

water for life and livelihoods

River basin planning: summary of
significant water management issues

South East River Basin District

supporting information

Annex 1 Summary notes on the Water Framework Directive

The Water Framework Directive is a European Union Directive designed to protect and improve the environmental condition of all waters, including rivers, lakes, groundwater, estuaries and coastal waters to 1 nautical mile. It also encourages the consistent management of the water environment throughout the European Union.

The Water Framework Directive is implemented through river basin planning, which involves setting environmental objectives for all groundwater and surface water bodies (including estuaries and coastal waters) within a river basin district, and then devising a programme of measures to meet those objectives. Table 1 below lists the range of environmental objectives required by the Directive. [‘Gateway to the European Union’ website](#)¹. Article 4 of the Directive sets out the environmental objectives.

Table 1 The Water Framework Directive environmental objectives

SURFACE WATERS	GROUNDWATERS
Prevent deterioration in status	Prevent deterioration in status
Aim to achieve Good Status by 2015	Aim to achieve Good Status by 2015
Reduce pollution from priority substances; and cease discharges, emissions and losses of priority hazardous substances	Prevent or limit input of pollutants into groundwater
Comply with objectives and standards for relevant protected areas	Implement the measures necessary to reverse any significant and sustained upward trend in pollutant concentrations
	Comply with objectives and standards for relevant protected areas

Whilst all surface water bodies must aim to achieve Good Status, those that are already at High Status must be maintained at this status. High Status may also be appropriate as an improvement target for some water bodies.

Many water bodies in ‘protected areas’ already have other objectives arising from other European Directives or our own legislation. Water bodies used to supply drinking water also need to aim to achieve their own environmental standards. We need to recognise these other environmental objectives in the river basin planning process.

Some surface water bodies may currently fail to meet Good Status due to man made changes carried out for good reasons, such as protecting people and property from flooding. In these cases, it may not be a sustainable objective to try to achieve Good Status. The Directive recognises this, defining some surface water bodies as ‘Heavily Modified’ or ‘Artificial’. These water bodies must then have an environmental objective where they can achieve ‘good ecological potential’ that is consistent with how they are used.

The river basin planning process requires other issues, such as economic considerations, social issues, and technical feasibility to be taken into account. This may mean setting alternative objectives for some water bodies, which allow for an extended time to achieve their objectives, or for a lower objective to be set. We will examine these issues in detail in the draft South East River Basin Management Plan, which we will present for consultation late in 2008.

¹ http://ec.europa.eu/environment/water/water-framework/index_en.html

The river basin planning process

The Water Framework Directive introduces six-year cycles of planning, action, review and re-planning. This first cycle will run between 2009 and 2015.

There are a number of stages in producing these River Basin Management Plans known as the river basin planning process. Figure 1 in the main document shows the main documents we need to publish, summarises their content and main purpose, and identifies when they were (or will be) produced. As the competent authority the Environment Agency will oversee this process with the support of River Basin District Liaison Panels.

As with other planning processes, we need to carry out a Strategic Environmental Assessment when developing and adopting River Basin Management Plans². As the River Basin Management Plan itself sets out to protect and improve the water environment, the Strategic Environmental Assessment will include this, but it will also consider the positive and negative effects of River Basin Management Plans on the wider environment.

The Strategic Environmental Assessment scoping document will be published for consultation in late summer 2007. If you would like to see this please contact:

- € Carol Peirce, NEAS, Environment Agency, Guildbourne House, Chatsworth Road, Worthing BN11 1LD.
- € Email: carol.peirce@environment-agency.gov.uk

² The requirement to undertake a Strategic Environmental Assessment comes from the European Directive 'on the assessment of the effects of certain plans and programmes on the environment', commonly known as the SEA Directive (EU Directive 2001/42/EC).

Annex 2 Main characteristics of the South East River Basin District

This Annex contains a general introduction to the South East River Basin District (RBD). For a detailed description of the RBD please refer to the River Basin Characterisation report and its accompanying 'Economic analysis of water use' report, which can be found at the [Defra website](#)³. These reports include maps of the RBD, showing protected areas and where the district is at risk of failing Water Framework Directive objectives.

General description of the South East River Basin District

The South East River Basin District covers over 10,000 square kilometres and includes the counties of Hampshire, the Isle of Wight, East and West Sussex and eastern Kent. A large proportion of the District is dominated by the rural landscape of the South Downs, but there are major urban centres including Brighton & Hove, Southampton and Portsmouth.

The South East RBD has a rich and varied environment, which supports biodiversity of national and international importance. This includes many aquatic sites protected under international designations. For example, 13 sites (covering 694 km²) have been designated Special Areas of Conservation under the Habitats Directive and 11 sites (covering 488 km²) classified as Special Protection Areas under the Birds Directive. Otters are returning after several years of extinction. Two of the main chalk rivers, the Test and the Itchen have the last vestiges of wild salmon populations in this area. Many rivers support a rich diversity of fauna and flora.

A rich range of habitats can be found, including maritime cliffs, chalk rivers, estuaries, reed beds, intertidal mudflat and sand flats, saltmarsh and saline lagoons. Our RBD supports around 68 per cent of the entire UK resource of coastal vegetated shingle habitat. Many of our habitats and species have suffered declines in both distribution and quality and are therefore the focus of national and local Biodiversity Action Plans.

In the inshore waters are several important commercial fish species such as cod and herring, and the estuaries and coastline provide spawning and nursery grounds for seabass, plaice and sole. Migratory species of commercial and recreational interest (salmon, sea trout and eels) and of conservation importance (shad species) are also present.

Over 3.1 million people live in the RBD, and the population is forecast to grow by 4.6 percent between 2002 and 2015⁴. The coastal environment is particularly under pressure as two-thirds of the population live on the coastline. Additional growth in housing is planned for the region. The draft South East Plan proposes an annual average of 28,900 additional dwellings per annum for the whole South East between 2006 and 2026. For the same period in our RBD this figure is currently over 10,000 per annum. The Plan focuses new development on existing urban areas and includes proposals for 'Growth Areas' in Ashford and additional major growth in areas including South Hampshire.

Services such as business, wholesale and distribution and retailing are key sectors in the region in terms of output. Manufacturing is a relatively small part of the economy. Electrical and optical equipment, chemicals and paper are the biggest sectors. Agriculture makes up a much smaller part of the economy, with vegetable growing and animal husbandry the largest agricultural activities. Between 1995 and 2002, output increased by a robust 4 percent per annum, with output in the services industries showing the strongest growth.

The retailing, health and business services sectors are the largest employers in the South East RBD. The tourism sector is also a significant employer in the RBD. The services

³ <http://www.defra.gov.uk/environment/water/wfd/article5/index.htm>

⁴ Ibid.

sectors, in particular business services, have experienced the largest growth in employment numbers between 1995 and 2002.

There is an extensive network of national and international transport links in the region providing a gateway to the rest of the UK and Europe. This includes the second busiest airport in the UK (Gatwick), the Channel Tunnel and commercial ports such as Dover, Newhaven, Ramsgate and Portsmouth, which provide access for mainland Europe. Southampton provides deepwater facilities for international marine traffic. The District is also home to a number of large leisure harbours, such as Chichester Harbour and the River Hamble, as well as many clubs providing substantial and varied opportunities for leisure use of water.

Forecasts for growth in output show that the business services sector will experience the highest growth, followed by the manufacturing and communications sector. Output is forecast to grow by 2.8 per cent per annum, less than the rate that has been recorded in the recent past⁵. Growth in employment is forecast to be highest in the education and business services sectors, whilst employment in the construction sector is forecast to fall up to 2015.

Pressures and impacts on the water environment

The environment is constantly under pressure from competing demands on space and natural resources, as well as from a range of natural forces such as sea-level rise. Water resources are very limited in the RBD. In the recent drought, resulting from two successive dry winters, groundwater levels reached the lowest on record in some parts of the South East region, although the wet winter of 2006/7 has led to levels returning to normal. This vulnerability is a serious concern, as groundwater provides 66% of water used for public consumption in our RBD, and is an important source of water for the environment.

The River Basin Characterisation work in 2004 that showed that most water bodies in the South East RBD are at risk of failing the objectives of the Water Framework Directive⁶. There are major environmental pressures that may need to be addressed. For example, more than 84 percent of the length of river water bodies, around 96 percent of estuarine area and 76 per cent of coastal area is at risk from physical alterations that cause habitat damage or loss. This can include land reclamation, shoreline reinforcement, river flood defence or barriers to fish passage such as weirs. Also, more than 50 percent of rivers, just under half of all lakes and more than 80 percent of groundwater in the RBD are at risk from urban and rural diffuse pollution.

The west of the district includes the major conurbations of Portsmouth and Southampton. It also includes the rivers Test, Itchen and Meon, which are important conservation areas, and provide water resources, recreation and fisheries services. The RBD also includes the New Forest National Park with its unique wetland habitats. Eastwards the landscape encompasses the South Downs, the coast and its harbours and the undulating Weald. The landscape is drained by a series of large fast-flowing rivers, which rise on the Weald and cut through the Downs on their way to the sea (Arun, Adur, Ouse and Cuckmere). Smaller rivers drain the coastal plain, such as the Pevensy Haven and the Aldingbourne Rife. Further east, the district extends north and eastwards from the High Weald to encompass the river valleys of the Stour and Eastern Rother, the downlands of Kent and the coastal marshes associated with the River Stour, the Eastern Rother and the Royal Military Canal.

11 per cent of land in the South East River Basin District is considered to be at risk of flooding, and lies within the Environment Agency's Flood Zone 2. This zone covers the extent of the flood from rivers or the sea with a 1000 to 1 chance of flooding in any year. Flooding can also take place from sewers or groundwater. To manage this risk the Environment

⁵ The information is taken from the River Basin Characterisation (Article 5) report, which was published in 2004

⁶ <http://www.defra.gov.uk/environment/water/wfd/article5/index.htm>

Agency maintains flood defences across the River Basin District, including flood walls, flood gates and sluices. As well as these, there are also flood defences managed and operated by local authorities and defences that are privately owned.

The main report describes the significant water management issues for the South East RBD. In addition to the significant issues, there are others that will need to be addressed in the River Basin Management Plan. These other water management issues tend to be more localised, affect a smaller number of waterbodies, or require further research to understand their environmental impact. Information on these other issues follows:

- € At present there is no evidence of impact from **acidification** on the district's waterbodies.

- € Some **alien species**, such as signal crayfish, floating pennywort and Himalayan balsam, are known to impact on the health of habitats in our river basin district. We will need to continue to control problem alien species and their impacts where we can. In addition, further research is needed on the precise ecological and possible economic impacts of some alien species.

- € **Commercial fisheries** can place pressures on the ecology of coasts, estuaries and freshwaters, including Shellfish waters. This can result from the direct capture and removal of fish or shellfish, wider habitat damage or modification to sea and estuary beds from mobile towed fishing gears, and fish stocking or farming. As a result, there is strong recognition of the need for ecosystem management, driven at EU, national and local levels within marine fisheries and environmental management organisations.

Extensive high resolution assessments of fishing activities inshore are available for some areas thanks for improved data collection in recent years. However, detailed seabed habitat mapping is needed to help deliver the Water Framework Directive.

- € Only a very small proportion of waterbodies across the district are under pressure from **metal pollution** and evidence shows this tends to be from naturally occurring iron deposits.

- € **Mines and minewaters** is another pressure requiring further research. In our RBD this pressure is restricted to parts of Kent and has a significant localised impact.

- € The pressure from **priority substances** such as tributyltin is a concern at specific sites such as Folkestone and Southampton Water and also because a fifth of the coastal waters in the district are considered at risk from this pollutant.

- € **Recreational activity** can negatively impact on the ecology of our water environment. Future built development within the district could further increase demand for recreational facilities, which need to be planned and managed sympathetically.

- € The Panel considered **Endocrine disruptors** (EDs) as an additional pressure to the generic list of national 'potential issues'. EDs are chemical substances that interfere with the normal working of hormonal systems. They are present in rivers throughout the RBD, and arise mainly from sewage treatment works, which receive wastewater containing them. Studies have shown that they harm the reproductive health of fish individuals, but wider impacts on ecology have not yet been demonstrated. We should take opportunities to manage them where this is cost effective. Some EDs will be addressed through the Water Framework Directive's objective for the reduction of pollution from priority substances.

Catchment, administrative, water body and protected area boundaries

The boundary for the groundwater bodies does not match with river basin district boundaries. This is because the boundary for the groundwater bodies is influenced by the underlying geology rather than the flow of surface water bodies. Consequently two groundwater bodies

that fall within the South East RBD cross the river basin district boundary with Thames RBD. Both these groundwater bodies are allocated to the South East RBD. There are also small overlaps with the South West RBD.

Table 1 Water bodies in the South East River Basin District

TYPE OF WATER BODY	NUMBER	LENGTH (KM)/ AREA (KM ²)
River and canal water bodies	354	2227
Groundwater water bodies	29	6432
Lake and reservoir water bodies	22	6
Estuarine (transitional) water bodies	20	55
Coastal water bodies	15	2112

Table 2 provides information about protected areas in the RBD. Maps of these areas can be found in [the River Basin Characterisation report](#). Protected areas for drinking water have been identified through the Water Framework Directive. All other protected areas were established under other, earlier European Union Directives. Under the Water Framework Directive we have to comply with all protected area objectives by 2015.

Table 2 Protected areas in the South East River Basin District

TYPE OF PROTECTED AREA	NUMBER	LENGTH (KM)/ AREA (KM ²)
AREAS DESIGNATED TO PROTECT ECONOMICALLY SIGNIFICANT SPECIES		
Shellfish waters	25	524 km ²
Freshwater fish lakes	2	-
Freshwater fish rivers	-	1200 km
Bathing waters	78 ⁷	
NUTRIENT SENSITIVE AREAS		
Nitrate Vulnerable Zones	- - 57 groundwater	545 km ² surface water 191 km ² groundwater/surface -
Urban Waste Water Treatment Directive	7 rivers 4 transitional waters	146 km 67.3 km ²
AREAS DESIGNATED FOR THE PROTECTION OF HABITATS OR SPECIES		
Special Areas of Conservation	13	693.85 km ²
Special Protection Areas	11	488.44 km ²
PROTECTED AREAS FOR DRINKING WATER SUPPLIES		
Drinking Water Protected Areas	52	-

⁷ Figure includes new waters for 2007 at Tankerton near Whitstable, and at Brighton Central.

Annex 3 How we decided what the significant water management issues are for the South East River Basin District

This Annex includes:

1. What we mean by 'significant water management issues';
2. The generic list of pressures (potential issues);
3. The criteria agreed to score the pressures (potential issues);
4. A description of the process we followed to identify the 'significant water management issues' for the South East RBD;
5. The evidence used to assess significance of pressures (potential issues);
6. The results of the process

1. What do we mean by 'significant water management issues'?

The Environment Agency defined a 'water management issue' as a pressure or impact that poses a risk to our ability to achieve the environmental objectives of the Water Framework Directive. A brief summary of the main objectives of the Directive and the requirements of the river basin planning process are included in Annex 1.

The Environment Agency suggested that however important an issue may be, if there are already measures in place to deal with it effectively then it is a less pressing issue for the River Basin District management plan. This allowed us to take into account the environment protection and improvement work which is already underway, or for which there are firm financial or legal commitments in the period up to 2015.

An issue may arise from on-going human activity (for example farming, public water supply, quarrying), from human activity in the past (for example abandoned mines, contaminated land) or from new development (for example increasing demand for public water supplies).

'Significant water management issues' then, are those issues that pose the *greatest risk* to our ability to achieve the Water Framework Directive environmental objectives.

To identify the 'significant water management issues' for our RBD we followed a nationally consistent approach based on two key items. These were:

- a. a generic list of 'potential issues' (initially described simply in terms of pressures);
- b. a set of standard criteria to help decide which of these 'potential issues' were 'significant' for our RBD.

2. The generic list of pressures ('potential issues')

A generic list of pressures or 'potential issues' was put together nationally by the Environment Agency, so that all the river basin districts would work from a similar starter list. This also ensured that the analysis was compatible with pressure categories used in various lines of evidence, including the risks assessments done for the [Characterisation Reports](#)⁸ published in December 2004 and those used for a national Strategic Assessment (see below).

The generic list of pressures used was:

- € Abstraction and other artificial flow pressures
- € Acidification
- € Alien species
- € Commercial fisheries (including shell fisheries)

⁸ <http://www.defra.gov.uk/environment/water/wfd/article5/index.htm>

- € Mines and minewaters
- € Nitrates
- € Organic pollution (Ammonia or Biological Oxygen Demand (BOD))
- € Other pollutants (for example faecal indicator organisms (FIOs), metals or radioactivity - customised as appropriate to the RBD)
- € Pesticides
- € Phosphates
- € Physical modification (estuaries or coastal waters)
- € Physical modification (rivers or lakes)
- € Priority and priority hazardous substances
- € Recreation (for example boating and angling)
- € Sediment
- € Urban and transport pollution.

3. The criteria agreed to score the 'potential issues'

We generated draft criteria to help identify significant issues in our RBD in October 2006. These were discussed at a national workshop in November, at which representatives from each Liaison Panel in England and Wales participated. The outcome from this workshop was a list of nine agreed criteria (set out below).

A record of the proceedings of this workshop is available from the Environment Agency's Southern Region office⁹.

CRITERIA	
1	How severely does this issue impact adversely on the achievement of the Water Framework Directive's objectives in any part of the River Basin District?
2	To what extent does improving the issue positively impact on 'quality of life' as described by Government headline indicators?
3	To what extent is the evidence that this issue is likely to impact on Water Framework Directive objectives based on sound and substantiated science?
4	To what spatial extent does this issue affect each category of water bodies in the River Basin District?
5	To what extent will measures already being implemented in the River Basin District fail to address current issue impacts by 2015?
6	How great are the potential economic benefits of addressing this issue, and how great are the potential economic costs of not addressing the issue?
7	To what extent will future built development negatively affect this issue by 2015?
8	To what extent will future changes in climate negatively affect this issue by 2015 and beyond?
9	To what extent will addressing this issue also address other issues relevant to delivery Water Framework Directive objectives in the River Basin District?

4. A description of the process we followed to identify the 'significant water management issues' for the South East RBD

The Environment Agency worked internally with staff at national, regional, and local team levels, and externally with the Liaison Panel, to identify the significant issues. This involved a

⁹ Environment Agency (Southern Region), Regional Strategy Unit, Guildbourne House, Chatsworth Road, Worthing, West Sussex BN11 1LD. Email southeastrbd@environment-agency.gov.uk, Customer Services 08708 506 506

range of meetings, workshops and draft documents, to ensure consensus on the issues selected.

Environment Agency staff worked on:

- € reviewing existing evidence through local knowledge and understanding
- € applying the nationally agreed criteria to produce a draft ranking of water management issues for Liaison Panel discussion. A wide range of evidence was used in this process.

The South East Liaison Panel contributed to this process by:

- € communicating the aims and objectives of the Water Framework Directive to other organisations
- € helping to develop and agree the national criteria to assess potential issues
- € contributing to a log of relevant evidence for issues in our RBD
- € commenting on a draft ranking of water management issues from Environment Agency staff. As a result, the relative positions of issues in the ranking changed, but issues did not move across the line suggested (see Figure 1)
- € requesting further information on priority substances, metals and endocrine disrupters and agreeing with the Environment Agency's recommendation that although not significant in our RBD, they need to be addressed in the River Basin Management Plan where they impact on environmental objectives
- € agreeing a list of significant water management issues
- € drafting and agreeing fuller descriptions of these issues at the river basin district level, including attributing issues to particular sectors where possible
- € helping to define basic options for measures which could address the issues.

The steps in the process in the South East RBD were:

- a. the Environment Agency introduced Water Framework Directive environmental objectives with a range of stakeholders in a river basin planning workshop in March 2006. Participants identified pressing water environment issues, which were later used as a 'sense check' during the selection of significant water management issues.
- b. the Panel held an initial discussion of the main water environment issues in the River Basin District at their first meeting in July 2006. The outputs were used as a 'sense check' later on in the process. The Liaison Panel discussed definitions and the process for establishing the 'Summary of significant water management issues report' at their second meeting in October 2006.
- c. each Liaison Panel developed draft criteria to be used in assessing significance. Representatives of each panel then participated in a national workshop to discuss each the draft criteria and agree a final set of criteria. The representatives from the South East panel were John Archer (National Farmers Union - Farming) and Paul Rayner (Royal Yachting Association – Recreation).
- d. senior regional Environment Agency staff participated in a workshop in November 2006 to understand the significant issues process, and begin to identify the scale at which the generic issues were felt in our RBD, and evidence for their scale and severity.
- e. the River Basin Programme Manager appointed consultants (Entec UK) to help develop a log of evidence for each water management issue in the South East RBD. This log was refined throughout the process with input from Environment Agency staff and the Liaison Panel.
- f. the Environment Agency held an internal ranking workshop, where staff used the nationally agreed criteria to assess the significance of the generic issues. Scores were applied to each issue using each criterion in turn (see Figure 1), where H (high) = 3, M (Medium) = 2 and L (Low) = 1. The resulting ranked list was separated into two groups – 'significant issues' and 'other water management issues'.

- g. the significant water management issues were then grouped in relation to specific activities, sectors and impact mechanisms. These groups were used to structure the Summary report, and the table in Annex 6.
- h. the River Basin Programme Manager held one to one meetings with each member of the Liaison Panel to run through the results of the ranking workshop, and the list of suggested significant issues. It was noted that the internal workshop provided a draft list as a 'starter for ten' – scores could be changed where supporting evidence could be provided. The one to ones generated a range of comments and extra evidence. Changes were made to some of the scores given for particular issues and particular criteria (see Figure 1 for scores).
- i. a revised ranking was presented to the Liaison Panel at their February meeting. The ranking and list of significant issues were agreed, subject to a request for a briefing to explain the impact of priority substances, metals and endocrine disrupters in the RBD. No change was made to the ranking or list of significant issues as a result of this briefing, which was provided by the Environment Agency.
- j. members of the Panel were identified to lead on drafting descriptions of the significant issues. Their comments were used to inform the preparation of the Summary report, which was based on a national template.
- k. the process for Panel endorsement of the final document was agreed at the April 2007 meeting.
- l. the Liaison Panel commented on and proposed amendments to the report and its Annexes. They endorsed the reports for public consultation. The Environment Agency compiled the final amended report for publication.

The process described above is documented through a series of meeting reports, which are available on request.

5. The evidence used to assess the significance of 'potential issues'

We gathered evidence of pressures and impacts on the water environment and the scale of the threat to the environmental objectives of the Water Framework Directive from a wide range of sources. This included information from reports and plans held by the Environment Agency (incorporating specific information on both England and Wales); information from external sources; and local knowledge from inside and outside our organisation. A log of key evidence we reviewed is available on request.

In some cases evidence is missing, incomplete, or contradictory. This made it more difficult to agree on how significant the issue was. Where we could not agree on the score for a specific issue we, as the competent authority, made the final decision.

The main sources of information we considered were:

- € the Environment Agency Strategic Assessment – this assessment represents a high level, national view of how close we are to meeting the Water Framework Directive objectives through the work that we and others are already doing. This was a useful reference for our assessments, which focused on the South East RBD.
- € information from other 'pressure and impact assessments' we carried out. Other sources of technical information, some held by us and some by external organisations, including local evidence of, and reasons for, failing to meet existing environmental standards.
- € evidence of pressures or impacts from existing plans, strategies, programmes and research:
 - 4 Environment Agency-led plans and strategies: for example Catchment Abstraction Management Strategies and Catchment Flood Management Plans;
 - 4 plans and strategies implemented by a range of organisations: for example Shoreline Management Plans, South East Plan etc;

- 4 other relevant plans, strategies and research relating to environmental issues and objectives relevant to the River Basin Management Plan.
- € the local knowledge and judgement of our staff and other interested groups who have contributed to the process.

We paid specific attention to identifying planned or anticipated future changes in the pressures that, if they were not managed properly, could result in failure of Water Framework Directive objectives. This includes, for example, pressures identified in Regional Water Resource Strategies, Regional Spatial Strategies, Regional Economic Strategies, and Housing Strategies.

6. The results of the process

The results of scoring all the evidence of environmental impacts by each pressure against the criteria is presented in Figure 2 below.

It is important to acknowledge that considerable uncertainty remains in understanding the links between some pressures and ecological impacts resulting from human activity, as well as apportioning some pressures to sources. As we undertake further monitoring and improve our scientific understanding we will be able to reduce this uncertainty. This improvement will be one of the important gains from the WFD process.

It is important to highlight the fact that all of the water management issues that were not identified as a significant water management issue will nevertheless still be carried forward for further, more detailed consideration in the draft River Basin Management Plan. Comments are welcomed on the issues selected for this report.

The Significant Water Management Issues selected for consultation in this report are:

- € Abstraction and other artificial flow regulation
- € Nitrates
- € Organic pollution
- € Pesticides
- € Phosphates
- € Physical modification (estuaries and coasts)
- € Physical modification (rivers and lakes)
- € Sediment
- € Urban and transport pollution pressures.

Figure 1 Results of the scoring exercise

WATER MANAGEMENT ISSUES	1	2	3	4	5	6	7	8	9	TOTAL
	SEVERITY OF IMPACT?	SPATIAL EXTENT OF IMPACT?	HOW ROBUST IS EVIDENCE BASE FOR IMPACTS?	SHORTFALL IN EXISTING MEASURES?	WOULD OTHER WFD ISSUES BENEFIT FROM ADDRESSING IT?	FUTURE DEVELOPMENT MAKES IT WORSE?	CLIMATE CHANGE MAKES IT WORSE?	ECONOMIC BENEFITS OF ADDRESSING IT?	QUALITY OF LIFE BENEFITS OF ADDRESSING IT?	
Nitrogen	H	H	H	H	H	M	H	H	H	26
Phosphates	H	H	H	M	H	M	H	H	H	25
Physical Modification (rivers & lakes)	H	H	H	H	M	H	H	M	H	25
Urban and Transport Pollution Pressures	H	M	M	H	H	H	H	H	H	25
Abstraction & other artificial flow pressures	H	H	M	M	H	H	H	M	H	24
Organic Pollution (BOD & NH3)	H	M	h	M	M	H	H	H	H	24
Physical Modification (estuaries & coastal waters)	H	H	H	H	M	H	H	M	M	24
Sediment	H	M	M	H	H	M	H	H	H	24
Pesticides	H	M	M	H	M	M	H	H	H	23
Other Pollutants - Metals	H	M	H	M	M	M	H	M	M	21
Priority Hazardous Substances & Chlorinated Solvents	H	M	H	M	M	M	M	M	M	20
Other Pollutants - Faecal Indicator Organisms (FIOs)	H	M	H	H	M	L	L	L	H	19
Commercial fisheries	M	M	M	M	M	M	L	L	M	16
Alien Species	M	M	L	H	M	L	M	L	L	15
Mines & Minewaters	H	L	L	H	M	L	L	L	L	14
Recreation (e.g. boating, angling)	M	M	L	L	M	M	L	L	M	14
Acidification	L	L	H	L	M	L	L	L	L	12

Most significant issues
Extra effort headlines
Need to be grouped by sectors and activities

Other water management issues. Will be dealt with in the River Basin Management Plan

Annex 4 Descriptions of the pressures (potential issues) we assessed

POTENTIAL ISSUES	DESCRIPTION
Abstraction and other artificial influences on flow	<p>Periods of naturally low flows are caused by low rainfall (e.g. during droughts) and are part of the mechanism that supports bio-diversity. The effects of low flows can be prolonged or made worse at critical periods by high levels of abstraction for public water supply, industry, agriculture or domestic use. Unsustainable abstraction from groundwater can lower groundwater levels and have knock-on impacts on dependent river flows or wetlands, or can induce the intrusion of poorer quality water from the sea or from deeper aquifers.</p> <p>Other artificial influences on flow include the return of treated sewage effluent (i.e. discharges), transfer of water between catchments or the storage and release of water from reservoirs. These influences may offset some of the impacts of abstraction, or result in flows being significantly higher or lower than they would naturally be.</p>
Acidification	<p>Acidification is the process whereby nitrogen oxides, sulphur dioxide and ammonia released into the atmosphere are converted into acidic substances. Acidification can cause toxic metals to leach out of soils and enter surface or groundwater. Various land-use practices such as farming, forestry etc can lead to acidification of watercourses. It can also cause problems to aquatic organisms by changing the pH of the water body.</p>
Alien species	<p>The term 'alien species' or 'invasive non-native species' is applied to a variety of plants and animals that have been introduced outside of their natural past or present range and whose introduction and/or spread threaten native wildlife. Some species pose serious threats to our natural biodiversity and have economic impacts for example, for flood risk management, water transfer schemes, disposal of soil as waste and fisheries management. Their presence and unabated spread can represent an important pressure on the ecological status of many waterbodies. Once established they are difficult or impossible to control. Examples include the plant Himalayan balsam, the American mink, the fish topmouth gudgeon and the American signal crayfish.</p>
Commercial fisheries including shell-fisheries	<p>Commercial fishing or shell-fishing can represent an important pressure on the ecological status of transitional or coastal water bodies. The viability of commercial fisheries is subject to the condition of EC designated shellfish waters (Protected Areas incorporated within the WFD). Pressures on ecological status include the direct capture and removal of fish or shellfish, or the wider habitat damage that can result from some types of fishing gears, particularly those of a heavy construction which drag the seabed or estuary substrate. Initial characterisation (Article 5) risk assessment focussed on the potential for physical habitat damage associated with fishing activities but also noted the need for a more holistic consideration of the direct impacts of fish or shellfish removal.</p> <p>Commercial fishing or fish farming may also have a detrimental ecological impact in fresh waters - either through the unsustainable large scale netting of migratory fish such as eels or salmon, or through the influence of fish stocking or farming on natural populations. Fish farming may also have associated abstraction or pollution pressure.</p>
Mines and minewaters	<p>The main contaminants in minewater are acidity (low pH) together with the metals; copper, iron, manganese and zinc. Minewater may also contain priority substances such as cadmium and lead. These contaminants are released when oxygen in the air or water reacts with minerals in the rock found near coal seams and mineral veins. The metals are then dissolved in the groundwater which discharges back into surface water bodies, or by rain in the case of spoil heaps. Such minewater related pollution may have significant ecological impacts.</p>

POTENTIAL ISSUES	DESCRIPTION
Nitrates	Nitrate is a major plant nutrient. High nitrate concentrations are the main cause of eutrophication in coastal waters and may also contribute to eutrophication in certain types of freshwaters. Eutrophication is the enrichment of waters by nutrients causing excess plant/ algal growth and leading to undesirable effects on the ecology, quality and uses of the water. In addition, high nitrate levels in waters used for drinking may be associated with human health issues and water companies must supply water below the legal 50mg/l limit. Large areas of England have high nitrate concentrations in surface and groundwaters. This is not the case for Wales, where nitrate concentrations are high only in a small number of isolated and localised areas.
Organic Pollution: Ammonia and Biochemical Oxygen Demand	<p>Ammonia dissolves readily in water and when in solution it forms free ammonia (NH₃) which is highly toxic to fish and other aquatic life. Free (NH₃) and ionised (NH₄⁺) forms of ammonia exist in chemical equilibrium and their relative distribution depends on the pH and temperature of the water, with increasing pH increasing the proportion of free ammonia. Total ammonia is a measure of how much free plus ionised ammonia there is.</p> <p>Biochemical Oxygen Demand (BOD) is not an individual pollutant, but a measure of the polluting potential of a sample of water. It is a measure of the amount of biodegradable organic matter. The greater the BOD the greater the polluting power of the effluent being measured. High BOD exerts a high oxygen demand on water, leading to oxygen depletion with potentially severe impacts on the whole ecosystem.</p>
Other Pollutants: Metals	Metals are naturally occurring in the environment and many are needed in small amounts by organisms to function properly. However, they can be toxic to aquatic organisms such as freshwater fish, invertebrates and marine organisms in larger quantities. Artificial metals contamination can accumulate in sediments and in organisms. For example, the priority hazardous substance mercury can form methyl mercury in anaerobic conditions, which is a highly toxic and bioaccumulable form of the metal that can cause significant health problems.
Other Pollutants: Faecal Indicator Organisms (FIOs)	<p>Micro-organisms occur in vast numbers in the natural aquatic environment. The greatest water borne risk of infection to humans is through drinking water or shellfish contaminated by pathogenic (i.e. infection causing) organisms (e.g. bacteria or viruses) from sewage or animal excrement. However, infection (e.g. gastroenteritis – inflammation of stomach and gut) can also occur through ingesting contaminated seawater or freshwater during bathing.</p> <p>It is impractical to test water for every known pathogen in every sample, and it has therefore become standard practice to test water for ‘faecal indicator organisms’ (FIOs). Whilst generally harmless in themselves, their presence in water are an indicator of sewage or animal contamination and the potential for pathogenic organisms to be present.</p> <p>The current EU Bathing Waters Directive (1976) includes such FIOs as faecal coliforms and faecal streptococci. The recently revised Bathing Waters Directive (2006), with objectives set in line with the WFD for 2015, takes account of more recent public health research and uses Esherichia Coli and Intestinal Enterococci as its FIOs. We monitor FIOs in those waters identified under the EU Bathing Waters, and Shellfish Waters Directives and the Government uses the results to report compliance or otherwise with the Directives’ FIO standards each year.</p>

POTENTIAL ISSUES	DESCRIPTION
Other Pollutants: Radioactivity	<p>Radioactivity is a form of energy released from radioactive elements (both man made - as an artificial 'pressure' - and as naturally occurring 'background'). It has the potential to cause adverse biological effects, with the effects caused dependent on the amount of energy absorbed by an organism (termed the absorbed dose). Factors affecting the absorbed dose are the identity of the radioactive element, the type of radioactivity, the chemical form of the element or compound, the exposure pathway to the organism and the biochemistry of the organism.</p> <p>Exposure can result in both acute and chronic adverse effects. Chronic effects, caused by long term, low level exposure to radiation, are characterised by carcinogenic (cancer causing) and mutagenic (mutation causing) effects due to damage at the cellular and sub-cellular level. Acute effects result from short term exposure to high levels of radiation.</p>
Pesticides	<p>'Pesticide' is a general term that includes all chemical and biological products used to kill or control pests. Pests are living organisms such as rodents, insects, fungi and plants that harm our food, our health or our environment. Pesticides are used in domestic, amenity and agricultural scenarios. Because of their toxic nature they can cause harm to 'non-target' organisms and if they are not stored, used and disposed of properly they pose a risk to terrestrial and aquatic wildlife. As well as ecological impacts, pesticides can also contaminate surface and ground waters abstracted for use as drinking water, thus increasing the need for treatment.</p> <p>In the EU and UK the regulatory regimes for authorising products distinguish between:</p> <ul style="list-style-type: none"> € Plant protection products – e.g. herbicides (weedkillers), insecticides, fungicides, molluscicides (slug/snail killer) used to protect plants. € Biocides - other products not for plant protection – e.g. wood preservatives, antifoulants, antimicrobial agents used in toiletries. <p>Sheep dip is a veterinary medicine used to treat parasites on sheep (e.g. scab, blowfly, ticks and lice). The two active ingredients used in sheep dip products are diazinon and cypermethrin (although products containing cypermethrin are presently suspended). Both these substances are highly toxic to invertebrates and very small levels in rivers can cause severe ecological damage. Recent lab research also indicates diazinon and cypermethrin can interfere with salmon reproduction by disrupting the ability of the male fish to respond to female hormones.</p>
Phosphates	<p>Phosphate is a major plant nutrient. High phosphate concentrations are the main cause of eutrophication in fresh waters. Eutrophication is the enrichment of waters by nutrients causing excess plant/algal growth and leading to undesirable effects on the ecology, quality and uses of the water. The water uses that can be affected include water abstraction, water sports, angling, wildlife conservation and livestock watering. In standing and slow-flowing fresh waters, blue-green algal blooms can occur; many such blooms are toxic and pose a hazard to humans involved in water sports and to animals that drink the water.</p>
Physical modifications (estuary and coastal waters)	<p>Estuarine and coastal waters are at risk in relation to a number of physical habitat pressures. These include 'land claim' (the creation of land behind defences, walls or piers, reducing the area of aquatic or inter-tidal habitat), shoreline reinforcement, navigation dredging, aggregate dredging and the placement of dredged material. The existence of weirs or tidal sluices can also limit the migration of fish such as salmon, restrict sediment movement, promote siltation, and prevent natural mixing between fresh and saline waters with consequent impacts on transitional ecological communities. Commercial fisheries and shellfish harvesting activities may also result in physical habitat damage but this pressure is considered and described separately (above). Coastal defences may inhibit the inland migration and maintenance of inter-tidal habitats squeezed by sea level rise as a result of climate change and isostatic balance.</p>

POTENTIAL ISSUES	DESCRIPTION
Physical modifications (rivers and lakes)	<p>Many lowland rivers in England and Wales have been subject to physical alteration of the channel form. These modifications include channel straightening, bunding, bank re-profiling and dredging for flood prevention, drainage or navigation purposes, as well as the creation of new channels for mill leats or irrigation. Such pressures may result in ecological habitat damage or loss that results in a decline or loss of species. Many of our lakes and reservoirs have been subject to significant physical alteration through the installation of dams, and the artificial manipulation of water storage and levels behind them. The existence of weirs, sluices and other impoundment in the river network may restrict the migration of fish such as eels, salmon and trout, impede sediment movement, promote siltation, and disrupt the interconnectedness of accessible habitat, particularly during periods of low flow.</p>
Priority and Priority Hazardous substances	<p>The Water Framework Directive sets out a list of the most polluting substances that have lethal and sub-lethal effects on a range of organisms. The list includes some naturally occurring substances such as metals, pesticides and other synthetic organic chemicals including chlorinated hydrocarbons. The severity of their effects depends on the availability to organisms, the nature of the particular substance and the susceptibility of the biological receptor. Severe contamination can result in lethal effects to the extent that the habitat becomes characterised by tolerant or opportunistic species. In less severe circumstances, sub-lethal impacts may affect the physiology, growth and development and reproduction of organisms in the water column and sediment. Furthermore, a number of these substances bio-accumulate and many persist in sediments. The most polluting have been termed priority hazardous substances and we must aim to eliminate discharges of these substances to the aquatic environment wherever possible.</p>
Recreation (e.g. boating, angling)	<p>Recreational activities on or associated with water may, if poorly planned or managed, have a direct impact on its quality or on the ecological assemblages within it. Boating activity, if intensive in shallow river or lake waters may be associated with raised levels of suspended solids, bank erosion and fuel related pollution. Recreational angling may also lead to impacts on fish communities unless sensitively and sustainably managed.</p>
Sediment	<p>The term sediment refers to anything that is not dissolved or in solution and which can be removed by filtration or settlement. In some cases (e.g. estuaries) sediment is an essential natural component of the ecosystem to maintain mudflats & salt marsh habitats. The term includes solids that are floating on top, or suspended within the water. It is worth noting that phosphate is often associated with sediment as it is bound to the soil (unlike nitrates, which are more soluble). Metals and many toxic organic compounds also tend to accumulate in sediments. In rivers and lakes for example, high concentrations of suspended solids can:</p> <ul style="list-style-type: none"> € be unsightly and an aesthetic nuisance; € bury fish eggs in the stream bed or coat their surface if they are on vegetation. In both cases the eggs can suffocate; € cause physical damage to fish gills which can result in death, a reduction in growth or cause a reduction in resistance to disease; € block spaces in bed gravel, preventing its use for spawning in trout and salmon rivers; € reduce the populations of river bed animals which are the food of fish; € Suppress photosynthesis due to a reduction in light penetration and by coating.

POTENTIAL ISSUES	DESCRIPTION
Urban and Transport pollution pressures	<p>Various pollution issues relate to transport networks. These include for example:</p> <ul style="list-style-type: none"> € air emissions from vehicles which are then deposited to water or land (and in some cases can cause acidification); € a range of pollutants which can run-off from roads including metals, residues from tyres and oils and sediment; € Priority Substances that are used as pesticides to control weeds on roadside verges and railway tracks; € run-off from air strips may contain de-icers and pesticides to control weeds; € dredging and maintenance of navigable waterways can result in water quality issues from suspended solids and leaching of contaminants from the sediment particles. <p>Urban pressures include the impacts related to transport networks and other issues of urban run-off containing pollutants such as organic waste, pesticides or fertilisers used in gardens or parks, and sediment from construction sites, including contaminated land. Also improperly maintained private sewage treatment works (package plants and septic tanks) can provide a source of ammonia and BOD. In addition, impermeable areas such as hard standing and roofs associated with physical development can increase the rate of run-off and sedimentation, leading to flashy flows including flooding or increased silting of water bodies.</p>

Annex 5 Examples of activities and sectors associated with the list of pressures (potential issues) we assessed.

POTENTIAL ISSUES	COMPONENTS OF ISSUE	EXAMPLE OF SOURCE OF ISSUE	EXAMPLE OF ACTIVITY
Abstractions and other artificial influences on flow	Unsustainable abstraction	€ Unsustainable abstraction of water	€ Irrigation € Industrial
	High flows	€ Engineered transfers € Consented discharges € Flow regulation	€ Controlling stream flows (e.g. from reservoirs) € Industrial € Boat traffic € Discharges from sewage treatment works
Acidification	Acidification	€ Emissions (SO ₂) € Emissions (NOx) € Emissions (NH ₄)	€ Power Stations € Road transport € Agriculture
Alien Species	Alien Species	€ Non-native species introduction	€ Intentional introduction of ornamental species € Release of alien species present in ballast water or contaminant of ship hulls € Intentional introduction as part of farming or angling strategies
		€ Inappropriate management of alien species	€ Construction and development practices for clearance, ineffective conservation networks for controlling NNIS € Inter-basin transfer of water for water management purposes € Commercial fishing
Commercial fisheries (including shell-fisheries)		€ Direct fish or shellfish removal	
		€ Detrimental ecological impact via large scale netting of migratory fish	
Mines and Minewaters	Mines and minewaters	€ Impact on natural fish populations	€ Run-off from minewaters or from tailings associated with mines
		€ Active mines and Disused mines	
Nitrates	Diffuse Nitrates	€ Leakage from sewerage system	€ Waste Water Treatment
		€ Unsatisfactory Combined Sewage Overflows (CSOs)	€ Farming
		€ Urban run-off	€ Animal and bird faeces deposited in the urban environment € use of fertilisers
		€ Run off from land	€ Industrial waste to land
		€ Ammonia releases to atmosphere, aerial deposition to land and water	€ Run off from application of fertilisers and nutrients to agricultural land € Farming

	Point Nitrates	Discharge of effluent	€	Source
Organic Pollution: Ammonia and Biochemical Oxygen Demand (BOD)	Point Source sanitary	Discharge of effluent	€	Sewage treatment works Industrial discharges
	Diffuse source sanitary	Discharge of effluent	€	Waste Water Treatment Works Industrial discharges
		Run-off containing faecal matter Run-off containing microbes	€ €	Private sewage treatment works (package plants and septic tanks) Conventional agriculture, intensive livestock rearing Application of sewage sludge to land Animal and bird faeces deposited in the urban environment
	Other Pollutants: Metals and other determinants	Point source metals	Industrial discharges	€
Chemical industry discharges			€	Chemical production
Wastewater treatment effluent			€	Wastewater treatment
Emissions from incineration			€	Waste incineration
Emissions from combustion			€	Fuel and power production
Diffuse source metals		Release of metals from land Emissions from road transport	€ €	Application of sewage sludge to land Fuel combustion
Other Pollutants: Faecal Indicator Organisms (FIOs)		Run off from upstream catchments Discharges to sea	€ €	Livestock farming Wastewater treatment
	Radioactive determinants	Radioactive emissions to water, air or land.	€	Nuclear fuel manufacture Nuclear power stations Nuclear reprocessing Decommissioning of research facilities Military use Research activities in hospitals, universities, pharmaceutical industry Historical contamination from metal mining, uranium and thorium
Pesticides	Diffuse Pesticides	Sheep dip Application Sheep dip disposal Spraying of trees Anti-foulant paint on boat hulls	€ € € €	Farming Forestry Navigation
		Pesticides in animal feed and therefore in faecal matter spillage incidents Emissions to water or air	€ €	Intensive farming using pesticides e.g. poultry; agricultural waste Pesticide manufacture

Phosphates	Point Phosphates	Discharge of sewage	Waste Water Treatment (Works)
	Diffuse Phosphates	Emissions of phosphates to water	Production of Phosphates as waste products
Physical modifications (estuaries and coastal waters)		Application of fertiliser	Farming
		Livestock	Background sources
		Spillage Incident	
		Background sources	
		Control structures	Flood risk management
		Dredging	Navigation
Physical modifications (rivers and lakes)		Impoundment for commercial fish rearing	Commercial fishing
		Land claim	Coastal development including energy generation and barrages
		Aggregate extraction	Industry
		Flood risk management	Control structures
		Barrier to migratory fish	River substrate manipulation
		Impoundment	Bed and bank reinforcement
Priority and Priority Hazardous Substances	Priority Substances and chlorinated solvents		River resectioning, straightening, realignment, channelisation
			Culverting
			Flow manipulation
			Impounding
			Construction
			Intensive use
		Removal of natural barriers	
		Modifications to sediment regime	
		Floodplain modification	
		Manufacture and use of Priority Substances and chlorinated solvents	Chemical and pharmaceutical industries, manufacturing industry
		Leaking sewers	Transport of sewage
		Minewaters from coal, metal and other mines	Mining
Recreation (e.g. boating & angling)		Run-off from transport	Run-off
		Run-off from contaminated land	Run-off
		Bank erosion	angling
		Impact on fish communities	boating

Sediment	Sediment run-off	<p>€ Sediment run-off from farmland</p> <p>€ Production of suspended solids (faecal matter) from fisheries</p> <p>€ Short-term run-off events during clearing and replanting</p> <p>€ Sediment run-off from roads and urban areas</p> <p>€ Run-off from mining waste</p> <p>€ Run-off from industrial waste</p>	<p>€ Farm management practices</p> <p>€ Aquaculture management practices</p> <p>€ Forestry management practices</p> <p>€ Urban drainage</p> <p>€ Mining waste management</p> <p>€ Industrial waste management</p>
	Dredging and disposal	<p>€ Dredging and disposal from port and harbour operations</p> <p>€ Navigation, commercial shipping</p>	<p>€ Dredging and river/estuary maintenance</p> <p>€ Disruption of nearshore/offshore sediments, alteration of benthic habitats and tide/sediment dynamics, mobilisation of contaminants</p>
Urban and Transport pollution pressures	Diffuse Urban	<p>€ Contaminated runoff from roads, railway lines, etc.</p>	<p>€ Contaminated land</p>
		<p>€ Boaters, anglers, recreational use of waterways resulting in diffuse pollution</p>	<p>€ Road runoff</p> <p>€ Airport run-off</p> <p>€ Railways run-off</p> <p>€ Use of waterways</p>

Annex 6 Possible types of measures to address the significant water management issues*

GROUPS OF SIGNIFICANT WATER MANAGEMENT ISSUES	OBJECTIVE	SECTOR	MEASURES		ENVIRONMENTAL OUTCOMES
			NATIONAL LEAD		
			RIVER BASIN DISTRICT INFLUENCE	RIVER BASIN DISTRICT LEAD	
Diffuse pollution from rural areas (nitrates, organic pollution, pesticides, phosphates, sediment)	<p>€ Reduce levels of nitrate, phosphorus and pesticides.</p> <p>€ Improve land management practice to reduce run off and soil erosion</p>	Agriculture including Forestry, Conservation, Fisheries, Government agencies, Industry, Water industry	€ Enforce existing requirements of regulations including Nitrates Directive (Nitrate Vulnerable Zones, Source Protection Zones), Groundwater Regulations, Silage Slurry and Fuel Oil Regulations, Sludge (Use in Agriculture) Regulations		€ Improved overall river water quality
			<p>€ Amend Sludge (Use in Agriculture) regulations</p> <p>€ Sheep dip pollution reduction programme</p> <p>€ NVZ extension if announced following 2006 review</p> <p>€ The Treasury to review case for taxes</p> <p>€ Land use policies to reflect social and economic value in agricultural production</p> <p>€ Maintain and extend National Pesticides Voluntary Initiative</p> <p>€ Extend assurance schemes such as Assured Combinable Crops (ACC), Red Tractor and LEAF</p>		<p>€ Reduced eutrophication</p> <p>€ Reduction in sediment problems</p> <p>€ Groundwater protection</p> <p>€ Drinking water protection</p> <p>€ Vibrant habitats</p>
			€ Review and consider raising minimum requirements for nutrient and soil management under Cross Compliance and environmental stewardship entry		
			€ Extended use of Catchment Sensitive Farming		
			€ Partnership project work such as Landcare on the Isle of Wight and in Sussex		
			€ Codes of good agricultural practice		
			€ Local voluntary initiatives and partnerships for example to promote flagship agri-environment schemes; develop/improve catchment approaches to delivering farm specific advice		

<p>Diffuse pollution from urban areas and transport (nitrates, organic pollution, pesticides, phosphates, sediment, urban and transport pollution)</p>	<p>€ Reduce runoff from urban development and roads</p> <p>€ Return some rivers to a more natural state</p>	<p>Conservation, Fisheries, Government agencies, Industry, Local authorities, Power generation, Recreation culture and sport, Urban and transport including developers, Water industry</p>	<p>€ General Binding Rules, for example to require sewerage misconnections to be dealt with at change of house ownership</p> <p>€ Regulate disposal of waste to land</p> <p>€ Upgrade combined sewer overflows through Water Company Asset Management Plans</p> <p>€ Capital maintenance works to address leaking sewers</p> <p>€ Factor the effect of climate change into sewer design</p> <p>€ Pollution prevention work including targeted campaigns</p> <p>€ Change in planning permissions and investment</p> <p>€ More integrated planning of urban drainage</p> <p>€ Spatial plan underpinned by evidence on the water cycle</p> <p>€ Greater use of sustainable urban and road drainage systems in appropriate areas, and retrofitting measures such as rainwater tanks where feasible.</p> <p>€ Cleanse gully-pots to remove sources of bacteria</p> <p>€ New voluntary codes of practice aimed at septic tank users</p> <p>€ Partnership projects such as the Green Blue to help deal with boating issues</p>	<p>€ Improved overall river water quality</p> <p>€ Reduction in sediment</p> <p>€ Groundwater protection</p> <p>€ Drinking water protection</p> <p>€ Reduced priority substances and specific pollutants</p> <p>€ Open up rivers</p> <p>€ Vibrant habitats</p>
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GROUPS OF SIGNIFICANT WATER MANAGEMENT ISSUES	OBJECTIVE	SECTOR	MEASURES		ENVIRONMENTAL OUTCOMES
			NATIONAL LEAD		
			RIVER BASIN DISTRICT INFLUENCE	RIVER BASIN DISTRICT LEAD	
Flow problems (abstraction and other artificial flow regulation, physical modification – rivers and lakes)	More sustainable water use	Agriculture, Conservation, Fisheries, Government agencies, Industry, Local Authorities, Power generation, Urban including developers, Water industry	Water resources regulation, including licencing, consenting and prohibition practices	Water resources regulation, including licencing, consenting and prohibition practices	Drinking water protection
			Water Company Water Resource Plans including development of new water resources and demand management	Water Company Water Resource Plans including development of new water resources and demand management	Demand management/reduced consumption
			Drive water efficiency through amendments to Building Regulations	Drive water efficiency through amendments to Building Regulations	Reduce excessive abstraction
			Use PRO9 to deliver outcomes	Use PRO9 to deliver outcomes	Vibrant habitats
			More effective demand management, for example installing meters in existing and new properties, influencing building regulations, use of smart tariffs, and market development for water efficiency devices	More effective demand management, for example installing meters in existing and new properties, influencing building regulations, use of smart tariffs, and market development for water efficiency devices	
			Water industry and agriculture to develop additional storage	Water industry and agriculture to develop additional storage	
			Review abstraction consents under the Habitats Directive	Review abstraction consents under the Habitats Directive	
			'Restoring Sustainable Abstraction' programme	'Restoring Sustainable Abstraction' programme	
			Examine role of effluent re-use	Examine role of effluent re-use	
			Environment Agency Catchment Abstraction Management Strategies	Environment Agency Catchment Abstraction Management Strategies	
			Spatial planning to favour development in areas with a sustainable water supply	Spatial planning to favour development in areas with a sustainable water supply	
			Planning conditions to encourage water efficiency	Planning conditions to encourage water efficiency	
			Voluntary programmes to influence behaviour	Voluntary programmes to influence behaviour	
Habitat restoration	Habitat restoration				

<p>Physical modification (physical modification - estuaries and coasts, physical modification - rivers and lakes)</p>	<p>€ Reduced risk to estuaries and coastal waters from port operations € Reduction in impact of flood risk schemes on good status € Manage risks from new developments € Improve habitats along rivers € Remove barriers to fish migration</p>	<p>Agriculture including Forestry, Conservation, Fisheries, Government agencies, Industry, Local Authorities, Recreation culture and sport, Navigation, Ports</p>	<p>€ Continue to licence activities including for example Coastal Protection Act € Regulate and consent dredging activity to reduce the risk of harm to the environment € Mineral extraction regulations € Dredging and Disposal Strategies, modified dredging regimes, and review dredging practices where appropriate € Produce Catchment Flood Management Plans and Shoreline Management Plans that agree policies for sustainable flood risk management € Spatial plan with appropriate water based policies € Promote river naturalisation through the development planning process € Switch to soft flood defences in floodplains and on coasts € Partnerships and local action e.g. to secure buffer strips and river restoration or prevent bank damage € Remove and modify obstructions to fish passage including weirs and tidal gates € Raise awareness to prevent bank damage by river boat traffic, livestock, horses and aquaculture</p>	<p>€ Improved overall river water quality € Reduction in risk from sediment € Reduce excessive abstraction € Demand management € Vibrant habitats € Open up rivers</p>
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GROUPS OF SIGNIFICANT WATER MANAGEMENT ISSUES	OBJECTIVE	SECTOR	MEASURES		ENVIRONMENTAL OUTCOMES	
			NATIONAL LEAD			
			RIVER BASIN DISTRICT INFLUENCE	RIVER BASIN DISTRICT LEAD		
Point source pollution (nitrates, organic pollution, pesticides, phosphates)	Reduce phosphorus and other chemical inputs to sewers, surface and groundwater	Agriculture, Conservation, Fisheries, Government agencies, Local Industry, Local authorities, Urban, Water Industry	€	Discharge consent permitting system managed by the Environment Agency	€	Improved overall river water quality
			€	Activities linked to the Pollution Prevention and Control (PPC) Regulations	€	Reduced eutrophication
			€	National controls and customer persuasion to limit phosphorus in detergents	€	Reduction in sediment
			€	Over £500M of investment in wastewater treatment between 2004 and 2009 through Southern Water's Asset Management Plan	€	Groundwater protection
			€	Use PRO9 to deliver outcomes including enhanced levels of effluent treatment	€	Drinking water protection
			€	Improve combined sewers to reduce overflows	€	Reduce excessive abstraction
			€	Reduce abstractions and manage demand	€	Reduced priority substances and specific pollutants
			€	Put in place Water Cycle Strategies	€	Open up rivers
			€	Drainage area plans	€	Vibrant habitats
			€	Manage or reduce intensity and impact of point aquaculture emissions		
			€	Complement these activities with catchment sensitive/low nitrogen farming practices		

*The measures set out in this Annex are a mixture of examples of existing measures, and potential modified and new measures. They read across to the descriptions of the significant issues set out in Section 4 of the main report. Work to further define measures will continue throughout 2007 and 2008, and a Programme of Measures will be set out in the draft River Basin Management Plan, to be published in December 2008. Further information on the next steps in provided in Annex 7.

Annex 7 How possible measures and scenarios are assessed

When possible new or amended measures are considered, the consideration should take into account:

- € how much they cost
- € what the benefits will be
- € how cost-effective they are
- € what effects they will have on the wider environment.

To establish this information a number of assessments need to be carried out. These assessments need to follow a transparent methodology and be as open as possible. Not all measures will need to be assessed. Many measures will be linked to current activities and plans led by the Environment Agency as well as others, and have been assessed already.

The assessment methods that will be considered are:

- € Cost Effectiveness Analysis
- € Disproportionate Cost Assessment
- € Strategic Environmental Assessment
- € Impact Assessment.

These assessments are described in more detail below. The assessments will consider a number of underlying principles, including:

- € the polluter pays – where the party responsible for a water body not meeting its environmental objective should pay for the necessary measures to put it right;
- € sustainability in terms of the balance of impacts on different users of the water environment, including the ecology; and
- € a risk based approach – any approach to regulation should be risk based and proportionate to the issue it is addressing.

As the river basin planning process progresses, we will analyse the programme of measures for each River Basin District in more detail if necessary.

Preliminary Cost Effectiveness Analysis (pCEA)

Defra and the Welsh Assembly Government are currently carrying out a preliminary Cost Effectiveness Analysis (pCEA) on countrywide measures in England and Wales. The main objective of this work is to produce a national overview for each country of the costs and effectiveness of measures that could be used, and the sectors that could be involved in delivering them. The pCEA is specifically looking at the measures and sectors that may be included in the first round of River Basin Management Plans.

This pCEA is being carried out with the close involvement of stakeholders through their participation on a number of working groups. These groups represent the main economic sectors that would be affected as well as the “cross-cutting” pressures on the water environment. These groups will develop a view on different combinations of measures within the given sectors and provide high level analysis on the cost and effectiveness of these measures. The subsequent pCEA synthesis work is looking at cross-sectoral combinations of measures.

The working groups that were set up are:

- € agriculture
- € fisheries, alien species and biodiversity
- € flood and planning issues
- € hydromorphology
- € industry
- € minewaters
- € navigation
- € non-agricultural diffuse water pollution.
- € nutrients
- € sediments
- € toxic substances
- € water industry
- € water resources.

A Wales sub-group has been set-up to support the working groups by further considering pressures and measures in Wales.

The results expected from the pCEA include information on:

- € the likely cost of implementing measures
- € how costs could be distributed between the main sectors and groups
- € different phasing of the work needed over time
- € possible new mechanisms and/or measures for specific problems.

These results will give the Governments in England and Wales a good indication of the key issues and constraints for preparing and implementing the first River Basin Management Plans and will provide an indication of preferred combinations of types of measures or scenarios. The outcomes of pCEA will also help in revising the Impact Assessment for the Water Framework Directive, and support Ministerial decisions on new measures and funding.

The pCEA results for England and Wales are due by late 2007. On concluding the pCEA, Defra and the Welsh Assembly Government will each publish Ministerial guidance to the Environment Agency, and other delivery partners, for implementing the Water Framework Directive.

Site Specific Cost Effectiveness Analysis

More detailed Cost Effectiveness Analysis will be carried out where additional assessment is required on a site-specific basis. This will help establish the measure or measures that best achieve a Water Framework Directive environmental objective, at the least cost and within the required time scale at a specific location. However, a Cost Effectiveness Analysis will be carried out only if a measure has not been assessed already as part of the preparation of other plans and processes and if it is considered to require one.

Disproportionate Cost Assessment

Disproportionate Cost Assessment (DCA) takes into consideration both the benefits from achieving the environmental objective and the impact on different sectors. DCA extends the assessment carried out in Cost Effectiveness Analysis to include the full range of costs and benefits associated with the implementation of a particular measure, and the outcomes this would achieve in terms of environmental and other improvements. DCA takes into consideration both water and non-water related benefits.

DCA will be carried out where disproportionate costs are important to the decision to set alternative environmental objectives which have longer deadlines or may be less strict. It is important to bear in mind that we are allowed to justify setting alternative objectives only in some specific cases.

The criteria for defining disproportionate cost are ultimately subject to a policy decision taken by the European Union. It is expected that Ministerial guidance, which will be issued after the completion of current pCEA work, will clarify the definition of disproportionate cost.

Although no final policy decisions have been made yet, the UK view submitted to the European Union is that: DCA should consider the consequences of implementing the combination of measures in terms of the distribution of gains and losses among stakeholders. This can be done by taking into account the following:

- € the extent of any deviation from the polluter pays principle
- € the affordability of the environmental improvement for those who would have to pay, taking into account the characteristics of the economic sector concerned
- € any adverse consequences for vulnerable or disadvantaged social groups
- € the scale of recent investment in environmental improvements already made by those who would have to pay.

The view also argues that Disproportionate Cost Assessment should take into account qualitative, quantitative or monetised information on costs and benefits, or any combination of this information, to help make the necessary judgements. The way in which information is used and taken into account should be clear and transparent. The analysis should also consider the extent to which any disproportionate distributional consequences can be mitigated, for example through alternative financing arrangements.

Over the longer term, it should be possible to establish suitable mechanisms for spreading and sharing costs in ways that do not give rise to such consequences. Where this can be done before 2027, extended deadlines for achieving good status can be set. Where it cannot, it may be appropriate to set less stringent objectives. In deciding if this is appropriate, the length of time without the benefits of achieving good status should be taken into account. Realising the benefits sooner rather than later may outweigh the adverse distributional consequences. Any less stringent objectives should be reviewed in each river basin planning cycle thereafter.

Strategic Environmental Assessment

The objective of Strategic Environmental Assessment is to provide a high level of protection for the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes. The main reason for carrying out this assessment is to establish what the effects of certain plans and programmes are on the environment and to promote sustainable development.

The requirement to undertake Strategic Environmental Assessment comes from the European Directive, commonly known as the SEA Directive (EU Directive 2001/42/EC).

As the River Basin Management Plans sets out to protect and improve the water environment, the Strategic Environmental Assessment will include assessment of this but also focus on the wider non-water environmental effects (positives and negatives) of River Basin Management Plans, including climate change.

Impact Assessments

This is a statutory requirement on all new regulations to establish the costs and benefits of its implementation. An Impact Assessment will be published alongside each draft River Basin Management Plan. The information in the Impact Assessment will draw on the outputs of the pCEA, Cost Effective Analysis and Disproportionate Cost Assessment as well as other existing analysis.

The Impact Assessment will follow the guidance published by Defra and Welsh Assembly Government on River Basin Planning Guidance and the Cabinet Office or equivalent in Wales (as required by the Government of Wales Act 2006).

It will present a summary of the impacts of the programme of measures as well as a number of potential alternative approaches based on different scenarios. This will be supported by more detailed information which will demonstrate how proposals were arrived at. It will set out the costs and benefits of each scenario, providing an analysis of the impact of measures on different sectors

How will we select our approach or scenarios of measures?

In preparing the draft River Basin Management Plans, options or scenarios for the programme of measures will be considered. These will take into account how fast we should try to achieve the objectives and the level of certainty, that is, how likely we are to be able to achieve the results. For example, should we aim to achieve the objectives by 2015, or, on the basis of technical feasibility or disproportionate cost, should we consider reaching these over three cycles (by 2027). The River Basin Management Plans will prioritise measures accordingly. The Plans will also need to take into account how much emphasis to place on regulatory measures and how much on voluntary action.

The scenarios to be considered will need to be sustainable, treat sectors even-handedly, be cost-effective and consider how the polluter pays principle applies.