Severn Estuary Shoreline Management Plan Review

ATKINS

Severn Estuary Shoreline Management Plan Review (SMP2)

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Atkins Ltd and the SECG would like to thank all those that attended stakeholder events, provided data, information and feedback and filled in questionnaires during the public consultation.

Severn Estuary Shoreline Management Plan (SMP) Review

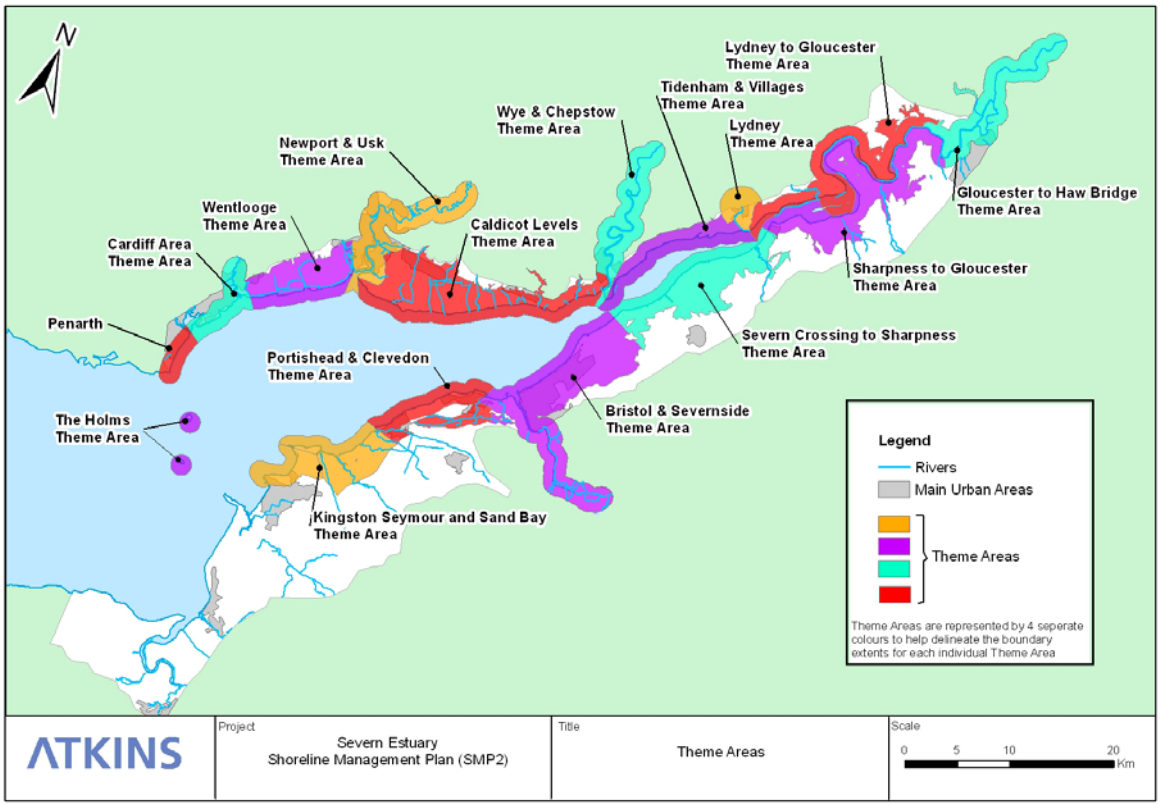
EXECUTIVE SUMMARY

The ***Shoreline Management Plan Review (SMP2)*** is a non–statutory document, containing draft policies proposing how the shoreline around the Severn Estuary should be managed over the next 100 years.

The SMP2 has been developed by the ***Severn Estuary Coastal Group (SECG)***, in consultation with the people that live, work and visit the shoreline of the Severn Estuary using government-agreed guidance documents. The SECG is a partnership of the Environment Agency, conservation authorities, Internal Drainage Boards (IDBs) and various local authorities around the Severn Estuary.

The study area of the SMP2 follows the shoreline from Lavernock Point, near Penarth in Wales to Anchor Head, just north of Weston Bay in England. The upstream boundary is at Haw Bridge, near Gloucester, which is just below the current tidal limit and still influenced by the sea. It also includes the islands of Flat Holm and Steep Holm.

The shoreline has been divided into ***16 Theme Areas*** based on regions, towns and cities around the Severn Estuary. Each Theme Area has been sub-divided into manageable lengths of coast, called ***Policy Units***. There are 66 Policy Units covering the study area of this Severn Estuary SMP2.



The SMP2 has been developed taking account of predicted changes to sea level rise caused by climate change over the next 100 years. The SMP2 is therefore seen as an important tool / guide for decision makers and planners to make sure that future land use on the shoreline does not put future generations at risk or impose unmanageable financial burdens in terms of coastal defence. The assessments used to inform this SMP2 have been completed at a high level and a very large scale (covering over 275 miles of shoreline), so that it provides a general picture of change, but is not intended to focus in detail on local differences regarding shoreline position in the future.

There are important sites of historical significance and internationally protected habitats around the Severn. The SMP2 helps to plan how these sites can adapt to climate change or how these assets/features need to be protected, replaced or adapted as a consequence of a particular shoreline policy being implemented.

A draft policy option has been chosen for each Policy Unit and for each time period (epoch) covered by the SMP2 (0-20 years, 20-50 years and 50-100 years). There are four possible policy options available to choose from:

- **Hold the Line (HTL)** – to provide some level of coastal defence, keeping the position of the defence approximately where it is now. This does not automatically mean that defences will be improved to counteract climate change – i.e.: how well the shore is protected from coastal flooding is not considered by the SMP2. This will be considered in more detail by Flood Risk Management Strategies and individual defence schemes.
- **No Active Intervention (NAI)** – assumes that no maintenance, repair or replacement of existing defence structures takes place. It is a 'do nothing' scenario against which different policies can be tested but it is also a viable policy choice for some stretches of shoreline e.g. where there is a low risk of flooding or erosion now or in the future).
- **Managed Realignment (MR)** – is the landward movement of defences, giving up some land to the sea to form a more sustainable defence line in the future. This option may create additional habitat such as mud flats or saltmarsh, which provide a natural flood risk defence.

- **Advance the Line (ATL)** - means reclaiming land from the sea by building new defences further seaward. This has not been proposed as a preferred policy option anywhere in the Severn Estuary SMP2.

There are a total of 198 policy options covering the whole Severn Estuary shoreline over the 100 year SMP2 period. The table below shows the distribution of different policy options proposed for this draft in the SMP2 over each epoch.

	Preferred policy options chosen		
Epoch	Hold the Line (HTL)	No Active Intervention (NAI)	Managed Realignment (MR)
Short term 0 to 20 years (2025)	40	22	4
Medium term 20 to 50 years (2055)	40	22	4
Long term 50 to 100 years (2105)	40	21	5

Many readers will focus on the local details and the draft policy option for the area where they live. **It is important to read the text accompanying the draft policies as well as the headline policy choice** – the way in which policies might be implemented is different in different Policy Units.

It is also important to recognise that the decisions made at the local level need to reflect the understanding of physical processes in the whole Severn Estuary and take account of policies and priorities at a regional and national level. **The Policy Statements that have been produced need to be read in the context of the wider-scale issues and policy implications**, which are set out in Part A of the SMP2.

All of the SMP2 documents are available online at www.severnestuary.net/secg.

Adolygiad o Gynllun Rheoli Traethlinau (SMP) Aber Hafren

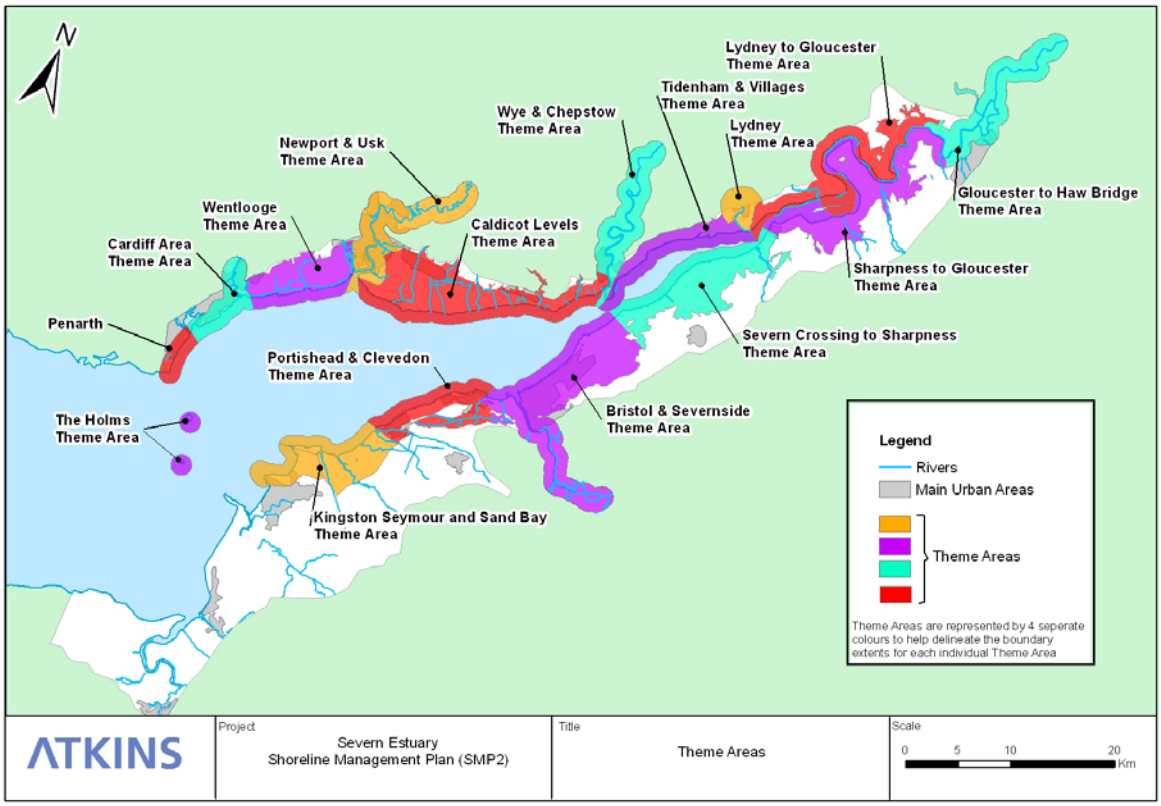
Crynodeb Gweithredol

Mae'r ***Adolygiad o'r Cynllun Rheoli Traethlinau (SMP2)*** yn ddogfen anstatudol sy'n cynnwys polisïau drafft yn argymell sut y dylid rheoli'r traethlin o amgylch Aber Hafren dros y 100 mlynedd nesaf.

Datblygwyd SMP2 gan ***Grŵp Arfordirol Aber Hafren (SECG),*** gan ymgynghori â'r bobl sy'n byw, yn gweithio ac yn ymweld ag arforlin Aber Hafren, gan ddefnyddio dogfennau canllaw a gytunwyd gan y llywodraeth. Mae SECG yn bartneriaeth o'r amryfal awdurdodau lleol, awdurdodau cadwraeth, Byrddau Draenio Mewnol ac Asiantaeth yr Amgylchedd o amgylch Aber Hafren.

Mae ardal astudiaeth SMP2 yn dilyn yr arforlin o Drwyn Larnog, ger Penarth yng Nghymru, i Anchor Head, ychydig i'r gogledd o Fae Weston yn Lloegr. Y ffin i fyny'r afon yw Haw Bridge, ger Caerloyw, sydd ychydig yn is na ffin y llanw ar hyn o bryd ac sydd eto tan ddylanwad y môr. Mae hefyd yn cynnwys ynysoedd Echni a Ronech.

Rhannwyd yr arforlin yn ***16 Ardal Thema*** seiliedig ar ranbarthau, trefi a dinasoedd o amgylch Aber Hafren. Is-rannwyd pob Ardal Thema yn ddarnau o arfordir y gellir eu rheoli, a elwir yn ***Unedau Polisi.*** Ceir 66 o Unedau Polisi yn ymestyn dros ardal astudiaeth SMP2 Aber Hafren.



Datblygwyd SMP2 gan roi ystyriaeth i newidiadau a ragfynegir i'r cynnydd yn lefel y môr a achosir gan newid yn yr hinsawdd dros y 100 mlynedd nesaf. Gwelir yr SMP2 felly fel teclyn / canllaw pwysig i rai sy'n llunio penderfyniadau a chynllunwyr i sicrhau nad yw'r defnydd a wneir o dir yn y dyfodol ar yr arforlin yn rhoi cenedlaethau'r dyfodol mewn perygl neu'n rhoi beichiau ariannol na ellir eu rheoli arnynt yn nhermau amddiffyn yr arfordir. Cwblhawyd yr asesiadau a ddefnyddiwyd i oleuo'r SMP2 hwn ar lefel uchel ac i raddfa fawr iawn (yn ymestyn dros 275 milltir o arforlin), fel y rhydd ddarlun cyffredinol o newid: ond ni fwriedir iddo ganolbwyntio ar wahaniaethau lleol ynglŷn â sefyllfa'r arforlin yn y dyfodol.

Ceir safleoedd pwysig o bwys hanesyddol a chynefinoedd a warchodir yn rhyngwladol o amgylch Aber Hafren. Mae SMP2 yn helpu cynllunio sut y gall y safleoedd hyn ymaddasu i newid yn yr hinsawdd neu sut y mae angen gwarchod, amnewid neu addasu'r asedau / nodweddion hyn o ganlyniad i weithredu polisi arbennig ynglŷn â'r traethlin.

Dewiswyd polisi drafft ar gyfer pob Uned Polisi ac ar gyfer pob cyfnod o amser (epoc) yr ymdrinnir ag ef gan SMP2 (0-20 o flynyddoedd, 20-50 o flynyddoedd a 50-100 o flynyddoedd). Mae pedwar o ddewisiadau polisi posibl ar gael i ddethol ohonynt:

- **Dal y Llinell (HTL) –** darparu rhywfaint o amddiffyniad arfordirol, gan gadw safle'r amddiffyniad lle mae, yn fras, ar hyn o bryd. Nid yw hyn o reidrwydd yn golygu y bydd amddiffynfeydd yn cael eu gwella i wrthsefyll newid yn yr hinsawdd – e.e. nid ystyrir pa mor dda y gwarchodir y traethlin rhag llifogydd arfordirol gan SMP2. Ystyrir hyn yn fanylach gan Strategaethau Rheoli Risg Llifogydd a chynlluniau amddiffyn unigol.
- **Dim Ymyrraeth Weithredol (NAI) –** mae'n tybio nad oes unrhyw waith cynnal, trwsio nac amnewid ar strwythurau amddiffyn presennol yn digwydd. Dyma senarios 'gwneud dim' y gellir profi gwahanol bolisïau yn eu herbyn, ond mae hefyd yn ddewis polisi hyfyw ar gyfer rhai darnau o'r traethlin e.e. lle bo bygythiad lifogydd neu erydu, yn awr neu yn y dyfodol, yn fychan.
- **Adlinellu Rheoledig** - mae hyn yn golygu symud yr amddiffynfeydd yn ôl tua'r tir, gan ildio rhywfaint o dir i'r môr, a chreu llinell amddiffyn fwy cynaliadwy yn y dyfodol. Gall y dewis hwn greu cynefin ychwanegol, megis traethellau llaid neu forfa heli, sy'n darparu amddiffyniad naturiol rhag perygl llifogydd.

- **Symud y Llinell Ymlaen** – golyga hyn adfer tir o'r môr drwy greu amddiffynfeydd newydd ymhellach i gyfeiriad y môr. Nis argymhellwyd yn ddewis polisi a ffefrir yn unrhyw le yn SMP2 Aber Hafren.

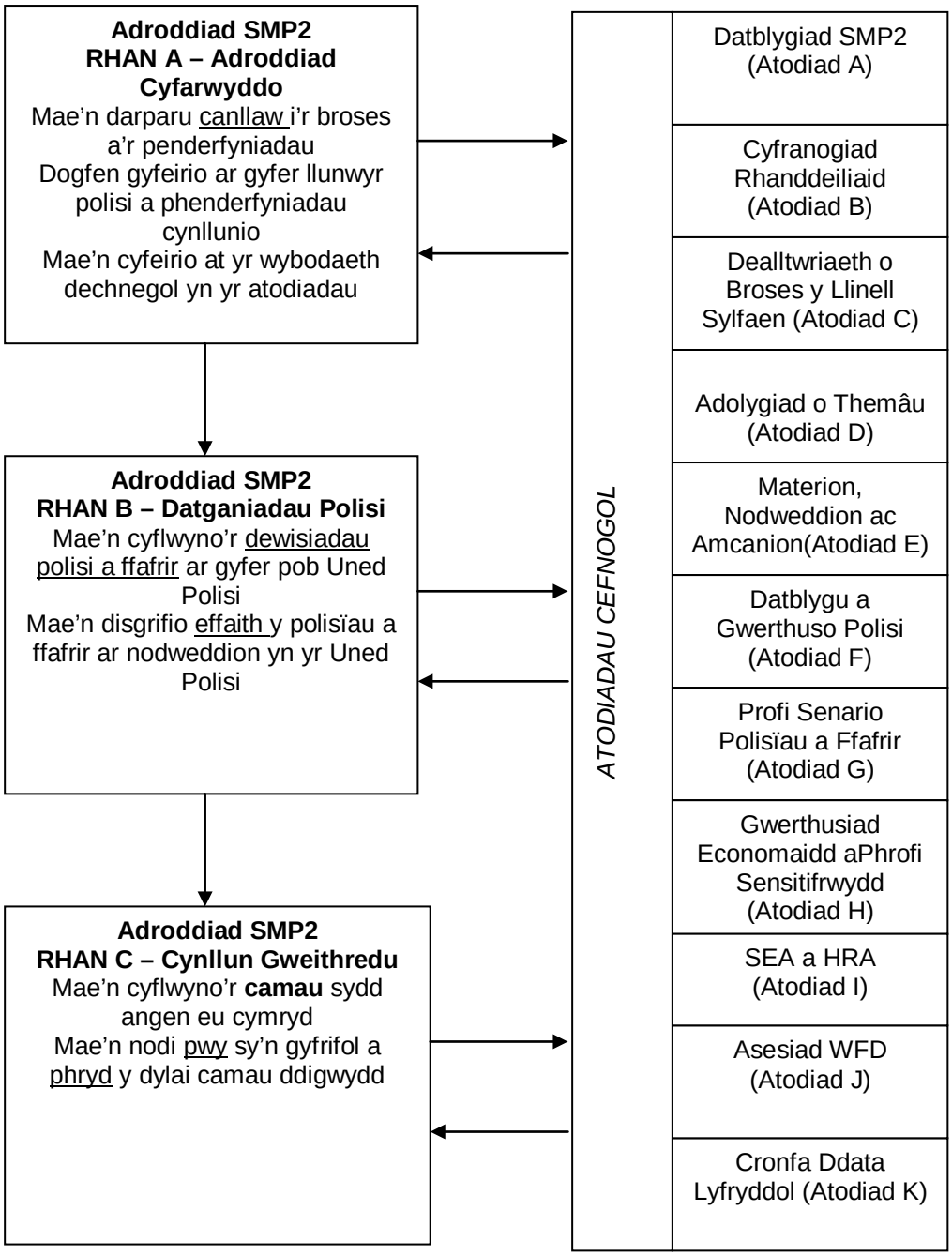
Ceir cyfanswm o 198 o ddewisiadau polisi drafft yn ymdrin â thraethlin Aber Hafren i gyd dros gyfnod SMP2 o 100 mlynedd. Mae'r tabl isod yn dangos dosbarthiad gwahanol ddewisiadau polisi a argymhellir ar gyfer y drafft hwn yn SMP2 dros bob epoc.

	Dewisiadau polisi a ddewiswyd		
Epoc	Dal y Llinell	Dim Ymyrraeth Weithredol	Ailaleinio wedi ei Reoli
Tymor byr 0 i 20 o flynyddoedd (2025)	40	22	4
Tymor canolig 20 i 50 o flynyddoedd (2055)	40	22	4
Tymor hir 50 i 100 o flynyddoedd (2105)	40	21	5

Bydd llawer o ddarllenwyr yn canolbwyntio ar y manylion lleol a'r polisi drafft detholedig ar gyfer yr ardal y maent yn byw ynddi. **Mae'n bwysig darllen y testun i gyd-fynd â'r polisïau drafft yn ogystal â'r penawdau polisi** – mae'r modd y gellid gweithredu polisïau yn amrywio o'r naill Uned Bolisi i'r llall.

Mae'n bwysig cydnabod bod angen i'r penderfyniadau a wneir ar y lefel leol adlewyrchu dealltwriaeth o brosesau ffisegol yn Aber Hafren gyfan, ac ystyried polisïau a blaenoriaethau ar lefel ranbarthol a chenedlaethol. **Mae angen darllen y Datganiadau Polisi a gynhyrchwyd yng nghyd-destun y materion a'r goblygiadau polisi ar raddfa ehangach**, a gyflwynir yn Rhan A SMP2.

Mae'r holl ddogfennau SMP2 ar gael ar-lein yn www.severnestuary.net/secg.


Adroddiad SMP2
RHAN A – Adroddiad Cyfarwyddo
Mae'n darparu canllaw i'r broses a'r penderfyniadau
Dogfen gyfeirio ar gyfer llunwyr polisi a phenderfyniadau cynllunio
Mae'n cyfeirio at yr wybodaeth dechnegol yn yr atodiadau
Adroddiad SMP2
RHAN B – Datganiadau Polisi
Mae'n cyflwyno'r dewisiadau polisi a ffafrir ar gyfer pob Uned Polisi
Mae'n disgrifio effaith y polisïau a ffafrir ar nodweddion yn yr Uned Polisi
Adroddiad SMP2
RHAN C – Cynllun Gweithredu
Mae'n cyflwyno'r camau sydd angen eu cymryd
Mae'n nodi pwy sy'n gyfrifol a phryd y dylai camau ddigwydd
ATODIADAU CEFNOGOL
Datblygiad SMP2 (Atodiad A)
Cyfranogiad Rhanddeiliaid (Atodiad B)
Dealltwriaeth o Broses y Llinell Sylfaen (Atodiad C)
Adolygiad o Themâu (Atodiad D)
Materion, Nodweddion ac Amcanion(Atodiad E)
Datblygu a Gwerthuso Polisi (Atodiad F)
Profi Senario Polisïau a Ffafrir (Atodiad G)
Gwerthusiad Economaidd aPhrofi Sensitifrwydd (Atodiad H)
SEA a HRA (Atodiad I)
Asesiad WFD (Atodiad J)
Cronfa Ddata Lyfryddol (Atodiad K)

Acronyms and Abbreviations

Term	Definition
AA	Appropriate Assessment.
ABP	Association of British Ports
AONB	Area of Outstanding Natural Beauty.
ASERA	Association of Severn Estuary Relevant Authorities
ATL	Advance the Line
BAP	Biodiversity Action Plans
BCCPA	Bristol Channel Counter Pollution Association
BCR	Benefit-cost ratio
BMIF	British Marine Federation
Cadw	The Welsh Assembly Government historic environment advisor
CAPE	Community Adaptation Planning and Engagement
CCW	Countryside Council for Wales
CD	Chart Datum.
CFMP	Catchment Flood Management Plan
CHaMP	Coastal Habitat Management Plan
CPSE	Coast Protection Survey England
CSG	Client Steering Group, principal decision-making body for the Shoreline Management Plan = Severn Estuary Coastal Group (SECG)
CV	Capital Value. The actual value of costs or benefits.
DCLG	Department of Communities and Local Government
DECC	Department of Energy and Climate Change
Defra	Department for Food, Environment and Rural Affairs.
EA	Environment Agency, may also be referred to as 'The Agency'
EH	English Heritage
EiP	Examination in Public
EMF	Elected Members Forum (SMP2), comprising an Elected Member from each of the Local Authorities
FCA	Flood Consequence Assessment

Term	Definition
FCDPAG3	Flood and Coastal Defences Project Appraisal Guidance
FCS	Favourable Conservation Status
GCR	Geological Conservation Review site
GES	Good Ecological Status
GGAT	Glamorgan-Gwent Archaeological Trust
GHT	Gloucester Harbour Trustees
GIS	Geographic Information System
HAT	Highest Astronomical Tide
HER	Historic Environment Record
HLT	High Level Target
HMWB	Heavily Modified Water Bodies
HRA	Habitats Regulations Assessment
HTL	Hold the Line
ICZM	Integrated Coastal Zone Management
H&S	Health and Safety
IFCA	Integrated Flood Consequence Assessment
IROPI	Imperative Reasons of Over-riding Public Interest
JAC	Joint Advisory Committee (of the Severn Estuary Partnership)
KSG	Key Stakeholder Group, which acts as a focal point for discussion and consultation through development of the SMP
KWS	Key Wildlife Sites
LAT	Lowest Astronomical Tide
LDP	Local Development Plan
LPA	Local Planning Authority
MAFF	Ministry of Agriculture Fisheries and Food (now DEFRA)
MCZ	Marine Conservation Zone
MHWN	Mean High Water Neap tide
MHWS	Mean High Water Spring tide
MLWN	Mean Low Water Neap tide

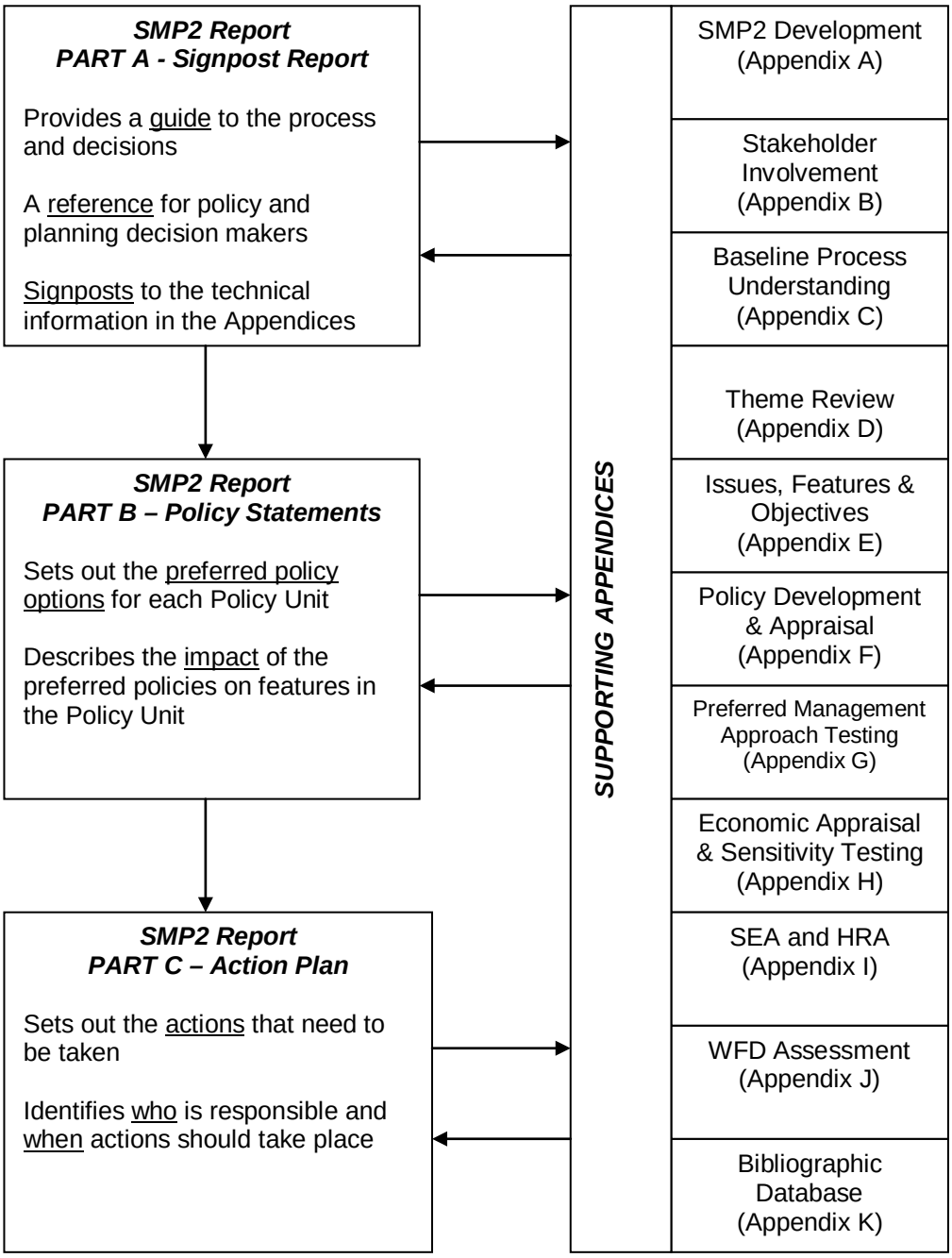
Term	Definition
MLWS	Mean Low Water Spring tide
MMO	Marine Management Organisation
MoD	Ministry of Defence
MR	Managed Realignment
MSL	Mean Sea Level
MU	Management Unit
NAI	No Active Intervention
NE	Natural England
NEDS	National Economic Development Strategy
NFDCC	National Flood and Coastal Defence Database
NMR	National Monuments Record
NNR	National Nature Reserve
NRA	National Rivers Authority
NT	National Trust
ODPM	Office of the Deputy Prime Minister
PCPA	Planning and Compulsory Purchase Act
PMG	Project Management Group
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
PSA	Public Service Agreement
PU	Policy Unit
PWW	Planning Policy Wales
QRG	Quality Review Group
RBMP	River Basin Management Plan
RCZAS	Rapid Coastal Zone Assessment Survey
RDP	Rural Development Plan
RIGS	Regionally Important Geological / Geomorphological Sites
RSS	Regional Spatial Strategy

Term	Definition
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SDAP	Sustainable Development Action Plan
SDS	Sustainable Development Schemes
SEA	Strategic Environmental Assessment
SECG	Severn Estuary Coastal Group = Client Steering Group (CSG)
SEP	Severn Estuary Partnership
SESMP2	Severn Estuary Shoreline Management Plan Review
SEFRMS	Severn Estuary Flood Risk Management Strategy
SFC	Sea Fisheries Committee
SFRA	Strategic flood risk assessment
SMP	Shoreline Management Plan
SMP1	A first-round Shoreline Management Plan
SMP2	A second-round Shoreline Management Plan
SMR	Sites and Monuments Record
SoP	Standard of Protection
SPA	Special Protection Area
SRS	Single Regional Strategy
SSSI	Site of Special Scientific Interest
SuDs	Sustainable Urban Drainage System
TAN	Technical Advice Note
UKCiP	United Kingdom Climate Impacts Programme
UKCP	UK Climate Projections
WAG	Welsh Assembly Government
WFD	Water Framework Directive
WPM	With Present Management
WSP	Wales Spatial Plan

Structure of the Report

The ***Shoreline Management Plan Review (SMP2)*** consists of this ***Shoreline Management Plan report*** and the ***11 supporting appendices***.

Together, they provide the high level strategic direction for managing the shoreline around the Severn Estuary and the research and analysis that has been undertaken in making the decisions on the policy options.



The ***Shoreline Management Plan report*** is divided into three parts:

- ***Part A* – Signpost Report –** acts as a guide to the development process, setting out the main processes, actions, assumptions and issues that have been undertaken in selecting the policy options for each stretch of shoreline (***Policy Unit***) for each of the three SMP2 ***epochs*** (0-20 years, 20-50 years and 50-100 years).
- **Part B - SMP2 Policy Statements –** makes up the majority of the report. It sets out the justification for the preferred policy selected for each individual stretch of shoreline (***Policy Unit***) for each time epoch (i.e. 0 - 20 years, 20 - 50 years and 50 - 100 years);
- **Part C - Action Plan –** this Part sets out the actions that need to be taken over the next 5 – 10 years to start implementing the SMP2 policies. It only covers immediate actions that fall within the first time epoch (0 - 20 years) as it is expected that the SMP2 will be reviewed during this time.

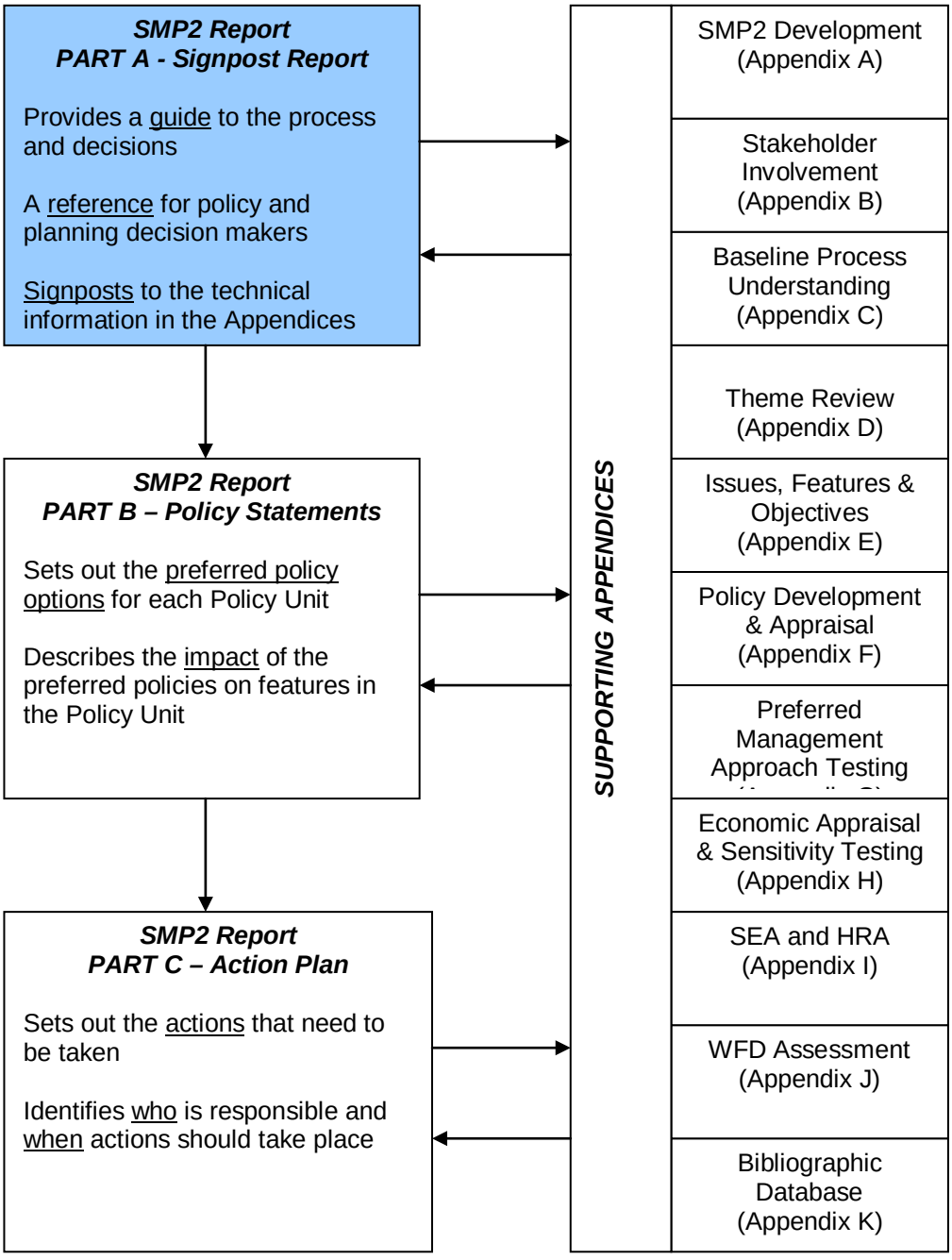
There are ***11 Supporting Appendices***, which contain the following information:

- **Appendix A – SMP2 Development –** the SMP2, its purpose, structure and development and the decision making process are explained more fully;
- **Appendix B – Stakeholder Involvement –** this sets out the consultations with groups and the public that have taken place throughout the development of the SMP2. It includes responses from stakeholders and how they have been addressed*;*
- **Appendix C – Baseline Process Understanding –** contains the details of coastal dynamics, defence data and shoreline interactions that have supported the SMP2 development;
- **Appendix D – Theme Review –** identifies a series of Theme Areas and describes key nature conservation, landscape, human environment (including current and future land-use), and historic environment issues and why they are important to people in and around the Estuary. Each Theme Area is based around towns and other areas (e.g. rivers) that are easily recognisable. The Theme Review outlines important over-arching policies and legislation that affect the Estuary and the decision-making process of the SMP2;
- **Appendix E – Issues, Features and Objectives –** identifies features around the Estuary (e.g. a coastal path, commercial property, farmland, etc.), the issues associated with them (e.g. risk of damage from coastal flooding), the benefits that people receive from them (economic, social, environmental, recreational, etc.), an objective for each feature and the relative importance of the feature. Initial ***Key Policy Drivers*** for the SMP2 are identified;
- **Appendix F – Policy Development and Appraisal –** sets out how each possible policy option has been appraised for each stretch of shoreline (***Policy Unit***) and how well each policy would achieve the objectives for the features in that Policy Unit. It considers how each policy option would affect the way the shoreline would change over time. This process overlaps and has been combined the SEA appraisal;
- **Appendix G – Preferred Policy Scenario Testing –** considers how each stretch of shoreline (Policy Unit) interacts with the adjacent Policy Units and how this impacts on the choice of policy to develop ***Management Approaches*** for groups of Policy Units;
- **Appendix H – Economic Appraisal and Sensitivity Testing –** the economic analysis undertaken in support of the SMP2. This includes testing how sensitive the figures are to change over time;
- **Appendix I – Strategic Environmental Assessment (SEA) Report** and **Habitats Regulation Assessment (HRA) –** this Appendix is divided into two parts. Each part is a separate report. Part A sets out the steps taken in developing the SMP2 to meet the

requirements of the SEA Directive. Part B contains information to support a Habitats Regulations Assessment (HRA)*;*

- **Appendix J – Water Framework Directive (WFD) Assessment –** sets out the assessment of the SMP2 to ensure compliance with the WFD. This has been undertaken by the Environment Agency, which is the Competent Authority for the WFD in England and Wales; and
- **Appendix K – Bibliographic Database –** References for all supporting information used to develop the SMP2.

PART A – SIGNPOST REPORT



This part acts as a guide to the development process, setting out the main processes, actions, assumptions and issues that have been undertaken in selecting the policy options for each stretch of shoreline (***Policy Unit***) for each of the three SMP2 ***epochs*** (0-20 years, 20-50 years and 50-100 years).

It is designed to give an overview of the process and the reasons for decision without providing in-depth technical information.

It has been written as a reference tool for professional users (e.g. Local authority planners, policy and decision makers) who need to make decisions about land use, flood risk management and development but who are not technical specialists in coastal erosion and flooding.

It can also be read and used by other people that live, work and visit the Severn Estuary, such as land owners, developers, farmers, conservationists, etc. to help them understand the way the SMP2 has been developed.

It also provides signposts to the more detailed, technical information (in ***Appendices A – K***) that supported the SMP2 decision making process, for use by technical specialists.

1. Introduction

Shoreline Management Plans (SMPs) are non-statutory documents. They advise on how the shoreline should change in the long term. They are developed all round the coast of England and Wales and are an important part of the way coastal flooding and erosion is managed by local and national government and other regulators and managers, such as Internal Drainage Boards (IDBs) and the Environment Agency (EA). They are considered a vital part of the planning and management of coastal erosion and flooding by Defra[1], the Welsh Assembly Government (WAG), Local Authorities, the EA and others.

1.1 Structure of the report

This Signpost Report is set out in five parts:

- **Section 1 – Introduction –** a brief description of the SMP2, its purpose and its structure. More detail is in ***Appendix A***;
- **Section 2 – Project Assumptions and Definitions –** the main assumptions that have been made during the development of the SMP2. More detail can be found in ***Appendices E – I;***
- **Section 3 – SMP2 Development –** an overview of the development and approach to the SMP2. More detail is in ***Appendix A***;
- **Section 4 – Environmental Assessments –** sets out how the preparation of the SMP2 has met the requirements of legislation to protect the environment. Additional information can be found in ***Appendices I and J***;
- **Section 5 – Key Factors Influencing SMP2 Decision Making –** issues of particular relevance to the Severn Estuary, such as the England-Wales cross border differences.

Many readers will focus on the local details in the Policy Statements **(Part B)**, but it is important to recognise that the decisions made at the local level need to reflect the understanding of coastal and tidal processes in the whole Severn Estuary shoreline and take account of policies and priorities at a regional and national level.

The Policy Statements **(Part B)** should be read in the context of the wider-scale issues and policy implications, as set out in ***Sections 2, 3*** and ***5***, and the background information in the ***Appendices***.

This report has been produced for a non-technical audience. In order to make it as useful and easy to read as possible, it contains only an overview of the development and decision making processes and does not include all the technical information supporting the policy options made. More detailed technical information is available to provide clarity and transparency in the decision-making process in supporting ***Appendices A - K***.

All of the SMP2 documents are available online at www.severnestuary.net/secg.

[1] The Department for the Environment, Food and Rural Affairs.

1.2 The Shoreline Management Plan Reviews (SMP2s)

The first set of SMPs was published several years ago. An SMP for the Severn Estuary was completed in November 2000. On the north coast it covered the shoreline from Lavernock Point in Wales, to Haw Bridge near Gloucester in England, and on the south coast the SMP covered the shoreline from Haw Bridge to Brean Down, west of Weston Bay in England. Since 2000, progress has been made in understanding and mapping the shoreline of England and Wales and the way it changes. All SMPs around England and Wales are now being updated. This document is the ***Severn Estuary Shoreline Management Plan Review (SMP2)***. It includes:

- An assessment of the way that the coast will change over time – identifying the natural forces shaping the shoreline and predicting, as far as possible, how the shoreline will change over time with erosion, sea level rise and climate change (in 20, 50 and 100 years);
- Identifying the risks to people, property, the natural and historic environment as the coast changes; and
- Policies for the different stretches of shoreline (Policy Units) to manage the risks in a sustainable way.

The assessments carried out to develop the SMP2 have been done at a high level and a very large scale (covering over 275 miles of shoreline), so that it provides a general picture of change, but does not focus on very local issues.

The SMP2 has been developed in partnership by the ***Severn Estuary Coastal Group (SECG)***, in consultation with the people that live, work and visit the shoreline of the Severn Estuary.

1.3 What does the SMP2 do?

Although there is not a legal requirement to produce an SMP, Government in England and Wales believe they are important and useful documents for planners and flood and erosion risk managers, so have a positive policy in place to produce SMPs.

It is important to avoid making decisions that would place additional responsibilities on future generations by unnecessarily increasing the number of areas at risk from coastal flooding and erosion, or not planning adequately to cope with coastal flooding and erosion in areas where traditional defences are not sustainable.

The SMP2 will help planners and regulators to plan for and manage the way that the shoreline will change over time. This could be by maintaining or improving defences, by enabling the natural processes to play a greater role, creating new natural habitat or by helping areas that are at risk to cope with and limit the impact of coastal flooding and erosion.

The SMP2 provides greater certainty for landowners, residents and businesses on how the shoreline will be managed by regulators during the next 100 years, so that they can plan ahead and make decisions about investments, homes, development and the management of their resources.

Funding for flood and erosion risk management measures comes from a range or organisations, including central government, local authorities, the Environment Agency and landowners; and from a range of funding ‘pots’. Managing flood and erosion risk can be very expensive and actions may need to be funded for a long time – flood warnings need to be made whenever there is a risk of flooding; flood defences need to be built and maintained; and natural defences such as dunes and salt marshes need to be managed and monitored. Funding for managing flood and erosion risk is limited and individual flood defence schemes, management actions and awareness raising programmes compete for these limited funds. It is not possible to fund everything and prioritisation of management measures is necessary. This SMP2 sets out the overall policy that should be followed, but it does not guarantee that funding will be available for

all actions needed to implement that policy. Where the benefit-cost ratio (BCR) of the proposed policy option is low, schemes may be less likely to receive public funding and it may be necessary to secure funding from non-public sources.

The shoreline has been divided into 16 ***Theme Areas*** based on regions, towns and cities around the Severn Estuary that are easily recognisable. This is to help people around the Estuary to easily identify different areas without having to know the shoreline in great detail. The Theme areas are described in more detail in ***Appendix D***.

Each Theme Area has been divided into manageable sections called ***Policy Units***. For each Policy Unit and for ***epoch*** (0-20 years, 20-50 years and 50-100 years) the SMP2 recommends one of four policy options:

- ***No active intervention (NAI)***;
- ***Hold the line (HTL)***;
- ***Managed realignment (MR)***
- ***Advance the line (ATL)***.

These policy options and other important terms are described and explained in ***Section 2***.

1.4 How does the SMP2 fit with other plans?

The SMP2 will support and influence a whole range of regional, national and international policies, frameworks and strategies, not just those connected with managing the shoreline.

The SMP2 considers issues at a large geographic scale. It has to take account of the different approaches of many local authorities, the differences between rural and urban areas and the way the influence of the sea changes in different parts of the estuary.

This SMP2 also crosses the border between England and Wales, so has to take account of differences in the way that flooding, land use and planning (for the built and natural environment) are managed in the two countries.

The SMP2 only looks at the way coastal flooding and erosion is managed. It does not set policy for any other ways of managing flood risk (such as land drainage). It does not set out policy for managing the risk of flooding from other sources of flooding (such as from rivers, or urban surface water flooding). The SMP2 doesn't ignore these other forms of flooding or plans to manage other types of flood risk. It takes account of other flood risk management plans and policies (e.g. Catchment Flood Risk Management Plans (CFMPs)) to make sure that they are complimentary.

The ***Severn Estuary Coastal Group (SECG)*** has ensured that the SMP2 area meets or slightly overlaps with all CFMP areas around the Severn Estuary to ensure that flood risk management plans cover all areas, whether riverbanks or shorelines (see ***Figure 3.3*** in ***Section 3.7***). CFMPs that have already been prepared (mostly during 2008) that have a bearing on this SMP2 are:

- North and Mid Somerset Catchment Flood Management Plan
- Bristol Avon Catchment Flood Management Plan
- Severn Tidal Tributaries Catchment Flood Management Plan
- Severn Catchment Flood Management Plan
- Wye and Usk Catchment Flood Management Plan
- Eastern Valleys Catchment Flood Management Plan

- Taff and Ely Catchment Flood Management Plan
- Ogmore to Tawe Catchment Flood Management Plan

1.5 Severn Estuary Flood Risk Management Strategy (SEFRMS)

An important parallel and more detailed study taking place for the EA is the ***Severn Estuary Flood Risk Management Strategy (SEFRMS)***. This started in February 2008. The SMP2 started in October 2008. The SEFRMS was designed so that it could run in parallel and be linked to the development of the SMP2 (see ***Figure 3.4***).

The purpose of the SEFRMS is to be an engineering focused study that looks at agreed SMP2 policy decisions in more detail and develop these into practical management options that will help implement the policies. The SEFRMS will analyse where defences would be positioned, the most appropriate standard of protection and the particular engineering challenges at specific areas along the shoreline.

Studies that have been carried out to feed into the SEFRMS have also been used to inform the SMP2. Many of these studies are of a greater level of detail than might normally be carried out for an SMP2. The development of the Severn Estuary SMP2 has benefitted from these more detailed studies.

It is important to recognise the difference between these two projects:

1. The ***SMP2*** is mainly for a planning audience. It only provides a policy approach over specific timescales. It only provides the policy on the position of the defence line and the management approach for the defence. It does not set out information on how policies should be implemented e.g. what shoreline defences should be built of, their precise location and line, or the standard of protection to which they should be built.
2. The ***SEFRMS*** is mainly for an engineering audience but will be developed in consultation with everyone that has an interest in coastal erosion and flood risk management, including Internal Drainage Boards, nature conservation interests and landowners. It develops the policies into a strategy to deliver the most environmentally and economically sustainable coastal defence options possible. The SEFRMS will provide detail on how policies should be implemented, including where defences will be, the level of flood and erosion risk protection they will provide and will identify where any remaining risk of flooding and erosion will need to be managed e.g. flood storage, habitat creation, community resilience.

2. Defining Important SMP2 Terms

The SMP2 and the Defra SMP Guidance Documents include a lot of terminology. What these terms mean is not always clear and the way they are interpreted has an influence on the decision making process.

This SMP2 is unique. It is totally within a designated EU nature conservation site. It is the only wholly estuarine SMP. Flooding (not erosion) is the dominant management risk and straddles two national administrations (Wales and England). For these reasons, the Defra SMP Guidance Documents have needed to be clarified in places to accommodate this, such as in the definition of ***With Present Management*** or what was considered to be a ***Key Policy Driver***. Some important terms are defined below.

2.1 Policy Options

2.1.1 Hold the Line

Hold the Line (HTL) means keeping the line of the defence in approximately its current location. This may mean repairing or replacing defences. HTL may include some minor adjustment to the position of the defence to suit new defence structures and the particular engineering solutions developed when defences are designed.

There are three ways in which HTL may be implemented:

- HTL to increase the amount of protection that the defences provide – this will mean changing the height, width or size of defences to cope with more severe floods than they do today. Using flood risk management terminology this means improving the ***Standard of Protection (SoP)***. It is sometimes referred to as an ***Improve*** policy in EA River or coastal strategy studies (e.g. the Severn Estuary Flood Risk Management Strategy (***SEFRMS***).
- HTL to counter increases in sea level rise and climate change impacts - this will mean changing the height, width or size of defences to cope with changes caused by climate change and sea level rise. Using flood risk management terminology this means maintaining the same ***Standard of Protection (SoP)*** as today. It is sometimes referred to as a ***Sustain*** policy in EA River or coastal strategy studies (e.g. the Severn Estuary Flood Risk Management Strategy (***SEFRMS***).
- HTL but not increasing the size of defences so that, as climate change and sea level rise impacts increase, the level of protection may gradually decrease and other actions may be needed to cope with the impacts of flooding (e.g. flood warnings, demountable defences, changes in building materials). Using flood risk management terminology this assumes the ***Standard of Protection (SoP)*** will gradually decrease over time. It is sometimes referred to as a ***Maintain*** policy in EA River or coastal strategy studies (e.g. the Severn Estuary Flood Risk Management Strategy (SEFRMS).

Whether or not a HTL policy means increasing the size of built defences or not is not considered at an SMP2 level. The decision on how a HTL policy will be implemented will be considered in more detail by the ***SEFRMS*** (see ***Section 1.5***).

A HTL policy does not guarantee funding for defence maintenance and / or capital works along these sections of the shoreline. All actions to manage the risk of flooding and erosion compete for a limited amount of funding. Decisions will have to be made on how to prioritise management measures.

2.1.2 No Active Intervention (NAI)

The ***No Active Intervention (NAI)*** policy option is based on assuming that no maintenance, repair or replacement of the existing defence structures takes place. It is a 'do nothing' scenario against which different policies can be tested. It is also a viable policy choice for some stretches of coast e.g. where there is a low risk of flooding or erosion now or in the future.

NAI does not mean that defences will be allowed to fail in an uncontrolled or unsafe manner. An NAI policy option will require defences to be monitored and may require some engineering works to be undertaken to ensure that the defences do not pose a threat to public health and safety. This may include minor repairs in some places or safe removal of defences in others.

Overall, the NAI policy option means that defences will gradually be removed, either manually to ensure the safety of the public, or through weathering, and will not be replaced. Information on the NAI assessment and the condition of the defences is contained in ***Appendix C***.

2.1.3 Managed Realignment (MR)

Managed Realignment (MR) involves the landward movement of defences, giving up some land to the sea to form a more sustainable defence in the long-term. This option may create additional habitat such as mud flats or saltmarsh, which provide natural flood risk benefits.

How and when a MR policy will be implemented, the location of the new line of defence and what the new defences will be built from will be considered in more detail by the ***SEFRMS***.

A MR policy does not guarantee funding for new realigned defences or their future maintenance along these sections of the shoreline. All actions to manage the risk of flooding and erosion compete for a limited amount of funding. Decisions will have to be made on how to prioritise management measures.

2.1.4 Advance the Line

The ***Advance the Line (ATL)*** policy option means reclaiming land from the sea by building new defences further seaward.

ATL is not considered to be a suitable policy choice in rivers/tributaries flowing into the Severn Estuary or in the Estuary upstream of Awre (upstream of the Noose). ATL would reduce the amount of water and the flood conveyance/movement in these locations. This policy option could lead to greater flooding and / or increase erosion.

2.2 Other Important Definitions

2.2.1 With Present Management (WPM)

It is important to consider what would happen if current policies and practices were continued into the future. This helps to decide if there is a need to change the approach to managing flood and erosion risk. The ***With Present Management (WPM)*** assessment looks at the results of continuing the current management approach. In this SMP2, WPM is considered to mean continuing with the policy set out in the SMP1 for the stretch of coast in question. It does not refer to any specific standard of defence protection afforded by any structure. Information on the WPM assessment is contained in ***Appendix C***.

2.2.2 International / National / Regional / Local

In this SMP2, where two national administrations (England and Wales) are involved in the decision making process and the management of coastal flooding and erosion, the following definitions have been used:

- ***International –*** beyond the UK e.g. at an EU level;
- ***National –*** England, Wales or the UK as a whole;
- ***Regional –*** covering a sub-national area e.g. a group of local authorities, a Wales Spatial Plan (WSP) area, a Regional Spatial Strategy (RSS) area; and
- ***Local –*** individual towns, villages, parishes.

3. The SMP2 Development Process

3.1 Role of the Coastal Group

The ***Severn Estuary Coastal Group (SECG)*** has developed the SMP2. The SECG is a partnership of the local authorities, conservation authorities, Internal Drainage Boards (IDBs) and Environment Agency regions around the Severn Estuary. It was originally formed in 1993 to draft the SMP1, which was completed in 2000. The SECG formed a ***Project Management Group (PMG)*** to oversee the day to day management of the SMP2 production.

3.2 Stages in the Development of the SMP2

This SMP2 has been developed following the Defra SMP Guidance Documents, which aims to help coastal groups around England and Wales to produce SMP2s that have been developed following a consistent approach with an in-depth and robust assessment of economic, environmental and social factors.

The guidance has been adopted by WAG to apply to SMP2s in Wales, with some additional guidance to take account of particular Welsh issues. In some places, additional clarification or changes from the guidance was needed. Where this has happened, this has been discussed and agreed by the ***SECG***.

The ***SECG*** has followed the Stages set out in the Defra SMP Guidance Documents as summarised below:

- **Stage 1 – Scope the SMP2 –** this is a key stage that sets important parameters for the SMP2, including defining the area of the SMP2, together with the inland and upstream extents. It also involves identifying important stakeholders, making them aware of the SMP2 process and setting up the communication methods for the development process. Data collection and any additional modelling and analysis are also part of this stage. This is included as an Annex in ***Appendix A***;
- **Stage 2 – Assessments to Support Policy Development –** most of the technical analysis, mapping and risk assessment is undertaken in this stage. It includes developing an understanding of the physical processes affecting the shoreline, mapping what would happen if defences were not maintained (***'No Active Intervention'***) and determining what would happen if current SMP1 policies were continued (***'With Present Management'***). Important features, issues and the benefits that people get from the features are also identified (see ***Figure 3.1***);

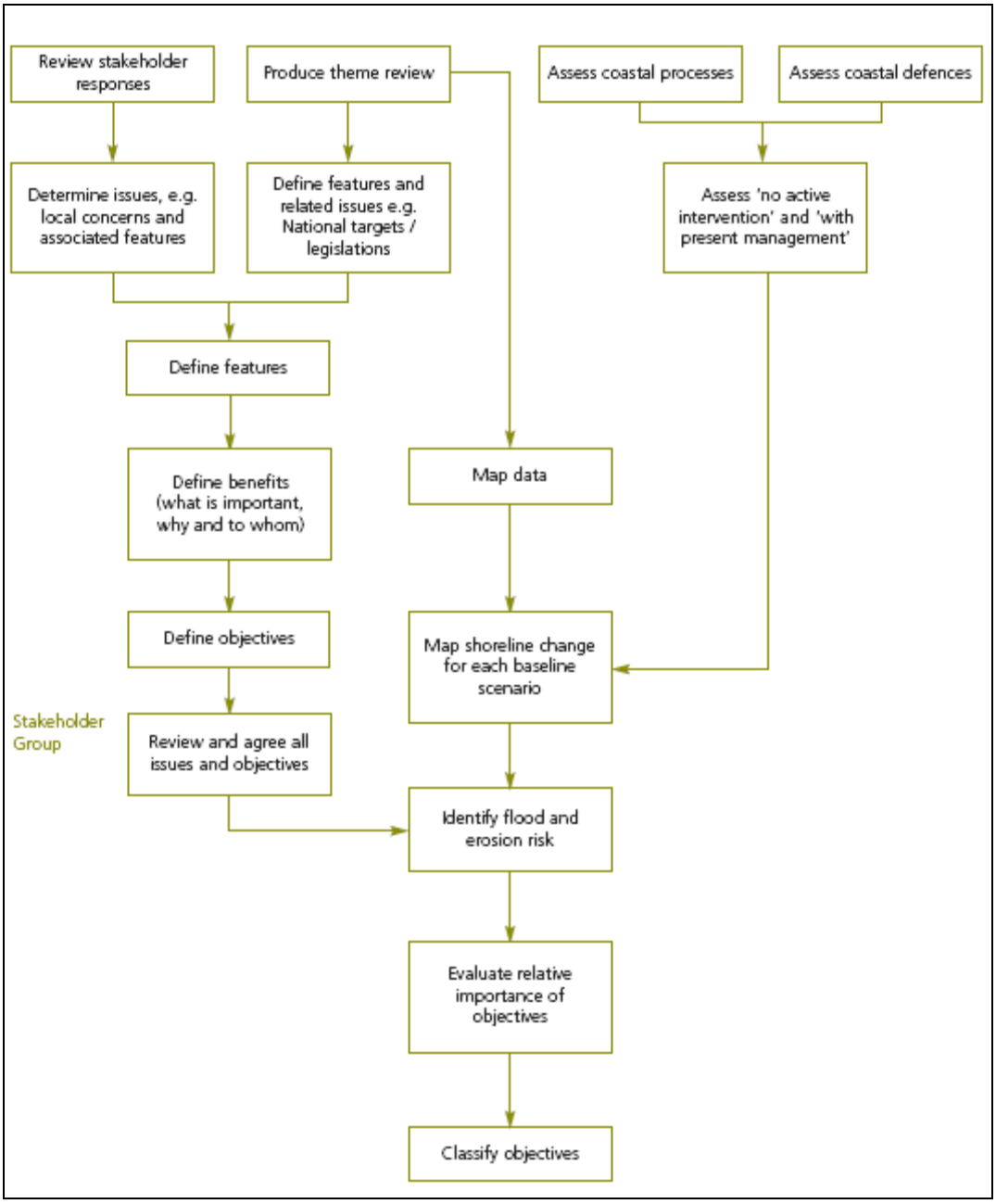


Figure 3.1 – Stage 2 flow Diagram

- **Stage 3 – Policy Development –** this stage brings together the analysis, modelling and mapping undertaken in Stage 2, with comments and information received from stakeholders, to identify what would happen under each of the four policy options available to determine which one is the most appropriate choice for each stretch of shoreline (***Policy Unit***). The way that adjacent Policy Units interact is also considered, as this can affect the decisions made e.g. whether a particular policy option has a negative impact on an adjacent stretch of shoreline. The draft SMP2 is produced by the end of this stage;
- **Stage 4 – Public Examination –** a full 12-week public consultation on the draft SMP2 and the proposed policies for each stretch of shoreline (***Policy Unit***). All technical documents are made available. All four groups of stakeholders are involved in this stage *(see **section 3.8**)*;

- **Stage 5 – Finalise the SMP2 –** the results of the public consultation are used to make any amendments to the draft SMP2 to produce the final SMP2. An ***Action Plan*** is also produced. This sets out the actions that need to be taken over the next 5 – 10 years to start implementing the SMP2 policies and who should be responsible for those actions.
- **Stage 6 – Publish and make available the final SMP2 –** The final agreed SMP2 and Action Plan are published and made available. Each organisation on the SECG has a copy and electronic versions are made available online.
  *This stage will begin once the SMP2 has been finalised and adopted (see **Section 3.10**).*

More detail on the SMP2 development process is contained in ***Appendix A***.

3.3 Taking Account of Climate Change

Climate change is a significant challenge that has particular focus at the coast. Responses to the challenges of climate change can be divided into two types:

- **Mitigation** – trying to reduce the amount of climate change e.g. by reducing greenhouse gas emissions; and
- **Adaptation** – accepting that some change will happen and responding to that change e.g. by building houses that are able to cope with flooding.

The SMP2 can help to contribute to 'adaptation' actions by considering what the future risks of flooding and erosion might be, taking account of climate change predictions, and identifying areas at risk e.g. due to rises in sea level. This is given particular consideration within the ***Action Plan*** through the assessment of the Defra Adaptation Toolkit and the Community Adaptation Planning and Engagement (CAPE) which has recently been published (Fernandez-Bilbao *et al*, November 2009). CAPE is an England only project.

In Wales, the New Approaches Programme, which was launched in July 2007, takes an holistic approach to managing flood risk from all sources and aims to work closely with stakeholders to help communicate risk and reduce the impacts of flooding. WAG intends to consult on their strategy for managing flood risk across Wales in 2010.

It is important that the long-term policies in the SMP2 influence planning, land use and management around the shoreline in a sustainable way that does not put future generations at risk or impose unmanageable financial burdens. Flood and erosion defences reduce the risk to the assets they protect from flooding, but they do not remove the risk completely. In order to cope with future change and future risks, all new developments of homes, businesses or infrastructure in flood and erosion risk areas should be appropriately adaptable, resilient and resistant e.g. built from flood resistant materials, form part of developments with flood storage areas, etc.. Decisions on the land use in flood and erosion risk areas should fully consider the risks now and in the future and be adaptable to change. This may include imposing and enforcing conditions on planning decisions.

3.3.1 Coastal Squeeze

In terms of important natural environmental assets, the Severn Estuary (with its high tidal current regime and complicated sediment dynamics) is an almost unique environment that is rich in fish and invertebrates, making the Estuary internationally important, particularly for birds, and the habitats that they live and feed on. The habitats and species in the Estuary are dependent on the interaction between the freshwater and seawater flows and are vulnerable to changes in river flows, sedimentation and sea level. Many natural areas have been lost due to historic land drainage, urban development and agricultural practices.

As sea levels rise, coastal and intertidal areas (e.g. beaches, shingle, saltmarsh), are lost to the sea in a process known as '***coastal squeeze***'. Where there are no hard defences, these habitats can move landwards, gradually replacing the lost areas. Where man-made structures, such as sea walls, are in place, the coastal habitats can't move further inland and become 'squeezed' between the rising sea levels and the hard defences (see ***Figure 3.2***). In order to create additional habitat a ***Managed Realignment (MR)*** policy could be adopted. The implementation of the ***Managed Realignment*** policy will be subject to additional investigations and studies.

MR will not happen automatically. During the time when the policy changes from Hold the Line (HTL) to MR the location, size and construction of new, set back defences will need to be agreed, how existing defences are removed or allowed to deteriorate safely will need to be decided and stakeholders and landowners will need to be involved in the development of these projects. Actions will be needed during the transition to a re-aligned defence to help people to understand what the policy means for them and helping them to manage that change (e.g. community engagement, management of flooding events, flood warnings, etc.).

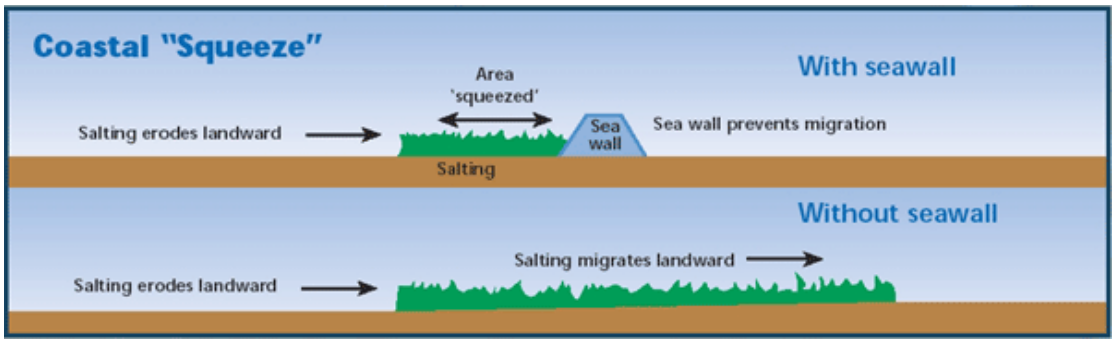


Figure 3.1 - Coastal Squeeze

3.3.2 Sea Level Rise

The land around the Severn Estuary is low lying. Sea level rise or an increase in the amount of coastal flooding could affect a large geographic area. In taking account of these changes this SMP2 differs from the approach recommended within the Defra SMP Guidance Documents.

The Defra SMP Guidance Documents suggest that if defences are breached the whole flood plain can be assumed to be at risk. In the case of this SMP2, that would mean assuming the whole SMP2 area would flood. This is not thought to be a helpful assumption as the chances of such an event are very low and would not help planners decide where to allow or forbid development, which is one of the aims for the SMP2.

Sea level rise is thought to pose the greatest real risk and be the most important consideration in deciding on the right policy option to manage coastal flooding and climate change. To work out which areas of the estuary would be affected by sea level rise, the change in ***Mean High Water Springs (MHWS)*** is seen as the most appropriate and has therefore been calculated to assist in policy making.

Mean High Water Springs (MHWS) is the average height that the tide reaches on a Spring Tide. Spring Tides basically occur when there is a new moon or a full moon. Spring tides rise furthest up the shore at high tide and go out furthest at low tide (i.e. maximum tidal range occurs). MHWS gives the average highest level that the tides reach at high tide.

As sea level rises, MHWS will rise as well, meaning that the tide will reach further and further up the shore profile and further and further in land, particularly where the land is low lying (as is found within this SMP2 area). Land which, over time, is affected by MHWS moving landwards

becomes unusable without intervention for many purposes – it cannot be used for housing, commercial development, farming, etc. because it is regularly covered by the tide (approx. twice per month). Showing how MHWS changes over time in the SMP2 area is, therefore, very useful for people that make decisions about planning and land use because it will highlight areas that will become unusable. It is for this reason that this SMP2 has introduced a valid variance to the Defra Procedural Guidance.

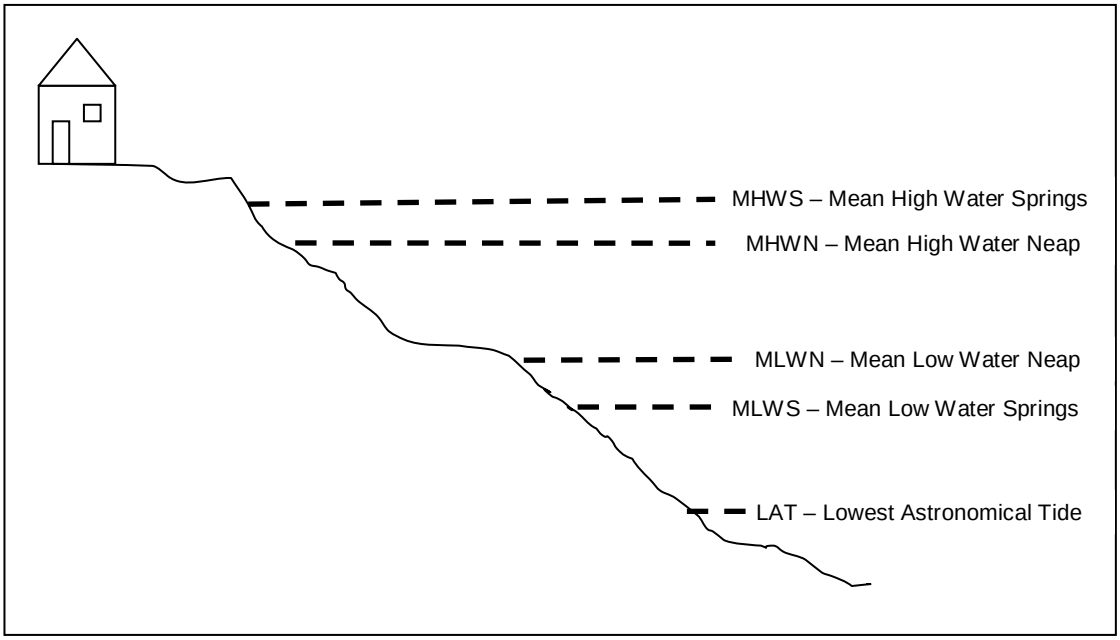


Figure 3.2 - Tide heights

3.3.3 Climate Change Predictions

The ***UK Climate Impacts Programme scenarios (UKCIP02)*** suggest that by 2080 the sea level will rise by between 20cm and 80cm in the South West and by about 40cm around Wales. Formal guidance on UKCIP02 was issued by Defra in 2006 and WAG in 2007. TheUKCIP02 predictions have recently been updated by the ***UK Climate Projections 2009 (UKCP09),*** which estimate sea level rises between 37cm and 53cm in England and Wales. Due to the timing of UKCP09 publications, the SMP2 used UKCIP02 predictions as applied in Defra (2006) and WAG (2007). The UKCP09 sea level rise predictions are either less than or very similar to the Defra (2006) and WAG (2007) guidance.

The change in MHWS has been calculated using the Defra (2006) and WAG (2007) formal guidance for sea level rise and information on the height of the land. This has been plotted on a map to show what would happen if current defences were not maintained, repaired or replaced. This is the ***No Active Intervention*** scenario (see ***Section 2.1.2*** for the definition). More information is in ***Appendix C***.

There are some drawbacks to this approach. Some areas of low lying land may be highlighted as being affected when they would not be, because there is an area of higher land between it and the current shore position. Other areas may be highlighted as not affected when they would be, because a man-made structure such as a road, railway line, drain or ditch could carry water further inshore than it would be otherwise be able to travel.

These are localised issues that may require closer attention during subsequent studies. For this strategic level policy document, decisions in such situations are unlikely to sway future policy option selection due to the scale of the issue.

The SMP2 shows a general pattern of the areas that could be affected by sea level rise if defences were not maintained. When coastal and erosion risk managers are investigating how to implement SMP2 policies, further investigation and research will be needed to understand exactly how sea level rise affects the particular area.

3.4 Policy Scenario Setting

The term 'Scenario' (as set out in the Defra SMP Guidance Documents) is seen as misleading amongst many stakeholders. To this end, the term has been replaced with 'Management Approach' as this is seen as more appropriate for communication purposes for stakeholders including Elected Members, planners and decision makers. This definition is discussed in more detail within **Appendix G**.

3.5 Key Policy Drivers

Key Policy Drivers are features that are so important that they can influence the choice of policy option at a large scale, in more than one stretch of shoreline (***Policy Unit***) and possibly across the whole SMP2. Keeping or improving the benefits people get from these features may be a requirement at a regional, national or international level e.g. protecting EU conservation sites is an international commitment. Key Policy Drivers point towards the choice of possible policies. Impacts on Key Policy Drivers have been assessed as ***major impacts***.

Features that are not Key Policy Drivers are not ignored. They are considered in choosing the policy option in the Policy Unit where they occur, but they do not influence the choice of an option beyond the boundary of a Policy Unit. Key Policy Drivers can influence the choice of an option in more than one Policy Unit (i.e. across a far broader strategic area) if it appears of wider importance.

The following sections sets out how different types of feature have been assessed and whether they are considered to be Key Policy Drivers. Information on the initial assessment of Key Policy Drivers is set out in ***Appendix F***.

3.5.1 Property, Land Use & Human Health

The SMP2 considers the impacts on people, human health and land use over a large area and long time. Key Policy Drivers are those areas containing a large number of people. In this SMP2, a large number of people is defined as being ***more than 10,000 in one area***. With this criterion in mind, the following settlement areas are defined as ***a Key Policy Driver:***

Main SMP2 residential areas

- Bristol
- Caldicot / Portskewett
- Cardiff
- Chepstow
- Clevedon
- Gloucester
- Lydney
- Magor / Undy
- Newport
- Penarth
- Portishead
- Yatton / Congresbury

Quedgely and Yatton / Congresbury are only partly within the SMP2 area, but as they contain more than 10,000 people, they are included as Key Policy Driver towns in the list above.

3.5.2 Critical Infrastructure

Critical infrastructure is the transportation, communication and service features that are vitally important for the region and potentially difficult and costly to relocate in the short term. They include motorways, ports, railways, large electricity power stations and large water treatment works. In some more rural areas where there is only one access road into / out of a location, this is also considered to be critical infrastructure, as there is no alternative route available (critical for emergency access and community well being etc). Critical infrastructure ***is therefore a Key Policy Driver.***

3.5.3 Agricultural Land

A large area of the SMP2 is agricultural land. Its importance at a local, regional and national level is recognised (see ***Section 4.5***). There is no national policy or guidance on how important agricultural land is in making decisions about managing the risk of coastal flooding and erosion. Based on the lack of such guidance or policy, this SMP2 does ***not consider it to be a Key Policy Driver***. Where agricultural land may be at risk, it has been assessed as a feature within the Policy Unit. The assessment has been valued based on agricultural land valuation (see ***Table 3.1***).

3.5.4 Nature Conservation

There are many designated nature conservation sites in the SMP2 area of local, national and international importance (see ***Section 4.3***). The SMP2 considers ***international conservation sites are Key Policy Drivers***. This includes SACs, SPAs and Ramsar sites. These sites are generally large and fall within more than one Policy Unit. In some cases, these sites cover the majority of the SMP2 area e.g. Severn Estuary SAC site. The size and international importance of these sites has been a key factor in deciding that international conservation sites are Key Policy Drivers.

National and local conservation sites are not considered to be Key Policy Drivers. This includes SSSIs, NNRs and LNRs. Many SSSIs sit within or form the basis of internationally designated sites. National and local sites that are not also internationally designated tend to be smaller than international conservation sites and tend to fall within a single or only a small number of Policy Units.

3.5.5 Landscape Character & Visual Amenity

Designated and non-designated landscape sites ***are not considered to be Key Policy Drivers***.

3.5.6 Historic Environment

The historic environment of the Severn Estuary is important. There is no clear guidance on how the historic environment should be prioritised when considering coastal flooding and erosion (see ***Section 4.4***). This SMP2 does ***not consider it to be a Key Policy Driver***.

3.5.7 Amenity & Recreation

Recreational features are **not** considered to be ***Key Policy Drivers***. This includes coastal paths, boat clubs and moorings, recreational angling sites, etc. Where a proposed policy could result in the loss of a coastal footpath, there is potential, subject to planning consents, for these to be re-routed as the shoreline realigns and / or when defences are realigned. It is important to note that where defences currently support / protect a footpath, maintaining the footpath alone is not justification for continuing to provide the defence.

3.6 Economics

The economic impact of SMP2 policy options has been calculated. This has used existing published information and data sources. Assumptions and estimations have been made when calculating the financial costs and benefits of different policy options. The section below briefly sets out the main assumptions that have been made. More detail on the economic calculations and information used can be found in ***Appendix H***.

It should be noted that where the preferred policy option proposes that defences are constructed, rebuilt or maintained that this does not guarantee funding for these works. All actions to manage the risk of flooding and erosion compete for a limited amount of funding. Decisions will have to be made on how to prioritise management measures.

Where the benefit-cost ratio (BCR) of the proposed policy option is low, schemes may be less likely to receive public funding and it may be necessary to secure funding from non-public sources (see ***Appendix H*** for more detail on the economics).

3.6.1 Costs / damages not included in the calculations

It is not possible to value all costs or benefits in the economic assessment e.g. the cost of temporary disruption to roads would depend on how long and how often the disruptions occur, the size of road, the length affected, how many people use it, etc. This level of detail is difficult to determine accurately and depends on too many factors to take into account. The following have therefore not been included in the economic assessment:

- Cost of impacts on recreation, on tourism, the local economy and the natural and historic environment;
- Value of ecosystem systems e.g. the benefit provided by saltmarsh acting as a natural defence; and
- Costs of temporary disruption to transport networks. Where damages would be large enough to require complete re-building / re-routing, these have been included (see below).

3.6.2 Costs that have been included in the calculations

Existing sources of information and guidance have been used to estimate the cost of having to replace / rebuild structures damaged by coastal flooding and erosion. The following sources of information and costs have been used:

- National Property Database – has been used to identify residential and non-residential properties at risk and their value;
- Cost of a new motorway - £14m per km *(taken from the Multi-Coloured Manual and accepted by the EA as figures used in the recent Avonmouth to Aust Flood Strategy Study)*;
- Cost of new dual carriageway - £7m per km *(taken from the Multi-Coloured Manual and accepted by the EA as figures used in the recent Avonmouth to Aust Flood Strategy Study)*;

- Cost of new railway track - £3.6m per km *(taken from the Multi-Coloured Manual and accepted by the EA as figures used in the recent Avonmouth to Aust Flood Strategy Study)*; and
- Write-off value of agricultural land (see table below). Agricultural land is considered to be written off, as flooding by salt water is assumed to make it unusable.

Table 3.1 - Cost for different grades of agricultural land

Agricultural Land Classification Grade	Write-off value (£/ha)
1	6,290
2	6,290
3	7,050
4	4,500
5	4,500

Source: Multi Coloured Manual 2005 - Chapter 9, page 196. Middlesex University, Flood Hazard Research Centre

3.6.3 The Cost of Coastal and Tidal Defences

The SMP2 Guidance Documents (Defra, 2006) provide costs for replacing / building new defences and for maintaining existing defences. They also estimate how long each type of defence will last before it will need to be replaced.

These are compared against the cost of the damage that would be done by coastal flooding and erosion. The cost of maintaining or building defences is multiplied by 1.5 in the 20 – 50 year epoch and by 2 in the 50 – 100 year epoch to account for the need to build defences taller, wider, and stronger to counteract climate change and sea level rise.

Table 3.2 - Cost for different types of defence

Defence type	Cost to maintain (per km per year)	Cost to build (per km)	Replacement period (years)
Hard defences e.g. seawalls, rock revetments	£10,000	£2.7million	100
Earth embankments, groynes, etc.	£10,000	£0.6 million	50
Beach management – replacement of sand, shingle, etc.	£20,000	£5.1 million	30

Source: SMP Guidance Volume 2: Procedures, Appendix C: Socio-economic Appraisal and Sensitivity Testing

There are no cost estimates available for the maintenance or replacement of a structure like the Cardiff Bay Barrage. The 'hard defences' costs have been used for the Cardiff Bay Barrage. It should be noted that this underestimates the costs of maintaining the Cardiff Bay Barrage. An increase in costs would not alter the policy option.

3.7 The SMP2 Study Area

The SECG has defined the area covered by the SMP2. It follows the shoreline from Lavernock Point, near Penarth in Wales to Anchor Head, just north of Weston Bay in England. The upstream boundary of the SMP2 is at Haw Bridge, near Gloucester. Haw Bridge is just below the current tidal limit and still influenced by the sea. It is likely that the influence of the tide and the tidal limit will change over the 100-year time period that the SMP2 covers. Haw Bridge is, therefore, considered an appropriate upper limit to the SMP2.

From the shoreline, the area of the SMP2 extends inland one kilometre or to the extent of a 1 in 1,000 year flooding event (whichever is greatest) and upstream into rivers that flow into the Estuary. This ensures that all areas likely to be affected by changes to the shoreline or flooding from the sea are included within the area of the SMP2. The SMP2 also includes the islands of Flat Holm and Steep Holm.

The SMP2 has considered the whole Severn Estuary and its tributaries up to the tidal limits which, in some cases, extend someway inland (refer to ***Appendix A*** for the tidal limits used). Detailed studies of many of the tributaries along this shoreline have not been undertaken, and limited technical process information was available for this SMP2. The recently completed ***Catchment Flood Management Plans (CFMPs)*** (Environment Agency, 2008) that cover the Severn and tributaries have been used as the basis for setting policy in the SMP2 where management plans overlap. It should be noted that the policies and terminology used by CFMPs are not directly equivalent to SMP2 policies. ***Figure 3.3*** shows the SMP2 and CFMP boundaries.

The SMP2 area overlaps with the area covered by the ***Severn Estuary Flood Risk Management Strategy (SEFRMS)*** study area (see ***Section 1.4***). The SMP2 extends further upstream into the River Severn and its tributaries than the SEFRMS. The SEFRMS boundary extends further along the English shoreline to include part of Bridgwater Bay (see ***Figure 3.4***).

Figure 3.3 – Catchment Flood Management Plans around the SMP2 area

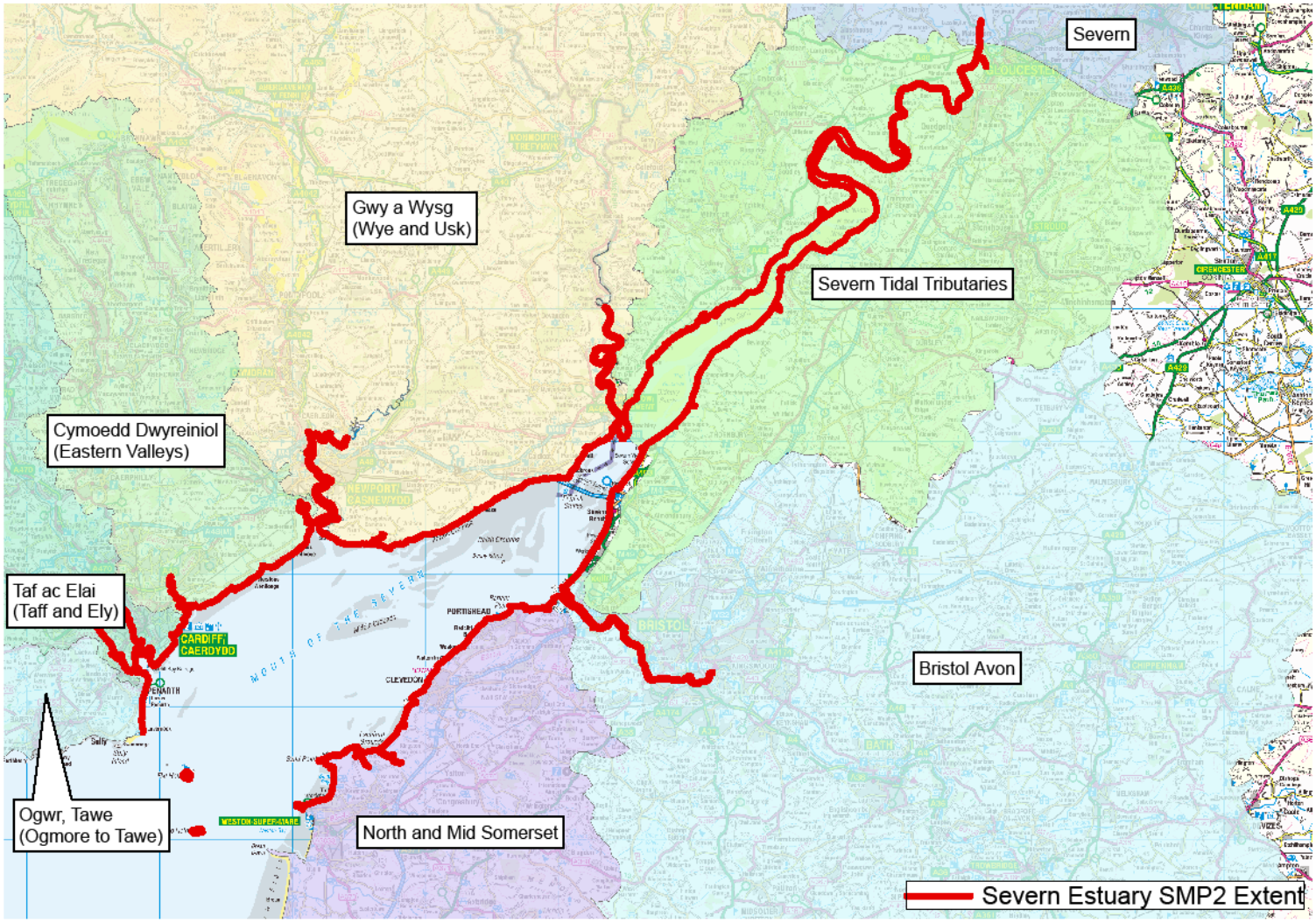
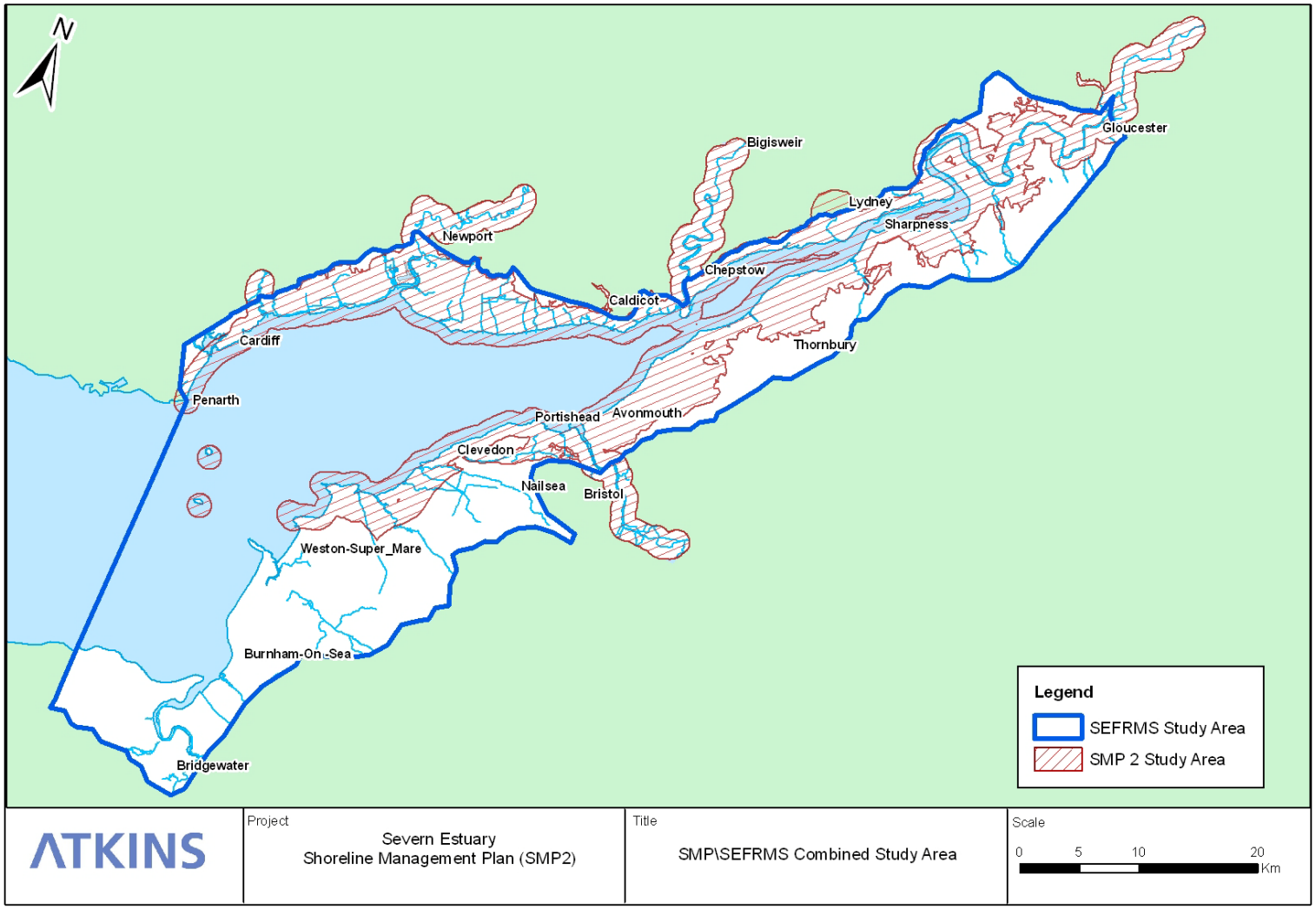


Figure 3.4 - Project Boundaries



3.8 Stakeholder Involvement

The opinions and views of stakeholders – those people that live, work and are interested in the area affected by the SMP2 – are important in producing an effective SMP2. Throughout the development of the SMP2, stakeholders have been asked to contribute information, local knowledge and their views (see ***Appendix B***).

Four different groups of stakeholders have been involved in the development of the SMP2. No one group is more important than any other and views or comments raised by one group do not have more or less weight than views raised by another.

- **Severn Estuary Coastal Group (SECG) / Project Management Group (PMG) –** includes representatives from 10 Local Authorities, 3 Environment Agency (EA) Regions, 2 Internal Drainage Boards (IDBs) and the national statutory nature conservation bodies, as well as input from historic environment representatives from England and Wales;
- **Elected Members Forum (EMF) –** a forum for elected representatives from the Local Authorities within the SECG area to be involved in the SMP2 development process. Elected Members ultimately represent their constituents – the residents, businesses, etc. that will be affected by the SMP2 policies;
- **Key Stakeholders Group (KSG) –** a focal point for discussion and consultation – made up of people with primary interests in the Estuary (industry, conservation, user groups, etc.). Includes all town and parish councils; and
- **All other stakeholders –** this includes everyone that does not fall into one of the groups above, including members of the public. It is the largest and most diverse group.

Many people could be represented by more than one group e.g. home owners could be represented by their local parish council, their elected Councillor or they could represent themselves as a member of the public. It has been up to the individual to decide the best way for them feed into the SMP2 development process.

The ***Severn Estuary Coastal Group (SECG)*** website (www.severnestuary.net/secg) has provided a single point of access to information and documents for all stakeholders throughout the project. More detail on how stakeholders have been involved, the issues raised and how they have been addressed by the SMP2 can be found in ***Appendix B***.

3.9 Projects that Influenced the Development of the SMP2

Since the SMP1 was completed in 2000, a number of projects and studies have been completed that have influenced the way the SMP2 has been developed. These are briefly described below.

3.9.1 Futurecoast

A national Defra-funded project, known as *Futurecoast* (Halcrow, 2002) developed a new way of looking at coastal change, known as a 'behavioural systems approach', which looks at ***how*** and ***why*** the coast changes over time. This approach was used by Defra to develop new guidance on how SMP2's should be developed (see below) and helps by providing nationally consistent predictions of long-term coastal evolution. It should be noted, however, that *Futurecoast* did not cover the whole area of this SMP2, as it did not extend upstream of the Severn Crossings, nor upstream of the Severn Estuary tributaries.

3.9.2 SMP2 Procedural Guidance

Following a review of the strengths and weaknesses of SMP1s, and in consultation with coastal flood and erosion risk managers, Defra produced an updated set of guidance to help coastal groups review SMP1s and produce SMP2s (Defra, 2006). The guidance has been adopted by WAG to apply to SMP2s in Wales, with some additional guidance to take account of particular Welsh issues. This SMP2 has followed the guidance (see ***Section 3.2*** for more information on the guidance and stages in the SMP2 development).

3.9.3 Lessons Learnt from the First Five SMP2s

Defra carried out a brief review of the pilot SMP2s in 2007. This and the first few full SMP2s completed were reviewed in February 2009 in a document entitled *Lessons Learnt from the First Five Reviews*. This SMP2 has taken the findings of that Review into account.

One important aspect of this SMP2 is that it is a cross-border plan for England and Wales. None of the plans reviewed were cross-border plans, so it was unable to comment on some of the specific challenges faced in cross border situations. The need for further advice in these areas will need to be considered again by the Review Group in 2010 following the review of further completed Plans. The ***Severn Estuary Coastal Group (SECG)*** recommend that the Severn Estuary is included in any future review so that the challenges, actions and solutions found in the development of this SMP2 can be passed on to benefit future cross-border SMP's and other plans.

3.9.4 Other Nationally Strategic Studies, Policies and Legislation

This SMP2 report takes the Severn Estuary SMP1 (produced in 2000) as the starting point and builds on it, taking account of studies, models, surveys and other changes including:

- The latest studies and modelling undertaken since the SMP1 including, climate change predictions (UKCIP02)[1], flood mapping (EA Flood Zone Mapping) and *Severn Estuary Coastal Habitat Management Plan* (CHaMP);
- Issues identified by more recent coastal defence schemes and plans undertaken at a more local level (e.g. *Gwent Levels Foreshore Management plan, Avonmouth to Aust Tidal Defence Scheme*);
- Changes in legislation (e.g. EU Habitat Directive amendments, Water Framework Directive, Marine and Coastal Access Act);
- Changes in national flood and coastal defence planning requirements (e.g. consideration of longer-term planning horizons - 100 year timescales, the *Pitt Review*, *New Approaches*);
- Results of any regional coastal monitoring activities; and
- The EA Quality Review Group (QRG) success criteria used to evaluate SMP2s. Defra and WAG are observers on the QRG.

3.10 Adoption of the Severn Estuary SMP2

Following the SMP2 development process, the public consultation and revision, the SMP2 should be adopted / approved by Local Authorities and the Environment Agency Regional Flood

[1] UKCP09 was not released in time to incorporate into the SMP2. The SMP2 uses UKCIP02 high emissions, highest estimate scenario to predict sea level rise. These estimates are similar to those in the H++ UKCP09 predictions.

Defence Committees (RFDCs) in England. Defra has delegated their final approval of SMP2s in England to the EA Regional Directors. Once all Local Authorities and RFDCs have approved / adopted the plan, final approval is then given by the EA Regional Director(s) and WAG.

Natural England (NE) and the ***Countryside Council for Wales (CCW)*** are advisors to the ***Severn Estuary Coastal Group (SECG)***, individual partners on the group and national government. Their input to the development of the SMP2 ensures it is compliant with relevant national and EU nature conservation legislation (see ***Section 4*** for more information on nature conservation legislation).

4. Key Factors in the Severn SMP2

4.1 Overview

The Severn Estuary is a complex and challenging environment to manage; politically, environmentally and socially. The coastline has many uses, including ports, towns and extensive industrial developments alongside significant historic value and important agricultural and conservation areas. Ten local authorities and two national administrations share this shoreline and so it is a truly multi-sectoral estuary that requires an integrated approach to its management.

This section sets out some of the over-arching issues that affect the whole SMP2 area and have had a significant influence on the decisions made in developing the SMP2. Some of these issues may be the same in other areas of England and Wales, but many are specific to the Severn Estuary.

4.2 Governance in the Severn Estuary (Administration and Management)

The Severn Estuary is one of only two SMP2 Reviews that cross a national border (the other being the Dee Estuary). It must take account of the different policies and priorities of two national governments and the way that this affects the management and decision-making processes. All SMP2s must show evidence of consultation and communications to show that all policy options are considered to aid this decision making process. In cross border situations, this evidence needs to be clearly communicated (in both Welsh and English language where appropriate) and be transparent for wider acceptance within the two countries (see ***Appendix B*** on stakeholder involvement).

The ***Welsh Assembly Government (WAG)*** is responsible for many areas of policy and legislation that need to be considered in developing the SMP2 e.g. nature conservation, planning, flood risk management, waste management and some areas of transport. Policies and priorities in Wales are not always the same as in England, because they have been developed with the needs and wants of the people of Wales in mind. Wales has developed a risk based approach to flood and erosion management as part of its New Approaches Programme. This plays a significant role in the way policy choices in Wales are made. WAG plays an advisory role only in the SMP2 process, though has produced a Supplementary Note to the existing Defra SMP2 Guidance Document (Defra, 2006) that requests further clarification and attention in specific parts of the guidance.

UK Government is responsible for policy and legislation in England and for the UK as a whole, where these matters are not devolved. This means that UK Government may be responsible for things in Wales as well as in England e.g. ports policy.

The SMP2 requires sign off in both England and Wales for the ***final SMP2 report*** and ***Action Plan*** and for the ***Strategic Environmental Assessment (SEA)*** and ***Habitats Regulations Assessment (HRA***) requirements (see ***Section 5***). Should ***Imperative Reasons of Over-riding Public Interest (IROPI)*** be identified as part of the HRA process, both Welsh Ministers and the Secretary of State will need to be involved (see ***Section 4.3*** below).

Each government has its own ***Statutory Nature Conservation Advisor*** – Natural England (NE) in England and the Countryside Council for Wales (CCW) in Wales. They both have similar roles – to advise on the protection of the natural environment – but like the national governments, they have different priorities and policies depending on the specific issues in

England and Wales. Both CCW and NE are advisors to the ***SECG*** in the development of this SMP2.

More information on the policies and legislation in England and Wales that affect the SMP2 is in the Theme Review in ***Appendix D***.

The ***Environment Agency (EA)*** is an England and Wales body, but has slightly different roles in England and Wales. The EA is the main flood risk management operating authority in England and Wales. It is empowered (but does not have a legal obligation) to manage flood risk from designated 'main rivers' and to provide coastal flood defence. In England the EA also provides a strategic overview role for coastal erosion and flooding. It does not have this role in Wales. There remain challenges in delivering the policies set out in the SMP2 associated with organisations (such as the EA) that have different roles in coastal management in England and Wales.

The Severn Estuary benefits from several well established partnership groupings that have an Estuary-wide remit. They have come together under the umbrella of the Joint Estuary Groups initiative to collectively manage the Estuary. The ***Severn Estuary Partnership (SEP)*** is a vital facilitator in helping to co-ordinate actions and foster co-operation and communication within the Estuary and acts as Secretariat for a number of the partnership groupings within the Severn Estuary, including the ***SECG***. SEP also hosts the Severn Estuary Gateway website, which acts as a portal to the other partnerships within the Estuary – www.severnestuary.net

4.3 Natural Environment - Protected Sites and Species

4.3.1 Internationally Protected Sites

The EU Habitats and Birds Directives aim to protect European birds and species and the habitats that support them and help halt the loss of EU biodiversity by creating a coherent network of protected sites across the EU. These sites are collectively known as ***Natura 2000*** sites.

The aim for all Natura 2000 sites is to achieve ***Favourable Conservation Status (FCS)*** for all the ***features*** of the site, for the site as a whole and for the whole EU network of sites. A site feature is a habitat or species that is one of the reasons for the site's protection. Favourable condition is described by a number of ***conservation objectives*** for each of the features within the site.

The Ramsar Convention aims to protect important wetlands, by designating and protecting wetland sites of international importance. These are known as ***Ramsar Sites***.

Since the SMP1, new sites have been designated and the Habitats Regulations in the UK have been amended, increasing the level of protection for the species and habitats protected by the sites. The SMP2 area contains all three types of internationally protected site:

- **Special Areas of Conservation (SACs) -** to protect habitats and species. There are seven SACs in the SMP2 area – Severn Estuary SAC, River Usk SAC, River Wye SAC, Wye Valley & Forest of Dean SAC, Wye Valley Woodlands SAC, Avon Gorge Woodlands SAC, and the Mendip Limestone Grasslands SAC;
- **Special Protection Areas (SPAs) -** to protect birds and their supporting habitats, including salt marshes and intertidal mud, sand and rocky shores. There are two SPAs in the SMP2 area - Severn Estuary SPA and the Walmore Common SPA;**Ramsar Sites –** to protect wetlands. The SMP2 area contains the Severn Estuary Ramsar Site.

It is a legal requirement to protect Natura 2000 sites and their features. If part of a site or the whole site is at risk from coastal squeeze, other areas need to be identified and protected to replace the lost areas.

If sites are at risk from human action, e.g. as a result of this SMP, that risk must be eliminated. If this is not possible, the actions are only permitted for ***Imperative Reasons of Over-riding Public Interest (IROPI)***. These decisions can only be made by Welsh Ministers / the Secretary of State with the agreement of the European Commission (see ***Section 5***).

The large area covered by the Severn Estuary SAC and SPA, and the number of other Natura 2000 sites in the SMP2 area means that the requirements of the legislation that protects these sites have played a significant role in the decision making process.

4.3.2 National Protected Sites and Species

Sites of Special Scientific Interest (SSSIs) are of national importance for nature conservation and designated under the Wildlife and Countryside Act (WCA) 1981, as amended the Countryside and Rights of Way (CROW) Act 2000. A list of 'operations likely to damage' features is associated with each SSSI. These operations need to be taken into consideration in undertaking any activity in a SSSI. There are 52 SSSIs in the SMP2 area.

The UK Biodiversity Action Plan (UKBAP) sets out actions needed to sustain and enhance the UK's biodiversity at a national level. It has been produced as part of the UK's commitment to the Convention on Biological Diversity (CBD). As part of the UKBAP, Local Biodiversity Action Plans (LBAPs) have been produced to focus on more local needs. There are 11 LBAPs of relevance in the SMP2 area.

There are a number of other protected sites in the SMP2 area, including four National Nature Reserves (NNRs) and an Area of Outstanding Natural Beauty (AONB). More information on the landscape and nature conservation in the SMP2 area is contained in the Theme Review in ***Appendix D***.

4.4 Historic Environment

The historic environment includes evidence for past environments, archaeological sites, historic buildings, designed landscapes and the historic aspects of the wider landscape. Historic environment features are important as a record of human activity over thousands of years, the contribution they make to the landscape, to community identify and as tourism and leisure attractions. The Severn Estuary has been the focus of settlement and exploitation for much of the last 10,000 years so much that there are few areas that have not been occupied, developed or exploited by people.

There are **113 Scheduled Monuments, 8 registered Historic Parks and Gardens** and **hundreds of Listed Buildings** in the SMP2 area (***Appendix D***). Designation does not, however, fully reflect the importance of the historic environment in the SMP2 area - there are hundreds of historic sites that have not been designated, some of which may be of national importance. Phase 1 of the Rapid Coastal Zone Assessment (RCZA) for the Historic Environment (funding by English Heritage) informed the Severn Estuary SMP2 evaluation process of non designated features of the historic environment on the banks of the Severn Estuary in England that could be vulnerable to coastal change.

Coastal change creates opportunities and threats for the historic environment e.g. erosion could reveal new artefacts but could also damage items of historic value. It is not practical or even possible to protect historic environment sites indefinitely. Choices need to be made about which sites should be protected and how to protect them. It may be necessary to implement a programme to collect information about threatened sites. The programme could include appropriate records of structures and artefacts in danger of being eroded, covered up, or affected by the creation of new defences. .

English Heritage and Cadw recognise that coastal erosion, flooding and climate change need to be taken account of in the way the historic environment is managed. There is, however, no clear policy for how the historic environment in the Severn Estuary should be managed or how sites should be prioritised for protection or recording. The SMP2 has been developed in consultation with historic environment experts around the Estuary.

In the absence of clear guidance on priorities, and given the very large number of non-designated historic environment sites, only Scheduled Ancient Monuments (SAMs) and Listed Buildings have been identified on the Policy Unit maps in ***Annex A***. Other historic environment features have, however, been taken into account in the assessment of policy options. More information on the historic environment can be found in the Theme Review in ***Appendix D*** and in the Issues, Features and Objectives report in ***Appendix E.***

4.5 Agricultural Land

A large part of the SMP2 area is used for agriculture. The Agricultural Land Classification (ALC) system grades agricultural land based on its quality and the range of different types of agriculture it can be used for. The grade is based on a number of factors including soil depth, risk of flooding and drought risk. Grade 1 land is the most valuable because it is high quality and can be used to grow a wide range of crops. Grade 5 land is the least valuable because it is only generally suitable for grazing.

Approximately half the agricultural land in England and Wales is Grade 3 and this is subdivided into Grade 3a and Grade 3b. Most of the agricultural land in the SMP2 is of Grade 3. Grade 3 land is considered 'good to moderate' and is generally used for cereals, oilseed rape, potatoes, sugar beet or for grazing / grass.

English, Welsh and UK policies recognise the importance of agricultural land for producing food and the challenges facing farming, including those from climate change, globalisation and rising fuel prices and competition for land. The issues of food security and how self-sufficient the UK is in food production are becoming more important. The UK is currently 60% self-sufficient in all foods (i.e. producing 60% of all the food consumed in the UK) and could produce more than enough food to make the UK completely self-sufficient (Defra, 2008).

Land use planning guidance in England (PPS7) and Wales (TAN 6) (WAG 2002, ODPM 2006) advises that significant development of agricultural land is avoided and that lower grade land (Grades 3b, 4 and 5) should be used in preference to higher grade land (Grades 1, 2 and 3a) if there is a need to develop agricultural land. Currently, there is no national guidance on the relative priority of agricultural land when making decisions about the management of flood and erosion risks.

Defra has published a supplementary guidance note *Valuation of Agricultural Land and Output for Appraisal Purposes May 2008*. This provides an update on the value of agricultural land for use in assessing flood and coastal defence projects in England only. Similar guidance for Wales is not currently available. The Defra valuation of agricultural land has been used in all the assessments in this SMP2.

In the absence of specific guidance, the SMP2 has used existing agricultural land values to assess the importance of agricultural land (see ***Table 3.1***).

4.6 The Severn Barrage

The extremely high tidal range of the Severn Estuary means that the Estuary could generate renewable energy generation from wave and tidal power technologies. The Department for Energy and Climate Change (DECC) and WAG are currently part way through funding a study of possible renewable energy generation technologies in the Severn Estuary. A two year project to

evaluate the potential for electricity generation from the Severn Estuary has reached its mid-point. A briefing note on this project will be issued separately. Updates on the progress of the project are available at the DECC website:

http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/severn_tidal_power/severn_tidal_power.aspx

The study aims to gather and assess evidence to help Government to decide if it should use public money to help support a renewable energy generation scheme in the Severn. Phase 1 of the study has finished. This reduced a long list of 10 possible schemes down to a shorter list of 5 possible scheme types. These are being considered in more detail in Phase 2. A public consultation on Phase 2 will probably take place some time during 2010.

If a Severn tidal power project does go ahead, it would have to go through the normal planning and permitting process that other developments go through. This could take 3 - 5 years and would include more public consultation.

The SMP2 **does not take into account** the impacts of any of the possible schemes, as no decision has been made on which one (if any) would be supported by Government. This means there are too many uncertainties to take account of.

The feasibility study and any planning application will have to take potential impacts on coastal flooding and erosion into account, and take account of the policies in the SMP2. If a tidal power project is developed, the SMP2 should be reviewed to decide if the policies needs to be amended.

4.7 Cardiff Bay Barrage

The SMP2 assumes that the Cardiff Bay Barrage remains operational throughout the entire SMP2 period (100 years) and operates as it was designed to. It does not consider risks associated with the failure of the barrage or its infrastructure. These assumptions are consistent with those made in the ***Taff and Ely Catchment Flood Management Plan (CFMP)*** and have been agreed with the Environment Agency Wales.

This means that even under ***No Active Intervention (NAI)***, the Cardiff Bay Barrage reduces the risk of impacts from coastal flooding along its length during all three SMP2 epochs.

There are no standard costs for the maintenance of a structure like the Cardiff Bay Barrage in the available guidance. Maintenance costs for 'hard defences' have been used in the SMP2 (see ***Section 3.6***). It should be noted that this underestimates the costs of maintaining the Cardiff Bay Barrage, potentially significantly.

4.8 Health and Safety Risks from Defence Structures

All the policies presented will need to be supported by strategic monitoring and must take due account of Health and Safety legislation, and any relevant advice or guidance on public health and safety at flood and coastal management sites, such as that in the Defra / EA R&D Project *Guide to Public Safety on FCD Risk Management Sites – 2009* when they are implemented.

Over the three epochs considered by the SMP2 there are units of shoreline that have a No Active Intervention (NAI) policy, leading to the gradual deterioration of defences, followed by a Managed Realignment (MR) policy. In these scenarios, there may be some works required during the NAI period to ensure the defences manage the impacts of flooding until realigned defences have been put in place and to ensure that the defences deteriorate in a safe manner. The amount of works needed during the NAI period will depend on the existing defences in place and their residual life. Other actions (e.g. community engagement, management of flooding

events, flood warnings, etc.) will also be needed during the NAI period and the transition to a re-aligned defence.

4.9 Private Defences

Along parts of the SMP2 shoreline, there are private defences that have been built by individual landowners. The preferred policy statements in this SMP2 indicate where defences could, or could not, be maintained for technical and / or environmental reasons, i.e. influence on coastal erosion or flooding.

It is acknowledged that at some point individuals may wish to build new defences where presently there are none or increase / improve existing defences. In these situations, these actions may be permitted, but it is the responsibility of the landowner to demonstrate there would be no adverse impacts on coastal processes (either upstream or downstream or in the area offshore) or designated and protected features, as part of the normal planning application process. It is not possible to prescribe specific policies for this situation as it is unknown if, when or where individual landowners may wish to build or amend private defences.

4.10 Dredging

There are a number of areas in and around the SMP2 area that are dredged either to maintain navigation channels (***maintenance dredging***) or to extract the sand and gravel, which is then used, mainly in the construction industry. Maintenance dredging generally takes place around existing ports and dock areas. The material that is removed is generally pumped away from the area it has been dredged, disposed of at licensed disposal sites at sea or used to replace sediment lost from beaches by erosion (known as ***beach nourishment***). This means the sediment is recycled rather than being completely removed.

Dredging can affect the way the shoreline changes, by changing the way tides and waves move or by removing sand and gravel that contributes to the creation of beaches, dunes, sandbanks and other physical features. Dredging is strictly controlled by a system of licences that are managed by government or government agencies (WAG, Crown Estate, Marine Management Organisation). Applications for dredging licences need to be supported by an Environmental Impact Assessment (EIA) that considers all the possible impacts of dredging on the environment, including how it could affect flooding and the way the shoreline changes. When a licence is granted, conditions are applied controlling the amount of sediment that can be removed, when and how the impacts of the dredging should be monitored.

The SMP2 assumes that dredging will continue in and around the Severn Estuary and Bristol Channel. Many studies have been carried out to see if dredging affects the way the shoreline changes, but no effects have been proven (CHaMP, 2005). The licensing process should help to ensure that dredging activities do not impact on the management of the shoreline or increase the risk of impacts from flooding. More information on the way the shoreline behaves, the sediment movement, waves, tides and water flows in the SMP2 area can be found in ***Appendix C***.

5. Environmental Assessment

5.1 Introduction

There are three assessments of the potential environmental impacts of the SMP2 policies that are required by law and have been integrated into, or carried out on this SMP2. This section provides an overview of the three assessments, their general requirements and where further information on the assessments can be found in the Appendices.

5.2 Strategic Environmental Assessment (SEA)

Strategic Environmental Assessment (SEA) (Appendix I) is the systematic appraisal of the possible effects of decisions taken at a high level (such as those in strategies, policies and plans) on the built, natural and historic environments.

The EU SEA Directive[1] sets out the legal requirements for this appraisal in EU countries. The SEA Directive is transposed into law in England and Wales by the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 1633) and the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 (SI 1656).

Although the SMP2 is not a statutory plan, it forms an integral part of decision making in relation to coastal areas. Defra and WAG, therefore, recommend that an SEA is carried out.

Whilst the SMP2 is being developed, the Environment Agency is also developing a ***Severn Estuary Flood Risk Management Strategy (SEFRMS)***. This takes a more detailed look at the future management of flood defence structures and how some of the flood risk policies proposed in the SMP2 will be implemented. The areas and issues being considered for both the SMP2 and the SEFRMS are very similar and an SEA is required for both projects. To reduce confusion between the two projects, aid communication and information sharing, and reduce costs to both processes, some elements of the SEA process have been combined. More information on the SEFRMS can be found in ***Section 1.5***.

5.2.1 The SEA Process

Undertaking an SEA is not a 'one-off' action. Taking account of the possible impacts of decisions on the environment is a step by step process that is part of the whole SMP2 development process. The SEA legislation requires that certain actions are taken (e.g. early and on-going stakeholder engagement) and that certain outputs are produced (e.g. an environmental report). The production of the SMP2 has met the requirements of the SEA Directive in the following ways:

- **SEA Scoping Report –** this was produced in January 2009. It was circulated to the SECG and was brought to the attention of other stakeholders as part of the ***Key Stakeholder Group (KSG)*** events held in January 2009, through ***Severn Estuary Partnership (SEP)*** E-news and was published on the SECG website. The report covers the SMP2 and the SEFRMS;
- **Stakeholder Engagement –** this is an integral part of both the SMP2 and SEA processes. An overview of stakeholder involvement in the SMP2 development is set out in ***Section 3.8*** above. More detail on stakeholder engagement is contained in ***Appendix B***;

[1] Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment

- **Identification of Key Environmental Information –** the SEA Scoping Report, describes the environment in terms of '***receptors'*** (Population & human health; Biodiversity; Land use; Geology & soils; Water; Air; Material assets; Historic environment; Landscape; and the interrelationship between them);
- The SMP2 Theme Review (see ***Appendix D***) also describes the environment, using the headings "Policies & legislation"; "Landscape & nature conservation"; "Historic environment"; "Current & future land use". Information on the coastal dynamics, defence data and shoreline interactions is presented separately and can be found in ***Appendix C***. Issues and features (described in the Theme Review) are set out in ***Appendix E***;
- **Identification of Objectives –** the SMP2 identifies features around the shoreline of the Severn Estuary. This includes features in each of the receptor groups of the SEA. Each feature has a corresponding objective, which takes account of the risks to that feature from coastal erosion and flooding and the benefits people get from the features. Issues, features and objectives are set out clearly in ***Appendix E***;
- **Assessment of Policy Options, including their potential impacts on the environment –** the evaluation of policy options and their effects, including their effectiveness to meet objectives is part of ***Stage 3*** of the SMP2 development and an integral part of the SEA. This assessment of policy options fully incorporated possible impacts on the environment and the achievement (or otherwise) of SEA objectives. The detail of these assessments can be found in ***Appendices F, G, H and I***;
- **Consideration of Alternatives –** there are four policy options available for each stretch of shoreline (***Policy Unit***). These policy options have been set by national government and are contained in the SMP2 Guidance Documents (Defra, 2006). They are described in ***Section 2.1***. The possible implications of choosing each of these policies in each Policy Unit are set out in ***Appendix F***. This considers how well each policy option achieves the objectives for the features within the Policy Unit. Some features have competing objectives, so it is not possible to meet the objectives of all the features. How adjacent Policy Units interact is considered in ***Appendix G***;
- **Effects of the SMP2 –** the choice of policy and the effect of that policy on each stretch of shoreline (***Policy Unit***) is set out in ***Annex A*** of this report. This describes the impact on property, land use & human health, nature conservation; landscape character & visual amenity; the historic environment; and amenity & recreational use*;*
- **Environmental Report –** the SEA Environmental Report is contained in ***Appendix I***. It also contains information to support the Habitats Regulations Assessment (see ***Section 5.3 below***.
- **Monitoring –** the ***Action Plan*** sets out the different monitoring that is needed in the SMP2 area*.*
- **Post Adoption Statement –** this document is part of the SEA process. It summarises how environmental issues were integrated into the SMP process; the reasons for choosing the preferred options; the consultation results and the monitoring that is proposed.

5.2.2 SEA Conclusions

The SEA for the SMP2 draws the following conclusions, which are contained in ***Appendix I Part A***:

- **Population and Human Health –** the SMP2 will result in significant benefits to populations, human health, material assets and critical infrastructure. In some less densely populated areas, policy options may lead to flooding of agricultural land more often than under an

alternate policy option, which could agricultural activities. The SMP2 is also considered to have a minor beneficial impact on protecting recreational resources;

- **Biodiversity, Flora and Fauna –** the Severn Estuary SPA, Severn Estuary SAC and Severn Estuary Ramsar sites will be adversely impacted by the SMP2. Actions are needed to compensate for these impacts. These are being developed as part of the SEFRMS. The impacts to European Protected Sites and Ramsar Sites are also assessed under the HRA (see ***Section 5.3***). SSSIs designated for biological reasons will not be impacted and the SMP2 will have a major positive impact on geological SSSIs, allowing them to evolve naturally;
- **Historic Environment –** Overall the SMP2 will have a major beneficial impact on the historic environment, largely protecting features and historic landscapes, although there is potential for adverse impacts in some areas. The ***Action Plan*** highlights where actions are needed. The SEFRMS will consider possible impacts to the historic environment in more detail;
- **Water Environment –** The SMP2 will have a major positive effect on water resources and water quality.
- **Air and Climate –** in areas where the shoreline will be able to adapt to accommodate changes as a result of climate changes (i.e. where there is a NAI or MR policy option), the SMP2 has been assessed as having a minor positive impact. Where the policy option is HTL, this does not allow the coast to change naturally and defences will need to be maintained or improved and has been assessed as a minor negative impact;
- **Landscape –** overall, the impact of the SMP2 is considered to be neutral. It will have adverse impacts in some areas but beneficial impacts in others;
- **Sustainable Development –** the SMP2 is considered to have a neutral impact as it will allow natural processes to continue in some areas (minor beneficial impact), but will restrict natural processes in other and require the ongoing input of resources to manage defences (minor adverse impact).

More detail on the SEA process, assessment and results can be found in ***Appendix I Part A***.

5.3 Habitats Regulations Assessment (HRA)

The EU Habitats (92/43/EEC) and Birds (79/409/EEC) Directives aim to protect European birds and species and the habitats that support them. In the UK, the Directives are implemented through the Conservation of Habitats and Species Regulations 2010, which replace the Conservation (Natural Habitats &c.) Regulations 1994. These are known as the ***Habitats Regulations***.

The legislation requires '***competent authorities***' to undertake an '***appropriate assessment***' of plans, projects and strategies that may have a significant effect on the site, if those plans, projects or strategies are not directly concerned with the management of the protected sites themselves. The process that includes the 'appropriate assessment' is known as a ***Habitats Regulations Assessment (HRA)***.

In the UK, it is also policy to carry out a similar assessment for sites designated under the Ramsar Convention (known as ***Ramsar sites***).

The majority of the SMP2 area covers the Severn Estuary SAC, SPA and Ramsar site. Other Severn Estuary European protected sites are also wholly or partly within the area of the SMP2 or located nearby and could be affected by the SMP2. The 'competent authorities' therefore need to carry out an HRA to ensure that damage to the sites does not take place when the policies in

the SMP2 are followed. If it is not possible to eliminate all damage to the sites, measures must be taken to compensate for any damage or loss.

For this SMP2, the competent authorities are WAG and Defra. In England, Defra has delegated this role to the EA. The information to support the HRA can be found in ***Appendix I***.

To put into practice SMP2 policies, each project will need to undergo a HRA. The SMP2 only sets out the policy, not how it might be put into action. Projects will consider individual actions (e.g. construction activity). A HRA is needed for each project to ensure that the particular actions proposed do not harm the protected sites or species.

5.3.1 Agreeing the HRA

The procedures for agreeing and signing off the HRA are different in England and Wales. The Countryside Council for Wales (CCW) advises Welsh management authorities on nature conservation matters, including the Welsh Assembly Government (WAG) Local Authorities and the Environment Agency Wales (EAW). Natural England (NE) advises English management authorities on nature conservation matters, including Defra, Local Authorities and the Environment Agency (EA).

The cross border nature of this SMP2 makes the legal requirements of these pieces of legislation complicated because there is no one 'competent authority' that can act for and sign off all the assessments. This means that ensuring all the authorities are satisfied that the processes have been completed in accordance with the legislation is complex and time consuming.

If policies lead to protected habitats being at risk from human action, that risk must be eliminated. If this is not possible, the actions are only permitted for ***Imperative Reasons of Over-riding Public Interest (IROPI)***. These decisions can only be made by Welsh Ministers / the Secretary of State with the agreement of the European Commission. More information on how protected sites have been taken into account in the decision making process can be found in ***Section 4.3*** and in ***Appendices G and I***.

5.3.2 HRA Conclusions

The HRA considered 30 European protected sites that could potentially be affected by the SMP2. After initial assessment, likely significant effects could not be ruled out at six of the 30 sites and an '***appropriate assessment***' was carried out.

The '**appropriate assessment**' concluded that the SMP2 could have potentially significant effects on the following sites:

- Severn Estuary SPA
- Severn Estuary SAC
- Severn Estuary Ramsar
- Somerset Levels and Moors SPA
- Somerset Levels and Moors Ramsar

The adverse impacts of the plan are due to:

- Loss of intertidal habitat (mudflats, sandflats and saltmarsh) as a result of coastal squeeze (see ***Section 3.3***);
- Loss of terrestrial and freshwater habitats as a result of Managed Realignment (MR) and;

- Changes to the shape of the estuary as a whole, which could affect the way it works.

The appropriate assessment also concluded that it was not possible to tell if some of the possible effects of the SMP2 would be damaging and that more detailed assessment will be needed as part of the ***Severn Estuary Flood Risk Management Strategy (SEFRMS*** that is being developed by the EA***)***.

A ***Statement of Case (SoC)*** for ***Imperative Reasons of Over-riding Public Interest (IROPI)*** is being drawn up on behalf of the SECG to present to the Defra Secretary of State and Welsh Minister for agreement.

The SEFRMS includes work to create a ***Habitat Delivery Plan*** to work out where and when habitats will be lost and to find areas where new habitat could be created to replace areas lost through coastal erosion and flood risk management. Initial findings suggest that enough areas for compensation can be identified within the SMP2 study area but more work is required to identify the most appropriate areas to create replacement habitat. The SEFRMS project will continue after the SMP2 has been completed. More information on the SEFRMS can be found in ***Section 1.5.***

5.4 Water Framework Directive (WFD)

The EU Council Directive 2000/60/EC establishing a framework for the Community action in the field of water policy is designed to improve and integrate the way water bodies are managed throughout Europe. It is commonly known as the ***Water Framework Directive (WFD)***. The WFD was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.

The aim of the WFD is for all inland and coastal waters in the EU to be in 'good' condition by 2015. This is achieved in part by creating a system of management plans, called ***River Basin Management Plans (RBMPs)***. The SMP2 is within the ***Severn RBMP*** area. There are 859 water bodies within the ten catchments in the Severn RBMP. Five catchments contain shoreline within the SMP2 area – Bristol, Gloucester, Wye, Usk and South East Valleys.

Many of the aims of the WFD are relevant to the preparation of the SMP2 and the SMP2 has the potential to help deliver some of the actions identified in the draft RBMP, including[1]:

- Bring Natura 2000 sites into ***Favourable Conservation Status (FCS)*** as defined by the conservation objectives (set out in the Regulation 33 package for the Severn Estuary SAC, SPA, Ramsar);
- EA Wales Catchment Initiatives;
- Identify appropriate opportunities for the modification, mitigation or removal of redundant flood defence structures;
- Where appropriate, allow natural river processes and functioning to occur e.g. erosion and deposition;
- Promote the use of soft engineering where appropriate to create bank stability; and
- Embed WFD objectives into water body management and maintenance procedures;

In order to ensure that the SMP2 does not conflict with the Severn RBMP or undermine the aims of the WFD, the Environment Agency has provided advice through the SECG in the development of the SMP2. The Environment Agency has also undertaken an assessment of the SMP2 (see ***Appendix J***).

[1] Only Scenario A and B actions have been considered i.e. those actions that are already taking place, are planned or would occur if the draft RBMP is approved.

5.4.1 WFD Assessment Conclusions

There are 71 water bodies within the SMP2 area (out of a total of 859 water bodies in the Severn ***River Basin Management Plan (RBMP)*** area. For most of these water bodies, the SMP2 is unlikely to affect WFD objectives. There are seven areas where the SMP2 could impact on the achievement of WFD objectives:

- Cardiff (CAR)
- Wentlooge (WEN)
- Caldicott Levels (CALD)
- Lydney (LYD)
- Lydney to Gloucester (GLO)
- Sharpness to Severn Crossing (SEV)
- Bristol and Severnside (BRIS)

The SMP2 may lead to WFD objectives not being reached as a result of loss of intertidal habitats or because of an increase in '***tide locking***. Tide locking occurs when water cannot flow out of a river, drain or outfall due to the level of seawater being above the outfall. This already occurs in many places, but with sea level rise, it may mean that it occurs for longer periods of time than it does now. This might lead to water remaining on tidal flood plains or unable to drain away from land for longer periods of time, possibly leading to changes in the habitats.

The SEFRMS will help to identify areas where new habitat could be created to replace lost areas. Actions may also be needed as part of ***Catchment Flood Management Plans (CFMPs)*** (see ***Section 1.4***). The SEFRMS is looking at all forms of flooding and will look in more detail at how policies will be implemented to try to reduce the impacts of tide locking.