncertainty, especially surrounding the positive effect of an increase in tidal prism on navigation in Wells harbour channel.

Recommended preferred policy package
The recommended preferred policy package is option B: managed realignment to create intertidal habitat and support navigation. There is uncertainty about the positive effect on navigation, but there are significant benefits (creation of intertidal habitats, opportunity to develop knowledge about the effects of realignment on navigation to support decisions for other frontages), while the negative effects are limited.

### E4.4.16 PDZ 2M Stiffkey bay

The intent of management for this frontage has been agreed in the preceding stage, so there is no need to go through full appraisal. The agreed option is no active intervention.

Description of the policy package
This frontage is not currently defended and it is unlikely there will be any reasons for introducing defences in the future.

Shoreline development for the policy package
During epochs 1 and 2 the higher saltmarsh is likely to continue to increase in height while the lower saltmarsh will experience vertical and horizontal erosion. During epoch 3 the rate of sea level rise is expected to outpace saltmarsh development, which is likely to lead to overall saltmarsh loss.

### E4.4.17 PDZ 3A Reclaimed areas behind Blakeney Spit

**Policy packages for appraisal**

This PDZ covers Blakeney Freshes, Cley marshes, River Glaven outfall, the local defences at Morston and the River Stiffkey outfall. The following policy packages are being appraised for this combination of frontages:

- a – Sustain current use of defended land
- b – Managed realignment to create intertidal habitat

**A: Sustain current use of defended land**
Description of the policy package
Keep the existing alignment of the frontage for all three epochs.

Shoreline development for the policy package

Blakeney Spit will continue with its 40-year cyclic progression of gradual growth to the west and rapid decline to the east during storm events from the north east, combined with some rollback of the spit (limited by the sand bank in front of the spit). During epochs 1 and 2, the saltmarsh behind the spit will generally continue to increase in height, but in epoch 2 some horizontal loss of lower saltmarsh is possible. Sea level rise would increase pressure on the defences, but this is partly counteracted by the accretion. Into epoch 3, the development behind the spit depends on the complex interaction between accelerating sea level rise and development of the intertidal area. This will determine how the tidal prism develops, which in turn determines the morphological response of the intertidal area. It is possible that the area will silt up (strongly reducing pressure on the defences), but it is also possible that the spit will remain detached.

**B: Managed realignment to create intertidal habitat**

Description of the policy package

The intent of this policy package is to move the defences further inland to increase the area of intertidal habitat. The realignment at Morston would happen as soon as possible after providing defences for the houses and A149. As well as its direct benefits on channel navigability and intertidal habitats, this realignment would act as a pilot to develop understanding to feed into decisions about further realignments in later epochs. The policy package assumes realignment of Blakeney Freshes in epoch 2 and of Cley west bank in epoch 3 (including providing defences for properties and adapting the A149). Defence of the River Glaven and River Stiffkey valleys would continue at both river outfalls.

Shoreline development for the policy package

During epoch 1 the sea bank east of Morston would be breached, opening up the marshes to tidal influence. This will increase the tidal prism and the associated flows into Blakeney harbour by about 17 per cent, which will help to sustain the channels. It will extend the intertidal area by around 13 hectares.

During epoch 2 the sea banks around Blakeney Freshes would be breached, opening up the marshes to tidal influence. This will increase the tidal prism and the associated flows into Blakeney harbour by about 490 per cent, which will help to sustain the channels. It will extend the intertidal area by around 136 hectares.

During epoch 3 Cley west bank would be breached, opening up the area to tidal influence. This will increase the tidal prism and the associated flows into Blakeney harbour by about 40 per cent, which will help to sustain the channels. It will extend the intertidal area by about 150 hectares in total.

**Comparison of the policy packages**

Both options intend to keep protecting the houses and infrastructure behind them.

The key difference between the options concerns the effect on habitats and agricultural land in the currently-defended area. This should be balanced against creating new habitats and the likely positive effect of sustaining the channels behind Blakeney Spit. The length and extent of defences also varies between the options. In summary:

- The realignment option is negative for agriculture but likely to be positive for navigation and fisheries that use the channels
- For habitats:
  - the realignment option creates intertidal habitat but loses (partly designated) grazing marsh habitat
  - the decision may be influenced by the overall effect of SMP policies on habitat losses and gains at the SMP scale or higher. This will have to be developed in the parallel Appropriate Assessment process and ongoing communication at national level
- The length and extent of defences is much smaller for the realignment option, but this does need new defences to be built. Holding the current lines leaves a long and relatively exposed defence, but without the need for construction until epoch 3.

The preferred policy should reflect the right balance between these aspects. It should also take into account the uncertainty, especially surrounding the positive effects of increasing the tidal prism on navigation and on Blakeney Spit.

Recommended preferred policy package

The recommended preferred policy package is option B: managed realignment to create intertidal habitat. Even though there is uncertainty about the positive effect on navigation, this policy package includes realignment at Morston in epoch 1 (after providing defences/adaptation), because there are significant benefits (creating intertidal habitats, opportunity to develop knowledge about effects of realignment to support decisions for other frontages), while the negative effects are limited.

## E4.4.18 PDZ 3B Stiffkey to Morston

The intent of management for this frontage has been agreed in the preceding stage, so there is no need to go through full appraisal. The agreed option is no active intervention.

Description of the policy package
This frontage is not currently defended and there are unlikely to be any reasons for building defences in the future.

Shoreline development for the policy package
During epochs 1 and 2 the higher saltmarsh is likely to continue to increase in height while the lower saltmarsh will experience vertical and horizontal erosion. In epoch 3 the rate of sea level rise is expected to outpace saltmarsh development, which is likely to lead to overall saltmarsh loss. What happens here will be influenced to an extent by policy decisions for the area behind Blakeney Spit.

## E4.4.19 PDZ 3C Blakeney

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain current use of defended land
- b – No active intervention after time for adaptation

**A: Sustain current use of defended land**
Description of the policy package
Keep the defences where they are now for all three epochs.

Shoreline development for the policy package
Sea level rise and possible increased storminess are likely to increase loading on the defences throughout all epochs. For epochs 1 and 2 this is counteracted to some extent by the intertidal area accreting and causing increased wave dissipation. Into epoch 3, however, coastal squeeze is likely to occur which will further increase loading. What happens here will be influenced to an extent by policy decisions for the currently-reclaimed areas, particularly Blakeney Freshes.

**B: No active intervention**
Description of the policy package
This scenario assumes that the defences are held in epoch 1 to allow time for adaptation. This would be followed in epochs 2 and 3 by no active intervention.

Shoreline development for the policy package
The defences are predicted to fail during epoch 2, which would have a big effect on the use of the quay. The exposure will increase through sea level rise and increased storminess, likely to be made worse into epoch 3 due to coastal squeeze.

**Comparison of the policy packages**

This defence protects a narrow strip of land and there are no significant effects along the shoreline. The decision for this PDZ therefore revolves around the question whether it is worthwhile to keep maintaining the defence. The testing of economic viability will inform whether this is likely to be affordable for the local authority in its coastal protection role. Even if it is not, the SMP has not identified any reasons why other parties would not be allowed to continue maintaining the defences.

Recommended preferred policy package
The recommended preferred policy package is option A: sustain current use of defended land. The assessment of economic viability informs the likely source of funding.

## E4.4.20 PDZ 3D Cley to Salthouse shingle ridge

**Policy packages for appraisal**

The following policy packages are being appraised for this frontage:

- a – Sustain flood defence function through minimum intervention
- b - No active intervention

**A: Sustain flood defence function through minimum intervention**
Description of the policy package
This policy package continues the existing policy. In principle there is no active intervention on the shingle ridge itself. However, overtopping sea water is drained from the marshes and it includes the intent to intervene if the shingle ridge were to breach and cause unacceptable flood risk. The need for these interventions depends on the shoreline response, to be informed by monitoring of ongoing developments.

Shoreline development for the policy package
Rollback of the shingle ridge is expected at a rate of about one metre a year and the ridge is expected to flatten and widen further. Based on the shoreline response assessment, it is likely that no intervention will be needed during epoch 1 to maintain the flood defence function, while in later epochs it may be necessary to do some work. Even if interventions are carried out, it is assumed that the natural alignment of the ridge will be allowed to develop overall. Any intervention is likely to be local reshaping of the ridge, but not changing or holding its alignment. These developments, and the need to intervene, depend on how often extreme events occur.

**B: No active intervention**

Description of the policy package

This scenario assumes that there is a policy of no active intervention for the shingle ridge throughout all epochs. If the ridge breaches or otherwise stops performing its flood defence function, flood defences for properties at Cley and Salthouse would be provided, as well as adpatation of the A149. The need for these interventions depends on the shoreline response, to be informed by monitoring of ongoing developments.

Shoreline development for the policy package

Rollback of the shingle ridge is expected at a rate of about one metre a year and the ridge is expected to flatten and widen further. Based on the shoreline response assessment, it is likely that no intervention will be needed during epoch 1 to maintain the flood defence function, while in later epochs it may be necessary to do some work. These developments, and the need for intervention, depend on how often extreme events happen.

## Comparison of the policy packages

The key difference between the two options concerns the intent of management for the area behind the shingle ridge and for the shingle ridge itself. Also, uncertainty over how the shingle ridge will develop is an important factor in the decisions.

Ideally, it would be possible to continue the current management approach of no active intervention on the shingle ridge itself, while maintaining the salinity gradient for the marshes through drainage and maintaining the flood defence function for the road and properties because the ridge is there. However, if extreme events (in the longer term) start to cause breaches, there may have to be a choice or compromise between the shingle ridge habitat, the brackish habitat and protecting the road and houses.

Recommended preferred policy package

The recommended preferred policy package is option A: maintain flood defence function through minimum intervention. This continues the current management approach. Monitoring how the shingle ridge develops is an essential element of the policy and will determine the need to intervene.

## E4.5 Example appraisal table

These tables give an example of the appraisal that was completed for all PDZs where a decision was necessary. Note that this example refers to the draft SMP. The appraisal tables that support the final SMP policies are in appendix G.

**PDZ2G (Reclaimed areas behind Scolt Head Island) (a) Sustain current use of defended land**

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations.** | | | | | | | |
| Extent of reliance on hard defences and flexibility of coastal management | This frontage is protected by continuous vegetated earth embankments. | **4** | Sea level rise increases loading on defences but this is partly compensated by continued accretion of saltmarsh and siltation behind Scolt Head. | **5** | Likely continuation of processes from epoch 1: pressure increase due to sea level rise compensated by accretion behind Scolt Head. | **5** | Possible continuation of processes from epoch 1: pressure increase due to sea level rise compensated by accretion behind Scolt Head. Significant uncertainty. |
| Level of flood and erosion risk to people and properties | There are currently 146 defended properties in the tidal flood zone. | **N/A** | All properties remain defended in both policy packages so does not affect decision-making. | **N/A** | All properties remain defended in both policy packages so does not affect decision-making. | **N/A** | All properties remain defended in both policy packages so does not affect decision-making. |

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To ensure that local policy decisions do not adversely affect wider natural coastal processes.** | | | | | | | |
| Effect on neighbouring frontages | Scolt Head Island. Brancaster bay. Holkham bay and dune system. | 5 | Potential for positive effect on Brancaster bay and Holkham bay not used. | 5 | Potential for positive effect on Brancaster bay and Holkham bay not used. | 5 | Potential for positive effect on Brancaster bay and Holkham bay not used. |
| **To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.)** | | | | | | | |
| Effect of shoreline management on the economic viability of communities through its effect on economic activities on defended land (tourism, recreation, agriculture, fisheries) | Peddars Way and Norfolk coast path. Grades 2, 3 and 4 agricultural land. Access to Holkham dunes. Caravan park and campsite, miniature railway, boating lake and golf course at Wells-next-the-Sea. | 9 | All economic features and associated activities remain protected. | 9 | All economic features and associated activities remain protected. | 9 | All economic features and associated activities remain protected. |
| Effect of shoreline | Moorings in | 3 | Siltation will continue | 2 | Siltation likely to | 1 | Siltation will possibly |

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| management on the economic viability of communities through its effect on economic activities in intertidal areas (tourism, recreation, agriculture, fisheries) | Overy Creek and Mow Creek. | | in Mow Creek and Overy Creek reducing the navigability of the channels. | | continue in Mow Creek and Overy Creek reducing the navigability of the channels. | | continue in Mow Creek and Overy Creek reducing the navigability of the channels. Significant uncertainty. |
| Effect of shoreline management on the social viability of communities through its effect on public services and infrastructure | Coastguard look-out and RNLI station at Wells flood bank. A149. Sewage treatment works at Wells-next-the-Sea. | **9** | All services and infrastructure remain defended. | **9** | All services and infrastructure remain defended. | **9** | All services and infrastructure remain defended. |

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| Effect of shoreline management on houses, leading to need for adaptation or loss | There are currently 146 defended properties in the tidal flood zone. | 9 | No houses need adaptation or will be lost. | 9 | No houses need adaptation or will be lost. | 9 | No houses need adaptation or will be lost. |
| **To consider social and economic well-being and allow communities and individuals to adapt to coastal change.** | | | | | | | |
| Adequacy of time available for communities and individuals to adapt | Marsh Farm (Norton Marsh). Marsh Farm and Marsh House Farm (Overy Marsh). Burnham Deepdale. Burnham Norton. | 9 | No adaptation needed. | 9 | No adaptation needed. | 9 | No adaptation needed. |
| **To take account of the value of the north Norfolk coast area to wider society.** | | | | | | | |
| Effect on socio-economic features of regional, national or international significance | No relevant features. | | N/A | | N/A | | N/A |
| **To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences.** | | | | | | | |

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| Adequacy of time available for planning system to adapt | | 9 | No changes needing the planning system to adapt. | 9 | No changes needing the planning system to adapt. | 9 | No changes needing the planning system to adapt. |
| **To contribute to maintaining and enhancing protected sites and species, subject to natural change.** | | | | | | | |
| Effect of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting functional, sustainable and dynamic coastal change | North Norfolk Coast Ramsar site, SPA, SAC and SSSI. Holkham NNR and Scolt Head Island NNR. | 5 | As defences remain, this limits the dynamism of coastal processes. However, the freshwater SPA habitats will remain protected. | 5 | As defences remain, this limits the dynamism of coastal processes. However, the freshwater SPA habitats will remain protected. | 4 | As defences remain, this limits the dynamism of coastal processes. However, the freshwater SPA habitats will remain protected. Silting up of channels behind Scolt Head Island will inhibit rollback of the island leading to erosion of the grey dunes. |

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To support maintenance and enhancement of biodiversity in the wider coastal zone.** | | | | | | | |
| Effect of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets both within designated sites and the wider coastal countryside | Reedbeds, mudflat, coastal and flood plain grazing marsh, purple moor grass and rush pasture, lowland meadow, coastal sand dunes and lowland acid dry grassland. | **5** | Overall area of BAP habitats unchanged. Saltmarsh becomes mudflat and mudflat becomes sub-littoral as sea level rises. | **5** | Overall area of BAP habitats unchanged. Saltmarsh becomes mudflat and mudflat becomes sub-littoral as sea level rises. | **5** | Overall area of BAP habitats unchanged. Saltmarsh becomes mudflat and mudflat becomes sub-littoral as sea level rises. |

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To contribute to maintaining and enhancing the character of the coastal landscape.** | | | | | | | |
| Effect of shoreline management on the dynamic character of the coastal landscape, including consideration of geological, geomorphological, historic environment and cultural features and the role of settlements in the landscape | Norfolk Coast AONB. North Norfolk Coast SSSI. | **4** | Defences maintained in current position detracting from the dynamic natural character of the landscape. | **4** | Defences maintained in current position detracting from the dynamic natural character of the landscape. | **4** | Defences maintained in current position detracting from the dynamic natural character of the landscape. |
| **To have regard for the historic environment and its value for the heritage, culture and economy of the area.** | | | | | | | |
| Effect on historic environment and its wider value | Iron age fort on Overy Marsh (SM). Holkham Hall registered park and garden. Listed buildings at Brancaster | **9** | All historic environment designations remain protected. | **9** | All historic environment designations remain protected. | **9** | All historic environment designations remain protected. |

| Criterion | Current Situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| | Staithe (one grade II*), in the River Burn valley (one grade I, three grade II* and 12 grade II), Burnham Overy Staithe (four grade II), Marsh House Farm (grade II), Gun Hill farmhouse (grade II), Holkham (grade II) and Wells-next-the-Sea (20 grade II). | | | | | | |

**PDZ2G (Reclaimed areas behind Scolt Head Island) (b) Managed realignment to create intertidal habitat**

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To manage the coast to reduce reliance on defences and to promote flexible coastal management options for present and future generations.** | | | | | | | |
| Extent of reliance on hard defences and flexibility of coastal management. | This frontage is protected by continuous vegetated earth embankments. | **4** | All defences are maintained through this epoch. Sea level rise increases loading but this is partly compensated by accretion behind Scolt Head. | **7** | The defences to Deepdale and Norton marsh are breached and new shorter defences are built at Burnham Deepdale, Burnham Norton and the River Burn outfall. For remaining defences, likely continuation of processes from epoch 1: pressure increase due to sea level rise compensated by accretion behind Scolt Head. | **8** | Defences at Overy marsh are breached and a new shorter defence line is built between Marsh House Farm and Holkham dunes. For remaining defences, possible continuation of processes from epoch 1: pressure increase due to sea level rise compensated by accretion behind Scolt Head. Significant uncertainty. |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| Level of flood and erosion risk to people and properties | There are currently 146 defended properties in the tidal flood zone. | N/A | All properties remain defended in both policy packages so does not affect decision-making. | N/A | All properties remain defended in both policy packages so does not affect decision-making. | N/A | All properties remain defended in both policy packages so does not affect decision-making. |
| **To ensure that local policy decisions do not adversely affect wider natural coastal processes.** | | | | | | | |
| Effect on neighbouring frontages | Scolt Head Island. Brancaster bay. Holkham bay and dune system. | 5 | Potential for positive effect on Brancaster bay and Holkham bay not used. | 8 | Increased tidal exchange likely to strengthen outer estuary and Scolt Head Island, reducing pressure on Brancaster bay and Holkham bay. | 9 | Further increased tidal exchange likely to strengthen outer estuary and Scolt Head Island, further reducing pressure on Brancaster bay and Holkham bay. Significant uncertainty. |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To consider the effects of coastal change on local industries (tourism, agriculture, fisheries etc.)** | | | | | | | |
| Effect of shoreline management on the economic viability of communities through its impact on economic activities on defended land (tourism, recreation, agriculture, fisheries) | Peddars Way and Norfolk coast path. Grades 2, 3 and 4 agricultural land. Access to Holkham dunes. Caravan park and campsite, miniature railway, boating lake and golf course at Wells-next-the-Sea. | 9 | All economic features and associated activities remain protected. | 2 | Peddars Way and Norfolk coast path cut at Deepdale and Norton marsh, so realignment needed. Newly-created zone of tidal influence contains 242 hectares of agricultural land (12 hectares grade 3 and 230 hectares grade 4). All other features and activities remain protected. | 1 | Peddars Way and Norfolk coast path cut at Overy marshes Due to sea level rise an extra 155 hectares of agricultural land falls within the zone of tidal influence (21 hectares grade 2, 130 hectares grade 3 and four hectares grade 4). All other features and activities remain protected. |
| Effect of shoreline management on the economic viability of communities | Moorings in Overy Creek and Mow Creek. | 3 | Siltation will continue in Mow Creek and Overy Creek reducing the navigability of | 8 | Improved navigation for sailing in Overy Creek and to Brancaster harbour due to a 38 per cent and 65 per cent increase in tidal prism | 9 | Improved navigation for sailing in Overy Creek and to Brancaster harbour due to a 150 per cent |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| through its effect on economic activities in intertidal areas (tourism, recreation, agriculture, fisheries) | | | the channels. | | respectively compared to the present day. | | and 105 per cent increase in tidal prism respectively compared to the present day. |
| Effect of shoreline management on the social viability of communities through its effect on public services and infrastructure | Coastguard look-out and RNLI station at Wells flood bank. A149. Sewage treatment works at Wells-next-the-Sea. | **9** | All services and infrastructure remain defended. | **9** | All services and infrastructure remain defended. | **9** | All services and infrastructure remain defended. |
| Effect of shoreline management on houses leading to need for adaptation or loss. | There are currently 146 defended properties in the tidal flood zone. | **9** | No houses need adapting or will be lost. | **9** | No houses need adapting or will be lost. | **9** | No houses need adapting or will be lost. |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To consider social and economic well-being and allow communities and individuals to adapt to coastal change.** | | | | | | | |
| Adequacy of time available for communities and individuals to adapt | Marsh Farm (Norton marsh). Marsh Farm and Marsh House Farm (Overy marsh). Burnham Deepdale. Burnham Norton. | **9** | No adaptation needed as defences are maintained. | **7** | Defences at Norton and Deepdale marshes built before current defences breached to increase tidal exchange. Adaptation only therefore needed for agriculture and there is adequate time. | **9** | Defences at Overy marsh built before current defences breached to increase tidal exchange. Adaptation only therefore needed for agriculture and there is adequate time. |
| **To take account of the value of the north Norfolk coast area to wider society.** | | | | | | | |
| Effect on socio-economic features of regional, national or international significance | No relevant features. | | N/A | | N/A | | N/A |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To ensure that the timing of the policies allows the land use planning system to respond to any shoreline management changes and their consequences.** | | | | | | | |
| Adequacy of time available for planning system to adapt | | 9 | No adaptation needed. | 9 | Sufficient time for the planning system to adapt. | 9 | Sufficient time for the planning system to adapt. |
| **To contribute to maintaining and enhancing protected sites and species, subject to natural change** | | | | | | | |
| Effect of shoreline management on achieving management objectives for international, national and locally important habitats and species, keeping them in favourable condition (including no significant loss of extent or populations) while promoting | North Norfolk Coast Ramsar site, SPA, SAC and SSSI. Holkham NNR and Scolt Head Island NNR. | 5 | As defences remain, this limits the dynamism of coastal processes. However, the freshwater SPA habitats will remain protected. | 5 | Deepdale marsh is undesignated and realignment there will increase potential habitat area. However, Norton marsh is designated freshwater SPA habitat that will be lost. Dynamic natural coastal change will be promoted at these places. | 6 | SPA habitat at Overy marshes will be lost as defences are partially removed. However, dynamic natural coastal change will be promoted here. |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| functional, sustainable and dynamic coastal change | | | | | | | |
| **To support maintenance and enhancement of biodiversity in the wider coastal zone.** | | | | | | | |
| Effect of shoreline management on achieving national and local Biodiversity Action Plan (BAP) targets both within designated sites and the wider coastal countryside | Reedbeds, mudflat, coastal and flood plain grazing marsh, purple moor grass and rush pasture, lowland meadow, coastal sand dunes and lowland acid dry grassland. | **5** | Overall area of BAP habitats unchanged. Saltmarsh becomes mudflat and mudflat becomes sub-littoral as sea level rises. | **8** | Large increase in total BAP habitat area due to removal of defences at Deepdale marsh. | **6** | Small habitat area increase due to the removal of defences at Overy marsh and sea level rise. |
| **To contribute to maintaining and enhancing the character of the coastal landscape.** | | | | | | | |
| Effect of shoreline management on the dynamic character of the coastal | Norfolk Coast AONB. North Norfolk Coast SSSI. | **4** | Defences maintained in current position detracting from the dynamic | **7** | Partial removal of defences at Deepdale and Norton marshes returning landscape of the whole frontage to a more natural | **8** | Partial removal of defences at Overy Marsh, continuing the process of returning landscape to a more |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| landscape, including consideration of geological, geomorphological, historic environment and cultural features and the role of settlements in the landscape | | | natural character of the landscape. | | system. | | natural system. |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| **To have regard for the historic environment and its value for the heritage, culture and economy of the area** | | | | | | | |
| Effect on historic environment and its wider value | Iron age fort on Overy Marsh (SM). Holkham Hall registered park and garden. Listed buildings at Brancaster Staithe (one grade II*), in the River Burn valley (one grade I, three grade II* and 12 grade II), Burnham Overy Staithe (four grade II), Marsh House Farm (grade II), Gun Hill farmhouse (grade II), | **9** | All historic environment designations remain protected. | **9** | All historic environment designations remain protected. | **9** | All historic environment designations remain protected. |

| Criterion | Current situation | Epoch 1 (2025) | | Epoch 2 (2055) | | Epoch 3 (2105) | |
|---|---|---|---|---|---|---|---|
| | | Score | Explanation | Score | Explanation | Score | Explanation |
| | Holkham (grade II), and Wells-next-the-Sea (20 grade II). | | | | | | |

**PDZ2G (a) - Sustain current use of defended land - Assessment for each principle**

| Principle | Overall score - Epoch 1 | Overall score - Epoch 2 | Overall score - Epoch 3 |
|---|---|---|---|
| Reduce reliance on hard defences and promote flexible coastal management options. | 4 | 5 | 5 |
| Ensure policy decisions do not adversely affect wider coastal processes. | 5 | 5 | 5 |
| Consider the effects of coastal change on local industries. | 8 | 7 | 7 |
| Allowing time for communities to adapt to coastal change and considering social and economic well-being. | 9 | 9 | 9 |
| To take account of the value of the north Norfolk coast area to wider society. | N/A | N/A | N/A |
| Length of time available for planning system to adapt. | 9 | 9 | 9 |
| Maintaining and enhancing protected sites and species, subject to natural change. | 5 | 5 | 4 |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | 5 | 5 | 5 |

| | | | |
|---|---|---|---|
| To contribute to maintaining and enhancing the character of the coastal landscape. | **4** | **4** | **4** |
| To have regard for the historic environment and its value for the heritage, culture and economy of the area. | **9** | **9** | **9** |

**PDZ2G (b) - Managed realignment to create intertidal habitat - Assessment for each principle**

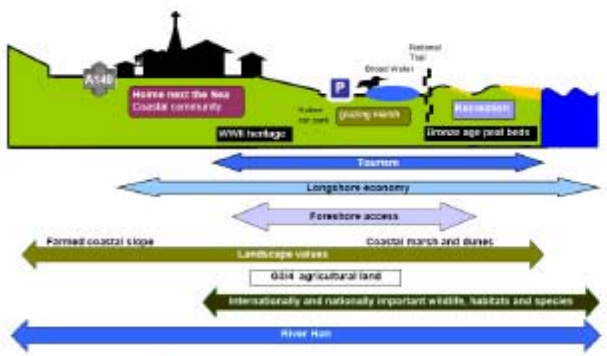
| Principle | Overall score - Epoch 1 | Overall score - Epoch 2 | Overall score - Epoch 3 |
|---|---|---|---|
| Reduce reliance on hard defences and promote flexible coastal management options. | 4 | 7 | 8 |
| Ensure policy decisions do not adversely affect wider coastal processes. | 5 | 8 | 9 |
| Consider the effects of coastal change on local industries. | 8 | 7 | 7 |
| Allowing time for communities to adapt to coastal change and considering social and economic well-being. | 9 | 7 | 9 |
| To take account of the value of the North Norfolk coast area to wider society. | N/A | N/A | N/A |
| Adequacy of time available for planning system to adapt. | 9 | 9 | 9 |
| Maintaining and enhancing protected sites and species, subject to natural change. | 5 | 5 | 6 |
| To support maintenance and enhancement of biodiversity in the wider coastal zone. | 5 | 8 | 6 |

| | | | |
|---|---|---|---|
| To contribute to maintaining and enhancing the character of the coastal landscape. | **4** | **7** | **8** |
| To have regard for the historic environment and its value for the heritage, culture and economy of the area. | **9** | **9** | **9** |

## E4.6 Policy appraisal graphics

This section contains the policy appraisal graphics that were used while developing the draft SMP. Appendix G contains the appraisal tables and associated icons and scoring that support the final SMP policies.

## PDZ 1A Old Hunstanton Dunes

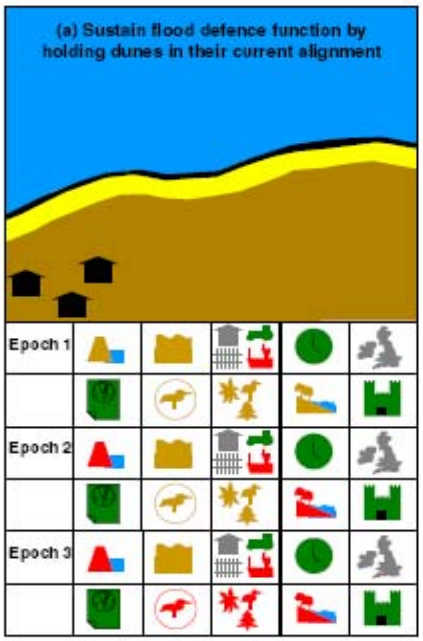


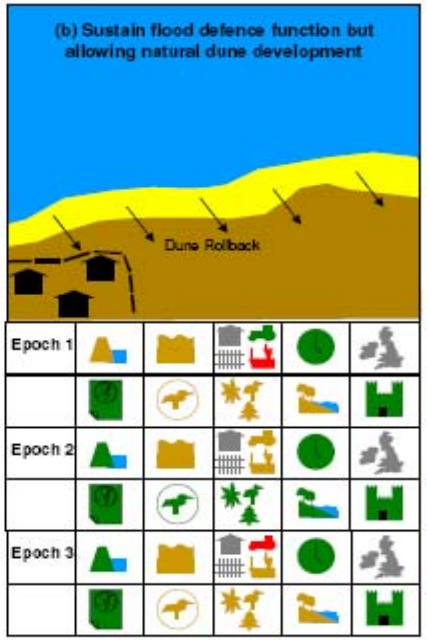

**Principle:**

- Reliance on Defences
- Ensure local policies do not affect wider coastal processes
- Impact of coastal change on local industry, infrastructure and property
- Allowing adaptation of communities to coastal change
- Value of North Norfolk to wider society
- Allowing planning system to respond to changes in shoreline management
- Maintaining protected sites and species
- Maintaining and enhancing coastal biodiversity
- Maintaining and enhancing the coastal landscape
- Historic environment, heritage and culture

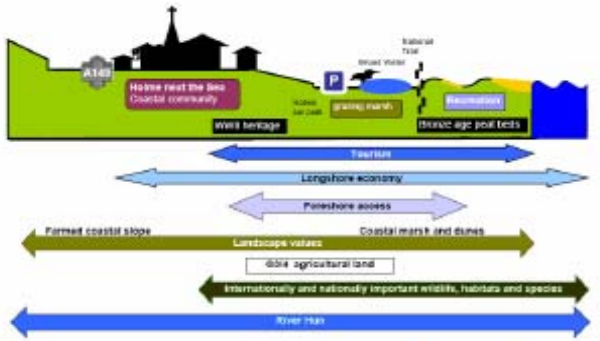
**Result:**

- Negative
- Positive
- Not Applicable

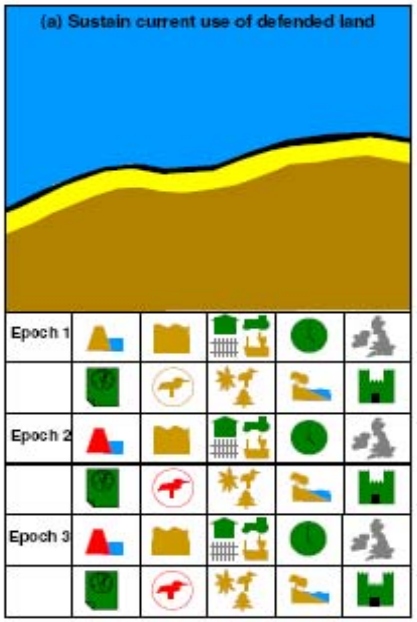


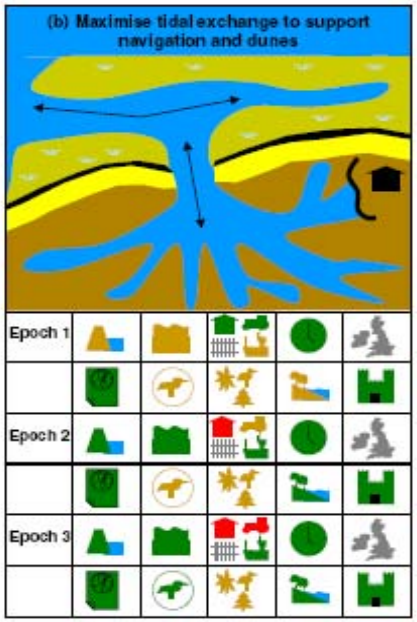



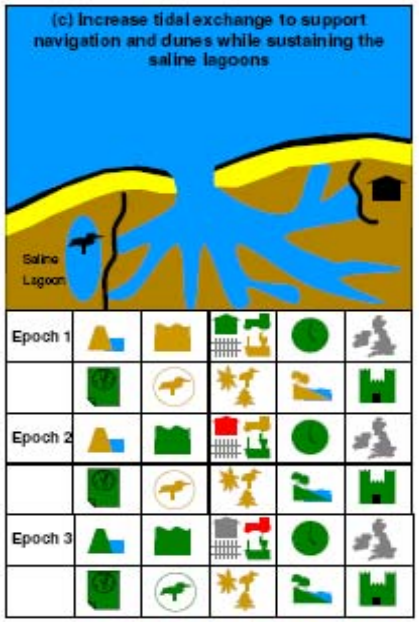
## PDZ 1C Thornham Sea Bank







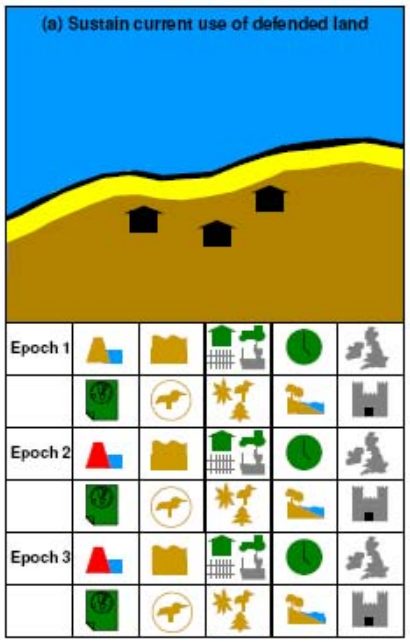
PDZ 1D Thornham

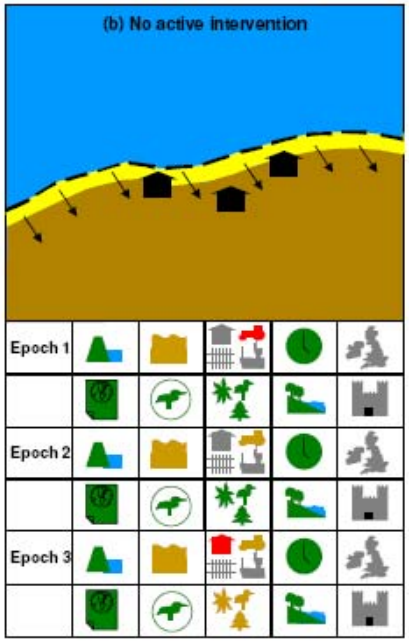

Principle :

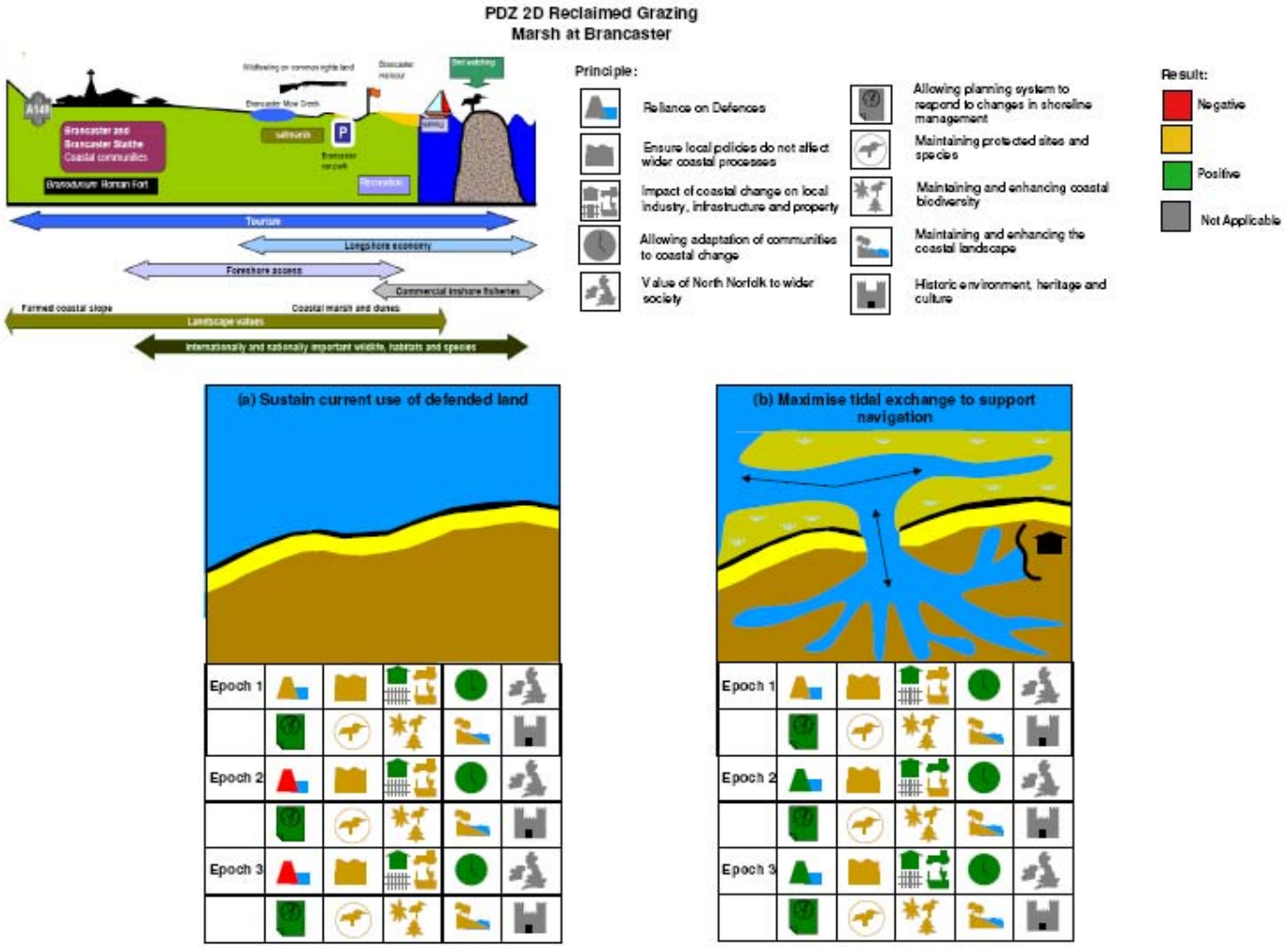
- Reliance on Defences
- Ensure local policies do not affect wider coastal processes
- Impact of coastal change on local industry, infrastructure and property
- Allowing adaptation of communities to coastal change
- Value of North Norfolk to wider society
- Allowing planning system to respond to changes in shoreline management
- Maintaining protected sites and species
- Maintaining and enhancing coastal biodiversity
- Maintaining and enhancing the coastal landscape
- Historic environment, heritage and culture

Result:

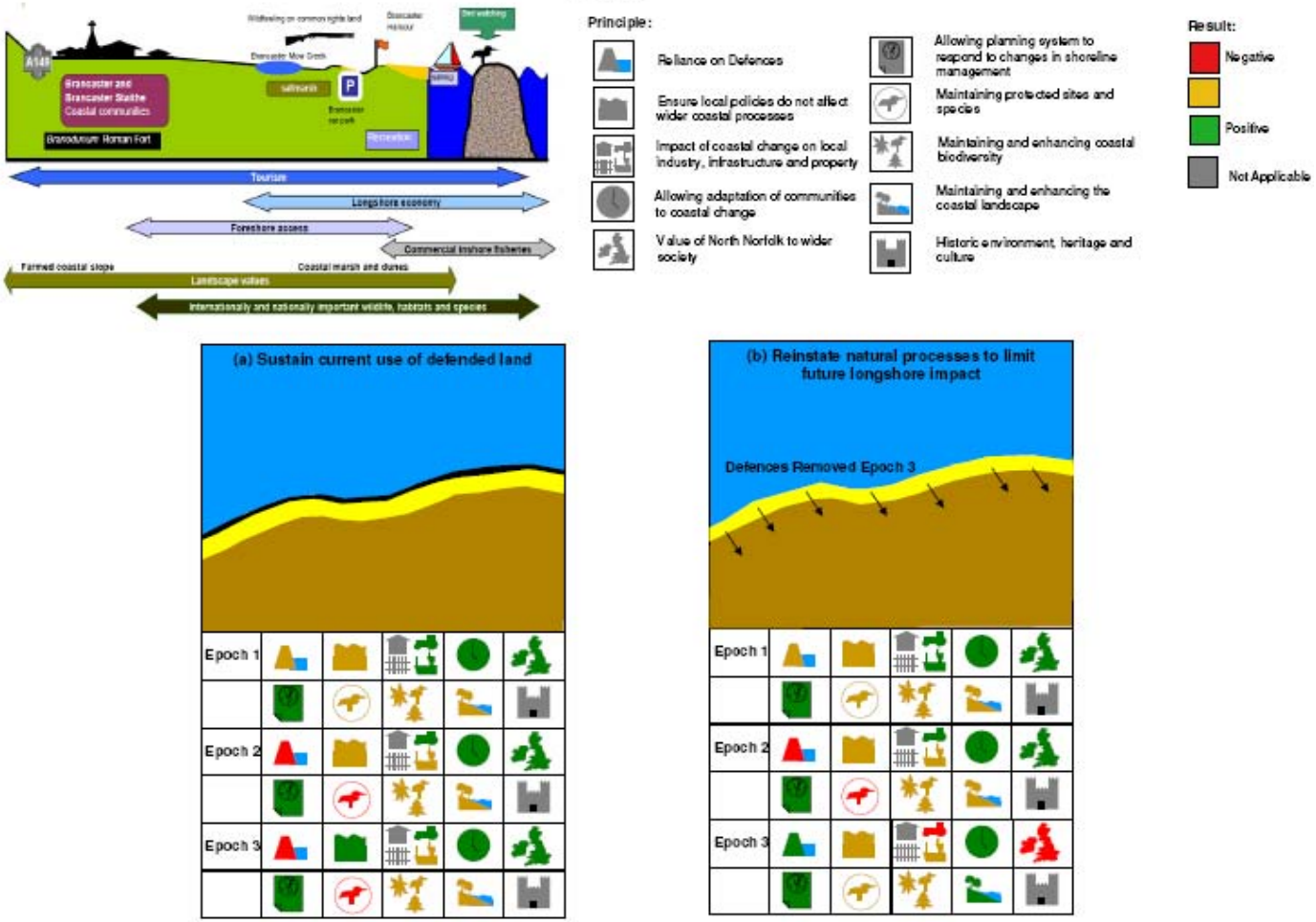
- Negative
- Positive
- Not Applicable

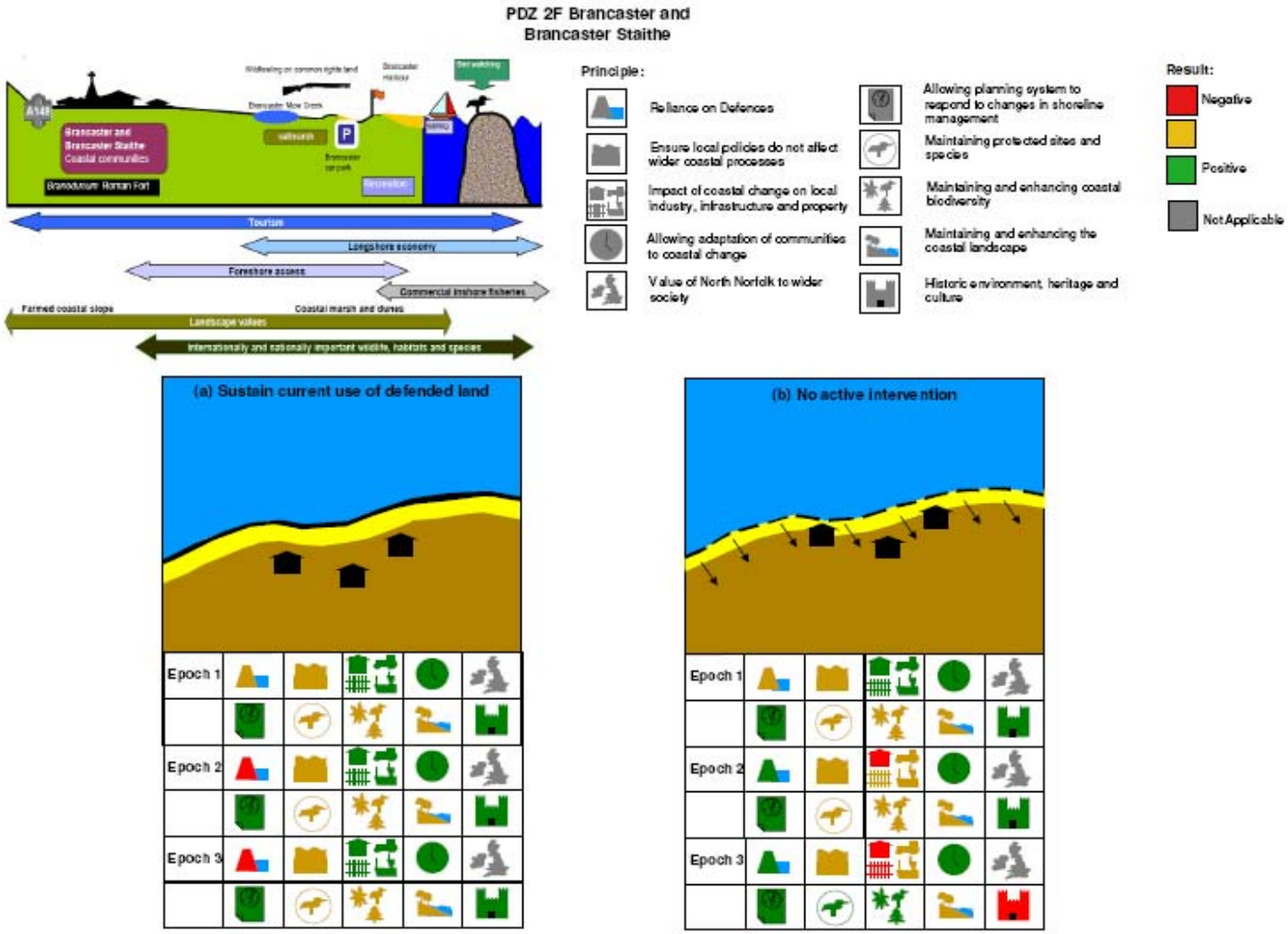


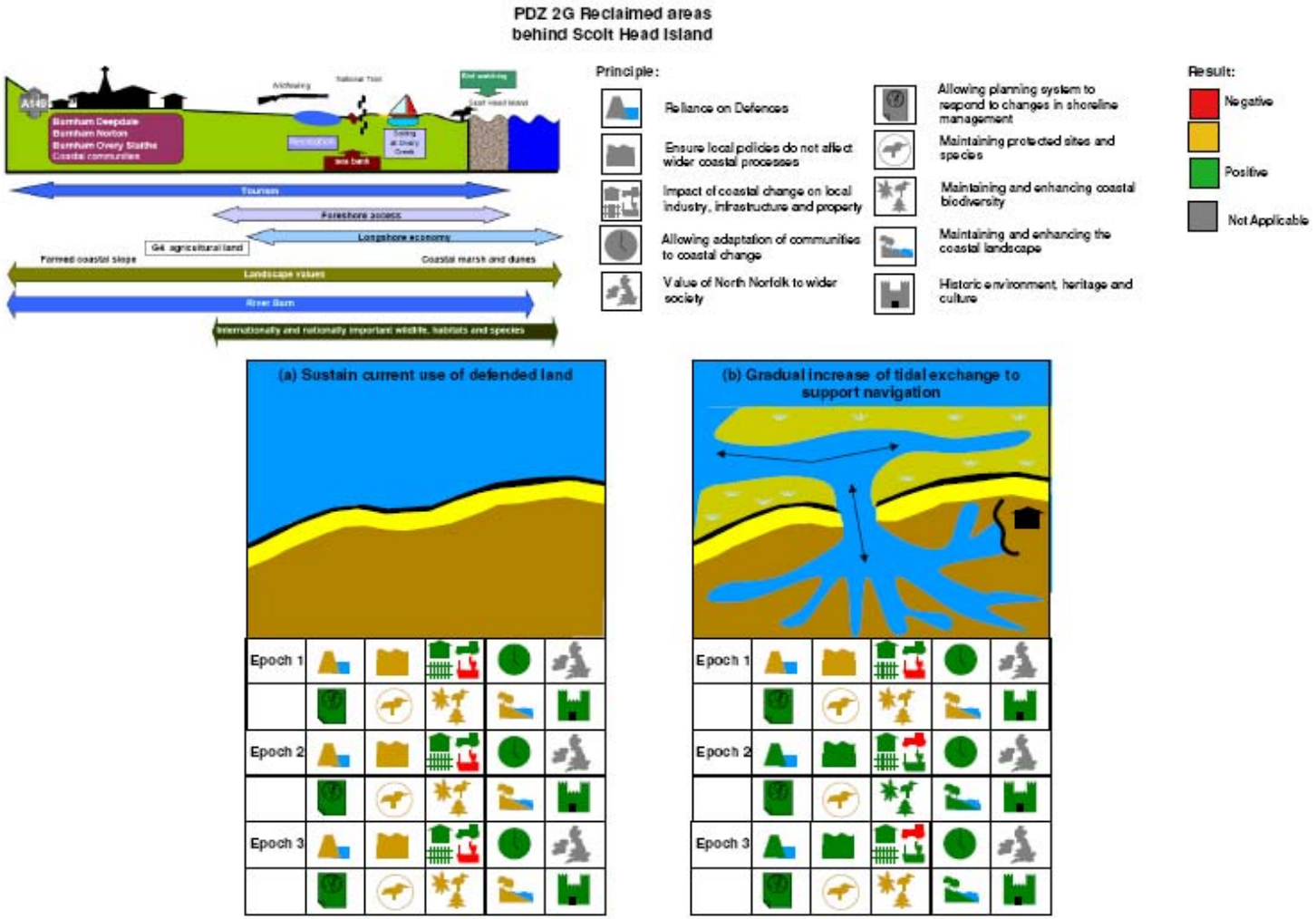




PDZ 2D Reclaimed Grazing Marsh at Brancaster
Principle:
Reliance on Defences
Ensure local policies do not affect wider coastal processes
Impact of coastal change on local industry, infrastructure and property
Allowing adaptation of communities to coastal change
Value of North Norfolk to wider society
Allowing planning system to respond to changes in shoreline management
Maintaining protected sites and species
Maintaining and enhancing coastal biodiversity
Maintaining and enhancing the coastal landscape
Historic environment, heritage and culture
Result:
Negative
Positive
Not Applicable
Tourism
Longshore economy
Foreshore access
Commercial inshore fisheries
Farmed coastal slope
Coastal marsh and dunes
Landscape values
Internationally and nationally important wildlife, habitats and species
(a) Sustain current use of defended land
(b) Maximise tidal exchange to support navigation
Epoch 1
Epoch 2
Epoch 3

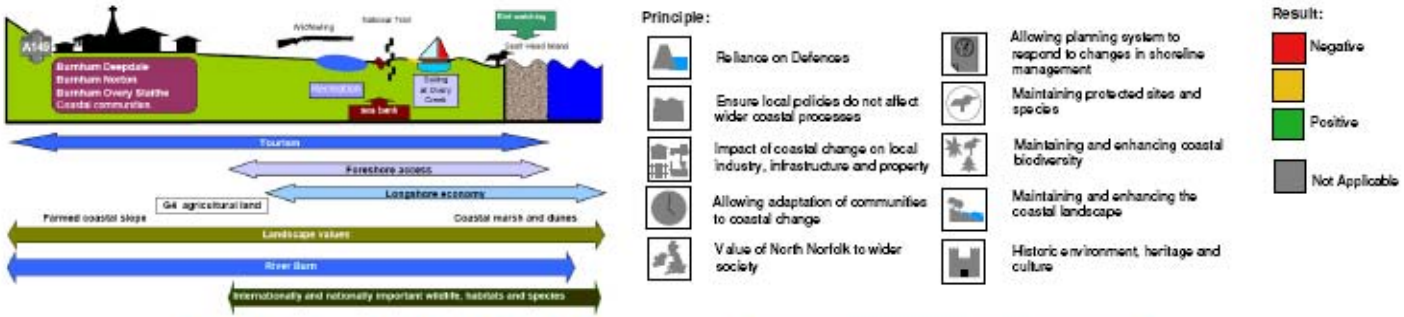
## PDZ 2E Royal west Norfolk Golf Club

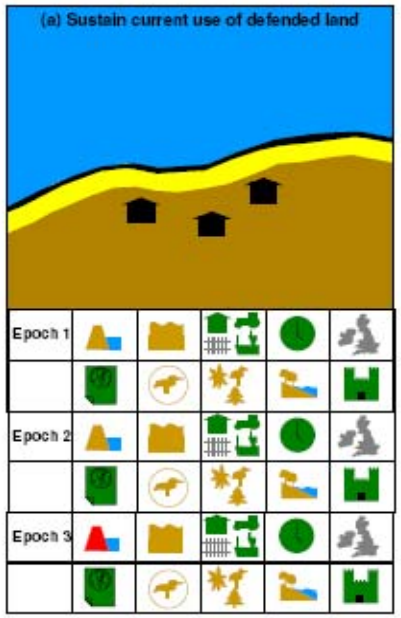


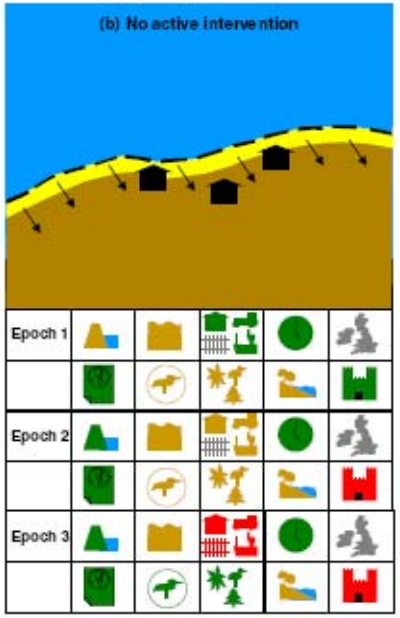

PDZ 2F Brancaster and
Brancaster Staithe
Principle:
Reliance on Defences
Ensure local policies do not affect wider coastal processes
Impact of coastal change on local industry, infrastructure and property
Allowing adaptation of communities to coastal change
Value of North Norfolk to wider society
Allowing planning system to respond to changes in shoreline management
Maintaining protected sites and species
Maintaining and enhancing coastal biodiversity
Maintaining and enhancing the coastal landscape
Historic environment, heritage and culture
Result:
Negative
Positive
Not Applicable
Brancaster and Brancaster Staithe Coastal communities
Branodunum: Roman Fort
Tourism
Longshore economy
Foreshore access
Commercial inshore fisheries
Farmed coastal slope
Coastal marsh and dunes
Landscape values
Internationally and nationally important wildlife, habitats and species
(a) Sustain current use of defended land
Epoch 1
Epoch 2
Epoch 3
(b) No active intervention
Epoch 1
Epoch 2
Epoch 3


PDZ 2G Reclaimed areas
behind Scolt Head Island
Principle:
Reliance on Defences
Ensure local policies do not affect wider coastal processes
Impact of coastal change on local industry, infrastructure and property
Allowing adaptation of communities to coastal change
Value of North Norfolk to wider society
Allowing planning system to respond to changes in shoreline management
Maintaining protected sites and species
Maintaining and enhancing coastal biodiversity
Maintaining and enhancing the coastal landscape
Historic environment, heritage and culture
Result:
Negative
Positive
Not Applicable
Tourism
Foreshore access
Longshore economy
G4 agricultural land
Formed coastal slope
Coastal marsh and dunes
Landscape values
River Burn
Internationally and nationally important wildlife, habitats and species
(a) Sustain current use of defended land
(b) Gradual increase of tidal exchange to support navigation
Epoch 1
Epoch 2
Epoch 3

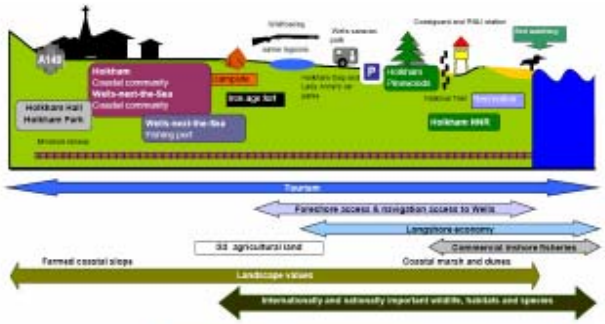
PDZ 2H Burnham Overy
Staithe



## PDZ 2H Wells Quay

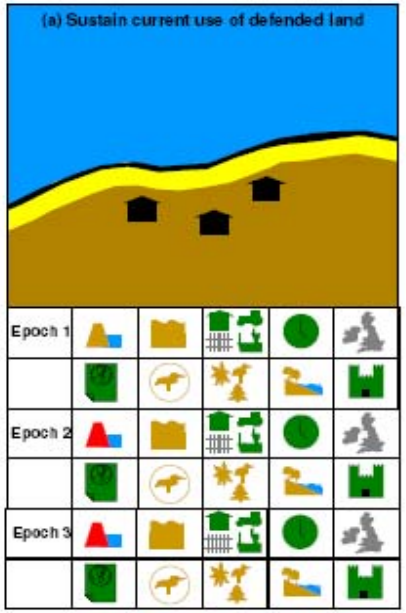


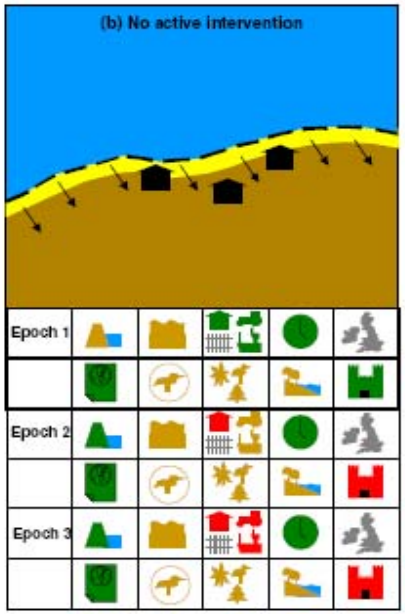

Principle:

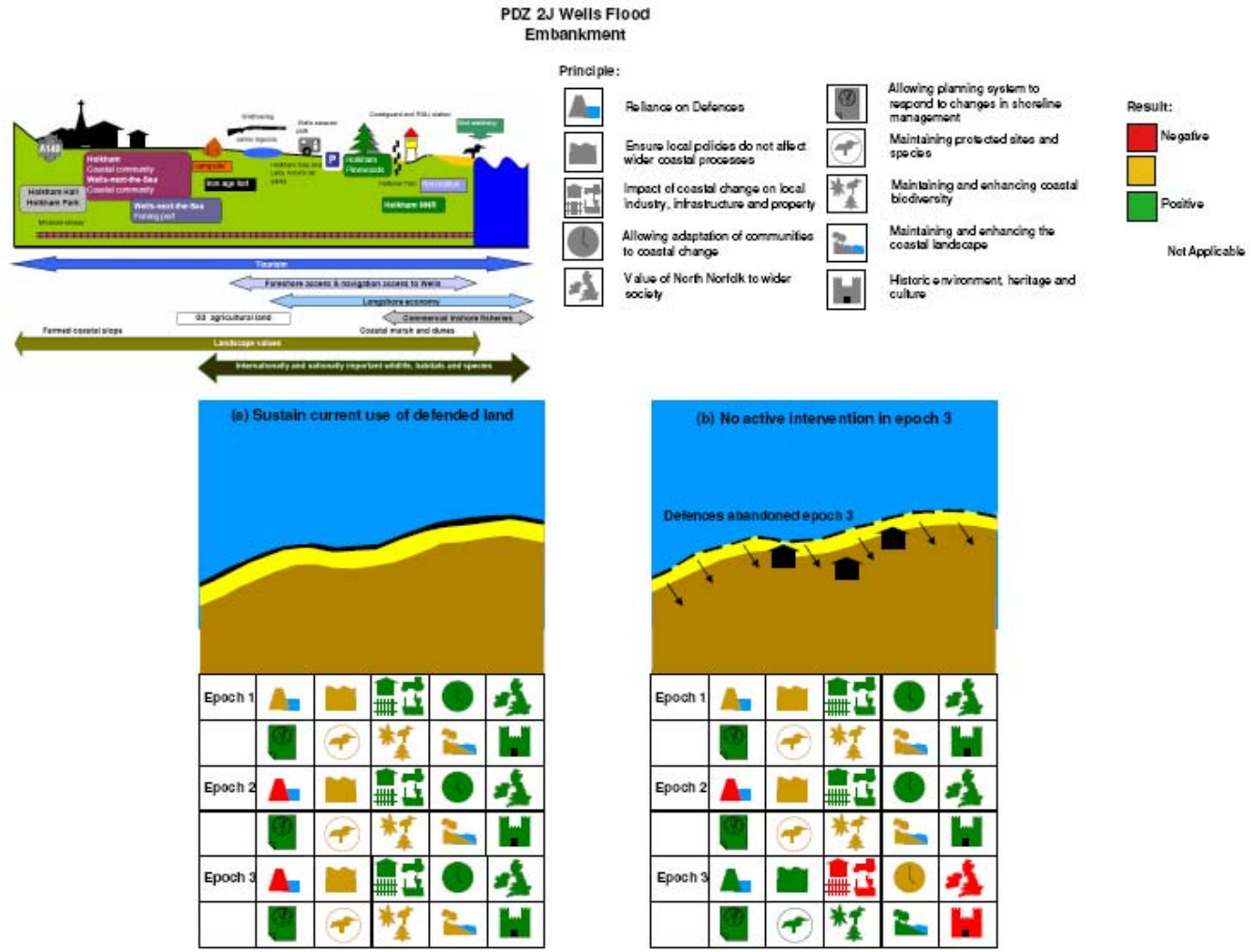
- Reliance on Defences
- Ensure local policies do not affect wider coastal processes
- Impact of coastal change on local industry, infrastructure and property
- Allowing adaptation of communities to coastal change
- Value of North Norfolk to wider society
- Allowing planning system to respond to changes in shoreline management
- Maintaining protected sites and species
- Maintaining and enhancing coastal biodiversity
- Maintaining and enhancing the coastal landscape
- Historic environment, heritage and culture

Result:

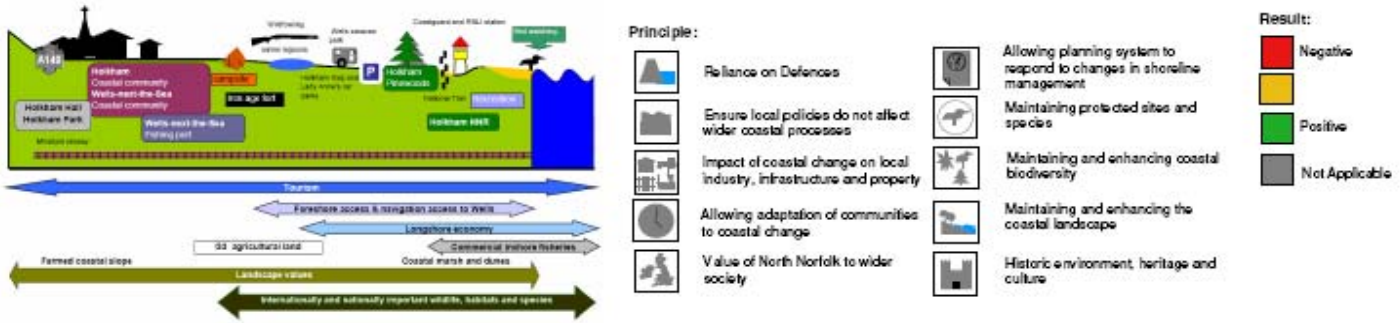
- Negative
- Positive
- Not Applicable

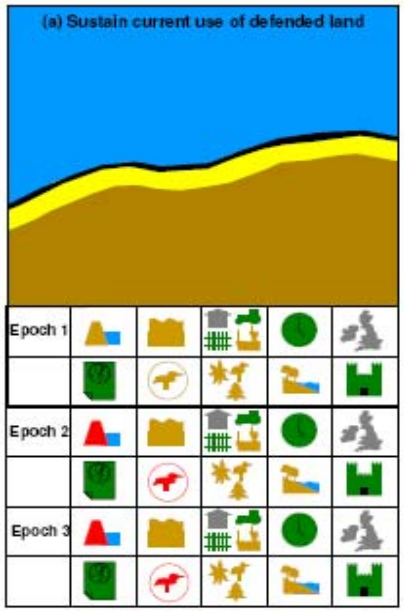


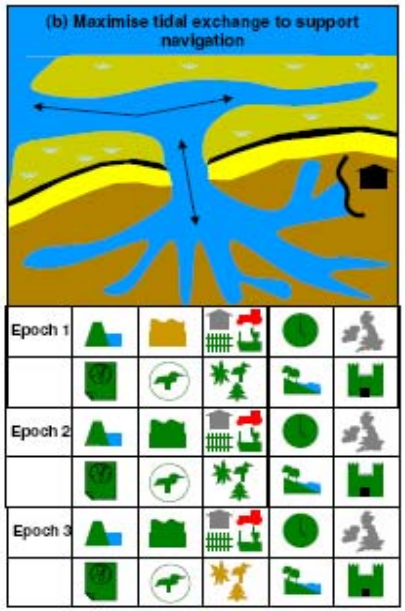




PDZ 2J Wells Flood Embankment
Principle:
Reliance on Defences
Ensure local policies do not affect wider coastal processes
Impact of coastal change on local industry, infrastructure and property
Allowing adaptation of communities to coastal change
Value of North Norfolk to wider society
Allowing planning system to respond to changes in shoreline management
Maintaining protected sites and species
Maintaining and enhancing coastal biodiversity
Maintaining and enhancing the coastal landscape
Historic environment, heritage and culture
Result:
Negative
Positive
Not Applicable
(a) Sustain current use of defended land
(b) No active intervention in epoch 3
Defences abandoned epoch 3
Epoch 1
Epoch 2
Epoch 3

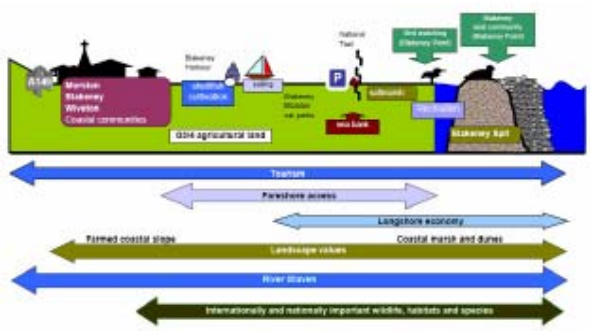
## PDZ 2J Wells East Bank



**PDZ 3A Reclaimed areas behind Blakeney Spit**

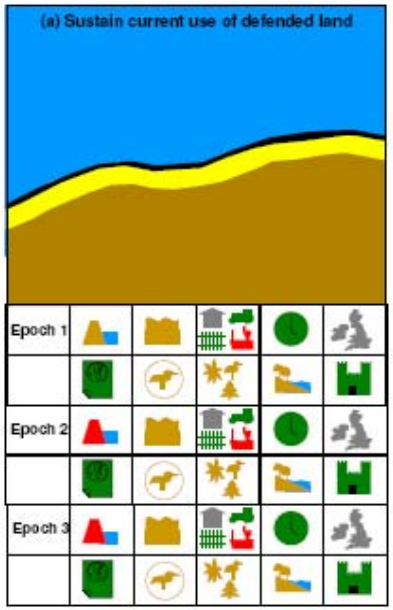


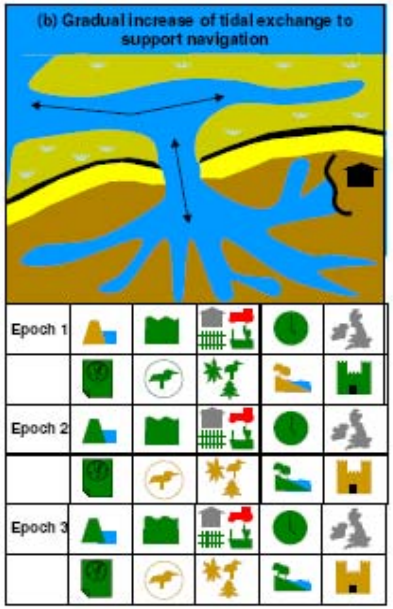

Principle:

- Reliance on Defences
- Ensure local policies do not affect wider coastal processes
- Impact of coastal change on local industry, infrastructure and property
- Allowing adaptation of communities to coastal change
- Value of North Norfolk to wider society
- Allowing planning system to respond to changes in shoreline management
- Maintaining protected sites and species
- Maintaining and enhancing coastal biodiversity
- Maintaining and enhancing the coastal landscape
- Historic environment, heritage and culture

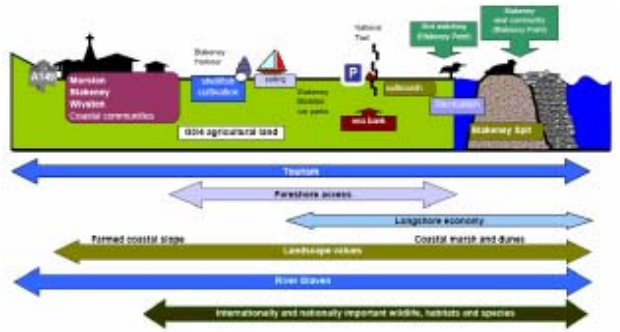
Result:

- Negative
- Positive
- Not Applicable



## PDZ 3C Blakeney

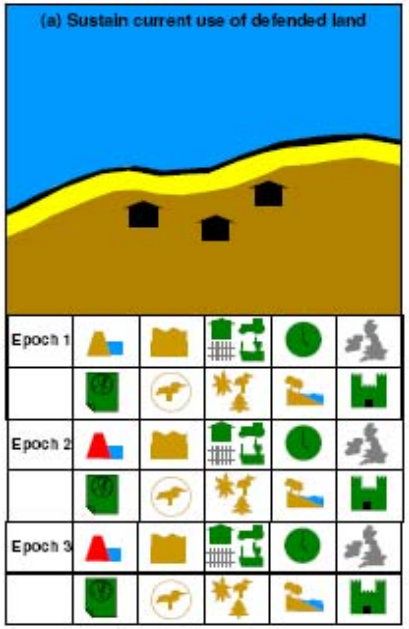


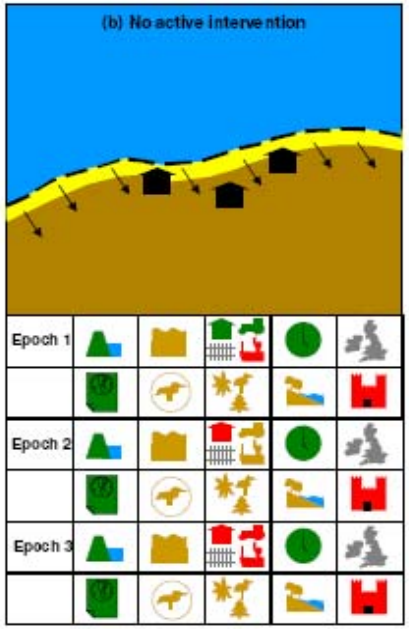

Principle:

- Reliance on Defences
- Ensure local policies do not affect wider coastal processes
- Impact of coastal change on local industry, infrastructure and property
- Allowing adaptation of communities to coastal change
- Value of North Norfolk to wider society
- Allowing planning system to respond to changes in shoreline management
- Maintaining protected sites and species
- Maintaining and enhancing coastal biodiversity
- Maintaining and enhancing the coastal landscape
- Historic environment, heritage and culture

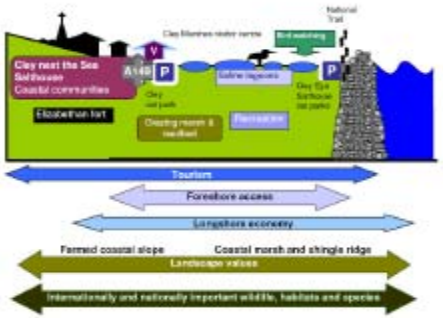
Result:

- Negative
- Positive
- Not Applicable



## PDZ 3D Cley and Salthouse shingle ridge

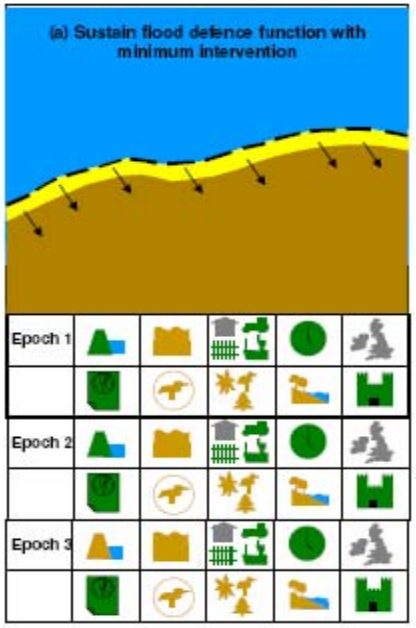


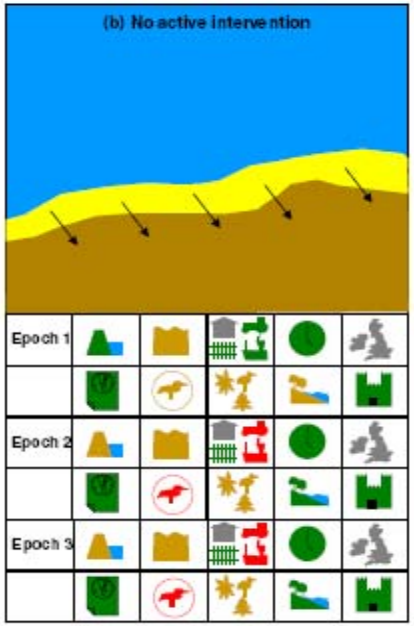

Principle:

- Reliance on Defences
- Ensure local policies do not affect wider coastal processes
- Impact of coastal change on local industry, infrastructure and property
- Allowing adaptation of communities to coastal change
- Value of North Norfolk to wider society
- Allowing planning system to respond to changes in shoreline management
- Maintaining protected sites and species
- Maintaining and enhancing coastal biodiversity
- Maintaining and enhancing the coastal landscape
- Historic environment, heritage and culture

Result:

- Negative
- Positive
- Not Applicable



# E5 Post-public consultation

## E5.1 Introduction

Following public consultation, a number of changes were made that are relevant for policy development and appraisal. These have been incorporated throughout the main SMP document and other appendices. However, for this appendix, which tells the story of policy development and appraisal, it was considered preferable to leave intact the draft version of the appendix which explains how the draft SMP was developed and to add this section to explain the changes that were made after consultation.

The two main changes after consultation concern the role of the historic environment in appraisal and a number of changes in policy where the draft SMP contained managed realignment policies.

These changes were presented, discussed and agreed at a meeting with the Client Steering Group and were then formally agreed at the following Elected Members' Forum meeting. The changes and additions are discussed briefly below.

## E5.2 Historic environment

The response of English Heritage and Norfolk Landscape Archaeology to the public consultation raised concerns about the role of the historic environment in the SMP. This has been addressed by additional data collation and analysis, working closely with Norfolk Landscape Archaeology and English Heritage. The results have been incorporated throughout the SMP, particularly in the main SMP document, the theme review (appendix D) and the appraisal results (appendix G), which contain additional data and reflect the revised analysis. There has been no change to the structure of the appraisal process (principles, criteria and indicators).

The effect of the additional data in policy appraisal is reflected in appendix G (appraisal tables of final policies) and in the main SMP document, particularly section 2.2 (description of land use and environment), section 3.2 (description of the implications of the plan, particularly under the heading historic environment) and in the policy statements.

## E5.3 Policy changes

The North Norfolk SMP's public consultation has led to a number of policy changes. The main SMP document and the other appendices reflect the final plan. This section summarises the main changes compared to the draft SMP. Table E5.1 gives an overview of the changes.

**Table E5.1 Policy changes from draft to final SMP**

| PDZ | Draft SMP policy | | | Final SMP policy | | |
|---|---|---|---|---|---|---|
| | Epoch 1 | Epoch 2 | Epoch 3 | Epoch 1 | Epoch 2 | Epoch 3 |
| 1C | HtL | MR/HtL | MR/HtL | HtL | HtL | HtL/MR |
| 2D | HtL | MR/HtL | MR/HtL | HtL | HtL/MR | HtL/MR |
| 2G.1 | HtL | MR/HtL | MR/HtL | HtL | HtL | HtL/MR |
| 2G.3 | HtL | HtL | MR/HtL | HtL | HtL | HtL/MR |
| 2L | MR | HtL | HtL | HtL | HtL | HtL |
| 3A.2 | MR | HtL | HtL | HtL | HtL | HtL |
| 3A.3 | HtL | MR/HtL | MR/HtL | HtL | MR | HtL |

There are three types of changes:

- The firm epoch 1 managed realignments for Wells east bank (2L) and Morston (3A.2) were changed to hold the line for all epochs. This change was driven by considering that some of the reasons for realignment at these locations (increase in tidal prism with positive effects on navigation, reduction of pressure in neighbouring frontages, defence sustainability) are too uncertain compared to the clear disadvantages for existing land use. Public consultation also provided additional information about some of these disadvantages, such as the effects on land drainage. The policy statements in the main document still retain a caveat that a change in flood risk management may be needed in the future for reasons of defence sustainability.
- Some of the conditional managed realignment/hold the line policies were changed to conditional hold the line/managed realignment policies and some of these have been delayed from epoch 2 to epoch 3 (1C Thornham sea bank and 2G.1 Deepdale and Norton marshes). The reasons for this change are similar to those described above. Most of the drivers are relatively uncertain while some of the constraints are clear and direct.
- The conditional epoch 2 managed realignment/hold the line policy for Blakeney Freshes (3A.3) was changed to a firm epoch 2 managed realignment policy. This recognises the consultation response of the National Trust (the main landowner for the area, see appendix B) and the urgent socio-economic need to improve navigation access to Blakeney, which an increase in tidal prism could support. The effect of this policy on the internationally designated freshwater and brackish habitats in Blakeney Freshes is recognised and addressed in the Appropriate Assessment (appendix M).