

## 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 this coast where development has occurred, which has been taking place as sea levels have slowly risen and land levels have gradually dropped, the latter being the ongoing, very long term consequences of the last ice-age. The erosion seen today along this coast is therefore nothing new. Flooding is also nothing new; with flood events being recorded along this coast throughout history.

Over historic time-scales, the coast has experienced a number of very large storm events that have resulted in the well recorded loss or damage to coastal communities, which are evidence of natural changes that can occur along this coast in a very short period above the underlying longer-term changes that are typically slower and more gradual. One such example is the 'great gale' of November 1824 that caused flooding and erosion resulting in the loss of property and life between Cornwall and Hampshire, and notably the destruction of the village of East Fleet as a result of large waves breaking over the Chesil Beach onto the village.

Many of these events took place well before parts of the shorelines affected were defended to the extent they are at present, although in some places, the impacts of these natural events has been compounded by human intervention, such as the mining of shingle from parts of the Chesil Barrier system causing low beach levels, or the dredging of nearshore bank systems allowing larger waves to reach the shoreline (e.g. as occurred at Hallsands). Therefore, although humans may have impacted upon the change occurring at the shoreline, they have not, in the main, caused it.

Equally, there is no reason to suggest that this natural change is not still taking place, nor that we should assume that it will not continue to take place in the future. Human intervention will not halt this natural process; coastal defence works carried out over the last century have not prevented natural change from occurring, they have simply delayed its full implications from being felt. Coastal defence works are one approach to resisting erosion and shoreline retreat, but it is only sustainable for a limited time. The decision to be made now is how we are going to manage this shoreline change in the future.

### 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 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 hydrodynamic 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), but 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; with bigger storms, increasing rainfall and rising sea levels. The amount of physical change for any one length of

coast depends on the degree of exposure of the coast and the underlying geology. Increasing rainfall in between longer periods of drier weather can lead to increased cliff recession potential above that observed historically.

It is extremely important that the long term policies in the SMP recognise these future issues and reflect likely future constraints to management planning. Thus, the SMP acts as early warning to those other plans and initiatives that are vital to the 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 the sediment supply associated with the onshore transport of offshore sediments has diminished. This problem has been particularly exacerbated on this frontage where there is very limited contemporary sediment feed into, what are, largely relict beaches (i.e. beaches that receives no fresh supply of sediment), and upon which there has been substantial development.

As already discussed, the erosion of the shoreline is nothing new; this is an ongoing process, but we are more aware of it than in the past. However, it is not just the shoreline that is naturally changing, but the whole coastal system, i.e. the backshore, beach and nearshore (sub-tidal) zone. Along much of the South Devon and Dorset coastline, this movement 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. That change in seabed level is evidenced by narrower and steeper beaches along a lot of the frontage. Narrowing, lowering and loss of sandy and shingle beaches (e.g. at Dawlish) associated with large sea defences are typical of the effects of accelerating sea level rise and the result is that these defences stand adjacent to deeper water than would perhaps be otherwise expected. We should not expect the future to be any different and, as such, the foreshore level at existing defence locations may be anticipated to be much lower than present beach levels. Indeed, accelerated sea-level rise will increase the speed of change.

If we choose to continue to defend our shorelines in the same locations that we do at present, then the size of the defences will need to alter considerably; one consequence of deeper water is much larger waves at the defence. Defences will need to be wider to remain stable against bigger waves, 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. Measured data being gathered by the ongoing regional coastal monitoring programmes will be vital to monitoring future coastal change and inform future management decisions.

### Sediment movement

A shoreline sediment system allowed to behave naturally without any disruption 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.

However, the lack of coarse sediment (sand/shingle/cobble) linkage along the South Devon and Dorset SMP coastline due to the lack of contemporary sediment inputs to the system combined with the emergence of headlands, serve to inhibit the alongshore transport of sediment, to the extent that many of the beaches along this shoreline, notably Chesil Beach and Slapton Sands, are considered to be relict features. As such, the coastal processes and coarse sediment transport interactions along the SMP coastline can be considered within discrete units, and so the extent of any impact of any sediment interruption, be it from the formation of a natural landslide lobe or as a result of human intervention (i.e. constructing defences), is significantly reduced

in terms of consequence to within an individual sediment transport unit. This is not to say that defences cannot be introduced without causing adverse effect, rather that defence management needs to work with these processes and limit problems at other locations within individual process units, but that impacts beyond these limits are negligible and so of lesser importance.

### **Defence impacts**

In general, there is less acceptance of coastal change than in the past and it is apparent, through the development of SMPs and strategy studies, that there is often 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 South Devon and Dorset 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 alone provide defence function to reduce the risk of flooding to large areas of low-lying land, including significant areas of development and infrastructure (for example Dawlish Warren spit across the mouth of the Exe Estuary). Along the cliffed frontages of the SMP area, the base of cliffs are, in places, protected from erosion through linear defences, limiting any erosion of the cliff edge. If the cliff edge were to erode, however, this could be the source of local beach building material leading to the development of a natural form of protection for the cliffs, although this is dependent upon the local geology which varies across the length of the SMP coastline.

If we were to continue to defend parts of this coastline into the future as we have done in the past along the lengths where significant cliff recession is expected to occur, the long term picture would be one of a very fragmented shoreline along these areas, characterised by a series of both natural and 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 100 to 200m 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 present along these frontages and any groynes present would have become redundant; water will remain present 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, or mitigation for loss of assets.

### **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, 2009) 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 South Devon and Dorset 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

Environmental sustainability is difficult to define as it depends upon social attitudes, which are constantly changing.

Historically, communities at risk from coastal erosion 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 technology, we are less prepared to accept change, in the belief that we can resist nature. Inevitably attitudes will continue to alter; analyses of possible 'futures' are already taking place (the Foresight programme run by the Office of Science and Technology, [www.foresight.gov.uk](http://www.foresight.gov.uk)), considering the implications for many aspects of life, including approaches to flooding and erosion under different scenarios. It is not possible to predict how attitudes will change in the future; therefore the SMP is based upon existing criteria and constraints, whilst recognising that these may alter over time 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 special quality of the landforms, 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 South Devon and Dorset coast are designated as AONBs in order to sustain this unique landscape by protecting the landscape and enhancing recreational opportunities in the area. In addition, four

Heritage Coasts 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 NAI 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 SPA or a 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 BAP habitat within designated sites may be lost or gained);
- seek opportunities for environmental enhancement; and
- monitor any changes to habitats, including contributions to SSSI/SPA conservation targets, loss and gain of habitats, and to keep records.

During the development of SMP policy options, BAP habitats have been identified and appraised within the context of the designated sites. 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, both directly and indirectly. In places, coastal defences may be detrimental to conservation interests, e.g. those seen along the cliffed frontages that reduce the quality of geological exposures and geomorphology within the Jurassic Coast World Heritage Site, 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. Coastal habitats may also form the coastal defence, e.g. Dawlish Warren spit across the mouth of the Exe Estuary. 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. It is recognised that 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'. Natural England is actively seeking to ensure that coastal erosion and flood risk management proposals are designed to ensure that SSSIs are conserved and, where possible, enhancement opportunities that benefit ecology and geology are implemented, whilst also allowing the coast to remain naturally dynamic.

Under Section 28G of the Countryside and Rights of Way Act 2000, Natural England is provided with the responsibility and power to safeguard England's finest and most vulnerable wildlife and geological features.

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, possibly looking beyond the designation boundaries to consider wider scale or longer term benefits.

Where possible, opportunities for enhancing biodiversity have been identified within the report and have been taken into consideration in the selection of the preferred policies to enable operating authorities to make progress with implementing the UK BAP and local BAPs. There are several areas along the SMP frontage where biodiversity opportunities can be taken, e.g. allowing more natural coastal processes to take place along large stretches of low-lying areas either by No Active Intervention or through Managed Realignment (e.g. increases in intertidal habitat at The Maer etc), 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 land use (both current and future), 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% 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. However, 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).

There is a number of commercial and industrial interests along the coast including ports and harbours, areas of stone and mineral extraction and dredging activities. These tend to be concentrated in the larger towns and cities such as Plymouth, Brixham, Newton Abbot, Exeter and Portland. The continuation of these industries is essential to sustain the economy of the region as a whole.

In addition, there are military establishments, such as the military assets and firing ranges at Lulworth Camp, 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, railways, sanitation) in some parts of the study area is also an important consideration. Where affected and still required, this infrastructure will need to be replaced.

### **(ii) Population and health**

A number of large urban settlements are present along the coastline of the study area and those settlements with populations over 50,000 people comprise Weymouth, Exeter, Torquay, Paignton and Plymouth.

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. The South Devon and Dorset coast is an important destination for visitors from the UK, Europe and the rest of the world, aided by the Jurassic Coast World Heritage Site designation (bestowed upon much of this coast by UNESCO in 2001) and the English Riviera Geopark. 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. As well as the natural beauty of the area, the large number of accessible, award winning bathing beaches (e.g. Blue Flag status), marinas and sailing clubs is also a prime draw for visitors, especially in the summer months. 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 for a number of reasons (English Heritage, 2006):

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

Within the study area, there is a combination of designated (e.g. Cornwall and West Devon Mining World Heritage Site, 184 Scheduled Monuments, numerous Listed Buildings, over 26 Registered Parks and Gardens and built Conservation Areas) and significant non-scheduled or unknown archaeological assets. These are described more fully in **Appendix D** 'SEA Environmental Baseline Report (Theme Review)'. These assets are unique and, if destroyed, they can not be recreated; therefore they are vulnerable to any coastal erosion and/or flooding. Conversely, the very process of coastal erosion is uncovering sites of historical interest. 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. Therefore, each site must be considered as an individual site and balanced against other objectives at that location.