

State of the Environment 2003



The Environment Agency's assessment of the environment in South East England



**ENVIRONMENT
AGENCY**

Our environment is a prized and valuable asset. Despite the many pressures, we are encouraged by much of the progress toward a better environment in recent years. The water in our rivers and at our beaches is cleaner than before. Air pollution is lower than ten years ago. Species like otters have returned to many of our rivers.

But we know that this progress is not guaranteed and in many instances it is under threat. We need to understand the causes of these threats so that in partnership with others we can take steps to address them.

Our previous two reports received wide acclaim. This report builds and expands on previous editions. By recording progress against a series of indicators, we show where the environment is improving, where it is getting worse and where it is under pressure. We provide an in-depth assessment of our environment and highlight the main messages under each theme. The report concludes by looking at the emerging pressures - the issues that policy makers, planners, industry and agriculture all need to address if the improvement in our environment is to be sustained.

An improved environment is to everyone's benefit. We want this report to be a catalyst for action - positively influencing your thoughts and actions to the benefit of the environment and the lives of the growing population in the south east. The Environment Agency's vision is of a rich, healthy and diverse environment for present and future generations. The passion, dedication and energy of everyone who cares for the environment is the fuel that will turn our vision into reality. Despite the pressures, our environment has improved and together we can solve many of the problems identified in this report.



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A handwritten signature in black ink, appearing to read 'David Jordan'.

David Jordan
Regional Director -
Southern Region



A handwritten signature in black ink, appearing to read 'Chris Birks'.

Chris Birks
Regional Director -
Thames Region

The South East of England has many characteristics that set it apart from other regions.

It is an environmentally attractive region. It is the most wooded region in England. Around two-thirds of the land is farmed and around 40 per cent of the region is covered by a conservation designation from European sites to local nature reserves.

Over the past decade, there have been a number of significant improvements to our environment. Air quality has improved, largely due to fewer emissions from heavy industry - influenced by regulation and change in fuel type - and through technological advances in motor vehicles that have cut exhaust fumes. The quality of the water in our rivers is better as many sewage treatment works have been improved through a combination of regulation and investment. Similar investment has enhanced the cleanliness of bathing water at our beaches. Strengthened flood defences have protected more properties against the threat of flooding. Many businesses have begun to adopt practices that do less damage to the environment.

At the same time, this region faces some of the most serious environmental challenges in the country - challenges that are expected to increase over the next decade. Even where aspects of the environment have improved over recent years - for example with air quality - there are still problem areas at a local level and progress in the longer term is far from guaranteed. Competing demands on the space and natural resources as well as a range of natural forces mean the environment is under increasing pressure. The rising population and planned new development will increase demand on drinking water supplies, waste disposal capacity and add to flood risks. Climate change promises to bring wetter, stormier winters and hotter, drier summers - or increased flood risks in one half of the year and potential water shortages in the other.

The South East's population of almost 8 million people - in around 3 million households¹ - has grown

by around 6 per cent in the last decade. With plans for over 1 million new homes in the South East over the next two decades, major changes will be needed in construction techniques, water demand and waste management if this growth is to be achieved without damaging the environment.

The Environment Agency's main findings for the environment of the South East are as follows:

● **Improving Air Quality**

While air quality in the South East is continuing to improve, emissions from road traffic pose the greatest threat to this trend. The region has higher than average car use. It hosts almost a quarter of the national motorway network. Eight out of every ten households owns a car, compared to seven out of ten nationally. People in the South East travel 8,100 miles each year - compared with a UK average of 6,800 miles. Increased air traffic and new airport proposals could further add to air pollution. The environmental impact on air quality by industrial processes regulated by the Environment Agency is decreasing and this trend is set to continue.

● **Protecting and Enhancing Water Quality**

River quality in the South East has improved significantly over the last decade. Bathing water quality at the South East's beaches is the best it has been since records began, but further improvements are needed. New development, climate change and diffuse pollution threaten continued improvements to water quality. The amount of nutrients in our rivers has fallen over the past ten years, largely due to improvements in sewage treatment. However, nutrient levels in our rivers and groundwaters remain too high and often originate from unregulated sources - such as agricultural run-off.

¹ Government Office for the South East and Housing Corporation South East (2002) *South East Regional Housing Statement 2002-2005: A Framework for Action. Building Consensus.*

Executive Summary

● **Managing Waste**

Waste is one of the major environmental challenges facing the South East. The amount of waste generated in the South East continues to increase. In 2000/01 around 25 million tonnes of waste was produced in the region of which 15 million tonnes went into licensed landfill sites. New environmental legislation and a shortage of landfill sites require a massive redirection of waste away from landfill and towards re-use and recycling in the next few years. Industry, businesses and the public need to reduce the amount of waste produced and waste will need to be put to more productive use.

● **Managing Water Resources**

Unless steps are taken to reduce demand and increase supply, parts of the South East face the prospect of water shortages in the future. The South East consumes more water per person than most other regions, but receives one of the lowest amounts of rainfall. Three quarters of the population depends on groundwater (as opposed to water stored in reservoirs or taken from rivers) for its water supplies - and these supplies are particularly at risk if climate change brings less rainfall in summer months, when demand is highest. Water efficiency measures - such as water leakage controls, water metering and water-efficient domestic appliances - are fundamental to managing water resources.

● **Managing Flood Risk**

The South East has over 235,000 properties at risk from flooding. The investment in river and coastal flood defences and warning systems has reduced the impact of recent heavy rainfall events and storm tides. Continued investment in both coastal and fluvial areas is needed to decrease the risks to life and property. Risk of inundation from the sea remains the region's biggest flood risk. With significant development pressures in the South East, including the plan to develop new 'Sustainable Communities' along the Thames Gateway, at Ashford in Kent and around Milton Keynes, it is vital that flood risks are fully considered in all new building proposals.

● **Limiting and Adapting to Climate Change**

The impacts of global warming are being increasingly felt in the South East. Predicted drier summers will mean there will be increased pressure on water resources - which in some parts of the region are already stretched and proposed new development could aggravate the situation. Predicted stormier and wetter winters will increase flood risks. Perhaps the greatest risks will come from a combination of stormier winters and predicted rises in sea level around the region's

1,124 km long coastline - where coastal flooding could threaten both important coastal habitats and the region's heavily urbanised coastal strip.

● **Restoring Land Quality**

Two thirds of land in the region is farmed and agriculture exerts a major influence on land quality. Poor land management techniques can cause pollution and soil erosion, while good practice can enhance the environment. The increasing population, the trend towards rural living and the trend towards smaller households are increasing the demand for greenfield land for housing. Around 55 per cent of new homes are now built on previously developed - or brownfield - sites, against a national target of 60 per cent by 2008.

● **Maintaining and Enhancing Biodiversity**

Our habitats and wildlife are under increasing pressure from development, farming and climate change. Climate change is expected to lead to the migration of species and habitats northwards. Indigenous plants are being displaced by non-native plants in many areas. The otter population is slowly recovering from a massive decline in the 1960s. They remain rare in the region. The water vole population has declined over the last 10 years and they could become extinct in many areas within the next few years.

● **Additional Quality of Life Measures**

The health of the environment is integral to people's quality of life. Air quality, clean water, safe and effective sewage and waste disposal are all vital for a good environment. Around 40 per cent of the South East is covered by a conservation designation from European sites to local nature reserves. It is the most wooded region in England providing many benefits not least natural beauty and quiet places for recreation. The level of pesticides threatening the environment has reduced. Beach litter remains at a high level, posing a threat to wildlife and people and reducing the beauty of the coastline.

There are enormous pressures on our rich and diverse environment. By measuring and spelling out these pressures, the Environment Agency wants this report to inform and help shape progress towards an improved and healthier environment.

"The Environment Agency has a crucial role to play in ensuring the future of the South East. The region has an economy ranked in the top twenty in the world and this brings with it a number of pressures on the environment. The Environment Agency will continue to influence at the highest level in order to address key issues such as climate change, demand on water supply, flood risk and the increasing amount of waste that is being generated. We must all take responsibility to ensure that the prosperity of our region is not achieved at great cost to future generations and that the impacts on air, land and water are kept to a minimum".

David Jordan Regional Director - Southern Region
Chris Birks Regional Director - Thames Region

The South East region

The geographical boundaries of the South East region used throughout this report correspond to the area covered by the Government Office for the South East

(GOSE), the South East England Development Agency (SEEDA) and the South East England Regional Assembly (the Regional Assembly). This encompasses the counties and unitary authorities between Kent in the south east, Hampshire in the south west and Buckinghamshire in the north but excludes the Greater London area. It covers a total of 19,400 km², encompassing 19 county and unitary authorities and 55 district authorities. The South East includes the Environment Agency's Southern Region and a major part of the Thames Region.

The South East has many distinctive qualities that set it apart from other regions. It is a place in which the environment is constantly under pressure due to competing demands on space and natural resources, as well as from a range of natural forces. It is undoubtedly the region facing the greatest development pressures, and consequently challenges, on the environment outside London.

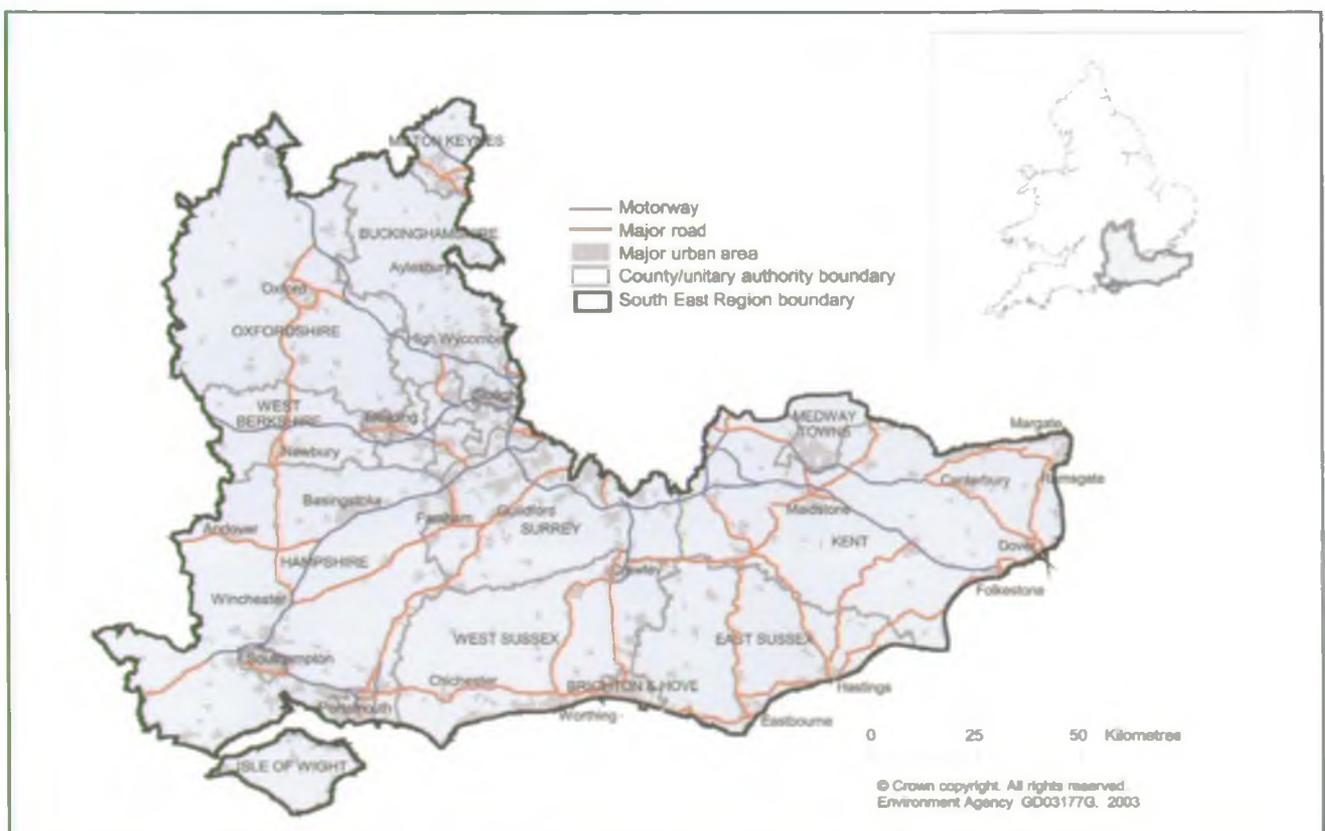


Figure 1: The South East England region

SEEDA is planning to ensure the South East region is one of the world's top fifteen regional economies by 2012, as measured against a broad range of economic, social and environmental indicators². The region accounts for 16 per cent of the UK's Gross Domestic Product³ and is closely linked to the economy of London and significantly influenced by its proximity to mainland Europe. However, there remains considerable variation within the region, with significant pockets of deprivation located on the south coast in Hastings, Brighton and Hove and also in towns such as Slough.

There is an extensive network of national and international transport links in the region providing a gateway to the rest of the UK and Europe. The region includes the UK's second busiest airport, Gatwick, with the busiest, Heathrow, located just outside the region. The Channel Tunnel and ports such as Dover, Newhaven, Ramsgate and Portsmouth provide access to mainland Europe. Southampton and Sheerness provide deepwater facilities for international marine traffic.

The environment in the South East is one of the region's key assets. Around 40 per cent of the region is protected by some form of conservation designation (e.g. Area of Outstanding Natural Beauty or Site of Special Scientific Interest). However, there are considerable pressures on the region's environment arising from: the demand for new development; increasing demand for domestic water and energy supplies; plans for new roads; and the safe disposal of waste. The increasing population, decreasing average household size and the scale of economic activity in the region exacerbate these pressures. The relatively low rainfall in the South East and the effect of climate change on weather patterns and sea levels are also vital considerations.

Key facts on the South East region

- In 2000 the environmental economy contributed over £7.8 billion Gross Value Added to the South East's economy, equivalent to just over 6 per cent of the total regional economy⁴.
- The South East has by far the most heavily used roads outside London (average daily flow⁵ of 4,800 vehicles per day on all roads compared to the England average of 3,600 vehicles)⁶.
- The South East has 25,000 manufacturing enterprises which contribute £18 billion to the

economy and employ more than 500,000 people, representing 19 per cent of the region's business workforce⁷.

- The population in the South East accounts for 13.6 per cent of the UK total and had a population growth of 5.9 per cent between 1991 and 2001 compared to 3.7 per cent nationally⁸. The rising population places increasing pressure on the provision of housing, drinking water supplies and disposing of waste properly and safely.
- Four of the UK's biggest airports, Heathrow, Gatwick, Stansted and Luton, are located in or close to the South East, with a possible fifth under consideration. The wider South East⁹ accounts for 60 per cent of all UK air travel. Predictions suggest the capacity could triple over the next 30 years¹⁰.
- Landfill capacity in the South East is limited and disposing of waste in the future will present the region with a major challenge. Twenty five million tonnes of waste is produced each year within the region of which 15 million tonnes is landfilled.

We need to find the answers to a range of difficult questions, such as:

- How can we reduce the amount of rubbish we produce and improve the take-up of recycling initiatives?
- How can we make our air, land and rivers clean enough for people to enjoy their surroundings and for wildlife to continue to flourish?
- How can we reduce the risk of flooding to homes and businesses from rivers and the sea?
- How can we safeguard our wildlife whilst accommodating new housing and the growth of the region's economy?
- How can we continue to safeguard the quality of the air we breathe whilst the number of vehicles on our roads continues to increase?

² SEEDA (2002) *Regional Economic Strategy for South East England 2002-2012*

³ Office for National Statistics (2002) *Region in Figures: South East*

⁴ SEEDA (2002) *The Environmental Economy of the South East of England: Executive Summary*

⁵ Average daily flow: annual traffic divided by road length x 366

⁶ Department for Transport (2002) *Transport Statistics Bulletin. Regional Transport Statistics: 2002 Edition*

⁷ SEEDA (2002) *Regional Economic Strategy for South East England 2002-2012*

⁸ Office for National Statistics (2002) *Region in Figures: South East*

⁹ Data includes Essex, Suffolk and Norfolk

¹⁰ Department for Transport (2003) *The Future Development of Air Transport in the United Kingdom: South East. Second Edition*

- How can we continue to ensure adequate water supply when faced with the development pressures the region is under, whilst taking into account the impact of climate change on the region's rainfall patterns?

The environment needs to be put at the forefront of our thinking to ensure that environmental improvements are achieved with benefits for people and wildlife alike.

This report presents background information and detailed analyses of environmental indicators from which environmental trends can be determined. By setting out baseline conditions and trends over time, it is possible to identify and quantify how the state of the environment, and factors affecting it, have changed over recent years. This helps identify why these changes have occurred, to manage and monitor that change and to think about future changes.

The purpose of the report

This third State of the Environment Report for the South East is part of an on-going Environment Agency initiative to report on the state of the environment and identifies key areas where further work is needed to deliver environmental improvements. This is done by:

- analysing trends in key environmental indicators over time to demonstrate where the environment is improving, but also highlighting areas where the trend shows unfavourable progress towards our objectives;
- identifying the key issues facing the South East where increased effort is needed to ensure that quality of life continues to rise;
- setting out new and emerging issues of environmental importance to the South East; and
- providing information on the role the Environment Agency and other key partners play in ensuring effective protection of the environment.

*An Environmental Vision*¹¹ published in 2001 sets out the Environment Agency's long term vision for 2020 that everyone will be able to enjoy the benefit of a clean, safe and healthy environment. The State of the Environment Report 2003 will enable the Environment Agency to monitor and report on its

performance and contribution, and that of others, to the quality of the environment, and the quality of life, in South East England. The report will also be used to inform development plans, strategies and initiatives in the South East.

Sustainable development in the South East will only be achieved through delivering key environmental improvements that include the effective protection of the environment and the prudent use of natural resources.

An Environmental Vision: Themes for the future

Our vision for the environment and a sustainable future is:

A healthy, rich and diverse environment in England and Wales, for present and future generations.

The fundamental goals we want to help achieve:

- **A better quality of life.** People will have peace of mind from knowing that they live in a healthier environment, richer in wildlife and natural diversity - an environment that they will care for and can use, appreciate and enjoy.
- **An enhanced environment for wildlife.** Wildlife will thrive in urban and rural areas. Habitats will improve in their extent and quality to sustainable levels for the benefit of all species. Everyone will understand the importance of safeguarding biodiversity.

The environmental outcomes for which we are striving:

- **Cleaner air for everyone.** We will have cleaner and healthier air. The emission of chemical pollutants into the atmosphere will decline greatly and will be below the level at which they can do significant harm.

¹¹ Environment Agency (2001) *An Environmental Vision: The Environment Agency's contribution to Sustainable Development*

- **Improved and protected inland and coastal water.** Our rivers, lakes and coastal waters will be far cleaner. They will sustain diverse and healthy ecosystems, water sports and recreation such as boating and fishing, and those uses needed by a thriving and healthy community.
- **Restored, protected land with healthier soils.** Our land and soils in the countryside and towns will be exposed far less to pollutants. They will support a wide range of uses, including production of healthy, nutritious food and other crops, without damaging wildlife or human health. Contaminated and damaged land will be restored and protected.

The changes we will seek:

- **A 'greener' business world.** Industry and businesses will value the services that come from a rich and diverse natural environment. In the process, they will reap the benefits of sustainable business practices, improve competitiveness and value to shareholders and secure trust in the wider community.
- **Wiser, sustainable use of natural resources.** Business, public agencies, other organisations and individuals will minimise the waste they produce. They will reuse and recycle materials far more intensively, and will make more efficient use of energy and materials.

The risks and problems we will help manage, prevent and overcome:

- **Limiting and adapting to climate change.** Drastic cuts will have been made in the emission of 'greenhouse gases' such as carbon dioxide and society as a whole will take account of, and be prepared for, the probable changes to our climate.
- **Reducing flood risk.** Flood warnings and sustainable defences will continue to prevent deaths from flooding. Property damage and distress will be minimised. The role of wetlands in reducing flood risks will be recognised and all the environmental benefits from natural floods will be maximised.

Policy context

This report will make an important contribution to the South East's environmental agenda. In particular it will inform and influence the implementation and future review of the following:

- **Regional Sustainable Development Framework**
The *Regional Sustainable Development Framework: A Better Quality of Life in the South East*¹² (RSDF) was adopted in June 2001 and sets out a vision for sustainable development in the region, including a series of objectives and associated indicators. The RSDF provides a common sustainable development context for the Regional Planning Guidance (RPG) and the Regional Economic Strategy (RES). A number of the issues and associated indicators identified in this report are relevant to those in the RSDF, particularly those concerning water quality, waste, water resources, air quality, climate change and flood risk.
- **Regional Planning Guidance/Regional Spatial Strategy**
Current *Regional Planning Guidance for the South East (RPG9)*¹³ advises on the proposed levels and pattern of development for the region. RPG9 is advisory, but under the Government's current proposals to reform the planning system, it is likely to become a statutory Regional Spatial Strategy (RSS). The purpose of the RSS will be to provide a spatial framework for local plans, including transport plans, integrating regional and sub-regional priorities for housing, environmental protection and improvement, transport and economic development. A statutory RSS for the South East is likely to be in place by 2006, as the Regional Assembly, the regional planning body in the South East, is currently reviewing RPG9 along RSS lines. The State of the Environment Report 2003 will be an important source of environmental information for this review.
- **Regional Economic Strategy**
Three years after the publication of the first RES, SEEDA published the revised RES for the South East in 2002¹⁴. This sets out a 10-year framework covering 2002 to 2012 for delivering the economic aspirations of the region, set within the broader context of sustainable development. The aim is that by 2012 the South East will be in the world's top fifteen performing regional economies, measured against a broad range of economic, social and environmental indicators. The State of the Environment Report 2003 will be instrumental in providing the information on these environmental indicators.

¹² South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

¹³ ODPM (2001) *Regional Planning Guidance for the South East (RPG9)*

¹⁴ SEEDA (2002) *Regional Economic Strategy for South East England 2002-2012*

Environmental indicators illustrate change in the environment and can highlight the increasing pressures caused by stresses and strains on the environment. They show progress against the objective of sustainable development of which the environment is a key aspect. They provide consistent information over time about the environment and assist decision making with respect to the environment.

The indicators used by the Environment Agency cover a wide range of environmental issues facing the South East and meet the following criteria:

- The importance of the indicator to illustrate a key aspect of the region's environment;
- The ability of the indicator to record environmental change in a meaningful way;
- The availability of data for the indicator; and
- The regularity with which data for the indicator is updated.

The pressure-state-response framework is used to present the environmental indicators in this report:

-  **Pressure indicators** - measure the negative forces on the environment, which are usually caused by human activities, but may include measures of pressures caused by natural processes
-  **State indicators** - measure the quality and stock of natural resources in the environment
-  **Response indicators** - assess the normally beneficial impacts of activities which aim to address environmental issues

A summary of the indicators presented in Sections 3.1 to 3.9 of the report is shown in Table 1. The table shows where the environment as a whole is showing signs of improvement or deterioration. The direction of progress does not show whether the indicator meets relevant objectives or is at sustainable levels. These details are covered in the subsequent chapters.

Linkages are also made to similar indicators used in the following documents:

- *Quality of Life Counts (1999)* developed by DETR (the predecessor to Defra)¹⁵;
- *Regional Sustainable Development Framework (RSDF) for the South East*¹⁶; and
- The national set of indicators used by the Environment Agency.

¹⁵ DETR (1999) *Quality of Life Counts: Indicators for a strategy for sustainable development for the United Kingdom: a baseline assessment*

¹⁶ South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

Table 1: Indicators of the state of the environment in the South East

Objective	Indicator Type	Progress Direction	Link to other indicator sets		
			Quality of Life Counts	Regional Sustainable Development Framework	Environment Agency National Indicator Set
Improving Air Quality					
Days when air pollution is moderate or higher	S	✓ urban ~ rural	✓	✓	✓
Sulphur dioxide concentration		✓	✓		(✓ ¹⁷)
Nitrogen dioxide concentration		✓	✓		(✓ ¹⁷)
Particulate concentration		✓	✓		(✓ ¹⁷)
Emissions to air from processes regulated by the Environment Agency	P	✓			✓
Road traffic		x	✓		✓
Protecting and Enhancing Water Quality					
River water quality • Chemical • Biological • Aesthetic	CS	— ✓ ◆	✓ ✓	✓ ✓	✓ ✓
Compliance with River Quality Objectives		—	✓	✓	✓
Compliance with the EC Bathing Waters Directive		✓	✓	✓	
Nutrient status of freshwaters • Phosphate • Nitrate		✓ —	✓ ✓		✓ ✓
Nutrient status of groundwater		◆			
Water pollution incidents	P	◆			✓
Managing Waste					
Disposal method, type and quantity of waste	P	◆	✓	✓	✓
Household waste arisings and recycling targets		◆ ✓ recycling	✓	✓	✓
Managing Water Resources					
Quantity of rainfall	P	—			✓
River flows and groundwater levels	S	—			✓
Water demand and availability • Water resource supply-demand balance		—	✓		✓
• Household per capita consumption • Predicted water demand as a percentage of 1997/98	P	◆	✓	✓	
• Promotion of demand management measures - leakage • Water meter penetration	R	✓ ✓	✓		✓

¹⁷ The Environment Agency's national State of the Environment Report uses the indicator 'Concentrations of selected air pollutants in the UK'

Key:

✓ Environment improving x Environment deteriorating ~ No significant change in environment ◆ Limited data to identify change

Objective	Indicator Type	Progress Direction	Link to other indicator sets		
			Quality of Life Counts	Regional Sustainable Development Framework	Environment Agency National Indicator Set
Managing Flood Risk					
Change in beach volumes	(S)	◇			
Number of properties 'at risk' from flooding		✗			
Number of flood warnings	(R)	✓			
Future development and flood risk	(P)	✗			
Limiting and Adapting to Climate Change					
Annual average surface temperature in central England	(S)	✗	✓		✓
Sea level change at Sheerness, Kent		✗	✓		✓
Future climate change in the South East	(P)	✗ flood risk ✗ water resources ✗			
Final energy consumption in the UK by sector			✓ ¹⁸		✓
UK greenhouse gas emissions		✓	✓	✓	✓
UK carbon dioxide emissions by end user		✓ industry ✗ transport	✓		✓
Percentage of electricity generated from renewable sources	(R)	✓	✓	✓	✓
Protecting and Improving Land Quality					
New homes built on previously developed land	(P)	✓	✓	✓	✓
Area under agri-environment schemes	(R)	◇		✓	
Pollution from agricultural sources	(P)	✓			
Maintaining and Enhancing Biodiversity					
Distribution of key habitats and species • Intertidal mudflat and coastal saltmarsh • Chalk rivers • Otters • Water voles	(S)	✗ ✗ ✓ ✗			
Numbers of salmon and sea trout		✓ Itchen ✓ Test ✗ Thames			✓
Distribution of fish species - shad, lamprey and bullhead		◇			
Distribution of floating pennywort	(P)	✗			
Additional Quality of Life Measures					
Craft on inland navigable waterways	(R)	✗			✓
Area of woodland	(S)	✓			
Beach litter	(P)	✓			✓
Use of pesticides in agriculture and horticulture	(P)	◇			✓

¹⁸ Indicator 'Energy and water consumption by sector'; 'Waste and hazardous emissions by sector'

Key:

✓ Environment improving ✗ Environment deteriorating ~ No significant change in environment ◇ Limited data to identify change



3.1 Improving Air Quality

Improving Air Quality

We will have cleaner and healthier air. The emission of chemical pollutants into the atmosphere will decline greatly and will be below the level at which they can cause significant harm.

Key messages

- Air quality in the South East is continuing to improve;
- Road traffic emissions pose the biggest threat to air quality, even though emissions from road traffic are decreasing in terms of particulate and nitrogen oxides;
- The impact of industrial processes regulated by the Environment Agency on air quality is falling;
- Local authorities across the South East are developing action plans for pollution hotspots where air quality objectives are not being met;
- The use of improved and innovative technology in industry and in motor transport will help to sustain continued improvements in air quality in the South East.

Background

The quality of the air we breathe is crucial to everyone. Clean air should be valued and demanded by society. Controlling air pollution to reduce the risk of poor health, to protect the natural environment and to contribute to our quality of life is a key component of sustainable development. Air quality in the South East is generally good, but there are times when unacceptably high levels of pollution can harm human health and the wider environment.

The Government's *Air Quality Strategy*¹⁹ sets out national air quality objectives for eight pollutants that are considered acceptable from our current knowledge of the effects on health and the environment. The objectives, which will become legally binding in 2005, were adopted by Government in January 2000. Depending on the pollutant and averaging period (annually or hourly) there are differing dates by when the standard must be achieved. New objectives for nitrogen oxides (NO_x) and sulphur dioxide (SO₂) have been adopted to protect vegetation and ecosystems. These will be monitored away from urban and industrial areas and motorways. The Government is currently consulting

on proposals to revise the objectives for benzene and carbon monoxide (CO), the main source of which is road transport, and fine particulate, the main source of which is combustion. It is also looking to introduce a standard for polycyclic aromatic hydrocarbons, that are primarily produced by road transport, in 2010.

Historically, emissions of the main air pollutants have been concentrated in urban areas, along busy roads and in certain parts of the South East in concentrations of industry, such as Southampton, the Medway Towns and the East Thames corridor. However, it is also true to say that the industrial sources are often relatively minor, except for SO₂, in overall effect compared to smaller individual sources such as vehicles.

Roles and responsibilities

The *Air Quality Strategy* describes the roles of the key players responsible for managing air quality

¹⁹ DETR (2000) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Working Together for Clean Air*

including the Environment Agency and local authorities.

The Environment Agency plays a central role in protecting air quality through regulating and controlling emissions from the largest, most technically complex and potentially most polluting industrial processes. The Environment Agency's regulatory duties are set out under the Integrated Pollution Control (IPC) regime and the more recently introduced Integrated Pollution Prevention and Control (IPPC) regime that came into force on 1st August 2000 through the Pollution Prevention and Control (PPC) Regulations. IPPC is designed to prevent, reduce and eliminate pollution at source through the efficient use of natural resources and is intended to help industrial operators move towards greater environmental sustainability. The new IPPC regime is more far-reaching than IPC covering noise and vibration, energy efficiency, waste minimisation, environmental accidents and site protection in addition to covering a wider range of activities. It also considers the whole 'installation' and not just individual processes or activities.

By 2007 the majority of IPC authorisations enforced by the Environment Agency will have transferred to the PPC permitting regime. In issuing PPC permits

the Environment Agency is obliged to take account of the international objectives and standards such as EC limit values, national requirements including national air quality objectives and also any local objectives and standards.

Local authorities are responsible for regulating those processes which fall under Part A(2) of the PPC regime, which are of a smaller size than those regulated by the Environment Agency. They are also responsible for regulating Part B processes which fall under the Local Air Pollution, Prevention and Control regime a continuation of the previous Local Air Pollution Control system focussing on emissions to air only.

Local authorities also control pollution from domestic sources, develop local air quality strategies and can impose local traffic management powers. The Environment Agency provides assistance and information to local authorities where, for example, the authority has declared an Air Quality Management Area (AQMA) to address areas where a national air quality standard will not be met. Once an AQMA has been declared the local authority has to develop an Air Quality Action Plan to tackle the air quality issues.

Sources of air pollutants in the South East

- Traffic emissions are significantly lower than in previous decades due to technological improvements made through engine design and catalytic converters, but this is counter balanced by the steady increase in traffic in the South East;
- Environment Agency and local authority regulated industrial processes release a range of air emissions into the environment, but are strictly controlled through permitting processes;
- Sulphur dioxide is released from the combustion of sulphur-containing fuels, principally coal and heavy oils. Although cleaner fuels are now widely used, emissions from ferries and tankers in the English Channel do not fall under regulation, permitting the burning of fuel with a higher sulphur content than allowed on land;
- The aviation industry contributes to emissions through the major airports within or in close proximity to the South East;
- Natural processes such as wind blown soils and dust, sea-spray salt and volcanic emissions, as well as the man-made source from construction work, contribute to particulate levels. Their impact varies depending on meteorological conditions;
- One-off events, such as 'bonfire night' or increases in traffic movements on bank holiday weekends, contribute to localised air quality problems;
- Emissions from mainland Europe contribute to poor air quality in Sussex and Kent.

Air quality in the South East

The South East has few major industrial processes relative to its population and economic activity. However, there are local pollution hotspots caused by emissions from industrial activity and energy generation.

Air quality is also significantly affected by emissions from other sources, such as road transport, which increases levels of NO_x and CO. Whilst emissions to air from processes regulated by the Environment Agency - principally heavy industry - are improving, the South East faces a crisis in terms of the number of vehicles travelling on our roads. Road traffic contributes substantially to local air pollution particularly NO_x, and also contributes to climate change through carbon dioxide (CO₂) emissions. On a national scale, current emissions from cars contribute about two thirds of the NO_x emissions attributed to road transport²⁰. The high level of car ownership in the South East presents a challenge to ensure air pollution is reduced and air quality continues to improve.

Local air pollution hotspots remain a problem. In December 2002 there were 25 AQMAs declared to address air quality problems - 23 on the basis of nitrogen dioxide (NO₂), 11 for particulate (PM₁₀ (particles with a diameter less than or equal to 10 µm) and 1 for SO₂. The areas range from Oxford and Wycombe District in the north to Maidstone, Dover and Medway in the east²¹. The Environment Agency has also participated in drawing up plans with local authorities for the most complex areas where industrial pollution may contribute to poor air quality. Two such Zones of Industrial Pollution Sources have been identified - in Southampton and in the East Thames Corridor.

Indicators

Six indicators have been selected to demonstrate the state of the air environment:

- Indicator 1** Days when air pollution is moderate or higher
- Indicator 2** Sulphur dioxide concentration
- Indicator 3** Nitrogen dioxide concentration
- Indicator 4** Particulate concentration
- Indicator 5** Emissions to air from processes regulated by the Environment Agency
- Indicator 6** Road traffic

The indicators cover both background air quality and the contribution of key pollutants from processes regulated by the Environment Agency. The *Regional Sustainable Development Framework (RSDF)*²² uses Indicator 1 to report on the regional objective 'To reduce air pollution and ensure air quality continues to improve'.

Indicator 1 Days when air pollution is moderate or higher

Background to the indicator

The Government's *Air Quality Strategy* sets air quality objectives based on the best available scientific and medical advice for the protection of human health. However, the objectives should not be regarded as sharp dividing lines between levels of pollution that pose no threat to health and levels that pose a significant threat.

This indicator is one of the fifteen headline indicators at the heart of the UK Government's *Sustainable Development Strategy*²³. It measures the number of days on which pollution is moderate or higher. This is equivalent to the threshold between the low and moderate banding in the national air quality objectives. The indicator is measured using five pollutants - ozone, PM₁₀, CO, SO₂ and NO₂.

²⁰ www.environment-agency.gov.uk

²¹ National Environmental Technology Centre

²² South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

²³ DETR (1999) *A better quality of life: a strategy for sustainable development for the UK*



- Low:** Effects are unlikely to be noticed even by individuals who know they are sensitive to air pollutants.
- Moderate:** Mild effects, unlikely to require action. May be noticed amongst sensitive individuals.
- High:** Significant effects may be noticed by sensitive individuals and action to avoid or reduce these effects may be needed (e.g. reducing exposure by spending less time in polluted areas). Asthmatics will find their 'reliever' inhaler is likely to reverse the effects on the lung.
- Very high:** The effects on sensitive individuals described for 'High' levels of pollution may worsen.

There are five national automated monitoring network sites across the South East (see Figure 2) which provide information for the purposes of this indicator.

Urban sites

- Southampton Centre, Hampshire
- Reading, Berkshire

Rural sites

- Harwell, Oxfordshire
- Lullington Heath, East Sussex
- Rochester, Kent

Trends

The number of days when air pollution was moderate or higher is shown in Figure 3. Urban sites have seen an overall improvement in air quality. The monitoring site at Reading, used for the purposes of this indicator since 1998, showed a fall in the number of days when air pollution was moderate or higher in 2000 and 2001, after an increase in 1999.

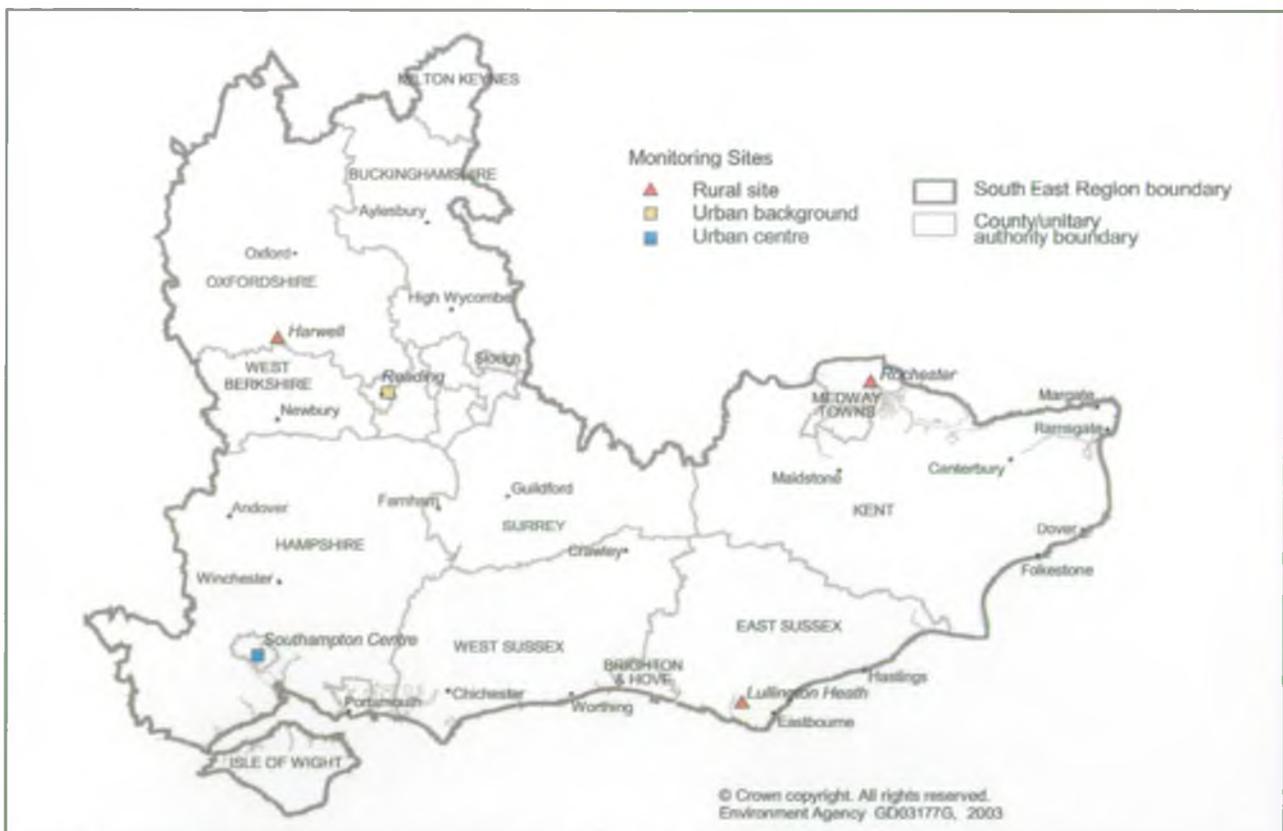


Figure 2: Location of air quality monitoring sites in the South East

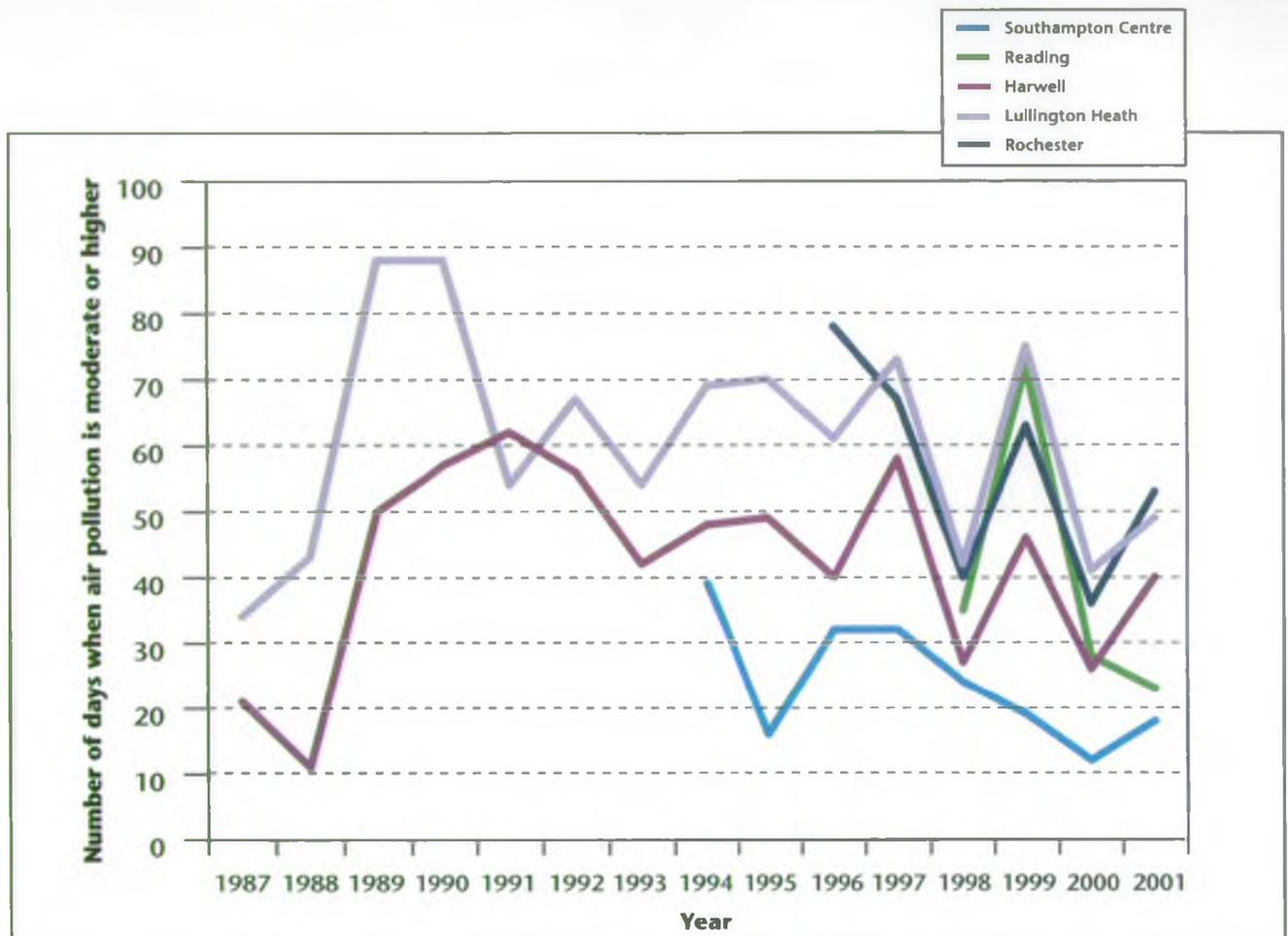


Figure 3: Days when air pollution is moderate or higher, 1987-2001²⁴

The data for the three rural sites has fluctuated. In 2001 there were more days when air pollution was moderate or higher at all the rural sites compared with 2000. Of the five monitoring sites, Lullington Heath, situated close to the East Sussex coast, has recorded the highest number of days when air pollution was moderate or higher in all but three years since 1987. It is thought emissions from mainland Europe affect the air quality at this site.

Targets

The national *Air Quality Strategy* sets national air quality objectives to be achieved between 2005 and 2009 for individual pollutants. Even when these objectives are met there will still be some days when air pollution is moderate or higher due to different reporting periods. Where AQMAs have been designated, local authorities are developing action

plans to reduce the number of days when air pollution is moderate or higher.

Indicator 2 Sulphur dioxide concentration

Background to the indicator

The main source of sulphur dioxide (SO₂) is the burning of fossil fuels in power stations, oil refineries and other large industrial plants regulated by the Environment Agency. The fuel and power sector is by far the largest source of SO₂ contributing 71 per cent of the national total. The combustion of sulphur-containing fossil fuels, such as coal and heavy oils, which was the predominant source of SO₂, have

²⁴ Source: Defra

been replaced by cleaner fuels. Motor vehicles, domestic boilers and fires also release SO₂.

SO₂ can irritate the eyes and air passages and at peak environmental concentrations may worsen the symptoms of those suffering from asthma or lung disease. It can also lead to direct effects on vegetation and can contribute to acid rain. SO₂ can be transported over long distances and up to a third of the deposition of sulphur in some parts of the UK may come from continental European sources.

Historically in the South East there have been higher levels of SO₂ surrounding the industrial areas near Southampton and the north Kent coast. Nationally the Environment Agency has required the electricity supply industry to implement plans to ensure the achievement of the SO₂ air quality objectives by 2005. Figure 4 shows the SO₂ concentrations at the air quality monitoring sites in the South East.

Trends

Over the last decade there have been substantial reductions in the levels of SO₂ at all sites across the South East. The extensive dataset held for Lullington Heath clearly demonstrates this trend, with a decrease from a high of around 7 parts per billion (ppb) in 1991 to around 1 ppb in 2001.

Targets

The national *Air Quality Strategy* sets out national air quality objectives for SO₂ for both protecting human health and also for the protection of vegetation and

²⁵ Source: National Environmental Technology Centre

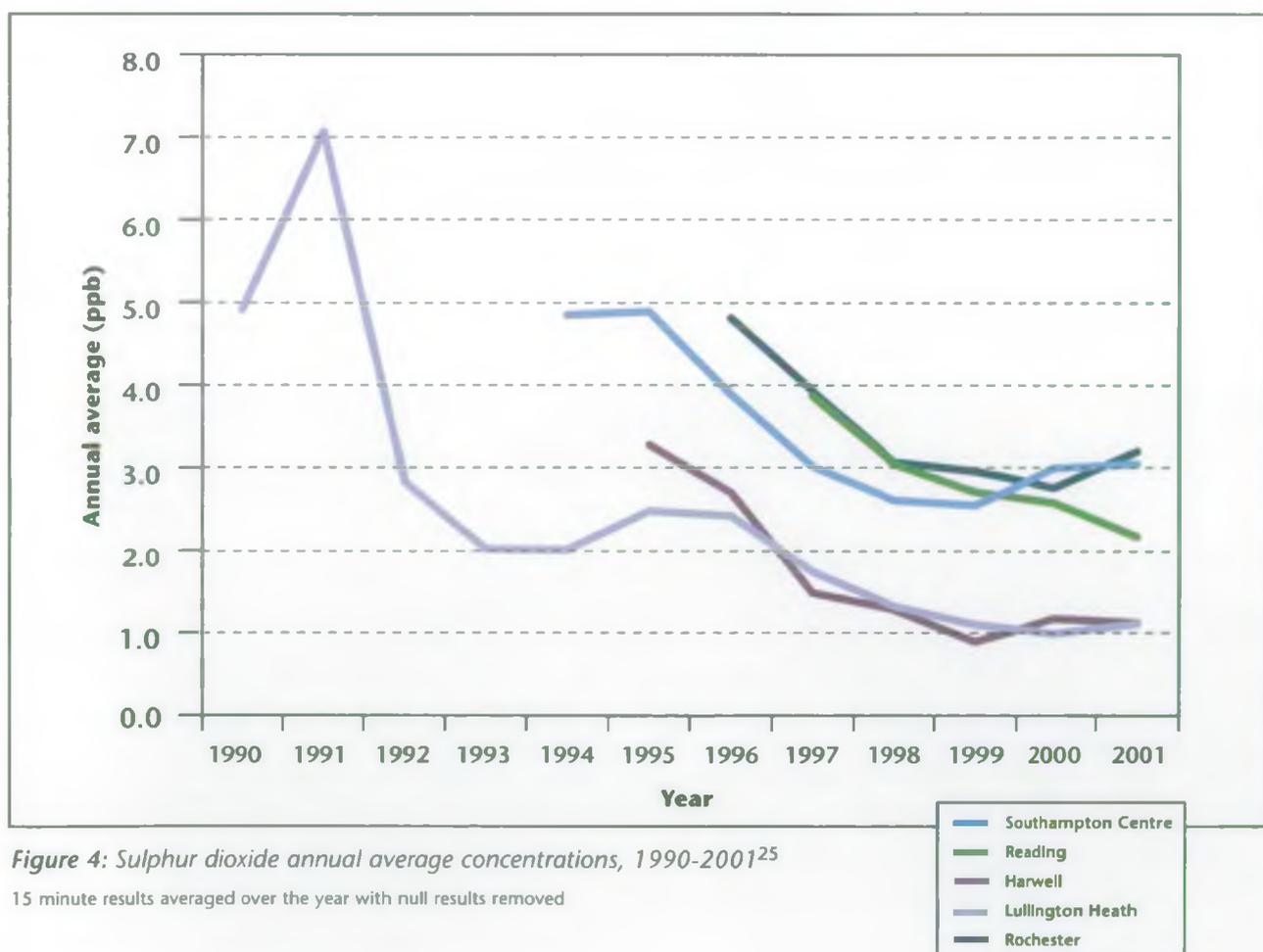


Figure 4: Sulphur dioxide annual average concentrations, 1990-2001²⁵

15 minute results averaged over the year with null results removed

ecosystems. The dates for the objectives to be achieved vary from December 2000 to December 2005 depending on the type of standard. Where AQMAs have been designated, local authorities are developing action plans to improve air quality and these should improve SO_2 levels in the South East. Power stations regulated by the Environment Agency are due to meet the required reduction in SO_2 emissions by 2005.

contributing to acid rain formation that impacts on buildings, lakes, streams and plants. Increased nitrogen deposition can also lead to nutrient imbalances, resulting in changes to the species composition of sensitive habitats. NO_x directly affects human health, for example aggravating asthma and other lung diseases. It can also react with volatile organic compounds in the presence of sunlight to form low-level ozone. Figure 5 shows the NO_2 concentrations from the air quality monitoring sites in the South East.

S

Indicator 3 Nitrogen dioxide concentration

Background to the indicator

The term 'nitrogen oxides' (NO_x) is usually used to describe two gases, nitric oxide (NO), and nitrogen dioxide (NO_2). Man-made releases of NO_x are primarily from fuel combustion (including traffic emissions), biomass burning and some production processes. NO_x can harm the environment by

Trends

All five sites reflect a trend of reducing NO_2 levels in the South East. The rural sites, Lullington Heath, Harwell and Rochester, have consistently recorded lower NO_2 concentrations than the urban sites, Reading and Southampton Centre. Both urban sites

²⁶ Source: National Environmental Technology Centre

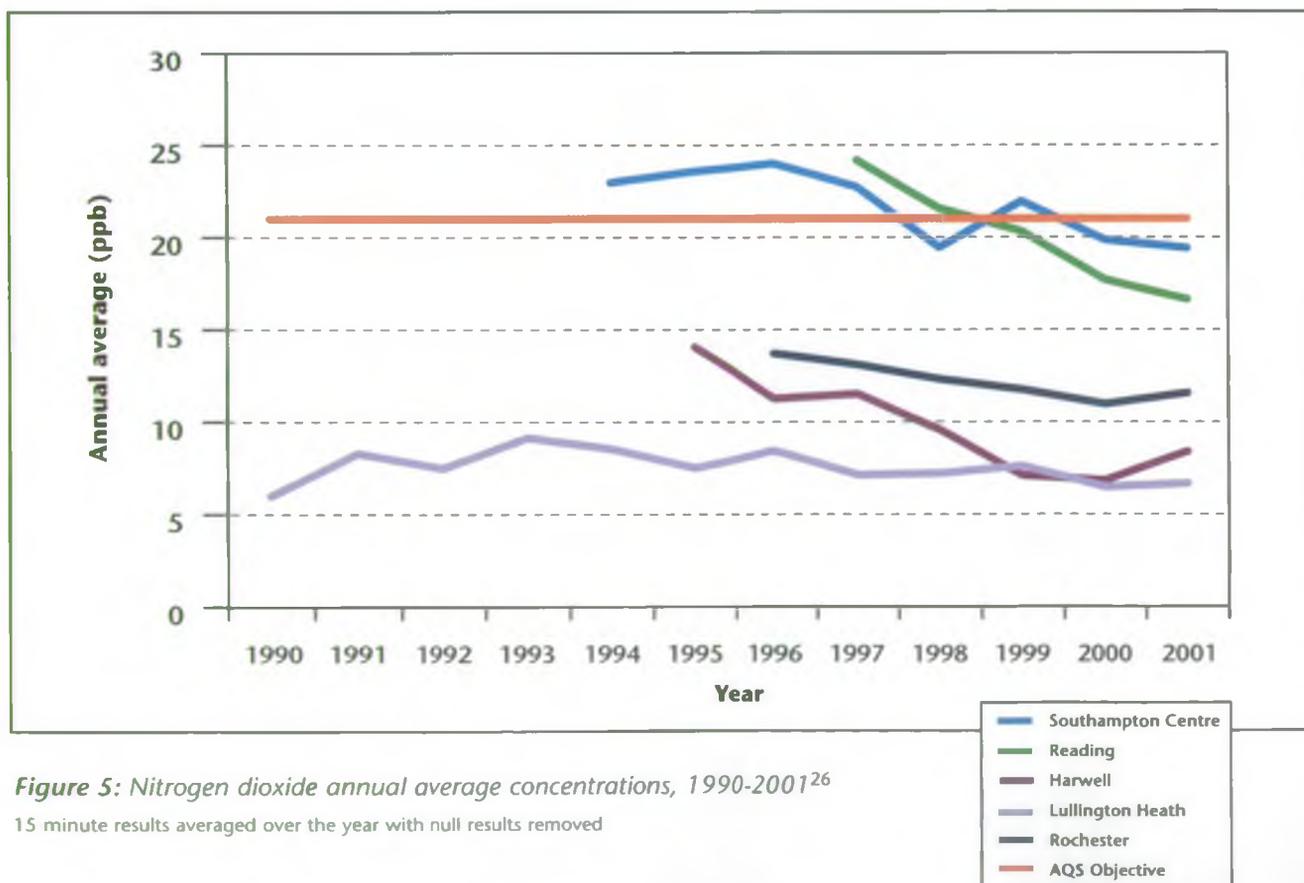


Figure 5: Nitrogen dioxide annual average concentrations, 1990-2001²⁶

15 minute results averaged over the year with null results removed

recorded breaches of the NO₂ air quality objective in the last 5 years although since 2000 both sites have been compliant with the objective.

Targets

The national *Air Quality Strategy* sets out two national air quality objectives for NO₂ for protecting human health:

- a 1-hour mean objective of 105 ppb not to be exceeded more than 18 times per year; and
- an annual mean objective of 21 ppb.

Both objectives are to be achieved by 31 December 2005. Where AQMAs have been designated, local authorities are developing action plans to improve air quality and these should improve NO₂ levels in the South East.

Indicator 4 Particulate concentration

S

Background to the indicator

Particulate matter refers to tiny particles suspended in the air composed of a wide range of materials from a variety of different sources. They vary in size and shape and are often reported as PM₁₀ (particles with diameter less than or equal to 10 µm) and total particulate. PM₁₀ consists of three predominant source types: primary particles mainly from combustion sources, including road traffic; secondary particles formed by chemical reactions in the atmosphere; and coarse particles such as suspended soils, dusts, sea salt and biological particles. Recent concern has focused on PM₁₀ and PM_{2.5} (particles with a diameter less than or equal to 2.5 µm) arising mainly from the combustion of diesel in the transport

²⁷ Source: National Environmental Technology Centre

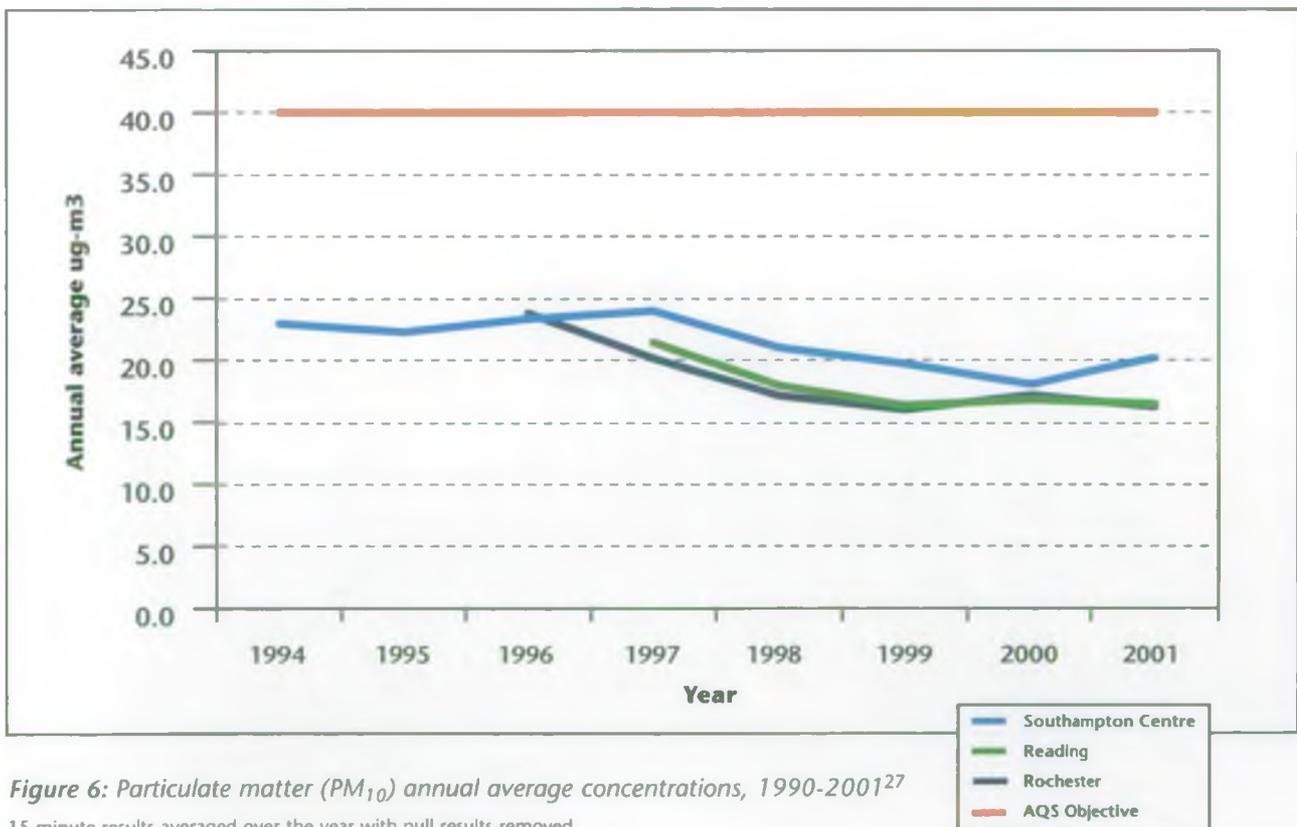


Figure 6: Particulate matter (PM₁₀) annual average concentrations, 1990-2001²⁷
15 minute results averaged over the year with null results removed

sector. These very small particles can be carried deep into the lungs, causing inflammation and a worsening of conditions such as heart and lung diseases. Figure 6 shows the PM₁₀ concentrations from the air quality monitoring sites in the South East.

Trends

All three sites in the South East monitored for PM₁₀, Rochester, Reading and Southampton Centre, have consistently recorded levels below the air quality objective of 40 µg/m³. In addition, all the sites have demonstrated reduced particulate levels over the last 5 years.

Targets

The national *Air Quality Strategy* sets out two objectives for particulate matter for protecting human health: a 24-hour mean objective of 50 µg/m³ not to be exceeded more than 35 times a year; and an annual mean of 40 µg/m³. Both objectives are to be achieved by 31 December 2004. Where AQMAs have been designated, local authorities are developing

action plans to improve air quality and these should improve particulate levels in the South East.

Indicator 5 Emissions to air from processes regulated by the Environment Agency



Background to the indicator

The Environment Agency regulates the most complex industrial processes that, if not carefully managed, could be the most polluting. Site specific limits and monitoring conditions are set by the Environment Agency for air emissions from the processes it regulates.

Industry produces a significant proportion of the UK emissions to air, although this has been reduced substantially compared with the past. This is partly due to the 'dash for gas' since the early 1990s reducing the emissions of SO₂. The reduction in emissions in the South East is also partly explained by

²⁸ Source: Environment Agency

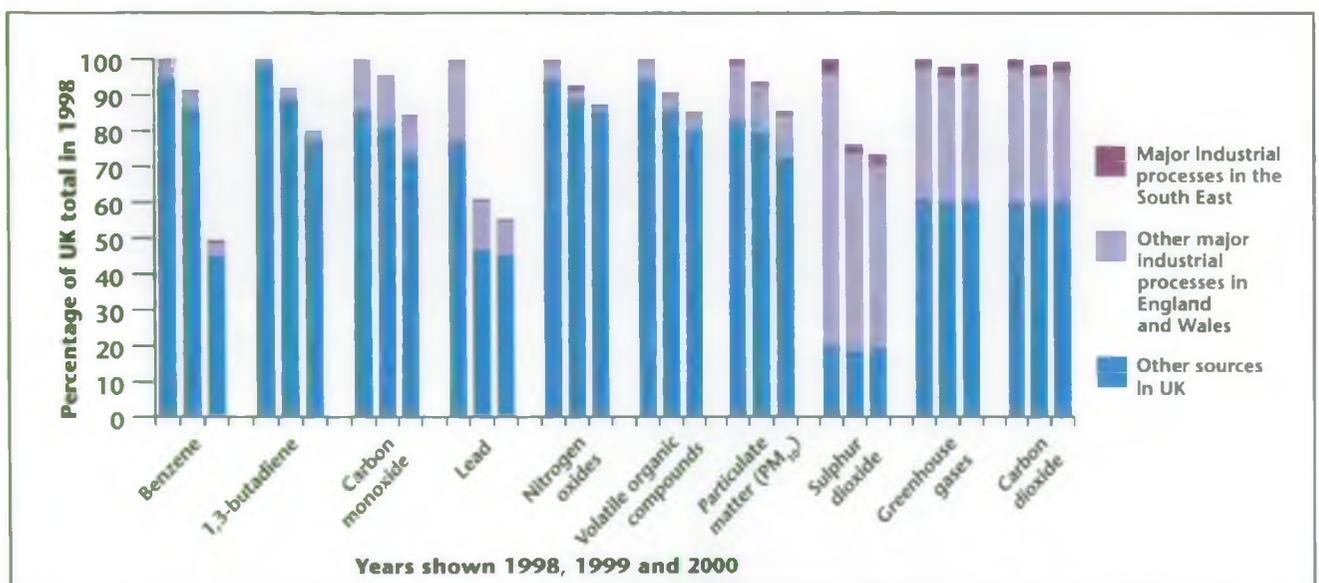


Figure 7: Air pollution from major industrial processes regulated by the Environment Agency nationally and in the South East compared with other sources in the UK²⁸

the shift in the types of industry located in the region, with the trend over recent decades away from heavy industry and manufacturing towards a more service based economy.

The use of 'Best Available Techniques' by operators in industrial processes delivers progressive reductions in releases to air and thereby contributes to improved air quality. Negotiated agreements between Defra and the operators should bring further reductions in CO₂ as part of the Climate Change Levy agreements.

Operators are required to report emission levels to the Environment Agency on a regular basis. This information is publicly available through the Pollution Inventory on the Environment Agency's website. The Inventory, which was launched in 1998, provides an annual record of emissions from selected activities regulated by the Environment Agency. For air emissions it reports on a number of activities including the energy, mineral and chemical industries, the production and processing of metals, waste management and food and drink production.

Trends

Figure 7 illustrates the progress being made to reduce emissions from industrial processes regulated by the Environment Agency. It also clearly shows that the proportion of air emissions from Environment Agency regulated processes in the South East is small compared to emissions from these processes nationally, as well as from other sources including road traffic. It should be noted that CO₂ is included in its own right, but is also included within the greenhouse gas category.

There are a number of specific trends that can be identified from Figure 7:

- Releases of all pollutants decreased nationally between 1998 and 2000 although the reductions seen for greenhouse gases and carbon dioxide were small compared to reductions seen for other pollutants;
- The most marked overall decreases were seen for benzene and lead where releases in 2000 were less than 60 per cent of those in 1998;
- Since 1998 releases of benzene, 1,3-butadiene, lead, NO_x, volatile organic compounds, PM₁₀ and SO₂ have been reduced from sources regulated by the Environment Agency. Of particular note are the

reductions of NO_x, which reduced from 18 kilotonnes in 1998 to 12 kilotonnes in 2000. Similar reductions are apparent for SO₂ and PM₁₀, which reduced from 65 to 54 kilotonnes and 3.5 to 2.1 kilotonnes respectively;

- Releases of CO, CO₂ and all greenhouse gases have, however, increased from processes regulated by the Environment Agency in the South East.

The data indicates that the Environment Agency's efforts are having a direct positive impact for some substances on the air environment in the South East although there are still improvements to be made.

Targets

The Environment Agency continually aims to improve the quality of emissions from major industrial processes through its regulatory role and from the improvement programmes it requires, as necessary, from operators. Improvement plans set out release limits for particular substances for individual sites, in consultation with the operator.

Indicator 6 Road traffic



Background to the indicator

Emissions to air from road traffic in the South East are influenced by a number of factors including volume of traffic, congestion, fuel type and engine technology. Although emissions of PM₁₀ and NO_x are declining and are predicted to continue to fall through to 2015, road traffic presents the greatest threat to air quality in the South East.

The South East is the largest English region in terms of population and has the largest regional Gross Domestic Product outside London. It also has the largest car ownership in the UK and residents of the South East travel further than in any other region. Estimates suggest that the cost of congestion runs into billions of pounds each year. If no action is taken, road traffic is predicted to increase by more than a third over the next 20 years²⁹.

²⁹ DETR (1999) *Quality of Life Counts: Indicators for a strategy for sustainable development for the United Kingdom. A baseline assessment*

Emission levels for newer vehicles are becoming more stringent and, as vehicles are replaced by newer ones fitted with catalytic converters, emissions should decline. However, NO_x levels may present a particular problem in the future with the predicted increase in traffic. A concern remains over the high proportion of short journeys that do not allow efficient emission control mechanisms to operate.

Table 2 shows the average daily motor vehicle flows in 2001 whilst Figure 8 shows the kilometres travelled by all motor vehicle traffic in all regions from 1999 to 2001. Figure 9 shows the modelled annual average concentration of NO_x in the South East in 1996.

Table 2: Average daily motor vehicle flows, 2001³⁰

Thousand vehicles per day ¹		
	South East	England
Motorway	98.1	80.7
Major roads		
Non built-up ²	18.3	14.3
Built-up ³	15.5	16.1
Minor roads		
Non built-up	1.4	0.9
Built-up	2.2	2.0
All roads⁴	4.9	3.7

Trends

In the South East travel by all modes of road transport in 2001 totalled over 84 billion kilometres, an increase of over 1.6 billion kilometres since 1999. The total distance travelled exceeded that of all other regions by over 30 billion kilometres. The region also saw the second highest increase in road traffic between 1999 and 2001 after the West Midlands.

There were over 17,000 more vehicle movements on motorways in the South East in 2001 than the average for England reflecting the extensive use that is made of the motorway network in the region. In addition, there are more vehicles on all types of roads in the South East than across the rest of England.

³⁰ Department for Transport (2002) *Transport Statistics Bulletin. Regional Transport Statistics: 2002 Edition*

³¹ Source: Department of Transport (2002)

¹ Average daily flow is the number of vehicles passing a point per year divided by 366

² Non built-up roads: all those with a speed limit in excess of 40 mph

³ Built-up roads: all those having a speed limit of 40 mph or less

⁴ All roads: weighted average flow for all motor vehicles on all roads

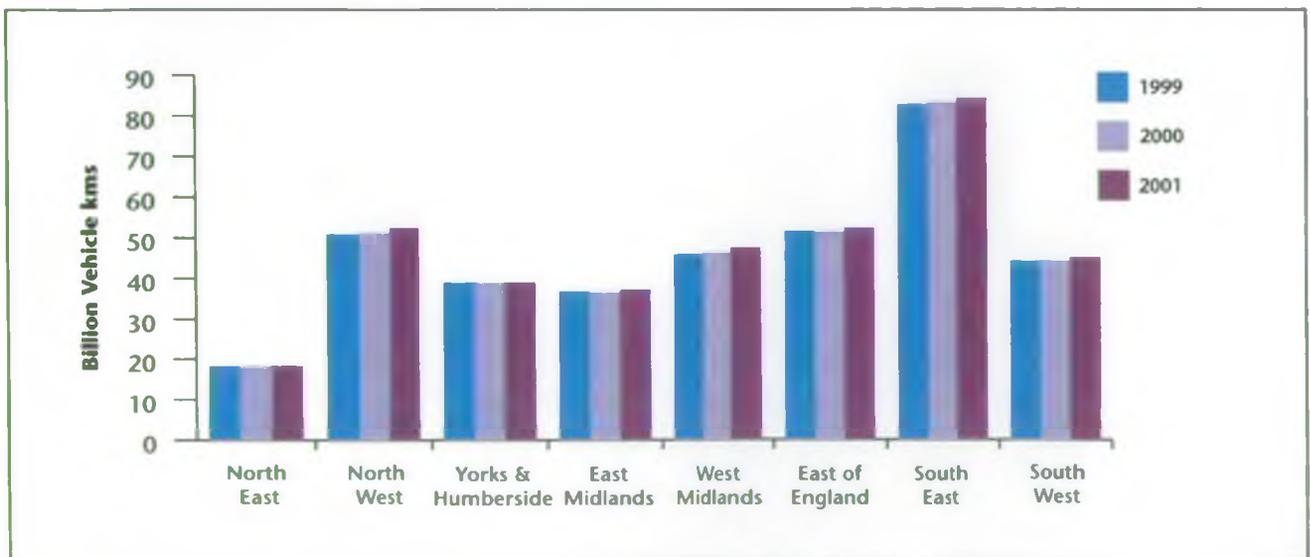


Figure 8: Kilometres travelled by all motor vehicle traffic, 1999-2001³¹

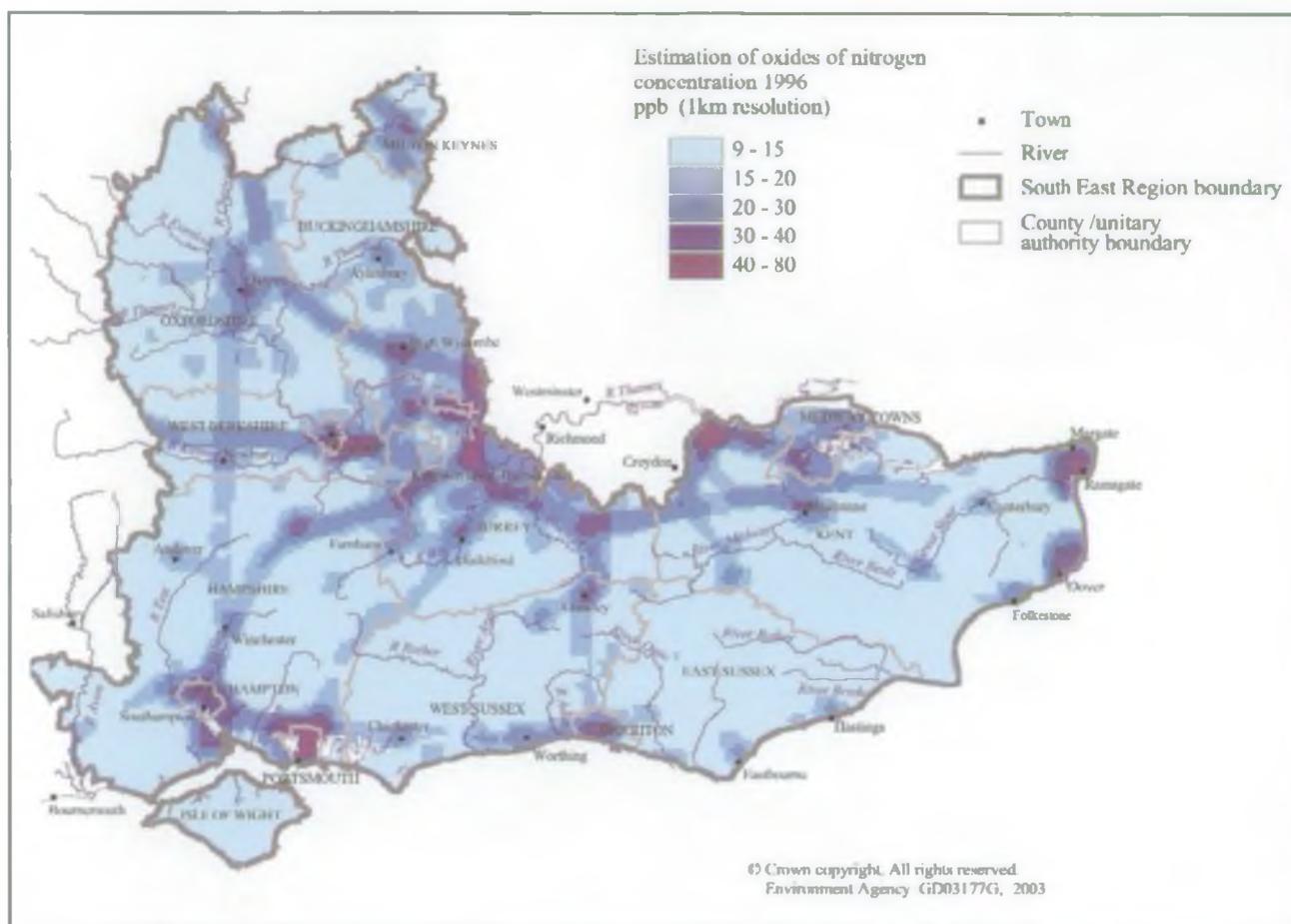


Figure 9: Modelled annual average concentration of oxides of nitrogen in the South East, 1996³²

The distance travelled by road, the high proportion of households with two or more vehicles and the greater number of vehicles on the roads all contribute to a negative impact on air quality due to traffic emissions in the South East.

The impact on NO_x levels from major urban areas and road corridors in the South East is evident in Figure 9. The higher concentrations follow the major road networks in the region. Road transport is thought to account for 50 per cent of the total UK emissions of NO_x .

Targets

The South East England Regional Assembly (the Regional Assembly) recently issued (January 2003) a

draft *Regional Transport Strategy*³³ which will replace the current Regional Transport Strategy set out in *Regional Planning Guidance for the South East (RPG9)*³⁴. The draft Strategy develops the proposals and policies which will provide the basis for linking transport planning to the economic development, social and other goals of the region. Drawing upon the results of a review of the availability of existing baseline data sets, the Regional Assembly proposes using a set of headline indicators to monitor performance of the draft strategy. These are:

³² Source: National Environmental Technology Centre

³³ South East England Regional Assembly (2003) *Draft Regional Transport Strategy: From Crisis to Cutting Edge*

³⁴ ODPM (2001) *Regional Planning Guidance for the South East (RPG9)*

- Mode of travel to work;
- Mode of travel to school;
- Kilometres travelled per person per year by mode;
- Number of people killed and seriously injured (total and children) as the average for the current five years;
- Freight mode share by tonne per kilometre (to be developed as the information is not currently available in the required format); and
- Level of road traffic (a specific indicator to be developed in consultation with the Highways Agency).

These headline indicators form part of the wider RPG9 and RSDf monitoring process and will feed directly into the annual monitoring report published for the region by the Regional Assembly.

Actions and responses

Key actions to improve air quality in the South East. The Environment Agency will:

- Work with the South East England Regional Assembly to ensure that road and air transport have the minimum impact on air quality in the region;
- Advise local authorities on locations of sensitive sites so that they can take air quality into account in their planning strategies and planning decisions;
- Contribute fully to the Kent and Medway Air Quality Partnership, Sussex Air Quality Steering Group and the *Air Quality Strategy* review and assessment process carried out by local authorities;
- Continue to deliver improvements in air quality in the South East through its regulation of industrial processes. This will be achieved through the implementation of the Integrated Pollution Prevention and Control regime and the review of earlier Integrated Pollution Control authorisations and of sites covered by the Habitats Directive;
- Study the effects of industrial processes to identify what actions will improve air quality where Local Authorities have identified Air Quality Management Areas;
- Liaise with health authorities and other health experts to investigate the impact of pollutants in order to better understand the links between air quality and health.



3.2 Protecting and Enhancing Water Quality



Protecting and Enhancing Water Quality

Restoring the quality of our rivers and beaches protects public health, provides enjoyment and a sense of well-being and creates assets for tourism and new jobs.

Key messages

- River quality in the South East has improved significantly over the last decade due to effective regulation by the Environment Agency and significant investment by water companies;
- New development, climate change and diffuse pollution threaten continued improvements to water quality. Compliance with River Quality Objectives fell slightly in 2001;
- Bathing water quality is the best it has been since records began;
- The amount of nutrients in our rivers has fallen over the past ten years, mainly due to improvements in sewage treatment works and a reduction in the phosphate content of detergents. The amount of nutrients and other pollutants draining into watercourses from unregulated sources - such as agricultural run-off - is still too high;
- The main potential threat to water quality comes from point sources, such as sewage treatment works, which are regulated by the Environment Agency. However, the impact of unregulated pollution sources, such as agricultural and urban run-off, is a growing concern in the South East.

Background

Rivers, wetlands, floodplains, estuaries, groundwaters and coastal waters are vital ingredients in the region's environment. They support amphibians, fish, plants and invertebrates which are fundamental in the food chain. Large numbers of bird species and rare mammals, such as water voles and otters, are reliant on the water environment. Rivers form important links between otherwise fragmented habitats and so act as wildlife corridors. Rivers and estuaries are a source of water for drinking, domestic, agricultural and industrial use. Along with coastal waters, rivers and estuaries are also a valuable recreational asset.

The water environment is subject to numerous pressures, including pollution, habitat degradation and low flows (caused by drought, over-abstraction and climate change). An integrated approach to river

basin management is required for the effective management of water quality.

The quality of the water environment in the South East has significantly improved since water companies have been required to make significant investment in improvements through their Asset Management Plans (AMPs), part of the water industry's periodic review since the 1990s. The AMP programmes have resulted in many benefits, ranging from cleaner bathing waters to a reduction in the number of rivers of 'poor' and 'bad' quality. In the South East, substantial improvements have been made to the marine environment through improvements to sewage discharges from coastal towns and areas such as Bognor, Littlehampton, Worthing and the Isle of Wight. In addition, there has been a comprehensive programme of improvements affecting estuaries and freshwaters.

Roles and responsibilities

The Environment Agency is responsible for maintaining and improving the quality of surface and ground waters and aims to prevent or reduce the risk of water pollution and ensure that if pollution occurs it is appropriately cleaned up.

The Environment Agency determines legal consents for discharges to the water environment under four main regulatory regimes:

- The Water Resources Act 1991;
- The Environmental Protection Act 1990;
- The Pollution Prevention and Control Regulations 1999; and
- The Groundwater Regulations 1998.

The Environment Agency uses a variety of water quality standards and targets to determine the conditions to impose on discharges to the water environment. These standards protect wildlife and nature, control the risks to the quality of water abstracted for supply to our homes or used to irrigate crops and ensure the enjoyment of recreational pursuits such as bathing, angling and boating. The Environment Agency periodically reviews the conditions of these discharges. This process is used to deliver environmental improvements and ensure that the needs of water based European Union Directives including the Freshwater Fish (78/659/EEC); Surface Water Abstraction (75/440/EEC); Dangerous Substances (76/464/EEC); Bathing Water (76/110/EEC); Shellfish Waters (79/923/EEC); Nitrate (91/676/EEC); Groundwater (80/68/EEC); and Urban Waste Water Treatment (91/271/EEC) Directives, as well as relevant UK legislation, are met.

The Environment Agency also conducts extensive monitoring to inform where water quality is acceptable or needs improving. This monitoring allows decisions to be based on accurate and relevant information. It also helps identify water companies' investment priorities through the AMP process and helps to improve other industrial discharges.

The Environment Agency analyses, informs and advises on the environmental performance of water companies in delivering their environmental requirements. It also helps decide what environmental improvements should be made as part of the periodic review process of water companies. Currently the delivery of environmental

improvements under the third AMP (AMP3) covering April 2000 to March 2005 is being monitored and the new environmental requirements under the fourth AMP (AMP4) covering April 2005 to March 2010 are being established. The periodic review affects the amount householders pay for their water bills and the Environment Agency plays a key role in these reviews. For example under AMP3 water companies must invest £29 per customer in environmental improvements.

The Environment Agency is also the competent body for the implementation of the Water Framework Directive (2000/60/EC) which came into force in December 2000. The concept of 'good ecological status' is central to this Directive which requires this objective to be met by 2015.

Water companies are major abstractors from and dischargers to the environment. The water companies are responsible for providing the water supply and sewerage services to the majority of householders in the South East. Improving the way they operate can lead to significant improvements in rivers and coastal waters. Water companies:

- Abstract water from rivers at over 450 sites;
- Abstract water from over 15,000 groundwater boreholes; and
- Manage around 750 sewage treatment works, and the associated sewerage network.

The Drinking Water Inspectorate has overall responsibility for the quality of water in our taps whilst the Local Authority Environmental Health Departments have responsibility for issues of public health.

Water Quality in the South East

The South East supports a variety of types of river, including internationally important groundwater fed chalk rivers, lowland clay rivers, small heathland streams in the New Forest, small drainage ditches, urban streams and the middle and upper reaches of the River Thames. The region also supports 30 estuaries totalling more than 460 km in length, notably the industrialised Solent Water, which supports valuable commercial shellfisheries, and the Medway estuary, with the former naval dockyard at Chatham and extensive saltmarsh habitats in its



middle and lower reaches. Equally important as an economic resource, providing recreational and tourism attractions, the region has 80 EC designated bathing waters.

Although the South East has a relatively low number of industrial discharges to the water environment, its large and growing population means that sewage discharges, which can cause problems both by reducing the amount of oxygen in rivers and by raising nutrient levels, are numerous. Additional problems that can indirectly affect water quality are diffuse inputs from agricultural runoff, leading to excessive plant and algal growths, and urban run-off. Drought years, such as the hot dry summers of 1995, 1996 and 1997, may concentrate contaminants and thus worsen water quality, while the actual quantities of pollutant entering the watercourse remain constant. It is predicted that climate change will reduce summer rainfall resulting in decreased river flows and hence poorer water quality.

There have been substantial improvements in the biological and chemical quality of the South East's rivers since 1990. Less than 6 per cent of rivers were classed as chemically 'poor' or 'bad' in 2000 compared with around 15 per cent in 1990. This improvement is due to the Environment Agency's supervision of a major clean up of discharges from sewage treatment works and industry. For example, between 1990 and 2000 water companies spent over £4 billion nationally improving inland waters. In the five years to 2005, they will invest a further £2.9 billion nationally. There are, however, many rivers that still have high levels of nutrients and frequent examples of poor and bad aesthetic quality.

Indicators

Six indicators have been selected to demonstrate the state of the water environment:

- Indicator 7** River water quality
- Chemical
 - Biological
 - Aesthetic
- Indicator 8** Compliance with River Quality Objectives
- Indicator 9** Compliance with the EC Bathing Waters Directive

Indicator 10 Nutrient status of freshwaters

Indicator 11 Nutrient status of groundwater

Indicator 12 Water pollution incidents

The *Regional Sustainable Development Framework*³⁵ (RSDF) uses Indicators 7, 8 and 9 to demonstrate progress against meeting the regional objective 'To maintain and improve the water quality of the Region's rivers and coast'.

Indicator 7 River water quality

Background to the indicator

The Environment Agency uses a range of measures of river quality - biological, chemical and aesthetic quality - using the General Quality Assessment (GQA) scheme. The scheme provides a consistent assessment of the state of the water environment and enables comparisons to be made between different time periods and locations. In the South East around 4,500 km of rivers and canals are assessed by the Environment Agency.



³⁵ South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

The GQA scheme

Chemical - the chemical assessment of rivers is based on three measurements: dissolved oxygen; biochemical oxygen demand; and ammonia. They are good, simple indicators of the extent to which rivers are affected by waste water discharges and runoff from farms. Chemical quality is allocated one of six grades from Grade A (very good) to Grade F (bad) and is assessed over a three-year period.

Biological - the biological assessment of rivers is based on the range of macroinvertebrates (small animals such as freshwater shrimps, insect larvae, water beetles and snails) present in a river. This is compared to the number expected in the river assuming it is not polluted or physically damaged, whilst taking account of natural differences due to different types of geology, for example. The assessment provides an integrated measure of the biological 'health' of the river environment. Biological quality is allocated one of six grades from Grade a (very good) to Grade f (bad).

Aesthetic - aesthetic quality is assessed by surveying sites for items that spoil the look and smell of rivers: the amount and type of litter; oil; scum; foam; sewage fungus; colour; and odour. Both the water surface and the banks where there is public access are considered. Each site assessed is given a grade based on combining the presence of each item and weighted according to their perceived importance. For example, sewage litter is considered less acceptable than foam; foam is less acceptable than general litter and so on. The aesthetic grading is from Grade 1 (good) to Grade 4 (bad) which describes its overall aesthetic quality. The Environment Agency tested the method in 2000 when 68 sites in the South East were assessed. As a result, some changes to the method have been recommended. The Environment Agency is working with the National Aquatic Litter Group on a new protocol that can be used by any organisation to monitor the aesthetic quality of rivers.

Figures 10 and 11 show the grades and geographical distributions of the chemical GQA scheme whilst the grade and geographical distributions of the biological

GQA scheme are shown in Figures 12 and 13, respectively. The proportion of rivers in different aesthetic GQA grades is shown in Figure 14.

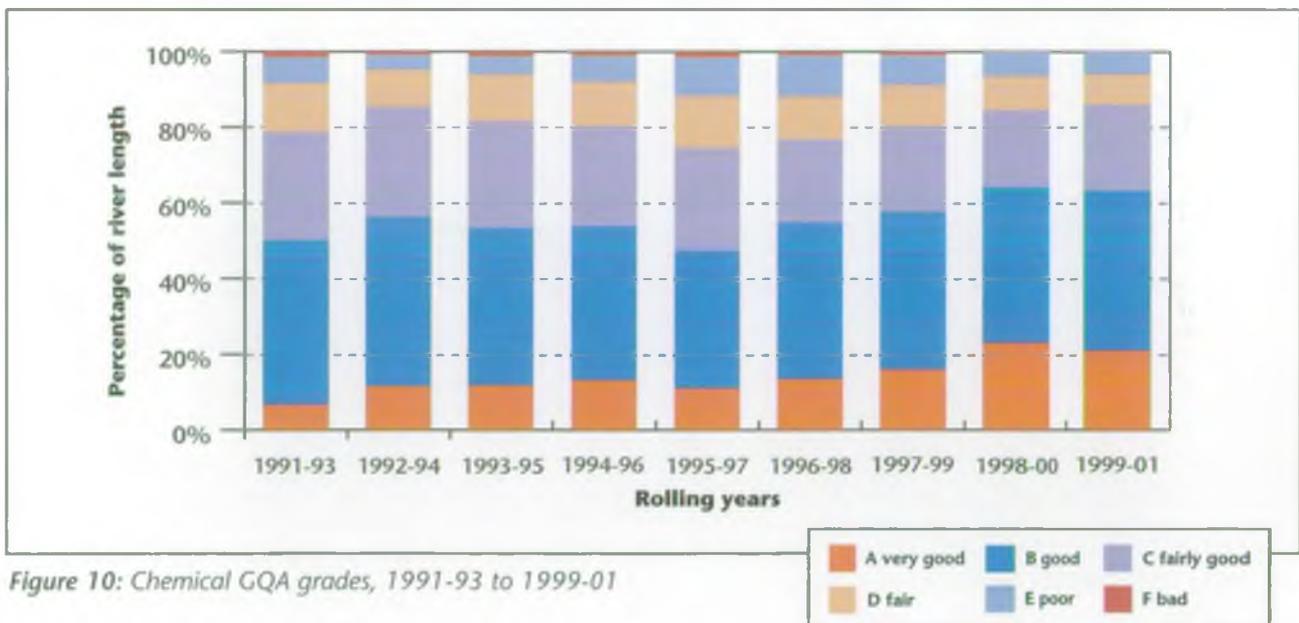


Figure 10: Chemical GQA grades, 1991-93 to 1999-01

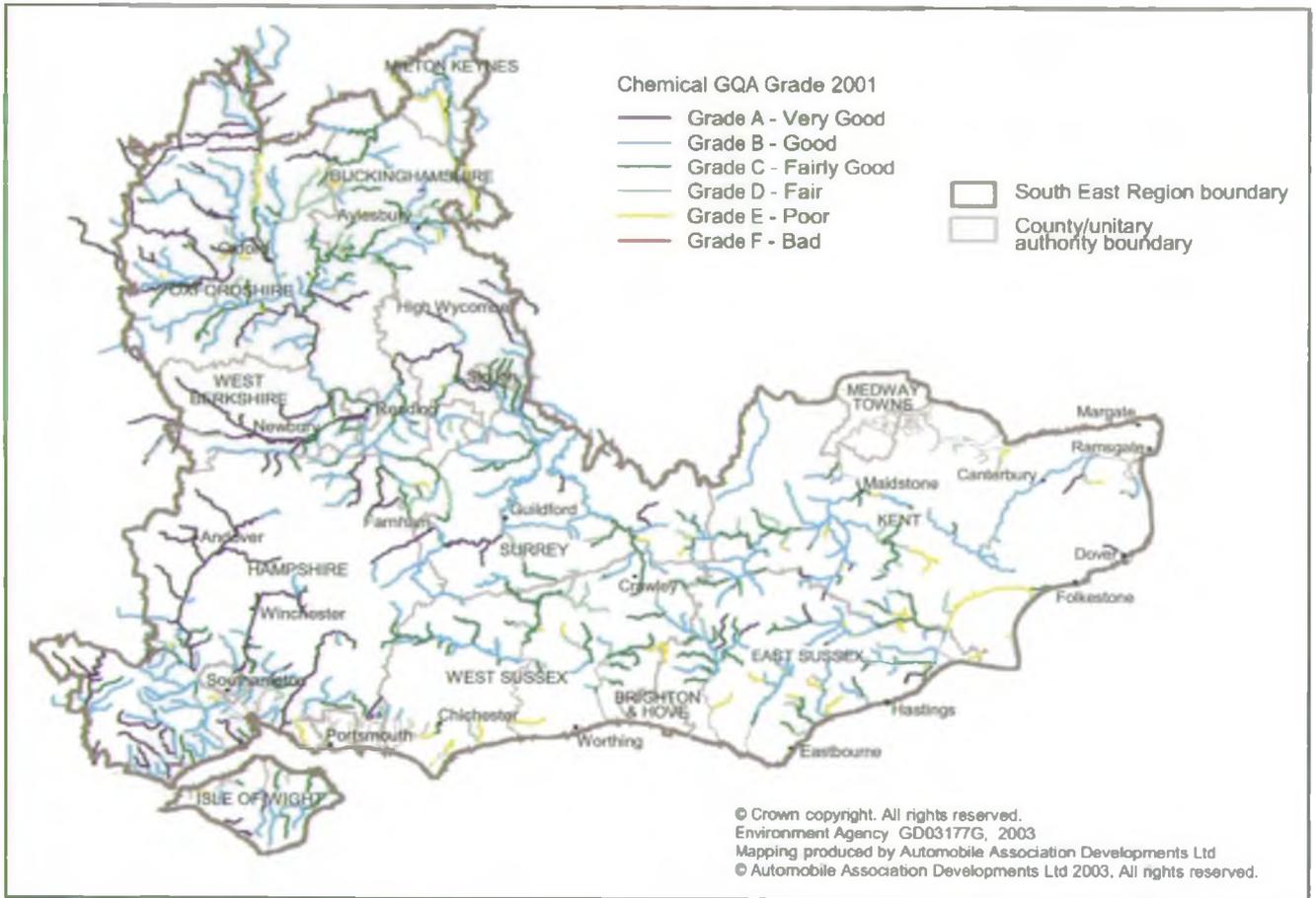


Figure 11: Chemical GQA, 2001

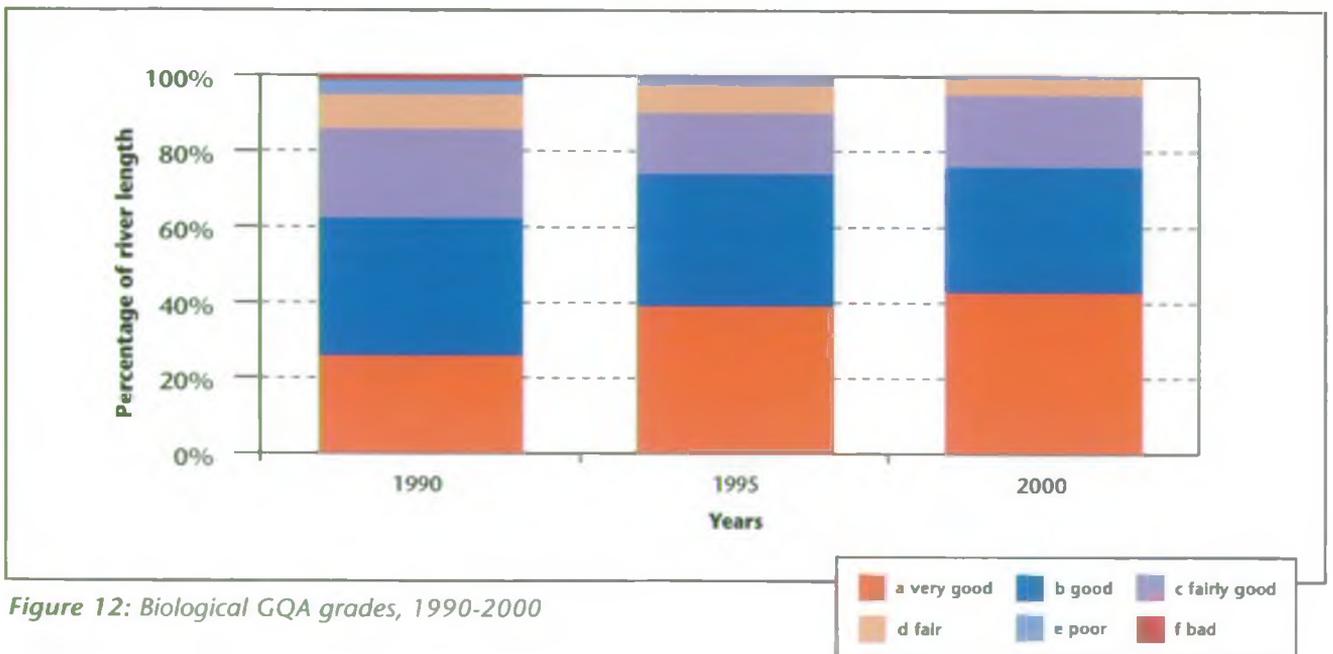


Figure 12: Biological GQA grades, 1990-2000

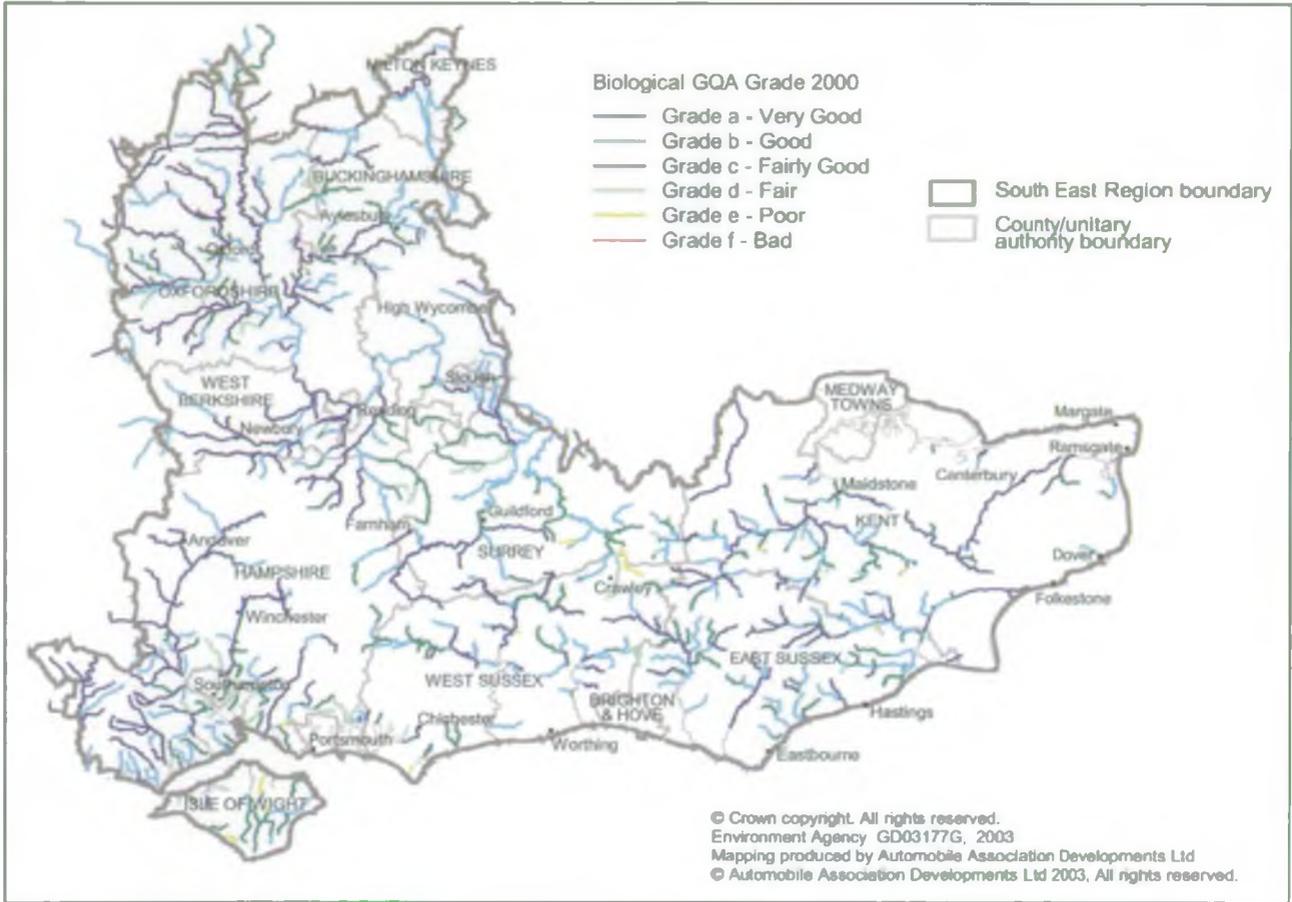


Figure 13: Biological GQA, 2000

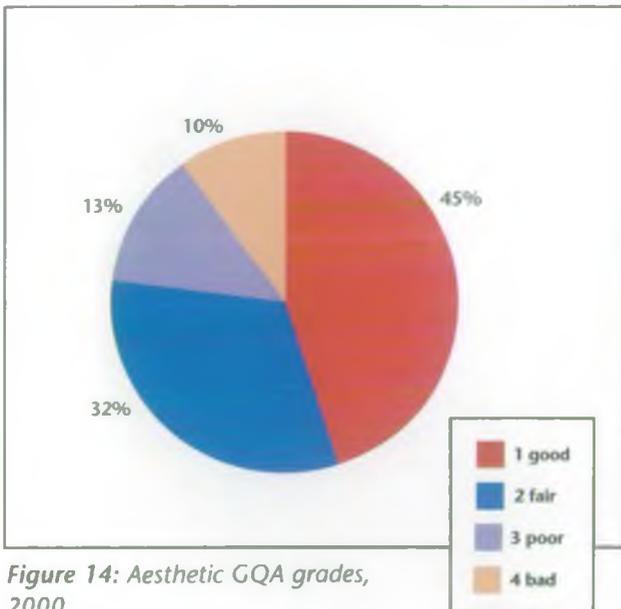


Figure 14: Aesthetic GQA grades, 2000

Trends

Chemical quality

Chemical quality is primarily an indicator of organic pollution. In 2001, 94 per cent of rivers were of 'good' or 'fair' quality compared with 93 per cent in 2000 and 84 per cent in 1990 demonstrating an underlying trend of improvement. There has also been an improvement in the number of rivers achieving Grade A (very good) over the last decade. In 2000 and 2001 over 20 per cent of our rivers in the South East fell within this category compared to 12 per cent in 1995 and 8 per cent in 1990. These improvements are largely due to the significant improvements that have been made in the quality of discharges to rivers in the South East. However, deteriorations in water quality can also result from effects of low flow conditions during drought years, with subsequent recovery. For example, this explains the dip in rivers of good and fair quality (Grades A to D) in 1995-97.



There has been a marked decline in the rate of improvement in chemical quality in recent years in Hampshire, Sussex and Kent. This is thought to be a result of three factors: a rising population forcing sewage works to discharge greater volumes into rivers; drought conditions in 2001; and increasing diffuse pollution including agricultural and urban run-off.

Biological quality

Biological quality is an indicator of the overall 'health' of rivers. Over 99 per cent of rivers in the South East were of 'good' or 'fair' quality in 2000, compared with 97 per cent in 1995 and 95 per cent in 1990. No rivers fell in the 'bad' grading in 2000. Less than 1 per cent fell within the 'poor' grading in 2000, compared to 2.5 per cent in 1995 and 4 per cent in 1990. The data demonstrates an underlying improvement in biological quality in the South East.

Although the region's rivers are of generally high quality the growing population of the South East means that the volume of treated sewage entering river systems is increasing. Problems are frequently most acute in the upper reaches of catchments and during drought periods, when treated sewage can constitute a significant proportion of river flow. This means the current biological quality of rivers in the region is unlikely to meet the standards required by the EC Water Framework Directive (2000/60/EC).

Aesthetic quality

Aesthetic quality is an indicator of the overall 'impression' of rivers. Of the sites surveyed in the South East, 77 per cent were aesthetically 'good' or 'fair'. The remainder were recorded as being aesthetically 'poor' or 'bad'. The most frequent item reducing aesthetic quality were litter items such as crisp and cigarette packets. In the future it is hoped to build up a longer-term dataset to facilitate aesthetic reporting.

Targets

The GQA scheme is designed to measure the Environment Agency's progress in the water environment and the overall target is to continue improvements. The Environment Agency has set a target to achieve an 85 per cent reduction in the number of point source discharges from industrial processes causing acute toxic effects. Achieving this target will include carrying out modelling of discharges to ensure the consent limits meet the

environmental quality standards that are designed to protect all aquatic life. In addressing this target the biological quality of rivers should improve.

The Environment Agency is developing Biological Quality Objectives for rivers based on GQA biology grades. These objectives will be used to implement the Water Framework Directive as they will identify the 'gap' between current biological quality and the Directive's requirements. They will also allow the Environment Agency to use biological targets for operational and investment planning.

Indicator 8 Compliance with River Quality Objectives

Background to the indicator

The Environment Agency has set water quality targets for all main rivers using the River Ecosystem (RE) Classification system which has five classes, from RE1 (very good water quality) to RE5 (poor water quality). These targets are known as River Quality Objectives (RQOs). They are used to plan the maintenance and improvement of river quality and provide a basis for setting discharge consent standards.

Compliance is reported annually using a three-year rolling dataset. Where river quality does not meet the objective set, then an improvement plan must be established. To meet the objective, it may be necessary to make improvements to discharges to the river.

Factors affecting compliance are complex and include interactions between natural and anthropogenic effects, such as sewage treatment works and river flows. Therefore achievement of 100 per cent compliance is unlikely but it is possible to improve from the current situation.

- RE1 Water of very good quality suitable for all fish species
- RE2 Water of good quality suitable for all fish species
- RE3 Water of fair quality suitable for high class coarse fish populations
- RE4 Water of fair quality suitable for coarse fish populations
- RE5 Water of poor quality which is likely to limit coarse fish populations

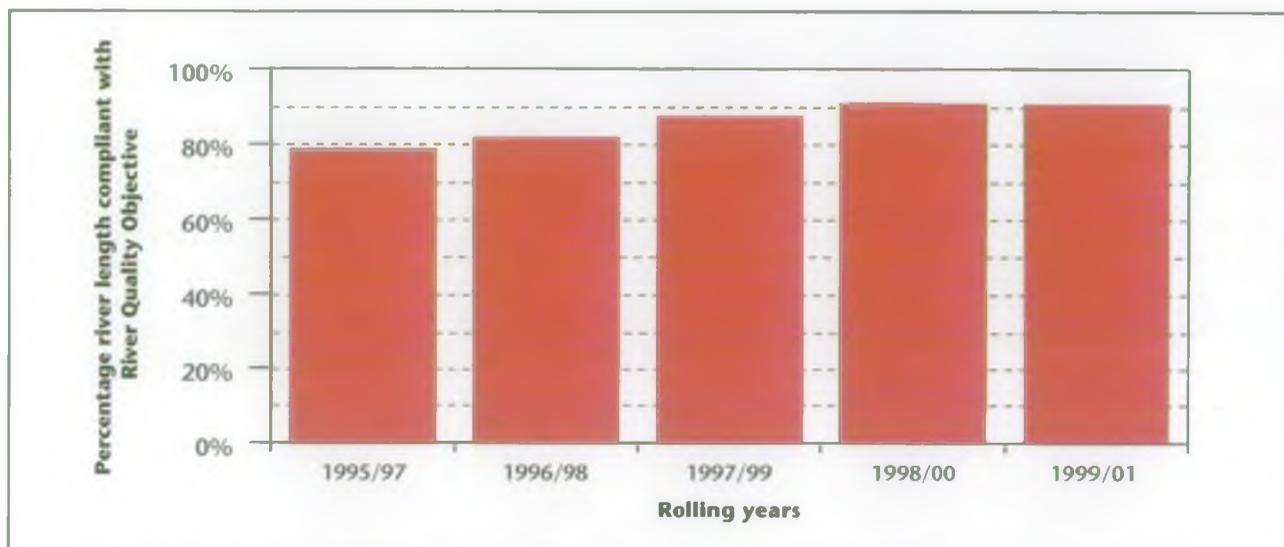


Figure 15: River Quality Objective compliance, 1997-2001

Trends

Figure 15 shows that in 1997 compliance with RQOs was below 80 per cent but has steadily increased to 91 per cent compliance in 2000. However, the improving trend has levelled off to just under 91 per cent in 2001 indicating that continued vigilance is needed.

Targets

The Government has set a national target to ensure 91 per cent of rivers are compliant by 2005. In 2000 the target was met in the South East but compliance has since slipped marginally.

Indicator 9 Compliance with the EC Bathing Water Directive

Background to the indicator

Contamination of bathing waters can pose a risk to human health and the environment. Improving the microbiological quality of our bathing waters enhances our enjoyment of them and can also

benefit the local tourist industry, especially in the South East's coastal resorts such as Southsea, Brighton, Eastbourne and Margate. The quality of the bathing waters in the South East is therefore a top priority. The region has 80 designated bathing waters of which one is the inland bathing water at Frensham Great Pond in Surrey.

The EC Directive on Bathing Waters (76/110/EEC), which the Environment Agency enforces, sets water quality standards designed to protect the health of bathers and to maintain and improve overall water quality. Standards are set for bacteria, amongst other things, which are indicators of pollution typically from sewage or farm waste. There are two types of standards: imperative standards that a bathing water must meet; and guideline standards that should be aimed for.

Water quality at each bathing water is sampled 20 times during the bathing season from 15 May to 30 September. All samples are taken at predetermined points where the average density of bathers has traditionally been highest. The indicators measured are total coliform, faecal coliform, faecal streptococci, enterovirus and salmonella. In order for a bathing water to comply with the Directive, 95 per cent of samples (i.e. at least 19 out of 20 samples) must meet the imperative (mandatory) standards.

In October 2000, the EU Commission proposed a significant revision to the Directive. This included a



tighter bathing water quality standard that could result in a dramatic fall in compliance. It also included provisions for recreational waters and some management measures for bathing waters. These include public warnings when run-off from agricultural land or sewage discharges could reduce bathing water quality temporarily after rainfall and proposals for improved public information at bathing waters.

Water companies have carried out extensive improvements under the AMP process to ensure that their discharges do not pollute bathing waters. Other Directives, such as the Urban Waste Water Treatment Directive (91/271/EEC) and the Shellfish Waters Directive (79/923/EEC), have also either directly or indirectly been drivers for bathing water quality improvements.

To date, discharges and the level of treatment applied to those discharges has been the biggest influence on the quality of bathing water. As these sources of pollution are dealt with and minimised, other diffuse sources of pollution become proportionately more important. Such sources include agricultural run-off and urban run-off. Many coastal towns have combined sewerage systems that in times of heavy rainfall can overflow carrying a mixture of rainwater and untreated sewage into surface waters. The prevailing weather conditions also affect bathing

water quality. Wet and cloudy summers result in poorer water quality than dry sunny summers, as there is less ultraviolet light that naturally destroys bacterial contamination. The operation of storm overflows is also more likely in wet weather.

The Seaside Awards and the Blue Flag Awards are both high profile schemes that are locally important in attracting tourist trade. Local authorities must apply to Environmental Campaigns (formerly the Tidy Britain Group) for these awards using, in part, bathing water quality data collected by the Environment Agency to support their case.

Trends

Figure 16 shows the bathing water quality in the South East has improved between 1993 and 2002 although there was a slight decline between 1994 and 1996. Since 1998 no beaches in the South East have consistently failed the imperative standards of the Bathing Waters Directive. Over 98 per cent of bathing waters monitored in 2002 complied with the imperative standards of the Directive. Some 76 per cent of bathing waters monitored in 2002 complied with the much stricter guideline standards (Figure 17). During 2000 to 2002, 95 per cent of coastal

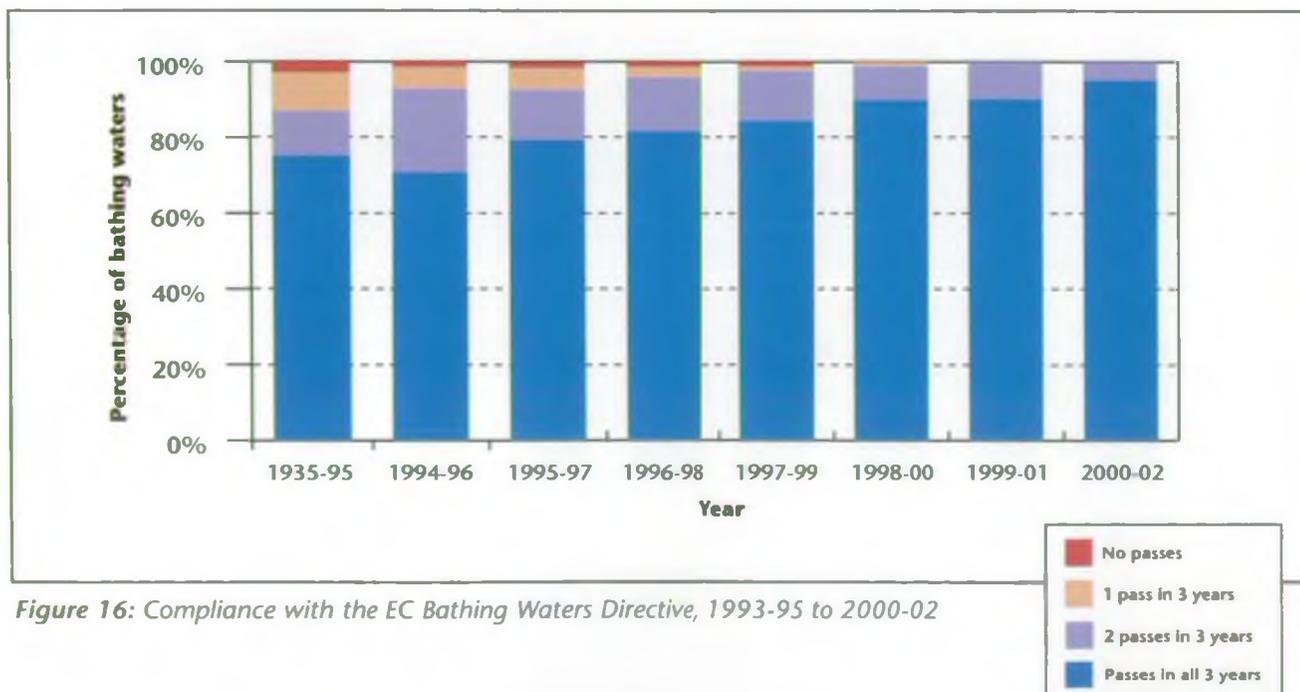


Figure 16: Compliance with the EC Bathing Waters Directive, 1993-95 to 2000-02

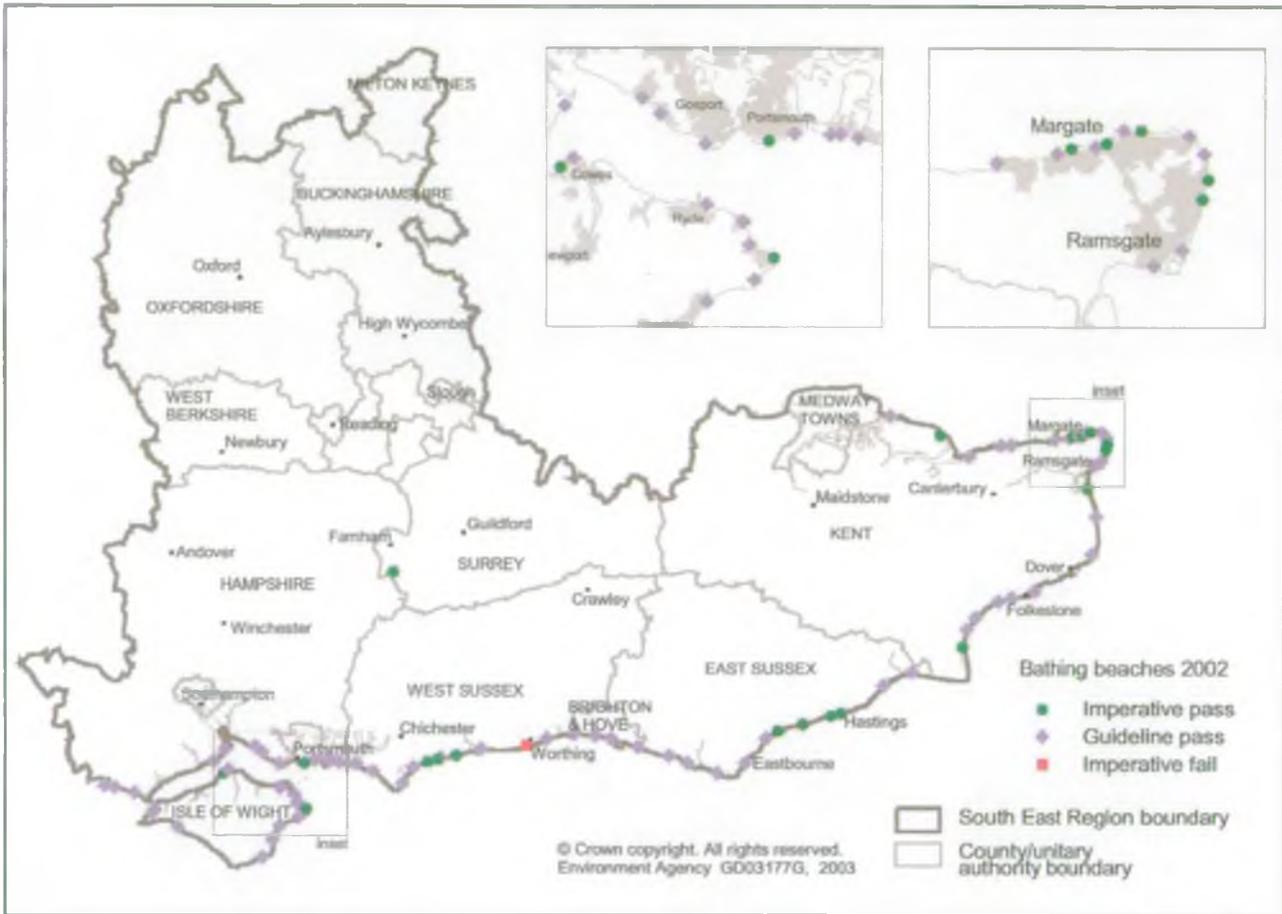


Figure 17: Bathing beach compliance, 2002

bathing waters complied each year, compared to only 77 per cent in 1993 to 1995. These improvements in the quality of bathing waters are due to substantial investment to improve discharges from many coastal sewage treatment works.

Targets

The Environment Agency has a target to achieve, and then maintain, at least 97 per cent compliance with the imperative standards and to achieve 85 per cent compliance with the more stringent guideline standards by 2005. Whilst the South East meets the imperative standards target, further work is needed to ensure guideline standards are met.

Indicator 10 Nutrient status of freshwaters



Background to the indicator

Eutrophication is the process of nutrient enrichment in waters that results in the stimulation of a range of changes, including increased production of algae and aquatic plants, which may negatively affect water quality and the uses to which the water may be put. In England and Wales eutrophication has had a high profile since the late 1980s when the widespread occurrence of blue-green algal blooms in standing and slow-flowing waters gave rise to considerable public concern. In temperate freshwater systems phosphorus is generally the key nutrient limiting



plant productivity, but for coastal waters nitrogen is the limiting factor. Nutrients present in waters originate from a number of sources both natural and manmade. The main sources are sewage effluents and run-off from agricultural land.

Eutrophication can have both temporary and irreversible effects on aquatic ecosystems. For example, fluctuating dissolved oxygen levels can result in the death of invertebrates; blue-green algae can produce toxins that can seriously affect the health of exposed mammals (including humans), fish and shellfish; and enrichment can seriously reduce biodiversity and cause problems for water abstraction, livestock watering, water-sports and angling. Nitrate can also have health implications for drinking water abstractions in fresh waters.

The Environment Agency commissioned a report *Costing Eutrophication*³⁶ that estimated the annual damage costs of freshwater eutrophication in England and Wales were £75-114 million. In August 2000 the Environment Agency published its eutrophication management strategy *Aquatic Eutrophication in England and Wales*³⁷. This promotes partnership approaches to eutrophication management, measures to reduce nutrient inputs to water and more comprehensive catchment-based actions for priority (impacted) waters. In the South East local catchment-based action is being trialled through pilot eutrophication control action plans on the River Kennet in Berkshire and the Pevensy Levels in East Sussex.

Where eutrophic conditions are apparent, the Environment Agency can designate Sensitive Areas, subject to Defra's approval, under the EC Urban Waste Water Treatment Directive (91/271/EEC). In the South East there are a number of Sensitive Areas, including stretches on the River Thames, River Test, River Itchen, the internationally important wetland Pevensy Levels and several estuaries (Paghham Harbour, Chichester Harbour, Langstone Harbour and Portsmouth Harbour). In these Sensitive Areas, water companies may have to invest in nutrient stripping installations to reduce the nutrient content of discharges as part of the AMP process.

Under the EC Habitats Directive (92/43/EEC) the Government must take action to identify and safeguard the most valuable conservation sites. Where discharges to the water environment are shown to impact on such sites, nutrient stripping can be required. Similar requirements are imposed by the

Countryside and Rights of Way Act (2000) for discharges affecting Sites of Special Scientific Interest.

The Environment Agency carries out nutrient assessments of rivers based on samples analysed for nitrate and phosphate. There are no set 'good' or 'bad' concentrations for nutrients in rivers in the way that chemical and biological quality are described. Rivers in different parts of the country have naturally different concentrations of nutrients. 'Very low' nutrient concentrations, for example, are not necessarily good or bad; the classification merely states that concentrations in this river are very low relative to other rivers. The classification can, however, identify where further investigations are needed into the nutrient status of rivers. Phosphate and nitrate concentrations are each allocated one of six grades from Grade 1 (very low) to Grade 6 (excessively high).

Trends

Due to the nature of rivers in the South East natural phosphate concentrations would be 'low' to 'high' and nitrate concentrations would be 'low' to 'moderately low'.

Phosphate

Figure 18 shows there has been a significant reduction in the number of rivers recording phosphate concentrations greater than 30 mg/l (excessively high). Only 15 per cent of rivers fell into this category in 2001, compared to 40 per cent in 1990. There has been a 7 per cent reduction in the river length recording high, very high and excessively high concentrations of phosphate (greater than 0.1 mg/l) between 1990 and 2001. There has also been a steady increase in the river length falling within the top three grades (less than 0.1 mg/l) over this period. The river length demonstrating very low concentrations has increased from zero in 1990 and 1995 to just under 3 per cent in 2000 and 2001. The installation of nutrient stripping plants at sewage treatment works and reduction in phosphate levels in detergents accounts for the majority of this improvement.

³⁶ Pretty, J.N. et al (2002) *A preliminary assessment of the Environmental Costs of the Eutrophication of Freshwaters in England and Wales*. University of Essex

³⁷ Environment Agency (2002) *Aquatic Eutrophication in England and Wales*

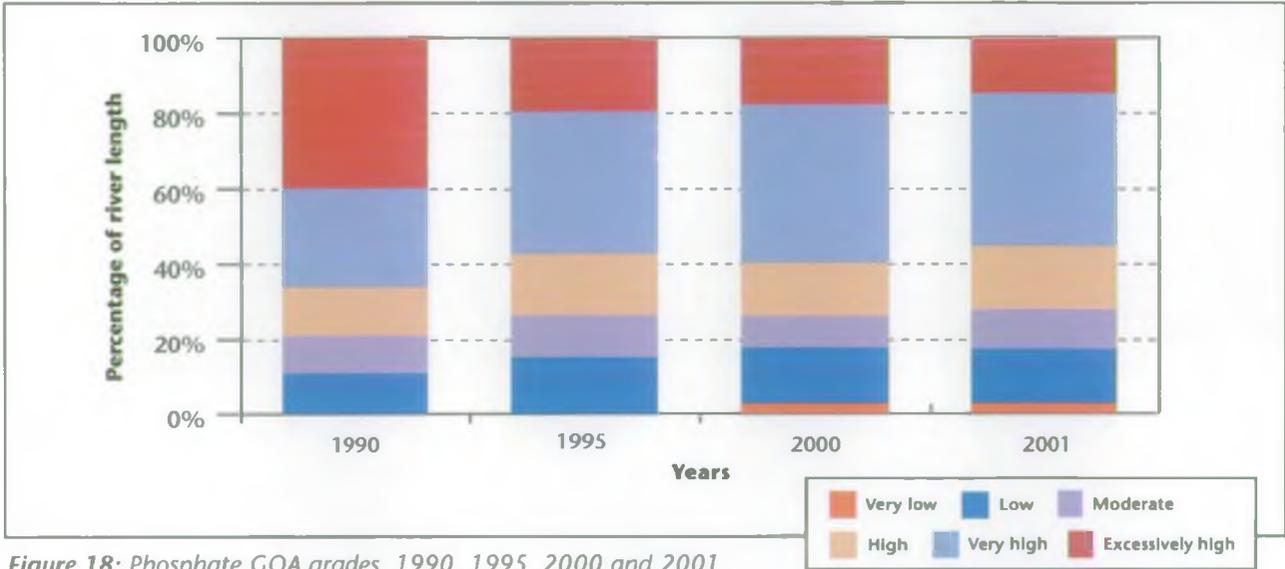


Figure 18: Phosphate GQA grades, 1990, 1995, 2000 and 2001

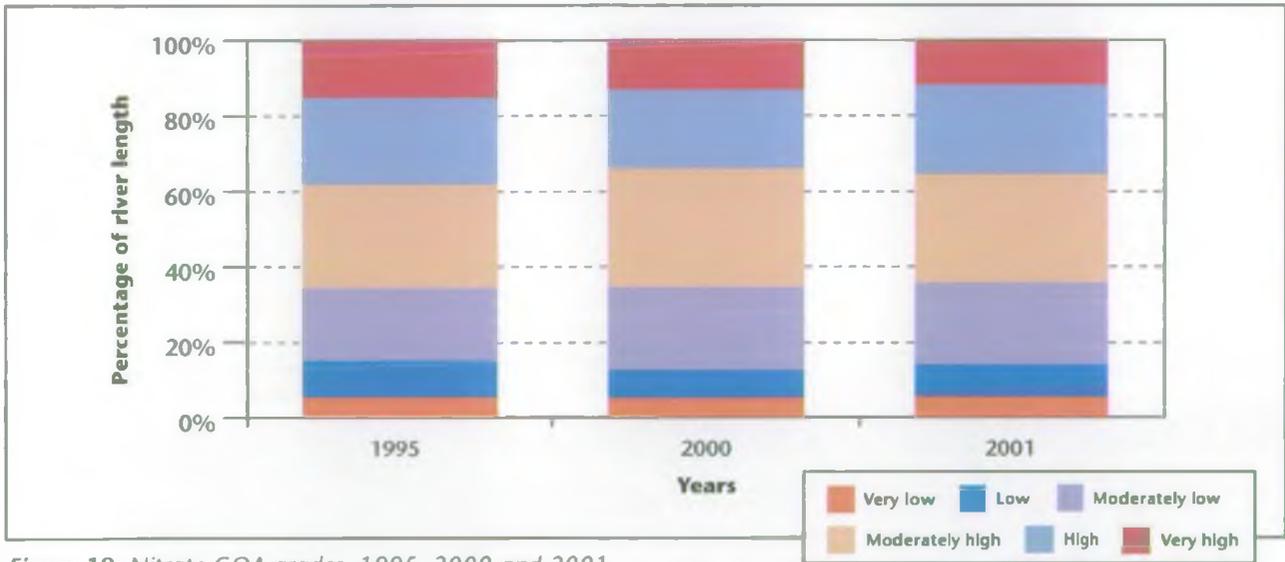


Figure 19: Nitrate GQA grades, 1995, 2000 and 2001

Nitrate

There has been a less marked change in nitrate concentrations in the South East between 1995 and 2001 (Figure 19). Whilst there has been a reduction of around 4 per cent in river length recording very high concentrations (greater than 40 mg/l) there has been no overall reduction in river length recording high concentrations. In line with this trend there has been no improvement in the length recording very low, low or moderately low concentrations.

Targets

In the Environment Agency's eutrophication management strategy, interim phosphorus standards are set for running fresh waters for use in eutrophication control (see Table 3). English Nature has developed a system which links the phosphorus targets to a suggested river type. These guide local site-specific targets for a particular water body.



Biological targets to address nutrient levels are likely to be developed to meet the requirements of the EC Water Framework Directive (2000/60/EEC).

Table 3: Target phosphorus concentrations for running fresh waters

Trophic category	Running fresh water (mg/l, annual SRP ³⁸ mean)	Suggested application to river type ³⁹
Oligotrophic	0.002	Upland watercourses
Mesotrophic	0.06	Mid-altitude watercourses on hard substrates. Lowland, small and medium-sized watercourses on chalk and sandstone
Meso-eutrophic	0.1	Lowland large rivers on chalk and sandstone
Eutrophic	0.2	Lowland rivers on clay substrates and large alluvial river sections

There are no specific river quality targets for nitrate. In setting consents to control the quality of discharges to waters the Environment Agency will take due regard of any environmental quality standards considering both nitrate and phosphate.

Indicator 11 Nutrient status of groundwater

Background to the indicator

Since the 1940s the increase in use of nitrogen based fertilisers and the ploughing up of large areas of grassland has resulted in significantly increased levels of nitrates in surface and groundwaters. This is particularly important in the South East as a high percentage of public water supply comes from groundwater. The protection of groundwater from pollution is important because once polluted, groundwater takes a long time to naturally recover.

The World Health Organisation (WHO) first expressed concern in the 1950s that elevated nitrate levels in drinking water could present a health risk to young

infants - the blue baby syndrome. As a result both the WHO and the EC Directives on Drinking Water (80/778/EEC) and Surface Water Abstraction (75/440/EEC) set nitrate standards for water quality for human consumption at 50 mg/l nitrate.

The more recent EC Nitrate Directive (91/676/EEC) sets standards to reduce water pollution caused by nitrates from agricultural sources and to prevent any further such pollution. It requires measures to protect surface fresh waters and groundwater from nitrates derived from agriculture and to prevent the enrichment of water bodies by nitrogen compounds which can lead to eutrophication (see Indicator 10: Nutrient status in freshwaters).

The Nitrate Directive also requires the identification of Nitrate Vulnerable Zones (NVZs) where nitrates from agricultural sources are known to contribute to pollution. A NVZ is an area of land which drains either into a surface or groundwater where the nitrate levels are currently or likely to exceed a concentration of 50 mg/l or into a freshwater which is likely to become eutrophic.

Following extensive consultation in 2002, around 50 per cent of the South East has been designated as either a surface water or groundwater NVZ (Figure 20). Surface water NVZ boundaries are derived from the catchment area upstream of a chemical GQA monitoring point that exceeds the 50mg/l nitrate limit. Groundwater NVZ boundaries are derived from a model of soil vulnerability combined with areas that are susceptible to nitrate leaching from soil into groundwater. These areas are combined with locations where nitrate is likely to exceed 50 mg/l nitrate by the year 2017 based on trends in actual groundwater quality data.

The Ministry of Agriculture, Fisheries and Food (now under Defra) published a *Code of Good Agricultural Practice for Water*⁴⁰ which provides practical advice to farmers on how to avoid pollution of water by agricultural activities.

³⁸ SRP - Soluble Reactive Phosphorus

³⁹ English Nature (2000) *Phosphorus and River Ecology: Tackling Sewage Inputs*

⁴⁰ Ministry of Agriculture, Fisheries and Food (1998) *Code of Good Agricultural Practice for Water (Revised Edition)*

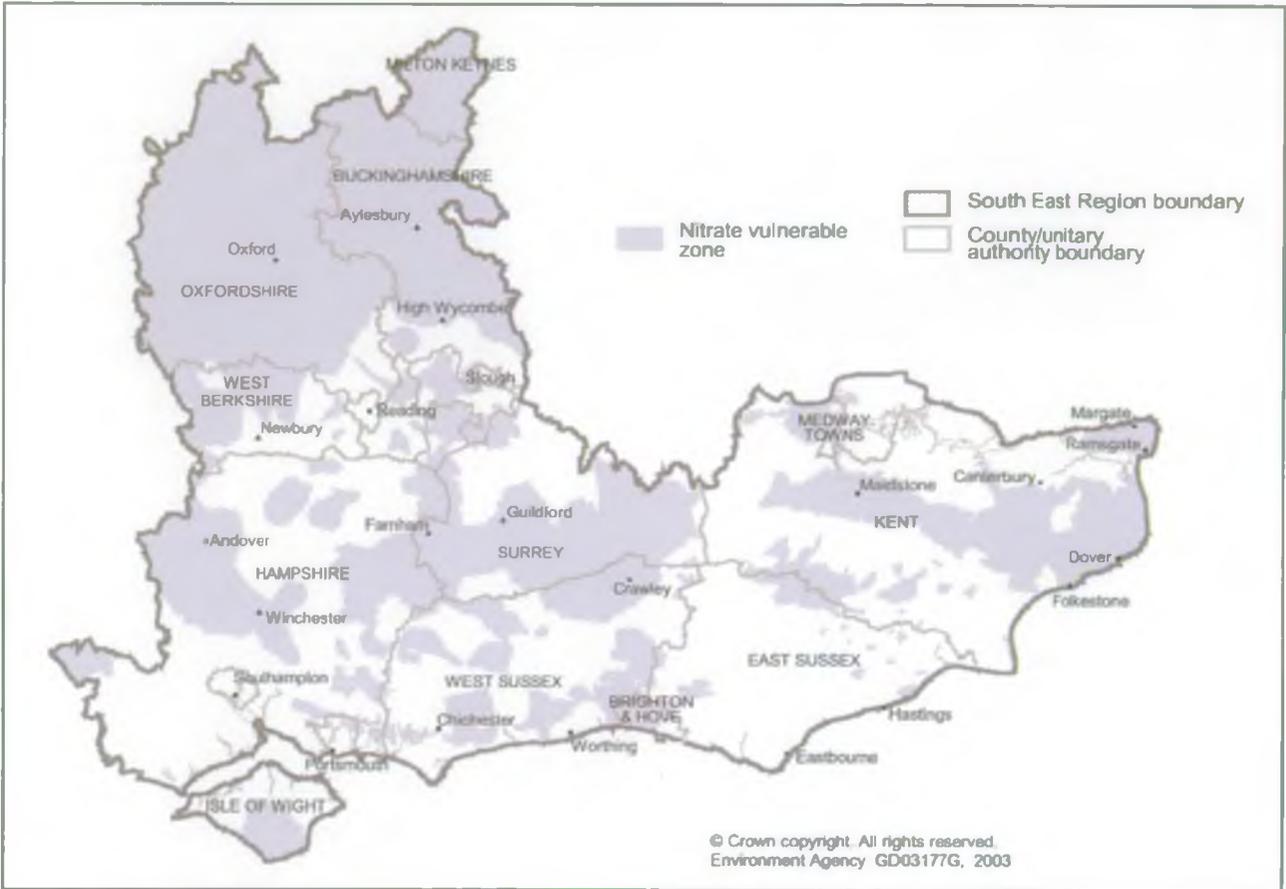


Figure 20: Extent of Nitrate Vulnerable Zones in the South East, 2002

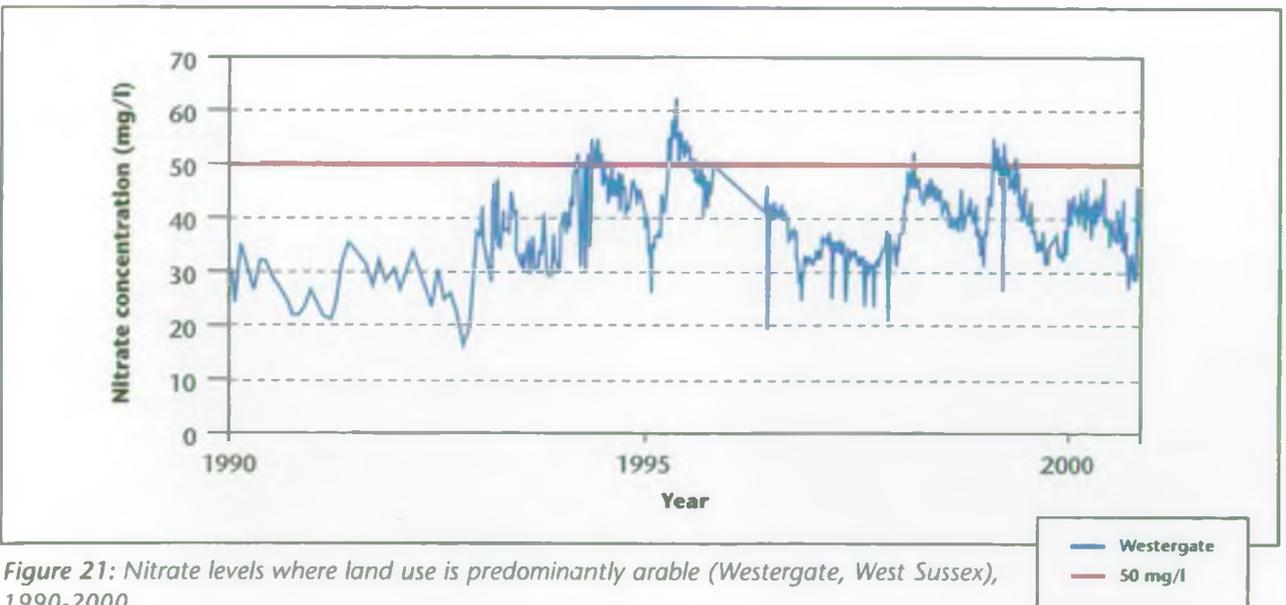


Figure 21: Nitrate levels where land use is predominantly arable (Westergate, West Sussex), 1990-2000

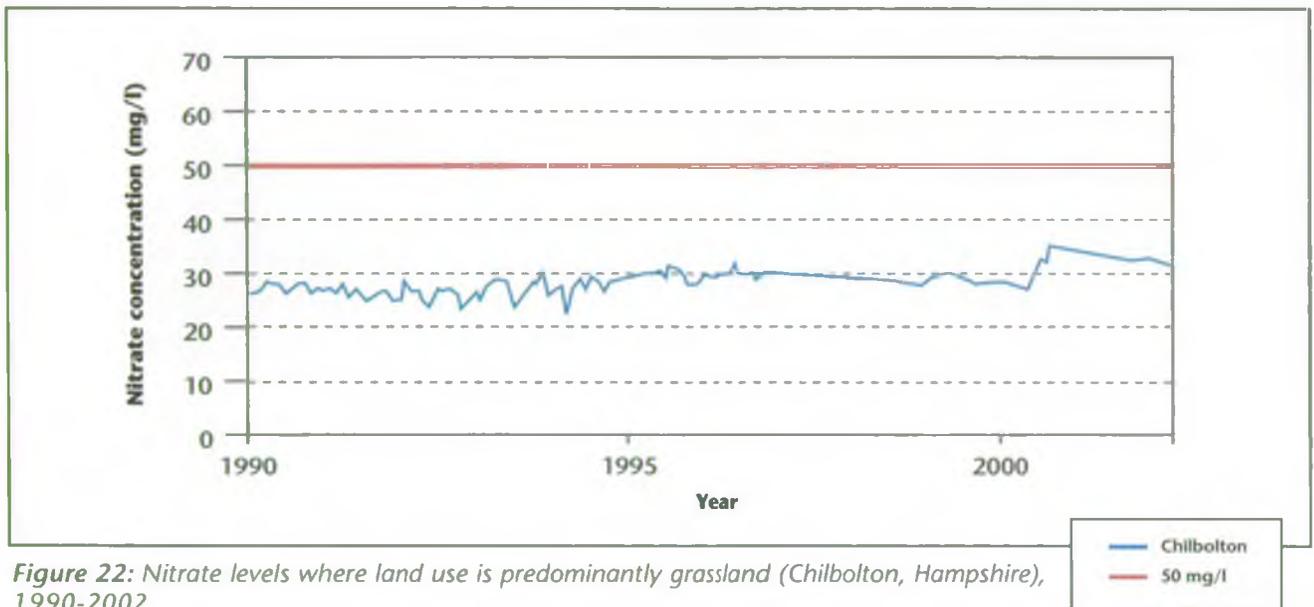


Figure 22: Nitrate levels where land use is predominantly grassland (Chilbolton, Hampshire), 1990-2002

Trends

Figures 21 and 22 show nitrate concentrations in groundwater between 1990 and 2000 at two abstractions in the chalk aquifer on arable and grassland, respectively. The nitrate concentrations in groundwater at both these sites are subject to seasonal variation. However, where the predominant land use is arable there is an enhanced seasonal variability and concentrations on occasions have exceeded the 50 mg/l nitrate limit.

Targets

Under the Action Programme for Nitrate Vulnerable Zones Regulations 1998 there are a number of actions to be undertaken within a NVZ to reduce water pollution from agricultural nitrates. These include:

- Limiting inorganic fertiliser application to that which meets the crops' needs;
- Limiting organic manure applications with incremental reduction to 170 kg/ha of nitrogen;
- Implementing closed periods for applying some types of manures onto sandy or shallow soils - 1st September to 1st November for fields in grassland or to be sown with an autumn sown crop and 1st August to 1st November for fields not in grass, nor to be sown with an autumn sown crop; and

- Requiring farmers to keep adequate records of crops, livestock numbers and use of organic manures and inorganic fertilisers.

The Environment Agency is the enforcing body for the Regulations and has a duty to inspect farms on a four-yearly basis to ensure adherence to these measures.

Work is currently being undertaken to identify long term trends in groundwater nitrates using monitoring data collected by the Environment Agency over the ten year period 1990 to 2000. Data will be extrapolated to 2017 to predict future trends in nitrate levels and to identify whether other areas will need to become designated as NVZs. Further groundwater monitoring data is also being collected as the Environment Agency is extending its national network of boreholes and springs to enable monitoring of background quality.

Indicator 12 Water pollution incidents

Background to the indicator

The extensive economic activity in the South East means there is a real potential for businesses to significantly damage the environment through

accidental or deliberate releases of substances. The Environment Agency aims to ensure that environmental considerations are at the heart of businesses in the South East, so that they are sustainable and trusted by the wider community.

Many activities have the potential to cause pollution and affect water quality, including the water industry, urban infrastructure, agriculture, industry, horticulture, domestic sources and transport. Pollutants from these sources can enter the water environment via a number of routes, including:

- Discharged directly into surface water or groundwater;
- Filtered through the groundwater to emerge in surface water;
- Discharged via runoff from the land; or
- Deposited from the atmosphere.

Pollution can arise from point sources, such as effluent discharges from pipes or may be more dispersed and diffuse. Weather conditions can exacerbate both point source and diffuse water pollution. Pollution can be fatal for fish and other aquatic life, pose a threat to human health and damage areas of natural beauty.

In the South East, the Environment Agency deals with a large number of complaints and reports of pollution, which are either causing or have the potential to cause damage to the water environment. The Environment Agency responds to pollution reports and the details of the incident are recorded on the National Incident Recording System. The information on the system can be used to direct future resources to minimise, and where possible prevent, pollution and to identify under-performing sectors or industries.

A water pollution incident is classified according to its impact and is allocated to one of four categories. Category 1 represents persistent and/or extensive effects on the water environment whereas Category 4 represents no impact on the water environment. In addition, information is collected on the source and type of pollutant.

Trends

The Environment Agency introduced an improved reporting system in 2001 so direct comparisons with previous years are difficult.

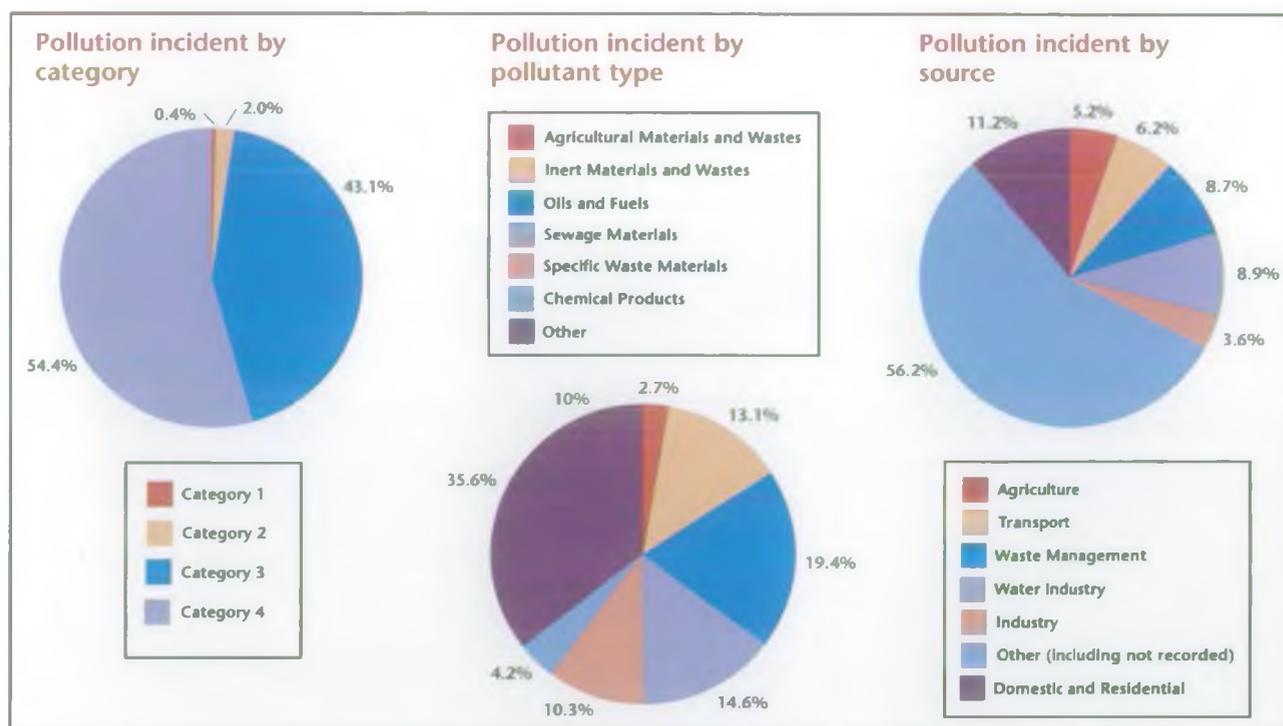


Figure 23: Water pollution incidents in the South East, July 2001 - June 2002



Figure 23 shows that between July 2001 and June 2002, of the 4918 pollution incidents affecting the water environment of the South East, less than 4 per cent were of the most serious types (Category 1 and 2) whilst over 96 per cent were Category 3 and 4 incidents.

The most common types of pollutants in the South East are sewage and oils and fuels. Other common pollutants include inert materials, waste materials, chemicals and agricultural materials and wastes. The remaining pollutants do not fit any one category and range from fire fighting run-off to silt and urban run-off.

The main sources of substantiated incidents on the water environment in the region were domestic and residential sources, waste management, water industry, transport, agriculture and industry. Other sources of pollution include domestic activities and premises such as medical buildings, hotels and schools. Around 70 per cent of water pollution incidents are from sources not directly regulated by the Environment Agency.

Targets

The Environment Agency has a national target to achieve a 12 per cent reduction in Category 1 and 2

pollution incidents from all sectors by 2007. In the South East, the Environment Agency will address this by encouraging industry and business to take the environment seriously. In addition there will be targeted pollution prevention campaigns, such as the Oil Care Campaign, and the use of risk assessments to reduce environmental harm.

The Environment Agency also has a target to achieve a 15 per cent reduction in significant breaches of permit conditions by 2007. This includes conditions contained in discharge consents, Integrated Pollution Control authorisations and Pollution, Prevention and Control permits. The target will be achieved through a number of means, including utilising our legal powers to ensure compliance.

Unlike point source pollution, diffuse pollution cannot be easily controlled by issuing licences or permits. Regulatory approaches have to be subtler and in many cases need to be co-ordinated with the land use planning system. To continue to make water quality improvements, diffuse pollution issues from agricultural and urban sources need to be addressed and innovative ways to control the risks they cause adopted.

Actions and responses

Key actions to improve water quality in the South East. The Environment Agency will:

- Investigate the slow-down in the rate of improvement in River Quality Objective compliance and the decline in chemical General Quality Assessment results seen in 2001. This will include identifying any effects from climate change and development pressure;
- Continue to investigate possible sources of contamination at all non-compliant bathing waters. The aim for the future will be for all beaches to comply in all years;
- Continue to work with water companies to ensure they deliver the agreed environmental programme under AMP3. The Environment Agency will work with the companies to develop further improvements through AMP4 during 2005 - 2010;
- Ensure the requirements of the Urban Waste Water Treatment Directive (91/271/EEC), Habitats Directive (92/43/EEC) and Countryside and Rights of Way Act (2000) with regard to nutrients are met;
- Undertake targeted pollution prevention campaigns to reduce the impact from diffuse and point pollution sources;
- Manage reductions in nitrate pollution from agriculture by monitoring nitrate levels and contributing to the review of Nitrate Vulnerable Zones.



3.3 Managing Waste



Managing Waste

Action is needed to ensure waste is used as a valuable resource minimising the amount needing disposal.

Key messages

- Around 4 million tonnes of municipal waste is generated in the South East and this continues to increase each year;
- In 2000/01 around 25 million tonnes of waste was produced in the South East of which 15 million tonnes was deposited at licensed landfill sites;
- A massive diversion of waste away from landfill is required because of new legislation and a shortage of landfill sites;
- Action is needed now to reduce the amount of waste produced and for this waste to be used more productively.

Background

The management of waste is a major environmental challenge facing the South East. Rising waste production is set to conflict with both the capacity limits and the legal requirements to reduce reliance on landfill.

In 2000/01 the South East produced over 4 million tonnes of municipal (mainly household) waste, handled about 8 million tonnes of industrial and commercial wastes, and about 13 million tonnes of construction and demolition waste. Waste production is increasing as a result of strong economic growth and, in particular, household waste is rising at around 3 per cent per annum - faster than economic growth.

In the UK, most waste has been controlled since 1976 when it became clear that uncontrolled waste disposal posed a serious threat to quality of life and to the environment. Since then there has been a growth in waste related legislation controlling the storage, movement, treatment and disposal of 'controlled waste'⁴¹.

The EC Landfill Directive (99/31/EC) will have a significant impact on waste management in the UK. It aims to reduce the environmental damage

associated with the landfilling of waste by imposing stricter standards, banning certain wastes and requiring the diversion of waste away from landfill towards more sustainable uses and treatments.

Landfill space is continuing to be consumed without alternative treatment facilities becoming available. Some areas in the South East are close to running out of capacity. Waste needs to be managed in a sustainable manner, minimising the amount produced and re-using waste where possible.

The Government's *Waste Strategy 2000 for England and Wales*⁴² sets a range of demanding targets to increase re-use, energy recovery and recycling of waste. The Government has now evaluated the targets and progress of the Strategy and in late 2002 published suggestions on how it should be enhanced and taken forward more effectively⁴³. In addition, the South East England Regional Assembly (the Regional

⁴¹ Controlled waste covers household, industrial and commercial waste, but not mines and quarries waste, explosives or waste from agriculture. The Government is likely to add agricultural waste to the list of controlled wastes in 2003

⁴² Defra (2000) *Waste Strategy 2000 for England and Wales*

⁴³ Strategy Unit / Cabinet Office (2002) *Waste not, Want not - A strategy for tackling the waste problem in England*



Assembly) is preparing a Regional Waste Strategy which seeks to push Government targets even higher.

The Environment Agency published its national Strategic Waste Management Assessment in 2000 which presents information on waste production and management for each of the nine regional governments in England with a separate report for Wales. A partial update for 2000/01 data is due to be published during 2003. The assessment includes waste forecasting and modelling and shows how the quantity of waste requiring management could grow over the next 20 years and then compares three possible options for managing the waste. The first option is a baseline 'do nothing' option, the second is to implement a strategy with more energy recovery than recycling, and the third has more recycling than energy recovery. The model shows how many facilities of various types may be needed in the period so that decision makers can make sound, well informed decisions.

The options were prepared using the Environment Agency's Life Cycle Analysis tool. This tool enables the various environmental effects of each waste management option to be calculated. It includes the effects of the construction and operation of all infrastructure, transport arrangements and the re-use of recyclate. Applying the tool enables decision makers to properly compare the environmental effects of each option being considered, enabling them to take Best Practical Environmental Option into account when producing waste strategies or determining planning applications. This tool is due to be upgraded and when complete will be even more useful to local authorities and industry as they develop and evaluate waste strategies.

Roles and responsibilities

Sustainable waste management requires action by a number of different players: Government, local government, industry, commerce and the waste management industry. Of equal importance will be the action taken by us all as individuals, consumers and householders.

The Government set out the Environment Agency's role in the *Waste Strategy 2000 for England and Wales*. The Environment Agency must ensure that waste management activities do not cause pollution of the

environment or harm to human health. The Government also stated that the Environment Agency has a very important advisory and information gathering role. The Environment Agency is developing approaches and data tools that will help deliver regional and local waste strategies.

The Environment Agency is increasingly using a risk-based approach to regulation and measures success in terms of environmental outcomes. The Environment Agency now uses the Operator and Pollution Risk Appraisal approach towards licensed waste management sites. Each licensed site is given a score based on a combination of the environmental risk that it poses together with an assessment of the operator risk. The environmental risk is based on factors such as the type of waste, or the proximity of sensitive surface waters. The operator risk is based on the record of licence compliance, the risk of pollution or harm, together with the existence of quality management systems. The Environment Agency then inspects higher risk sites more frequently. Targeting resources in this way will improve operator performance.

Producer responsibility legislation also has a clear environmental outcome. The Producer Responsibility Obligations (Packaging Waste) Regulations 1997, which are monitored and enforced by the Environment Agency, place a requirement on industries that produce or handle significant amounts of packaging to ensure that a prescribed equivalent proportion is recycled. In future the principle of producer responsibility will be extended with the introduction of the EC End of Life Vehicle Directive (2000/53/EC) and Waste Electrical and Electronic Equipment Directive (2002/96/EC). Both will increase recycling and recovery of materials and reduce the amount of waste landfilled.

The Environment Agency works with local authorities and landowners to prevent contaminated land causing pollution or harm. Regulations under the Environmental Protection Act 1990 (Part II (A)) place duties on landowners, industry, local authorities and the Environment Agency designed to ensure contaminated land is remediated.

The Environment Agency is also working with partners to promote and share best practice on the re-use, recycling and management of waste. In the South East the Environment Agency is providing technical input to the South East Regional Technical



Advisory Body and the Regional Assembly in the development of the Regional Waste Strategy. This will be subject to public consultation in 2003 and, once approved, will be used to inform the preparation of the revised Regional Planning Guidance (RPG9⁴⁴) that will eventually be replaced by the Regional Spatial Strategy once the Government's reforms of the planning system have been approved.

Production and disposal of waste in the South East

- Four million tonnes of municipal waste, 8 million tonnes of industrial and commercial wastes, and 13 million tonnes of construction and demolition waste were produced in the South East in 2000/01;
- Landfill remains the most common waste management option with 81 per cent of municipal waste and about 60 per cent of other wastes disposed of by this route;
- About 17 per cent of municipal waste is recycled;
- About half of the 13 million tonnes of construction and demolition waste is re-used or recycled. An additional 25 per cent goes to exempt facilities for management and recovery;
- Landfills in the South East received over 15 million tonnes of waste in 2000/01;
- Certain parts of the Region are running out of landfill capacity for household, industrial and commercial wastes.

Indicators

Two indicators are used to illustrate the waste issues in the South East:

- Indicator 13** Disposal method, type and quantity of waste
- Indicator 14** Municipal waste arisings and recycling targets

The *Regional Sustainable Development Framework*⁴⁵ uses an indicator 'Waste generation and method of management' to report on the regional objective 'To

reduce waste generation and disposal, and achieve sustainable management of waste'.

Indicator 13 Disposal method, type and quantity of waste

Background to the indicator

The production of all types of waste varies with the economic cycle. Waste production has historically grown at its highest rate when the economy is growing and consumption of goods is highest. The Waste Strategy 2000 seeks to change the link between economic growth and growth in waste production. This 'decoupling' has been further emphasised by the Government's suggestion that the overall increase in waste should be reduced to two per cent per annum by 2006.

For this to happen there needs to be a greater awareness of the need to minimise, re-use and recycle waste. The implementation of a Waste Strategy in the South East needs to encourage this and other recovery methods and secure a substantial reduction in landfilling.

In addition to setting targets for recycling and recovery, the Government's Waste Strategy focuses on four key issues:

- **attitudes to waste** - local authorities need to raise awareness amongst the public and business of the issues surrounding waste production and management;
- **product design** - industry must look at ways of creating goods which can be cheaply re-used and recycled;
- **infrastructure** - local authorities must plan and be able to deliver new facilities for the collecting and recovery of all types of waste; and
- **markets for secondary materials** - a major barrier to recycling at present is the limited availability of end markets for secondary materials. Local authorities, commerce and industry must pursue green procurement policies, such as purchasing goods made out of recyclate and increasingly use secondary materials.

⁴⁴ ODPM (2001) *Regional Planning Guidance for the South East (RPG9)*

⁴⁵ South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

Table 4: Disposal methods and types and quantities of waste in 2000/01 (thousand tonnes)⁴⁶

Disposal/Treatment Method	Waste Type			Special Waste	Total
	Municipal Solid Waste	Commercial and Industrial Waste	Inert/Construction and Demolition Waste		
Inert Landfill	0	292	3028	0	3320
Non-inert Landfill	1243	1136	2136	0	4515
Co-disposal Landfill	2893	1961	2233	214	7301
Treatment	118	2027	1012	129	3286
Recycling	761	n/a	n/a	46	n/a
Incineration including Refuse Derived Fuel	0	n/a	0	16	n/a
Other	0	n/a	n/a	0	n/a
Total	5015	n/a	n/a	405	n/a

n/a = not available

Table 4 shows data for 2000/01 for wastes that have been landfilled or subject to a biological or physico-chemical treatment process, and partial data for recycling and other methods of dealing with waste. Not all of this material has arisen in the South East as there is an amount of waste which crosses regional boundaries, both inwards and outwards. Fuller details are published in the update to the Strategic Waste Management Assessment.

Trend

Our current data on waste disposal method, type and quantity is incomplete. More work is needed to complete the picture of change and to assist with this the Environment Agency will shortly be embarking on a second waste survey of commerce and industry.

Targets

The Government has set the following short to medium term targets in the Waste Strategy 2000:

- by 2005 to reduce the amount of commercial and industrial waste sent to landfill to 85 per cent of that landfilled in 1998;
- to reach the recycling and composting targets for

household/municipal waste - this will be by way of 'Best Value' targets that have been individually set for each local authority; and

- to meet the EC Landfill Directive targets - this could be by the introduction of interim targets for Waste Disposal Authorities.

Indicator 14 Municipal waste arisings and recycling targets

P

Background to the indicator

Municipal Solid Waste (MSW) comprises mainly of household waste. It also includes waste generated by local authority activities and also commercial waste collected by or on behalf of local authorities. It has been growing in quantity by around 3 per cent per annum. There are a number of factors that influence increased MSW production:

- increasing numbers of single or low occupancy homes which generate more waste per person;
- increasing population; and
- increasing disposable income leading to more consumption and more waste.

⁴⁶ Source: Defra and the Environment Agency



Although MSW typically accounts for only about 15 per cent of the controlled waste produced in an area, it is local government's responsibility to deal with this waste and as such it is a contentious political issue. Arrangements for its management are now more important than ever because of the EC Landfill Directive which requires Member States to progressively divert biodegradable MSW away from landfill (see Targets) to alternative waste treatment facilities.

Reducing the quantity of MSW needing to be disposed of is essential and forms one of the objectives of Government at national, regional and local levels. The Government has set specific targets for local authorities to recycle and recover value from household waste (see Targets).

To reduce the amount of MSW there is a need for greater public awareness of the need to minimise, re-use and recycle waste; the implementation of a Waste Strategy for the South East; Government targets for waste reduction; and local authority 'Best Value' targets.

Considerable progress to raise recycling and composting rates has been made in the past year as additional funding has been made available to some local authorities, and landfill tax continues to rise putting further pressure on waste producers. Greater co-operation is evident between the two levels of local government and this, together with the involvement of industry and the Waste Resources Action Programme, should bring further progress in the next few years as authorities meet and hopefully exceed 'Best Value' Targets.

Since 1995/96, the Government has commissioned annual surveys of local authorities in England and Wales, to gather information on the collection, treatment and disposal arrangements for household and other waste collected by them. The Environment Agency will continue to use this information to highlight the pressures on and achievements of local authorities in the South East and compare these to current targets.

Table 5 compares the amount of MSW produced in 2000/01 with that arising in 1998/99, whilst Figures 24 and 25 show details of the constituent parts of

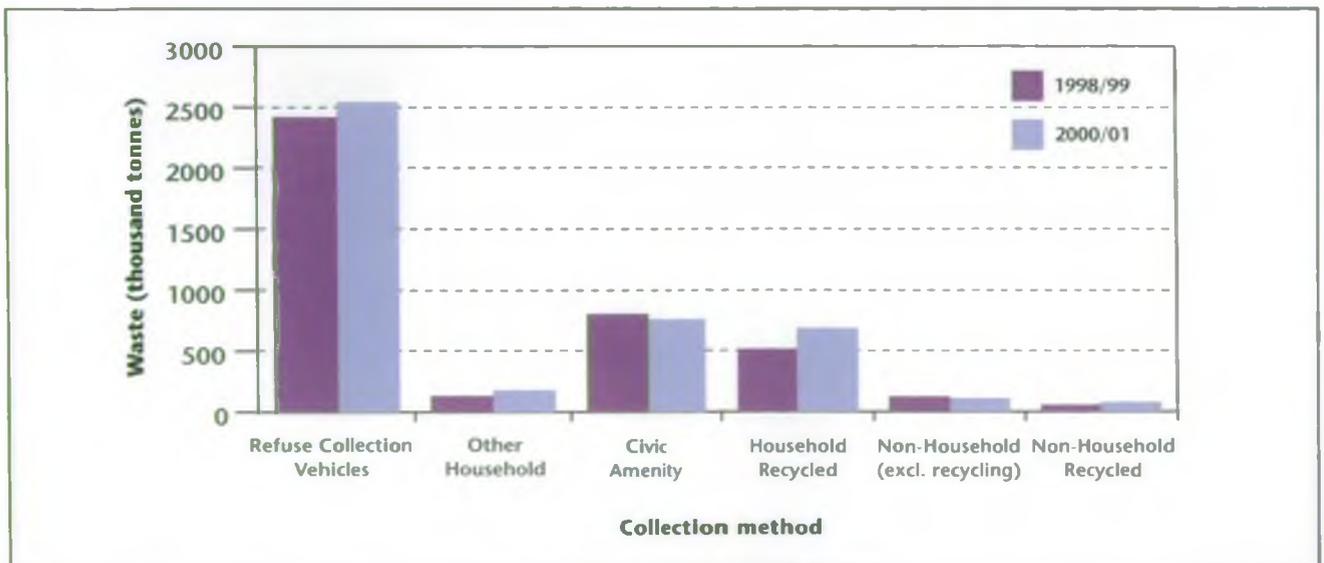


Figure 24: Collection method of Municipal Solid Waste in 1998/99 and 2000/01



municipal waste and the way that it was treated or disposed of.

Table 5: Municipal Solid Waste Arisings and Disposal/Treatment Methods (thousand tonnes)

	MSW	Recycled	Incineration including Refuse Derived Fuel	Other	Landfilled
1998/99	4047	570	112	3	3362
2000/01	4344	761	79	1	3502

Trends

Table 5 shows that the percentage of MSW destined for landfill as a disposal method has decreased from 83 to 81 per cent. Recycling has increased in use, up from 14.1 to 17.5 per cent, although it still accounts for a small proportion of the disposal method.

Figure 25 shows that despite the percentage falling the amount of MSW being landfilled has increased. Thus the overall growth in waste still exceeds any gains made by increased recycling. The increase in waste in the South East reflects the national increase which is currently averaging a little over three per

cent per annum, although there are considerable variations across the region. This increase is linked to a number of factors, including the number and size of households and the pattern of consumer spending.

There might also be an increase in the amount of commercial waste mixed in with household waste due to attempts by businesses to avoid the increased costs of disposal partly brought about by the landfill tax.

Improved recycling rates represent an increase in public awareness and participation. However there is still a need for much greater action by most local authorities if Government targets are to be met.

Targets

The Government's *Waste Strategy 2000 for England and Wales* sets local authorities targets that include the following:

- recover value from 40 per cent of municipal waste by 2005, rising to 67 per cent by 2015; and
- recycle or compost at least 25 per cent of household waste by 2005, rising to 33 per cent by 2015.

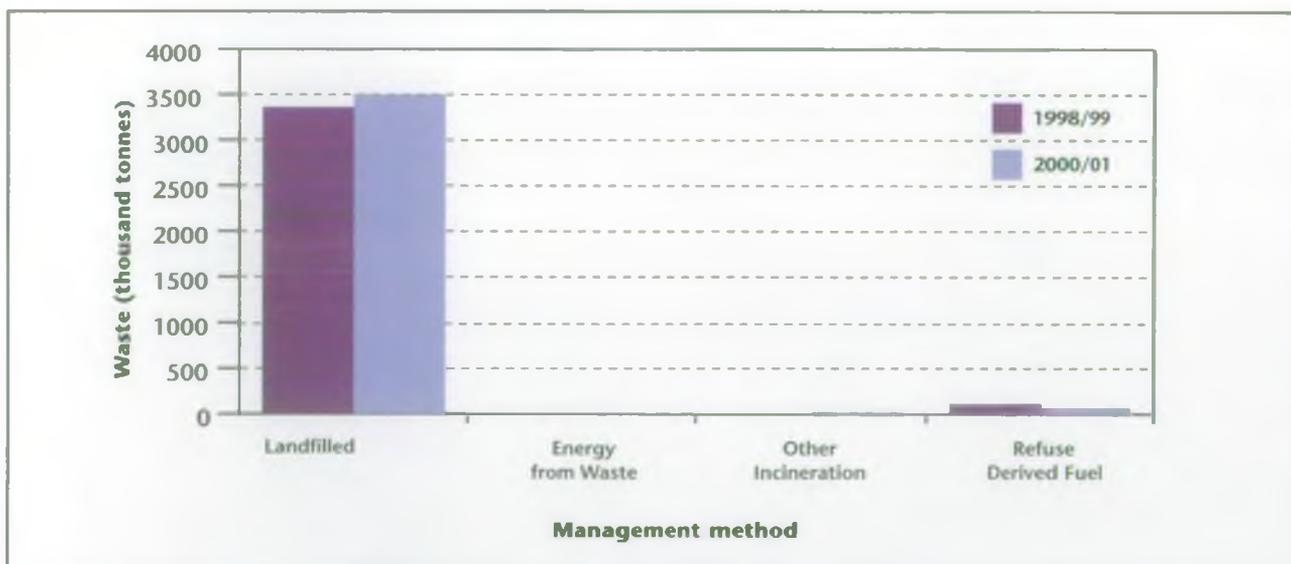


Figure 25: Management method of Municipal Solid Waste in 1998/99 and 2000/01



The EC Landfill Directive also sets targets:

- by 2010 to reduce biodegradable municipal waste landfilled to 75 per cent of that produced in 1995;
- by 2013 to reduce biodegradable municipal waste landfilled to 50 per cent of that produced in 1995; and
- by 2020 to reduce biodegradable municipal waste landfilled to 35 per cent of that produced in 1995.

The Government has suggested certain higher targets and new milestones which increases the pressure on local authorities and other key stakeholders to respond to the targets set in the *Waste Strategy 2000 for England and Wales*. The suggested targets are:

- recycle or compost at least 35 per cent of household waste by 2010 (up from 30 per cent), rising to 45 per cent by 2015 (up from 33 per cent); and
- slow annual waste growth from over three per cent to two per cent by 2006.

In addition the Regional Assembly's draft Waste Strategy for the South East raises these targets still higher suggesting that by 2020 MSW recycling and composting rates might reach 55 per cent. A similar figure is also suggested for commercial and industrial waste.

Actions and responses

Key actions to address the rate of waste production in the South East. The Environment Agency will:

- Work with the Regional Assembly, local authorities and industry to reduce the rate of growth of household waste, increase re-use and recycling and, where necessary, the recovery of energy from waste;
- Continue to develop risk-based regulation so that sites that handle waste are licensed and inspected according to the level of risk they pose to the environment;
- Provide high quality information on the amount and type of waste being dealt with in the South East;
- Develop and promote its software models that calculate the environmental impact of possible waste treatment or disposal options.



3.4 Managing Water Resources

Managing Water Resources

The South East is set to experience some of the most challenging pressures on water resources through demand for water from the population, new housing and economic development, as well as from climate change.

Key messages

- The South East consumes more water per person than most other regions, but receives one of the lowest amounts of rainfall;
- The South East is reliant on groundwater for up to 80 per cent of its public water supply;
- In our lifetime, drier summers are predicted in the South East as a result of climate change;
- Over the next ten years a huge increase in the demand for water in the South East is forecast. This will result in more unsustainable water abstractions unless demand is managed and new resources are developed;
- Use of water by industry, agriculture and the public has caused water supply and environmental stress during dry years;
- The sustainable management of water resources requires society to actively use less water whilst at the same time new water resources need to be developed;
- The Environment Agency believes that water efficiency measures are key to managing the scarce water resources in the South East. Increased metering, improved leakage control and water efficient domestic appliances can contribute to managing water demand.

Background

Water is vital to life. An adequate supply of clean and wholesome water is fundamental to public health and the maintenance of public water supplies. Water also plays an essential role in many industrial processes, including food production, power generation and chemical manufacture. However, water is a finite resource and a balance needs to be struck between the demands upon it and the needs of the environment that are dependent upon it.

Excessive water abstraction causes environmental damage. There are clearly limits to the amount of resource available for use from rivers and groundwater. These are:

- The effective rainfall which determines the hydrological and hydrogeological conditions within

the catchment area;

- The need for in-river flows to dilute discharges of industrial effluent and treated sewage; and
- The needs of wildlife that depend on the water environment.

The Environment Agency grants abstraction licences on a precautionary basis. The Environment Agency has also put in place a 'Restoring of Sustainable Abstraction' programme to address problems created from over-generous abstraction licencing in the past.

Roles and responsibilities

Even though fresh waters have long been used for human activities, abstractions have only been

regulated since the Water Resources Act (1963), developed following a severe drought in 1959. The Act created 29 river authorities to provide regional catchment based management of water resources and introduced abstraction licensing. Anyone who wants to use water from rivers or other natural supplies for industrial or agricultural purposes must have a licence to do so.

Today, the Environment Agency is responsible under the Environment Act (1995), which builds on the Water Resources Act (1991), for the sustainable management of water resources. This sets the overall framework for water resources planning and development through national and regional water resources strategies. The Environment Agency manages water resources by a system of abstraction licensing and enforcement.

The Environment Agency is currently developing Catchment Abstraction Management Strategies⁴⁷ (CAMS) for all river catchments. CAMS make information on water resource allocations publicly available and allow the balance between the needs of abstractors and those of the environment to be determined in consultation with the local community and interested parties.

The Environment Agency monitors river flows across the region. Flows are recorded at over 200 river gauging stations many of which are linked to Environment Agency offices by telephone or radio telemetry to enable rapid data access essential for flood monitoring and forecasting purposes. Groundwater levels are monitored at approximately 1400 observation boreholes in the region.

Other key stakeholders involved in the management of water resources are the Office of Water Services (OFWAT), the economic regulator of the water companies, and the water companies themselves.

Water resources in the South East

Although England and Wales are relatively well supplied with water resources on average, the distribution, both temporally and spatially, does not match the patterns of demand. The average effective rainfall is low in the south and east of England and becomes critical during periods of drought. The South East is set to face challenging pressures on



water resources through additional demands from housing and economic development, as well as global warming and climate change.

Average annual rainfall varies across the region from 800 mm to 1000 mm in the west and on high ground, to 550 mm to 650 mm in North Kent. In the South East only 25 to 50 per cent of rainfall recharges water resources. The remainder is lost through run-off to the sea, evaporation and transpiration by plants.

Groundwater held within aquifers is an important source of water in the South East for both consumption, supplying over 80 per cent of the public water supply, and the environment, supporting wetlands and rivers.

Indicators

Three indicators have been selected to measure the current state and pressures on water resources:

- Indicator 15** Quantity of rainfall
- Indicator 16** River flows and groundwater levels
- Indicator 17** Water demand and availability
 - Water resource supply-demand balance
 - Household per capita consumption
 - Predicted water demand as a percentage of 1997/98
 - Promotion of demand management measures - leakage
 - Water meter penetration

The *Regional Sustainable Development Framework*⁴⁸ uses Indicator 17 (household per capita consumption) to report on the regional objective 'To achieve sustainable water resources management'.

⁴⁷ Environment Agency (2001) *Managing Water Abstraction: The Catchment Abstraction Management Strategy process*

⁴⁸ South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*



P **Indicator 15** Quantity of rainfall

Background to the indicator

Rainfall replenishes rivers and groundwater levels through the year. It is naturally highly variable, both spatially and temporally. Extremes of rainfall, either over days, months or years can lead to substantial problems for the highly developed and densely populated South East. This can take the form of severe droughts, as seen in the early 1990s, or widespread flooding as experienced in 1998 and 2000.

On average the total amount of annual rainfall received by the South East is the lowest anywhere in the UK - around 740 mm. However, not all this rainfall is available for water supply. Much is lost through evapotranspiration - the South East has the highest evapotranspiration rates. The effective rainfall,

of approximately 275 mm, is the maximum potential water resource. This provides water for human use; the water required to maintain river flows at levels acceptable for conservation, recreation and fisheries; and groundwater levels high enough for conservation and to prevent saline intrusion into coastal aquifers.

The UK Climate Impacts Programme (UKCIP)⁴⁹ report suggests that the South East will experience the greatest changes in precipitation patterns by the 2080s⁵⁰. Current UK climate change scenarios forecast wetter winters (increase of up to 30 per cent in precipitation) and drier summers (decrease of between 15 and 60 per cent in precipitation) for the region by the 2080s. Higher overall temperatures are likely to result in increased evapotranspiration losses and, therefore, a decrease in effective rainfall.

⁴⁹ UK Climate Impacts Programme (2002) *Climate Change Scenarios*
⁵⁰ 2080s: 30 year period centred on the 2080s (2071 to 2100)

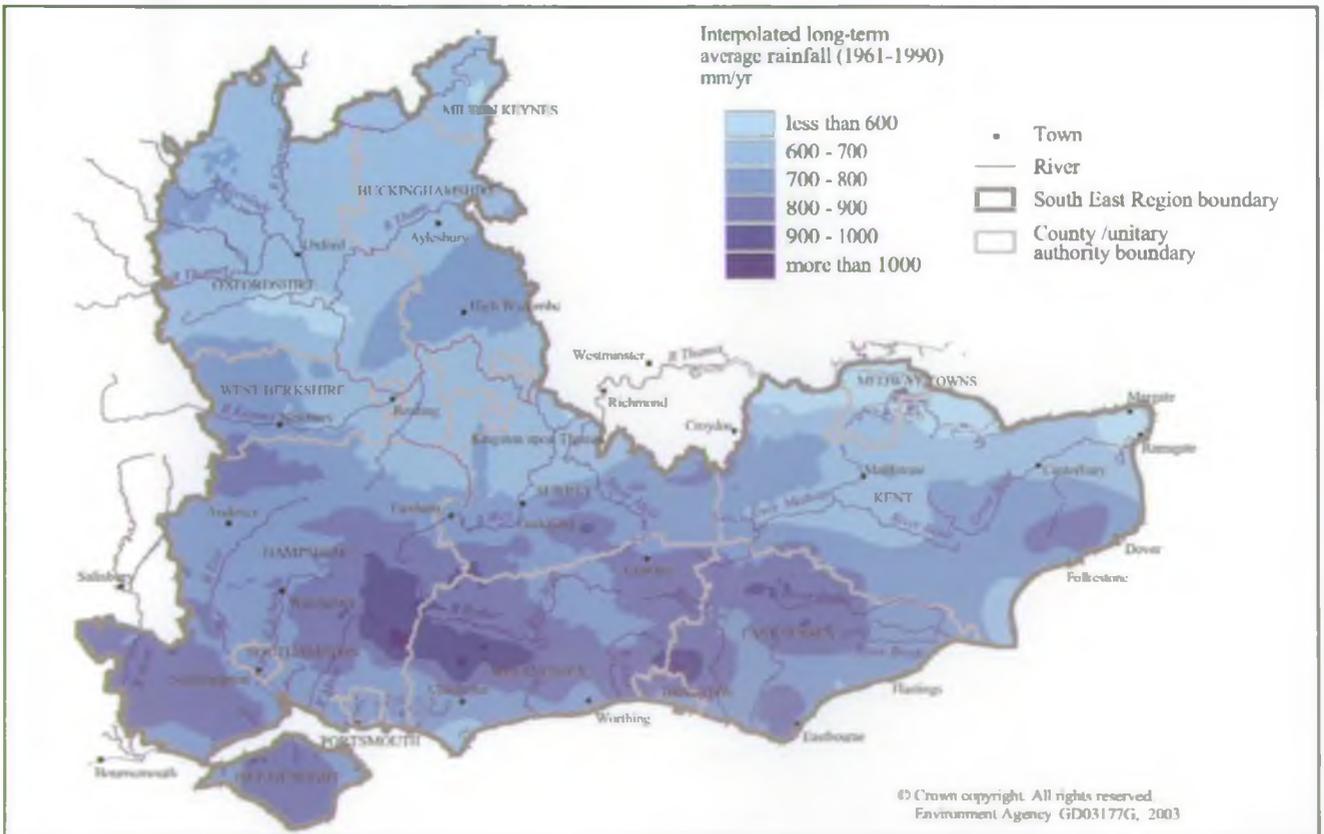


Figure 26: Average annual rainfall in the South East, 1961-1990

The UKCIP also suggests an increase in the frequency of extreme rainfall events. Rainfall intensities that previously have occurred, on average, once in a hundred years are likely to become more common, and overall intensities in the South East could potentially rise by 20 per cent by the 2080s. (See Section 3.6 - Limiting and Adapting to Climate Change).

The impact of climate change is likely to be detrimental to water availability. Changes in effective rainfall in late summer and early autumn could decrease river flow or delay and reduce the period of

groundwater recharge. Groundwater-fed catchments could, however, see a small increase in available resources as a result of the effect of wetter winters, increasing recharge.

Figure 26 shows the distribution of rainfall across the South East. It is based on the 1961-1990 long-term annual average rainfall for over 100 rain gauges. Figures 27 and 28 show the deviation in annual average rainfall dating back to 1853 and the pattern of winter rainfall from 1901 to 2001 for four long-term gauges within the region, respectively.

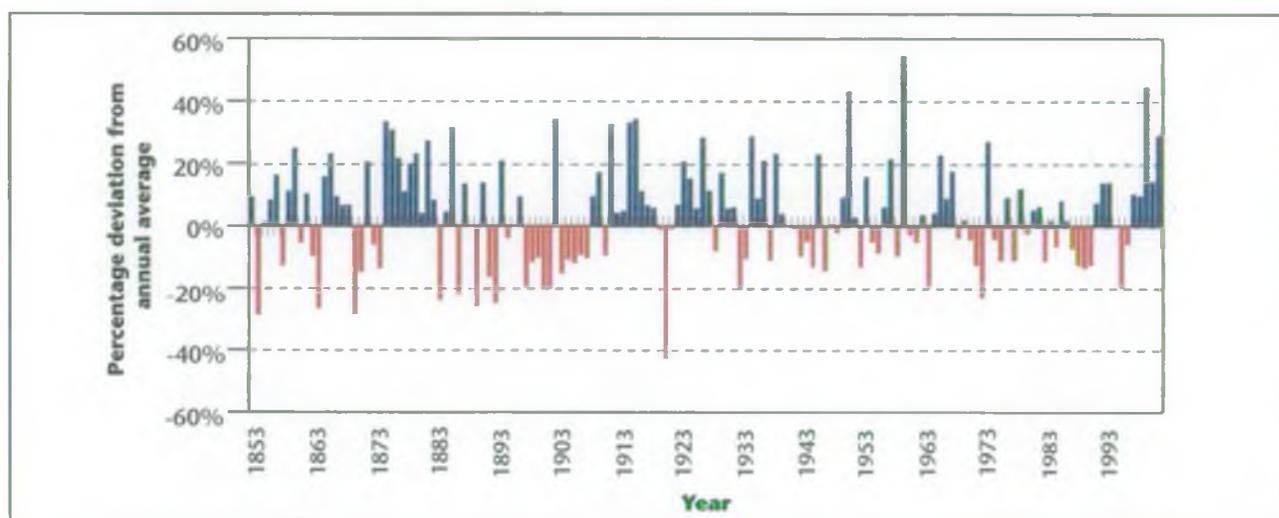


Figure 27: Rainfall at Oxford, Otterbourne, Chilgrove and Canterbury, expressed as a percentage deviation from the 1961-1990 long-term annual average rainfall, 1853-2002

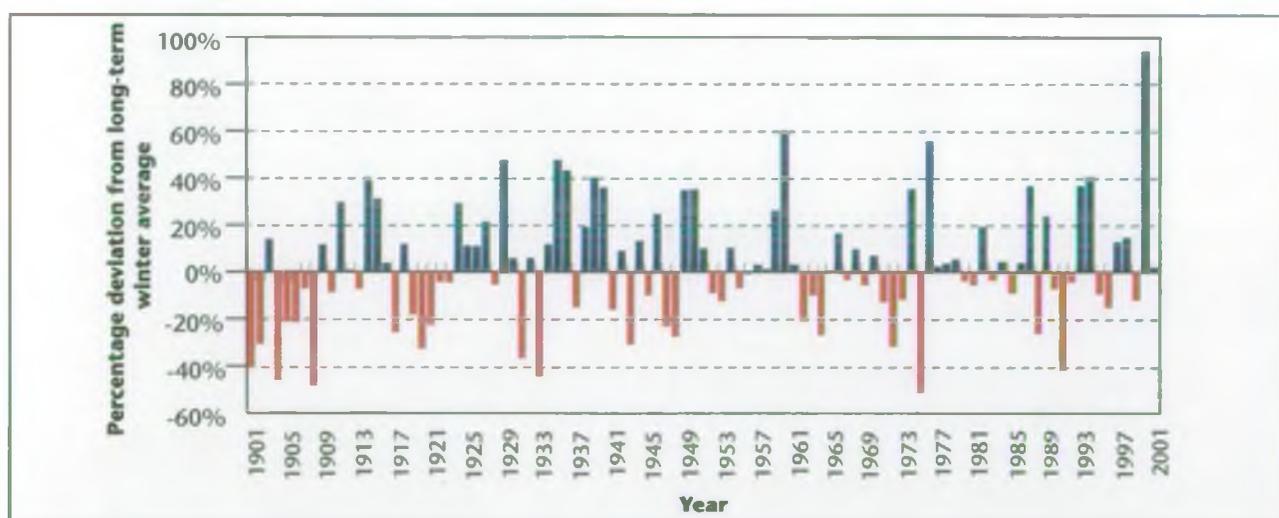


Figure 28: Winter rainfall at Oxford, Otterbourne, Chilgrove and Canterbury, expressed as a percentage of the 1961-1990 long-term winter average rainfall, 1901-2001

Trends

There is great variability, both spatially and temporally, around the average rainfall values. The isohyetal⁵¹ map shows that average rainfall can vary from less than 600 mm along the north Kent coast to over 1000 mm on the South Downs. The proportion of annual rainfall that is effective also varies across the region, ranging from 25 to 50 per cent, being generally higher in the south west of the region.

The time series plots show that rainfall can vary greatly over time, both on the scale of years and months. The proportion that is effective also varies greatly, from virtually nil in the summer to almost 100 per cent in the winter. Whilst the long-term average effective rainfall puts an overall limit on the available water within the region, planning needs to take into account the spatial and temporal variability of rainfall and effective rainfall.

Figure 28 shows the variability of winter rainfall totals for the previous century as a percentage of the 1961-1990 average winter rainfall. Despite the 2000 winter rainfall total being the highest on record, this cannot yet be conclusively attributed to climate change.

Targets

There is no target for quantity of rainfall as it is naturally variable and cannot be controlled. Future development proposals need to take account of the natural variability of water resources as well as possible future changes in average rainfall and its variability due to climate change.

Indicator 16 River flows and groundwater levels

Background to the indicator

With the increasing development pressure on the South East, it is essential that water resources are managed effectively to ensure the security of water supply and protection of the environment. River flow and groundwater regimes must be maintained to

protect river and wetland ecosystems and to maintain their use for fisheries, recreation, navigation and existing licensed abstraction.

River flows and groundwater levels vary in response to rainfall, temperature, soil moisture, plant productivity, soil type, geology, topography, land use and water use and return. Climate change and longer term weather fluctuations also have an effect. In addition to natural factors, abstractions and discharges can have a marked effect on river flows and groundwater levels. Section 3.8 on Maintaining and Enhancing Biodiversity highlights that water management and drainage can also have a particularly dramatic effect on the biodiversity of the South East. Extremes of flow, either high or low, cause the greatest environmental impact. Both extremes have been experienced in the South East during the previous decade.

Over many years this indicator should respond to any climate change effects and changes in abstraction policy. Twenty nine rivers have been identified nationally by the Environment Agency as suffering from low flows due to the high rates of abstraction, and many Sites of Special Scientific Interest are reported to be at risk from low water levels. The Environment Agency is assessing the implications of abstractions on candidate Special Areas of Conservation and Special Protection Areas in particular, as required by the EC Habitats Directive (92/43/EC). The Environment Agency is currently working with English Nature to identify critical sites and the changes needed to water company abstraction licences. It is clear the requirements for restoring sustainable abstractions will affect water yields and there may be a need to renegotiate licences.

Three rivers typical of the South East have been chosen to demonstrate changes in river flow:

- The River Thames at Reading (Figure 29);
- The River Medway at Teston (Figure 30); and
- The River Test at Broadlands (Figure 31)

The characteristics of these three river catchments have a profound effect on river flows. For example, the River Thames at Reading is influenced by the variable geology of the upper catchment, the effects

⁵¹ Isohyet: a line on a map connecting places having the same amount of rainfall over a given period

of abstraction downstream of the Goring Gap and river regulation for navigation.

Although the River Medway and River Test have similar sized catchments, they have very different hydrological characteristics. The River Medway flows

across the clay and sandstone of the Weald. It is characterised by a relatively low baseflow and is very responsive to rainfall. In contrast the River Test, which rises on the chalk of the Hampshire Downs has a higher baseflow and is less responsive to rainfall.

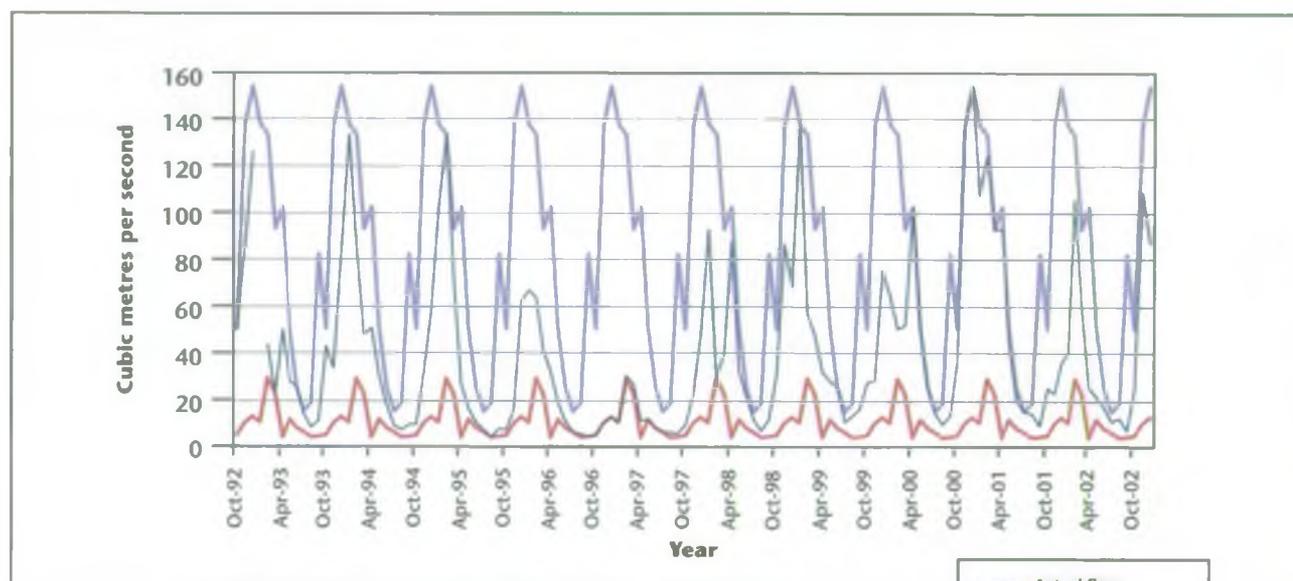


Figure 29: Mean monthly flows for the River Thames at Reading, 1992-2002

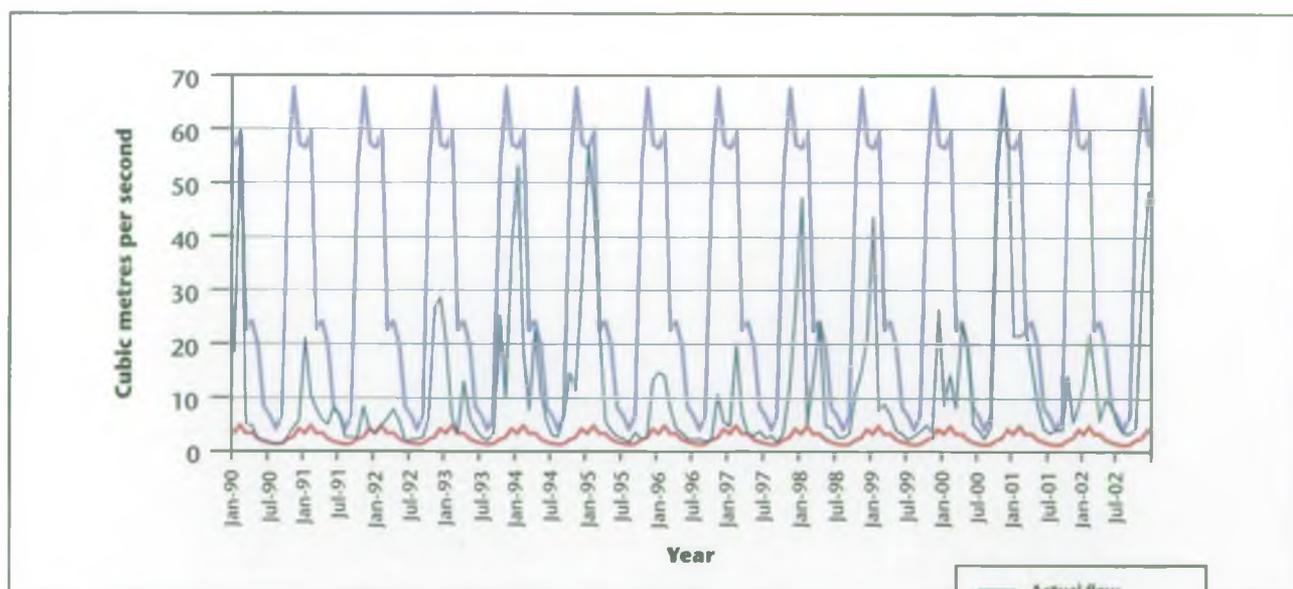
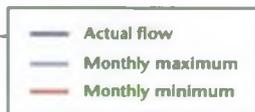
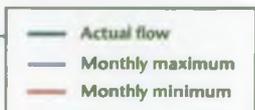


Figure 30: Mean monthly flows for the River Medway at Teston, 1990-2002



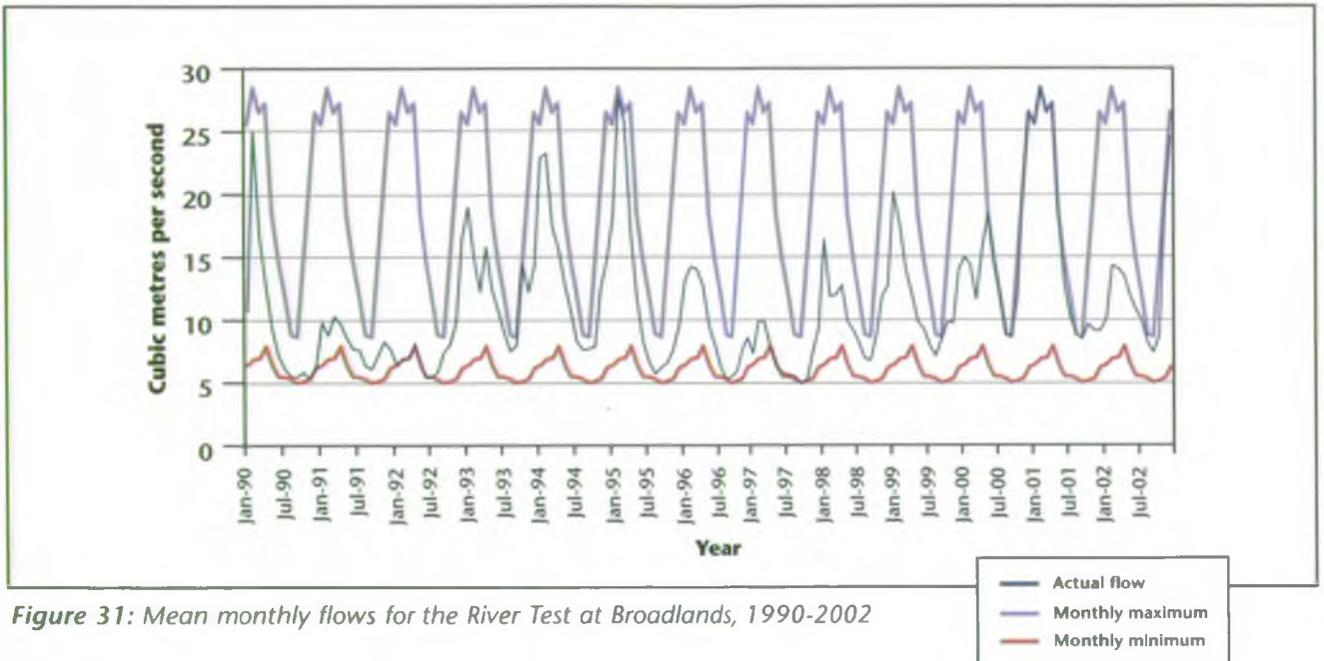


Figure 31: Mean monthly flows for the River Test at Broadlands, 1990-2002

Groundwater is an essential source of water in the South East. The Environment Agency monitors levels of groundwater across the region, where the predominant aquifer type is chalk. Year on year groundwater levels are dependent on rainfall,

abstraction and aquifer characteristics. River flows within the South East are significantly affected by groundwater levels. Groundwater levels for two typical aquifers are shown in Figures 32 and 33.

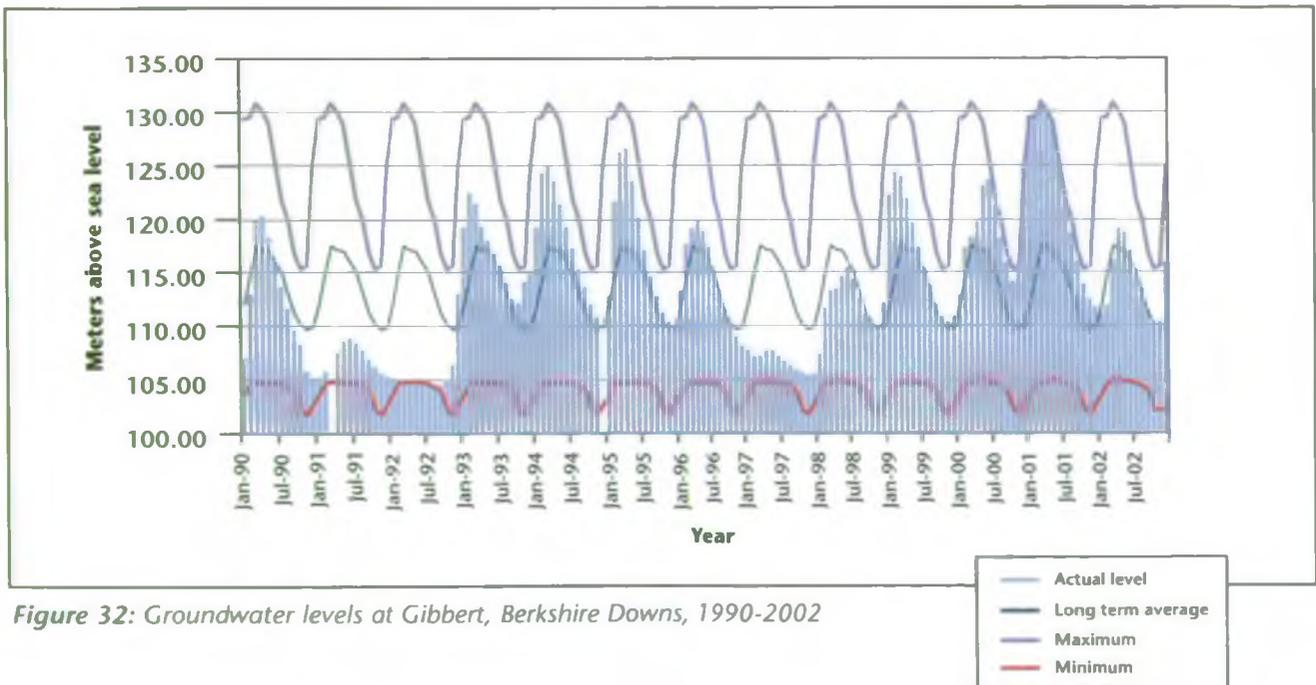


Figure 32: Groundwater levels at Gibbert, Berkshire Downs, 1990-2002

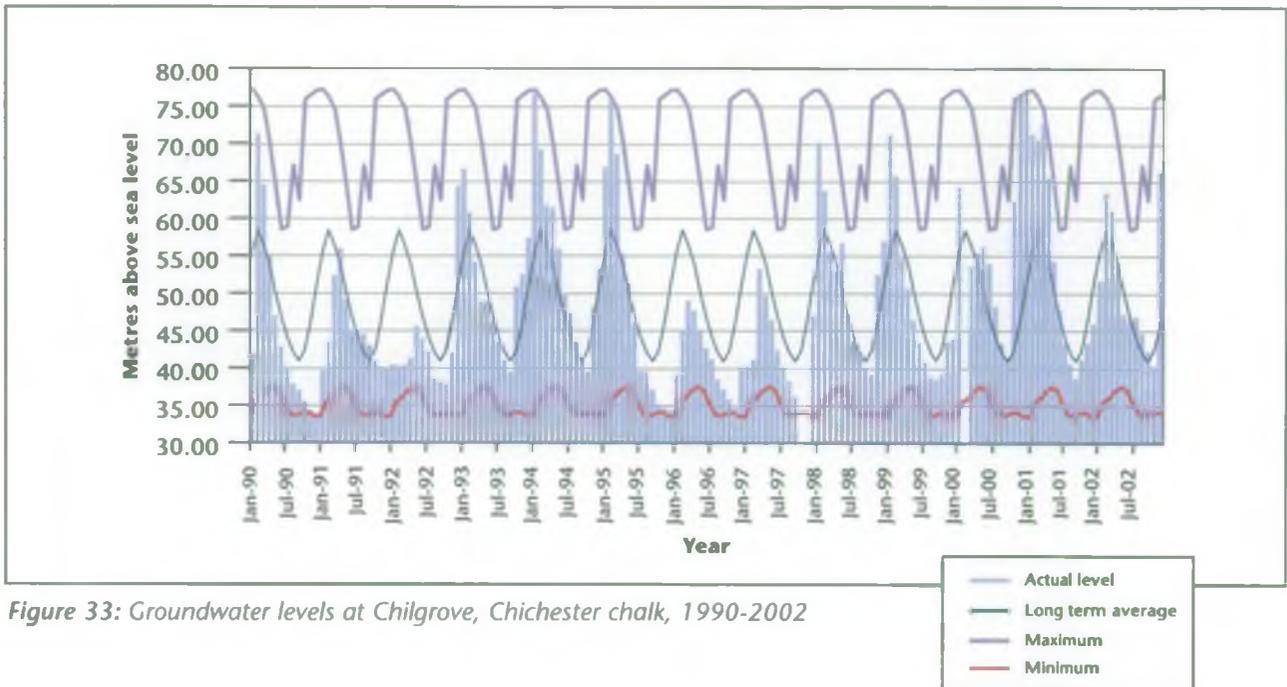


Figure 33: Groundwater levels at Chilgrove, Chichester chalk, 1990-2002

Trends

River flows

Rivers in the South East exhibit both seasonal and annual variation in flow (see Figures 29, 30 and 31). The drought years of 1990 to 1992 and 1996/97 and the high winter flows of 2000/01 stand out against the more average flows in other years.

Groundwater levels

Both groundwater sites show seasonal and annual variations in relation to recharge, with peaks and troughs reflecting effective rainfall, soil moisture deficit and hydrogeological factors. Over the last few years most groundwater sites have recharged to a high level, but were below average for substantial periods in 1991, 1992, 1996 and 1997.

Targets

River flows provide a good indicator of the pressures being placed upon river catchments from factors such as climate change, the impact of increased development and abstraction. The Environment Agency aims to ensure that water resources are

developed in a sustainable way taking into account environmental, economic and social factors.

Indicator 17 Water demand and availability

S

Background to the indicator

The demand placed on the region's water supplies has increased over the last century due to population growth and the increase in water dependency for a number of uses. People expect a secure and high quality water supply. It is important to safeguard the water supplies and to ensure that they are affordable in the future, without causing detriment to the environment.

Some uses of water, such as public water supply, agriculture and some industrial uses remove more water from the environment than they return or, the water is returned distant from the abstraction. These types of 'consumptive' abstractions can cause environmental low flows and stress in some rivers. Water companies have a major impact on the water cycle due to the large volumes of water that they



take from rivers and aquifers for supply, and the volume of effluent they subsequently return to the system. Public water supply accounts for over 80 per cent of total consumptive water abstraction in the South East.

Greater water efficiency within the existing and future housing stock is fundamental to the sustainable management of water resources. This first stage in delivering an efficient water strategy is through a better understanding of current water use behaviours. This will be achievable through greater water metering. However, close attention needs to be paid to trends in supply and demand to ensure that requirements for new water resource schemes are identified and planned prior to any major new development.

The boundaries of water resource zones, water companies and strategic planning authorities are not contiguous. It is therefore difficult to draw any direct, local conclusions on the sub-indicators used to report on water demand and availability without consulting with the various interests involved.

- **Supply demand balance** - The situation presented in Figure 34 shows the forecast demand for a dry year (2000/01) against the water available for use (licenced reliable water supply) in 1997/98. This is expressed as the surplus or deficit in water

resources for water resource zones, each including a margin to allow for uncertainties in the forecast surplus or deficit.

- **Per Capita Consumption** - Per Capita Consumption (PCC) is the amount of water used by each individual at home (see Figure 35). It should be noted that PCC data provided by water companies relies on estimates of other water balance components, such as estimated leakage rates and the occupancy rates for properties. It is usually assumed that people in measured (metered) households use less water than those in unmeasured properties.

There appears to be 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 PCC. The amount of water used is also likely to reflect the local weather conditions.

- **Predicted water demand** - Figure 36 shows the water companies' forecasts of demand growth for public water supply to 2025. The data is taken from the 1999 water resource plans for 5 of the water companies in the South East. It is believed to be representative of a dry year annual average forecast for the region. The demand for water takes into account predicted housing development, economic growth and expected changes in leakage levels.
- **Leakage** - Some water abstracted for public water supply is lost from the distribution mains and supply pipes on customer premises through leakage. Losses vary across the region due to a number of factors including the historical investment in leakage control and the differing nature of the companies' systems, topography and geography.

Leakage control from water mains has become a major issue in the last ten years. Mandatory leakage control targets set by OFWAT have resulted in a marked reduction in the total levels of leakage. Figure 37 shows the level of water leakage from 1997/98 to 2000/01.

- **Metering** - Metering contributes to the effective management of water resources. Household metering encourages people to consider their use of water by allowing them to understand how much they are using. Existing legislation means the extension of household metering will occur

gradually. The Water Industry Act 1999 introduced the right to free meter installation for households, which has encouraged more consumers to install meters. Almost all new homes are fitted with water meters. Figure 38 shows the actual and forecast metering by the water companies in the region.

water resource plans are expected in 2003 from the region's water companies that will show new forecasts for 2004/05.

Per capita consumption

Over the last 10 years PCC has grown by around 3 to 5 per cent although it does seem to be stabilising. Unmeasured household PCC is around 165 litres per head per day (l/h/d) and measured household PCC is around 150 l/h/d. The South East has the majority of the high PCC values in the country both for measured and unmeasured consumption values.

Predicted water demand

The water companies forecast that water demand will fall until 2004/5, mainly due to reductions in leakage, but will increase again beyond this date due to underlying trends in consumption.

Trends

Supply-demand balance

The forecast supply-demand balance map for 2000/01 shows great variation across the region. In some water resource zones the water demand is greater than water supply. Water companies have produced plans to overcome these deficits that may require new planning permissions and abstraction licences. New

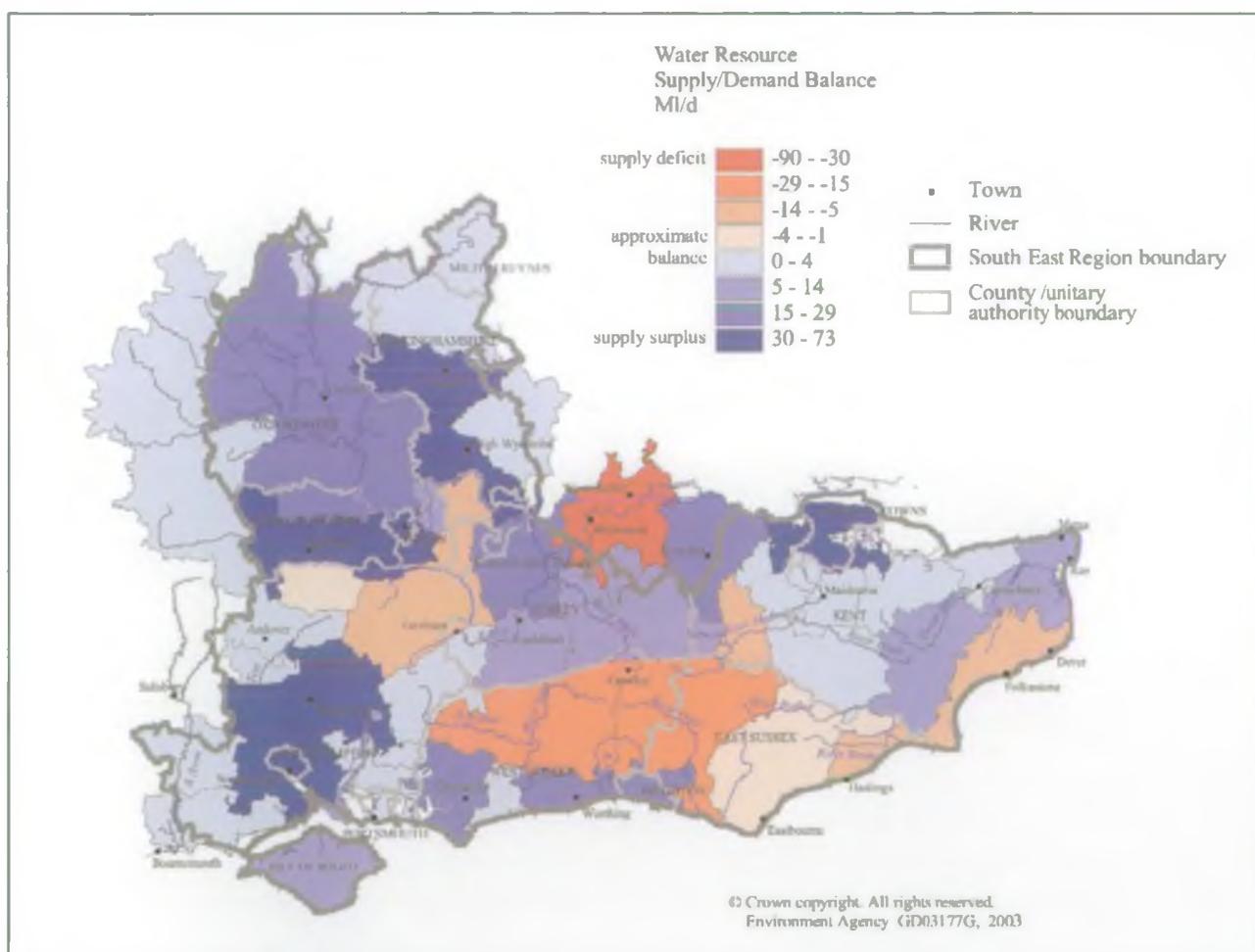


Figure 34: Water resource supply/demand balance in the South East

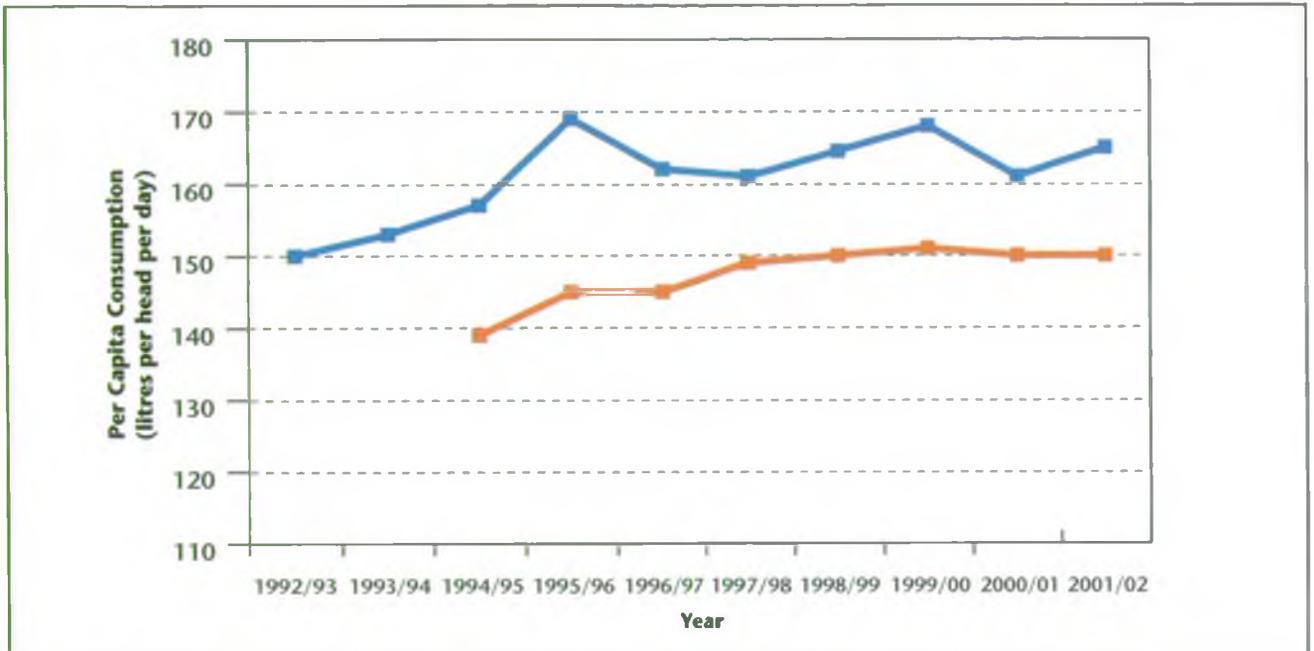
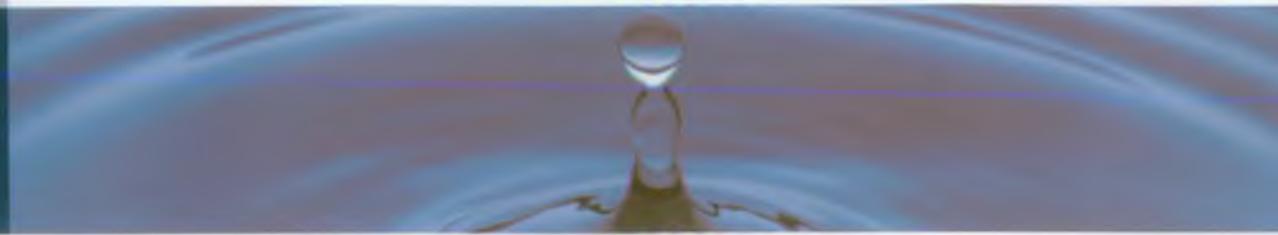


Figure 35: Per Capita Consumption in the South East, 1992-3 to 2001-02⁵²

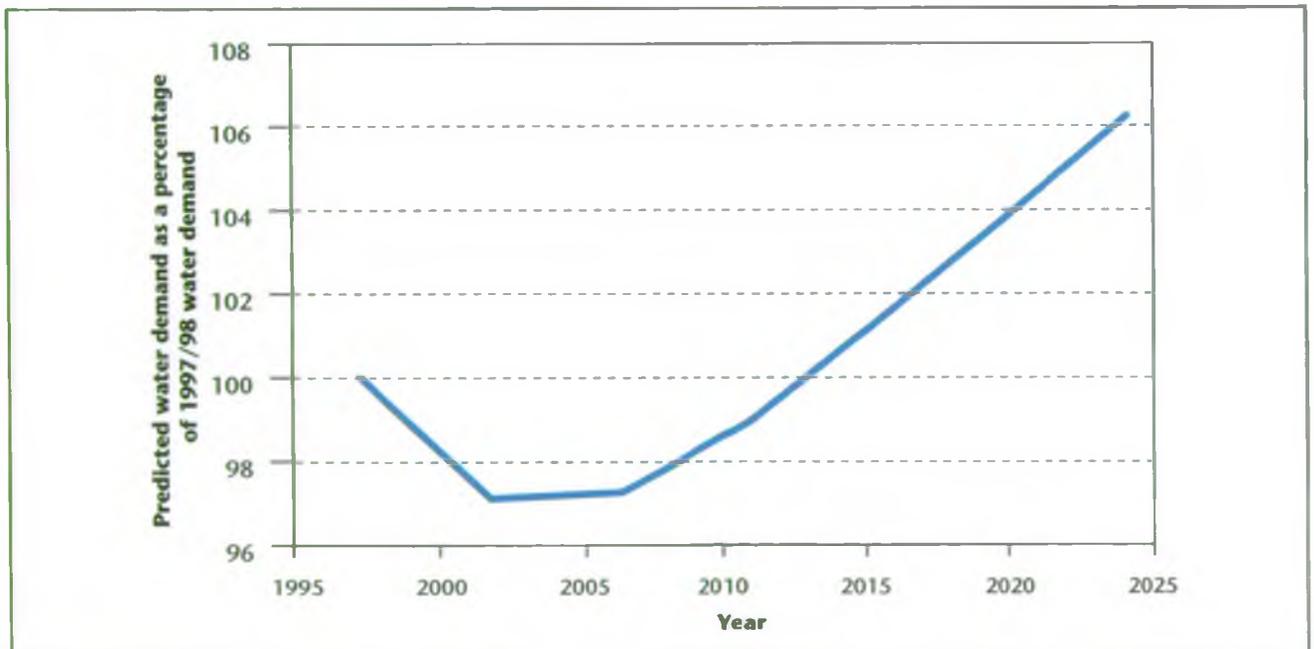


Figure 36: Predicted water demand as a percentage of the 1997/98 water demand, 1997-2025

Figure 36 takes account of new housing development as predicted in the water company water resource plans, leakage and savings made through water efficiency measures and metering. Overall demand

for water is predicted to rise in the future.

⁵² 1998/99 data is the average of the year directly preceding and following

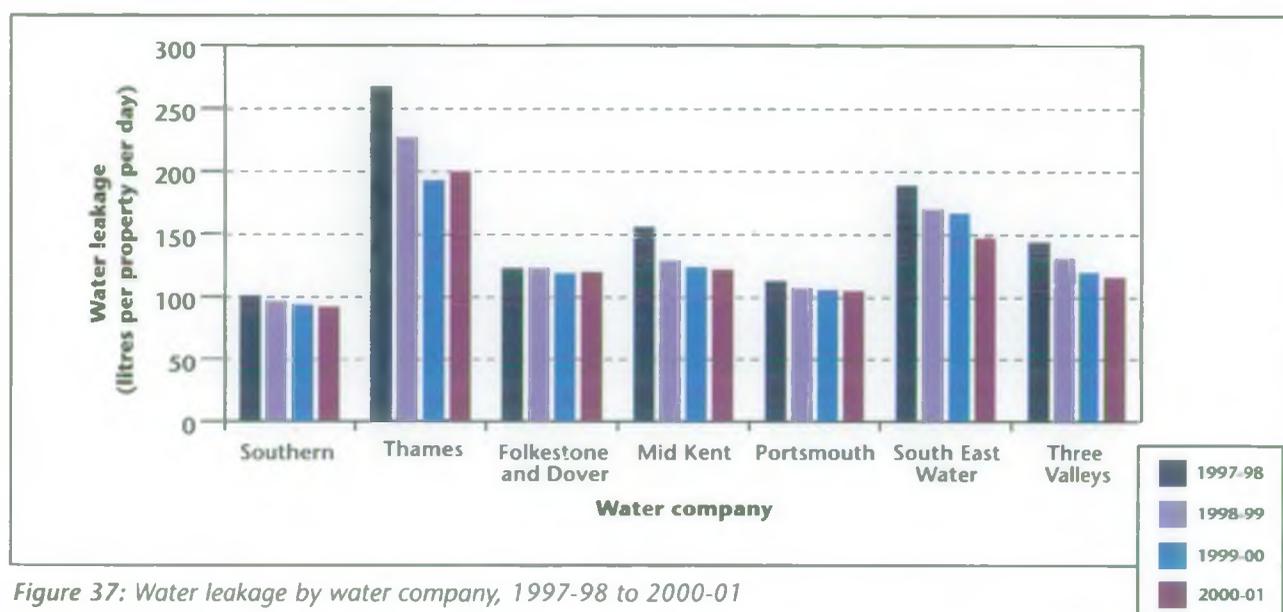


Figure 37: Water leakage by water company, 1997-98 to 2000-01

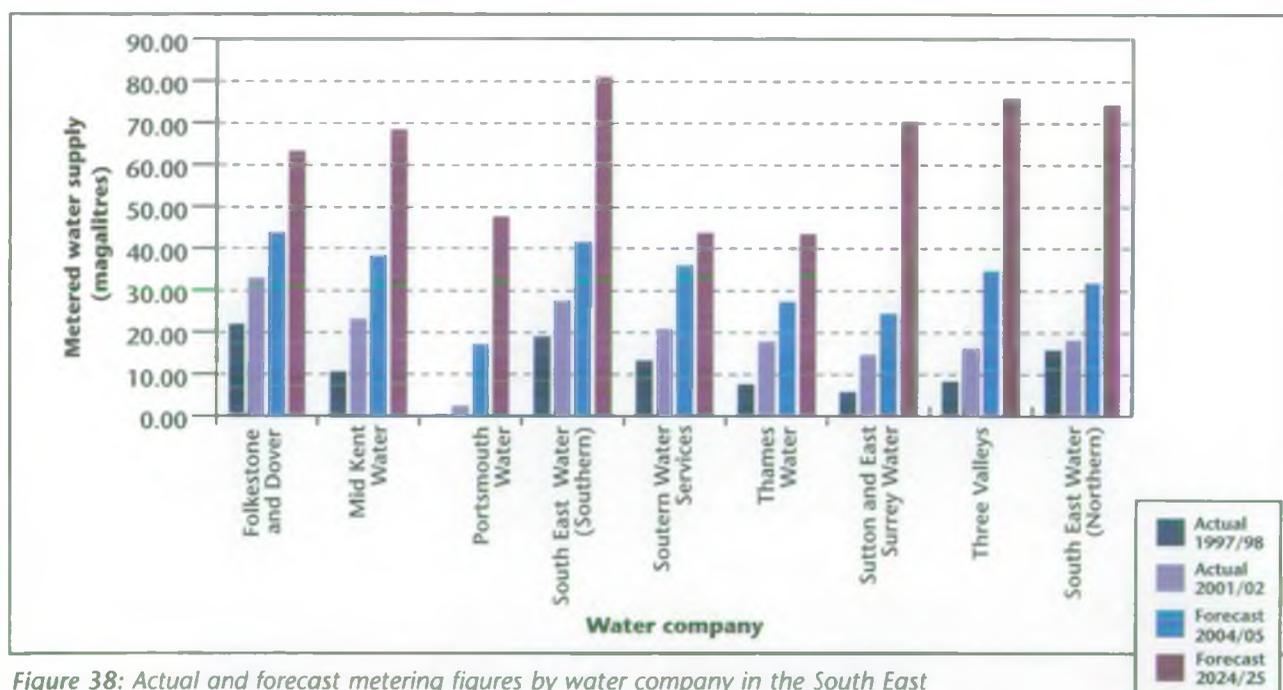


Figure 38: Actual and forecast metering figures by water company in the South East

Leakage

The leakage rates in 1997/98 and 2000/01 are compared in Figure 37. Leakage rates fell in five of the region's seven water companies. However, leakage within the Thames Water network rose considerably in 2000/01 compared to 1999/00. Folkestone and Dover Water have seen a marginal increase over the same time period.

Metering

All water companies in the South East have seen an increase in the number of metered properties since 1997/98. This increase has mainly been through voluntary take up, installations in new homes and the metering of sprinkler or swimming pool users. Continuation of this policy is unlikely to achieve the metering levels the Environment Agency believes

necessary. Most of the companies are unlikely to reach the forecasts for 2004/05 and 2024/35 proposed in their 1999 water resource plans.

Targets

The aim is to reach a positive balance between supply and demand across the South East whilst ensuring environmental sustainability. This requires a twin-track approach of measures intended to manage both existing and future increases in demand and, where appropriate, develop further water resources.

The Environment Agency published national and regional water resource strategies in March 2001 setting out the long-term framework for sustainable water resource management. The regional strategy for the South East contains a range of actions and progress in the South East will be reported annually. The strategies will be periodically reviewed. The regional strategy includes measures for the restoration of sustainable abstractions.

The Environment Agency monitors and reviews

annually the water companies' water resources plans, submitted in 1999. The water companies submit reports to the Environment Agency each September that include actual figures on the supply-demand balance for the preceding financial year including distribution input, leakage and metered and non-metered consumption. The companies will revise and resubmit their plans in detail in advance of the next periodic review of prices by OFWAT in 2004. OFWAT sets leakage targets for water companies. These are reviewed and published annually in OFWAT's '*Leakage and efficient use of water*' reports.

These strategies, plans and targets form the framework for the monitoring and review of public supply related issues and form the direction of future water resource management. Alongside this work, the Environment Agency analyses water resources through its CAMS. The first CAMS documents have been published for the South East and will be reviewed on a rolling six-year cycle. Contributing to sustainable development is the main objective of CAMS which will provide a consistent and structured approach to local water resources management, recognising both the abstractors' needs for water and the environmental needs.

Actions and responses

Key actions to address water resources in the South East. The Environment Agency will:

- Continue to investigate and implement schemes to limit the abstraction of water where this could damage the environment;
- Promote water conservation and demand management measures, such as metering and leakage control, to manage the increasing demand for water;
- Study trends in supply and demand to ensure that new water resource schemes are identified and planned prior to any major new development;
- Identify sites where water company abstraction is damaging the environment and work with water companies on the fourth Asset Management Plan (AMP4) to deliver the best possible outcomes;
- Seek to recover abstraction licenses over the next 20 to 25 years in areas where water abstraction is no longer deemed acceptable;
- Ask water companies to revise and resubmit their water resources plans in advance of the next periodic review of prices in 2004;
- Work with Thames Water to reduce leakage which continues to cause serious concern, both to the Environment Agency and OFWAT. With OFWAT, the company has been asked to produce a new water resources plan which will allow the Environment Agency to assess the supply-demand balance. Leakage reductions are necessary for Thames Water to develop an acceptable long-term supply-demand balance;
- Review progress against its water resources strategies annually.



3.5 Managing Flood Risk

Managing Flood Risk

Flooding has been a frequent event across the South East in recent years. Challenges for flood risk management are posed by our changing climate and development proposals. Investment in flood defences and flood warning systems will reduce the risk to human life.

Key messages

- Over 235,000 properties in the South East have been identified as being at risk from flooding;
- Risk of inundation from the sea is the region's biggest flood risk;
- The investment in flood defences and flood warning systems has significantly reduced the impact of recent heavy rainfall events. Continued investment is necessary to decrease the impact on life and property;
- With over one million new homes due to be built in the South East over the next 20 years, precautions should be taken to ensure that new buildings are not at risk of flooding;
- New development should include plans for suitable drainage, so run-off does not cause flooding elsewhere;
- The effects of climate change are uncertain, but are likely to be significant and increase flood risk in the South East.

Background

Flooding of land adjacent to rivers and the coast is a natural process that can have far reaching effects on people and property due to land use. Costs associated with flooding are not only financial and economic, such as damage to property and disruption to business, but also personal in terms of distress, injury and loss of life. During such events, considerable demands are placed on the emergency services and upon public services generally. Flooding of developed areas can result in a loss of public confidence in the planning services. However, flooding can also have many benefits to the environment including a contribution to the maintenance of certain important habitats.

Capital investment in flood defence has doubled since the early nineties, and represents between 40

and 45 per cent of total flood defence expenditure. Continued significant growth in investment is needed if the existing flood defence infrastructure is to be both sustained and improved. In certain situations it may not be economically or environmentally appropriate to undertake capital works to reduce flood risk and other floodplain and catchment management options may be considered.

The Government's *Planning Policy Guidance Note 25: Development And Flood Risk*⁵³ (PPG25) provides the context for managing future development to minimise distress and damage. PPG25 points out that inappropriately drained development can contribute to flooding elsewhere. Excessive rainfall can overwhelm the drainage capacity of land, particularly when the

⁵³ODPM (2001) *Planning Policy Guidance Note 25: Development And Flood Risk*

ground is already saturated or when channels become blocked and this issue should be assessed as part of a planning application. There are also established areas of development exposed to flood risk without adequate defences currently in place. Because of the high profile of recent flooding events a major challenge for the Environment Agency will be to manage the expectations of the public as to what the Environment Agency can, and cannot, do. The planning pressures in the South East are likely to increase regulatory activity by the Environment Agency on flood risk matters and planning authorities will need to focus on flood risk. Climate change scenarios will also need to be taken into account when planning in the medium and long term.

Flooding is an interaction of human activity and the natural environment. The impacts of flooding can be aggravated by:

- Urbanisation of catchments and other changes in land use, including changes in farming practices, which increase the rate and volume of run-off;
- Sediment movement that has constricted river cross-sections and affected flood levels;
- Inadequate maintenance of flood defence systems, watercourses, culverts and road gullies, particularly where this leads to channel blockage;
- Canalisation, modification and diversion of rivers and watercourses, which increase peak flood levels and accelerate travel times;
- Building of structures (e.g. embankments) which reduce storage and restrict flows over historical floodplains and thereby create additional flood risks throughout the catchment both upstream and downstream; and
- Lack of appropriate preparations by those at risk of flooding.

Defra has set three key objectives for flood and coastal defence:

- to encourage the provision of technically, environmentally and economically sound and sustainable flood and coastal defence measures; and
- to discourage inappropriate development in areas at risk from flooding and coastal erosion.

In November 1999 Defra issued a set of 'High Level Targets' for authorities who have flood defence responsibilities including the Environment Agency, local authorities and Internal Drainage Boards. The High Level Targets are a comprehensive set of fourteen targets that provide the framework by which performance is being measured and monitored.

Roles and responsibilities

The primary responsibility for safeguarding land and other property from flooding remains with the landowner. There is no statutory duty on central or local government to protect land or property against flooding. However, operating authorities such as the Environment Agency have permissive powers to undertake flood defence works.

In addition to property owners, Defra, the Environment Agency, local authorities and the Office of the Deputy Prime Minister (ODPM), all have significant roles in managing flood risk. The Environment Agency has a supervisory duty for all matters relating to flood defence and is the principal operating authority for main rivers and sea defences and also has the lead role for managing the dissemination of flood warnings. Local authorities are the operating authorities for ordinary watercourses, except where the power rests with Internal Drainage Boards. Local planning authorities are responsible for the control of development where it might be directly affected by flooding or affect flooding elsewhere. The ODPM has responsibilities for planning guidance and building regulations issues.

The Environment Agency makes a significant contribution to river basin management through works related to flood defence. Improvement works are aimed at reducing the risk from flooding to life and property and may take the form of either hard engineering such as wall raising or storage reservoirs, or soft engineering techniques aimed at working

with nature to reduce flood risk. Such works may remedy insensitive or inappropriate works in the past, or they may be needed to address increased risk arising from new development within the floodplain.

The Environment Agency is currently implementing the National Flood and Coastal Defence Database. This system will store facts relating to flood and coastal defences including data on the location and condition of all flood defence assets and information on flood plains. It will be used to hold all operating authorities' data and will be available to these authorities via the Internet.

Catchment Flood Management Plans are being developed by the Environment Agency to identify flooding issues and solutions on a catchment wide basis. The Environment Agency is also developing a method to assess flood risk that examines management options and the socio-economic impacts of flooding.

The Environment Agency's workforce carries out extensive essential maintenance works to watercourses. Channels are kept free from debris and blockages. The rivers are maintained to balance conservation needs against flood risk. The workforce is deployed on emergency response work when there is a high risk of, or actual flooding, including operating defences and control structures and ensuring that flows are maintained.

The Environment Agency contributes to the planning process at all levels and seeks to target detailed responses on those planning applications in locations at a higher risk of flooding.

Flooding in the South East

The coastline of the South East is subject to huge dynamic forces and is largely the product of ongoing management for both flood defence and coastal protection reasons. Climate change is placing further pressures on this heavily managed coastline. Inundation by the sea is largely due to combinations of high tide, storm surge and wave activity but may also be associated with structural failure of defences. Significant stretches of our coastline and rivers are monitored each year by the Environment Agency to assist with coastal and river management decision making.

There is considerable development pressure in the



South East for new housing both on greenfield sites, and also on previously developed brownfield sites that are often located in floodplains. The Environment Agency seeks to discourage inappropriate development in the floodplain and to enforce compliance with Bye Laws. It will be vital to focus more strongly on Sustainable Drainage Systems (SuDS), which use techniques to control surface water run-off as close to its origin as possible before it enters a watercourse.

Indicators

Four indicators have been used to monitor flood risk:

- Indicator 18** Change in beach volume
- Indicator 19** Number of properties 'at risk' from flooding
- Indicator 20** Number of flood warnings
- Indicator 21** Future development and flood risk

The South East *Regional Sustainable Development Framework*⁵⁴ uses Indicator 19 to report on the regional objective 'To reduce the risk of flooding that would be detrimental to public well-being, the economy and the natural environment'.

⁵⁴South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

As these indicators have limitations, it is hoped to be able to provide data on other flooding indicators in the future which could include the number of people living in unprotected flood risk areas and the number of people and properties flooded for defined return period/events.

Indicator 18 Change in beach volume

Background to the indicator

The coastline of the South East is subject to huge dynamic forces. Significant stretches of our coastline have been monitored by the Environment Agency by surveying beach profiles each year to assist with

coastal management decision making. Some of these data sets extend over 25 years and enable coastal trends to be determined and they are increasingly invaluable for investment planning purposes.

This indicator is based on the Environment Agency's Beach Monitoring Programme and is used to highlight areas suffering coastal erosion and indicates where future investment in flood defence schemes is required. The data is analysed to assist in the design of these defences or development of management strategies. For example, the beach management strategy for Seaford is currently being reviewed and will utilise this data.

The Environment Agency's monitoring programme has now been incorporated into a collaborative project with all maritime authorities between the Isle of Grain in Kent and Portland Bill in Dorset, which



Figure 39: Net change in beach volumes within Shoreline Management Plan management units, 1993-2002

includes all previous coastal monitoring programmes. The Defra grant aided programme collects beach profile and formation, bathymetric and wave and tidal data to provide sufficient information for strategic planning within the coastal zone.

Trends

Figure 39 indicates the coastline in the South East where there has been a net increase or decrease in beach volume between 1993 and 2002. The collaborative coastal monitoring programme does not have a sufficiently long data set yet to determine trends. It is intended that the data will be used to assess increased storminess, changes on the seabed and more accurately determine beach movement trends.

Targets

There are no targets associated with this indicator.

Indicator 19 Number of properties 'at risk' from flooding

Background to the indicator

A property is currently identified as having the potential to be at significant risk of flooding if it falls within an Indicative Flood Plain (see Figure 40). This represents a one per cent chance of flooding in any one year from a river (fluvial) or a 0.5 per cent chance of flooding in any one year from the sea (tidal) under present conditions, or the highest known flood. Indicative Flood Plains, which are areas that would flood without the presence of defences, make up some 11 per cent of the total land area in the South East, which is slightly higher than the figure of 10 per cent for England as a whole. Table 6 shows the number of properties that could flood from rivers, the sea or from both.

The Indicative Flood Plain map does not take into account the presence of flood defences and therefore

does not show the actual, or residual, flood risk faced by a property. Much of the Indicative Flood Plain is defended reducing the residual risk to development in this area. Through the 'National Flood Mapping Strategy' the Environment Agency is seeking to enhance the available information on flood risk and will produce flood risk maps showing these residual risks taking account of the effect of defences.

The Environment Agency is also mapping an outline of extreme flooding (without defences) defined by an annual probability of flooding of 0.1 per cent. Since predicted climate change is likely to elevate sea levels and increase peak river flows the Environment Agency's 'National Flood Mapping Strategy' is reconsidering all the flood outlines in light of the climate change predicted over the next 50 years.

Indicative Flood Plain maps are now published annually by the Environment Agency and can be accessed on its website. These maps are further supported around the coastline by Shoreline Management Plans that address both flood risk and coastal erosion issues.

The Environment Agency uses information on flood risk to target investment in flood warning systems and public awareness and other flood management schemes. The Environment Agency aims to secure the investment needed to ensure that properties within the floodplain are given as high a standard of protection from flood risk as is technically and economically viable.

Table 6: Number of 'at risk properties' in the South East

Type of risk	Number of properties
Tidal alone	93,034
Fluvial alone	110,996
Both tidal and Fluvial	31,572
Total	235,602

Trends

More than 235,000 properties in the South East have been identified as being at risk of flooding. As the Environment Agency's knowledge of flood risk is

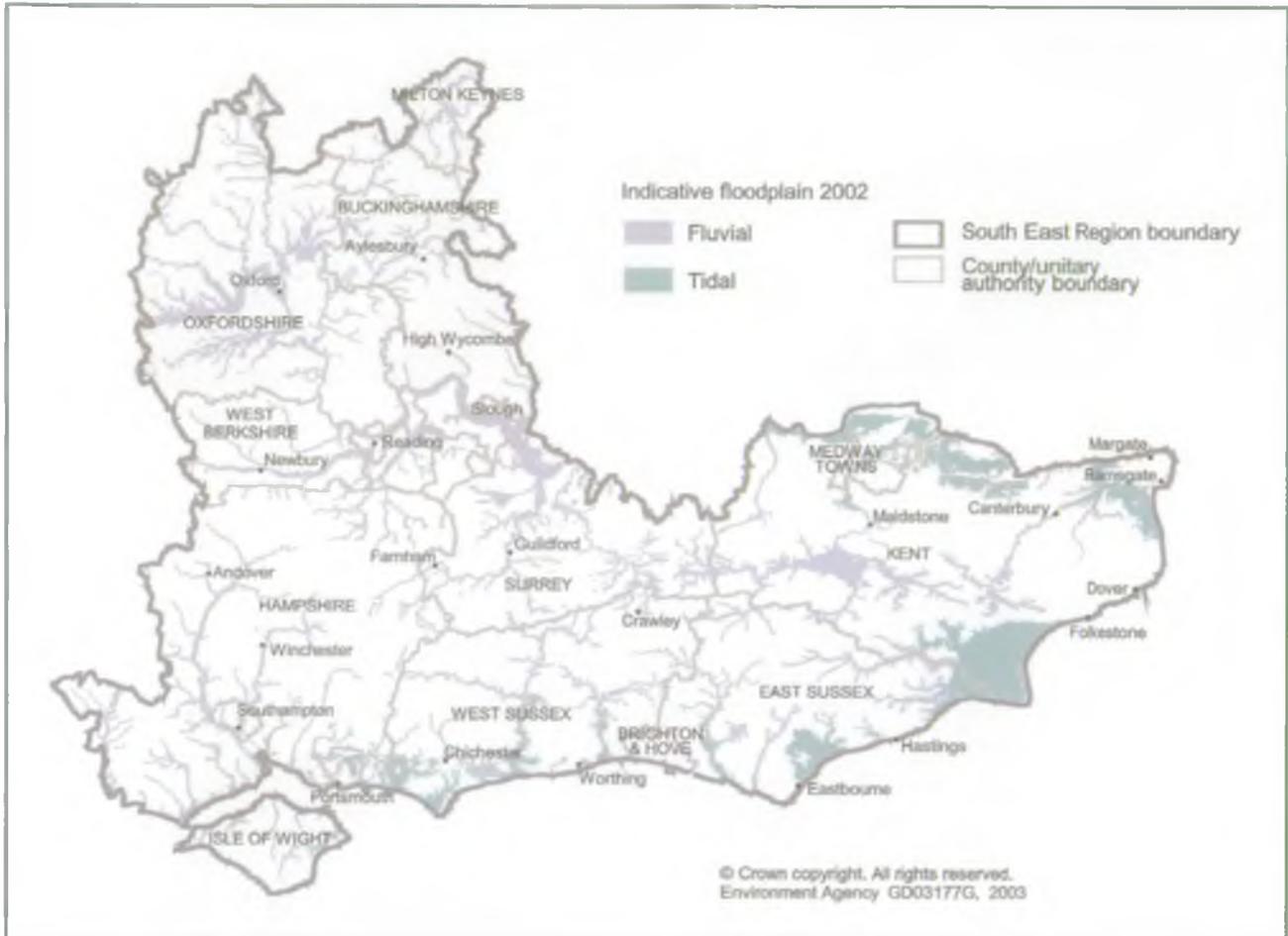


Figure 40: Indicative Flood Plain in the South East

augmented by actual flood events and modelling, the 'at risk' status of some properties may change. Development pressures and climate change are likely to place further properties 'at risk' of flooding. This indicator will be developed in subsequent state of the environment reporting to illustrate the change in number of properties at risk of flooding.

Targets

The Environment Agency will enhance flood defences to reduce the number of properties at risk of flooding. In addition, the improved mapping of flood risk areas will provide greater certainty about the number of properties indicated as being at risk of flooding.

The Environment Agency will continue to influence the planning process to reduce the amount of inappropriate new development in the floodplain in the future.

Indicator 20 Number of flood warnings



Background to the indicator

The Environment Agency operates a staged system for issuing warnings to the public.



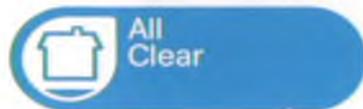
Flood Watch: flooding is possible in the area, be aware, be prepared, watch out!



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

Significant investments are being made to improve the Environment Agency's ability to forecast and

warn of imminent river and coastal flooding. Several factors can affect the number of flood warnings and flood events in the future, including the adequacy of current flood defences, the amount of inappropriate development in 'at risk' areas and weather conditions. Climate change scenarios predict more intense summer thunderstorms and an increase in winter rainfall, which could result in more frequent river flooding in the future. It is also predicted that climate change will increase the frequency of storm surge conditions and flooding from the sea. Many developed floodplains benefit from flood alleviation schemes, the design of which are based upon analysis of historic records that may not reflect future risk. Furthermore the presence of defences can encourage development in potential flood risk areas.

A major concern for the South East is the risk from coastal flooding. Soft shingle defences are used to protect many stretches of vulnerable coastline. High winds and tides can frequently test these defences as has been recently seen on the Selsey and Pevensey frontages. This has resulted in a need to strengthen the flood warning capability and raise public awareness of flood risk. One of the improvements has been to increase the number of properties offered a direct warning service via the Automated Voice Messaging (AVM) system.

Currently the AVM is the Environment Agency's principal method of directly warning people at risk from flooding. Figures 42 and 43 show the number

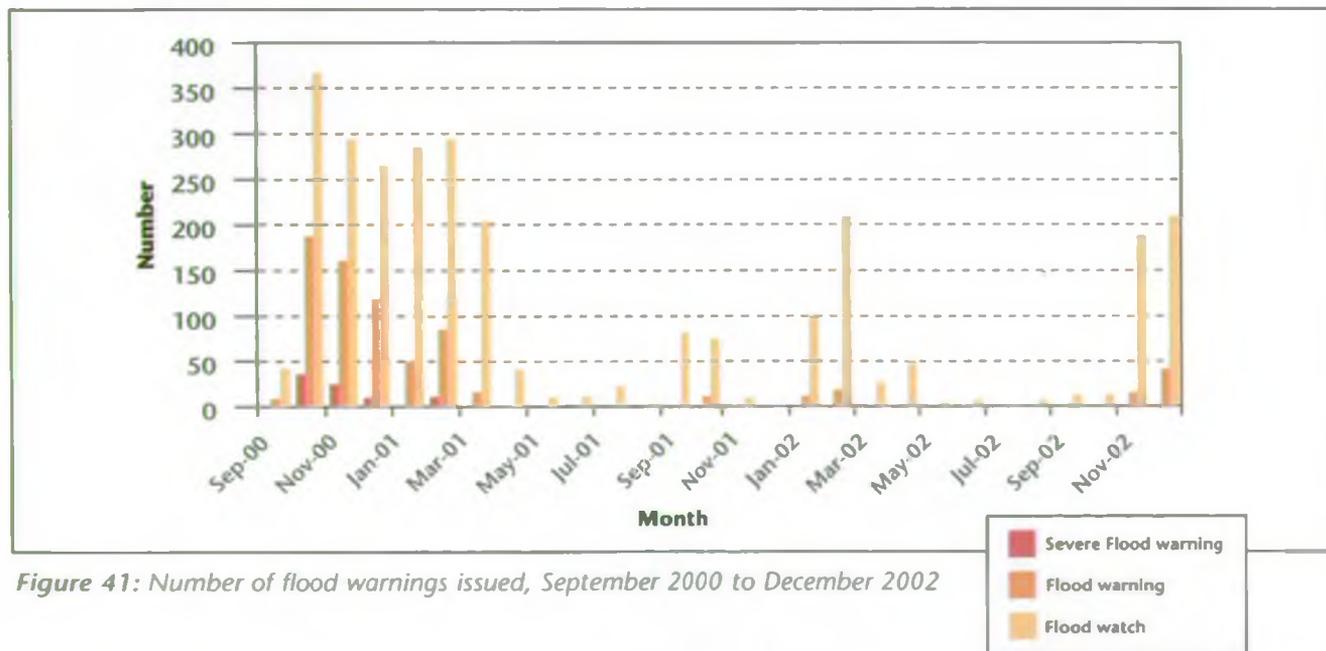


Figure 41: Number of flood warnings issued, September 2000 to December 2002

of registered warning recipients as a percentage of the number of 'at risk' properties. The use of AVM as an indicator for the State of the Environment report is a new development. A comprehensive picture of AVM uptake for the South East is not yet available. For future reports it is hoped data will be available for the whole of the South East.

Trends

As an indicator, the number of warnings has to be treated with some caution as a measure of potential flooding since the areas for which warnings are issued vary in terms of their size and number of properties covered. Figure 41 demonstrates the influence of the

weather on the number of flood warnings issued. During winter 2000/2001 the South East was subject to particularly stormy weather.

From Figures 42 and 43 it can be seen that there has been a substantial improvement in the number of registered recipients of flood warnings with an increase from 693 recipients in 1997 to over 50,000 today. This is attributed to annual public awareness campaigns at both national and local levels and also a heightened understanding of flood risk due to recent flooding events. It is vital to sustain and improve this level of public awareness, and especially to encourage those at risk of flooding to make appropriate preparations.

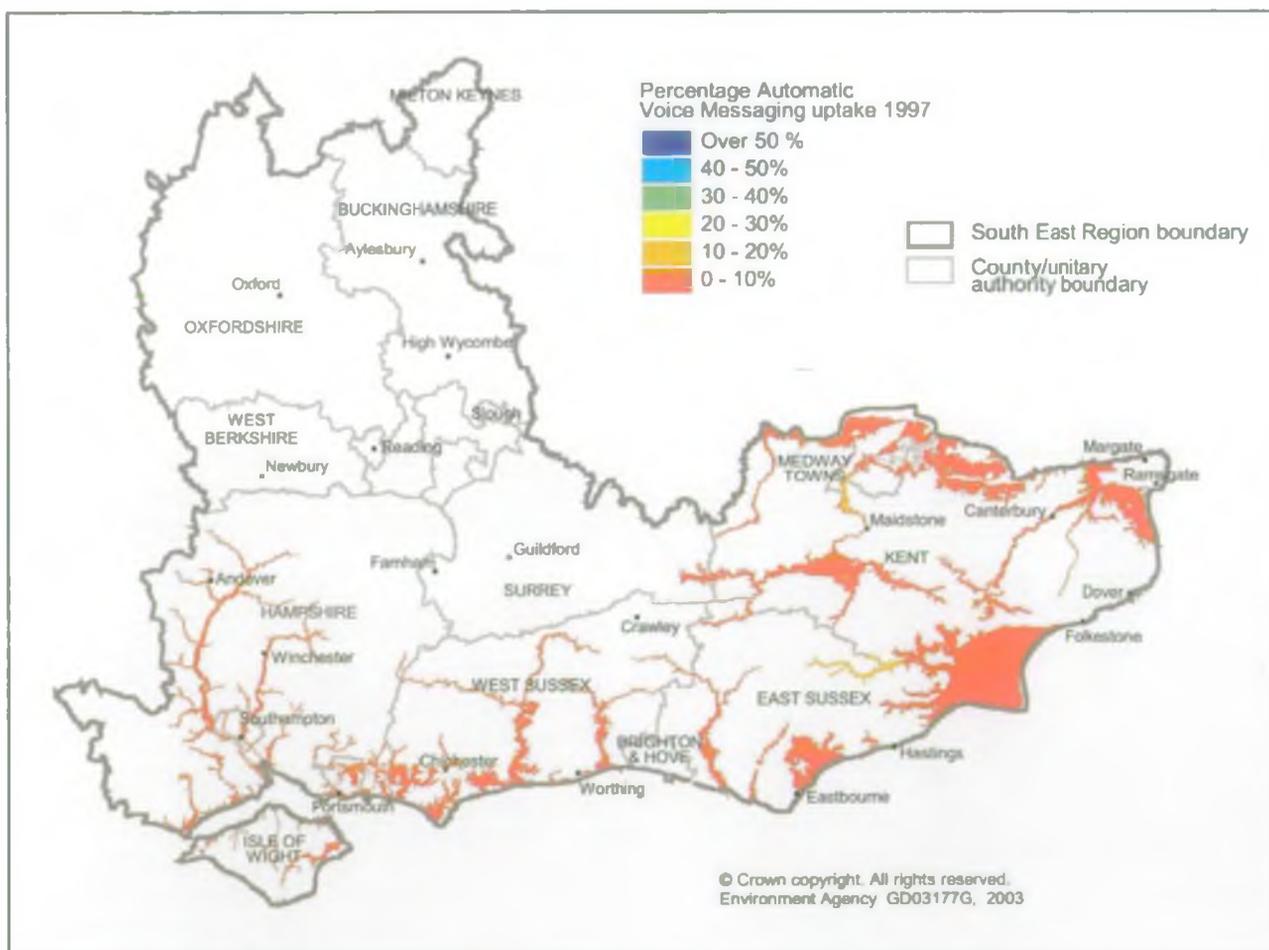


Figure 42: Automated Voice Messaging recipients as a percentage of 'at risk' properties, 1997

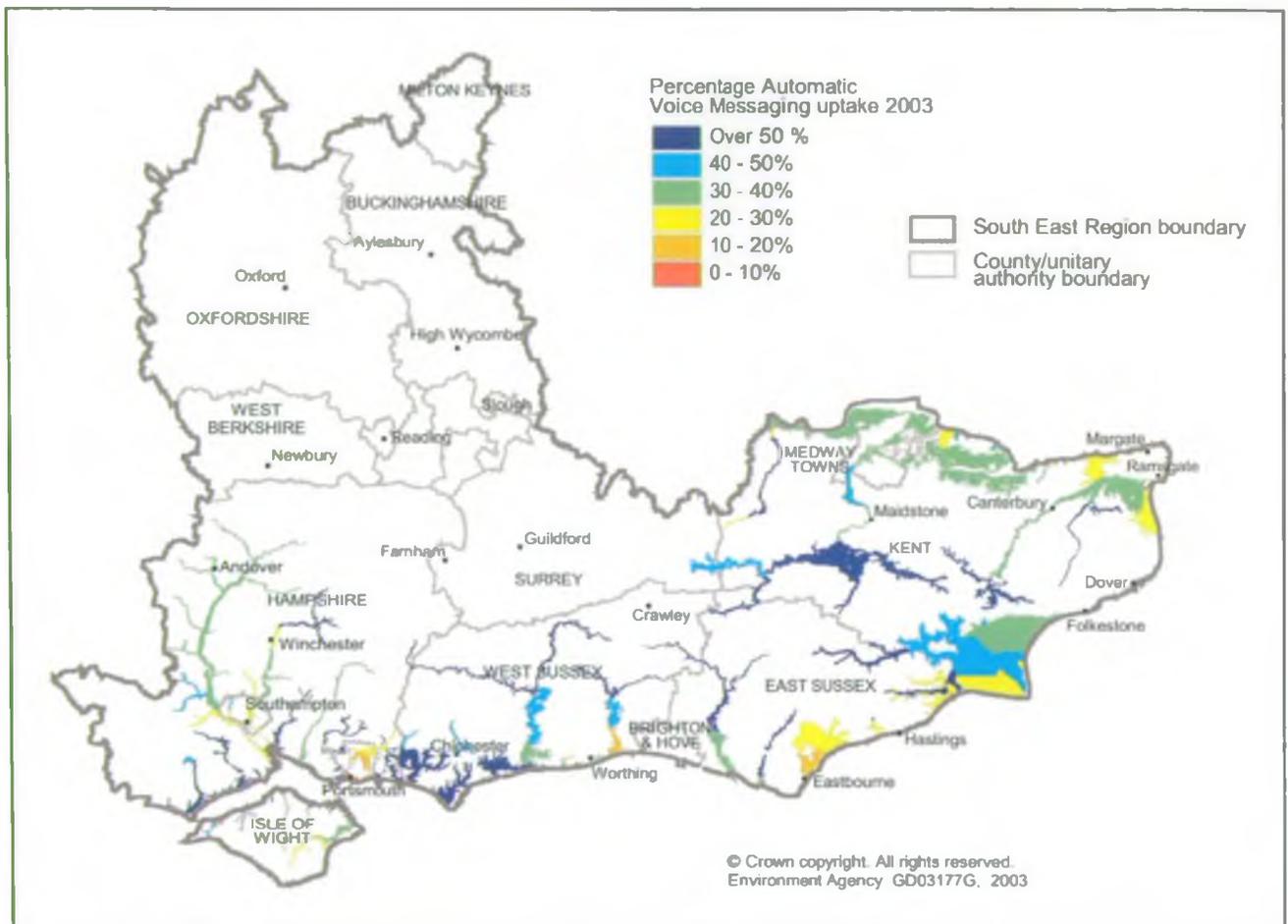


Figure 43: Automated Voice Messaging recipients as a percentage of 'at risk' properties, 2002

Targets

Defra's High Level Target for the provision of flood warnings includes a number of actions for the Environment Agency to achieve in conjunction with local authorities, emergency services and other partners:

- to develop a method for categorising the flood risk to an area for flood warning purposes;
- to determine where a flood warning service can be provided and the appropriate dissemination arrangements using the method developed;
- to determine and publish flood warning service standards for each area at risk from flooding;
- to report to Defra on achievement of service standards.

Indicator 21 Future development and flood risk

Background to the indicator

A key objective of the Environment Agency is to contribute to the Government's policy of reducing the risks to people and the natural and built environment due to flooding. Inappropriate development should be discouraged in areas at risk of flooding and the provision of sustainable drainage encouraged to ensure that new development does not increase flood risk elsewhere. The contribution to the reduction in flood risk that can be achieved by discouraging inappropriate development is significant.



The 8.1 million people who live in the South East represent 13.5 per cent of the UK's population and occupy 3 million households. The South East faces development pressures greater than anywhere outside London and this is reflected in development plans. Local planning authorities allocate development land and define policies that influence development in their Local Plans and determine planning applications. The Environment Agency is a statutory consultee in the plan making process and has a lead role in providing advice on flood issues.

The Government's *Planning Policy Guidance Note 25: Development and Flood Risk (PPG25)* discourages inappropriate development that may be at flood risk itself or which would increase the flood risk to others and states that the priority for development should be in areas with the least risk of flooding. The Environment Agency's advice on land allocations and planning applications is based on the best available information. PPG25 requires that those proposing a development should undertake a flood risk assessment which includes the run-off implications of

their proposals and is appropriate to the scale and nature of the development and the risks involved.

Figure 44 gives an indication of proposed residential dwelling numbers in the Environment Agency's Southern Region that fall within the Indicative Flood Plain. The Indicative Flood Plain map does not take into account the presence of flood defences and therefore does not show the actual, or residual, flood risk faced by a property. Much of the Indicative Flood Plain is defended and the effect of these defences is to reduce the residual risk to development in that area. Through the National Flood Mapping Strategy the Environment Agency is seeking to enhance the available information on flood risk and will produce flood risk maps showing these residual risks taking account of the effect of defences.

The information in Figure 44 and Table 7 has been gathered from published Local and Unitary Development Plans and includes the draft plans where these are the latest versions available. Such Plans contain land allocations for development for up to ten years from the Plan's publication. Local planning authorities publish these Plans at different times and thus have allocations for varying periods from the present time. Only 'major' development proposals are represented for both the residential and non-residential figures.

The use of future development in relation to flood risk is a new development for the State of the Environment report. A comprehensive picture of development and flood risk for the South East is not yet available. Figure 44 shows data for the Environment Agency's Southern Region but it is hoped data will be available for the Thames Region of the Environment Agency in the future.

Table 7: Development allocations within and outside the Indicative Flood Plain from published Local and Unitary Development Plans

Environment Agency Area	Within Indicative Flood Plain		Outside Indicative Flood Plain	
	Residential ¹ dwelling numbers	Non residential ² site area (ha)	Residential ¹ dwelling numbers	Non residential ² site area (ha)
Kent	13,250	*	61,250	*
Sussex	2,750	85	8,250	150
Hampshire and Isle of Wight	1,500	7	16,500	130

1: Allocations for 10 or more dwellings 2: Allocations for a site area greater than 1 hectare *: Figures not currently available

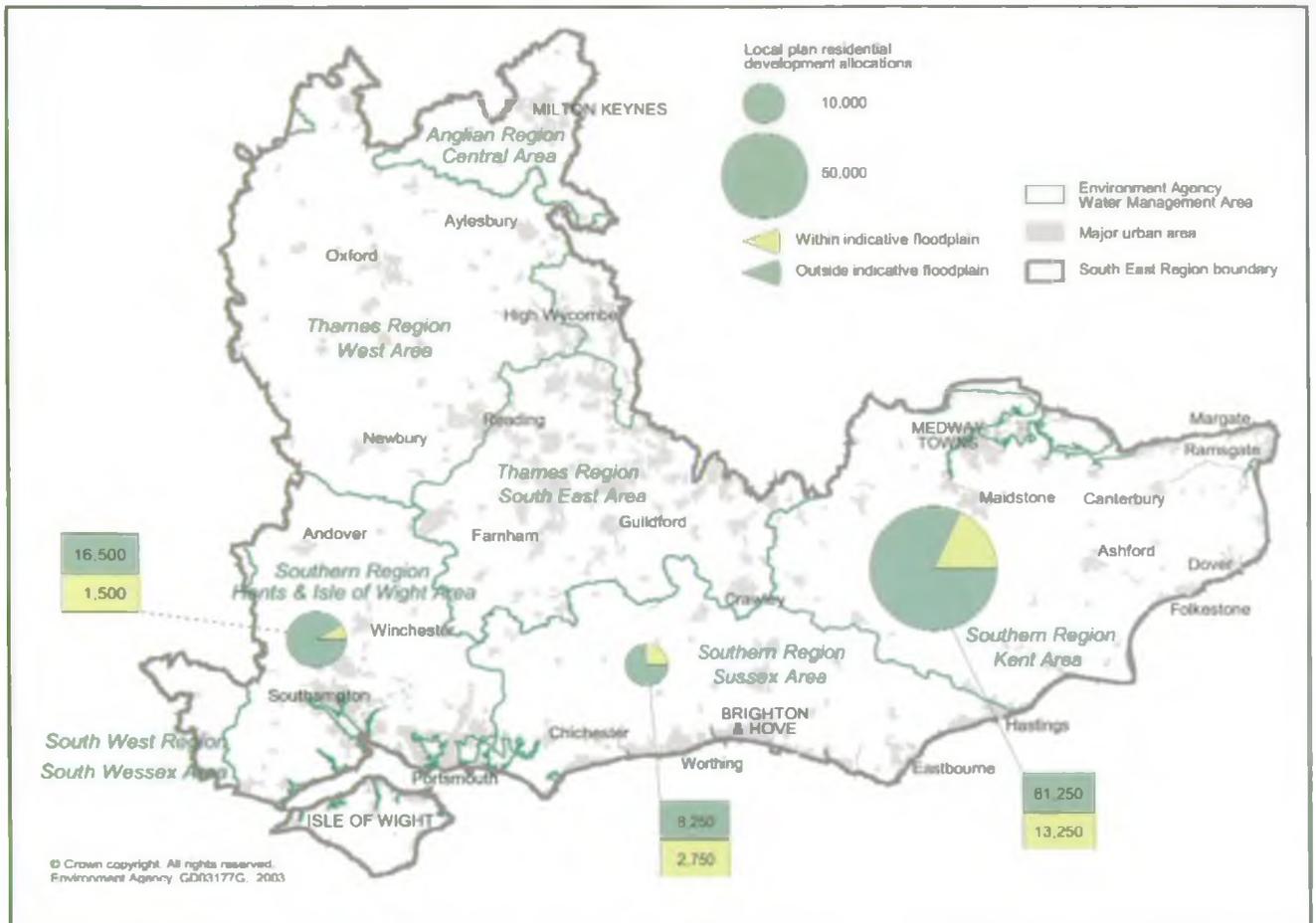


Figure 44: Proposed residential dwellings within the Indicative Flood Plain

The paper *Sustainable communities in the South East: Building for the future*⁵⁴ indicates that the pressure to develop in the South East will increase particularly in three identified growth areas - the Thames Gateway, Milton Keynes-South Midlands and Ashford (see Figure 45). The number of new house completions has dropped 18 per cent below the figures specified in RPG9 for the South East and the intention of 'Sustainable Communities' is to turn around this trend.

The Milton Keynes and Thames Gateway growth study areas are partly within the South East and those parts of the Thames Gateway area abutting the River Thames are likely to present a particular challenge with regard to flood risk issues. Located entirely in the region is the Ashford growth area where the 'Sustainable Communities' paper indicates an intention to provide 31,000 new homes by 2031, at an initial rate of 1000 per year. The Ashford area has

suffered from river flooding in the past and 'Sustainable Communities' recognises that flood management issues there will need to be addressed.

The Environment Agency has been involved as a partner in the plans for Ashford's growth and it is essential this involvement continues at an early stage in the development of these proposals with regard to the location and type of development. In view of climate change it is imperative that a precautionary approach is adopted to steer development away, where possible, from flood plains and to ensure that it does not contribute to flood risk elsewhere.

With the support of Defra, the Environment Agency builds and maintains defences to reduce the flood risk

⁵⁵ ODPM (2003) *Sustainable communities in the South East: Building for the future*

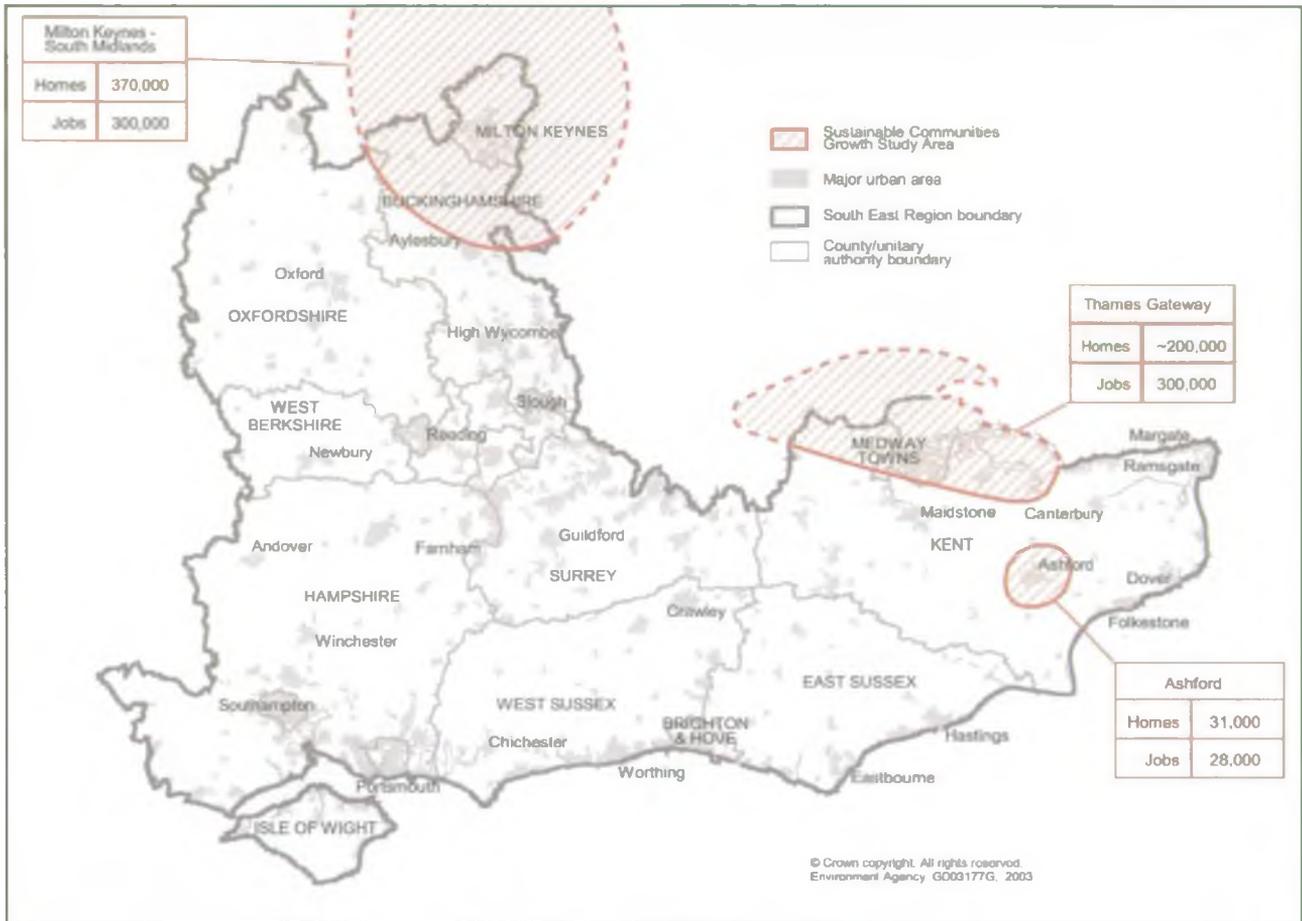


Figure 45: Growth study areas identified under the Sustainable Communities proposals

to existing development, where it can be shown to be worthwhile, but not specifically to facilitate new development. Should any of the development envisaged in 'Sustainable Communities' need to be located in flood risk areas that are not currently defended to an appropriate standard, consideration must be given as to how an appropriate standard of defence should be achieved. Defences, fully funded by the developer, are only likely to be acceptable provided they are consistent with relevant flood risk policies and do not have a significant impact on flood flows or storage. To achieve such arrangements local planning authorities may wish to enter into an agreement under Section 106 of the Town and Country Planning Act 1990 to ensure that the developer carries out the necessary work and that future maintenance commitments are met. Bearing in mind the scale of these proposed developments it may be appropriate for SEEDA to become involved in the advance

provision of flood risk management infrastructure to facilitate development.

Trends

The South East is one of the fastest growing regions and is a hot spot for further long-term development. The data presented indicates significant demand to build on the Indicative Flood Plain and this is likely to continue. The challenge is to ensure that any development on the Indicative Flood Plain is only in those areas protected against flood risk to an appropriate standard (taking the effects of climate change into account) and that the run-off from all development is managed appropriately to avoid flood risk to others.

It is particularly challenging that while the population is increasing, household size is reducing. This means dwelling numbers will increase more rapidly than population. Planning policy is also promoting denser housing layouts and, with smaller dwellings, individual dwelling soakaways may be difficult to achieve. This may encourage the move towards communal sustainable drainage systems in public open spaces.

Targets

The Environment Agency will continue to advise local planning authorities on flood risk issues and seek to guide development away from areas of higher flood risk. The Environment Agency will particularly seek to influence the development proposed in 'Sustainable Communities' to minimise the risk of flooding.

Planning for flood risk management in the Thames Estuary

The Thames Gateway growth area covers an area 69 km long by 32 km across and has one of the largest concentrations of brownfield sites in the country. The growth area is concentrated alongside the Thames Estuary where flood risk is of particular concern. The Thames Estuary is one of the UK's great natural assets, a highly complex and rich wildlife habitat linking London, Kent and Essex to the North Sea. It is also the most densely urbanised estuary in the country supporting some of the nation's best and most treasured architectural and archaeological features.

Over £80 billion of the flood risk property value of England and Wales lies within the Thames tidal flood plain. This property is protected to a high standard with tidal defences designed and built in response to the catastrophic floods of 1953. London and the Thames Estuary currently have one of the best tidal defence systems in the world which will provide a high standard of protection to well beyond 2030, but the effects of climate change present an unwelcome picture for the flood risk of future generations.

The Environment Agency believes that the current tidal defences will not sustain parts of this highly developed land against climate change, unless radical changes are made to the way in which flood defence and urban planning is managed. The time is right now to start planning the next generation of tidal defences for the Thames Estuary, and in doing this, the Environment Agency has extended its planning horizon by 70 years to the year 2100. With over a million people at risk this is both essential and prudent. 'Planning for Flood Risk Management in the Thames Estuary' is an initiative by the Anglian, Southern and Thames Regions of the Environment Agency to develop a strategy for flood risk management in the estuary for the next 100 years. The geographical area of this strategy is the tidal Thames and its natural floodplain extends from Teddington in west London to Sheerness/Shoeburyness in the outer estuary.

The project aims to:

- Assess and understand the tidal defences in the context of the wider Thames Estuary setting. This includes assessment of the residual useful life of the defences together with an understanding of the 'drivers' including climate change, urban development, social pressures and the environment;
- Inform and gain support of political and funding partners and stakeholders; and
- Prepare and manage a programme of studies linked with consultation, leading to a strategy for flood risk management in the Thames Estuary for the next 100 years.

Actions and responses

Key actions to minimise flood risk in the South East. The Environment Agency will:

- Continue to manage flood risk minimising the threat to human life, reducing distress and damage to property;
- Continue to contribute to the Town and Country Planning process at all levels and will seek to ensure that local planning authorities give appropriate importance to flood risk issues. The Environment Agency will also continue to contribute to reviews of those parts of the building regulations associated with flood risk;
- Improve its mapping of flood risk areas to enable properties 'at risk' of flooding to be more accurately defined;
- Contribute to Defra's review of its Planning Policy Guidance on Development and Flood Risk (PPG 25) in 2004;
- Work with water companies, local authorities, highway authorities and the house building industry to promote sustainable drainage techniques.



3.6 Limiting and Adapting to Climate Change

Limiting and Adapting to Climate Change

Climate change is widely recognised as the major environmental challenge. Concerted action is needed to reduce greenhouse gas emissions and adapt to the effects of climate change.

Key messages

- The Earth's average surface temperature rose by around 0.6°C during the 20th Century;
- The evidence increasingly suggests that most of the observed warming over the last 50 years is attributable to human activity;
- The impacts of climate change are predicted to be increasingly felt in the South East with wetter, stormier winters and drier summers;
- Summer rainfall in the South East is predicted to decrease placing water supplies under increasing pressure in some areas;
- Sea levels are rising around the region's coastline, threatening important coastal habitats and increasing the risk of coastal flooding.

Background

The Earth's average surface temperature rose by around 0.6°C during the 20th Century and the evidence increasingly suggests that most of the observed warming over the last 50 years is attributable to human activity. 'Greenhouse gases' in the atmosphere such as carbon dioxide absorb energy radiated from the Earth's surface and warm the atmosphere. Increasing concentrations of these gases in the atmosphere as a result of human activities such as the combustion of fossil fuels and deforestation have enhanced the 'greenhouse effect' and pushed up temperatures globally. Climate change refers to the changes that accompany global warming such as changes in the frequency and intensity of extreme weather events.

A recent Defra report indicates that globally temperatures are continuing to rise with 2002 joining 2001 and 1998 as the top three hottest years on record⁵⁶. In central England, the 1990s was the

warmest decade since records began in the 17th Century and recent climate change scenarios indicate that, by the 2080s⁵⁷, the average annual temperature in the UK may rise by between 2°C (under a 'low emissions scenario') and 3.5°C (under a 'high emissions scenario')⁵⁸. Increases in temperature will be accompanied by changes to the UK climate, including:

- High summer temperatures will become more frequent, whilst very cold winters will become increasingly rare;
- Winters will become wetter and summers may become drier;
- Snowfall amounts will decrease;
- Heavy winter precipitation will become more frequent; and
- Relative sea level will continue to rise around the shoreline.

⁵⁶ Defra (2002) *Global Atmosphere Research Programme Bi-Annual Report 2000 to 2002*

⁵⁷ 2080s: 30 year period centred on the 2080s (2071 to 2100)

⁵⁸ UK Climate Impacts Programme (2002) *Climate Change Scenarios*

The United Nations Framework Convention on Climate Change was adopted in 1992 and seeks to stabilise atmospheric concentrations of greenhouse gases. Under the Kyoto Protocol to the Convention, developed countries accepted a legally binding commitment to reduce their collective emissions of six greenhouse gases⁵⁹ by at least 5.2 per cent compared to 1990 levels by the period 2008-2012. For its part, the UK committed to reduce its emissions by 12.5 per cent by this period and adopted a domestic target to cut carbon dioxide emissions by 20 per cent below 1990 levels, by 2010. In addition, in February 2003, the Government's *Energy White Paper* proposed a target to reduce carbon dioxide emissions by 60 per cent from current levels by 2050⁶⁰.

The UK's Climate Change Programme seeks to both reduce greenhouse gas emissions and encourage adaptation to the impacts of climate change. Actions to reduce emissions include the introduction of the Climate Change Levy (a tax on the business use of energy), the creation of a domestic emissions trading scheme and the adoption of a national target to increase the proportion of electricity provided by renewable sources to 10 per cent by 2010 (the recent *Energy White Paper* includes an ambition to increase the renewables share of electricity generation to 20 per cent by 2020). To help prepare the UK for the effects of climate change, the Government has established the UK Climate Impacts Programme (UKCIP) which co-ordinates research into the impacts of climate change and helps organisations assess how they will be affected so they can plan to adapt.

Roles and responsibilities

Different sectors and organisations have different roles in reducing greenhouse gas emissions and adapting the region to the impacts of climate change.

The energy sector has a key role to play in reducing emissions. Changes in the energy supply sector such as the switch from coal to gas and nuclear power for electricity generation have been the main reasons for the reduction in greenhouse gas emissions in the UK. In the future, a lot will depend on how much electricity can be generated from renewable sources.

Business commitment to tackling climate change is



growing in the UK. The UK's emissions trading scheme is the world's first economy-wide greenhouse gas emissions trading scheme. Thirty-four organisations have voluntarily taken on a legally binding obligation to reduce their emissions against 1998-2000 levels, delivering over 4 million tonnes of additional carbon dioxide equivalent emissions reductions in 2006. These organisations include Shell UK Ltd, British Petroleum plc, British Airways plc and Tesco Stores Ltd.

Public sector bodies, including the South East England Regional Assembly (the Regional Assembly), local authorities and the Environment Agency, have a key role to play in reducing greenhouse gas emissions and adapting to the impacts of climate change. In October 2002, the Regional Assembly published a draft strategy for promoting energy efficiency and renewable energy in the South East⁶¹. This strategy will lead to amendments to Regional Planning Guidance for the South East (RPG9) which will then be delivered by local authorities. Local authorities consider climate change in preparing their development plans through, for example, promoting renewable energy sources and energy efficiency and carefully considering the location of new development in order to minimise flood risk.

⁵⁹ Greenhouse gases: Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride.

⁶⁰ Department for Trade and Industry (2003) *Energy White Paper: Our energy future - creating a low carbon economy*

⁶¹ South East England Regional Assembly (2002). *Harnessing the Elements: A Strategy for Energy Efficiency and Renewable Energy (Consultation Draft)*

For its part, the Environment Agency has a significant influence on industrial greenhouse gas emissions through its duties under the new Integrated Pollution Prevention and Control (IPPC) regime and its waste management activities. The Environment Agency will implement much of the new IPPC system that, for the first time, includes a requirement for companies to use energy efficiently. In relation to waste management, the Environment Agency has already been successful in, for example, encouraging landfill sites to install methane control and energy recovery systems. In addition, the Environment Agency has its own targets to improve the energy efficiency of its buildings and operations.

The Environment Agency is also at the forefront of dealing with the impacts of climate change through its duties in relation to flood defence and water resources. For example, the Environment Agency is developing guidelines for water companies' water resource plans on dealing with climate change impacts on resources and demands. The Environment Agency is a statutory consultee for a number of planning applications and can therefore help to ensure that decisions over future land use give appropriate weight to factors such as flood risk and water supply. The Environment Agency currently chairs the Regional Assembly's Natural Resources and Climate Change Advisory Group. To spearhead action on all aspects of climate change, the Environment Agency is setting up a dedicated national Climate Change Team.

The South East Climate Change Partnership (SECCP) brings together a diverse range of public, private and voluntary sector organisations and aims to investigate, inform and advise on the threats and opportunities arising from the impacts of climate change in the South East and to promote adaptive planning in the region. In 1999, the partnership published *Rising to the Challenge: The Impacts of Climate Change in the South East in the 21st Century*⁶².

Climate change in the South East

The climate of the South East is already changing. Over the past century the average temperature has risen by 0.5°C⁶³. Around the region's coastline the sea level is rising, threatening important coastal habitats and increasing the risks of coastal flooding.

More subtle signs of change are also evident. For example, higher temperatures have led to earlier leaf emergence in oak trees and the earlier arrival of swallows on the south coast.

Although the South East must work to reduce greenhouse gas emissions it must also accept the realities of climate change and adapt accordingly. A recent report by the SECCP⁶⁴ outlines some of the economic, social and environmental challenges of climate change (see Table 8).

Table 8: Economic, social and environmental challenges of climate change

Sector	Challenges
Agriculture	Changing heat, rainfall and soil conditions all affect what crops can be grown and their yields, as well as crop and animal diseases
Utilities and infrastructure	Climate affects both the supply of and demand for water and energy. Storms and floods pose risks to transport and buildings
Tourism	Warmer climates could stimulate tourism - but with possible impacts on water resources and transport
Planning	We will need to design for resilience to harsher average and extreme conditions and to protect sensitive areas
Emergency planning	Contingency plans will need to cater for more extreme and complex incidents
Biodiversity	Many valuable species and habitats will be affected by coastal erosion or by changes to temperature, water and soils
Business	Climate affects markets, consumer demand and supplies. Heating and air conditioning may need to change to maintain acceptable working conditions

A key challenge will be to balance the supply and demand for water. Water supply sources will benefit from greater rainfall in the winter, which will increase river flows and recharge groundwater supplies. However, in summer river flows will be much

⁶² South East Climate Change Partnership (1999) *Rising to the Challenge: The Impacts of Climate Change in the South East in the 21st Century*

⁶³ Source: South East Climate Change Partnership

⁶⁴ South East Climate Change Partnership (2002) *Climate Change Impacts - looking ahead for the South East*

reduced and this will lessen the amount of water available for commercial use and public consumption. In addition, demand for water increases considerably during hot summers. In response to supply concerns, water companies have a number of options to increase supply and manage demand. Supply may be increased through the construction of additional reservoirs for storing winter rainfall and recovering and recycling more water from sewage works. Demand may be managed through increased water metering, the use of water saving devices, rationing for some uses (e.g. golf courses and car washes) and information campaigns to encourage efficient use of water.

The changing frequency of extreme events including intense rainfall, drought and strong winds could lead to significant impacts. The South East has an infrastructure based on historic climate conditions. The implications are potentially far reaching; for example, flood defences built to protect against a 1 in 100 year event will not provide this level of protection as the climate changes. Similarly, the capacity of urban storm drains will be exceeded more frequently which may lead to increased flood damage. In light of these concerns, it is essential that the impacts of climate change continue to be researched and understood and that action is taken to guard against the adverse impacts.

Indicators

Seven indicators have been selected to illustrate climate change in the South East:

- Indicator 22** Annual average surface temperature in central England
- Indicator 23** Sea level change at Sheerness, Kent
- Indicator 24** Future climate change in the South East
- Indicator 25** Final energy consumption in the UK by sector
- Indicator 26** UK greenhouse gas emissions
- Indicator 27** UK carbon dioxide emissions by end user
- Indicator 28** Percentage of electricity generated from renewable sources

The *Regional Sustainable Development Framework*⁶⁵ uses Indicator 26 to report on the regional objective

'To address the causes of climate change through reducing emissions of greenhouse gases'.

These indicators are generally for the UK or England as a whole, as data does not necessarily exist for the South East. For example in relation to greenhouse gas emissions, there is no readily available set of emissions estimates for the region. Obtaining regional data on issues relating to climate change should be a priority for the future.

Several other sections of this report (such as Improving Air Quality, Protecting and Enhancing Water Quality, Maintaining and Enhancing Biodiversity, Managing Water Resources and Managing Flood Risk) include indicators relating to climate change and should be read in conjunction with this section. Particularly relevant indicators in other sections include:

- Emissions to air from processes regulated by the Environment Agency;
- River water quality and compliance with River Quality Objectives;
- Distribution of key habitats and species in the South East;
- Quantity of rainfall;
- River flows and groundwater levels; and
- Future development and flood risk.

Indicator 22 Annual average surface temperature in central England

Background to the indicator

The indicator compares annual mean global temperature and temperatures over central England with the average temperatures recorded between 1961 and 1990 (Figure 46). Increased global warming is accompanied by climate change. Possible impacts of climate change include loss of habitats and species, sea level rise and increases in storm damage, droughts and flooding.

⁶⁵ South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

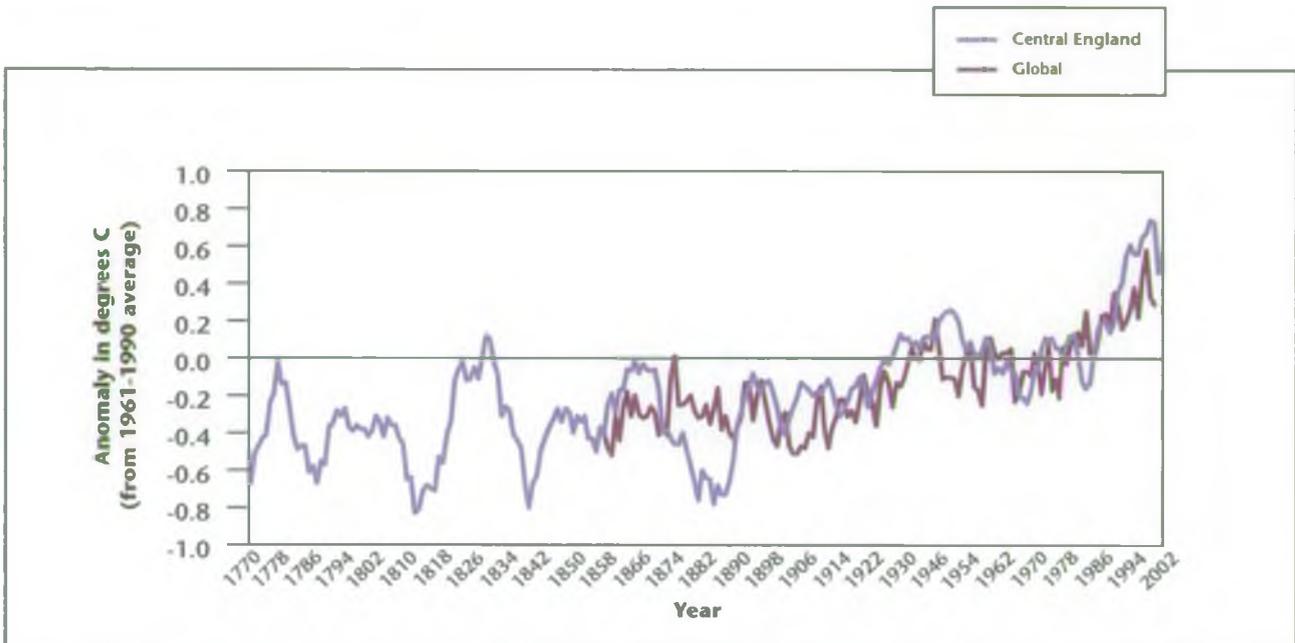


Figure 46: Average surface temperature, 1772-2001, global and central England⁶⁶

Trends

Average global surface temperature has increased by 0.4 to 0.7°C since the late 19th century. During the 20th century the annual mean central England temperature has warmed by about 0.6°C. This warming is accompanied by climatic change including the increased frequency and magnitude of extreme weather events.

Targets

There are no specific targets for central England temperature. Targets have been set for the potential causes of climate change, such as emissions of greenhouse gases (see indicators below).

It is anticipated that climate change will lead to a rise in global mean sea level, primarily as a result of thermal expansion of ocean water and glacial melt. Coastal areas could face a significant risk of increased flooding, inundation and erosion as a result of sea level rise, with or without more frequent and severe storm surges.

England and Wales are vulnerable to a rise in sea levels and to other potential changes in storm frequency and intensity. Over 8 per cent of the land area of England, including 50 per cent of grade one agricultural land, parts of several major urban centres and areas of internationally-designated conservation sites, are protected by river and coastal defences. Whilst climate change is unlikely to significantly change the total area at risk of flooding, it will increase the risk to which these areas are exposed.

Indicator 23 Sea level change at Sheerness, Kent

Background to the indicator

The indicator reveals changes in mean sea level at Sheerness in Kent over the past 150 years (Figure 47).

Trends

Monitoring at Sheerness in Kent indicates a rise in mean sea level of 2.2 mm per year. This contrasts with a lower rise of 0.7 mm per year at Aberdeen. This reflects rising sea level combined with

⁶⁶ Source: Hadley Centre for Climate Prediction and Research

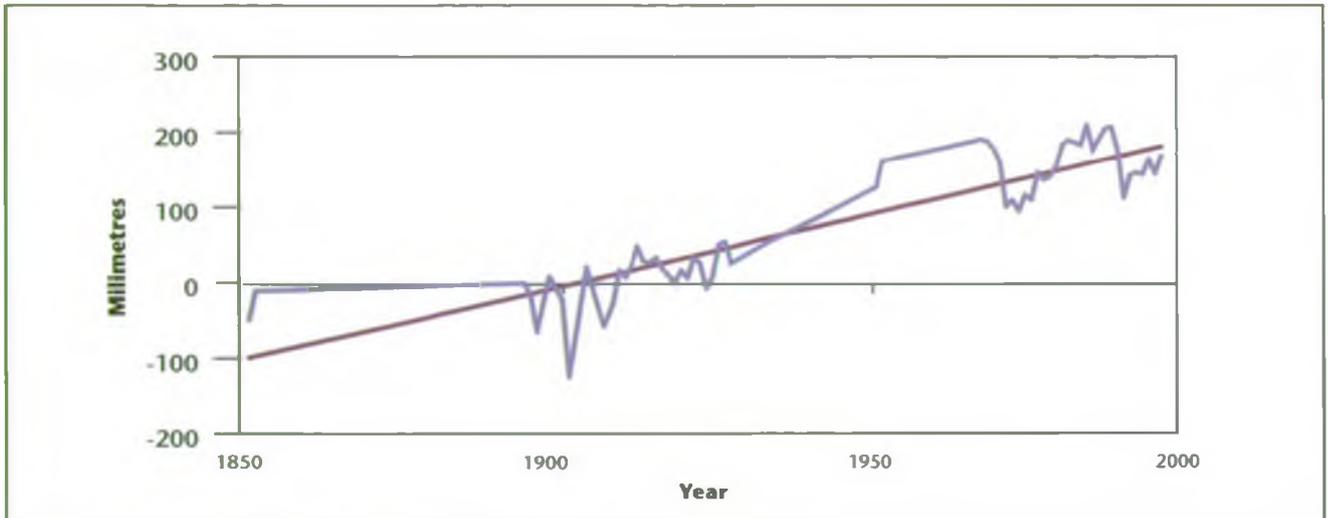


Figure 47: Changes in mean sea level at Sheerness, 1850-1997⁶⁷

geographic differences due to long-term geological movements whereby the south and east are sinking and the north rising. The relatively high increase in sea level around the South East places the region under greater threat of coastal flooding and erosion than other parts of the UK.

information on possible climate change in the South East. The maps opposite illustrate the implications of two different scenarios - high and low greenhouse gas emissions - for three aspects of climate change: daily temperature (Figure 48), summer precipitation (Figure 49) and winter precipitation (Figure 50).

Targets

There are no specific targets for sea level rise. It is an indicator of the effects of climate change. Targets have been set for the potential causes of climate change, such as emissions of greenhouse gases (see indicators 26 and 27).

Trends

Taking the high scenarios, by the 2080s⁶⁸ it would be expected that:

- summers will be hotter by 6°C and have 60 per cent less precipitation; and
- winters will be warmer by 1.5-3.5°C and have 30 per cent more precipitation.

There is also an expectation it could be warm enough for 40 to 100 extra days of plant growth per year⁶⁹ (currently about 250 days per year). Although the temperatures may be acceptable for increased periods of plant growth, the drier summers coupled with the same daylight hours as today mean in reality the increase in plant growth may not be seen.

Indicator 24 Future climate change in the South East

Background to the indicator

Climate change scenarios have been developed for the UK, which present information on the possible changes in the UK climate over the 21st century. The latest scenarios provided by the UKCIP in 2002, the UKCIP02 scenarios, were launched by the Government in April 2002. The scenarios provide

⁶⁷ Source: NERC Proudman Oceanographic Laboratory

⁶⁸ 2080s: 30 year period centred on the 2080s (2071 to 2100)

⁶⁹ South East Climate Change Partnership (2002) *Climate Change Impacts - looking ahead for the South East*

Figure 48: Change in annual average daily temperature in the South East under low and high emissions scenarios⁷⁰

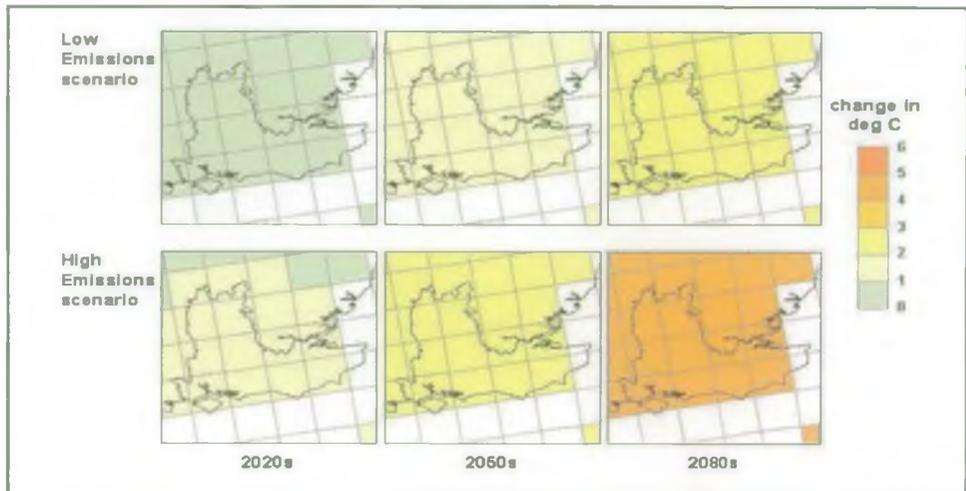


Figure 49: Percentage change in summer precipitation in the South East under low and high emissions scenarios⁷¹

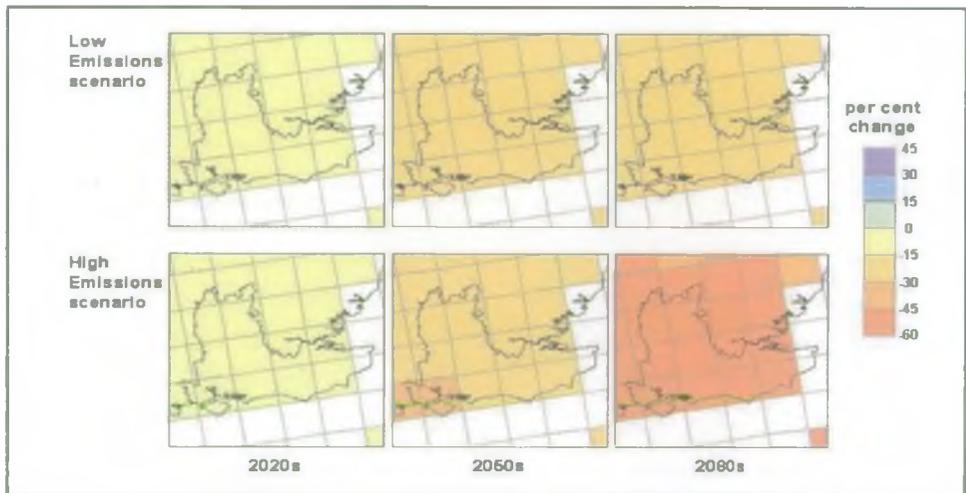
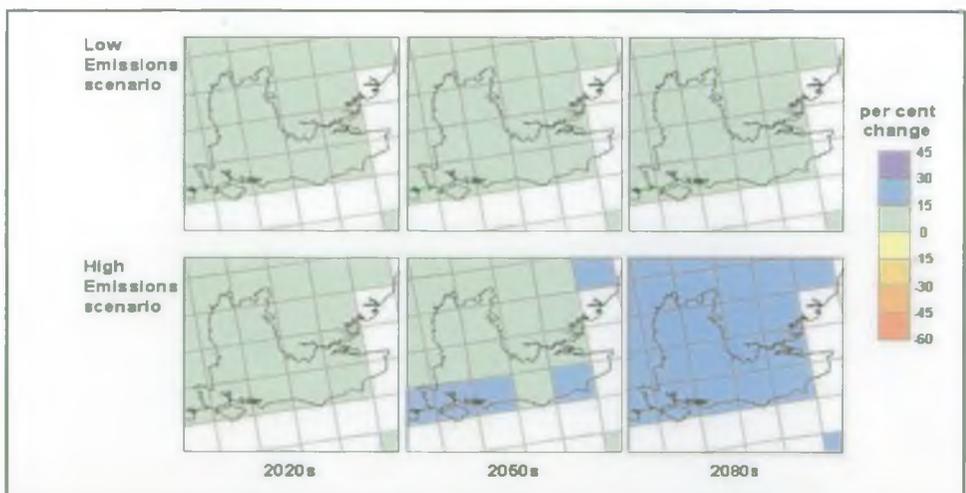


Figure 50: Percentage change in winter precipitation in the South East under low and high emissions scenarios⁷²



⁷⁰ Source: UKCIP02 Climate Change Scenarios http://www.ukcip.org.uk/climate_change/regional_maps.html

⁷¹ Source: UKCIP02 Climate Change Scenarios http://www.ukcip.org.uk/climate_change/regional_maps.html

⁷² Source: UKCIP02 Climate Change Scenarios http://www.ukcip.org.uk/climate_change/regional_maps.html

Targets

There are no specific targets relating to the impacts of climate change although targets have been set for the potential causes of climate change, such as emissions of greenhouse gases (see indicators 26 and 27).

Indicator 25 Final energy consumption in the UK by sector

Background to the indicator

The major source of carbon dioxide is fossil fuel combustion for energy purposes. Demand for energy in all its forms is a key determinant of carbon dioxide emissions. Energy efficiency and reduced consumption of fossil-fuel derived energy is a key requirement for tackling climate change. The trends in final energy consumption are needed in order to focus policy in the right areas.

Trends

Transport has been the biggest single energy user in the UK for the past 16 years and accounted for 36

per cent of final energy use in 2002. Although industrial energy consumption has declined this has been more than offset by increases in the transport and, to a lesser extent, household sectors. The overall increase in energy consumption in the transport sector is due to increased road traffic. This increase has outweighed improvements in energy efficiency of vehicles and led to increased emissions of greenhouse gases.

Targets

There are no specific targets for energy consumption, but the targets for carbon dioxide emissions and renewable energy for example are clearly relevant (see below).

Indicator 26 UK greenhouse gas emissions

Background to the indicator

All countries party to the United Nations Framework Convention on Climate Change have acknowledged the need to reduce emissions of greenhouse gases. In

⁷³ Source: Department of Trade and Industry

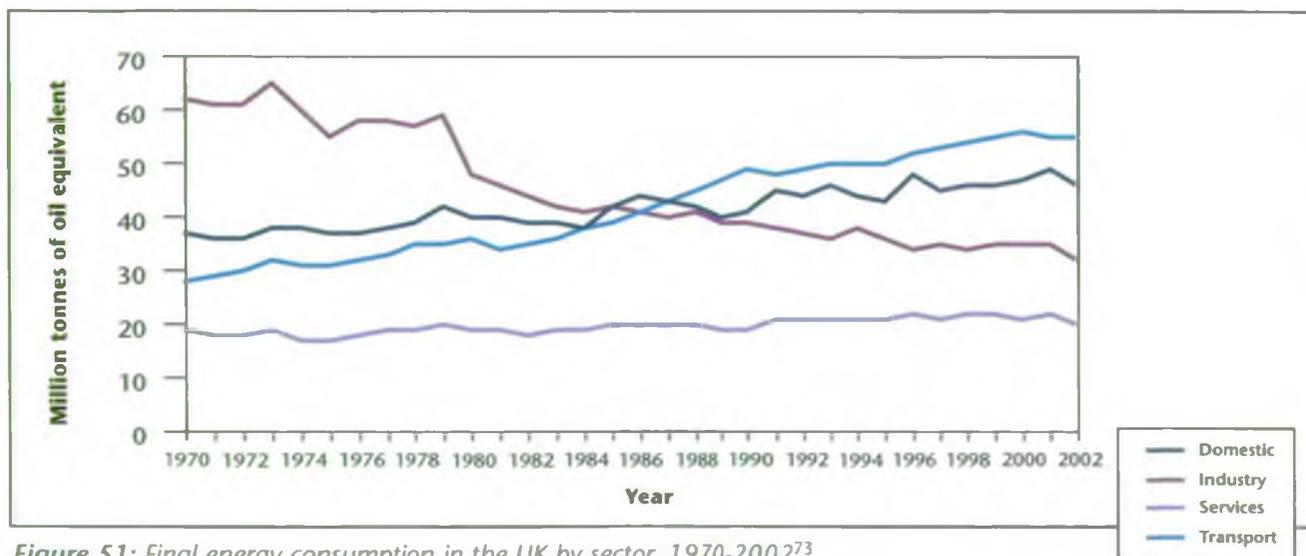


Figure 51: Final energy consumption in the UK by sector, 1970-2002⁷³

Note: figures for 2002 are provisional; services include the commercial sector, public administration and agriculture.

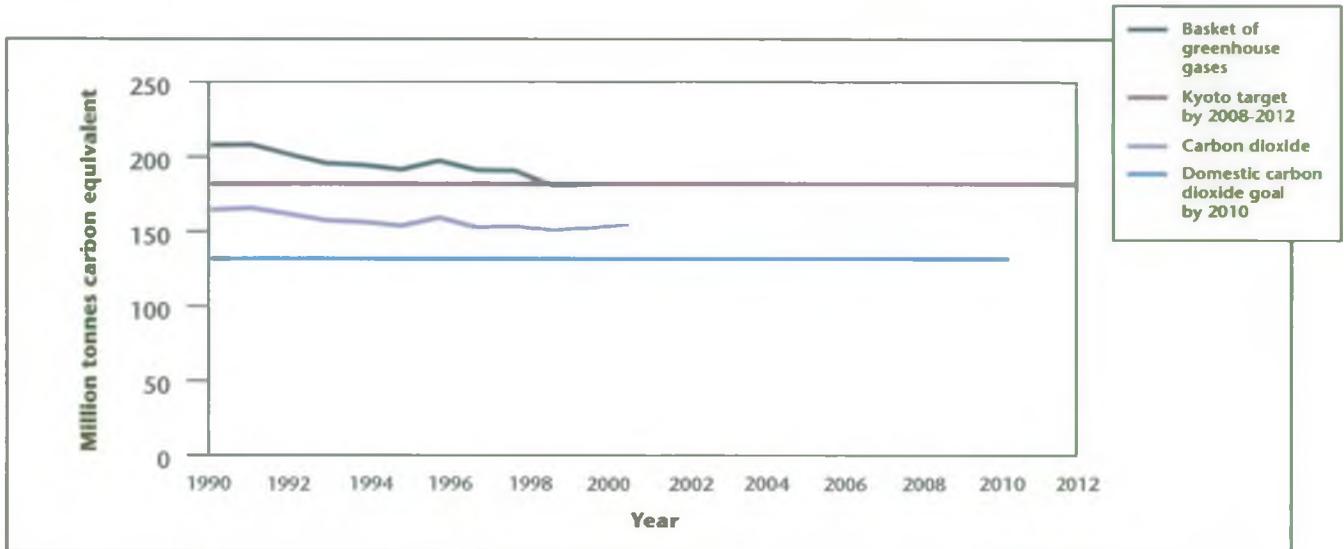


Figure 52: UK emissions of greenhouse gases, 1990-2012⁷⁴

2000, carbon dioxide accounted for 84 per cent of total UK greenhouse gas emissions. Transport has been the fastest growing source in the UK as a result of the sharp increase in road traffic, particularly in the 1980s (see Section 3.1 Indicator 6). Figure 52 shows the emissions of greenhouse gases from 1990 to 2000 and the targets associated with these emissions.

Trends

The UK is one of the few industrialised countries to have reduced its greenhouse emissions over the last decade. Emissions of the 'basket' of six greenhouse gases (weighted by global warming potential) fell by 13 per cent between 1990 and 2000. Significant cuts in carbon dioxide emissions were achieved between 1990 and 2000 mainly as a result of a shift from coal to gas and nuclear power for electricity generation and also efficiency improvements in power production following liberalisation of the electricity market⁷⁵.

Between 1990 and 2000, emissions of methane decreased by 33 per cent principally due to the decline in coal mining. In addition, landfill methane emissions fell by 41 per cent between 1990 and 2000 mainly because of increased collection of landfill gas for use as energy and for environmental control purposes⁷⁶.

Targets

Under the Kyoto Protocol, the UK has a legally binding target to reduce emissions of the basket of six greenhouse gases by 12.5 per cent relative to the 1990 level over the period 2008-2012. The UK has also adopted more demanding domestic goals to cut carbon dioxide emissions by 20 per cent below 1990 levels by 2010 and by 60 per cent by 2050. A recent audit of UK climate change policies and programmes for the UK Sustainable Development Commission predicts that the UK's target under the Kyoto Protocol will be achieved. However, the audit expresses doubts over the achievement of the Government's domestic goal to cut carbon dioxide emissions by 20 per cent below 1990 levels by 2010 and predicts that, without further measures, emissions will fall by at most 12.6 per cent by 2010⁷⁷.

⁷⁴ Source: National Environmental Technology Centre

⁷⁵ European Environment Agency (2003) *Greenhouse gas emission trends in Europe, 1999-2000*

⁷⁶ Defra (2001) *The UK's Third National Communication under the United Nations Framework Convention on Climate Change*

⁷⁷ Sustainable Development Commission (2003) *Policy Audit of UK Climate Change Policies and Programmes*, report by the Edinburgh Centre for Carbon Management



Indicator 27 UK carbon dioxide emissions by end user

Background to the indicator

Carbon dioxide is the most important greenhouse gas and indicators of trends by end users are required to target policy measures and monitor their effect. Figure 53 shows the UK carbon dioxide emissions by end user from 1970 to 2000.

Trends

The general decline in carbon dioxide emissions reflects increased efficiency in energy use, a switch in power stations from coal to natural gas and nuclear, and the decline in heavy industry. Between 1970 and 1997, emissions from industry and households fell by 48 per cent and 26 per cent respectively. However, in the same period, carbon dioxide emissions from transport rose by 87 per cent. The increase in transport emissions reflects the increase in road traffic, which has outweighed improvements in energy efficiency of vehicles.

The Government's 10 Year Transport Plan⁷⁹ states that total road traffic, measured in vehicle kilometres, is forecast to grow by 22 per cent between 2000 and

2010. Carbon dioxide emissions from the transport sector currently represent a quarter of the UK's total emissions and are forecast to increase by 2010 in line with traffic growth. Importantly, the South East along with the East of England has the highest level of household car ownership in the UK (1.2 cars per household) and residents of the South East travel further than those of any other region (8,067 miles per person per year) and 85 per cent of total distance travelled is by private car⁸⁰.

Targets

Under the Kyoto Protocol, the UK has a legally binding target to reduce emissions of the basket of six greenhouse gases by 12.5 per cent relative to the 1990 level over the period 2008-2012. More demanding domestic goals have been adopted to cut carbon dioxide emissions by 20 per cent below 1990 levels by 2010 and by 60 per cent by 2050. For its part, the Environment Agency will seek to reduce greenhouse gas emissions from processes it regulates proportionate to the progress needed to achieve this Government target and goal.

⁷⁸ Source: National Environmental Technology Centre

⁷⁹ DETR (2000) *Transport 2010: The 10 Year Plan*

⁸⁰ Department for Transport (2002) *Transport Statistics Bulletin. Regional Transport Statistics: 2002 edition*

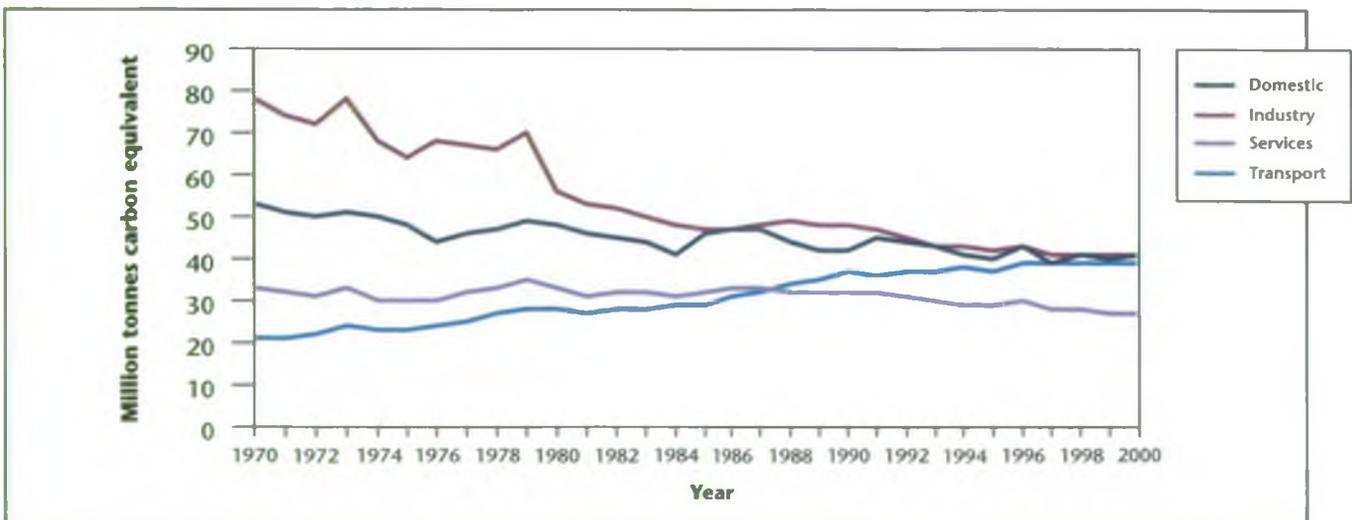


Figure 53: UK carbon dioxide emissions by end user, 1970-2000⁷⁸

Note: services includes emissions from public administration, agriculture, military, exports, marine bunkers, miscellaneous emissions and other emissions.

Other relevant targets include European-level agreements with car manufacturers to improve the average fuel efficiency of new cars by at least 25 per cent by 2008-2009⁸¹.

gas and the proportion falls to 0.05 per cent if energy derived from waste is excluded.

Targets

The Government has placed an obligation on electricity suppliers to increase the proportion of electricity provided by renewable sources to 10 per cent by 2010, subject to the cost to consumers being acceptable. The recent *Energy White Paper* includes an ambition to increase renewables share of electricity generation to 20 per cent by 2020 and, in addition, restates the target to at least double the UK's Combined Heat and Power capacity by 2010.

In October 2002, the Regional Assembly published a strategy for promoting energy efficiency and renewable energy in the South East⁸². The proposals within the strategy will, after consultation, form the basis of an amendment to the Regional Planning Guidance for the South East (RPC9). The strategy proposes a series of minimum targets for the percentage of electricity to be generated from renewable sources, culminating in a target of 14 per cent by 2026 (sufficient to power one million homes

Indicator 28 Percentage of electricity generated from renewable sources

Background to the indicator

To reduce emissions of carbon dioxide, the main greenhouse gas, more energy needs to be derived from sources which emit little or no carbon dioxide, in particular from new and renewable sources. In addition to hydropower, other sources currently include landfill gas and onshore wind. Figure 54 shows the percentage of energy generated from renewable sources for the UK.

Trends

Renewables provided 3.4 per cent of the electricity generated in the UK in 2001. At present only a very small proportion of electricity generation in the South East is from renewable sources, 0.65 per cent of the total. Most of this is from the combustion of landfill

⁸¹ <http://europa.eu.int>

⁸² South East England Regional Assembly (2002) *Harnessing the Elements: A Strategy for Energy Efficiency and Renewable Energy (Consultation Draft)*

⁸³ Source: Department of Trade and Industry

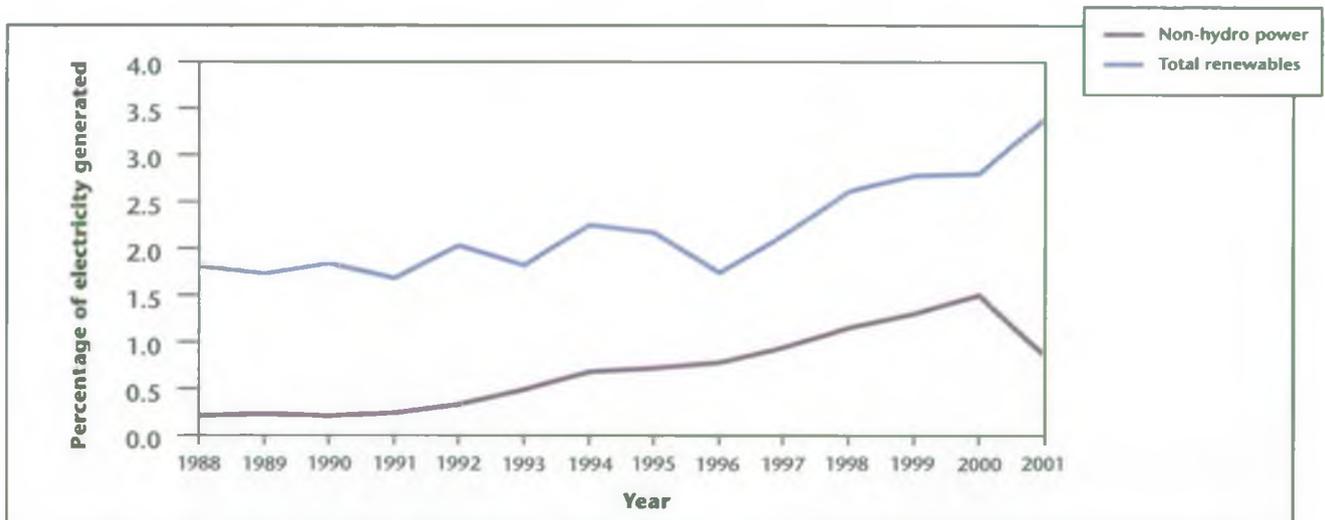


Figure 54: Percentage of electricity generated from renewable sources in the UK, 1988-2001⁸³

and save around 1.6 million tonnes of carbon dioxide) (see Table 9). Unlike the national targets for renewable energy (5 per cent by the end of 2003 and 10 per cent by 2010), the Regional Assembly's proposed targets exclude energy derived from municipal, commercial and industrial waste, including landfill gas combustion. Biomass, wind energy and solar energy are expected to provide the greatest contribution to meeting the targets. Indicative targets are also put forward for the following sub-regions: Thames Valley and Surrey, East and West Sussex, Hampshire and Isle of Wight and Kent.

Table 9: Minimum targets for electricity generated from renewable sources in the South East

<i>Year/timescale</i>	<i>Installed capacity (MW)</i>	<i>% regional electricity generation capacity</i>
<i>2010</i>	<i>450</i>	<i>4</i>
<i>2016</i>	<i>700</i>	<i>6</i>
<i>2026</i>	<i>1610</i>	<i>14</i>

Actions and responses

Key actions to mitigate and adapt to climate change in the South East. The Environment Agency will:

- Raise awareness of the significance of climate change impacts and the need to mitigate and adapt to them;
- Facilitate and encourage the reduction of greenhouse gas emissions;
- Reduce greenhouse gas emissions resulting from its own activities and lead by example;
- Continue to support the work of the South East Climate Change Partnership;
- Review and update the regional drought plan to take full account of climate changes;
- Help reduce water demand through the abstraction licensing process and publish Catchment Abstraction Management Strategies for all catchments in the South East;
- Support the Regional Assembly's strategy for promoting energy efficiency and renewable energy in the South East;
- Continue to advise local authorities on the appropriate siting of new development in order to minimise flood risk;
- Encourage 'carbon neutral' development and ensure that new development incorporates measures to reduce water and energy use and minimise waste generation.



3.7 Protecting and Improving Land Quality

Protecting and Improving Land Quality

Land is a valuable resource and an appropriate balance must be struck between a wide range of competing uses including agriculture, housing, industry, conservation and recreation.

Key messages

- The increasing population, the trend towards rural living and the trend towards smaller households are increasing the demand for greenfield land for housing in the South East;
- Concentrating development on previously developed 'brownfield' sites helps to relieve pressure for development in the countryside and encourages the reuse of vacant and derelict land and buildings;
- Two thirds of land in the South East is farmed and agricultural practice has a major effect on land quality;
- The main types of diffuse pollution from agriculture are nutrients from fertilisers and organic wastes, pesticides and eroded soil;
- Poor land management practices can lead to soil erosion, flooding and diffuse pollution.

Background

Land is a valuable resource and its conservation and enhancement needs careful management. Protecting and restoring the land will help improve peoples' quality of life, enhance the environment for wildlife and protect the water environment. Society is becoming increasingly aware of the environmental importance of land, but a greater appreciation of appropriate land management to protect soils is required.

The quality of land and soils also affects water quality and flood protection. Run-off and loss of soil as a result of inappropriate land management practices is detrimental to the environment. Similarly pollutants in the air can eventually find their way into soils.

The increasing population and the increase in the number of households in the South East exerts a significant pressure on land. The 2001 census revealed that over the preceding 20 years the population of England grew by 5 per cent while the population of the South East increased by 10.4 per

cent to just over 8 million. During the same period the number of households in the South East increased from 2.64 million in 1981 to around 3.4 million, a 29 per cent increase. Average household size fell from 2.74 persons in 1981 to 2.35 persons in 2001⁸⁴. This trend reflects social changes with people living longer, having fewer children and many more living alone. Smaller households are relatively high users of energy and water and tend to require more land per household member.

Increased population and an increase in the number of households have led to a commensurate rise in the demand for new homes. The Government wants 60 per cent of additional homes in England to be built on previously developed (brownfield) land by 2008 (including through the conversion of existing buildings). Concentrating new housing development on previously developed urban sites serves a dual purpose. Firstly, it helps to relieve pressure for development in the greenbelt and the wider countryside and, secondly, it helps to encourage

⁸⁴ Source: Office for National Statistics



urban regeneration and the 'urban renaissance' envisaged by Government. The push to focus development on brownfield sites also encourages the reuse of vacant and derelict land and buildings and the clean up of contaminated sites.

Agriculture is a major influence on land quality and has created a legacy of countryside features and wildlife habitats. Farming is by far the major land use in the South East. Since the Second World War the drive for higher agricultural output has been accompanied by an intensification in the use of land, fertilisers, pesticides, energy, irrigation and drainage and this has led to adverse impacts on the environment affecting water, land, air, wildlife and landscape. However, farmers are increasingly seen as guardians of the countryside as well as food producers. This change has led to increased pressure for reform of the Common Agricultural Policy (CAP) to enable increased provision of financial incentives for environmental benefit. Current agri-environment schemes involve Government payments to farmers who adopt land management practices that protect biodiversity, landscape and historical features. Several agri-environment schemes operate in the UK including the Environmentally Sensitive Areas scheme and the Countryside Stewardship Scheme.

Roles and responsibilities

Land is regulated by a wide range of organisations. Key bodies involved in regulating land use include Defra, the Office of the Deputy Prime Minister (ODPM), local authorities, the Environment Agency and other organisations such as the Forestry Commission, the Countryside Agency and English Nature.

The Environment Agency has duties that affect land including flood defence, waste management, pollution prevention, contaminated land and water resource responsibilities. The Environment Agency is a statutory consultee during the preparation of development plans and on a number of planning applications where the Agency seeks to ensure that new development only proceeds where it does not:

- Adversely affect river corridors and the natural water environment;
- Pose an unacceptable risk of flooding from rivers or the sea, or exacerbate flooding elsewhere;
- Create an unacceptable risk of contamination to air, land and ground and surface waters; or
- Require additional water resources beyond those available for industrial and public supply.

Local authorities have a wide range of responsibilities relevant to the land including responsibility for the planning system that regulates the development and use of land. They draw up development plans which allocate areas of land for future housing, industrial and commercial development and recreation. These plans also include policies against which future planning applications are assessed.

Local authorities also have duties in relation to contaminated land. In the past, the problems of contaminated land have been tackled almost exclusively in the context of redevelopment. However, under the Part IIA regime of the Environmental Protection Act 1990, introduced in England in April 2000, local authorities now have a responsibility to proactively inspect their areas and ensure the remediation of any contaminated land.

Several other non-departmental government bodies have key roles to play in land regulation. These include:

- The Forestry Commission which has responsibility for forestry policy throughout Britain;
- The Countryside Agency which has a particular interest in countryside management and rural development and in designations such as Areas of Outstanding Natural Beauty (AONB) and National Parks; and
- English Nature, the Government's wildlife advisor, which owns and manages many National Nature Reserves and is responsible for Sites of Special Scientific Interest (SSSI).

Defra has overall responsibility for agriculture and influences the environmental quality of agricultural land through its administration of various agri-environment schemes. In addition, patterns of agricultural production in the UK are heavily influenced by decisions made at the European level. The CAP exerts a significant influence on UK farming and has been a key driver for agricultural intensification.

Defra has a draft *Soil Strategy for England*⁸⁵ which is intended to lead towards the creation of systems, including monitoring frameworks and indicators, to judge whether the best possible use is made of the soil. It also reviews each of the many policies that potentially affect soil to check they are contributing to that result.

Land quality in the South East

Whilst around 40 per cent of the South East is protected by some form of conservation designation, such as AONB or SSSI, land quality is under pressure from development, agriculture, former waste and industrial sites, and construction.

In the South East the density of development is relatively high, dispersed suburban housing is widespread and the area of open countryside is diminishing. The pressure to accommodate increased housing is particularly acute in the South East. The *Regional Planning Guidance for the South East (RPG9)*⁸⁶ states that the region should accommodate an annual average rate of 39,000 net additional dwellings up to the year 2016. In addition, the Government has announced plans to accelerate the development of new communities in three growth areas - the Thames Gateway, Milton Keynes-South Midlands and Ashford⁸⁷.

However, the supply of previously developed land in the South East is less than in other regions. Generally, the more urbanised an area and the greater the level of industrial dereliction it has experienced, the greater the level of previously developed land. The South East has relatively few heavily urbanised areas and a substantially lower level of industrial dereliction than other regions.

Key agricultural issues affecting the state of the land in the South East are:

- Inappropriate soil management practices leading to diffuse pollution, sedimentation, flooding and loss of top soil;
- Reliance on pesticide use in intensive agricultural and horticultural systems;
- Loss of nutrients and organic wastes from agricultural sources;
- Management of agricultural land as a flood risk reduction measure;
- Farm diversification; and
- Future impacts on agricultural practices from climate change including changed yields and growing seasons and increased demand for irrigation.

Indicators

There are three indicators to demonstrate the state of the land environment:

- Indicator 29** New homes built on previously developed land
- Indicator 30** Area under agri-environment schemes
- Indicator 31** Pollution from agricultural sources

Indicator 29 is used in the *Regional Sustainable Development Framework*⁸⁸ to report on the regional objective 'To improve efficiency in land use through the re-use of previously developed land and existing buildings, and encourage urban renaissance'. Several other sections of this report (such as Managing Flood Risk, Protecting and Enhancing Water Quality, Managing Waste, Maintaining and Enhancing Biodiversity, Improving Air Quality and Additional Quality of Life Measures) include indicators relating to land quality and should be read in conjunction with this section. Particularly relevant indicators in other sections include:

⁸⁵ DETR and MAFF (2001) *Draft Soil Strategy for England*. A Consultation Paper

⁸⁶ ODPM (2001) *Regional Planning Guidance for the South East (RPG9)*

⁸⁷ ODPM (2003) *Sustainable communities in the South East: Building for the future*

⁸⁸ South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

- Indicator 2: Sulphur dioxide concentration
- Indicator 10: Nutrient status of freshwaters
- Indicator 12: Water pollution incidents
- Indicator 13: Disposal method, type and quantity of waste
- Indicator 21: Future development and flood risk
- Indicator 32: Distribution of key habitats and species
- Indicator 39: Use of pesticides in agriculture and horticulture

Indicator 29 New homes built on previously developed land

Background to the indicator

Concentrating new development on previously developed land can help to protect the countryside from further development and encourage urban regeneration. However, previously developed land is not evenly distributed in the South East. Its availability depends on a range of factors including the extent of

existing urbanisation and the level of industrial dereliction or decline experienced in the past. The South East has relatively few heavily urbanised areas and less of a history of industrial dereliction and decay than other regions.

It should be recognised that the supply of previously developed land is finite and the continued achievement of high percentages of development on previously developed sites cannot logically be sustained. The long-term supply of previously developed land will inevitably limit the extent to which target percentages can be met regardless of planning policies.

Overall the South East has among the lowest average densities for new dwellings in the country and there is a need to increase housing density and thus use land more efficiently. Current Government guidance advises local authorities to avoid developments which make inefficient use of land (those with less than 30 dwellings per hectare) and encourage housing development which uses land more efficiently (with between 30 and 50 dwellings per hectare)⁸⁹.

⁸⁹ DETR (2000) *Planning Policy Guidance Note 3: Housing*

⁹⁰ Source: Defra

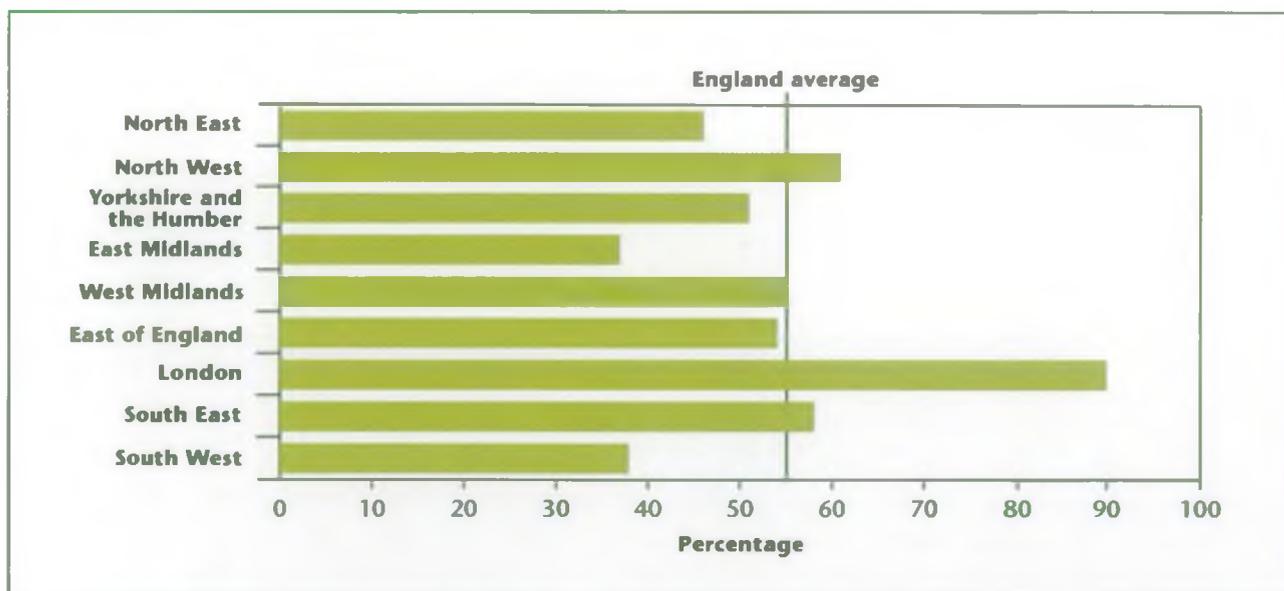


Figure 55: Percentage of new homes built on previously developed land (excluding conversions), 1997-2000⁹⁰

Note: the regional figures do not contain estimates for conversions, so are therefore not directly comparable with the regional targets or the national Headline Indicator. At the national level conversions are estimated to account for about 3 per cent

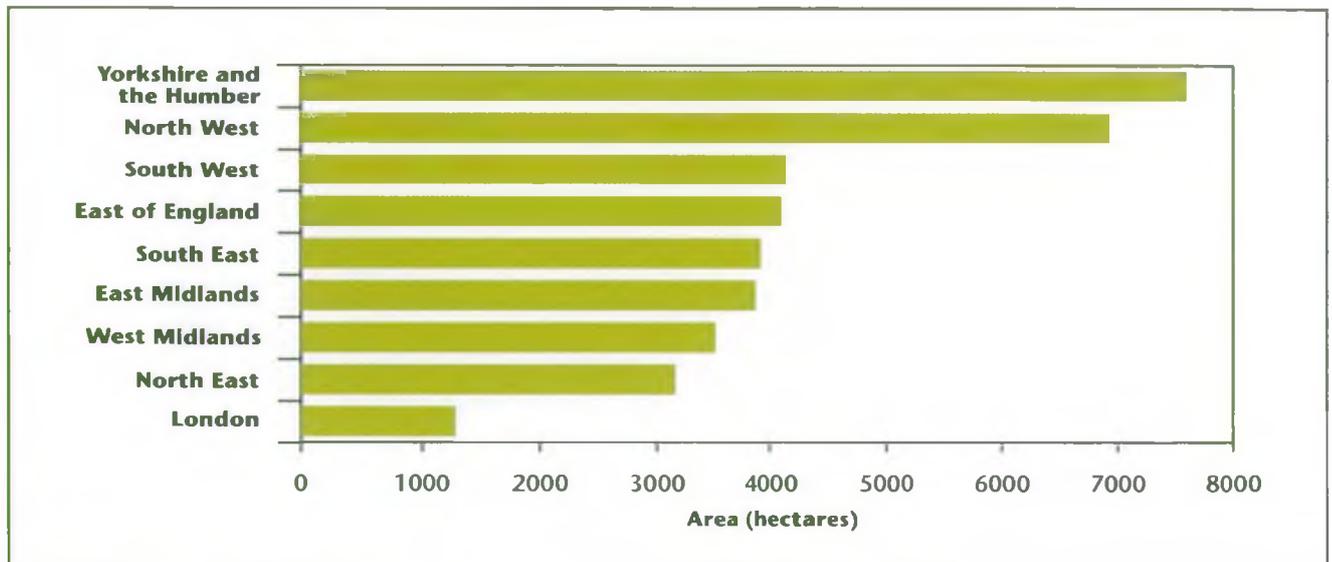


Figure 56: Area of vacant and derelict land and vacant buildings, 1998⁹¹

Vacant and derelict land and vacant buildings represent a wasted resource particularly in the South East where there is significant development pressure on the land. Some vacant and derelict land may be contaminated as a result of previous industrial use. There is no reliable estimate of the number of contaminated sites in the UK or the overall scale of the problem but the Environment Agency estimates that there could be between 5,000 and 20,000 contaminated sites in England and Wales that may have an impact on human health or the wider environment. The vacant and derelict sites in the region are concentrated in several areas including the Thames Gateway, the Kent coast and around Portsmouth.

Between 1997 and 2000 on average 55 per cent of new houses in England were built on previously developed land (Figure 55). The South East had the third highest proportion of new homes built on previously developed land (58 per cent) behind the North West (61 per cent) and London (90 per cent) (Figure 56). In addition, the number of vacant properties in the South East is decreasing annually but remains high. This illustrates the potential for more efficient use of existing housing.

The South East has just under 4000 hectares of vacant and derelict land and vacant buildings. In comparison Yorkshire and the Humber region has around 7500 hectares whilst the North West region has just under 7000 hectares. London contains the least area of all regions at around 1250 hectares.

Targets

By 2008, 60 per cent of additional housing in England should be provided on previously developed land (and through the conversion of existing buildings). The RPG for the South East (RPG9) also adopts a target of 60 per cent for the 'Rest of the South East' (the South East plus the counties of Bedfordshire, Essex and Hertfordshire which, since 2001, form part of the East of England region)⁹².

Indicator 30 Area under agri-environment schemes

Background to the indicator

Two major incentive (grant-aided) schemes encourage sustainable land management: Environmentally Sensitive Areas (ESA) and Countryside Stewardship Schemes (CSS). The schemes are voluntary and offer payments to farmers who adopt land management practices that protect biodiversity, landscape and historical features. It is worth noting that agri-

⁹¹ Source: Department for Transport, Local Government and the Regions
⁹² ODPM (2001) *Regional Planning Guidance for the South East (RPG9)*

environment schemes are often oversubscribed and about 20 per cent of CSS applications are rejected annually as a result of budgetary constraints. The ESA scheme operates in 22 areas of England designated as being of high environmental value whilst the CSS operates throughout England and is the Government's main incentive scheme for the wider countryside. The South East is home to four ESAs - the South Downs, the Test Valley, the Upper Thames Tributaries and the North Kent Marshes (see Figure 57).

The Government has agreed to establish an 'Entry-Level' agri-environment scheme (ELS). If pilot schemes are successful, this option will be made available to farmers in England from 2005⁹³. One of the main aims of the ELS is to make agri-environment schemes widely available and accessible to all to encourage uptake for the benefit of the environment.

The uptake of other schemes such as the Government's Organic Farming Scheme and the Woodland Grant Scheme also provide an indication of the degree to which land is managed sustainably.

Table 10: Extent of agri-environment schemes in the South East, 2000⁹⁴

	Number of agreements	Area under agreement (ha)
Environmentally Sensitive Area	776	30569
Countryside Stewardship Scheme	1415	24058

⁹³ Policy Commission on the Future of Food and Farming (2002) *Farming & Food: a sustainable future*

⁹⁴ Source: Farming and Rural Conservation Agency

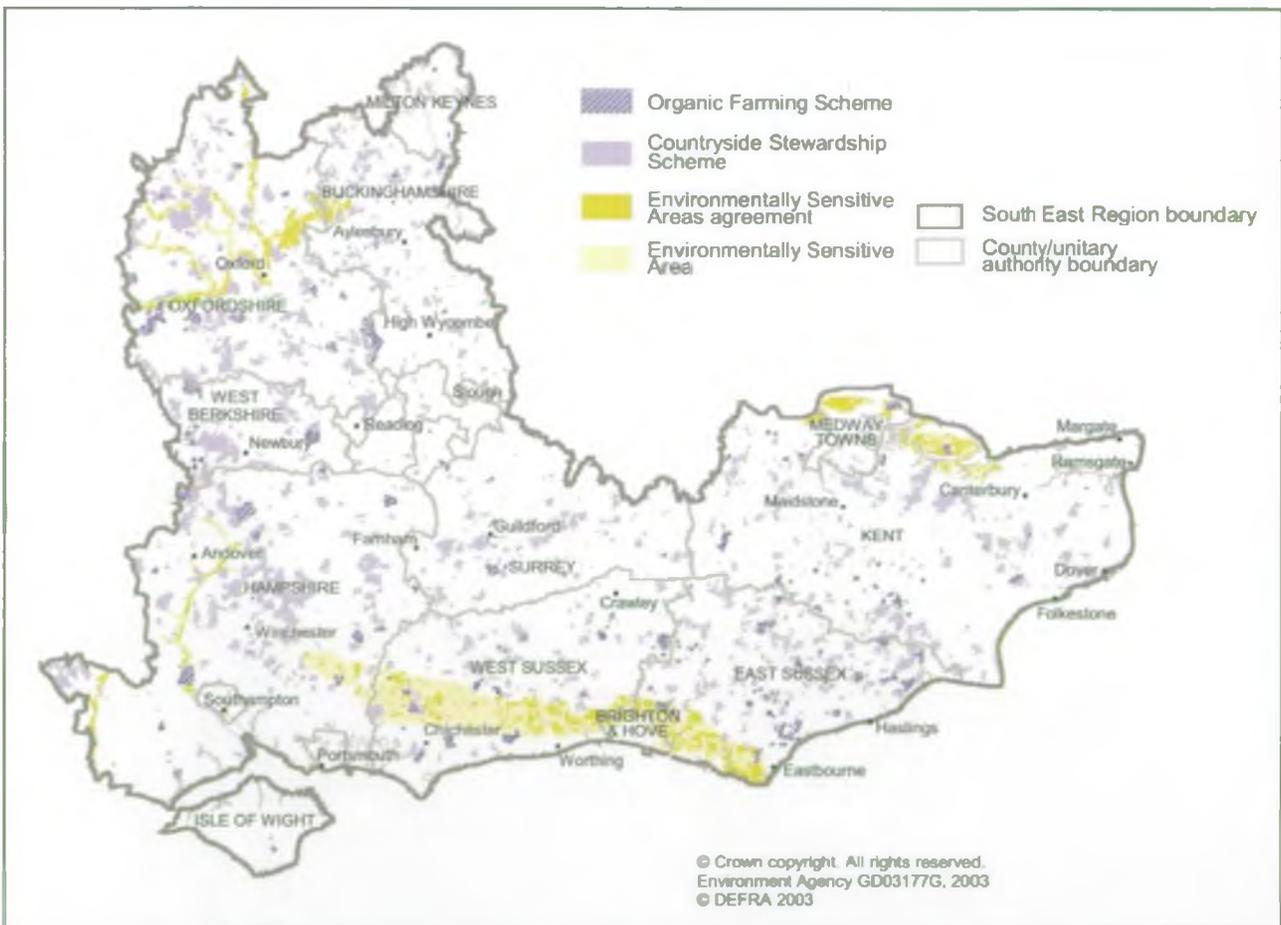


Figure 57: Environmentally Sensitive Areas, Countryside Stewardship Schemes and Organic Farming Schemes in the South East

Trends

The area of land under ESA or CSS agreement in the UK has risen significantly over the past decade. In the South East 30,569 and 24,058 hectares are covered by ESA and CSS agreements, respectively. The introduction of the new ELS in the future will make drawing conclusions on this indicator difficult.

Targets

The *Regional Sustainable Development Framework*⁹⁵ includes a target to increase the area of land covered by sustainable land management agreements such as those under the ESA and CSS schemes, within the period to 2006.

P

Indicator 31 Pollution from agricultural sources

Background to the indicator

Agriculture is a source of diffuse pollutants including silt from soil wash and soil erosion, nutrients from the application of fertiliser or spreading of organic wastes and pesticides from the handling and application of these chemicals. The increased intensification of farm production and the great steps made to reduce point source pollution from factories and sewage works mean that agriculture is now a major polluter of water. In England:

- Over 70 per cent of nitrate and 40 per cent of phosphate in waters originate from agricultural land;
- Up to half of the bathing waters are affected by short term contamination from agricultural pollution, mainly by microbes from livestock manure being washed off farm land after rain;
- The majority of silt loads to rivers and lakes are derived from heavy soil erosion from agricultural land. This alters the composition of gravel sediments, reducing water clarity and causing serious problems for fish, plants and insects; and
- Pesticides can contaminate drinking water sources, requiring expensive additional treatment at water

works to remove pesticides before this water can be supplied to consumers.

The Environment Agency wants to see the environment placed at the heart of farm businesses' thinking and supports the introduction of farm management measures to promote better management of soils, water and air. One way of helping achieve this is to develop tools to deliver advice on good environmental practice to farmers. The Environment Agency publication *Best Farming Practices: profiting from a good environment*⁹⁶ emphasises the protection of soil resources on agricultural land and provides an efficient working handbook for farmers and advisors. It covers several aspects of whole farm management that can be used to reduce costs, improve environmental quality and help ensure sustainable use of resources including the soil.

The Environment Agency is developing an Environmental Management System for Farms which sets out the environmental management standards that farmers need to meet to ensure compliance with environmental regulations. This will not only assist farmers to comply with legislation but reduce their impact on the environment.

Figure 58 presents data on pollution incidents occurring at agricultural premises. Incidents can be due to a range of pollutants not just agricultural pollutants. Figure 59 presents data on agricultural

⁹⁵ South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*

⁹⁶ Environment Agency (2003) *Best Farming Practices: profiting from a good environment* (2nd Edition)



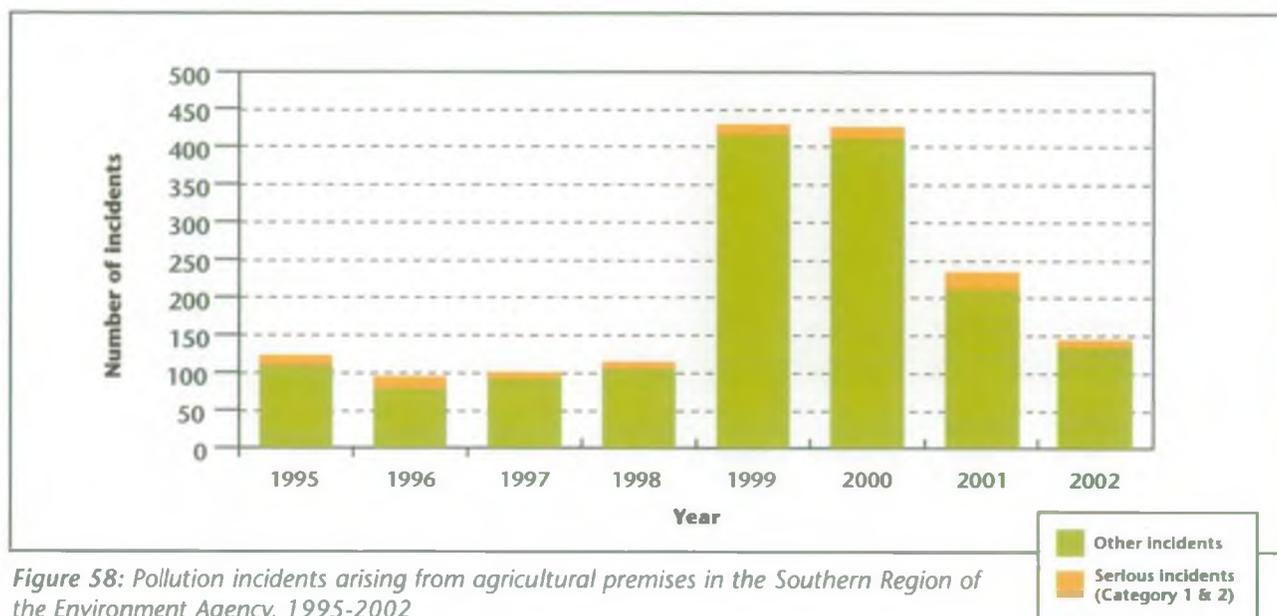


Figure 58: Pollution incidents arising from agricultural premises in the Southern Region of the Environment Agency, 1995-2002

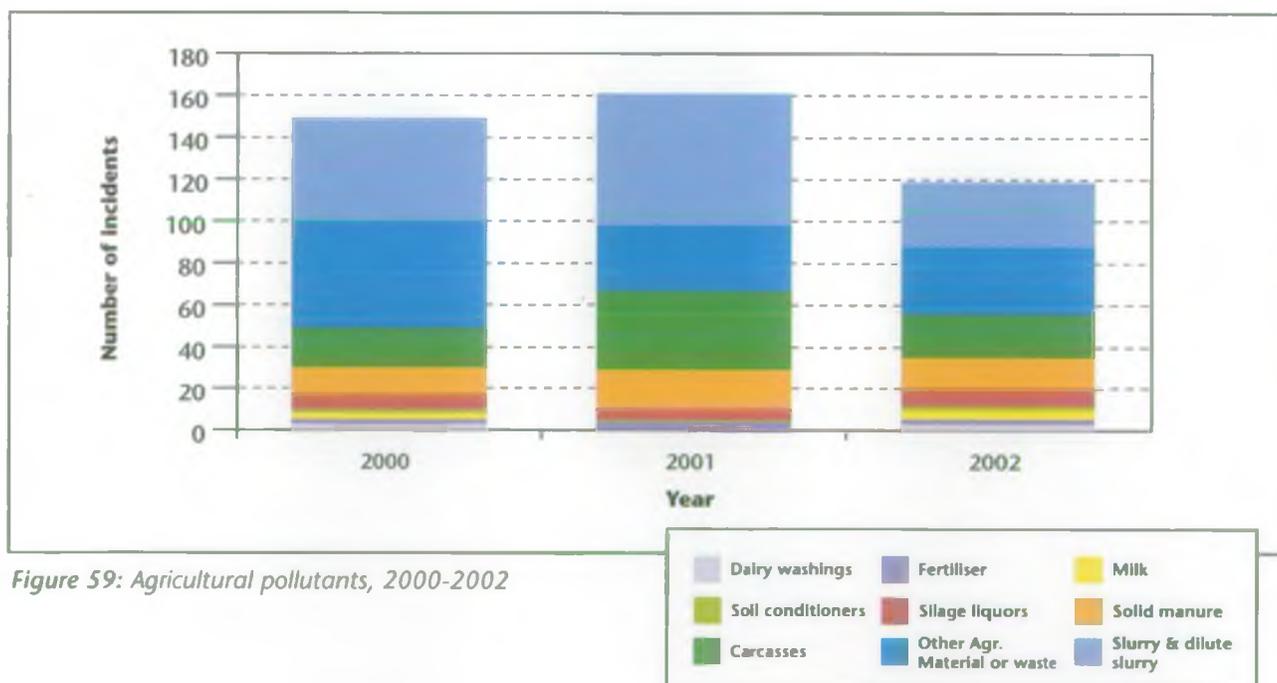


Figure 59: Agricultural pollutants, 2000-2002

pollutants. At the beginning of 1999, the Environment Agency introduced the Common Incident Classification Scheme methodology and a new national incident recording database allowing incidents affecting all media - air, land and water - to

be recorded. Therefore caution must be exercised in the comparison of yearly incident data and in the identification and interpretation of trends.

Trends

The increase in number of pollution incidents arising from agricultural premises seen in Figure 58 between 1998 and 1999 is the result of the introduction of the Common Incident Classification Scheme. Direct comparisons cannot be made between the years before and after 1999.

The total number of pollution incidents from agricultural premises was almost halved in 2001, 235 incidents, compared to 430 incidents in 1999 and 427 incidents in 2000 (see Figure 58). Some of the reduction may be accounted for by the lack of access to the countryside resulting from the Foot and Mouth outbreak. However, the total number of incidents for 2002 suggests a further reduction in incidents from agricultural sources.

In 2001 the number of significant incidents rose to an all time high. Six Category 1 incidents occurred in 2001, which equates to 33 per cent of all Category 1 incidents in the region. The six incidents were caused by pesticides, slurry and silage effluents and one incident from poultry manure causing an odour

problem. In addition to these pollutants some Category 2 incidents were caused by fuel oils.

The most common pollutants causing 'agricultural' pollution incidents are slurry and dilute slurry, solid manure, carcasses and other agricultural materials or wastes accounting for 83 per cent in 2002, 94 per cent in 2001 and 89 per cent in 2000. In 2001 the number of incidents caused by carcasses doubled compared to 2000. This can be attributed to the Foot and Mouth outbreak.

Targets

The Environment Agency has a national target to achieve a 12 per cent reduction in Category 1 and 2 pollution incidents from all sectors by 2007. This includes pollution incidents from agriculture. The Environment Agency undertakes a programme of farm visits to check compliance with relevant legislation and authorisations. The frequency of visits may be determined by the size of the operation or the risk associated with the activity.

Actions and responses

Key actions to improve land quality in the South East. The Environment Agency will:

- Support environmentally sustainable redevelopment of previously developed land;
- Work with the Regional Assembly to integrate the environment into regional development strategies;
- Comment on all local authority development plans and key planning applications;
- Continue to work with local authorities and SEEDA to restore contaminated land and promote best practice on contaminated land management;
- Produce and consult on plans for contaminated land for which the Environment Agency is responsible;
- Support and promote good farming practices - for example by encouraging farmers to adopt Environmental Management Systems for Farms.



3.8 Maintaining and Enhancing Biodiversity



Maintaining and Enhancing Biodiversity

The high quality of the natural environment in the South East is reflected in the large areas of land designated for amenity or intrinsic value. Around 40 per cent of the region is protected by some form of conservation designation - Areas of Outstanding Natural Beauty or Sites of Special Scientific Interest cover nearly six per cent.

Key messages

- The South East supports biodiversity of national and international significance. Around 40 per cent of the region is protected by some form of conservation designation - Areas of Outstanding Natural Beauty or Sites of Special Scientific Interest cover nearly six per cent;
- Valuable habitats and threatened species should be protected from new development;
- 'Green corridors' should be developed to allow wildlife to freely move between habitats;
- Many farming practices can have a major effect on wildlife and the countryside;
- The otter population is slowly recovering from a massive decline in the 1960s but otters remain rare in the South East;
- The number of water voles has declined over the last 10 years. If this trend continues, they could become extinct in many areas within the next few years;
- Climate change will affect the spread of many species and habitats. Mudflats and saltmarshes are at greatest risk from sea level rise;
- The sale of non-native plants should be controlled to reduce the spread of species like floating pennywort, which is displacing indigenous plants in many areas.

Background

Biodiversity is the rich variety of species, habitats and ecological systems that make up the living earth. It is a key indicator of the health of the environment and can alert us to subtle changes.

Biodiversity is locally, nationally and internationally important following the signing of the United Nations Convention on Biological Diversity at the Rio Earth Summit in June 1992. In response, the Government published four strategies, including the

*UK Biodiversity Action Plan*⁹⁷ (BAP) in 1994. Some 1,250 species are considered to be at risk in the UK. Of these, over 400 priority species and habitats have been identified and individual BAPs written by the UK Biodiversity Steering Group, representing a collection of interested bodies.

At the end of 2002, the Government published *Working with the Grain of Nature: a biodiversity strategy for England*. It describes necessary actions to

⁹⁷ www.ukbap.org.uk

make biodiversity a fundamental consideration in agriculture, water, woodland, marine and coastal management and urban areas and outlines a five year programme of changes to conserve, enhance and work with nature and ecosystems rather than against them. The strategy also promotes engagement with wider society to provide understanding of biodiversity needs and involvement in conserving and enhancing them.

The EC Habitats Directive (92/43/EEC), and the subsequent UK Habitats Regulations 1994, are designed to provide long term protection for a network, known as 'Natura 2000', of the most important wildlife sites across the European Union. The network includes Special Areas of Conservation (SACs), selected for plants, habitats and animals, and Special Protection Areas (SPAs), selected for wild birds under the EC Birds Directive (79/409/EEC). In addition, Government policy treats Ramsar⁹⁸ sites in a similar manner.

Roles and responsibilities

The Environment Agency leads on progressing action under the BAPs for 39 Priority Species and 5 types of wetland habitats. The species occurring in the South East range from the otter and water vole to the depressed river mussel and little whirlpool ramshorn snail. The wetland habitats cover chalk rivers, eutrophic standing waters, intertidal mudflats and coastal saltmarsh. The Environment Agency also actively collaborates with the organisations responsible for delivering other individual BAPs as part of its obligations, delivering its BAP actions through a combination of core work, collaborative projects and the development of policy.

The Habitats Regulations require the Environment Agency to ensure that no operation it authorises or undertakes adversely affects the integrity of European wildlife sites. They also require the Environment Agency to review and investigate all existing authorisations that may affect the ecological importance of a site. Wildlife sites can be affected by authorised activities located many miles away from them. Remediation is required to resolve any impacts upon the ecological integrity of a site identified through this review. The Environment Agency is working closely with English Nature, the lead

competent authority for the EC Habitats Directive, and those it authorises to ensure that the requirements of the regulations are met.

It is possible to measure the Environment Agency's progress with the BAP actions to be achieved by 2015 for which it is the lead organisation and this is shown in Figure 60. Of the agreed actions falling to the Environment Agency, 23 per cent have had no or little progress. However, 42 per cent have shown some progress or are subject to an on-going action. Only 1 per cent of actions have been completed to date.

The Environment Agency is a member of the South East England Biodiversity Forum, a liaison body of organisations involved in nature conservation which aims to provide a focus for furthering biodiversity.

The Environment Agency plays a key role in the town and country planning process and seeks to protect existing biodiversity and to work with developers to deliver substantial positive benefits in terms of new or improved habitat.

⁹⁸Ramsar sites are designated as Wetlands of International Importance under the international convention signed in Ramsar, Iran in 1971.

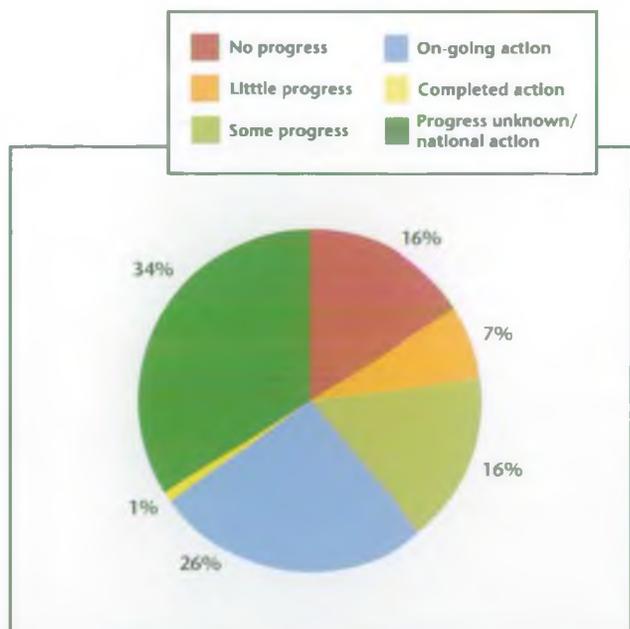


Figure 60: Progress made by the Environment Agency against Biodiversity Action Plan targets to December 2002



Biodiversity in the South East

A significant proportion of the South East is subject to wildlife designations, covering over 1000 km² of the region (see Figure 61). There are clear biodiversity hotspots in the South East notably the harbours of the Solent, chalk rivers, river valley floodplains and the North Kent Coast. Various and often multiple designations protect these areas.

The South East candidate SACs include several types of woodland in the New Forest, chalk grassland with orchids at a number of sites in Sussex and Kent, beech and yew woodland on chalk in Oxfordshire, Surrey and Hampshire, both wet and dry heathland in Surrey and Hampshire, saline lagoons around the Solent and Isle of Wight and important populations of wintering waterfowl in the estuaries. The SPAs also support a wide variety of bird species that are often

rare or vulnerable to habitat change. Several tern species breed on many coastal SPAs, Bewick's swan in the Arun Valley, Dartford warbler in the Ashdown Forest, bittern at Stodmarsh in Kent and Dartford warbler, woodlark and nightjar in the heathland SPAs of Surrey and Hampshire.

Climate change is a major threat to our biodiversity, with many native species potentially unable to adapt to the accelerating rate of climatic change. Associated sea level rise will lead to substantial loss of soft intertidal habitats, often designated as coastal SPA or candidate SAC. The creation of similar habitats to compensate for loss will be required to ensure the ecological integrity of the Natura 2000 network in the South East.

Biodiversity contributes significantly to the quality of life in the South East. However, the high levels of current and proposed development are threatening

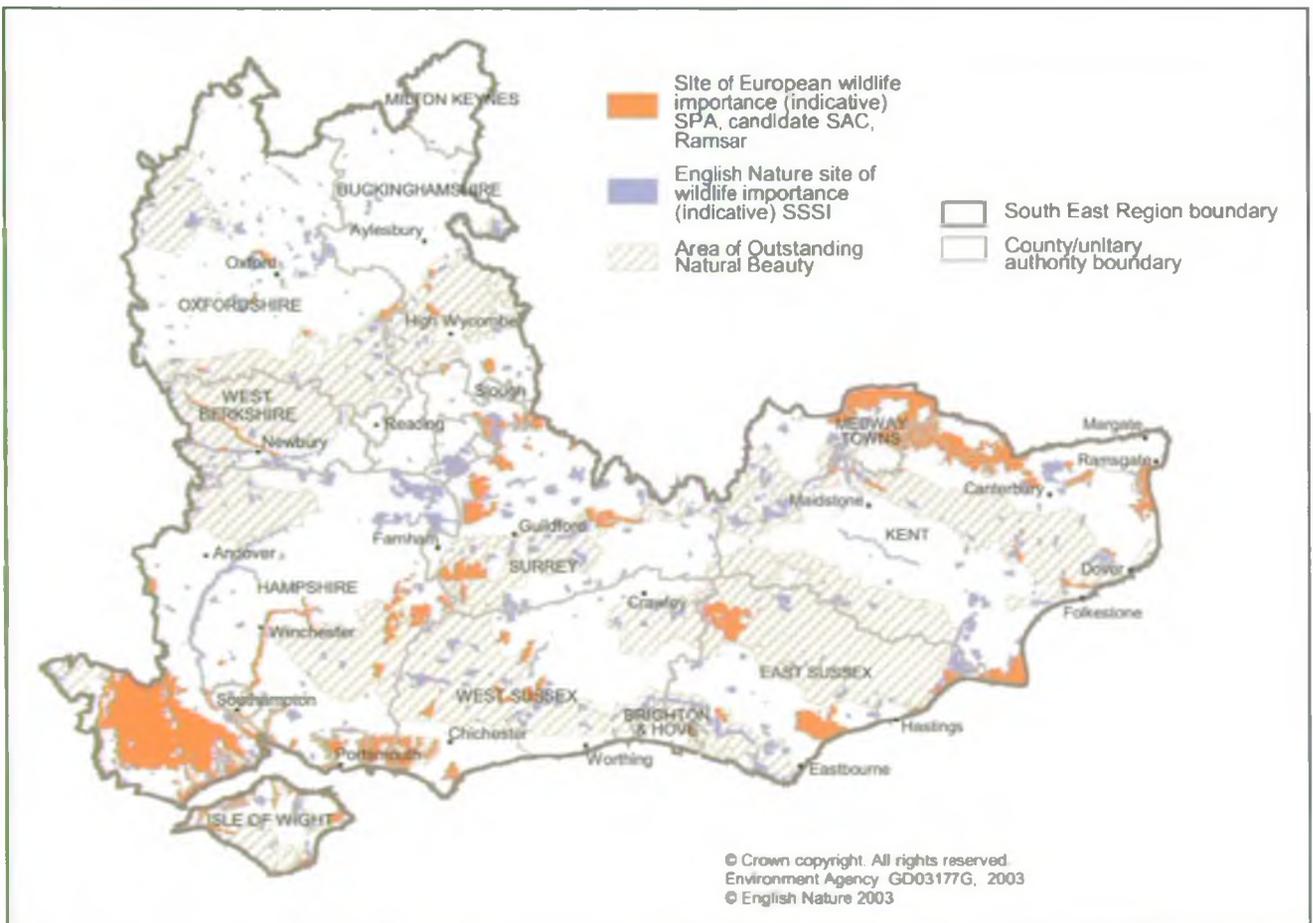


Figure 61: Sites of national and international importance in the South East

the resource and the piecemeal loss of habitats is a real danger. Examples include the airport proposals for Gatwick and also the proposed port development at Dibden Bay.

Threats to biodiversity in the South East

- Climate change and sea level rise
- Development pressure
- Habitat fragmentation and loss
- Poor agricultural management
- Flood defence schemes and operations
- Water management and drainage
- Spread of non-native species
- Deterioration of water quality
- Habitat destruction
- Water abstraction and impacts of drought

Indicators

Four indicators have been selected to demonstrate the state of biodiversity in the South East:

- Indicator 32** Distribution of key habitats and species:
- Intertidal mudflat and coastal saltmarsh
 - Chalk Rivers
 - Otters
 - Water voles
- Indicator 33** Numbers of salmon and sea trout
- Indicator 34** Distribution of fish species
- Shad
 - River lamprey
 - Bullhead
- Indicator 35** Distribution of floating pennywort

Indicator 32 Distribution of key habitats and species

Intertidal Mudflat and Coastal Saltmarsh

Background to the indicator

Mudflats are intertidal habitats created by the deposition of highly organic silt and clay sediments in

low energy coastal environments such as estuaries and other sheltered areas. Mudflats commonly make up the largest part of estuaries and are highly productive, supporting large numbers of birds, providing feeding and resting areas for internationally important populations of migrant and wintering waterfowl and nursery areas for sea fish such as bass and mullet. Coastal saltmarsh forms the upper vegetated parts of intertidal habitat, lying approximately between mean high water neap tides and mean high water spring tides.

Mudflat and saltmarsh habitats provide an important flood defence function by dissipating wave energy that could otherwise damage coastal defences and cause flooding of low-lying land and property. As such habitats are often constrained by a flood defence structure, the habitat cannot migrate inland and therefore losses due to sea level rise can be both significant and rapid. Climate change and the fact that the UK is tilting on a north-south axis, meaning the South East will become lower over time, compound this situation.

Factors causing the decline in mudflat and saltmarsh habitat are many and include land claim and encroachment by development, erosion, sediment dynamics, cord grass invasion, introduction of non-native species, barrage schemes, pollution, oil and gas exploration, dredging and bait digging.

Trends

Figure 62 shows the distribution of intertidal mudflats and coastal saltmarsh across the South East. The saltmarsh habitat is predominantly found on the North Kent marshes, Chichester Harbour and the Solent as well as substantial areas in the estuaries. The estimated current saltmarsh resource in the South East is approximately 5000 hectares or 11 per cent of the UK total.

Targets

The UK Habitat Action Plan sets the following targets for intertidal mudflats and coastal saltmarsh to be met by 2015:

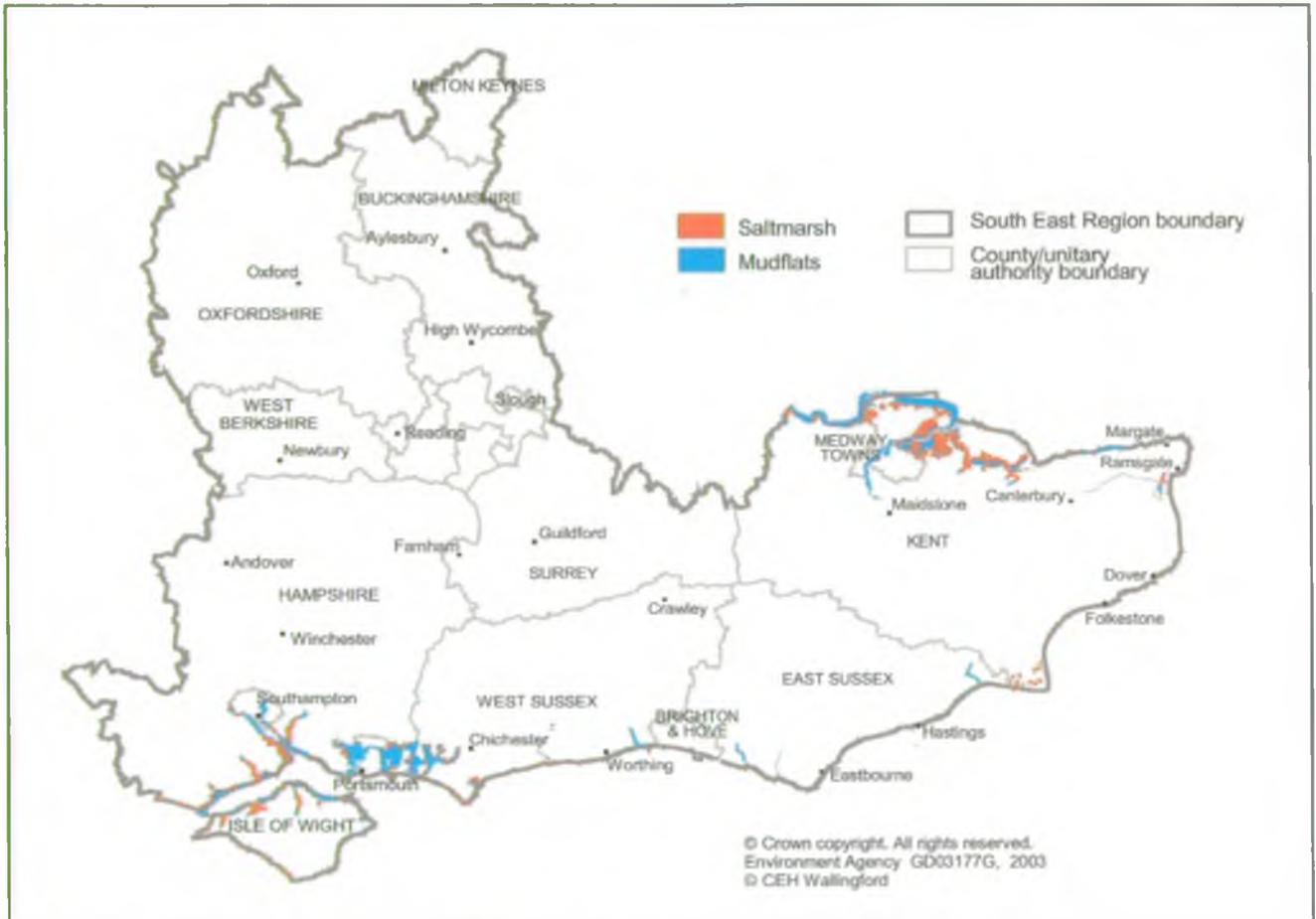


Figure 62: Distribution of intertidal mudflat and coastal saltmarsh in the South East

- To offset current losses due to coastal squeeze and erosion to maintain the existing extent of saltmarsh habitat and to restore the area of saltmarsh to 1992 levels;
- To ensure there is no further net loss of saltmarsh (currently estimated at 100 ha/year in the UK);
- To create a further 40 ha of saltmarsh in the UK for each year of the plan to replace the 600 ha lost between 1992 and 1998;
- To maintain the quality of the existing resource in terms of species diversity and, where necessary, restore the nature conservation interest through appropriate management;
- To maintain at least the present extent and regional distribution of the UK's mudflats. This target will require compensating predicted losses to development by the restoration of mudflats;
- To create and restore enough intertidal area over the next 50 years to offset predicted losses to rising sea level in the same period;
- To restore estuarine water quality to ensure that existing mudflats fulfil their important ecological and conservation role.

Chalk Rivers

Background to the indicator

Chalk rivers are watercourses where the flow is predominantly derived from chalk groundwater and which run for a significant distance over chalk geology. Typically the river water is very clear, has a

gravel bed and supports abundant and characteristic plant growth within the channel and along the margins. Many chalk rivers have headwaters known as winterbournes, which are naturally dry for varying periods each year.

The South East is home to about 50 per cent of the UK chalk river resource. In the South East the main chalk river resource is on the Hampshire Avon and Rivers Test, Itchen, Lambourn and Kennet. Three of these rivers, the Hampshire Avon, Itchen and Lambourn, are designated as candidate SACs under the EC Habitats Directive. The total length of chalk rivers in the region is 1,498 km representing approximately one third of the total river length.

Water pumped from both groundwater and river sources provide the majority of public, and industrial water supplies and can strongly influence seasonal river flows (see Section 3.4: Managing Water Resources). During times of low rainfall, abstraction can lead to reduced river flows to the detriment of the characteristic ecology for which chalk rivers are identified. Development pressure in the South East will demand increased abstraction whilst changing precipitation patterns due to climate change are likely to further magnify this threat. Several chalk rivers in the region are already the subject of programmes to alleviate low flows through a variety of projects, including negotiations with water companies to relocate abstraction points.

Many of the key chalk river habitats have been historically damaged by a combination of factors, such as land drainage, inappropriate river management, over-abstraction and diffuse pollution. The intensification of agriculture over the last 50 years has also had a significant adverse impact on the habitat, increasing the diffuse input of nutrients, pesticides and silt that enrich, pollute and smother habitat. Trampling by livestock or excessive recreational use also easily damage banks of chalk rivers with their associated fauna and flora.

Trends

Chalk rivers are a highly valued natural resource identified for special protection within the UK BAP. They are a finite resource since they are entirely dependent on the underlying geology. The quality of

chalk rivers can be damaged by a variety of causes, including excessive abstraction, poor river management, pollution, over-widening and sedimentation. The enhancements described in the case studies overleaf demonstrate the on-going investment by the Environment Agency and key partners to ensure the future of chalk rivers.

Targets

The Government's Habitat Action Plan has set the objective to maintain the typical fauna and flora of chalk rivers, including winterbourne stretches, and to restore water quality, flows and habitat diversity. This is the objective wherever chalk rivers have deteriorated and action would be cost effective.





Chalk River Case Studies

Chilterns Chalk Rivers Project: The project aims to conserve and enhance all major chalk streams in the Chilterns Area of Outstanding Natural Beauty, and to encourage enjoyment and understanding of them. The project provides advice to landowners and managers on riverside management, carries out practical work to enhance the streams for wildlife, undertakes surveys of rare species and provides educational material for schools. Events and projects have included working to re-establish brown trout stocks on the Hughenden Stream near High Wycombe, organising the Chilterns Water Festival, and opening walks such as the Alban Trail.

Habitat Restoration on the River Test and River Itchen: Over the last eight years an estimated 60,000 m² of chalk river habitat has been enhanced through riffle creation, with the addition of gravel, gravel cleaning, river re-energising through the use of hazel faggots and woody debris, river narrowing and tree management. At Ovington, on the upper River Itchen, a range of techniques have been used to benefit the whole chalk river ecology. Hazel faggots and brushwood mattresses were used to trap silt, alder logs were used to narrow an over-widened reach of river, undercut banks were created to provide winter lies for trout and summer refuges for water vole, coppicing was undertaken to promote water crowfoot growth, and an island which is known to be used by otters was extended.

The Upper River Kennet Rehabilitation Project: The project was designed to rehabilitate 10 km of chalk river between 1999 to 2003. One of its key aims is to demonstrate what can be achieved through a variety of river engineering techniques, founded on the principle of enabling the river to improve itself at low and high flows. Work has included extensive narrowing, installation of deflectors to re-energise the flow, gravel reinstatement, the building of a faggot causeway and an island using sarsen stone, and the use of straw bales as in-fill for severely over-deepened reaches. Principal partners are Thames Water, the Environment Agency and English Nature.

River Avon candidate SAC Management Strategy: A management strategy for the Hampshire Avon is helping promote an integrated approach to chalk river catchment management. The strategy provides a framework for protecting and enhancing the interest features of the river and aims to raise awareness, share knowledge and strengthen links between existing initiatives and bodies. The Environment Agency and English Nature developed the strategy in partnership with representatives of the riparian owners, fisheries interests, Wildlife Trusts, water companies and local authorities. It was funded under the *Life in UK Rivers Project*.

River Itchen Sustainability Study: The study assesses the impact of water company operations and land use on the River Itchen candidate SAC. A multidisciplinary approach integrates groundwater, surface water and ecological aspects to establish target flows for key chalk river species such as the brown trout, salmon and water crowfoot. Water level and habitat requirements will also be defined for species such as the southern damselfly, otter and wetland birds. The project partnership will develop a sustainable management plan balancing environmental interests against pressures including water consumption, waste water treatment, recreational pursuits and land use. The partnership is led by the Environment Agency and includes English Nature, Southern Water, Portsmouth Water, Hampshire County Council, Hampshire Wildlife Trust and Winchester and Eastleigh District Councils. It is funded mainly by the Environment Agency and water companies.

Otters Background to the indicator

Otters remain rare in the region. As a top aquatic predator, they provide a useful indicator of both

habitat and river quality. In order to thrive, otters need good fish stocks, numerous resting sites away from disturbance and sites for breeding. Otters have a high public profile and are listed as a priority species in the UK BAP. Otters are also listed in the Government's list of habitats and species of principal

importance in England for the EC Habitats Directive and are fully protected under the UK's Wildlife and Countryside Act 1981 (as amended) and the Countryside and Rights of Way Act 2000.

Otters suffered a population collapse across most of England in the 1960s following the introduction of persistent pesticides, although they were also declining through habitat loss as development pressures increased. Otters survive across the South East in low numbers where high quality habitat has remained. The persistent chemicals responsible in part for the decline have long since been banned from use. Otters are re-colonising from their strongholds in Wales and the South West.

High human population density and development pressure in the South East are likely to restrict re-colonisation and substantial conservation action is required to integrate otters into modern habitats.

Riparian habitats have been improved by planting scrub and trees on river banks and enhanced fish populations have been achieved through water quality improvements. However, these improvements are counter-balanced by continued losses of other riparian habitat through inappropriate land drainage, intensive agriculture, habitat fragmentation by development and disturbance by increased riverside access.

Otters have large ranges and may travel several kilometres each night. Several otters have been killed in the South East at road and rail crossings where bridge and culverts do not allow safe passage. Such losses are critical in limiting the expansion of the otter population and indicate the impacts of poorly designed and expanding development. Other losses may be suffered with otters drowned in fish traps where otter guards are not fitted, particularly fyke nets that are used to catch eels.

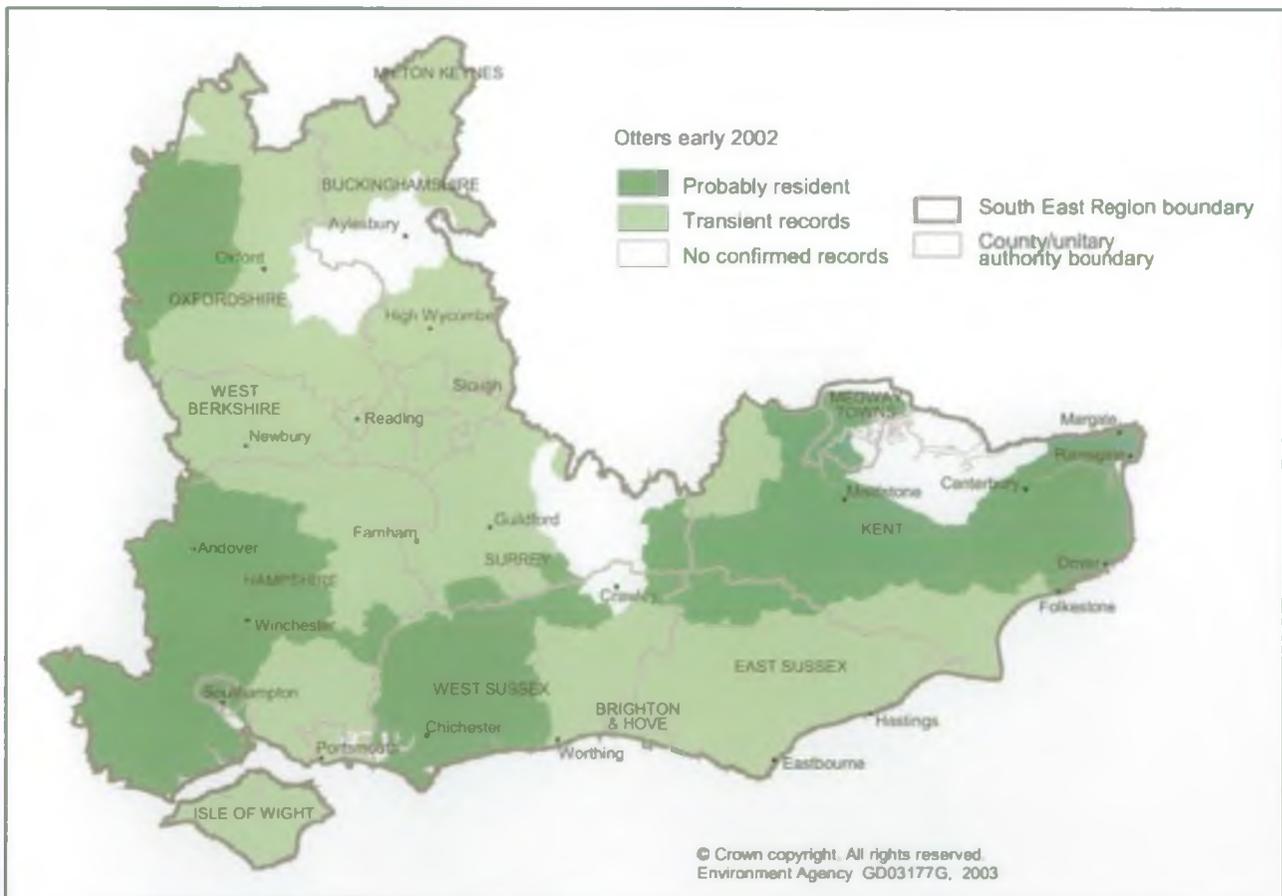


Figure 63: Distribution of otters in the South East, 2002



Since 1991, the Environment Agency has supported the collaborative 'South East Otters and Rivers Project' with the South East Wildlife Trusts, which has monitored and sought to enhance the otter population in the region. A further collaborative project has also been established in Sussex. These projects have raised awareness of the needs of otters and have ensured wide ranging habitat improvements, surveys, monitoring and road/rail crossing mitigation work to provide suitable conditions for natural otter colonisation.

Trends

The distribution of otters across the South East has increased significantly since the national otter survey in the early 1990s. Transient otters are supported in the majority of the South East catchments and coastline (Figure 63). Otters are now resident in the New Forest and River Itchen in Hampshire, the Upper Thames and its Oxfordshire tributaries, the Arun catchment in Sussex and the Medway and Stour catchments in Kent.

It should be noted that while whole catchments are shaded in Figure 63, otter distribution is usually concentrated around river corridors and the coast. The increase is attributed to improvements in habitat and the general environment and colonising animals arriving from neighbouring catchments. There have also been a number of independent releases of captive-bred animals by the Otter Trust in the region in the past, although natural re-colonisation is preferred by the Environment Agency.



Targets

The UK BAP target is to restore breeding otters to all catchments and coastal areas where they have been recorded since 1960 by 2010. The Environment Agency is contributing to this target through active habitat enhancement to support natural recovery. Progress toward this target in the South East is limited by the rate of re-colonisation, the loss of habitat to development and the risk of road and rail casualties. Re-colonisation of their entire historic range is unlikely due to substantial development since their decline.

Water Voles

Background to the indicator

Water voles have become much rarer in the South East over the past decade and may become locally extinct within the next few years if this trend continues. Water voles have a high public profile and are listed in the UK BAP. Their habitat is protected under the UK's Wildlife and Countryside Act 1981 (as amended).

Water voles are the UK's fastest declining mammal. Two national surveys by the Vincent Wildlife Trust in 1989-90 and 1996-98 showed an 88 per cent decline in only seven years. Water voles have disappeared from three quarters of their previously known sites across the South East in the last decade. It is planned to repeat the national survey again in 2005.

To thrive, water voles need lush waterside habitat, with established soft earth banks to burrow in and deep vegetation for food and cover from mink, their main predator. The best populations survive where there are clusters of colonies and mink are either absent or controlled. Isolated colonies can survive in urban centres where human and dog disturbance reduces the presence of mink.

Any recovery of the water vole in the South East is likely to be limited by the widespread abundance of mink, the fragmentation of suitable riparian habitat and the limited ability of the water vole to recolonise across long distances. Development pressure, human population growth and increasing recreational use of

rivers are likely to further limit water vole recovery and have the potential to accelerate the decline unless mitigation measures are implemented.

The survival of the key water vole populations across the South East is being monitored by detailed surveys undertaken by the Wildlife Trusts and the Environment Agency. In addition the performance of habitat enhancements and mitigations is also being assessed. The case study overleaf describes the *Chichester Sustainable Farming Partnership* set up on the Chichester coastal plain, which amongst other things, considers the water vole population.

Trends

Figure 64 shows the distribution of water voles by river catchment in 2002. While whole catchments are

shaded, water vole distribution is usually restricted to river corridors and the coastal floodplain. Some strongholds remain, but water voles are considered rare in approximately half of the region.

Targets

Under the UK BAP the key target is to maintain and restore water vole populations to all catchments and coastal areas where they were recorded in the 1989/90 baseline survey by 2010. Achieving this target will be challenging in the South East due to the pressures and constraints on water voles and their habitat.

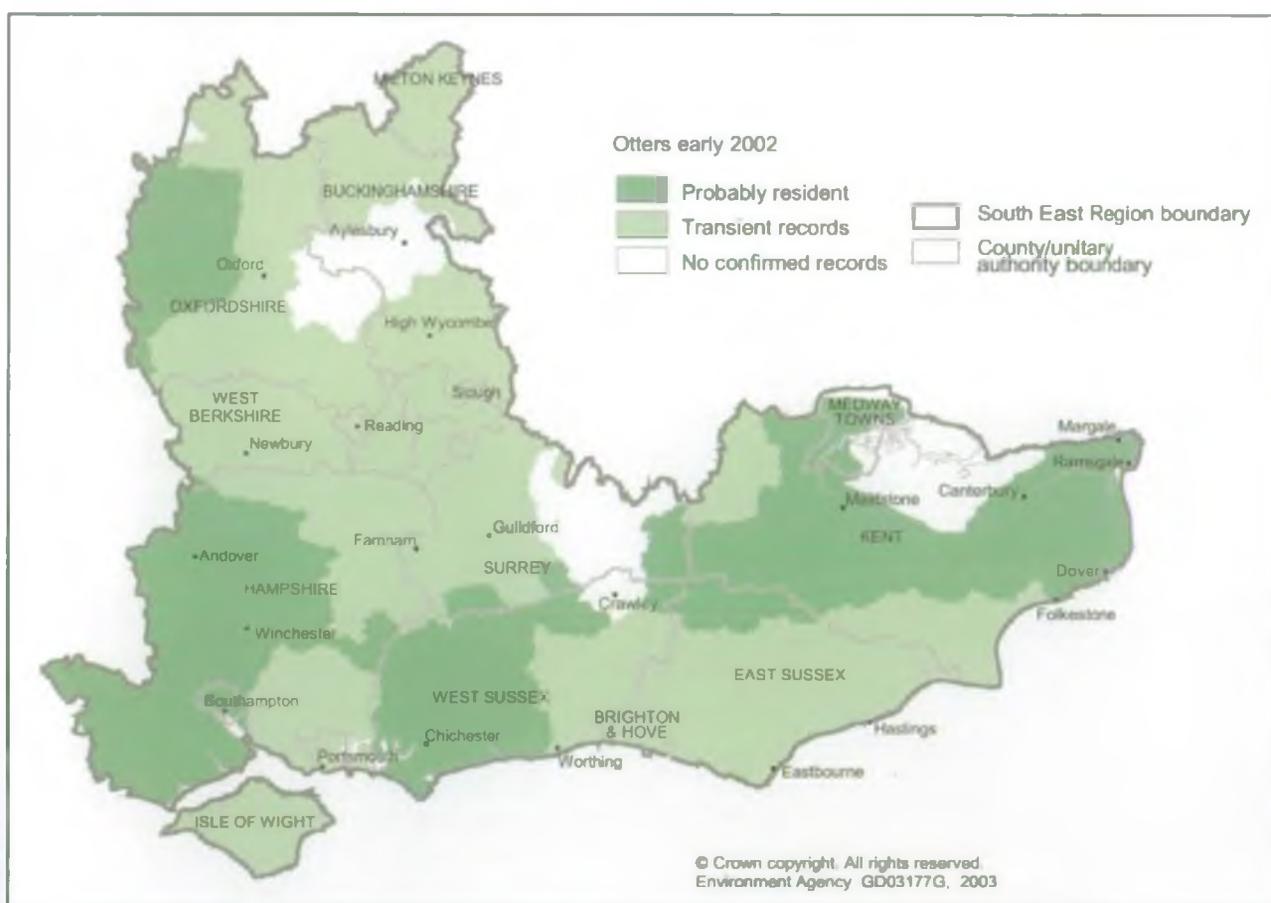


Figure 64: Distribution of water voles in the South East, 2002



Case Study - The Chichester Sustainable Farming Partnership

The Chichester coastal plain is a low lying fertile area of land which is subject to agriculture, housing development and flood defence pressures. A key indicator of the extent of pressures is the dramatic decline in water vole populations. The *Chichester Sustainable Farming Partnership* was established to find innovative ways of tackling this and other issues. The Partnership consists of the Farming and Wildlife Advisory Group, the Wildlife Conservation Research Unit (Oxford University), the Environment Agency, the Wildlife Trust, West Sussex County Council and local landowners.

Water vole populations suffered a 95 per cent decline in Sussex between 1989 and 1999 and this has been attributed to a number of factors, particularly habitat loss and predation by mink. Investigations carried out in 2000 concluded that water voles could become locally extinct in as little as three years if no action is taken. Populations were found to be extremely isolated and were at risk due to natural threats such as cold winters or natural flooding. Armed with this information the Partnership planned the conservation action required and established responsibilities.

A programme of farm-based advice, survey work and capital works is being undertaken by the Partnership. The Environment Agency has modified its flood defence maintenance work to be sympathetic to water vole needs whilst not compromising the standard of defence. Summer water levels in some smaller ditches have been raised using 10 inch dams to successfully increase water vole habitat. Around half of the watercourses across the Chichester Plain are now being managed sensitively. For example water voles on the Bremere Rife have benefited from sensitive management and 3 km of fencing to reduce grazing pressure. In addition, planning consideration on new developments now protects and seeks to create new water vole habitat, re-open piped watercourses and restore ditches.

Two large stewardship agreements have been established with key landowners to deliver significant conservation benefit. For example 20 km of 6 metre wide margins have been created that allow flexible access for annual flood defence vegetation maintenance. The extent of suitable habitat, one of the main limiting factors influencing water vole, is dramatically improving.

A successful programme has been undertaken to humanely control mink, with traps being operated over 6 months during 2001/02. This trapping effort complements the habitat improvement work and will continue in future years.

Survey work in 2002 has proved very encouraging for water voles. Populations appear to be expanding due to the changes in land management techniques promoted by the members of the Partnership. Water voles rely on good river and floodplain habitats and the enhancement and re-creation of these habitats will also benefit a range of wildlife.

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Indicator 33 Number of Salmon and Sea Trout

Background to the indicator

Salmon and sea trout provide an indicator of water quality and quantity and the physical condition of many rivers and estuaries in the South East. They additionally provide an indication of the state of our seas where they spend much of their adult life having migrated from their freshwater birthplaces only returning to these to spawn. The environmental

quality of estuaries and coastal waters is of greater importance to sea trout, as they inhabit these more local waters during the marine phase of their life cycle. By comparison salmon migrate to the North Atlantic areas off Greenland and the Faroe Islands.

The main salmon fisheries in the region are on the Hampshire Avon, River Test, River Itchen and River Thames. Historically they supported significant populations of salmon. However, today the salmon runs are a shadow of their former glory. Indeed salmon were absent from the River Thames between 1833 and 1974. Rehabilitation and habitat improvement

schemes have been operating on the River Thames since 1979 (in partnership with the Thames Salmon Trust) and the River Test and River Itchen since the 1980s (in partnership with local fishery interests).

Less is known about the relative abundance of sea trout in the region, although they are present in the majority of rivers. Limited evidence and observations suggest sea trout populations have fluctuated significantly over recent years and exist on a knife-edge between stock maintenance and decline.

As for other important aquatic biodiversity species and habitats, salmon and sea trout stocks are under significant stress from a combination of climate change, increasing development pressure and land use management changes in the marine and estuarine environment through which the fish migrate. They are also subject to poaching.

To flourish salmon and sea trout require strong river flows, high water quality, clean gravel and productive marine and freshwater environments in which to grow and feed. Prolonged impacts on any of these factors can and have caused devastating collapses to salmon and sea trout populations. The eggs of salmon and sea trout are particularly at risk of being choked and killed by silt and diffuse pollutants that settle into the river gravels in which they are laid, incubate and hatch. Such impacts have been particularly damaging across the region, with salmon egg survival rate on the River Itchen falling from 25

per cent to 4 per cent due to reduced river flows and greater silt inputs from agricultural run off.

The Environment Agency has a duty to maintain, improve and develop the fisheries resources of the South East, including the salmon and sea trout stocks. The abundance of salmon and sea trout is assessed by a combination of measures including fish counters, traps, rod and net catches and juvenile surveys. The salmon rod catches data provide the best historic record of the stocks and dates back to the early 1900s. The data on sea trout catches is less extensive.

Significant research work is being undertaken on the Hampshire rivers to investigate a number of specific factors that have been observed to impact on the salmon's life cycle. The knowledge gained through such assessments is essential to identify necessary management actions to promote a potential recovery of these stocks.

Trends

Figure 65 shows a substantial decline in salmon rod catches from 1970s levels reflecting a real decline in stock numbers. However, the Environment Agency's collaborative programme to sustain these stocks has contributed to their maintenance while the environmental causes of the decline are being addressed. Indeed, the number of salmon caught on

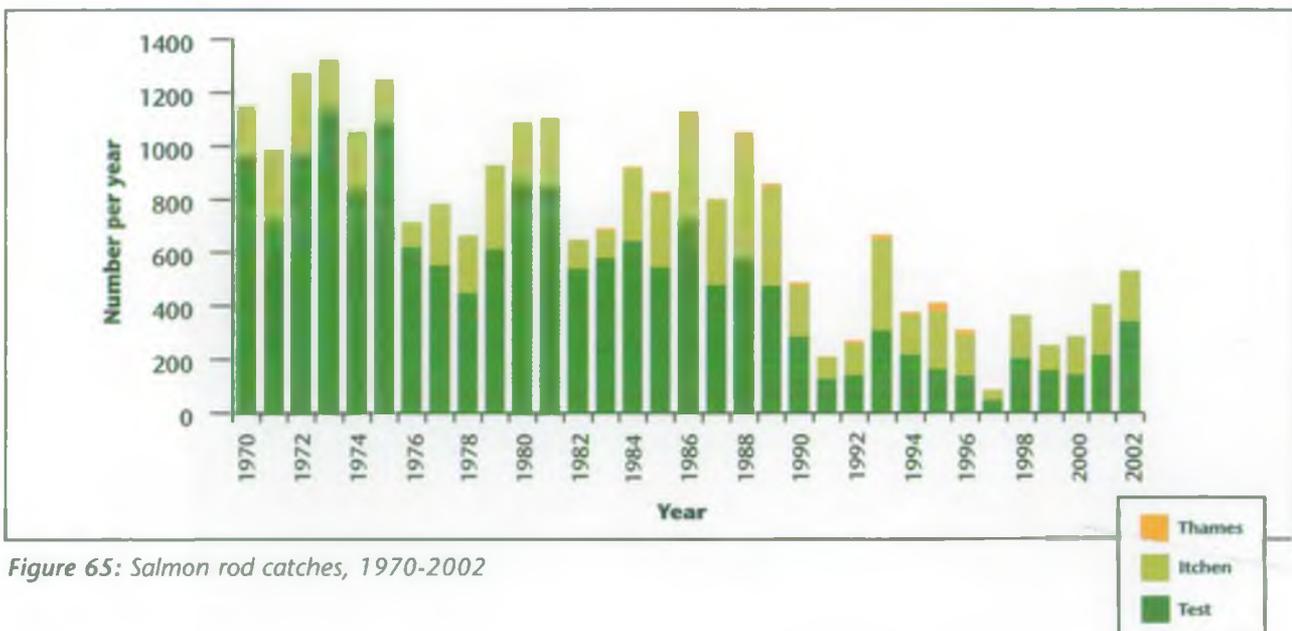


Figure 65: Salmon rod catches, 1970-2002

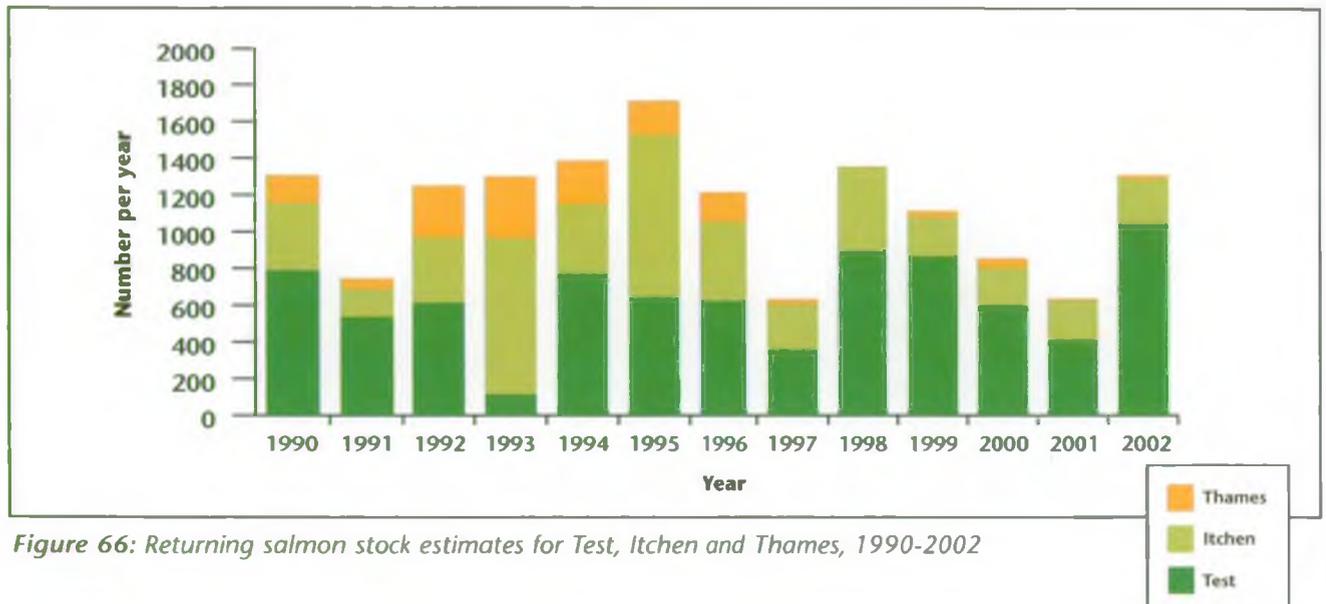


Figure 66: Returning salmon stock estimates for Test, Itchen and Thames, 1990-2002

the River Test have gradually increased since 1998, following an all time low in the number of catches in 1997. This pattern is mirrored on the River Itchen. Despite the increase in numbers caught on the River Thames in the late 1980s to the mid 1990s there have been no reports of salmon catches on the River Thames in recent years.

It should be noted that almost all salmon caught on the Rivers Test, Itchen and Thames are returned to the river. However, it is inevitable some will be re-caught resulting in an incorrect estimate of the population size. In order for a true picture to be made of the number of salmon in the rivers an independent estimate of the number of fish recaptured must be sought.

Figure 66 shows the returning salmon stock to the three rivers. The trend in returning salmon shows a fluctuating picture for the River Test since 1990. The trend for the River Itchen and River Thames, for the same period, shows a gradual decline. The numbers returning from 1997 onwards on these rivers are low compared to the numbers recorded returning in the early 1990s on both rivers.

Targets

The target for the River Test is to return a salmon run

of around 2000 adults by 2020. For the River Itchen the target is a salmon run of around 1000 adults by 2020. To achieve this, the Environment Agency has a secondary target of increasing the average survival of deposited salmon eggs to greater than 10 per cent in each river. This, combined with the complex array of other management measures being used to reduce losses during the salmon's life cycle, should promote the recovery of the stocks to target levels.

Indicator 34 Distribution of fish species

Background to the indicator

'Minor' fish species, such as the bullhead, shad, brook lamprey and river lamprey, are an integral part of the environment and the freshwater foodchain. The health of such populations can indicate the quality of the water and habitat especially in smaller streams and as such they provide a good indicator of the 'naturalness' of the habitat in the South East.

These fish species are protected under both international and national legislation. However, fish are subject to numerous pressures which can affect their distribution including:

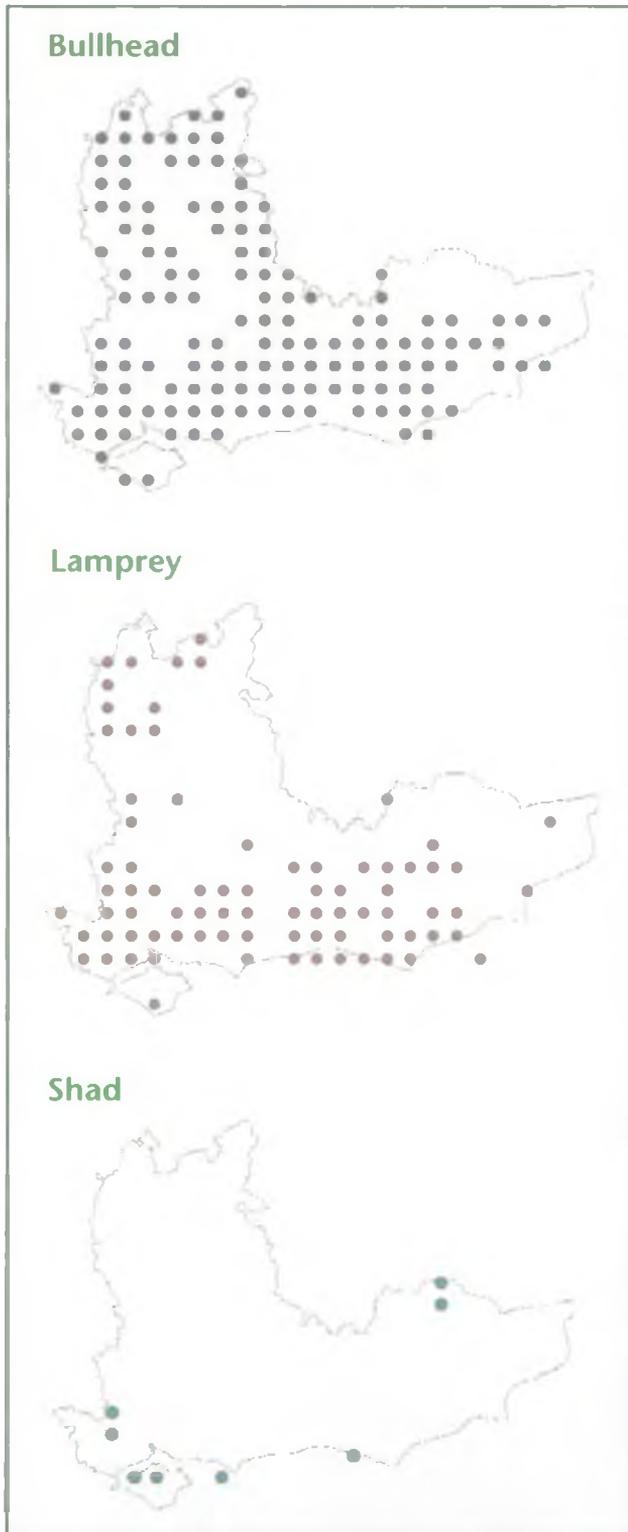


Figure 67: Distribution of minor fish species in the South East from 1900 onwards

- In-river structures causing barriers to movement;
- Changes in the flow regime;
- Dredging and channelisation, causing direct loss of larvae and loss of habitat diversity;
- Point and diffuse pollution;
- Exploitation for food or as angling bait;
- Excess sediments smothering preferred habitat;
- Eutrophication causing a change in balance between weed and open sediment;
- Overstocking with large predatory fish and competition from stocked non-native fish species; and
- Impact of fish diseases.

In 2001 a joint project was established between the Environment Agency, the Joint Nature Conservation Committee and the Centre for Ecology and Hydrology to provide a comprehensive overview of freshwater fish in the UK⁹⁹. The project compiled all electronic data sets received from the Environment Agency and other organisations.

Trends

Figure 67 shows the distribution of bullhead, shad and lamprey (brook and river). Of these species, the bullhead occurs across a significant proportion of the region. In contrast, river and brook lamprey are more restricted in their distribution. The distribution of shad is the most restricted, with just eight records from across the South East. It is not possible to determine trends for this indicator.

Targets

There is no specific target regarding minor fish species. The aim is to maintain and enhance the existing distribution of these species and to ensure sustainable populations.

⁹⁹ Davies et al. (2002) *Database and Atlas of Freshwater Fishes in the UK: Final Report*. Centre for Ecology and Hydrology (NERC)



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Indicator 35 Distribution of floating pennywort

Background to the indicator

The aquatic plant floating pennywort (*Hydrocotyle ranunculoides*) is a native species of North America that is closely related to our own native marsh pennywort (*Hydrocotyle vulgaris*). It was first recorded in the UK in 1990 from the River Chelmer in Chelmsford, Essex. By 1999 the plant had spread to at least 80 sites in the UK, mostly in Southern England. In the South East, known sites include the Pevensey Levels, Piltown Pond and Pagham Harbour SPA in Sussex and the River Wey and Wey Navigation in Surrey. The spread has been aided by recent milder winters that have enabled the mature plants to survive the winter period.

It is a robust species and grows as a rooted plant in the margins of slow-flowing or still waterbodies.

During the summer the plant grows out across the surface of the water at a staggering rate to cover the surface. At the peak of its growing season in August it can double its biomass within 3 days and has been observed to grow up to 8 metres from the bank in a single season. It forms dense interwoven mats that are liable to break free and float downstream. Even the smallest fragment can grow to establish a new plant. During the late summer the leaves of the plant rise above the surface of the water by up to 40 cm.

The plant is likely to have been introduced to the UK through releases from aquaria and garden ponds and is readily sold legally by garden centres. The plant

¹⁰⁰ Source: Centre for Ecology and Hydrology

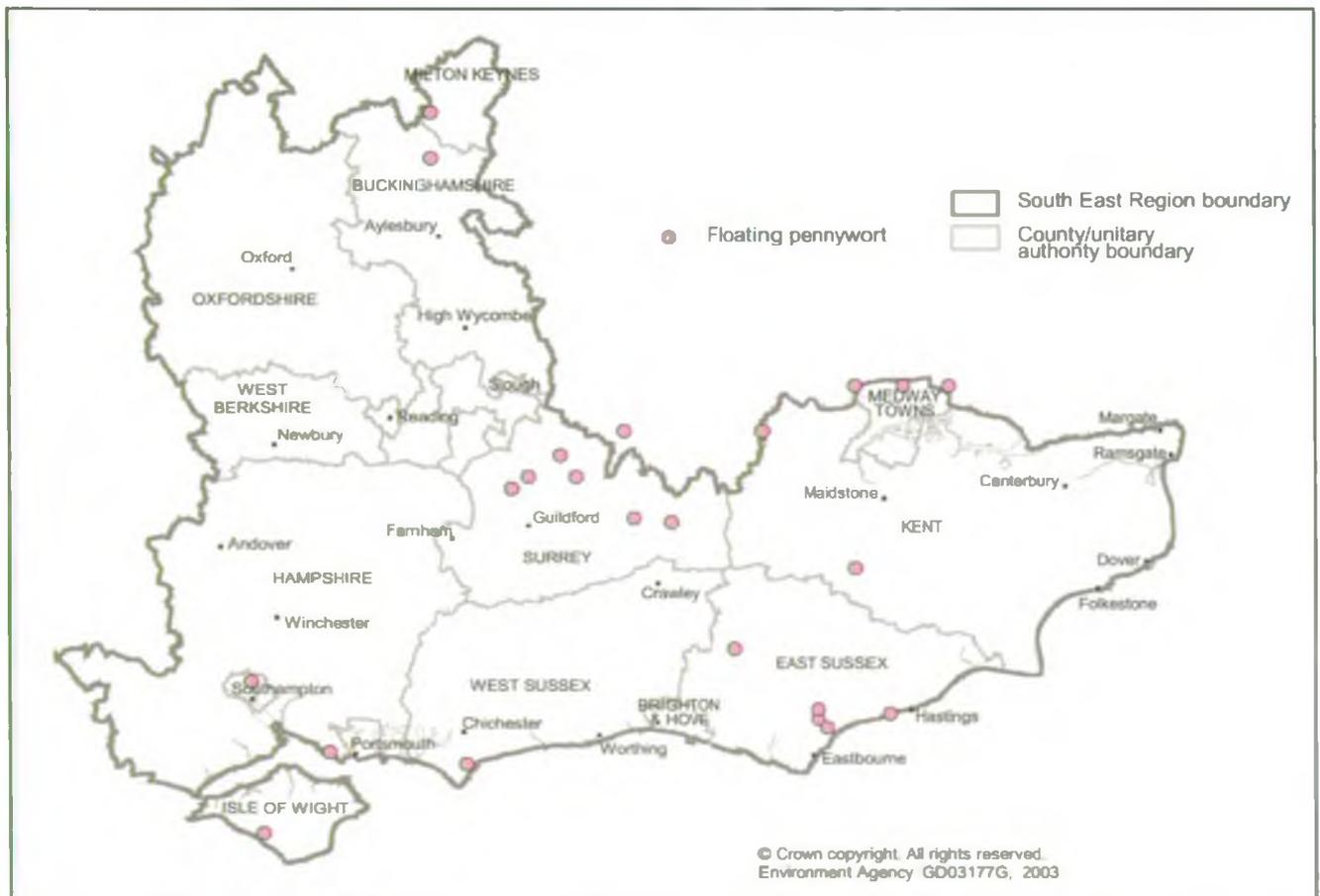


Figure 68: Distribution of floating pennywort in the South East, 2002¹⁰⁰

out-competes the native vegetation in watercourses and, as such, poses a significant threat to the ecological integrity of the sites, many of which are designated as European or international sites. In addition, the floating mats can interfere with the operation of flood defence structures leading to significant localised flooding in some cases. The amenity value of the affected watercourses is dramatically affected and the stretches cannot be fished. Low oxygen levels caused by the floating mats result in fish mortalities. Livestock have also drowned through mistaking the vegetation for firm ground.

The ability of the plant to grow quickly from the smallest fragment makes its control particularly difficult. Mechanical methods of weed removal offer only temporary control and may inadvertently cause the plant to spread downstream.

Trends

The plant is establishing itself in the UK, having been first found in the wild in 1990, but now recorded from approximately 80 sites in the UK, mostly in the

South East. Figure 68 shows the distribution of floating pennywort across the South East. It is expanding its range rapidly and creating widespread problems at each new location.

Targets

Although there is no specific target to address the spread of floating pennywort, new outbreaks must be addressed as a matter of urgency before the plant becomes established. If it is left for more than a growing season it will be well established and its eradication thereafter will be difficult and costly. Defra have published a non-native species policy¹⁰¹ outlining eight key recommendations to prevent, contain and control invasive non-native species. The Environment Agency has a role to play in awareness campaigns and monitoring work as well as contributing to risk management plans and undertaking control measures.

¹⁰¹ Defra (2003) *Review of non-native species policy: report of the working group*

Case Study - Controlling floating pennywort on the Pevensey Levels, East Sussex

On the Pevensey Levels the control of floating pennywort was attempted using herbicides, initially with some success. However, the plant quickly grew back across the channel, with regrowth occurring from the small fragments that had escaped treatment. It was concluded the plant had not taken up the herbicide.

Control was later attempted using another herbicide applied on several occasions throughout the summer. Surveys carried out in the late summer appeared to show that the treated stretches had a substantially reduced plant cover. Marginal 'reed' vegetation which had initially been 'scorched' by the herbicide recovered well. The operation was, however, difficult and resource intensive and it proved impossible to treat all affected areas. Some mechanical clearance had to be undertaken in the autumn to maintain clear drainage during the winter. The herbicide treatment will need to be carried out in successive years if the plant is to be controlled.

Conclusions

- Treatments must be continued throughout the spring and summer and particularly in August and September when the growth is most vigorous;
- The 'do nothing' option at sites poses significant risks to flood defence, biodiversity, agriculture, fisheries and amenity.

NB Any applications of herbicide in or near water must be approved by the Environment Agency and full attention paid to Health and Safety requirements.



Actions and responses

Key actions to improve biodiversity in the South East. The Environment Agency will:

- Publish a five year Biodiversity Strategy for the South East;
- Investigate the implications of climate change on the biodiversity of the region and establish how they will be accommodated within Environment Agency policy and operations;
- Apply appropriate conservation criteria when authorising new activities that could potentially impact on Special Protection Areas, Special Areas of Conservation or Ramsar sites. The Environment Agency will complete a full review of existing authorisations;
- Seek to influence at all levels to ensure that rural and urban development plans consider biodiversity issues and take measures to benefit biodiversity. The Environment Agency will seek mitigation and compensation measures where loss of habitat is unavoidable;
- Continue to support collaborative biodiversity projects and ensure suitable conditions are provided for UK BAP species;
- Ensure the next Shoreline Management Plans address the impacts of policy options upon intertidal mudflat and coastal saltmarsh. In addition, coastal strategies and catchment-based strategies will seek to achieve substantial net gains in the extent of these habitats. The significant habitat re-creation opportunities present in the coastal zone will be highlighted and progressed;
- Use remote sensing technologies to collect environmental data to facilitate the determination of annual losses and gains of coastal habitats;
- Continue to seek improvements in river water quality, target habitat restoration and creation and ensure appropriate channel management is carried out to ensure healthy and sustainable fisheries;
- Improve its biodiversity monitoring programme in order to better report on the state of biodiversity in the region.



3.9 Additional Quality of Life Measures



Additional Quality of Life Measures

A clean, healthy environment, rich in wildlife and natural diversity is, arguably, the single greatest contributor to a better quality of life.

Key messages

- The health of the environment is integral to people's quality of life. All areas of the Environment Agency's work contribute to the overall well-being of the South East;
- The South East is the most wooded region in England and provides a rich diversity of habitats for wildlife, renewable resources of timber, natural beauty and quiet places for recreation;
- The impact of industrial processes regulated by the Environment Agency on air quality is falling;
- There has been some success in reducing the levels of pesticides detected in our rivers, lakes, groundwater and coastal areas;
- Beach litter remains at a high level, posing a threat to wildlife and people and spoiling the natural beauty of our coastline.

Background

All aspects of the environment considered in this report - the quality of the air, land and water, biodiversity, water resources, managing waste, climate change and flood risk - are integral to improving overall quality of life and in many cases contribute not only to the health of the environment but also of people. People have peace of mind if they know they live in a healthy environment rich in wildlife and natural diversity - an environment that they can care for and can use, appreciate and enjoy.

The quality of surroundings is fundamental to a good quality of life. Noise, litter, graffiti and vandalism may be symptoms of wider problems, but can themselves promote a spiral of degradation, which may lead to crime, social exclusion and decline. Quality of life is reflected through people's social needs: good health, better housing and full access to services and recreation.

Roles and responsibilities

People use their local environment for leisure activities or make trips to particular attractions. The

Environment Agency has duties to promote recreation on and around water, to take account of recreation in its work and, where possible, makes sites under its control available for recreational use. The Environment Agency has particular responsibilities for enhancing quality of life through the promotion of navigation, angling and other recreation on our rivers and coasts. Waterways are a valuable recreational resource for everyone to enjoy, including the local community and those visiting from elsewhere in the country as well as overseas. The Environment Agency has a duty to take account of the needs of the chronically sick and disabled when carrying out its recreation duty.

The Environment Agency promotes recreation through contributing financially to projects, providing advice or by working in partnership with other organisations. Partners include British Waterways, the Association of Inland Navigation Authorities, British Canoeing Union, the Royal Yachting Association, the Inland Waterways Amenities Advisory Council (IWAAC) and the British Marine Federation.

Different navigation authorities, some public bodies, others private, manage the inland waterways. These include British Waterways and the Environment Agency, as well as local authorities and the National

Trust. Within the South East, the Environment Agency has responsibility for navigation on the non-tidal River Thames, River Medway and Harbour of Rye. British Waterways is responsible for several canals in the South East. The Environment Agency has signed a memorandum of understanding with British Waterways and other organisations with interests in navigation.

The Government's proposals for the future of our inland waterways are set out in its document *Waterways for Tomorrow*¹⁰². The Government's statutory advisory body on waterways is IWAAC.

Quality of Life in the South East

Tourism and related industries make a major contribution to the economy of the South East. In 2000 the South East was the destination of 4.05 million overseas visitors and 23.5 million domestic visitors¹⁰³. In addition to these, there were in excess of 210 million day visits to the region. The success of tourism in the South East can be attributed to the range of activities and attractions on offer to visitors as well as the diversity and quality of the environment. The South East England Regional Assembly (the Regional Assembly) has produced a draft Regional Spatial Planning Strategy for Tourism, *Destination South East*¹⁰⁴ that sets out a proposed policy framework for regional spatial planning aspects of tourism in the South East.

A large proportion of leisure day visits in the region are to the countryside, including an estimated 52 million per annum to the Chilterns Area of Outstanding Natural Beauty (AONB) and 32 million per annum to the South Downs AONB. Many of these visits are to undertake informal recreation in the form of walking, cycling and riding, on the region's 34,000 km rights of way network. The South East also includes four of the thirteen long distance routes designated as National Trails in England - The Thames Path, The Ridgeway, The North Downs Way and The South Downs Way. In addition, there are two proposed National Parks, the New Forest and the South Downs.

The high quality natural environment is complemented by an estimated 200 major tourist attractions ranging from theme parks to stately homes, generating an estimated 11.5 million visitors

a year. These include popular attractions in the region, such as Blenheim Palace and Thorpe Park, as well as smaller attractions. The non-tidal Thames is an important tourist destination attracting 14 million leisure day trips a year and an additional 28 million local visits. This contributes £204 million to the local economy. It is also home to over 120 sports clubs where thousands of people enjoy the river for outdoor activities.

There are over 100 sites owned by the Environment Agency available for some form of recreation, mainly walking or boating. These sites include a disused railway line on the Isle of Wight now converted to a cycle path, allotments in Romsey, the local nature reserves at Pagham Harbour and Park Wood, a 60 hectare site in East Sussex.

Indicators

Four indicators have been selected to demonstrate the quality of life in the South East:

- Indicator 36** Craft on inland navigable waterways
- Indicator 37** Area of woodland
- Indicator 38** Beach litter
- Indicator 39** Use of pesticides in agriculture and horticulture

Indicator 36 Craft on inland navigable waterways



Background to the indicator

Inland waterways are an important asset for recreation, tourism and commercial transport. The Environment Agency manages three waterways which are completely or predominantly in the South East - the non-tidal River Thames, the River Medway and the Harbour of Rye. British Waterways manages the Kennet and Avon Canal, Oxford Canal and the

¹⁰² Defra (2000) *Waterways for Tomorrow*

¹⁰³ Source: South East England Regional Assembly

¹⁰⁴ South East England Regional Assembly (2002) *Destination South East - Regional Spatial Planning Strategy for Tourism Consultation Draft*



Environment Agency navigations in the South East

The River Thames

Stretching from the edge of the Cotswolds to London, the River Thames passes through beautiful countryside, picturesque villages and historic towns, its banks dotted with numerous country mansions set in spacious parks.

Several locations along the river have royal connections, such as Windsor Castle, Hampton Court Palace and Runnymede. The River Thames has always played an important part in the nation's history, inspiring writers, composers and artists alike.

The Environment Agency manages the freshwater (non-tidal) River Thames, which extends for 236 km from the town bridge at Cricklade in Wiltshire to Teddington lock. The Environment Agency owns 44 locks and weir sites on the River Thames and one lock on the River Kennet, serviced by some 75 lock keepers and 15 patrol launches. Approximately 26,000 craft are registered on the River Thames each year.

The River Medway

The River Medway was opened to navigation about 250 years ago when waterborne transport was in its heyday. The River Medway is maintained by the Environment Agency which gives access to 31 km of the river.

There are 10 locks and associated sluices and weirs along the navigation which starts at Allington Lock and extends to the footbridge immediately downstream of the Leigh flood regulating barrier just west of Tonbridge. The locks divide the river into 10 reaches, known as Pens.

The Medway is an attractive place to visit and users can experience the delightful scenery of the garden of England whilst enjoying the peace and tranquillity of the river. The Medway Navigation attracts a host of water based activities, including all forms of boating, canoeing, sculling and angling. There is a footpath along the navigation called the Medway Valley Path. The Maidstone River Festival, held at the end of July, is the high point of recreational activity on the river.

Harbour of Rye

The Environment Agency is the competent harbour authority for the harbour of Rye. Situated on the beautiful Sussex coast, the harbour is one of the Cinque Ports and is therefore of significant historical interest. It provides an excellent base for sight-seeing, boaters, watersports enthusiasts and nature-lovers alike.

Trade to Rye Wharf is thriving, and is set to increase. An incentive to move goods to the 'coastal highways' has been launched, whereby ports or terminal operators can apply for freight grants to improve facilities, providing that they can demonstrate that lorries are being taken off the roads. Rye Wharf has obtained a new hydraulic cargo-handling machine with a 1.5 m bucket that has greatly increased the discharge speed, most ships being emptied within 3 hours.

Rye has a fishing fleet of 61 people with 33 fishing vessels of which 26 vessels are identified as active. For every person who goes to sea another 3 are employed in the shore-based processing and support sector. The contribution of the fishing industry to the local economy is around £8.7 million out of a total contribution of the harbour of £10.4 million. There are major plans to improve the fish market area to the east of the town.



Grand Union Canal (short lengths of which fall into the South East). Several other inland navigation authorities are responsible for managing other inland water stretches such as the Wey Navigation and the Basingstoke Canal. In addition to the inland waterways, there are public rights of navigation on the tidal section of many rivers where the registration of vessels is not required.

The number of registered craft on inland waterways managed by the Environment Agency and British Waterways, as well as lockages to measure traffic where available, can be used as an indication of the

level of boating activity on these waters.

The Environment Agency is responsible for navigation on 236 km of the River Thames between Cricklade near the source and Teddington Lock where the river becomes tidal, most of which is within the South East region. In November 2000 the Environment Agency launched an initiative 'Thames Ahead' to develop navigation and leisure on the non-tidal Thames. Developed in close collaboration with the boating trade and river users, 'Thames Ahead' aims to create a blueprint for sustainable leisure development, to improve facilities and to increase investment in the

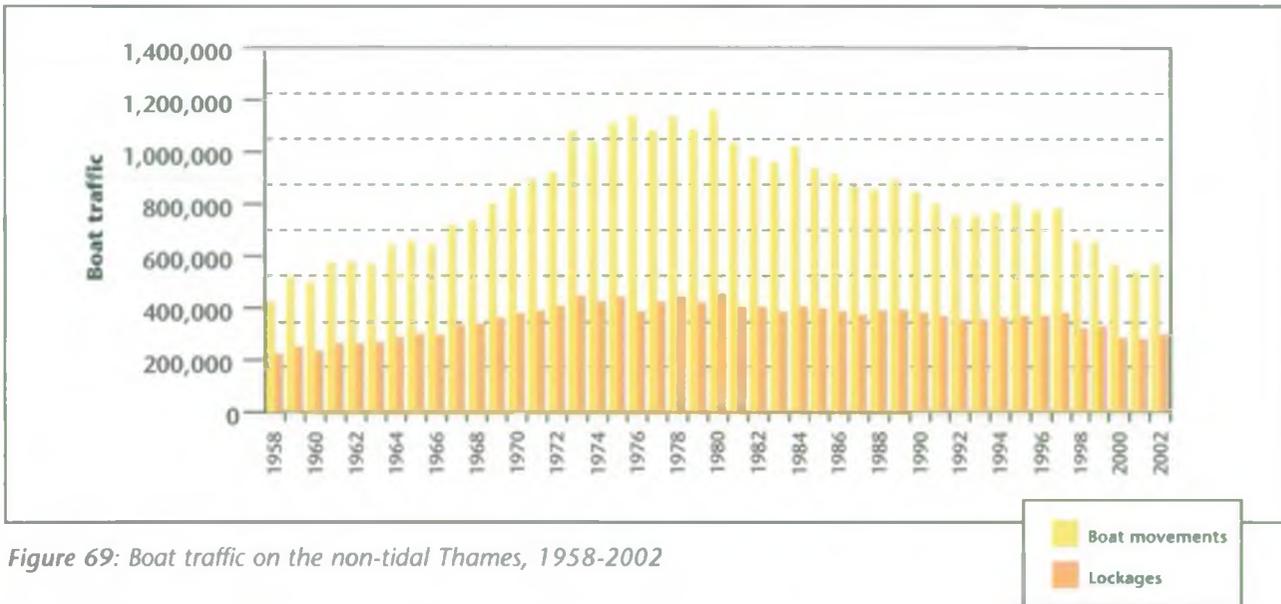


Figure 69: Boat traffic on the non-tidal Thames, 1958-2002

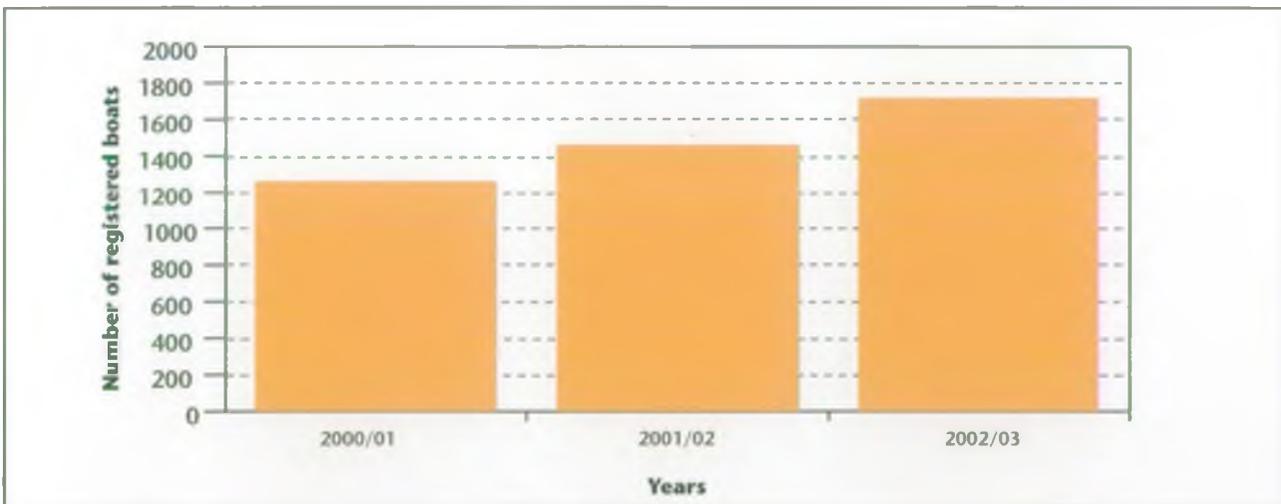


Figure 70: Registered boats on the River Medway, 2000-2003



river's infrastructure. The Environment Agency is working with partners to develop the 'River Alliance', a strategic partnership set up to rejuvenate the non-tidal River Thames.

Figure 69 shows the boat traffic on the non-tidal River Thames between 1958 and 2002. The figure shows the number of boats passing through locks each year (boat movements) and also the number of times a lock is used (lockages). Figure 70 shows the number of registered boats on the River Medway from 2000 to 2003.

Trends

The popularity of the River Thames was at its greatest between 1973 and 1981, with a peak of 1,163,305 craft movements in 1980. The late nineties saw a further decline in the number of boat movements from 784,628 in 1997 to 569,151 in 2002. The trend indicates a decline in the usage of the River Thames navigation with the current levels of usage not being seen since 1960.

In recent years the number of vessel registrations issued on the River Medway has increased in number. In 2002/03 over 1,700 boats were registered, which include short-term and annual registrations.

Targets

There are no specific national targets for increasing

the number of craft on inland navigable waterways, however, the Government's proposals for the future of inland waterways are set out in *Waterways for Tomorrow*. Whilst not setting specific targets, it states that the Government wants to:

- Promote the inland waterways;
- Encourage an integrated and sustainable approach to their use;
- Protect and conserve them as a vital part of our national heritage;
- Encourage their best and, where appropriate, innovative use; and
- Maximise the opportunities they offer for leisure and recreation, urban and rural regeneration, education and freight transport.

For its part, the Environment Agency is seeking to encourage the sustainable increase in craft on its navigations and to promote opportunities for access to inland waterways through its Waterways Plans. These focus on the sustainable development of recreation and navigation within the urban and rural environments. The objectives of such plans include:

- To promote waterway regeneration;
- To improve facilities for users;
- To improve and promote access for all users;
- To improve wildlife habitats in the waterway corridor;
- To improve navigation infrastructure; and
- To increase the number of boats on our waterways.

Medway Valley Countryside Partnership

The Medway Valley Countryside Partnership (formerly named the Medway River Project) is a not-for-profit organisation, which works to improve the countryside, recreation opportunities and wildlife habitats of the River Medway and the surrounding countryside. The partnership works with local people and communities and is sponsored by the Environment Agency, Kent County Council, Tonbridge and Malling Borough Council and Maidstone Borough Council. This sponsorship does not cover all the costs and the rest of the income is derived from grants and projects.

The partnership offers many services to a range of organisations and people including specialist knowledge of water environments, with involvement in pond restoration projects, management of wetland sites and the conservation management of riverside land.

The partnership also supports voluntary litter wardens along the river, who work to keep the banks of the river clean and tidy. Other projects the partnership takes on include creating new footbridges, upgrading sections of riverside paths and working with young people to educate them on the value of caring for the environment.

Indicator 37 Area of woodland

Background to the indicator

Forests and woodlands enhance our landscape and provide habitats for wildlife. They are places for leisure and recreation and are an economic resource for timber production, tourism, local development and regeneration.

Since 1924 the Forestry Commission has carried out a number of national woodland surveys. The fieldwork

for the latest survey of Great Britain, the *National Inventory of Woodland and Trees*¹⁰⁵, was completed in July 2000. The survey collected data on the size, distribution, composition and condition of woodlands. The main findings for the South East are shown below. Figures 71, 72 and 73 show the extent and composition of woodland in the South East. A key aspect of the South East's woodland is that a significant proportion is not intensively managed thus providing greater wildlife and amenity opportunities.

¹⁰⁵ Forestry Commission (2002) *National Inventory of Woodland and Trees - Regional Report of the South East*

¹⁰⁶ Source: Forestry Commission

Survey of woodland and trees - results for the South East

- The total area of woodland of 0.1 hectares and over in the South East is 270,084 hectares representing 14 per cent of the land area;
- Broadleaved woodland is the dominant forest type representing 55.2 per cent of all woodland;
- The main conifer is pine covering 29,921 hectares or 57 per cent of all conifer species;
- The main broadleaved species is oak covering 46,377 hectares or 27 per cent of all broadleaved species;
- 35,668 hectares or 14 per cent of woodland over 2 hectares is owned by or leased to the Forestry Commission;
- Woodland land cover increased by over 18,500 hectares from 13.1 per cent to 14.1 per cent of the land area between 1980 and 1996;
- The area of broadleaves increased by 26 per cent between 1980 and 1996;
- The relative proportion of broadleaves to conifers increased from 70 to 77 per cent between 1980 and 1996.

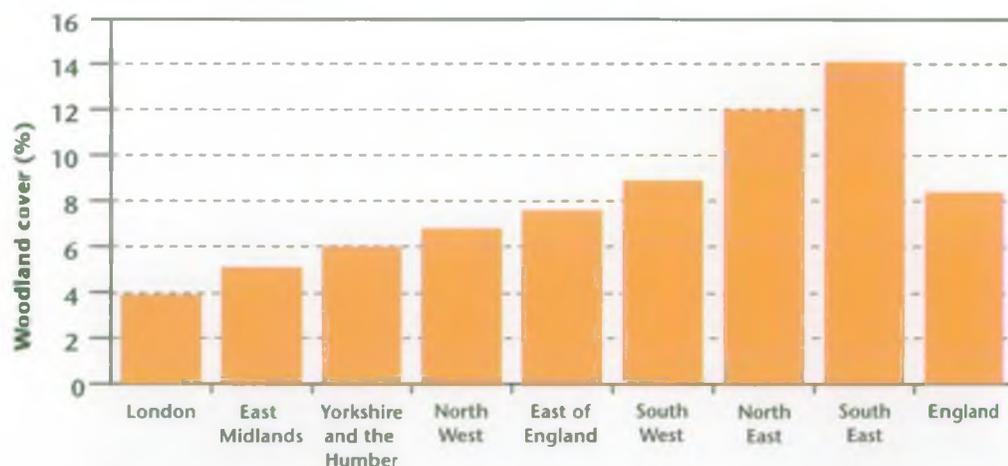


Figure 71: Summary of woodland area by region, 1996¹⁰⁶

Note: Area of regions used to derive woodland cover per cent is based on digital boundaries used in 1991 Census of Population

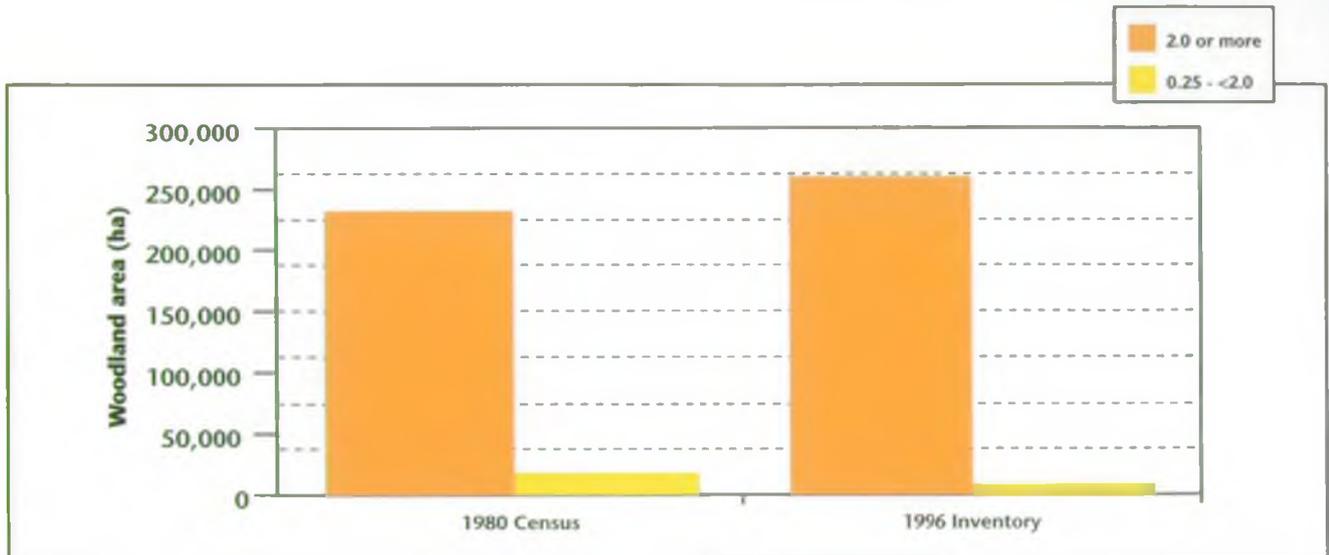


Figure 72: Comparison of woodland area between 1980 Census and 1996 Inventory in the South East¹⁰⁷

Note 1: Differences in sampling methodology may account for some of the apparent differences.

Note 2: The above figures from the 1996 Inventory exclude woodland between 0.1 and <0.25 hectares, thereby matching the scope of the 1980 Census.

Note 3: Land area used to calculate woodland cover percent (1996), 1,909,594 hectares, was based on the 1991 Census of Population digital boundaries.

Note 4: Land area used to calculate woodland cover percent (1980), 1,910,196 hectares, was based on Ordnance Survey data.

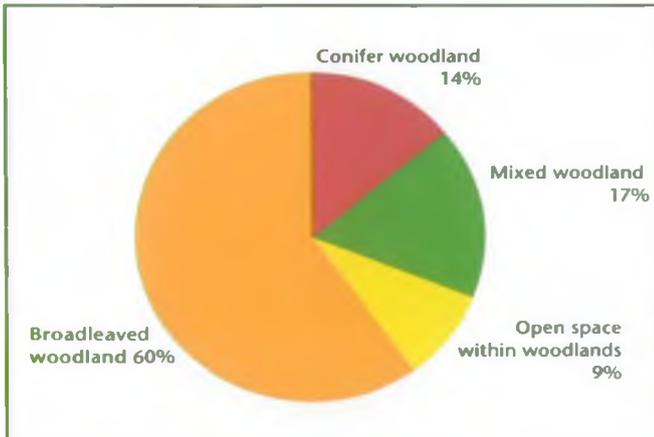


Figure 73: Dominant woodland type in the South East¹⁰⁸

Trends

The South East is the most wooded of all the English regions (see Figure 71). The area of woodlands in the South East of two hectares or more increased by 12 per cent between 1980 and 1996, whereas the area of woodlands of 0.25 to less than 2.0 hectares fell by 51 per cent (see Figure 72). The total area of all woodlands increased by 7 per cent over the same period, representing a change of woodland land cover from 13.1 to 14.1 per cent.

Targets

There are no specific targets for woodland. However, in 1998 the Government published a Forestry Strategy for England - *A New Focus for England's Woodlands*¹⁰⁹. It sets out the Government's strategic priorities and programmes for forestry in England.

Indicator 38 Beach litter

Background to the indicator

Litter not only spoils enjoyment of the coast but also threatens wildlife through entanglement and/or ingestion. Certain types of litter, such as sewage-related debris, harmful litter, oil and dog excrement are of greatest concern to beach users. The different types of litter found indicate pressures from different sources.

¹⁰⁷ Source: Forestry Commission

¹⁰⁸ Source: Forestry Commission

¹⁰⁹ Forestry Commission (1998) *England Forestry Strategy - A New Focus For England's Woodlands: Strategic Priorities and Programme*



The quantity of litter will be partly dependent on when beach surveys are carried out. For example, the quantity and type of litter following a hot bank holiday weekend would be different from that found after a rainy day. This indicator provides a useful estimate of types of litter, but care must be taken when considering trends.

The Marine Conservation Society (MCS) coordinates 'Beachwatch', a national annual clean up and survey of beaches that has taken place every September since 1993. Members of the MCS, supporters and the general public assist the clean-up of beaches and help raise awareness about the consequences of marine pollution to human health and wildlife. The results of the 2002 annual survey are published in the *Beachwatch 2002 Report*¹¹⁰.

The 'Beachwatch' survey results have also been used in the Environment Agency's report on *The State of the Environment of England and Wales: Coasts*¹¹¹ published in 1999, as a baseline average for assessing the state of UK beaches with respect to litter. Following collaboration between the Environment Agency and the National Aquatic Litter Group (NALG) the Environment Agency's Online Aesthetic Survey Information System database was launched in 2002. The database contains details of litter on beaches surveyed using a protocol developed by the NALG. It has been designed so that data from 'Beachwatch' and 'Adopt-a-Beach', also run by the MCS, surveys can be incorporated. Once fully established the database will provide a comprehensive picture of the occurrence of beach litter throughout England and Wales allowing the development of strategies to combat the problem.

In addition to 'Beachwatch', the Environment Agency has established 'BeachBeat' - a visual survey of aesthetic pollution such as litter on beaches in

England and Wales. 'BeachBeat' gives young people the chance to get involved in contributing to a better environment. By reporting the information they compile through the surveys it enables the Environment Agency and its partners to improve aesthetic quality of beaches by pinpointing site specific issues and taking action to tackle them.

There are three main award schemes for beaches:

- **European Blue Flag Awards** are the European standard for beach management and facilities, they are administered by Environmental Campaigns - formerly the Tidy Britain Group. They look at a whole range of beach management issues and require guideline pass for water quality under the EC Bathing Water Directive (76/110/EEC) (see Indicator 9, Section 3.2 Protecting and Enhancing Water Quality).
- **Seaside Awards** are very similar to the European Blue Flag Awards and are also administered by Environmental Campaigns. The criteria are slightly less stringent and require only a mandatory water quality pass under the EC Bathing Water Directive.
- **The Good Beach Guide** is the MCS's award scheme. It is primarily judged on the application of stringent criteria to the bathing water quality results. The guide includes information on beach facilities, but these do not have a bearing on the award.

Trends

The South East had the fifth highest density of beach litter of the eight regions surveyed in 2002. In 2002 the region recorded the lowest number of litter items per kilometre compared to 2000 and 2001. The South East was one of only two regions recording a decrease in the number of litter items between 2001 and 2002.

As in previous years, the majority of sourceable litter can be attributed to beach users and 'non-sourced' litter. In the South East an equal proportion of litter came from beach users and litter 'non-sourced'. Apart from the Channel Islands, the South East had the lowest litter derived from sewage related debris.

¹¹⁰ Marine Conservation Society (2002) *Beachwatch 2002 Report*

¹¹¹ Environment Agency (1999) *The State of the Environment of England and Wales: Coasts*

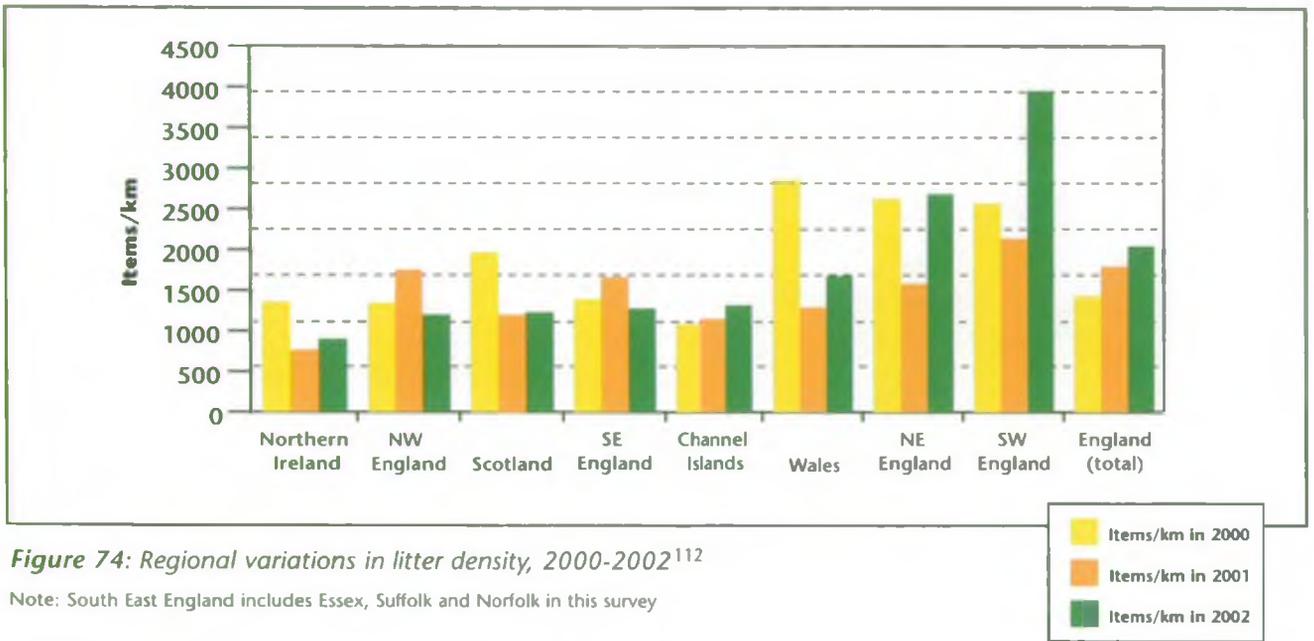


Figure 74: Regional variations in litter density, 2000-2002¹¹²

Note: South East England includes Essex, Suffolk and Norfolk in this survey

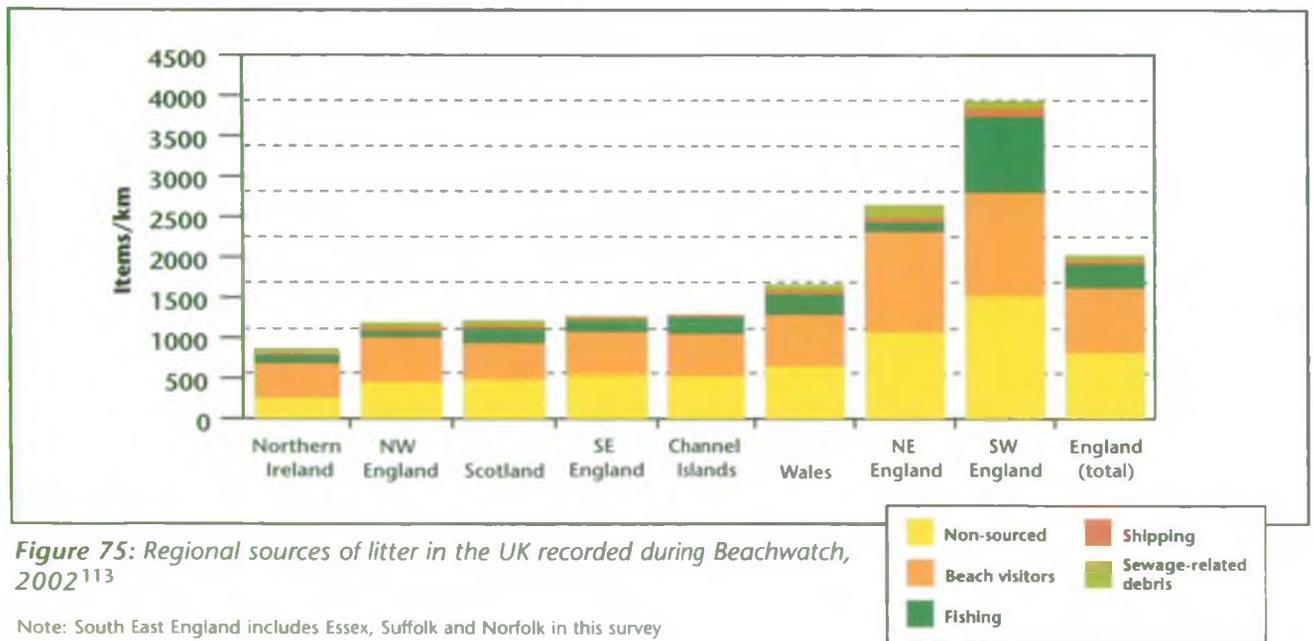


Figure 75: Regional sources of litter in the UK recorded during Beachwatch, 2002¹¹³

Note: South East England includes Essex, Suffolk and Norfolk in this survey

Targets

There are no specific targets for reducing beach litter. Reductions could be achieved through a variety of measures including:

- Education, publicity and awareness raising initiatives;
- Better enforcement of anti littering laws (i.e. Environmental Protection Act 1990);
- Implementation of preventative measures to reduce

illegal dumping at sea from ships, fishing vessels and offshore installations (e.g. the Merchant Shipping Regulations 1988 and other international conventions);

- Implementation of legislation to prevent pollution from sewage (e.g. the EC Bathing Water Directive

¹¹² Source: Beachwatch, 2002

¹¹³ Source: Beachwatch, 2002

(76/110/EEC) and Urban Waste Water Treatment Directive (97/27/EEC)); and

- Achievement of one of the award schemes for beaches.

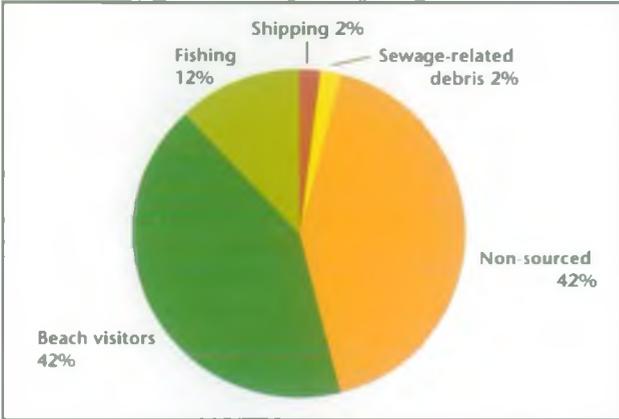


Figure 76: Sources of litter in the South East recorded during Beachwatch 2002¹¹⁴

of situations. The agriculture and horticulture sectors are major users of pesticides but they are also used widely in other situations such as amenity land, for public hygiene uses, as wood preservatives, boat anti-fouling paints or veterinary medicines.

The manufacture, sale and use of pesticides is highly regulated but even so, pesticides can be detected widely at low levels in many parts of the environment. The levels of pesticides found in the environment are not necessarily in proportion to their usage. A complex range of factors including physico-chemical properties, soil types and weather affect the transport of a pesticide in the environment from its site of application. The environment can be especially at risk from the misuse of chemicals or accidents that can cause serious environmental damage. Pesticides can contaminate freshwaters, groundwaters and soil even through approved uses.

There are significant regional differences in the use of agricultural pesticides. They are largely used in the arable areas of the east, midlands and southern England with less usage in Wales, the south west and the north west, although sheep dip chemicals (not included in these data) are likely to be more significant than agricultural chemicals in some of these areas.

Indicator 39 Use of pesticides in agriculture and horticulture

Background to the indicator

Pesticides are used to kill pest species in a wide range

¹¹⁴ Source: Beachwatch, 2002

¹¹⁵ Source: Defra

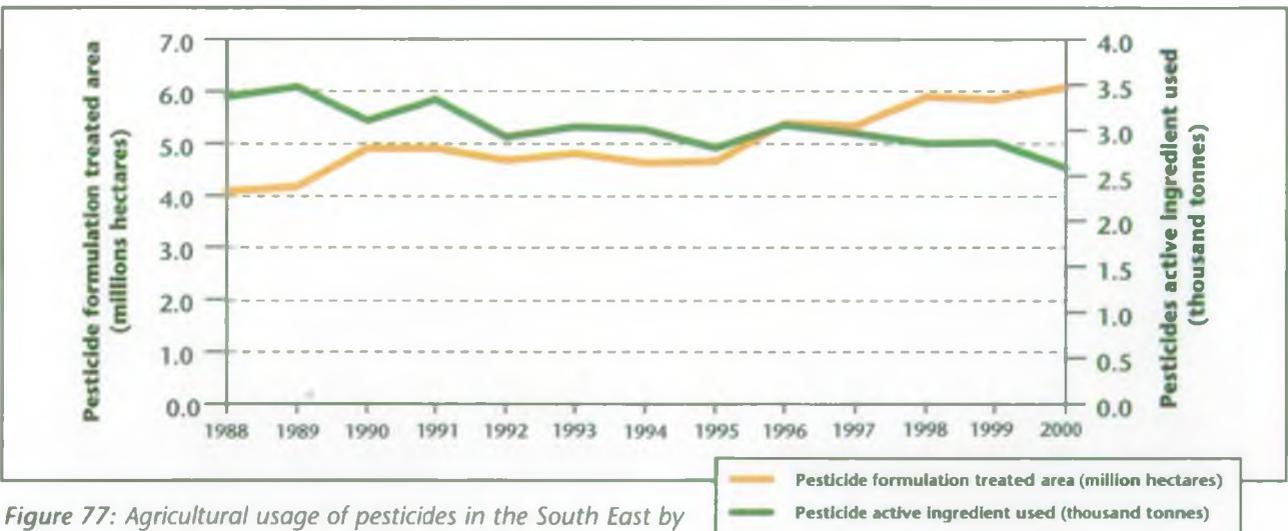


Figure 77: Agricultural usage of pesticides in the South East by weight used and area treated, 1988 to 2000¹¹⁵



Trends

This indicator shows that a decline in the weight of pesticides used has occurred in the past decade in the South East from a peak in 1989 of just less than 3500 tonnes to around 2600 tonnes in 2000. This is in part due to the development of newer, more effective pesticides, resulting in smaller quantities being required to achieve the same effect, and in part due to a change in agricultural methods of pesticide application. The total amount of pesticide used is not necessarily in proportion to the potential threat to the environment, because some pesticides used in small quantities may be more toxic than others used in larger quantities.

The formulation area treated is calculated by multiplying the area treated by the number of sprays it receives. This represents the average intensity of pesticide use on farmland and shows there has been an increase in 'spray area' from around 4.1 million hectares in 1998 to over 6.0 million hectares in 2000. This increase reflects a gradual move towards more frequent treatments and more complex tank mixtures of chemicals.

Targets

The Environment Agency monitors pesticide levels in water including surface fresh waters, groundwaters, marine waters, trade effluents and sewage discharges for both statutory and non-statutory purposes¹¹⁶. The data obtained are compared with Environmental Quality Standards (EQSs), the concentration of an individual substance which should not be exceeded in the environment, where available. The Environment Agency aims to ensure, through its regulatory role, full compliance with the EQSs set for different pesticides.

¹¹⁶ Environment Agency (2002) *Pesticides 2001 - the Environment Agency's pesticide monitoring programme.*

Actions and responses

Actions listed in the previous chapters contribute to the overall quality of life in the South East. In addition to these the Environment Agency will:

- Continue to contribute to Local Strategic Partnerships and initiatives such as the Medway Valley Countryside Partnership and the River Alliance;
- Work with key partners to regenerate waterways and improve access whilst keeping health and safety at the fore;
- Develop, publish and implement Waterways Plans for rivers managed by the Environment Agency and develop waterway standards;
- Be involved in various activities to try to minimise the impacts of pesticides on the environment including: developing the Environment Agency's Chemicals Strategy; participating in the Crop Protection Association's Voluntary Initiative; and implementing the Water Framework Directive;
- Work with the National Aquatic Litter Group to develop and maintain its Online Aesthetic Survey Information System and continue to support the 'Beachwatch' and 'Beachbeat' initiatives.

Emerging Issues, Future Priorities and Opportunities

Despite the progress and many improvements documented in this report, the environment of the South East faces growing pressures, many of which overlap. In the future, many of these pressures are set to increase and intensify, reinforcing the need for action across Government, industry and our wider society. While a great deal of action is already on stream - particularly through European environmental legislation - too often such action for the environment is itself seen as a problem. However, these drivers for change are opportunities to move industry, agriculture, the economy and consumers towards a better environment.

Many of the pressures on our environment are due to our general lifestyles and the economic success of the region. These include increasing strain on water resources, due to a growing population, more single-person households and higher per capita consumption; and potential air quality damage from increased traffic congestion.

Some of these pressures are likely to be exacerbated by global developments. Climate change is already making its mark on the environment of the South East and this is predicted to be an increasingly significant factor. Drier summers will compound growing demand on water supplies and sewage disposal. Wetter, stormier winters will add to flood risk, especially along the region's heavily developed coastline.

Some national initiatives, such as the 'Sustainable Communities'¹¹⁷ proposal, will bring their own pressures. For example, water resources are already so stressed in some parts of Kent that government proposals to build tens of thousands of additional homes will require careful planning if water shortages are to be avoided.

Within each of these pressures, the Environment Agency believes there are equally important opportunities. For example, if the strategic planning of new development takes full account of the environment, the infrastructure can be put in place to balance water resources against demand.

In a similar vein, a wave of European legislation is due to come into force which seeks to change how we deal with particular environmental problems. The

corresponding Directives deal with major social issues, such as waste disposal or water resources. While many of the changes required under these various pieces of legislation will challenge Government, industry, regulators, local authorities and the wider society, they will bring significant benefits for the environment.

The Environment Agency and its various partners in business, in government and in the wider society need to take these issues into account now, so that we can successfully build a better, cleaner and healthier environment in the future. An awareness of the environmental consequences of activity today - from our lifestyle expectations to massive development projects - needs to be the starting point for action to improve the environment tomorrow.

● Household Waste Production

The amount of household waste generated in the South East is growing faster than the economy and the population. From disposable nappies to food packaging, we are putting too much waste out for disposal. Major advances are needed to decrease the amount of household waste generated and the amounts that are recycled or reused. Physical capacity limits and legislative changes mean that landfilling our growing waste is not a long-term option for the South East. The capacity for waste minimisation, recycling and re-using waste - for example to generate energy - needs to grow.

● Water supply

Per capita consumption of water in the South East is higher than the rest of the country and it is increasing. There is already a delicate balance between existing water supplies and demand in some parts of Kent. This balance will become increasingly precarious as economic prosperity encourages greater water use. Population growth will add to demand, while supplies become more fragile as climate change takes effect.

¹¹⁷ ODPM (2003) *Sustainable communities in the South East: Building for the future*

- **Road traffic**

The growing population, increased car ownership and increasing commuter distances combine to threaten air quality. While improved vehicle technology has reduced the extent of pollution from individual cars, this improvement is threatened by the increase in car use and the increase in congestion. New development needs to incorporate adequate public transport infrastructure to reduce its impact on air quality.

- **Air traffic**

Four of the UK's biggest airports, Heathrow, Gatwick, Stansted and Luton, are located in or close to the South East, with a possible fifth under consideration. The air traffic capacity in the wider South East¹¹⁸ currently accounts for 60 per cent of all UK air travel. This could be set to triple in capacity over the next 30 years¹¹⁹. Such expansion has significant implications for the region's environment, as air transport has a significant effect on air quality.

- **Increased flooding**

The incidence of river flooding may get worse, both in frequency and in scale, due to wetter winters brought about by climate change. The impact of increased rainfall may be amplified by other factors, like changes in land management and increasing development in flood risk areas. As a result of sea level rise and more intense winter precipitation coastal flooding is a particular risk. The economic cost of flood damage is significant. Local planning authorities should take account of this when determining planning policies and determining applications for planning permission.

- **Sustainable Communities**

The Government's 'Sustainable Communities'¹²⁰ proposal identifies three growth areas in the South East: Milton Keynes in Buckinghamshire, Ashford in Kent and the Thames Gateway stretching from east London along the north Kent coast past Gravesend (see Section 3.5, Figure 45).

The Environment Agency will need to influence the development of these proposals to ensure the environment is taken into account. This will include ensuring areas of water scarcity are avoided, pressure on existing water treatment works is limited, suitable waste management facilities are available, designated wildlife sites are protected and development in the floodplain avoided. The

future impact of climate change in the South East also needs to be considered.

A Government commitment to build new homes to a certain environmental standard - incorporating water efficiency and energy efficiency measures - is a start, but does not go far enough to ensure effective protection of the environment. Higher standards are required and need to be economically, as well as environmentally, feasible.

- **Construction**

New development carries a significant risk of environmental damage during the construction process. The majority of waste currently generated in the South East is construction waste. Builders and developers need to adopt best-practice to ensure their business has a minimal impact on the environment.

Even before the announcement of the 'Sustainable Communities' proposals, existing development plans envisage an additional 39,000 new homes built in the South East every year. While several major developers have already put high environmental standards into practice, many smaller developments - often of just two or three houses at a time - take no account of the environment during their construction or in their long term operation. Environmental standards need to be built into all new construction projects.

¹¹⁸ Data includes Essex, Suffolk and Norfolk

¹¹⁹ Department for Transport (2003) *The Future Development of Air Transport in the United Kingdom: South East*. Second Edition

¹²⁰ ODPM (2003) *Sustainable communities in the South East: Building for the future*



- **Energy policy**

The Government published the White Paper 'Our energy future - creating a low carbon economy'¹²¹ in February 2003, setting out a long-term strategy for UK energy policy. It defines a long-term vision for energy policy considering environmental goals alongside security of supply, competitiveness and social goals. The environmental challenge of the paper is to put ourselves on a path to cut the UK's carbon dioxide emissions - the main contributor to global warming - by some 60 per cent by about 2050 with real progress by 2020. The Energy White paper identifies increased energy efficiency in existing buildings as the cheapest, cleanest and safest way to reduce carbon emissions.

- **Landfill Directive**

The EC Landfill Directive (99/31/EC) will dramatically change how waste is handled in this country. In a drive to reduce spiralling waste production and its disposal through landfill, the Directive sets tough targets to reduce the amount of waste going to landfill and to escalate the amount of waste being recycled and re-used. Hazardous waste will be banned from landfills completely.

Legislative action to encourage local authorities to meet these targets is currently going through Parliament. The Waste and Emissions Trading Bill progressively caps the amount of biodegradable waste each disposal authority can landfill each year. Local authorities are set recycling targets and more waste is being recycled than ever before.

Despite these positive developments, the existing capacity to recycle and re-use waste - for example, through combined heat and power plants - is limited. Further investment is needed if the demands to move away from landfill are to be met.

- **End of Life Vehicle Directive**

The EC End of Life Vehicle Directive (2000/53/EC) introduces the concept of 'producer responsibility' to the motor industry. From 1 January 2007, car manufacturers are due to meet all or at least a significant part of the costs of vehicle disposal. This Directive also aims to restrict the use of pollutants like heavy metals in new cars and to recycle 85 per cent of cars going to scrap. From 2007, the final owners will be able to dump their vehicles free of charge.

- **Waste Electrical and Electronic Equipment Directive**

Electrical and electronic goods often include heavy metals amongst their component parts. The EC Waste Electrical and Electronic Equipment Directive (2002/96/EC), which came into force in February 2003, requires a certain amount of such equipment to be recycled and recovered. The burden is expected to fall on local authorities, manufacturers and sellers of the products. Alongside this Directive, the EC Regulation of Hazardous Substances Directive, that comes into force in July 2006, will prohibit the inclusion of heavy metals such as lead, cadmium and mercury in consumer products.



- **Water Framework Directive**

The EC Water Framework Directive (2000/60/EC) is a significant piece of environmental legislation to be implemented across the European Union. The Directive integrates, replaces and builds upon a host of previously introduced environmental legislation. Its principal aims are to prevent the deterioration of any surface water body or groundwater, and to restore those requiring it, to good status by 2015. These will be achieved through a combination of monitoring and management action to assess and restore status.

¹²¹ Department for Trade and Industry (2003) *Energy White paper: Our energy future - creating a low carbon economy*

To achieve the 2015 target for good status the Environment Agency, in conjunction with its key partners, needs to act swiftly to establish monitoring networks to inform the river basin management planning process. These plans will identify impacts on the environment and the necessary actions required to restore good status.

- **Diffuse pollution**

Pollution of watercourses from a variety of unregulated sources is becoming increasingly significant, primarily as a result of improvements in regulated pollution sources. For example, where pollution from sewage treatment works is reduced, other sources of water pollution become proportionately greater. A significant source is from agriculture including nutrients from fertilisers, pesticides and soil and other debris. Other 'diffuse' sources include rain water run-off from roads and urban areas.

Improved regulation and the promotion of best practice on farms, being developed by the Environment Agency, will reduce the detrimental impact agricultural practices can have on the environment.

The Environment Agency will regularly monitor and document changes in the environmental indicators used in this report. The Environment Agency will develop new indicators to enable effective reporting against the range of emerging issues affecting the South East. Developing the range of indicators will also allow us to report fully against progress towards achieving the Environment Agency's goal of a better environment for present and future generations.

- Cabinet Office (2002) *Waste not, Want not - A strategy for tackling the waste problem in England*
- Davies *et al.* (2002) *Database and Atlas of Freshwater Fishes in the UK: Final Report*. Centre for Ecology and Hydrology (NERC)
- Defra (2000) *Waste Strategy 2000 for England and Wales*
- Defra (2000) *Waterways for Tomorrow*
- Defra (2001) *The UK's Third National Communication under the United Nations Framework Convention on Climate Change*
- Defra (2002) *Global Atmosphere Research Programme Bi-Annual Report 2000 to 2002*
- Defra (2003) *Review of non-native species policy: report of the working group*
- Department for Trade and Industry (2003) *Energy White Paper: Our energy future - creating a low carbon economy*
- Department for Transport (2002) *Transport Statistics Bulletin. Regional Transport Statistics: 2002 Edition*
- Department for Transport (2003) *The Future Development of Air Transport in the United Kingdom: South East. Second Edition*
- DETR (1999) *A better quality of life: a strategy for sustainable development for the UK*
- DETR (1999) *Quality of Life Counts: Indicators for a strategy for sustainable development for the United Kingdom: a baseline assessment*
- DETR (2000) *Planning Policy Guidance Note 3: Housing*
- DETR (2000) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Working Together for Clean Air*
- DETR and MAFF (2001) *Draft Soil Strategy for England. A Consultation Paper*
- English Nature (2000) *Phosphorus and River Ecology: Tackling Sewage Inputs*
- Environment Agency (1996) *The Environment of England and Wales - a snapshot*
- Environment Agency (1998) *State of the Environment Report for Thames Region (1998)*
- Environment Agency (1999) *The State of the Environment of England and Wales: Coasts*
- Environment Agency (2000) *Aquatic Eutrophication in England and Wales*
- Environment Agency (2000) *Environment 2000 and Beyond*
- Environment Agency (2000) *State of the Environment Report: The Environment Agency's contribution to a better environment in the South East*
- Environment Agency (2001) *An Environmental Vision: The Environment Agency's contribution to Sustainable Development*

Bibliography

- Environment Agency (2001) *Managing Water Abstraction: The Catchment Abstraction Management Strategy Process*
- Environment Agency (2001) *State of the Environment Report for London 2001*
- Environment Agency (2001) *State of the Environment Report for Thames Region - First update 2001*
- Environment Agency (2002) *Our Urban Future - Putting the environment at the heart of urban renewal*
- Environment Agency (2002) *Pesticides 2001 - the Environment Agency's pesticide monitoring programme*
- Environment Agency (2002) *State of the Environment 2001: The Environment Agency's contribution to a better environment in the South East*
- Environment Agency (2002) *The Urban Environment in England and Wales*
- Environment Agency (2003) *Best Farming Practices: profiting from a good environment (2nd Edition)*
- European Environment Agency (2003) *Greenhouse gas emission trends in Europe, 1999-2000*
- Forestry Commission (1998) *England Forestry Strategy - A New Focus For England's Woodlands: Strategic Priorities and Programme*
- Forestry Commission (2002) *National Inventory of Woodland and Trees - Regional Report of the South East*
- Government Office for the South East and Housing Corporation South East (2002) *South East Regional Housing Statement 2002-2005: A Framework for Action. Building Consensus.*
- Marine Conservation Society (2002) *Beachwatch 2002 Report*
- Ministry of Agriculture, Fisheries and Food (1998) *Code of Good Agricultural Practice for Water (Revised Edition)*
- Office for National Statistics (2002) *Region in Figures: South East*
- Office of the Deputy Prime Minister (2001) *Planning Policy Guidance Note 25: Development And Flood Risk*
- Office of the Deputy Prime Minister (2001) *Regional Planning Guidance for the South East (RPG9)*
- Office of the Deputy Prime Minister (2003) *Sustainable communities in the South East: Building for the future*
- Policy Commission on the Future of Food and Farming (2002) *Farming & Food: a sustainable future*
- Pretty, J. N., Mason, C. F., Nedwell, D. B. and Hine, R. E. (2002) *A preliminary assessment of the Environmental Costs of the Eutrophication of Freshwaters in England and Wales. University of Essex*
- SEEDA (2002) *Regional Economic Strategy for South East England 2002-2012*
- SEEDA (2002) *The Environmental Economy of the South East of England: Executive Summary*
- South East Climate Change Partnership (1999) *Rising to the Challenge: The Impacts of Climate Change in the South East in the 21st Century*
- South East Climate Change Partnership (2002) *Climate Change Impacts - looking ahead for the South East*
- South East England Regional Assembly (2001) *The Regional Sustainable Development Framework: A Better Quality of Life in the South East*
- South East England Regional Assembly (2002) *Destination South East - Regional Spatial Planning Strategy for Tourism Consultation Draft*
- South East England Regional Assembly (2002) *Harnessing the Elements: A Strategy for Energy Efficiency and Renewable Energy (Consultation Draft)*
- South East England Regional Assembly (2003) *Draft Regional Transport Strategy: From Crisis to Cutting Edge*
- Sustainable Development Commission (2003) *Policy Audit of UK Climate Change Policies and Programmes. Report by the Edinburgh Centre for Carbon Management*

Glossary

Abstraction: The removal of water from any source, either permanently or temporarily, usually by pumping. Requires a licence from the Environment Agency.

Abstraction licence: A statutory document issued by the Environment Agency to permit removal of water from a source of supply. It can limit the quantity of water taken daily.

Algal blooms: Rapid growth of phytoplankton in marine and freshwaters which may colour the water and may accumulate on the surface as a green scum. Decomposing dead cells consume large quantities of oxygen in the water which may result in the waters becoming anaerobic.

AONB: Areas of Outstanding Natural Beauty are designated under the National Parks and Access to the Countryside Act 1949 because of their outstanding scenic beauty. Their primary purpose is to conserve and enhance their natural beauty including flora and fauna.

Aquatic: Pertaining to the water environment.

Aquifer: A permeable geological stratum or formation that is capable of both storing and transmitting water in significant amounts.

Biodiversity: The number of different plant and animal species, including variants within each species, in an ecosystem. The variety of biological life.

BOD: Biochemical Oxygen Demand. The amount of dissolved oxygen consumed by chemical and microbiological action when a sample effluent is incubated for 5 days at 20°C.

Borehole: Generally a small diameter bored hole which is used to exploit an aquifer. Synonymous with the term well.

Catchment: An area which drains either naturally or with artificial assistance to a river. It includes the drainage channels, tributaries, floodplains and washlands associated with a river and an estuary where one is present. Also an area drained by a sewerage system.

Climate Change Levy: A tax on the business use of energy.

Coliform (Faecal Coliforms): A group of bacteria found in the intestine and faeces of most animals. Coliforms can sometimes be found in untreated water. The treatment process removes them and disinfection prevents their reappearance in the distribution system. In water receiving discharges, faecal coliform bacteria are used to indicate the presence of sewage.

Diffuse Pollution: Pollution from widespread activities with no one discrete source, for example acid rain, pesticides and urban run-off.

Diffuse Source: A source of pollution which is not an identifiable point discharge but includes field or urban runoff, atmospheric emissions or numerous poorly defined discharges.

Eutrophication: The enrichment of water by nutrients, especially nitrogen and/or phosphorous, which cause: accelerated growth of algae and high plant life: changes in the ecological balance and deterioration in water quality.

Evapotranspiration: The loss of moisture from the earth's surface by means of direct evaporation together with transpiration from vegetation.

Greenhouse gases: Natural and man-made gases which influence the greenhouse effect. Including carbon dioxide, methane, ozone, chlorofluorocarbons, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Glossary and Abbreviations

Groundwater: Refers to all subsurface water as distinct from surface water. Generally groundwater is considered to be that water which is below the zone of saturation and contained within porous soil or rock stratum (aquifer).

Isohyet: A line drawn through geographical points recording equal amounts of precipitation during a specific period.

Pesticide: A chemical which is selectively toxic to target organisms such as insects, weed and molluscs.

Planning Policy Guidance Notes: A series of planning policy statements to give guidance to local planning authorities, applicants, the public and consultees on a range of planning matters.

Point source: A source of pollution which is a discrete identifiable discharge, such as a sewage outfall or industrial discharge.

Precipitation: Deposition of moisture including dew, hail, rain, sleet and snow.

Ramsar Sites: Internationally important wetland sites adopted from the Convention of Wetlands of International Importance especially as water flow habitats (1971) and ratified by the UK government in 1976.

Sustainable Development: Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs (the Brundtland Report, 1987).

Waste: Any substance or object that is discarded, intended to be discarded or is required to be discarded may be considered to be waste.

Abbreviations

AMP	Asset Management Plan
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
AVM	Automated Voice Messaging
BAP	Biodiversity Action Plan
CAMS	Catchment Abstraction Management Strategy
CAP	Common Agricultural Policy
CSS	Countryside Stewardship Scheme
Defra	Department for Environment, Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions
ELS	Entry Level agri-environment Scheme
EQS	Environmental Quality Standard
ESA	Environmentally Sensitive Area
GDP	Gross Domestic Product
GOSE	Government Office for the South East
GQA	General Quality Assessment
IPC	Integrated Pollution Control
IPPC	Integrated Pollution Prevention and Control
IWAAC	Inland Waterways Amenity Advisory Council
MCS	Marine Conservation Society
MSW	Municipal Solid Waste
NALG	National Aquatic Litter Group
NVZ	Nitrate Vulnerable Zone
ODPM	Office of the Deputy Prime Minister
OFWAT	Office of Water Services

PCC	Per Capita Consumption
PPC	Pollution Prevention and Control
PPG	Planning Policy Guidance
RE	River Ecosystem
RES	Regional Economic Strategy
RPG	Regional Planning Guidance
RQO	River Quality Objective
RSDF	Regional Sustainable Development Framework
RSS	Regional Spatial Strategy
SAC	Special Area of Conservation
SECCP	South East Climate Change Partnership
SEEDA	South East England Development Agency
The Regional Assembly	South East England Regional Assembly
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Drainage Systems
UKCIP	UK Climate Impacts Programme
WHO	World Health Organisation

Units

°C	degrees Celsius
d	day
ha	hectare
km	kilometre
km²	square kilometre
l	litre
l/h/d	litre per head per day
m³	cubic metre
m³/s	cubic metres per second
mg	milligrams
mg/l	milligrams per litre
MI	megalitre
MI/d	megalitre per day
mm	millimetre
ppb	parts per billion (parts per 1000 million)
µg/l	micrograms per litre
µg/m³	micrograms per cubic metre
µm	micrometre

Chemical abbreviations

CO	Carbon monoxide
CO₂	Carbon dioxide
NO	Nitric oxide
NO_x	Nitrogen oxides
NO₂	Nitrogen dioxide
PM_{2.5}	Particles with a diameter less than or equal to 2.5 micrometres
PM₁₀	Particles with a diameter less than or equal to 10 micrometres
SO₂	Sulphur dioxide

The role of the Environment Agency

The Environment Agency is the leading public organisation for protecting and enhancing the environment in England and Wales. We regulate industry and inspect industrial sites to protect people and the environment from pollution and control environmental risks to health. We encourage ever more effective environmental stewardship by industry and all other sectors. The Environment Agency maintains essential flood defences, water resources and river navigation structures. We restore and improve the land and wildlife habitats

We have a duty to contribute towards the goal of sustainable development through taking an integrated approach towards the management of the environment. We also have a responsibility to 'compile information on' and 'to form an opinion' on the state of the environment and to make the data and information that we collect widely available.



'Communicating the message'

Related Environment Agency reports

The Environment Agency's first national overview, *The Environment of England and Wales - a snapshot*, was first published in 1996 and is regularly updated on the Environment Agency's website that can be found at <http://environment-agency.gov.uk>. In 2000 the Environment Agency published *Environment 2000 and Beyond* which considers how the environment in England and Wales may change in the future under the pressure of expected economic and social changes and of climate change.

Since the Snapshot was first published, the Environment Agency has produced more in-depth reports looking at particular aspects of the state of the environment, including fresh waters, coasts, the land and the atmosphere. Most recently in this series, the Environment Agency has published *The Urban Environment in England and Wales* (2002), which highlights the benefits of a safe and clean urban environment to economic growth and tackling social inequalities. This was followed-up by *Our Urban Future - Putting the environment at the heart of urban renewal*, which draws on the more detailed assessment contained in *The Urban Environment in England and Wales* and highlights trends in the state of the urban environment since 1990, focussing on public spaces, air quality, water quality, wildlife, buildings and development and flood risk.

Reports of particular relevance to the South East are:

- *State of the Environment 2001: The Environment Agency's contribution to a better environment in the South East* (2002);
- *State of the Environment Report for London 2001* (2001);
- *State of the Environment Report: The Environment Agency's contribution to a better environment in the South East* (2000);
- *State of the Environment Report for Thames Region - First update 2001* (2001); and
- *State of the Environment Report for Thames Region* (1998).

Picture reference

- Front cover** *Girl on swing - Environment Agency*
Boy enjoys paddle on flooded country lane - John Connor Press Associates Ltd
Housing development - Environment Agency
Breaking waves - Ray Kemp, Environment Agency
Mother and son with flower - John Chandler
Hawker dragonfly on twig - Phil Smith, Environment Agency
Bluebell woods - IKON IMAGING
- Pg 13** *Clouds - IKON IMAGING*
- Pg 16** *Air pollution in skies over the Vale of Aylesbury, Bucks from Dunstable Downs - Ernie Janes; RSPB-images.com*
- Pg 27** *Bathing beach sampling - Environment Agency*
- Pg 30** *Water quality sampling - Environment Agency*
- Pg 45** *Beddingham Landfill Site, East Sussex - David Nicholls*
- Pg 50** *Recycling operation - Environment Agency*
- Pg 53** *Water droplet - Environment Agency*
- Pg 55** *Water droplets on grass - Mark Hamblin; RSPB-images.com*
- Pg 62** *Running tap - Environment Agency*
- Pg 67** *Flooding in Worthing Town Centre - Sheila Crosswaite, Environment Agency*
- Pg 70** *Lewes under water - Denny Rowlands*
- Pg 77** *Flooding of new housing development - Environment Agency*
- Pg 81** *Breaking waves - Ray Kemp, Environment Agency*
- Pg 84** *Dog on path - Martyn Crosswaite*
- Pg 95** *Poppy in cornfield - Robyn Holland*
- Pg 97** *Straw bales in field - Martyn Crosswaite*
- Pg 102** *Cows in field - Environment Agency*
- Pg 105** *Ragged robin - Environment Agency*
- Pg 111** *Otter and water vole habitat creation, River Itchen - Environment Agency*
- Pg 114** *Otter cubs - Environment Agency*
- Pg 123** *Beech woodland - IKON IMAGING*
- Pg 131** *Seagull on litter bin - John Chandler*
- Pg 136** *Housing development - Environment Agency*
- Pg 137** *Storage of fridges prior to recycling - John Chandler*
- Pg 144** *Communicating the message - Environment Agency*
- Back cover** *Flooded roads - John Connor Press Associates Ltd*
Dog on path - Martyn Crosswaite
Storage of fridges prior to recycling - John Chandler
Fly tipping - Environment Agency
Straw bales in field - Martyn Crosswaite
Kingfisher - Environment Agency
Clouds - IKON IMAGING

The South East: Key Facts

- In 2000 the environmental economy contributed over £7.8 billion Gross Value Added to the South East's economy, equivalent to just over 6 per cent of the total regional economy¹.
- The region has by far the most heavily used roads outside London (average daily flow² of 4,800 vehicles per day on all roads compared to the England average of 3,600 vehicles)³.
- The South East has 25,000 manufacturing enterprises which contribute £18 billion to the economy and employ more than 500,000 people, representing 19 per cent of the region's business workforce⁴.
- The region's population accounts for 13.6 per cent of the UK total and had a population growth of 5.9 per cent between 1991 and 2001 compared to 3.7 per cent nationally⁵. The rising population places increasing pressure on the provision of housing, drinking water supplies and disposing of waste properly and safely.
- The South East is the most wooded region in the country and around 40 per cent of the region is protected by some form of conservation designation, such as Area of Outstanding Natural Beauty or Site of Special Scientific Interest.
- Four of the UK's biggest airports, Heathrow, Gatwick, Stansted and Luton, are located in or close to the South East, with a possible fifth under consideration. The wider South East⁶ accounts for 60 per cent of all UK air travel. Predictions suggest the capacity could triple over the next 30 years⁷.
- Landfill capacity is limited and disposing of waste in the future will present the region with a major challenge. Twenty-nine million tonnes of waste is re-used, recycled or disposed of in the region each year, of which around 15 million tonnes is landfilled.

The South East: Opportunities and Threats



Air Quality

Air quality in the South East is continuing to improve, but emissions from road traffic pose the greatest threat. The region has higher than average car use with eight out of every ten households owning a vehicle. Increased air traffic and new airports could further add to pollution. The damage to air quality by industries regulated by the Agency is falling and is set to continue.



Water Quality

River quality in the South East has improved significantly and bathing water quality at the South East's beaches is the best since records began. Further improvements are needed. New developments, climate change and diffuse pollution threaten improvements to water quality. River nutrients have fallen due to better sewage treatment. However, nutrient levels remain too high and often originate from unregulated sources. These sources include rain water run-off from roads, illegal fly-tipping and, most importantly, farming.

- 1 SEEDA (2002) *The Environmental Economy of the South East of England: Executive Summary*
- 2 Average daily flow: annual traffic divided by road length x 366
- 3 Department for Transport (2002) *Transport Statistics Bulletin. Regional Transport Statistics: 2002 Edition*
- 4 SEEDA (2002) *Regional Economic Strategy for South East England 2002-2012*
- 5 Office for National Statistics (2002) *Region in Figures: South East*
- 6 Data includes Essex, Suffolk and Norfolk
- 7 Department for Transport (2003) *The Future Development of Air Transport in the United Kingdom: South East. Second Edition*



State of the Environment 2003

The Environment Agency's assessment of the environment in South East England: A summary

The environment of South East England is a prized and valuable asset, rich in quality and diversity. Over the past decade, there have been significant improvements to the South East's environment.

- Air quality has improved. This is largely due to fewer emissions from heavy industry and improved vehicle technology which has cut exhaust fumes.
- Water quality in our rivers has improved as sewage treatment works have been upgraded through a combination of regulation and investment. Similar investment means we have cleaner bathing water at our beaches.
- Strengthened flood defences protect more properties than ever before from the threat of flooding.

However, at the same time, this region faces some of the most serious environmental challenges in the country - challenges that are expected to increase over the next decade.

- There are growing pressures on water resources, through a growing population, more single-person households and higher per capita consumption.

- Population growth and new development is bringing pressure on the land for development, adding to flood risks, increasing the challenges of safe management and disposal of waste and threatening air quality through increased traffic congestion.
- With plans for over 1 million new homes major changes are needed to ensure this growth does not damage the environment. Even where the environment has improved - for example with air quality - there are localised problem areas and progress is not guaranteed.

The Environment Agency believes there are important opportunities. For example, if the planning of new development takes full account of the environment, the infrastructure can be put in place to balance water resources against demand.

The Environment Agency and its partners in business, in Government and in the wider society need to take these issues into account now, so that we can successfully build a better, cleaner and healthier environment in the future. An awareness of the environmental consequences of activity today - from our lifestyle expectations to massive development projects - needs to be the starting point for action to improve the environment tomorrow.



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Future Growth - For Better or Worse?

The South East is set to grow over the next two decades, both in terms of its population and its economy. The population of 8 million is growing faster than the rest of the country and will continue to increase. There are proposals to build over 1 million new homes, adding to the existing stock of around 3 million. The South East's economy is set to grow into one of the world's top 15 regional economies.

If this growth is achieved in the wrong way, our environment will suffer. But there is a major opportunity to shape how we live in order to maintain the balance between natural resources and modern lifestyles.

The Government's 'Sustainable Communities'⁸ proposal, identifies three specific growth areas in the South East at Milton Keynes in Buckinghamshire, Ashford in Kent and the Thames Gateway stretching from east London along the north Kent coast past Gravesend.

Development on this scale must take full account of the environment if it is to produce homes and communities where people will want to live. Flood risks need to be fully assessed, especially along the Thames Gateway and around Ashford, which has an extensive flood plain. Population growth and greater prosperity will add to water demand, while supplies will become more fragile as climate change takes effect. Increased demand for domestic water supply also means an increased production of sewage. The

existing capacity for disposal needs to be expanded and improved.

Increased development also means a further increase in waste - construction waste whilst development takes place and domestic waste once people move in. Every effort is needed to reduce waste during construction and to ensure new residents can play their part to reduce, re-use and recycle. Waste recycling and waste disposal alternatives - such as waste-to-energy plants - need to be planned.

A Government commitment to build all new homes in development zones to an environmental standard - incorporating water efficiency and energy efficiency measures - is welcomed. Higher standards will provide effective protection of the environment and are economically viable.

The impact on air quality needs to be addressed. Public transport and the design of communities, which allow people to walk or cycle - safely and over short distances to key facilities like shops - can reduce car use and traffic congestion.

This report highlights the enormous pressures on our rich and diverse environment. These bring a need for change as well as new opportunities. It is essential that Government, regulators, business and wider society work together to ensure growth is achieved alongside a balanced and protected environment in the South East.

8 Office of the Deputy Prime Minister (2003) *Sustainable communities in the South East: Building for the future*

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Waste

The amount of waste generated is increasing. Household waste is growing faster than the economy and the growth in population. From disposable nappies to food packaging, we are putting too much rubbish in the bin. New legislation and a shortage of landfill sites require a massive redirection of waste toward recycling and re-use. Industry, businesses and the public need to reduce their waste which in itself needs to be used more productively.



Water Resources

Per capita consumption of water is higher than the rest of the country and is increasing. At the same time, the region has relatively low rainfall. Three quarters of the population depends on groundwater for its supplies - these are at risk, with climate change bringing less rainfall in summer months when demand is highest. The gap between existing water supplies is tight while economic and population growth will add to demand. Water efficiency measures - such as leakage controls, metering and water-efficient domestic appliances - are fundamental to managing resources.



Flood Risk

Over 235,000 properties are at risk from flooding. Investment in flood defences and warning systems have reduced the impact of rainfall events and storm tides. Risk of inundation from the sea remains the region's biggest risk. Flooding is predicted to get worse, both in frequency and scale, due to wetter winters brought by climate change. Coastal flooding, due to sea-level rises and more intense winter rainfall, is a particular risk. With significant development pressures it is vital that flood risks are fully considered in all new buildings.



Climate Change

The impacts of global warming are being increasingly felt in the region. Drier summers will mean increased pressure on water resources. In some parts of the region they are already stretched and new developments could aggravate the situation. Perhaps the greatest threat will come from stormier winters and predicted rises in sea level around the region's coastline. Flooding could threaten important coastal habitats and the heavily populated coastal strip.



Land Quality

Two-thirds of the region is farmed and agriculture is a major influence on land quality. Poor management can cause pollution and soil erosion, while good practices can enhance the environment. The expanding population, the trend towards rural living and smaller households are increasing the demand for greenfield land for housing. Around 55 per cent of new homes are now built on previously developed sites, against a national target of 60 per cent by 2008.



Biodiversity

Our habitats and wildlife are under increasing pressure from development, climate change and farming. Climate change is expected to lead to the migration of species and habitats northwards. The otter population is slowly recovering but they remain rare in the region. Water voles have declined and could become extinct in many areas.

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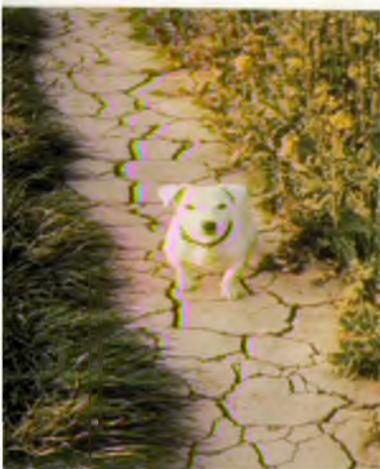
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