

3 Basis for Development of the Plan

3.1 Historical Perspective

The shoreline throughout much of the area covered by this SMP is naturally eroding and has been doing so for centuries. Man has sought to limit this natural process in many areas of the coast as sea levels have slowly risen and land levels gradually dropped. The erosion seen today along this coast is not a new phenomenon. Flooding is also not new with flood events being recorded along this coast throughout history, with the most recent cases occurring in March 2008

The coast has experienced a number of very large storm events that have resulted in the well-recorded loss or damage to coastal communities. One such example is the 'tsunami'-type event of January 1607 that caused extensive flooding of the coast resulting in the loss of property and life along both sides of the Bristol Channel. Events such as this are evidence of natural changes that can occur along this coast over alongside slower longer term changes.

Although humans may have impacted upon the change occurring at the shoreline, they have not, in the main, caused it. Many of these flood events took place well before parts of the shorelines affected were defended to the extent they are today, although in some places, the impacts of these natural events has been increased by human intervention. For example, the construction of groynes and other structures that protect one part of the coast can deprive sediment from sections of the coast further along. This effectively 'moves the problem' along the coast and is something that requires careful consideration when developing coastal defence schemes.

This natural change is still taking place and is likely to continue in the future. Coastal defence works help resist erosion and shoreline retreat, but it is only sustainable for a limited time and will not halt the natural changes. The decision to be made is how we are going to manage this shoreline change in the future.

Appendix C provides a detailed review of the understanding of coastal processes that has informed the development of the SMP policies.

3.2 Sustainable Policy

3.2.1 Coastal processes and coastal defence

Climate change

The coastline is undergoing constant change due to large-scale impacts of climate change, namely global sea level rise, and the day-to-day effects of waves and tidal currents. It is the implications of climate change that will determine sustainable shoreline management into the future.

Sea level attained a level close to its present position about 5,000 years ago, and the modern wave, tide and current regime has been operating since that time. The role of sea level rise in shoreline evolution is thought to have been limited over the last 2,000 years, due to the low rates of change (averaging less than a millimetre per year). We are now entering a period of accelerating sea level rise, which could result in the destabilisation of present coastal systems.

Recent climate studies have indicated that there are significant changes occurring within our climate; such as increasing winter rainfall, rising sea levels and increasing storm surge levels. The amount of physical change along any length of coast depends on the degree of exposure of the coast and the underlying geology. Increasing intensity of rainfall in between longer periods of drier weather can potentially lead to increased cliff recession, while rising sea levels may lead to increased toe erosion at the base of cliffs and slope failure.

It is extremely important that the long term policies in the SMP recognise these future risks and reflect likely future constraints to management planning. Thus, the SMP acts as early warning to other plans and initiatives related to communities and infrastructure within the coastal zone.

Changes at the coast

We are also now living with a reduced resource of sediment on many of our coasts, as its transport from further out at sea has diminished. This problem has been particularly exacerbated on the coastline examined in this plan with beaches receiving little or no fresh supply of sediment.

As already discussed, the erosion of the shoreline is an ongoing process and changes to the coastal system as a whole are better (although not fully) understood. Along much of the North Devon and Somerset coastline, movement of the shoreline is occurring in a landward direction as sea levels rise and the shoreline responds to the increase in energy reaching it from the sea. This process is called transgression. Although attention is focussed upon the shoreline position, this process also produces a deepening of the seabed at any particular point.

Beaches backed by large sea defences tend to experience narrowing, lowering and loss with the accelerating sea level rise, particularly where these sediments have not been replaced by cliff erosion. This leaves the defences in deeper water than expected which in turn allows larger waves to reach them. We should not expect the future to be any different and, as such, the level of the shore at existing defence locations may be much lower than present beach levels. Accelerated sea level rise may increase the speed of change.

If we continue to defend our shorelines with defences in the same locations as present they will need to increase in width to compensate for the larger waves in deeper water, have deeper foundations to cope with falling beach levels, and be greater in height to limit the amount of water passing over the top of them in storms.

Sediment movement

The movement of sediment along a shoreline allowed to behave naturally is considered to be sustainable. In some areas of the UK it can be demonstrated that long lengths of seemingly isolated coastline actually form one connected sediment system and that sediment movement from one source provides material to many locations further downdrift. Therefore, interference with the system at any point along the coast can have detrimental and sometimes unpredictable impacts considerable distances away.

There are limited shoreline sediment linkages along many sections of the SMP's frontage, with man-made and natural headlands limiting littoral (shoreline) sediment transport between sections of the coast. As such, the coastal processes and shoreline sediment transport interactions along the SMP coastline can be considered within largely discrete units with changes in sediment unlikely to impact other areas of shoreline. However, it should also be recognised that there is also a relationship along some parts of the SMP frontage with the transport of fine, mud sediments within the wider Severn Estuary. For example in Bridgwater Bay where the deposition of mud has resulted in a wide shallow foreshore that limits the effect of wave action at the coast. Defence management needs to work with these processes and limit problems at other locations within individual process units.

Defence impacts

In general, there is less acceptance of coastal change and it is apparent, through the development of SMPs and strategy studies, that there is commonly a public misconception that coastal change can be halted through engineering works. There is often a demand to continue to hold the existing defence line, in order to protect

assets, but this is coupled with an expectation that the shoreline will continue to look exactly as it does now. Due to the dynamic nature of our shoreline, this is incorrect in many, if not most, instances.

The North Devon and Somerset SMP coastline is, in places, heavily defended along both low-lying (flood risk) frontages and cliffed (coastal erosion risk) frontages. The defences used along this coastline comprise mainly linear seawalls at the rear of sand or shingle beaches which are, in places, also groyned to help retain beach material along these frontages. In some locations the beaches themselves act as a defence reducing the risk of flooding to large areas of low-lying land, including significant areas of development and infrastructure. An example of this is the shoreline between Burnham-on-Sea and Brean which fronts the Somerset Levels with defence provided by natural dune systems. Along the cliffed frontages of the SMP area, the base of cliffs have, in places, protected from erosion through linear seawall and revetment type defences, limiting any erosion of the cliff edge. However, even without these defences, it is likely that sediment provided through cliff erosion would only be likely to feed local beaches, with alongshore transport along this frontage generally limited by headland structures and landforms.

If we were to continue to defend parts of this coastline, as we are now, along the lengths where significant coastal retreat is expected to occur, the long term picture would be one of an even more fragmented shoreline in these areas, characterised by a series of man-made armoured headlands where settlements are defended with embayments in between. Seawalls would result in a series of large promontories, in some cases extending tens of metres out from the adjacent (undefended) eroded shoreline by the end of the century. These promontories would be highly exposed to waves in deep water, requiring much more substantial defences to be constructed. These defences would also need to be extended landward to prevent outflanking of the present seawalls. There would be no beaches along these frontages and any groynes would have become redundant with water at the structures at all times.

It must be recognised that, in the very long term, continuing to defend such stretches of shoreline may be technically unsustainable and consideration should be given to relocation of assets, or mitigation for their loss.

3.2.2 Economic sustainability

One of the difficulties facing us, as a nation, is the cost of continuing to protect shorelines to the extent that we do now. Many of the defences that exist today have been the result of reactive management without consideration of the long term consequences such as the financial commitment required.

Studies over the past few years have established that the cost of maintaining all existing defences is already likely to be at least 50 per cent more than present expenditure levels because of the climate changes being predicted, which will accelerate the natural changes already taking place (Burgess & Townend, 2004). In simple terms this means that either more money needs to be invested in coastal defence, or defence expenditure has to be prioritised. While the first option would clearly be the preference of those living or owning land along the coast, it has to be put into the context of how the general UK taxpayer wishes to see their money used. Given that the cost of providing effective and stable defences currently averages between £3 million and £5 million per kilometre, the number of privately owned properties that can be protected by this investment has to be weighed up against how else that money could be spent, for example in education, health and other social benefits.

Those areas where the UK taxpayer is prepared to continue to fund defence may well become even more selective and the threshold of when an area is no longer defended could well shift. While it is not known how attitudes might change, it is not unreasonable to assume that future policy-makers will be more inclined to resist investing considerable sums in protecting property in high-risk areas, such as the coast, if there are substantially cheaper options, such as constructing new properties further inland. Future investment in

defences, or otherwise, will in part be guided by the Environment Agency's Long Term Investment Strategy (Environment Agency, 2009a) and the definition by planning authorities of Coastal Change Management Areas to guide acceptable development in coastal areas at risk of flooding and erosion (Communities and Local Government website).

It is extremely important that the long term policies in the SMP recognise future economic issues and reflect likely future constraints, providing realism as to the future management of the shoreline.

With national financial constraints it is likely that protection will focus upon larger conurbations and towns, where the highest level of benefit is achieved for the investment made, i.e. more properties can be protected per pound of investment. In the case of the North Devon and Somerset SMP2, a number of areas will be affected by this, meaning that it will not be economically viable to replace defences. In these areas adaptation or resilience measures will be required to address the increased risk of erosion and/or flooding.

3.2.3 Environmental sustainability

The concept of environmental sustainability is subject to change over time, as it depends upon current social attitudes, which continue to alter.

Historically, communities at risk from coastal erosion were relocated, recognising that they were unable to resist change. In more recent times many coastal defences have been built without regard for the impacts upon the natural environment.

Today, because we have improved engineering, we are less prepared to accept change, in the belief that we can resist nature. Attitudes will continue to alter; analyses of possible 'futures' are already taking place considering the implications for many aspects of life, including approaches to flooding and erosion under different scenarios (the Foresight programme run by the Office of Science and Technology, www.foresight.gov.uk). We cannot predict how attitudes will change in the future; therefore the SMP is based upon existing criteria and constraints, while recognising that these may alter to accommodate changing social attitudes.

Quality of life depends on both the natural environment and the human environment, which are discussed below.

Natural environment

The forces of nature have created a variety of landforms and habitats around the North Devon and Somerset coastline. The special quality of the natural habitats, natural landscapes and geological/geomorphological features on this coast is recognised in a number of national and international designations (protected under statutory international and national legislation) as well as national (e.g. Planning Policy Statement 9, which sets out policies on the protection of biodiversity/geological conservation), regional and local planning policies.

Large parts of the North Devon and Somerset coast are designated as Areas of Outstanding Natural Beauty (AONB), National Park and/or UNESCO Biosphere Reserve in order to sustain this unique landscape by protecting the landscape and enhancing recreational opportunities in the area. In addition, two Heritage Coasts (Lundy Island and North Devon) are present within the study area, which have been designated for their exceptional scenic quality. Generally, landscape is difficult to value objectively as it is a mixture of the natural environment and social and cultural history. Therefore, defining a sustainable landscape is usually dependent upon both human and natural environmental factors.

Coastal management has the potential to change landforms and landscapes. In many areas, raising existing or constructing new coastal defences may be detrimental to both the landscape and seascape e.g. through the introduction of an artificial structure into a natural landscape or perhaps through the raising of defences which

while restricting views can also obscure the horizon and enclose a previously open landscape. The deterioration of coastal defences from a no active intervention policy also has the potential to degrade existing landscape quality.

Where possible, opportunities have been explored to enhance the existing landscape/seascape through the removal of defences and the creation of new areas of intertidal habitat.

There is a *legal* requirement to consider the implications of any 'plan or 'project' that may impact on a Special Protection Area for Birds (SPA) or a Special Area of Conservation (SAC), through the European Union Habitats Directive (Council Directive 92/43/EEC) and Birds Directive (Council Directive 79/409/EEC). The Defra High Level Targets for Flood and Coastal Defence (Target 4 – Biodiversity) also require all local councils and other operating authorities to:

- avoid damage to environmental interest;
- ensure no net loss to habitats covered by Biodiversity Action Plans (the SMP acknowledges where certain types of Biodiversity Action Plan habitat within designated sites may be lost or gained);
- seek opportunities for environmental enhancement; and
- monitor any changes to habitats, including contributions to Sits of Special Scientific Interest/Special Protection Area conservation targets, loss and gain of habitats, and to keep records.

Biodiversity Action Plans habitats were identified in developing policy options, opportunities for improvements to existing habitats or the creation of new habitats have been considered.

Coastal management can have a significant impact on habitats and landforms, both directly and indirectly. In places, coastal defences may be detrimental to conservation interests, e.g. those seen along in areas of the Severn Estuary that can potential reduce intertidal habitat due to coastal squeeze, but in other locations defences may protect the interest of a site, e.g. freshwater sites or designated terrestrial habitats in the hinterland of defences. Natural coastal structures may also form the coastal defence, e.g. pebble ridge at Northam Burrows. Therefore, coastal management decisions need to be made through consideration of both natural environmental features and risk management.

Although the conservation of ecological features in a changing environment remains important in terms of environmental sustainability, future management of the coast needs to allow habitats and features to respond and adjust to change, such as accelerated sea level rise. Coastal habitats cannot always be protected in-situ because a large element of their ecological interest derives from their dynamic nature and this is important to ensure the continued functionality of any habitat. This poses a particular challenge for nature conservation and shifts the emphasis from site preservation to conservation.

Under Section 28G of the Countryside and Rights of Way Act 2000, Natural England is responsible for safeguarding England's finest and most vulnerable wildlife and geological features. Natural England is actively seeking to ensure that coastal erosion and flood risk management proposals are designed to ensure that Sites of Special Scientific Interest are conserved and, where possible, ecology and geology enhancements are implemented, while also allowing the coast to remain naturally dynamic. Similarly, Section 85 of the Countryside and Rights of Way Act 2000 charges relevant authorities with conserving and enhancing areas of outstanding natural beauty.

Accommodating the objectives of environmental bodies, such as Natural England, and future shoreline change requires flexibility in the assessment of nature conservation issues. This includes comprehensively assessing the potential impact of activities beyond the immediate site designation boundaries to consider wider-scale (far-field effects) or longer term benefits.

Where possible, opportunities for enhancing biodiversity have been taken into consideration in the preferred policies' selection so help authorities to make progress with implementing the UK Biodiversity Action Plan and local biodiversity action plans. There are several areas along the SMP frontage where biodiversity opportunities can be taken by allowing more natural coastal processes to take place along large stretches of low-lying areas through no active intervention or managed realignment, and the protection of important terrestrial/freshwater habitats through holding the line. Such approaches need to be balanced against the socio-economic objectives for the area and engineering feasibility to deliver long term sustainable management.

Human (socio-economic) environment

The human environment covers such aspects as current and future land use, infrastructure, material assets, cultural heritage, population and health and the man-made landscape.

(i) Land-use, infrastructure and material assets

Historically, development of the coast took place in an unconstrained manner, often undertaken by individual land owners. Planning Policy Guidance 20 (PPG20) identifies that approximately 30 per cent of the coastline of England and Wales is developed; however, much of this development took place before the introduction of the Town and Country Planning Act, 1947. Growth of built development, both commercial and residential, within the coastal zone over the centuries has increasingly required engineering works to defend properties against the risk of erosion and flooding.

Continued construction of hard-engineered coastal and flood defences to protect development may not be economically sustainable in the long term (see Section 3.2.2). Local development frameworks now identify the need for 'sustainable development' and although the exact definition of this is uncertain, it recognises that opportunities for development on the coast are limited due to the risk of flooding, erosion, land instability and conservation policies (as discussed above). Planning Policy Statement 25 Supplement: Development and Coastal Change, that has now largely superseded PPG20, requires Coastal Change Management Areas to be defined to guide acceptable types of development based on the level of risk posed by coastal change, such that long-term sustainable development is directed to areas of very low risk.

In a similar way, Planning Policy Statement 25 (PPS25) on Development and Flood Risk seeks to direct development towards areas of low flood risk rather than areas of higher flood risk (which would in turn require more defence in the future).

The western section of this coast is predominately rural with an increasing number of commercial and industrial interests in the east towards the major conurbation of Bristol (outside of this SMP area). There are small ports and harbours and areas of mineral extraction in the west, however large scale industrial activities are concentrated along the M5 corridor in the towns of Weston-super-Mare and Bridgwater. The continuation of these industries is essential to sustain the economy of the region as a whole. Also situated along the SMP frontage is the Hinkley Point Nuclear Power Station. There are plans being developed for the expansion of this site and the SMP policies have been developed following consultation with the developer.

In addition, there are military establishments, such as the Royal Marine Base at Chivenor, and known landfill sites within the study area, which may be particularly vulnerable to flooding and/or erosion and are likely to require further consideration to ensure that policy scenarios are implemented in a sustainable manner (e.g. to avoid release of contaminants into soils, groundwater or surface water).

The potential risk of changes in coastal management posed to infrastructure (e.g. roads and railways) in some parts of the study area is also an important consideration.

(ii) Population and health

A number of urban settlements are present along the coastline of the study area but only Weston-super-Mare has a population of over 50,000 people. Sustainable coastal erosion and flood risk management of these settlements is one of the main objectives of the SMP, in order to meet social and economic needs and to avoid adverse impacts upon human health (e.g. the physical, psychological and socio-economic impacts of flooding).

A coastal location can be fundamental to some types of tourism/recreation and although the popularity of many British seaside resorts has declined in recent years, seaside tourism often still represents a substantial part of the local economy. However, the North Devon coast has seen a revival in recent years with the popularity of water based recreational activities such as surfing, windsurfing, kite surfing etc. This is aided by a number of award winning bathing beaches (e.g. Blue Flag status). This has made it an important destination for visitors from the UK, Europe and the rest of the world. In addition to recreation, the coast boasts International designations including Braunton Burrows Special Area of Conservation and the North Devon UNESCO Biosphere Reserve and the numerous nationally important nature and geological designations. Many of the towns along this coast are important centres for tourism, providing accommodation, facilities and services to the many visitors to the area each year. Thus, the impacts of policy on the tourism industry need to be carefully considered.

As the coastal strip represents an important recreational and amenity resource, many activities rely on the presence of a beach or access to the sea. Although assets landward of current defences and access routes may be protected through maintaining existing defences, it must be recognised that continuing such defence practices would, in the longer term, result in a significant alteration in the nature of the coast, with large concrete seawall structures, narrow beaches and limited access.

(iii) Historic environment (cultural heritage)

Heritage features are valuable because they (English Heritage, 2006):

- are evidence of past human activity;
- provide a sense of place (or roots) and community identity;
- contribute to the landscape aesthetics and quality; and
- may represent an economic asset due to their tourism interest.

Within the study area, there is a combination of designated areas such as Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and built Conservation Areas, as well as non-scheduled or unknown archaeological assets. These assets are unique and irreplaceable making protection against coastal erosion and/or flooding even more important. Conversely, the very process of coastal erosion is uncovering sites of historical interest. Only a few sites are protected by statutory law, but many more are recognised as being of high importance.

Government advice in PPG15 and PPG16 promotes the preservation of important heritage sites, wherever practicable. The government's policy on archaeological remains set out in PPG16 states that: "*Archaeological remains should be seen as a finite and non-renewable resource, in many cases highly fragile and vulnerable to damage and destruction. Appropriate management is therefore essential to ensure they survive in 'good condition'*".

However, due to the dynamic nature of our coastlines, this is not always possible, or sustainable to preserve these important assets. Therefore, each site must be considered as an individual site and balanced against other objectives at that location.

3.2.4 Renewable energy and the Severn Estuary

The Department for Energy and Climate Change (DECC) and the Welsh Assembly Government (WAG) are part way through funding a feasibility study of potential wave and tidal power generation technologies within the Severn Estuary. The feasibility study aims to gather evidence to help government to decide if it could/should support a tidal power scheme(s) in the Severn and on what terms for example public/private ownership or investment. Phase 1 of the study has been completed, reducing a list of ten possible schemes down to a shortlist of five.

As no decision has been made on which, if any, scheme would be supported by government, this SMP does not take into consideration any tidal or wave energy scheme in the SMP decision making process. This is also the approach being taken on the other SMP2s being developed around the Bristol Channel/Severn Estuary shoreline.

Phase 2 of the feasibility study will appraise the five shortlisted possible schemes in more detail, taking into account potential impacts on coastal flooding and erosion, including the policies set out in this SMP.