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- There were about 14,000 hectares of land in agricultural holdings in London in June 2001, 39 per cent of which was arable land.
- London had over 18,000 entries in the list of buildings of architectural or historic interest: 566 of these were Grade I and 1,260 Grade II*.

03: Environment



- Each household in London produces 1.1 tonnes of waste a year, and the quantity is growing at 2.5 per cent per annum.
- The half-century since the great London smog of December 1952 has seen a marked reduction in the pollutants associated with coal burning, whereas the pollutants of greatest concern in London now come from road traffic.
- 56 per cent of London's rivers and canals are rated 'Fairly good' or better.
- In 2002, rainfall in London exceeded 700 mm (27.5 inches) for the third year running – a figure otherwise exceeded only twice since 1940.

This chapter describes land use in London including the distribution of protected land in the Green Belt and areas of Open Land, and the important legacy of the capital's historic buildings and areas. It continues with a description of the waste collection and disposal services in London, followed by a discussion of air and river quality, and noise pollution. The chapter closes with a brief look at the weather in 2002.

The use of land and buildings

The Institute of Terrestrial Ecology's Land Cover Figure, based on images from Earth observation satellites, provides information on 25 types of land cover for the whole of Great Britain. It shows that although London is predominantly an urban area, it is not entirely built-up: over a third of its total land area is semi-natural or mown grass, tilled land and deciduous woodland. Table 3.1 summarises the principal categories of land coverage in London, while Map 3.2 illustrates their extent. The analysis is based on the Ordnance Survey's 1 x 1 kilometre grid squares and includes grid squares that cross the London boundary.

The analysis of land cover derived from satellite images identifies non-urban areas but does not indicate whether these areas are used for agriculture. However, the Census of Agriculture indicates there were 14,000 hectares of land in agricultural holdings in London in June 2001, of which 39 per cent was arable land, lower than the proportion in England as a whole (48 per cent). In addition, London had a quantity of set-aside land; 11 per cent of London's total land in agricultural holdings was set-aside compared with 7.6 per cent across the whole of England. Whilst the total area of agricultural holdings has not changed significantly, the area of arable land has fallen and the area of set-aside has increased since 1998.

As the majority of land in London is already in some form of developed use, most changes in use involve replacing existing buildings with new ones, or

Table 3.1

Land cover¹; London, 1988-1991

	Hectares and Percentages	
	Thousands of hectares ²	Percentages
Suburban	66	38
Continuous urban	36	20
Semi-natural grass	29	17
Mown grass	13	8
Tilled land	12	7
Deciduous woodland	8	4
Other vegetation	5	3
Inland water	2	1
Estuary	1	1
Other land	3	2
Total	174	100

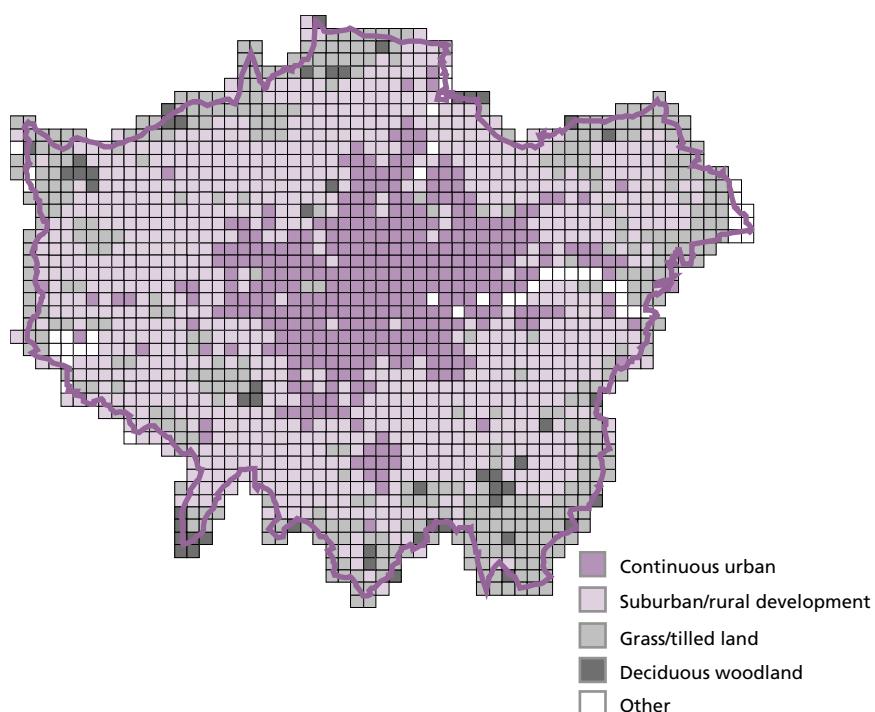
1 Data taken from the Land Cover Map of Great Britain.

2 The satellite classification may involve a degree of imprecision and misallocation, so the results should be used with caution.

Source: Institute of Terrestrial Ecology, Monks Wood © NERC

Map 3.2

Land cover by kilometre square¹, 1988-1991



1 Plot and data taken from the Land Cover Map of Great Britain. The satellite classification may involve a degree of imprecision and misallocation.

Source: Greater London Authority

putting old buildings to new uses. Land use changes recorded by the Ordnance Survey show that 85 per cent of land changing to developed uses between 1995 and 1998 had previously been in some form of developed use. A further five per cent was urban land which had not previously been developed (*Table 3.3*). Only 9 per cent of land changing to developed use was previously in agricultural or other land not previously developed. The proportions are similar for land specifically being developed for housing.

Some land has been so damaged by industrial or other development, that it is incapable of beneficial use without treatment. This includes disused landfill sites, worked-out mineral excavations and abandoned industrial installations. Some of this land may be contaminated as a result of leakage or because wastes were disposed of on site. The latest survey of derelict land carried out by the Office of the Deputy Prime Minister shows that there were 368 hectares of derelict land and buildings in London in 2001 (*Table 3.4*), a reduction from the 1,625 hectares reported in 1993.

Significant changes in the use of land or buildings, and the construction of new buildings and other structures, require consent under the Town and Country Planning Act 1990 and associated legislation. Applications are submitted to the relevant London Borough Council as the local planning authority. *Table 3.5* shows the number of planning applications received during 2001/02. The local authority makes most decisions and only a small proportion of applications are withdrawn, referred to the Office of the Deputy Prime Minister or refused. If consent is refused or the local planning authority fails to make a decision within eight weeks of receiving the application, the applicant may appeal to the Deputy Prime Minister. The number of applications received was lower in Inner London in 2001/02 than in 1998/99 (down from 34,200 to 32,100) but up in Outer London (up from 39,300 to 49,600). *Table 3.5* also

Table 3.3**Change in land use: London, 1995-1998^{1,2}**

	Hectares and percentages			
	Land changing to developed use		Land changing to residential use	
	Hectares ³	Percentage of total	Hectares ³	Percentage of total
Previous use of land				
Agriculture	15	2	5	2
Urban land not previously developed	35	5	25	9
Other land not previously developed	50	7	20	7
Residential	80	11	50	18
Vacant land previously developed	165	23	110	39
Other land previously developed	360	51	80	28
Total	705	100	285	100

1 The information relates only to map changes recorded by the Ordnance Survey between 1995 and 2001 for which the year of change is judged to be between 1995 and 1998.

2 See Notes and Definitions.

3 Figures are rounded to the nearest 5 hectares.

Source: Office of the Deputy Prime Minister

Table 3.4**Derelict land and buildings¹, 2001**

	Hectares	
	Derelict land and buildings	
Greenwich ²		107
Barking and Dagenham ²		89
Barnet ³		41
Newham		31
Wandsworth		31
Croydon		16
Harvington		15
Bexley ²		10
Other boroughs ⁴		28
London		368

1 Taken from the National Land Use Database of Previously Developed Land.

2 Completion figures have not been provided.

3 Completion is less than 85 per cent

4 Includes the City of London, Hackney, Hillingdon, Hounslow, Lewisham, Redbridge, Southwark, Tower Hamlets, Waltham Forest. Data for all other boroughs were either negligible or unavailable.

Source: National Land Use Database, Office of the Deputy Prime Minister

shows the number of applications granted, granted on appeal or refused across London.

Table 3.6 shows the number and floorspace of commercial and industrial buildings in London in 2001. In 2001 the total number of hereditaments (any property that may pass on to an heir) in London was over 228,000, covering a floorspace of just under 71 million square metres. Further information on commercial and industrial buildings and their floorspace in London boroughs is given in **Table A3.1** in the Appendix.

Protected land

London is surrounded by the Green Belt, the main purposes of which are to:

- check the unrestricted sprawl of the London built-up area;
- prevent neighbouring towns from merging with one another and with the London built-up area;
- safeguard the countryside from urban encroachment; and
- assist in urban regeneration by encouraging the reuse of derelict and other urban land.

The extent of the Green Belt is shown in **Map 3.7**.

One of London's greatest assets is its patchwork of parks and open land. Its inhabitants and visitors benefit from a legacy of Royal Parks, municipal parks and gardens, playing fields and many small public and private open spaces, particularly in central London. Certain parks and open areas are designated as Metropolitan Open Land because they:

- contribute to the physical structure of London by separating built-up areas;
- contain open air facilities, particularly for leisure, recreation, sport and tourism, which serve the whole or a significant part of London; or

Table 3.5

Planning applications, 2001/02¹

	Inner London ¹	Outer London	London	Thousands
Received ²	32.1	49.6	81.7	
Withdrawn ³	3.5	2.9	6.4	
Granted ²	21.0	31.3	52.3	
Granted on appeal ^{4,5}	0.2	0.6	0.8	
Refused ⁶	4.3	8.4	12.7	

1 Figures do not include estimates for 2 non-responding authorities.

2 Applications received in one year might not be decided in the same year; similarly some applications granted in one year might relate to applications received in the previous year.

3 The figures also include applications which were called in by the Office of the Deputy Prime Minister or turned away by the local authority.

4 The figures are the number of appeals allowed during the year under Section 78 (i) of the Town and Country Planning Act 1990. They may relate to applications which were refused in the preceding year.

5 These figures differ from those in other categories in the table in that they exclude certain types of applications, eg applications for listed building consent and conservation area consent.

6 Some applications received may properly be neither granted nor refused.

Source: Office of the Deputy Prime Minister

- contain features or landscape of historic, recreational, nature conservation or habitat interest at a metropolitan or national level.

These areas of Metropolitan Open Land are also shown in **Map 3.7**. Some of them are designated as conservation areas and/or are included in the Register of Parks and Gardens of Special Historic Interest. There are 33 Sites of Special Scientific Interest (SSSIs) in London,

including Epping Forest and Hainault Forest. Although the latter is partly in Essex, it is managed by the London Borough of Redbridge. In addition, the Mayor of London has identified a further 103 places as Sites of Metropolitan Importance for Nature Conservation.

Results from the 2001 survey of public attitudes to quality of life and to the environment, conducted by DEFRA, show that 75 per cent of Londoners said

Table 3.6

Total floorspace and number of hereditaments by bulk class: London, 2001¹

	Number of hereditaments (thousands)	Stock of floorspace (million sq m)	Thousands and million sq metres
Retail	100.9	16.0	
Offices ²	74.7	26.7	
Factories	28.5	13.0	
Warehouses	24.6	14.9	
All bulk classes	228.7	70.6	

1 These data are not comparable with data for 1984 and 1994 as published in previous editions of Focus on London due to changes in the definitions. See Notes and Definitions.

2 Commercial offices 23.7 million sq m; other offices 3.0 million sq m.

Source: Office of the Deputy Prime Minister

they had easy access to local green space without using a car or other transport. 29 per cent used their local green space once a week or more frequently.

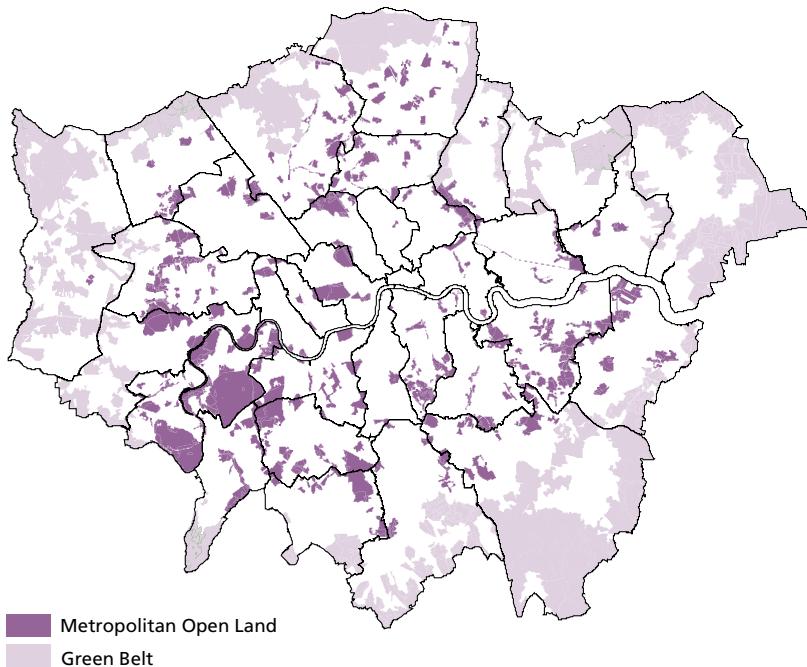
Historic buildings and areas

London is one of the most important historic cities in the world. This importance is embodied in individual buildings and in historic areas, many of which are subject to legal protection. A statutory list of buildings of architectural or historic interest is drawn up by the Department for Culture, Media and Sport based on advice from English Heritage. The objective is to preserve the special architectural or historic features, and the settings, of buildings and other structures on the list which are generally referred to as 'listed buildings'. A summary of the numbers of list entries in each London borough is shown in Table A3.2 in the Appendix. Some list entries include several buildings where they are grouped together, for example in a terrace. Altogether, there are over 18,000 list entries for London, of which just over three per cent are Grade I and almost seven per cent Grade II* (see Notes and Definitions). Over a fifth of the total are in the City of Westminster.

The Inter-Governmental World Heritage Committee under the World Heritage Convention, which was ratified in Britain in 1984, designates World Heritage Sites. The objective of the Convention is the identification, protection, conservation and preservation of cultural and natural sites of outstanding world value. However, designation as a World Heritage Site does not give any additional legal protection as such. There are three World Heritage Sites in London – the Palace of Westminster and Westminster Abbey, the Tower of London and Maritime Greenwich. In 1999, the Secretary of State for Culture, Media and Sport published a list of 25 sites as a tentative list that might be nominated for World Heritage status over the next five to ten years. This list included the Royal Botanic Gardens at Kew as well as selected parts of the

Map 3.7

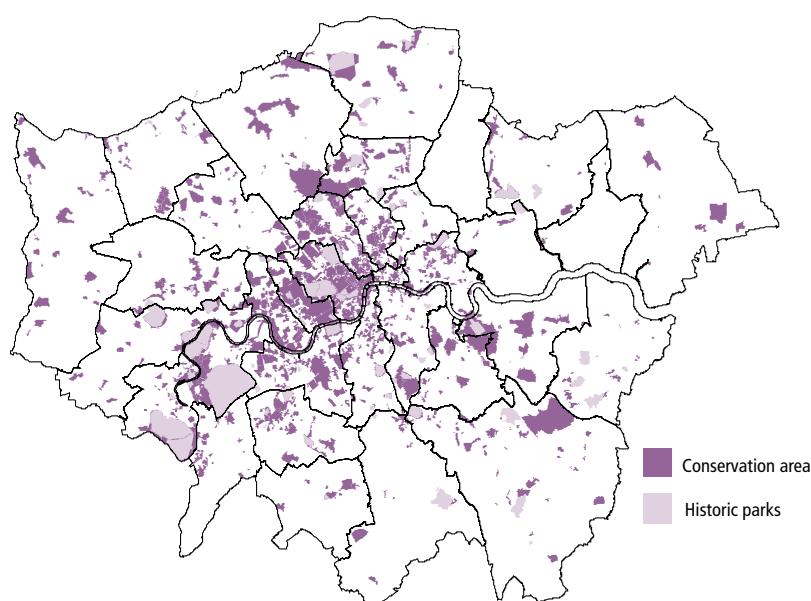
London's Green Belt and Metropolitan Open Land, 2003



Source: Environment and Scientific Service, Office of the Deputy Prime Minister

Map 3.8

Conservation areas and historic parks, 2003



1 Plot and data taken from the Land Cover Map of Great Britain. The satellite classification may involve a degree of imprecision and misallocation.

Source: Greater London Authority

Great Western Railway: from Paddington to Bristol including Paddington Station itself.

Ancient Monuments are designated by the Department for Culture, Media and Sport under the Ancient Monuments and Archaeological Areas Act 1979. The objective is the protection of monuments that are of national importance by virtue of their historic, architectural, artistic or archaeological interest. There are 151 scheduled Ancient Monuments in London, a third of them within the City of London (Table A3.2 in the Appendix).

Map 3.8 shows the areas of London that have been designated conservation areas (see Notes and Definitions). The objective of such a designation is the protection and enhancement of the character and appearance of whole areas, which are of special architectural or historic interest in a local context. There are 800 conservation areas in London, 10 per cent of the total for England and Wales.

English Heritage maintains a Register of Parks and Gardens of Special Historic Interest. As Map 3.8 shows, many historic parks and gardens are included within conservation areas. Out of 1,200 entries on the Register in England, 10 per cent are in London. They include Bushy Park, the gardens of Hampton Court, Greenwich Park and Finsbury Park as well as many smaller parks and gardens, particularly in central London.

Waste generation and disposal

In 2000/01, each household in London produced around 1.1 tonnes of waste. The 33 London local authorities, acting as waste collection authorities, collected about 4.44 million tonnes of municipal waste from households as well as residential homes, educational establishments, hospitals and some commercial premises (Table A3.3 in the Appendix). In London, 4 statutory waste disposal authorities and 12 individual

authorities, as shown in Map 3.9, disposed of this waste. Some of the individual authorities are organised into voluntary disposal consortia. The Environment Agency regulates the storage, transport and exchange and disposal of waste. Its regulatory responsibilities include licensing and monitoring waste management facilities and the implementation of the packaging waste policy. The agency is divided into 7 regions with London falling within the Thames Region.

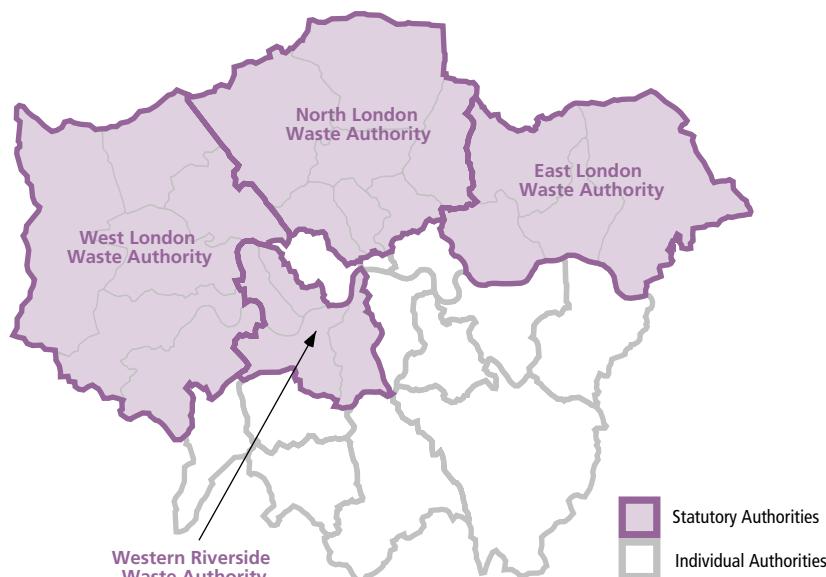
Estimates compiled for the Greater London Authority indicate that industrial and commercial waste accounted for around 6.38 million tonnes of additional waste in London in 2000/01. There was also an estimated 6.05 million tonnes of construction and demolition waste, and 0.36 million tonnes of special waste (which include hazardous or toxic wastes). Table A3.3 in the Appendix summarises the quantities of waste produced and how they were managed. The largest proportion of waste recycled (72 per cent) was construction and demolition waste used as aggregate rather than sent for disposal. This

contributed significantly towards achieving the target of 46 per cent waste recycling for London overall.

Municipal waste makes up about 26 per cent of the total waste produced in London each year. The quantity of municipal waste increased by 16 per cent between 1996/97 and 2000/01, an annual rate of about 4 per cent. However, the household component of municipal waste has grown more slowly, at an annual rate of 2.5 per cent and, as a result, the proportion of household waste in municipal solid waste (domestic, non-hazardous) declined from 81 per cent to 76 per cent. In 2000/01, 72 per cent of London's municipal waste was landfilled, 20 per cent was incinerated with energy recovery and 8 per cent was recycled or composted (Table A3.3 in the Appendix). In comparison to London, a higher proportion of municipal waste was landfilled in England as a whole, at 78 per cent, and a lower proportion was incinerated with energy recovery, at 9 per cent. A greater proportion of municipal waste in England was recycled, at 12 per cent.

Map 3.9

London Waste Disposal Authorities, 2003



Source: Greater London Authority

The level of incineration in London remained fairly constant between 1996/97 and 2000/01 due to constraints on capacity and an increase in recycling by 80 per cent in tonnage terms. The majority of the increase in municipal waste has been managed through landfill.

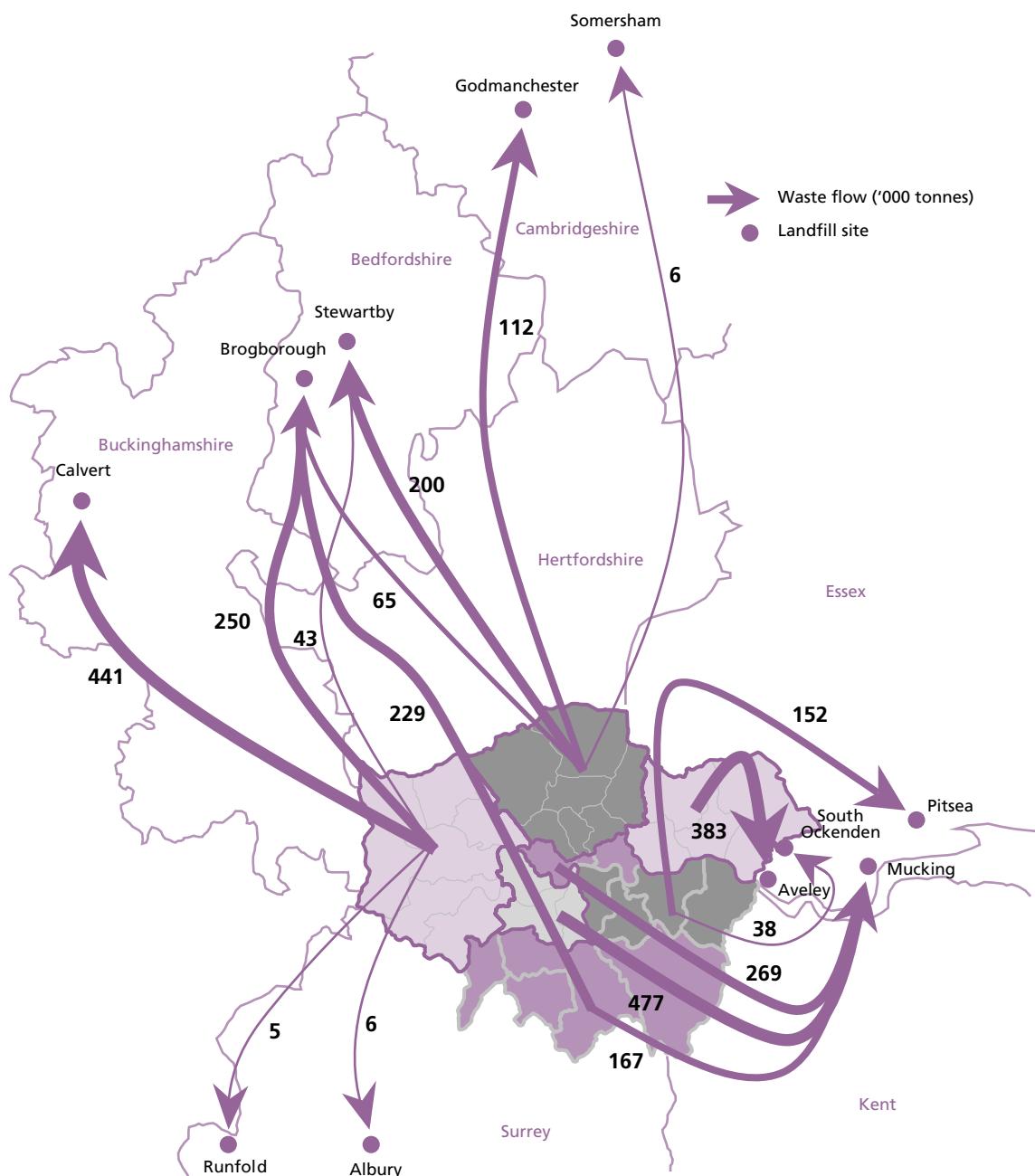
The amount of waste sent to landfill has risen by just under half a million tonnes: from 2.8 million tonnes in 1996/97 to 3.2 million tonnes in 2000/01.

The methods for managing waste by waste disposal authorities vary across London. London's two municipal waste

incinerators have a combined capacity of about 1 million tonnes of waste per year. The London Waste Ltd incinerator in Edmonton, Enfield handles significant quantities of waste from the North London Waste Authority and the East London Waste Authority, whilst the South East London Combined Heat and

Map 3.10

Waste disposal routes and sites outside London¹, 2000/01



¹ Movements of waste above 5,000 tonnes per year only. The areas shaded on the map represent the authorities or groups of authorities from which the waste materials are moved. Details of the London Waste Authorities are shown in Figure 3.9.

Power incinerator in Lewisham managed significant proportions of waste from Bexley, Lewisham, Greenwich and Westminster in 2000/01. Other areas send the majority of their waste to landfill.

In 2000/01, London exported about 66 per cent of its municipal waste for landfill to counties in the East and South East of England (London landfills 72 per cent of its municipal waste and more than 90 per cent of this was deposited in landfill outside the London area). These waste transfers are illustrated in Map 3.10. The former Greater London Council built three transfer stations for compacting waste into containers for transport by rail, to landfill sites in Oxfordshire, Buckinghamshire and Bedfordshire, as well as two new Western Riverside transfer stations at Cringle Dock and Smugglers Way for compacting waste for transport by barge to Mucking in Essex. The largest proportion of London's waste goes to Essex for landfill, although significant amounts go for disposal in Buckinghamshire, Bedfordshire and Cambridgeshire. The Environment Agency estimates that there is, at present, capacity for five years' landfill in the East region and just less than seven years in the South East region, at current total throughput levels.

The household recycling rate for London in 2000/01 was 9 per cent. Recycling rates across London waste authorities varied significantly. A number of the areas with responsibility for collection and disposal of waste are found in Outer London boroughs where the recycling rate is high. In 2000/01 Sutton recycled 25 per cent, Kingston upon Thames 20 per cent, Merton 18 per cent and Bexley 17 per cent. Of those areas which are waste collection authorities only, Barking and Dagenham achieved only 3 per cent whereas Richmond upon Thames recycled 16 per cent. Camden, an inner city collection authority, recycled 15 per cent. Although Camden had a high recycling rate, other Inner London boroughs tended to recycle less.

Table 3.11

Targets for recycling and recovery of municipal waste

	Percentages		
	2005	2010	2015
Recycling and composting of household waste	25	30	33
Recovery of municipal waste	40	45	67

Source: Department for Environment, Food and Rural Affairs

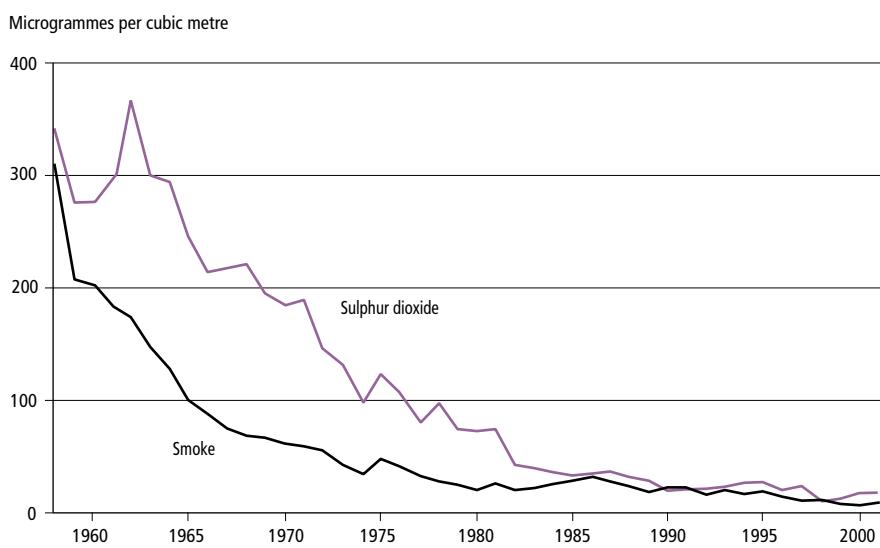
Hackney recycled just 1 per cent of its household waste, Newham 2 per cent, and Southwark and Tower Hamlets 3 per cent each. West London Waste Authority was the highest performing joint statutory waste disposal authority in 2000/01, recycling 11 per cent of household waste.

The Government's Best Value initiative was developed as a performance management framework that seeks to improve local services. It also aims to ensure that local people are better informed about the quality of local services they are getting. Together with two Audit Commission Performance

Indicators (ACPIs) there will be ten Best Value Performance Indicators (BVPIs), relating to waste services. These will cover strategic objectives, cost and efficiency, service delivery outcomes, quality and fair access. An eleventh BVPI was added for 2003/04 covering cleanliness of public spaces. The targets have been set against a baseline of performance in 1998/99 to achieve the national waste strategy recycling targets, as shown in Table 3.11. The overall targets for London are for a quarter of all household waste to be recycled or composted by 2005, increasing to a third by 2015. In terms of the recovery of municipal waste for

Figure 3.12

Annual average smoke and sulphur dioxide levels¹ in Central London



¹ Data relate to County Hall, London up to 1989, and to London City subsequently.

Source: National Air Quality Information Archive, Department for Environment, Food and Rural Affairs

London the target is 40 per cent by 2005, increasing to 67 per cent by 2015. Information on the quantities of waste collected and recycled by individual London boroughs are given in Table A3.4 in the Appendix.

Air quality

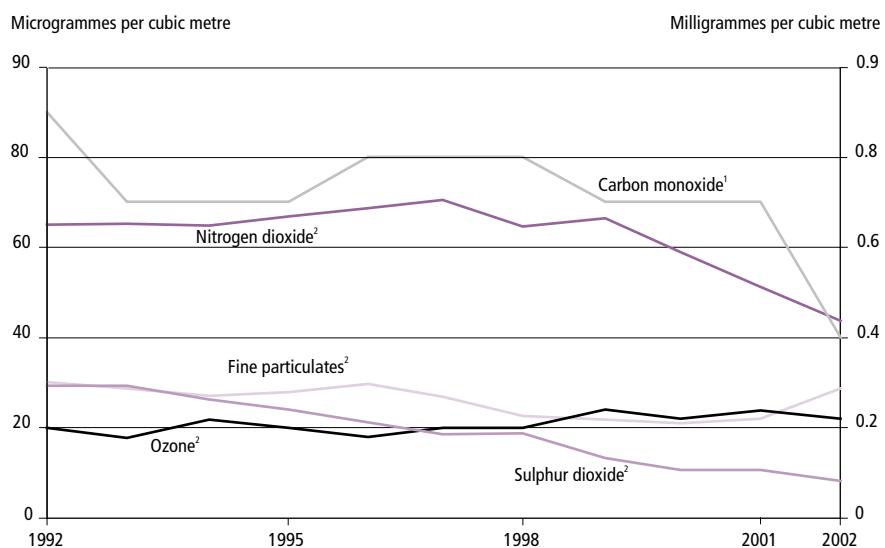
As far back as the 13th century London has had issues with air pollution. These were linked to the lime industry production process, which required the burning of large quantities of coal. In the 15th, 16th and 17th centuries shortages in the supply of fuel wood coupled with an increasing population brought a further increase in the use of coal and its associated air pollution problems. By the 19th century, London was frequently engulfed in thick fogs and, during an extreme fog in a single week of December 1873, there were 700 more deaths than normally expected at that time of year. In December 1952, London suffered from one of the worst smogs it had ever experienced, lasting for four days and leading to an estimated 3,500 to 4,000 premature deaths.

During the latter part of the 20th century, the occurrence of fogs declined, due to the marked decrease in the use of coal and heavy fuel oils, brought about by the creation of smokeless zones, which now cover most of London. The combined effect has not only reduced smoke emissions, but also lowered emissions of sulphur dioxide as shown in Figure 3.12.

However, as some forms of airborne pollutants decreased in recent years the growth in motor vehicle use has contributed towards further pollution. Figure 3.13 shows trends in five pollutants at the central London monitoring site in Bloomsbury between 1992 and 2002 (measurements taken at this site are intended to be representative of air quality in central London). The measurements show a steady downward trend in emissions of sulphur dioxide and a more erratic downward trend in emissions of carbon

Figure 3.13

Annual average concentrations of selected pollutants: Bloomsbury, Central London



¹ Microgrammes per cubic metre (left hand scale).

² Milligrammes per cubic metre (right hand scale).

Source: National Air Quality Information Archive, Department for Environment, Food and Rural Affairs

monoxide. Nitrogen dioxide emissions have been falling since 1997, whereas fine particulates (particles with a diameter of less than 10 microns, PM₁₀) generally had been falling for longer. There has been a slight but steady increase in ozone.

Road traffic has had an increasingly important impact on London's air

quality, responsible for a growing proportion of emissions of carbon monoxide, oxides of nitrogen, fine particulates (PM₁₀) and secondary pollutants such as ozone. Table 3.14 shows the contribution of road traffic, and other sources of emissions, of oxides of nitrogen (nitrogen monoxide together with nitrogen dioxide) and PM₁₀ (the pollutants of greatest concern

Table 3.14

Sources of air pollutant emissions, 1999

Sources of emissions	Oxides of nitrogen	Fine particulates ¹	Percentages
Road transport	58.2	67.9	
Rail, aviation, ships	11.5	8.1	
Regulated industrial processes	8.9	22.3	
Gas use in commercial and residential buildings	13.1	0.0	
Gas use in non-regulated industrial facilities	7.4	0.0	
Other	0.9	1.7	
Total	100.0	100.0	

¹ Particulate matter less than 10 microns in diameter, also referred to as PM₁₀.

Source: Greater London Authority; London Atmospheric Emissions Inventory, Transport for London

to the health of Londoners). Map 3.15 shows the calculated ground level concentrations of nitrogen dioxide across London. Air travel affects London's air quality both directly and indirectly. Aircraft landing and taking off, airside vehicles, passenger and freight traffic, and building heating and power plants all affect air quality.

Information about the air pollutant measurements taken at almost a hundred continuous automatic monitoring sites in London is summarised in Table 3.16. In addition to the automatic monitoring sites listed, non-automatic measurement of smoke and sulphur dioxide continues at eight sites in London. This maintains the time series of data used to compile Figure 3.13, which goes back to 1930, although no single site has operated continuously since then.

Results from the DEFRA 2001 survey of public attitudes to quality of life and the environment show that a higher proportion of respondents in London, compared with the UK as a whole, expressed concerns over traffic exhaust fumes and urban smog.

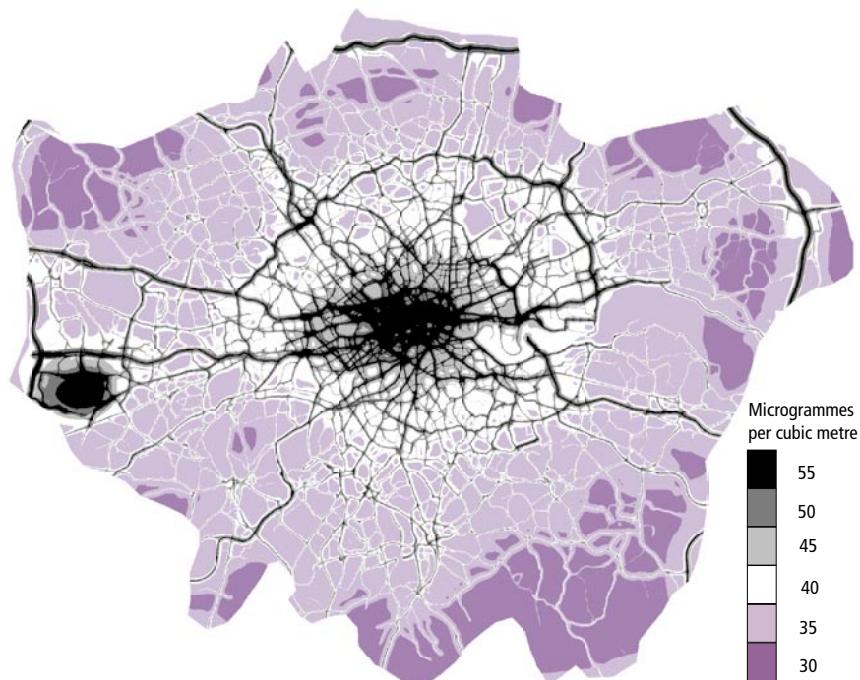
Energy use

Air quality is closely related to energy use because most pollutants are released to the atmosphere as a result of the combustion of fossil fuels. It was widely recognised at the time that one of the main causes of the fog in December 1952, referred to at the beginning of the previous section, was the use of coal. In 1952, coal supplied 61 per cent of London's energy needs, and 28 per cent was accounted for by house coal alone. If the coal burnt in power stations and to produce 'town gas' were included – this was a time before the arrival of gas from the North Sea – the proportions would have been even higher.

London's use of fuels has changed radically over the past 50 years. These changes are illustrated in Figure 3.17.

Map 3.15

Annual mean nitrogen dioxide concentrations, 1999



Source: Greater London Authority; Transport for London

Table 3.16

Automatic monitoring sites for each pollutant: classified by site type, March 2003

Pollutant	Kerbside	Roadside	Urban			Numbers
			background	Suburban	Other	
Oxides of nitrogen/Nitrogen dioxide (NO_x/NO_2)						
Sulphur dioxide (SO_2)	5	38	32	9	1	
Carbon monoxide (CO)	1	14	19	4	0	
Ozone (O_3)	1	19	14	2	1	
Fine particulates PM_{10}^1	1	4	17	6	1	
Fine particulates $\text{PM}_{2.5}^2$	1	25	20	8	1	
	1	3	2	2	0	

1 Particulate matter with an aerodynamic diameter of less than 10 micrometers.

2 Particulate matter with an aerodynamic diameter of less than 2.5 micrometers.

Source: Air Quality Consultants / Casella Stanger for Greater London Authority

The start of the decline in the use of house coal, from about 1957, coincided with the rapid growth in the use of oil. The economy was growing strongly and oil was favoured as a cleaner and less labour intensive fuel. Oil use continued to grow steadily until the first 'oil crisis' in 1973/74 when the Arab oil embargo led to a quadrupling in the price of oil by the Organisation of Petroleum Exporting Countries (OPEC),

Natural gas was discovered in abundance in the North Sea in 1965, and in 1967 a national programme began to convert boilers and other gas burning equipment to burn natural gas in place of town gas. Initially gas started to replace coal while oil use continued to grow. However, the high price of oil and the uncertainty over supplies resulting from the first 'oil crisis' in 1973/74 and the second 'oil crisis' in 1979, following the revolution in Iran, made gas much more attractive to industrial and commercial customers. Indeed, demand rose to the extent that commercial gas prices were initially raised as a restraint and then, when demand could still not be met, the British Gas Corporation had to use its statutory power to refuse to supply customers requiring more than 25,000 therms (2.6 terajoules) a year.

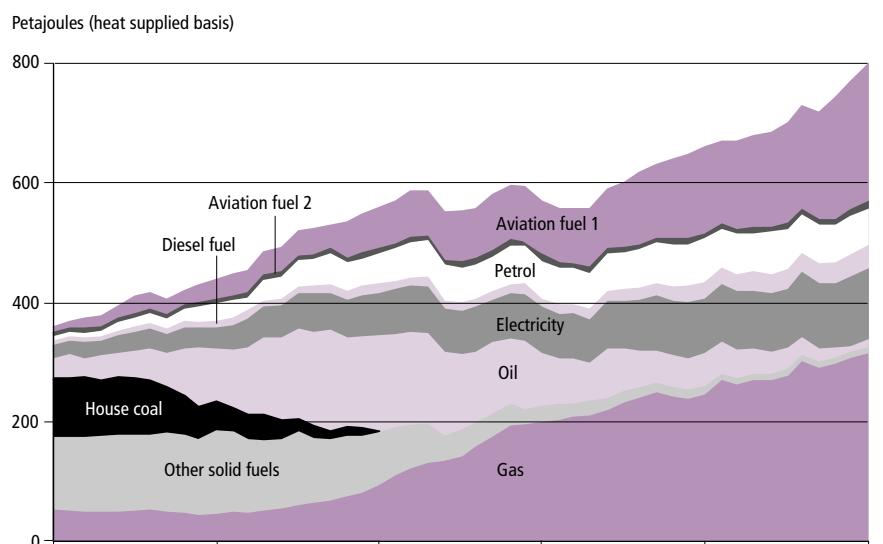
Oil prices began to decline from 1981, and then fell sharply at the end of 1985 and through 1986, but by then gas had captured almost all of the coal market and 60 per cent of the market met by oil at its peak in 1973 in London.

The total amount of energy used in London in 2000 was 545 petajoules (Table 3.18); which is the equivalent of 151,502 gigawatt hours or 21.3 million tonnes of coal. This is just over 11 per cent of final energy use in the United Kingdom, or 1.7 per cent of energy use in the European Union. Energy use by different sectors, and by fuel type, is summarised in Table 3.18.

The domestic sector was the largest energy using sector in London. At 45

Figure 3.17

Energy use, London



Source: Greater London Authority

per cent, this has grown by 14 per cent since 1991. The majority of domestic energy was used for space and water heating, but the main area of growth in energy use was in appliances, such as dishwashers and microwave cookers, and more homes with central heating. Energy use in commerce and industry has shown a proportional decline, from 39 to 34 per cent of total energy use. There has been a continued reduction in energy use by industry in London but this has been counterbalanced by a growth in commercial energy use. Industrial energy use fell from 26 per cent in 1965 to 12 per cent in 1991 and has now declined to just 7 per cent.

Transport accounts for 22 per cent of energy use in London, a growth of 18 per cent since 1956. The majority of transport energy use is by road transport (83 per cent). An estimated 5.2 million tonnes of aviation fuel was delivered to London's airports in 2000, principally Heathrow. However, most of this was actually used during flights to other destinations. Only 6 per cent of the 5.2 million tonnes of aviation fuel delivered

is accounted for by landings and takeoffs within the London area. This represents just over 2 per cent of total energy use in London.

River and canal water quality

The Environment Agency undertakes regular assessments of the water quality in rivers and canals throughout England and Wales. The General Quality Assessment Scheme defines six grades (denoted A to F) on the basis of the concentrations of biological oxygen demand (BOD), total ammonia and dissolved oxygen. Grades A and B represent water of 'very good' or 'good' chemical quality, whilst grades C and D equate to 'fairly good' or 'fair' quality, and grades E and F represent 'poor' and 'bad' quality respectively.

Map 3.19 shows the grading of rivers and canals within Greater London for the period 1999 to 2001. Most of London's rivers and canals fall into the B to E range of grades. The River Wandle Carshalton arm and the confluence of the two arms to Beddington, the Colne from the Chess to the Harefield Reach

of the Grand Union Canal and the Misbourne to the River Thames were the only sections of river graded A in 1999-2001, totalling 26 kilometres. Two reaches of the Thames as well as sections of the Lee and Cray totalling 46 kilometres were downgraded to B in the 1999-2001 classification. Nevertheless, the percentage of London's rivers and canals in the top three grades, A to C, was 56 per cent – second only to a peak of 60 per cent in 1992-94. The Riverside Sewage Treatment Works to Thames section of the River Ingrebourne (1.8 kilometres) continues to be the only stretch of river graded F or 'bad'.

Table 3.20 compares the percentage of river length for each chemical quality grade between 1999 and 2001 in London, the Thames Region and England and Wales as a whole. It can be seen from this that the percentage of river length in the upper three grades in London (56 per cent) is lower than in that in the Thames Region as a whole (87 per cent) or England and Wales (also 87 per cent).

As part of the water quality management strategy for the Thames estuary, the Environment Agency has established water quality objectives that include dissolved oxygen standards to allow the passage of migratory fish and to sustain the resident fish population. Water quality in the estuary is most vulnerable during the summer when the water temperature is elevated and incoming freshwater flows are low. During heavy summer storms the estuary receives a large pollution load from storm sewage discharges causing deterioration in dissolved oxygen concentrations. The Environment Agency's water quality management strategy for the tidal Thames incorporates a formal operating agreement with Thames Water Utilities. This is necessary to ensure that the dissolved oxygen levels do not fall sufficiently low to endanger fish or other wildlife. Under the operating agreement, the Environment Agency can request improved effluent quality

Table 3.18

Energy consumption in London: by sector and type of fuel, 2000

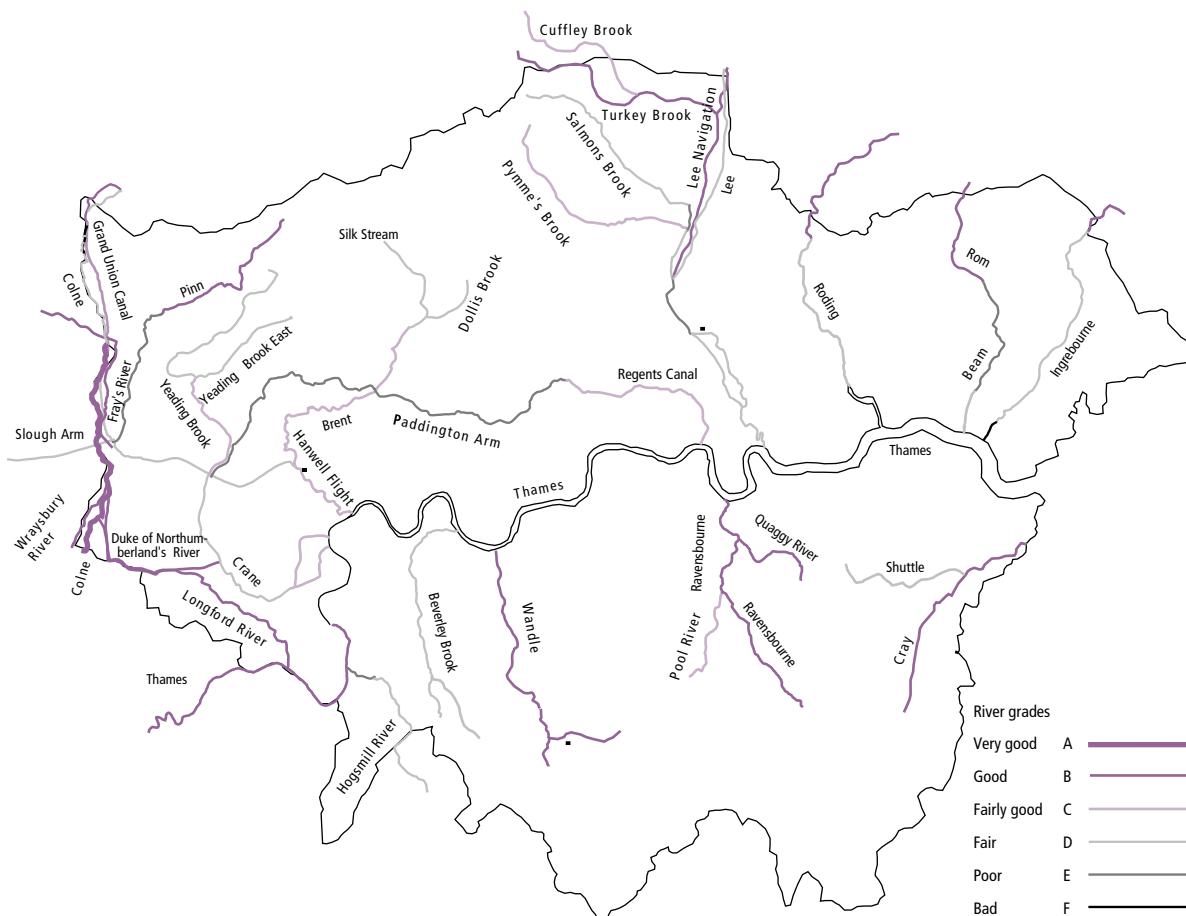
Energy units and percentages

	Gigawatt hours	Petajoules	Percentage of sector	Percentage of total
Commercial and industrial				
Oil	4,664	17	9	..
Coal	128	0	0	..
Gas	36,043	130	71	..
Electricity	10,100	36	20	..
All commercial and industrial	50,935	183	100	34
Domestic				
Oil	188	1	0	..
Coal	0	0	0	..
Gas	49,450	178	72	..
Electricity	18,706	67	27	..
All domestic	68,344	246	100	45
Transport				
Road				
Petrol	17,503	63
Diesel	9,452	34
All road	26,955	97	83	..
Rail				
Underground				
Electricity	1,095	4
Inter-City and suburban				
Electricity	690	2
Diesel	241	1
All rail	2,026	7	6	..
Shipping	51	0	0	..
Air	3,635	13	11	..
All transport	32,667	118	100	22
Total	151,502	545	..	100

Source: Greater London Authority

Map 3.19

River and canal quality¹, 1999-2001



¹ Grades for the main stretches of the Thames are not shown. For details of the quality along the Thames see text.

Source: Environment Agency

standards from the sewage treatment works during the summer and the suspension of abstraction for the drinking water supply in order to increase freshwater flows into the estuary. Thames Water Utilities also provides two oxygenation vessels, Thames Bubbler and Thames Vitality, which inject oxygen into the river water to counter the effects of storm sewage. In critical situations the Environment Agency can also inject hydrogen peroxide from sites at Barnes and Chelsea.

The estuary has been divided into three reaches for determining water quality objectives: Teddington to Battersea; Battersea to Mucking; and Mucking to the Seaward Limit. These reaches each

represent a different salinity regime and supporting different biological communities. In 2001 and 2002 the middle reaches (Battersea to Mucking) failed to achieve their dissolved oxygen standards in the two summer quarters due to increased organic loads from the major sewage treatment works and storm sewage discharges. This required increased deployment of the oxygenation vessels in both years (for 35 days and 48 days respectively).

The implementation of the EU Urban Waste Water Treatment Directive, and the banning of sewage sludge disposal at sea after 1999, required Thames Water to adopt alternative means of sludge disposal. The introduction of the incineration of sludge from Thames

Water's largest sewage treatment works initially posed new challenges to the sewage treatment process. This resulted in deterioration of effluent quality after 2000. It is expected that significant further investment at the major Thames-side sewage treatment works since 2000 should result in improved effluent quality from 2003 onwards. This should, in turn, lead to improved water quality in the tideway.

Table 3.21 summarises the number of substantiated water pollution incidents occurring in London and the Environment Agency's wider Thames Region during 2001. The Environment Agency records all reported pollution incidents within London; noting the location, the type of premises where

Table 3.20**Percentage of river and canal length: by water quality¹, 1999-2001**

	Percentage ²		
	London	Thames Region	England and Wales
A – Very good	5.6	27.2	32.8
B – Good	31.7	40.6	36.2
C – Fairly good	18.3	18.8	18.2
D – Fair	33.2	10.4	7.5
E – Poor	10.7	3.0	5.0
F – Bad	0.4	0.0	0.3

¹ Chemical water quality, by grade.² Percentage of river length in each grade.

Source: The Environment Agency

Table 3.21**Water pollution incidents¹: by source, 2000²**

	Numbers											
	Sewage and Water											
	Industrial		related		Agricultural		Other		Total		Number of prosecutions ⁴	
	All	Major ³	All	Major ³	All	Major ³	All	Major ³	All	Major ³	All	Major ³
Environment Agency Regions⁵												
United Kingdom	6,426	128	5,098	118	5,464	112	23,782	88	40,770	446	343	
North East	617	0	701	2	423	5	2,734	3	4,475	10	20	
North West	972	3	333	0	769	2	2,997	4	5,071	9	19	
Midlands	1,022	7	759	2	688	4	4,229	1	6,698	14	31	
Anglian	360	1	322	1	372	2	1,914	5	2,968	9	25	
Thames (includes London)	379	1	388	5	242	1	3,541	9	4,550	16	25	
Southern	628	3	520	1	427	0	2,112	1	3,687	5	29	
South West	610	3	638	0	1,059	4	2,808	0	5,115	7	37	
England	4,588	18	3,661	11	3,980	18	20,335	23	32,564	70	186	
Wales	707	0	360	2	580	3	2,195	2	3,842	7	49	
Scotland ²	683	98	755	102	380	59	845	59	2,663	318	34	
Northern Ireland	448	12	322	3	524	32	407	4	1,701	51	74	

¹ Data relate to substantiated reports of pollution only (Categories 1-4).² Figures for Scotland relate to the financial year 2000/01.³ Major incidents are those corresponding to Category 1 in the Environment Agency's pollution incidents classification scheme. For Scotland the term 'serious incidents' is used and compares broadly with all of Category 1 and most of Category 2 used by the Environment Agency.⁴ For England and Wales total prosecutions include cases concluded and prosecutions outstanding. Prosecutions concluded relate to cases which had been brought to court by 31 March 2000.⁵ In England and Wales the boundaries of the Environment Agency Regions are based on river catchment areas and not county borders. In particular, the figures shown for Wales are for the Environment Agency region for Wales.

Source: Environment Agency; Scottish Environment Protection Agency; Department of the Environment, Northern Ireland

the incident occurred, the pollutant or pollutants involved, and the effect on air, land and water. Water pollution incidents are categorised on a scale of 1 to 4 where:

- Category 1 is major impact;
- Category 2 is significant impact;
- Category 3 is minor impact;
- Category 4 is no impact.

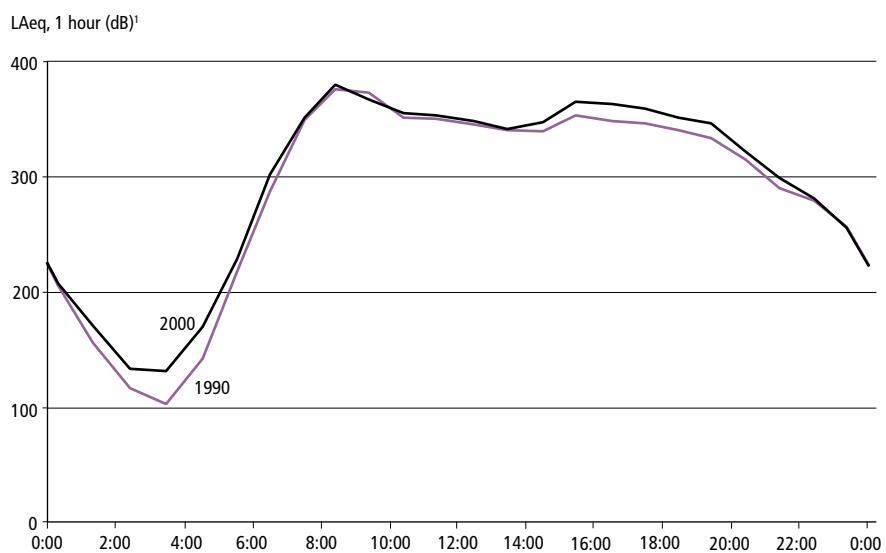
Noise pollution

Measuring the scale of noise problems, London-wide, is difficult because only limited monitoring of noise is carried out. Some London boroughs measure noise levels at only a small number of sites across the local area, perhaps at three or four locations. Changes in the physical environment around a measurement location can affect year on year comparison of data from that site. Consequently, comprehensive data on noise levels for the whole of London are not available at present. The Building Research Establishment collected some data for the Department of Environment, Transport and the Regions as part of national surveys in 1990 and 2000. However, only Outer London boroughs were sampled. Figure 3.22 shows the hour-by-hour noise pattern in decibels (dB) for the two years, averaged over all the sites measured in each survey. The changes between 1990 to 2000 are small and therefore should not be viewed as evidence of a change in the general level of noise in Outer London as a whole. The increases or decreases at individual sites would have greater variation than the small changes in the average values, and so would be more apparent to those living or working in the vicinity.

The Chartered Institute of Environmental Health annually requests noise complaint data from local authorities around England and Wales, including the Corporation of London and the 32 London boroughs. However, response

Figure 3.22

24 hour history of noise, Outer London



¹ LAeq, 1 hour (dB) is the average 'A' weighted decibels over 1 hour (see Notes and Definitions).

Source: Building Research Establishment

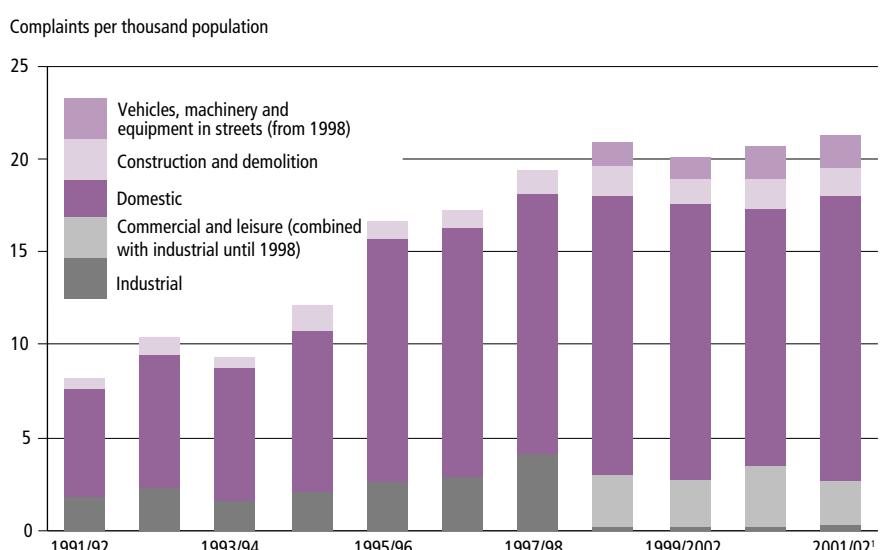
rates vary from year to year and so data for different years are not directly comparable. Figure 3.23 shows complaints per thousand population in London. Not all complaints to local authorities regarding noise are determined by the authority to be a

nuisance (within the legal constraints under which the authorities operate).

Many people in London are affected by aircraft noise. Between April 2001 and March 2002, BAA plc (formerly the British Airports Authority) received a

Figure 3.23

Noise complaints by type, London



¹ Provisional.

Source: Chartered Institute of Environmental Health

total of 7,221 complaints, of which 95 per cent related to aircraft noise and a further 0.5 per cent concerned ground noise. Of the total number of complaints, 4,843 were from the 9 local authorities nearest to Heathrow. Four of these (Hillingdon, Ealing, Hounslow and Richmond) are within London.

In 2002, the Greater London Authority carried out a survey of London households. This survey questioned over 8,000 London householders on a range of issues including noise. It asked respondents if they had 'no problem', 'a problem but not serious' or 'a serious problem' with a range of environmental issues. The results of the noise questions in the survey are shown in Figure 3.24. The main problems were road traffic noise, aircraft noise and noisy neighbours.

Weather report 2002

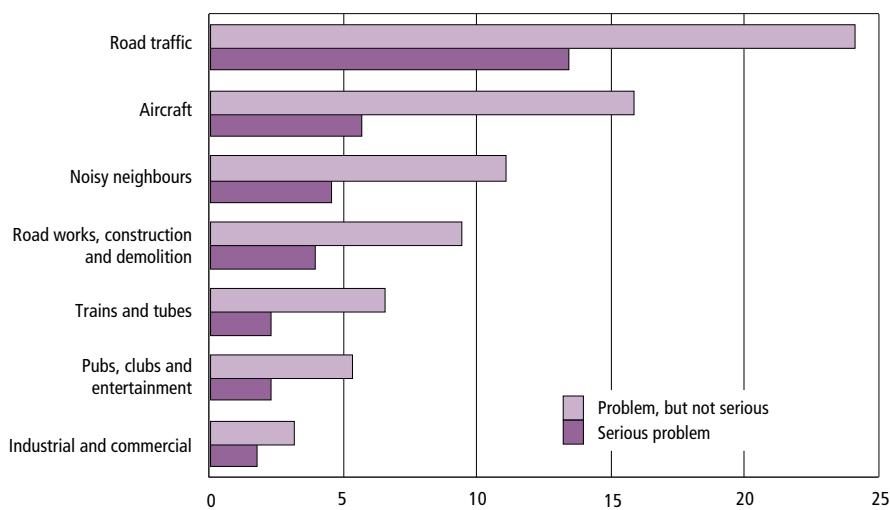
2002 was a wet year. Almost 800 millimetres (31.5 inches) of rain fell in Central London, 49 per cent above the average between 1961 and 1990 (Figure 3.25). 2000 was the wettest year since records began in 1940, and in the following year total annual rainfall exceeded 700 millimetres. The mean temperature for 2002 was 12.9°C, about 1.5 degrees above the average over the 30 years 1961 to 1990 (Figure 3.26). The amount of sunshine recorded was similar to the average over the last 30 years at 1,590 hours. Just four air frosts were recorded in 2002, all in January. In London the only instance of sleet or snow was during February 2002. In 2001 a temperature of 25°C was exceeded on 31 separate days.

January 2002 was warm but dull. The month started cold and frosty with clear skies and sunny periods but soon became mild and cloudy. The end of the month saw some exceptionally mild days and nights but was rather windy. Temperatures remained high into February with the warmest February night in Central London since records began (in 1940) on the second of the month.

Figure 3.24

Reporting noise as a problem: London, 2002¹

Percentages



¹ Provisional. Based on those responding to household survey.

Source: London Household Survey, Greater London Authority

In March 2002, London had the warmest Good Friday (of those falling in March) since records began in 1940. April started very dry with no significant rain for the first 16 days. During this period a notably low humidity value of 16 per cent was recorded.

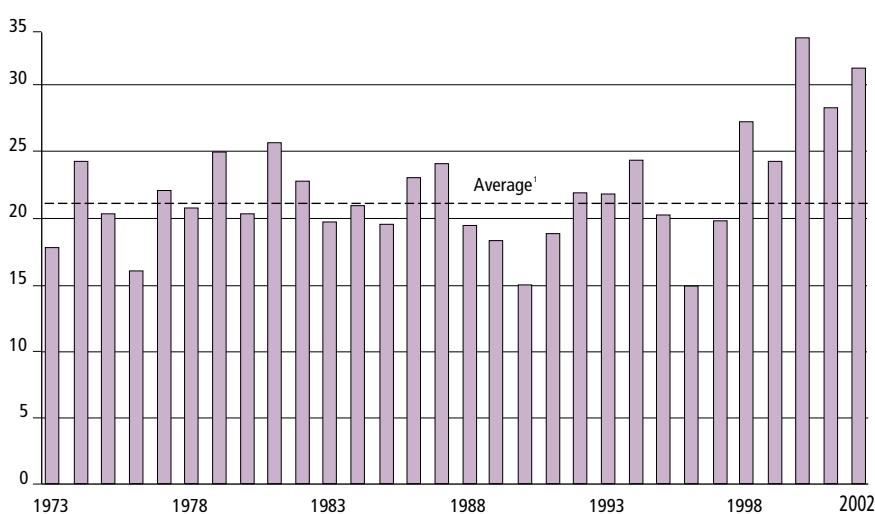
Later unsettled and occasionally thundery weather brought a fair amount of rain.

May and June of 2002 saw a return of close to average temperatures and rainfall. May was generally warm and

Figure 3.25

Annual rainfall in London

Inches



¹ Average for 1961 to 1990.

Source: London Weather Centre, Meteorological Office

dry but the last ten days were unsettled with thunderstorms, notably on two days. This more inclement weather extended into the first half of June after which much drier conditions were experienced. Indeed, the first half of the month had seen around 80 per cent of the total month's rainfall with that total 16 per cent above the average for June.

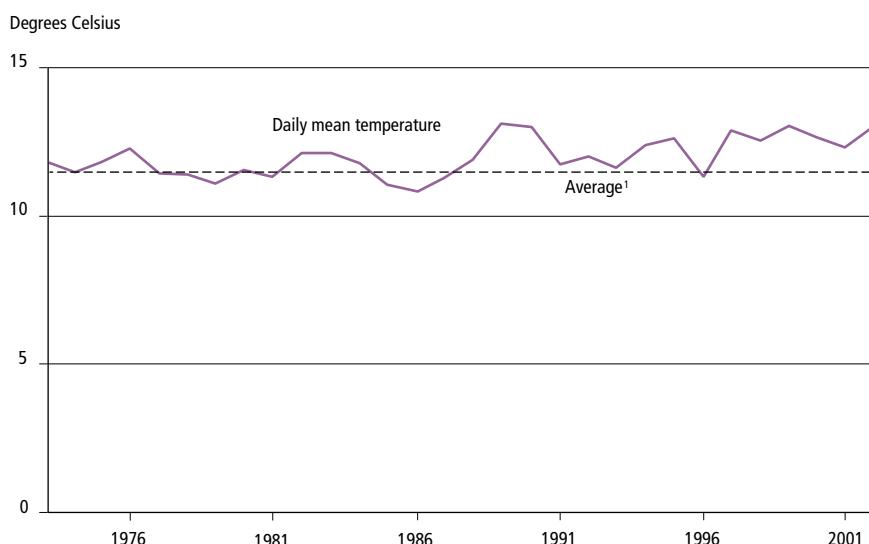
The weather became unsettled again in July 2002. It was the wettest July for ten years but the warmest for 14 years. The last part of the month saw rising temperatures, to 32.2°C (90°F) on 29 July. August was the wettest since 1977. However, almost two thirds of the rain fell on just three days and there were ten completely dry days in the month.

Anticyclonic conditions dominated September bringing dry weather and only 50 per cent of the rainfall of an average September. However, a storm from Biscay fell across London on the 9th delivering three quarters of the month's average rainfall in one day. Winds were mostly light or gentle throughout and fog was reported towards the end of the month. October began dry and sunny but the weather became unsettled by the middle of the month and the final week saw heavy showers, hail and thunder, and winds gusting to more than 60 knots were measured at Heathrow and Northolt.

The unsettled weather continued into November, which was the wettest since records began in 1940. It was only the sixth time that more than 100 millimetres (3.9 inches) of rain had been recorded in November. There were only four completely dry days but despite the rain, sunshine was only a little below normal. The very wet conditions continued into the next month with two and a half times the normal rainfall for the month. Thus the wettest December on record followed the wettest November.

Figure 3.26

Daily mean temperature in London



¹ Average for 1961 to 1990.

Source: London Weather Centre, Meteorological Office