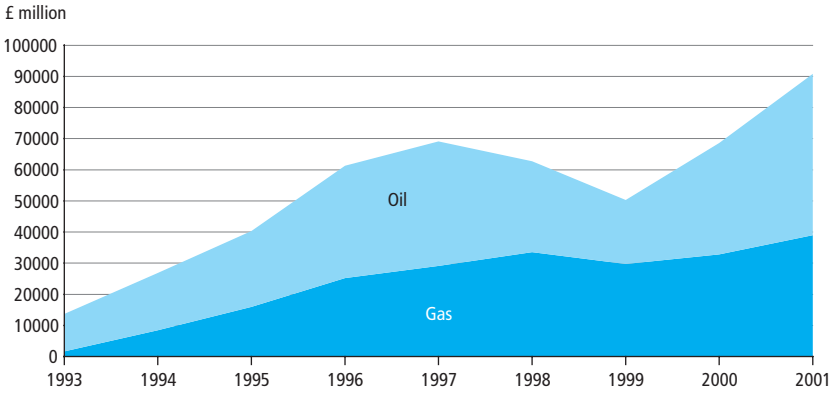
Part 5

Chapter 13

UK Environmental Accounts

The Environmental Accounts at a glance

Value of oil and gas reserves 1993 to 2001

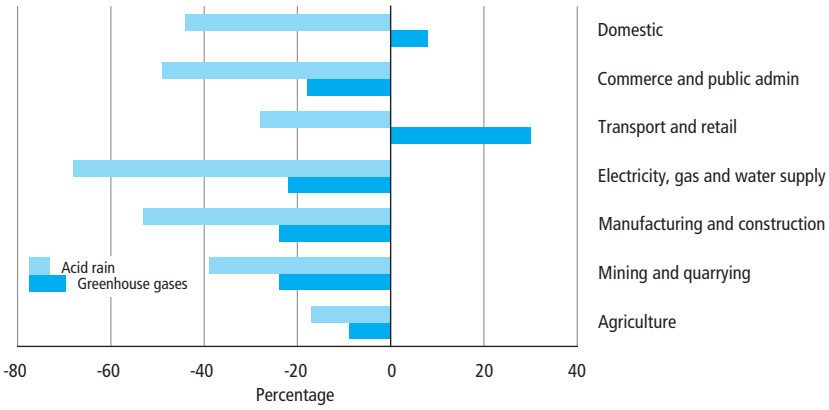


Source: ONS

Oil and gas reserves

The value of the UK's recoverable oil and gas reserves mainly depends upon the estimated physical amounts remaining, the current rate of extraction and the assumed future price per unit of oil or gas, net of the cost of extraction. Since 1993 the estimated physical stock of reserves has fallen as a result of extraction, but the value of the reserves has generally risen, with increases in the price of oil being particularly significant. By the end of 2001 oil reserves were valued at £52 billion while gas reserves were estimated to be worth £39 billion.

Atmospheric emissions of greenhouse gases and acid rain precursors, percentage change from 1990 to 2000



Source: NETCEN, ONS

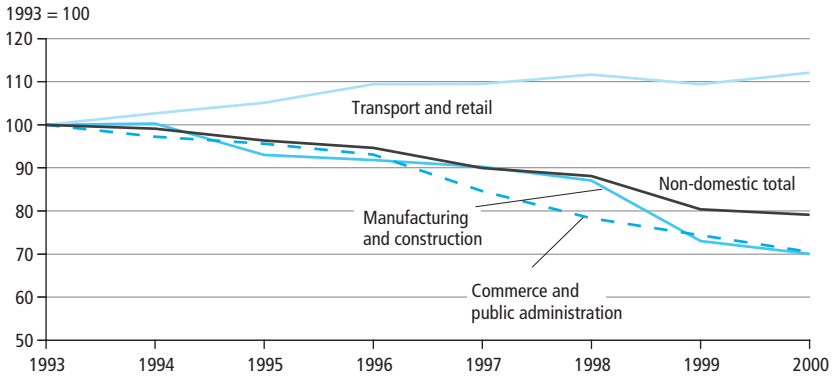
Atmospheric emissions

On a national accounts basis, UK non-domestic greenhouse gas and acid rain precursor emissions fell between 1990 and 2000, by 14.4% and 53.2% respectively.

The electricity, gas and water supply sector shows large reductions but remains the biggest contributor to these emissions. Its share of UK totals has fallen from 27% to 24% for greenhouse gases and from 48% to 33% for acid rain precursors. The main reason is a shift away from the use of coal and oil in power stations

All sectors show reductions in acid rain precursor emissions since 1990, due partly to reduced emissions of nitrogen oxides from road transport, reflecting increased use of catalytic converters and low sulphur DERV.

Greenhouse gas emissions per unit of output (Gross Value Added at constant prices) 1993 to 2000



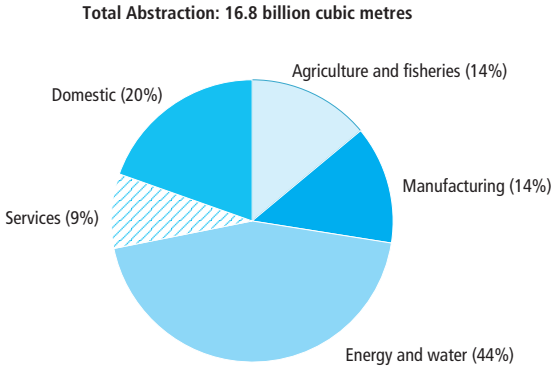
Source: NETCEN, ONS

In terms of greenhouse gas emissions per unit of output (i.e. gross value added at constant prices), most sectors show substantial improvements. The exception is the transport and retail sector where greenhouse gases per unit of output have been increasing steadily since 1993.

Water resource use

In 1997/98 nearly 17 billion cubic metres of water were abstracted from groundwater and non-tidal waters in the UK. About 20% of this (3.2 billion cubic metres) was used by households through the public water supply network. A further 1.8 billion cubic metres were lost through leakage. Electricity generation and fisheries account for the bulk of the use of water abstracted directly by industries.

UK water resource use by industry, 1997/98

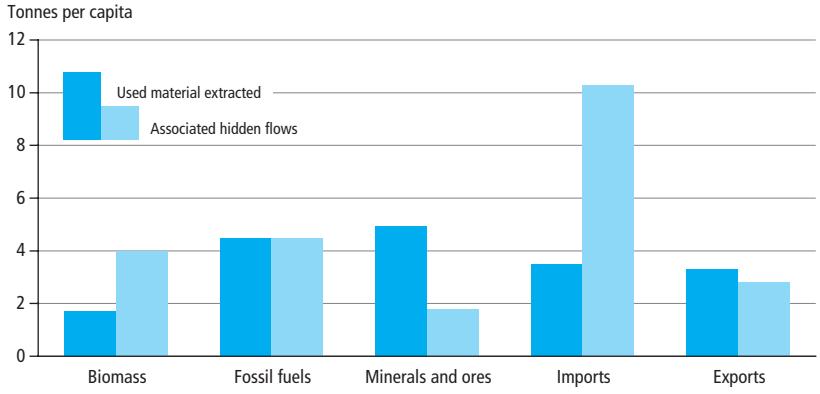


Source: ONS, Environment Agency

Material flow accounting

Material flows in the UK economy consist of the mass of used domestic extraction (such as fossil fuels), together with trade flows (imports and exports). Associated with these flows is the movement of unused material (or hidden flows) from domestic extraction (such as quarrying overburden) and from the production of imports and exports. In 2000, movements of materials that are extracted from the UK environment for use in the economy were roughly matched by movements of unused material. However, imports of goods, equivalent to 3.5 tonnes per capita, are associated with large movements of unused material, particularly in relation to the imports of semi-processed metals such as copper and tin.

Material flows in the UK, 2000

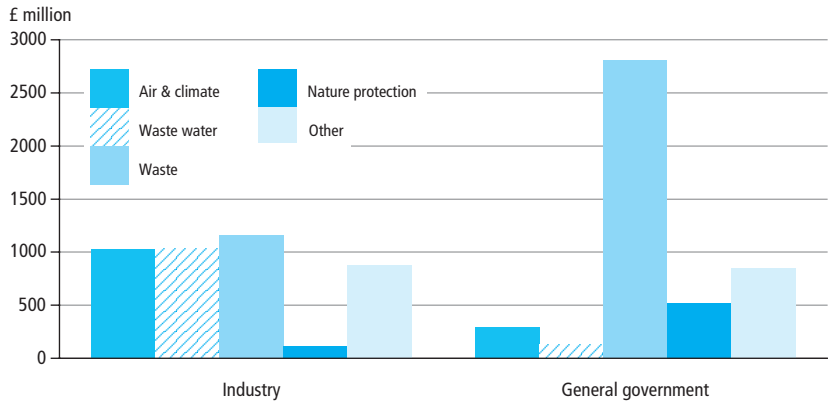


Source: ONS

Environmental expenditure

In 2000, manufacturing industries and utilities spent roughly £4.2 billion on the environment. About £0.5 billion of this expenditure was financed by the general government sector in the form of grants and subsidies. Most of the spending is on the protection of air quality and the management of waste and waste water, with only £120 million spent on the protection of biodiversity and landscape. In contrast, the general government sector spent £2.8 billion on waste management, mainly through local authorities, and a further £0.5 billion on nature conservation, but only £0.1 billion directly on waste water management.

Environmental protection expenditure by industry and general government sectors, 2000



Source: ONS, DEFRA

Chapter 13: UK Environmental Accounts

Environmental accounts are "satellite accounts" to the main National Accounts. Environmental satellite accounts facilitate analysis of the wider impact of economic change, by providing information on the environmental impact of economic activity (in particular on the emissions of pollutants) and on the importance of natural resources to the economy. The accounts use similar concepts and classifications of industries to those employed in the National Accounts, and they reflect the recommended European Union and United Nations frameworks for developing such accounts.

The accounts are used to inform sustainable development policy, to model impacts of fiscal or monetary measures and to evaluate the environmental performance of different industrial sectors.

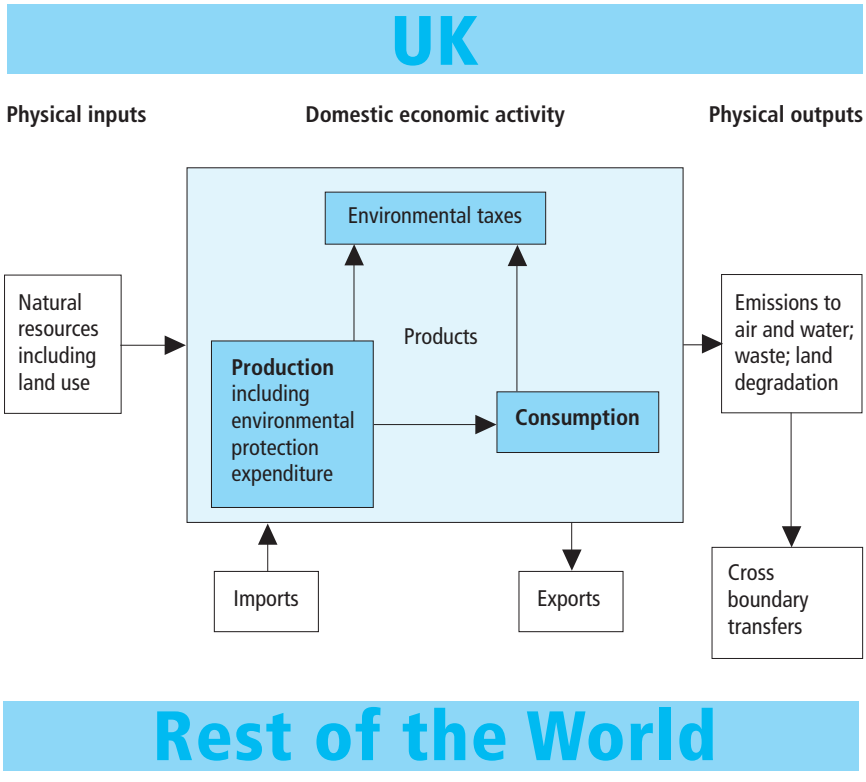
Most data are provided in units of physical measurement (volume or mass), although where appropriate some accounts are shown in monetary units.

This chapter updates information published in last year's 'Blue Book' and includes new tables on the consumption of water resources in 1997/98 and on environmental protection expenditure by the general government sector in 2000. More detailed information is available on the National Statistics website at

www.statistics.gov.uk/environmentalaccounts.asp

The diagram below shows how the areas covered by environmental accounts relate to the economy as described by the National Accounts.

Environment and economy interactions



Oil and gas reserves (Tables 13.1 and 13.2)

Definition of oil and gas

Oil reserves include both oil and the liquids and liquefied products obtained from gas fields, gas-condensate fields and from the associated gas in oil fields. Gas reserves are the quantity of gas expected to be available for sale from dry gas fields, gas-condensate fields and oil fields with associated gas. Gas which is expected to be flared or used offshore is not included.

Table 13.1 gives estimates, published each year by the Department of Trade and Industry[1], of the level of recoverable oil and gas reserves in the United Kingdom.

Recoverable reserves are classified into two main categories: discovered and undiscovered. The discovered reserves are subdivided into proven, probable and possible. **Proven reserves** are known reserves which, on the available evidence, are virtually certain to be technically and economically producible, i.e. having a better than 90 per cent chance of being produced. **Probable reserves** are known reserves which are not yet proven but which are estimated to have a better than 50 per cent chance of being technically and economically producible. **Possible reserves** are those reserves which, at present, cannot be regarded as 'probable', but are estimated to have a significant but less than 50 per cent chance of being technically and economically producible.

Simulation models using Monte Carlo techniques have been used each year by the DTI to assess the likely existence and size of **undiscovered oil and gas fields** on the UK Continental Shelf (UKCS). The assessments are presented as ranges, but the limits of the ranges should not be regarded as maxima or minima. Estimates of the volume of undiscovered reserves have fluctuated considerably in recent years as new areas of UKCS have been subjected to statistical analysis and older areas have been re-assessed.

The lower ends of the ranges of total reserves shown in the table are sums of estimated remaining proven reserves and the lower end of the range of undiscovered reserves for the end of that year. The upper ends of the ranges of total reserves are sums of estimated proven, possible and probable reserves, plus the upper end of the range of undiscovered reserves, for the end of that year.

The expected level of reserves is calculated as the sum of proven and probable reserves and the lower bound estimate of the range of undiscovered reserves. **Other volume changes** are calculated as the difference between the expected level of reserves at the start of the year, less extraction within that year, and the estimated level of reserves at the start of the following year.

Life expectancy is calculated as the expected level of reserves at the end of the year divided by the current level of annual extraction. This calculation gives an indication of the theoretical number of years for which extraction could be sustained at current levels. In practice, towards the end of that period, the rate of extraction is likely to decrease as individual oil and gas fields are exhausted, so the period of extraction will be longer than that implied by the life expectancy calculation.

Monetary valuation of oil and gas reserves

Expressing UK oil and gas reserves in monetary terms allows these subsoil assets to be compared with other economic entities. This provides a means for the commercial depletion of subsoil assets to be set against national income. The results for 1993 to 2001 are presented in Table 13.2 in the form of a balance sheet.

Since observed market values for transactions in the assets in situ are not widely available, the **present value method** is used to put a monetary value on the physical stocks of assets. This is an indirect valuation method measuring the current value of the asset's future streams of income by discounting the expected future rent, often referred to as the **economic rent** or **resource rent**. The method relies

on information about the size of resource rent, the number of years for which the rent is to be received and the social discount rate to be applied.

The **resource rent** is the net income from extraction defined as total revenue from sales less all costs incurred in the extraction process i.e. operating costs, depreciation of capital and allowances for decommissioning costs and the return on capital. The rate of return on capital is estimated to be 8% in real terms, in line with Eurostat recommendations[2], but it is worth noting that the resulting valuations are very sensitive to variations in this estimate. Future resource rents can then be calculated using the assumption that the future unit resource rents (i.e. the resource rent per unit of fuel extracted) is constant in real terms and equal to the average of the last three years' unit rents. The estimated values are also very sensitive to this assumption.

In the calculation, it is assumed that the amounts extracted decrease as the reserves are gradually exhausted. The time span until the complete exhaustion of the reserves is the period over which resource rents are discounted, using a social discount rate of 4%, again in line with Eurostat recommendations[2].

Using these assumptions it is possible to calculate a present value of the stocks of oil and gas reserves at the start and end of each year. The accumulation account then breaks down the change between the start-of-year balance and the end-of-year balance. While physical stocks may change only as a result of extraction and other volume changes such as reassessments, monetary stocks can change for a number of other reasons.

Extraction is equal to the total resource rent for the year, effectively reducing the present value of the stocks by that amount.

Revaluation due to time passing takes account of the fact that, as we move forward in time, the period over which the future rents are discounted is one year less, thereby reducing the effect of discounting future incomes.

Other volume changes are reassessments which change the estimated physical stock of recoverable reserves.

The **change in the extraction path** sets out in monetary terms the addition or subtraction to the present value arising from a change in the amounts assumed to be extracted each year.

The **change in unit rent** gives the change in the future stream of income resulting from a change in the estimated unit resource rent.

The estimates of some of these elements have been significantly revised since last year's 'Blue Book', following a review of the methodology used for calculating the element relating to the effect of changes in the extraction path.

Energy consumption (Table 13.3)

Table 13.3 gives estimates of total energy used by each industrial sector and the proportion of total energy used from renewable resources, for the years 1993 to 2000. Detailed estimates of consumption of different fuel types by each sub-sector are given on the National Statistics website

www.statistics.gov.uk/environmentalaccounts/energy

Unit of measurement

The unit of measurement is tonne of oil equivalent (toe), which enables different fuels to be compared and aggregated. It should be regarded as a measure of energy content rather than a physical quantity. Standard conversion factors for each type of fuel are given in the Digest of UK Energy Statistics (DUKES)[3].

Consumption of fossil fuels, energy used in transformation processes and losses in distribution

The consumption of fossil fuels, and the related consumption of energy, can be analysed from a

number of different perspectives. In terms of atmospheric emissions, it may be helpful to identify which industrial sectors are actually consuming the fossil fuels that give rise to emissions. From this perspective, fuels used by the electricity generation sector are attributed entirely to that sector, even though some of the energy is transformed into electricity and used by other sectors. This analysis is shown in Part 1 of Table 13.3 and is consistent with that used in the atmospheric emissions accounts (see Tables 13.4 and 13.5). Hence the estimated fossil fuel consumption by industry shown in Part 1 of Table 13.3 can be directly related to the estimated emissions of air pollutants.

In terms of energy consumption, it is possible to attribute energy used during the process of transformation into electricity, and the energy lost in distributing electricity to end users, either directly to the electricity generation sector, or indirectly to the consumers of energy. Parts 2 and 3 of Table 13.3 consider energy consumption from both points of view. Part 2 allocates the consumption of energy directly to the immediate consumer of the energy, while Part 3 allocates these "electricity overheads" of the major power producers to the user of the electricity. For this purpose, the consumption of electrical energy produced by autogenerators, either for their own use or supplied directly to other consumers, has been ignored.

Renewable energy sources

Renewable energy is defined to include solar power, energy from wind, wave and tide, hydroelectricity, and energy from wood, straw and sewage gas. Landfill gas and municipal solid waste combustion have also been included with renewable energy for the purposes of defining energy sources in the context of sustainable development policy.

Sources and methods for estimating consumption of energy by industrial sector

Data for estimating fuel consumption by broad industrial sectors are collected by the DTI and are published in DUKES. However, the figures shown in Table 13.3 differ from those given in DUKES in that:

- fuels used by the UK fishing fleet, UK international shipping and aircraft operators, and ships and aircraft used for UK military purposes, are included, whether or not they were purchased in the UK, whereas fuels purchased in the UK by non-resident operators are excluded;
- purchases of petrol and DERV abroad by UK motorists and road hauliers are included;
- non-energy uses of fuels for example, chemical feedstocks, solvents, lubricants and road-making material, are excluded. However, energy lost through gas leakage etc is included;
- the classification of industrial sectors used in environmental accounts differs from that used in DUKES. In particular, the transport sector is defined to include only enterprises that provide transport services to other consumers (i.e. public transport operators, freight haulage companies, etc.). The energy consumed by households' use of private cars is allocated to the domestic sector.

The adjustments for the consumption of energy from fuels purchased abroad and for gas leakage are revisions to the estimates given in last year's 'Blue Book', following new research into the amounts involved[4].

Atmospheric emissions (Tables 13.4 and 13.5)

Tables 13.4 and 13.5 give estimates of pollutants directly emitted to the atmosphere by each industrial sector. The figures are on a National Accounts basis and differ from the basis used to monitor progress against the Kyoto protocol in that they include estimated emissions from fuels purchased abroad by UK residents, including those used by international shipping and aircraft on international flights, and exclude emissions from fuels purchased in the UK by

non-UK residents. The adjustment for emissions from the consumption of energy from fuels purchased abroad is a revision to the estimates given in last year's 'Blue Book', following new research into the amounts consumed[4]. A further minor difference is that for emissions of hydro-fluorocarbons, perfluorocarbons and sulphur hexafluoride the UK climate change programme uses a 1995 base year in accordance with Article 3.8 of the Kyoto Protocol. Detailed estimates of pollutants from each sub-sector, for the years 1990 to 2000, are given on the National Statistics website at

www.statistics.gov.uk/environmentalaccounts/airemissions

The website also gives details of other pollutants, such as other heavy metals.

Pollutants and environmental themes

Atmospheric emissions can be aggregated according to their contribution to environmental themes such as greenhouse gases and acid rain. A description of the pollutants covered and the methodology used to calculate environmental themes is given in the annex to these notes.

Attributing emissions to industrial sectors

The disaggregation of national estimates of emissions to industrial sectors is based upon an initial disaggregation provided by the National Environmental Technology Centre (NETCEN) which maintains the National Atmospheric Emissions Inventory (NAEI). Emissions were estimated by multiplying fuel consumption by emissions factors and adding releases unrelated to fuel use such as methane arising from landfill.

The NAEI data is used to identify the main processes and industries responsible for the emissions, which are then allocated to individual sectors on the basis of information from a variety of sources. For example, emissions from DERV use by Heavy Goods Vehicles are allocated to sectors using vehicle mileage data from the Department for Transport. Expenditure information is also used, for example to allocate emissions arising from the use of various industrial coatings (e.g. general industrial, heavy duty and vehicle refinishing) to relevant sectors in proportion to each sector's expenditure on paints, varnishes and similar coatings, printing ink and mastics, using the National Accounts supply-use tables as the main source. A full description of the methods and sources used in these accounts is available on request from the Environmental Accounts branch, Office for National Statistics.

Table 13.4 shows estimates of air pollutants directly emitted by industry in 2000. Emissions generated by the electricity supply industry have not been reallocated to their customers in this analysis. Emissions from road haulage are given on an 'own account' basis, i.e. attributed to the sector owning the transport rather than to the sector of the goods being transported. Similarly emissions from households' use of private cars is allocated to the domestic sector. Figures for total road transport emissions are provided separately.

Table 13.5 shows estimates of emissions of greenhouse gases and acid rain emissions by industrial sector for the years 1993 to 2000.

Consumption of water resources (Table 13.6)

Water is used extensively throughout the UK economy. The bulk of the water consumed by agriculture and industry comes from direct abstractions from rivers and lakes, although a significant amount of the water provided through the public water supply (PWS) network is also used by various industries, such as the food and drinks sector and the chemicals industry.

Table 13.6 shows the use of inland and non-tidal waters in 1997/98. It excludes abstraction of tidal waters (whether freshwater or not) and in situ uses such as for hydro-electric power, but does include

some other "non-consumptive" uses where the water is returned to the same part of the environment in an unchanged state, such as where the water has been used for cooling purposes only.

The account of water use shown in Table 13.6 includes a number of miscellaneous categories, either where it has not been possible to identify the precise sector which uses the water or where the estimates from different sources do not reconcile completely. The categories used in the account are as follows:

- 'unspecified industry' is use by manufacturing industry where the sector is unknown;
- use by the water supply sector is defined to include not only the water industry's own use but also leakage from the PWS
- 'other abstractions' relate to a number of small but miscellaneous uses such as private domestic water supply
- 'statistical discrepancies' denote the difference between the estimated total abstractions for PWS and estimated supply.

Sources and methods

The estimates are primarily based on research carried out by the Environment Agency on water consumption in England and Wales[5]. For the use of the Public Water Supply (PWS) in 1997/98, the Agency asked the water companies to provide estimates of use by industrial sectors. Estimates were made for areas where no information on the breakdown of use was available. Information on direct abstractions of groundwater and non-tidal waters by sector in 1997/98 was obtained from the Agency's National Abstraction Licensing Database, using a combination of information on the purpose of the abstractions and the ratio of actual use to licensed use. Estimates for Scotland and Northern Ireland are based on Scottish Executive figures for PWS use and grossed up estimates of direct abstractions using the figures for England and Wales, but they also take into account figures given in a separate survey of water use by industry and commerce in the UK[6].

Material flows (Table 13.7)

Economy-wide material flow accounts record the total mass of natural resources and products that are used by the economy, either directly in the production, distribution and consumption of products and services, or indirectly through the movement of materials which are displaced in order for production to take place.

A material flow account balances the inputs (extraction of natural resources from the UK environment, and imports of goods) with the outputs (wastes, emissions to air and water, exports) and accumulation (in terms of new buildings etc) within the economy.

The direct input of materials into the economy derives primarily from domestic extraction, that is from biomass (agricultural harvest, timber, fish and animal grazing), fossil fuel extraction (such as coal, crude oil and natural gas) and mineral extraction (metal ores, industrial minerals such as pottery clay, and construction material such as crushed rock, sand and gravel).

The direct input of materials from domestic sources is supplemented by the imports of products, which may be of raw materials such as unprocessed agricultural products, but can also be semi-manufactured or finished products. In a similar way the UK produces exports of raw materials, semi-manufactured and finished goods which can be viewed as inputs to the production and consumption of overseas economies.

Water is used so widely and in such quantities that its inclusion in the accounts tends to obscure other resource use. For this reason, the accounts only include the water that is contained in products (eg agricultural produce and imported beverages). Water

for other consumptive uses (cleaning or irrigation) and *in situ* uses (such as hydroelectric power) is excluded from these accounts.

The accounts also provide a framework for recording the quantity of raw material that is translocated by the process of extraction, but not actually used in the production of goods and services. These movements are known as hidden flows. Hidden flows may be as a result of extraction activities within the UK economy, or associated with the extraction of raw materials in other countries which are then imported into the UK economy. Examples of hidden flows are unused extraction from mining and quarrying (also known as overburden), discarded material from harvesting (eg wood harvesting losses such as timber felled but left in the forests), and soil and rock moved as a result of construction and dredging.

Indicators

There are a number of indicators which can be used to summarise the flows of materials into and out of the economy. Table 13.7 includes three of the main indicators used to measure inputs. There are also a number of output and material balance indicators, which cannot yet be calculated because of lack of data. The output indicators are potentially more useful as they provide a better link with the environmental impact of resource consumption.

The **Direct Material Input (DMI)** measures the input of materials directly used by the economy, that is all materials that form part of products or are used in production and consumption activities. DMI equals used extraction in the UK (including that which is used or contained in the production of exports) plus imports.

Domestic material consumption (DMC) measures the total amount of material directly consumed by the economy i.e. it includes domestic extraction and imports but excludes exports.

The **Total Material Requirement (TMR)** measures the total material basis of the economy, that is the total direct and indirect resource requirements of all the production and consumption activities. TMR includes the amount of used extraction in the UK, the imports into the UK and the resulting indirect or hidden flows associated with extraction in the UK and imports from other countries. Although TMR is widely favoured as a resource use indicator, the estimates of indirect flows are less reliable than those for materials directly used by the economy, and it can also be argued that it double-counts trade flows, in that materials used both in the production of imports and in the production of exports are included. The indicator therefore needs to be considered alongside other indicators.

In summary:

Direct Material Input (DMI)
= used domestic extraction + imports

Domestic Material Consumption (DMC)
= DMI – exports

Total Material Requirement (TMR)
= DMI + indirect flows from domestic extractions
+ indirect flows associated with imports

Sources and methods

Data on the yields of agriculture, forestry and fishing comes from the Food and Agriculture Organization (FAO)[7]. Mineral extraction data has been taken from the UK Minerals Yearbook[8] and information on the mass of imports and exports has been taken from trade information compiled by HM Customs and Excise[9].

Factors applied to give estimates of the amounts of unused material moved for each tonne of used material have been taken from research carried out by the Wuppertal Institute on behalf of the Department for Environment, Food and Rural Affairs (DEFRA)[10]. The methodology used to compile the account is also based upon the Wuppertal Institute's research.

More information about the material flow accounts is available in Economic Trends[11] and in the National Statistics website at:

www.statistics.gov.uk/environmentalaccounts/materialflows

Note, imports and exports have been grouped differently in this chapter in comparison with the article on material flow accounts published in Economic Trends.

Government revenues from environmental taxes (Table 13.8)

Table 13.8 shows the amounts raised in environmental taxes between 1993 and 2001.

Definition of an environmental tax

An environmental tax is defined as a tax whose base is a physical unit (or a proxy for it) that has a proven specific negative impact on the environment. By convention, in addition to polluted-related taxes, all energy and transport taxes are classified as environmental taxes. This definition has been agreed by international experts and adopted by the Statistical Office of the European Communities (Eurostat) and Organisation for Economic Co-operation and Development (OECD). It enables analysis to be based on the effects of taxes rather than the aims behind their introduction, i.e. the aim of a tax for raising government revenue rather than reducing environmental degradation does not preclude it from being defined as an environmental tax.

Nevertheless, the interpretation and use of measures of environmental taxes need care. In particular, the levels of revenues from environmental taxes do not necessarily indicate the relative importance or the success of environmental policy. High environmental tax revenues can result either from high rates of taxes or from high levels of environmental problems (e.g. pollution) leading to a large tax base. The broad measure of revenues can also fail to capture the effect of the differential rates that encourage a shift away from higher impact behaviour (such as the use of leaded petrol).

Taxes on energy products include duties on hydrocarbon oils used in road vehicles, the main ones being ultra low sulphur petrol and ultra low sulphur diesel. Taxes on energy products also include those used for non-transport purposes (such as industrial gas turbines and heating installations, with a reduced rate for energy saving materials) and the fossil fuel levy, which is levied on sales of electricity from fossil fuels and used to compensate companies producing electricity from non-fossil fuel sources such as nuclear or renewable energy.

The climate change levy, which is a tax on non-domestic use of energy, was introduced in April 2001. The levy applies to the suppliers of the following energy types: electricity, natural gas as supplied by a gas utility, petroleum and hydrocarbon gas in a liquid state, coal and lignite, coke and semi-coke of coal or lignite, and petroleum coke. The rates of the levy are based on the type and quantity of fuel supplied, with a range of reliefs and exemptions available to business users of energy.

VAT on duty is calculated as a fixed proportion (in most cases 17.5%) of the duty paid on hydrocarbon oils. In practice much of this VAT will be reclaimed by business, but it could be argued that the total will eventually be paid when the final product or service is purchased.

Taxes on road vehicles include Vehicle Excise Duty, which owners of motor vehicles can pay on either a six monthly or annual basis. There have been various changes to this duty over recent years. Most recently, as from 1 May 2002, private cars, taxis and light goods vehicles registered before 1 March 2001 with an engine size up to and including 1549cc are subject to a lower tax than cars with engine sizes greater than 1549cc. The same vehicle types registered on or after 1 March 2001 are taxed according to the level of carbon dioxide emissions. Car tax was payable on purchases of new cars, up until 1993 when it was discontinued.

Air passenger duty was introduced on 1 November 1994. It applies to the carriage from a UK

airport of chargeable passengers on chargeable aircraft at two different rates. The lower rate is charged where passengers are travelling to a UK destination or within the European Economic Area (EEA), and the higher rate applies in all other cases. On the year of introduction, the lower and higher rates of duty were £5 and £10 respectively. From 1 April 2001, standard rates of £10 for EEA destinations and £40 for other destinations have been applied. There are also reduced rates of duty for the lowest class of travel on any flights.

Landfill tax was introduced in October 1996 and aims to encourage waste producers to produce less waste, recover more value from waste e.g. through recycling or composting and to use more environmentally friendly methods of waste disposal. The tax applies to active and inactive (inert) waste disposed of at landfill sites. Types of waste excluded from this tax include dredgings, disposals from mines and quarries and also waste resulting from the clearance of contaminated land. A standard rate of tax is levied on active waste, this was £7.00 on introduction of the tax, rising to £10 in April 1999, and increasing by £1.00 per tonne each year until 2004, when it will be £15 per tonne. A lower rate of tax is levied on inert waste, which has remained at £2.00 per tonne from the year of introduction.

Environmental protection expenditure in 2000 (Tables 13.9 and 13.10)

Tables 13.9 and 13.10 show the estimated expenditure on environmental protection in 2000.

Definition of expenditure

Environmental protection expenditure is defined as capital and operational expenditure incurred because of, and which can be directly related to, the pursuit of an environmental objective. Spending on installations and processes which are environmentally beneficial, but which also produce revenue (or savings) exceeding expenditures, is excluded on the grounds that it is likely to have been carried out for commercial not environmental reasons. Also excluded are expenditures on natural resource management (e.g. fisheries and water resources), on the prevention of natural hazards (e.g. flood defence), on the provision of access and amenities to National Parks etc, and on the urban environment. The spending has been classified by the following groups of environmental concerns:

- Protection of ambient air and climate
- Waste water management
- Waste management
- Protection of biodiversity and landscapes
- Other abatement activities such as on the protection of soil and groundwater, protection against radiation, and noise and vibration abatement
- Other environmental expenditure (on research and development, education and administration).

The spending by the general government sector shown in Table 13.10 has also been classified by the following types of expenditure:

- current costs, including staff costs (compensation of employees), other on-going expenditure on purchases of goods and services, and the estimated consumption of fixed capital
- capital expenditure or investment including outlays on land and on the additions of new durable goods to the stock of fixed assets for environmental protection
- income from sales, fees and charges for the provision of current or capital goods and services, such as fees for waste removal, but excluding taxes
- current and capital transfers to other sectors of the economy

- net transfers to and from the Rest of the World, in the form of aid or other grants, net of grants received from the EU. Figures in Table 13.10 should not be added to those in Table 13.9 without allowing for these transfers between sectors.

Sources

Table 13.9 gives figures for spending by the extraction, manufacturing, energy production and water supply industries. They are drawn from a survey for 2000 carried out on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) by URS Corporation Ltd[12]. The estimates should be regarded as approximate orders of magnitude only. Because of this qualification the estimates shown fall outside the scope of National Statistics. Table 13.10, which gives estimates for expenditures by the general government sector, is based on an ONS survey of government departments covering 1996/97 to 2000/01[13].

Comparisons with previous surveys

The information on spending by industries in 2000, which is summarised in Table 13.9, comes from the third of a regular series of surveys. The estimates from this survey and the earlier 1997 and 1999 surveys should be regarded as very approximate and any comparisons between the results should be treated with care.

Annex: Atmospheric pollutants and environmental themes

Greenhouse gases

There is a growing consensus that the rise in concentrations of greenhouse gases in the atmosphere has led to changes in the global climate system. The greenhouse gases included in the atmospheric emissions accounts are those covered by the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

The main source of **carbon dioxide (CO_2)** is from the combustion of fossil fuels, but it is also produced in some industrial processes such as the manufacture of cement. Carbon dioxide is a long-lived gas remaining in the atmosphere for between 50 and 200 years. It is the main anthropogenic greenhouse gas.

Methane (CH_4) is produced when organic matter is broken down in the absence of oxygen. Large quantities are produced by enteric fermentation in cattle and sheep, by the spreading of animal manure and from organic waste deposited in landfill sites. Methane is also emitted in coal mining, oil and gas extraction and gas distribution activities. Methane is a significant greenhouse gas.

Nitrous oxide (N_2O) is released in a few industrial processes and from the soil when nitrogenous fertilisers are applied in agriculture and horticulture. These are the main anthropogenic sources. It is a long-lived pollutant, lasting about 120 years in the atmosphere and is a potent greenhouse gas.

Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) are artificial fluids that contain chlorine and/or fluorine. Because of their low reactivity and non-toxicity they were widely used as refrigerants, foam blowing agents, aerosol propellants and solvents.

To aggregate the greenhouse gases covered in the accounts, a weighting based on the relative global warming potential (GWP) of each of the gases is applied, using the effect of CO_2 over a 100 year period as a reference. This gives methane a weight of 21 relative to CO_2 and nitrous oxide a weight of 310 relative to CO_2. SF_6 has a GWP of 23,900 relative to CO_2 . The GWP of the other fluorinated compounds varies according to the individual gas.

Greenhouse gas emissions are sometimes shown in terms of carbon equivalent rather than CO_2 equivalent. To convert from CO_2 equivalent to carbon equivalent it is necessary to multiply by 12/44.

Acid rain precursors

The term 'acid rain' describes the various chemical reactions which acidic gases and particles undergo in the atmosphere. The gases may be transported long distances before being deposited as wet or dry deposition. When deposited, hydrogen ions may be released, forming dilute acids, which damage ecosystems and buildings. The gases covered are sulphur dioxide (SO_2), nitrogen oxides (NO_x) and ammonia (NH_3).

The emissions are weighted together using their relative acidifying effects. The weights, given relative to SO_2, are 0.7 for NO_x and 1.9 for NH_3. This is a simplification of the chemistry involved, and there are a number of factors which can affect the eventual deposition and effect of acid rain. There may be an upward bias on the weights of the nitrogen-based compounds in terms of damage to ecosystems.

Sulphur dioxide (SO_2) is produced when coal and some petroleum products containing sulphur impurities are burnt. Sulphur dioxide is an acid gas that can cause respiratory irritation. It can damage ecosystems and buildings directly and is a major contributor to acid rain.

Nitrogen oxides (NO_x) arise when fossil fuels are burnt under certain conditions. High concentrations are harmful to health and reduce plant growth. Like sulphur dioxide, nitrogen oxides contribute to acid rain; nitrogen dioxide (NO_2) also plays a part in the formation of ground ozone layer.

Ammonia (NH_3) is predominantly emitted from spreading animal manure and some fertilisers.

Other air pollutants

PM10s are smoke particles whose diameter is less than 10 microns. They are regarded as responsible for some physiological damage and have been linked to premature mortality from respiratory diseases.

Carbon monoxide (CO) is produced in small quantities when fossil fuel is burnt with insufficient oxygen for complete combustion. At high concentrations carbon monoxide is toxic.

Non-methane volatile organic compounds (NMVOCs) cover a variety of chemicals, many of which are known carcinogens. Emissions of NMVOCs arise from the deliberate and incidental evaporation of solvents (e.g. in paints and cleaning products), from accidental spillage and from non-combustion of petroleum products. The environmental accounts include natural emissions of NMVOCs from managed forests. NMVOCs play a role in the formation of ground level ozone, which can have an adverse effect on health. The NMVOC emissions include benzene and 1,3-butadiene.

Benzene is released largely from the distribution and combustion of petrol. It is a carcinogen which has also been found to cause bone-marrow depression and consequent leukopenia (depressed white blood cell count) on prolonged exposure.

1,3-Butadiene is a colourless, gaseous hydrocarbon. It is produced by dehydrogenation of butene, or of mixtures of butene and butane; it may also be made from ethanol. 1,3-butadiene is believed to be a carcinogen, for which the safe level is not known. Emissions of 1,3-butadiene arise from combustion of petroleum products and in its manufacture of synthetic rubber, nylon and latex paints in the chemical industry. 1,3-butadiene is not present in petrol but is formed as a by-product of combustion. The increasing use of catalytic converters through the 1990's has caused a significant reduction in emissions from the road transport sector.

Heavy Metals

Lead (Pb) is a heavy metal that is emitted from the combustion of petrol, coal combustion and metal works. Emissions of lead continued to fall in 2000, mainly as a result of the ban on the sale of leaded petrol from 1 January 2000. Lead has been found to inhibit the development of children's intelligence. If the levels of lead are sufficient, lead can cause degenerative processes such as osteoporosis, inhibit many enzyme reactions in the body and cause

reproductive disorders such as sterility and miscarriages.

Cadmium (Cd) is a normal constituent of soil and water at low concentrations. Industrially, cadmium is used as an anti-friction agent, in alloys, semi-conductors, control rods for nuclear reactors and PVC and battery manufacture. The main sources of cadmium emissions are from waste incineration, and iron and steel manufacture. Emissions of cadmium have declined over recent years; this is mainly attributable to the decline in coal combustion.

Environmentally, cadmium is dangerous because many plants and some animals absorb it easily and concentrate it in tissues. Cadmium competes with calcium in the body, and if levels are sufficient, it will displace calcium, causing embrittlement of bones and painful deformations of the skeleton. Cadmium also competes with zinc in the body, and if levels of cadmium are high enough, cadmium will also displace zinc from enzymes in the body.

The main sources of **mercury (Hg)** emissions are waste incineration, the manufacture of chlorine in mercury cells, non-ferrous metal production and coal combustion. Emissions of mercury have declined over recent years due to improved controls on mercury cells and their replacement by diaphragm cells and the decline of coal use. Due to the volatility of mercury, if levels are sufficiently high, compounds containing mercury attack and destroy various parts of the body, particularly teeth, lung tissues and intestines.

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UK Environmental Accounts tables

13.1 Estimates of remaining recoverable oil and gas reserves

End year:	1993	1994	1995	1996	1997	1998	1999	2000	2001
OIL (million tonnes)									
Discovered reserves									
Proven	605	575	605	665	690	685	665	630	605
Probable	800	920	765	690	700	575	455	380	350
Possible	690	580	520	670	625	540	545	480	475
Range of undiscovered reserves									
Lower end	560	480	380	285	285	275	250	225	205
Upper end	3 355	3 140	2 920	2 700	2 680	2 550	2 600	2 300	1 930
Range of total reserves									
Lower end[1]	1 165	1 055	985	950	975	960	915	855	810
Upper end[2]	5 450	5 215	4 810	4 725	4 695	4 350	4 265	3 790	3 360
Expected level of reserves[3]									
Opening stocks	1 895	1 965	1 975	1 750	1 640	1 675	1 535	1 370	1 235
Extraction	- 100	- 127	- 130	- 130	- 128	- 132	- 137	- 126	- 128
Other volume changes	170	137	- 95	20	163	- 8	- 28	- 9	53
Closing stocks	1 965	1 975	1 750	1 640	1 675	1 535	1 370	1 235	1 160
Life expectancy[4] (years)	20	16	13	13	13	12	10	10	9
GAS (billion cubic metres)									
Discovered reserves									
Proven	630	660	700	760	765	755	760	735	695
Probable	805	855	780	660	620	585	500	460	445
Possible	480	400	435	540	600	455	490	430	395
Range of undiscovered reserves									
Lower end	300	430	395	440	500	440	355	325	290
Upper end	1 297	1 602	1 412	1 585	1 700	1 595	1 465	1 440	1 680
Range of total reserves									
Lower end[1]	930	1 090	1 095	1 200	1 265	1 195	1 115	1 060	985
Upper end[2]	3 212	3 517	3 327	3 545	3 685	3 390	3 215	3 065	3 215
Expected level of reserves[3]									
Opening stocks	1 620	1 735	1 945	1 875	1 860	1 885	1 780	1 615	1 520
Extraction	- 61	- 65	- 70	- 84	- 86	- 89	- 99	- 108	- 115
Other volume changes	176	275	0	69	111	- 16	- 66	13	25
Closing stocks	1 735	1 945	1 875	1 860	1 885	1 780	1 615	1 520	1 430
Life expectancy[4] (years)	28	30	27	22	22	20	16	14	12

1 The lower end of the range of total reserves has been calculated as the sum of proven reserves and the lower end of the range of undiscovered reserves.
2 The upper end of the range of total reserves is the sum of proven, probable and possible reserves and the upper end of the range of undiscovered reserves.
3 Expected reserves are the sum of proven reserves, probable reserves and the lower end of the range of undiscovered reserves.
4 Based on expected level of reserves at end year and current extraction rates.

Source: Department of Trade and Industry

13.2 Monetary balance sheets for oil and gas reserves[1]

£ million

	1993	1994	1995	1996	1997	1998	1999	2000	2001
OIL									
Opening stocks	9 094	12 034	18 402	24 337	36 097	39 990	29 275	20 586	35 835
Extraction	- 953	- 1 686	- 2 462	- 3 822	- 4 136	- 3 303	- 2 598	- 4 598	- 7 060
Revaluation due to time passing	564	877	1 265	1 801	1 873	1 483	1 060	1 828	2 543
Other volume changes	649	871	- 915	314	2 862	- 106	- 322	- 197	1 898
Change in extraction	284	1 518	209	- 13	- 130	288	196	- 763	166
Change in rent	2 395	4 789	7 838	13 480	3 424	- 9 077	- 7 025	18 979	18 435
Closing stocks	12 034	18 402	24 337	36 097	39 990	29 275	20 586	35 835	51 818
GAS									
Opening stocks[2]	- 3 028	1 637	8 459	16 004	25 217	29 083	33 492	29 739	32 779
Extraction	- 106	- 534	- 1 071	- 1 866	- 2 156	- 2 621	- 2 638	- 3 218	- 4 145
Revaluation due to time passing	75	382	776	1 213	1 382	1 659	1 516	1 633	1 902
Other volume changes	85	603	2	539	993	- 178	- 783	195	497
Change in extraction	128	207	715	2 056	213	539	1 258	1 016	1 045
Change in rent	4 482	6 165	7 124	7 271	3 434	5 011	- 3 106	3 414	6 893
Closing stocks	1 637	8 459	16 004	25 217	29 083	33 492	29 739	32 779	38 971

1 The estimated opening and closing stock values are based on the present value method (see chapter notes for a more detailed description of the methodololgy used). The estimates are extremely sensitive to the estimated return to capital and to assumptions about future unit resource rents.
2 The negative stock value results from an estimated negative resource rent. It could have been set to zero by definition, but has been left in the table in order to show the results of the assumptions made in the calculations.

Source: ONS

13.3 Energy consumption

Million tonnes of oil equivalent

	1993	1994	1995	1996	1997	1998	1999	2000
Direct use of energy from fossil fuels								
Agriculture	2.0	2.0	1.9	2.1	1.9	2.0	1.8	1.7
Mining and quarrying	5.1	5.5	5.5	6.1	6.3	6.8	6.5	6.7
Manufacturing	41.3	42.4	42.0	42.9	43.6	42.8	42.3	41.1
Electricity, gas and water supply	52.0	51.8	53.2	54.1	51.7	53.8	53.3	56.9
Construction	1.3	1.3	1.3	1.4	1.4	1.3	1.4	1.3
Wholesale and retail trade	4.9	4.8	4.8	5.2	5.2	5.5	6.1	6.4
Transport and communication	23.1	23.6	24.6	25.9	26.9	28.3	27.9	28.3
Financial intermediation	4.9	5.0	5.2	5.5	4.9	5.3	5.3	5.4
Public administration	4.7	4.7	4.8	4.8	4.6	4.1	3.9	3.7
Education, health and social work	4.5	4.4	4.4	4.8	4.7	4.6	4.8	4.8
Other services	2.2	2.1	2.1	2.1	1.7	1.6	1.5	1.5
Domestic	57.5	55.4	53.6	59.5	56.8	57.5	57.9	58.1
Total use of energy from fossil fuels	203.3	203.0	203.5	214.3	209.8	213.5	212.6	215.9
Energy from other sources[1]	23.4	23.1	23.1	24.0	24.8	25.0	24.0	21.4
Total energy consumption of primary fuels and equivalents	226.7	226.1	226.7	238.3	234.6	238.5	236.6	237.3
Direct use of energy including electricity								
Agriculture	2.3	2.3	2.3	2.4	2.3	2.3	2.2	2.0
Mining and quarrying	5.5	5.8	5.8	6.5	6.7	7.0	6.8	6.9
Manufacturing	48.5	49.5	49.3	50.3	51.3	50.4	50.1	49.2
Electricity, gas and water supply	51.3	51.1	52.0	52.8	51.0	53.1	51.2	51.7
of which - transformation losses by major producers	*45.1*	*44.5*	*45.1*	*45.1*	*44.0*	*45.2*	*43.4*	*43.6*
- distribution losses of electricity supply	*2.0*	*2.3*	*2.6*	*2.4*	*2.5*	*2.4*	*2.4*	*2.5*
Construction	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Wholesale and retail trade	6.9	6.8	6.8	7.3	7.6	7.9	8.7	9.0
Transport and communication	24.0	24.5	25.5	26.9	28.0	29.4	28.9	29.4
Financial intermediation	6.8	7.0	7.3	7.7	7.3	7.6	7.6	7.8
Public administration	5.3	5.3	5.6	5.6	5.3	4.8	4.5	4.3
Education, health and social work	5.7	5.7	5.6	6.0	5.9	5.7	6.1	6.1
Other services	2.7	2.5	2.4	2.4	2.0	1.8	1.7	1.7
Domestic	66.1	64.0	62.4	68.8	65.8	66.9	67.3	67.7
Total energy consumption of primary fuels and equivalents	226.7	226.1	226.7	238.3	234.6	238.5	236.6	237.3
Reallocated use of energy								
Energy industry electricity transformation losses and distribution losses allocated to final consumer								
Agriculture	2.9	2.9	2.8	2.9	2.8	2.9	2.6	2.5
Mining and quarrying	6.3	6.3	6.4	7.1	7.1	7.5	7.2	7.4
Manufacturing	60.6	61.4	61.5	62.3	63.2	62.6	61.9	61.2
Electricity, gas and water supply	11.1	11.4	11.6	12.3	11.2	12.3	11.8	12.0
Construction	1.7	1.7	1.8	1.8	1.7	1.7	1.7	1.7
Wholesale and retail trade	10.2	10.1	10.2	10.6	11.3	11.6	12.6	12.9
Transport and communication	25.6	26.0	27.2	28.6	29.9	31.2	30.5	31.0
Financial intermediation	10.2	10.4	10.8	11.2	11.0	11.3	11.1	11.3
Public administration	6.3	6.5	6.9	6.8	6.4	6.0	5.4	5.3
Education, health and social work	7.9	7.9	7.6	8.1	7.7	7.5	8.1	8.1
Other services	3.4	3.1	3.0	3.0	2.6	2.2	2.0	2.0
Domestic	80.6	78.5	77.0	83.7	79.8	81.8	81.7	82.0
Total energy consumption of primary fuels and equivalents	226.7	226.1	226.7	238.3	234.6	238.5	236.6	237.3
Energy from renewable sources[2]	1.6	2.1	2.2	2.1	2.3	2.6	2.8	3.0
Percentage from renewable sources	0.7%	0.9%	1.0%	0.9%	1.0%	1.1%	1.2%	1.3%

1 Nuclear power, hydroelectric power and imports of electricity.
2 Renewable sources include solar power and energy from wind, wave and tide, hydroelectricity, wood, straw and sewage gas. Landfill gas and municipal solid waste combustion have also been included within this definition.

Source: NETCEN, Department of Trade and Industry, ONS

13.4 Atmospheric emissions 2000

Thousand tonnes

	Greenhouse gases[1]	Acid rain precursors[2]	Emissions affecting air quality							
			PM10[3]	CO[4]	NMVOC[5]	Benzene	Butadiene	Lead (tonnes)	Cadmium (tonnes)	Mercury (tonnes)
Agriculture	54 200	530	20.1	60.8	147.7	0.2	0.2	3.8	0.01	0.00
Mining and quarrying	31 400	70	23.2	43.9	196.1	0.4	0.0	0.4	0.04	0.02
Manufacturing	133 000	440	37.9	780.6	439.4	3.4	0.9	132.8	3.42	4.17
Electricity, gas and water supply	165 900	1 060	22.4	68.4	75.0	0.3	0.0	17.5	0.41	1.44
Construction	3 700	10	5.4	51.4	53.8	0.2	0.1	0.5	0.01	0.00
Wholesale and retail trade	19 800	40	6.2	186.7	131.1	0.9	0.4	17.7	0.04	0.01
Transport and communication	82 000	560	17.4	366.3	128.8	2.4	2.5	21.9	0.25	0.03
Financial intermediation	14 900	30	4.2	183.1	24.0	0.5	0.2	17.9	0.03	0.00
Public administration	10 000	60	1.4	21.4	5.6	0.3	0.0	1.4	0.01	0.04
Education, health and social work	11 600	20	1.9	40.8	6.3	0.1	0.0	4.9	0.02	0.08
Other services	19 900	40	1.3	23.9	15.2	0.1	0.1	5.7	0.66	2.24
Domestic	150 000	360	37.0	2521.5	476.5	9.8	2.7	277.7	0.47	0.53
Totals	696 400	3 220	178.4	4348.8	1699.4	18.5	7.1	502.3	5.36	8.56
Of which, emissions from road transport	123 600	480	32.2	2915.5	414.2	7.8	4.7	329.2	0.38	0.00

1 Carbon dioxide, methane, nitrous oxide, hydro-fluorocarbons, perfluorocarbons and sulphur hexafluoride expressed in thousand tonnes of carbon dioxide equivalent.
2 Sulphur dioxide, nitrogen oxides and ammonia expressed as thousand tonnes of sulphur dioxide equivalent.
3 PM10s are carbon particles in air arising from incomplete combustion.
4 Carbon monoxide.
5 Non-methane Volatile Organic Compounds including benzene and 1,3-butadiene.

Source: NETCEN, ONS

13.5 Greenhouse gas and acid rain precursor emissions

Thousand tonnes

	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gases - CO_2, CH_4, N_2O, HFC, PFCs and SF_6[1]								
Agriculture	57 800	58 700	58 800	59 600	59 700	58 700	57 300	54 200
Mining & quarrying	37 800	35 700	35 800	37 300	35 900	35 200	32 400	31 400
Manufacturing	161 600	167 300	163 400	166 900	169 200	164 400	137 700	133 000
Electricity, gas and water supply	180 100	176 600	175 400	173 200	158 500	162 700	154 600	165 900
Construction	3 700	3 800	3 800	3 900	3 800	3 800	3 800	3 700
Wholesale and retail trade	12 900	13 200	13 600	14 800	15 500	16 700	18 800	19 800
Transport and communication	67 200	68 900	71 600	75 500	78 400	82 400	80 900	82 000
Financial intermediation	12 800	13 300	13 900	14 600	13 300	14 500	14 500	14 900
Public administration	13 100	12 900	13 000	13 000	12 400	10 900	10 600	10 000
Education, health and social work	11 700	11 300	11 100	11 900	11 800	11 200	11 700	11 600
Other services	28 000	27 200	26 500	25 600	23 800	22 400	21 000	19 900
Domestic	149 200	143 300	137 900	152 700	146 800	148 700	150 000	150 000
Total greenhouse gas emissions	735 900	732 200	724 800	749 000	729 100	731 600	693 300	696 400
Of which, emissions from road transport	114 900	116 100	115 800	121 000	122 800	122 700	124 200	123 600
Acid rain precursor emissions - SO_2, NO_x, NH_3[2]								
Agriculture	610	610	580	580	590	580	570	530
Mining & quarrying	110	100	80	90	90	80	70	70
Manufacturing	960	880	780	720	680	590	520	440
Electricity, gas and water supply	2 490	2 140	1 950	1 640	1 290	1 330	1 000	1 060
Construction	20	20	20	20	20	10	10	10
Wholesale and retail trade	70	70	60	60	50	50	50	40
Transport and communication	710	680	690	700	730	740	610	560
Financial intermediation	50	50	50	50	40	40	30	30
Public administration	90	80	80	80	80	60	60	60
Education, health and social work	60	50	40	40	40	30	20	20
Other services	60	60	60	50	50	40	40	40
Domestic	600	560	510	520	480	440	410	360
Total acid rain precursor emissions	5 830	5 300	4 900	4 550	4 140	3 990	3 390	3 220
Of which, emissions from road transport	880	850	780	750	680	610	550	480

1 Carbon dioxide, methane, nitrous oxide, hydroflurocarbons, perflurocarbons and sulphur hexafluoride expressed in thousand tonnes of carbon dioxide equivalent.
2 Sulphur dioxide, nitrogen oxides and ammonia expressed in thousand tonnes of sulphur dioxide equivalent.

Source: NETCEN, ONS

13.6 Consumption of water resources by industrial sector 1997/98

Million cubic metres

	Public water supply	Direct abstractions from groundwater and non-tidal waters	Total groundwater and non-tidal abstractions
Use of groundwater and non-tidal water by:			
Agriculture	10	360	370
Fisheries	-	2 060	2 060
Mining and extraction[1]	10	60	70
Food, drink and tobacco	190	110	300
Textiles	10	80	90
Pulp, paper, printing and publishing	20	190	210
Fuel processing	-	-	-
Chemicals	240	430	670
Rubber and plastics	-	10	10
Mineral products	10	70	80
Metal manufacturing and products	90	240	330
Manufacture of machinery	100	10	110
Electrical equipment	30	-	30
Transport equipment	30	-	30
Other manufacturing including recycling	150	10	160
Unspecified industry[2]	120	160	280
Electricity and gas production	50	5 560	5 610
Water supply[3]	1 750	-	1 750
Construction	10	10	20
Wholesale, hotels and catering	140	-	140
Education and health	190	-	190
Other services	310	-	310
Domestic	3 180	70	3 250
Other abstractions[4]	-	160	160
Statistical discrepancies	600	-	600
Total use of groundwater and non-tidal waters	7 240	9 590	16 830

1 Excludes mineral washing
2 Includes mineral washing
3 Includes leakage
4 Includes some private domestic water supply, public water supply licences and frost protection use.

Source: Environment Agency, Scottish Executive, ONS

13.7 Material flows, 1970 to 2000

Million tonnes

	1970	1975	1980	1985	1990	1995	1996	1997	1998	1999	2000
Domestic extraction											
Biomass											
Agricultural harvest	42	38	47	47	46	47	54	53	51	52	51
Timber	3	3	4	5	6	8	7	7	7	7	7
Animal grazing	49	49	49	48	46	44	44	45	44	43	43
Fish	1	1	1	1	1	1	1	1	1	1	1
Total biomass	96	92	101	100	100	100	106	107	103	104	103
Minerals											
Ores	12	5	1	1	0	0	0	0	0	0	0
Clay	38	33	25	23	21	18	16	15	16	15	16
Other industrial minerals	14	12	11	11	11	10	10	10	9	8	8
Sand and gravel	122	131	110	112	128	106	101	103	103	105	102
Crushed stone	156	169	150	160	212	200	181	182	182	179	168
Total minerals	342	350	298	307	373	334	308	310	310	308	295
Fossil fuels											
Coal	149	129	130	94	94	53	50	48	41	37	32
Natural gas	11	37	39	37	43	71	84	86	90	99	108
Crude oil	0	2	80	128	92	130	130	128	133	137	127
Total fossil fuels	161	168	249	259	229	255	265	263	265	274	268
Total domestic extraction	598	609	648	666	701	689	679	680	678	686	665
Imports											
Biomass	40	35	32	34	41	43	43	44	45	45	46
Minerals	30	32	24	34	41	51	48	51	53	49	49
Fossil fuels	123	111	74	76	89	73	77	79	76	70	83
Other products	3	5	11	12	17	21	24	25	26	24	30
Total imports	197	183	140	156	187	187	191	200	201	189	208
Exports											
Biomass	3	6	8	12	14	16	16	19	18	17	18
Minerals	17	20	26	22	25	39	41	43	42	41	44
Fossil fuels	23	19	60	102	67	103	99	106	103	108	115
Other products	4	6	7	10	11	16	17	18	17	18	19
Total exports	47	51	101	146	117	174	174	185	181	184	196
Indirect flows											
- from domestic extraction[1] (excl soil erosion)	579	597	665	653	720	666	675	671	637	644	612
Of which;											
unused biomass	16	16	22	25	27	27	31	31	30	29	30
fossil fuels	189	228	327	313	355	318	317	323	288	298	267
minerals and ores	177	158	121	115	135	117	110	110	112	110	108
soil excavation and dredging	198	197	195	200	204	204	216	207	207	207	207
- from production of imports	394	395	368	423	457	527	514	541	597	549	614
Summary aggregates											
Direct Material Input (domestic extraction + imports)	795	792	788	821	888	876	871	880	879	875	873
Domestic Material Consumption (domestic extraction + imports - exports)	748	741	687	676	771	702	697	694	698	691	677
Total Material Requirement (direct material input + indirect flows)	1 768	1 784	1 821	1 897	2 065	2 069	2 059	2 093	2 113	2 067	2 099

1 Indirect flows from domestic extraction relate to unused material which is moved during extraction, such as overburden from mining and quarrying

Source: Wuppertal Institute, ONS

13.8 Government revenues from environmental taxes

£ million

		1993	1994	1995	1996	1997	1998	1999	2000	2001
Energy										
Duty on hydrocarbon oils	**GTAP**	12 497	13 984	15 360	16 895	18 357	20 996	22 391	23 041	22 046
including										
Unleaded petrol[1]	**GBHE**	4 242	5 101	5 901	7 043	8 073	9 897	11 952	12 548	1 980
Leaded petrol	**GBHL**	4 502	4 349	4 088	3 716	3 393	2 984	1 630	7	3
Ultra low sulphur petrol	**ZXTK**	-		-	-	-	-	-	1 162	11 042
Diesel	**GBHH**	3 484	4 257	5 127	5 888	6 528	7 088	1 274	32	60
Ultra low sulphur diesel	**GBHI**	-	-	-	-	146	806	7 338	9 061	8 754
VAT on duty	**CMYA**	2 187	2 447	2 688	2 957	3 212	3 674	3 918	4 032	3 858
Fossil fuel levy	**CIQY**	1 331	1 355	1 306	978	418	181	104	56	86
Climate change levy	**LSNT**	-	-	-	-	-	-	-	-	588
Road vehicles										
Vehicle excise duty	**CMXZ**	3 482	3 848	3 954	4 149	4 334	4 631	4 873	4 606	4 061
Car tax	**GTAT**	- 4	-	-	-	-	-	-	-	-
Other environmental taxes										
Air passenger duty	**CWAA**	-	33	339	353	442	823	884	940	824
Land ll tax	**BKOF**	-	-	-	5	378	333	430	461	505
Total environmental taxes		19 493	21 667	23 647	25 337	27 141	30 638	32 600	33 136	31 968
Environmental taxes as a % of:										
Total taxes and social contributions		9.0	9.2	9.3	9.5	9.4	9.6	9.8	9.3	8.6
Gross domestic product		3.0	3.2	3.3	3.3	3.3	3.6	3.6	3.5	3.2

1 Unleaded petrol includes superunleaded petrol.

13.9 Environmental protection expenditure in specified industries, 2000

£ million

	Protection of ambient air and climate	Waste water management	Waste management	Protection of bio-diversity and landscape	Other environmental protection expenditure	Research and development expenditure	Total environmental expenditure
Mining and quarrying	105	40	134	58	121	37	494
Food, beverages and tobacco	60	271	110	2	44	9	497
Textiles and leather products	40	42	22	0	3	1	108
Wood and wood products	15	8	29	0	3	2	57
Pulp and paper products, printing and publishing	43	105	95	10	71	3	326
Solid and nuclear fuels, oil refining	13	18	8	0	4	2	44
Chemicals and man-made fibres	164	238	125	5	75	22	628
Rubber and plastic products	89	28	71	-	41	2	231
Other non-metallic mineral products	61	28	47	2	17	5	159
Basic metals and metal products	66	71	86	8	60	29	320
Machinery and equipment	47	62	216	2	35	37	399
Electrical and optical equipment	88	49	44	2	52	3	239
Transport equipment	54	48	47	1	65	4	218
Other manufacturing	6	10	30	0	5	1	52
Energy production and water	180	19	98	28	122	6	452
Total expenditure in extraction, manufacturing, energy and water supply industries	1 031	1 036	1 162	117	717	162	4 225

The figures in this table fall outside the scope of National Statistics

Source: Department for Environment, Food and Rural Affairs

13.10 Environmental protection expenditure by the general government sector, 2000

£ million

	Protection of ambient air and climate	Waste water management	Waste management	Protection of bio-diversity and landscape	Other abatement activities[1]	Research and development, education and administration	Total environmental expenditure
Staff costs	35	62	235	138	19	70	559
Other running costs[2]	59	114	3 017	312	62	291	3 854
less							
Current income	- 33	- 84	- 483	- 30	- 9	- 65	- 705
Net operating costs	62	91	2 768	420	72	295	3 708
Capital payments[3]	8	7	53	27	95	15	204
less							
Capital receipts	- 0	-	- 7	- 1	- 0	- 1	- 9
Net capital expenditure	8	7	45	26	95	14	196
Current grants and subsidies							
- to industry	79	-	2	90	20	67	258
- to households	-	0	-	-	-	16	16
Capital grants and subsidies							
- to public corporations	-	32	-	2	-	-	34
- to industry	10	1	0	25	199	5	240
- to households	112	0	-	-	1	-	113
Net transfers to the Rest of the World	5	-	0	- 40	63	9	37
Net expenditure[2]	276	131	2 815	523	450	406	4 602

1 Includes expenditure on the protection of soil and groundwater, on noise and vibration abatement, on protection against radiation and on other environmental protection activities.
2 Includes an allowance for the consumption of fixed capital.
3 Includes outlays on land.

Source: ONS