PANORAMA OF THE EUROPEAN UNION

2003 EDITION

ISBN 92-894-7234-0
Cat. No. KS-59-04-249-EN-N

A selection of Environmental Pressure Indicators for the EU and Acceding countries

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EUROPEAN COMMISSION

eurostat

THEME 8
Environment and energy

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Luxembourg: Office for Official Publications of the European Communities, 2003

ISBN 92-894-7234-0

Contents

Introduction

A selection of Environmental Pressure Indicators for the EU and Acceding Countries

This publication presents the results of the latest phase of the Environmental Pressure Indicators project to develop a comprehensive set of indicators for the EU. The project reflects some of the efforts undertaken by the Commission to provide decision-makers and the general public with information necessary for the design and monitoring of an adequate environment policy for the European Union. It should be seen as part of a suite of indicators being developed for policy purposes, and which also includes sectoral 'integration' indicators and sustainable development indicators, and inevitably many of the indicators will be included in more than one set of indicators. This of course is not a shortcoming of the process, but rather a confirmation that the issues and pressures identified here are significant pressures on our environment, and deserve attention.

The earlier phases of the project culminated in the publication in 1999 and 2001 of a set of Environmental Pressure Indicators for the EU (EPI)[1]. With Accession of ten new Member States imminent, this phase of the work aimed to extend the coverage of the EPI to the Acceding Countries. Because of limited resources, it was not possible to cover all of the policy fields included in the previous editions.

The policy fields and indicators

This publication shows the most important trends in a number of indicators for four policy fields: *Resource Depletion, Waste, Climate Change*, and *Air Pollution*. While most of the other policy fields covered in earlier editions remain important, with existing resources, it was not possible to update them for the EU countries nor to extend them to the Acceding Countries. It is hoped to remedy this situation in the next edition. However, the indicators on *Ozone Depletion* will be discontinued and the policy field *Urban Environmental Problems* will no longer be included, as most of the problems are found in other policy fields. The exception is noise, but data for this are so scarce that the indicator cannot yet be regularly updated.

The experience gained in the production of the earlier editions and the feedback from users have enabled us to refine and improve the presentation of the indicators, removing duplication, and adding more explanation where warranted. A few indicators are totally new, in that the issue is presented here for the first time, but had been identified by the indicator selection procedure as one of the top ten most important issues in their field. These are a new AP-5, Ammonia emissions, and RD-3b Soil erosion.

For each indicator, where possible, an attempt has been made to quantify the contribution of the different sectors of the economy to the overall pressure. Depending on the data available this can take several forms, ranging from a single pie-chart, giving the sectoral breakdown for one or a few countries, to a number of extra pages giving detailed sectoral information.

Because different data sources are used to compile the indicators, the definitions of the sectors may differ from one indicator to another (see Annex for more information), as does the reliability of the data presented. However, this does not take away from the utility of providing an *indication* of the importance of the different sectors, as added information to help the policy maker to identify where more information and, perhaps, action is most needed to prevent deterioration of the environment.

Data quality and transparency

The indicators presented here come from a variety of data sources, many of which have not been fully harmonised. Furthermore the methodologies used within the countries are not always fully transparent nor well-established, with the result that the quality of the indicators varies, as does their reliability. In order to provide guidance on the status of the indicators, a 'traffic light' coding, or 'semaphore' for the indicators has been adopted. The quality of the indicators was assessed for four categories, using several criteria for each category:

[1] These early phases of the project are described on the web site: http://e-m-a-i-l.nu/tepi/. This site provides a general introduction to the Environmental Pressure Indicators Project, with background documents, technical, methodological, and current issues.

- **Relevancy** refers to the closeness of the operational definition of the indicator to the environmental problem to be measured, the methodology chosen and the relevancy of the breakdown published.
- **Overall accuracy** represents issues such as comparability of data, reliability of data sources, coverage of the indicator, reliability of the methodology used and whether the results could be validated (e.g. sensitivity analysis; confirmation through other data or approaches).
- **Time representation** deals with the completeness of the time series and the consistency of methodology used over time.
- **Spatial representation** relates to the number of Member States that are represented in the indicator, the use of the same or similar methodologies by countries, the geographical coverage and reliability of data within the countries.

For each of the indicators, a quality 'semaphore' is presented as below:

Relevancy: Red	Accuracy: Yellow	Time Rep.: Green	Spatial Rep.: Green

Green indicates no significant problems with the indicator and Red means there are major reservations about this indicator. Many of the 'semaphores' have seen some improvement since the first publication, reflecting better data availability, or methodologies.

RESOURCE DEPLETION

Introduction

The issue of resource depletion addresses two main types of resources: those which are finite and those which are renewable, provided the exploitation rate does not exceed the renewal rate. For finite resources the main issue is to ensure that existing resources are used efficiently and, if possible, to develop renewable alternatives. Among the wide range of finite resources used regularly by society, two in particular stand out as of grave concern: fossil fuels and soil. Demand for energy continues to rise, and in spite of some efforts to increase the use of renewable energy sources, most of this demand is met by fossil fuels.

Unsealed land/soil performs a vital role in our daily lives, it produces food and other raw materials; it absorbs water, reducing the risk of flooding and allowing aquifers to be replenished; it acts as a sink for some pollutants, and it is an essential component of most terrestrial ecosystems. No renewable alternatives exist. Two main pressures have been identified as threatening soil resources: soil sealing, i.e. urbanisation, road building, etc. and soil erosion. Most towns have grown up in flat areas or river valleys with the most fertile soil, as the ability to grow food nearby was a prime consideration for our forefathers. As the towns spread, it is these fertile areas that are taken as building land and for roads etc. Fertile land lost to urban sprawl or to heavy erosion can be considered permanently lost.

Among the renewable resources, concern is greatest for water, fish[2] and forests. These are fully renewable provided they are not over-exploited, i.e. when the rate of extraction does not exceed the rate of replacement. The major problem is the difficulty in assessing the rate of replacement, especially in the case of groundwater resources and fish. For forests in the EU and acceding countries, the rate of exploitation seems to be sustainable, i.e. new growth is estimated to be higher than removals. However, this should be taken in context: the EU imports considerable amounts of wood, wood pulp and paper from outside the EU, where it is more difficult to assess whether the imported product is produced from sustainable forests. Another aspect of forest resources is the loss of certain native, generally slow-growing, tree species, which are the habitat of native wildlife.

Pressure on resources comes from different sectors of the economy, depending on the resource. Industry is the major consumer of timber (pulp and paper industry and wood industry) and it shares with other sectors a significant role in energy and water use and in land consumption. Agriculture is an important contributor to the pressure on water resources and soil fertility, and the transport and energy sectors on fossil fuels. And of course, households are important final consumers of water, energy, and land through the extension of urbanisation.

The *Waste* chapter presents another aspect of the depletion of finite resources.

[2] Fishing pressure was previously included under the theme *Marine Environment*. As the theme is not covered in this publication, Fishing Pressure is reproduced here to ensure that this important resource is not neglected.

RD-1: Water consumption

Definition and purpose

Water is a renewable resource, provided the consumption rate does not exceed the long term replacement rate. When water resources are limited and renewal rates low, heavy demand for freshwater can lead to the collapse of aquifers, so that these can no longer be replenished. Over-exploitation of water resources also affects the natural flow of rivers, the water cycle as a whole and the ecosystems that depend on it.

This indicator is intended to assess the degree to which available water resources are exploited. It is defined as the annual gross freshwater abstraction (of both ground and surface water resources). The indicator is expressed in m³ per capita, which in theory allows direct comparison between countries. A comparison of water abstraction with the rate at which water reserves are renewed would give a better overview of depletion of water reserves, but the necessary data are not available.

Water demand arises from different economic and human activities: demand from households, industry, agriculture, energy sector, urban amenities, tourism, etc. The quantity of freshwater used per capita is directly related to individual and industrial water consumption patterns. It also directly reflects the effects of measures to promote water-saving.

Water abstraction 1)

m^3 per capita

	Surface water abstraction								Ground water abstraction							
	1990	1995	1996	1997	1998	1999	2000	2001	1990	1995	1996	1997	1998	1999	2000	2001
EU-15	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
BE	:	737	666	683	667	:	:	:	:	67	66	65	63	:	:	:
DK	:	:	2	3	4	3	3	:	246	170	181	174	139	:	:	:
DE	491	438	:	:	413	:	:	:	89	93	:	:	82	:	:	:
EL	576	442	440	:	:	:	:	:	198	299	298	:	:	:	:	:
ES	808	712	:	899	:	:	:	:	142	138	:	141	:	:	:	:
FR	556	600	:	414	447	444	:	:	110	104	:	104	106	104	:	:
IE	:	264	:	:	:	:	:	:	:	63	:	:	:	:	:	:
IT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
LU	:	69	:	:	:	68	:	:	:	71	:	:	:	74	:	:
NL	453	:	226	:	:	:	:	:	70	:	74	:	:	:	:	:
AT	333	284	309	309	:	:		:	153	135	135	132	:	:	:	:
PT	426	:	:	:	482	:	:	:	309	:	:	:	632	:	:	:
FI	420	447	:	:	:	396	:	:	48	50	:	:	:	55	:	:
SE	277	234	234	233	232	232	232	:	71	75	75	74	74	74	72	:
UK	205	223	183	201	211	244	230	:	50	52	51	51	47	46	47	:
IS	:	22	19	19	15	15	14	14	:	592	582	571	562	551	545	536
NO	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
CH	258	239	240	237	238	:	:	:	141	127	122	124	124	123	124	:
CZ	269	196	189	185	168	138	133	128	81	70	60	57	53	54	54	52
EE	1 731	959	930	893	882	849	887	:	315	235	174	220	217	207	186	:
CY	:	:	:	:	247	:	117	:	:	:	:	:	324	:	115	:
LV	:	88	89	79	77	71	69	60	:	77	72	67	63	55	50	49
LT	1 028	1 151	1 457	1 228	1 329	1 205	923	707	134	82	78	63	55	49	45	43
HU	508	496	503	483	485	456	470	:	99	95	86	84	85	93	87	:
MT	0	0	0	0	0	0	0	0	60	55	58	55	49	51	45	:
PL	314	261	261	257	249	242	237	230	85	74	73	74	68	75	74	70
SI	140	112	85	85	76	86	85	:	83	83	82	80	77	75	69	:
SK	262	151	155	151	136	129	134	133	138	108	101	93	92	86	83	78

Source: Eurostat
1)D and E (surface water) : 1990 is 1991 data ; F and IRL (ground water): 1995 is 1994 data. UK: data refer to England & Wales only.

Methodology and data problems

The availability of data for water abstraction in the 15 EU countries is very poor, and available data are far from homogeneous. Comparison between countries and of trends within some countries is very difficult, as there are important differences in sources used, definitions applied, and activities included. For example, some countries provide data only for water extracted for the public water supply, so that no data is available for consumers taking water directly from a well, river, or lake. It should also be noted that water abstracted for use in cooling in power stations or in industrial processes is generally returned to the source and therefore does not contribute to depletion. This fraction should not be included in the indicator, but available data do not always allow for such precision.

Relevance: Green	Accuracy: Red	Time rep.: Yellow	Spatial rep.: Red

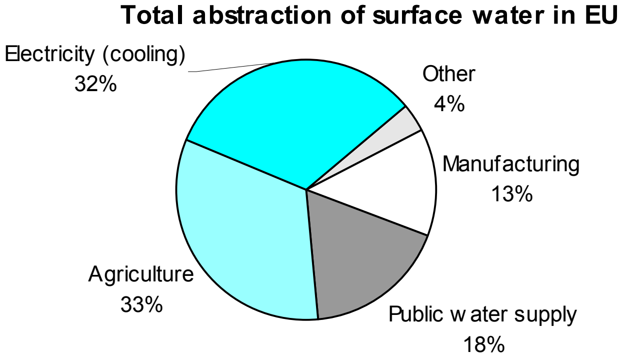
RD-1: Water consumption

Relevant Sectors: **Agriculture, Industry, Services, Households**

Targets

The objectives set by the EU Water Framework Directive[3] are to ensure adequate supply of drinking water and of water for other economic requirements, to protect water quality, and to alleviate the adverse impact of floods and droughts. No quantified targets have been set.

Estimate of breakdown of abstraction of (surface and ground) water by sector [1)]



Source: Eurostat
1) Based on the latest year for which data is available. This is between 1996-2001, except for IRL which is 1994 data.

Comments

Given the paucity of data, the above chart is indicative only and the following comments are tentative.

Surface water is the dominant source of freshwater, supplying more than 2/3 of total demand in 11 of the European countries for which data is available. Marine and brackish water, including desalinated water, is also increasingly used by industry in southern countries, contributing modestly to reducing demand for surface water.

The major use of surface water is for cooling purposes in electricity generation (approx. one third of total abstraction). This does not affect resources significantly, as cooling water is generally returned after use to the water body from which it was extracted.

The demand from agriculture (around one third of the total) is strongly linked to the needs for irrigation which may vary widely from country to country and from one year to another, depending on the weather conditions. For example, in the very dry summer of 1996 the Netherlands needed more that four times as much water for irrigation as in 1998.

Water demand by manufacturing industry (around 13%) has fallen since the 1980s, partly as a result of improvements in the efficiency of water use due to increased water prices, with more water being recycled within the system. This trend also reflects a shift of some of the more water-intensive industries to non-European (especially non-OECD) countries.

Increased tourism regularly inflates the population in Mediterranean countries, adding extra pressure to already scarce water resources. Available per capita figures for those countries with a large tourist industry are well above the EU average, as they are calculated using the normal population of the country, and do not include the massive influx of tourists each year.

[3] Directive 2000/60/EC of 23 October 2000, Official Journal (OJ L 327) of 22 December 2000.

RD-2: Energy use

Definition and purpose

This indicator presents the gross inland consumption of energy (GIC), the total amount of primary energy or imported energy products that each country requires to meet its internal needs.

The demand for energy is met mainly by fossil fuels such as coal, lignite, oil, and natural gas, and by nuclear energy. Only a very small percentage of the resources currently used are semi-renewable energy sources such as biogas, wood and waste and renewable sources such as water, wind and solar energy.

About 35% of primary energy is converted into electricity, before being used by the final consumer. The burning of fossil fuels in conventional power stations results in the unavoidable loss of about two thirds of the energy input. For this reason, the energy needed to meet the national demand (GIC) is much higher than the final energy consumed by the end user.

Gross inland energy consumption[1)]

kg oe per capita

	1990	1995	1996	1997	1998	1999	2000	2001
	Gross Inland Consumption							
EU-15	3 627	3 671	3 794	3 764	3 838	3 838	3 874	3 940
BE	4 751	4 981	5 322	5 420	5 515	5 569	5 583	5 419
DK	3 436	3 916	4 355	4 037	3 960	3 802	3 688	3 728
DE	4 501	4 134	4 263	4 211	4 201	4 128	4 139	4 241
EL	2 198	2 311	2 428	2 440	2 557	2 540	2 660	2 742
ES	2 303	2 609	2 569	2 699	2 824	2 984	3 089	3 145
FR	3 944	4 061	4 277	4 158	4 270	4 253	4 393	4 497
IE	2 923	3 064	3 228	3 353	3 530	3 703	3 692	3 762
IT	2 730	2 842	2 834	2 865	2 964	3 005	3 048	3 053
LU	9 362	8 202	8 239	8 011	7 727	8 015	8 327	8 532
NL	4 488	4 756	4 922	4 826	4 791	4 726	4 769	4 853
AT	3 189	3 323	3 515	3 507	3 554	3 536	3 509	3 747
PT	1 703	1 978	1 972	2 088	2 234	2 394	2 369	2 413
FI	5 770	5 652	6 087	6 379	6 452	6 355	6 312	6 413
SE	5 526	5 713	5 836	5 684	5 730	5 739	5 401	5 792
UK	3 674	3 727	3 888	3 781	3 898	3 860	3 865	3 874
IS	8 724	8 019	9 210	9 327	9 858	11 149	11 575	11 819
NO	5 095	5 447	5 312	5 565	5 778	6 009	5 823	5 965
CH	:	:	:	:	:	:	:	:
CZ	4 555	3 928	4 050	4 079	3 944	3 669	3 902	3 990
EE	6 288	3 540	3 795	3 771	3 593	3 376	3 333	3 680
CY	2 700	2 669	2 844	2 757	3 071	3 014	3 169	3 175
LV	1 537	1 470	1 429	1 344	1 326	1 568	1 545	1 804
LT	4 413	2 232	2 389	2 253	2 522	2 143	1 954	2 215
HU	2 709	2 462	2 526	2 487	2 475	2 512	2 483	2 499
MT	1 649	2 152	2 363	2 479	2 587	2 557	2 472	2 103
PL	2 629	2 592	2 774	2 671	2 517	2 412	2 333	2 335
SI	2 763	3 060	3 207	3 252	3 226	3 200	3 203	3 329
SK	:	:	:	:	:	:	:	:

Source: Eurostat

1) 2001 figures for EU-15, DE, IT and NL are provisional

Methodology and data problems

In order to be able to aggregate the different types of fuel, a common unit, based on the energy content of the different fuel types is needed. The unit chosen is the kilogramme of oil equivalent, which is a standardised unit equivalent to 41868 kJ.

No problems were encountered for this indicator, the data used being considered very reliable.

Relevance: Green	Accuracy: Green	Time Rep.: Green	Spatial Rep.: Green

RD-2: Energy use

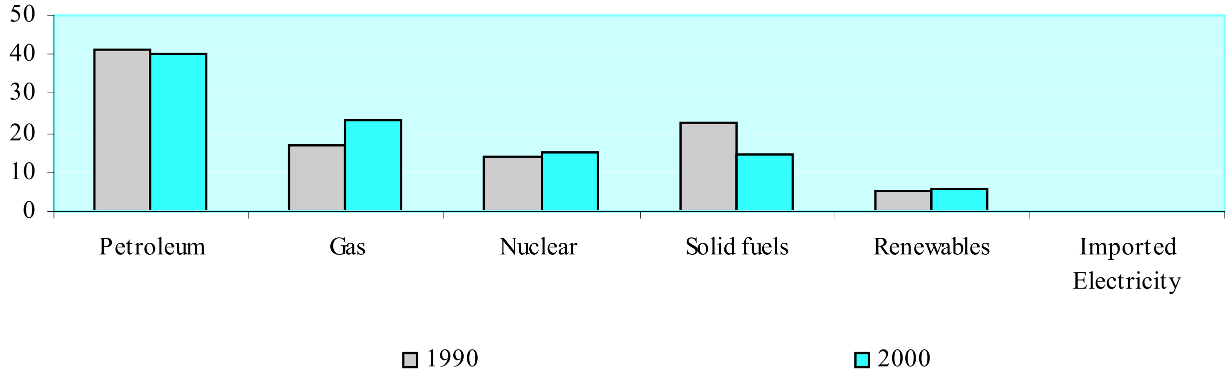
Relevant Sectors: **Energy, Transport, Industry, Households, Services**

Targets

The Brussels Council of March 2003 set a target of increasing the share of renewable energy for the EU-15 to 12% of energy needs and 22% of electricity needs by 2010. Moreover, the EU is promoting the use of alternative fuels i.e. non-petroleum, in transport, with the aim that 5.75% of transport fuel should be alternative fuels by 2010.

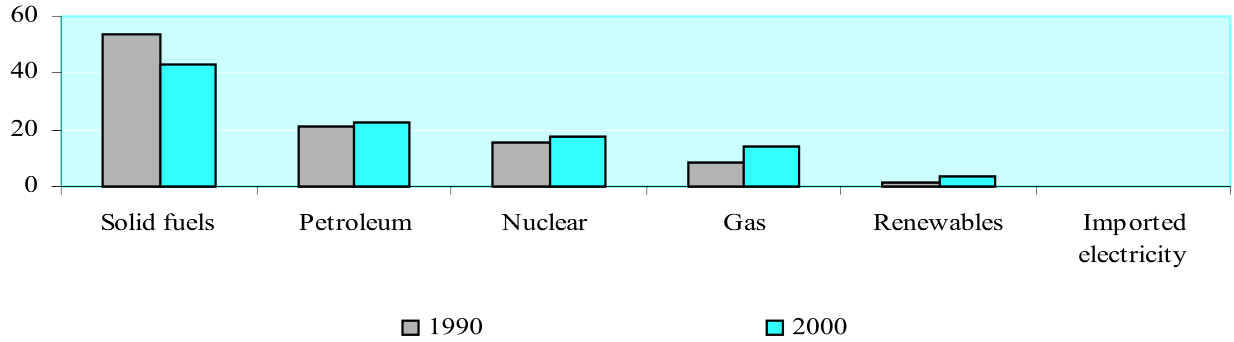
EU-15 Gross inland energy consumption by fuel type

% of GIC



AC-10 Gross inland energy consumption by fuel type

% of GIC



Source: Eurostat

Comments

Gross inland energy consumption in EU-15 increased by just over 11% between 1990-2001. In IS and NO the increase was much more important, at 26%, while consumption in acceding countries fell by 17%.

Use of solid fuels has fallen dramatically in all countries since 1990, following the decline in the coal and lignite (brown coal) mining industry in DE, UK, CZ and PL. Dependence on gas has increased in all countries where natural gas is available, accounting for 23% of EU-15 energy needs and 13% of the needs of acceding countries in 2000, compared to only 17% and 8% respectively in 1990. Around 40% of the EU’s energy need is met by petroleum, a level similar to 1990. For acceding countries, this figure is 22%, up slightly since 1990.

The share of nuclear power has increased as a whole in both EU-15 and AC-10, but the trend varies from one country to another. Since 1990, of the thirteen countries with working nuclear power stations, DE, FR, UK and the SK have increased reliance on nuclear energy, while ES, SE and LT have reduced theirs.

In the EU, renewable energy sources account for 6% of total gross inland energy consumption, up from 5% in 1990. Waste and biomass are considered renewable fuels when they are incinerated to produce electricity. These together with hydroelectricity account for the major part of renewable energy sources. Wind power is growing dramatically, by 3000% between 1990 and 2001. However, it still only represents 2.5% of renewables.

RD-2: Energy use (continued)

Electricity Production

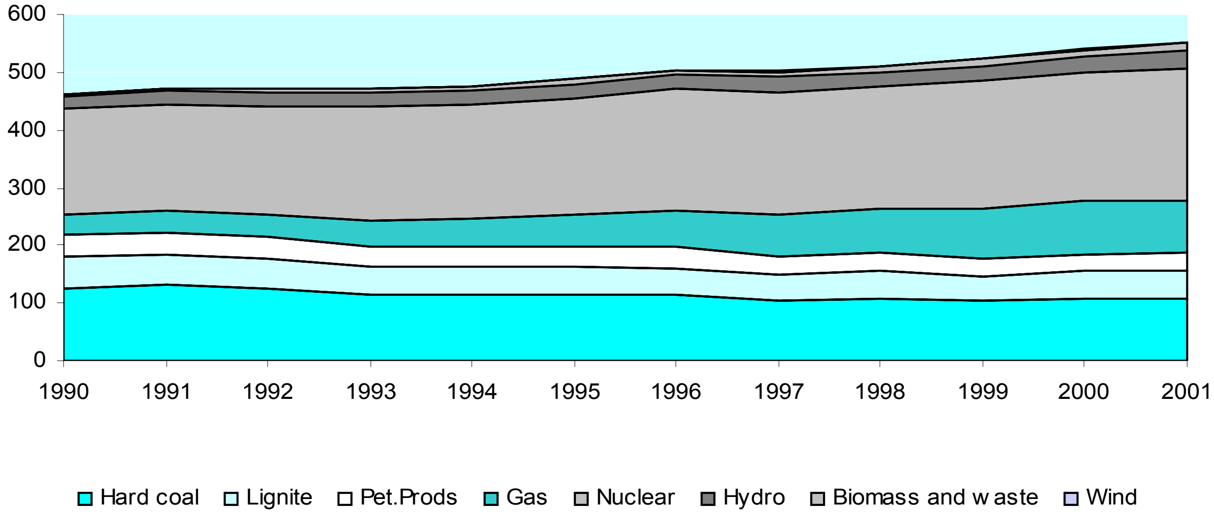
The burning of fossil fuels in conventional power stations results in the unavoidable loss of about two thirds of the energy input. The fuels used to produce electricity are decided as much by geography as by political or economic decision. The countries with a strong tradition of coal mining have generally built up their electricity generating capacity on the basis of that industry, though coal mining is now in decline throughout the EU. Following the 1970's oil crises, several countries turned to indigenous supplies of lignite and peat as a secure source of energy and invested in lignite/peat burning power stations.

The topography of flat countries rules out hydroelectric plants, whereas for countries with a suitable topography, hydropower is more or less fully exploited, reducing the scope to increase electricity generation from this source. Hydro-electricity is also vulnerable to weather conditions: a dry winter can mean that reservoirs are not fully replenished, or during a dry summer, water normally stored for electricity production may be needed to prevent damage to crops. These conditions increase the need to use other sources, usually fossil fuels, to replace hydropower for electricity generation. Rejection of nuclear power in some countries means that increased demand for electricity is normally met by increased use of fossil fuels.

The ALTENER and SAVE programmes foresee that the share of electricity produced from renewable energy sources should be increased to 22 % of electricity consumption by 2010, with different targets for each Member State [4].

Fuels used for electricity generation in EU-15

Million tonnes of oil equivalent



Comments

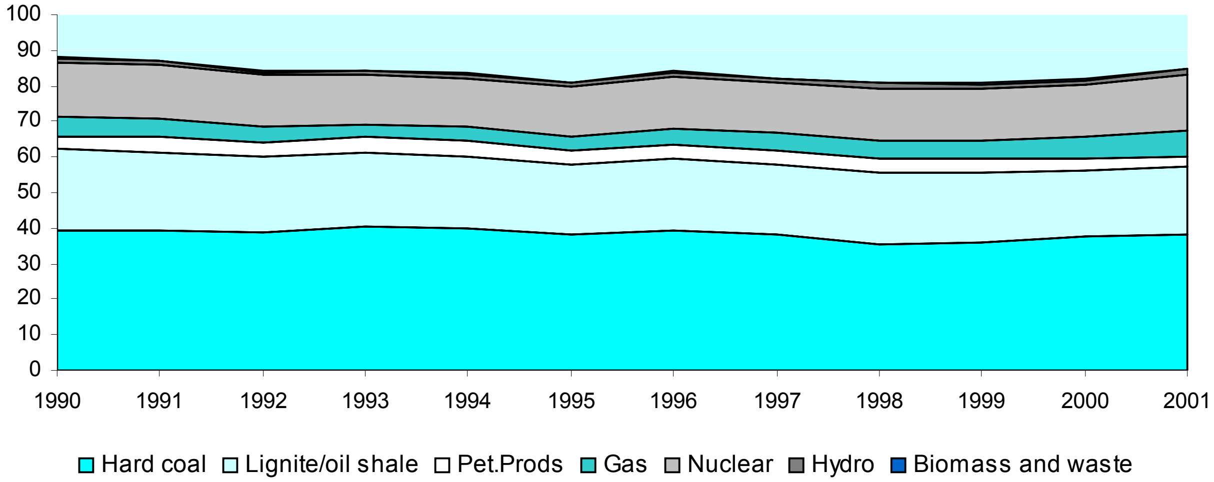
The overall amount of energy needed to produce electricity in the EU has increased by 19% since 1990, reflecting increased demand for electricity. More than 41% of the fuel used to generate electricity in the EU is nuclear energy, slightly more than in 1990 (39%). But fossil fuels still represent 50% of fuel inputs to power stations, down from 55% in 1990. Inputs of coal are down 15% since 1990, accounting for less than 20% of fuel inputs to power stations by 2001, compared to 27% in 1990. There is also a swing away from use of lignite and peat, for environmental and economic reasons, down from 12% of input to power stations in 1990 to 9% in 2001. The use of petroleum products to generate electricity is also down, accounting for just 5% of fuel input in 2001. Gas is the rising star for electricity generation; use of gas to generate electricity has risen by 150%, so that gas makes up over 16% of inputs. The use of gas in combined cycle gas turbines increases the efficiency of electricity production to around 60%.

[4] see Directive 2001/77/EC of 27 September 2001, OJ L 283 of 27/10/2001.

RD-2: Energy use (continued)

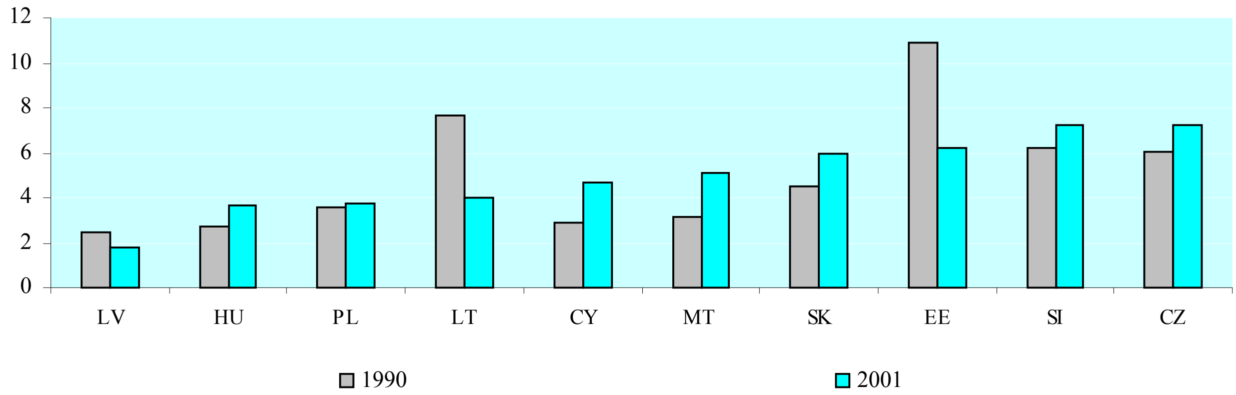
Fuel used for electricity generation in AC-10

Million tonnes of oil equivalent



Electricity generation in AC-10

MWh per capita



Source: Eurostat

Comments

In contrast to the EU, nuclear energy in Acceding Countries accounts for ony 19% of fuel inputs to power stations; only five countries, Czech Republic, Hungary, Lithuania, Slovenia and the Slovak Republic, have nuclear power stations. Petroleum products and gas make up 12% of inputs, compared to 10% in 1990. Hydroelectricity and biomass account for just 2%.

Two thirds of inputs to power stations are coal, lignite and oil shale (Estonia). Although input of oil shale has fallen by 56% since 1990, it is of major importance in Estonia, where it is used to generate more than 90% of electricity. Waste generated during oil shale extraction and treatment is considered hazardous and makes up 77% of the total waste generated in Estonia.

Overall electricity generation in the Acceding countries has increased by only 5% since 1990, compared to an increase of almost 30% in EU-15 countries. However, the picture is not homogeneous for all Acceding countries. Electricity generation fell dramatically in Estonia (-50%), as a result of a sharp fall in exports to Russia and Latvia, and of falling consumption (-22%) within the country itself. In spite of this, per capita generation remains high in Estonia, compared to other Acceding Countries. Generation fell also in Lithuania (-48%) and Latvia (-36%) due to a sharp fall in demand for electricity (-54% and -52% respectively).

RD-3a: Increase in built-up land

Definition and purpose

Unsealed land is a finite, largely non-renewable, resource, performing essential functions in water protection, the preservation of habitats, landscapes and cultural heritage as well as the provision of raw materials, particularly food. Fertile land and natural spaces lost to urban sprawl are considered to be lost permanently.

The purpose of this indicator is to show the rate of increase in built-up land. Built up land is defined as land used for dwellings, industry, commerce, public services, recreation, transport, technical infrastructure, communications, quarries, pits and mines. Scattered farm buildings are excluded.

Built-up land and related land 1)

	Built-up land (km²)					Share in total area (%)	Annual growth (%)	Built-up land (km²/1 000 inhab.)	
	1980	1985	1990	1995	2000			first year	latest year
BE	4 344	4 645	4 980	5 336	5 640	18.7	1.5	441	551
DK	3 140	:	:	3 620 e	:	8.4	1.0	613	694
DE	30 004	31 906	33 720	42 183	45 735	12.8	2.6	384	557
EL	:	:	:	:	:	:	:	:	:
ES	18 518	19 128	19 292	:	:	3.8	0.4	497	497
FR	:	32 448	35 148	39 159	42 104	7.7	2.0	588	717
IE	:	:	:	:	:	:	:	:	:
IT	:	:	:	:	:	:	:	:	:
LU	:	:	220	:	:	8.5	:	:	580
NL	5 085	5 348	5 386	5 608	5 754	13.9	0.7	361	365
AT	:	:	3 112	3 410	3 817	4.6	1.5	405	471
PT	:	:	14 140	:	16 367	18.3	1.7	1 425	1 640
FI	7 730	:	7 520	7 595	:	2.2	:	1 620	1 490
SE	10 890	:	11 720	:	:	2.6	0.8	1 312	1 374
UK	:	:	:	:	36 140	14.2	:	:	610
IS	1 100	:	1 250	1 353	1 450	1.4	1.6	4 847	5 196
NO	:	:	:	:	:	:	:	:	:
CH	:	2 464	:	2 791	:	6.8	1.3	382	398
CZ	7 399	7 795	8 119	8 176	8 100	10.3	0.5	717	788
EE	:	:	:	: :	:	:	:	:	:
CY	:	:	:	:	:	:	:	:	:
LV	2 749	2 648	2 632	:	2 143	3.3	:	1 096	878
LT	1 338	1 421	1 574	1 760	1 984	3.0	2.5	393	536
HU	:	:	:	:	:	:	:	:	:
MT	:	:	:	:	:	:	:	:	:
PL	18 353	19 221	19 830	20 368	20 531	6.6	0.6	518	531
SI	:	:	:	604	795	3.9	3.2	303	400
SK	3 832	3 851	3 737	3 720	3 684	7.5	:	772	683

Source: Eurostat

1) Some figures may refer to the closest year for which data is available (limit +/- 1 or 2 years before or after).
Break in series for FI, LT and the SK. For DE, figures for 1980 to 1990 refer to the former West Germany.

Methodology and data problems

The definitions and methods used for collection of data on built up land vary from one country to another. As land use changes relatively slowly, data are not normally compiled every year: every five or more years is more normal. In fact, as land use is often the responsibility of local authorities, the definitions, methods and timing may even differ within a country, resulting in little comparable data for the different Member States.

The widely varying average built up area per capita reflects the poor quality of the data more than real differences in built up area per capita.

Relevance: Yellow	Accuracy: Red	Time Rep.: Yellow	Spatial Rep.: Red

RD-3a: Increase in built-up land

Relevant Sectors: Households, Services, Transport, Industry, Tourism

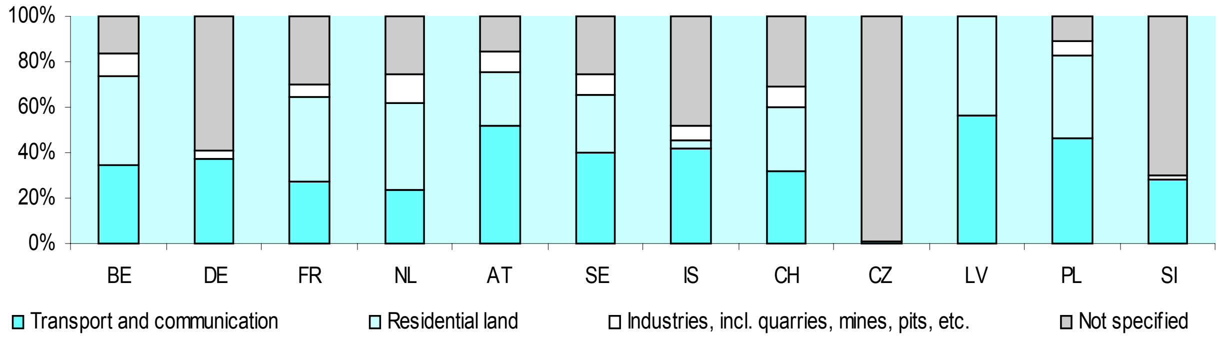
Targets

The European Spatial Development Project aims to control land use pressure by limiting the physical expansion of towns and ensuring the re-use of previously developed 'brown-field' sites. Several countries and cities have already set targets for the re-use of 'brown-field' sites, contributing also to inner city regeneration.

The 6EAP calls for the integration of landscape protection and restoration into regional policy and the implementation of integrated coastal zone management to address the issue of increasing urbanisation in coastal areas.

Built-up area by main sectors

%



Source: Eurostat.

Comments

According to the available data, more than 18% of land in Belgium and Portugal is classed as built up, while for England and Wales, Netherlands and Germany it is around 14%. The lowest rates are found in Finland and Sweden where the population tend to congregate in the south and on the coast, leaving vast areas uninhabited, and in Austria where the geography of the country tends to limit expansion.

Of the EU countries, it should be noted that no data is available for Greece, Ireland or Italy and no recent data for Spain, Luxembourg and Sweden. Most of these saw high growth rates during the 1990s, while Ireland, Luxembourg and Spain also saw their populations increase significantly during the 1990s. These are normally factors that drive expansion of cities and transport networks. It could be expected that built up area in these countries also increased significantly during the 1990s.

The per capita figures for Portugal, Finland and Swedn are much higher than for other countries. This suggests that the definitions used by these three countries are much broader than those used for the rest of the EU and Acceding Countries.

RD-3b (new): Soil erosion

Definition and purpose

Erosion is a natural process, and depends on soil type, slope, and exposure to wind and water, the main causes of erosion. Exposure is exacerbated by inappropriate land management practices. It results in soil structure deterioration, irreversible soil loss and can lead to desertification.

The indicator measures the area of land affected by water and wind erosion and the rate of erosion, measured in terms of the tonnes of soil lost per hectare of agricultural land per year.

Area affected by soil erosion, and soil loss in agricultural land

	Area affected by erosion	of which Agric. land affected	Share of area affected	Share of agric. land affected	Period covered	Soil loss in agricultural land (tonnes/hectare/year)	
	(1000 hectares)		(% of total country area)			1990-95	1995-00
BE	:	240	:	7.9	1995-2000	:	0.24
EL	7 559	3	57.3	0.0	1990-1995	:	:
ES	9 161	6 477	18.2	12.8	1990-1995	28	:
FR	:	:	:	:	1990-1999	:	17
IT	12 415	:	36.5	:	1990-1995	:	:
AT	625	625	7.45	7.5	1990-1995	:	9
IS	6 800	1 500	65.8	14.5	1990-1995	:	:
CH	:	:	:	:	1990-2000	:	10.0
CZ	1 191	:	15.1	:	2000	:	:
EE	145	:	3.21	:	2000	:	:
CY	:	113	:	12.2	1990-2000	4.9	4.3
LV	737	:	11.4	:	1990-1995	:	:
LT	681	:	10.4	:	2000	:	:
HU	2 300	:	24.7	:	1990-1995	33.0	33.0
PL	6 200	4 000	20.4	13.1	1990-1995	:	:
SK	1 857	889	37.9	18.1	1990-1995	:	4.5

Source : European Topic Centre on Terrestrial Environment and Eurostat

Methodology and data problems

Data is based on expert estimates and comes from various sources. Availability is poor and irregular and no time series are available. Moreover, no harmonisation of results has been possible. However the main countries affected by erosion are covered.

Soil erosion is a local issue and national figures of soil loss are of little real use. The few figures on soil loss at national level can be the result of widespread but limited erosion or massive erosion problems in limited areas. In Belgium for instance, 8% of the area occupied by arable land and permanent crops in the Flemish region are affected by erosion (originating from water and ploughing) of over 10 tonnes per hectare per year, and 18 % of arable land are affected by erosion of over 5 tonnes per hectare per year, compared with an average of only 0.24 t/ha/year on total Belgian agricultural land.

Relevance: Green	Accuracy: Green	Time Rep.: Green	Spatial Rep.: Green

RD-3b (new): Soil erosion

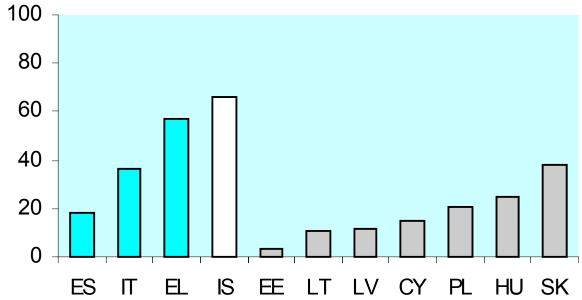
Relevant Sectors: **Agriculture**

Targets

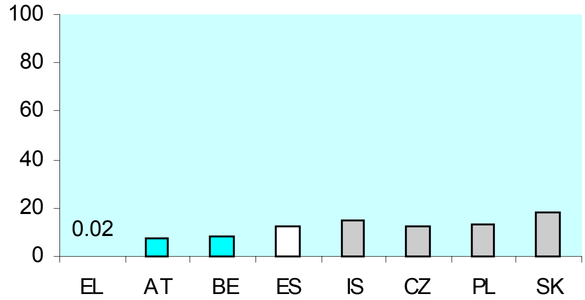
In the context of the 6EAP, the Commission has published a Communication 'Towards a Thematic Strategy for Soil Protection' (COM(2002) 179 final, 16.04.2002) and many EU policies are relevant to soil protection. At country level, national targets have been set in e.g. the Slovak Republic, aiming at a 50% reduction of the area affected by erosion by 2010 compared to 1991, and the most affected European countries have ratified the 1994 Convention to Combat Desertification.

Share of land area affected by erosion in selected countries

% of total country area

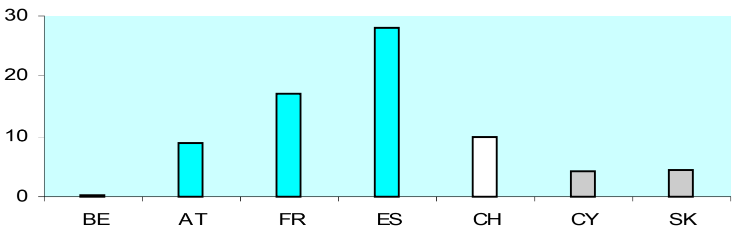


% of total agricultural area



Soil loss in selected countries

tonnes per hectare of agricultural land per year



Comments

Erosion is a Europe-wide issue affecting mainly the Mediterranean regions, Central Europe and even northern France and Belgium, with different levels of severity. Some agricultural practices such as large-scale farming, overgrazing and poor water and irrigation management contribute to the problem. Olive plantations and vineyards are particularly at risk as large areas remain uncovered by vegetation throughout the year. Forest fires in the Mediterranean region also leave soil exposed and vulnerable to erosion. Erosion is often more intense in loamy and/or sandy soils and in soils with low organic matter content, an essential feature for resisting erosion.

Soil loss is considered to be irreversible, when it exceeds 1 t/ha per year. Areas affected by serious erosion are at risk of desertification [5], an issue which has not only environmental but also socio-economic implications. This applies to dry areas in central and south-east Spain, central and southern Italy, southern France and Portugal as well as extensive areas of Greece.

Around 26 million hectares were estimated to suffer from water erosion and 1 million hectares from wind erosion in Europe [6] in the years up to 1990. The figures provided in the table suggest that this had almost doubled by around 1995.

[5] See UNEP, 1992, World Atlas of Desertification, Edward Arnold, London and EC, 1994, Report on Desertification and land degradation in the European Mediterranean.
[6] World Map of the Status of Human Induced Soil Degradation , GLASOD, 1990 (expert estimates).

RD-4: Fishing pressure (previously ME-2)

Definition and purpose

Continued removal of fish from stocks that are outside ‘safe biological limits’ (SBL) constitutes a major pressure on those stocks, and jeopardises their ability to recover to safe levels. Other factors include the fecundity of the fish type and how far below the SBL the stock is.

The EU, autonomously or jointly with others, is responsible for managing fish stocks in large parts of the North-East Atlantic (as defined in Council Regulation 850/98/EC[7]), comprising the North Sea, the Baltic Sea, the Bay of Biscay and the Iberian Peninsula. The Mediterranean Sea is not covered.

This indicator shows the percentage of catches taken from EU managed waters that are from stocks considered to be outside safe biological limits. In general terms, a stock is considered to be outside SBL if ICES, the International Council for the Exploration of the Sea, has assessed the spawning stock biomass (SSB) to be below the recommended precautionary SSB level[8]. If no warning has been given by ICES, then it is assumed that the stock is within safe biological limits.

The catch data are estimated by ICES for assessment purposes and refer to catches by EU Member States and third countries from stocks managed by the EU.

The classification used (benthic, demersal, diadromous, pelagic and industrial) reflects both the biology of the species and the type of fishery realised by bringing together types of fish of comparable commercial value, although important differences still occur within each type.

Catches taken from NE Atlantic stocks managed by the EU (2001) 1)

	Total catch (tonnes)	Share in total catch (%)	% catch from stocks within SBL	% catch from stocks outside SBL
Diadromous	3 310	0.05	37	63
Demersal	776 000	10.8	39	61
Pelagic	4 541 010	63.2	51	49
Benthic	399 660	5.6	59	41
Industrial	1 468 180	20.4	100	0
Total	7 188 160	100	60	40

Source: European Commission, based on ICES (International Council for the Exploration of the Sea)
1) Diadromous: salmon, sea trout etc.
Demersal: roundfish such as cod, haddock, whiting, hake, etc
Pelagic: herring, anchovy, sardine, mackerel, horse mackerel (North Sea and southern stocks), redfish
Benthic: nephops, prawns, anglerfish, Norway lobster, flatfish (turbot, brill, lemon sole, witches, dabs)
Industrial (production of meal and oil): sprat, sandeel, Norway pout

Methodology and data problems

Data is made available through an annual assessment report by the Advisory Committee on Fishery Management (ACFM) of ICES. The ACFM includes representatives of some EU Member States. Both the assessment of stocks and estimation of catches are based on scientifically sound methodology used by ICES, and advocated in Council Regulation 850/98/EC for the conservation of fishery resources. Monitoring activities are based on scientific surveys rather than commercial catches leading to low values of SSB estimates and thus biased exploitation patterns (ICES, 2001).

Data has been provided for 2001 only.

Relevance: Green	Accuracy: Green/Yellow	Time rep.: Red	Spatial rep.: Yellow

[7] of 30 March 1998, OJ L 125, 27/04/1998, p. 0001 - 0036
[8] Further details on the way ICES formulates advice in precautionary terms can be obtained from the ICES website: http://www.ices.dk

RD-4: Fishing pressure (previously ME-2)

Relevant Sectors: **Fishery**

Targets

Under the Common Fisheries Policy (CFP), the EU is requested to set specific mid- to long term targets that identify sustainable levels for fish stocks or fish harvesting (see COM 2000(803)). Total Allowable Catches (i.e. catch limits) are defined for the main fish stocks, and revised annually depending on the evolution of stocks.

Protection is also provided to certain stocks under Council Regulation 2371/2002[9] on the conservation and sustainable exploitation of fisheries resources. This Regulation recommends, as a priority, the adoption of recovery plans for stocks which are outside SBL, including targets against which the recovery of the stocks shall be assessed. For fisheries exploiting stocks at/or within SBL, management plans to maintain stocks within SBL should be adopted.

Current stocks outside SBL, recommended for recovery plans in 2003, and other stocks outside SBL

	Blue whiting	Cod	North. hake	Whiting	Norway lobster	Sole	Haddock	Anglerf.	Horse macke.	Megrims	Plaice
Type of species	D	D	D	D	B	B	D	B	P	B	D
Kattegat		RP									
North Sea			RP			SBL		SBL			
Skagerrak			RP								
Western w aters		RP (North)	RP					SBL			
Irish Sea				RP			RP				
Cantabrian Sea					RP						
Bay of Biscay					RP	RP (North)		SBL	SBL	SBL	
Iberian region (West.)					RP				SBL		
Baltic Sea											
West Scotland									SBL		
West Ireland									SBL		
West. Engl. Channel						SBL					
Celtic Sea						SBL					SBL
Norw egian Sea						SBL		SBL			

Source: European Commission, based on ICES
1) Type of species: D : demersal, P: pelagic; B: benthic.
RP: stock outside SBL, for which a recovery plan is recommended by scientific advice; SBL: other stocks outside SBL.

Comments[10]

It should be noted that the precautionary reference levels are not management targets; they rather reflect a stock status that should trigger recovery plans.

Fish stocks and landings have declined dramatically over the last 25 years, though the situation varies depending on the species and areas concerned. For many commercially important demersal stocks, the numbers of mature fish and landings were about twice as high in the early 1970s as in the late 1990s. For some stocks such as cod even more drastic reductions in mature fish have occurred. Stocks of small pelagic and industrial species have generally not deteriorated over the last 20 years. Benthic species tend for their part to be economically overexploited although from a biological point of view their situation is not systematically serious. Lastly, there is not enough scientific information available to determine to which extent species such as skates and rays, and the minor flatfish species (turbot, etc.) may also be overexploited.

Recent scientific advice from ICES suggests that the level of fishing mortality of the main Community fish stocks needs to be reduced by between one-third and one-half, depending on the type of fishery (flatfish, other demersal, pelagic) and area concerned, in order to ensure sustainable fishing.

[9] of 20 December 2002, OJ L 358 , 31.12.2002.
[10] See European Commission website: ***http://europa.eu.int/comm/fisheries/reform/index_en.htm, Background, annex***

RD-5: Timber harvesting

Definition and purpose

Wood is an economically valuable and renewable natural resource, provided the long term extraction rate does not exceed the rate of new growth. This indicator is defined as the ratio of fellings to net annual increment (NAI), a measure of growth. Both fellings and NAI are measured as volumes overbark,

Net annual increment is the gross increment minus natural losses while *fellings* refer to the volume of all trees, living or dead, which are felled during a given period, whether or not removed from the forest or other felling sites.

The figures below are annual averages for the periods 1980-1990 and 1990-1999, together with data for the year 2000. Averages over several years are considered a better indicator than annual figures, as fellings can be influenced by weather conditions (a major storm can bring down a large number of trees, providing enough wood for several years' needs) and by a downturn in the economy (temporary reduction in the demand for wood, or availability of cheaper supplies from abroad).

EU imports of roundwood and wood harvesting ratio

1 000 m³ overbark unless otherwise specified

	Fellings			Net annual increment			Wood harvesting ratio *(%)*		
	Averages		2000	Averages		2000	Averages		2000
	1980-1989	1990-1999		1980-1989	1990-1999		1980-1989	1990-1999	
EU-15	228 131	309 553	299 530	332 484	487 770	459 506	69	63	65
BE+LU	3 426	4 800	4 400	4 457	5 843	5 804	77	82	76
DK	2 535	2 444	2 194	3 515	3 200	3 200	72	76	69
DE	42 716	48 584	48 584	:	90 649	88 998	:	54	55
EL	3 376	:	:	3 648	3 813	3 520	93	:	:
ES	18 530	15 863	11 028	33 488	30 092	28 589	55	53	39
FR	:	60 174	60 174	67 649	93 211	92 299	:	65	65
IE	1 568	2 330	2 330	3 363	3 500	3 450	47	67	68
IT	:	10 101	8 746	:	30 507	18 713	:	33	47
NL	1 520	2 150	1 438	2 419	2 328	2 205	63	92	65
AT	17 402	20 041	19 521	23 972	27 837	27 337	73	72	71
PT	11 245	11 500	11 200	11 793	14 312	12 900	95	80	87
FI	57 460	54 300	54 300	71 735	73 666	72 470	80	74	75
SE	60 218	67 766	66 115	95 357	94 122	85 431	63	72	77
UK	8 135	9 500	9 500	11 088	14 690	14 590	73	65	65
IS	:	:	:	:	58	37	:	:	:
NO	12 765	11 632	11 632	18 546	24 391	22 041	69	48	53
CH	5 760	7 451	7 076	6 070	8 848	8 155	95	84	87
CZ	:	:	16 200	:	:	20 355	:	:	80
EE	:	:	:	:	:	7 137	:	:	:
CY	:	:	50	:	:	44	:	:	114
LV	:	:	6 570	:	:	11 050	:	:	59
LT	:	:	5 240	:	:	8 504	:	:	62
HU	:	:	5 880	:	:	9 925	:	:	59
MT	:	:	:	:	:	0	:	:	:
PL	:	:	30 532	:	:	39 436	:	:	77
SI	:	:	2 300	:	:	6 132	:	:	38
SK	:	:	7 100	:	:	12 337	:	:	58

Source: Eurostat

BE+LU: Belgium and Luxembourg

Methodology and data problems

These figures make no distinction between wood from managed forests and from natural or semi-natural forests, though the effect on natural forests is of more concern than forests maintained specifically for wood production. Information on specific species is not available for fellings and NAI.

Relevance: Green	Accuracy: Green	Time Rep.: Green	Spatial Rep: Green

RD-5: Timber harvesting

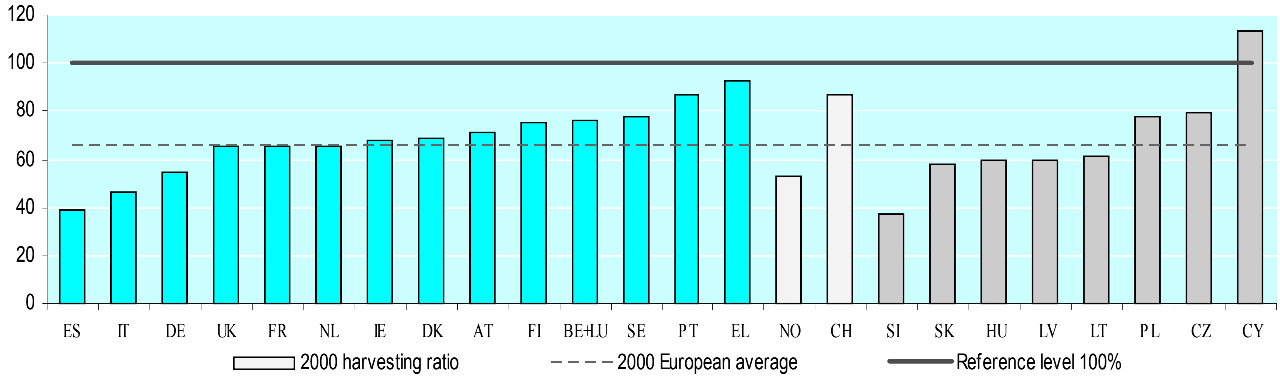
Relevant Sectors: **Agriculture (Forestry), Industry**

Targets

The 6EAP calls for the further development of forestry and good forest management under rural development plans, and encourages the creation of credible forest certification schemes.

EU wood harvesting ratio 1) 2)

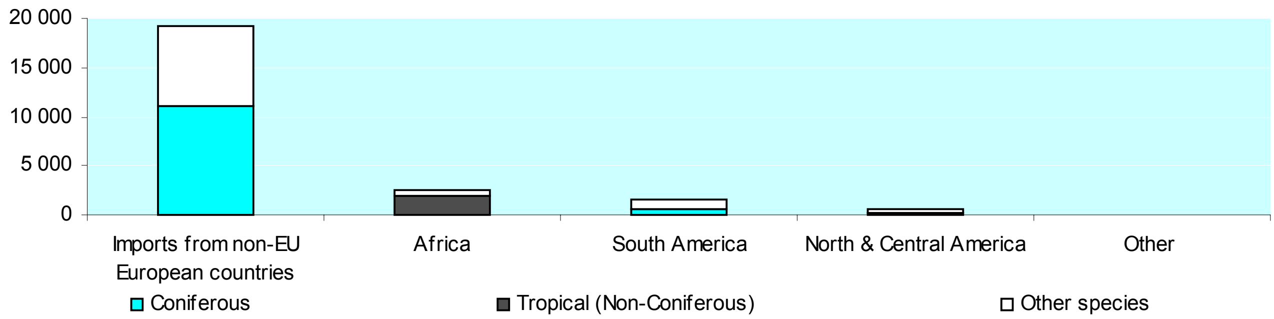
%



Source: UNECE/TBFRA / Eurostat
1) A 100 % reference level means that the NAI is equal to the volume of felled timber. Values below that level indicate more growth than removals.
2) EL: harvesting ratio is 1980-89 average. European average: excluding IS, EE and MT.

EU imports of industrial roundwood by region and species group

1 000 m³



Source: FAOSTAT

Comments

Over the period 1980-1990, the total NAI in EU forests averaged 332 million m³, while total fellings amounted to 228 million m³, 69 % of the net annual increment. For the period 1990-1999, both NAI (488 million m³) and total fellings (310 million m³) increased, but the harvesting ratio fell to 63 % of the NAI. In 2000, both NAI and fellings decreased by 6% and 3% respectively. Fellings have remained well below increments, and forest loss through development has been offset by expansion into agricultural and other land. European forest resources have therefore been expanding slightly. In 2000, the total volume of growing stock available for wood supply in Community forests was estimated at around 125 million hectares, dominated by coniferous species.

The EU also imports wood, wood pulp and paper, putting pressure on forest resources in other countries. In the last 20 years, European imports of roundwood have almost doubled, with imported products meeting around 16-17% of total demand for wood. Around two thirds of imported roundwood are coniferous and almost 70% of that comes from within the EU. Other European countries, mainly Russia, supply a further 29%. Africa is the main provider of tropical wood (2 million tonnes, 94% of total imports of tropical wood). Net imports of wood pulp and paper have also almost doubled since 1980.

WASTE

Introduction

Waste is defined in Article 1 of Directive 75/442/EEC [11] as any substance or object in the categories set out in Annex I which the holder discards or intends or is required to discard.

Economic growth has resulted in an increase in the amount of waste generated over the past decades. Waste management, i.e. waste collection and treatment, has become an independent economic sector, as waste becomes an environmental problem of growing concern.

Both hazardous and non-hazardous waste exert pressures on the environment. The environmental impacts that have been most closely associated with waste are:

- pollution of ground and surface water, through leaching and run-off;
- soil contamination and damage to nature;
- emissions of methane, a powerful greenhouse gas, from landfill sites;
- risks to health due to emission of dusts, odours and hazardous gases and to unregulated fires.

The Community's approach to waste management policy is defined in Council Resolution 97/C 76/01[12]. Based on this Resolution, priority is to be given to waste prevention. Where not possible, the other options are, in order of priority, reuse, recycling, and incineration (preferably with energy recovery), with waste landfilling as a last resort. The 6EAP for its part proposes to develop a thematic strategy on waste recycling [13], including indicative recycling targets, to encourage the creation of markets for recycled materials and to develop an Integrated Product Policy (IPP) approach and make producers responsible for their products when they become waste.

The Basle Convention on the control of transboundary movements of hazardous waste and its disposal has also had a major influence on the waste management policies of Member States. A further development of the Convention introduced a ban on exports of hazardous waste to non-OECD countries. This was transposed into Community legislation by Council Regulation 97/120/EC [14].

This theme describes some of the different types of waste generated, and various methods used to dispose of waste, i.e. landfilling, incineration, recovery or recycling. Some overlap is unavoidable, for example, the industry sector is the most important sector in the generation of hazardous waste.

Although most of the data used in this policy field comes from the OECD/Eurostat joint questionnaire to OECD Member States, compilation of waste statistics at Community level has shown that the sets of data produced by the countries are very heterogeneous. The recent EC Regulation on Waste Statistics [15] will remedy this situation by establishing a framework for the production of statistics on generation, recovery and disposal of waste (excluding radioactive waste which is covered by other legislation) by all economic sectors and households, through a system of statistical surveys in industry, local authorities and the processing sector, and by requiring Member States to draw up a programme of pilot studies on imports and exports of waste.

[11] OJ L 194 of 25.7.1975, p. 39 as amended by Council Directive 91/156/EEC of 18.3.1991.

[12] OJ C 076 of 11.3.1997, p.1-4 .

[13] see proposal for a Directive (COM(2001) 729 final, 07.12.2001) amending Directive 94/62/EC (OJ L 365, 31.12.1994, p.10-23) on packaging and packaging waste.

[14] OJ L 22 of 24.1.1997, p. 14.

[15] Regulation (EC) 2150/2002, OJ L 332 of 9.12.2002.

WA-1: Waste landfilled

Definition and purpose

The indicator should cover all waste landfilled, irrespective of whether the sites meet minimum standards for the protection of soil and groundwater. This includes landfills for hazardous waste, municipal and non-hazardous waste and landfills for inert waste. The amount of waste landfilled depends on the national policy on waste management, i.e. on the importance given to waste avoidance, incineration and recycling, and the extent of illegal dumping. Depending on the type of waste, how the landfill is constructed and the hydrological conditions, landfilling can lead to environmental problems such as leaching of nutrients, heavy metals and other toxic compounds, emission of greenhouse gases (CH_4 and CO_2) and loss of natural areas. Hence, landfill should only be used when other possible waste treatment methods have been exhausted.

Municipal and hazardous waste landfilled [1)]

kg per capita

	Municipal waste landfilled								Hazardous waste landfilled							
	1990	1995	1996	1997	1998	1999	2000	2001	1990	1995	1996	1997	1998	1999	2000	2001
BE	199 p	203 p	192 p	152 p	145 p	:	:	:	:	52	:	:	62	62	:	:
DK	:	96	82	65	67	68	67	:	:	10	11	9	11	22	19	:
DE	560	:	:	216	197	:	:	:	58	:	39	46	46	:	:	:
EL	:	:	:	170	178	186	216	:	:	:	:	22	:	:	:	:
ES	241	310	300	321	319	333	319	:	:	:	:	:	:	:	:	:
FR	:	235	247	248	248	245	244	:	12	13	12	12	14	:	:	:
IE	:	398	:	:	478	:	554	:	:	1	9	:	11	:	:	:
IT	:	419	377	370	361	377	379	:	:	11	:	14	0	:	:	:
LU	:	160	163	144	146	140	138	:	:	42	-	-	-	-	-	-
NL	:	160	109	68	82	72	87	82	18	11	8	9	24	22	25	:
AT	257	202	183	187	184	192	:	:	:	:	:	:	:	:	:	:
PT	:	202	235	269	312	360	335	:	:	:	:	:	:	:	:	:
FI	482	268	:	281	294	284	306	:	:	:	:	46	:	:	:	:
SE	164	:	:	:	147	:	138	:	:	:	:	:	:	:	:	:
UK	:	410	423	445	503	511	:	:	:	:	:	:	:	:	:	:
IS	:	472	481	511	518	533	555	565 p	:	:	:	:	:	:	:	:
NO	:	456	425	383	417	328	336	:	:	:	:	:	38	25	:	:
CH	192	162	154	153	151	150	138	:	:	25	24	31	31	:	:	:
CZ	:	:	:	:	:	:	:	:	:	17	13	14	27	14	29	38
EE	:	355	382	405	382	393	438	:	:	4 369	4 558	4 565	4 162	3 976	4 204	:
CY	546	551	552	567	582	597	617	628	:	:	:	:	:	:	:	:
LV	:	:	:	:	:	:	:	385	:	:	:	:	:	:	:	:
LT	:	416	389	407	426	334	294	283	:	:	:	:	:	:	0.2 e	:
HU	382	349	371	395	401	411	383	:	231	136	101	:	:	:	:	:
MT	:	:	:	:	:	362	344	472	:	:	:	:	:	:	:	:
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SI	:	542	:	:	570	:	:	424	:	:	:	:	:	:	:	:
SK	:	:	:	:	:	:	196	:	:	:	:	:	54	:	:	:

Source: Eurostat and national sources

1) Some figures for 1990 and 1995 may refer to the closest year for which data is available (limit +/- 1 or 2 years before or after). EL: controlled landfill only ; ES: household waste only ; LU: figures exclude inert waste ; UK: England & Wales only.

Methodology and data problems

Data are only available for municipal and hazardous waste though, in general, the data situation is poor, particularly for hazardous waste. This leaves a large area uncovered by data. There is no true link between waste types and treatment procedures in most countries, and the different landfill sites for *hazardous waste*, *non-hazardous waste, municipal waste or inert waste* can receive other types of waste than those for which they have been designed.

As statistical data collection is always limited to legal activities, the reported data will be incomplete (and the environmental pressure higher) if a significant percentage of illegal dumping of waste is suspected.

Moreover, as the indicator does not specify to what extent a landfill is equipped with technical systems (insulation from soil and groundwater, drainage system, gas collection system) and to what extent nuisance and nature deterioration is prevented, the indicator can only lead to a first estimation of the environmental pressure from the landfilling of waste.

Relevance: Green	Accuracy: Yellow	Time rep.: Yellow	Spatial rep.: Yellow/Red

eurostat

WA-1: Waste landfilled

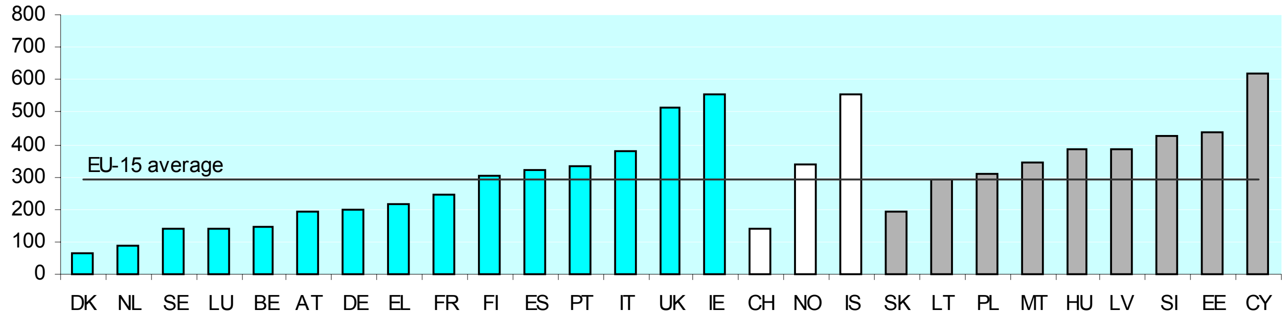
Relevant Sectors: **Industry, Households, Services**

Targets

With the implementation of Council Directive 1999/31/EC [16] on the landfill of waste, the activity of landfilling in Europe will become highly regulated. The Directive identifies waste types excluded from landfilling, defines application and permission rules, lists the control and monitoring procedures for the operational and after-care phase of a landfill and the technical waste acceptance procedures to be established. The environmental burden from landfilling should decrease and the economic importance (costs and benefits) increase.

Municipal waste landfilled (latest year available)

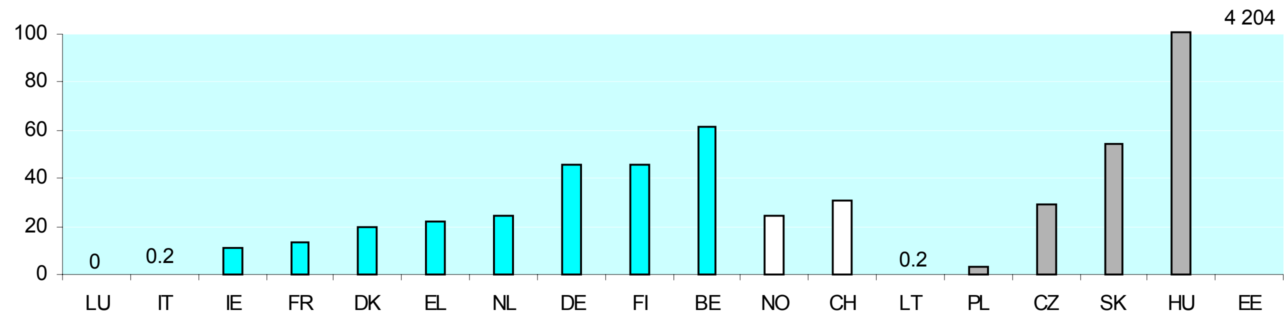
kg per capita



Source: Eurostat and national sources

Hazardous waste landfilled (latest year available)

kg per capita



Source: Eurostat and national sources

Comments

The definition of *municipal waste* can vary from one country to another, depending to some extent on how waste collection is organised. However, a general decrease in the amounts of municipal waste landfilled in the EU is noted; in EFTA countries the amounts have also decreased, except in Iceland. Landfill is still by far the most commonly used option for disposal for municipal waste, except in Denmark, Luxembourg, Netherlands and Switzerland. The data for Greece refer to controlled landfill only.

The poor data situation makes it difficult to evaluate the trend in landfilling of hazardous waste in most countries. Again landfill appears to be the preferred method of disposal for this type of waste. As every country has its own definition of what constitutes hazardous waste, these figures conceal a wide range of different types of waste. In general, the quantities of *hazardous waste* sent to landfill in EU and EFTA countries are considerably smaller than for municipal waste, with a maximum of 62 kg per capita (Belgium). The extremely high levels of hazardous waste landfilled in Estonia are the result of the large quantities of hazardous waste generated during the treatment of oil shale to produce fuel (97% of hazardous waste) *(see WA-3)*.

[16] OJ C 182 of 16.7.1999, p.1.

WA-2: Waste incinerated

Definition and purpose

The indicator should cover the total amount of all types of incinerated waste (hazardous/non-hazardous, industrial/commercial/household). There is no differentiation between different types of facilities, e.g. whether they are fitted with equipment to reduce pollution or to recover energy. Wastes which are incinerated via co-combustion in special industrial furnaces such as cement ovens, blast furnaces and kilns should be included.

The indicator thus reflects the total amount of waste incinerated in special waste incineration plants or co-combusted.

Municipal and hazardous waste incinerated 1) 2)

kg per capita

	Municipal waste incinerated								Hazardous waste incinerated							
	1990	1995	1996	1997	1998	1999	2000	2001	1990	1995	1996	1997	1998	1999	2000	2001
BE	157 p	171 p	161 p	167 p	158 p	157 p	163 p	:	:	10	:	:	11	13	:	:
DK	:	294	308	315	312	315	347	:	:	28	28	27	28	22	19	:
DE	105	:	:	111	111	:	:	:	31	:	11	14	14	:	:	:
EL	-	-	-	-	-	-	:	:	:	:	:	:	:	:	2	:
ES	16	18	18	26	76	61	43	:	:	:	4	:	:	:	5	:
FR	:	184	175	174	172	173	176	:	16	21	22	21	23	:	:	:
IE	-	-	-	-	-	-	-	-	:	14	15	:	20	:	:	:
IT	:	:	27	30	34	37	40	:	:	2	:	7	11	:	:	:
LU	359	312	306	299	288	310	283	:	-	-	-	-	-	-	-	-
NL	:	145	176	227	236	245	233	232	12	12	10	10	16	18	25	: p
AT	41	54	54	55	54	56	:	:	8	11	13	:	:	14	:	:
PT	:	1	1	:	:	35	91	:	:	:	:	:	:	:	:	:
FI	10	:	:	22	28	38	52	:	:	:	:	20	:	:	:	:
SE	152	:	:	:	158	:	165	:	:	:	:	:	:	:	:	:
UK	:	50	40	32	47	49	:	:	:	:	:	:	:	:	:	:
IS	:	56	56	56	48	54	61	60 p	:	19	22	22	22	22	22	21
NO	:	84	81	84	85	92	90 e	79 e	:	:	:	:	27	25	:	:
CH	337 e	288	282	281	280	299	321	:	:	40	42	47	52	:	:	:
CZ	:	:	:	:	18 e	:	:	:	:	3	3	3	52	4	4	5
EE	:	-	-	-	-	-	0	-	:	0.7	-	-	0.1	0.2	2.4	:
CY	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
LV	:	:	:	:	:	:	:	12	:	:	:	:	:	0.7	0.8	2
LT	:	-	-	-	-	-	-	-	:	:	:	:	:	:	0.4 e	1
HU	29	32	32	32	35	35	35	:	165	145	109	:	:	:	:	:
MT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
PL	:	:	:	:	:	:	:	0	-	-	-	-	-	-	-	:
SI	:	-	:	:	-	:	:	:	:	:	:	:	:	:	:	0.2
SK	:	:	:	:	:	:	:	:	:	:	:	:	25	:	:	:

Source : Eurostat and national sources
1) e = country estimate, p = provisional
2) Some figures for 1990 and 1995 refer to the closest year for which data is available (limit +/- 1 or 2 years before or after). UK refers to England & Wales only.

Methodology and data problems

The data situation is similar to WA-1. The amounts of waste incinerated depend on the growth in waste generated, the efficiency of recycling systems and the availability of appropriate incineration technology. Depending on the country, data on hazardous waste incinerated may not include all waste incinerated at co-combustion plants within industry itself.

Waste incineration is a controversial topic because it leads both to positive effects (destruction of hazardous substances, reduction in the volume of waste to be landfilled, energy recovery, substitution of fossil fuels via co-combustion) and to negative effects (hazardous residues, emissions of hazardous gases, polluted water from flue gas cleaning). Data sets on the amount of waste incinerated are insufficient to accurately describe environmental pressure. When fully implemented, the Waste Statistics Regulation will provide data on incineration capacities; however, several other factors would need to be taken into account to evaluate environmental pressure from incineration: pollution abatement facilities attached to incinerators, potential and actual energy recovery at incinerators, and residuals (including gaseous emissions). Any analysis of the environmental pressure and the environmental benefit from incineration should compare alternative methods of treatment, e.g. separate collection or sorting followed by material recovery, composting of biodegradable components and final disposal.

Relevance: Green	Accuracy: Yellow	Time Rep.: Yellow/Red	Spatial Rep.: Yellow/Red

WA-2: Waste incinerated

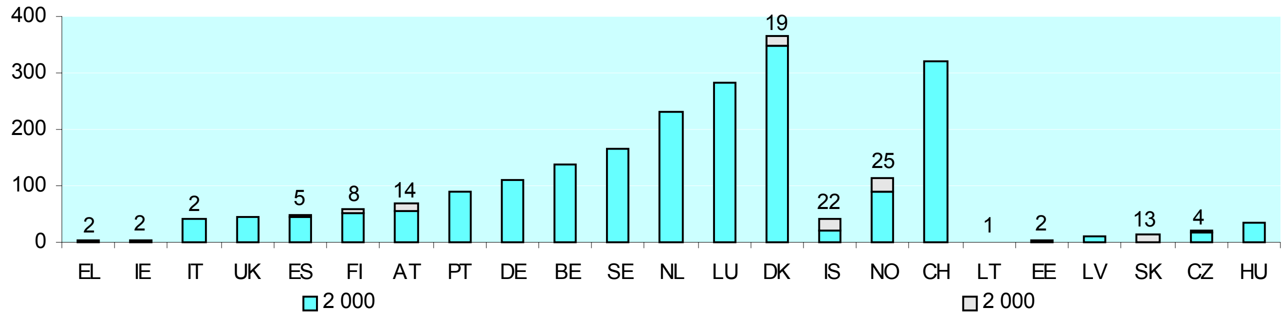
Relevant Sectors: **Households, Industry, Services, Tourism**

Targets

The objective of Directive 2000/76/EC [17] is to prevent or limit, as far as practicable, negative effects on the environment from the incineration and co-incineration of waste, in particular emissions to air, soil, surface water and groundwater, and the associated risks to human health. The Directive imposes stringent operational conditions and technical requirements, through fixing emission limits for waste incineration and co-incineration plants within the Community. All types of waste incineration, including municipal waste and co-combustion, are covered by the Directive.

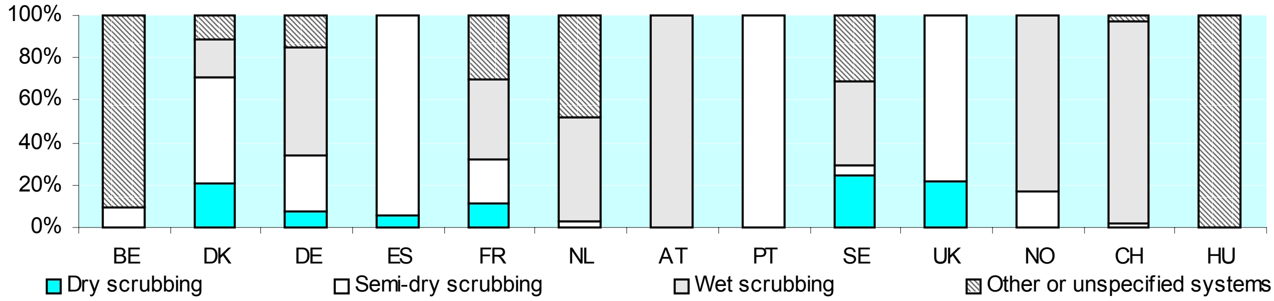
Municipal and hazardous waste incinerated with energy recovery (latest year available)

kg per capita



Use of flue gas cleaning systems by type[1)] (2000-2001)

% of furnaces



Source: Eurostat
1) BE: 86% unspecified systems ; NL: 40% of furnaces use semi-dry + wet scrubbing ; HU: electrostatic precipitator only.

Comments

DK, IT, NL, AT, PT, FI, IS, NO and HU have increased incineration of municipal waste since 1990, while EL, IE and LT still have no incinerators for this waste. Levels of incineration vary, depending on the number and location of suitable incinerators, but the recovery of energy from the process, mainly for heating or generating electricity, is widespread.

According to the ISWA, almost all incineration plants in Europe are equipped with a flue gas cleaning system[18]. The systems most commonly used are semi-dry and/or wet scrubbing, followed by dry scrubbing, either separately or combined (e.g. dry or semi-dry + wet). The level of scrubbing technology differs greatly. In FR large quantities of waste are incinerated in systems fitted only with dust removers, or scrubbing systems. In ES, IT, PT and FI, where very little waste is incinerated, similar systems are in use. DE, AT and SE have a large number of plants equipped with additional special equipment to remove nitrogen oxides or dioxins and mercury from the flue gas. In DK[19], 46% of total waste incineration at the end of 2000 was handled in plants that meet the limits set out in Directive 2000/76/EC for dioxin. This variation in levels of cleaning technology is one of the issues the Directive is intended to tackle.

[17] OJ L 332 of 28.12.2000, p. 91 – 111.
[18] Flue gas cleaning systems refer to dry, semi-dry, wet scrubbing, electrostatic precipitator, bag house filter, flue gas condensation, multi cyclone, selective catalytic/non-catalytic reduction, carbon injection, mechanical collector, or others
[19] Source: Danish EPA.

WA-3: Hazardous waste generated

Definition and purpose

The purpose of this indicator is to show the trend in the amount of hazardous waste generated by all economic sectors. Council Directive 91/689/EEC [20] defines hazardous waste, based on a list of properties. On this basis, Commission Decision 2000/532/EC [21], as amended by Council Decision 2001/573/EC [22], established a harmonised list of wastes (European Waste Catalogue). At national level, additional waste types may be declared hazardous if, in the opinion of a Member State, they display any of these properties.

The sectors are defined according to the NACE classification of economic activities, with NACE E Electricity, gas, & water supply split into Energy production (NACE 40) and Water purification and distribution (NACE 41).

Hazardous waste generated and hazardous waste recovered [1) 2)]

1 000 tonnes

	Total generation			Agriculture		Mining		Manufacturing		Energy		Construction		Water		Total recovery		
	1990	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1990	1995	2000
BE	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	508	634
DK	:	252	287	:	:	:	:	116	87	:	:	45	8	:	:	:	200	185
DE	13 079	9 686	11 372	:	:	:	:	3 940	4 323	:	:	:	:	:	:	:	1 631	1 361
EL	450	350	391	:	:	:	:	:	:	:	:	:	:	:	:	121	100	114
ES	1 708	3 394	3 063	:	:	:	4	:	1 345	:	27	:	:	:	:	:	:	1 300
FR	7 000 e	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	172	222
IE	:	248	370	:	:	:	:	:	:	:	1	:	:	:	:	:	103	153
IT	3 246	2 708	4 058	9	6	4	6	2 166	2 522	:	119	26	:	48	2	:	125	1 903
LU	:	200	197	:	:	:	:	:	:	:	:	:	:	:	:	:	43	72
NL	1 040	1 004	1 500	3	:	50	65	418	497	4	8	20	:	3	2	38	144	339
AT	:	595	972	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
PT	:	668	:	:	:	:	3	:	300	:	2	:	0	:	:	:	:	:
FI	:	485	:	:	:	:	:	:	:	:	:	1	:	:	:	:	61	:
SE	154	:	:	:	:	:	2	:	801	:	:	:	:	:	:	:	:	:
UK	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
IS	:	6	8 p	:	:	:	:	:	:	:	:	:	:	:	:	:	5	6
NO	:	650	631	:	:	:	:	418	438	:	:	:	8	:	:	30	:	:
CH	:	831	1 043	:	:	:	:	:	:	:	:	:	:	:	:	:	51	73
CZ	:	6 005	2 817	:	26	:	14	:	1 660	:	522	:	162	:	9	:	557	1 003
EE	:	7 273	6 200	:	:	:	:	:	:	:	:	:	:	:	:	:	372	141
CY	:	50	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
LV	:	180	82	0.1	0.1	0.01	:	78	79	0.2	0.2	0.1	0.1	41	32	:	:	:
LT	:	153	111	:	:	:	:	:	:	:	:	:	:	:	:	:	:	78
HU	4 691	2 274	951	:	:	:	:	:	:	:	:	:	:	:	:	348	489	:
MT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
PL	:	3 866	1 601	:	:	:	:	:	:	:	:	:	:	:	:	:	:	400
SI	:	170	68	:	:	:	4.6	:	59	:	0.5	:	0.6	:	0.1	:	:	:
SK	:	1 168	1 630	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

Source : Eurostat and national sources
1) Some figures refer to the closest or latest (e.g. 2001) year for which data is available (limit +/- 1 or 2 years before or after). Therefore some totals do not match the sum of the sectors, e.g. LV (total generation + manufacturing: 2000 data, water: 1999 data).
2) NL: due to a change of definition in 1998, the figures show a large increase.

Methodology and data problems

Ideally the data should correspond to the list of wastes derived from the European Waste Catalogue. However the main source currently available is the OECD/Eurostat Joint Questionnaire on waste, which classifies hazardous waste according to the Y-codes of the Basle Convention [23]. Most of the data provided are based on national definitions of hazardous waste types. Data availability should improve when the Community list of hazardous waste is applied by the Member States and the Waste Statistics Regulation is fully implemented.

Given these limitations, data quality and comparability are limited and trends should be interpreted with care.

Relevance: Yellow	Accuracy: Yellow	Time Rep.: Yellow	Spatial Rep.: Yellow

[20] OJ L377 of 31.12.1991, p.20.
[21] OJ L 226, 06.09.2000, p. 0003 - 0024
[22] OJ L 203, 28.07.2001, p. 0018 – 0019. The amendments refer to a number of entries relating to waste containing dangerous silicones and construction materials containing asbestos.
[23] Convention on the control of transboundary movements of hazardous waste and their disposal (1994).

WA-3: Hazardous waste generated

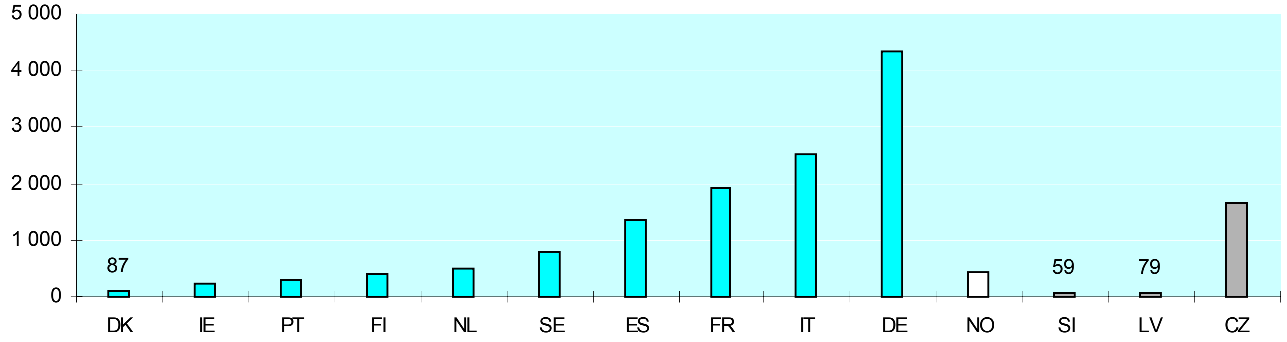
Relevant Sectors: **Industry, Services, Energy, Agriculture, Households**

Targets

Directive 91/156/EEC [24] lays down the basic principles for waste management. Articles 3-4 state that Member States shall support the reduction of the generation of hazardous wastes, the reduction of their hazardous properties and their recovery and must ensure that wastes are recovered, recycled or disposed of without danger to human health or harm to the environment. Article 5 aims to make the EU self-sufficient in waste disposal facilities by ensuring that adequate waste disposal installations are made available.

Hazardous waste generated by the manufacturing sector (latest year available)

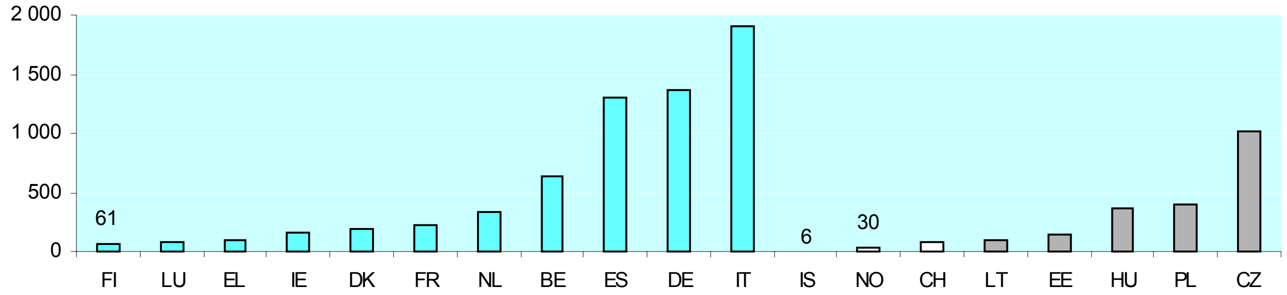
1 000 tonnes



Source: Eurostat and national sources

Hazardous waste recovered (latest year available)

1 000 tonnes



Source: Eurostat and national sources

Comments

Overall only around 10% of hazardous waste generated is recovered, though data for some countries does not include waste recovered on site. The highest recovery levels are in DK (64%), IS (75%) and LT (70%).

Clearly the generation of hazardous waste depends to a large extent on the structure of industry in a country. The manufacturing sector accounts for around one third of all hazardous waste generated in DK, DE, and NL, 44% in ES, and around 63% in IT. In NO, the share is 69%, in CZ, 59%, and around 90% in LV and SI. Of all manufacturing industries, the chemical branch produces the highest levels of hazardous waste. The record levels in Estonia are generated during the treatment of oil shale to produce fuel, which accounted for 6 of the 6.2 mio. tonnes of hazardous waste generated in that country in 2001.

[24] OJ L078, 26.03.1991, p. 32 – 37

WA-4: Municipal waste generated

Definition and purpose

The purpose of this indicator is to track the amount of municipal waste which is generated per capita and, by implication, the impact of measures to reduce waste.

Municipal waste is waste collected by or on behalf of municipalities. It includes waste from households, commercial activities, office buildings and institutions, as well as waste with similar properties from businesses and municipal services. Household waste includes bulky waste and separately collected fractions of waste such as paper, clothes, etc.

Municipal waste is classified according to the following main categories: paper, paperboard & paper products, plastics, glass, metals, food waste, garden waste & similar materials, and other similar waste.

Municipal and household waste generated [1)]

kg per capita

	Municipal waste generated								Household waste generated							
	1990	1995	1996	1997	1998	1999	2000	2001	1990	1995	1996	1997	1998	1999	2000	2001
BE	421	443	440	474	471	476	484	:	:	360	354	373	374	372	378	:
DK	:	567	619	588	593	627	665	:	:	500	527	526	528	558	579	:
DE	634	533	543	556	537	:	:	:	:	:	400	406	388	:	:	:
EL	296	306	344	372	388	405	421	432	:	:	:	:	:	:	:	:
ES	:	:	:	:	:	:	:	:	323	380	390	437	442	465	520	:
FR	:	501 s	509 s	512 s	516 s	517 s	531 s	:	:	416	425	428	432	434	448	:
IE	:	431	:	:	523	:	626	:	:	273	:	:	315	:	332	:
IT	:	450 s	453 s	463 s	466 s	492 s	502 s	:	:	:	:	:	:	:	:	:
LU		591	587	606	627	648	655	:	:	476	480	496	500	523	548	:
NL	:	549	567	587	589	599	615	610	:	469	486	505	510	527	541	538
AT	417	432	510	526	526	556	:	:	326	329	345	360	361	383	:	:
PT	302	392	406	414 s	432 s	437	445	:	:	:	:	:	:	:	:	:
FI	623	:	:	429	447	465	483	:	:	:	:	171	:	:	:	:
SE	375 s	:	:	:	452 s	:	429 s	:	:	:	:	:	:	:	:	:
UK	:	487	500	521	533	558	:	:	:	:	388	402	404	424	:	:
IS	:	622 s	631 s	645 s	661 s	685 s	710 s	727	:	240	243	248	250	258	265	272
NO	472	626	632	619	647	596	615	:	189 e	270	273	287	309	314	324	335
CH	617	602	605	610	619	643	664	:	:	:	:	:	:	:	:	:
CZ	:	:	310 e	318 e	293	327	334	273	:	:	:	:	:	:	:	:
EE	:	357 s	383 s	406 s	383 s	394 s	461 s	:	:	200	304	254	237	180	146	:
CY	546	551	596	614	638	657	679	692	455	:	:	:	:	:	:	:
LV	:	260 s	260 s	250	243	239	:	301	:	:	:	:	:	:	:	:
LT	:	416 s	389 s	407 s	426 s	334 s	294 s	283 s	:	:	:	:	:	:	:	:
HU	530 e	464 e	473 e	493 e	491 e	490 e	453 e	458	238	248	266	280	276	279	266	264
MT	:	:	:	:	385	473	494	550	:	:	:	:	301	273	277	270
PL	292	285	301	315	306	319	316	287	191	198	214	211	209	216	219	208
SI	:	515	:	:	584	:	:	479	:	288	:	:	369	:	:	:
SK	:	302 s	317 s	:	316 s	315 s	316	:	:	227	196	:	204	:	165	:

Source: Eurostat and national sources
1) e = country estimate,   p = provisional
Some figures for 1990 and 1995 refer to the closest year for which data is available (limit +/- 1 or 2 years before or after).

Methodology and data problems

The availability and quality of the data are the main obstacles in the formulation of this indicator and therefore trends should be interpreted carefully. Currently no uniform definition of municipal waste is applied by Member States. Most of the data come from municipalities and some data sets may not include all materials collected separately for recycling because this type of collection is often carried out by private organisations or enterprises rather than on behalf of municipalities.

In order to increase the quality of data and improve analysis, more information on waste collected by private enterprises is required.

Relevance: Green	Accuracy: Yellow	Time Rep.: Yellow	Spatial Rep.: Yellow

WA-4: Municipal waste generated

Relevant Sectors: **Households, Services, Tourism, Industry**

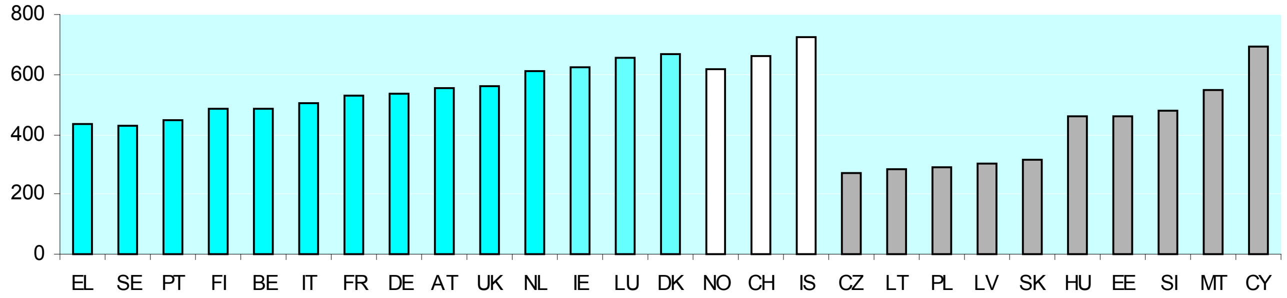
Targets

The 6EAP prioritises waste prevention and has set a target of a 20% reduction in the quantity of waste going to final disposal from 2000 levels by 2010.

Under the proposal for a Directive (COM(2001) 729) [25], targets for packaging waste include recovery rates of between 60-75% and recycling rates of between 55-70% to be achieved by 30 June 2006. More recently, (COM(2002) 291) proposes more ambitious targets to be achieved by the end of 2008, including a minimum overall recovery rate of 60% and of 55-80% for recycling *(see WA-6)*.

Municipal waste generated (latest year available)

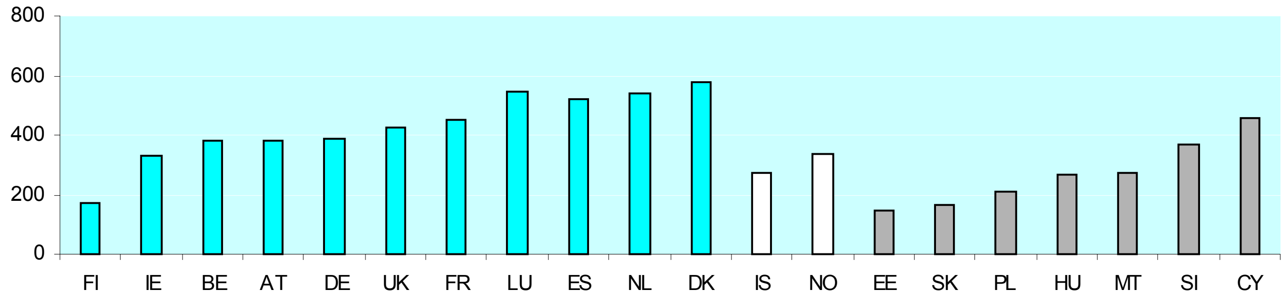
kg per capita



Source: Eurostat and national sources

Household waste generated (latest year available)

kg per capita



Source: Eurostat and national sources

Comments

Comparison of countries is difficult because the definitions applied differ from one country to another. However, the data provided show that 14 of the 28 countries (DK, DE, FR, IE, IT, LU, NL, AT, UK, IS, NO, CH, CY and MT) generate more than 500 kg per capita of municipal waste every year. In some countries (DE, FI, CZ and LT) the observed reduction may be caused by the expanded activities of private waste collection enterprises, which are not covered by official statistics.

The differences between municipal waste and household waste are the result of the different collection systems in countries: in Belgium, Denmark, Luxembourg, the UK and Poland municipal waste comes mainly from households; in France, the Netherlands, Austria and Finland, it includes considerable amounts of waste from commercial and industrial activities.

[25] revising Directive 94/62/EEC on packaging and packaging (OJ L 365 of 31.12.1994).

WA-5: Industrial waste generated

Definition and purpose

This indicator shows the amounts of industrial waste generated by the economic sectors corresponding to NACE section C Mining & quarrying, section D Manufacturing and section E Electricity, gas, & water supply (split into Energy - NACE 40 - and Water - NACE 41).

Industrial waste is a direct output of industrial processes, and is strongly linked to the process technology used. Waste reduction is rarely achieved by adding end-of-pipe technology, but rather through the introduction of new process technologies. As the indicator tracks the generation of waste, the development of the indicator is linked to economic development. Industrial waste includes all types of waste, i.e. hazardous, non-hazardous and mineral waste, and is disposed of in different ways, e.g. incineration, landfill or recycling *(see WA-1, WA-2 and WA-6)*.

Industrial waste generated [1)]

1 000 tonnes

	Mining & quarrying			Manufacturing			Energy production			Water purification & distribution		
	1990	1995	2000	1990	1995	2000	1990	1995	2000	1990	1995	2000
BE	:	618	:	:	13 240	13 779	:	1 183	1 287	:	56	131
DK	:	:	:	:	2 563	2 948	1 139	1 699	1 176	:	:	:
DE	88 840	7 849	7 460	84 051	15 605	17 422	31 058	1 057	1 386	:	:	:
EL	3 800	3 900	:	:	6 682	:	7 680	9 320	:	:	:	:
ES	:	:	:	:	:	20 308	:	:	2 463	:	:	:
FR	:	:	:	:	101 000 e	98 000 e	:	:	:	:	:	980
IE	:	2 200	3 510	:	3 781	5 113	:	353	450	:	58	:
IT	:	350	500	:	22 210	28 422	:	:	1 358	:	1 183	355
LU	:	:	:	:	:	:	:	:	:	:	:	:
NL	391	335	268	7 665	8 893	19 148	1 553	1 403	1 652	:	70	124
PL	91 111	82 371	45 804	32 846	22 608	58 975	17 845	16 647	18 101	538	436	1 730
FI	:	28 000	29 600	:	15 910	:	:	1 274	:	:	:	:
SE	:	:	63 818	:	:	19 780	:	:	:	:	:	:
UK	107 000	82 000	118 000	56 000	56 000	50 000	13 000	13 000	:	35 000	36 000	:
IS	:	:	:	:	10	10	:	:	:	:	:	:
NO	9 000	:	:	2 000	3 147	3 339	:	:	21 e	:	:	:
CH	:	:	:	:	:	:	:	:	:	:	:	:
CZ	:	361	2 678	:	12 193 e	9 618	:	15 439	7 967	:	539	777
EE												
CY	:	:	:	:	:		:	:	:	:	:	:
LV	-	-	-	-	-	-	-	-	8	-	-	-
LT	:	1 143	1 201	-	-	-	-	-	-	-	-	-
HU	10 630	10 123	2 233	30 980	6 692	2 605	4 300	2 878	3 612	:	:	790
MT	:	:	:	:	:	422	:	:	:	:	:	:
AT	21	:	:	12 955	14 284	:	1 150	:	:	6 619	2 297	2 330
PT	:	4 726	4 665	:	13 316	8 356	:	882	126	:	:	:
SI	:	70	196	:	1 212	1 493	:	1 044	273	:	44	42

Source: Eurostat and national sources

1) Some figures refer to the closest year for which data is available (limit +/- 1 or 2 years before or after).

Methodology and data problems

Data availability is poor and varies from country to country. Data quality and the definition of industrial waste also vary from one country to another. A large portion of industrial waste is mineral and in some countries is used as a construction material. This fraction is often classified as a by-product rather than waste. This may also be the case for some organic residuals from the food industry. In the Netherlands, for instance, manufacturing waste in 2000 includes around 10 mio. t. of residuals ('by-products') from the food and basic metal industries which are recovered and considered as waste. Therefore the scope for comparisons of countries based on this data is limited.

Relevance: Green	Accuracy: Red	Time Rep.: Red	Spatial Rep.: Red

WA-5: Industrial waste generated

Relevant Sectors: **Industry**

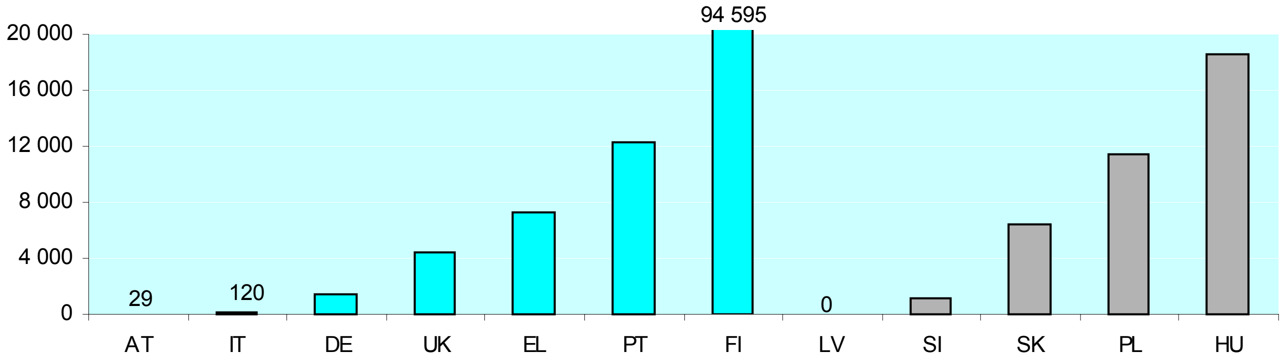
Targets

The 6EAP target is to reduce the quantity of waste going to final disposal by around 20% based on 2000 levels by 2010 and in the order of 50% by 2050.

Intensity of industrial waste generation by sectors – (latest year available)

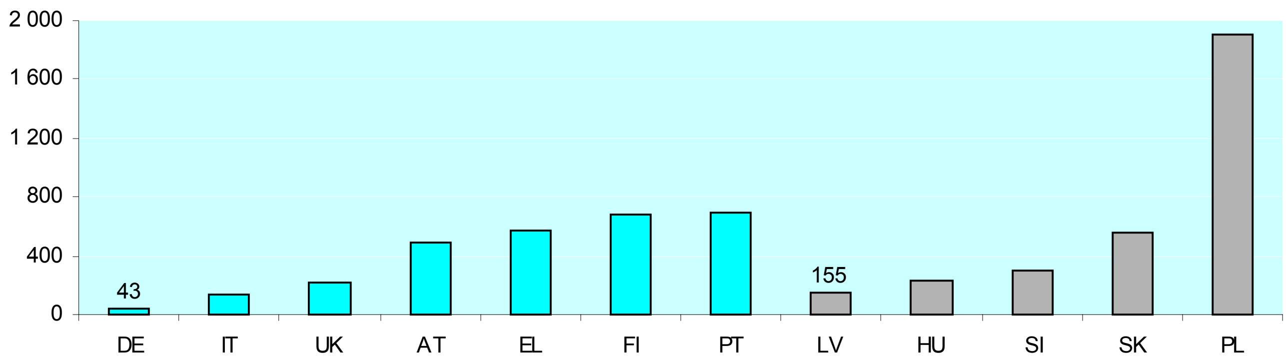
Mining and quarrying

tonnes per million EUR of GVA[1] at current basic prices



Manufacturing

tonnes per million EUR of GVA[1] at current basic prices



Source: Eurostat and national sources
1) GVA = gross value added

Comments

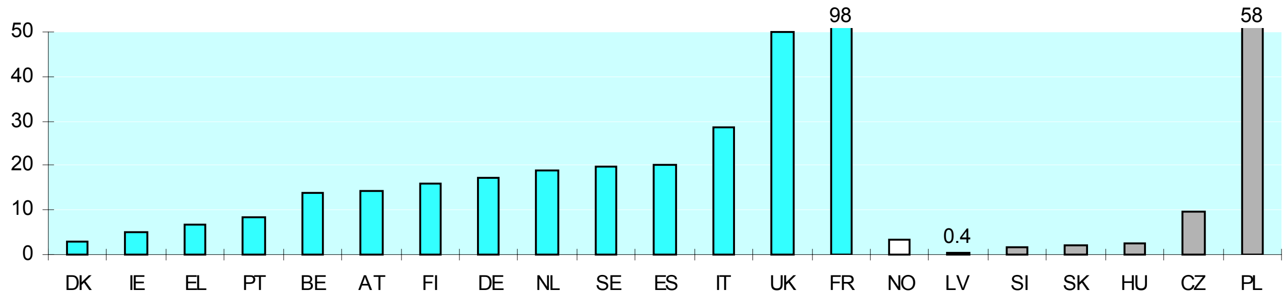
In general, the amount of industrial waste generated over the last decade has remained fairly stable in the EU, though significant reduction can be seen in Germany, following re-unification (move away from lignite and hard coal). In Poland, waste from mining activities has been cut by half, while waste from the other sectors (manufacturing, water, and, to a lesser extent, energy) has increased considerably.

The sectoral breakdown presented in the above graph shows significant differences between countries: this is largely dependent on the structure of industry and economy within the country. In general, 'basic' industries have a high waste intensity which reflects a low value added and relatively high levels of waste, whereas sophisticated products have a low waste intensity as they give rise to high value added while generating relatively small quantities of waste. The waste intensity (the amount of waste generated per EUR of value added) of the whole industrial sector cannot be estimated, for lack of data.

WA-5: Industrial waste generated (continued)

Generation in the manufacturing branch (2000 or latest year available)

million tonnes

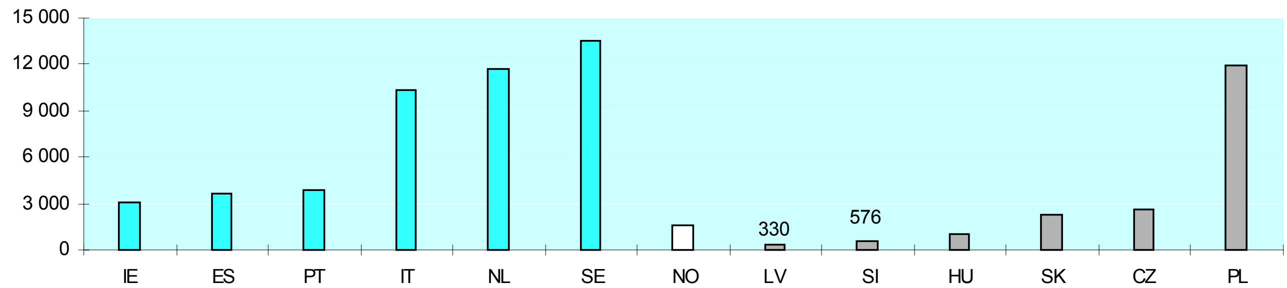


The trends among countries and branches are difficult to analyse as data is sparse. However, the total quantity of manufacturing waste generated in the 21 European countries in the above graph is estimated to have exceeded 360 mio. t. in 2000. The manufacturing sector is dominant in most countries. (The 6 countries not shown, LU, IS, CH, CY, LT, MT make up less than 3% of total population of EU, EFTA and Accession Countries i.e. 12.7 mio. vs. 463.3 mio).

The analysis of the sectors in the graphs below is based on the 13 countries (ES, IE, IT, NL, PT, SE, NO, CZ, HU, LV, PL, SI, SK) that provide data for at least one year close to 2000 for the sectors analysed. These countries generated just over 180 mio. t. of manufacturing waste or 863 kg per capita (for a population of 209 million).

Food, textile, wood, paper and printing (NACE 15-22)

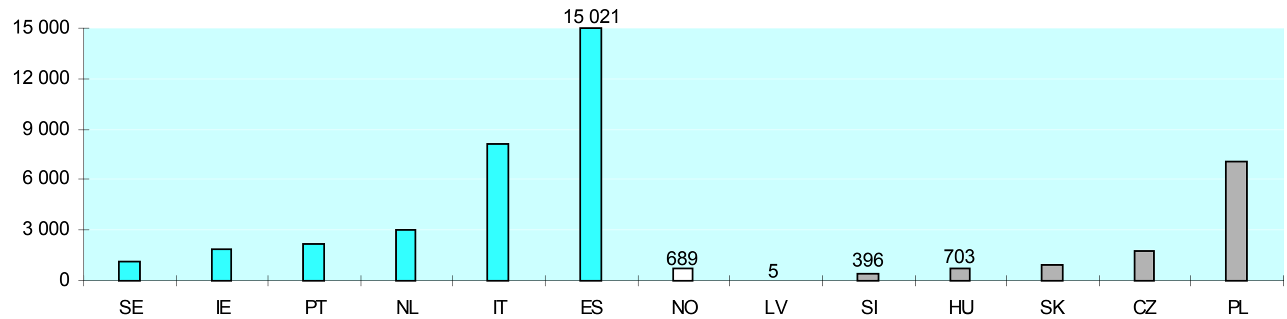
1 000 tonnes



This category generates around 66.6 mio. t. or 318 kg per capita of mainly organic waste, more than half of which (38 mio. t. or 180 kg per capita) comes from food waste. Wood and paper contribute 13.5 and 10.7 mio. t. respectively, with Sweden and Slovekia as main contributors. Textile and printing account for less than 5 mio. t. overall.

Oil refineries, chemicals, rubber, non-metallic mineral products (NACE 23-26)

1 000 tonnes

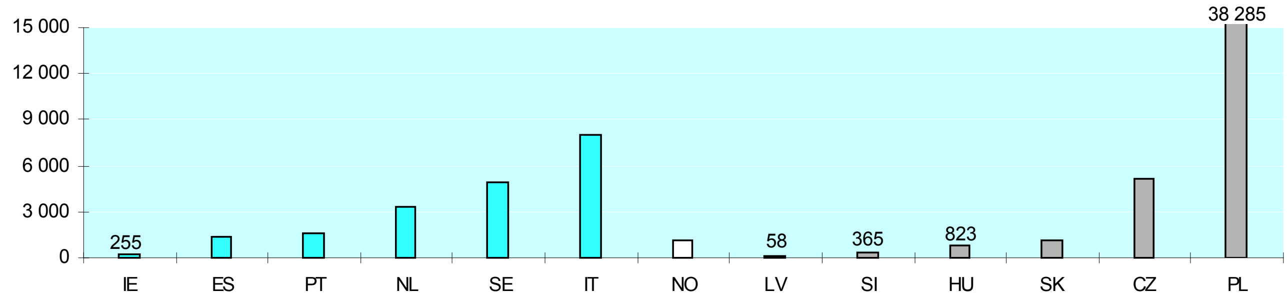


This group generates 43 tonnes of waste (205 kg per capita), most of which is of chemical and mineral origin. The dominant branch is non-metallic mineral products (24.7 mio. t), followed by chemicals (15.7 mio. t).

WA-5: Industrial waste generated (continued)

Metals and machinery (NACE 27-35)

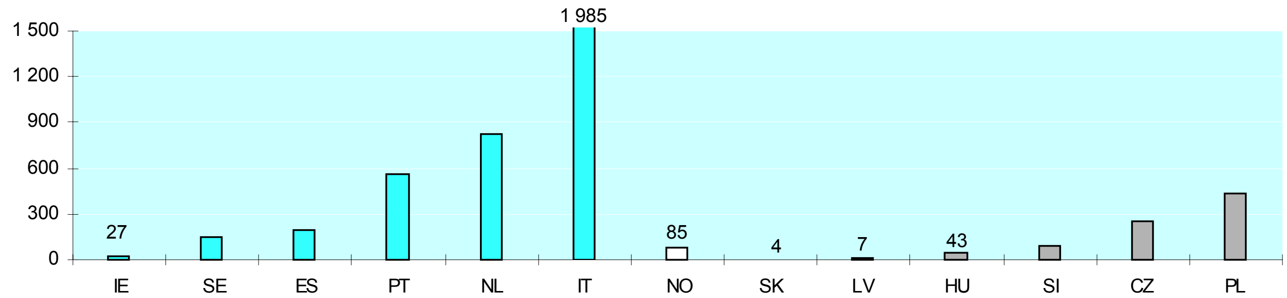
1 000 tonnes



Basic metals and fabricated metal products & machinery together generate most of the waste in this group, with a total of almost 66.6 million tonnes. Most of this is metallic waste, of which more than 80% comes from the basic metals industry (55 mio. t) in 5 countries, namely Poland (37.5 mio. t), Italy (4.5 mio. t), Sweden (3.7 mio. t), the Czech Republic (3.8 mio. t) and the Netherlands (2.5 mio. t).

Other manufacturing branches (NACE 36-37)

1 000 tonnes



The other manufacturing branches (manufacturing of furniture, manufacturing n.e.c. and recycling) are responsible for the generation of around 4.7 million tonnes of waste, of a non-specific composition. No remarkable levels appear except in Italy (almost 2 mio. t.).

The overview provided by the above graphics focuses on the data available for the manufacturing branch and its main sub-branches. Unfortunately, data is not available for all of these and for each country, nor is it available for the sub-branches of the other industrial branches mining, energy production, water purification & distribution, and construction.

WA-6: Recovery and recycling of packaging waste

Definition and purpose

The indicator is defined as the levels of recovery and recycling attained by the EU Member States for selected packaging materials including glass, paper and fibre board, metals (aluminium and steel), plastic (PVC, PP, PS, PET, PE and other), wood, composites and other materials.

Various treatment methods aimed at avoiding landfilling or incineration, are applied to products at the end of their life cycle, e.g. reuse, recycling or recovery. The definitions of these methods are not harmonised among countries. However, reuse is generally defined as the use of products or materials at the end of their life for the original or other purposes without any (important) processing, while recycling requires a true reprocessing, excluding energy recovery. The term 'recovery', which is defined by reference to a list of operations (see Council Directive on Waste 75/442/EEC), refers to recycling and incineration with energy recovery.

Packaging waste recovered and recycled

tonnes or % of apparent consumption [1)]

	Total apparent consumption of packaging			Recovery rate			Recycling rate		
	1997	1998	1999	1997	1998	1999	1997	1998	1999
EU-15	59 157 993	63 003 154	63 511 925	53%	54%	56%	46%	47%	50%
BE	1 356 100	1 426 360	1 477 830	62%	73%	71%	62%	64%	59%
DK	906 792	837 927	846 061	84%	89%	92%	40%	50%	53%
DE	13 712 900	14 090 200	14 626 800	83%	81%	80%	81%	80%	79%
EL	710 800	794 800	855 500	37%	35%	34%	37%	35%	34%
ES	5 834 671	6 318 358	6 239 979	37%	37%	42%	34%	34%	38%
FR	11 070 000	11 641 000	11 999 000	55%	56%	57%	40%	42%	42%
IE	602 197	682 688	704 038	15%	15%	17%	15%	15%	17%
IT	10 220 000	10 584 000	11 134 000	30%	34%	37%	28%	32%	34%
LU	76 508	77 496	79 701	51%	56%	59%	51%	56%	59%
NL	2 745 000	2 525 000	2 593 000	78%	84%	85%	55%	62%	64%
AT	1 269 000	1 115 000	1 130 000	66%	70%	72%	61%	65%	66%
PT	:	1 025 025	1 211 172	:	35%	35%	:	35%	35%
FI	418 300	424 100	442 600	54%	55%	60%	42%	45%	50%
SE	923 400	955 200	972 000	65%	82%	73%	58%	75%	65%
UK	10 003 325	10 244 000	9 200 244	27%	33%	41%	24%	28%	35%

Source: European Commission, EEA and national sources
1) Apparent consumption refers to the amount of packaging put on the market.

Methodology and data problems

The collection systems for waste packaging materials are used for household waste but also for commercial and industrial activities.

The analysis of waste recycling activities via the recycling rate (% of apparent consumption) may lead to some confusion, as the calculation of apparent consumption can only be approximate, because of the difficulties in calculating the exact amounts of packaging materials associated with finished products which are imported or exported.

At present, this data source does not include data on recycling in the Acceding Countries.

Relevance: Green	Accuracy: Yellow	Time Rep.: Yellow	Spatial Rep.: Yellow

WA-6: Recovery and recycling of packaging waste

Relevant Sectors: **Households, Transport, Services, Industry, Tourism**

Targets

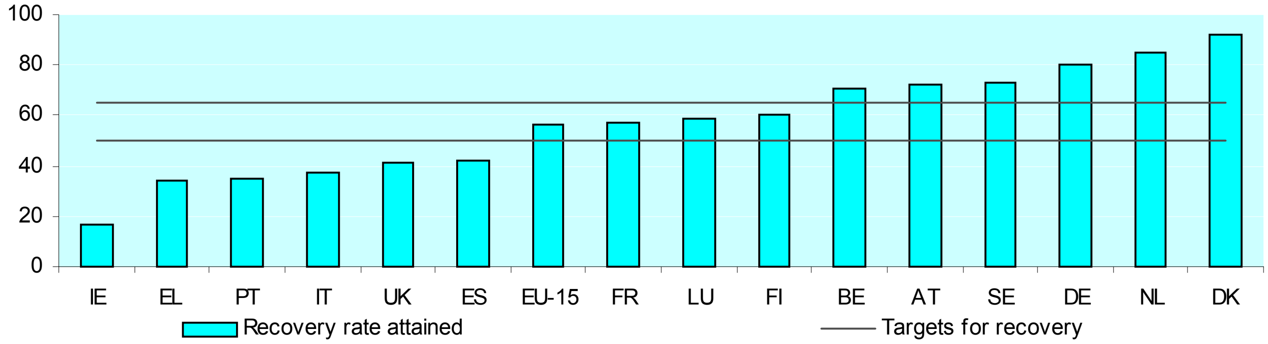
Agenda 21 recommended that all industrialised countries should have a national programme for efficient waste reuse and recycling by the year 2000, and that developed countries should establish voluntary targets for the recycling of waste. Several countries have set national recycling targets for the packaging industry.

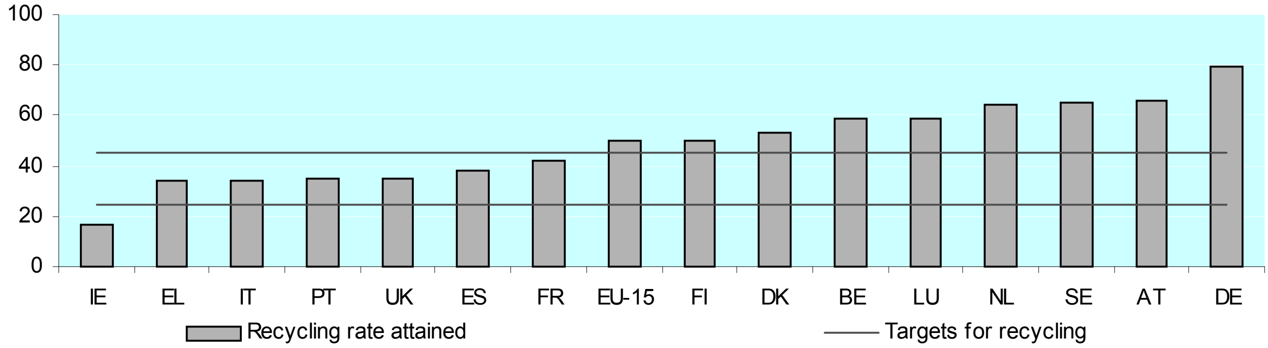
Directive 94/62/EEC [26] on packaging and packaging waste set targets for Member States of 50-65% recovery and 25-45% recycling of packaging waste by weight, with a minimum of 15% per material, to be reached by June 2001 (2005 for EL, IE and PT). These targets have been used for the graphs below. COM(2001) 729 proposes target recovery rates for packaging waste of 60-75% and recycling rates of 55-70%, to be achieved by 30 June 2006.

The more recent Common Position N°18/2003 proposes more ambitious targets for packaging, to be achieved by the end of 2008 (and by a date between 2010-2012, still to be fixed, for EL, IE and PT). These targets are:
minimum overall recovery rate of 60%, and of 55-80% for recycling, with 60% for glass, paper and cardboard, 50% for metal, 22.5% for plastic and 15% for wood.

Rates of recovery and recycling of total packaging attained in 1999 versus 2001 targets [1)]

%





Source: European Commission and national sources
1) Targets applicable by 2005 for EL, IE and PT.

Comments

The amount of packaging placed on the market was estimated at around 63.5 mio. tonnes in 1999, made up of paper: 41%, glass: 24%, plastic: 16%, wood: 12% and metal: 7%. The separate collection of these different waste fractions is the most important contributor to the reduction of municipal waste.

The trend is towards more recovery and recycling, in accordance with the constraints set by EU legislation. Nevertheless amounts of packaging (and other) waste are constantly increasing and the figures provided show large variations in the amount of recovered or recycled packaging materials from one country to another, depending largely on the availability of collection facilities as well as proximity to recycling facilities (NACE 37).

If the proposals set out in Common Position N°18/2003 are adopted, the consequent recycling and recovery of waste materials should have a positive effect on the decrease in waste levels.

[26] OJ L 365 of 31.12.1994.

WA-6: Recovery and recycling of packaging waste (continued)

Rates of recovery and recycling attained by selected packaging materials in 1999 vs. 2001 targets

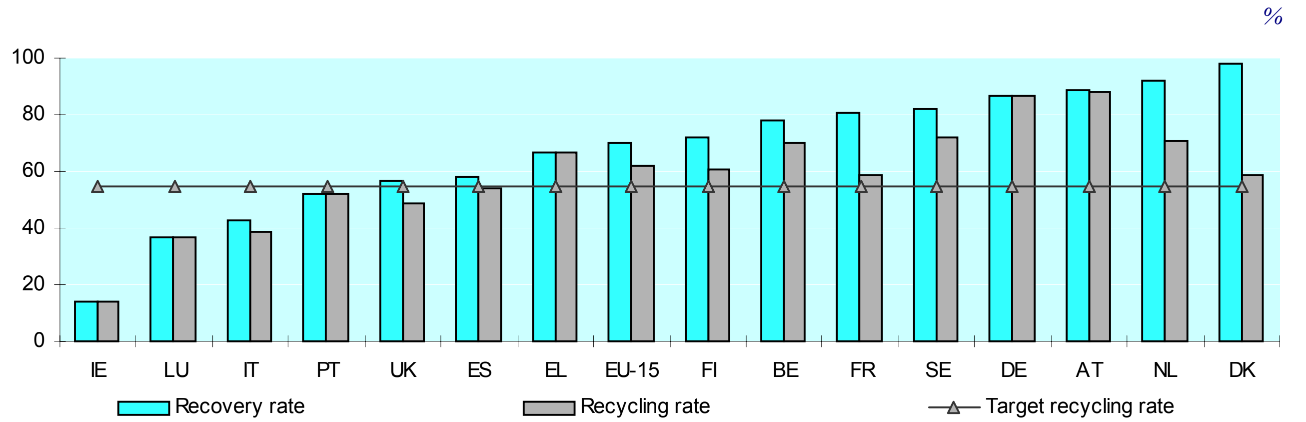
Under existing legislation, at least 50% of packaging material should be recovered and 25% recycled by 2001, with a minimum of 15% to be recycled for each type of packaging material. Based on this 15% target, the minimum amounts of packaging material to be recycled at EU-15 level compared to the amounts actually recycled in 1999 were the following:

- paper: around 3.8 million tonnes to be recycled versus a total of almost 18 million tonnes actually recycled ;
- glass: 2.3 vs. 8.5 million tonnes;
- plastic: 1.5 vs. 2.1 million tonnes;
- wood: 1.2 vs. 2.9 million tonnes ;
- metal: 0.7 vs. 2.1 million tonnes.

In 1999, the target of 50% recovery was attained at EU level, although EL, ES, IE, IT, PT and UK still fell short of this level. The upper target (65%) has only been reached in BE, DK, DE, NL, AT and SE. For recycling, all EU countries met the lower target, except Ireland, which has a reduction target of 25% for 2001. The upper target of 45% was exceeded by BE, DK, DE, LU, NL, AT, FI and SE. Individually, most Member States managed in 1999 to recycle 15% or more of each material, with some exceptions for paper, and especially for plastic and metal *(see below)*.

The graphs below illustrate country achievements, based on the targets set in COM(2001) 729.

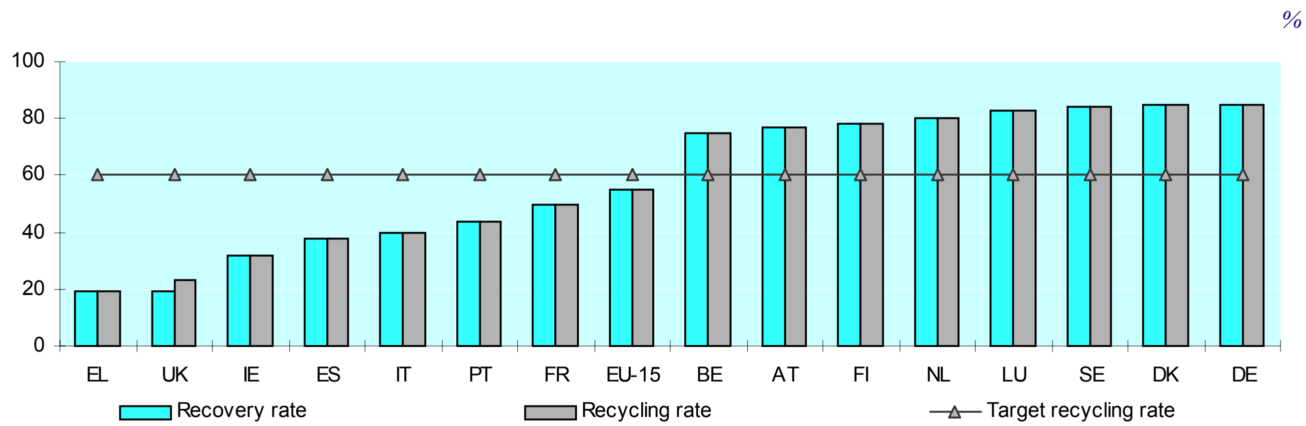
Packaging paper and fibreboard



Source: European Commission and national sources

Paper and fibreboard is the main packaging material used in the EU and has the highest recovery and recycling rates, exceeding 50% in almost all countries. Only Ireland, for which the target year is 2005, is below the 15% minimum recycling target rate.

Packaging glass



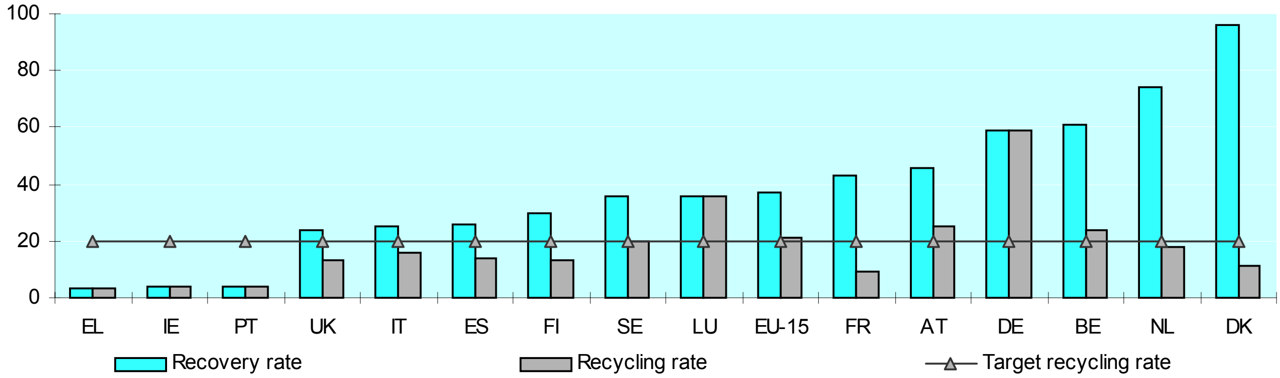
Source: European Commission and national sources

Glass is the second most important packaging material. In general, recovery and recycling rates are equal, reaching 50% or more in 9 of the 15 countries (BE, DK, DE, FR, LU, NL, AT, FI, SE).

WA-6: Recovery and recycling of packaging waste (continued)

Packaging plastic

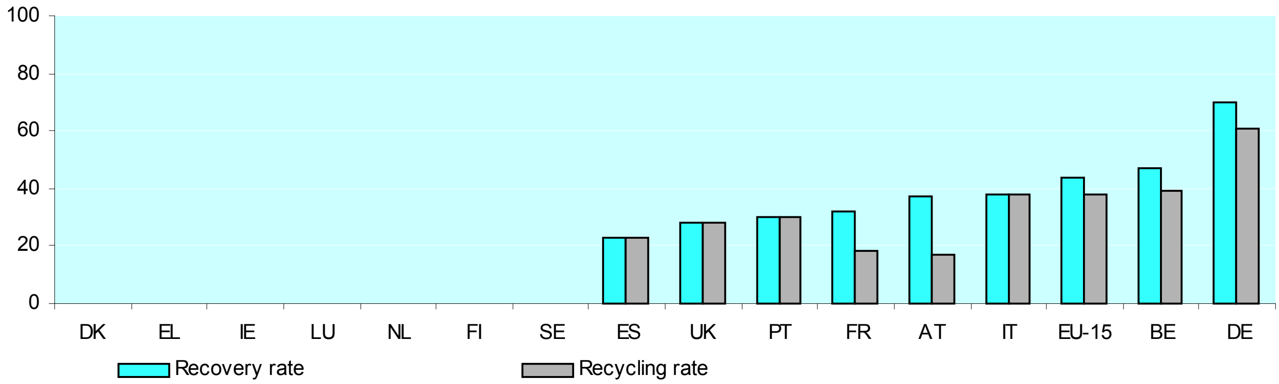
%



Source: European Commission and national sources

Packaging wood

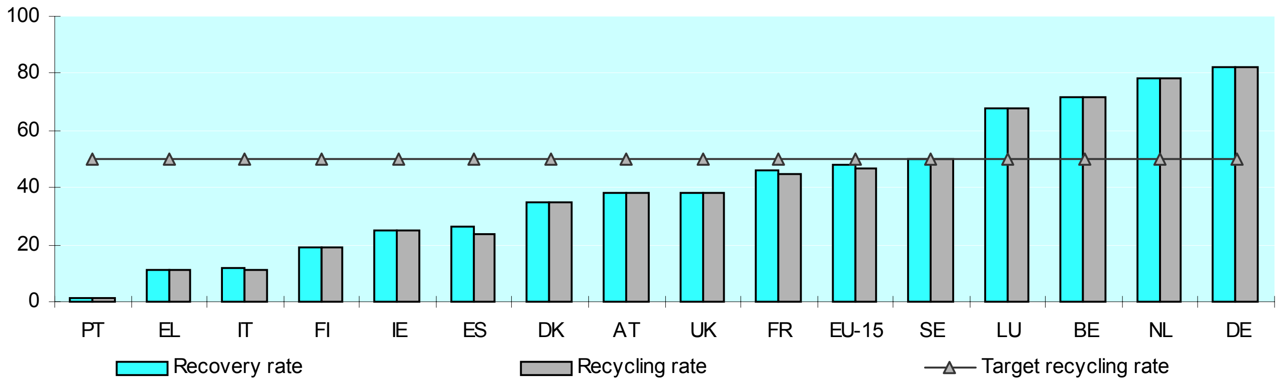
%



Source: European Commission and national sources

Packaging metal

%



Source: European Commission and national sources

The recovery and recycling of plastic, wood and metal are more limited than for the other materials. There is no specific target for the recycling of wood, which is mentioned in the Directive as a material but with no obligation to report data. For plastic, in 1999 DK, ES, FR, and the UK had not reached the 15% minimum target for recycling. This is also the case for EL, IE and PT, for whom the target year is 2005. For metal, neither EL, IT nor PT meet the 15% minimum target, and only five countries (BE, DE, LU, NL, SE) meet the 50% target.

CLIMATE CHANGE

Introduction

The Earth's average surface temperature rose by around 0.6°C during the 20^{th} century and most scientific advisors to the world's governments conclude that evidence is growing that most of the warming over the last 50 years is attributable to human activities, such as burning of fossil fuels and deforestation. The resulting increased energy in the weather system is predicted to lead to increased storms and rainfall in some areas, while others may suffer drought. How fast and where this change will happen is still controversial, but there is consensus in the scientific community that the consequences may be serious.

In 1992 the United Nations Conference on Environment and Development, in Rio de Janeiro, adopted the Framework Convention on Climate Change as the basis for global political action. As a result of this convention, new commitments to reduce emissions of greenhouse gases beyond the year 2000 were agreed in Kyoto in December 1997. The Kyoto Protocol, signed by 84 parties and ratified or accessed by 32 parties, stipulates that Annex 1 Parties (mainly industrialised countries) shall individually or jointly reduce their aggregate emissions of a "basket" of six greenhouse gases to 5% below 1990 levels by the period 2008-2012. For its part, the EU committed itself to an 8% reduction in aggregate emissions by the same period.

In contrast to this political target the Inter-governmental Panel on Climate Change (IPCC) indicates the need for an immediate 50-70% reduction in global CO_2 emissions in order to stabilise global CO_2 concentrations at the 1990 level by 2100.

In order to meet the 8% target, Council Decision (2002/358/EC[27]) of 25 April 2002 sets individual targets for each of the EU Member States for the period 2008-2012. Under this so-called 'burden sharing', several countries are allowed to increase emissions, provided these are offset by reductions in other countries. In March 2000 the Commission launched the European Climate Change Programme (ECCP[28]) to prepare additional policies and measures, as well as an emissions trading scheme, to ensure that the EU achieves its target.

The 'Kyoto basket' of six greenhouse gases form the basis of the indicators presented here. The first three indicators cover CO_2, CH_4 and N_2O which account for around 98% of the environmental pressure leading to climate change. The fourth indicator covers the Kyoto industrial gases hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF_6).

The 6 gases can be weighted by their Global Warming Potentials (GWP) which refer to the amount of heat trapped by the different gases, which varies from one gas to another: CO_2 = 1, CH_4 = 21, N_2O = 310 and SF_6 = 23 900. The amount of time the gas in question is likely to remain in the atmosphere is another important feature, and therefore GWP also vary depending on the time scale used, normally a 100-years time horizon, as recommended by the IPCC. This means that over a period of 100 years, one tonne e.g. of CH_4 will have a warming effect equivalent to 21 tonnes of CO_2. Based on these GWP, indices of emissions of greenhouse gases have been calculated, to show how far the EU has been successful in reducing greenhouse gas emissions.

The World Summit on Sustainable Development (WSSD or Rio+10) held in Johannesburg in 2002 has set no specific targets for climate change, but has made commitments towards the urgent and substantial increase in the share of renewables as well as the setting-up of programmes on sustainable consumption and production which should both have indirect positive effects on climate change.

For more detailed analysis see: *Analysis of greenhouse gas emission trends and projections in Europe*, EEA 2003.

[27] OJ L176 of 05/07/2002

[28] EU policies and measures to reduce greenhouse gas emissions: Towards a European Climate Change Programme (ECCP), COM (2000) 88.

CC-1: Emissions of carbon dioxide (CO_2)

Definition and purpose

The purpose of this indicator is to monitor the total net anthropogenic emissions of carbon dioxide (CO_2), the most important greenhouse gas. Anthropogenic CO_2 emissions result mainly from the use of energy, from industrial processes, agriculture, land-use change and forestry (LUCF).

The total national CO_2 emissions shown in the tables below are compiled according to the IPCC Guidelines for National Greenhouse Gas Inventories and exclude emissions from international aviation or maritime bunkers and from LUCF.

Emissions of CO_2

tonnes CO_2 per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	9.2	9.2	8.9	8.7	8.7	8.8	9.0	8.8	8.9	8.8	8.8	:
BE	11.8	12.4	12.2	12.0	12.3	12.6	12.8	12.4	12.7	12.4	12.3	12.4
DK	10.3	12.3	11.2	11.6	12.3	11.7	14.2	12.4	11.3	10.8	9.9	10.2
DE	12.8	12.2	11.6	11.3	11.1	11.0	11.3	10.8	10.7	10.4	10.4	10.6
EL	5.9	6.0	6.2	5.9	6.2	6.5	6.2	6.7	6.9	7.5	7.7	:
ES	5.9	6.0	6.2	6.0	6.2	6.5	6.2	6.7	6.9	7.5	7.8	7.7
FR	7.0	7.4	7.2	6.8	6.7	6.8	7.0	6.9	7.2	7.0	6.9	7.0
IE	9.1	9.2	9.3	9.2	9.5	9.7	9.9	10.5	10.9	11.3	11.7	12.1
IT	7.6	7.5	7.5	7.3	7.2	7.7	7.6	7.6	7.8	7.9	8.0	8.0
LU	:	:	:	:	:	:	:	:	:	:	12.4	12.4
NL	10.7	11.2	11.0	11.0	11.0	11.2	11.6	10.8	11.1	10.8	11.0	11.3
AT	7.8	8.2	7.4	7.4	7.5	7.8	8.3	8.2	8.2	8.0	8.0	8.5
PT	4.4	4.6	5.1	4.9	5.0	5.3	5.0	5.2	5.7	6.4	6.2	6.3
FI	12.6	12.2	11.7	11.7	12.9	12.3	13.3	13.0	12.5	12.4	12.0	13.1
SE	6.6	6.6	6.5	6.4	6.9	6.7	7.1	6.5	6.6	6.4	6.1	6.2
UK	10.2	10.2	9.9	9.6	9.6	9.4	9.7	9.2	9.3	9.1	9.1	9.3
IS	8.5	8.1	8.5	8.8	8.5	8.6	8.9	9.2	9.1	9.4	8.6	:
NO	8.2	7.8	8.0	8.3	8.6	8.6	9.3	9.3	9.3	9.3	9.2	9.2
CH	6.7	6.9	6.7	6.3	6.2	6.2	6.3	6.1	6.3	6.3	6.3	:
CZ	15.8	:	:	:	12.6	:	12.9	13.3	12.5	11.8	12.4	12.5
EE	24.2	22.9	16.7	13.5	14.2	12.9	13.7	13.8	12.6	11.6	12.3	12.5
CY	6.9	6.9	7.5	7.8	7.7	7.6	8.0	8.0	8.6	8.8	9.2	:
LV	8.4	6.8	5.2	4.7	4.6	4.0	3.8	3.6	3.5	3.1	2.9	3.3
LT	10.7	:	:	:	:	4.1	4.4	4.4	4.5	:	:	:
HU	6.9	6.5	5.9	5.9	5.8	5.8	5.9	5.8	5.7	6.0	:	:
MT	5.4	5.8	6.1	6.2	6.3	6.3	6.3	6.3	6.3	6.5	6.4	:
PL	10.0	9.6	9.7	9.5	9.7	9.0	9.6	9.4	8.7	8.5	8.1	8.2
SI	7.2	6.8	6.8	7.1	7.2	7.5	7.9	:	:	:	:	:
SK	11.2	9.9	9.1	8.5	8.0	8.2	8.2	8.3	8.1	7.9	7.4	7.7

Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

Methodology and data problems

Methods for estimating CO_2 removals by LUCF are still being discussed. Further work by UNFCCC and IPCC is needed to verify the data and minimise the levels of uncertainty.

Relevance: Green	Accuracy: Green	Time Rep.: Green	Spatial Rep.: Green

CC-1: Emissions of carbon dioxide (CO_2)

Relevant Sectors: **Energy, Industry, Transport, Households**

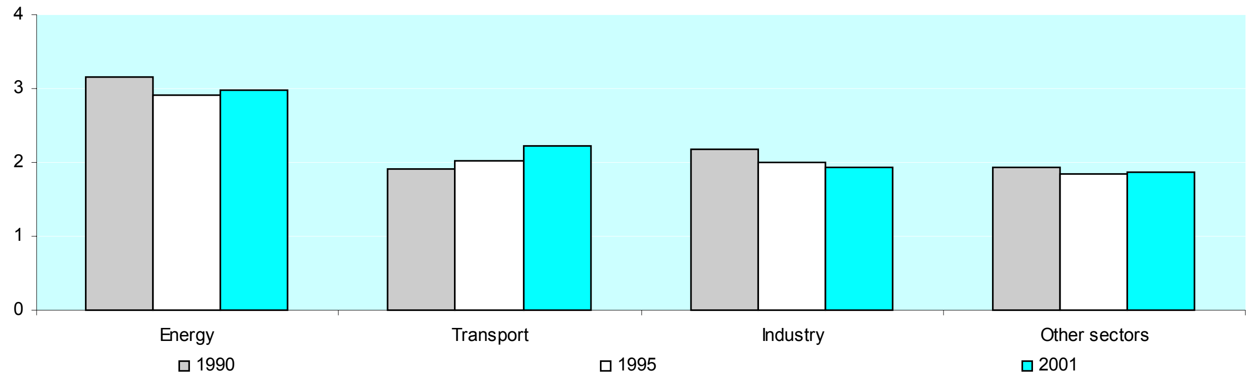
Targets

Under the Kyoto Protocol, the EU has set itself a target of an 8% reduction in greenhouse gas emissions, compared to 1990 levels, by the period 2008-2012. Council Decision (2002/358/EC) of 25 April 2002 sets out individual targets for each of the EU Member States for the period 2008-2012 under which several countries are allowed to increase aggregated emissions, while others have accepted to reduce emissions by more than 8%.

Moreover, the EU strategy on CO_2 emissions from passenger cars aims to reduce CO_2 emissions from passenger cars to an average of 120 g/km for all new passenger cars marketed in the Union, by 2010 at the latest .

EU-15 emissions of CO_2 by economic sectors [1)]

tonnes CO_2 per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.
1) See Annex on Nomenclatures for sector definitions.

Comments

In EU-15, CO_2 emissions per capita decreased by 3% between 1990 and 2000-2001. There is no common trend at country level. While Germany and the UK achieved significant reductions, other countries show an increase in CO_2 emissions. In Germany the reduction can be attributed to structural changes in industry after re-unification, a move to less carbon intensive fuels and more energy efficient technology. In the UK the reduction is partly the result of major changes in the electricity industry, with a move away from use of coal towards gas for electricity generation (see also *RD-5*). In those countries where emissions increased, high economic growth was observed.

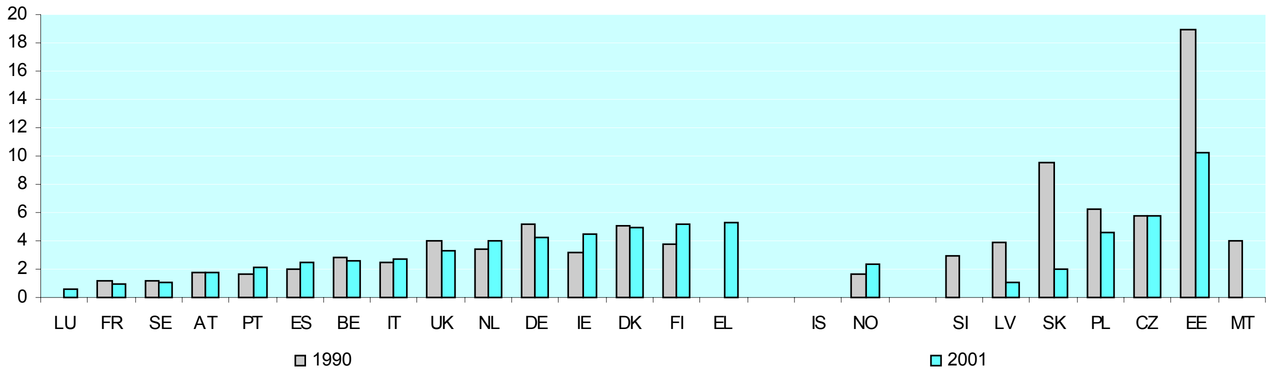
In the Acceding countries the trend since 1990 has been downwards, except in Cyprus. However, in the last year or so, some small increases have been observed in most acceding countries, reflecting increased growth in these countries.

The bulk of CO_2 emissions in the EU comes from the burning of fossil fuels, whether in power stations, industry, households or for transport purposes. The energy sector (dominated by electricity generation) is the most important, contributing 33% of total emissions in 2000-2001. The industry sector is responsible for 22% of total emissions, and shows an 8% improvement compared to 1990. On the other hand, emissions from the transportation sector, which does not include international aviation or sea transport, continue to rise, with an increase of 20% since 1990, and now account for 25% of total CO_2 emissions. The sector known as “others” is mainly composed of residential and commercial heating and is responsible for the remaining 21% of total emissions.

CC-1: Emissions of carbon dioxide (CO_2) - continued

CO_2 emissions of the energy sector

tonnes CO_2 per capita



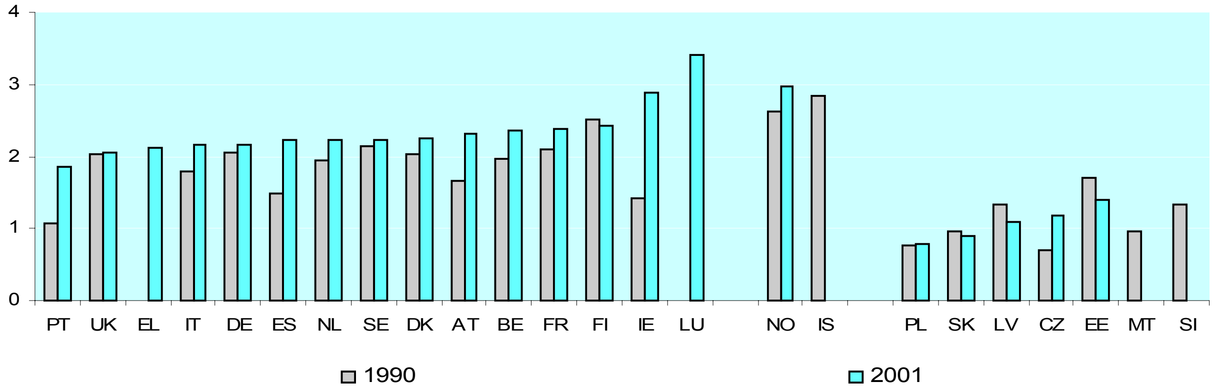
Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

CO_2 is the most important greenhouse gas emitted by the energy sector. Per capita levels vary between 0.6 kg in Luxembourg and 10.2 kg in Estonia, which is more than 3 times the average (3.2 kg) for the countries shown.

This large variation reflects the differences in energy sources used to generate electricity (Luxembourg imports most of its electricity, and therefore emissions from this sector are low). A high use of nuclear power, hydropower or imports (France, Sweden, Austria) results in low emissions from this sector. Significant reductions can be observed in Belgium (-10%), Germany (-20%), France (-19%) and the UK (-16%), partly as a result of fuel switching. Significant reductions are also recorded in most Acceding countries, especially in Estonia (-46%), Lavtia (-71%) and the Slovak Republic (-80%).

CO_2 emissions of the transport sector

tonnes CO_2 per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

In contrast to other sectors, the situation for the internal transport sector [29] is quite similar for all countries, showing a steady rise or stagnation at a high level.

The relative increase in CO_2 emissions is higher for countries with lower absolute emissions (Spain, Ireland, Austria and Portugal). Ireland in particular has seen a spectacular doubling of emissions, from being one of the lowest emitters from the transport sector in 1990 to the second highest in 2001, reflecting the economic boom in the country during the nineties. Emissions have remained relatively stable in countries with the highest petrol prices.

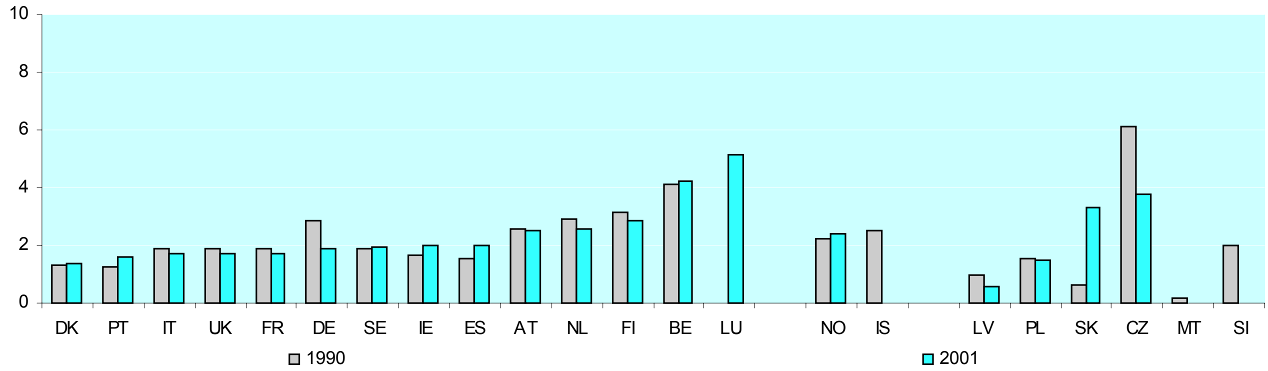
In the Acceding countries, emissions have grown by almost 70% in the Czech Republic since 1990 but decreased or remained stable in the other countries.

[29] See Annex on Nomenclatures.

CC-1: Emissions of carbon dioxide (CO_2) - continued

CO_2 emissions of the industry sector

tonnes CO_2 per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

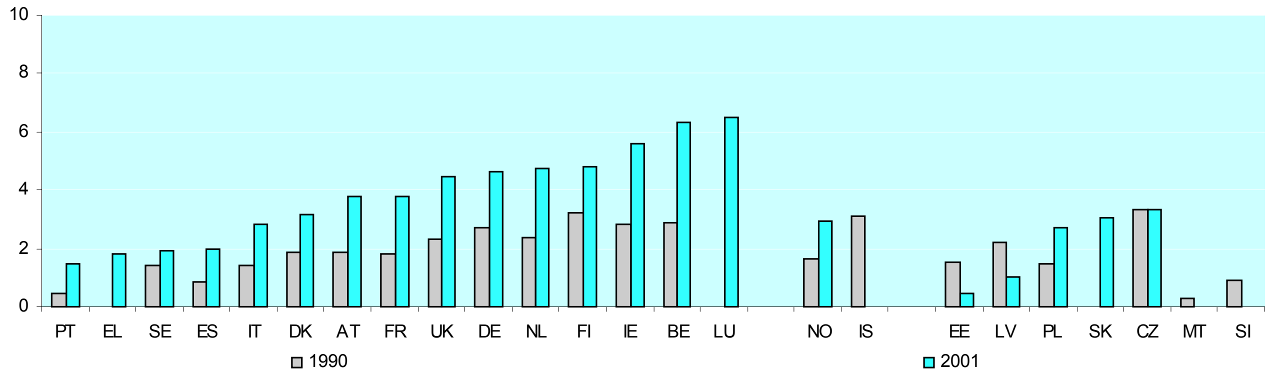
Emissions for the industry sector are below 6 kg per capita in all countries, with an average at around 2 kg per capita.

Structural changes and economic growth affect CO_2 emissions from the industrial sector. Structural changes, particularly following re-unification, are the main reason for the reduction in Germany (-33%). Emissions from Ireland, Spain and Portugal increased significantly (+21%, +27% and +28% respectively), reflecting above average economic growth in these countries.

With an average at 3.3 kg per capita, up from 0.6 kg, the Slovak Republic has increased emissions from this sector by more than 400%, as a result of sharp economic growth in this country (per capita GDP up 66 % during the same period).

CO_2 emissions of the remaining economic sectors

tonnes CO_2 per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

CO_2 emissions from the remaining sectors are dominated by residential and commercial space heating. The clear advantage of the Mediterranean countries (Greece, Spain, Italy and Portugal) in this respect are reflected by lower levels of emissions from these sectors (1.5 to 2.8 tonnes per capita).

Among the Scandinavian countries, with their high building insulation standards, Sweden has maintained emissions at significantly lower levels than other countries (1.9 tonnes per capita). Choice of fuel also has an impact, and the high use of electricity and wood (considered by UNFCCC to be CO_2 neutral) for heating in Sweden also contributes to the lower level of emissions. For the same reason, values for France are also relatively low. However, in most EU-15 countries emissions from these sectors are rising steeply, doubling in some cases (BE, FR, IE, IT, UK) since 1990, increasing by 140% in Spain and tripling in Portugal.

There is no harmonised trend among Acceding countries, with values varying between 0.4 (Estonia) and 3.3 kg per capita (Czech Republic).

CC-2: Emissions of methane (CH_4)

Definition and purpose

The main sources of anthropogenic methane (CH_4) are agriculture (mainly from livestock and manure handling), waste landfill sites, coal mining and natural gas production and distribution.

The purpose of this indicator is to monitor total anthropogenic CH_4 emissions. Although CH_4 emissions expressed in tonnes are lower than total CO_2 emissions, CH_4 has a high global warming potential (GWP) (21 times higher than CO_2, assuming a 100-year time horizon) and is the second biggest contributor to anthropogenic greenhouse gas emissions. CH_4 enters into complex chemical reactions in the atmosphere, also influencing ozone levels in the troposphere and stratosphere; ozone is also a direct greenhouse gas. Some estimate that methane's indirect effect on global warming, resulting from these chemical reactions, may be comparable in magnitude to its direct effect, although considerable uncertainty remains.

The emissions data presented below are compiled according to the IPCC "Guidelines for National Greenhouse Gas Inventories" which have been formally adopted by the Parties of the UNFCCC as the international method for estimating emissions. They are presented in tonnes of CO_2 equivalent, which takes into account the higher GWP.

CH_4 emissions

tonnes CO_2 equivalents per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	:
BE	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0
DK	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0
DE	1.3	1.1	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6
EL	:	:	:	:	:	:	:	:	:	:	:	:
ES	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0
FR	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1
IE	3.4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.4	3.4	3.3
IT	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6
LU	:	:	:	:	:	:	:	:	:	:	:	1.1
NL	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.4	1.4	1.3	1.3
AT	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1
PT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1
FI	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.0	1.0
SE	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7
UK	1.3	1.3	1.3	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.8	0.8
IS	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	:
NO	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.6	1.6
CH	:	:	:	:	:	:	:	:	:	:	:	:
CZ	1.6	:	:	:	1.3	:	1.2	1.2	1.1	1.0	1.0	1.0
EE	2.8	2.3	1.9	1.6	1.7	1.7	1.9	2.1	1.9	1.7	1.8	1.4
CY	:	:	:	:	:	:	:	:	:	:	:	:
LV	1.4	1.3	1.2	0.9	0.8	0.9	0.9	0.8	0.8	0.8	0.8	1.0
LT	:	:	:	:	:	:	:	:	:	:	:	:
HU	:	:	:	:	:	:	:	:	:	:	:	:
MT	0.9	0.8	1.0	1.0	0.9	1.0	1.0	0.8	0.8	0.8	1.0	:
PL	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.3	1.2	1.2	1.0
SI	1.2	1.2	1.2	1.2	1.2	1.2	1.2	:	:	:	:	:
SK	1.3	1.2	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8

Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

Methodology and data problems

Further work by UNFCC and IPCC is needed to verify the data and to minimise the levels of uncertainty. The uncertainties for methane are larger than for carbon dioxide, but considered adequate for assessing trends.

Relevance: Green	Accuracy: Green	Time Rep.: Green	Spatial Rep.: Green

CC-2: Emissions of methane (CH_4)

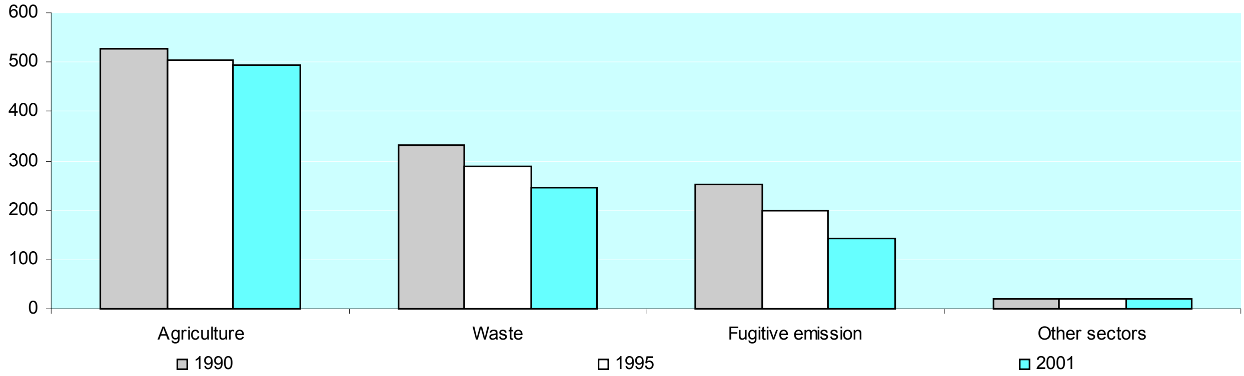
Relevant Sectors: **Agriculture, Households, Energy, Transport**

Targets

In response to the Kyoto Protocol, the EU has agreed to an overall 8% reduction, in relation to 1990 levels, in the emissions of a basket of 6 greenhouse gases, including methane, by the period 2008-2012. In order to meet this commitment, Council Decision (2002/358/EC) of 25 April 2002 sets out individual targets for each of the EU Member States, allowing several countries to increase aggregated emissions, while others reduce emissions by more than 8%.

EU-15 emissions of CH_4 by economic sectors – EU-15 [1)]

kg CO_2 equivalents per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.
1) See Annex on Nomenclatures for sector definitions.

Comments

In EU-15, the highest per capita methane emission figures are seen in Ireland, which has a high population of cattle and sheep, the main source of agricultural methane emissions, compared to its small human population. Agriculture is the most important source of anthropogenic methane emissions, accounting for 55% of the total in 2001, compared to 47% in 1990), with waste and waste water management accounting for 27% (down from 29%) and coal mining and natural gas distribution responsible for a further 16% (down from 22%).

The table shows a decrease in total anthropogenic methane emissions in EU-15 and the Acceding countries between 1990 and 2001. Reductions have been achieved through reduction in livestock numbers, better waste management and fewer losses in the gas distribution network and from coal mining, due in part to the closure of mines in several countries.

The more industrialised countries in which agriculture represents a very small part of the economy tend to have the lowest per capita emissions. These also tend to be the countries with the most advanced management systems for waste. Anaerobic decomposition of waste in landfill sites is the major source of gas from waste. Since 1990 emissions from waste have risen in five countries, Spain (+71%), Italy (+18%), Portugal (+10%), Belgium (+5%) and Greece (+4%). Over the same period Germany and Finland have managed to reduce emissions from waste by 60%, illustrating the improvements which might be expected as countries implement the Landfill Directive[30].

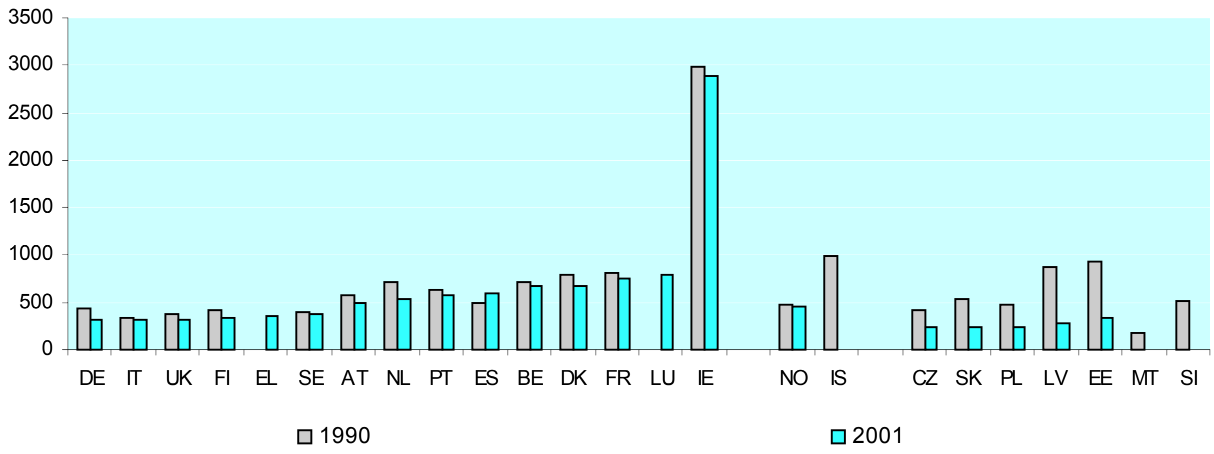
Emission levels in Acceding countries range from 0.8 tonne of CO_2 equivalents per capita in the Slovak Republic to 1.4 tonnes in Estonia. In general emission levels for these countries have fallen since 1990, with emissions in Estonia undergoing the strongest cut of about 50%.

[30] OJ L182 , 16/07/1999 p. 0001 - 0019

CC-2: Emissions of methane (CH_4) - continued

CH_4 emissions of the agricultural sector

kg CO_2 equivalents per capita

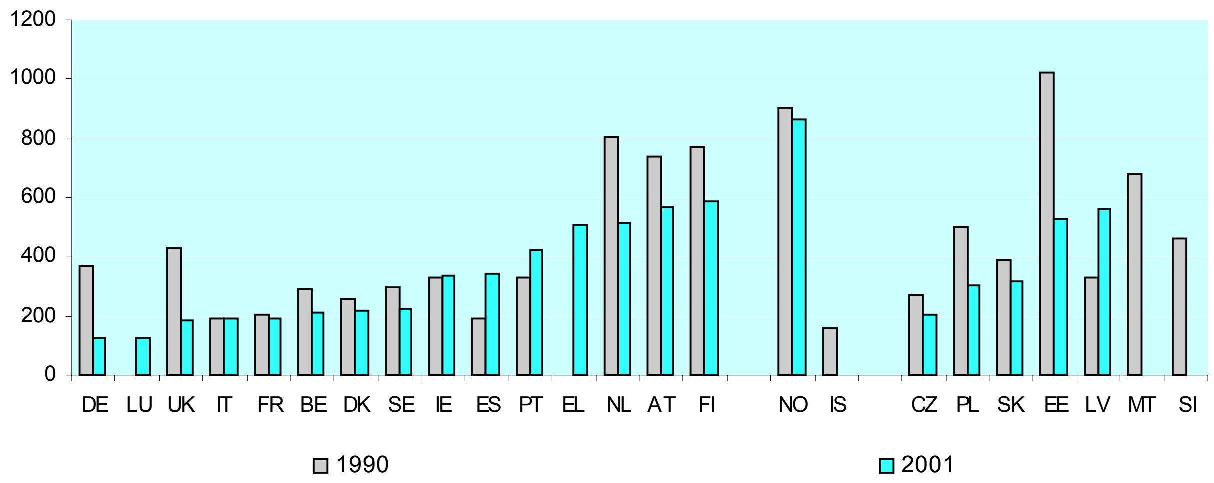


Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

Methane emissions in total have declined by one sixth since 1990, from 12 million to 10 million tonnes of CH_4. Cattle and sheep are the main source of agricultural methane emissions. Ireland, withits high livestock population compared to a small human population, has the highest level of emissions from agriculture, reaching almost 3 tonnes of CO_2 equivalents per inhabitant. Unlike other countries, the high level observed in Irish agriculture has been relatively constant since 1990, declining by only 2.8% over the period, while huge decreases are recorded in Germany (-28%), and especially the Acceding countries, where reductions range from 44% (Czech Republic) to 65% (Latvia).

CH_4 emissions of the waste management sector

kg CO_2 equivalents per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

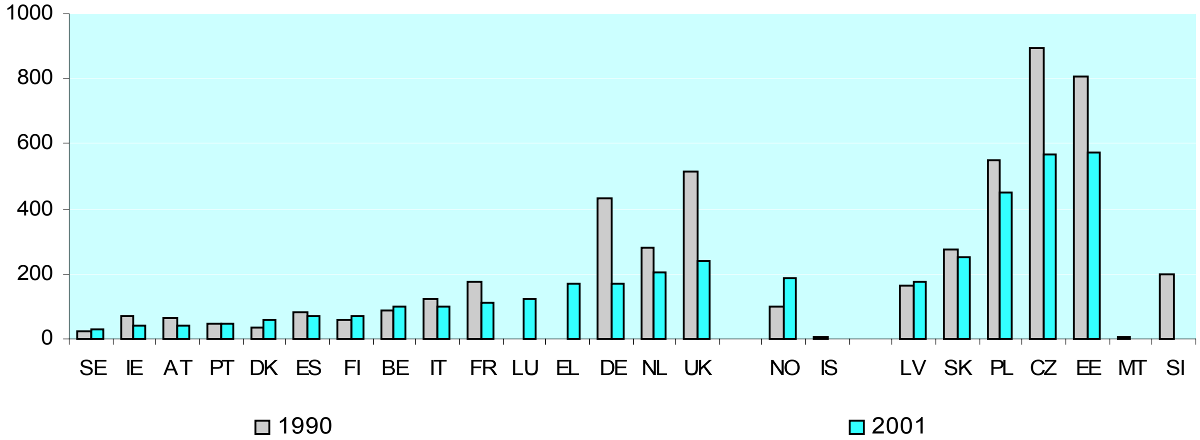
Emissions from the waste management sector have dropped by a quarter, with, among the EU-15 countries, only Spain and Portugal showing increases, due largely to increased waste landfilling. In the Acceding countries, Latvia undergoes the same upward trend, probably for the same reason.

On the other hand, Germany has managed to reduce emissions by 66% due to sharp reductions in the quantities of biodegradable municipal waste landfilled.

CC-2: Emissions of methane (CH_4) - continued

CH_4 fugitive emissions from fuels

kg CO_2 equivalents per capita



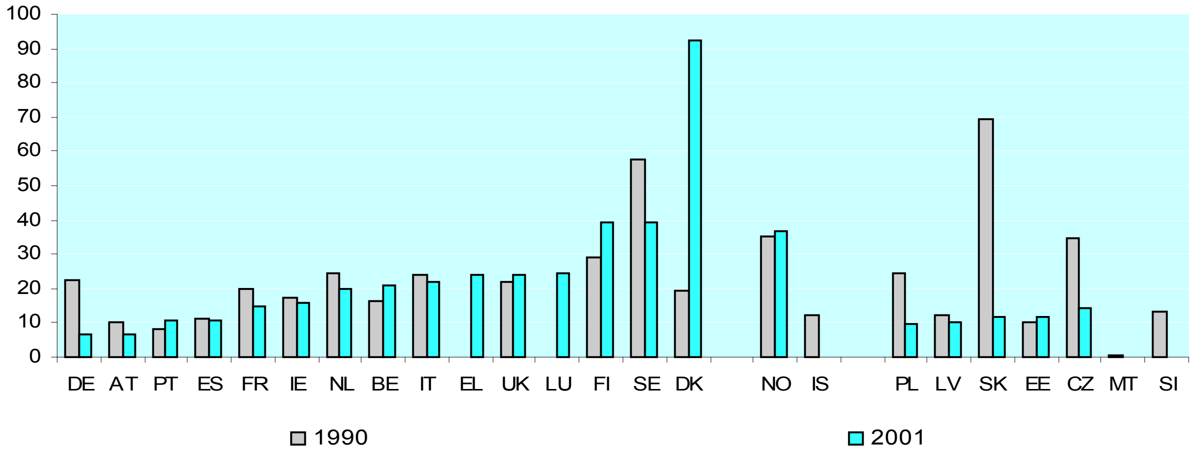
Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

Between 1990 and 2001 total fugitive emissions, i.e. losses from coal mines, oil and gas exploration, and natural gas distribution, fell from almost 6 million tonnes to 3.7 million tonnes. In the EU-15 in particular, a decline of 44% is recorded, with sharp cuts of over 50% in Germany and the UK. This is attributed to the closure of some coal mines, but, more importantly, to considerable investments in upgrading the natural gas distribution systems.

In the Acceding countries, the overall reduction from this sector was smaller, at 24% below 1990 levels, but per capita emissions, in general, still exceed by far the amounts recorded in EU-15.

CH_4 emissions of the remaining economic sectors

kg CO_2 equivalents per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

The contribution of the other economic sectors is negligible, falling from less than 450 to around 340 tonnes overall, that it is around 10 times lower than fugitive emissions from fuels, above.

CC-3: Emissions of nitrous oxide (N_2O)

Definition and purpose

The main purpose of this indicator is to monitor anthropogenic N_2O emissions. N_2O is one of the major greenhouse gases and its radiative forcing capacity is higher even than methane. The global warming potential for N_2O is around 310, assuming a 100-year time horizon, i.e. it is 310 times more potent than CO_2 as a greenhouse gas. Nitrous oxide emissions are produced mostly by denitrification processes in anaerobic environments with a high nitrate load, such as soils on which manure and other fertilisers have been spread and sediments in polluted water bodies. N_2O is also released in limited quantities by the use of fossil fuels.

The main sources of anthropogenic N_2O emissions are intensive agriculture and a number of industrial processes. Natural sources are poorly quantified but are probably twice as large as anthropogenic sources. They are not included in this indicator. Nitrous oxide is a particularly long lived greenhouse gas, and is also linked to ozone depletion as, during its long lifetime, N_2O can reach the stratosphere and react with the ozone.

The emissions below have been calculated according to the IPCC “Guidelines for the National Greenhouse Gas Inventories”, formally adopted by the Parties to the UNFCC as the international method for estimating emissions.

N_2O emissions

tonnes CO_2 equivalents per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	:
BE	1.2	1.2	1.1	1.1	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.1
DK	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.6
DE	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.8	0.7	0.7	0.7
EL	:	:	:	:	:	:	:	:	:	:	:	:
ES	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7
FR	1.6	1.6	1.5	1.5	1.5	1.5	1.6	1.6	1.4	1.3	1.3	1.3
IE	2.7	2.7	2.7	2.7	2.8	2.8	2.8	2.9	2.9	2.9	2.8	2.7
IT	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
LU	:	:	:	:	:	:	:	:	:	:	:	0.2
NL	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0
AT	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7
PT	0.8	0.8	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.8	0.8
FI	1.7	1.6	1.4	1.5	1.5	1.5	1.5	1.6	1.5	1.5	1.4	1.4
SE	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
UK	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8	0.8	0.7
IS	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.8	0.4	:
NO	1.3	1.3	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.2
CH	:	:	:	:	:	:	:	:	:	:	:	:
CZ	1.1	:	:	:	0.8	:	0.9	0.9	0.8	0.8	0.8	0.8
EE	0.7	0.6	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3
CY	:	:	:	:	:	:	:	:	:	:	:	:
LV	1.1	1.1	0.8	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5
LT	:	:	:	:	:	:	:	:	:	:	:	:
HU	:	:	:	:	:	:	:	:	:	:	:	:
MT	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	:
PL	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.6	0.6
SI	0.8	0.8	0.8	0.8	0.8	0.8	0.8	:	:	:	:	:
SK	1.2	1.0	0.8	0.7	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6

Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

Methodology and data problems

Estimating N_2O emissions is not as straightforward as estimating CO_2, and the uncertainties in the resulting data are more important than for CO_2. Further work by UNFCC and IPCC is needed to verify the data and to minimise the levels of uncertainty.

Relevance: Green	Accuracy: Green	Time Rep.: Yellow	Spatial Rep.: Yellow

CC-3: Emissions of nitrous oxide (N_2O)

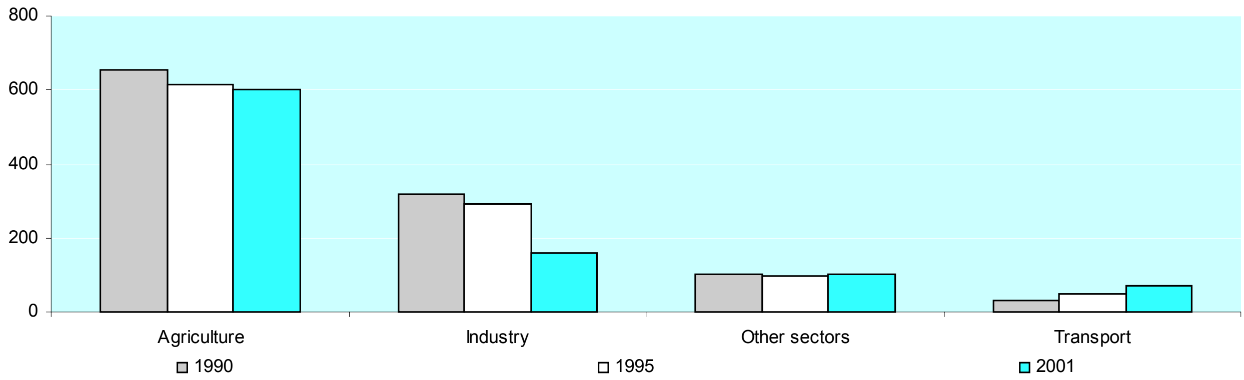
Relevant Sectors: **Agriculture, Industry, Energy, Transport**

Targets

N_2O is one of the gases included in the basket of greenhouse gases covered by the Kyoto Protocol. In order to meet its Kyoto commitment, Council Decision (2002/358/EC) of 25 April 2002 sets out individual targets for each of the EU Member States, allowing several countries to increase aggregated emissions, while others reduce emissions by more than 8%.

EU-15 emissions of N_2O by sector

kg CO_2 equivalents per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.
1) See Annex on Nomenclatures for sector definitions.

Comments

Agricultural soils are the main source of N_2O emissions, accounting for 65%, versus 59% in 1990. Industrial emissions fell by half, down from 29% in 1990 to 17% of overall N_2O emissions. Transport is now responsible for 8% of the total, up from 3% in 1990, due mainly to the increased use of catalytic converters which produce N_2O as a by-product of NO_x reduction. The agriculture sector has decreased by 7% overall, especially following a decline of 18% in the Acceding countries, compared to a fall of only 5.5% in EU-15.
In EU-15, two countries, Denmark and Finland have reduced their per capita emissions by one quarter, but are still among the biggest emitters. The high per capita emissions in Ireland and Denmark are due to the fact that both countries have an important agriculture sector. In the Acceding countries, larger reductions are recorded, in all countries except Poland where emissions increased.
N_2O emission levels from industry are around one quarter of those for agriculture and are declining, falling by almost half in EU-15 and 13% in the Acceding countries over the period. Specific measures taken by the chemical industry concerning the production of adipic acid have resulted in important emission reductions in the German, Dutch and French industrial sector.

CC-4: Emissions of HFCs, PFCs and SF_6

Definition and purpose

The purpose of this indicator is to monitor the emissions of the three industrial gases covered by the Kyoto Protocol: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF_6). HFCs are alkane-hydrocarbons containing fluorine but no chlorine and are used as substitutes for ozone depleting CFCs. PFCs are a group comprised of seven gases or volatile solvents: perfluoromethane (CF_4), perfluoroethane (C_2F_6), perfluoropropane (C_3F_8), perfluorobutane (C_4F_{10}), perfluorocyclobutane (c-C_4F_8), perfluoropentane (C_5F_{12}) and perfluorohexane (C_6F_{14}).

Due to their high global warming potential, long atmospheric lifetime, and growing emissions, these gases are increasingly contributing to climate change.

HFC, PFC and SF_6 emissions

kg CO_2 equivalents per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	130	124	123	128	140	161	172	187	196	155	162	155
BE	44	44	43	43	43	43	62	72	71	79	110	130
DK	-	-	18	44	51	66	83	90	107	129	149	131
DE	128	129	133	153	155	181	169	171	177	158	139	148
EL	118	134	113	173	221	331	381	416	405	407	420	426
ES	85	78	93	80	110	141	154	179	170	204	221	143
FR	135	109	95	82	78	91	108	124	137	156	189	200
IE	51	51	50	50	50	50	72	94	69	110	145	155
IT	16	17	16	16	19	27	23	29	34	35	47	66
LU	123	121	119	118	116	115	113	111	110	109	107	106
NL	473	399	440	474	556	529	646	692	727	419	357	209
AT	193	214	167	111	138	216	234	234	222	201	214	214
PT	:	:	:	:	:	:	:	0.7	1	2	4	7
FI	-	-	-	-	8	19	29	48	58	77	111	141
SE	62	61	59	60	64	73	72	85	79	87	81	83
UK	250	250	244	251	272	298	318	345	374	175	189	186
IS	:	:	:	:	:	:	:	:	0.1	718	519	:
NO	1,233	1,080	633	628	595	498	466	458	474	482	452	464
CH	:	:	:	:	:	:	:	:	:	:	:	:
CZ	:	:	:	:	:	:	13	29	38	40	67	103
EE	:	:	:	:	:	:	:	:	:	:	:	:
CY	:	:	:	:	:	:	:	:	:	:	:	:
LV	:	:	:	:	:	:	:	:	:	:	:	:
LT	:	:	:	:	:	:	:	:	:	:	:	:
HU	:	:	:	:	:	:	:	:	:	:	:	:
MT	:	:	:	:	:	:	:	:	:	:	:	:
PL	:	:	:	:	:	22	22	26	27	34	42	56
SI	:	:	:	:	:	:	:	:	:	:	:	:
SK	51	51	47	29	25	26	15	19	13	15	17	18

Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.

Methodology and data problems

Data availability is poor. Most countries have only recently started to integrate HFCs, PFCs and SF_6 into their emission inventories, and, a more detailed inventory based on individual substances would be needed for aggregation. For some countries estimates have been made by the EEA, in the absence of official data from the country itself. Although reduction targets refer to 1990 as the base year, estimates for that year have proved difficult for many countries.

Further work by UNFCC and IPCC is needed to improve the data and to minimise the levels of uncertainty.

Relevance: Green	Accuracy: Yellow	Time Rep.: Yellow	Spatial Rep.: Red

CC-4: Emissions of HFCs, PFCs and SF_6

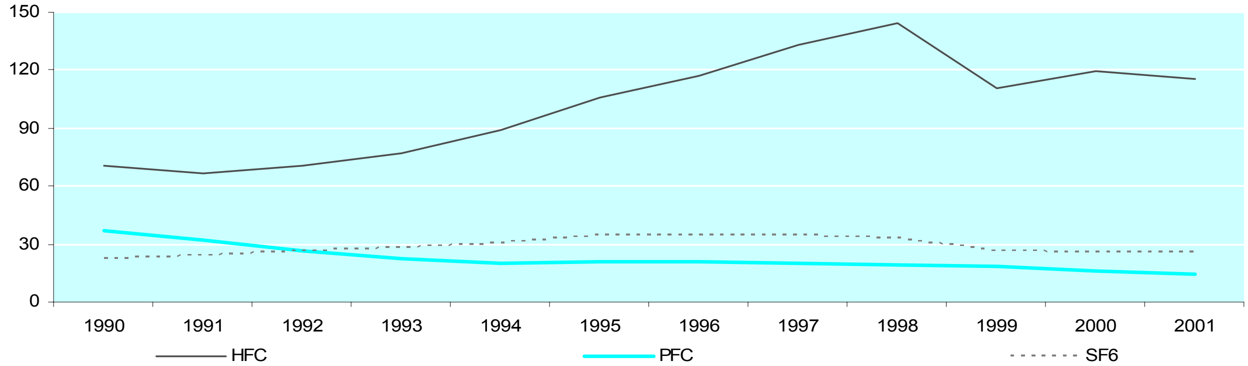
Relevant Sectors: **Industry**

Targets

The Kyoto Protocol introduced HFCs, PFCs and SF_6 for the first time into the basket of greenhouse gases covered by international agreements.

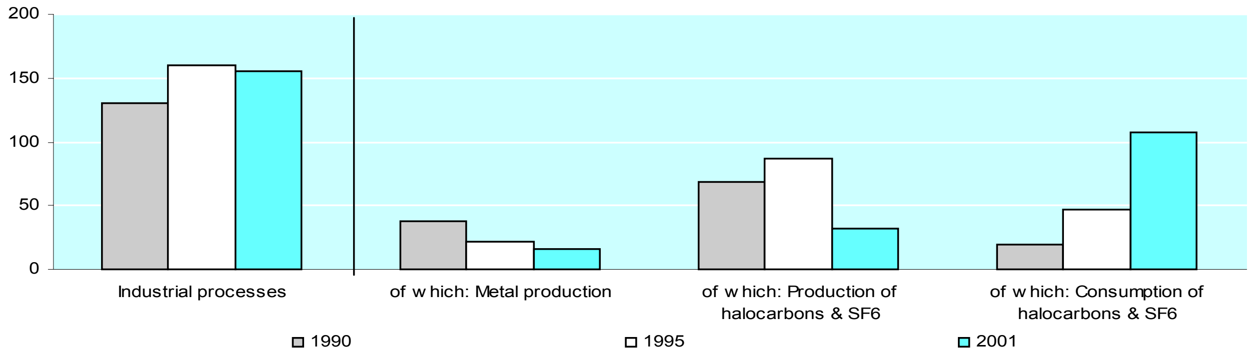
EU-15 emissions of HFC, PFC and SF_6

kg CO_2 equivalents per capita



Total EU emissions of HFC, PFC and SF_6 by industry and breakdown by industrial sector [1)]

kg CO_2 equivalents per capita



Source: Annual European Community Greenhouse Gas Inventory, Submission to UNFCCC, EEA.
1) See Annex on Nomenclatures for sector definitions.

Comments

Because of the different GWPs of the gases covered by this indicator, reductions in emissions of individual gases may be more than offset by small increases in emissions of gases with a much higher GWP. In other words, the total amount in tonnes of gas emitted may fall, but emissions in terms of GWP may rise.

In general, total emissions expressed in GWP are increasing. The strongest increases can be observed in Belgium, Denmark, Greece, Spain, Ireland, Italy, Portugal and the Czech Republic. On the hand, Norway has cut its emissions by 3, while the decline of 68% in the Slovak Republic hides an increase in HFC and a decrease in PFC emissions.

The sources of HFC, PFC and SF_6 emissions are almost exclusively industrial processes (where recycling is generally easier). Emissions of HFCs dominate; these are widely used in air conditioners for road vehicles, which are subject to significant leakage, in refrigerators and as a solvent and blowing agent. PFC emissions have been cut by more than half, from 37 to 15 kg per capita and represent less than 10% of emissions. The main source of perfluoromethane and perfluoroethane is primary aluminium production. The other PFCs are used as solvents mainly in the electronics industry. SF_6 is stable at around 17% of emissions and around 25 kg per capita. The main uses of SF_6 are as a cover gas in the metal industry (magnesium), or for electrical insulation purposes in power transmission equipment and in several specialised electronic applications.

AIR POLLUTION

Introduction

Acidification, tropospheric ("ground-level") ozone and eutrophication are inter-related, transboundary environmental problems caused by emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOC) and ammonia (NH_3), and their chemical conversion products. Acidification - the deposition of acidifying pollutants (SO_2, NO_x, NH_3) onto vegetation, surface waters, soils and buildings - affects biological populations and forests, and damages buildings and monuments. Eutrophication of soil and water bodies is exacerbated by the deposition of nitrogen compounds (NO_x and NH_3). Tropospheric ozone is not emitted directly but is formed by the reaction of precursors such as nitrogen oxides (NO_x) and VOC (as well as CH_4 and CO) under the influence of sunlight; it is harmful to human health, causing damage to the respiratory tract. Human health is also at risk from high concentrations of particles, particularly those smaller than 10µm, which have been associated with heart and lung disease.

EU legislation covers air pollutants to a large extent. A recent directive [31] sets national emission ceilings (NEC) to be achieved by 2010 and 2020, for SO_2, NH_3, NO_x and VOCs, 4 of the 6 main pollutants responsible for acidification, ground-level ozone, and eutrophication *(see overleaf).* No targets have been set in the EU for emissions of particles.

The NEC proposal is closely related to existing EU environmental policy and legislation (such as the 1997 Acidification Strategy [32], the Clean Air for Europe programme (CAFÉ) [33] and the Auto Oil I and II packages [34]), and is more ambitious than the multi-pollutant protocol to the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Transboundary Air Pollution (CLRTAP) signed in Gothenburg in November 1999, which also sets national emission ceilings for most UNECE countries including the EU Member States.

The acidification strategy aims to reduce significantly the extent of the areas in the EU where the tolerance of sensitive ecosystems to acidity is exceeded by 2010. Current predictions indicate that the extent of affected areas in the EU in 2010 would be reduced from 8.7 to 4.5 million hectares.

[31] Directive 2001/81/EC of 23 October 2001, OJ L 309 of 27.11.2001.

[32] The strategy (COM(97) 88)

[33] COM (2001) 245 final of 04.05.2001

[34] First programme (1992-1996): set vehicle emission and fuel quality standards for 2000 and beyond.
Second programme (1997-2000): set objectives for emissions of benzene, CO, NO_2, PM10 and O_3, to be achieved in 2005 or 2010.

AP Introduction

Targets

The aim of the NEC Directive is to limit emissions of acidifying and eutrophying pollutants and ozone precursors in order to protect the environment and human health against the adverse effects of acidification, soil eutrophication and ground level ozone, and to move towards the long term objectives of not exceeding critical levels and loads and of effective protection of all people against recognised health risks from air pollution. The National Emission Ceilings are designed with the aim of broadly meeting the interim environmental objectives set for 2010. Meeting those objectives is expected to result in a reduction of soil eutrophication to such an extent that the Community area with depositions of nutrient nitrogen in excess of the critical loads will be reduced by about 30% compared with the situation in 1990. The national emission ceilings are given below.

For more information see http://europa.eu.int/comm/environment/air/ceilings.htm

National emission ceilings to be attained by 2010

kilotonnes

	SO_2	NOx	VOC	NH_3
	National emission ceilings			
EU-15	3 850	6 519	6 510	3 110
BE	99	176	139	74
DK	55	127	85	69
DE	520	1 050	995	550
EL	523	344	261	73
ES	746	847	662	353
FR	375	810	1 050	780
IE	42	65	55	116
IT	475	990	1 159	419
LU	4	11	9	7
NL	50	260	185	128
AT	39	103	159	66
PT	160	250	180	90
FI	110	170	130	31
SE	67	148	241	57
UK	585	1 167	1 200	297

Source: European Commission (NEC Directive 2001).

Aggregation of emissions of acidifying substances and ozone precursors

The contribution of the different air pollutants to the problems of acidification and tropospheric ozone formation varies according to the chemical properties of the pollutant. For example, in terms of acidification, a reduction in emissions of NO_x by one tonne is less beneficial than a reduction of one tonne of SO_x which in turn is less beneficial than a reduction of one tonne of NH_3. Therefore to try to see the real trends in effective emissions of acidifying substances, it is useful to aggregate the main acidifying pollutants weighted by their acidification potential.

A similar situation exists for ozone formation: the different ozone precursors have different (tropospheric) ozone forming potentials (TOFP), based on their chemical properties. Using the TOFPs as weighting factors, it is possible to aggregate emissions of ozone precursors, to see the trend in the ozone forming potential of the emissions. Although there is still ongoing discussion over the values of these TOFPs, it is recognised that NO_x together with NMVOCs are by far the most potent ozone precursors, with CO and CH_4 far behind.

The trends in aggregated emissions of acidifying substances and ozone precursors are shown below, in index form.

The following widely accepted factors are used to convert the various substances to acid equivalents:
SO_x=0.031, NOx=0.022, NH_3=0.059.

For ozone precursors, following factors, recommended by the European Environment Agency, are used to convert emissions to tropospheric ozone formation potentials (TOFP): CH_4=0.014, CO=0.110, NMVOC=1.000 and NO_x=1.220.

Index of weighted emissions of acidifying substances and ozone precursors

index: 1990=100

	1991	1993	1995	1997	1999	2001	1991	1993	1995	1997	1999	2001
	Acidifying potential						Tropospheric potential					
EU-15	94	84	76	68	63	49	98	90	86	80	73	59
BE	94	90	84	79	73	103	96	97	93	89	88	92
DK	113	92	87	80	65	58	108	97	93	92	80	74
DE	81	66	53	41	37	34	89	75	67	60	54	53
EL	105	105	107	103	107	:	100	101	101	106	109	97
ES	101	95	92	91	88	79	105	99	99	99	101	99
FR	104	92	88	83	80	75	101	93	86	79	74	70
IE	100	97	97	100	100	:	100	98	94	99	92	:
IT	97	92	88	79	72	:	103	103	99	85	76	:
LU	102	103	83	72	65	:	104	109	81	69	60	:
NL	97	87	81	77	68	64	95	87	80	72	66	64
AT	98	88	84	83	79	73	96	87	82	80	76	75
PT	99	101	104	101	106	101	106	112	116	120	118	123
FI	87	73	63	65	60	56	96	91	85	84	81	76
SE	97	93	89	84	77	74	98	92	90	85	81	65
UK	96	86	70	57	47	45	96	87	78	71	61	57
IS	99	105	103	104	108	:	104	109	102	95	94	:
NO	94	94	94	96	96	89	96	104	107	108	105	106
CH	97	91	87	81	79	75	94	82	74	67	61	:
CZ	94	75	57	43	26	23	96	78	60	61	55	48
EE	96	60	49	49	42	39	93	51	57	64	52	45
CY	78	98	94	105	110	117	89	111	106	117	122	:
LV	91	53	44	36	29	21	105	71	49	47	55	45
LT	100	71	44	39	34	41	94	54	58	63	52	:
HU	87	73	70	67	61	46	83	77	78	78	82	:
MT	:	:	:	:	:	:	99	117	115	87	125	:
PL	92	83	76	71	60	53	97	96	82	83	74	70
SI	93	95	75	71	64	-	93	99	105	110	90	:
SK	85	65	54	44	38	32	83	71	71	57	53	43

Source: ETC/ACC.

Almost all countries have managed to reduce their overall emissions of air pollutants, and this is reflected in the generally downward trend seen in the indices of acidification and ozone forming potential. It should be borne in mind that weather conditions play an important role in the formation of tropospheric ozone, and therefore the trend shown in ozone forming potential does not necessarily reflect the real formation of ozone.

AP-1: Emissions of nitrogen oxides (NO_x)

Definition and purpose

The purpose of this indicator is to show trends in releases of nitrogen oxides (NO_x) into the atmosphere. NO_x can be transported over large distances and deposited many kilometres away from the source. It contributes to a number of environmental problems, including acidification, eutrophication, and increased concentration of photo-oxidants in the atmosphere, resulting in episodes of photochemical smog. In certain conditions, local NO_x emissions in urban areas with high traffic intensity lead to the formation of tropospheric ozone, with impacts on human health.

Although there are natural sources of NO_x, these are minor compared to anthropogenic emissions, which arise primarily from the reaction of nitrogen and oxygen during the combustion of fossil fuels and biomass, but also from selected production processes.

NO_x includes the nitrogen oxides NO and NO_2. For the sake of comparability, emissions are given here in units of NO_2.

NO_x emissions

kg NO_2 per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	36.66	36.02	35.04	33.54	32.19	31.23	30.80	29.35	28.49	27.55	26.73	:
BE	33.58	32.64	33.33	32.78	32.97	35.44	31.06	30.09	30.61	28.30	32.13	30.89
DK	53.94	63.15	54.24	54.24	55.23	51.57	59.42	51.37	45.89	42.91	39.21	38.14
DE	34.51	31.47	28.90	27.29	25.33	24.28	23.22	21.70	20.47	19.75	19.23	19.33
EL	28.65	29.22	28.85	28.21	28.72	28.34	29.24	29.56	31.78	30.95	30.41	:
ES	32.71	33.70	34.39	33.80	34.25	34.46	33.64	34.61	34.31	35.79	35.99	34.89
FR	33.58	34.45	33.56	31.29	30.29	29.47	28.84	27.53	27.07	25.78	24.51	23.88
IE	33.65	34.08	36.65	33.34	32.09	31.97	33.15	32.58	33.03	31.78	33.10	:
IT	34.22	34.89	35.41	34.94	31.33	30.91	30.35	28.89	27.62	25.86	23.75	:
LU	60.64	:	:	63.26	57.37	51.65	53.29	43.03	40.12	37.51	39.02	:
NL	38.27	37.84	36.75	35.11	33.24	31.51	32.34	29.10	27.34	27.22	26.03	25.65
AT	26.53	26.90	25.42	24.74	23.83	23.38	25.70	24.17	25.14	23.88	24.19	24.50
PT	28.83	30.57	32.84	32.32	32.65	33.90	33.36	34.02	36.36	38.58	39.79	38.68
FI	60.31	58.02	56.47	55.79	55.53	50.60	52.38	50.66	48.96	47.87	45.64	42.85
SE	39.17	38.88	36.90	35.32	36.59	33.57	33.38	31.66	30.18	29.25	28.44	27.92
UK	48.03	45.59	44.04	40.79	39.46	37.09	36.80	34.12	32.49	30.55	29.18	28.06
IS	103.63	104.35	109.35	111.67	110.16	106.38	110.47	105.98	101.70	:	:	:
NO	52.92	50.12	49.61	51.64	50.64	50.82	52.63	53.04	53.20	53.54	50.02	49.07
CH	23.08	21.63	20.17	18.67	17.79	17.10	16.00	15.11	14.66	13.90	13.36	12.70
CZ	52.50	50.27	48.10	43.97	36.29	35.61	35.46	33.85	31.17	30.42	31.23	32.34
EE	43.08	40.31	25.22	24.96	27.27	28.23	30.08	30.64	31.64	27.39	33.97	27.58
CY	26.66	23.29	27.15	28.02	27.67	26.03	28.54	28.34	29.49	29.27	30.47	23.84
LV	29.92	23.50	19.12	19.42	17.85	18.62	17.35	17.02	16.47	15.62	14.62	17.75
LT	42.61	44.43	26.16	20.88	20.68	17.48	17.51	15.38	16.20	14.59	12.84	14.89
HU	22.94	19.60	17.70	17.85	18.20	18.54	19.19	19.66	20.03	19.92	18.42	:
MT	:	:	:	:	:	:	:	:	:	:	:	:
PL	33.65	31.69	29.50	29.15	28.83	29.03	29.79	28.73	25.63	24.59	21.68	20.83
SI	31.56	29.00	29.02	31.59	33.18	33.68	35.17	35.73	32.24	29.32	29.18	:
SK	40.66	36.80	34.18	32.74	30.92	32.49	24.59	23.24	24.13	21.88	19.63	19.62

Source: Annual European Community CLRTAP Inventory, EEA.

Methodology and data problems

Good estimates of NO_x emissions require detailed information on the characteristics of combustion conditions and processes, the operating conditions of engines or other combustion sources. As this information is often of rather poor quality and the influencing factors complex, the resulting estimates are less reliable than those of SO_x emissions. In addition, data does not always cover emissions from all mobile sources. Further work is needed by CLRTAP/EMEP to improve estimates. Nevertheless, the trends shown by these estimates are considered to be representative of real trends.

Relevance: Green	Accuracy: Green	Time Rep.: Green	Spatial Rep.: Green

AP-1: Emissions of nitrogen oxides (NO_x)

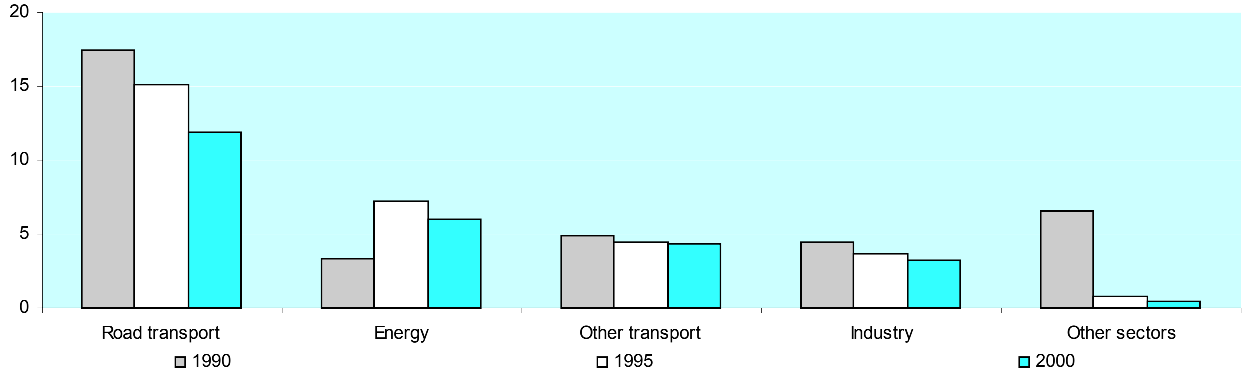
Relevant Sectors: **Transport, Energy, Industry**

Targets

Targets for NO_x as set by the 1999 Gothenburg Protocol (UNECE CLRTAP) imply a 49% reduction by 2010 compared to 1990. The tougher limits set for 2010 by the EU National Emissions Ceilings Directive correspond to a reduction of around 57% compared to 1990.

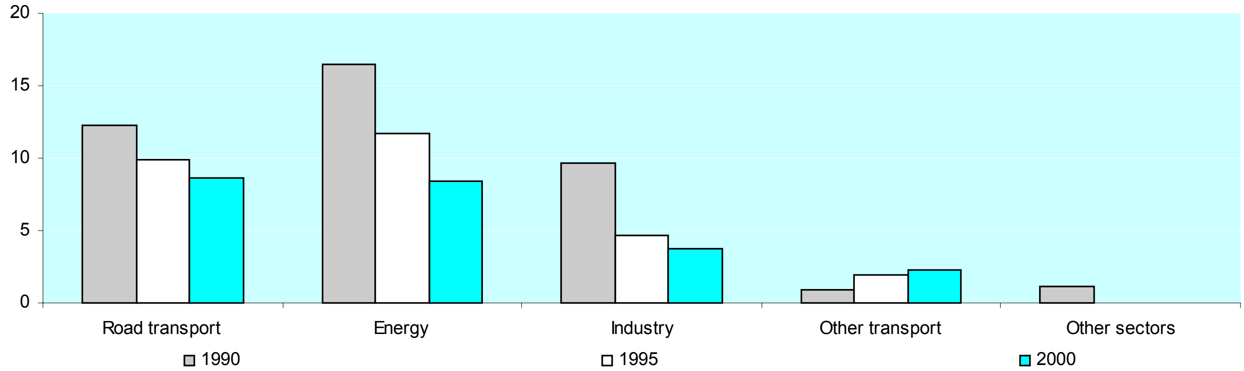
EU-15 emissions of NO_2 by economic sectors [1) 2)]

kg NO_2 per capita



ACC-10 emissions of NO_2 by economic sectors [1) 2)]

kg NO_2 per capita



Source: Annual European Community CLRTAP Inventory, EEA.
1) See Annex on Nomenclatures for sector definitions
2) ACC-10, excluding Malta.

Comments

Total emissions of NO_x have decreased by 30% in Europe (-27 % and -43% in EU-15 and Accession countries) since 1990, thanks to a shift away from the use of solid fuels, especially for the production of electricity. The apparent increase in emissions from the EU-15 energy sector recorded between 1990 and 1995 is the result of a reallocation of emissions previously recorded under 'other sectors'.

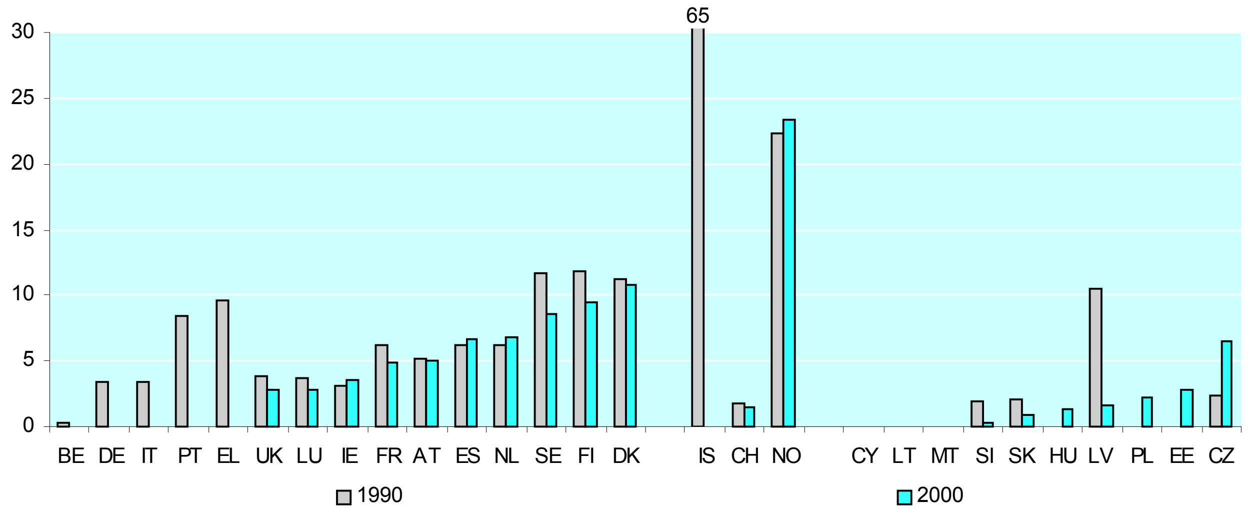
The main obstacle to achieving the targets is the growth in road transport. The fitting of catalytic converters, which reduce emissions of NO_x, is beginning to have some effect, but because of the time lag involved before vehicles fitted with catalysts fully replace the existing stock of road vehicles, the full impact has not yet been felt. This is especially the case for acceding countries, where emissions due to road transport account for 37% of NO_x emissions, up from 30% in 1990.

AP-1: Emissions of nitrogen oxides (NO_x) (continued)

Breakdown of NO_x emissions – selected sectors

NO_x emissions from the industry sector

kg NO_2 per capita

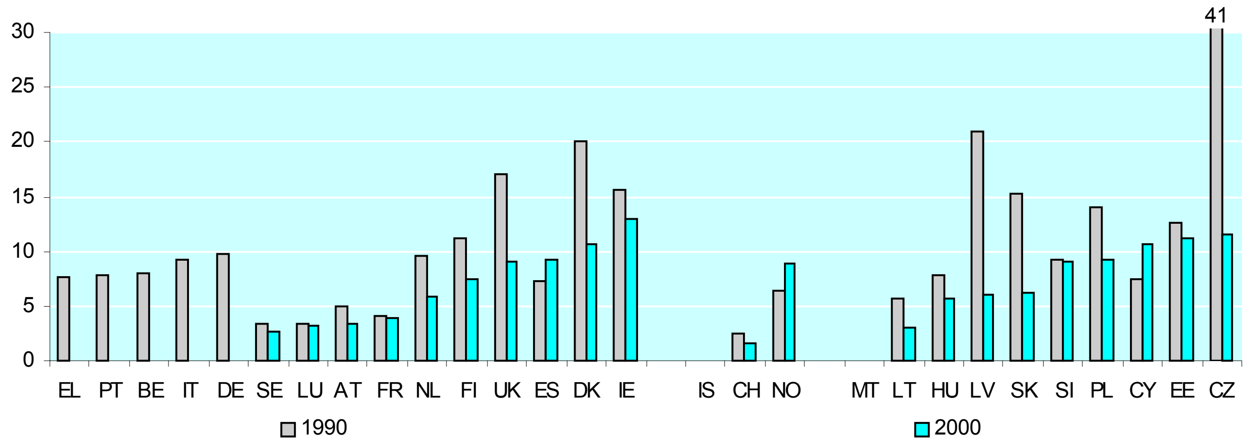


Source: Annual European Community CLRTAP Inventory, EEA.

Emissions from fuel combustion and industrial processes have fallen by 25% and 61% respectively in EU-15 and AC-10, resulting in an overall decline of 37%, from 5.3 to 3.3 kg per capita. Emissions from this sector in EU countries are fairly stable at 0.4-0.3 kg per capita, as opposed to the Acceding countries where emissions have fallen from 10 to 4 kg per capita.

NO_x emissions from road transport

kg NO_2 per capita



Source: Annual European Community CLRTAP Inventory, EEA.

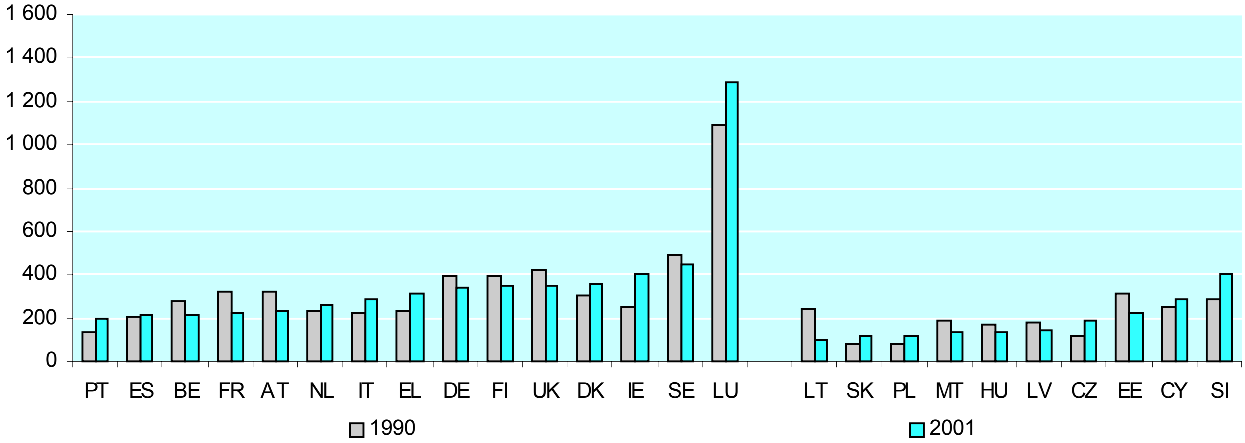
Emissions from road transport (around 45% of the total) are decreasing in all countries for which there is data except Spain, Norway and Cyprus. However for some of the countries where use of transport fuel has increased most (*see below*), no emissions data are available for the transport sector for 2000.

AP-1: Emissions of nitrogen oxides (NO_x) (continued)

Energy consumption by road transport

Petrol consumption

kg per capita

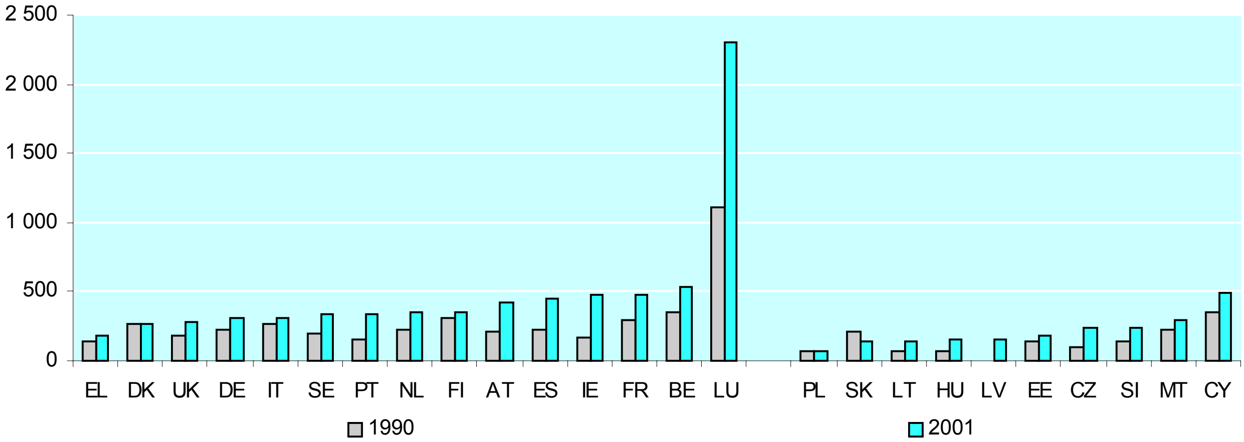


Source : Eurostat

In EU-15 use of petrol for road transport has fallen since 1990 by 5% on average. This masks diverging trends within the countries: petrol use increased by 75% in Ireland, 46% in Portugal, 41% in Greece, 38% in Luxembourg, 27% in Italy, 23% in Denmark and 19% in the Netherlands, while decreasing in seven Member States (FR, AT, BE, UK, DE, FI, SE) by between 5% in Sweden and 27% in France. In the Acceding countries, five countries (PL, CZ, SK, SI, and CY) increased their petrol consumption by between 30% and 62%, while sales of petrol fell in the remaining five countries, by as much as 59% in Lithuania.

Diesel fuel consumption

kg per capita



Source: Eurostat

Over the same period, use of diesel fuel has increased by an average of more than 50%. As catalytic converters are still not common on diesel engines, this tends to counteract the effect of the adoption of catalysts on petrol engined cars. For the EU-15 countries, the largest increases in the use of diesel fuel since 1990 are seen in Ireland (+ 202%), Luxembourg (+ 141%), Portugal (+ 122%), Austria (+ 107%) and Spain (+102%). The increases for both diesel and petrol recorded for Luxembourg are to some extent due to the large amount of transit and cross-border traffic.

For the acceding countries, only the Slovak Republic saw use of diesel fall; for the others the increases were less dramatic than for EU-15, and ranged from just +2% in Poland to +120% in the Czech Republic. Hungary and Lithuania saw diesel sales increase by more than 100% over the period.

AP-2: Emissions of non-methane volatile organic compounds (NMVOCs)

Definition and purpose

The main purpose of this indicator is to monitor NMVOC emissions, which, together with nitrogen oxides, contribute to the formation of photo-oxidants and are thus responsible for photochemical smog, especially during the summer. Some NMVOCs, for example benzene and 1,3-butadiene, are also carcinogenic. NMVOC emissions are directly related to the evaporation, both deliberate and accidental, of organic solvents e.g. in paints and cleaning products, and to the production, transportation, distribution, storage and use of fossil fuels for energy purposes. Methane is not included in these emissions of organic compounds, as their effects on health and the environment are quite different from the non-methane compounds.

NMVOC emissions

kg NMVOCs per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	40.02	37.88	36.59	34.61	33.41	32.11	30.98	29.99	29.07	28.26	26.86	:
BE	27.54	27.84	27.64	27.31	26.53	25.86	24.84	24.48	26.39	28.00	22.76	24.55
DK	31.55	31.87	31.38	31.08	30.40	29.53	29.14	27.49	26.06	25.03	24.20	23.18
DE	40.70	35.11	31.64	28.77	26.56	24.77	23.10	22.19	21.20	20.23	19.60	19.57
EL	25.20	24.80	25.35	26.09	26.32	26.14	27.14	27.18	27.59	27.63	28.90	:
ES	41.98	42.70	42.09	39.44	40.90	39.56	38.99	38.93	40.15	40.11	39.01	38.13
FR	43.66	43.06	41.95	39.81	37.38	35.85	34.16	32.83	31.67	30.19	29.45	28.29
IE	33.36	33.23	33.83	32.22	31.82	30.85	32.60	31.76	33.57	27.77	25.55	:
IT	35.98	32.95	34.00	32.65	31.68	31.43	30.70	29.41	27.62	29.85	27.05	25.24
LU	50.09	:	:	45.55	44.90	39.35	38.76	35.86	30.68	34.72	34.20	:
NL	33.04	30.78	28.95	26.58	25.36	23.53	23.36	20.36	19.23	18.46	17.52	16.95
AT	44.87	41.58	37.24	35.42	33.69	33.71	33.40	30.99	29.97	29.32	28.63	28.57
PT	39.32	42.42	45.21	45.90	45.89	47.92	45.36	51.44	54.53	49.60	47.95	47.94
FI	45.03	42.01	40.56	38.77	38.20	36.87	35.57	34.10	33.22	32.17	31.13	30.30
SE	58.40	55.64	53.22	49.13	46.65	45.26	44.02	40.02	38.32	35.91	34.31	34.11
UK	42.12	40.91	39.03	37.01	36.02	33.68	32.37	31.07	28.60	25.82	23.82	22.38
IS	50.44	55.89	54.29	51.83	53.57	44.95	44.78	36.31	36.71	:	:	:
NO	69.45	69.18	75.35	78.62	81.39	84.40	84.90	83.78	80.13	80.53	81.95	83.49
CH	41.80	38.66	35.37	32.72	30.57	28.49	27.04	25.70	24.38	23.16	22.19	20.41
CZ	42.56	38.02	35.49	33.51	30.00	28.26	28.39	26.87	23.50	22.74	22.09	21.43
EE	56.25	52.15	29.06	27.25	29.66	31.85	34.00	36.86	36.94	29.26	24.78	24.36
CY	:	:	:	:	:	:	:	:	:	:	:	18.97
LV	53.49	36.66	29.73	28.24	29.70	31.39	33.10	33.83	33.88	33.12	29.12	34.19
LT	29.12	29.71	17.61	13.92	13.96	20.71	22.09	21.85	21.33	18.37	16.44	19.12
HU	19.76	14.49	13.74	14.45	13.82	14.64	14.69	14.25	13.91	16.85	17.23	:
MT	:	:	:	:	:	:	:	:	:	:	:	:
PL	21.85	21.82	21.01	19.68	21.27	19.93	19.84	20.03	18.88	18.91	15.50	22.59
SI	22.04	20.50	20.01	21.06	22.12	22.12	24.62	24.16	21.16	20.22	20.12	:
SK	49.55	:	:	28.41	:	29.69	29.99	25.66	24.50	24.10	16.49	16.62

Source: Annual European Community CLRTAP Inventory, EEA.

Methodology and data problems

The EMEP/CORINAIR methodologies cover emissions of NMVOCs from all anthropogenic activities, including all hydrocarbons that are volatile under ambient air conditions. These methodologies are based on parameters such as the amount of fuel consumed for energy purposes, information on the storage and handling of fuels during transportation and distribution, and structural data on the amount of solvent contained in a series of products (e.g. paint, dry-cleaning agents etc). The reliability of estimates of these emissions is generally low, due to poor data on the use of solvents. To address this, Member States generally use a “solvent balance” (i.e. *production + imports - exports + stock variations*) and default emission factors to obtain the “potential” total NMVOC emissions from the use of solvents and related products.

Relevance: Green	**Accuracy: Yellow**	**Time Rep.: Green**	**Spatial Rep.: Green**

AP-2: Emissions of non-methane volatile organic compounds (NMVOCs)

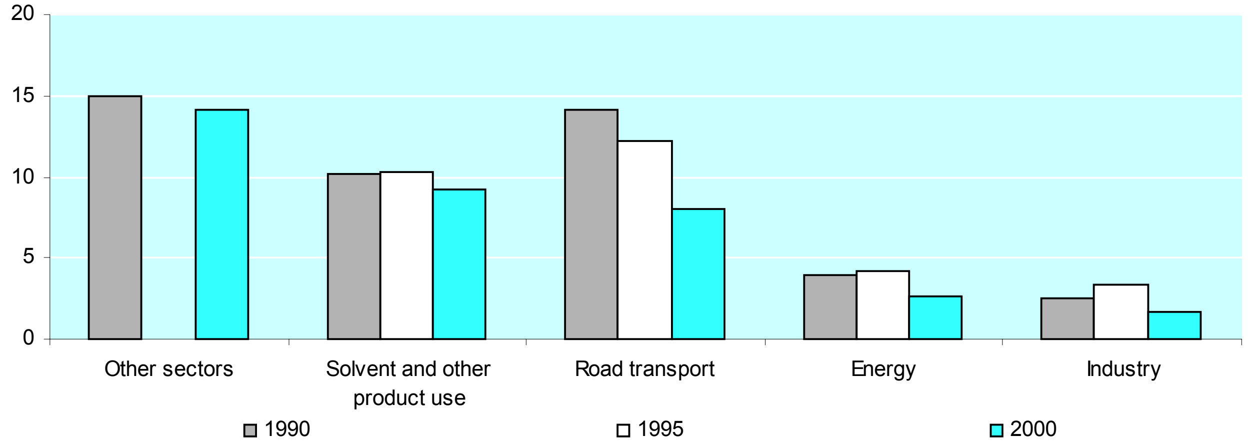
Relevant Sectors: **Transport, Industry**

Targets

The UNECE CLRTAP Protocol signed in Gothenburg in 1999 has set a target of a 57% reduction in VOC emissions between 1990 and 2010. The EU Directive on National Emission Ceilings[35] sets similar targets for the 15 EU Member States.

EU-15 emissions of NMVOCs by economic sectors [1)]

kg per capita



Source: Annual European Community CLRTAP Inventory, EEA.
1) See Annex on Nomenclatures for sector definitions.

Comments

According to the figures, total emissions of NMVOCs in the EU decreased by more than 30% between 1990 and 2000-2001, though in Greece and Portugal emissions rose significantly. The largest reductions took place in Germany, Netherlands, Austria, Sweden and the UK. Further decreases can be expected once the Solvent Directive[36] (1999/13/EC) and the IPPC Directive[37] (96/61/EC) are fully implemented. In the Acceding countries, emissions have also decreased systematically, except in Poland (+3%).

In EU-15, the use of solvents and the transportation, storage and handling of fuel are the main sources of NMVOC emissions. Just over 30% of emissions come from use of solvents and products containing solvents (which release volatile organic compounds during use). These solvents are used in a wide range of products used in many different sectors (i.e. industry, households, services, etc), and it is not possible to attribute them to any particular sector. Emissions from the use of solvents and solvent-containing products have been reduced in those countries that have implemented solvent control regulations. Significant decreases are seen in the Netherlands (-42%), Finland (-39%) and the UK (-33%) whereas emissions have increased in Spain, Ireland and Luxembourg. The same downward trend appears in EFTA and Accession countries

Transport was responsible for more than 30% of NMVOC emissions in 2000-2001, mainly from road transport (almost 20%), especially exhaust gases from motor vehicles, and in the form of fugitive emissions of gasoline, which occur during filling of petrol tanks. However, the increasing use of catalytic converters throughout the 90s has caused a significant reduction of emissions from the road transport sector. Other fugitive emissions occur during the extraction, transportation and distribution of fossil fuel.

Emissions from industry, which made up less than 10 % of the total in 2000-2201, are mainly released during the different industrial processes. Reductions have been achieved by using alternative products and technologies, or by means of emission-abatement technologies.

[35] Directive 2001/81/EC of 23 October 2001, OJ L309 of 27.11.2001
[36] OJ L085, 29/03/1999 p. 0001-0022
[37] OJ L257, 10/10/1996 p. 0026-0040

AP-3: Emissions of sulphur dioxide (SO_2)

Definition and purpose

The purpose of this indicator is to show trends in anthropogenic sulphur dioxide (SO_2) emissions. SO_2 emissions are partly responsible for acidification, and for the occurrence of winter smog episodes. SO_2 has also been found to contribute to the degradation of visibility due to high concentrations of aerosol sulphates in the atmosphere. Natural SO_2 emissions, for example from the eruption of volcanoes, are not taken into account in this indicator, but play an important role in some regions of Europe.

The main anthropogenic source of sulphur dioxide emissions is the combustion of coal, lignite and petroleum products. The total amount of SO_2 emissions is directly related to the amount of sulphur contained in the different types of fossil fuels and the desulphurisation techniques used, if any. For transport, emissions are directly related to the amount of sulphur content of different fuels. For electricity production, emissions depend both on the sulphur content and on the efficiency of the desulphurisation technologies used (e.g. flue gas scrubbers, calcium additives, fluid bed combustion). The sulphur content of diesel fuels also has an impact on the emissions of particles from diesel engines *(see AP-5)*.

SO_2 emissions

kg SO_2 per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	44.98	40.45	37.06	33.63	30.30	27.50	23.92	21.35	20.14	18.03	16.25	:
BE	36.39	33.04	31.43	29.20	24.95	25.37	23.66	21.53	20.80	17.72	16.11	15.78
DK	35.05	46.44	36.03	29.34	30.02	28.38	34.09	20.66	14.05	10.16	5.20	4.73
DE	67.25	50.15	41.23	36.43	30.37	23.79	16.38	12.68	10.18	9.00	7.77	7.90
EL	48.71	52.16	53.04	52.66	49.67	51.81	50.17	49.68	50.23	51.27	45.76	:
ES	56.15	55.82	54.92	51.47	50.10	46.20	40.26	44.53	40.92	41.12	38.26	35.39
FR	23.33	25.31	22.37	19.29	18.35	17.11	16.62	14.02	14.41	12.26	11.13	10.33
IE	53.04	51.12	48.48	45.11	48.84	44.75	40.61	45.45	47.64	41.93	34.69	:
IT	29.10	27.14	24.49	23.35	22.23	23.05	21.80	18.80	18.07	16.02	13.14	:
LU	39.55	:	:	37.96	32.43	22.13	19.38	14.34	9.44	8.90	7.09	:
NL	13.56	11.53	11.37	10.76	9.52	9.14	8.71	7.58	6.90	6.54	5.77	5.56
AT	10.23	9.23	7.51	7.27	6.44	6.47	6.36	5.68	5.32	4.83	4.69	4.52
PT	29.03	28.65	34.77	31.21	28.20	32.08	26.31	26.68	30.03	31.56	28.30	29.33
FI	52.27	38.81	28.04	24.33	22.45	18.83	20.52	19.29	17.48	16.86	14.21	16.44
SE	12.43	11.56	10.17	9.01	9.15	8.27	10.94	7.88	7.62	6.13	6.45	6.39
UK	64.74	61.19	59.75	53.53	45.97	40.34	34.58	28.35	27.25	20.76	19.96	18.88
IS	94.57	90.28	92.02	93.37	89.79	89.52	89.94	90.78	98.39	:	:	:
NO	12.26	10.38	8.52	8.14	7.88	7.68	7.51	6.83	6.70	6.41	5.94	5.51
CH	6.29	6.07	5.55	4.92	4.45	4.84	4.25	3.67	3.89	3.58	2.69	2.93
CZ	181.43	171.75	149.33	137.52	123.86	105.49	91.46	67.61	42.53	26.05	25.69	24.45
EE	160.34	156.64	119.70	100.88	98.88	79.78	84.67	81.39	75.66	71.25	71.87	67.09
CY	68.14	48.03	55.73	60.25	58.11	56.18	61.15	63.43	65.67	66.53	66.24	63.63
LV	35.65	26.65	22.24	22.14	27.52	21.55	20.35	15.57	14.48	12.09	7.02	5.66
LT	59.87	62.63	37.10	33.45	31.42	25.28	25.05	20.77	25.38	18.91	11.65	13.22
HU	97.35	88.17	80.00	73.42	72.10	68.81	65.90	64.77	58.41	58.46	48.39	:
MT	:	:	:	:	:	:	:	:	:	:	:	:
PL	84.39	78.57	73.61	71.06	67.78	61.69	61.38	56.42	49.15	44.48	39.06	40.37
SI	98.18	90.00	93.05	91.77	88.97	62.83	56.27	59.39	61.97	52.57	48.30	:
SK	102.50	84.41	71.75	61.16	44.60	44.62	42.29	37.55	33.22	31.71	22.97	23.88

Source: Annual European Community CLRTAP Inventory, EEA.

Methodology and data problems

When details of the sulphur content of fuels or the efficiency of desulphurisation plants are not available, default emission factors are generally used by Member States to estimate SO_2 emissions. Notwithstanding this, estimates of emissions of SO_2 are considered to be fairly reliable.

Relevance: Green	Accuracy: Green	Time Rep.: Green	Spatial Rep.: Green

AP-3: Emissions of sulphur dioxide (SO_2)

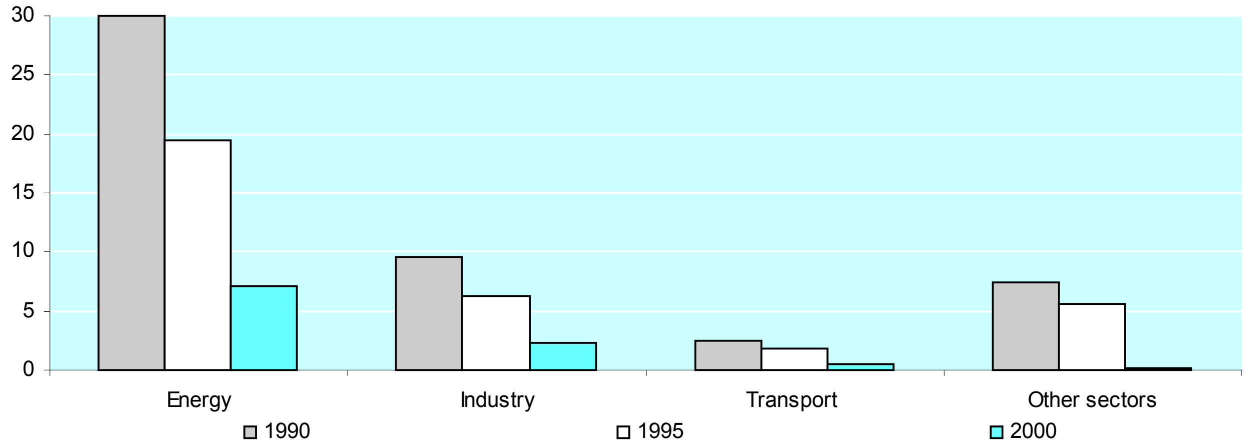
Relevant Sectors: **Energy, Industry, Transport**

Targets

Targets set by the 1999 Gothenburg Protocol represent a fall of 75% between 1990 and 2010, while the EU Directive on National Emission Ceilings aims for a decrease of 77% for EU-15 over the same period.

EU-15 emissions of SO_2 by economic sectors [1)]

kg per capita



Source: Annual European Community CLRTAP Inventory, EEA.
1) See Annex on Nomenclatures for sector definitions.

Comments

SO_2 emissions have fallen by two thirds since 1990, with AT, DE, LU, DK and IT seeing the largest decreases. The result is that Germany, the highest per capita emitter all through the 1980s, is now well below the EU average. One important contributory factor to Germany's improved performance has been the reduction in use of brown coal (lignite), a fuel with high sulphur content. Increased dependence on lignite for electricity generation is one reason why Greece is now the highest per capita emitter in the EU, followed by Ireland, a significant user of peat as a fuel to generate electricity. The major fall in emissions in Luxembourg reflects the move in the iron and steel industry to the electric arc method of steel production, which eliminates the need for coke, and thus the emissions of SO_2 associated with the coking process.

Directive 98/70/EC provides specifications for petrol and diesel fuel sold in the Community, so that, from 1 January 2005, petrol and diesel fuel must contain no more than 50 parts per million of sulphur, a level agreed at the end of the Auto-Oil I Programme. More recently the Commission made a proposal[38] to amend Directive 98/70/EC in order to further reduce the sulphur content of petrol and diesel fuels to 10 ppm. Although the overall contribution of transport to emissions of SO_2 is small and falling, the upward trends in transport fuel consumption (*see AP-1*) will cause emissions from this sector to increase, if the sulphur content of transport fuels remains the same.

In general the decreases seen between 1980 and 2000-2001 can be attributed to:

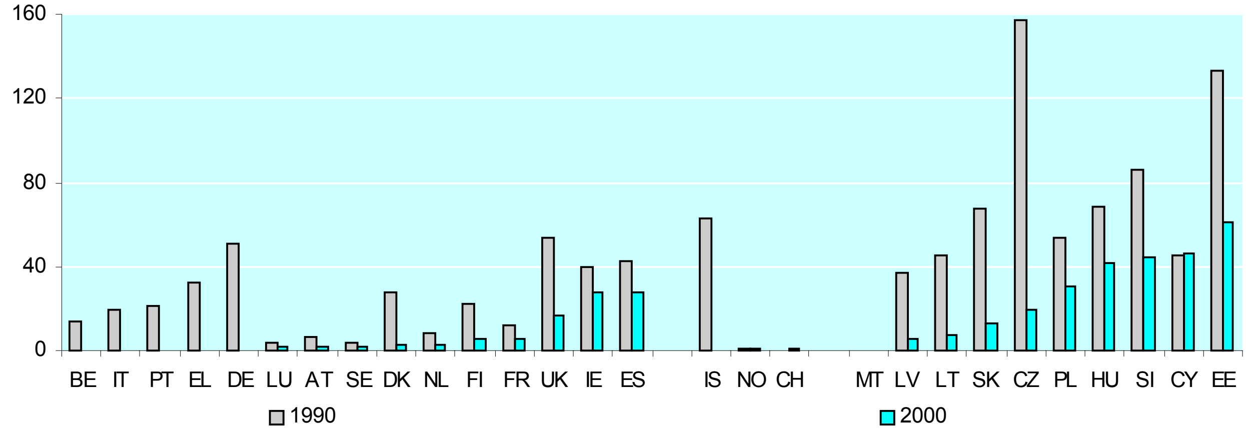
- the move away from sulphur-rich fuels, in particular coal and lignite, towards natural gas;
- the introduction of flue gas desulphurisation equipment;
- European legislation reducing the sulphur content of fuels (fuel oils);
- the increase in use of nuclear power.

[38] See COM(2001)241

AP-3: Emissions of sulphur dioxide (SO_2) (continued)

SO_2 emissions of the energy sector

kg SO_2 per capita



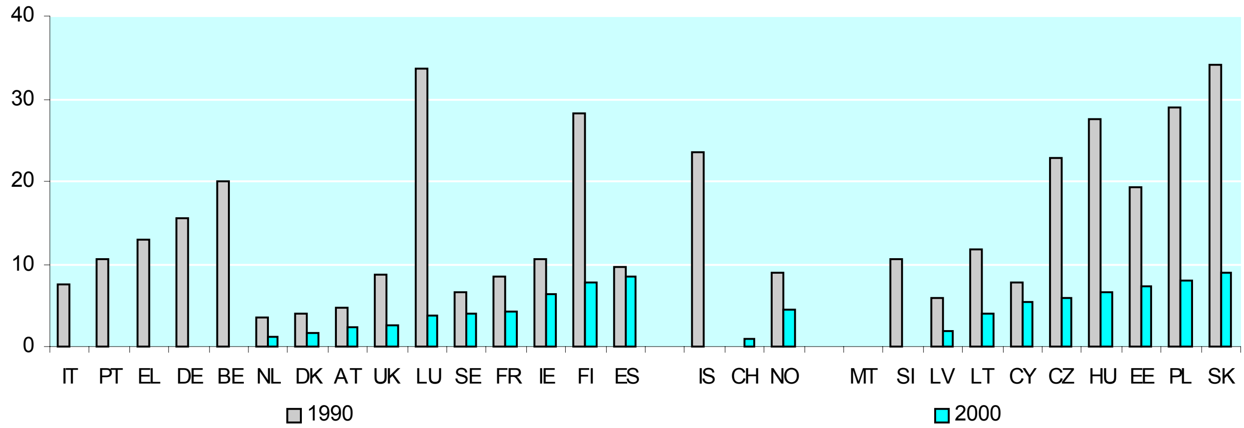
Source: Annual European Community CLRTAP inventory, EEA.

The energy industry, and particularly the electricity generation industry, is the most important source of SO_2 emissions. It is also the sector where the largest improvements have been seen, with emissions falling by more than half in both EU and Acceding countries. Emissions initially depend on the type and sulphur content of fuel used for electricity generation.

The largest reductions are seen in those countries that have moved away from use of lignite and coal to generate electricity, towards low sulphur fuels and/or have installed flue gas desulphurisation technology. For example, Germany, Italy and the UK have achieved remarkable reductions, with declines from around 3 000 tonnes emitted in Germany in 1990, to around 500 tonnes in 2000, while Italy has cut emissions from 1 000 tonnes to 500-600 tonnes and the UK from around 3 000 tonnes to 1 000 tonnes. In the Acceding countries, emissions have been cut by 60%, especially in the Czech Republic, down from 1 200 tonnes to 140 tonnes, and Poland, down from 1 600 tonnes to 140 tonnes.

SO_2 emissions of the industry sector

kg SO_2 per capita



Source: Annual European Community CLRTAP inventory, EEA.

Emissions from the industrial sector are mainly from fuel combustion in manufacturing industry, which account for around two thirds of industrial emissions overall. These have fallen by 2/3 since 1990, while emissions from industrial processes declined by around one half in EU-15 and 80% in Acceding countries over the same period.

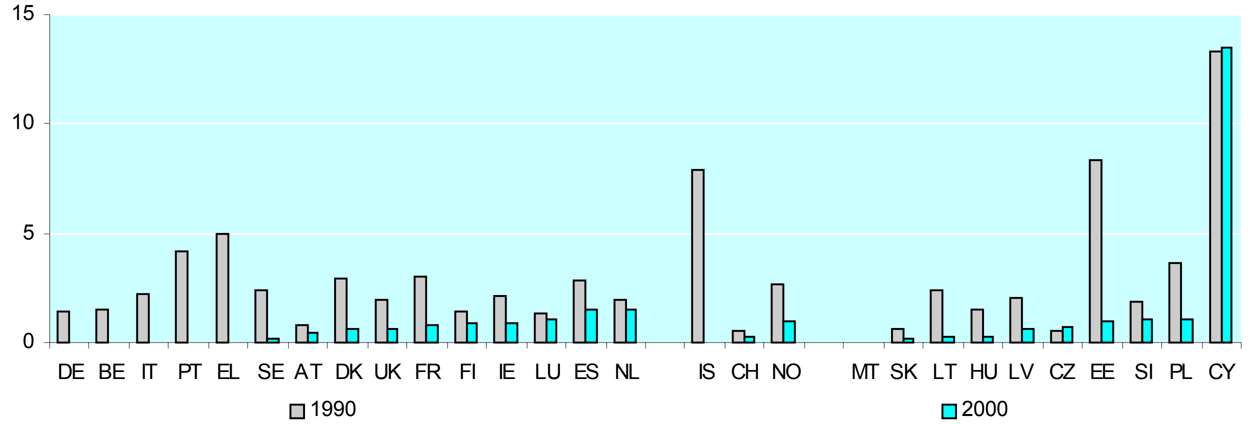
Decreases are attributable to fuel switching and ,in some Member States, to changes in the structure of industry.

AP-3: Emissions of sulphur dioxide (SO_2) (continued)

Relevant Sectors: **Energy, Industry, Transport**

SO_2 emissions by the transport sector

kg SO_2 per capita



Source: Annual European Community CLRTAP inventory, EEA.

The emissions from transport are mainly due to overall transport fuel consumption and the sulphur content of the fuels used for road transport. The improvement due to the reduction in the S content of petrol has been partly off-set by the major increase in the use of diesel fuel (*see AP-1*). In EU-15, overall emissions of SO_2 have fallen from 500 to 120-150 tonnes especially as a result of huge cuts in Germany, France, Italy and the UK (-70-90%), the biggest emitters. Important reductions are seen also in Sweden and Denmark. For Acceding countries as a whole, similar results are noted, mainly due to an important reduction in emissions from transport in Poland.

Other transport covers internal air and rail transport and inland navigation, which includes ferries between the mainland and islands within the national territory, as well as other mobile sources and machinery. The high sulphur content of the heavy fuel oil used for inland navigation and for other machinery contributes to the high emissions levels for some Member States, for this sector. International transport, including transport between EU Member States, is not covered.

In some countries fuel sales for fishing vessels are included in sales for inland navigation, in other countries fuels for fishing are treated as international bunker fuels, while in a few countries, fishing is treated as a sector in its own right. Therefore depending on the country, SO_2 emissions caused by the use of heavy fuel oil for fishing vessels may be allocated to other transport.

AP-4: Emissions of particles (PM_{10} and $PM_{2.5}$)

Definition and purpose

The purpose of this indicator is to show the main activities responsible for the release of smoke particles (including dust and soot) with a diameter smaller than 10 µm, into the atmosphere. Airborne particles are both solid and liquid, of various sizes and chemical composition, and can lead to episodes of winter smog in areas of low wind speeds and temperature inversion, when combined with high levels of SO_2.

Under these conditions, pollutants cannot be diluted into the upper atmosphere, which leads to high concentrations in the lower atmosphere. The particles are believed to penetrate deeply into the lungs, increasing the death rate in members of the population suffering from heart and lung diseases. Particle emissions are also associated with degradation of visibility. The particles smaller than 2.5 µm are mostly carbon (soot resulting from incomplete combustion of fuels, especially wood smoke and diesel engine exhaust) and, to a lesser extent, carbonaceous particles formed during the photochemical reaction sequence that also leads to O_3 formation, as well as sulphate and nitrate particles resulting from the oxidation of SO_2 and NO_x released during fuel combustion and their reaction products; these can persist in the air for long periods, forming a more or less stable aerosol, and can be transported over long distances. Coarser particles (soil and mineral ash) originate mainly from mechanical processes such as mining, quarrying, and other industrial processes, as well as wear and tear of tyres and brakes in road traffic, and are more quickly lost as their mass leads to rapid sedimentation.

Emissions of PM_{10} and $PM_{2.5}$

kg PM per capita

	PM_{10}												$PM_{2.5}$			
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	1990	1995	2000	2001
EU-15	3.3	3.0	2.8	2.7	2.5	2.8	2.5	2.3	2.4	2.5	2.8	:	2.0	1.7	1.6	:
BE	:	:	:	:	:	:	:	:	:	:	6.4	6.4	:	:	3.5	-
DK	:	:	:	:	:	:	:	:	:	:	3.7	3.7	:	:	2.5	-
DE	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
EL	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
ES	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	-
FR	11.1	11.7	11.1	10.5	9.9	9.9	10.2	9.8	9.9	9.6	9.3	9.3	6.5	5.8	5.1	-
IE	:	:	:	:	:	:	:	:	:	:	3.6	:	:	:	:	:
IT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
LU	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
NL	6.0	:	:	:	:	4.5	:	:	2.8	4.0	3.9	3.8	3.6	2.8	2.4	-
AT	6.0	:	:	:	:	5.8	:	:	:	6.0	5.9	5.9	3.6	3.4	3.4	-
PT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
FI	:	:	:	:	:	5.9	:	:	:	:	9.3	10.4	:	4.3	7.3	-
SE	13.3	12.7	12.0	11.5	10.7	10.4	9.9	9.0	8.4	7.6	7.5	7.8	10.1	7.7	5.1	-
UK	5.4	5.3	5.1	4.9	4.6	4.1	4.0	3.6	3.5	3.3	3.0	3.0	3.3	2.5	1.8	-
IS	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
NO	16.6	15.2	14.4	15.8	16.0	15.5	16.1	16.8	15.3	14.6	14.7	14.3	13.9	13.5	12.5	-
CH	4.8	:	:	:	:	4.0	:	:	:	:	3.7	3.3	:	2.2	:	:
CZ	:	:	:	:	:	:	:	:	:	:	:	4.2	:	:	:	:
EE	:	:	:	:	:	22.3	:	:	:	:	:	:	:	9.2	:	:
CY	:	:	:	:	:	:	:	:	:	:	:	0.8	:	:	:	:
LV	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
LT	:	:	:	:	:	:	:	:	:	:	:	0.2	:	:	:	:
HU	:	:	:	:	:	-	-	-	-	-	-	:	:	-	-	:
MT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
PL	:	:	:	:	:	:	:	:	:	:	7.3	7.9	:	:	3.5	-
SI	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
SK	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

Source: Annual European Community CLRTAP Inventory, EEA.

Methodology and data problems

Differences in national definitions and methodologies, and in size thresholds, mean that the national totals given above should not be used for comparing countries, but may be used to look at trends over time within individual countries. A lot more work is needed to improve the coverage and to fill in the data gaps for these pollutants.

Relevance: Green	Accuracy: Yellow	Time Rep.: Green	Spatial Rep.: Yellow

AP-4: Emissions of particles (PM_{10} and $PM_{2.5}$)

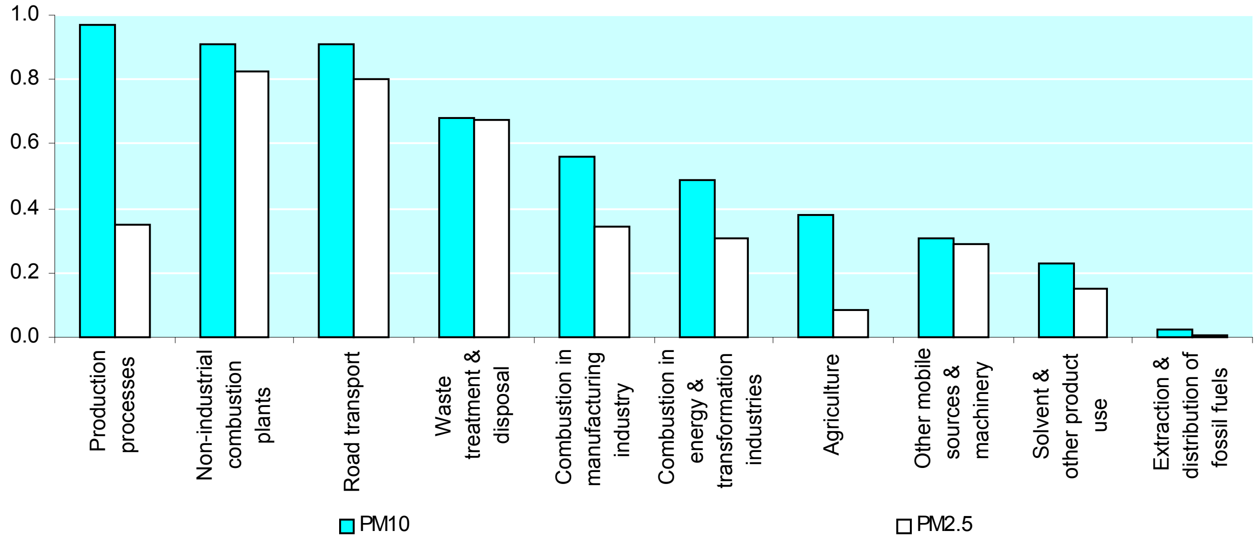
Relevant Sectors: **Transport, Energy, Industry**

Targets

No ceilings for emissions of particles have been set in the EU, although Directive 97/68/EC sets limit values for emissions of gaseous and particulate pollutants from internal combustion engines (with a power comprised between 18kW and 560kW) installed in non-road mobile machinery. Also, under Directive 99/30/EC[39], limit values for concentrations of particles such as PM_{10} have been fixed for ambient air quality, for the year 2005.

EU-15 emissions of particles by economic sectors (1995)

kg PM per capita



Source: TNO (CEPMEIP programme for EMEP under UNECE CLRTAP, http://www.air.sk/tno/cepmeip/)

Comments

Although data availability is very poor, a decrease in total emissions of particles has been observed since 1990. This is mainly due to a decline in the use of coal for heating, steam raising and power generation.

As shown in the graph, total aggregated emissions of particles (PM_{10} and $_{2.5}$) arise essentially from the combustion of fossil fuels, whether in industrial or non-industrial combustion plants, in power stations and by road transport (18.4%). More specifically, $PM_{2..5}$ are believed to arise mainly from:

- the combustion of coal, oil, gasoline, diesel, wood;
- atmospheric transformation products of NO_x, SO_2 and organic compounds including biogenic species (e.g. terpenes);
- high temperature processes, smelters, steel mills, etc.,

while the main emitters of PM_{10} are the re-suspension of industrial dust and soil tracked onto roads, suspension from disturbed soil (e.g. farming, mining, unpaved roads), biological sources, construction and demolition, coal and oil combustion, ocean spray[40]. Around 30% of emissions are due to waste treatment and disposal and to production processes, both at around 14% of the total.

About 60% of the particles are estimated to be $PM_{10,}$ and 40% for $PM_{2.5}$. As these pollutants do not have the same toxicological properties, the same lifetime, etc., nor the same impact on health and environment, emissions should ideally be weighted taking such characteristics into account ; however no such weighting factors exist.

[39] OJ L163, 29/06/1999 p. 0041 – 0060. Based on the Air Quality Framework Directive 96/62/EC.
[40] Source: WHO 1999 web site based on USEPA (1995a, b).

AP-5: Emissions of ammonia (NH_3)

Definition and purpose

Ammonia is an 'acid rain' precursor which is mainly emitted from spreading animal manure and, to a lesser extent, the production of artificial fertilisers. NH_3 may lead to acidification after it reaches the soil, where it is nitrified by bacteriological action to give nitric acid. NH_3 may react with the sulphuric and nitric acids to form ammonium sulphate and ammonium nitrate particles.

With its short lifetime in the atmosphere, NH_3 is to a large extent deposited close to the source of emissions; however large parts of Europe have seen substantial changes in the vegetation in natural terrestrial ecosystems, due to the nitrogen fertilisation effect caused by NH_3 and NO_x. Finally, soil acidification is closely linked to water acidification, which can affect aquatic life, groundwater and the related drinking water supply.

NH_3 emissions

kg NH_3 per capita

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	9.82	9.30	9.09	8.89	8.81	8.97	8.82	8.95	8.95	8.95	8.56	:
BE	9.98	9.32	9.24	9.67	9.53	9.87	9.75	9.71	10.01	9.76	7.95	:
DK	25.90	25.07	24.60	23.94	23.09	21.67	20.76	20.66	20.77	19.76	19.51	19.07
DE	9.30	8.19	7.92	7.59	7.32	7.40	7.43	7.30	7.36	7.36	7.25	7.38
EL	7.81	7.65	7.29	7.25	7.01	8.14	6.98	6.77	7.04	6.93	:	:
ES	8.50	8.21	8.14	7.63	8.13	7.81	8.66	8.65	9.12	9.42	9.79	9.55
FR	13.77	13.60	13.37	13.14	13.19	13.20	13.34	13.39	13.37	13.35	13.34	13.20
IE	31.94	32.66	32.98	32.78	33.21	33.36	33.70	33.68	34.38	33.91	32.30	:
IT	8.22	7.95	7.75	7.88	8.03	8.05	7.50	7.71	7.61	7.78	7.58	:
LU	18.46	:	:	17.71	17.46	17.22	16.96	16.73	16.52	16.99	16.59	:
NL	15.58	15.19	11.90	12.53	10.82	12.51	9.42	12.08	10.86	10.53	9.58	9.26
AT	6.80	6.87	6.34	7.10	7.17	7.08	6.89	7.05	6.95	6.79	6.63	6.61
PT	11.29	10.83	11.35	10.64	10.00	10.69	10.38	10.17	10.34	10.92	10.51	10.52
FI	7.64	:	8.15	:	:	6.90	6.84	7.40	7.34	6.82	6.40	6.41
SE	6.38	6.38	6.35	7.08	7.07	6.98	6.99	6.73	6.76	6.41	6.47	6.08
UK	5.93	5.95	5.66	5.65	5.64	5.45	5.49	5.53	5.42	5.33	4.98	4.84
IS	:	:	:	:	:	:	:	:	:	:	:	:
NO	5.34	5.41	5.73	5.65	5.69	6.00	6.06	5.92	5.86	5.74	5.67	5.46
CH	10.71	10.52	10.38	10.28	10.05	9.86	9.77	9.74	9.62	9.59	9.53	9.37
CZ	15.05	12.93	11.15	9.59	8.81	8.32	7.85	7.86	7.77	7.29	7.20	7.50
EE	15.46	14.14	11.84	8.78	8.36	7.37	6.47	6.66	6.71	5.86	6.39	6.56
CY	:	:	:	:	:	:	:	:	:	:	:	11.25
LV	16.38	15.67	12.38	7.56	6.55	6.64	6.20	5.85	5.45	4.92	4.87	5.24
LT	22.65	22.75	21.62	21.41	21.48	10.22	9.70	9.44	9.45	7.84	6.81	13.62
HU	11.95	8.98	8.13	7.47	7.40	7.52	7.64	7.47	7.25	7.05	7.05	:
MT	:	:	:	:	:	:	:	:	:	:	:	:
PL	13.35	11.79	11.67	9.94	9.97	9.85	9.43	9.06	9.60	8.82	8.33	8.00
SI	12.02	11.50	12.01	11.53	11.06	11.06	11.05	9.56	10.08	10.11	9.56	:
SK	11.91	10.68	8.87	7.83	7.25	7.39	7.08	6.71	5.96	5.60	5.48	5.26

Source: Annual European Community CLRTAP Inventory, EEA.

Methodology and data problems

Ammonia emissions are mainly estimated from rather poor data and assumptions about agricultural practices (manure storage, handling and spreading). Information on direct ammonia emissions from crops following fertiliser application is very poor. It is well known that plant foliage emits and absorbs ammonia, but estimates of net emissions are much more uncertain. It is difficult in practice to separate the plant emissions from those due to the use of fertilisers, since both are a function of fertiliser nitrogen supply. Also the estimates of ammonia emitted by decomposing agricultural crops are extremely uncertain, as emissions from this source are very variable.

Relevance: Green	**Accuracy: Yellow**	**Time Rep.: Green**	**Spatial Rep.: Green**

AP-5: Emissions of ammonia (NH_3)

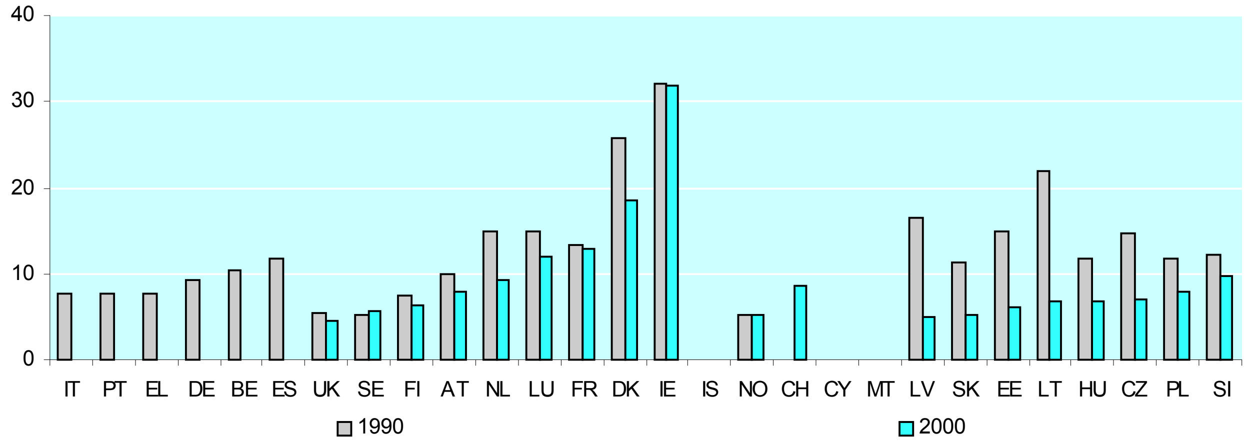
Relevant Sectors: **Agriculture**

Targets

COM (97) 88 set out the Community strategy to combat acidification, which, together with the more recent EU Directive on National Emission Ceilings[41], aims for a decrease of NH_3 emissions to 3 110 kilotonnes by 2010, through new developments in the field of agriculture, new livestock projections and improvements in emission reduction methods in the agricultural sector.

EU-15 emissions of NH_3 by agriculture [1)]

kg NH_3 per capita



Source: Annual European Community CLRTAP Inventory, EEA.
1) See Annex on Nomenclatures for sector definitions.

Comments

Emissions of ammonia decreased by around 7% overall between 1990-2000, though Spain saw an increase of 17%, and Ireland and Norway, 9%, over the same period. In the Acceding countries, emissions have decreased by at least 20% (Slovenia), and up to 70% in Lithuania and Latvia. Their average is at around 7.5 kg per capita, quite close to that of EU-15 (8.8 kg) and of EFTA countries (around 8.1 kg).

About 80% of ammonia is emitted by agriculture, mainly due to volatilisation from livestock excretions (80%) and from mineral nitrogenous fertilisers and fertilised crops (10-20%). Emissions due to crops without fertilisers are negligible, with the exception of nitrogen fixing leguminous crops, where the amounts of ammonia emitted from foliage and decomposing leaves is similar to that for fertilised crops.

The highest amounts of per capita NH_3 emissions are in the Netherlands due to intensive livestock breeding, and in Northern Italy because of the high use of fertilisers. Decreased emissions of ammonia in almost all European countries are the consequence of the increasing pressure of milk quotas (fewer dairy cows) as well as an increasing awareness among farmers leading to changes in fertiliser practices (lower rates of application, more precise methods of application and alternative crop management techniques).

[41] OJ C375, 28/12/2000 p. 0001-0011.

ANNEXES

ANNEX 1: ABBREVIATIONS, ACRONYMS & SYMBOLS

Abbreviations, Acronyms & Symbols

0	Amount lower than 0.5
_	Amount equal to zero
.	Not applicable
:	No data available
|	Break in time series (e.g. due to German reunification)
e	National estimate
p	Provisional data
s	Eurostat estimate
6EAP	The sixth EU environment action programme 2001-10
AT	Austria
AC-10	10 Acceding Countries: Czech Republic (CZ), Estonia (EE), Cyprus (CY), Latvia (LV), Lithuania (LT), Hungary (HU), Malta (MT), Poland (PL), Slovenia (SI), Slovak Republic (SK)
BE	Belgium
C	Carbon
CH_4	Methane
CLRTAP	UNECE Convention on Long Range Transboundary Air Pollution
CO_2	Carbon Dioxide
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
EEA	European Environment Agency
EL	Greece
ETC	European Topic Centre (of the EEA)
ETC-ACC	ETC Air and Climate Change
ETC-WMF	ETC Waste and Material Flows
EU	European Union
EU-15	EU with 15 Member States (EU-12 + FIN, S, A)
Eurostat	Statistical Office of the European Communities, European Commission, Luxembourg
EWC	European Waste Catalogue
FR	France
FI	Finland
GHG	Greenhouse Gases
GIC	Gross Inland energy Consumption (the total amount of energy necessary to satisfy internal needs)
GVA	gross value added
GWP	Global Warming Potential
ha	hectare
HFCs	Hydrofluorocarbons
HU	Hungary
inhab.	inhabitant
IT	Italy
IPCC	Intergovernmental Panel on Climate Change
IE	Ireland
IS	Iceland
ISWA	International Solid Waste Association
kg oe	kilogramme of oil equivalent
km^2	square kilometre
kWh	kilowatt hour
LT	Lithuania
LU	Luxembourg
LV	Latvia
m^3	cubic metre
Mio	million
MT	Malta
MWTP	Municipal Waste water Treatment Plant
N_2O	Nitrous Oxide
NACE	Nomenclature of Economic Activities in the European Union
NAI	Net Annual Increment
NH_3	Ammonia
NL	Netherlands
NMVOCs	Non-Methane Volatile Organic Compounds
NO	Norway
NO_x	Nitrogen Oxides

OJ	Official Journal of the European Communities Available on http://europa.eu.int/pol/env/index_en.htm.
PL	Poland
PT	Portugal
PFCs	Perfluorocarbons
SE	Sweden
SF_6	Sulphurhexafluoride
SI	Slovenia
SK	Slovak Republic
SO_2	Sulphur Dioxide
SO_x	Sulphur Oxides
t	Tonne(s) (1000 kilogrammes)
TBFRA	Temperate and Boreal Forest Resources Assessment
toe	Tonnes of oil equivalent
UK	United Kingdom
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile Organic Compounds

ANNEX 2: NOMENCLATURES

Nomenclatures

1. NACE Rev.1 classification of economic activities used by Eurostat

NACE Rev. 1 is a statistical classification of economic activities in the European Community. It serves as a basis for the compilation of statistics on the production, factors of production (labour, raw materials, energy, etc.), and fixed capital formation operations of these activities. The use of NACE Rev. 1 was made compulsory by Council Regulation (EEC) n° 3037/90, amended by Commission Regulation (EEC) n° 761/93 of 24 March 1993. It is fully harmonised with the industrial classification of the Member States and the United Nations.
The activities covered in NACE Rev. 1 are as follows:

- **Section A Agriculture, hunting and forestry**
- **Section B Fishing**
- **Section C Mining and quarrying**

10 Mining of coal & lignite; extraction of peat
11 Extraction of crude petroleum & natural gas; service activities incidental to oil & gas extraction excluding surveying
12 Mining of uranium & thorium ores
13 Mining of metal ores
14 Other mining & quarrying

- **Section D Manufacturing**

da
15 Manufacture of food products & beverages
16 Manufacture of tobacco products

db
17 Manufacture of textiles
18 Manufacture of wearing apparel; dressing & dyeing of fur

dc
19 Tanning & dressing of leather; manufacture of luggage, handbags, saddlery, harness & footwear

dd
20 Manufacture of wood & of products of wood & cork, except furniture; manufacture of articles of straw & plaiting materials

de
21 Manufacture of pulp, paper & paper products
22 Publishing, printing & reproduction of recorded media

df
23 Manufacture of coke, refined petroleum products & nuclear fuel

dg
24 Manufacture of chemicals & chemical products
dh
25 Manufacture of rubber & plastic products

di
26 Manufacture of other non-metallic mineral products

dj
27 Manufacture of basic metals
28 Manufacture of fabricated metal products, except machinery & equipment

dk
29 Manufacture of machinery & equipment n.e.c.

dl
30 Manufacture of office machinery & computers
31 Manufacture of electrical machinery & apparatus n.e.c.
32 Manufacture of radio, television & communication equipment & apparatus
33 Manufacture of medical, precision & optical instruments, watches & clocks

dm
34 Manufacture of motor vehicles, trailers & semi-trailers
35 Manufacture of other transport equipment

dn
36 Manufacture of furniture; manufacturing n.e.c.
37 Recycling

- **Section E Electricity, gas and water supply**

45 Construction

- **Section F Construction**

40 Electricity, gas, steam & hot water supply
41 Collection, purification & distribution of water

- **Section G Wholesale and retail trade**
- **Section H Hotels and restaurants**
- **Section I Transport, storage and communication**
- **Section J Financial intermediation**
- **Section K Real estate, renting and business activities**
- **Section L Public administration and defence**
- **Section M Education**
- **Section N Health and social work**
- **Section O Other Community, social and personal service activities**
- **Section P Activities of households**
- **Section Q Extra-territorial organizations and bodies**

NACE-type sectoral breakdown applied to indicators based on data from the Eurostat/OECD Joint Questionnaire:

- Agriculture: Section A Agriculture, hunting and forestry
- Fishery: Section B Fishing
- Industry: Section C Mining and quarrying + Section D Manufacturing [42] + Section E Electricity, gas and water supply + Section F Construction – NACE 37 + 90 + 34 + 35 (see below)
- Waste treatment: NACE 37 Recycling + NACE 90 Sewage and refuse dispsoal, sanitation and similar activities
- Transport: Section I + NACE 34 Manufacture of motor vehicles, trailers & semi-trailers + NACE 35 Manufacture of other transport equipment

[42] For reasons of data availability, Industry will often be restricted to Manufacturing (Section D) only.

Nomenclatures

2. IPCC classification used by UNFCCC

The full IPCC classification covers the following greenhouse gas source and sink categories
(SUMMARY 1.A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES - IPCC TABLE 7A):

1. Energy
- A. Fuel Combustion
  1. Energy Industries
  2. Manufacturing Industries and Construction
  3. Transport
  4. Other Sectors
  5. Other
- B. Fugitive Emissions from Fuels
  1. Solid Fuels
  2. Oil and Natural Gas

2. Industrial Processes
- A. Mineral Products
- B. Chemical Industry
- C. Metal Production
- D. Other Production
- E. Production of Halocarbons and SF_6
- F. Consumption of Halocarbons and SF_6
- G. Other

3. Solvent and Other Product Use

4. Agriculture
- A. Enteric Fermentation
- B. Manure Management
- C. Rice Cultivation
- D. Agricultural Soils
- E. Prescribed Burning of Savannas
- F. Field Burning of Agricultural Residues
- G. Other

5. Land-Use Change and Forestry
- A. Changes in Forest & Other Woody Biomass Stocks
- B. Forest and Grassland Conversion
- C. Abandonment of Managed Lands
- D. CO_2 Emissions and Removals from Soil
- E. Other

6. Waste
- A. Solid Waste Disposal on Land
- B. Wastewater Handling
- C. Waste Incineration
- D. Other

7. Other

Definitions applied in the Climate Change chapter

EEA sectors, UNFCCC based	UNFCCC Sectors, Common Reporting Format
0	Total National Emissions
1	Energy Industries
2	Manufacturing Industries and Construction, Industrial Processes
3	Transport
4	Agriculture
5	Waste
6	Other Energy Sectors, Other Energy, Fugitive Emissions from Fuels, Solvent and Other Product Use, Other Sectors

Nomenclatures

3. SNAP classification used by UNECE/EMEP

The CORINAIR/UNECE source category split of emissions covers the following [43]:

0. National total
1. Combustion in energy and transformation industries
2. Non-industrial combustion plants
3. Combustion in manufacturing industry
4. Production processes
5. Extraction and distribution of fossil fuels and geothermal energy
6. Solvent and other product use
7. Road transport
8. Other mobile sources and machinery
9. Waste treatment and disposal
10. Agriculture
11. Other sources and sinks

Definitions applied to sectors in the Air Pollution chapter

- Energy: 1. Combustion in energy and transformation industries + 2. Non-industrial combustion plants + 5. Extraction and distribution of fossil fuels and geothermal energy

- Industry: 3. Combustion in manufacturing industry +4. Production processes + 6. Solvent and Other Product Use

- Transport: 7. Road transport + 8. Other mobile sources and machinery

- Other : sectors not included elsewhere (varies depending on the indicator)

[43] http://webdab.emep.int/

Annex 3:

EU-15, EFTA, Acceding Countries: Population

Annex 3

Population of EU-15, EFTA, Acceding Countries and others

Population 1st January

1 000 people

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU-15	363 763	365 382	367 061	368 935	370 323	371 442	372 476	373 487	374 345	375 277	376 482	:
BE	9 948	9 987	10 022	10 068	10 101	10 131	10 143	10 170	10 192	10 214	10 239	10 263
DK	5 135	5 146	5 162	5 181	5 197	5 216	5 251	5 275	5 295	5 314	5 330	5 349
DE	79 113	79 753	80 275	80 975	81 338	81 539	81 817	82 012	82 057	82 037	82 163	82 260
EL	10 121	10 200	10 294	10 349	10 410	10 443	10 465	10 487	10 511	10 522	10 554	:
ES	38 826	38 875	38 965	39 057	39 136	39 197	39 249	39 308	39 388	:	39 733	40 122
FR	56 577	56 841	57 111	57 369	57 565	57 753	57 936	58 116	58 299	58 497	58 749	59 037
IE	3 507	3 521	3 547	3 569	3 583	3 598	3 620	3 652	3 694	:	3 777	3 826
IT	56 694	56 744	56 757	56 960	57 138	57 269	57 333	57 461	57 563	57 613	57 680	57 844
LU	379	384	390	395	401	407	413	418	424	:	436	441
NL	14 893	15 010	15 129	15 239	15 342	15 424	15 494	15 567	15 654	15 760	15 864	15 987
AT	7 690	7 769	7 868	7 962	8 015	8 040	8 055	8 068	8 075	8 083	8 103	8 121
PT	9 920	9 877	9 961	9 965	9 983	10 013	10 041	10 070	10 108	10 150	10 198	10 263
FI	4 974	4 998	5 029	5 055	5 078	5 099	5 117	5 132	5 147	5 160	5 171	5 181
SE	8 527	8 591	8 644	8 692	8 745	8 816	8 837	8 844	8 848	8 854	8 861	8 883
UK	57 459	57 685	57 907	58 099	58 293	58 500	58 704	58 905	59 090	59 391	59 623	59 863
IS	254	256	260	262	265	267	268	270	272	276	279	283
NO	4 233	4 250	4 274	4 299	4 325	4 348	4 370	4 393	4 418	4 445	4 478	4 503
CH	6 674	6 751	6 843	6 908	6 969	7 019	7 062	7 081	7 096	7 124	7 164	7 204
CZ	10 362	10 364	10 313	10 326	10 334	10 333	10 321	10 309	10 299	10 290	10 278	10 267
EE	1 572	1 570	1 562	1 527	1 507	1 492	1 476	1 462	1 454	1 446	1 372	1 367
CY	675	687	700	714	723	730	736	741	746	:	755	759
LV	2 673	2 668	2 657	2 606	2 566	2 530	2 502	2 480	2 458	2 439	2 380	2 366
LT	3 708	3 736	3 747	3 736	3 724	3 718	3 712	3 707	3 704	3 701	3 699	3 693
HU	10 375	10 355	10 337	10 310	10 277	10 246	10 212	10 174	10 135	10 092	10 043	:
MT	352	356	360	363	366	369	371	374	377	379	380	391
PL	38 038	38 183	38 309	38 418	38 505	38 581	38 609	38 639	38 660	38 667	38 654	38 644
SI	1 996	2 000	1 999	1 994	1 989	1 989	1 990	1 987	1 985	1 978	1 988	1 990
SK	5 288	5 272	5 296	5 314	5 336	5 356	5 368	5 379	5 388	5 393	5 399	5 403

Source: Eurostat.