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In the Spotlight

ENERGY AND ENVIRONMENT

Federal Statistical Office of Germany

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Preface

A careful approach to energy and environmental policy needs to rely on a comprehensive set of basic information. It is the incumbent task of official statistics to ensure the regular collection and updating of information giving evidence on the extent and the evolution of environmental stresses caused, in particular, by the generation of energy as well as on the effectiveness of energy and environmental policy decisions.

Energy supply is an elementary prerequisite of modern societies. Major goals of today's energy policy consist no longer in the mere necessity to ensure a sufficient supply of energy, but they address the challenge that energy production should be „sustainable" for both the environment and future generations and that energy should be used carefully in a way, which is safe, economical and ecologically clean.

The environment is used in many ways. Any economic activity, be it the production of goods and services, be it consumption, involves using our natural environment: raw materials or energy resources are withdrawn from nature, areas and lands are needed as a site for production, transport etc., and nature is used as a sink for the discharge of residuals and pollutants. The principle of sustainability requires dealing with nature as carefully as possible, so that future generations, too, may enjoy an intact environment.

In the past we used to examine energy and environment as two separate issues. In fact, however, the two areas are strongly interrelated. For example, improving energy efficiency means not only saving energy resources but also reducing air emissions. Therefore, this volume of the series „In the Spotlight" brings together data focussing on selected environmental aspects of energy supply and energy use, with special emphasis on renewable energy resources. For that purpose, we use the data that are described in the annexes of this report as well as results of environmental and economic accounts (EEA).

The volume „Energy and Environment" of the series „In the Spotlight" can provide but a first and general overview of the many links between energy and environmental issues. For further details, please, refer to the references listed at the end of this report.

To everyone who has made this publication possible, I would like to offer my most heartfelt thanks.

Johann Hahlen

President of the Federal Statistical Office

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Abbreviations

Units of measurement

bn = Billion
m^3 = cubic meter
mn = Million
MW = Megawatt
t = Tonnes
TWh = Terawatt hours

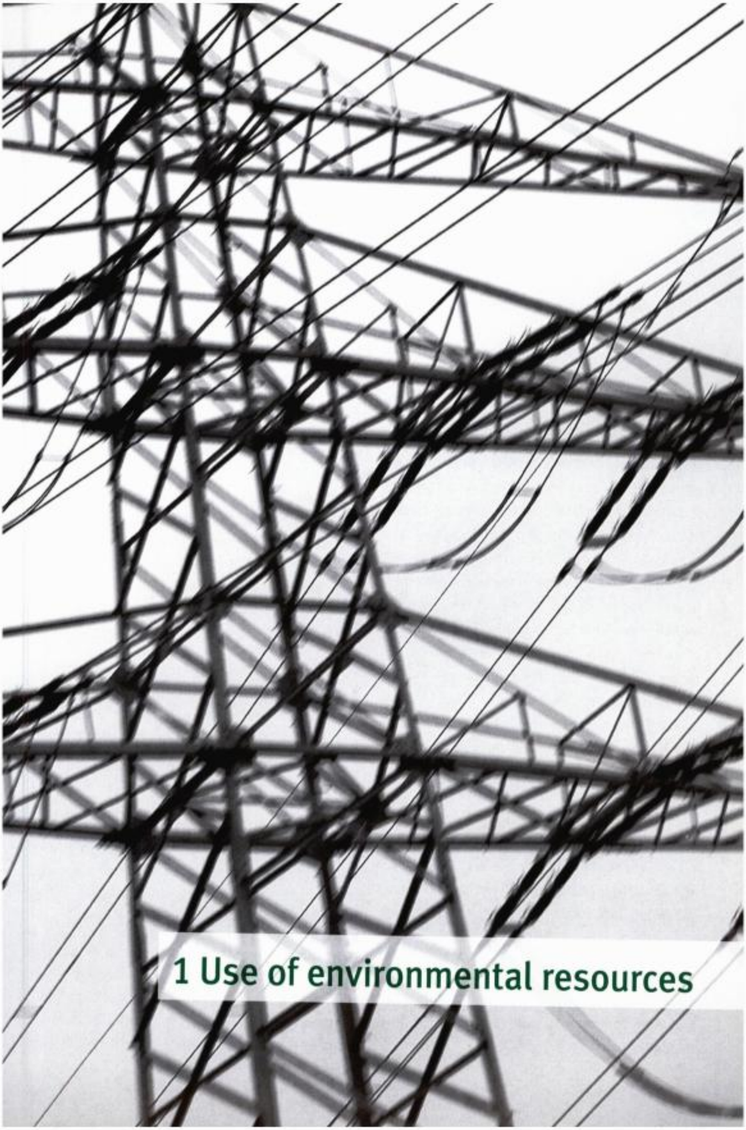
MJ = Megajoule = 10^6 Joule
GJ = Gigajoule = 10^9 Joule
TJ = Terajoule = 10^{12} Joule
PJ = Petajoule = 10^{15} Joule

Emissions

CF_4 = Carbon tetrafluoride
CFC_s = Chlorofluorocarbons
C_2F_6 = Hexafluorethane
C_3F_8 = Octafluoropropane
CO = Carbon monoxide
CO_2 = Carbon dioxide
CH_4 = Methane
HFCs = Partially halogenated chlorofluorocarbons
N_2O = Nitrous oxide
NH_3 = Ammonia
NMVOC = Non-methane volatile organic compounds
NO_x = Nitrogen oxides
SF_6 = Sulphur hexafluoride
SO_2 = Sulphur dioxide

Other abbreviations

AG EE Stat = Working group on „Renewable Energies Statistics"
AG Strerz = Expert group on „Power Generation"
AGEB = Working group on „Balanced Energy Tables"
BMU = Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
DIW = German Institute for Economic Research
EEA = Environmental-Economic Accounting
EnStatG = Energy Statistics Act
EU = European Union
UBA = Federal Environmental Agency
UStatG = Environmental Statistics Act
PEC = Primary energy consumption
RME = Biodimethylester



1 Use of environmental resources

1 Use of environmental resources

Economic activities such as the production of goods and services or consumption, involves using our natural environment by withdrawing materials from nature as raw materials, using area as a location for economic activities, and discharging residuals and pollutants into nature, i.e. substances are taken up by nature. Doing business in line with the principle of sustainability requires dealing with nature as carefully as possible, so that future generations, too, may enjoy an intact environment.

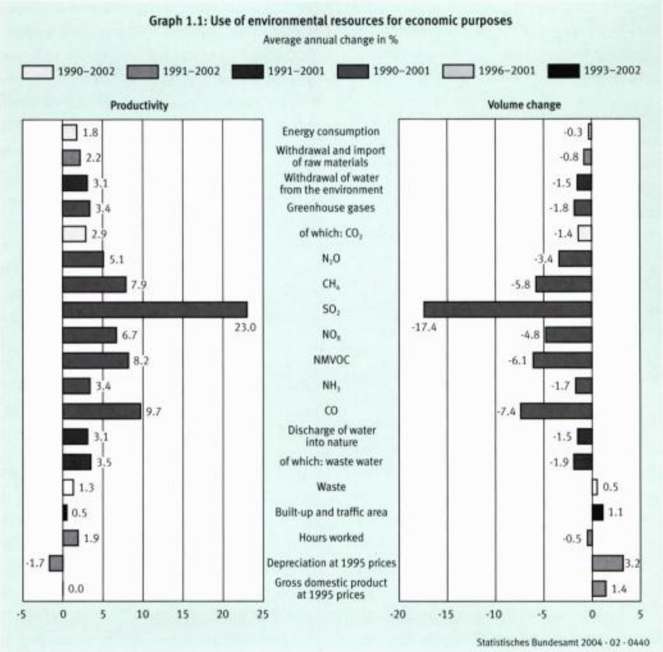
Environmental-Economic Accounting (EEA) highlights the use of environmental factors by economic activities. Hence, the study of the economic production factors of labour and capital, which is customary in national accounts, is to include the environment as an input factor. The use of material environmental resources can be directly measured by using the volume of the input factors relating to consumption of raw materials, energy or water. The use of area can be described by virtue of the quantity and nature of the use of area. The use of nature as a sink for residuals and pollutants can be measured only indirectly, that is, by using the quantity of residuals and pollutants discharged (air emissions, waste water and waste). If we establish a relation between the various quantities measured in physical units and economic performance, we may calculate productivities – similar to studying the economic input factors of labour and capital – as indicators of the efficiency of using natural input factors.

Depending on the goals set, when observing the use of natural factors, the focus can fall on either the observation of the quantitative trends (absolute reduction in pressure) or the observation of productivity trends (increase in efficiency).

The quantitative use of most natural factors decreased in the nineties, although the extent differed considerably. Nature as a source of resources, in its function as a raw material and energy provider, was used somewhat less heavily in 2001/2002 than at the start of the nineties. Energy consumption fell by 2.1 % between 1990 and 2002 (average of -0.3 % per year, see graph 1.1). Raw material consumption has fallen by 8.9 % since 1991 (average -0.8 % per year). Withdrawal of water from nature fell between 1991 and 2001 by 14.3 % (average -1.5 % per year). The trend of water discharge into nature was the same as that of water withdrawal. The quantity of waste water fell between 1991 and 2001 by an average of 1.9 % per year. Air emissions were reduced in terms of volume for all pollutants. Carbon dioxide (CO_2) was reduced by an annual average of 1.4 % between 1990 and 2002, whilst emissions of sulphur dioxide (SO_2) in the period up to 2001 in fact fell by an annual average of 17.4 %. In contrast to the situation shown by the other indicators observed here, the quantity of waste and use of area continued to increase.

Productivity, an indicator of the efficiency of use of factors, may be defined as an input factor which indicates how much economic performance is produced using one unit of this factor which means gross domestic product (in real terms) divided by input factor. Productivity expresses how efficiently a national economy deals with the use of work, capital and nature. These factors cannot be directly compared with one another because their characteristics and functions differ. An observation of their development over longer periods may provide information on the changing relationship between these factors.

One can observe, furthermore, that in calculating productivity, the total real yield of economic activities relates exclusively to the respective production factor although the product is the result of an interaction between all production factors. The produc-



tivities ascertained may therefore only be used as a rough guide.

The use of natural input factors has become more efficient in Germany in the past decade for all the factors observed. Energy productivity increased between 1990 and 2002 by an average of 1.8 % per year. Raw material productivity increased between 1991 and 2002 by an annual average of 2.2 %. Water productivity increased between 1991 and 2001 by an average of 3.1 % per year. By contrast, the average annual increase in area productivity (built-up and traffic area) in the 1993 to 2002 period was relatively low, at 0.5 %.

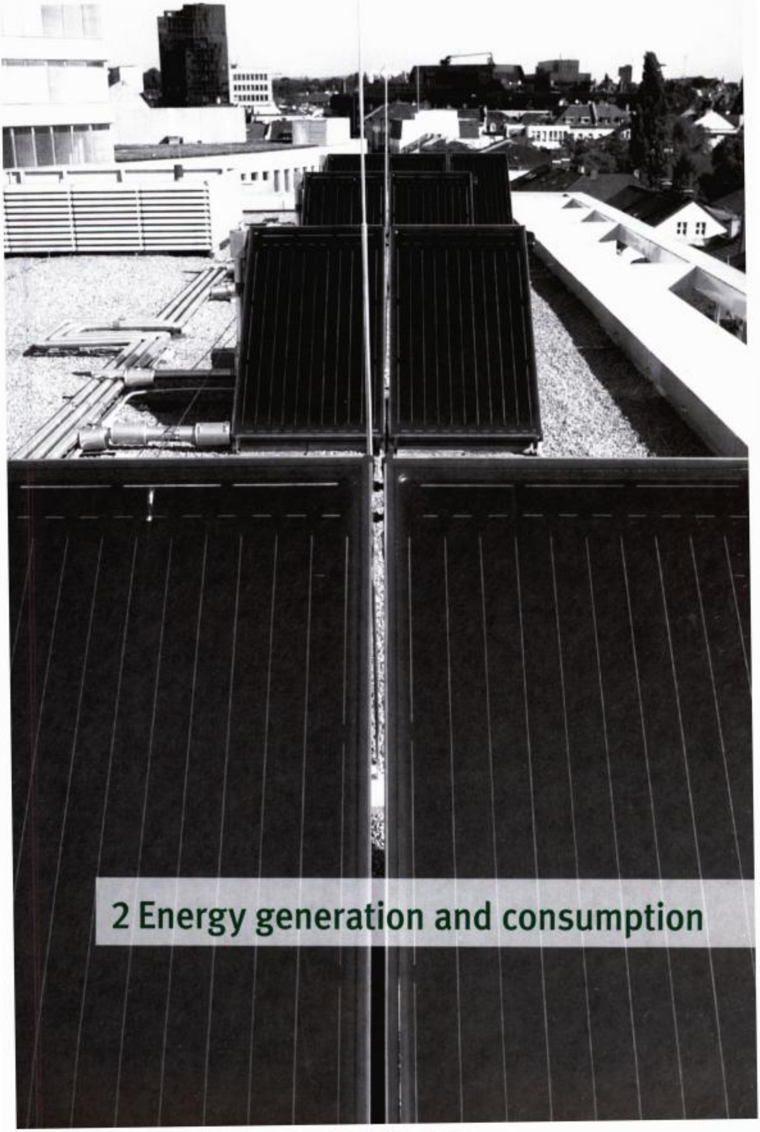
Trends in energy productivity in the period under observation were characterised in the new Länder in particular by a considerable reduction in the use of energy in the new Länder at the start of the nineties. Trends in raw material productivity were mainly influenced by fluctuations in demand for raw materials for the construction industry. The favourable trends in water productivity are due in particular to expansions in the legal tools of water management and savings caused by a sharp rise in water and waste water charges.

The productivity increase in the use of the environment as a sink for air emissions was much greater than in the productivity view of the withdrawal of resources (energy and raw materials) and in the use of area. The relationship between gross domestic product and greenhouse gas emissions (greenhouse gas productivity) increased in the past decade (1990 to 2001) by an annual average of 3.4 %. The most important anthropogenic greenhouse gas in terms of volume is carbon dioxide (CO_2). The proportion of CO_2 compared with the overall generation of greenhouse gases measured in CO_2-equivalents was 87.5 % in Germany in 2001. CO_2 productivity increased between 1990 and 2002 by an average of 2.9 % per year. The increase in gross domestic product per unit of air pollutants discharged into nature (productivity of the individual air pollutants) from 1990 to 2001 ranged between 3.4 % per year for ammonia (NH_3) and 23.0 % per year for sulphur dioxide (SO_2). Waste water productivity increased in the period 1991 to 2001 by an average of 3.5 % per year. It therefore developed in a manner similar to water productivity. Waste productivity increased between 1996 and 2001 by an average of 1.3 % per year.

The environmental indicators of the Federal Government's Sustainability Strategy are provided with quantitative targets in most cases, so that the actual trends can be viewed in light of the goals set by society. Some of the environmental sustainability indicators chosen by the Federal Government in the spring of 2002 include for example energy productivity (see http://www.bundesregierung.de/Themen-A-Z/Nachhaltige-Entwicklung-,11408/Dialog-Nachhaltigkeit.htm).

The Federal Government is aiming to double energy productivity between 1990 and 2020. Between 1990 and 2002 energy productivity rose by a total of Euro 27.1 per gigajoule. This means an annual increase of Euro 2.3 per gigajoule. An assessment of these trends for the overall period from 1990 to 2002 should take into account the fact that from 1990 to 1991 alone, energy productivity increased by an average of Euro 5.1/GJ, whilst in the following eleven years, i.e. from 1991 to 2002, it only increased by almost Euro 2.0/GJ per year. In order to reach the goal targeted by the Federal Government on the basis of the status achieved in 2002, mathematically by 2020 a further annual increase of Euro 4.7/GJ would be needed, supposing that the trend remains unchanged. This means that in the years to come, a considerable acceleration of the increase in productivity would have to be achieved in comparison with the Euro 2.3/GJ achieved to date.

Further comprehensive data on the various topics covered by Environmental-Economic Accounting was published recently (see "Umweltnutzung und Wirtschaft – Bericht zu den Umweltökonomischen Gesamtrechnungen 2003", which is available as a free download on the homepage http://www.destatis.de under the subject area "Umwelt" – "Aktuelle Themen der Umweltökonomischen Gesamtrechnungen" – "Umweltnutzung und Wirtschaft"). Selected topical areas such as energy consumption, air emissions, water and waste will be studied in detail in the following chapters.



2 Energy generation and consumption

2 Energy generation and consumption

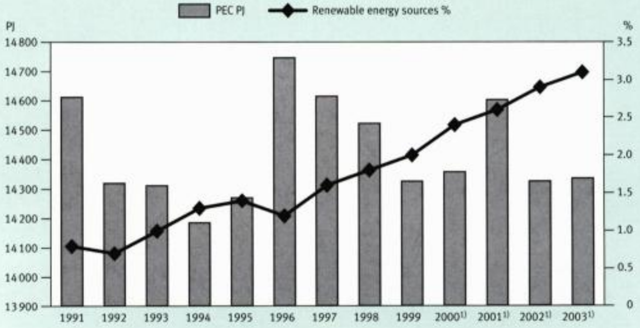
2.1 Renewable energy

At present, the term "renewable energy" covers many different sources of data, such as e. g. the data of the Federal Statistical Office, figures of various associations and data of research and scientific institutes to mention just some of them. These sources are tapped by interested data users who reprocess, interpret and publish the data in the most different ways. So it happens that one and the same phenomenon is often described by different, sometimes even controversial data and analyses.

So far, the system of official statistics has been unable to portray more than just a small portion of these modern forms of energy generation, which are in a process of permanent expansion. Nevertheless, first improvements have been reached with a new Energy Statistics Act (EnStatG) coming into force in early 2003, which now is put into action step by step (see Annex 6.1). That is why over the next few years a noticeable improvement will be achieved in the collection of detailed data on renewable energies. But gaps in the officially reported data will continue to exist, for example, in the field of decentralised heat generation, gaps that need to be filled by different means.

Two new working groups were established on national level to bundle the expertise and know-how available at many different places, to discuss methodological and technical questions, to standardise survey procedures and to simplify the harmonisation of final results: a working group on "Renewable Energies Statistics" (AG EE Stat) acting under the auspices of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and an expert Group on "Power Generation" (AG Strerz) maintaining close relations to the working Group on "Balanced Energy Tables" (AGEB). The Federal Statistical Office is represented in all of the mentioned bodies.

Graph 2.1: Primary energy consumption (PEC) and share of renewable energy sources



1) Preliminary data. – Source: AGEB, AG EE Stat

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Table 2.1: Primary energy consumption and share of renewable energy sources

Year	Primary energy consumption	Share of renewable energy sources
	PJ	%
1991	14 611	*0.8*
1992	14 319	*0.7*
1993	14 310	*1.0*
1994	14 184	*1.3*
1995	14 269	*1.4*
1996	14 746	*1.2*
1997	14 614	*1.6*
1998	14 521	*1.8*
1999	14 324	*2.0*
2000 1)	14 356	*2.4*
2001 1)	14 602	*2.6*
2002 1)	14 305	*2.9*
2003 1)	14 334	*3.1*

1) Preliminary data.

Sources: AGEB, AG EE Stat

The AGEB defines renewable energy sources as "...a collective term for natural energy sources, which either are permanently available or can be traced back to energy flows regenerated or reproduced within manageable periods covering the lifetimes of a few generations. They include: solar energy, wind energy, hydropower, energy from biomass and geothermal energy" (see Working Group on Balanced Energy Tables (ed.): Energy balance-sheets of the Federal Republic of Germany, current annual volumes, Frankfurt on Main, page 7).

The results presented here refer to the Federal Republic of Germany. Unless otherwise indicated, all figures for the years 2002 and 2003 are provisional.

Total energy from renewable energy sources

Primary energy consumption (PEC) in a country "...is obtained as the sum of production of primary energy sources, stock changes and net foreign trade, less international marine bunkers" (see ibid, page 8). According to AGEB estimates, from 1991 to 2003 PEC oscillated between 14 184 and 14 746 petajoules (PJ) mainly as a function of the prevailing weather conditions. The current provisional value for 2003 amounts to some 14 334 PJ (see graph 2.1 and table 2.1).

First computations made by the Working Group on Renewable Energies Statistics (AG EE Stat) have shown that during the period under observation the percentage of renewable energy sources in PEC increased from 0.8 % in 1991 to nearly 3.1 % in 2003. The reason for that is that there is a large variety of different funding schemes and subsidies on state, federal and European levels. The most important energy sources used for the production of electricity, heat and fuels are biomass/waste as well as water and wind power. It is worthwhile mentioning that biomass/waste have always been the quantitatively most important energy sources ever since records were kept. As stated by AG EE Stat, energy generation from biomass/waste is by far holding the leading position, its share amounting to some 58 %, followed by hydropower (18 %) and wind energy (16 %).

Electricity from renewable energy sources

However, political and statistical monitoring is focussed on one field, i. e. electricity supply. What is

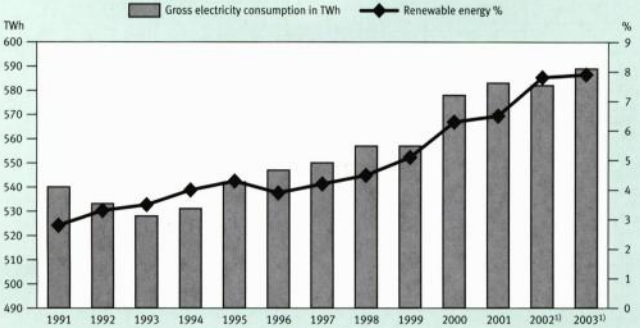
Table 2.2: Gross electricity consumption and share of renewable energy sources

Year	Gross electricity comsumption	Share of renewable energy sources
	TWh	%
1991	539.6	*2.8*
1992	532.8	*3.3*
1993	527.9	*3.5*
1994	530.8	*4.0*
1995	541.6	*4.3*
1996	547.4	*3.9*
1997	549.9	*4.2*
1998	556.7	*4.5*
1999	557.3	*5.1*
2000	578.1	*6.3*
2001	582.8	*6.5*
2002 1)	581.9	*7.8*
2003 1)	589.0	*7.9*

1) Preliminary data.

Sources: AG Strerz, AG EE Stat

Graph 2.2: Gross electricity consumption and share of renewable energy sources



1) Preliminary data. – Source: AG Strerz, AG EE Stat

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considered here in compliance with Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 is gross national electricity consumption. In the period under review, the share of renewable energies in gross electricity consumption has developed rapidly. Being 2.8 % in 1991, it has increased continuously, reaching 7.9 % in 2003. A success like that is all the more remarkable as gross electricity consumption rose by 9.1 %, i.e. from 539.6 to 589.0 Terawatt hours (TWh), during the same period (see graph 2.2 and table 2.2).

In this context, the renewable part of hydropower accounts for 3.5 % and that of wind energy for 3.1 %. The contribution of the various kinds of biomass to electricity supply remains relatively small with circa 1 %, including the biogenic share in thermal treatment of waste.

Electricity from hydropower

For many decades Germany has possessed a highly developed system of using water resources for the generation of electricity. At present, its total installed capacity amounts to some 4 625 Megawatts (MW), excluding pump storage stations. Total power generation (including electricity fed by third-party equipment into the distribution grid) increased from 19.2 TWh in 1991 to 25.0 TWh in the last year. However, this trend is not steady, but it depends on natural conditions and on other factors. Thus, the highest value was reached with 29.4 TWh in 2000 owing to favourable conditions of natural water supply (see table 2.3).

However, hydropower does not mean always renewable hydropower. If electricity is generated by power stations operated by water from rivers or storage reservoirs, the total amount of power generation is considered to be renewable; but when it comes to pump storage stations, we must, pursuant to Directive 2001/77/EC mentioned above, make a distinction between the natural inflow into the upper basin and the artificial inflow of pumped water. Renewable is only that power that was generated by pump storage stations with a natural inflow. That is why total electricity generation shown in table 2.3 is different from renewable electricity generation. Electricity generation from the renewable part of hydropower rose from 15.9 TWh in 1991 to 20.4 TWh in 2003.

Table 2.3: Generation of electricity by hydro power

Year	Total	Of which renewable
	TWh	
1991	19.2	15.9
1992	21.9	18.6
1993	22.3	19.0
1994	23.5	20.2
1995	25.2	21.6
1996	22.7	18.8
1997	22.0	19.0
1998	22.5	19.0
1999	24.7	21.3
2000	29.4	25.5
2001	27.8	23.9
2002 1)	27.9	23.8
2003 1)	25.0	20.4

1) Preliminary data.

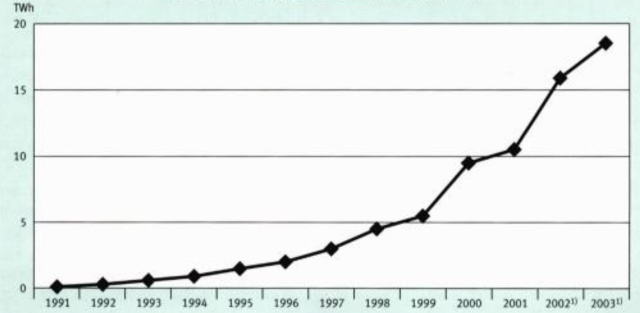
Sources: Federal Statistical Office, AG Strerz

Electricity from wind energy

In the period under observation, the use of wind energy has taken an exceptionally fast development. Supported by a legally guaranteed remuneration fee for feeding electricity from wind power into the distribution grid, electricity generation increased from 0.1 TWh in 1991 to 18.5 TWh in 2003 (see graph 2.3).

About 99 % of all electricity obtained from wind energy do not stem from facilities of electricity supply businesses, but from facilities which are operated by third parties – in most cases in the form of wind parks – and which produce electricity fed into the general distribution grid for a remuneration payment. However, as in the case of hydropower, electricity supply is subject to strong variation both regionally and chronologically. As for technological reasons wind energy, unlike hydropower, does not have storage facilities, it is necessary – in order to ensure the continuity of public electricity supply – that a so called stand-by power is made available by conventional power stations.

Graph 2.3: Electricity generation from wind power in TWh



1) Preliminary data.– Source: AG Strerz

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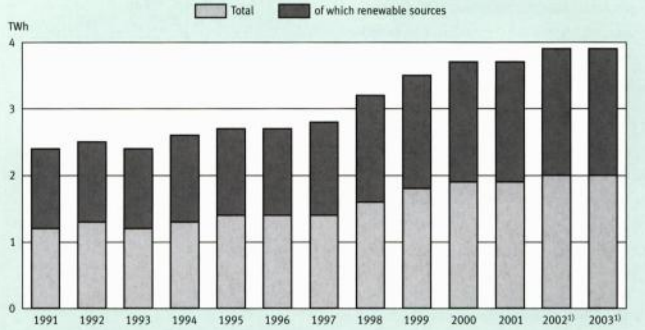
Graph 2.4: Electricity generation from waste in TWh



1) Preliminary data.– Source: Federal Statistical Office, AG Strerz

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Electricity from biomass/waste

Directive 2001/77/EC defines biomass as "...the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries as well as the biodegradable fraction of industrial and municipal waste". However, at present, an unambiguous "national agreement" on the concrete substances which has to be regarded as "biodegradable" is lacking; and the views expressed in the literature are correspondingly controversial. Thus, for lack of information and in the absence of an agreement the expert group on "Power generation" (AG Strerz) decided that no more than half of the electricity generated by thermal treatment of municipal waste should be regarded as renewable.

In the 1990s, however, all electricity generated from municipal waste was counted as electricity from renewable sources. For comparison, both values are shown in graph 2.4. Thus, total electricity generation from waste was 2.4 TWh in 1991 and increased continually, reaching 3.9 TWh last year. On the premise mentioned, the percentage of electricity generated from waste in gross electricity consumption fell from 0.45 % in 1991 to 0.32 % in 2003.

Liquid biofuels

Apart from electricity and heat, an increasing amount of fuels and lubricants is obtained from renewable energy sources. At present, however, the liquid biofuel used almost exclusively is biodiesel, so called biodimethylester (RME). That is so, because the mass marketing of other biogenic fuels such as bioethanol, biomethanol, biogas or synthetic gasoline from renewable energy sources has been delayed by the cost involved, which is still very high.

The production of biodiesel increased swiftly from 200 t RME in 1991 to circa 700 000 t RME in 2003 (see graph 2.5). Reasons other than the legally stipulated financial subsidies stimulating this development are the introduction of a biofuel standard in 1997, the fact that such fuel can be used without problems in most diesel cars and the substitution effect caused by raised prices for fossil diesel fuels caused, in their turn, by raised crude oil prices and increased taxes.

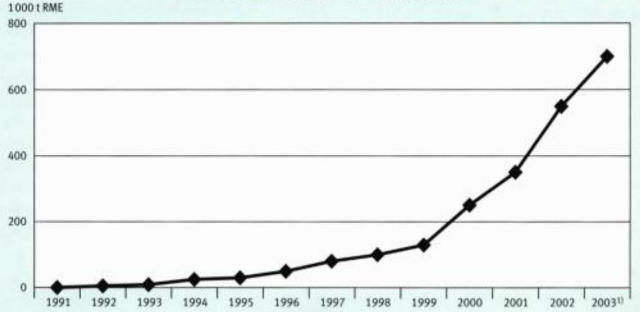
Although describing just some of the aspects which are of importance to energy generation from renewable energy sources, the statements made above show in an exemplary way how dynamically these modern technologies have developed in the last few years.

2.2 Energy consumption in general

Energy is of crucial importance for almost any production process. The production and use of energy put pressures on the environment through the withdrawal of non-renewable raw materials from nature, through the impairment of landscapes and ecosystems in the process of energy production, through the emission of air pollutants and solid residuals as well as through the withdrawal and discharge of cooling water in the process of energetic transformation or combustion.

For the analysis of energy consumption and use, Environmental-Economic Accounting data at the medium aggregation level provide important information referring to the various stages of the economic process. Energy use comprises the entire use of energy in a specific economic sector, irrespective of whether the energy is consumed there or transformed (e.g. coal into electricity) and passed on in another form to downstream sectors. Energy consumption is the difference between the quantity of energy used in an economic sector and the quantity passed on by that sector to downstream sectors. Generally, the quantity of energy used is entirely consumed in the process of production and consumption activities of the sector (e.g. to run machines, equipment and vehicles or for room heating) and finally discharged into the environment in the form of heat. In sectors producing energetic products for further use in subsequent production stages, only part of the energy used is consumed. The consumption of energy required for the

Graph 2.5: Generation from biofuels in 1000 t RME



1) Preliminary data.– Source: Union for the promotion of oil and protein plants (Ufop)

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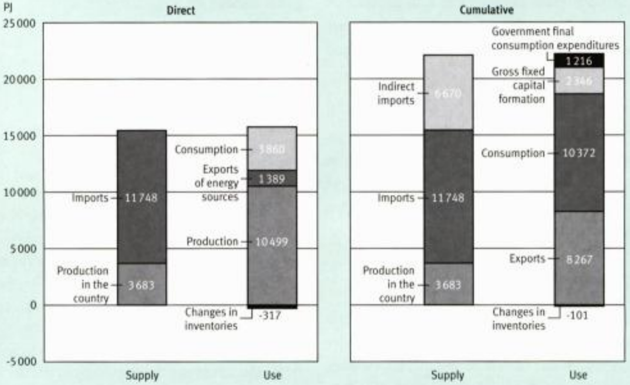
Graph 2.6: Supply and use of primary energy, 2000



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use of goods results directly from a specific activity of economic sectors and households. It is therefore referred to as direct energy consumption. The consumption of energy required at the stages preceding the production of goods is referred to as indirect consumption. The quantity of energy indirectly required abroad can be taken into account by assuming production structure and technology corresponding to that within the country. The sum of direct and indirect consumption is the cumulative energy consumption.

The direct volume of primary energy in Germany amounted to 15 431 petajoules in 2000, 3 683 petajoules of which were produced within the country (23.9 %) and 11 748 petajoules (76.1 %) were imported (see graph 2.6). Of the total volume, 10 499 petajoules (68.0 %) were used for the production of goods and services (intermediate consumption) while 3 860 petajoules (25.0 %) were directly consumed through consumption activities of households. 1 389 petajoules (9.0 %) were exported as energy sources.

Another way of examining the volume of energy is looking at it as the cumulative energy volume from the aspect of Final Uses (final consumption expenditure of households and non-profit institutions serving households, government final consumption expenditure, exports, gross fixed capital formation and changes in inventories). When looking at things this way, what is allocated to the relevant Final Use is not only direct energy consumption but also indirect energy consumption, i. e. the total quantity of energy used at all stages of production (as intermediate consumption) for the production of the goods of Final Use.

Data directly collected are not available on the amount of indirect energy use for the goods of Final

Use. They may however be estimated using a model approach on the basis of input-output tables. What is included here in analysing indirect energy consumption is the indirect energy consumption that was used abroad for the production of imported intermediate consumption goods. Thus it is possible to cover the entire volume of energy used for the production of goods of Final Use.

The indirect energy content of the imported goods (excluding energy sources) amounted to 6 670 petajoules in 2000. So the cumulative volume of primary energy is 22 101 petajoules, which is over two fifth more than the direct volume. The share of the imported quantity of energy increases accordingly when indirect imports are included, so that with such an overall approach more than four fifth (83.3 %) of the cumulative primary energy were imported from abroad.

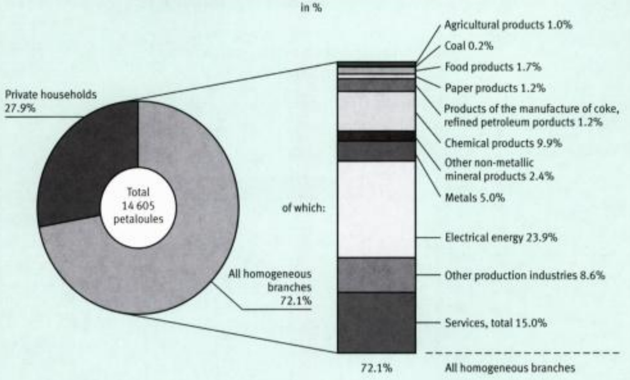
Of the total volume of primary energy, 10 372 petajoules (46.9 %) were used for the production of goods for household consumption. For the production of exported goods, 8 267 petajoules (37.4 %) were used. The remaining primary energy was spread over the other categories of Final Use.

Examining things from the aspect of environmental pressures caused by domestic economic activities shows that just a small part of environmental pressures related to the withdrawal of energy sources from nature were created within the country, whereas the large majority was produced abroad.

The following explanations will focus on direct energy consumption of the individual economic sectors in Germany. A major factor influencing the development of energy consumption is the use of energy in the production area. Production accounts for more than two thirds of direct domestic energy use (pro-

Graph 2.7: Energy consumption by economic activities, 2001

in %



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duction and consumption) underlying the indicator (see graph 2.7).

The development of energy consumption in the overall economy is the result of general economic growth, structural changes (shifts between the shares of economic branches with different energy intensity in the total production) and the trend of energy productivity or the specific energy consumption of the various sectors (see graph 2.8). The decreasing trend of direct energy consumption in production between 1991 and 2001 (-2.4 %) was mainly due to the trend in production industries (-4.9 %). For the service sector, however, a marked rise in energy use (+10.8 %) was observed. Energy use of households increased as well (+6.8 %).

Within production industries, the sectors with high energy consumption reduced their consumption, in part even substantially, over the period examined. They include coal with a reduction of 79.6 %, chemical products (-4.2 %), metals (-3.7 %) as well as electrical energy (-3.7%). Increases in energy consumption compared with 1991 were recorded in particular for other non-metallic mineral products (+13.9%).

A major factor influencing the development of productivity in the overall economy is the trend of en-

Graph 2.8: Energy consumption by economic activities

Change 2001 on 1991 in %

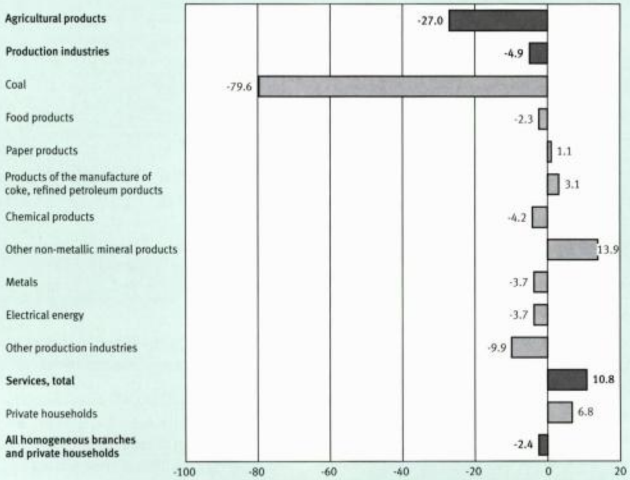

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Table 2.4: Specific energy consumption by homogeneous branches 2001

Homogeneous branches	Per EUR of gross value added	Change over 1991
	MJ	%
Agricultural products	5.8	*- 37.6*
Production industries	16.4	*1.4*
Of which		
Food products	8.9	*4.6*
Products of the manufacture of coke, refined petroleum products	131.1	*- 8.9*
Chemical products	40.2	*- 14.9*
Other non-metallic mineral products	23.3	*15.8*
Metals	47.5	*- 9.5*
Electrical energy	118.0	*- 15.0*
Services total	1.7	*- 14.4*
All homogeneous branches	5.8	*- 16.5*

ergy efficiency in the individual sectors. The energy efficiency may be represented approximately by the development of energy productivity (gross value added per energy consumption) or of the specific energy consumption (energy consumption per gross value added). In the following, the term "specific energy consumption" will be used which is common for the representation by sectors.

The decrease in energy consumption was due not only to the reduction of the specific energy consumption in individual sectors but also the changing economic structure, i.e. the relative expansion of low-energy sectors and the relative shrinking of energy-intensive sectors. The level of specific energy consumption differs considerably for the various production processes – depending on the relevant technological situation (see table 2.4). The average specific energy consumption in production industries was 16.4 MJ per EUR in 2001, while for services it was an average of just 1.7 MJ per EUR. Within production industries, for example, the specific energy consumption of food products is 8.9 MJ per EUR, while for electrical energy it was 118.0 MJ per EUR.

The specific energy consumption between 1991 and 2001 in production industries increased by 1.4 %, whereas in the service sector it decreased by -14.4 %). Within production industries, specific energy consumption trends varied. A particularly marked decline was observed for electrical energy supply (-15.0 %) and chemical products (-14.9 %).

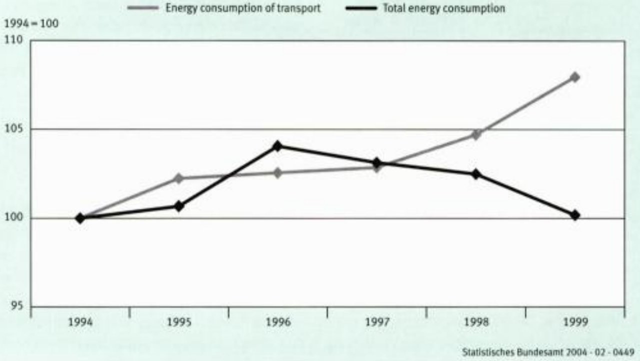
2.3 Energy consumption by transport activities

A large number of economic and social trends have resulted in recent years in a constant increase in traffic volume in Germany, entailing considerable environmental burdens, such as consumption of non-renewable energy sources, emissions of air pollutants, noise pollution, land use, sealing and fragmentation of the landscape. The integration of the ecological, social and economic aspects in sectoral transport policy are particularly significant because of the major burden placed on the environment and on people, and of the high socio-economic value of mobility. A sustainability strategy attaches the highest priority to transport; this strategy aims to sever the link between economic development and transport and to move road traffic to rail and water, as well as reducing land use.

The following data aim to show traffic-related energy and fuel consumption for the period 1991 – 1999. In 1999, consumption by transport is 2 754 TJ, and 19 % of the macroeconomic energy consumption and roughly 62 400 kt of fuel, in other words 95 % of the fuel consumption by the domestic economy. Transport accounts for 23 % of CO_2-emissions. CO_2-emissions per terajoule for transport are hence higher than average since the group of 'transport' emitters is highly dependent on fuels for its energy-related processes.

Transport has very large shares of emissions of CO and NOx (over 50 %). As to the other pollutants parti-

Graph 2.9: Energy consumption of transport

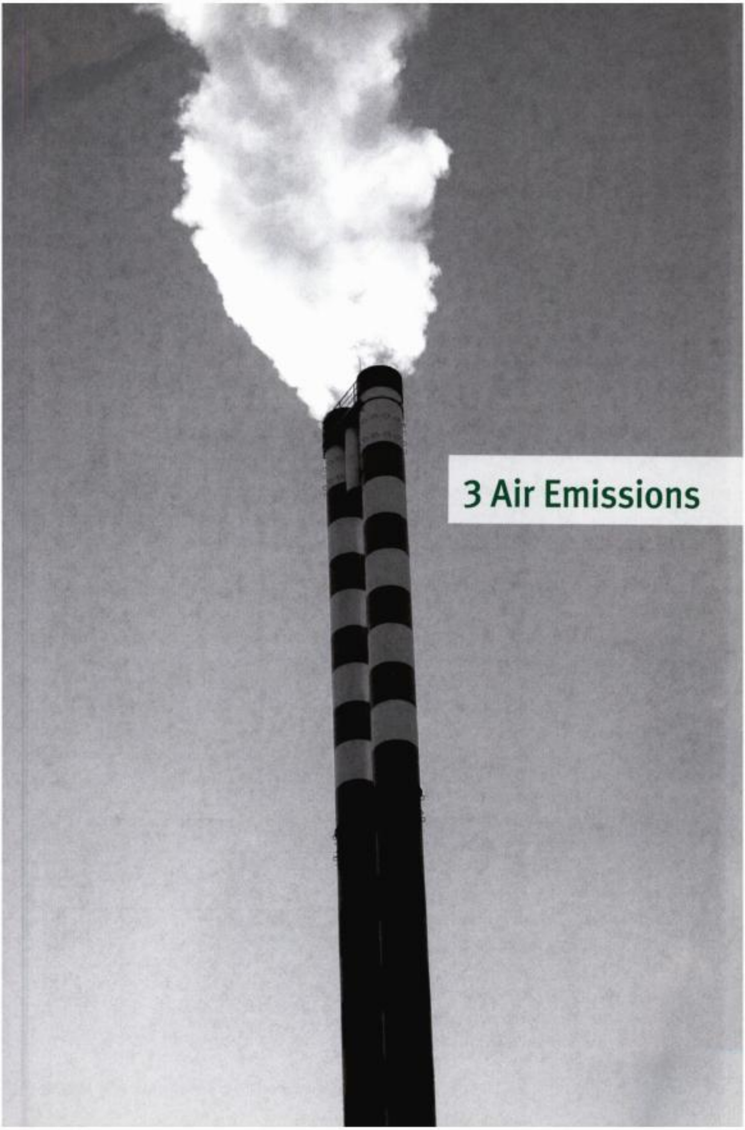


cles, NO_2 and SO_2, its share is smaller (13 % and less than 10 % respectively).

Graph 2.9 portrays the energy consumption of transport for 1994 – 1999. In this period, traffic-related energy consumption increased by approximately 1.1 % per year. The increase is however at least twice as high in goods transport (2.8 % per year) and much lower in passenger transport (approximately 0.5 % per year). The motor for growth in goods transport is above all supporting and auxiliary transport services (freight forwarding), other services, air transport and wholesale and retail trade. In passenger transport, energy consumption is increasing in air transport especially. Private households, other services and forwarding of freight show smaller increases, while in the other homogeneous branches the energy consumption of passenger transport is decreasing.

For further details see the report „Energy consumption and air emissions caused by transport activities" of which a short version is available as a free download (http://www.destatis.de).

3 Air Emissions



3 Air emissions

3.1 Greenhouse gas emissions

According to the international agreement of Kyoto, the following substances are counted among others as greenhouse gases: carbon dioxide (CO_2), nitrous oxide (laughing gas, N_2O), methane (CH_4), partially halogenated CFCs (HFCs), carbon tetrafluoride (CF_4), hexafluoroethane (C_2F_6), octafluoropropane (C_3F_8) and sulphur hexafluoride (SF_6). Most of these emissions are caused by the combustion of fossil fuels, such as coal, mineral oil and natural gas. Other major sources are agricultural activities and the use of solvents. As repeatedly stated by many scientists, the so called greenhouse gases may have large global warming potentials.

Table 3.1: Components of greenhouse gases

Greenhouse gases	1990	2001 1)
	%	
Total	100	100
Of which		
CO_2	83.6	87.5
N_2O	7.2	6.1
CH_4	8.3	5.2
HFCs, CF_4, C_2F_6, C_3F_8, SF_6	0.8	1.2

1) Preliminary data.

Because of the high importance that greenhouse gases have for the climate, the Federal Government has included "greenhouse gases" as an indicator in its Sustainable Development Strategy. The Federal Government aims at reducing greenhouse gas emissions in Germany by 21 % until 2010 as compared with 1990.

The total generation of greenhouse gases is indicated in so-called CO_2-equivalents measuring the greenhouse effect of the various gases. The basis for the determination of total greenhouse gas emissions is provided by data on the various pollutants, which are measured in t and converted into carbon dioxide units on the basis of generally recognised equivalence indicators corresponding to a pollutant's potential damage to the environment.

In 2001, the generation of greenhouse gases amounted to 995 million t CO_2-equivalents. They consisted of carbon dioxide with a CO_2-equivalent of 871 million t, of nitrous oxide with a CO_2-equivalent of 60 million t and of methane with a CO_2-equivalent of 52 million t emitted to the environment. HFCs, CF_4, C_2F_6, C_3F_8 and SF_6 accounted altogether for 12 million t CO_2-equivalents. CO_2 alone contributed 87.5 % to all greenhouse gases in 2001 (see table 3.1).

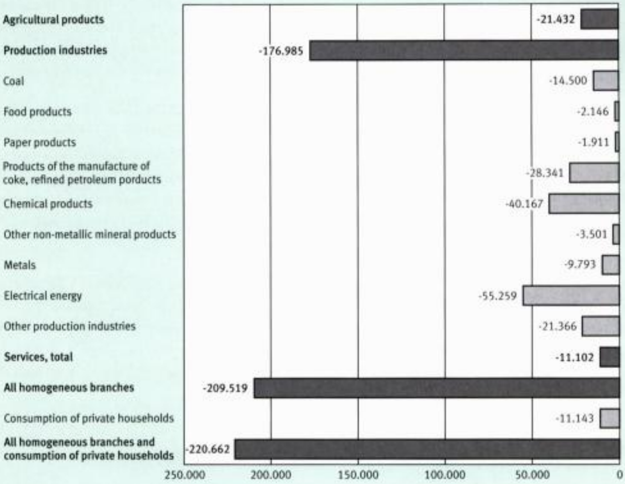
Distinguished by economic activities, 983.3 million t of CO_2-equivalents were produced in 2001 (see table 3.2). At present, a tabulation distinguishing production sectors in the context of environmental and economic accounting is only available for pollutants such as carbon dioxide, nitrous oxide and methane. If the emissions of the mentioned three most important greenhouse gases are distributed between the production sectors, we see that they show a clear focus of concentration. In 2001, 78.8 % of all direct emissions were caused by production processes and 22.2 % by the consumption of households. Production industries, in their turn, accounted for about 57.7 % of total emissions. Circa one third (35.5 %)

Table 3.2: Direct greenhouse gases by economic activities 2001

Economic activities	Volume CO_2-equivalent
	mn t
Agricultural products	73.5
Production industries	567.9
Of which	
Electrical energy	349.2
Services, total	123.4
All homogeneous branches	764.8
Consumption of private households	218.5
All homogeneous branches and consumption of private households	983.5

Graph 3.1: Direct greenhouse gases by economic activities

Change 2001 on 1990 in million tonnes CO_2-equivalent



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of emissions originated from electrical energy. The CO_2- emissions of this sector are mainly caused by power generation. It has to be considered that the 349.2 million t of greenhouse gas emissions of this sector are a direct result of the sector's primary function, which consists in transforming fossil fuels into electricity and supplying other sectors with it.

Since the early 1990s the strains on nature used as a sink for greenhouse gases have decreased considerably (see graph 3.1). Between 1990 and 2001, the reduction amounted to as much as 220.6 million t CO_2-equivalents (of which one quarter of this reduction was achieved by electrical energy with – 55.3 million t). This corresponds to an average annual decrease of 19.8 million t. The annual reduction achieved for carbon dioxide, nitrous oxide and methane taken together, the three quantitatively most important greenhouse gases (measured in CO_2-equivalents), amounted even to 20.0 million t. For other greenhouse gases, which are much less important in terms of weight, a slight increase has been noticed over the last few years (0.2 million t CO_2-equivalents).

3.2 CO_2-emissions

Emissions of carbon dioxide (CO_2) are mainly caused by burning fossil fuels such as coal, mineral oil and natural gas. By analogy with the way in which in-come and value added figures are shown in national accounts, energy consumption and the related CO_2- emissions can be regarded from two aspects – generation and use. That shows that CO_2-emissions, though originating from the production of goods and partly also from direct household consumption activities (e.g. heating of rooms and individual traffic), are, on the other hand, caused by the final demand for goods and services.

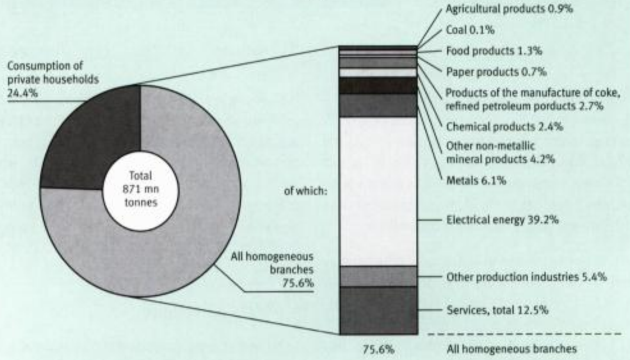
The estimates of carbon dioxide by production and economic sector and by households, which take place in the context of environmental and economic accounts (EEA), are based on data on energy consumption and emission-relevant energy, which, in their turn, basically stem from the energy tables drawn up by the working group on energy balance-sheets (German Institute for Economic Research – DIW) and from the input output tables (Federal Statistical Office). In addition, use is made of specific emission coefficients made available by the Federal Environmental Agency (UBA). The key CO_2 figures of environmental and economic accounts are fully compatible with the corresponding figures by groups of emission sources, which the Federal Environmental Agency is publishing, and the two figures can be converted into each other taking into account the quantifiable distinctions between the two concepts.

The vital importance that carbon dioxide has for the environment is emphasised in the Sustainable Development Strategy of the Federal Government by the fact that it includes carbon dioxide as a separate indicator. The Federal Government aims at reducing carbon dioxide emissions to 75 % by the year 2005 as compared with 1990.

Emissions distributed by branches show a clear focus in some fields. In 2001, 75.6 % of total direct emission were caused by production and 24.4 % by household consumption (see graph 3.2). Production industries accounted for about 62 % of total emis-

Graph 3.2: Direct CO_2-emissions by economic activities, 2001

in %



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sion. More than one third (39.2 %) stemmed from electrical energy, most of this sector's CO_2-emissions are related to the generation of electricity.

Former trends in the development of CO_2-emissions by production sector from 1990 to 2001 are of particular importance, as such knowledge enables us to realistically assess the possibility of achieving the national emission goal, i.e. a 25 % reduction of emission (by 2005 as compared with 1990). In the last few years, the "large" sources of CO_2-emissions have been able to reduce their emissions distinctly. Production sectors contributed 135 million t to a total reduction of 144 million t achieved within the country (in 2001 compared to 1990), in particular electrical energy contributed 51.6 million t. Services was the only branch to cause more emissions in 2001 than in 1990 (+9 million t).

One factor which determines the evolution of direct CO_2-emissions in production (in the production sectors) is the volume of production. With other conditions unchanged, CO_2-emissions will decrease or increase in accordance with changes in the volume of production. With the volume of production growing, emissions cannot be reduced unless the energy whose consumption in the final analyses causes the CO_2-emissions is used more efficiently, i.e. unless one manages to produce the same product with less input of energy. This process is supported both by technical progress in general and by the relative increase in prices for energy as a factor of production in particular.

Other possible factors with energy-saving potentials include, as in household consumption, transition to energy sources containing less carbon per energy unit – for example, the substitution of coal by natural gas or by renewable energy sources – as well as a change in the structure of production towards an increase in the output of goods manufactured with less input of energy. The change in the structure of production is first of all a result of a corresponding change in the structure of demand. The latter one consists of a multitude of partly controversial trends in energy consumption. For further details see the attached list of references.

3.3 Other air emissions

Air emissions include the emission of sulphur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3) and non-methane volatile organic compounds (NMVOC). These emissions originate, in particular, from the burning of fossil fuels such as coal, mineral oil and natural gas. Other important sources are agricultural activities.

Table 3.3: Air emissions

Air emissions	1990	2001
	mn t	
SO_2	5.3	0,6
NO_X	2.7	1.6
NMVOC	3.2	1.6
NH_3	0.7	0.6

As air emissions are of high importance to mankind, the Sustainable Development Strategy of the Federal Government includes air pollutants as a separate indicator. The Federal Government aims at reducing emissions of air pollutants by 70 % in Germany by the year 2010 as compared with 1990.

The air pollutant index is calculated - in accordance with the Sustainable Development Strategy - by determining the unweighted mean of the various relatives (in relation to the year 1990). However, it is also possible to show individual air pollutant data.

In 2001, emissions of air pollutants amounted arithmetically to 4 451 thousand t. They consisted of 0.6 million t of sulphur dioxide, 1.6 million t of nitrogen oxides and 1.6 million t of NMVOC, which were emitted to the environment. Ammonia emissions (NH_3) amounted to 0.6 million t (see table 3.3).

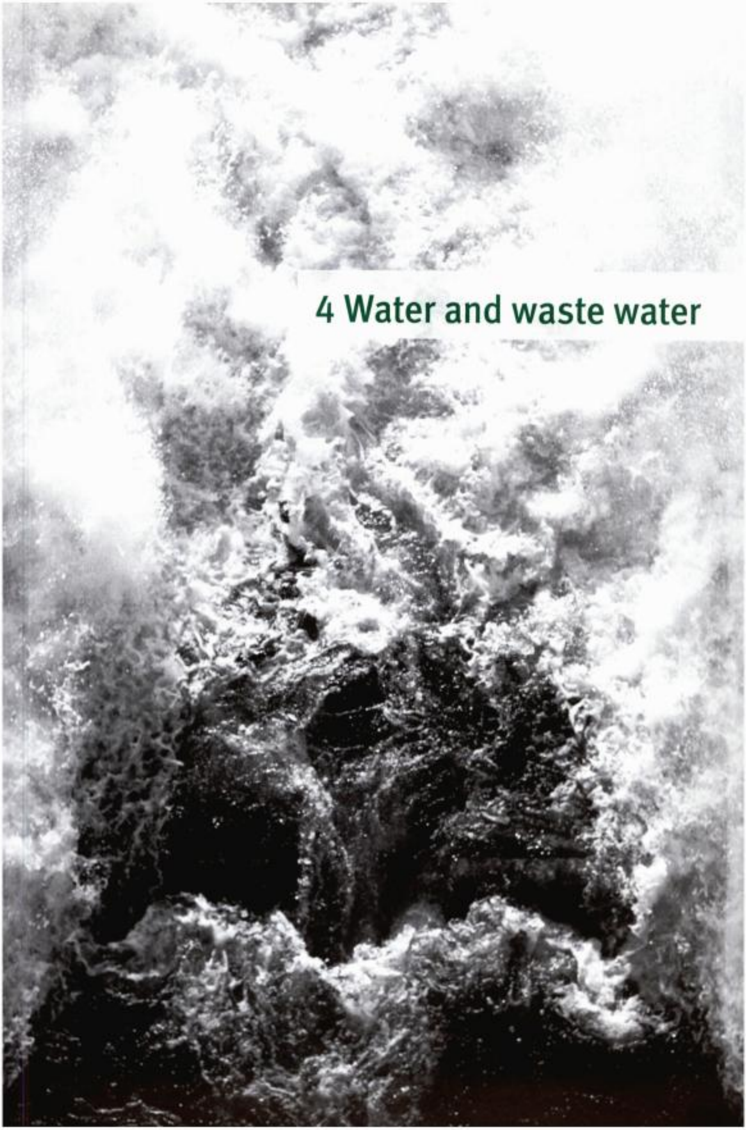
Since the early 1990s the use of nature as a sink for air pollutants has decreased considerably. Between 1990 and 2001 the emission of air pollutants – as the sum of the various pollutants in t – fell by almost two thirds (-62.9 %). If calculated as an unweighted index – as in the context of the Sustainable Development Strategy, the reduction amounted to 49.3 %. A particularly strong reduction was achieved regarding sulphur dioxide (SO_2) with a 88 % decrease (-4.7 million t). The emission of NMVOC fell by about 50 % (-1.6 million t). Emissions of nitrogen oxides were reduced by 42 % (-1.1 million t). NH_3-emissions decreased by 18 % (-0.1 million t).

Table 3.4: Direct SO_2 emissions by economic activities

Economic activities	Change 2001 over 1990
	mn t
Agricultural products	– 0.1
Production industries	– 3.9
Of which	
Products of the manufacture of coke, refined petroleum products	– 0.5
Chemical products	– 0.2
Electrical energy	– 2.4
Services, total	– 0.3
All homogeneous branches	– 4.7

Distributing emissions by homogeneous branches, we find a clear focus in some fields. In 2001, 83.4 % of the reduction of direct SO_2 emissions compared to 1991 were caused by production industries and 8.7 % by household consumption. Between 1990 and 2001, as far as sulphur dioxide (SO_2) is concerned, more than half of the total reduction of 4.7 million t can be assigned to the field of electricity generation with -2.4 million t (see table 3.4).

4 Water and waste water



4 Water and waste water

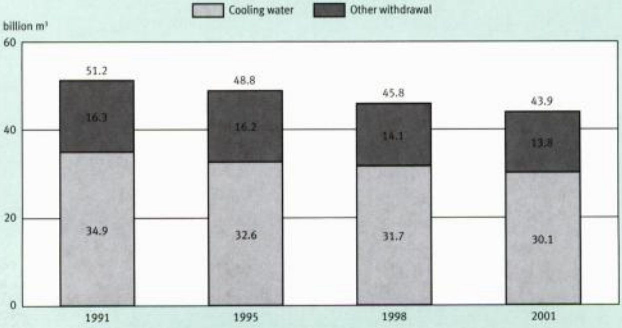
The goals of sustainable water management are the conserving use of water resources, as well as to keep low the burden imposed on nature by discharged waste water. This goal was drawn up by the United Nations Conference on Environment and Development held in Rio de Janeiro in June 1992. In order to promote the sustainable use of water resources in Europe, and hence also in Germany, the European Parliament and the Council of the European Union adopted the Water Framework Directive in 2000 (Directive 2000/60/EC).

Roughly 43.9 billion m³ of water were withdrawn from nature in Germany in 2001 (see graph 4.1). This corresponds to withdrawal of roughly 530 m³ of water per inhabitant. Water withdrawal contrasts to water supply in Germany, which in the long-term average is estimated at 188 billion m³ per year. Hence, an average of roughly 2 280 m³ of water resources per inhabitant were available in 2001. Annual water withdrawal in relation to water supply, so-called water use intensity, is almost 23 % in Germany. Water use intensity shows regional variations, depending on the amount of precipitation and hydrological circumstances.

Two-thirds of the total volume of water withdrawn from nature in 2001 were used as cooling water. Water withdrawal from nature fell sharply in the nineties. It fell between 1991 and 2001 by 14.3 % (-7.3 billion m³). The withdrawal of cooling water fell by 13.9 % (-4.9 billion m³). Other withdrawal fell by 15.2 % (-2.5 billion m³) which is the withdrawal of the water supply branch and the other branches using water for production-specific purposes, for steam generation or for water used by employees, as well as unused water (in particular underground water).

According to the concept of Environmental-Economic Accounting, infiltration and rain water and unused water is an element of the withdrawal of water from

Graph 4.1: Water withdrawal from nature 1991–2001



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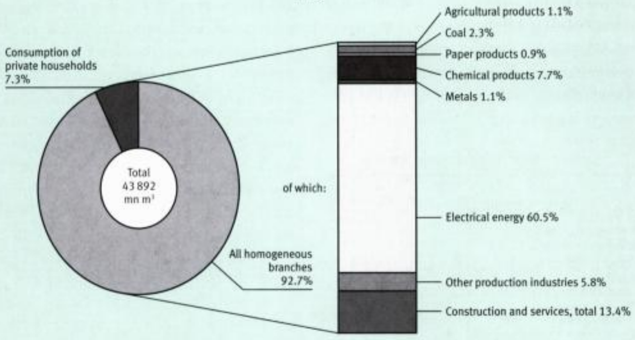
Graph 4.2: Water use 2001

in %



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nature. In contrast to the trends in the total volume of water withdrawn from nature, which as described fell between 1991 and 2001, an increase of 1.9 billion m³ can be recorded in infiltration and rain water in this period (1991 3.4 billion m³, 2001 5.2 billion m³). The reason for the increase in the volume of infiltration and rain water is the expansion of the canal network as a result of the increase in built-up and traffic area.

Of total water use, amounting to 43.9 billion m³ of water, 92.7 % was accounted for in 2001 by production, and 7.3 % by private households (see graph 4.2). Much more than half the water use on domestic territory was accounted for by the homogeneous branch electrical energy (60.5 %). Water is almost exclusively used in this branch as a coolant.

Water use has decreased in all important homogeneous branches since 1991 (see table 4.1 on the next page). The fall for all homogeneous branches and consumption by private households was 7.3 billion m³ (-14.3 %). The greatest reductions in absolute terms were achieved in the branches electrical energy at 4.7 billion m³ (-15.2 %) and products of agriculture at 1.0 billion m³ (-67.5 %). The relatively strong reduction in water use in agriculture, to roughly one-third of the original level, is caused in particular by the fact that the use of irrigation water has fallen considerably in the eastern parts of Germany.

The more efficient use of water resources was in particular promoted by trends in water and waste water prices, as well as by the use of new technologies, such as water-saving household appliances and production procedures. The production prices for water for provision to private households and industry increased by almost 51 % between 1991 and 2001. The increase was thus much greater than that in production prices as a whole, which rose by only 8.8 % in the same period.

Water and waste water

Internal operational factors have also contributed to the reduction in water use. Multiple use and the use of recycled water increased in particular. In order to reduce the use of cooling water, recycling was increased (use factor 1991: 2.4, 2001: 2.9). The relationship of the total water used to the volume of the water used in the plant in the period 1991 to 2001 increased in the branch of mining and manufacturing

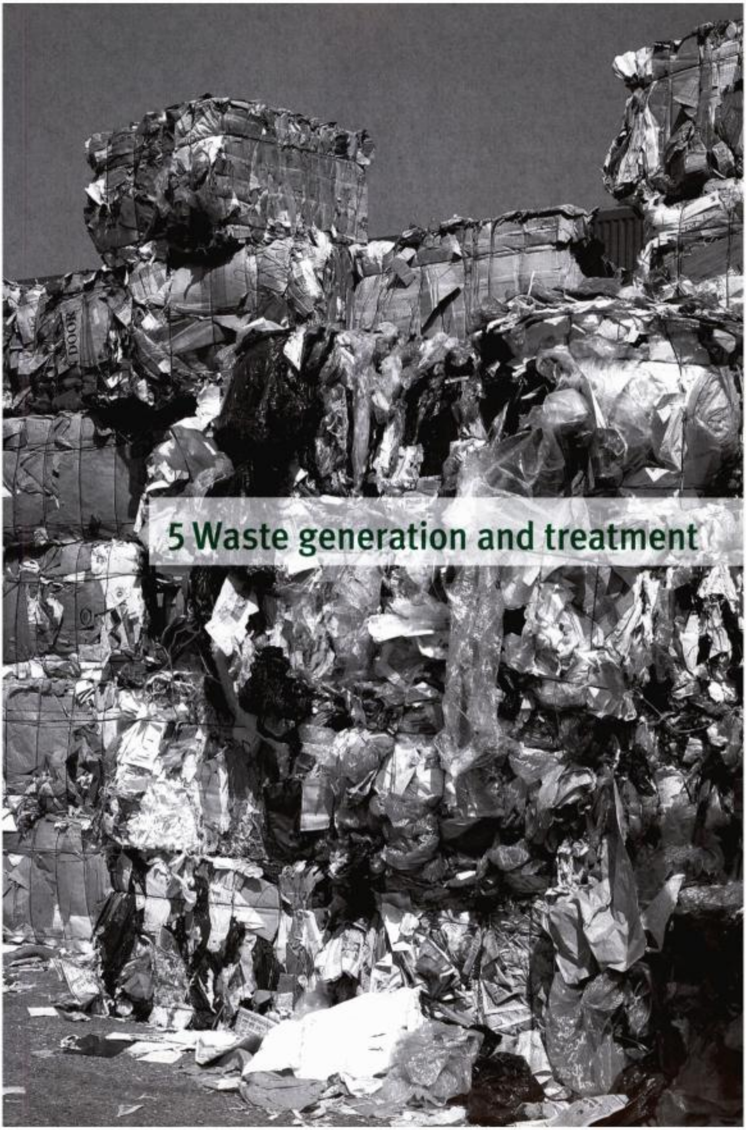
Table 4.1: Water use by economic activities

Economic activities	Volume change 2001 over 1991
	bn m³
Agricultural products	– 1.0
Production industries	– 7.8
Of which	
Electrical energy	– 4.7
Services, total	– 0.1
All homogeneous branches	– 7.0
Consumption of private households	– 0.3
All homogeneous branches and consumption of private households	– 7.3

from almost four to almost five. If one takes a look at the manufacturing branch separately, the relationship increased to more than five. In particular in the homogeneous branches "chemicals, chemical products and man-made fibres" and "basic metals", the use of water-saving technologies, as well as the substitution of water by other substances such as emulsions, played a major role.

The extent and trends in the volume of waste water are determined largely by water withdrawal from nature. The two values differ mainly by the volume of evaporation and other losses which arise in the economic process or in private households. From the point of view of sustainable water management, the quality of the discharged waste water is particularly significant since it plays a vital role in determining the quality of the water, and can influence the biological balance of the ecosystems.

36.3 billion m³ of waste water were discharged into the environment in 2001. As with water withdrawal, the biggest share of the waste water was cooling water. The share of cooling waste water was 79 % (28.6 billion m³) in 2001. This is almost exclusively the cooling waste water coming from electricity generation processes. The cooling waste water discharged has a higher temperature than the withdrawn water, and hence imposes a burden on the environment. Furthermore – depending on the procedure – it can contain chemicals which are used to counter algae attacks in the cooling systems, and also burden the environment. Untreated discharged water is largely underground water from mining, which generally is not harmful.



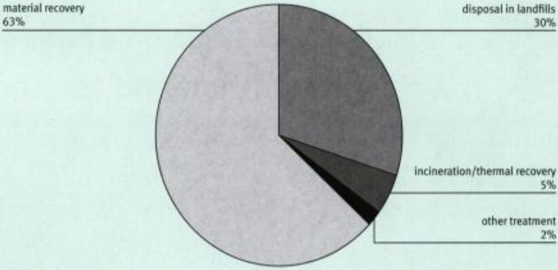
5 Waste generation and treatment

5 Waste generation and treatment

Environmental statistics are a major tool in environmental monitoring, and hence at the same time form a major basis for environmental policy measures. Selected groups of waste as sub-positions of total generation are of special interest both nationally and internationally. In accord with the requirements of the EU (given concrete form last year by the Waste Statistics Regulation) and the national standards imposed on statistics, the following characteristics were defined as cornerstones of total waste generation: municipal waste, construction and demolition waste, slag from mining, production and commercial waste and waste requiring special supervision.

For 2001, the amount of waste in Germany was 394.5 million t. Almost two-thirds (61.7 %) are construction and demolition waste, followed by slag from mining at 12.5 %, municipal waste at 12.4 %, production and commercial waste at 9.5 % and waste requiring special supervision at 3.9 %. The amount of waste for Germany shows from 1996 to 2000 an overall upward trend, from 385.3 million t in 1996 to 406.6 million t in 2000, which only reversed in 2001, with a decrease of about 12 million t or 3 % as against the previous year to 394.5 million t. This fall was caused by the reduction in the volume of construction and demolition waste, with a decrease of roughly 10 million t from 253.7 million t in 2000 to 243.5 million t in 2001.

Graph 5.1: Waste treatment (disposal and recovery) 2001



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Partly, waste is incinerated in specifically designed installations. One purpose is to dispose waste, at the same time however, waste is to a certain extent incinerated to generate energy or heat. In 2001, most of the waste (63 %) was recovered, 30 % were disposed in landfills and 5 % were incinerated (see graph 5.1).

6 Annex

6.1 Surveys of the Energy Statistics Act (EnStatG)

On 1 January 2003, the Energy Statistics Act (Act on the New Regulation of Energy Statistics and on the Modification of the Statistical Register Act and the Value Added Tax Act of 26 July 2002, article 1 "Act on Energy Statistics (Energy Statistics Act – EnStatG), FLG . I page 2867) came into force after a long time of preparation. This new act brings together official energy statistics formerly based on a variety of legislative provisions, adapting them to the users' changed needs for information, including statistics on the heat market, combined heat and power generation as well as renewable energy sources, which will be made available in the future as well. In addition, data collection on energy consumption in the industry has been newly regulated so that, in particular, small and medium-sized businesses are relieved from a large part of their response burden. In that way, one has taken into account the instruction of policy-makers to reduce the burden on respondents and to strive for cost neutrality in official statistics. In addition, with the new act coming into force a recommendation given by the Statistical Advisory Board on restructuring energy statistics was put into effect.

The central goal of energy policies is a sustainable supply of energy, ensuring that energy is supplied and used in an equally safe, economical and ecologically clean way. To pursue this goal, the responsible political institutions in the Federation and the federal states need trustworthy statistical information, on which they can rely. Another reason why energy supply figures are so important is that they give orientation to other political fields such as , for example, economic, environmental, transport and financial policies.

The new Energy Statistics Act, which comprises a maximally possible number of energy sources and uses, provides a statistical framework for energy policy making. It is based on a standard concept of data collection, which is the basis of a special system of energy statistics. The concept was built by bringing together all the formerly scattered surveys for the collection of energy statistics. For that purpose it had been necessary to update the rules for the various surveys and to close the gaps that existed. At the same time, it was possible to eliminate cases of duplication and to reduce the extent of the survey and the number of units covered to what was actually required in technical terms. In addition, the act stipulated surveys for some energy sectors which had formerly not sufficiently been covered by statistical surveys. Furthermore, the new act provides for a regional breakdown of certain variables, taking into account the needs for comprehensive and timely reports in line with the federal structure of the Federal Republic of Germany. The adoption of this act means that a recommendation given by the Statistical Advisory Board on restructuring energy statistics has been put into practice. The following table shows the most important modifications at a glance.

In view of the tight budget for official statistics, the act had to focus on the most urgent problems of energy statistics. To meet the requirements in terms of cost neutrality and reduction of the response burden, additional surveys could be implemented only to the extent to which the present programme of energy statistics would be reduced. The newly included surveys on the heat market, the combined generation of heat and power, renewable energy sources and external coal trade are directly related to a corresponding reduction of some other surveys, such as for example a statistical survey on industrial energy uses. Here it is planned to considerably reduce the response burden as compared with the existing practice. This relates, in particular, to local units and enterprises in mining and quarrying and in manufacturing industries, where the present monthly or quarterly survey of maximally 68 000 local units will be discontinued and the data will be collected on an annual basis from a maximum of 60 000 local units instead. The said local units will also be freed from reporting annual statistics on the generation and utilisation of flammable gases. Monthly surveys on the generation, utilisation and supply of liquefied petroleum and refinery gas have been cancelled as well.

A field, which is not covered by this act, is mineral oil, as the respective data for this field are being collected on the basis of the Mineral Oil Data Act of 1988. Integrating this act into the Energy Statistics Act does not make sense, as the Mineral Oil Data Act primarily serves the enforcement of administrative rules.

Surveys of the Energy Statistics Act (EnStatG)

Statistical survey No.	Name of statistical survey	Frequency	Reporting population EnStatG	Changes (+) new variable, (–) variable dropped
066K	Electricity supply (power stations)	m	Maximally 1 000 utility operators	(+) Combined Heat and Power (CHP)
066N	Electricity supply (grid operators)	m	Maximally 1 000 network operators	(–) 24-hour values grid load
066Z	Electricity supply (grid operators): Supply of electricity from renewable energy sources	y	all network operators	(+) number and performance of feeding utilities
067	Power generating utilities in mining and manufacturing industries	y	All users of self-generated energy	(+) CHP (–) 24-hour values (–) various kinds of activity
064	District heat supply: Generation, use, supply of heat; energy sources used for heat generation	y	Maximally 1 000 operators	new survey
068, 069	Gas supply (district gas utilities, producers, coking plants): Generation, use, supply of gas	m	Maximally 100 operators	(+) export by country
070	Mineral oil processing businesses: Generation, use, supply of LPG and refinery gas	m		survey cancelled
072	LPG sales companies: Generation, use, supply of LPG	m		survey cancelled
073	Sewage disposal (purification plants, other sewage treatment plants): Generation and use of sewage gas	y	Maximally 6 000 operators	(+) supply of sewage gas by country (+) supply of electricity from sewage gasby country
074	Local units in mining and manufacturing industries: Generation and use of flammable gases; Energy sources used for the generation of gas	y		survey cancelled
075	LPG sales companies: Supply of LPG	y	Maximally 130 businesses	(+) enlargement of consumer groups (+) supplies by country
075	Mineral oil processing businesses: Supply of LPG			
061	Import and export of coal	m	all importers/exporters	new survey
062	Geothermal processes	y	Maximally 100 operators	new survey
063	Biomass fuels	y	Maximally 100 operators	new survey
060	Purchases, stocks, consumption, supply of energy sources (local units of mining and manufacturing industries)	j m/q	Maximally 60 000 local units maximally 68 000 local units	new survey (–) survey dropped
082	Gas supply (district and local gas utilities, producers, coking plants): Supply, import and export of gas	y	All operators	(+) stocks, use of energy sources for the generation of gas (+) export by country (+) transit volumes of gas
083	Electricity supply (operators of utilities/grids): Supply, import and export of electricity	y	All operators	no change

6.2 Surveys of the Environmental Statistics Act (UStatG)

Beginning in 1996 as reference year, the new act on environmental statistics (Act on Environmental Statistics (Environmental Statistics Act – UStatG) of 21 September 1994, FLG. I page 2530) regulates more than 30 surveys, which in the fields waste and water management, air pollution control and environmental economy collects two types of characteristics, which are of relevance to environmental policy:

- pollution of the environment by emissions in concrete fields such as waste, water and air;
- economic importance of environmental protection expenditures.

One focus of the new environmental statistics act was the demand for reducing the response burden. Two examples illustrate the situation: From 1996 on, administrative records will be used for the collection of data on waste requiring special supervision and on air pollution control.

With regard to waste statistics, today's waste management includes not only the innocuous removal of waste, but also its recovery and avoidance. These shifts in the priorities of waste legislation influenced the evolution of the Environmental Statistics Act (UStatG). The former UStatG provided for two waste surveys, namely a statistical survey on public waste removal, on the one hand, and a statistical survey on the amount of waste produced and removed in the producing sector, i.e. industry and construction (as well as in other institutions), on the other hand. The new UStatG retains public waste removal, data collection on the amount of waste produced and removed in the producing sector has changed considerably with emphasis being placed more strongly on the recovery of waste.

Pursuant to the Water Management Act, water bodies as parts of the ecosystem are to be exploited so that they serve the public interest and, in compliance with that, the interest of individuals and that all possible impairments are avoided. This is one reason why water management statistics are the oldest of all environmental statistics, which are considered here: surveys to collect data on public water supply and public sanitary engineering existed a long time before the first Environmental Statistics Act was adopted.

The current Environmental Statistics Act slightly modified the water surveys and supplemented them by two more surveys (water supply for irrigation purposes in agriculture and equipment for the handling of water pollutants). At present, the Environmental Statistics Act comprises 12 surveys in the water management field.

Surveys on air pollution control were newly introduced by the Environmental Statistics Act. More concretely, these are the following two surveys: the air pollution survey and the survey on certain substances affecting the ozone layer and the climate.

Statistics on environmental economics are supposed to quantify the economic implications of environmental protection, by determining the expenditure which accrues to commercial businesses from the avoidance, reduction or removal of emissions, on the one hand, and by showing how important the market of environmental protection goods and services is for the national economy, on the other hand.

Surveys of the Environmental Statistics Act (UStatG)

Article	Name of survey (internal abbreviation)	First reference year	Periodicity
Waste management			
art. 3 para 1 No. 1	Waste management survey in the waste management industry (AE) internal (in-plant) waste management (AB)	1996	yearly
art. 3 para 2 No 1	Survey on the collection of household refuse, household-type industrial and other waste by public refuse collection utilities (EHM) refuse by utilities other than public refuse collection utilities (EA)	1996	every 4 years
art. 4	Evaluation of secondary statistics on waste requiring special supervision (Ü) and on cross-border refuse haulage (GV, done by the Federal Environment Office)	1996	yearly
art. 5 para 1 No. 1	Survey on the processing and recycling of construction waste, construction site refuse, excavated ground and road demolition debris (BS)	1996	every 2 years
art. 5 para 1 No. 2	Survey on the utilisation of construction waste in public construction activities (BR)	1997	every 2 years
art. 5 para 2, 4	Survey on the recycling of used oil (ÖL) used glass (GL) and used paper (PA)	1996	every 2 years
art. 5 para 3	Survey on the recycling and material utilisation of plastics (KST)	1996	every 2 years
art. 5 para 5	Survey on the collection of sales packages (VV) and secondary and transport packages (TUV)	1996	yearly
Water management			
art. 6 para 1	Survey of public water supply (supply and discharge of water - 6W)	1998	every 3 years
art. 6 para 3	Survey of public sewage disposal (public sewage system - 6S, sewage treatment facilities - 6K)	1998	every 3 years
art. 6 para 4	Survey of households' own water supply and sewage disposal (6P)	1998	every 3 years
art. 7	Survey of water supply and sewage disposal in mining, quarrying and manufacturing (water supply, use of water and fate of sewage - 7A, sewage treatment -7B)	1998	every 3 years
art. 8	Survey of water supply and sewage disposal in agriculture	1998	every 4 years
art. 9	Survey of water supply and sewage disposal in thermal power stations for public supply (water supply, use of water and fate of sewage - 9A, sewage treatment -9B)	1998	every 3 years
art. 12, 14	Survey of accidents in handling and hauling water pollutants	1996	yearly
art. 13	Survey of plants for the handling of water pollutants	1999	every 5 years
Air pollution control			
art. 10	Air pollution survey (evaluation of emission declarations)	1996	every 4 years
art. 11	Survey of certain substances, which are harmful to the ozone layer and affect the climate	1996	yearly
Environmental economics			
art. 15 para 1 No. 1	Survey of environmental protection investments	1996	yearly
art. 15 para 1 No. 2	Survey of current environmental protection expenditures	1996	yearly
art. 16 para 1	Survey of goods and services for environmental protection	1997	yearly
art. 16 para 2	Survey of the structure of environmental protection investments	1996-99	every 4 years

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For a free download of data of the surveys mentioned in the Annexes 6.1 and 6.2 as well as of EEA see: http://www.destatis.de.