

EA-THAMES  
BOX 3

STATE OF THE ENVIRONMENT REPORT

for **THAMES REGION**  
FIRST UPDATE 2001



ENVIRONMENT AGENCY

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# Foreword



The Environment Agency has a responsibility to 'compile information on' and 'to form an opinion on' the state of the environment. Since the publication in 1996 of our first overview 'The Environment of England and Wales – A Snapshot', we have made significant improvements in our environmental reporting. Our most recent national publication, 'Environment 2000

and Beyond', uses current environmental information to consider how the environment might change in future under the pressure of expected economic and social changes and of natural drivers, such as climate change.

The success of our previous Regional State of the Environment Report led to our commitment to update this report. In this document we have attempted to reflect the environmental trends found across the Region, which have been illustrated by the indicators. We have supplemented the previous indicators in the previous report where possible to increase our understanding of the Regional environment.

The report combines information from a wide variety of sources to provide an overall Regional assessment. Progress towards a better environment can not be achieved without the full support of our partners. These relationships are vitally important to us and we will work to make effective co-operation a continuing reality.

Finally, it is hoped that this report will continue to raise awareness of the stresses and strains placed upon the environment of the Thames Region and the challenges we face in the future.

A handwritten signature in blue ink that reads "C. Birks".

Chris Birks  
Regional General Manager

ENVIRONMENT AGENCY



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This report is divided into five main parts

## 1. Background to the report

A summary of the context of the report.

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## 2. Thames Region's environment

A description of the Region, its physical structure, natural resources, population, economy and administrative framework.

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## 3. The key environmental indicators

The key environmental indicators covering:

- the state of the environment;
- the pressures on the environment;
- responses to the state and pressures.

including the indicators that will be used to measure future change.

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#### **4. Trends and issues for the Region**

A review of the environmental trends emerging and the major issues facing the Region, as raised by the indicators, presented under the following themes:

- a better quality of life;
- an enhanced environment for wildlife;
- cleaner air for everyone;
- improved and protected inland and coastal waters;
- restored and protected land with healthier soils;
- a 'greener' business world;
- wiser, sustainable use of natural resources;
- protecting and restoring the land;
- limiting and adapting to climate change;
- reducing flood risk.

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#### **5. The way forward**

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time of going to press – 20th December 2000



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# 1. BACKGROUND TO THE REPORT



The Agency summarises its duties, powers and interests in its national vision:

*"A better environment in England and Wales for present and future generations"*

To achieve this vision, the Agency emphasises cooperation, education, pollution prevention and, when necessary, vigorous enforcement of the appropriate regulations.

## 1.1 THE ROLE OF THE ENVIRONMENT AGENCY

Our duties, powers and interests include pollution prevention and control, flood defence, water resources, waste regulation, fisheries, navigation and the conservation and enhancement of the natural beauty and amenity of inland and coastal waters. In the case of many of these, including air pollution and the decontamination of land, we share a role with others, particularly local authorities.

At the heart of all our work is the aim of achieving sustainable development, which involves the integration of human needs and the environment in which we live.

It is important to remember that we are not responsible for regulating every aspect of the environment, and for certain issues other organisations are primarily responsible. A guide to our duties, powers and interests is given in Appendix I.

## 1.2 STATE OF THE ENVIRONMENT REPORTING

A sound scientific understanding of what the state of the environment is at any one time, and how it is responding to the many and varied pressures that are placed upon it, is critical to achieving a high quality environment. Our success will be measured by how far we have been able to protect and improve the state of the environment as a result of direct actions, or as a result of our influence over the actions of others.

We produced a national overview of the state of the environment in April 1996, called *The Environment of England and Wales – A Snapshot*. The information published in the Snapshot is available on our website (<http://www.environment-agency.gov.uk>), which is regularly updated.

Since the publication of the Snapshot, the Agency has

produced four more in-depth reports looking at particular aspects of the state of the environment. These are:

- *State of the Environment of England and Wales – Fresh Waters*
- *State of the Environment of England and Wales – The Land*
- *State of the Environment of England and Wales – Coasts*
- *State of the Environment of England and Wales – Atmosphere*

Details of these reports can also be found on the Agency's website.

We have also recently published *State of the Environment Report – The Environment Agency's contribution to a better environment in the South East (2000)*. This report is our assessment of the environment in the South East of England and highlights the environmental challenges faced by the Region. It has been produced for the Government Office for the South East's boundary (see Local Authorities Map page 19) and should inform and influence a number of regional initiatives, including The Regional Sustainable Development framework; Regional Planning Guidance; and the Regional Economic Strategy.

Our most recent publication the *State of the Environment Report for London (2001)* provides an assessment of the environment in London and identifies the environmental challenges which Londoners and the Agency will face. It is also hoped that the baseline provided by the report will help the Greater London Authority in producing their own state of the environment report in the future.

At a local level, production of Local Environment Agency Local Plans (LEAPs) has continued. LEAPs are our management plans for identifying, prioritising and solving local environmental issues related to our functions, taking



into account the views of our local customers. Since the publication of the last report, the LEAP programme has been completed for the Region. Each catchment now has in place an environmental overview and action plan (see indicator R6).

### 1.3 THE AGENCY'S STATE OF THE ENVIRONMENT REPORT FOR THAMES REGION – 2001

The purpose of this report is to:

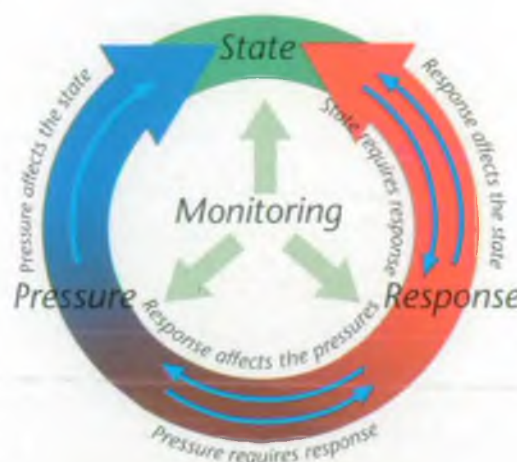
- promote and increase awareness of the state of the Region's environment, and the pressures acting upon it;
- assist in highlighting some of the most critical environmental issues for the Region;
- continue to provide an integrated snapshot of the state of the environment against which future changes can be measured using key indicators.

This report focuses upon Thames Region, one of the Agency's eight Regions covering England and Wales. Environmental data sets are collected by a multitude of different organisations and we have not sought to present them all here. Instead, the report concentrates on our specific areas of environmental responsibility. However, where appropriate this is set in a wider environmental context to provide a more meaningful commentary.



Thames Region

This report presents environmental data for the Region using a state-pressure-response format that is illustrated in the diagram (see also Section 3). The indicators can only give a flavour of the environmental data available and cannot reflect all of our work. This report also highlights some of the issues facing the Region which are of greatest concern, for example, where the current state of the environment is unacceptable and where the pressures on the environment are increasing.



This report is the first update of the original State of the Environment Report published in 1998. Whilst this is a relatively short time period in which to monitor significant changes in the state of the environment, the report outlines the Region's commitment to identifying and monitoring change. This revised information also helps us to modify our actions and to begin to address any issues emerging from the data. A summary of the current indicator trends is contained in section 3.1.

We have started to address the gaps identified in our data from the last report, with some additional indicators being added. However, this will continue to evolve over time as more data sets become available and will reflect some of the developments in this area of work (e.g. DETR's – Quality of Life Counts, DETR, 1999).

Building on the success of the last report, the document will continue to provide an educational resource and will highlight the available environmental data from the Agency.

A guide to the sources of information and references are included in Appendix II. Contact details for the Agency are included at the back of the report.



## 2. THAMES REGION'S ENVIRONMENT



### 2.1 OVERVIEW OF THE REGION

Thames Region covers the basin of the River Thames and its tributaries. The Regional boundary contains many of the resources required to sustain its 12 million people including living space, water resources, the route for sewage treatment and disposal, and to a lesser extent the space for waste disposal, and is therefore self-sufficient in many ways. However, the Region's resources are limited and under severe pressure from its high and growing population (4% increase between 1991 and 1997). As a result, parts of the Region rely heavily on the re-use of resources. It therefore makes sense for the Thames Region, perhaps more than any other Agency region, to consider the state of its environment as a Regional entity as part of our approach to sustainable development.

The western parts of the Region are predominantly rural, with towns concentrated along the M40 and M4 motorway corridors. In the north and south eastern parts, urban land uses tend to predominate, although considerable areas of rural land remain. The eastern part is dominated by Greater London which is heavily urbanised and constrained by the Green Belt.

### 2.2 PHYSICAL CHARACTERISTICS AND ENVIRONMENTAL ASSETS

To place the current state of the environment in context, we must first consider the natural environment, particularly the physical features over which we have no control and the important environmental assets, including landscape, wildlife and heritage features. The current environment makes the Region an attractive place in which to live and work.

More than 40% of the Region is classified as an Area of Outstanding Natural Beauty (AONB), Green Belt or enjoys some other form of environmental protection. The

protection and enhancement of areas of high quality natural environment and the opportunities for improving quality of life and urban regeneration, particularly in London, represent key issues for the Agency and its partners.

● the Upper Thames Basin, lying between the hills of the Cotswolds, Chilterns and Berkshire Downs, has a high quality and quite rural environment.

● the London conurbation, where the network of parks and river corridors are an important environmental asset. The Thames provides a 'wildlife superhighway' across the city to the estuary.

● the valleys of the Upper and Middle Lee and their tributaries, such as the attractive Beane and Mimram valley. Several of the towns have significant potential for economic regeneration.

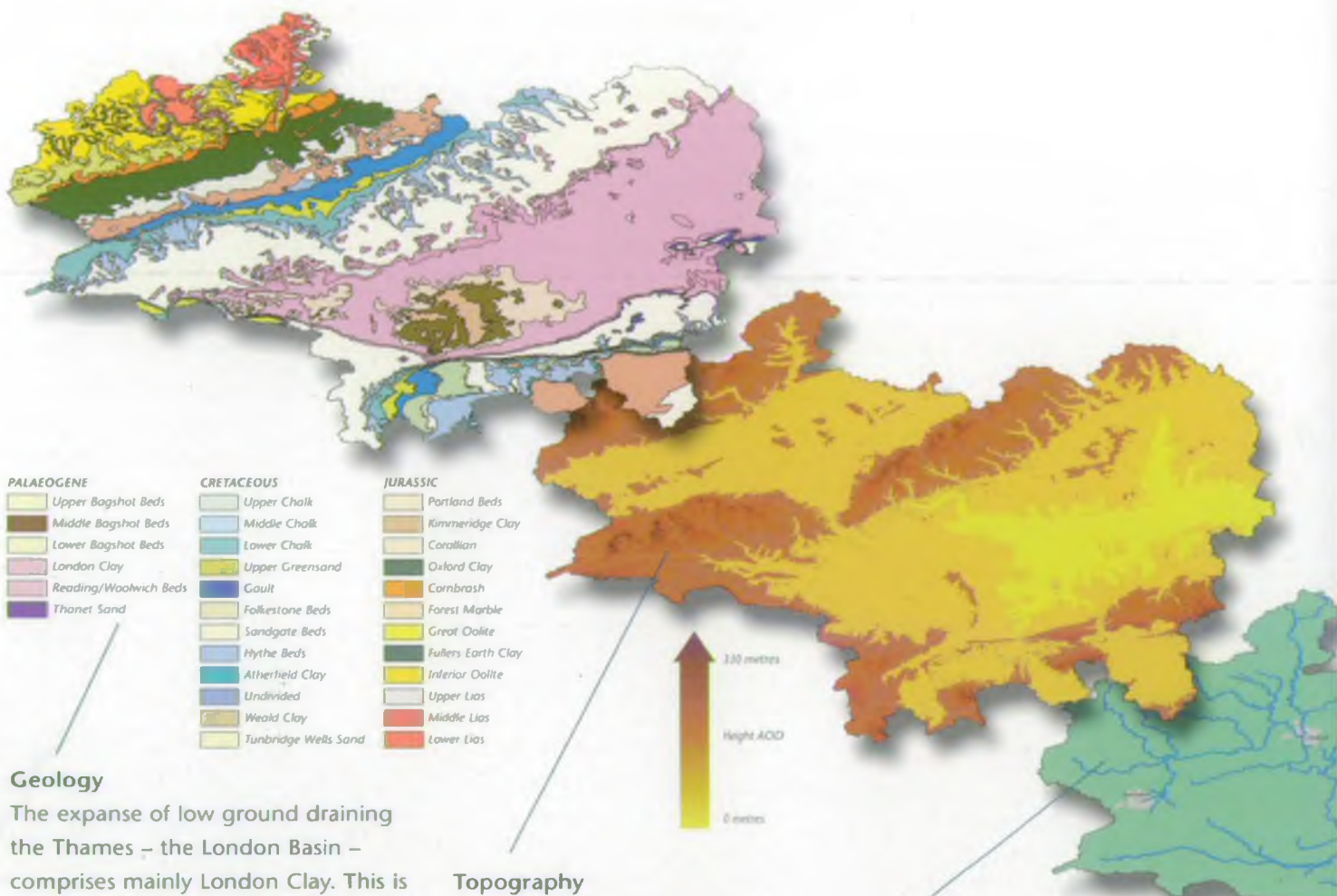


● the Middle Thames Basin between Goring and Teddington contains several historic towns, ecologically rich tributaries and chalk streams in an attractive landscape. Nearer London, the Thames valley has extensive areas of gravel workings and numerous reservoirs.

● the extensively developed downland valleys of the rivers Mole and Wey to the south and south west of London including towns such as Crawley and Guildford.



# The Physical Characteristics of the Region



## Geology

The expanse of low ground draining the Thames – the London Basin – comprises mainly London Clay. This is bounded by Chalk uplands – the Berkshire Downs, Chilterns, Hampshire Downs, Hog's Back and North Downs. The Region is bounded in the west by the Cotswolds, with the steep limestone scarp slope on one side and the long gentle dip slope to clay vales on the other. The Region is bounded to the south of London and the North Downs by the heavy clays and sands of the Weald.

The Chalk is the major groundwater resource for the Region, along with important contributions from the Cotswold Limestones, the Lower Greensands of the Weald and the perched water table in the river gravels which overlay part of the Region.

(Source of data: British Geological Survey)

## Topography

The topography of the Region is strongly influenced by the structure of the underlying geology and the effects of glaciation and the Region's drainage pattern. The Region varies in height from the Thames Estuary at sea level to parts of the Cotswolds, Chilterns, Berkshire Downs and North Downs which rise to approximately 300m above sea level.

(Source of data: Ordnance Survey)

## Rivers

The Region includes the River Thames and its tributaries, including the Kennet, Thame, Loddon, Wey, Colne, Mole and Lee. There are 5,330km of Main River in the Region. The area of the fluvial floodplain in the region is 70,000ha.

(Source of data: Environment Agency)





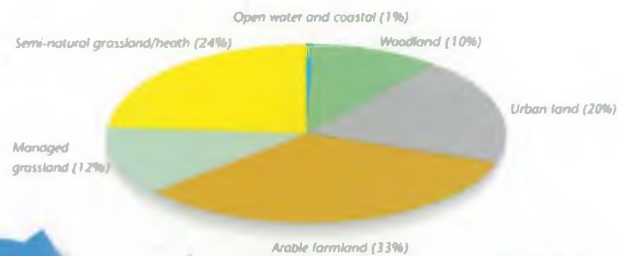


### Land Cover

This map shows the main pattern of urban areas in the Region, the arable land in the more rural parts to the north and west and the more wooded areas in Surrey, Berkshire and Hampshire. The tidal Thames and the reservoirs and lakes of the Lee Valley, south west London, Colne Valley and the Cotswold Water Park are clearly visible. The proportions of land uses within the Region are shown in the pie chart.

(Source of data: Institute of Terrestrial Ecology)

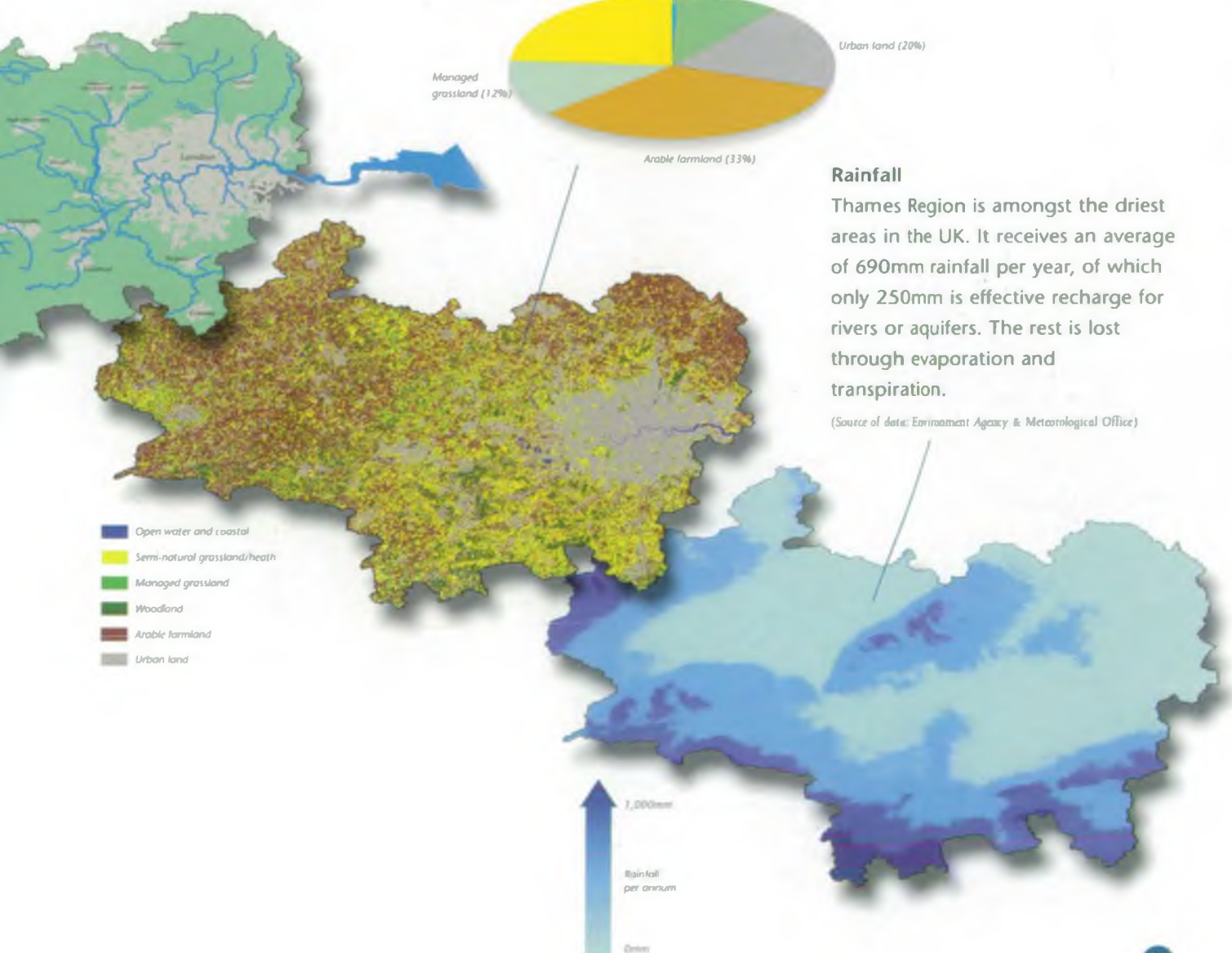
### Land cover



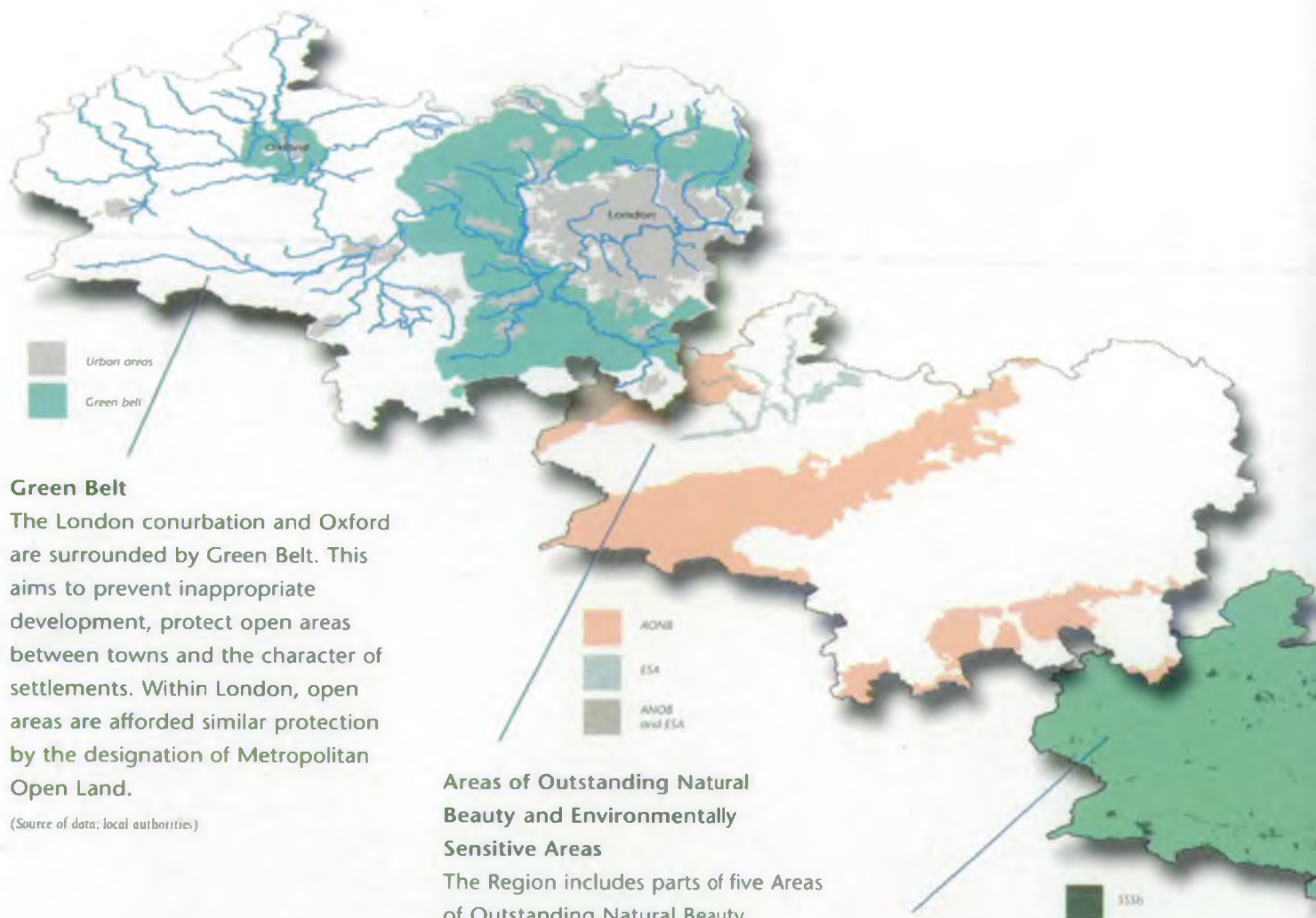
### Rainfall

Thames Region is amongst the driest areas in the UK. It receives an average of 690mm rainfall per year, of which only 250mm is effective recharge for rivers or aquifers. The rest is lost through evaporation and transpiration.

(Source of data: Environment Agency & Meteorological Office)



# The Environmental Assets of the Region



## Green Belt

The London conurbation and Oxford are surrounded by Green Belt. This aims to prevent inappropriate development, protect open areas between towns and the character of settlements. Within London, open areas are afforded similar protection by the designation of Metropolitan Open Land.

(Source of data: local authorities.)

## Areas of Outstanding Natural Beauty and Environmentally Sensitive Areas

The Region includes parts of five Areas of Outstanding Natural Beauty (AONBs) – Cotswolds, Chilterns, North Wessex Downs, Surrey Hills and Kent Downs – and parts of two Environmentally Sensitive Areas (ESAs) covering some of the upper Thames tributaries and the Cotswolds. ESAs include agricultural landscape where traditional management practices help conserve the visual, ecological or historical characteristics. AONBs cover 3,454sq km of the Region (26.8%) and ESAs cover 656sq km (5.1%).

(Source of data: Countryside Agency & MAFF)

## Sites of Special Scientific Interest

There are 463 Sites of Special Scientific Interest (SSSIs) within the Thames Region covering 353sq km (2.7% of the Region). The proportion of the SSSIs within the Region which contain at least some of the following broad habitat types is: Grassland 58%; Heathland 15%; Wetland 50%; Woodland 61%; Geological/Industrial 18%; Tall Herb 3%; Coastal/Cliff 1%. There are also 5 Special Protection Areas (SPAs) and 23 Special Areas of Conservation (SACs) that may be designated in the Region.

(Source of data: English Nature)





#### EC Designated Fisheries

The European Community (EC) Freshwater Fisheries Directive (78/659/EEC) 'on the quality of waters needing protection or improvement in order to support fish life' provides a statutory basis for the protection of water quality in certain rivers. The length of river in the Region designated as Salmonid fishery is 443.4km and Cyprinid fishery is 976.6km.

(Source of data: Environment Agency)

#### Countryside Character Areas

The Countryside Character Programme is a joint initiative by the Countryside Agency and English Nature covering England. The Character Areas cover the whole countryside and not just designated areas. A series of descriptions which analyse the area's character and identify the main forces for change have been produced as part of the initiative. The Character Areas complement the Natural Area identified by English Nature which focuses on the nature conservation characteristics of these areas.

(Source of data: Countryside Agency & English Nature)



## 2.3 ECONOMY AND POPULATION

The Thames Region is already intensively developed and pressure for new development continues. The Region has less than 10% of the land area of England and Wales, but contains nearly a quarter of the population, generates more than a quarter of Gross National Product and has a similar percentage of all construction work.

Key facts and figures	England and Wales	Thames Region (% of England and Wales total)
Area (sq km)	150,000	13,000 (8.6%)
Population (millions, 1994)	52.0	12.0 (23.1%)
Population density (number per sq km)	347	923
Households (millions, 1994)	23.4	5.0 (23.5%)

Note – Information within this table will be updated in the future following the 2001 census.

The Region, which includes London with its world city status, contributes significantly to the national economy. It is also at the forefront of many new industries such as information technology, biotechnology and advanced engineering. Some 88% of the working population in the

Region are employed in the service sector.

A major issue is how to cope with the scale and pattern of future development and economic activity. Since the publication of the previous report the intense debate over housing development and its future allocation has continued. During the past two years the revised Regional Planning Guidance has been delayed due to the Department of Environment, Transport and the Regions (DETR) awaiting the recommendations of the Crow Report on future housing allocation within the South East.

The new Regional Planning Guidance for the South East (RPG9) has published revised figures identifying a net increase in the housing allocation across the Thames Region. When compared to the figures published in the previous State of the Environment Report this is a good indicator of the pressure the environment is under (see indicator P4).

Regional Development Agencies (RDAs) have been tasked with producing strategies for the economic development within their Regions. The South East England Development Agency (SEEDA), which covers the majority of the Thames Region, published its economic strategy in October 1999. This strategy, which will be promoted within the overall context of sustainability, will provide the focus for economic regeneration across the South East.





## 2.4 ADMINISTRATIVE FRAMEWORK

The past two years have seen a number of developments relating to the regional level of Government. On 7 May 2000, London elected its first Mayor to oversee the work of the newly formed Greater London Authority (GLA). This important body has a wide ranging remit over the management of the capital.

The GLA Act 1999 requires that the Mayor produces a State of the Environment Report for London before the end of three years in the first term and thereafter every four years. It is anticipated that the Agency will work closely with the GLA in the production of this report. To assist in this process we have recently published our own *State of the Environment Report for London (2001)*.

Since our last State of the Environment Report, the Regional Development Agencies (RDAs) have been formed. The Thames Region includes part of the South East England Development Agency (SEEDA), the East of England Development Agency (EEDA) and the West of England Development Agency (WEEDA).

The RDAs have the following statutory purposes:

- *to further the economic development and regeneration;*
- *to promote business efficiency, investment and competitiveness;*
- *to promote employment;*
- *to enhance the development and application of skills relevant to employment; and*
- *to contribute to the achievement of sustainable development in the United Kingdom where it is relevant in its area to do so.*

In addition to these new partners, we have continued to work closely with the DETR, Government Offices and local planning authorities. Similarly, we have continued to work regularly alongside other Government agencies, such as English Nature, the Countryside Agency and English Heritage, and at a local level with conservation groups, sport and recreation groups, landowners, developers, industry and commerce.

Local authorities are especially important partners, and they have a particular interest in state of the environment reporting. We have worked with several local authorities in the Region, as well as organisations such as SEEDA, to provide information for their state of the environment reports and environmental indicators.

The Region includes parts of over 100 local authorities, as shown in the map, including significant areas of:

- 9 county councils;
- 33 London boroughs (including the City of London);
- 7 unitary authorities; and
- 38 district councils.

This report has been compiled using the operational boundary of the Region within which we collect data and manage the environment. However, where local authorities cross our regional boundaries we will ensure that one Region is the main point of contact.

### 3. THE KEY ENVIRONMENTAL INDICATORS FOR THE REGION



#### 3.1 REPORTING FRAMEWORK

We have continued to monitor the Region's environment against a series of indicators. These have been developed in discussions with a range of external organisations and were presented in the first Regional State of the Environment Report in 1998. A state-pressure-response framework is used to present the indicators:



'State' indicators measure the quality and stock of natural resources;



'Pressure' indicators measure the forces on the environment which are usually caused by human activities, but may include measures of pressures caused by natural processes;



'Response' indicators assess the normally beneficial impacts of activities, which aim to address environmental problems.

The selection of the key indicators is based on a number of criteria, including:

- the importance of the indicator to illustrate a key aspect of the Thames Region environment;
- its ability to record environmental change in a meaningful way; and
- the regularity with which the data for the indicator is updated.

We present 41 indicators in this report, including 16 state indicators, 15 pressure indicators and 10 response indicators. Many of these indicators are related to one another, for example the amount of rainfall (*indicator S3*) affects river flows and the quantity of groundwater (*indicators S5 and S10 respectively*), which in turn affects water quality (*indicator S6*). Where indicators are related to one another, they are highlighted throughout the report. We collect the majority of data used for the indicators, although some of the data has been obtained from other organisations.

The trend demonstrated since the original State of the Environment Report in 1988 is summarised under the text

for each indicator and new data is highlighted within the figures. The overall trends are also discussed in section 4. The trends are illustrated for each indicator using the following symbols:



positive progress/improving



change uncertain or mixed



unfavourable progress/deteriorating/no progress

We have added three new indicators in this update compared to the original report. These are:

- S15 – Compliance with Bathing Water Directive;
- S16 – Number of days when air pollution exceeds national objectives; and
- P15 – Water levels in the River Thames

The Bathing Waters indicator was not included in our original list of state indicators because there were very few designated bathing waters in the Region. However, a number of new bathing waters have been designated over the last few years. The number of days when air pollution exceeds national objectives is a DETR headline indicator and has been included to complement the Agency's role of regulator of major industrial processes.

In addition to the new indicators, two of the original indicators have been updated to reflect new information that has become available:

- S2 – Air quality: concentration of key pollutants – this indicator now includes data sets for sulphur dioxide, ozone and particulates, as well as oxides of nitrogen; and
- S14 – Distribution of key biodiversity species – this indicator now includes data relating to the Greater Water-parsnip in addition to the other species apart from Redshank which has been omitted from this update.



## Summary of recent changes in indicators

### 😊 positive progress/improving

- Air quality: concentration of key pollutants (S2)
- Quantity of rainfall (S3)
- Quantity of river flows (S5)
- Chemical river water quality (S6)
- Radiation levels in the vicinity of nuclear sites (S9)
- Quantity of groundwater (S10)
- Distribution of key biodiversity species – Otter, Bittern (S14)
- Consistency in compliance with Bathing Water Directive (S15)
- Rate of water leakage (P2)
- Rate of water demand (P3)
- Number of sewage treatment works compliant with consent (P10)
- Emissions to air from major industries (P11)
- Number of Local Environment Agency Plans completed (R6)
- Number of water level management plans completed (R8)
- Number of rivers/wetlands affected by abstraction under study or remediated (R9)
- Proportion of rivers for which a landscape assessment has been undertaken (R10)

### 😐 change uncertain or mixed

- Number of heavy rainfall events (S4)
- Biological river water quality (S7)
- Tidal Thames water quality: dissolved oxygen (S8)
- Numbers of salmon returning to the River Thames (S13)
- Distribution of key biodiversity species – Greater Water-parsnip, Club-tailed Dragonfly, Scarce Chaser (S14)
- Number of days when air pollution exceeds national objectives (S16)
- Demand for aggregates (P9)
- Water levels in the River Thames (P15)
- Number of trivial and tidal flood warnings issued (R2)
- Number of river reaches benefitting from environmental enhancements implemented by flood defence (R3)
- Proportion of river reaches receiving maintenance (R7)

### 😞 unfavourable progress/deteriorating/no progress

- Area of urban land (S1)
- Groundwater levels in London (S11)
- Groundwater quality: concentration of nitrates (S12)
- Long term change in temperature (P1)
- Projected housing development (P4)
- Number of planning applications (P5)
- Passenger transport and vehicle traffic (P6)
- Boat traffic on the non-tidal Thames (P7)
- Volume of water abstraction and consumption (P8)
- Waste production and management (P12)
- Volume of waste to landfill (P13)
- Number of water pollution incidents (P14)
- Number of Thames Barrier closures against tidal surges (R1)
- Amount of waste recovered (R4)
- Use of the Thames Bubbler and Vitality (R5)

Since we published the last report, there have been two significant publications that have included environmental and sustainable development indicators. The DETR published *A Better Quality of Life Counts* in 1999 which provided a baseline assessment strategy for sustainable development. The Agency has also produced a new vision for the future, *An Environmental Vision* which includes a number of environmental indicators for Agency use. In many cases the Agency indicators are produced directly from the environmental indicators in *A Better Quality of Life Counts*. We have suggested 39 indicators in our

national menu of which there are five 'headline indicators':

- rivers of good or fair quality;
- emissions of greenhouse gases;
- waste arisings and management in the UK;
- days when air pollution is moderate or higher in the UK;
- populations of wild birds in the UK.

These all have been included in this Regional report apart from loadings of major contaminants to coastal waters, which is not applicable to Thames Region.

### 3.2 STATE OF THE ENVIRONMENT

In the past there has been no comprehensive or fully integrated means by which the 'state' of the environment, as a whole, has been assessed. This is partly because many of the standards which apply to environmental materials have evolved independently to protect man, or aspects of the environment, against specific risks. Assessing the 'state' of the environment at a point in time is clearly a very complex undertaking.

One approach to differentiate between the different aspects of the state of the environment is to distinguish between the three environmental media:



• land;



• air; and



• water.

This approach has been used to categorise the key state indicators included in the report.

#### Key State Indicators

S1	Area of urban land	
S2	Air quality: concentration of key pollutants	
S3	Quantity of rainfall	
S4	Number of heavy rainfall events	
S5	Quantity of river flows	
S6	Chemical river water quality	
S7	Biological river water quality	
S8	Tidal Thames water quality: dissolved oxygen	
S9	Radiation levels in the vicinity of nuclear sites	
S10	Quantity of groundwater	
S11	Groundwater levels in London	
S12	Groundwater quality: concentration of nitrates	

S13 Numbers of salmon returning to the River Thames

S14 Distribution of key biodiversity species

#### New indicators:

S15 Compliance with Bathing Waters Directive

S16 Number of days when air pollution exceeds national objectives

As we have previously identified, there are two new state indicators included in this report. Whilst new legislation has been enacted in respect of contaminated land and progress has been made in the adoption of a National Fisheries Classification scheme, neither of these initiatives produced data sets that can be used as indicators as yet. The National Fish Classification Monitoring Programme will, in future, enable more objective assessment of temporal changes in both fish populations and fisheries performance.

Additional information on sulphur dioxide, ozone and particulates, as well as oxides of nitrogen have been included in Indicator S2 and the indicator title changed accordingly. Indicator S14 – distribution of key biodiversity species – has also been modified slightly with the indicator now including data on the Greater Water-parsnip, a UK biodiversity priority species. The Redshank is not included in this update as information is not available for the whole Region. However, hopefully it will be included again in future reports when more data should be available. This could be provided by this year's breeding waders survey by the British Trust for Ornithology.

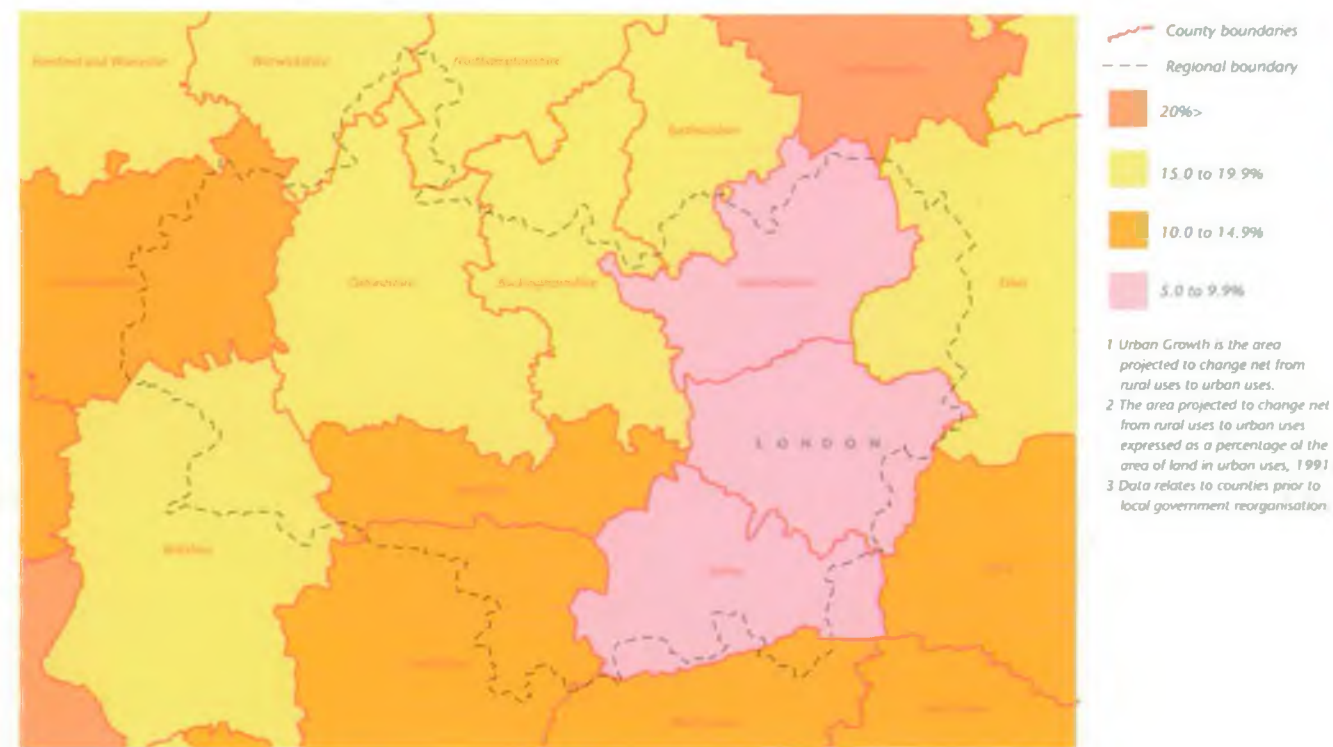
#### Potential State Indicators for the Future

• Area of contaminated land and number of major sites in the Region	
• Area of floodplain developed	
• Length of national fisheries classification scheme classes	



STATE INDICATORS

S1. Projections of Urban Growth<sup>1,2</sup>, 1991-2016<sup>3</sup>



INDICATOR S1.  
Area of Urban Land

Since the publication of the last report the Institute of Terrestrial Ecology has not updated its 1990 land cover data set. In the last report we stated that 2,516 sq km or 19.6% of the Region was classified as urban according to this data set.

The Office for National Statistics provides projections of urban growth between 1991 and 2016. This information is organised by county, and across the Region the projected net change from rural to urban uses varies from 4.9% or less in Surrey, Hertfordshire and London, compared with 15-19.9% in both Buckinghamshire and Oxfordshire during the same period. Central Government is promoting the redeveloping of previously developed or brownfield sites

within urban areas as opposed to new greenfield sites through the urban white paper.

An additional source of information is the DETR's National Land Use Database which identifies derelict land in the UK. The final results of the 1998 survey identified that there are 57,710 hectares of previously developed land currently unused or potentially available for development in the UK. Within the Government Office South East and London Regions 12,560 hectares of potential development land are identified; this represents 22% of the national total. The redevelopment of brownfield land brings with it a number of inherent environmental risks. For example, contaminated land issues will have to be addressed during the redevelopment of such sites.

S1. Previously developed land that is unused or may be available for redevelopment by land type and Government Office Region, 1998

Government Office Region	Vacant and Derelict Land (hectares)			Currently in Use (hectares)		
	Previously developed vacant land	Derelict land and buildings	Vacant buildings	Allocated in a local plan for any use or with planning permission for housing	Known redevelopment potential but no planning allocation or permission	All previously developed land that is unused or may be available for redevelopment
South East	1,760	1,310	850	3,420	2,400	9,740
London	470	530	290	1,120	410	2,820
England	14,860	19,340	4,310	10,960	8,240	57,710

The housing figures published in the Regional Planning Guidance RCG9 (see indicator P4) also provide an indication of the continuing trend for urbanisation across the Region. The potential cost of this trend will continue to include physical damage to the environment, pollution and congestion, which imposes significant additional costs on the Regional economy.



With the increasing pressure for new homes to be built in the South East, the trend for urbanisation is likely to continue. This could be partly balanced by recycling previously developed land.

Source: Institute of Terrestrial Ecology, DETR & the Office for National Statistics



#### INDICATOR S2.

##### Air Quality: Concentrations of Key Pollutants

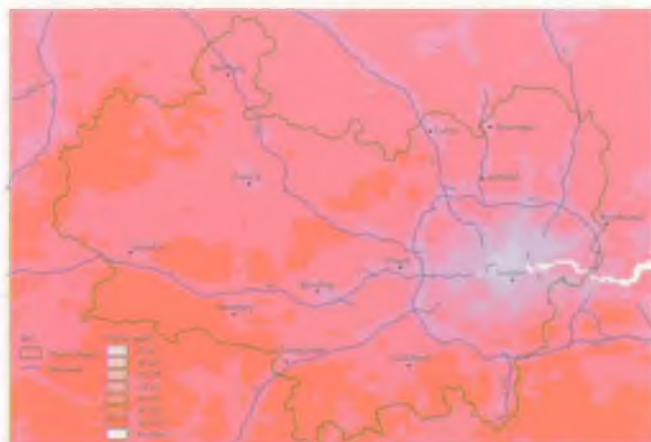
The monitoring of air quality is very complex and the responsibility is split between different organisations (see section 4.5). The Government's standards and objectives for air quality are set out in the *Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2000)*. There are eight pollutants for which a standard limit and objective has been set: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, ozone, fine particles (so called PM<sup>10</sup> – particles less than 10 microns in size) and sulphur dioxide. These objectives have primarily been set to protect human health.

In the last report we presented data solely on nitrogen dioxide. However, we have expanded on the range of pollutants in this update to include information on particulates, ozone and sulphur dioxide. The information presented in the maps has been taken from NETCEN (National Environment Technology Centre) data and we have also drawn upon their document *Air Pollution in the UK: 1997*.

The following summarises the situation across the Region for these key pollutants:

- **Ozone** – Ozone is not emitted directly from any man-made source in any significant quantities. It arises from chemical reactions in the atmosphere caused by sunlight. Oxides of nitrogen and Volatile Organic Compounds (produced by combustion, other industrial processes and activities such as solvent use and petrol distribution and handling) react to form ozone. These chemical reactions do not take place instantaneously and once ozone has been produced it may persist for several days. Therefore, maximum concentrations generally occur downwind of the source areas of the pollutant emissions. This partly explains the higher concentration of ozone in rural rather than urban areas. Lower concentrations are also generally

found in urban areas as ozone reacts with nitric oxide from exhaust fumes to form nitrogen dioxide.



S2. Average summer hourly ozone concentrations (ppb), 1995

The concentration of ozone reflects this urban and rural divide, with the southern half of the Region being affected by its proximity to mainland Europe.

- **Nitrogen dioxide** – All combustion processes in air produce oxides of nitrogen. Road transport is thought to account for 50% of the total UK emissions of nitrogen oxides, the electricity supply industry about 20% and the industrial and commercial sectors about 17%. In major urban areas, road transport will account for a higher percentage.

The map illustrates the influence of the major urban areas and the road corridors with the highest levels are found within central London. Virtually all urban sites across the country exceed the UK National Air Quality objectives for nitrogen dioxide.



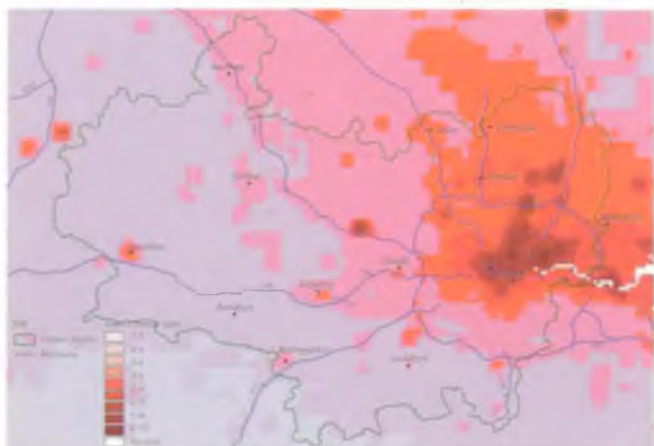
S2. Annual average hourly oxides of nitrogen concentrations (ppb), 1996

- **Sulphur dioxide** – The predominant source of sulphur dioxide is the combustion of sulphur-containing fossil fuels, principally coal and heavy oils. Sulphur dioxide dissolves in water to give an acidic solution which is readily oxidised to sulphuric acid. Cleaner fuels have



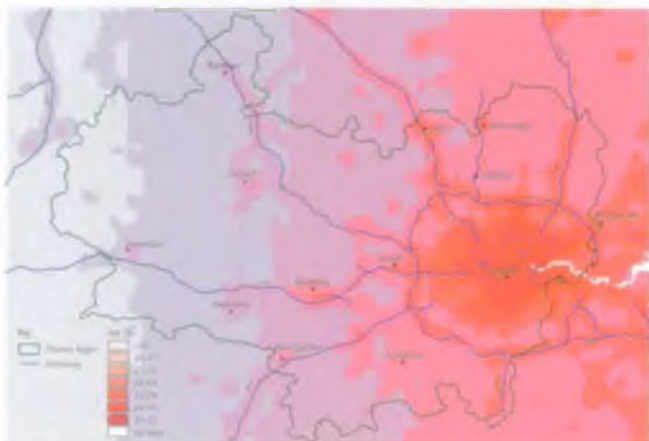
largely replaced coal in the domestic, commercial and industrial sectors and power generation is now concentrated in larger, more efficient stations, generally in rural areas.

The Region has relatively few major combustion processes compared with other parts of the country. However, the map shows higher levels of sulphur dioxide in industrial areas within London and the Thames corridor.



S2. Annual average hourly estimated sulphur dioxide concentrations (ppb), 1996

- **Particulates** – Particulates in the atmosphere are composed of a wide range of materials arising from a variety of sources. These are: primary particles, arising from combustion sources (mainly road traffic); secondary particles, mainly sulphate and nitrate formed by chemical reactions in the atmosphere; and coarse particles, suspended soils and dusts, sea salt, biological particles and particles from construction work.



S2. Annual average hourly particulate matter (PM<sub>10</sub>) concentrations (ug/m<sup>3</sup>), 1996

There is a significant difference in levels between the west and east of the Region. Closer proximity to mainland Europe makes a contribution to secondary particles, which explains the higher background concentration within the east of the Region.

Concentrations also clearly follow the road network within the east of the Region.



*Emissions of all pollutants measured since 1990 have fallen across the Region. However, levels of nitrogen oxides may present a particular problem in the future with predicted increases in road traffic. The relatively high concentrations of particulates and ozone in the Region are partially a result of the proximity of mainland Europe.*

Source : DETR & NETCEN

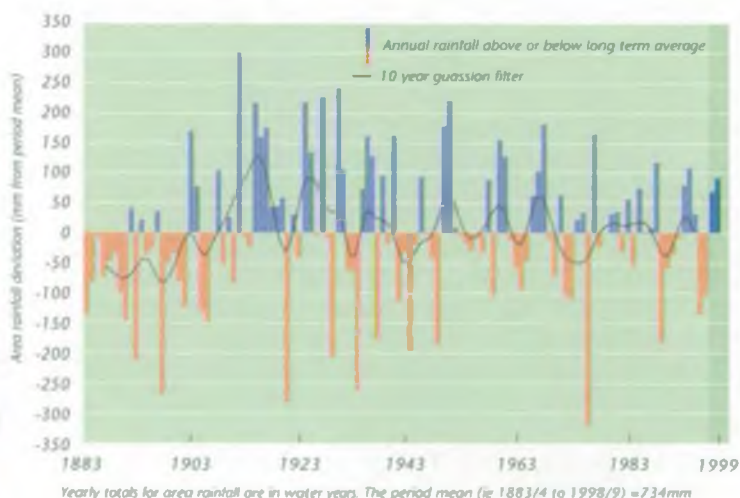


### INDICATOR S3.

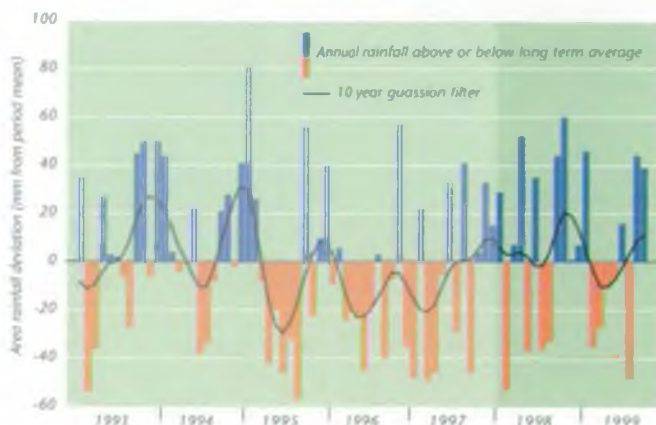
#### Quantity of Rainfall

Following two years of below average rainfall, the past couple of years have seen an increase in the amount of precipitation across the Region. This has helped to restore the low river and groundwater levels across the Thames Basin presented in the previous report (see indicators S5 and S10). The variation in total rainfall over the last decade is not unusual when compared with historic data sets presented in the graph and cannot be definitely attributed to climate change.

S3. Rainfall in the Thames Region, 1883-1999



S3. Monthly rainfall in the Thames Region, 1993-1999



The potential effects of climate change may lead to a change in the nature of rainfall across the catchment, with winters becoming wetter and summers drier. Shorter and heavier downpours may increasingly become the normal rainfall pattern for the catchment if climate change begins to affect our weather (see indicator P1).



The total amount of rainfall has increased during the past two years to above the long-term average. However, it is fully expected that rainfall levels will continue to fluctuate, as they have historically, over the next few years.

Source: Environment Agency & Meteorological Office



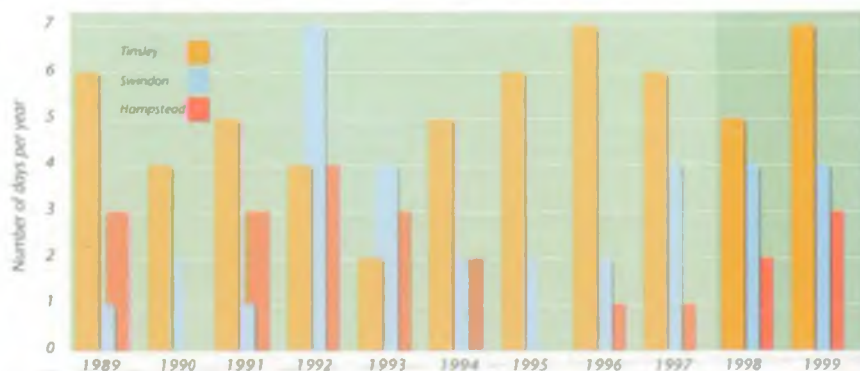
#### INDICATOR S4.

##### Number of Heavy Rainfall Events

Rainfall frequency and intensity have a direct effect on flooding incidents. We need to look at long-term trends and patterns of rainfall which may create new challenges for the management of flood risk in the Region. The graph shows the number of heavy rainfall events (over 20 mm in a day) in three example locations: Swindon, Tinsley and Hampstead. Since the publication of the last report, monitoring at the Gatwick rain gauge has stopped and we have included Tinsley instead, located within a few miles of Gatwick. This will provide comparable data in the future.

The degree of flooding caused by these heavy rainfall events or storms will depend on the permeability of the ground and river levels at the time of the rainfall and therefore may not be directly associated with specific flooding events. We need to look at long-term trends and patterns of rainfall, which may create new challenges for the management of flood risk in the Region.

S4. Number of days per year with rainfall above 20mm, 1989-1999



The number of heavy rainfall events is likely to continue to be erratic. This indicator should provide a useful long-term reference to monitor the potential impact of climate change. This information will in turn be used to influence the Agency's management of flood risk in the future.

Source: Environment Agency & Meteorological Office



#### INDICATOR S5.

##### Quantity of River Flows

The quantity of river flows is closely linked to rainfall (see indicator S3). The last two years have seen an increase in the total amount of rainfall across the Region. This is mirrored in the mean flows for all the monitoring sites during the past two years. For all of the sites highlighted, the flows recorded in 1999 are comparable to those monitored in the pre-drought conditions of 1994-95. The low flows in rivers during periods of drought can have a number of environmental effects, including impacts on fisheries and aquatic habitat and water quality as well as reducing the volume of water available for abstraction and navigation.

#### S5. River flows in the Thames Region, 1993-1999

River Lee at Feildes Weir (Naturalised) 1993-99



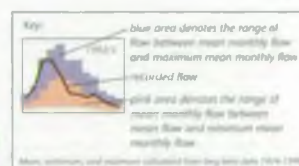
River Thames at Eynsham (Naturalised) 1993-99



River Kennet at Theale 1993-99



River Thames at Kingston (Naturalised) 1993-99





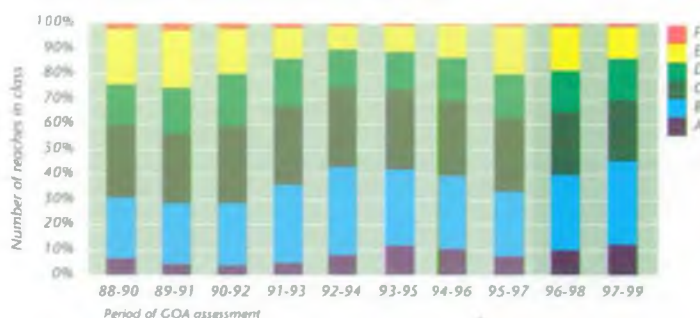
Naturalised river flows are used for the River Thames at Eynsham and Kingston, and the River Lee at Fieldes Weir. The flow in the rivers at these sites is greatly affected by public water supply abstractions (see indicator P8). The 'naturalised' flow is, effectively, the river flow upstream of these local abstractions.



*Future trends of river flows are largely reliant on the amount of rainfall received across the Region. Whilst rainfall levels have increased during the past two years (see also indicator S3), they will continue to fluctuate over time.*

Source: Environment Agency

S6. Thames Region chemical GQA results, 1988-1999



Over the last two years rainfall has increased significantly. This has in turn helped to restore water quality to pre-1995 levels. During this period 24% of reaches improved their grading, whereas only 6% fell in quality.



*Chemical GQA has improved over the last two years and further changes could be seen with enhancements to current discharges. This could, however, be masked by fluctuations in rainfall across the Region.*

Source: Environment Agency

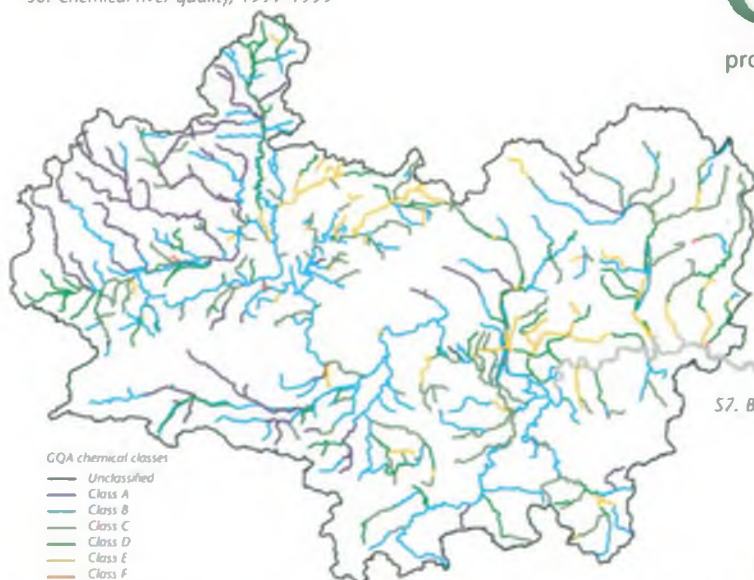


#### INDICATOR S6.

##### Chemical River Water Quality

The General Quality Assessment (GQA) scheme is used to assess the quality of rivers, to monitor trends over time and to compare rivers in different areas. The general chemistry component of the GQA is made up of six grades (A to F) defined by standards of dissolved oxygen, biochemical oxygen demand and total ammonia.

S6. Chemical river quality, 1997-1999



Chemical river quality showed a marked increase between 1990 and 1995. This is due to two main factors: firstly a significant improvement in the quality of specific discharges to the Thames and its tributaries (see indicator P10); and secondly, a return to average flow conditions for the catchment as a whole following the 1989-91 drought (see indicator S5). Between 1995 and 1997 river quality deteriorated markedly. This was almost entirely due to the drought conditions, which grew in intensity after 1995, with flows in 1997 being some of the lowest on record (see indicator S5).



#### INDICATOR S7.

##### Biological River Water Quality

The biological assessment of river water quality provides a broad measure of pollution and is based on monitoring invertebrates which live on the river bed. The graph shows the results for the biological assessment of our rivers in 1997. While the majority of rivers are classed as 'very good' or 'good', poorer water quality is seen around urban areas and below significant discharges.

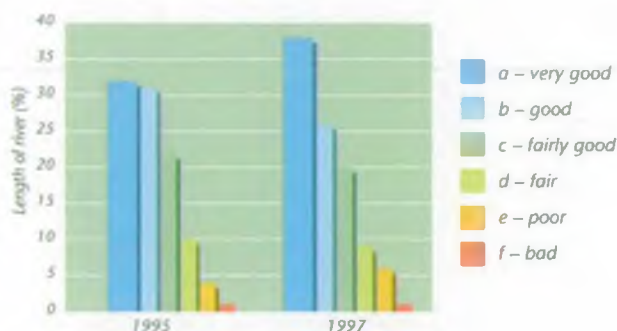
S7. Biological river water quality, 1997





Improvements in biological river quality since 1995 reflect improvements in the quality of discharges. Reductions in biological river quality result from low flows which reduce the dilution of discharges (see indicator S5). When those rivers suffer extreme low flows with drying out, there is a high impact on the flora and fauna, which will take time to recover.

S7. Biological river water quality, 1995 and 1997



Updated information on biological GQA will not be available until July 2001, and we have therefore not been able to update this indicator since the last State of the Environment Report. From 2001, the collection of biological data will be altered to produce results on an annual basis. Critical monitoring sites (about 10% of current sites) will be monitored annually, with a number of additional sites measured on a three-year rolling programme (about 30% of current sites).



*We have not been able to update this indicator since the last report therefore no trend has been identified.*

Source : Environment Agency



#### INDICATOR S8.

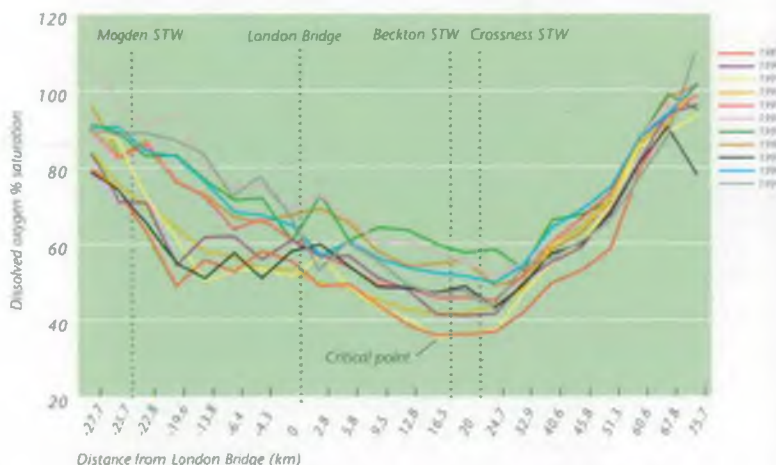
##### Tidal Thames Water Quality: Dissolved Oxygen

Dissolved oxygen is one of the main parameters used in assessing the chemical water quality of the tidal Thames (below Teddington). It is also a key component for assessing compliance with Regional water quality standards. During the summer, when freshwater flows are low and river temperatures are high, water quality in the upper and middle reaches of the tideway is increasingly influenced by the discharges from the major sewage treatment works (STWs).

We have an Operating Agreement with Thames Water which requires improved effluent quality at the major tideway STWs during much of the summer. This normally ensures that background dissolved oxygen levels are satisfactory. However, discharges from London's combined sewer overflows (CSOs) following rainfall can result in

severe depletion of river oxygen levels. When this occurs, the Thames Bubbler or Vitality are deployed to inject oxygen into the water at critical locations (see indicator R5). The change in dissolved oxygen levels in the tidal Thames is shown in the graph.

S8. Dissolved oxygen profile in the Tidal Thames, May – September mean, 1989-1999



*Dissolved oxygen levels in 1996-99 continued to follow the underlying trend of previous years.*

Source: Environment Agency



#### INDICATOR S9.

##### Radiation Levels in the Vicinity of Nuclear Sites

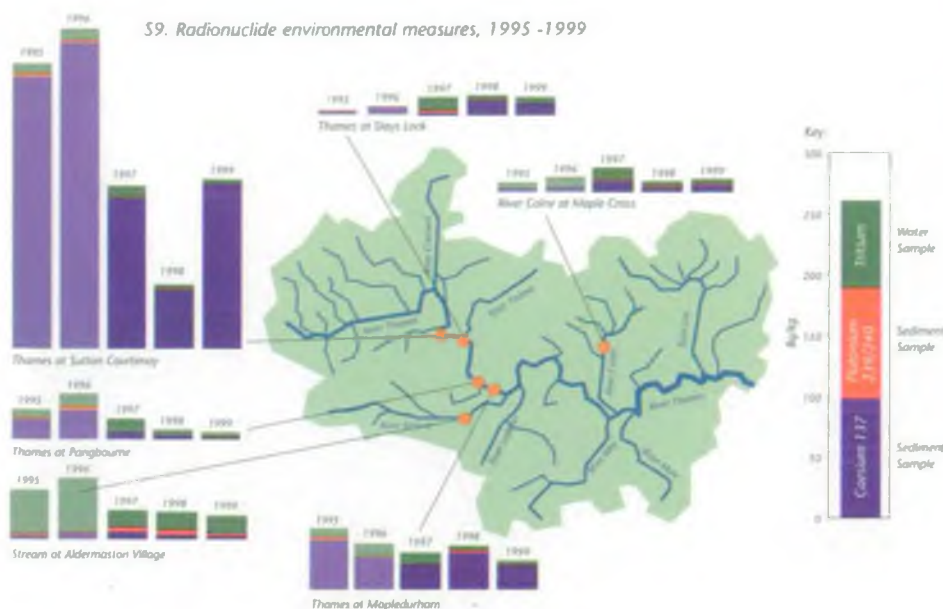
We are responsible for regulating industrial and other uses of radioactive substances and the disposal of radioactive waste. This duty is performed within the framework of internationally accepted standards of radiation safety for members of the public. The standards are translated into statutes and Government policies, which we enforce. We also have powers to require users to minimise the amounts of radioactive waste produced and to dispose of wastes by the most appropriate means. In this way the resulting radiation doses to members of the public are kept very low.

There are six nuclear sites within the Thames Region and approximately 200 other users disposing of radioactive waste. Many sites send wastes for handling at other locations in addition to local disposals to sewers, the atmosphere or rivers. Many large hospitals make discharges to sewers where the waste receives treatment before being discharged to rivers.

We have a programme of environmental monitoring designed to ensure the acceptability of the discharges made by nuclear sites. Data from this programme is shown on the map. In a few cases it is possible to detect small quantities of radioactivity in environmental media. For the



S9. Radionuclide environmental measures, 1995-1999



INDICATOR S10.  
Quantity of  
Groundwater

Groundwater is an essential source of high quality water for public and private domestic supplies, and for some industrial uses. It provides over 40% of public supply in Thames Region as well as contributing to the flow of many rivers particularly in the upper catchment (see indicators S5, S12 and P8). The effect of prolonged dry weather can be seen very clearly in groundwater levels (see indicator S3). The problem has been particularly acute in the chalk

Thames at Sutton Courtenay, where caesium-137 has been detected in river sediments, both discharges and concentrations in sediments of this radionuclide have decreased in recent years. Calculations of radiation exposure to members of the public use additional information on the length of exposure to radioactivity in the environment and their pattern of consumption of local foodstuffs. The radiation doses that result are very small and well below the appropriate limit.

aquifer in the north east of the Region, as demonstrated by the record for Therfield Rectory (see indicator R9).

All three sites have seen an improvement in groundwater levels since the last report. Whilst these levels have not recovered to those of 1995 they have significantly improved compared to the low levels experienced in 1997.



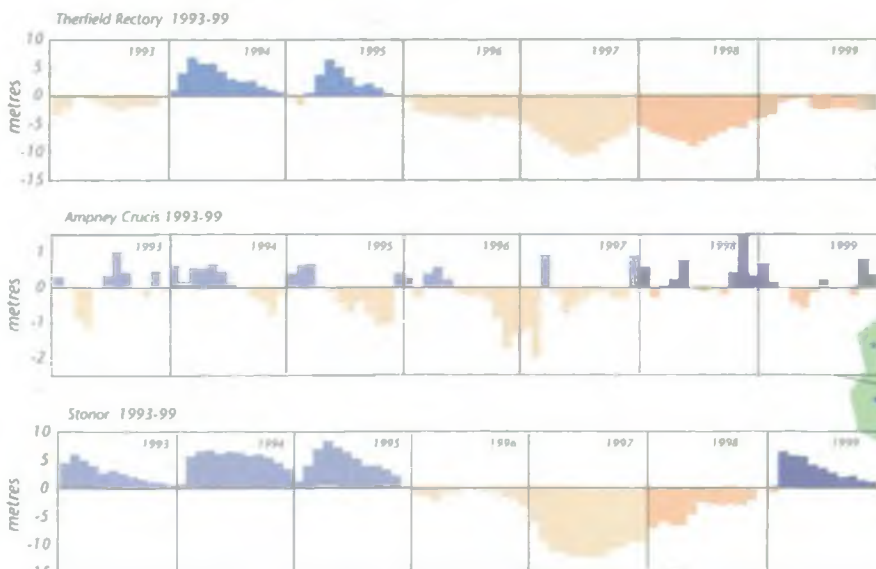
Future trends in groundwater levels are largely reliant on the amount of rainfall across the Region. Whilst rainfall levels along with groundwater levels have increased during the last two years (see indicator S3), they will continue to fluctuate over time.

Source: Environment Agency

The concentration of radionuclides detected continues to be very small.

Source: Environment Agency

S10. Groundwater levels in Thames Region, 1993-1999



Bars show groundwater level (metres) above (blue) or below (red) monthly long term average. Long term average is calculated between 1974-1998





## INDICATOR S11.

**Groundwater levels in London**

London is located at the eastern end of the London Basin Syncline, one of the major geological structures in south east England. Present throughout this trough-like structure is the Chalk, the most extensive aquifer in Britain, overlain firstly by sands and then, predominantly, by the London Clay.

Since abstraction from the aquifer started nearly two centuries ago, there have been major changes in groundwater levels and hence the state of groundwater storage. Increasing abstraction, mainly for commercial and industrial purposes in the nineteenth and early twentieth centuries, led to progressive decline of levels reaching a maximum fall of 90 m in the centre of the basin. Starting in the Second World War and continuing ever since, abstractions have declined, leading to a reversal of the downward trend in 1965-70, to a rise which continues to this day at up to 2.5 m per year.

Whilst levels are now rising, the earlier decline in groundwater levels caused dewatering of a large volume of the aquifer over substantial areas. This led the Metropolitan Water Board to experiment with the idea of artificially recharging this dewatered volume to store water instead of building another surface reservoir. The recharge water is treated mains water, a surplus of which is available in the existing distribution system at times of seasonally low demand.

Today's rising groundwater presents a threat to tunnels and building foundations built into the dewatered aquifer, particularly in central London. Controlling the rise by pumping offers a potential resource, which, the Agency considers, could produce 30-50 Ml/d of additional water. Thames Water have embarked on a programme to utilise it as far as possible but private, smaller abstractors are also showing interest and may have a part to play in filling in around and between Thames Water's larger abstractions. Some of the water is of poor quality and may be more suited for non-potable use (e.g. cooling and toilet flushing), rather than for public water supply requiring expensive treatment.



*The past two years have continued to see water levels rising. Levels in central London are now at their highest since the 1890s. The Agency is working closely with Thames Water, the Corporation of London and other interested organisations through the GARDIT project to develop a longer-term solution to this problem.*

Source : Environment Agency



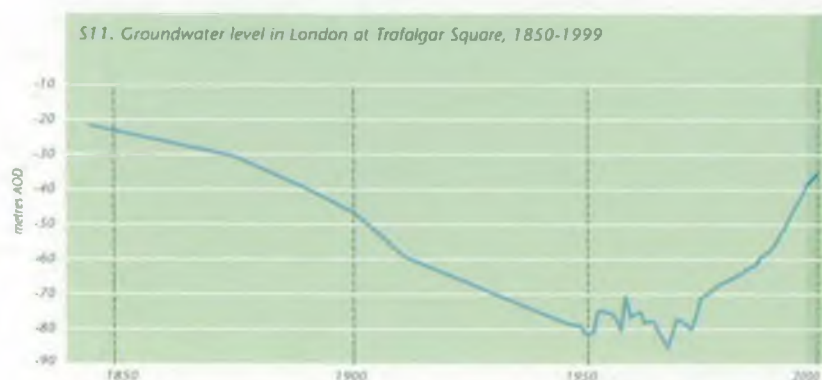
## INDICATOR S12.

**Groundwater Quality: Concentration of Nitrates**

In order to help manage protection of groundwater from pollution Thames Region has set up a Regional groundwater quality monitoring network comprising approximately 500 private and public sources.

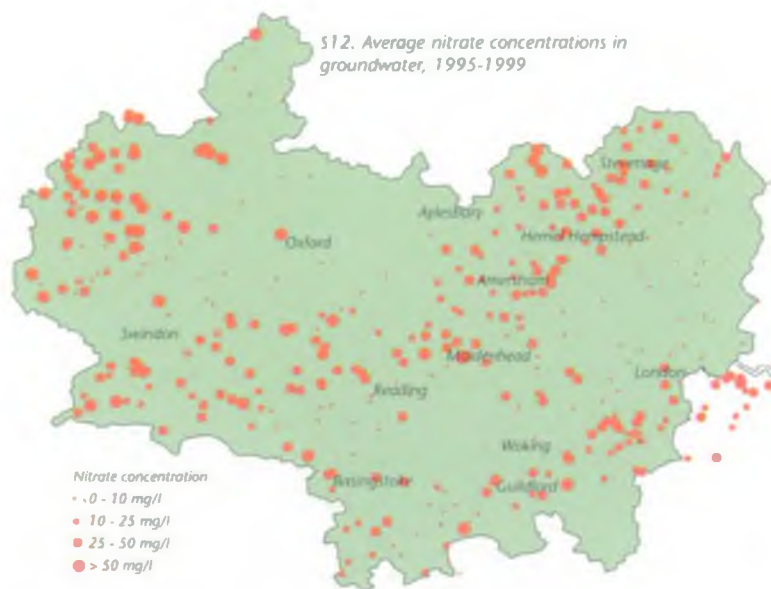
Generally the groundwater in Thames Region is of good quality. However, one of the most problematical and widespread groundwater contaminants in the Region is nitrate. Nitrate is regularly found in groundwater in some areas at concentrations exceeding the drinking water limit as established in the European Commission's Directive on Drinking Water (80/778/EEC). Although agriculture is believed to be the major contributor towards nitrate presence in groundwater, other sources of nitrate include waste (particularly through old landfills, septic tanks and leaking sewers), contaminated land sites and atmospheric emissions from vehicles and energy production plants (i.e. power stations).

The map shows the average concentration of nitrate across the Agency's groundwater quality monitoring network between 1995 and 2000. The concentrations show a strong correlation with geology. Concentration class limits of 10, 25 and 50 mg NO<sub>3</sub>/l were selected because the natural content of groundwater is up to 10 mg



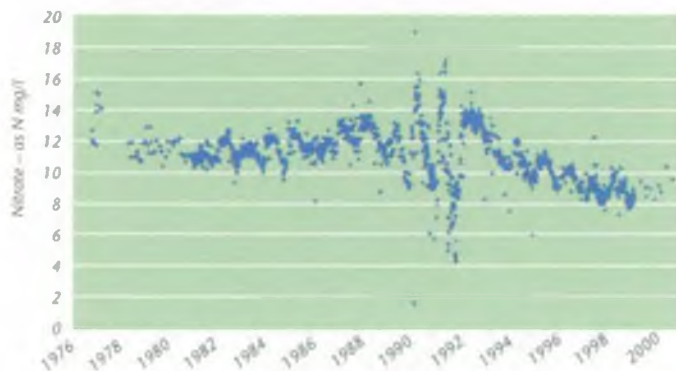
The technique was explored further in the 1970s and 1980s leading eventually to Thames Water's North London Artificial Recharge Scheme which is now in operation. In broad principle the scheme will be used to meet drought deficiencies in the surface water resources supplying London. Between major abstraction operations, the aquifer will be recharged by a combination of natural recovery and artificial recharge.





$\text{NO}_3/\text{l}$ , and because a guide level of 25 mg  $\text{NO}_3/\text{l}$  and a maximum admissible concentration of 50 mg  $\text{NO}_3/\text{l}$  are given in the Drinking Water Directive.

S12. Nitrate concentrations at the Old Chalford public water supply spring, 1976-2000



Nitrate concentrations in groundwater across Thames Region are continuing to increase slowly. However,

there has been one success story at Old Chalford Public Water Supply spring where nitrate concentrations are starting to decrease. This is believed to be a result of the Nitrate Sensitive Area scheme, which has been in operation at Old Chalford since 1990.

Source: Environment Agency



### INDICATOR S13.

#### Numbers of Salmon Returning to the River Thames

There is evidence that the River Thames once supported a healthy salmon population with catches landed and sold at the Billingsgate fish market. However, as London grew as a city during the Industrial Revolution, pollution of the tidal river contributed to the extinction of the salmon population by 1833.

Happily the population showed signs of returning during the 1970s and the Thames Salmon Rehabilitation Scheme began in 1979 with the long-term objective of restoring a self-sustaining population to the river. Since then good progress has been made and every year adult

salmon pass through London on their journey upstream to find suitable areas to lay their eggs.

In 1986 the Thames Salmon Trust was formed to provide finance for the scheme and has been a great success with more than £1 million raised to date. The Rehabilitation Scheme includes fish rearing and stocking, construction of fish passes and monitoring programmes to evaluate progress.

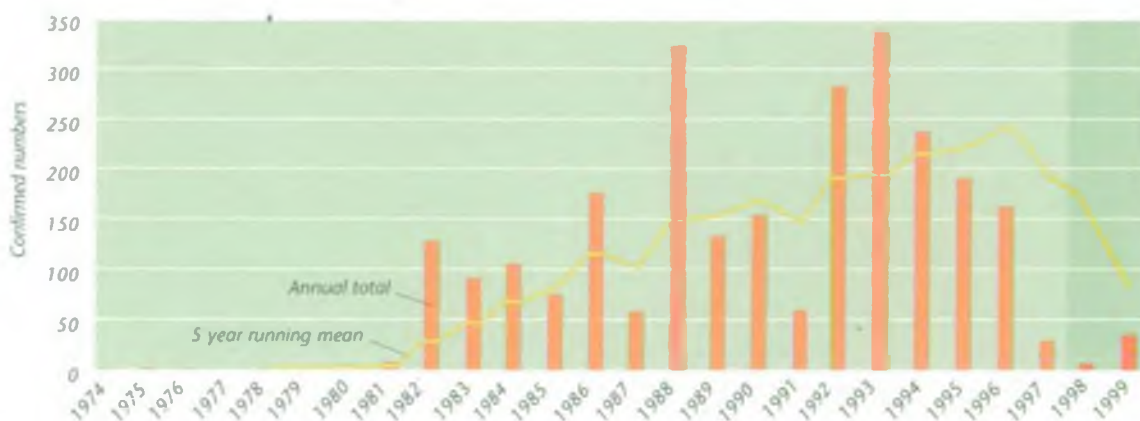
The confirmed minimum number of returns is based on fish taken in traps, rod and line, mortalities and electro-fished. This probably represents 60-70% of the total numbers. The presence of salmon in the river is an excellent indicator of water quality in the River Thames and all the way through London.



Over the past few years the Thames has seen a steady decline in the number of returning salmon. A slight recovery in numbers seems to have taken place in 1999.

Source: Environment Agency

S13. Number of salmon returning to the River Thames, 1974-1999





## INDICATOR S14.

## Distribution of Key Biodiversity Species

The Environment Agency's duties include the promotion and furtherance of the conservation of flora and fauna which are dependent on an aquatic environment and land associated with inland and coastal waters. We therefore seek to protect and enhance habitats and species through our day-to-day activities and responsibilities and by working in partnership with other organisations.

The species identified by the UK Biodiversity Group (see section 4.4) require special attention and consequently four of these, namely Otter, Bittern, Greater Water-parsnip and Scarce Chaser have all been chosen as indicators in this report. We also chose Club-tailed Dragonfly, which, although is not included on the UK list, is a very localised species with important populations in Thames Region. Redshank, which was included in the previous report, has not been included in this update as we have not received any updated information on its distribution. This species is, however, an excellent indicator of riparian and floodplain land-use change and is a species for which much habitat enhancement work is currently being, and will continue to be, done. Hopefully, it will again be included in future reports when more data should be available, such as from the forthcoming breeding waders survey by the British Trust for Ornithology.

## Otter

The European Otter is a large, semi-aquatic mammal, reaching up to 1.2 metres in length. It is an important indicator of good quality in rivers and wetlands, as its presence indicates a relatively pollution-free environment with plentiful fish stocks and good riparian habitat that also benefits other wildlife.

S14. Distribution of Otter since 1995 by LEAP area



It was formerly widespread throughout the UK but underwent a rapid decline between the 1950s and 1970s and also declined over much of its western European range. This decline was primarily due to organochlorine pesticides polluting watercourses, with other possible secondary factors including hunting, impoverished and degraded bankside habitats, incidental mortality such as road deaths and disturbance.

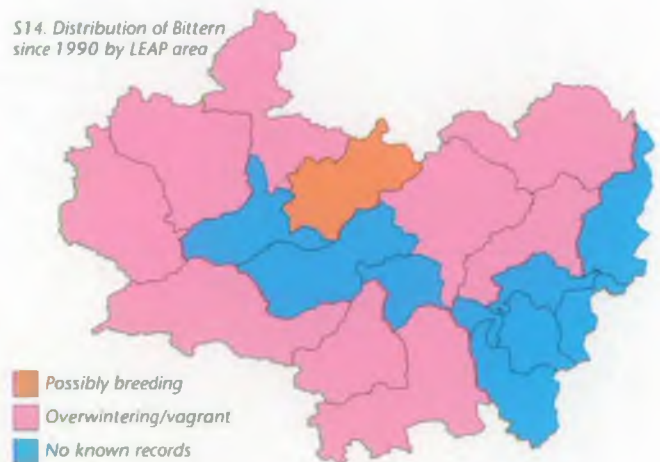


Recent records suggest that the decline in the UK has now halted and the Otter population is recovering, with sightings being reported in formerly occupied river catchments. In Thames Region, Otters probably bred in the Windrush and Upper Lee catchments during the 1990's and transient Otters have been recorded with increasing frequency in several other catchments. Recent independent releases by The Otter Trust are believed to have artificially bolstered the population in the Upper Thames and there is evidence that these animals are dispersing naturally.

## Bittern

The Bittern is a large, brown, heron-like bird that lives in dense reedbeds and feeds principally on fish and amphibians. It is a localised and rare breeding species, confined almost entirely to lowland marshes dominated by common reed in Norfolk, Suffolk and Lancashire.

S14. Distribution of Bittern since 1990 by LEAP area



The UK population peaked at 70 pairs in the 1960s when it bred in eight counties, but declined to only 15 or 16 males in 1994. Numbers are boosted in winter by continental migrants. The decline has been largely caused by long-term loss of suitable reedbed habitat through inappropriate management and fragmentation, decline in food availability, small population size and possibly through the degradation of their habitat through pesticide and heavy metal pollution.



Since the last report, and for the first time in many years, Bitterns are believed to have bred in the Thame LEAP area in 1999. This took place in a less than optimum site although breeding did not occur in the following year. In recent years, between six and seven adult Bittern have overwintered in the Lee Valley Park, making this a nationally important site for overwintering Bittern. Overwintering and vagrant individuals have also been recorded in a number of other LEAP areas. The restoration of existing reedbeds and the creation of suitable new reedbeds are contributing to the halt in the decline and the increase in numbers of this species on a national scale and it is hoped that reedbed management and creation in Thames Region will soon reap benefits for this species.

### Greater Water-parsnip

Greater Water-parsnip is a large member of the Umbelliferae plant family that can grow up to 2 metres in height. It was a species of fens and swamps but following the drainage and reclamation of fens in the UK, it is now most often found in drainage ditches in the south and east of England. Further decline has been brought about by the frequent clearing and over-engineering of ditches, exposure to prolonged heavy grazing and the dereliction of ditches leading to scrub invasion.

S14. Distribution of Greater Water-parsnip since 1980 by LEAP area



Although it has been recorded in eight of the 19 LEAP areas, since 1980 it actually has a very localised distribution and has not been found at previously known sites in very recent surveys.

### Club-tailed Dragonfly

This medium-sized, yellow-green and black dragonfly with a noticeable club-shaped tail is found along slow-flowing

ivers or in adjacent woodlands. It is a nationally scarce species with an extremely local distribution, but can occur in very large populations where the habitat is suitable. Threats to their habitat come from water pollution, excessive dredging and loss of woodland within easy reach of the river.

S14. Distribution of Club-tailed Dragonfly since 1990 by LEAP area



In Thames Region, there are strong populations on the River Thames from Lechlade to below Windsor and smaller populations also occur in the Kennet and Loddon LEAP areas. There is also a relatively recent record for the Wey LEAP area. It is not included in the UK Biodiversity Action Plan (BAP), but is included in this report because of the important populations that occur in this Region. It has also been included in the Agency's Thames Region Biodiversity Strategy (see section 4.4).

### Scarce Chaser

The females and immature males of this dragonfly species are a vivid orange in colour, while the mature males have powder-blue abdomens. It occurs in river floodplains and

S14. Distribution of Scarce Chaser since 1990 by LEAP area



water meadows and threats include shading of habitat, over-abstraction of water, inappropriate river management and water pollution. It is classified as 'Rare' in the 1987 British Red Data Book of Insects and is classified as a 'Species of Conservation Concern' (the 'long' list) on the UK BAP.



*Although locally abundant where it does occur, this species is scarce throughout its range in southern and eastern England. Current populations appear to be stable and have expanded in some locations. The only confirmed breeding population in Thames Region is on the River Wey in Surrey, which means there is no change in its distribution from the previous report.*

Source: Environment Agency



#### INDICATOR S15.

#### Compliance with the Bathing Waters Directive

The mandatory standards set by the EC Bathing Waters Directive (76/160/EEC) are to protect the public and avoid sewage contamination of bathing waters. Thames Region had 14 EC designated bathing waters in 2000.

The Environment Agency plays an important role in the implementation of the Directive. The bathing season runs from 15 May to 30 September and sampling begins two weeks before the start of the season. A minimum of 20

samples is taken at regular intervals to monitor the quality of each of the 14 designated bathing waters presently within the Region. All samples are taken at predetermined points off the beach where the average density of bathers has traditionally been highest.

Each sample is then analysed and compared against the standards set out by the Directive to give an indication of the extent to which bathing water is contaminated by sewage. In order for bathing water to comply with the Directive, 95 per cent of samples taken must meet these standards. Samples are analysed for faecal streptococci for Blue Flag and Seaside Award scheme purposes.

Whilst all of the issues passed the required standards in 2000, the Serpentine in Hyde Park failed to meet the EC Directive standards in 1999. Its failure is difficult to explain, as there are no consented discharges into the Serpentine. Two sources of contamination have been identified as possible contributing factors to these failures and an action plan has been implemented to minimise contamination in the future.



*Designated bathing waters are getting cleaner. The trend is for increasing consistency of compliance, which is when a bathing water site has complied for three consecutive years.*

Source: Environment Agency

S15. Compliance with Bathing Waters Directive, 2000







## INDICATOR S16.

### Number of Days when Air Pollution Exceeds National Objectives

The Government's Air Quality Strategy sets air quality standards for the protection of human health. The standards are based on the best available scientific and medical advice. The standards should not be regarded as a sharp dividing line between levels of pollution that pose no threat to health and levels that pose a significant threat to health. This indicator measures the number of days per monitoring site on which pollution levels for a number of substances were above the National Air Quality Strategy standards.

The influence of emissions from mainland Europe on ozone and particulate levels in the southern half of the Region, particularly in rural areas, makes this an international issue. The outcome of the EC negotiations on a new EC Ozone Directive, together with the commitments in the United Nations Economic Commissions for Europe (UNECE) Protocol, will determine what can be achieved in terms of ambient levels of ozone in the UK. The Government considers particulates to be one of the most important challenges for the period covered by the Air Quality Strategy, this includes reducing concentrations and understanding the health effects. There is currently no clear trend appearing for both nitrogen dioxide or sulphur dioxide, although with the introduction of cleaner fuels, failures for sulphur dioxide are expected to decrease.

The performance of this indicator will also be linked closely to that of P6 and P11 in the future.

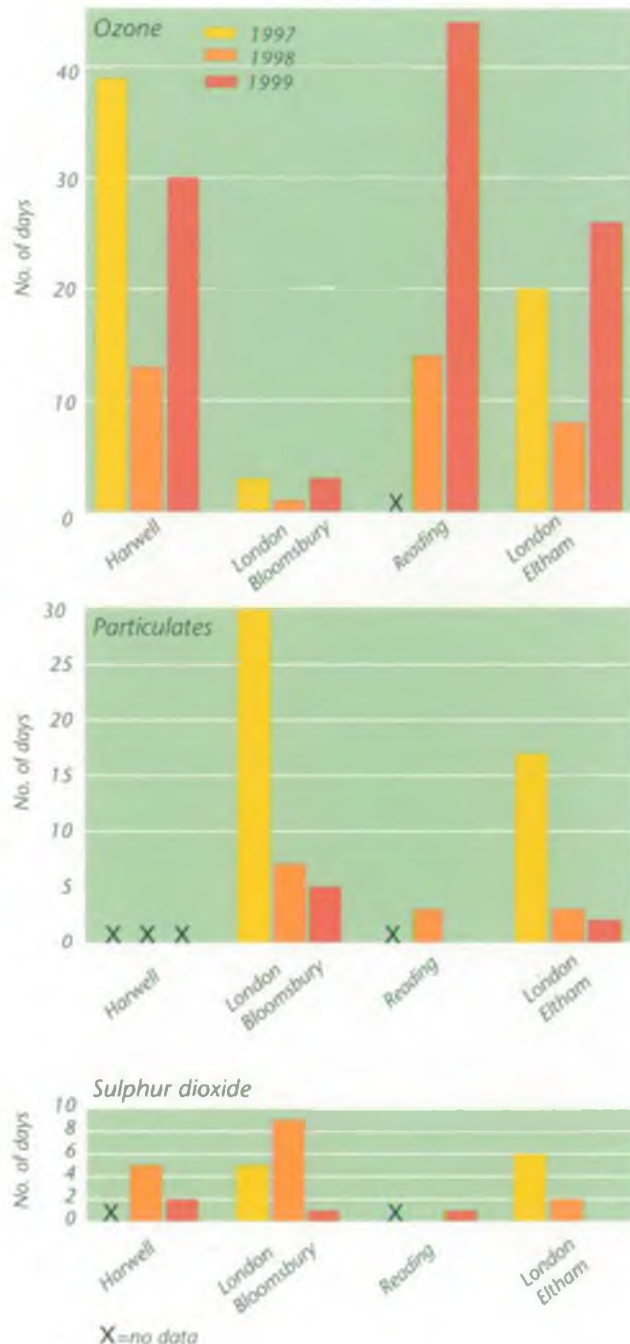


Data from monitoring stations across the Region for all substances do not identify any clear trends at present.

We hope to provide additional information for a wider range of substances in the next report.

Source: NETCEN

S16. Number of days when air pollution exceeds national objectives, 1997-1999



### 3.3 PRESSURES ON THE ENVIRONMENT

The pressures on the environment arise from both controllable and non-controllable sources. Some pressures relate to geographic position, the nature of the countryside, population density and distribution. Some pressures arise directly from controlled releases of substances to the atmosphere, to the aquatic environment, and into and onto land. Pressures also arise from the abstraction of materials from the environment, most notably – but not exclusively – that of water. We do not control all these activities solely, or even jointly.

The following six categories are used as a framework for assessing pressures, or 'stresses and strains', on the environment:



**Natural forces:** these include climate variations such as the extent and rate of change in sea level, changes in weather and rainfall patterns and temperature extremes. They also include other natural pressures, such as radiation from naturally occurring radon, which may require action to mitigate or ameliorate their potential effects.



**Societal influences:** these are perhaps the greatest and most embracing pressures on the environment. They range from the size and distribution of the population, the number of households, the pattern of energy consumption, the nature and frequency of transport, planned changes in land use, recreational practices and activities, plus changes in public attitudes and perceptions of environmental matters.



**Abstractions and removals:** these include the removal of water, minerals, and materials, such as peat (and perhaps even the cropping of trees, which cannot rapidly be replaced), where the quantities, the processes involved, the timing, or the rate of removal are sufficient to require some form of control.



**Usage, releases and discharges:** these include emissions from point sources to the environment plus the cumulative input from diffuse sources such as fertilisers and pesticides. They are measured by the quantity used or discharged with regard to their potential environmental impact.



**Waste arisings and disposals:** these include the by-products of industry and society including solid and liquid wastes. The creation and disposal of such materials creates pressures on the environment, however the manner in which they are managed (reused and recycled) can provide an additional resource.



**Illegal practices (accidents and non-compliance with regulations):** these include pollution incidents affecting air, land and water; fly-tipping; organised environmental crime; and recorded breaches of compliance with existing environmental licences.

The key pressure indicators included in this report are categorised by this framework.

#### Key Pressure Indicators







P1	Long-term change in temperature	
P2	Rate of water leakage	
P3	Rate of water demand	
P4	Projected housing development	
P5	Number of planning applications	
P6	Passenger transport and vehicle traffic	
P7	Boat traffic on the non-tidal Thames	
P8	Volume of water abstraction and consumption	
P9	Demand for aggregates	
P10	Number of sewage treatment works compliant with consent	
P11	Emissions to air from major industries	
P12	Waste production and management	
P13	Volume of waste to landfill	
P14	Number of water pollution incidents	
<b>New indicator:</b>		
P15	Water levels in the River Thames	

We have introduced one new pressure indicator since the last report. This monitors the frequency of flood flows recorded at Teddington weir on the River Thames. With climate change potentially increasing the physical threat of flooding, this indicator should provide a useful longer-term data set. Since the production of the last report there have been a number of changes in recording and quantifying waste. As a result we have had to alter the previous indicators found within the report.



There are a number of potential indicators for which we still hope to have data for in the future.

Potential Pressure Indicators for the Future

- Number of contacts which need to be made when a flood warning is issued 
- Recreational use of the River Thames footpath 
- Emissions of methane to air from landfill sites 
- Emissions of CO<sub>2</sub> to air from Part A processes 
- Amount of waste transportation by mode 
- Amount of sewage sludge produced 

## PRESSURE INDICATORS



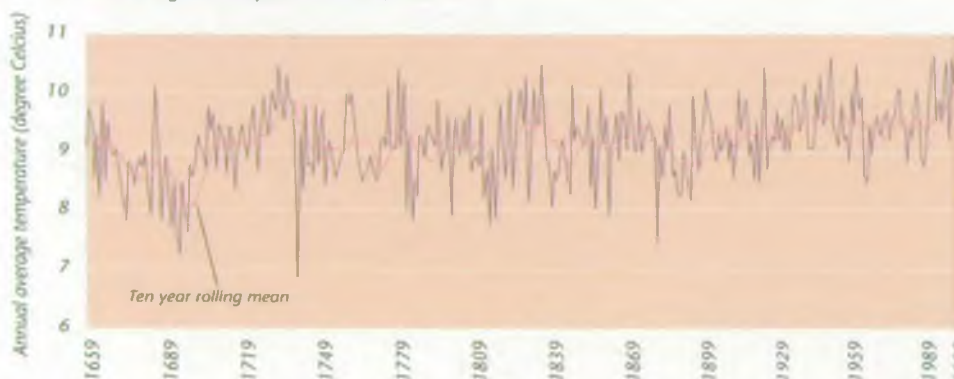
### INDICATOR P1.

#### Long-term Change in Temperature

The climate is a fundamental natural pressure on the state of the Region's environment (see section 4.10) For the purpose of this report we have continued to use the long-term records for Central England. Average temperatures for the past two years have continued to rise. In 1999 the average was  $+1.16^{\circ}\text{C}$  above the 1961-90 average, the warmest year recorded in 341 years.

The 1990s were the warmest decade on record to date. The warmest two years globally were 1997 and 1998, with the latter the warmest at  $0.57^{\circ}\text{C}$  above the 1961-90 mean. The six warmest years globally have now occurred in the 1990s. They are in descending order 1998, 1997, 1995, 1990, 1999 and 1991.

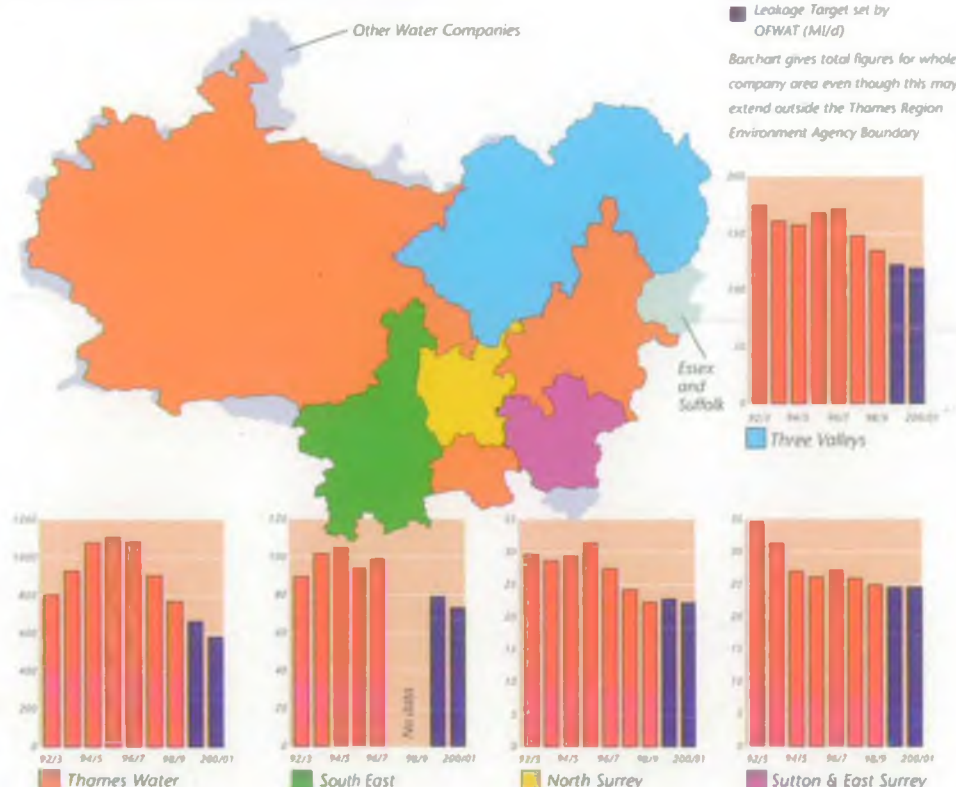
P1. Central England temperature record, 1659-1999



Whilst there is still uncertainty over the causes, the trend identified by the current dataset indicates an increase in the overall background temperature in Central England.

Source: University of East Anglia, Norwich and the Hadley Centre

P2. Water company leakage rates, 1992/93-2000/01



### INDICATOR P2.

#### Rate of Water Leakage

During the very dry

summer in 1995, leakage rates from water company pipes became a prominent issue, particularly for those companies whose leakage rates were considered to be unacceptably high. In 1997, the water industry regulator OFWAT, set mandatory leakage targets for each of the water companies.

Water companies are continuing to work towards achieving these targets

and ultimately moving towards economic levels of leakage.

Since our last report, Mid Southern Water has become part of the South East Water Company and we do not yet have data for this company.



Over the past two years all the water companies within the Region have met the leakage targets set by OFWAT. Of particular note is Thames Water who has reduced leakage levels from 1082.9MI/d in 1996/97 to 781MI/d in 1998/99.

Source: OFWAT & water companies





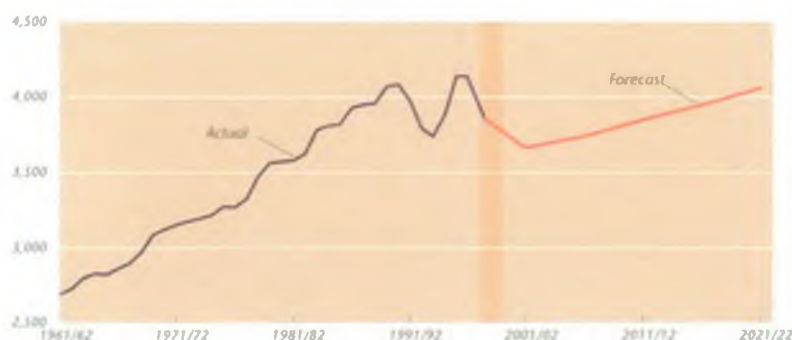
#### INDICATOR P3.

##### Rate of Water Demand

Approximately 5,000Ml are abstracted daily from rivers and groundwater to support the Region's 11.5 million population. Abstraction for public water supplies accounts for 86% of the total taken. Demand for public water supplies in the Region has risen by over 50% since the early 1960's. Recent trends highlight a number of factors influencing demand for water:

- the impact of restrictions and the drought in reducing demand during 1988-1992;
- the contrasting increase in demand during the hot, dry spell of 1995/96;
- the impact of particularly cold spells (e.g. January 1997) on leakage for water; and,
- more recently, the impacts on demand of leakage reduction by all companies within the Region.

P3. Comparison of actual and demand forecasts, 1961-2021



Future pressures on water supplies include increasing demand from new development and continuing pressures for development; underlying trends in consumption; restoring sustainable abstraction; protecting the quality of available resources; and, the potential impacts of climate change on both demands and available resources. In 1999, the water companies submitted Water Resources Plans showing how they intend to manage and develop their supply systems over the next 25 years.

Drawing on the companies' plans, the Agency's water resources strategies will provide a broad framework within which the sustainable management of water resources can be achieved, protecting the water environment and providing a flexible approach in view of the many uncertainties that face water resources. The strategies will be based on the twin track management of resources; taking a balanced view, seeking the efficient use of water whilst bringing forward timely proposals for water resources development where appropriate.



Since the last report, demand has continued to fall, mainly due to the reductions in leakage achieved by all companies. However, the companies' forecasts indicate an underlying trend of increasing per capita consumption of water. Continued progress in leakage reduction and the promotion of water efficiency to businesses and domestic users will be vital in achieving the sustainable management of water resources in the Region. OFWAT set further challenging targets for Thames Water and those for South East Water are currently under review.

Source: Environment Agency & water companies



#### INDICATOR P4.

##### Projected Housing Development

Since the publication of the last report, the Regional Planning Guidance for the South East (RPG9) has been published. The past two years have seen a continuing debate over the proposed levels of housing development across the South East Region. The DETR commissioned the *Crow Report* (1999) in the interim period to review the overall figures for housing provision and this research has been used in the publication of the Regional Guidance.

Whilst Government reduced the number of new homes to be built annually from 43,000 to 39,000 this figure still continues to reflect the increasing pressure being placed upon land within the South East Region. This indicator is linked to the rise in the area of urban land (see indicator 57). The policy to increase the proportion of housing on previously developed land will in turn raise environmental issues related to the redevelopment of potentially contaminated sites.



The recent pressure for new homes across the South East is likely to continue in the future.

Source : SERPLAN and DETR



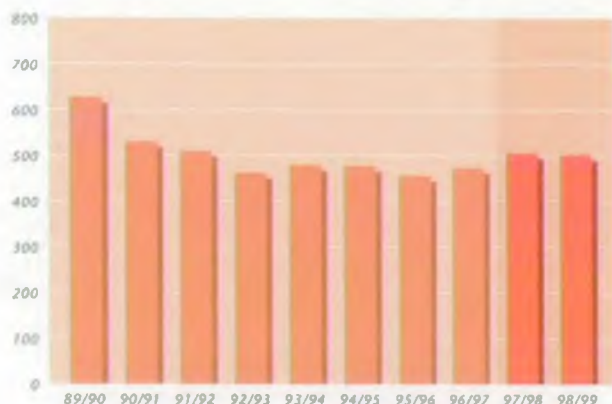
#### INDICATOR P5.

##### Number of Planning Applications

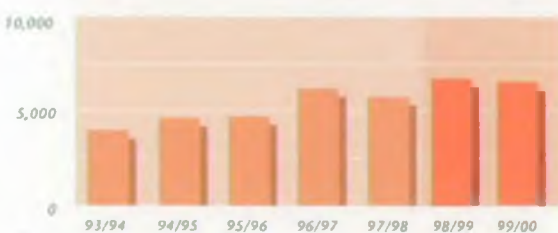
The continuing buoyant economy in the South East has led to a continual pressure for development across the Region. The Agency is a consultee for certain types of planning applications and only comments on planning applications that have a potential adverse environmental impact. In the Thames Region, local planning authorities make just over 100,000 planning decisions per annum. This is double the number of decisions made in most of our other Regions.

Since the publication of our last report, the DETR have not updated the previously available dataset on the number of planning applications on a district-by-district basis. We have therefore included a comparison against the number of planning applications being received by local government across the whole of England. Both data sets show that the number of planning applications has continued to rise. This has been due primarily to the economic confidence currently found within the development market. At present, Thames Region is involved in many of the country's large infrastructure projects, which requires a substantial input of staff time. These include the proposed Heathrow Terminal 5, the Channel Tunnel Rail Link and Inner Thames Marshes SSSI development proposals.

P5. Planning applications by district planning authorities, 1989/90-1998/99



P5. Number of Agency planning consultations, 1993/94-1999/00



The Agency is reviewing how it interacts with the planning process, with the aim of providing a more efficient and effective service for both the public and planning authorities. The first step will be the prioritisation of applications to assess the environmental risks they pose. This may have an impact on the figures used in subsequent state of the environment reports.



The number of planning applications being determined by local authorities is largely dependent on the economic climate at the time, this in turn affects the number which the Agency

comments upon. At present the market is buoyant and consequently the number of applications is at a high level. New development can also present the opportunity for environmental enhancements and may not always be a negative pressure on the environment.

Source: DETR & Agency

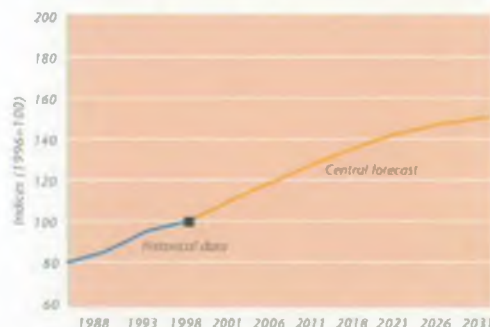


#### INDICATOR P6.

##### Passenger Transport and Vehicle Traffic

Transport exerts pressures on the environment in many ways. Road transport accounts for over 90% of passenger travel within Great Britain, and for over 80% of the freight moved. Vehicles emit many gases, particulate materials and other substances into the atmosphere (see indicators S2 and S16). This is not directly our responsibility, but we must understand the different sources and relative quantities of different chemicals in order to assess the general state of the environment. Road construction also places pressures on the environment and traffic noise is a major nuisance in some areas.

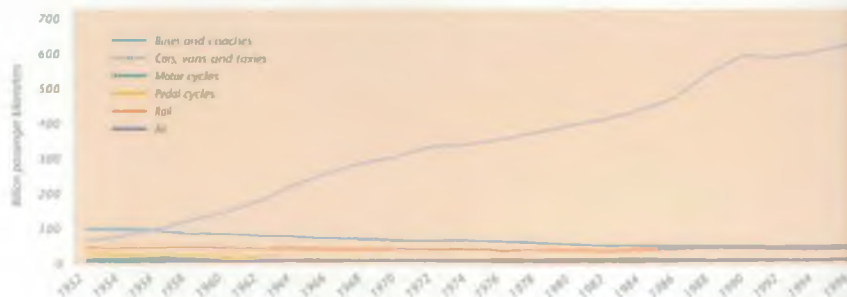
P6. Forecast of motor traffic in Great Britain, 1996-2031



The increase in vehicle movements is forecast to continue. By 2031 the DETR predict that the private use of cars and taxis will increase by 48%. Perhaps more concerning is the forecast for goods vehicles whose increase ranges from a 57% to a 105%. On average motor traffic is set to double over the next 30 years.

Current figures for traffic generation show that there has been a slight decline in bus and coach travel. Car and

P6. Passenger transport and vehicle traffic in Great Britain, 1952-1998



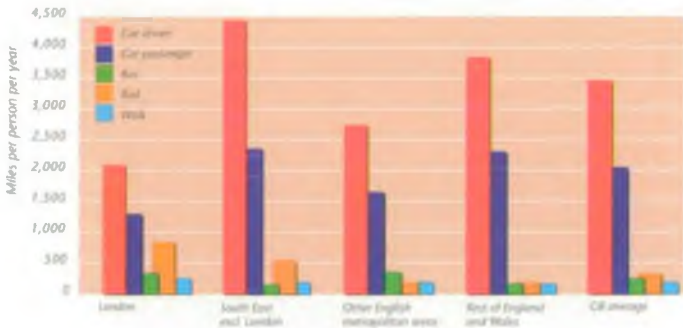


van movements continue to increase with an additional 10 billion passenger miles being created over this review period. There has been a slight rise (0.7%) in the numbers of passengers travelling by rail.

The total number of miles travelled by individuals has declined slightly since the last report. Across the South East there has been a decline of 3%, whilst across London this has been recorded at 4%. This 4% drop for London residents continues the declining trend for the past 12 years.

Compared to the previous report, the percentage use of cars per person has once again increased from 66% to 71% in London and 82% to 88% in the remaining South East.

P6. Average distance travelled per person per year by region of residence, 1996-1998



There seems to be no slowing of the trend for increased road traffic growth at present. The only noticeable decrease seems to be in the length of people's journeys, which may be due to the increasing levels of congestion found upon the road network.

Source: DETR

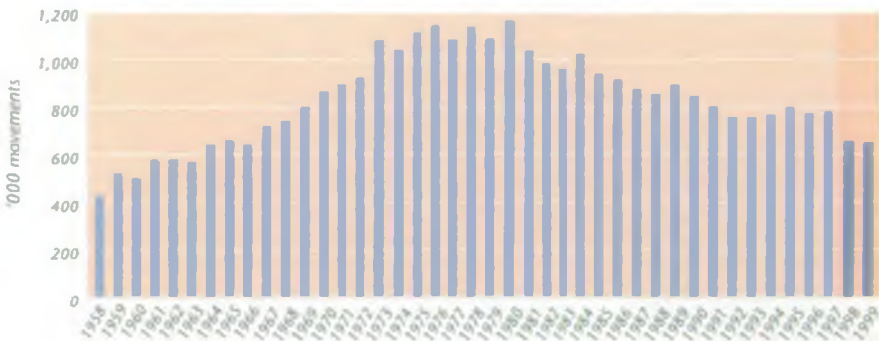


### INDICATOR P7. Boat Traffic on the Non-tidal Thames

We are responsible for navigation on 217 km of the River Thames between Cricklade near the source and Teddington Lock where the river becomes tidal. The navigational role of the River Thames has changed over time. Originally it acted as a natural trade route, but the development of the railway system in the middle of the nineteenth century led to its decline as a commercial link. Today the Thames is an important recreational asset.

The popularity of the river was at its greatest between 1973 and 1981, with a peak of 1,163,305 craft movements in 1980. Since the publication of the last report there has been a decline in the number of boat movements from 784,628 in 1997 to 655,556 in 1999. The trend indicates a

P7. Boat traffic on the non-tidal Thames, 1958-1999



decline in the usage of the River Thames navigation with the current levels of usage not being seen since 1965-66.



There has been a significant decline in the number of boat movements since 1997. Reasons for this decline in numbers are not clear and may be the result of a number of factors including cheaper holidays abroad. The Agency will be undertaking market research this year in an attempt to understand why these changes have continued to take place.

Source: Environment Agency

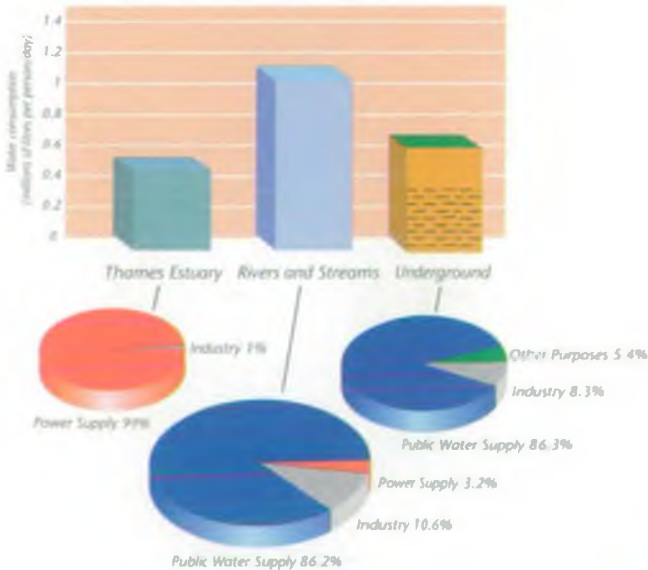


### INDICATOR P8. Volume of Water Consumption and Abstraction

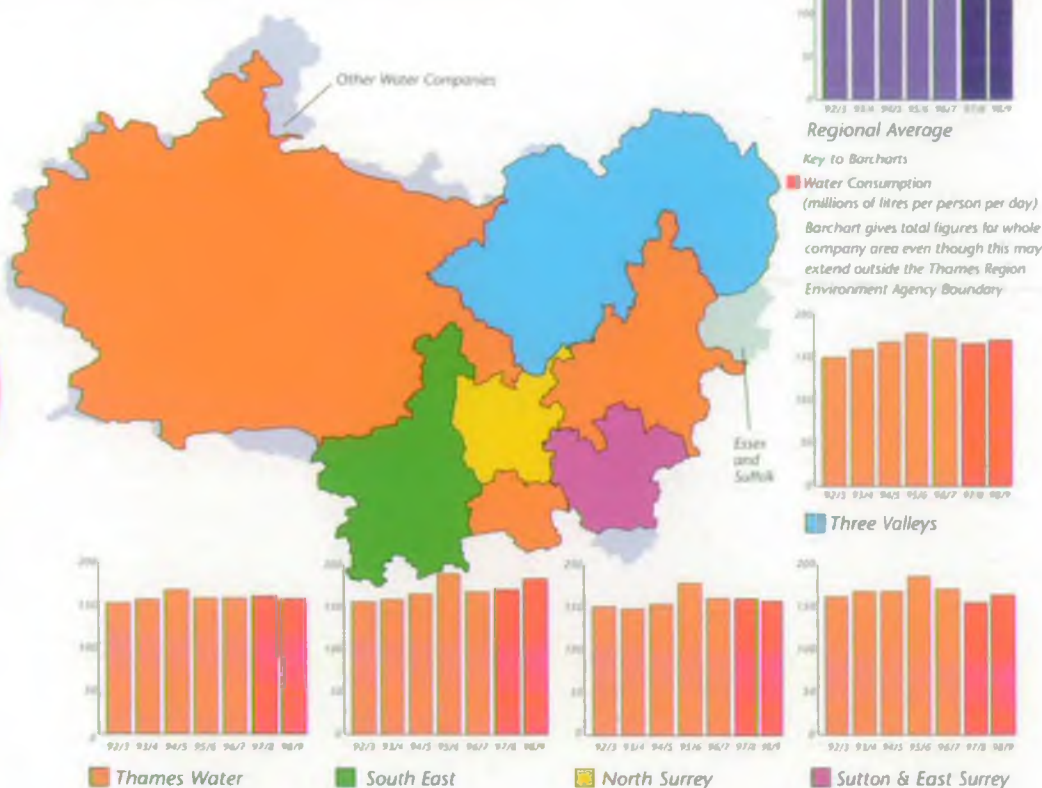
About half of the volume of water abstracted in Thames Region comes from non-tidal rivers and streams, with the rest being taken from tidal waters and groundwater in equal proportions. Of the non-tidal abstractions, the majority of the water is used for public water supply. Tidal abstractions are mainly used for cooling water in power generation.

P8. Water abstraction in Thames Region, 1998-1999

Water is abstracted from:



P8. Water consumption per person each day, 1992/93-1998/99



The average domestic consumption of water per person per day in the Thames Region is 166 litres (1998-1999). This is 13 litres per person per day higher than consumption in 1992-1993.

This continuing increase is due to many factors, particularly: the increase in use of household appliances such as washing machines, dishwashers and power showers; the increase in garden watering and car washing; and the reduction in household occupancy rates (lower occupancy households tend to use more water per person).



*The trend for the consumption of water continues to increase. Water conservation and demand management measures, including water metering, will play an important role in managing the predicted increase in per capita consumption.*

Source: Environment Agency & water companies



#### INDICATOR P9. Demand for Aggregates

Government advice published in 1994, currently being updated, provides a framework for aggregate supply until 2006. This predicts a substantial increase in the demand for aggregates in the South East Region. As a result, minerals planning authorities in the South East are expected to make a provision of 420 million tonnes of sand

and gravel from local land sources between 1996 and 2006. However, there is expected to be a 33% shortfall of local land won sand and gravel during 1992-2006. This shortfall will need to be met by importing marine aggregates and crushed rock, together with recycling and use of secondary materials. These forecasts are likely to be revised as part of the new legislation.

The graph compares the South East Regional apportionment with sales and permissions over the last 15 years. Whilst the flow of permissions was erratic,

the 15-year total for sales (403.8 million tonnes) and permissions (375.6 million tonnes) were similar. The average annual sales figure for the last 10-year period is 25.1 million tonnes, consistently below the current Regional apportionment figure of 28.0 million tonnes. However, over the recent six years 1993-98, average sales were only 22.4 million tonnes, 20% below the Regional apportionment.


The balance between different sources of aggregates, the total volume demanded and the amount of recycling and use of secondary materials has implications for the environment. The winning of sand and gravel, for example, has the potential to cause a range of environmental impacts, including loss of habitat, water pollution and

P9. Comparison between sand and gravel sales and permissions in the South East Region, 1984-1998





changes in groundwater levels and flows.

 The graph shows that although the flow of permissions was uneven the most recent 10 years of permissions exceeds that of total sales. In the last three years the planning permissions comprise little over 50% of the sales figure.

Source: DETR & South East Region Aggregates Working Party



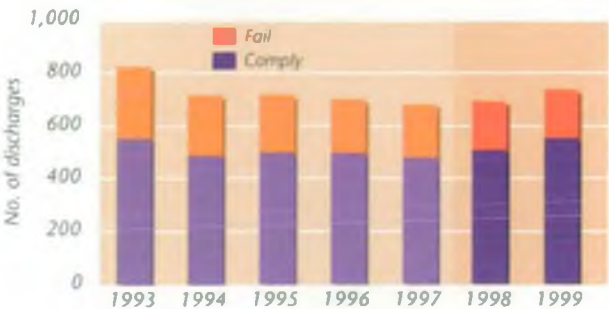
**INDICATOR P10.**  
**Number of Sewage Treatment Works Compliant with Consent**

A major influence on the quality of the freshwater rivers in the Region is the discharge from sewage treatment works. As of April 1998, we had over 11,420 consented discharges in the Region. This includes 4,357 septic tanks which discharge to ground and more than 400 urban sewage treatment works, which discharge into rivers. These Agency consented sewage works range in size from Boarstall in Oxfordshire discharging 4m<sup>3</sup>/day to Crossness Sewage Treatment Works which discharges approximately 2,946,000m<sup>3</sup>/day into the River Thames.

P10. Water utilities sewage works compliance, 1993-1999



P10. Private and trade discharge compliance, 1993-1999




There are 2,325 private discharges of treated sewage, which do not have a significant effect on major rivers, but are of local importance to small tributaries particularly in the south east area of the Region. The urban and village sized treatment works are owned and operated by Thames Water (TW). As well as being a pressure on the rivers, the

discharges are a key component of the Region's freshwater environment, since the whole Region is dependent on the reuse of water to serve the large population (see section 4.6).

The graphs show the compliance of both water utilities and private and trade discharges. Over the last 10 years, there has been a marked improvement in the compliance of TW's treated sewage discharges.

The number of private and trade discharges has increased slightly from 702 in 1998 to 751 in 1999. Of those consented discharges greater than 5m<sup>3</sup>/day, there has been a reduction in the number of consents failing from 28% in 1998 to 25% in 1999. There has been little change in the number of water utilities consented discharges with an average of 2% failure rate over the past two years.

 It is expected that the number of consented discharges failing their licences will continue to be reduced. The Asset Management Plan programme will continue to place pressure on the water utilities to improve their already high level of performance.

Source: Environment Agency



**INDICATOR P11.**  
**Emissions to Air from Major Industries**

Industries with the greatest potential to pollute the environment are subject to a system of Integrated Pollution Control (IPC). Two lists of processes have been prescribed by the regulations. Part A processes are controlled under IPC by the Agency; and Part B processes are controlled at a local level with regard to their discharges to the atmosphere under a system of Local Authority Air Pollution Control (LAAPC) (see section 4.8). There are approximately 150 Part A processes authorised in the Region and these fall into the following industrial types:

- fuel and power (30);
- metals (15);
- minerals (5);
- chemical (80);
- waste (15);
- others (5).

Under the recently introduced Pollution Prevention and Control (PPC) regime, the Agency will take a wider range of environmental effects into account when determining permit conditions. These include energy efficiency, noise and site restoration as well as the processes' local effect. All Part A processes will transfer over to PPC over the next seven years.

P11. Releases of AQS substances from Part A processes, 1998

Substance	England and Wales (tonnes)	Thames Region		
		tonnes	percentage of England and Wales total	percentage change since 1996
Sulphur dioxide	1,253,748	50,115	3.99	-0.41
Nitrogen oxides (as NO <sub>2</sub> )	453,136	18,226	4.02	+0.32
Carbon monoxide	716,995	5,943	0.82	-11.38
Particulates*	37,490	938	2.5	-1.30
Benzene	1,815	19.4	1.07	-2.93
Lead	214	1	0.46	-1.24
Volatile Organic Compounds (VOCs)	200,456	3,959	1.97	-

**Note:**

- lead occurs in several Pollution Inventory (PI) groups and this is therefore an estimate
- not all particulates are PM<sub>10</sub>, but future reporting will pick up PM<sub>10</sub>s only
- the quantity of particulates includes an estimate for Didcot A
- particulates\* – this figure represents only particulates >10 microns (the parameter used for air quality standards), total particulates in 1998 was 1,250 tonnes

Releases to the environment from Part A processes are estimated and compiled in a Pollution Inventory. The releases to air of Air Quality Strategy (AQS) substances from Part A processes in Thames Region are summarised in the table below.

Thames Region continues to produce a relatively small proportion of the total emissions from all Part A processes in England and Wales with emissions of pollutants generally decreasing. The Region has few major industrial processes relative to its population and economic activity. However, air quality is also affected by emissions from other sources, for example, approximately three-quarters of total carbon monoxide emissions and half of the total nitrogen oxides emissions are from road transport (see indicator S2).

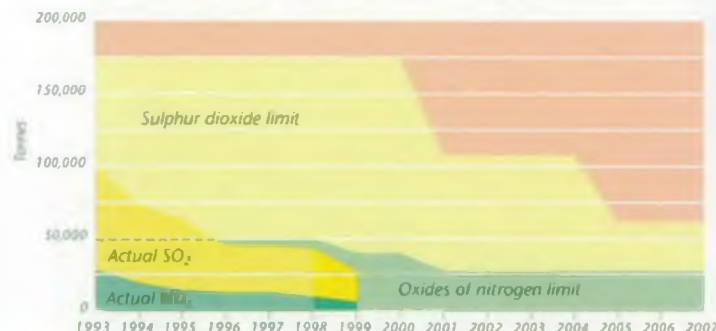
The increase in sulphur dioxide releases was primarily due to an increase in the sulphur content of the solid fuel for Didcot A power station. However, the overall future trend will be downwards following more restrictive constraints which were placed on the power generation industry early in 2000 to ensure air quality standards are not compromised. The reduction in nitrogen oxides releases is due to a combination of the use of more low-NO<sub>x</sub> technology plus some plant shutdowns.

It is not possible to say what the trend is for carbon monoxide because since 1996 the reporting of this substance has been refined and a number of Part A processes now report which did not previously. However, overall the releases of this substance in the Region will continue to be dominated by non-Part A sources (e.g. traffic).

Particulates have decreased significantly since 1996 at a number of Part A processes as a result of fitting better abatement equipment. Releases of benzene were much reduced as a result of major plant improvements at Rhone

Poulenc in Dagenham. This trend will continue as this Part A process, which released the majority of benzene in the Region, has now closed down. Better abatement on some of the Part A processes has reduced the releases of lead. The reporting of VOCs has been changed since 1996 so there is not a comparable baseline figure to use against the release for 1998.

P11. Staged limit reductions in Didcot A compared with actual released



Didcot Power Station is one of the most significant Part A installations in the Region and the graph shows how emissions of sulphur dioxide and oxides of nitrogen from Didcot A have decreased over the last six years and how a staged reduction in limits is planned for the future. Didcot's emissions performance since the last report has been heavily influenced by the reduction in electricity generation from the plant during 1999. It is expected that emissions will rise once again whilst still being within the stage reduction limits.



Emissions from Agency managed processes continue to be reduced and it is expected that these will continue to reach more sustainable limits.

Source: Environment Agency





#### INDICATOR P12.

##### Waste Production and Management

Since the production of the last report there have been a number of changes in the recording and quantification of waste. Consequently, we have had to alter the previous indicators used in the report.

The total quantity of controlled waste (controlled waste includes household, commercial, industrial and special and clinical wastes; these are controlled under the Environmental Protection Act 1990) produced in Thames Region in 1998/99 was approximately 21 million tonnes. This total includes 1,014,000 tonnes of 'Special' waste. Approximately 17 million tonnes of this was deposited within Thames Region at facilities permitted by the Environment Agency. As data on waste arisings is produced by local authority area, this total is based on the waste arisings for each of the main counties that form part of the Thames Region, as well as Greater London. The types of waste that make up this total are illustrated in the pie chart:

P12. Waste production and management, 1998-1999



This indicator considers the amount of municipal waste that local authorities have to dispose of, including collected household and non-household waste, civic amenity site waste and recycling. Data has been collected by the DETR from waste disposal authorities on the quantities of waste they had to manage. It is estimated that Thames Region produced over 7 million tonnes of municipal waste. The table below shows how this waste was managed.

Around 10% of the Region's municipal waste is recycled or composted. It is very unlikely that with the current growth in population, coupled with the reducing

size of household units, that an overall reduction in the amount of household waste generated will be achieved. Nationally, total household waste arisings have increased. This is linked to a number of social, economic and demographic factors. The number and size of households, economic climate and level of employment, for example, all have an effect on the amount of waste produced. New housing development in the South East will further increase the total amount of household waste that is generated.



*If municipal waste continues to grow in quantity, current levels of recycling and recovery will not be adequate enough to support the 2010 landfill diversion target.*

Source: Environment Agency

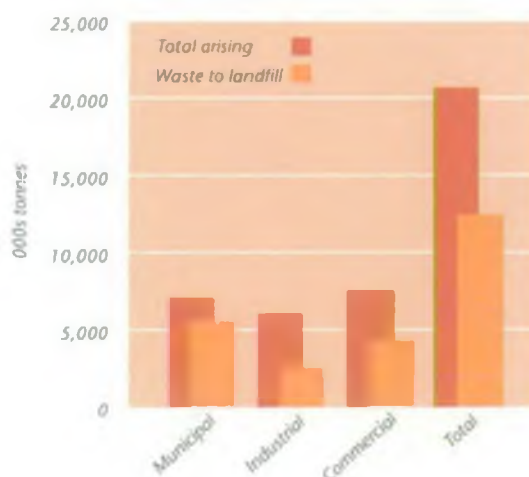


#### INDICATOR P13.

##### Volume of Waste to Landfill

Thames Region is currently very reliant on landfill for waste management, with over 60% of municipal, industrial and commercial waste arisings landfilled in 1998-1999. The Landfill Directive and the targets in Waste Strategy 2000 will drive the need for increased waste minimisation, recycling and recovery, and alternative treatment and disposal facilities for the Region's waste.

P13. Volume of waste to landfill, 1998-1999



P12. Thames Region Municipal Waste Production and Management, 1998-1999 (000's tonnes)

Collections				Recycled	Waste Management Method		
Regular household collection	Other household sources	Civic amenity sites	Non-household sources		Landfilled	Energy from waste	Other incineration
4,076	377	984	938	718	5,566	818	2

Information collected by the Agency indicates that the total estimated remaining void capacity on 1st April 1999 at licensed landfill sites within the Region was in the order of 105 million cubic metres equivalent to approximately 84 million tonnes. It was also estimated that approximately 15% of the estimated remaining void capacity was restricted to the reception of inert wastes only.



The majority of controlled waste produced in the Thames Region is currently sent to landfill. To achieve a more sustainable approach, a radical change in practice will be required to reduce the quantity of waste going to landfill, through minimisation, re-use, recycling and treatment. Such a change in approach would enable the management of remaining landfill to be used for the long term for the disposal of residues and untreatable wastes.

Source : Environment Agency

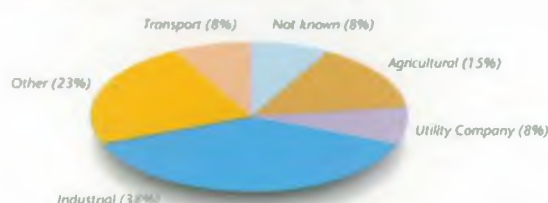


#### INDICATOR P14.

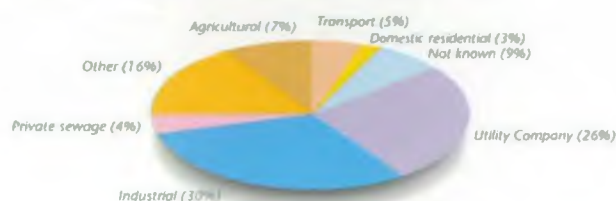
##### Number of Water Pollution Incidents

A significant pressure on the aquatic environment is the number and severity of pollution incidents. Unfortunately figures are only available for 1998, but these show an increase in the number of pollution incidents reported, continuing the trend of previous years.

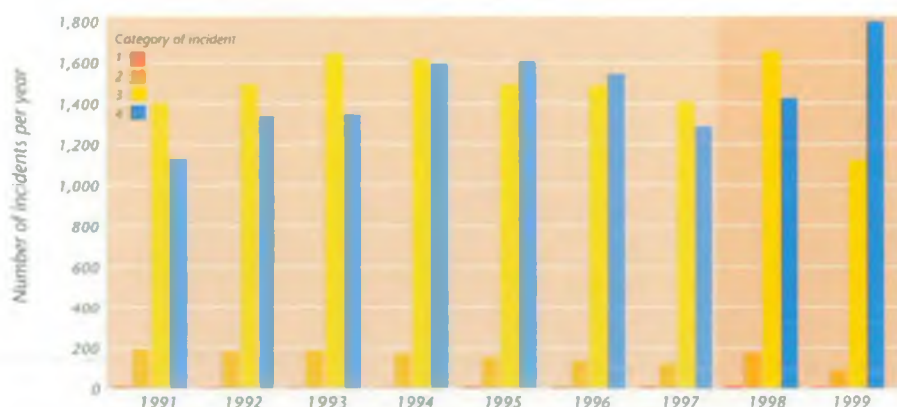
P14. Source of category 1 pollution incidents, 1998



P14. Source of category 2 pollution incidents, 1998



P14. Number of water pollution incidents by category, 1991-1999



Pollution incidents are classified into one of four categories depending on their significance: category 1 are the most serious, and category 4 are the least serious. The total number of incidents and the number of category 1 and 2 incidents have both increased slightly during the past year, returning to the levels seen in 1992-1994. In 1998, there was a total of 2,998 substantiated pollution incidents in Thames Region, of which only 94 posed a serious threat to the environment (category 1 and 2 incidents).

Since the publication of the last report, the categorisation of pollution incidents has been altered to reflect all aspects of the environment (i.e. land, air, water). Unfortunately, this makes comparison of data difficult to achieve for this report.



Following an increase in pollution incidents during 1998, the numbers have decreased to those seen in 1992-94.

Source: Environment Agency



#### INDICATOR P15.

##### Water Levels in the River Thames

Accurate records of newsworthy floods occurring along the River Thames and its tributaries date back to 6 November 1091, when the following incident was chronicled by J. Thornton:

"Owing to the perpetual downpour of 1091, the Thames rose with alarming rapidity and the old wooden 'London Bridge' was swept away, the lands on each side being considerably flooded."

Some records date back to flooding in AD 9, 48, 479 and 973, but no further details are supplied on their extent. Regular flow monitoring data at Teddington Lock is available back to 1893. Information was collected prior to this, but less frequently. The bar chart shows the number of



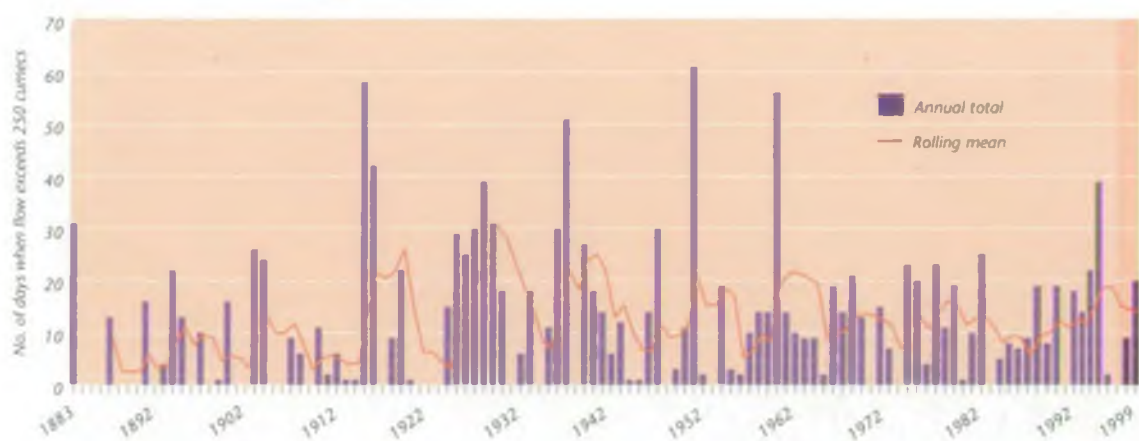
days when the daily mean flow was above 250 cumecs (cubic metres per second).



Whilst the data provides an interesting picture of flow rates over the past hundred years, it does not provide a clear indication of any increase in the number of flood events in this location. What is noticeable, however, is that the number of years when no flooding took place has decreased since 1893.

Source: Environment Agency

P15. River Thames flow at Teddington, 1893-1999



### 3.4 RESPONSES TO THE STATE AND PRESSURES

The response indicators illustrate actions or activities intended to address the current state of the environment, or the pressures acting upon it. These responses may be actions we undertake or that other organisations, or individuals, are responsible for. The response indicators have been divided into four categories:



**Technical reaction:** these include technical solutions to improve the state of the environment or reduce the pressures acting upon it, such as the construction of flood defences, recycling waste and the installation of pollution abatement measures.



**Management and policy response:** these include the national, Regional and local policies, plans and programmes that we produce. One of the most important of these are LEAPs which set out our commitment to a programme of local action.













**Economic measures:** these include taxes, charges and other economic instruments aimed at achieving environmental benefits. Examples that are already used, or may be introduced, include the landfill tax, taxation on leaded petrol and road charging.



**Advice, education and enforcement:** this category includes much of our everyday work. Advice and education is central to our proactive approach to environmental management, examples of which include pollution control visits, educational material for schoolchildren and comments on planning applications. However, enforcement action is also used, when appropriate, and where we have been given such powers.








#### Key Response Indicators

R1	Number of Thames Barrier closures against tidal surges	
R2	Number of fluvial and tidal flood warnings issued	
R3	Number of river reaches benefiting from environmental enhancements implemented by flood defence	
R4	Amount of waste recovered	
R5	Use of the Thames Bubbler and Vitality	
R6	Number of Local Environment Agency Plans completed	
R7	Proportion of river reaches receiving maintenance	

R8	Number of Water Level Management Plans completed	
R9	Number of low flow rivers under study or remediated	
R10	Proportion of rivers for which a landscape assessment has been undertaken	

No new response indicators have been introduced in this update of the State of the Environment Report. However, there are still a number of potential indicators we hope to have data on in the future.

#### Potential Response Indicators for the Future

•	Amount of waste minimisation/recovery by type	
•	Amount of landfill gas used for energy generation	
•	Area of restored landfill sites by use	
•	Reduction in releases from Part A processes	
•	Number of LEAP actions implemented	
•	Number of companies advised about waste management	
•	Number of pollution control visits	



## RESPONSE INDICATORS



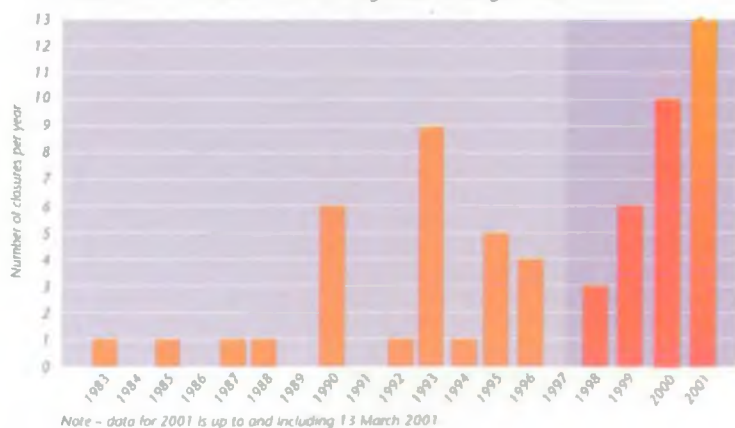
### INDICATOR R1.

#### Number of Thames Barrier Closures against Tidal Surges

The control of flooding in the lower part of the River Thames, where the main threat is from the sea, is one of our important responsibilities. Under certain weather conditions surge tides occur and these can present a major threat when combined with a high spring tide. The main defences are a number of movable flood gates, the most notable of which is the Thames Barrier, as well as sea walls upstream of the Barrier and 32km of embankments downstream.



R1. Number of Thames Barrier closures against tidal surges, 1983-1999



Without effective defences, when the surge enters the Thames Estuary, there is danger of flooding along most of the tidal river as far as Teddington. Such a flood could engulf much of central London, presenting a threat to life, flooding the underground system, disabling freshwater and sewer systems, power, gas and vital telephone and data services and causing severe damage to thousands of homes, shops, business and buildings in the heart of the

capital. It is currently estimated that a major flood within London could cost in excess of £30 billion in damages alone.

High tide levels in central London are rising by some 60cm each century. This is a result of factors including rising sea levels, increasing storminess and tidal variation, the downward tilting of the south east corner of England and the settlement of London on its bed of clay.

The Thames Barrier was closed 49 times to protect London from tidal flooding between 1983 and 2000. The graph shows a significant increase in the number of closures during 2000. However, this number of closures has already nearly been equaled during the first few weeks of 2001. Between the 1 January and 13 March 2001 the Barrier has been closed on thirteen occasions. It is not possible to categorically state that this is due to climate change and sea level rise, but it is an indicator of possible future trends.



Since 1990 the frequency of Barrier closures has increased. The erratic nature of the weather makes it difficult to predict future trends exactly. However, the effects of sea level rise are expected to make further closures more frequent.

Source: Environment Agency



### INDICATOR R2.

#### Number of Fluvial and Tidal Flood Warnings Issued

The risk of flooding from rivers and the sea is a constant threat. It can happen very quickly and without warning. Since September 1996 the Agency has taken the lead role in issuing flood warnings. We conduct detailed flood forecasting and make the decision whether or not to issue a flood warning.

The Agency commissioned an independent review (the Bye Report) following flooding across Wales and central England during Easter 1998. This identified the need to strengthen the flood warning capability and raise the public awareness of flood risks. We are responding to these recommendations by making significant investments over the coming years. One of the many recommendations was to change the way we issue warnings to the public:

*"Colour-coded warnings appear to be misunderstood by nearly all who receive them"*

*"The interests of the public are not well served by warnings given on the colour-coded basis"*

(Bye and Horner, 1998)

Since 12 September 2000 a new four-staged warning system has been introduced, replacing the old colour-coded system of yellow, amber and red. The new flood warning codes are:

**Flood Watch:** Flooding is possible in the area, be aware, be prepared, watch out!



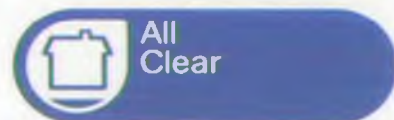
**Flood Warning:** Flooding of homes, businesses and main roads is expected in the area, act now!



**Severe Flood Warning:** Severe flooding is expected in the area, there is imminent danger to life and property, act now!

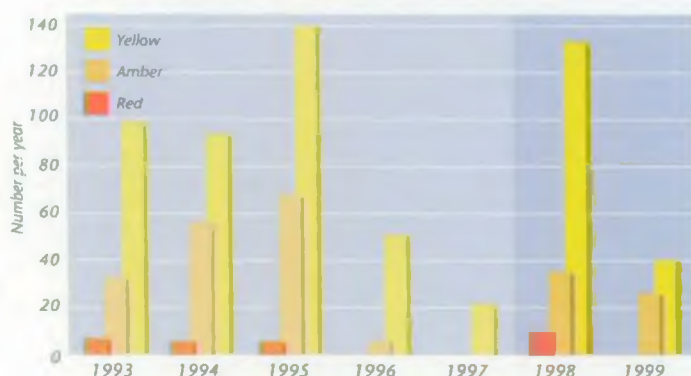


**All Clear:** There are no Flood Watches or Warnings currently in force in the area.



The number of warnings has to be treated with some caution as a measure of potential flooding, as the areas for which warnings are issued vary in terms of their size and numbers of properties covered.

R2. Number of fluvial flood warnings issued, 1993-1999



R2. Number of Tidal flood warnings, 1993-1999



Significant investments are being made to improve our ability to forecast and warn of imminent flooding. Future developments will enable more rigorous assessment of performance as our knowledge of flood warning risk areas and properties at risk improves. Thus the analysis of flood warnings used in this report is offered as an interim step.



No long term trends can be identified due to the current erratic data. Several factors could affect the number of flood warnings and flooding in the future, including the effectiveness of flood defences, the amount of development in the natural floodplain and in risk areas, and the weather conditions. Climate change scenarios predict an increase in winter rainfall, which could result in increased river flooding during the winter.

Source: Environment Agency



#### INDICATOR R3.

##### Number of River Reaches Benefiting from Environmental Enhancements Implemented by Flood Defence

We have a duty to promote the conservation and enhancement of natural beauty and amenity of inland and coastal waters. One of the ways we carry out this duty is to incorporate environmental enhancements into flood defence schemes and programmes of work. The number of reaches benefiting from environmental enhancement works implemented by flood defence staff during the period 1 April 1997 to 31 March 1998 was 47 (the Region includes 1,047 reaches for the definition of works). Unfortunately it has not been possible to update this indicator since the last report. However, we will endeavour to update it in the future.



We have not been able to update this indicator since the last report, therefore no trend has been identified.

Source: Environment Agency



#### INDICATOR R4.

##### Amount of Waste Recovered

In 1998-1999, approximately 10% of Thames Region's Municipal Waste, and 31% of Commercial and Industrial waste was recycled, accounting for almost 5 million tonnes of waste. (Excluding energy from waste).

There are two major municipal waste incinerator plants in the Thames Region: Edmonton in North London, and Lewisham in South East London. These electricity-generating facilities have a throughput of approximately 555,000 and 420,000 tonnes per year respectively. A third Combined Heat and Power (CHP) unit is in operation at Slough power station, which provides electricity and steam



to the local industrial estate, nearby households as well as the national grid. This facility uses approximately 50,000 tonnes per annum of 'refuse derived fuel' and 'fibre fuel' to supplement gas, coal and oil burning.

R4. Municipal, Industrial and Commercial Waste Recycling (000's tonnes), 1998 – 1999

	Municipal	Industrial	Commercial
Recycling	718	2,142	2,057
Total produced	7,093	6,034	7,529
% of total	10%	35%	27%



*Reducing the amount of untreated waste disposed to landfill will require a greater consideration of waste minimisation, re-use and recycling. The minimisation of the distance waste is transported also needs to be considered and the impact of road transfer lessened by increasing the use of river and rail transfer.*

Source: Environment Agency



#### INDICATOR R5.

##### Use of the Thames Bubbler and Vitality

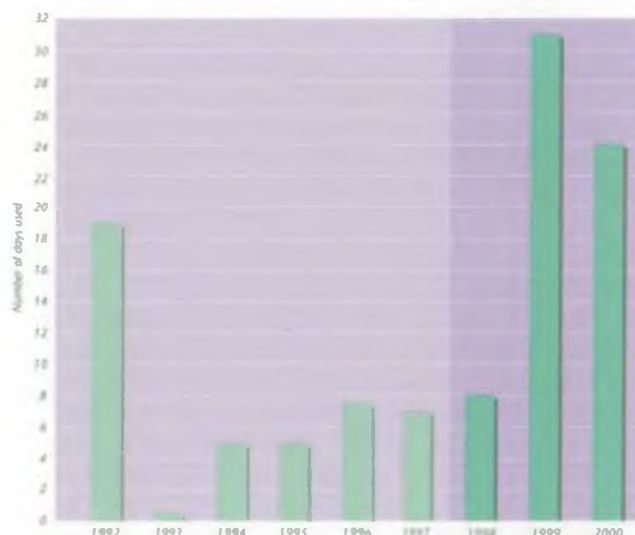
Discharges of storm water from combined sewage overflows (CSOs) following heavy rainfall are a pressure on water quality in the tidal Thames during summer months (see indicator S8 and section 4.6). This combined drainage system receives both foul drainage from domestic and industrial premises and surface water runoff from impermeable areas, for example, roads, roofs, pavements and car parks. The sewers, designed in the mid-nineteenth century, have inadequate storage capacity to cope with flows generated from heavy rainfall. In order to prevent sewage backing up in the system and overflowing into properties and onto streets, overflow weirs within the sewers were constructed to allow drainage out of the system directly into the tidal Thames.

Severe deoxygenation following the operation of these sewage overflows caused several major fish mortalities between 1973 and 1986. In 1989, the Thames Bubbler, a craft capable of injecting up to 30 tonnes of oxygen per day at critical locations, came into operation. The Thames Bubbler and the more recently acquired oxygenation vessel, Thames Vitality, are owned by Thames Water (TW) and operated at our request. All aspects of their operation are funded by TW. Data received from nine automatic water quality monitoring stations sited between Kew and Purfleet enables us to identify the high risk areas and deploy the oxygenation vessels accordingly. Rainfall and river flow data along with information from key pumping stations in the sewerage system also help us to manage these 'storm events'.

Five of the most problematic CSOs are scheduled for interim improvements by 2005 as part of TW's obligations under the current Asset Management Plan (AMP3). This preliminary work at Hammersmith, Western, Lots Road and

Abbey Mills pumping stations and at Putney Bridge should reduce the level of aesthetic pollution due to sewage-derived litter. There should also be some reduction in the organic load discharged during severe storms. As part of AMP3, the Agency, TW and the GLA will be working together to produce a long-term sustainable solution to London's drainage problems.

R5. Number of days the Bubbler/Vitality was used, 1992-2000



*Fluctuation in the deployment of Thames Bubbler and Vitality normally depends on climatic factors. In 1999 and 2000 the vessels were used on 31 and 24 days respectively, compared with an average annual use of 8 days over the preceding three years 1996-1998. The recent increased usage was due to a combination of more frequent significant rainfall and some periods of non-compliance with operating agreement effluent standards at Beckton STW.*

Source: Environment Agency



#### INDICATOR R6.

##### Number of Local Environment Agency Plans Completed

Local Environment Agency Plans (LEAPs) are non-statutory documents covering the full range of our responsibilities and are being produced for all catchments within the Region. LEAPs detail proposals for local environmental action on the ground by the Agency or its partners and are initially published as consultation documents followed by final action plans. Annual reviews update progress.

Substantial progress has been made with producing these documents, with environmental overviews and action plans being published for all LEAP areas in the Thames Region.

Whilst this indicator has provided a useful guide to action on the ground, it is expected that in the future the numbers of LEAP actions that are being implemented across the Region will be reported.

R6. LEAP Environmental Overviews and Action Plans, 2001



Good progress has been made in completing the LEAP programme since the last report, with 14 out of the 18 catchments having completed action plans. The remaining LEAPs are expected to be completed in 2001.

Source: Environment Agency



#### INDICATOR R7.

##### Proportion of River Reaches Receiving Maintenance

Thames Region has 5,200 km of main river, and in 1997, 33% of this total length received maintenance such as clearance of vegetation, desilting or the removal of debris and blockages. These works are important for maintaining river flows and preventing flooding during periods of high rainfall. Unfortunately it has not been possible to update this indicator since the last report but we will endeavour to do so in time for the next report.



We have not been able to update this indicator since the last report, therefore no trend has been identified.

Source: Environment Agency



#### INDICATOR R8.

##### Number of Water Level Management Plans Completed

Water Level Management Plans (WLMPs) provide a means by which the water level requirements for a range of activities in a particular area, including agriculture, flood defences and conservation, can be balanced and integrated. Wetland wildlife is dependent on an appropriate water management regime to maintain the different degrees of wetness which are required or tolerated by different plant and animal species. For example, annual winter flooding benefits overwintering wildfowl and waders while a high water-table will benefit some plant species but disadvantage others.

Ingrebourne Marshes and Inner Thames Marshes SSSIs are two wetland SSSIs in the east end of Greater London which were both suffering from poor management and low water levels. As a result, the ecological value, particularly regarding wading birds, was in such serious decline that their SSSI status was threatened. To halt this decline, the WLMP stated that both sites should be periodically flooded and there should be an increase in background water levels. At Ingrebourne Marshes this was achieved by redirecting a spring and installing customised water control devices in banks crossing the marsh. At Inner Thames Marshes, the water levels are controlled via a pumping station.

Following the implementation of the WLMP actions, a dramatic improvement has been seen at both sites. Ingrebourne Marshes now attracts and supports a diverse range of ducks and wading birds including breeding Redshank, Shelduck, Shoveler, Gadwall, Water Rail and Snipe. The reed and sedge has flourished and new growth has appeared where there was previously bare earth. At Inner Thames Marshes duck numbers have become nationally significant, as have the populations of aquatic invertebrates, particularly beetles. The site is now ecologically richer than when it was designated as an SSSI. Other significant findings on the site have been one of Greater London's largest colonies of Water Voles and a population of Palmate Newts estimated at 1 million individuals.

We have agreed with English Nature a list of 92 wetland sites, mostly Sites of Special Scientific Interest, which will benefit from a WLMP in Thames Region. By the end of 2000, WLMPs were completed for 76 sites and implementation of the recommendations has started on 20 of these sites. The remaining 16 WLMPs should be completed by the end of April 2001. In the previous State



of the Environment Report we reported that at the end of 1997 WLMPs had been completed for 26 sites and work had started on recommendations for 16 sites.



Good progress has been made on completing all the WLMPs in the Region since the last report, with all expected to be completed by the end of April 2001.

Source: Environment Agency & English Nature



#### INDICATOR R9.

##### Number of Rivers/Wetlands Affected by Abstraction Under Study or Remediated

We are working with water companies and other stakeholders on the alleviation of the effects of abstraction on a number of rivers and wetlands which have suffered from long-term abstraction at unsustainable levels. Guidelines to aid national consistency in the investigation and resolving of sustainability problems are nearing completion.

Since the publication of the last report, the Region has initiated a further seven studies into the remediation of low flows and solutions have been identified for three of the rivers which were under investigation. At present four rivers have been successfully restored to an acceptable condition. These are the Rivers Pang, Ver, Misbourne and Letcombe Brook. These studies have been historically known as Alleviation of Low Flows (ALF) schemes.

R9. Location of sustainability sites under study or remediated, 2000



Good progress has been made in identifying and implementing solutions to low flow problems since the last report and a number of new studies have been taken on. The potential impacts of climate change could lead to rivers suffering low flow problems in the longer term. The Agency's new Catchment Abstraction Management Strategy (CAMS)

and restoring sustainable abstraction programme (RSAP) will be instrumental in identifying and securing further solutions.

Source: Environment Agency

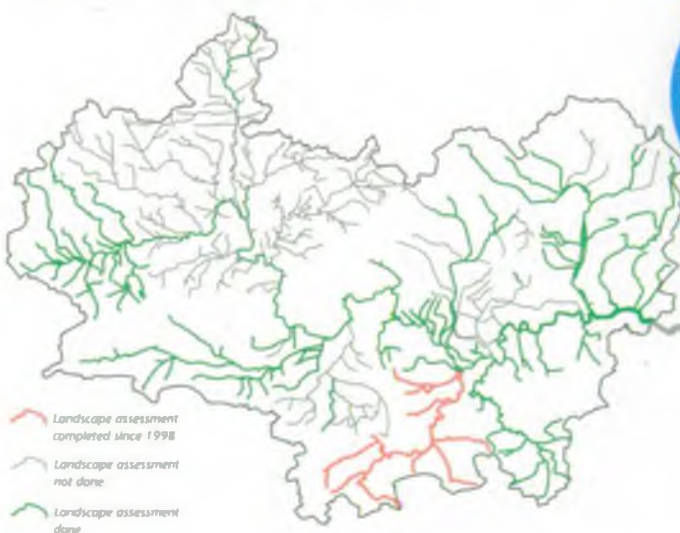


#### INDICATOR R10.

##### Proportion of Rivers for which a Landscape Assessment has been undertaken

Landscape assessments are an important tool for providing information about the character and quality of the rivers, and enable the need and opportunity for environmental enhancement to be assessed. The Regional coverage has been influenced by the extent of past change and current pressures, hence Greater London is well covered. A rolling programme of landscape assessments is ongoing, with the River Wey catchment being assessed since the last report. To deliver the actions identified in landscape assessments we will seek opportunities to secure partnership funding with external bodies.

R10. Coverage of river landscape assessments, 2000



There has been continued progress in undertaking landscape assessments across the Region. In future, it is hoped that this indicator may be developed to reflect the findings of these assessments.

Source: Environment Agency




## 4. TRENDS AND MAJOR ISSUES FOR THE REGION



### 4.1 ENVIRONMENTAL CHANGE

The table below summarises the trends demonstrated by the data collected since the last report (i.e. over the last two years). In most cases a trend can be identified and symbols have been used to signify either no change or variable data since the last document. The likely future trend is also indicated.

### Summary of Trends in the Indicators

-  positive progress/improving
-  change uncertain or mixed
-  unfavourable progress/deteriorating/no progress

### State Indicators

Indicators	Recent trend	Expected future trend
S1 Area of urban land	 The area of urban land has increased.	 Urbanisation is likely to continue, this could be partly balanced by recycling of previously developed land.
S2 Air quality: concentration of key pollutants	 Emissions of all pollutants measured since 1990 have fallen across the Region.	 Nitrogen oxides levels may present a particular problem in the future with predicted increases in traffic.
S3 Quantity of rainfall	 The amount of rainfall has increased over the past two years.	 It is expected that rainfall levels will continue to fluctuate, as they have historically, over the next few years.
S4 Number of heavy rainfall events	 The number of heavy rainfall events continues to fluctuate in an unpredictable manner.	 The number of heavy rainfall events is likely to continue to be erratic. This indicator should provide a useful long-term reference to monitor the potential impact of climate change.
S5 Quantity of river flows	 River flows have increased during the past two years.	 In the future flows are expected to continue to fluctuate as they have historically. River flows are largely reliant on the amount of rainfall received across the Region.
S6 Chemical river water quality	 Chemical GQA has improved over the last two years. This is primarily due to the increasing amount of rainfall.	 Further improvements could be seen with improved discharges, but this could be masked by fluctuations in rainfall across the Region.



Indicators	Recent trend	Expected future trend
S7 Biological river water quality	☹️ We have not been able to update this indicator since the last report therefore no trend has been identified.	Unable to provide trend at present.
S8 Tidal Thames water quality: dissolved oxygen	☹️ Dissolved oxygen levels between 1996-99 continued to follow the underlying trend of previous years.	☹️ Future trends in dissolved oxygen levels will be dependent on improving discharges from sewage treatment works.
S9 Radiation levels in the vicinity of nuclear sites	😊 The concentration of radionuclides detected continues to be very small.	😊 There is expected to be no fluctuation in the low levels of radiation found across the Region over the next few years.
S10 Quantity of groundwater	😊 Groundwater levels have risen over the past two years. This is due to the increase in rainfall.	☹️ Future trends in groundwater levels are largely reliant on the amount of rainfall across the Region. Whilst rainfall levels along with groundwater levels have increased during the last two years, they are expected to continue to fluctuate as they have historically.
S11 Groundwater levels in London	☹️ Water levels continue to rise in the centre of London.	☹️ Groundwater levels are likely to continue to rise until intervention measures are successful in halting this trend.
S12 Groundwater quality: concentration of nitrates	☹️ Nitrate concentrations in groundwater across Thames Region are continuing to increase slowly.	☹️ Future trends are unclear at present with some success being achieved in the Chilterns over the past couple of years.
S13 Numbers of salmon returning to the River Thames	☹️ Over the past few years the Thames has seen a steady decline in the number of returning salmon. A slight recovery in numbers seems to have taken place in 1999.	☹️ The trend for increased salmon numbers is likely to increase over the next few years and then stabilise.
S14 Distribution of key biodiversity species		
Otter	😊 Recent records suggest that the decline in the UK has now halted and the Otter population is recovering, with sightings being reported in former catchments. Otters are now resident in Thames Region.	😊 It is expected that the Otter will continue to expand its distribution within the Region (particularly into the Cherwell, Thames (Eynsham to Benson) and Ock and Colne LEAP areas), benefiting from improvements in river quality and habitat enhancements. Road deaths remain a threat, however, to successful recolonisation.
Bittern	😊 In Thames Region, since the previous report and for the first time in many years, Bitterns are believed to have bred in the Thame LEAP area. Overwintering and vagrant individuals have also been recorded in a number of other LEAP areas. The Lee Valley in particular is now a nationally important site for overwintering Bittern.	😊 Recent efforts to improve and create reedbed habitat for Bittern, such as in the Lee Valley, Thatcham Reedbeds, Otmoor and Cotswold Water Park, are hopefully going to provide the conditions for the Bittern to establish itself as a regular breeding bird in the Region.
Greater Water-parsnip	☹️ Since 1980, although quite widespread in Thames Region, it actually has a very localised distribution and has not been found at previously known sites in very recent surveys.	☹️ Surveys will be carried out to determine the current distribution and status of Greater Water-parsnip in Thames Region (currently confirmed at only one site) and appropriate management of all sites will follow. Through these actions, the aim is to maintain the species at all extant sites and provide opportunities for it to spread from these areas.

## Indicators

## Recent trend

## Expected future trend

Club-tailed dragonfly



In Thames Region, there are strong populations on the River Thames from Lechlade to below Windsor and smaller populations also occur in the Kennet and Loddon LEAP areas. There is also a relatively recent record for the Wey LEAP area.



Periodic sampling of club-tailed dragonfly will be required to establish the trend of this species. However, through the continued sensitive management of backwaters, it is expected that this species will increase its range within Thames Region.

Scarce Chaser



Although locally abundant where it does occur, this species is scarce throughout its range in southern and eastern England. Current populations appear to be stable and have expanded in some locations.



There are no specific actions for Scarce Chaser at present and, being a very localised species, the future expansion of its range is unknown.

## New Indicators

S15 Compliance with Bathing Waters Directive



Designated bathing waters are getting cleaner. The trend is for increasing consistency of compliance, which is when a bathing water site has complied for three consecutive years.



Compliance should continue to rise.

S16 Number of days when air pollution exceeds national objectives



Data from monitoring stations across the Region for all substances do not identify any clear trends at present.



The increase in road traffic may lead to an increased failure of nitrogen oxide standards.

## Pressure Indicators

P1 Long-term change in temperature



Whilst there is still uncertainty over the causes, the trend identified by the current data sets indicate an increase in the overall background temperature in Central England.



Temperature levels are predicted to rise.

P2 Rate of water leakage



Over the past two years all the water companies within the Region have met the leakage targets set by OFWAT.



Investment from the water companies continues to reduce leakage, but the rate of improvement is likely to decrease as an economic level of leakage is reached.

P3 Rate of water demand



Since the last report demand for water has fallen mainly due to the reduction in leakage.



According to water companies' forecasts the decrease in demand is set to continue until 2004/05, however, demand will increase again beyond this date due to the underlying trends in consumption.

P4 Projected housing development



The pressure for new homes across the South East is likely to continue.



Increased housing figures are predicted to continue to rise across the Region.

P5 Number of planning applications



A buoyant economy has resulted in an increase in the number of planning applications in the Region.



The number of planning applications being determined by local authorities is largely dependent on the economic climate at the time, this in turn affects the number which the Agency comments upon. At present the market is buoyant and consequently the number of applications is at a high level.

P6 Passenger transport and vehicle traffic





















There seems to be no slowing of the trend for increased road traffic growth at present.



Traffic levels are likely to continue to rise.



Indicators	Recent trend	Expected future trend
P7 Boat traffic on the non-tidal Thames	 There has been a significant decline in the number of boat movements since 1997.	 It is uncertain what the future of the boating market will be due to the variety of external factors involved.
P8 Volume of water abstraction and consumption	 The trend for the consumption of water continues to increase.	 Levels of consumption per capita continue to rise. Water conservation and demand management measures, including water metering, will play an important role in managing the predicted increase in per capita consumption.
P9 Demand for aggregates	 Although the flow of permissions was uneven, the most recent 10 years of permissions exceeds that of total sales. In the last three years the planning permissions comprise little over 50% of the sales figure.	 Future demand for aggregates will be driven to a large extent by the national economy.
P10 Number of sewage treatment works compliant with consent	 It is expected that the number of consented discharges failing their licences will continue to be reduced.	 The AMP programme will continue to place pressure on the water utilities to improve their already high level of performance.
P11 Emissions to air from major industries	 Since the last report, the releases of most NAQS substances from Part A processes have fallen significantly.	 IPC and then IPPC will continue to drive releases down.
P12 Waste production and management	 If municipal waste continues to grow in quantity, current levels of recycling and recovery will not be adequate enough to support the 2010 landfill diversion target.	 Waste production looks as though it will continue to increase in the immediate future.
P13 Volume of waste to landfill	 The majority of controlled waste produced in the Thames Region is currently sent to landfill.	 To achieve a more sustainable approach, a radical change in practice will be required to reduce the quantity of waste going to landfill, through minimisation, re-use, recycling and treatment.
P14 Number of water pollution incidents	 Following an increase in incidents during 1998, the number have decreased to those seen in 1992-94.	 The present incident recording system has been replaced, which will make the comparisons with future historic data difficult.
New Indicator		
P15 Water levels in the River Thames	 The current flow data does not provide a clear trend at present.	 Whilst a longer-term trend is emerging the effect of climate change may make this indicator particularly interesting in the future.

## Response Indicators

### Indicators

### Recent trend

### Expected future trend

R1 Number of Thames Barrier closures against tidal surges



Since 1990 the frequency of Barrier closures has increased.



The erratic nature of the weather makes it difficult to exactly predict future trends. However, the effects of sea level rise are predicted to make further closures more frequent.

R2 Number of fluvial and tidal flood warnings issued



No long term trends can be identified due to the current erratic data. Several factors could affect the number of flood warnings and flooding in the future, including the effectiveness of flood defences, the amount of development in the natural floodplain and in risk areas, and the weather conditions.



Whilst there is a great deal of uncertainty over the future risks associated with flooding, climate change scenarios predict an increase in winter rainfall, which could result in increased river flooding during winter months.

R3 Number of river reaches benefiting from environmental enhancements implemented by flood defence



We have not been able to update this indicator since the last report, therefore no trend has been identified.



Whilst we are unable to provide trend at present the Agency will continue to seek opportunities for environmental enhancements.

R4 Amount of waste recovered



Reducing the amount of untreated waste disposed to landfill will require a greater consideration of waste minimisation, re-use and recycling.



Unless the growth in waste can be stabilised alternative treatment facilities will be required.

R5 Use of the Thames Bubbler and Vitality



Fluctuations in the use of the Thames Bubbler and Vitality have continued over the past two years.



Increased usage of the Bubbler and Vitality will be caused through a combination of more frequent rainfall and periods of non-compliance with operating agreement effluent standards at Beckton STW.

R6 Number of Local Environment Agency Plans completed



Good progress has been made in completing the LEAPs since the last report, 14 out of the 18 have completed action plans. The remaining LEAPs are expected to be completed by March 2001.

All draft plans have been completed and it is expected that all plans will be in place by the end of the current year. Numbers of actions completed will be reported in the future.

R7 Proportion of river reaches receiving maintenance



We have not been able to update this indicator since the last report therefore no trend has been identified.



Whilst we are unable to provide a trend at present, the Agency will continue to maintain water courses.

R8 Number of water level management plans completed



Good progress has been made on completing the WLMPs in the Region since the last report with all expected to be complete by the end of 2000.



The number of plans being implemented continues to increase.

R9 Number of rivers/wetlands affected by abstraction under study or remediated



Good progress has been made in identifying solutions to sustainability problems since the last report and a number of new studies have been taken on.



The increasing demand for water and the potential impacts of climate change could lead to a continual trend for rivers to suffer from low flow problems.

R10 Proportion of rivers for which a landscape assessment has been undertaken



There has been continued progress in undertaking landscape assessments across the Region.



In future, it is hoped that this indicator may be developed to reflect the findings of these assessments.



## 4.2 IDENTIFYING THE MAJOR ISSUES

In our new document *An Environmental Vision* we set out environmental objectives across nine themes (shown below). These are the principal and immediate issues which we, in partnership with other groups, will focus on:

- a better quality of life
- an enhanced environment for wildlife
- cleaner air for everyone
- improved and protected inland and coastal waters
- restored and protected land with healthier soils
- a 'greener' business world
- wiser, sustainable use of natural resources
- limiting and adapting to climate change
- reducing flood risk

This update of the State of the Environment Report has provided an opportunity to revisit some of the major issues

facing the Region within these nine themes. The following table illustrates the interrelationship between these themes and the state-pressure-response indicators in section 3. The major issues for the Region raised by the indicators, and some of the actions that are being taken to address them, are discussed in more detail below. The indicators in the previous section have assisted this process by illustrating where any of the following criteria apply:

- the state of the environment is currently not meeting its standard or targets;
- the state of the environment is considered to be unacceptable;
- a pressure is having a detrimental effect on the state of the environment;
- a pressure is rising and may have a detrimental effect on the state of the environment in the future;
- a response is required to address one of the above.

### Relevant Indicators to the Major Issues

Issues	State	Pressure	Response
A better quality of life	<ul style="list-style-type: none"> <li>• a significant proportion of the Region is already urbanised (S1)</li> <li>• existing development and infrastructure affects the state of local air quality (S2), biodiversity (S14), water quality (S6, S7, S8) and the impact of heavy rainfall (S4).</li> <li>• bathing water quality (S15) also provides a good indicator of the current quality of the environment.</li> </ul>	<ul style="list-style-type: none"> <li>• pressures include housing development (P4), demand for water resources (P3 and P8), car transport (P6), demand for aggregates (P9), sewage effluent (P10), energy generation (P11), waste arisings and disposal (P12 and P13) and pollution incidents (P14).</li> </ul>	<ul style="list-style-type: none"> <li>• responses include protection against flooding (R1 and R2), managing water quality (R5), providing design guidance (R10) and remediating low flows (R9).</li> </ul>
An enhanced environment for wildlife	<ul style="list-style-type: none"> <li>• the Region's existing resources are represented by key species including mammals, birds, invertebrates and fish (S13 and S14).</li> </ul>	<ul style="list-style-type: none"> <li>• there are numerous pressures including: temperature change (P1), housing development (P4), water abstraction (P8), sewage effluent (P10), air pollution (P11) and pollution incidents (P14).</li> </ul>	<ul style="list-style-type: none"> <li>• responses include water level management plans (R8) and remediating low flows (R9).</li> </ul>
Cleaner air for everyone	<ul style="list-style-type: none"> <li>• local air quality, represented by oxides nitrogen, ozone, sulphur dioxide and particulate levels, are generally poorer in urban areas (S2).</li> </ul>	<ul style="list-style-type: none"> <li>• vehicle emissions are a major source of local air pollution (P6).</li> <li>• the Region has relatively few Part A IPC processes and emissions to air are comparatively low (P11).</li> <li>• landfill sites are a potential source of methane (P13).</li> </ul>	<ul style="list-style-type: none"> <li>• local authorities are principally responsible for local air quality, but we also have a role to play (see section 4.5).</li> </ul>

Issues	State	Pressure	Response
Improved and protected inland and coastal waters	<ul style="list-style-type: none"> <li>the water quality of the Region's rivers (S6, S7 and S8) and groundwater (S12) are under pressure.</li> <li>river flows also affect water quality (S5) and heavy rainfall affects flooding (S4).</li> <li>bathing water quality (S15) also provides a good indicator of the current quality of the environment.</li> </ul>	<ul style="list-style-type: none"> <li>pressures include urban development (P4 and P5), sewage effluent (P10) and pollution incidents (P14).</li> </ul>	<ul style="list-style-type: none"> <li>managing the Tidal Thames including the Thames Bubbler (R5).</li> </ul>
Restored, and protected land with healthier soils	<ul style="list-style-type: none"> <li>a significant proportion of the Region is already urbanised (S1).</li> </ul>	<ul style="list-style-type: none"> <li>pressures include housing development (P4), car transport (P6), demand for aggregates (P9), waste arisings and disposal (P12, P13) and pollution incidents (P14).</li> </ul>	<ul style="list-style-type: none"> <li>this is a developing area for the Agency and will be represented by indicators in the future.</li> </ul>
A 'greener' business world	<ul style="list-style-type: none"> <li>the Region is heavily urbanised and therefore produces significant volumes of waste (S1).</li> <li>radiation doses resulting from nuclear site discharges are well within appropriate limits (S9).</li> </ul>	<ul style="list-style-type: none"> <li>the number of consented sewage treatment works (P10) and amount of waste going to landfill (P13) all place pressures on the environment.</li> <li>the Region has relatively few Part A IPC processes and emissions to air are comparatively low (P11).</li> </ul>	<ul style="list-style-type: none"> <li>this is a developing area for the Agency and will be represented by indicators in the future.</li> </ul>
Wiser, sustainable use of natural resources	<ul style="list-style-type: none"> <li>resources include river water (S5) and groundwater (S10) which are dependent on rainfall (S3).</li> </ul>	<ul style="list-style-type: none"> <li>pressures include increased water demand (P3 and P8), which is affected by the number of households (P4), leakage rates (P2) and drought (P1).</li> <li>waste arisings and provision of management facilities (P12) also presents pressure.</li> </ul>	<ul style="list-style-type: none"> <li>responses include remediating low flows (R9) and recycling of waste (R4).</li> </ul>
Limiting and adapting to climate change	<ul style="list-style-type: none"> <li>a natural driver on the state of the environment, including rainfall (S3) and frequency of severe weather events (S4).</li> <li>potential secondary effects on water resources (S5 and S10), biodiversity (S14) and water quality (S6, S7 and S8).</li> </ul>	<ul style="list-style-type: none"> <li>climate change as a pressure is indicated by long-term temperature change (P1).</li> <li>one of the pressures on climate change is emission of greenhouse gases (P11).</li> </ul>	<ul style="list-style-type: none"> <li>climate change may have an effect on flood risk, how it is managed will be of critical concern to the Region (R1 and R2)</li> </ul>
Reducing flood risk	<ul style="list-style-type: none"> <li>the frequency of flood events will increasingly be affected by the impact of heavy rainfall (S4).</li> </ul>	<ul style="list-style-type: none"> <li>pressures will include the loss of natural floodplain to housing and infrastructure development (P4) and increasing water levels found within the Thames (P15).</li> </ul>	<ul style="list-style-type: none"> <li>managing flood risk including the Thames Barrier (R1), and flood warning (R2).</li> </ul>



#### 4.3 A BETTER QUALITY OF LIFE

##### Pressure for Development

Twelve million people, or 23% of the population of England and Wales, live in Thames Region creating intense pressure on the natural environment. Although the population growth of the Region is expected to decline past the year 2000, demand for dwellings and employment will continue to grow (*see indicator P4*).

An indicator of the health of the economy and development pressure is the number of planning applications received by planning authorities. At the peak of the development boom of the late 1980s there were 680,000 planning applications per annum nationally, this has now declined to an average of 480,000. Planning authorities in Thames Region make more than 100,000 planning decisions every year, indicating the high level of development pressures (*see indicator P5*).

Following much discussion and debate over the publication of the revised RPG9, central Government has reduced the number of new homes to be built annually within the South East from 43,000 to 39,000. Whilst this figure has been reduced it reflects the increasing pressure being placed upon the environment within the South East Region.

##### Recreation and Navigation

The Region is rich in inland waters, rivers, canals, lakes and flooded gravel pits which act as magnets to people in their leisure time. We aim to ensure that whilst protecting the environment, good use is made of these waters for all kinds of activities – angling, birdwatching, boating, canoeing, diving, rowing, walking or simply river watching. The promotion and provision of riverside walks and recreation areas for picnicking has increased public access to the Region's rivers. Likewise the establishment of the Thames Path, a major project in which we continue to be heavily involved, has made the River Thames more accessible. Future management of recreation issues across Thames Region will be focused through the recently published *Thames Region – Interim Regional Recreation Action Plan, 2000-2004*.

The Thames Path starts near the source of the Thames at Kemble in Gloucestershire and continues to the Thames Barrier at Woolwich, approximately 340km. We have installed sensors to monitor the walkers along the Thames Path at five locations. These highlight the demands placed upon the river as a natural recreational resource, with some of the more popular locations visited by well over 1,000,000 people a year. As more data sets become available, this could be used as an indicator in the future.



We are the navigation authority for the non-tidal Thames upstream of Teddington. This is arguably the most famous as well as the busiest inland navigation in the country and the many competing demands for this invaluable resource place intense management demands on our staff. Whilst the number of boat movements is less than at the river's peak popularity in the 1970s and early 1980s (*see indicator P7*), there are still approximately 30,000 registered and visiting pleasure boats on the 217km of navigable river – about 7 metres per boat. The future management of the Thames Navigation is currently being considered by the *Thames Ahead* project, which is seeking to develop the current recreational use of the navigation.

##### Bathing Waters

There are currently 14 EC Designated Bathing Waters found across the Region which vary in location from the Cotswolds to the Thames Estuary (*see indicator S15*). Clean Bathing Waters can have a direct impact on tourism which is important to the local economies within the Region. Failure to meet standards has a negative impact on tourism and hence local economies. The primary driver behind improvements to the sewage infrastructure is controlled through the Asset Management Plan (AMP) programme and this will continue to be a priority for the Agency within future programmes.

#### 4.4 AN ENHANCED ENVIRONMENT FOR WILDLIFE

Biodiversity broadly means the diversity and variety of wildlife and the habitats that support it. Conserving biodiversity is an essential element of the Agency's contribution towards achieving sustainable development. We seek to protect and enhance habitats and species through our day-to-day activities and this includes the wider countryside as well as more specific actions for the national priority species and habitats.

In 1995, the UK Biodiversity Steering Group produced a 'long list' of 1,250 of the UK's most threatened species. From this list, 416 species were placed in either a 'short' or 'middle' list and for each of these species there would be a dedicated Species Action Plan (SAP) or conservation statement written. Similarly, approximately 40 of the UK's most vulnerable habitats were identified, each of which was to have a Habitat Action Plan (HAP) or habitat statement written for it.

The initial report published by the UK Biodiversity Steering Group in 1995 included 116 SAPs and 14 HAPs. The species lists were reviewed in 1997, when a further 100 species were added to the 'short/middle' list while a few species were found to no longer meet qualification criteria. All 'long' list species were classified as 'Species of Conservation Concern' while the 'short' and 'middle' lists were amalgamated and the species classified as 'Priority Species'.

Since the previous State of the Environment Report, six volumes of Tranche 2 Action Plans have been published, containing 275 SAPs and 31 HAPs. This brings a total of 391 SAPs and 45 HAPs completed for the UK.

#### Biodiversity Species in the Thames Region

The Environment Agency is responsible for the actions on a number of the UK priority species and habitats, particularly where we are the national contact point or lead partner. In response to this the Region is producing a *Thames Region Biodiversity Strategy and Action Plan*. This will ultimately include Regional action plans for 49 priority species, 29 species of conservation concern and 7 locally important species as well as action plans for 14 priority habitats. These figures are subject to change however. The first volume of the strategy was completed in September 2000 and includes action plans for 15 priority species and 3 habitats (see below) that we have categorised as '1' (where we are the contact point) and/or '2' (where we are the lead partner). Work has now started on the action plans for the remaining habitats and species.

Thames Region Species Action Plans have been completed for:

- European Otter \* #
- Water Vole \* #
- Marsh Warbler \*
- Twaite Shad #
- White-clawed Crayfish \*
- Southern Damselfly \*
- Little Whirlpool Ram's Horn Snail \* #



*Twaite Shad*

- Glutinous Snail \* #
- Fine-lined Pea Mussel \* #
- Depressed River Mussel \* #
- Cut Grass #
- Greater Water-parsnip #
- Great Tassel Stonewort \*
- Tassel Stonewort \*
- Freshwater Bryozoan \*

\* indicates that the Agency is the national contact.

# indicates that the Agency is the, or one of the, lead partners.

Thames Region Habitat Action Plans have been completed for:

- Chalk Rivers \*
- Coastal Salt Marsh \*
- Eutrophic Standing Waters \*

\* indicates that the Agency is the lead agency.



#### The Region's contribution to enhancing biodiversity and managing freshwater fisheries

Actions identified in the UK Steering Group Report can largely be delivered as a result of work programmes implemented primarily for other purposes using 'best practice principles'. For example, the water quality improvements required under the Urban Waste Water Treatment Directive will, if our latest proposals for sensitive area status are accepted by the DETR, be of direct benefit to biodiversity in waters that host priority species such as White-clawed Crayfish, Depressed River Mussel and Twaite and Allis Shad, as well as to several chalk rivers.

The reduction in sulphur dioxide emissions proposed in the current review of electricity supply industry authorisations will be of direct benefit to key species suffering the effects of acidification. Biodiversity requirements are also specifically addressed in major programmes such as the AMP investment programme for the water industry, where several chalk streams are



proposed for investment to address the effects of abstraction.

Environmental appraisals and the preparation of Environmental Statements for major flood defence capital works ensure that biodiversity requirements are addressed in the options appraisal and scheme design. The current programme of Water Level Management Plan (WLMP) preparation will also consider biodiversity needs at nearly 100 wetland sites influenced by our activities (*see indicator R8*). Local Environment Agency Action Plans (*see indicator R6*) are being used at a local level to implement specific Agency actions and objectives required by the UK Plan, as well as local Biodiversity Action Plans (BAPs).

In addition, our conservation staff are involved in a number of other projects and activities to enhance biodiversity including:

- co-funding projects to establish the distribution of relevant species and habitats – our staff are acting as the national contact points for several of the UK BAP short list species;
- bidding for funding and overseeing implementation of prioritised action plans;
- raising public awareness of biodiversity issues, through participation in Local County BAPs, media events etc;
- implementing actions, within the UK Plan, SAPs and HAPs where appropriate with other organisations and individuals.

Well over 100 separate collaborative projects were undertaken by the Region between April 1998 and March 2000. Most of these involved habitat enhancements of benefit to a wide range of species. These projects resulted in £1.6M worth of Agency expenditure, but they attracted a further £2.5M of external funding for river and wetland biodiversity work. Examples included:

- implementation of the fourth phase of the Thatcham Reedbeds WLMP, including excavation of a lagoon, refurbishment of control structures, installation of gauge boards and flow monitoring, to benefit bittern, water rail and Desmoulin's whorl snail etc. (in collaboration with English Nature, the RSPB, West Berks Council).
- restoration of the Spring Brook in Bromley, including removal of the concrete channel, creation of beaches and berms and wetland planting, to benefit a wide variety of wildlife and people. (in collaboration with the London Borough of Bromley).
- water quality monitoring and management plan production for ponds containing Starfruit in Bucks and Surrey (in collaboration with Plantlife).
- numerous Water Vole projects, including funding of county-wide surveys in Berks, Bucks, Oxon, Surrey and

Wilts, the creation and enhancement of wetlands and streams for Water Voles and the production of information booklets on Water Vole habitat management for landowners, and rat control and Water Vole conservation (in collaboration with the County Wildlife Trusts and WildCRU).

- conversion of an Agency-owned pillbox into a bat hibernaculum and ongoing monitoring and maintenance of tree-mounted bat boxes on various lock sites along the Thames (in collaboration with the Oxfordshire Bat Group).
- creation of a huge new wetland complex at Otmoor, adjacent to the existing SSSI, to create breeding habitat for a wide variety of wetland species, including Bittern, Shoveler and Redshank. (In collaboration with the RSPB).

The Thames Salmon Rehabilitation Scheme continues to make progress towards restoring a self-sustaining salmon population to the river. Salmon now pass regularly through the tidal Thames to freshwater (*see indicator S13*). In partnership with the Thames Salmon Trust, fish passes have been built on all the weirs between London and Reading. A grant from the Millennium Commission has also allowed 16 passes to be built on the River Kennet. Once completed these will allow adult salmon access to suitable spawning and nursery habitat for the first time in 160 years. A system is in place to record adult salmon returning to the river and monitor their progress upstream over the numerous weirs.

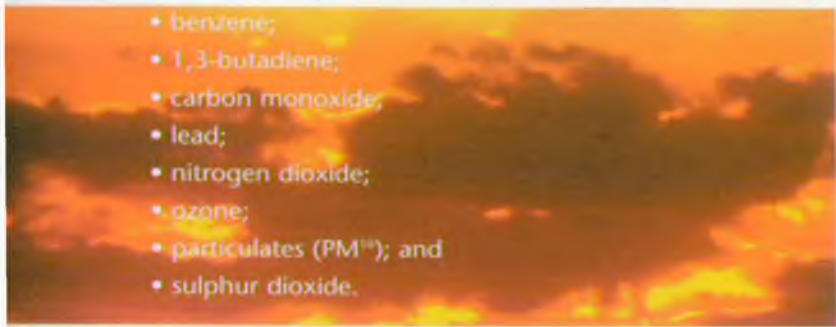
### Biodiversity and Climate Change

Probable evidence of climate change can be seen in the recent colonisation and expanding distribution of certain insect species in the south and east of England. For example, dragonfly species such as the Red-veined Darter and the Lesser Emperor, which were formerly only vagrant in the UK, have bred at an increasing number of sites in recent years. Other insects such as Roesel's Bush Cricket and the Long-winged Conehead are rapidly expanding their range in a north-westerly direction across Britain, and now occur throughout much of the Region, after being very scarce and localised only 15 years ago.

Birds too may be reflecting subtle changes in climate – for example the Little Egret started breeding on the south coast only four years ago, but the population now exceeds 50 pairs and with increasing numbers being recorded in Thames Region, it probably won't be long before they start breeding here as well. Declines in species due to climate change are also likely, but these will probably be associated with habitat loss due to climate change and will therefore take much longer to detect.

#### 4.5 CLEANER AIR FOR EVERYONE

The quality of the air that we breathe is crucial to us all. Air quality in the UK is generally good, but there are sometimes unacceptably high levels of pollution that can harm human health and the environment. The Government's Air Quality Strategy (AQS) describes plans to improve and protect ambient air quality in the UK. The Strategy sets objectives for protecting human health by limiting the eight main air pollutants. These pollutants are:

- 
- benzene;
  - 1,3-butadiene;
  - carbon monoxide;
  - lead;
  - nitrogen dioxide;
  - ozone;
  - particulates (PM<sup>10</sup>); and
  - sulphur dioxide.

There are also two new Strategy objectives to protect vegetation and ecosystems, which will be monitored away from urban and industrial areas and motorways.

The major air quality problem in London is the failing of nitrogen dioxide and particulate targets due to traffic emissions. The most significant effect of the industrial processes regulated by the Agency is from sulphur dioxide to the east of London, where a number of power stations and a refinery lie beyond the London boundary.

The Air Quality Strategy describes the roles of the Agency, local authorities and industry in managing air quality. We play our part mainly through the regulation and control of emissions from the largest, most technically complex and potentially most polluting industrial processes under Integrated Pollution Control (IPC). Under the recently introduced Pollution Prevention and Control (PPC) regime we will take a wider range of environmental effects into account when determining permit conditions. These will include energy efficiency, noise and site restoration. All IPC processes will transfer to the PPC regime over the next seven years.

It is likely that the Region's major air quality problems will be in London where nitrogen dioxide and particulate targets will be compromised by traffic (*see indicator S2*). The most dominant effect of processes we regulate will be that of sulphur dioxide to the east of London where a number of power stations and a refinery are just beyond the boundary of the Thames Region (*see indicator P11*).

#### 4.6 IMPROVED AND PROTECTED INLAND AND COASTAL WATERS

We have a clear duty to protect and improve water quality.

Planned degradation is not an option that is considered but as quality generally becomes better, further improvements become more difficult to achieve. Uses which require water quality of a certain standard are many and varied, for example, drinking water supply, fisheries, bathing, amenity and abstractions for industry or agriculture. However, these uses must be balanced against the ecological value the water quality supports.

The water quality of rivers in the Thames Region is generally good. There are very few river reaches of poor quality, with only 1% being Grade F (or 'poor') Chemical GQA in 1999 (*see indicator S6*). Although there are few obvious severe water quality problems in Thames Region, water is under intense pressure from the Region's population (*see section 4.3*). The pressure is illustrated by the high proportion of the Region's river flows that are made up of treated effluent. During dry summer periods many rivers can consist of over 90% treated sewage. This demonstrates how essential the returned effluent is, not only for reuse by people, but to provide flows in rivers.

As treated sewage can effectively become the main source of some rivers, effluent must be treated to an extremely high standard to maintain water quality. In some cases new development will increase pressures and further improvements in effluent quality will impose ever larger costs on the water consumer.

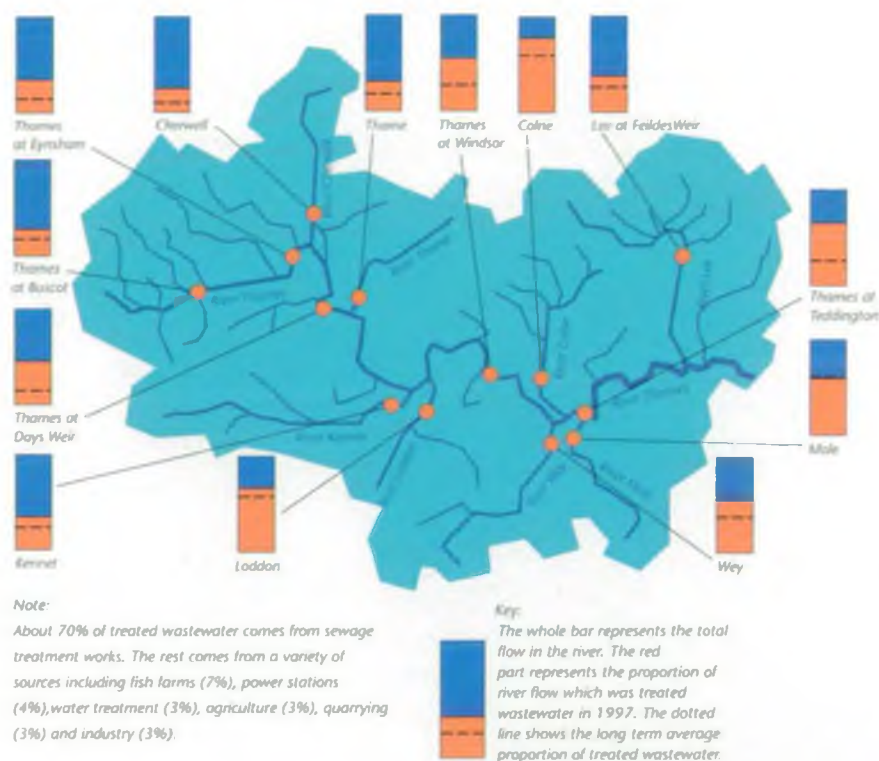
Water quality in the Region has been heavily influenced by recent droughts (*see indicator S3*). Comparing river flows and water quality over the last decade shows that the periods of below average river flow in 1991-1992 and 1996/97 coincide with poorer water quality. Using the period 1988-90 as a baseline, the changes in the number of reaches in each chemical water quality grade show an obvious improvement from 1990 to 1994 as the number of reaches in grade E decreased and the number of reaches in grade B increased. As flow decreased in 1996-1997 (*see indicator S5*) the quality approaches that of the 1988-90 period.

There has been a continual improvement in the quality of discharges during the last eight years, so despite the severity of the drought in 1997-1998 quality has improved compared to 1990 (*see indicator P10*). Uncertainty about climate change makes it very difficult to set appropriate discharge consent standards. If we plan for the worst case then the cost burden on water users would be enormous. However, if we do not take climate change into account we could find a rapid deterioration in the quality of our rivers.

Diffuse sources of pollution, such as urban drainage and runoff from agricultural areas, can have a detrimental effect on water quality, for example causing low dissolved oxygen



Proportion of river flow that is treated effluent, 1997



and nutrient enrichment. Nutrient enrichment of rivers from point and diffuse discharges that may lead to eutrophication, which causes accelerated growth of algae and plant life, is also a key issue in Thames Region. This is partly being addressed by phosphate reduction of major sewage treatment work discharges. The reduction of phosphate from agricultural land is not currently under our control.

The protection and improvement of water quality in Thames Region is a complex task. It requires the consideration of factors whose behaviour is often difficult to predict. In addition, we are also required to take account of the costs and the benefits of proposed improvements.

To manage the environment effectively, it is important to consider all of its facets, and the problems and potential threats to it, in an integrated way. This approach is particularly relevant to river basins, which pose many challenges that cannot be considered in isolation. The LEAP process is an example of how we are delivering our wide range of responsibilities in an integrated way (see indicator R6).



#### 4.7 RESTORED, PROTECTED LAND WITH HEALTHIER SOILS

The publication of Lord Rogers' Urban Task Force report *Towards an Urban Renaissance* (1999) signalled a significant change in the approach to dealing with derelict urban sites. The Government's urban white paper (2000) which promotes the reuse of derelict and previously developed sites of derelict land within urban areas.

The Government is promoting the idea that as part of the sequential approach to future housing development, 60% of construction should be on previously developed land. Some of this land may be contaminated as a result of its previous use. The Government objective for contaminated land is to identify and remove unacceptable risks to human

health and the environment. Derelict or previously developed land identified as contaminated will be remediated back into beneficial use. The costs of this remediation to the private sector or public purse will be proportionate, manageable and economically sustainable.

Future action on the legacy of land contamination will be led primarily under Part IIA of the *Environmental Protection Act 1990*, which was enacted by the *Contaminated Land (England) Regulations 2000*. The powers in the Regulations are only enacted where current regimes cannot be used.

We are currently providing information to the local authorities to help them prepare their

inspection strategies, which in turn will be used by the authorities to identify contaminated land. We will also provide assistance and advice to the authorities on the remediation of these contaminated sites, and on those sites subsequently designated as special sites, we will be the enforcing authority with powers to ensure the sites are remediated.



#### 4.8 A 'GREENER' BUSINESS WORLD

Under the Environmental Protection Act 1990 (EPA90) two lists of processes have been prescribed for control: Part A processes are controlled under Integrated Pollution Control (IPC) by the Agency; Part B processes are controlled at a local level with regard to their discharges to the atmosphere under a system of Local Authority Air Pollution Control. For Part A processes Best Available Techniques Not Entailing Excessive Cost (BATNEEC) must be used by operators to prevent, minimise or render harmless releases to the environment. Additionally, the overall effect on the environment must be minimised. Also the EPA90 requires that the releases from these processes should not compromise air quality standards, which are currently set for nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>), lead and suspended particles.

The UK Air Quality Strategy was enacted under the Environment Act 1995. This states that the Environment Agency 'shall have regard to the UK AQS in exercising its pollution control functions'. Guidance suggests that generally the application of normal plant upgrading under IPC should meet the objectives of the UK AQS. However, local circumstances may require further reductions from an IPC process where it is the most cost effective route for effecting reductions. An example of this is the electricity supply industry, whose power stations have been required to reduce SO<sub>2</sub> emissions by 2005 to ensure the UK AQS objective is not breached.

There are approximately 150 Part A processes in the Region which we regulate, including chemical and pharmaceutical manufacturers, incinerators and power stations. However, compared with other Regions, Thames Region has few major industries (*see indicator P11*). Not all Part A installations release to air and some which do are insignificant. Our pollution inspectors are responsible for assessing and authorising these processes to ensure the pollution to the environment as a whole (whether by releases to air, water or land) is minimised. The types of air pollutants released from the different types of processes are set out below:

- combustion processes release NO<sub>x</sub>, SO<sub>2</sub>, CO and particulates;
- metals processes release lead and particulates;
- minerals processes release NO<sub>x</sub>, SO<sub>2</sub> and particulates;
- chemicals processes can release VOCs and may have on-site boilers;
- incineration processes release NO<sub>x</sub>, metals and particulates.

There have already been significant improvements to

Part A installations in the Region. Combustion processes have been converted to natural gas, low NO<sub>x</sub> burners are commonly used and gas turbines have been installed to the standards available for new plants. Metals processes have had their abatement plants upgraded. Chemicals processes have higher levels of recycling potential wastes, alternative solvents have been found or abatement has been installed. Incineration plants have had their abatement plants upgraded and new plants have been built to current best standards.

The continuing use of BATNEEC for the Part A processes we regulate will deliver progressive reductions in releases to air and thereby contribute to improved air quality in the Region.

#### 4.9 WISER, SUSTAINABLE USE OF NATURAL RESOURCES

##### Balancing Water Use and Environmental Needs

Water is a fundamental need of the Region's population for domestic, industrial and agricultural purposes. In addition, rivers, streams and lakes provide habitats for plants, fish, and other wildlife. Management of river flow and water levels is also required to dilute effluent from industry and sewage works, to maintain and enhance the aesthetic and recreational value of natural waterways, and to maintain navigation.

Groundwater meets about 40% of public water supply in the Region (*see indicator S10*). It also sustains the baseflow of rivers and provides most of the flow in a river during summer and autumn, and during periods of drought.

However, water is a finite resource and a sustainable balance needs to be struck between our demands and the needs of the environment that are dependent upon it. There has been an increase in the number of locations where authorised abstractions are perceived to be causing or have the potential to cause environmental problems. We are reviewing abstraction licences, especially those which could impact on SSSI's, Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). We are also working with water companies to reduce licensed abstraction where the natural ecology is being affected and to undertake further investigations where the impact of abstraction is uncertain (*see indicator R9*). Since our last report a number of additional rivers have benefited from reducing abstraction and restoring flows (*see indicator R9*).

##### Drought and Climate Change

Although England and Wales are relatively well supplied with water resources on average, their distribution, both temporally and spatially, is not necessarily well matched



with patterns of demand. The average effective rainfall is low in the south and east of England and becomes critical during periods of drought; we already use a greater proportion of effective rainfall than any other Region in the country.

The Region is set to experience some of the most challenging pressures on water resources; through continued increases in demand from the existing population, new demands from housing and economic development, as well as the potential uncertainties of global warming and further climate change on both demand and available resources.

Climate change is potentially an important issue in Thames Region (see section 4.10). It could impact on water resources in the next 25 years and beyond through changes to rainfall, evaporation and temperature. Secondary impacts include changing water demand due to fluctuations in the duration and frequency of hot and dry summers. Changes in agricultural water requirements may also occur if the patterns of land use in the Region alter significantly.

Water Demand

The water resources balance for the main companies in the Thames Region is already defined as 'tight' by the Office of the Director General of Water Services (OFWAT), and agreed by the Agency. Further economic development and increases in demand and population will serve to exacerbate the situation across the Region.

Beyond 2004-2005 the water companies do not expect further leakage reduction to be economically viable. However, the economic level of leakage reduction may vary with supply and demand and changes in technology and approach. It is likely that there is a relationship between water use and affluence, some areas of the Region are amongst the most affluent in the country and exhibit some of the highest levels of per capita consumption (PCC).

Water companies predict that metered water consumption will reduce water use, but that both measured and unmeasured PCC will rise between 1997-1998 and 2024-2025. In peak periods water consumption is higher than in average conditions. Drought or dry years cause a significant increase in the amount of water used. The 1995-1996 drought had a considerable impact on abstraction, with more water being abstracted in that period for public water supply, agricultural and industrial uses than in a typical year.

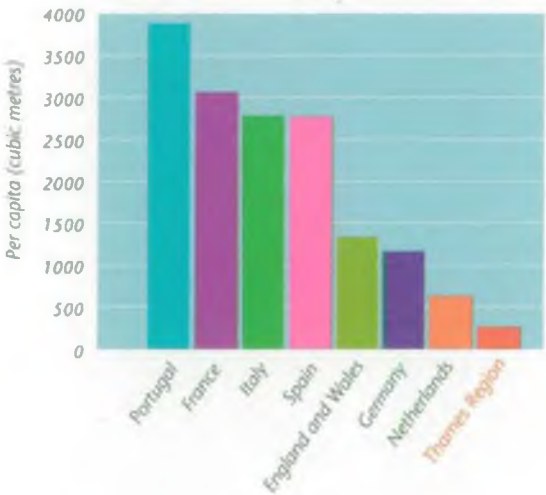
In many parts of the Region special attention has to be paid to peak demands as the majority of water supply is derived from groundwater sources. Abstraction from

groundwater causes the water table to be drawn down in the vicinity of the borehole and therefore cannot be increased beyond a maximum rate to meet rising demand.

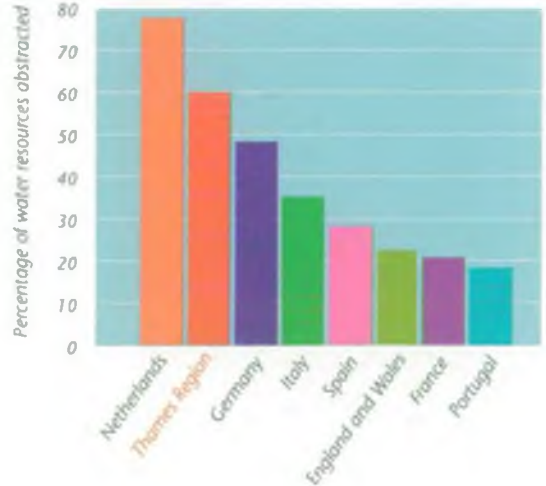
Parts of the Region are over-licensed, that is, if abstractors took their full quota then conflicts would arise between man's needs and the environment's needs and between the needs of different abstractors. More urgently, some areas are regarded as already over-abstracted as the actual water abstraction is considered to cause environmental damage.

Increased demand for water has to be balanced with the availability of the resource. The bar charts show how the Thames Region has a lower per capita availability of water compared with the average for England and Wales and with many European countries, and that it also abstracts a high proportion of what is available. This is caused by the high density of population found within the Region, rather than the low level of rainfall. The first graph outlines annual internal renewable water resources

Annual internal renewable water resources



Annual abstraction, 1997



available, which identifies the quantity of effective rainfall (i.e. the amount of rainfall reaching surface and groundwater after the losses to the air by evaporation) available per capita. The second illustrates the percentage of the available water resource abstracted within a country or region.

### Future Action

In 1998, the Agency published *A Price Worth Paying* that identified Habitats Directives sites (SACs and SPAs), SSSIs and other sustainability sites of abstraction-related environmental concern. This also resulted in the National Environmental Programme which set down a programme of environmental improvements to be undertaken by the water companies over the period 2000-05, through the Asset Management Planning (AMP) process regulated by OFWAT.

We are in the process of reviewing our current Water Resources Strategy. As part of this process in October 1999 the Agency published its consultation document *Sustainable Water Resources for the Future: Values and Challenges* as a start in developing a new strategy for the sustainable management of water resources within England and Wales. In conjunction with the water resource plans produced by the water companies this strategy will form the direction of future water resource management. The national and Regional strategies are due to be published in 2001. These will provide a framework for the sustainable management of water resources over the next 25 years.

Also in 2001, the Agency will launch Catchment Abstraction Management Strategies (CAMS). This will be a new process to run for many years ahead for managing abstraction on a local catchment scale. It will involve external consultation and result in public documents which will present essential information on water resources and set out policies for granting and modifying abstractions.

### Sustainable Waste Management

#### *Roles and Responsibilities*

There are a number of organisations that will be involved in the future debate over waste management. These are:

- *Environment Agency* – The Environment Agency is responsible for regulating the treatment, storage and disposal of controlled wastes (e.g. industrial, household and commercial wastes but excluding mine and quarry wastes, agricultural wastes, sewage sludge (except that disposed of to landfill), radioactive waste and explosives). The Agency also registers waste carriers, waste brokers, activities exempt from licensing, monitors the movements of special (hazardous) wastes and wastes imported or

exported from England and Wales to or from counties outside the UK. The Agency also has an important role in the provision of data, information and advice to ensure that waste strategies are selected in light of reliable information and that the risks of the chosen strategies and facilities are regulated to minimise impacts on people and the environment.

- *Local Authorities* – Local authorities, through the development planning system, have responsibility for the allocation of land for the management of wastes. This is achieved through the production of Regional planning guidance (RPG), waste local plans or unitary development plans, and responses to planning applications. Local authorities also have responsibility for the production of local integrated strategies for the management of municipal wastes and for the placing of contracts for waste collection, recycling, recovery and disposal.
- *Regional Technical Advisory Bodies (RTAB) for Waste* – Officer level groups set up in each planning Region comprised of representatives from Waste Planning Authorities, Waste Disposal Authorities, the waste industry, the Government Office, Unitary Authorities and the Environment Agency, reporting to the Regional Planning Body. RTABs are tasked with assembling data on waste management, examining the implications for the future provision of waste management facilities and identifying options for meeting Regional waste management requirements in terms of the likely quantities of waste and the nature and distribution of facilities.

#### *Waste Disposal*

Government is committed to achieving objectives in the *Waste Strategy 2000* and under European legislation such as the Landfill Directive and the Packaging Directive. The Landfill Directive requires the diversion of municipal biodegradable wastes from landfill and the complete ban on co-disposal (hazardous with non-hazardous waste) landfills. The diversion targets for biodegradable municipal waste are 75%, 50% and 35% of the amount produced in 1995 by 2010, 2013 and 2020 respectively. If municipal waste continues to grow in quantity, current levels of recycling and recovery will not be adequate enough to support the 2010 landfill diversion target. *The Waste Strategy 2000 for England and Wales* requires that landfilling of industrial and commercial waste is reduced to 85% of the 1998 level by 2005. These targets will require major changes in the way waste in the Region is handled if they are to be met.

The majority of controlled waste produced in the



Thames Region is currently sent to landfill (see indicator P13). For a more sustainable approach, a radical change in practice will be required to reduce the quantity of waste going to landfill, through minimisation, re-use, recycling and treatment. That change in approach will enable the management of remaining landfill, for the long term for the disposal of residues and untreatable wastes. London has a particular problem in that most of its waste is exported to neighbouring counties for disposal. The minimisation of the distance waste is transported also needs to be considered and the impact of road transfer lessened by increasing the use of river and rail transfer.

#### *Monitoring Waste*

Unless the growth rate in household waste can be stabilised, the Agency expects the number and range of facilities to increase. The Agency believes that a much greater emphasis should be given to stabilising the current growth rate of household waste to reduce the need for additional treatment facilities which generally are not welcomed.

The Agency published its first *Strategic Waste Management Assessments* in November 2000, one for each Planning Region in England and Wales. They provide consistent comprehensive, local information about the amounts and types of waste produced and how they are managed (see indicator P12). They also contain forecasts, of future waste production at intervals in line with the Government's Waste Strategy and the diversion targets in the Landfill Directive. In time, a series can be built up to show changes in the total of waste generated and changes in management practices. They are the first product following the Environment Agency's national waste survey of industry and commerce, the largest such survey ever carried out in Europe.

#### 4.10 LIMITING AND ADAPTING TO CLIMATE CHANGE

One of the main themes of our vision is the issue of climate change and how to address it. It pervades all other issues, being the principal 'natural' driver upon the state of the environment, acting as a pressure by changing rainfall patterns, the frequency of severe weather conditions and sea level rise. The secondary effects will be manifest on the state of the Region's environment through many ways, including water resources, influences on the extent and frequency of riverine and coastal flooding, biodiversity, the ability to comply with environmental standards and targets, human health-related aspects, and landscape and other aesthetic considerations.

Indicator P1 shows that the sequence of record temperatures throughout the 1980s and 1990s is continuing. Since the last Regional State of the Environment Report it is significant that the equal warmest year on record in Central England occurred in 1999.

#### **Mitigating the Causes of Climate Change**

The Government has now published its Climate Change Programme, to which we made a major input. We will continue to push for the lowering of greenhouse gas emissions through:

- The control of IPC processes for which we are the regulators and the bringing into force of the energy efficiency elements of the PPC regulations. We are working with Government to ensure that this legislation ties into the climate change levy and other possible initiatives with economic instruments and carbon trading.
- The regulation of methane emissions from landfill sites.
- The promotion internally and externally of energy efficiency particularly related to that generated from carbon sources. We have reduced our mileage and increased the energy efficiency of our buildings and transport fleet. We will continue to promote energy efficiency with our stakeholders. The consequences for

the environment of global warming will be so significant that we need to raise the awareness of all as to how we can try to slow it down.

#### **Adapting to Climate Change**

Since the last report we have been working with many partners as part of the UK Climate Impacts programme to assess the potential effects of climate change on the South East. An initial report *Rising to the Challenge* was launched in November 1999 and we are taking forward the major findings.





The greatest impacts are likely to be with respect to flood risk both riverine and coastal, pressure on water resources, effects on water quality and effects on biodiversity. None of the likely effects is easy to quantify at this stage and we are acting as the lead partner in attempting how best to manage uncertainty. We are also working with the Greater London Authority (GLA) to assess the effects of climate change on London and have commissioned a project to look at the effects in the wider Thames estuary.

It is clear that Thames Region is as vulnerable as the rest of the UK to the effects of climate change. If we are to protect the environment of the Region we need to support and encourage efforts to make greenhouse gas emission limits effective on a global basis.



#### 4.11 REDUCING FLOOD RISK

Flooding of land adjacent to rivers and the coast is a natural process that can have far-reaching effects on people and property as a result of previous decisions about settlement and land use. There are considerable costs associated with the damage it causes. These costs are not only financial and economic, such as damage to property and flood defences and disruption to business, but can also cause distress, injury and loss of life as well as extreme demands on the emergency services and loss of public confidence in the planning services. However, flooding can also have many benefits to the environment, for example it is essential to maintain certain important habitats.

##### Causes of Flooding

The recent DETR Consultation Paper on *Development and Flood Risk* (PPG 25 – DETR, 2001), identifies the principal cause of river flooding as excessive rainfall or snow melt

within a limited period, which overwhelms the drainage capacity of land, particularly when the ground is already saturated or when channels become blocked. Some areas are subject to combinations of tidal and river impacts. The impacts can be aggravated by:

- the growth of built development in catchments and other changes in land use, which increase the rate and volume of runoff;
- sediment movement that has changed river cross-sections and affected flood levels;
- inadequate maintenance of flood defence systems, watercourses, culverts (including the flood relief areas around them) and road gullies, particularly where this leads to channel blockage;
- canalisation, modification and diversion of rivers and watercourses, which increase the rate of flow and decrease the time taken for water to travel within a catchment; and
- building of structures (e.g. embankments) which reduce storage and restrict flows over historical floodplains and thereby create additional flood risks both upstream and downstream.

Flooding is, therefore, a combination of human activity and natural physical conditions.

We make a significant contribution to river basin management through works related to flood defence. Improvement works aimed at reducing the risk from flooding to life and property might take the form of channel deepening or widening, storage provision, river control structures or raised defences. Such works may tackle insensitive or inappropriate works in the past, or they may be needed to address increased risk arising from new development within the floodplain.

The Maidenhead, Windsor and Eton Flood Alleviation Scheme, which is the largest inland flood alleviation scheme undertaken by the Agency, is an example of where it has been necessary for a major scheme to reduce flood risk. The scheme comprises a new 11.5 km flood alleviation channel and incorporates considerable ecological enhancement and access provision.

Extensive essential maintenance works to watercourses and previous improvement schemes, are carried out by our internal workforce. In addition, channels are kept free from debris and blockages, and excessive growth from vegetation is controlled where required. Where flooding is imminent despite these measures, we operate a Flood Warning service (*see indicator R2*). The workforce is deployed on emergency response work that includes operating defences and control structures and ensuring



that flows are maintained without blockages occurring. The Thames Barrier is by far the largest of these structures and together with the Thames tidal defences protects the homes and businesses of 1.2 million people in London (see indicator R1).

### Current Pressures

It is currently estimated that 1.85 million homes, 185,000 commercial properties and 5 million people are now at risk of flooding within England and Wales. Guidance on development within flood risk areas has existed since 1947 and the most recent Planning Policy Guidance (PPG25) will be the sixth revision. There has been a steady increase over the last five years in the number of planning applications for development in floodplains. Last year in excess of 526,000 planning applications were submitted within England and Wales. These include 223,000 houses of which 19,725 (9% of the total) were located in floodplains. If this trend were to continue to the 3.8 million houses proposed by 2021, a further 342,000 additional houses would be built in flood risk areas.

The threat presented by flooding is best illustrated by the events which took place in October and November 2000. The combined rainfall totals made the period the wettest for 40 years and the second wettest since records began in 1882. In the extreme west and south of the Thames Region rainfall totals were close to 200mm. During the period between the 28 October to 14 November 2000, 9 severe flood warnings, 110 flood warnings and 248 flood watches were issued across the Region. The highest levels and flows since 1947 were recorded on the Lower Roding and the highest flows since 1968 on many reaches of the River Mole. Flows on the River Wey, Kennet, Stort, Ash, Lower Lee and Blackwater exceeded or came close to exceeding the previous highest on record. In total over 400 properties were flooded during this period. It is also estimated that between 50,000 and 100,000 properties were successfully protected from flooding by the defences currently in place.

### Future Management

In November 1999 Ministry of Agriculture Fisheries and Food (MAFF) issued a set of 'High Level Targets' for flood and coastal defence operating authorities. This is a comprehensive set of 14 targets, which provides the framework by which performance will be measured and monitored.

There is a substantial pressure to develop land, with the number of households projected to increase by 20% by 2021. It is crucial to recognise that this must be done in a

more sustainable way, to provide for and to protect existing and future generations. To achieve these targets will involve actions from the Agency, as well as others including local authorities and English Nature. The Regional Planning Guidance for the South East (RPG9) provides a framework for the policies and guidance that local authorities should include in local development plans relating to flooding.

To help achieve the goal of a better quality of life for everyone, flood risk must be given full consideration at a very early stage in planning and development processes. PPG25 should help promote seamless and integrated partnerships across river catchments to facilitate development that is more sustainable. This will enable development options to be better understood and more informed choices to be made.

The Agency is assessing flood risk on a number of levels to determine the appropriate requirements for direct warning and public awareness campaigns based on the probability, impact and risk of flooding. The flood warning system will have to be strengthened to ensure that wherever possible those who choose to live in an at-risk area receive prior warnings of imminent flooding. Indicative floodplain maps were issued by the Agency to all planning authorities in 1999 to assist their decision making. These will be updated periodically as further information and knowledge becomes available.

The Environment Agency looks to local authorities to give appropriate weight to flood risk information in preparing development plans and considering individual proposals for development. The Agency will comment on development plans and respond to planning applications, opposing inappropriate development on flood risk grounds. We will monitor the implications of climate change which may provide further limitations due to increased risks and increased costs of engineering adequate flood defences.

The planning pressures in the South East are likely to increase regulatory activity by the Agency on flood risk matters and will need an increased focus to be placed on flood risk by planning authorities. Local authorities should also encourage the adoption of sustainable urban drainage practices.

## 5. THE WAY FORWARD



The environmental indicators have illustrated the intense pressure that the Region's environment is under. These pressures are emphasised by the issues raised in section 4 and the main Regional environmental management challenges identified in the report which are summarised below.

The Region's high population density and people's lifestyle expectations are exerting many stresses upon Thames Region's environment and its management. This affects the availability of critical resources, the quality of all environmental media – land, air and water – and the health of the natural environment including biodiversity and fisheries.

Additional development will intensify current problems particularly if the trend towards dispersed patterns of development and economic activity is allowed to continue. Concentrating the majority of future development in urban areas should produce a more sustainable pattern of development, movement and economic activity. However, this also raises new environmental management challenges, such as urban air quality issues, pressures for urban re-modelling and the regeneration of brownfield sites. In particular many of the Region's urban areas have developed alongside rivers in areas vulnerable to flooding. Development of these sites may require flood compensation and surface water management measures, remediation of contaminated land and improvements to degraded urban rivers.

The trend towards smaller household size is likely to lead to higher levels of water consumption and waste generation per head of population. Water abstraction for public supply affects river flows and groundwater levels, threatening aquatic and wetland habitats. Regional demand for aggregates for construction projects is also high. It is predicted that a third of demand will need to be met by imports. Local extraction of aggregates needs effective management to avoid adverse effects on groundwater levels; flood risk; floodplain habitats and

biodiversity; and river corridor landscapes and their continuity.

Most of the Region's waste is currently sent for disposal in landfill sites. However, landfill void space continues to be used up at a faster rate than it is being created. In addition, current practices are wasteful of resources and fail to deal with waste arisings in the most environmentally sound manner. A radical change in waste practice is needed to implement the Government's waste hierarchy. This should place emphasis on minimisation and the efficient use of re-usable resources.

Water quality is a particular problem where sewage treatment works discharge into smaller and more environmentally sensitive rivers where water company discharge standards are already tight and challenging to meet. Further development would exacerbate this.

### Future Drivers

Over the next five years a number of factors will be important in influencing the management of the environment and monitoring of environmental quality across the Region. The challenge for the Agency, in partnership with a variety of organisations, is to adapt to these changes and to manage pressures to achieve a sustainable and enhanced environment.

There are a number of pieces of new or proposed legislation which will have a significant effect on future environmental management, for example:

- *EC Habitats Directive* – this has recently been enacted and includes the requirement on the Agency to review its authorisations to identify the potential impacts on internationally important wildlife sites.
- *Contaminated Land Regulations* – these include the requirement to identify contaminated sites, with 'special' sites being identified in close consultation with the Agency.
- *EC Directive on Integrated Pollution Prevention Control (IPPC)* – this has recently been enacted and will directly



impact on the control of polluting activities. The control of currently unregulated processes will be phased in over the next seven years placing an increasing emphasis on the 'polluter pays' principle.

- *Development and Flood Risk (PPG25)* – the recent consultation paper from the DETR will strengthen, if adopted, the approach of restricting development within the floodplains.
- *EC Landfill Directive* – this requires significant changes in how waste is managed including the diversion of large quantities of municipal biodegradable wastes from landfill and the complete ban on co-disposal landfills.
- *EC Water Framework Directive* – this will replace a number of existing Directives, integrate management of water flows with the ecological quality of the aquatic environment and introduce the requirement for river basin planning.

#### Mechanisms for Action and Partnership

This report presents a snapshot of the state of Thames Region's environment, against this background future change can be measured. It concentrates on the aspects of the environment in which we have a particular interest. However, environmental management responsibilities are split between numerous organisations which all have a slightly different environmental focus. Partnership is therefore essential in working towards the common goal of sustainable development.

For our part, we have an established framework for addressing environmental issues. At a national level, the document *An Environmental Vision* sets out our policy objectives and priorities. These policy aims and objectives are implemented through the *Corporate Plan* at national, Regional and area levels. Finally, *Local Environment Agency Plans* provide our commitment to a programme of local environmental improvements. It is the intention that the *State of the Environment Report* will inform all these levels of environmental management in the Thames Region. Because of the importance of London with the Agency's Thames Region, we have produced a specific state of the environment report for London. We will be working with the Greater London Authority and Mayor over the coming years to assist with the preparation of their state of the environment reports and their various strategies.

Throughout this report we have highlighted future actions being driven by policies, plans and strategies produced by a number of organisations, such as the Government's Air Quality and Waste Strategies, the Regional Planning Guidance, Biodiversity Action Plans and water companies' Water Resource Plans. The Environment

Agency is itself developing strategies that will influence the approach to environmental management and monitoring in the future (e.g. water resources strategies, regional biodiversity action plans and strategic waste assessments).

This report has demonstrated that progress towards a better environment cannot be achieved without the full support of our partners. These relationships are vitally important to us and we will work to make effective co-operation a continuing reality.

#### Acknowledgements

The State of the Environment Report has been produced by the Environment Protection department under the direction of a steering group chaired by Tim Reeder, Land Quality and Technical Services Manager.

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## APPENDIX I.

# THE AGENCY'S DUTIES, POWERS AND INTERESTS

The Environment Agency has a wide range of interests in the areas of water management, waste management and pollution prevention and control. Whilst many of these interests are supported by statutory duties and powers,

much of our work is advisory, with the relevant powers resting with other bodies such as local planning authorities. The following table summarises our duties, powers and interests.

Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:
<b>Water Resources</b> <i>The Agency has a duty to conserve, redistribute, augment and secure the proper use of water resources.</i>	<ul style="list-style-type: none"> <li>• Grant or vary water abstraction and impoundment licences on application.</li> <li>• Revoke or vary existing licences to reinstate flows or levels to surface waters or groundwaters which have become depleted as a result of abstraction, and are subject to a liability for compensation.</li> <li>• Secure the proper use of water resources through its role in water resources planning, the assessment of reasonable need for abstractions and promotion of more efficient use of water resources.</li> <li>• Monitor and enforce abstraction and impoundment licence conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• The more efficient use of water by water companies, developers, industry, agriculture and the public and the introduction of water efficiency measures and suitable design and layout of the infrastructure.</li> </ul>
<b>Flood Defence</b> <i>The Agency has a duty to exercise general supervision over all matters relating to flood defence throughout each catchment.</i>	<ul style="list-style-type: none"> <li>• Control, through Land Drainage consents, development within 8 m of a Main River (16 m for the tidal Thames and tributaries) (Water Resources Act 1991, Section 109) or building of a structure that would affect the flow of an ordinary watercourse (Land Drainage Act 1991, Section 23).</li> <li>• Produce flood risk maps for all main rivers under Section 105 of the Water Resources Act 1991.</li> <li>• Undertake works to Main Rivers using permissive powers.</li> <li>• Issue flood warnings for Main Rivers to the public, local authorities and the police.</li> <li>• Provide and maintain tidal defences in London.</li> <li>• Consent mineral workings within 16 m of Main Rivers.</li> </ul>	<ul style="list-style-type: none"> <li>• Granting of planning permission throughout a catchment but especially floodplains where development can significantly increase flood risk. This permission is granted by local planning authorities.</li> <li>• Installation of surface water source control measures e.g. flood attenuation structures.</li> <li>• Supervising the maintenance of ordinary watercourses, which is a local authority remit but may impact on Main Rivers.</li> <li>• Installation of buffer zones which reduce flood risk and have significant environmental benefits.</li> <li>• Urban and rural land use and measures that can reduce flood risk or the need for watercourse maintenance.</li> </ul>
<b>Water Quality</b> <i>The Agency has a duty to monitor, protect, manage and, where possible, enhance the quality of all controlled waters including rivers, groundwaters, lakes, canals, estuaries and coastal waters through the prevention and control of pollution.</i>	<ul style="list-style-type: none"> <li>• Issue discharge consents to control pollution loads in controlled waters.</li> <li>• Regulate discharges to controlled waters in respect of water quality, through the issue and enforcement of discharge consents.</li> <li>• Issue 'works notices' where action is required to reduce the risk of pollution.</li> <li>• Prosecute polluters and recover the costs of clean-up operations.</li> </ul>	<ul style="list-style-type: none"> <li>• The control of runoff from roads and highways. This is a Highways Agency duty.</li> <li>• The greater use of source control measures to reduce pollution by surface-water runoff.</li> <li>• Prevention and education campaigns to reduce pollution incidents.</li> </ul>



Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:
<b>Integrated Pollution Control and Air Quality</b> <i>The Agency has a duty to implement Part I of the Environmental Protection Act 1990.</i>	<ul style="list-style-type: none"> <li>• Regulate the largest technically-complex and potentially most polluting prescribed industrial processes, such as refineries, chemical works and power stations including enforcement of, and guidance on, BATNEEC and BPEO.</li> <li>• Have regard to the Government's National Air Quality Strategy when setting standards for the releases to air from industrial processes.</li> </ul>	<ul style="list-style-type: none"> <li>• The vast number of smaller industrial processes which are controlled by local authorities.</li> <li>• Control over vehicular emissions and transport planning.</li> </ul>
<b>Radioactive Substances</b> <i>The Agency has a duty under the Radioactive Substances Act 1993 to regulate the use of radioactive materials and the disposal of radioactive waste.</i>	<ul style="list-style-type: none"> <li>• Issue certificates to users of radioactive materials and disposers of radioactive waste, with an overall objective of protecting members of the public.</li> </ul>	<ul style="list-style-type: none"> <li>• The health effects of radiation.</li> </ul>
<b>Waste Management</b> <i>The Agency has a duty to regulate the management of waste, including the treatment, storage, transport and disposal of controlled waste, to prevent pollution of the environment, harm to public health or detriment to local amenities.</i>	<ul style="list-style-type: none"> <li>• Issue Waste Management Licences and vary conditions.</li> <li>• Suspend and revoke licences.</li> <li>• Investigate and prosecute illegal waste management operations.</li> </ul>	<ul style="list-style-type: none"> <li>• The siting and granting of planning permission for waste management facilities. This is conducted by the waste industry and local planning authorities. The Agency, as a statutory consultee on planning applications, can advise on such matters.</li> </ul>
<b>Contaminated Land</b> <i>The Agency has a duty to develop an integrated approach to the prevention and control of land contamination ensuring that remediation is proportionate to risks and cost effective in terms of the economy and environment.</i>	<ul style="list-style-type: none"> <li>• Regulate the remediation of contaminated land designated as special sites.</li> <li>• Prevent future land contamination by means of its IPC, Water Quality and other statutory powers.</li> <li>• Report on the state of contaminated land.</li> </ul>	<ul style="list-style-type: none"> <li>• Securing with others, including local authorities, landowners and developers, the safe remediation of contaminated land.</li> </ul>
<b>Conservation</b> <i>The Agency will further conservation, wherever possible, when carrying out water management functions; have regard to conservation when carrying out pollution control functions; and promote the conservation of flora and fauna which are dependent on an aquatic environment.</i>	<ul style="list-style-type: none"> <li>• The Agency has no direct conservation powers, but uses its powers with regard to water management and pollution to exploit opportunities for furthering and promoting conservation.</li> </ul>	<ul style="list-style-type: none"> <li>• The conservation impacts of new development. These are controlled by local planning authorities.</li> <li>• Protection of specific sites or species, which is a function of English Nature. The Agency does, however, provide advice to local authorities and developers to protect the integrity of such sites or species.</li> <li>• Implementation of the UK Biodiversity Plan for which it is the contact point for 12 species and one habitat.</li> </ul>
<b>Landscape</b> <i>The Agency will further landscape conservation and enhancement when carrying out water management functions; have regard to the landscape when carrying out pollution control functions; and promote the conservation and enhancement of the natural beauty of rivers and associated land.</i>	<ul style="list-style-type: none"> <li>• The Agency must further the conservation and enhancement of natural beauty when exercising its water management powers and have regard to the landscape in exercising its pollution control powers.</li> </ul>	<ul style="list-style-type: none"> <li>• The landscape impact of new development, particularly within river corridors. This is controlled by local planning authorities.</li> </ul>

**Agency Duty****The Agency has powers to:****The Agency has an interest  
(but no powers) in:****Archaeology**

The Agency has a duty to consider the impact of all of its regulatory, operational and advising activities upon archaeology and heritage, and implement mitigation and enhancement measures where appropriate.

- The Agency must promote its archaeological objectives through the exercise of its water management and pollution control duties.

- Direct protection or management of sites of archaeological or heritage interest. This is carried out by local planning authorities, county archaeologists and English Heritage.

**Fisheries**

The Agency has a duty to maintain, improve and develop salmon, trout, freshwater and eel fisheries.

- Regulate fisheries by a system of licensing.
- Make and enforce fisheries byelaws to prevent illegal fishing. Promote the free passage of fish and consent fish passes.
- Monitor fisheries and enforce measures to prevent fish-entrainment in abstractions.
- Promote its fisheries duty by means of Land Drainage Consents, water abstraction applications and discharge applications.

- The determination of planning applications which could affect fisheries.

**Recreation**

The Agency has a duty to promote rivers and water space for recreational use.

- The Agency contributes towards its recreation duty through the exercise of its statutory powers and duties in water management.

- Promotion of water sports. This is carried out by the Sports Council and other sports bodies.

**Navigation**

The Agency has a duty to maintain and improve non-tidal Thames navigation from Cricklade to Teddington.

- Improve, conserve and operate the non-tidal Thames navigation. Regulate navigation by a system of licensing.
- Enforce navigation legislation.

- The management and operation of the Port of London, British Waterways navigations and other navigations within the Region.



## APPENDIX II.

# SOURCES OF INFORMATION AND REFERENCES

### Sources of Information

We have indicated throughout this report the sources of the information used. We are the main source of the data for the key environmental indicators, however we have also used data from other organisations, such as: Berkshire Atlas Group, British Geological Survey, Countryside Commission, DETR, English Nature, Institute of Terrestrial Ecology, local authorities, MAFF, Meteorological Office (including the Hadley Centre), NETCEN, OFWAT, Ordnance Survey, SEEDA, University of East Anglia and water companies. Where this data is taken from a document, it is included in the references below. Information has also been taken from some of these organisations' websites, including:

- Department of the Environment, Transport and the Regions (<http://www.detr.gov.uk>);
- University of East Anglia, Climatic Change Unit (<http://www.cru.uea.ac.uk>);
- Meteorological Office (<http://www.meto.gov.uk>).

We are required by law to maintain a set of Public Registers. Information is held in a combination of paper and computer files which may be inspected at our Regional and Area offices. Our booklet entitled *A Guide to the Information Available to the Public* describes the information on the Public Registers and is available from the PR Department of our Regional Office. Contact details for the Regional and Area Offices are included on the back cover of this report.

In addition to the Public Registers, we have the data available for most of the key environmental indicators for which we are the source of the information. Specific inquiries relating to this *State of the Environment Report* should be directed to the Environmental Monitoring and Assessment team of our Environment Protection department in Reading.

Our Local Environment Agency Plans (LEAPs) are an important source of local information and details of those which are currently available can be obtained from our Area Offices. General information on the work of the Environment Agency is available on our website (<http://www.environment-agency.gov.uk>) which also has an updated version of *The Environment of England and Wales – A Snapshot*.

### References

- Department of the Environment (1994) *Biodiversity: The UK Action Plan*. The Stationery Office, London.
- Department of the Environment (1995) *Biodiversity: The UK Steering Group Report 1995*. The Stationery Office, London.
- Department of the Environment (1995) *Making Waste Work: A Strategy for Sustainable Waste Management in England and Wales*. The Stationery Office, London.
- Department of the Environment (1997) *United Kingdom National Air Quality Strategy*. The Stationery Office, London.
- Department of the Environment, Transport and the Regions (1998) *Less Waste: More Value*. The Stationery Office, London.
- Department of the Environment, Transport and the Regions (1999) *A Better Quality of Life – A Strategy for sustainable development for the UK*. The Stationery Office, London.
- Department of the Environment, Transport and the Regions (1999) *A Way with Waste – A Draft Waste Strategy for England and Wales*. The Stationery Office, London.
- Department of the Environment, Transport and the Regions (1999) *Indicators for a Strategy for Sustainable Development for the UK: A Baseline assessment*. The Stationery Office, London.
- Department of the Environment, Transport and the Regions (1999) *Report on the Review of the National Air Quality Strategy Proposals to Amend the Strategy*. The Stationery Office, London.
- Department of the Environment, Transport and the Regions (2000) *Development and Flood Risk (PPG25) Revised Consultation Draft*. The Stationery Office, London.
- Department of the Environment, Transport and the Regions (2000) *Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. The Stationery Office, London.
- Environment Agency (1996) *The Environment of England and Wales: A Snapshot*. Environment Agency, Bristol.
- Environment Agency (1997) *An Environmental Strategy for the Millennium and Beyond*. Environment Agency, Bristol.
- Environment Agency (1997) *Policy and Practice for the Protection of Floodplains*. Environment Agency, Bristol.
- Environment Agency (1998) *The State of the Environment of England and Wales: Fresh Waters*. The Stationery Office, London.
- Environment Agency (1998) *Thames Environment 21: The Environment Agency Strategy for Land-use Planning in Thames Region*. Environment Agency, Reading.
- Environment Agency (1998) *A Price Worth Paying*. Environment Agency, Bristol.

Environment Agency (1998) *Living on the Edge – A Guide to the Rights and Responsibilities of a Riverside Owner*. Environment Agency, Bristol.

Environment Agency (1998) *Policy and Practice for the Protection of Groundwater*. The Stationery Office, London.

Environment Agency (1998) *State of the Environment Report for Thames Region*. Environment Agency, Bristol.

Environment Agency (1999) *Flood Warning Service Strategy for England and Wales*. Environment Agency, Bristol.

Environment Agency (1999) *Planning Public Water Supplies – The Environment Agency's Report on Water Company Water Resources Plans to the Secretary of State for the Environment, Transport and the Regions and Secretary of State for Wales*. Environment Agency, Bristol.

Environment Agency (1999) *Sustainable Water Resources for the Future: Values and Challenges. Consultation Document for the Environment Agency's Water Resources Strategy*. Environment Agency, Bristol.

Environment Agency (2000) *The State of the Environment of England & Wales: The Atmosphere*. Environment Agency, Bristol.

Environment Agency (2000) *The State of the Environment of England & Wales: The Coast*. Environment Agency, Bristol.

Environment Agency (2000) *The State of the Environment for England & Wales: The Land*. Environment Agency, Bristol.

Environment Agency (2000) *The Floods Report October & November 2000 – Thames Region*. Environment Agency, Reading.

Environment Agency (2000) *Thames Region – Interim Regional Recreation Action Plan, 2000-2004*. Environment Agency, Reading.

Government Office for London (1996) *Strategic Planning Guidance for London – RPG3*. Government Office for London, London.

Government Office for the South East (2000) *Regional Planning Guidance for the South East (RPG9)*. Government Office for the South East, London.

Hulme, M. and Jenkins, G.J. (1998) *Climate Change Scenarios for the UK: Scientific Report*. UKCIP Technical Report No. 1, Climatic Research Unit, Norwich.

Ministry of Agriculture, Fisheries and Food (1999) *High Level Targets for Flood Defence and Elaboration of the Environment Agency's Flood Defence Supervisory Duty*. Ministry of Agriculture, Fisheries and Food, London.

Office for National Statistics (1999) *Regional Trends 34 – 1999 Edition*. The Stationery Office, London.

South East England Development Agency (1999) *Building a Better World Class Region – Towards an Economic Strategy for the South East of England – Consultation Document*. South East England Development Agency.

South East Regional Planning Conference (1998) *A Sustainable Development Strategy for the South East*. South East Regional Planning Conference.

Urban Task Force (1999) *Towards an Urban Renaissance*. The Stationery Office, London.

Wade, S., Hossell, J. & Hough, M. (eds) (1999) *Rising to the Challenge – The Impacts of Climate Change in the South East*. Technical Report. WS Atkins, Epsom.



# APPENDIX III.

## SYMBOLS, ABBREVIATIONS AND GLOSSARY

### Symbols

Bq/kg	becquerels per kilogram
°C	degrees Celsius
cm	centimetre
d	day
ha	hectare
km	kilometre
km <sup>2</sup> or sq km	square kilometre
l	litre
l/h/d	litres per head per day
m	metres
m <sup>3</sup>	cubic metres
m <sup>3</sup> /d	cubic metres per day
m <sup>3</sup> /s	cubic metres per second
mg	milligrams
mg/l as N	milligrams of nitrogen per litre
MI	megalitre
MI/d	megalitres per day
MI/a	megalitres per annum
mm	millimetre
ppb	parts per billion (parts per 1000 million)
µg/l	micrograms per litre
µg/m <sup>3</sup>	micrograms per cubic metre
<	less than
>	more than
≥	greater than or equal to
%	percentage
£m	millions of pounds

### Abbreviations

ALF	Alleviation of Low Flows
AMP	Asset Management Plan
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQMS	Automatic Quality Monitoring Stations
AQS	Air Quality Strategy
BAP	Biodiversity Action Plan
BATNEEC	Best Available Technique Not Entailing Excessive Cost
BMWP	Biological Monitoring Working Party
BOD	Biochemical Oxygen Demand
BPEO	Best Practicable Environmental Option
CAMS	Catchment Abstraction Management Strategies
CO	Carbon Monoxide

CO <sub>2</sub>	Carbon Dioxide
CPRE	Council for the Protection of Rural England
CRI	Chemical Release Inventory
CSO	Combined Sewer Overflow
DETR	Department of the Environment, Transport and the Regions
DO	Dissolved Oxygen
EPA90	Environmental Protection Act 1990
EC	European Council
ESA	Environmentally Sensitive Area
GDP	Gross Domestic Product
GLA	Greater London Authority
GQA	General Quality Assessment
HAP	Habitat Action Plan
HMIP	Her Majesty's Inspectorate of Pollution
IPC	Integrated Pollution Control
IPPC	Integrated Pollution Prevention Control
LA21	Local Agenda 21
LAAPC	Local Authority Air Pollution Control
LAPC	Local Air Pollution Control
LAQM	Local Air Quality Monitoring
LAQN	Local Air Quality Network
LEAP	Local Environment Agency Plan
LPA	Local Planning Authorities
LPAC	London Planning Advisory Committee
MAFF	Ministry of Agriculture, Fisheries and Food
MPG	Mineral Planning Guidance
NAQS	National Air Quality Strategy
NETCEN	National Environment Technology Centre
NOx	Nitrogen Oxide
NRA	National Rivers Authority
NVZ	Nitrate Vulnerable Zone
OFWAT	Office of Water Services
PCC	Per Capita Consumption
PPC	Pollution Prevention Control
PPG	Planning Policy Guidance
PWS	Public Water Supply
R&D	Research & Development
RDA	Regional Development Agency
RE	River Ecosystem
RES	Regional Economic Strategy
RPC	Regional Planning Guidance
RQO	River Quality Objective
RSDF	Regional Sustainable Development Framework

SAC	Special Area of Conservation
SAP	Species Action Plan
SEEDA	South East England Development Agency
SERAWP	South East Regional Aggregates Working Party
SERPLAN	South East Regional Planning Conference
SO <sub>2</sub>	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
TEBP	Thames Estuary Benthic Programme
TW	Thames Water Utilities Limited
UNCED	United Nations Conference on Environment and Development
UNECE	United Nations Economic Commission for Europe
VOC	Volatile Organic Compounds
WDAs	Waste Disposal Authorities
WLMP	Water Level Management Plan
WQO	Water Quality Objectives

## Glossary

**Above Ordnance Datum (AOD)** – land levels are measured relative to the average sea level at Newlyn in Cornwall. This average level is referred to as 'Ordnance Datum'. Contours on Ordnance Survey maps of the UK show heights in metres above Ordnance Datum.

**Abstraction** – removal of water from surface or groundwater.

**Abstraction licence** – licence issued by the Environment Agency under s.38 of the Water Resources Act 1991 to permit removal of water from a source of supply. It can limit the quantity of water taken daily.

**Agency** – Environment Agency

**Agenda 21** – a comprehensive programme of worldwide action to achieve more sustainable development for the next century. UK Government adopted the declaration at the UN Conference on Environment and Development (the Earth Summit) held in Rio de Janeiro in 1992.

**Aggregates** – minerals used in construction.

**Algae** – a diverse group of simple aquatic plants, some microscopic, which can grow in rivers and the sea in great profusion (blooms).

**Alien** – plant or animal not native to the country concerned.

**Ammonia** – a chemical found in water often as the result of discharge of sewage effluents. High levels of ammonia affect fisheries and abstractions for potable water supply.

**Aquifer** – underground water source – water-bearing rock.

**Area of Outstanding Natural Beauty (AONB)** – designated by the Countryside Commission under the National Parks and Access to the Countryside Act 1942, to conserve and enhance the natural beauty of the landscape, mainly through planning controls.

**Asset Management Plan 3 (AMP3)** – the third Asset Management Plan produced by the water companies for the Office of Water Services (OFWAT). It sets out the water industry investment programme for the period 2000 to 2010.

**Augmentation** – the addition of water by artificial input. Usually to 'top up' low flows in the summer either by groundwater pumping or via reservoir release.

**Baseflow** – the flow in a river derived from groundwater sources.

**Best Available Technique Not Entailing Excessive Cost (BATNEEC)** – the level of pollution control required for sites under EPA90. Includes the technology and management of the site to prevent the release of prescribed substances, or to reduce the releases to a minimum and to render harmless any other substances that might cause harm if released.

**Best Practicable Environmental Option (BPEO)** – the BPEO procedure establishes, for a given set of objectives, the integrated pollution control option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long as well as the short term.

**Biochemical oxygen demand (BOD)** – a standard test which measures over five days the amount of oxygen taken up by aerobic bacteria to oxidise organic (and some inorganic) matter.

**Biodiversity** – variety amongst living organisms.

**Biomass** – a quantitative estimate of animal and/or plant matter.

**Brownfield site** – land which has previously been used for built development.

**Catchment** – the total area from which a single river collects surface run-off.

**Civic amenity site** – facility provided by a local authority for householders to take bulky household waste, garden wastes and other household wastes which are not normally taken by vehicles on domestic waste collection rounds.

**Coliform (faecal)** – a group of bacteria used as indicators of possible contamination of water by sewage.

**Catchment Management Plan (CMP)** – an integrated plan for a river catchment produced by the NRA.

**Coarse fish** – this is a common term for cyprinid fish and other commonly associated species such as pike, perch and eels of angling significance. The term does not normally refer to minor species such as bullhead, stone loach, minnow and stickleback.

**Combined Sewer Overflow (CSO)** – an overflow structure which permits a discharge from the sewerage system during wet weather.

**Consent (discharge)** – a statutory document issued by the Environment Agency under Schedule 10 of the Water Resources Act 1991 as amended by the Environment Act 1995 to indicate any limits and conditions on the discharge of an effluent to a controlled water.

**Controlled waters** – defined by the Water Resources Act 1991, Part III Section 104. They include groundwaters and inland waters, estuaries and coastal waters to three nautical miles from the shore.

**Controlled waste** – defined by the Control of Pollution Act 1974, Part I Section 30. It includes household, industrial and commercial waste.

**Cretaceous** – geological period between 65 and 140 million years ago.

**Culvert** – drain or covered channel carrying water across or under a road, canal etc.

**Cyprinid fish** – fish of the family Cyprinidae (e.g. roach, bream, carp and chub).

**Diffuse pollution** – pollution without a single point source, e.g. acid rain, pesticides, urban runoff etc.

**Dissolved oxygen (DO)** – the amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of 'health' of water. It is used to classify waters.

**Effective rainfall** – the amount of rainfall reaching surface and groundwater after the losses to the air by evaporation.

**Effluent** – water discharged from a site which may be contaminated, for example with sewage or waste substances from industrial processes.

**Ecosystem** – a functioning, interacting system composed of one or more living organisms and their effective environment, in a biological, chemical and physical sense.

**Environmentally Sensitive Area (ESA)** – an area designated by MAFF where grant aid is available to support traditional farming methods.

**Evaporation** – the change from a liquid or solid state to a vapour.

**Eutrophication** – the enrichment by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce disturbance to the balance of organisms present in the water and to the quality of the water concerned.

**Floodplain** – parts of river valleys or coastal plains which are inundated during floods. It includes areas protected by flood defences.

**Fluvial** – pertaining to, or found in rivers.



**General Quality Assessment (GQA)** – a scheme for assessing and reporting environmental water quality. The chemical grades for rivers introduced in 1994 use BOD, Ammonia and Dissolved Oxygen. Other grades for estuarine and coastal waters are being developed and aesthetic components will be measured and graded by a system now under trial. The GQA scheme replaces the NWC classification system.

**Greenfield site** – land which has never been used for development.

**Groundwater** – water contained in the void spaces in pervious rocks and also within the soil.

**Habitat** – natural home of plant or animal.

**Hydrogeology** – branch of geology concerned with water within the earth's crust.

**Hydrograph** – a graph showing stage (water height) or discharge, plotted against time.

**Hydrology** – the study of water and its dynamics.

**Indigenous** – occurring naturally in a particular area.

**Integrated Pollution Control (IPC)** – an approach to pollution control in the UK which takes account of potential effects upon all environmental media. Applies to prescribed processes and uses the principles of BATNEEC and BPEO.

**Invertebrates** – animals without a backbone (e.g. insects, worms and spiders).

**Jurassic** – geological period between 140 and 195 million years ago.

**Landfill site** – site used for waste disposal into/onto land.

**Leachate** – solution formed when water percolates through a permeable medium. Can be mineral-rich, toxic or carry bacteria.

**Levels of service** – minimum standards of flood protection.

Appropriate levels of service are calculated according to land use.

**Local Environment Agency Plan (LEAPs)** – the process by which the Agency plans to meet all the environmental issues in a catchment. A consultation plan is published, followed by an action plan, which is reviewed every five years.

**Low flow river** – a river identified by the Agency as having excessively low flows and requiring action to improve the situation.

**Main River** – a river designated under the Water Resources Act 1991 by the Ministry of Agriculture, Fisheries and Food, where formal consent from the Agency is required for all activities that interfere with the bed or banks of the river or obstruct the flow.

**Microinvertebrate** – an invertebrate of sufficient size to be retained in a net with a specified mesh size, usually about one millimetre.

**Micro-organisms** – general term for any microscopic organism, including algae, bacteria, fungi and viruses.

**Nitrate Sensitive Area (NSA)** – area designated by MAFF with advice from the Agency, where agricultural activities are controlled to reduce nitrate contamination of groundwater.

**Nitrate Vulnerable Zone (NVZ)** – an area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding, the limit of 50 mg/l laid down in the 1991 EC Nitrate Directive, and where compulsory, uncompensated agricultural measures will be introduced from 1996 as a means of reducing those levels.

**Ordinary Watercourse** – every natural river or stream which is not a Main River (see above) and is covered under the Land Drainage Act 1991. Sometimes referred to as Non-main River. Responsibility for maintenance lies with the landowner.

**Palaeogene** – geological period within the Tertiary era which ranges from 2 and 65 million years.

**Percentile** – one of 99 values of a variable dividing its distribution into 100 groups with equal frequencies.

**Permissive powers** – powers which confer the right to do things but not the duty.

**Potable water** – water suitable for human consumption.

**Radionuclide** – a radioactive atom which emits corpuscular or electromagnetic radiation.

**Reach** – a length of river channel.

**Return period** – refers to the return period of a flood. Flood events are described in terms of the frequency at which, on average, a certain severity of flood is exceeded. This frequency is usually expressed as a return period in years e.g. 1 in 50 years.

**Riparian** – relating to or situated on the bank of a river or stream.

**River corridor** – land which has visual, physical or ecological links to a watercourse and which is dependent on the quality or level of the water within the channel.

**River Habitat Survey (RHS)** – an inventory of physical features of the river and adjacent habitat.

**River terrace(s)** – lateral bench between a river channel and its valley sides.

**River Quality Objective (RQO)** – the level of water quality that a river should achieve in order to be suitable for its agreed uses.

**Runoff** – water leaving a river catchment. Normally regarded as rainfall minus evapotranspiration (evaporation and loss of water by plants) but commonly used to mean rainwater flowing across the land (also known as overland flow).

**Salmonid fish** – game fish, e.g. trout and salmon.

**Set-aside** – the EC set-aside scheme was first introduced for the crop year 1991/1992 as part of the Common Agricultural Policy reform. Farmers are compensated for setting aside land used for the production of arable crops.

**Sewage** – liquid waste from cities, towns and villages which is normally collected and conveyed in sewers for treatment and/or discharge to the environment.

**Sewerage** – a system of underground pipes designed to carry sewage to sewage treatment works.

**Site of Special Scientific Interest (SSSI)** – site of national importance designated under the Wildlife and Countryside Act 1981 by English Nature in England. Sites may be designated to protect wildlife, geology or land forms.

**Source control** – a collective term used to describe the management of runoff at or near the point of impact of rainfall and before it reaches the piped drainage and sewerage systems of urban areas. They include balancing ponds, permeable pavements and underground water butts.

**Source Protection Zone (SPZ)** – the area over which recharge is captured by an abstraction borehole. SPZs are designated by the Environment Agency and are delineated to protect potable water supplies against the polluting effects of human activity. **Special Protection Areas (SPAs)** – sites identified by UK Government under the EC Directive on the Conservation of Wild Birds (79/409/EC).

**Special Area of Conservation (SAC)** – areas designated under the EC Habitats Directive.

**Statutory Water Quality Objective (SWQO)** – Water quality objectives set by the Secretary of State in relation to controlled waters.

**Structure Plans** – statutory documents produced by County Councils outlining their strategy for development over a 10-15 year timescale.

**Surface water** – general term used to describe all the water features such as rivers, streams, springs, ponds and lakes.

**Sustainable development** – development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

**Sustainable Urban Drainage Systems (SUDS)** – a collective term used to describe the management of runoff at or near the point of impact of rainfall and before it reaches the piped drainage and sewerage systems of urban areas. They include balancing ponds, permeable pavements and underground water butts.

**Transpiration** – emission of water vapour from plants.

**Trade effluent** – a discharge of water from a commercial or industrial site.

**Tributary** – a stream or river which feeds into a larger one.

**Watercourse** – a stream, river, canal or channel along which water flows.

**Water table** – level below which the soil/rock is permanently saturated.



# memo



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