EN06 Energy-related emissions of acidifying substances

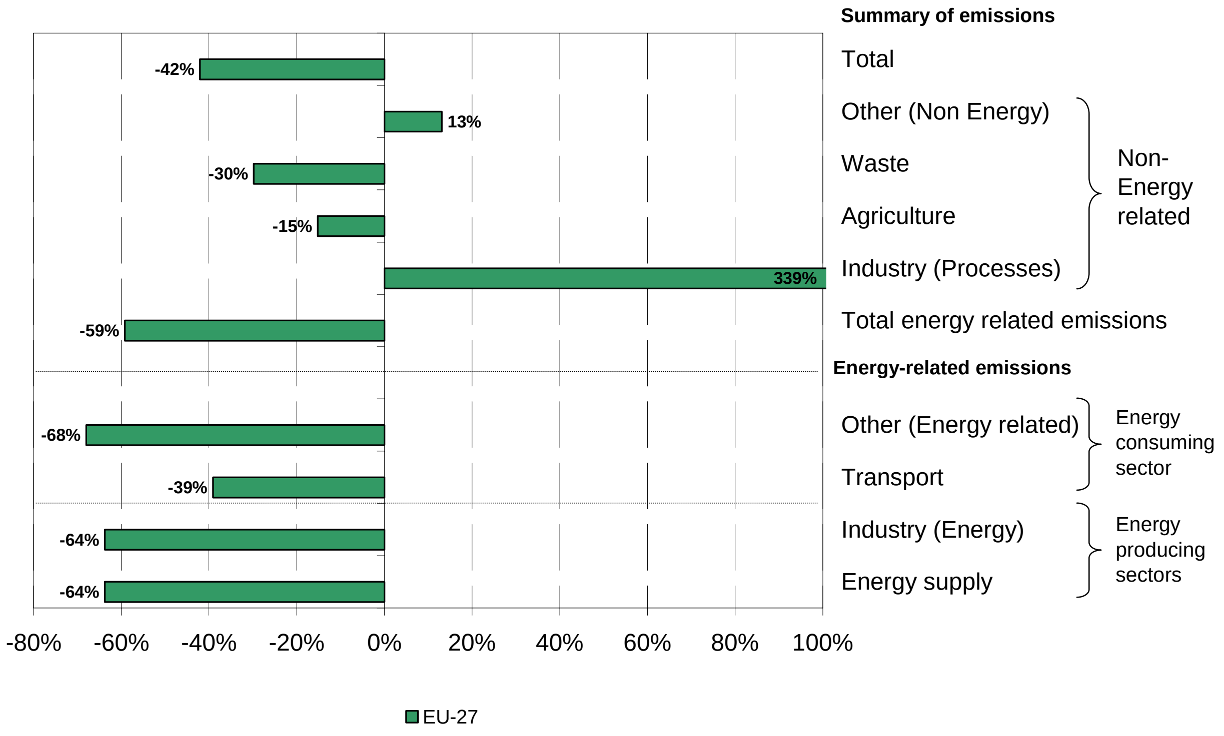
Key message

Emissions of energy-related acidifying pollutants decreased by 59 % in the EU-27 between 1990 and 2005. This was mainly due to the introduction of abatement technologies, fuel switching and the uptake of low sulphur fuels together with improved energy efficiency and the closure of inefficient power plants. Further reductions in acidifying emissions from energy use are still needed to improve remaining local and transboundary air pollution issues.

Rationale

Energy production and use account for the majority of nitrogen oxides (NO_x) and sulphur dioxide (SO_2) emissions, but only a small fraction of ammonia (NH_3) emissions. These pollutants all contribute to acid deposition, leading to potential changes in soil and water quality and damage to forests, crops and other vegetation, and to adverse effects on aquatic ecosystems in rivers and lakes. Acidification also damages buildings and cultural monuments and, because acidifying pollutants also contribute to the formation of fine particulates in the atmosphere, it also indirectly contributes to human respiratory diseases.

Fig. 1: Changes (%) in emissions of acidifying pollutants by source category, 1990-2005, EU-27 (weighted by tropospheric ozone formation potential)

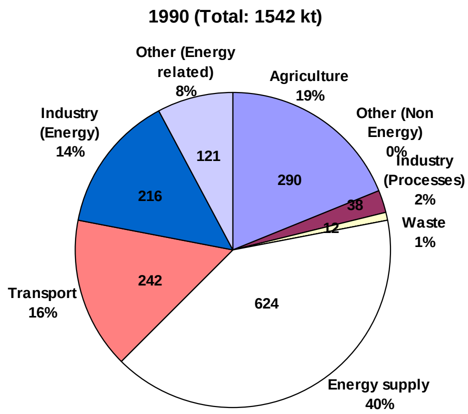


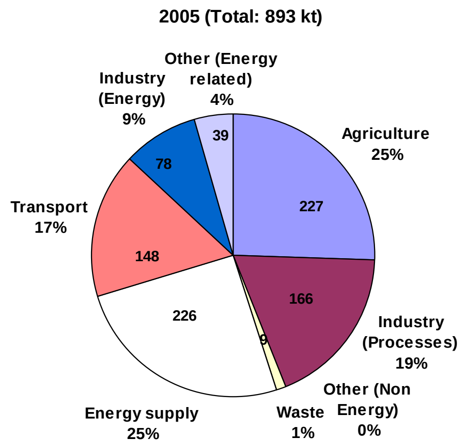
Notes: The figure shows the emissions of acidifying pollutants (sulphur dioxide SO_2, nitrogen oxides NO_x and ammonia NH_3) each weighted by an acid equivalency factor prior to aggregation to represent their respective acidification potentials. The acid equivalency factors are given by: $w(SO_2)$ = 2/64 acid eq/g = 31.25 acid eq/kg, $w(NO_x)$ = 1/46 acid eq/g = 21.74 acid eq/kg and $w(NH_3)$ = 1/17 acid eq/g = 58.82 acid eq/kg.

The energy supply sector includes public electricity and heat production, oil refining, production of solid fuels and fugitive emissions from fuels. The transport sector includes emissions from road and off-road sources (e.g. railways and vehicles used for agriculture and forestry). Industry (Energy) relates to emissions from combustion processes used in the manufacturing industry including boilers, gas turbines and stationary engines. ‘Other (energy-related)’ covers energy use mainly in the services and household sectors.

Source: EEA/ETC-ACC 2007

Fig. 2: Sectoral shares of acidifying pollutants (SO_2, NO_x, NH_3; energy and non-energy components) of total emissions, EU-27. Values within the segments indicate the level of emissions (kt) emitted from each sector.





Source: EEA/ETC-ACC 2007.

1. Indicator assessment

EU-27 energy-related acidifying emissions are responsible for 55 % of the total acidifying emissions in 2005, underlining the large contribution that energy use makes to both local and transboundary air pollution. In the case of NO_x and SO_2, the share of energy-related emissions is even higher with energy-related sectors contributing 95 % and 62% to total emissions for each of these respective pollutants.

Agriculture and Transport are the sectors with the highest emissions of acidifying substance per capita across the EU-27 and the EEA (Fig 4).

Energy-related acidifying emissions decreased by 59 % over the period 1990-2005 (Fig 3). In the EU-15 this has mainly been due to improved abatement technology and increased rates of implementation of these technologies, switching from coal and heavy fuel oil to natural gas, the increased share of low sulphur fuels, and improved energy efficiency. In the new EU-12 Member States, the main reasons for the decrease in emissions include the combined effect of economic restructuring, reduced energy consumption, closing of inefficient plants, reduced use of sulphurous fuels and the increased market penetration of pollution abatement technologies such as flue gas desulphurisation.

The energy supply sector (power production etc) was responsible for the largest decrease in emissions of energy-related acidifying pollutants in the EU-27 between 1990 and 2005 in absolute terms (-398 kt or -64% in relative terms), with the ‘manufacturing industry’ and ‘services and household’ sectors showing a similar percentage decrease of emissions. In the latter sectors, this was mainly due to a decrease of SO_2 emissions caused by use of less sulphurous fuels (including fuel switching etc). In the electricity production sector, combustion modification and flue-gas treatment have been used to reduce NO_x emissions (see EN09 for details). One of the most common forms of combustion modification is to use low NO_x burners, which typically can reduce NO_x emissions by up to 40 %. Flue gas treatment such as selective catalytic reduction can also be used to remove NO_x from the flue gases. Transport emissions of acidifying pollutants across the EU-27 have also decreased significantly by 39 % between 1990 and 2005, largely due to the introduction of catalytic converters on new cars since the early 1990s. Across Europe there is an increasing awareness of the contribution made to acidifying pollutant emissions by ship traffic. (A detailed discussion of this issue is contained in TERM indicator fact sheet TERM03 - Transport emissions of air pollutants.) Many of these actions were implemented as a result of various European policies and measures, including the IPPC Directive, the Large Combustion Plant Directive and vehicle EURO standards (see section 2.2).

The majority of EU-27 Member States have contributed to the reduction in overall emissions of acidifying substances. In particular, many of the EU-12 Member States (excluding Bulgaria, Romania) have already met or exceeded their indicative targets under the National Emission Ceilings Directive (NECD) due to structural changes in their economies, such as the decline in heavy industry and the closure of older inefficient power plants. This has led to a decline of over 50 % in emissions in the period 1990-2005 in many cases, even though total per capita emissions often still remain high (compared to EU-15 Member States). However, some EU-15 Member States are currently not well on track to meet their 2010 emissions targets under the NECD (see EEA, 2008).

2. Indicator rationale

2.1 Environmental context

Acidification is caused by emissions of sulphur dioxide, nitrogen dioxide and ammonia into the atmosphere, and their subsequent chemical reactions and deposition on ecosystems and materials (see also EEA 2008). Deposition of acidifying substances causes damage to ecosystems, buildings and materials (corrosion). The adverse effect associated with each individual pollutant depends on its potential to acidify and the individual properties of the ecosystems and materials. The deposition of acidifying substance still often exceeds the critical loads[1] of the ecosystems across Europe[2]. Efforts to reduce the effects of acidification are therefore focused on reducing the emissions of acidifying substances. NO_x and SO_2 can react in the atmosphere and transform into small-diameter particulate matter which when inhaled, can have direct or indirect impacts on human health causing harmful effects such as respiratory problems. See EN07 for more information about energy-related particulate emissions. NO_x is also a tropospheric ozone precursor that reacts in the atmosphere in the presence of sunlight to form ozone which, in high concentrations, can lead to significant health impacts and damage to crops and other vegetation (see also EN05). Furthermore, an excessive input of nitrogen nutrients from atmospheric deposition or via run-off following atmospheric deposition can lead to eutrophication of waters.

2.2 Policy context

Several EU-wide emissions limits and targets exist for the reduction of total SO_2, NO_x and NH_3 emissions, including the National Emissions Ceiling Directive (NECD; 2001/81/EC) and the UNECE LRTAP Convention Gothenburg Protocol under UNECE LRTAP Convention (UNECE 1999). This indicator provides relevant information for assessing the achievement of these targets and also for analyses performed within the European Commission's Clean Air for Europe programme (CAFE). This thematic strategy on air quality was released in September 2005[3].

The NEC Directive includes emission reduction targets that are slightly stricter than the targets set in the Gothenburg Protocol and requires the introduction of national emission ceilings for emissions of SO_2, NO_x and NH_3 (and also for NMVOCs) in each Member State, as well as setting interim environmental objectives for reducing the exposure of ecosystems and human populations to damaging levels of the acid pollutants. Targets for the new Member States are temporary and are without prejudice to the on-going review of the NECD. A proposal for a revised NEC Directive (which will set 2020 emission ceiling targets for these acidifying pollutants), is expected in spring 2008. Targets for Bulgaria and Romania are provisional and not binding. Hence, the existing EU25 NECD Target has been used in the following analysis.
In terms of the energy sector, the most relevant NEC Directive targets for the EU-25 (exclude Romania and Bulgaria) as a whole are:

- SO_2: emissions reduction of 74 % by 2010 from 1990 levels;
- NO_x: emissions reduction of 53 % by 2010 from 1990 levels.

NH_3 emissions are also an important source of acid deposition and have an emissions target under NEC (emissions reduction target of 15 % by 2010 from 1990 levels), but energy-related emissions of ammonia are insignificant, accounting for only 2.5 % of total EU-27 ammonia emissions in 2005. Agriculture is by far the largest contributing sector to EU ammonia emissions.

Other key policies that have contributed to the reduction of acidifying emissions across Europe include:

- The Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC), which entered into force in 1999. It aims to prevent or minimise pollution of water, air and soil by industrial effluent and other waste from industrial installations, including energy industries, by defining basic obligations for operating licences or permits and by introducing targets, or benchmarks, for energy efficiency. It requires the application of Best Available Techniques in new installations (and for existing plants over 10 years, according to national legislation).

- The Large Combustion Plant Directive (2001/80/EC) is important in reducing emissions of SO_2, NO_x and dust from combustion plants with a thermal capacity greater than 50 MW. The Directive sets emission limits for licensing of new plants and requires Member States to establish programmes for reducing total emissions. Emissions limits for all plants are also set under the IPPC Directive.

[1] Critical load: the ability of the eco-systems to bear an environmental load (i.e. acidifying depositions) without significant damage
[2] ,Air Pollution in Europe 1990-2004, EEA Report No21/2007, http://reports.eea.europa.eu/
[3] The CAFE Programme/implementation of the Thematic Strategy on Air Pollution, http://ec.europa.eu/environment/air/cafe/index.htm

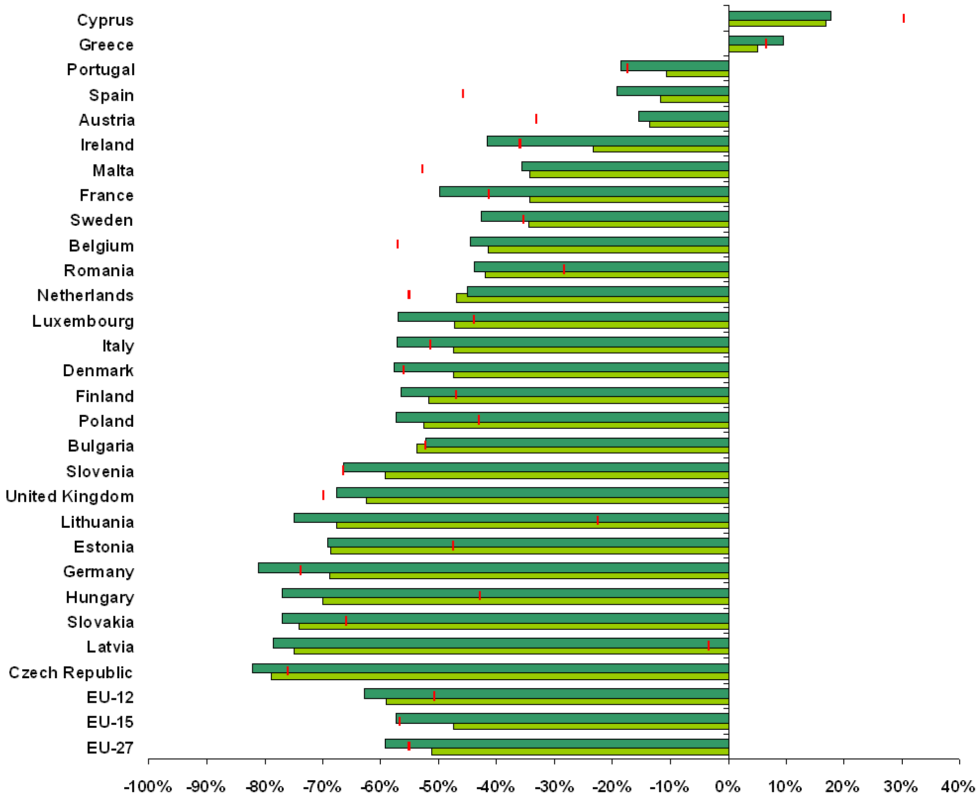
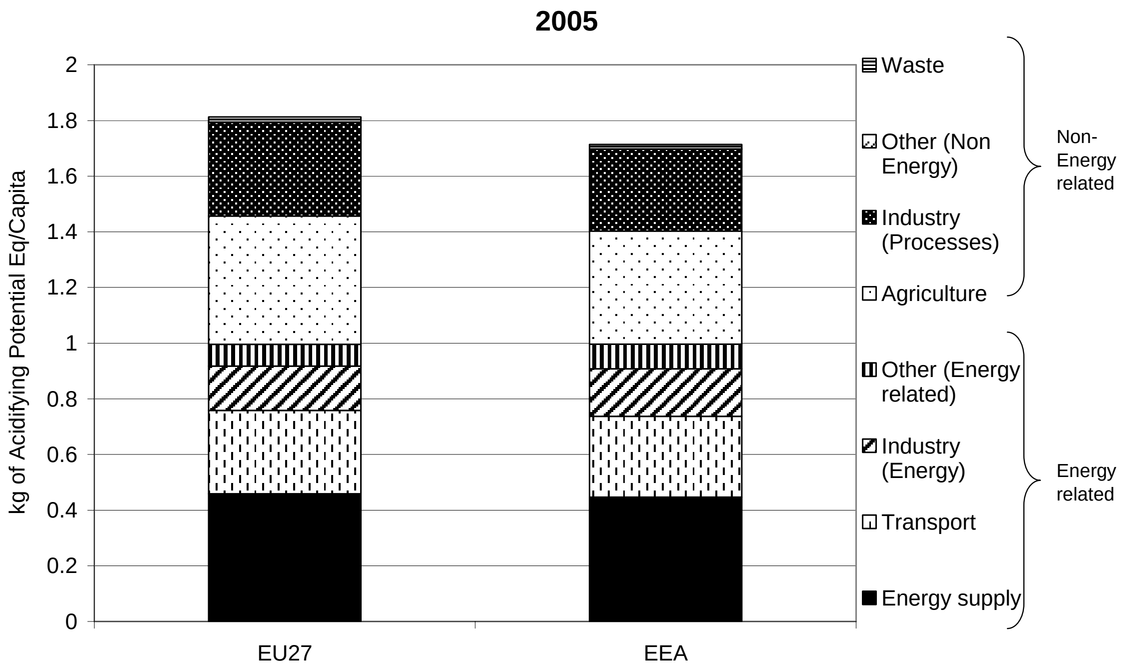


Fig. 3: Overall change in emissions of acidifying substances by country, 1990-2005

Note: The graph shows the emissions of acidifying pollutants (SO2, NOx and NH3) each weighted by an acid equivalency factor prior to aggregation to represent their respective acidification potentials. The acid equivalency factors are given by: w(SO2) = 2/64 acid eq/g = 31.25 acid eq/kg, w(NOx) = 1/46 acid eq/g = 21.74 acid eq/kg and w(NH3) = 1/17 acid eq/g = 58.82 acid eq/kg. The target indicated is the aggregate 2010 National Emissions Ceiling Directive target for the combined acidifying pollutants NOx, SO2 and NH3. The targets are set in absolute emission levels (i.e. kt) but, for reasons of scale, the chart shows the percentage reduction/limitation needed to meet the combined targets compared to 1990 levels. The target for EU-27 is based on the EU-25 NECD target (Targets for Bulgaria and Romania are provisional) (see also EEA, 2008).

Source: EEA/ETC-ACC 2007.

Fig. 4: Emissions of acidifying substances per capita by sectors, 2005



Source: EEA/ETC-ACC 2007, Eurostat, 2007

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The Treaty of Accession 2003 of the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia. AA2003/ACT/Annex II/en 2072.

Table 1: Energy-related emissions of acidifying substances 1990-2005 (acidifying potential units; ktonnes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	% Change 1990-2005
Austria	6.7	6.9	6.1	6.0	5.7	5.6	6.0	5.6	5.7	5.4	5.4	5.6	5.7	6.0	5.7	5.7	-15%
Belgium	17.6	18.0	17.9	17.1	16.0	14.9	13.6	12.7	12.7	11.2	11.2	11.0	10.2	10.1	10.2	9.8	-45%
Bulgaria	67.4	55.8	38.7	48.3	49.0	49.9	48.3	46.0	42.7	32.5	34.4	32.7	33.7	34.0	32.8	32.3	-52%
Croatia	6.9	4.5	4.5	4.4	4.5	3.5	3.2	3.9	4.5	4.5	3.4	3.5	3.6	3.6	3.2	3.2	-54%
Cyprus	1.3	1.3	1.5	1.5	1.6	1.6	1.6	1.7	1.8	1.9	1.9	1.8	1.9	1.7	1.6	1.5	18%
Czech Republic	72.6	69.2	61.5	55.2	47.9	43.0	38.9	31.0	22.8	16.9	16.9	15.0	14.2	14.3	14.3	13.0	-82%
Denmark	11.5	14.4	11.9	10.7	10.7	10.1	12.0	8.8	7.7	6.7	5.5	5.4	5.3	5.7	5.2	4.9	-58%
Estonia	10.1	9.3	6.9	5.7	5.6	4.5	4.8	4.5	4.1	3.8	3.8	3.7	3.6	4.0	3.6	3.1	-69%
Finland	13.0	10.9	9.3	9.0	8.8	7.8	8.4	8.1	7.6	7.4	7.1	6.9	6.5	7.1	6.6	5.6	-57%
France	78.4	83.1	76.9	69.9	67.0	63.9	62.7	56.7	57.1	52.2	47.8	45.1	42.6	41.8	40.7	39.4	-50%
FYR of Macedonia	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.2	2.9	3.6	3.7	3.7	4.3	3.8	3.8	1006%
Germany	224.5	175.8	150.3	137.5	120.0	97.5	86.7	77.6	68.0	61.7	52.6	52.1	49.3	48.3	46.3	42.5	-81%
Greece	21.4	22.8	23.5	23.5	22.7	23.6	23.1	23.1	23.8	24.0	22.3	22.9	22.8	24.5	23.4	23.4	10%
Hungary	36.3	32.6	29.9	27.4	27.0	26.0	25.2	24.8	22.8	22.7	19.1	16.4	15.2	14.6	11.6	8.3	-77%
Iceland	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	-
Ireland	8.3	8.3	8.1	7.6	8.1	7.7	7.4	8.0	8.4	7.8	7.2	7.0	5.9	5.1	4.9	4.9	-42%
Italy	94.8	92.3	89.8	84.8	80.3	77.6	74.7	70.7	64.5	59.3	53.2	51.2	46.7	43.3	40.6	40.6	-57%
Latvia	4.4	3.8	3.2	3.0	2.9	2.3	2.5	2.0	1.9	1.7	1.1	1.0	1.0	0.9	0.9	1.0	-79%
Liechtenstein	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-55%
Lithuania	10.2	10.8	6.4	5.6	5.3	4.4	4.4	3.7	4.3	3.5	2.5	2.6	2.4	2.3	2.4	2.6	-75%
Luxembourg	0.9	1.0	1.0	1.0	0.9	0.7	0.7	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	-57%
Malta	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.8	0.8	-36%
Netherlands	17.4	16.8	16.2	15.4	14.7	13.8	13.6	12.1	11.3	11.7	10.5	10.2	9.9	10.2	9.8	9.5	-45%
Norway	5.2	4.9	4.8	4.9	4.8	4.8	5.1	5.1	5.1	5.2	4.8	4.8	4.6	4.6	4.6	4.5	-12%
Poland	129.9	119.0	112.0	108.3	104.6	96.9	97.5	90.9	79.9	73.7	64.5	65.4	62.3	60.1	55.8	55.4	-57%
Portugal	14.7	14.8	17.2	15.4	14.6	15.8	13.8	14.3	16.0	16.5	15.2	14.8	14.9	11.5	11.6	12.0	-18%
Romania	51.2	41.7	36.5	35.0	34.5	34.0	33.4	32.8	32.3	26.7	28.6	33.3	32.1	31.0	29.9	28.7	-44%
Slovakia	21.6	18.1	15.8	14.0	11.0	11.3	10.0	9.0	8.5	7.9	6.4	6.5	5.5	5.5	5.2	5.0	-77%
Slovenia	7.5	6.9	7.1	7.1	7.0	5.4	5.1	5.3	5.3	4.6	4.3	3.4	3.4	3.2	2.9	2.5	-66%
Spain	93.2	93.9	93.5	89.3	88.5	84.3	76.4	82.9	78.5	80.7	76.9	76.1	80.7	72.0	75.2	75.2	-19%
Sweden	8.9	8.9	8.6	7.8	8.0	7.3	7.1	6.6	6.4	6.0	5.7	5.6	5.5	5.5	5.3	5.1	-43%
Switzerland	4.5	4.2	3.9	3.5	3.5	3.3	3.2	3.0	2.9	2.7	2.6	2.6	2.5	2.4	2.3	2.2	-50%
Turkey	63.1	65.5	65.4	65.4	72.1	71.7	78.2	80.1	83.7	85.4	85.1	85.2	77.9	70.6	70.6	70.6	12%
United Kingdom	177.9	169.3	164.9	150.7	135.4	123.5	111.2	97.7	95.4	80.8	79.2	74.8	68.9	68.8	62.5	57.6	-68%
EU-27	**1203.1**	**1107.2**	**1016.0**	**958.2**	**899.0**	**834.5**	**790.5**	**738.7**	**691.0**	**629.0**	**584.9**	**572.3**	**552.1**	**533.3**	**510.3**	**490.8**	**-59%**
EEA	**1275.8**	**1181.9**	**1090.1**	**1032.1**	**979.4**	**914.4**	**877.0**	**827.0**	**782.8**	**722.4**	**677.3**	**664.9**	**637.1**	**610.8**	**587.7**	**568.1**	**-55%**

Source: EEA/ETC-ACC 2007. **Key:** NR – Not reported

Meta data

Technical information

1. Data source: Officially reported national total and sectoral emissions to UNECE/EMEP (United Nations Economic Commission for Europe/Co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe) Convention on Long-range Transboundary Air Pollution (LRTAP Convention), submission 2007. Base data are available on the EMEP web site (http://webdab.emep.int/). Emissions of acidifying substances is one of the European Environment Agency's core-set indicators. More information can be found at http://themes.eea.europa.eu/IMS/CSI
   Gross inland energy consumption data from Eurostat (download July 2007) http://epp.eurostat.ec.europa.eu/

2. Description of data: Emissions of combined SO_2 and NO_x (also NH_3 where applicable) in 1000 tonnes acid equivalents. Gaps filled by EEA/ETC-ACC where necessary using simple interpolation techniques (see 6).

3. Geographical coverage: EU-27 for comparison with EU National Emission Ceilings Directive. Other analyses include data for EFTA-4 (Iceland, Liechtenstein, Switzerland and Norway) and FYR of Macedonia, Croatia and Turkey. The EEA-32 country grouping includes EU-27, EFTA-4 and Turkey.

4. Temporal coverage: 1990-2005

5. Methodology and frequency of data collection: Annual country data submissions to UNECE/LRTAP Convention/EMEP. Combination of emission measurements and emission estimates based on volume of activities and emission factors. Recommended methodologies for emission data collection are compiled in the Joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook 3rd edition, EEA, Copenhagen EEA (2006).

6. Methodology of data manipulation': EEA/ETC-ACC gap-filling methodology. To allow trend analysis where countries have not reported data for one or several years, data has been interpolated to derive annual emissions. If the reported data is missing either at the beginning or at the end of the time series period, the emission value has been considered to equal the first (or last) reported emission value. It is recognised that the use of gap-filling can potentially lead to artificial trends, but it is considered unavoidable if a comprehensive and comparable set of emissions data for European countries is required for policy analysis purposes. The gap-filled air emissions spreadsheet is available on http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=818
Acid Equivalents: Weighting factors (w) are used for SO_2, NO_x and NH_3, which are multiplied with the emissions (Em, Gg) and the resulting acid equiv. emissions are added (de Leeuw 2002).
Thus, total acid equivalent emission = $w(SO_2)*Em(SO_2) + w(NO_x)*Em(NO_x) + w(NH_3)*Em(NH_3)$ where weight factors are given by:
$w(SO_2)$ = 2/64 acid eq/g = 31.25 acid eq/kg
$w(NO_x)$ = 1/46 acid eq/g = 21.74 acid eq/kg
$w(NH_3)$ = 1/17 acid eq/g = 58.82 acid eq/kg
These factors are assumed to be representative for Europe as a whole; on the (very) local scale different factors might be estimated; see de Leeuw (2002) for a more extensive discussion on the uncertainties in these factors. Due to the variation in potential TOFP factors that might be determined on a local scale, the use of such factors does not always have wide support or recognition in EU Member States.
The energy supply sector includes public electricity and heat production, oil refining, production of solid fuels and fugitive emissions from fuels. The transport sector includes emissions from road and off-road sources (e.g. railways and vehicles used for agriculture and forestry). Industry (Energy) relates to emissions from combustion processes used in the manufacturing industry including boilers, gas turbines and stationary engines. 'Other (energy-related)' covers energy use principally in the services and household sectors.

Base data, reported in SNAP, draft NFR or NFR are converted into EEA sector codes to obtain a common reporting format across all countries and pollutants:

- Energy industry: Emissions from public heat and electricity generation - Fugitive emissions: Emissions from extraction and distribution of solid fossil fuels and geothermal energy
- Industry (Energy): relates to emissions from combustion processes used in the manufacturing industry including boilers, gas turbines and stationary engines
- Industry (Processes): Emissions from production processes
- Road transport: light and heavy duty vehicles, passenger cars and motorcycles;
- Off-road transport: railways, domestic shipping, certain aircraft movements, and non-road mobile machinery used in agriculture, forestry;
- Agriculture: manure management, fertiliser application, field-burning of agricultural wastes
- Waste: incineration, waste-water management.
- Other (energy-related) covers energy use principally in the services and household sectors
- Other (Non Energy): Emissions from solvent and other product use.

The following table shows the conversion of NFR sector codes into EEA sector codes (EEA, 2006):

EEA classification		Non-GHGs (NFR)	GHGs (CRF)
0	National totals	National Total	National totals without LUCF (sector 5)
1	Energy industries	1A1	1A1
3	Industry (Energy)	1A2	1A2
2	Fugitive emissions	1B	1B
11	Transport	n.a.	n.a.
7	Road transport	1A3b	1A3b
8	Other transport (non-road mobile machinery)	1A3 (excl 1A3b) + sectors mapped to 8 in table below	1A3a, 1A3c, 1A3d, 1A3e
9	Industry (Processes)	2	2
4	Agriculture	4 + 5B	4
5	Waste	6	6
6	Other (Energy)	1A4a, 1A4b, 1A4b(i), 1A4c(i), 1A5a	1A4+1A5
10	Other (non-energy)	3 + 7	3+7
14	Unallocated	Difference between NT and sum of sectors (1-12)	
12	Energy Industries (Power Production 1A1a)	1A1a	1A1a

15	residential	n.a.	1A4 b
16	services, agriculture and other sectors	n.a.	1A4a + 1A4c + 1A5

Quality information

7. Strengths and weaknesses (at data level): Strength: officially reported data following agreed procedures and Emission Inventory Guidebook (EEA 2006), e.g. regarding source sector split. Weakness: The incomplete reporting and resultant extrapolation may obscure some trends.

8. Reliability, accuracy, robustness, uncertainty (at data level):
The uncertainties of total sulphur dioxide emission estimates in Europe are relatively low, as the sulphur emitted mainly comes from the fuel burnt and therefore can be accurately estimated. However, because of the need for interpolation to account for missing data the complete dataset used here will have higher uncertainty. EMEP has compared modelled (which include emission data as one of the model parameters) and measured concentrations throughout Europe (EMEP 2005). From these studies the uncertainties associated with the modelled annual averages for a specific point in time have been estimated in the order of ± 30 %. This is consistent with an inventory uncertainty of ±10 % (with additional uncertainties arising from the other model parameters, modelling methodologies, and the air quality measurement data etc).
In contrast, NO_x emission estimates in Europe are thought to have higher uncertainty, as the NO_x emitted comes both from the fuel burnt and the combustion air and so cannot be estimated accurately from fuel nitrogen alone. EMEP has compared modelled and measured concentrations throughout Europe (EMEP 2005). From these studies differences for individual monitoring stations of more than a factor of two have been found. This is consistent with an inventory of national annual emissions having an uncertainty of ±30% or greater (there are also uncertainties in the air quality measurements and especially the modelling).
For some countries, reported time-series emissions data may be inconsistent. This may occur where for example different inventory reporting definitions have been used in different years and/or where changes made to estimation methodologies have not been applied back to 1990. For all emissions the trend is likely to be much more accurate than individual absolute annual values - the annual values are not independent of each other.

9. Overall scoring (1 = no major problems, 3 = major reservations):
   Relevance: 1
   Accuracy: 2 (acidifying coefficients not agreed and used in all EU Member States)
   Comparability over time: 2
   Comparability over space: 2