Statistics in focus

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Manufacturing industry 1995-2003

Economic activities and their pressure on the environment

Manufacturing industry emitted the equivalent of 910 million tonnes of carbon dioxide (CO_2) in 2000, making it the second major emitter of greenhouse gases (GHG), after the Electricity, gas and water supply sector (1 091 million tonnes CO_2 equivalent). Emissions of the greenhouse gases methane (CH_4) and nitrous oxide (N_2O) are of minor importance in comparison to CO_2 emissions, which are mainly connected with fuel combustion. The manufacturing industries compete in an international market and are price driven. This situation enables better comparability than if any of the industries were oligopolistic in nature (a market situation in which each of a few producers affects but does not control the market). In 2000, manufacturing industries contributed 1 543 billion euros to the EU-15 economy and employed about 30 million people. The year before they had spent close to 6 billion euros on activities for the protection of air quality and climate change.

This publication focuses on manufacturing industry (NACE D, divisions 15 to 37) and presents an analysis of NACE D sub-sections, based on data from environmental accounts (see Methodological Notes).

GHG emissions (CO_2, CH_4 and N_2O only) are examined in relation to three main indicators: *gross value added* (GVA), e*mployment* (EMP), and *environmental protection expenditure* for air quality and climate protection (EPE air). Figure 1 presents an overview of manufacturing industries in the EU-15 sorted by their GHG emissions. It can be seen that heavy industries such as basic metals and non metallic minerals account for about half of GHG emissions from manufacturing industry. Manufacture of machinery and equipment alone account for almost one third of the GVA of manufacturing industry.

Figure 1: EU-15 overview 2000

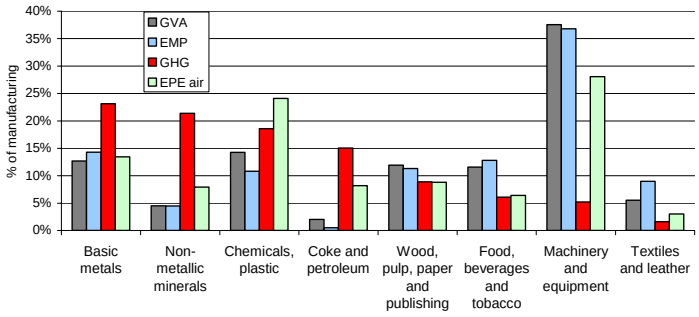


Figure 2 presents time series for the four variables for manufacturing industry in the EU-15. GVA increased by 15 % between 1995 and 2003, while GHG emissions decreased by 8 %. This suggests that structural and technological changes within manufacturing have had some impact on GHG emissions. In-depth analysis shows that changes have mainly occurred as a result of a move to the use of low carbon sources of energy and to the reduction of GHG emissions from the adipic acid production, a component used in the production of nylon.

Figure 2: Manufacturing industry (NACE D) in EU-15

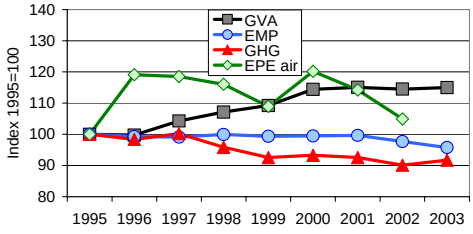
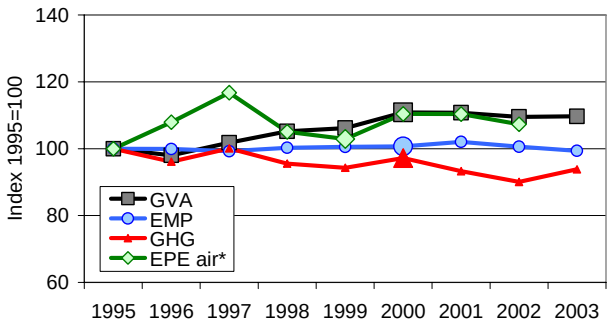


Figure 3: NACE DJ in EU-15



* EPE air only include division 27

The metals sector (NACE DJ, divisions 27 and 28) has historically been a cornerstone of the EU: indeed the Treaty establishing the European Steel and Coal Community was the first European Community Treaty ratified. NACE DJ covers the manufacture of basic metals, including iron, steel and ferroalloys, basic precious and non-ferrous metals. It also includes initial processing stages that cover activities such as the manufacture of tubes, bars, strips, wires and sheets of metal and the casting of metals. Investments for the protection of air and climate are mainly focused on catalytic converters, changes of cooling media and filter equipment. On average, investments account for more than half of total spending on environmental protection. The other part is related to current outlays.

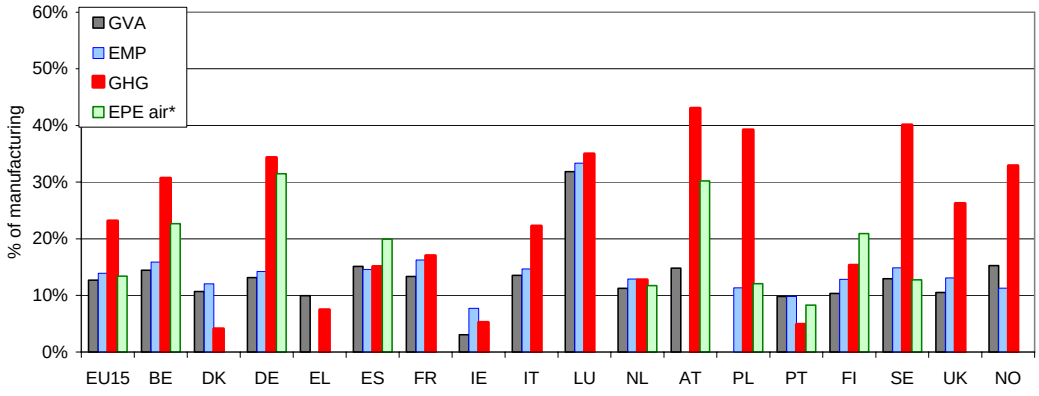
Figure 3 shows that GHG emissions from this sector within the EU-15 decreased by 6% in the period 1995 to 2003. During the same time period GVA increased by 10%, i.e. an absolute decoupling has occurred. The ratio between the GHG emissions and GVA, the GHG intensity, provides a measure for the environmental pressure from the specific economic activity (see Methodological Notes). In 1995 the intensity for the basic metals industry stood at 1 200 tonnes CO_2 equivalent per million euros compared to close to 1 000 tonnes per million euros in 2003. Employment during the same period was very stable. EPE air fluctuated between 1995 and 2002 but remained 7% higher in 2002 then in 1995.

In 2000 NACE DJ was the largest emitter of greenhouse gases in the EU-15 economy, with 23% of total emissions from NACE D. Figure 4 shows that Austria, Sweden, Poland, Luxembourg, Germany, Norway and Belgium are well above the average. In each of these countries, GHG emissions account for over 30 % of NACE D total. When looking at GHG intensity the picture slightly changes. Finland appears, besides countries such as Belgium, Norway and Austria (and, in a lower extent, Luxembourg and United Kingdom) as emitting above average.

With 13% of total manufacturing GVA in 2000, the basic metals industry was the third largest contributor to wealth creation among manufacturing NACE D subsections and the second largest employer (14% of NACE D total). The sector's share of GVA in Spain, Austria, Luxembourg and Norway was well above the EU-15 average. Its share of employment is also above the EU-15 average of 14% in Belgium, France, Sweden, Italy, and Luxembourg.

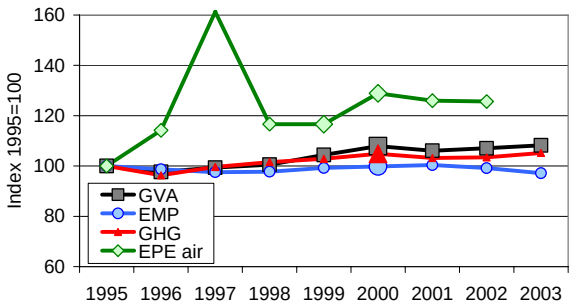
The year before, in 1999 NACE DJ accounted for 13% of the spending on EPE air in manufacturing industry in the EU-15. However, this accounts for just below 0.4% of the GVA in the industry. Expenditure in Germany, Austria, Belgium, Finland and Spain are well above the EU-15 average.

Figure 4: NACE DJ – Environment economic profile in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

Figure 5: NACE DI in EU-15



This section focuses on the manufacture of other non-metallic mineral products (NACE DI, division 26). Eight NACE groups are included in this section, which includes glass manufacturing; the manufacture of ceramic and clay products; the manufacture of cement and concrete; and the working of stone and miscellaneous non-metallic mineral products. Note that the quarrying of non-metallic mineral products is covered in NACE sector C. This industry is mainly significant in the south of Europe. Investments for the protection of air and climate, especially within the cement industry, are mainly focused on reducing gases from the kilns used in the production process and from burning fuel. On average, the expenditure on air quality and climate protection consists of slightly more than half of investments. The other part is related to current outlays.

Figure 5 shows that GHG emissions in the EU-15 increased by 5% between 1995 and 2003. During the same period GVA in the EU-15 increased by 8%.

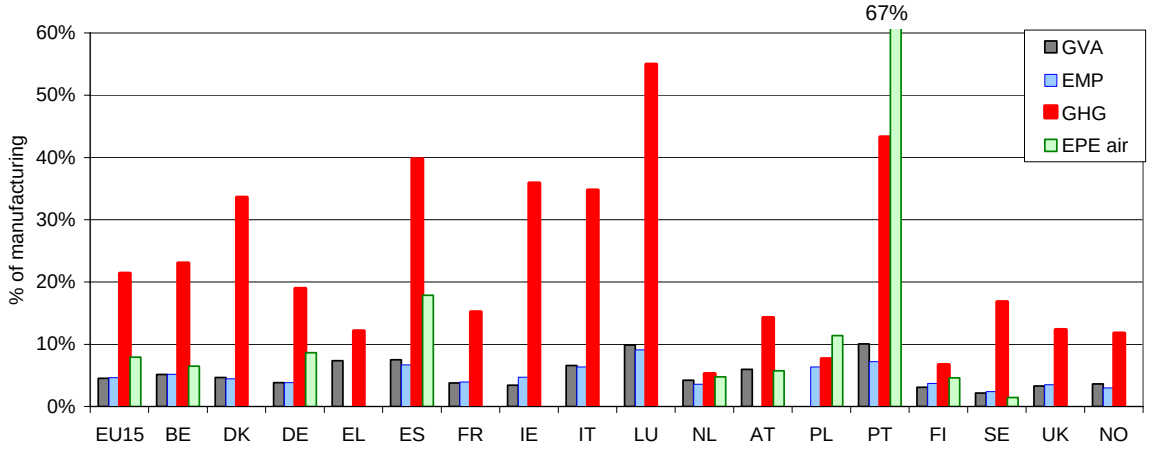
GHG intensity has decreased slightly from 2 900 tonnes CO_2 equivalent per million euros in 1995 to about 2 800 tonnes per million euros in 2003. Employment in the sector in EU-15 decreased by 3% between 1995 and 2003. Total expenditure for the protection of ambient air and climate between 1995 and 2002 was irregular, with the highest rate of investments seen in 1997. The investments in EPE air were doubled in 1997 compared to 1995.

In 2000, NACE DI was one of the highest emitters of GHG emissions in the EU-15 economy (195 million tonnes CO_2 equivalent or 21.4% of total NACE D). Luxembourg, Portugal, Spain, Ireland, Italy and Denmark are well above the average share of GHG emissions. In each of these countries the GHG emissions account for over 30% of manufacturing GHG emissions. This means that NACE DJ and DI account for the largest share of all GHG emissions in the manufacturing industry. The intensity indicator shows that Luxembourg, Portugal, Belgium and Spain are all well above average, exceeding 5 000 tonnes CO_2 equivalent per million euros.

The Figure 6 shows that the share of GVA and EMP for the EU-15 is much lower than the share for GHG emissions. However the importance of NACE DI in the southern European countries is evident. Spain, Italy, Greece, and Portugal, but also Luxembourg, are all well above the EU-15 average for GVA and employment (no EMP available for Greece).

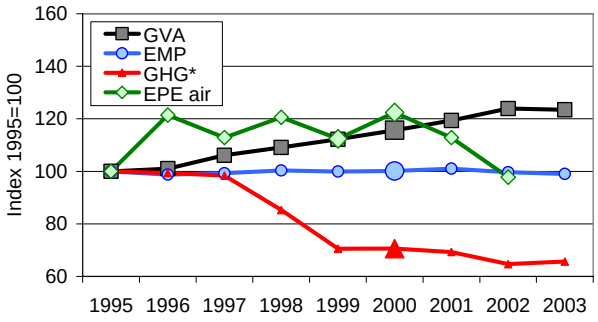
In 1999 NACE DI accounted for 8% of spending on EPE air in manufacturing industry, i.e. just below 0.7% of GVA is spent on air protection, making it the third largest spender within manufacturing industry in the EU, after coke and petroleum, and chemical and plastic manufacturing. Portugal, Spain, Poland, and Germany are all well above the EU-15 average on expenditure to protect ambient air and climate. In relation to GVA Portugal spent the most, with about 2.8% of GVA. Germany spent just below 1% of GVA to protect air quality and climate.

Figure 6: NACE DI – Environment economic profile in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

Figure 7: NACE DG+DH in EU-15



* GHG only include NACE DG

Manufacture of chemicals and chemical products; rubber and plastic products (NACE DG+DH, divisions 24 and 25) are characterised by high levels of capital output but lower rates for capital investment and EMP. Consequently, there is a high labour productivity in this sector, due to the high value added they produce. Plastics and rubber are used as input into other sectors such as electronics, health care, automotive and food packaging industries. Most production of plastic products is by moulding raw plastic materials supplied by synthetic chemical producers. Investments by this industry for air protection focus on filtering and treatment of waste gases. Investment in special equipment such as taps, valves and sealed pump shafts are included in the protection activities covered.

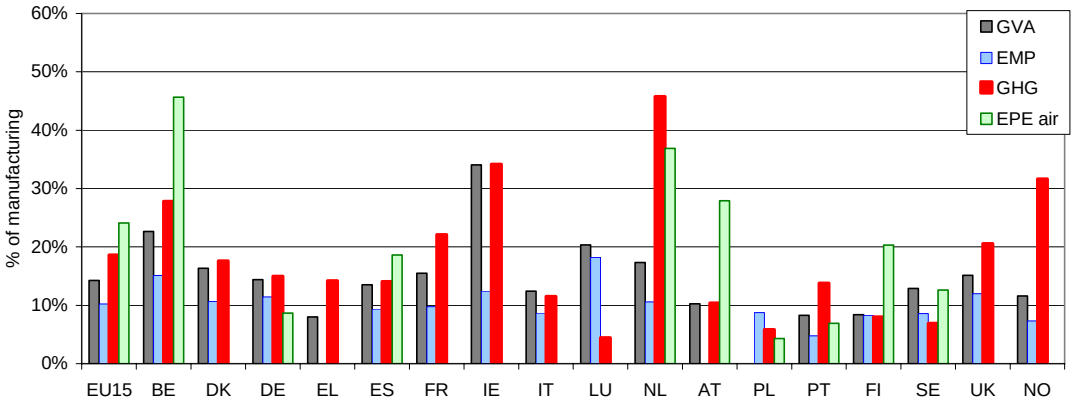
Figure 7 shows that the GHG emissions for NACE DG in EU-15 decreased substantially, especially between 1997 and 1999. This reduction is mainly the result of cuts in nitrous oxide emissions due to changes in the adipic acid production (EEA 2005). Nitrous oxide emissions accounted for around 33% of the total GHG emissions from this sector in 2000, with CO_2 at about 66% and CH_4 less than 1%. GVA in NACE DG+DH increased by 23% from 1995 to 2003 in the EU-15. This reduction of GHG emissions and the increase of GVA have lead to a significant decrease of the GHG intensity. In 1995 the intensity lay at about 1 700 tonnes CO_2 equivalent per million euros and in 2003 the intensity was down to just below 900 in the chemical industry (NACE DG).

Figure 8 shows that in 2000, GHG emissions (for NACE DG+DH) stood at 19% of the total for NACE D. The share of GHG is well above average for Netherlands, Ireland, Norway and Belgium. The intensity indicator supports the results from Figure 8 with the exception of Ireland. The other countries are all above 1 500 tonnes CO_2 equivalent per million euros.

NACE DG+DH were major contributors of economic wealth and important industries for employment. GVA accounted for 14% of total manufacturing and EMP for 11%. In 2000 the share of NACE DG+DH in Ireland, Belgium and Luxembourg were well above the EU-15 average for GVA. However, in terms of EMP Ireland is very close to the average share indicating a high productivity level.

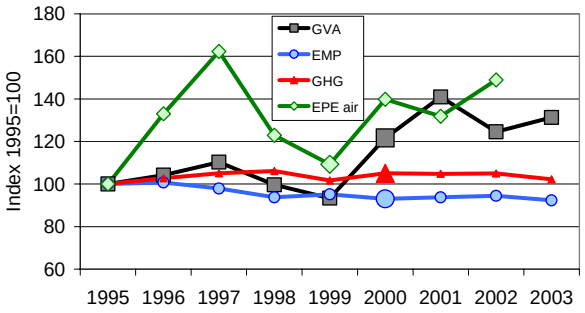
NACE DG+DH were the largest spenders on EPE air in 1999, accounting for 24% of such spending in manufacturing industry, which represents 0.6% of the sectors' GVA. The huge increase in EPE air is due partly to increasing investments but even more to increasing current expenditure. On average, less than half of the expenditure incurred was due to investments. Belgium and the Netherlands spend well above the EU-15 average on EPE air. They are also spending most; about 1.5% in terms of their GVA.

Figure 8: NACE DG+DH – Environment economic profile in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

Figure 9: NACE DF in EU-15



The coke, refined petroleum products and nuclear fuels sector (NACE DF, division 23) is a very productive and profitable industrial activity, despite the low share of GVA and EMP within manufacturing industry. Investments and current expenditure for air quality and climate protection can be found in equipment for filtering and treating emissions of sulphur dioxide and nitrogen oxides.

Metallurgical coke comes from coal that is "coked", or heated in an oxygen-free atmosphere until all volatile components evaporate. Most metallurgical coke is used in iron and steel industry processes such as blast furnaces to reduce iron ore to iron. Most coke plants are co-located with iron and steel production facilities. Oil refineries process crude oil to produce heating oil, gasoline, diesel, heavy fuel oils and liquefied petroleum gas, as well as other petroleum products that are used as raw materials in the production of many other products such as chemicals, paint, pesticides etc. Depending on the quality of the crude oil and the process used (distilling, reforming, cracking) the emissions vary. For coke production, the emissions vary depending on the quality of the coal, just as the coke production depends on driving off the volatile matter in the coal.

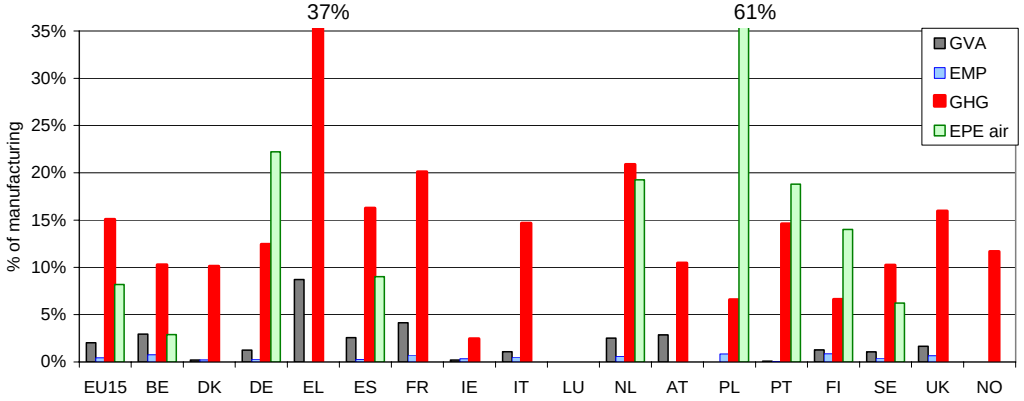
Figure 9 shows that in 2003 GHG emissions were at the same level as in 1995, and that GVA increased by over 30% during the same period, with a peak in 2001 of 40%. The GVA fluctuates with the price of crude oil. The GHG intensity decreased from over 6 000 tonnes CO_2 equivalent per million euros in 1995 to about 4 900 tonnes per million euros in 2003. Finland saw an increase by 162% from a low level of GVA in 1995. This increase was due to a combination of high intermediate consumption and output rates and the fluctuating prices of their raw material, oil. EMP decreased after 1997 and in 2003 was down 8% from 1995. Major investments took place for the protection of air and climate in 1997. During the period 1995-2002, current expenditure rose extensively and the total expenditure for quality and climate protection was up 57%.

In 2000, NACE DF had a high share of GHG emissions of 15% of total NACE D, but much lower share for GVA and EMP (2% and 0.5% of NACE D, respectively). Greece, the Netherlands and France are well above average (no data for EMP available for Greece). Considering GHG intensity, the Netherlands continue to stay above average, as does Portugal, Denmark, Finland, Italy and Spain.

The share of GVA in this manufacturing industry, with the exception of Greece and France (9%, 4%) is low (EU-average 2%).

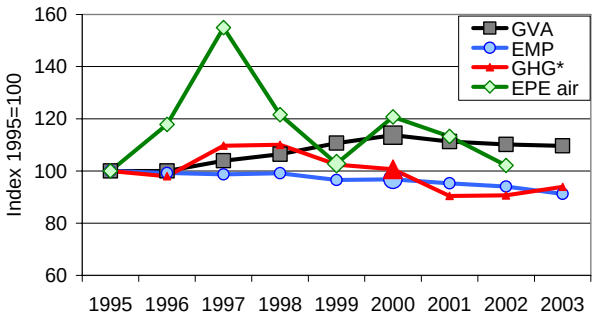
The year before in 1999, NACE DF accounted for 8% of the spending on EPE air in the manufacturing industry. However, in 1999 they spent close to 2.1% of GVA on air protection, making them the actual highest spending sector in the EU-15 within manufacturing industry. EPE air spending is well above average for Poland, Germany Netherlands, Portugal and Finland. Compared with other sectors, NACE DF spends considerably more on air quality and climate protection: Netherlands, Finland, Germany and Sweden spent between 7 and 4% of GVA for environment protection. Portugal is an exceptional case, 40% of their GVA was spent on air quality and climate protection.

Figure 10: NACE DF – Environment economic profile in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

Figure 11: NACE DD+DE in EU-15



*GHG only include NACE DE

This page covers forest-based activities, more specifically the manufacture of wood and wood products and the manufacture of pulp, paper and paper products (NACE DD+DE, divisions 20 to 22). In general, these sectors are important for the Nordic countries. NACE DD includes all stages of wood processing that follow on from the activity of forestry, while NACE DE is a downstream activity that uses by-products from the initial processing of wood. NACE DE also includes print-based publishing as well as electronic publishing. While the wood and wood products sector is characterised by small enterprises producing for local or national markets, the pulp, paper and paper products industry displays much higher levels of industrial concentration and is dominated by multinational corporations. The pulp and paper industry is highly energy and water intensive. Recycled paper has become an important raw material for the sector (the fibres are recycled). Investments in air quality and climate protection are mainly found in equipment for treating gaseous emissions from furnaces and incinerators. Also filters are of great importance in the expenditure.

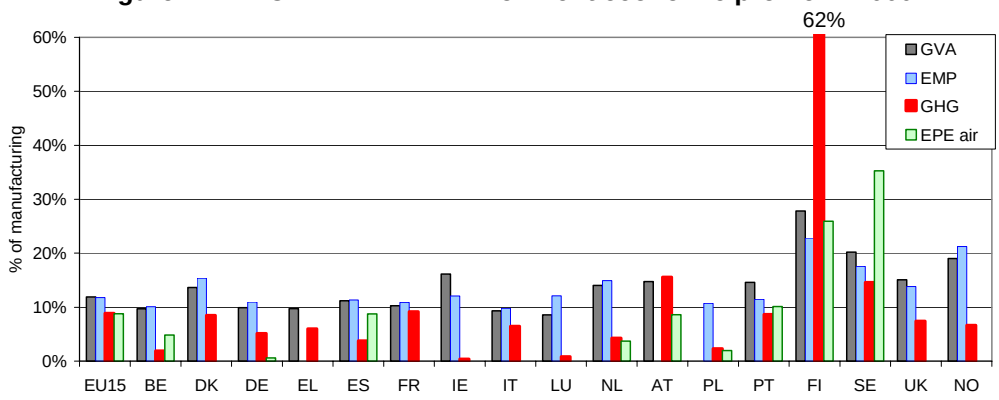
Between 1995 and 2003 GHG emissions for NACE DE decreased by 6% as seen in Figure 11. However an increase can be seen from 2001 onwards. During the same period (1995-2003), GVA increased about 10% but has decreased since 2001. This decline in GVA combined with the increase of GHG emissions increased the GHG intensity in the industry between 2001 and 2003. In 2003 NACE DE emitted about 400 tonnes CO_2 equivalent per million euros compared with about 500 tonnes CO_2 equivalent per million euros in 1995. During the same time period EMP in both industries (NACE DD+DE) declined by 9%. The two industries follow each other concerning the investment rate for environmental protection although the pulp and paper industry saw an increase in current expenditure over the period 1995-2002 while the wood industry saw a decrease.

In an EU-15 perspective these industries are a minor source of GHG emissions; they account for 9% of NACE D. Concerning GHG emissions, Finland and Austria and Sweden are well above average as seen in Figure 12. The pulp and paper industry commonly uses their own facilities for energy production, but in Finland the production is not sold to other users as the industry in, for example, Sweden does, causing a large part of the emissions to show in the figure. The GHG intensity supports the results shown in Figure 12 for Finland, but also Portugal is above average.

NACE DD+DE subsections contributed 12% to the EU-15 manufacturing GVA and EMP in 2000. Finland, Sweden and Norway had high shares of 28, 20, 19% for the GVA, and also high shares of 23, 18, and 21% for employment. Also, Ireland, UK and the Netherlands rely mainly on the pulp and paper industry for employment and GVA.

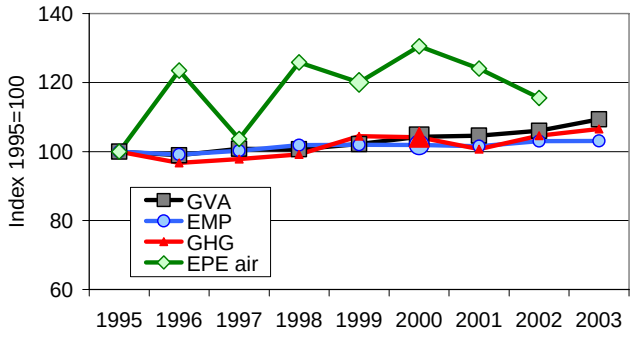
In 1999 the industry spent 9% of manufacturing expenditure on air pollution protection. In the same year this accounted for 0.3% of GVA. The share of EPE air was well above average for Sweden and Finland as seen in Figure 12. In 1999 the Swedish EPE air accounted for just above 1% of GVA making them the highest spender. Second is Portugal with 0.7% of GVA.

Figure 12: NACE DD+DE – Environment economic profile in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

Figure 13: NACE DA in EU-15



This page refers to the processing of food, beverage and tobacco products (NACE DA, divisions 15 and 16) and excludes the agricultural activities of growing, farming, livestock rearing and hunting. GHG emissions stem mainly from the manufacture of sugar, starches and starch products, and for the production and preservation of poultry meat (see Methodological Notes: EPER). Some of the companies run combustion installations with a capacity of more than 50 MW and the GHG emissions are attributed to these activities. Investments for air quality and climate protection account for close to two thirds of total expenditure in air protection. Expenditures are mainly made to improve air quality with filters, altering chimneys or other related actions.

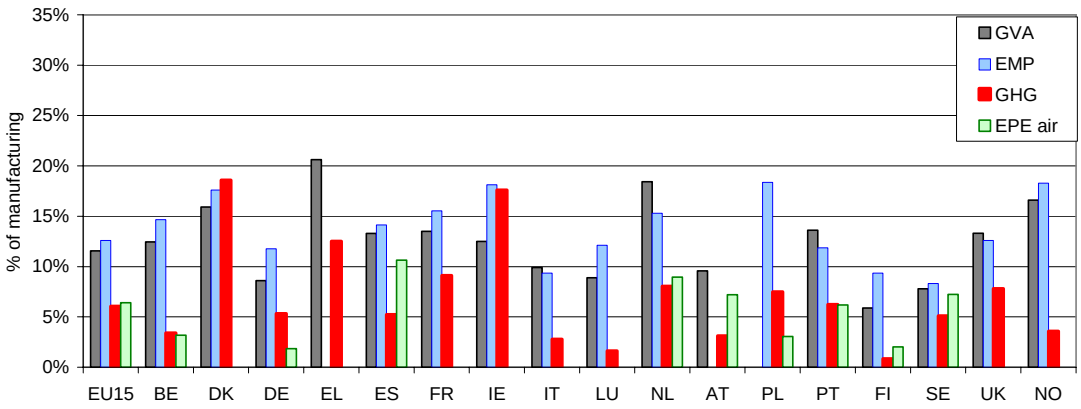
The time series in Figure 13 shows steadily increasing GVA and GHG emissions. The GHG emissions do not follow the falling trend in manufacturing industry where decoupling can be found, and the GHG intensity has been stable at around 300 tonnes CO_2 equivalent per million euros. EMP in the EU-15 increased by 3% from 1995 to 2003. The industry has seen a steady increase in current expenditure for the protection of air quality and climate protection. The investment rate has however fluctuated between 1995 and 2002.

NACE DA is a minor emitter of GHG emissions; in 2000 only 6% of the total GHG emissions from NACE D came from NACE DA. Denmark, Ireland and Greece are well above the EU average. In Denmark the industry is energy intensive and uses natural gas and to some extent fuel oil for its process purposes. The food industry is mainly focused on the production of unprocessed meat. When considering the GHG intensity, Denmark and Greece are well above the EU average along with Portugal, the Netherlands and France. They are all emitting above 400 tonnes CO_2 equivalent per million euros.

In 2000 the manufacture of food, beverages and tobacco was the third largest industrial subsection in the EU economy measured by EMP (13% of NACE D total), and the fifth largest contributor to wealth creation among all NACE D subsections, with 12% of total manufacturing GVA. The share of GVA is well above the EU average of 12% for four countries: Denmark, Greece, Netherlands, and Norway. In terms of employment Denmark, Ireland, Poland and Norway are also well above the average (13%).

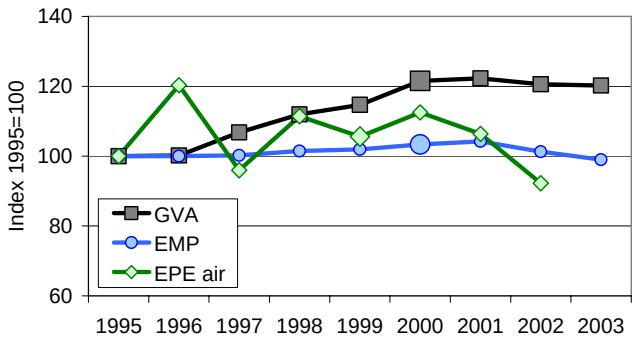
The level of expenditure for treatment and prevention of air emissions in 1999 makes NACE DA one of the lowest spending industries for air protection. The 352 million euros spent corresponds to 0.2% of GVA in the EU-15. In 1999 the share of EPE air was above average of total manufacturing for Spain and the Netherlands. However Austria, Sweden and the Netherlands spent most in protective measures with just below 0.4% of GVA.

Figure 14: NACE DA – Environment economic profile by country in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

Figure 15: NACE DK-DN in EU-15



Note: No estimation of GHG emissions possible for NACE DK-DN

This page focuses on machinery and equipment manufacturing (NACE DK-DN, divisions 29-37). It includes for example the manufacture of machinery and equipment, electrical and optical equipment and transport equipment. These groups consist of several different activities that produce a range of goods from intermediate goods (such as electronic components) to capital goods (such as transmission equipment) and consumer goods (televisions, telephones, cameras or watches). There are often strong interconnections between the various activities. The diversity of this sector means that the types of investments into environmental protection vary from industry to industry. In general, the investments target changes of cooling media, filters, changes of energy sources, and changes in the production processes.

Figure 15 shows that GVA in the EU-15 increased by about 20% between 1995 and 2003. This increase of GVA has occurred in all four different industries included (DK-DN). Manufacture of electrical and optical equipment (NACE DL) has seen the strongest increase of GVA with 41%. Employment in 2003 was back at 1995 level after a few years of slightly higher employment rates.

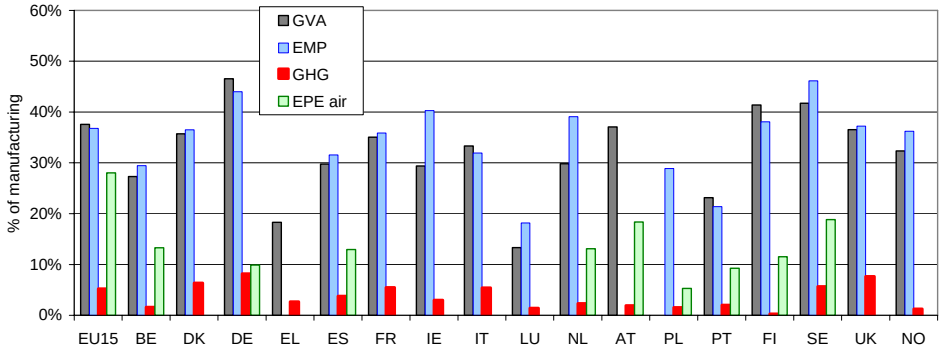
One quarter of the combined EPE air for these industries consists of investments, which means that most expenditure is current expenditure. The industry has however steadily increased its current outlays and the investment rate dropped with 26% in 2002 compared to 1995.

In 2000 NACE DK-DN were minor sources of GHG emissions: only 5% came from these industries. In terms of GHG intensity in 2000, the NACE DK-DN industries emitted 82 tonnes CO_2 equivalent per million euros. From Figure 16 it is seen that the Member States located in the north of Europe are slightly above EU average in GHG emissions but the picture changes when looking at the GHG intensity for the countries. Portugal, Spain and Greece in the south and Luxembourg and the UK in the north are well above the average with over 100 tonnes CO_2 equivalent per million euros each.

In 2000, NACE sectors DK-DN were the largest activities in the EU-15's manufacturing sector, as measured by the EMP and GVA (respectively 37% and 38% of NACE D). GVA in Germany, Sweden and Finland is well above the EU average of 38% of total manufacturing industry. In terms of EMP Ireland has a higher share than Finland but the economic contribution in Ireland was lower than the EU average.

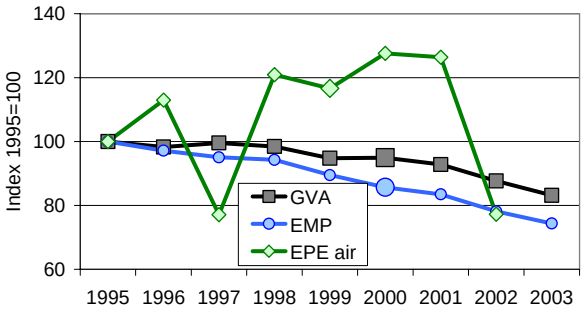
The year before, in 1999 NACE DK-DN accounted for 28% of the spending on EPE air in the manufacturing industry making it the largest contributor to environmental protection for ambient air and climate. However this represents just above 0.2% of GVA on air protection, revealing that the large size of the industry was the reason for the high share.

Figure 16: NACE DK-DN – Environment economic profile in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

Figure 17: NACE DB+DC in EU-15



Note: No estimation of GHG emissions possible for NACE DB+DC

This page covers the manufacture of textiles, clothing, fur and leather goods (NACE DB+DC, divisions 17 to 19). It is a labour-intensive industrial activity, with relatively high shares of EMP in relation to GVA. In general, the textile and leather industry is an important sector in southern Europe, especially in Greece, Spain, Italy and Portugal. Investments for the protection of air quality and climate protection are mainly focused on capturing particles with filters and altering chimneys. The treatment of emissions from the use of chemicals and burning of fuels for dyeing and bleaching are also part of such activities.

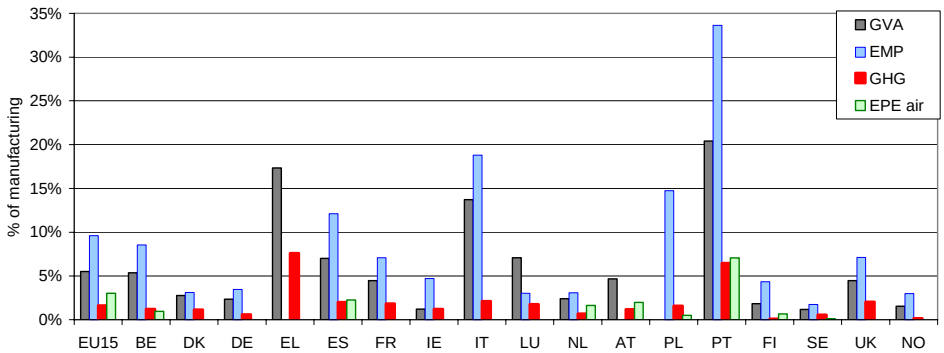
In the EU-15 as a whole, GVA in 2003 was below the 1995 level as was EMP, which dropped 26% from 1995 to 2003, as seen in Figure 17. EPE air has fluctuated over the same time period and in 2002 was well below 1995 spending. Investments only account on average for 44% of the total expenditure on air quality and climate protection. Most expenditure is therefore current outlays for administrative and labour costs for environmental activities.

In 2000, the Textiles and Leather industry was a minor source for GHG emissions (less then 2% of NACE D total or 174 tonnes CO_2 equivalent per million euros). These emissions came mostly from coating, finishing, and dyeing operations requiring fuel combustion. Figure 18 show that only Greece and Portugal show shares above the average. However in terms of GHG intensity, several countries in the south, the Benelux countries and the UK to the north are above the average: all are above 200 tonnes CO_2 equivalent per million euros.

The industries only account for a minor share of GVA and EMP (5.5% and 9% respectively). Greece, Spain Italy and Portugal show shares well above the EU average for GVA and EMP as seen in Figure 18 (no EMP for Greece available). Additionally, the share of EMP was high in Poland but no data was available for GVA. The share of GVA is smaller in Italy than in Greece and Portugal, although absolute values of GVA give another picture: Greece's GVA, at 2 317 million euros, is only 8% of Italy's GVA. Portugal's GVA is only around 10% of Italy's income (3 605 million euros). These pictures are more or less proportional to the size of each economy and the strength of other sub-sectors of manufacturing.

In 1999 NACE DB+DC accounted for 3% of total manufacturing's expenditure on protecting ambient air and climate. This accounts for 0.2% of the industries own GVA. Portugal spent 7% of total manufacturing EPE on air quality and climate protection, well above the EU average of 3% as seen in Figure 18. This represents less than 0.2% of Portugal's GVA. The Netherlands spent the highest proportion of EPE air in terms of GVA with over 0.4% of their GVA on air quality and climate protection.

Figure 18: NACE DB+DC – Environment economic profile in 2000



Note: GHG emissions for EL, FR, LU, and PT are estimated, EPE air in 1999 (exceptions: DE and ES in 2001)

ESSENTIAL INFORMATION – METHODOLOGICAL NOTES

Environmental Accounts – satellite account to the National Accounts

The central framework - the national accounts - presents the development of an economy over time. It shows not only economic activities but also the levels of an economy's productive assets and the wealth of its inhabitants at particular points in time. If environmental aspects were directly included in national accounts these would be overburdened with information. A satellite approach is therefore applied, where some conceptual freedoms exist for compiling the accounts. The satellite accounts, in this case the environmental accounts, can therefore be linked directly with relevant economic and environmental statistics and provide harmonised comparable accounts across any country applying this methodology[1].

Decomposition analysis[2]

The scale component of a decomposition analysis estimates the linear trend for emissions connected with the described economic growth. Given constant emissions per unit produced, these emissions would increase at the same rate as production. For the EU-15 the scale component was around 115% between 1995 and 2003 presented in Figure 2 in this SIF. The real value of emissions was around 92% for the same period. For NACE D the scale component is much higher than the total emissions (92%) due to the large reduction in technological changes (-26% between 1995 and 2003), i.e. a move to low carbon sources for the energy production or a change in the adipic acid production. The composition component was very small for the period 1995 to 2003; it reflects the impact on air emissions from the production structure.

1995-2003	
114.9	Economic change (S)
2.5	Change in composition (C)
-25.8	Technology change (T)
91.7	Sum

Variables included in this SIF

Greenhouse Gas (GHG) emissions covered by the Kyoto Protocol are carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). Data for the last three (fluorinated) gases was not available. The focus therefore lies on the other three (non-fluorinated) GHG emissions. CO_2 from fuel combustion is dominant with above 96% of the total; CH_4 and N_2O are below 3%. Exceptions are in the textiles and leather industries where CH_4 emissions are around 5% and CO_2 at 93%. Another exception is for chemicals manufacturing where N_2O is also important with 33% of the emissions and the CO_2 contribution is at 66%. In order to aggregate these emissions and present a single figure for the climate change issue they are expressed in CO_2 equivalent based on the concept of its Global Warming Potential (GWP). This means the estimated potential of a greenhouse gas contributing to global warming in the atmosphere over a 100-year time horizon. The GWP ranges from 1 for CO_2, to 21 for CH_4, and 310 for N_2O.

Emissions from **non-economic agents** (e.g. nature, land use changes and forestry) are excluded in the environmental accounts framework. But emissions from **biomass** when it is connected with economic activities (wood and wood waste, charcoal, bio-alcohol, black liquor, as well as landfill and sludge gas) are included. Emissions covered stem from national economic activities, that is they respect the **residential principle** (i.e. emissions are those generated by resident units). Emissions by resident units abroad, essentially covering tourists driving abroad and companies engaged in international transport activities, should be fully included in the accounts either under the industry earning the value added from these activities or under households (transport). Conversely, all emissions by non-resident entities (foreign lorries and tourists) within the national boundary should be excluded in the data sets. Source of data: Eurostat NAMEA Air questionnaire.

Gross Value Added (GVA) (European System of Accounts (ESA) 1995, 9.23) is the net result of output valued at basic prices less intermediate consumption valued at purchasers' prices. GVA is calculated before consumption of fixed capital. In this SIF data presented in times series are at constant prices and data presented in profiles are at current prices. Source of data: National Accounts, ESA 1995.

Total Employment (ESA 1995, 11.11-12) covers all persons – both employees and self-employed – engaged in some productive activity that falls within the production boundary of the system. Employees are defined as all persons who, by agreement, work for another resident institutional unit and receive a remuneration. Source of data: National Accounts, ESA 1995.

Environmental Protection Expenditure is the investments and current expenditure spent on all purposeful activities directly aimed at the prevention, reduction and elimination of pollution or any other degradation of the environment. It excludes activities that, while beneficial to the environment, primarily satisfy technical needs or health and safety requirements, depreciation or payments of interest, fines and penalties for non-compliance with environmental

regulations or compensations to third parties. The year 1999 was chosen so as to provide a picture of potential effects the spending might have on the emissions at a macro level. Source of data: Joint Eurostat/OECD Questionnaire on Environmental Protection Expenditure and Revenues.

GHG intensity: ratio between the GHG emissions and the related GVA. The GHG intensity provides a measurement of the environmental pressure due to GHG emissions from economic activities.

NACE sectors and sub-sectors
Statistical classification of economic activities in the European Community:

D	**Manufacturing**
DA	Manufacture of food products, beverages and tobacco
DB	Manufacture of textiles and textile products
DC	Manufacture of leather and leather products
DD	Manufacture of wood and wood products
DE	Manufacture of pulp, paper and paper products; publishing and printing
DF	Manufacture of coke, refined petroleum products and nuclear fuel
DG	Manufacture of chemicals, chemical products and man-made fibres
DH	Manufacture of rubber and plastic products
DI	Manufacture of other non-metallic mineral products
DJ	Manufacture of basic metals and fabricated metal products
DK	Manufacture of machinery and equipment n.e.c (not elsewhere classified)
DL	Manufacture of electrical and optical equipment
DM	Manufacture of transport equipment
DN	Manufacturing n.e.c

Data quality: Due to data availability at the time of data extraction, GHG emissions are presented only for the EU-15, Poland and Norway, and EPE air data refers to 1999 (DE and ES in 2001). The EU-15 aggregates are Eurostat estimates.
GVA: Recent changes in the methods of allocating Financial Intermediation Services Indirectly Measured (FISIM) reduce comparability between the MS until all countries have updated their methodology. However, on average, the allocation of FISIM would not increase GDP by more than 1%.

GHG emissions: Data deriving from the questionnaire are reported according to NACE two-digit level and for some industries at NACE three-digit level. There are discrepancies among the countries of reported units and work on the harmonisation of data is in progress.

EPE air: The variable belongs to a larger set of data including other environmental domains under the Classification of Environmental Protection Activities (CEPA). The allocation of the expenditure to a particular domain varies from reporting countries. Work to further harmonise and strengthen the data quality is ongoing. Please note that Germany excludes pollution prevention investments.

Estimations
Greenhouse gases: Time series for the EU-15 is based on the GHG inventories under the UN Framework Convention on Climate Change[3]. CO_2 emissions from the common reporting format (CRF) Sector 1.A.2: 'Fuel combustion - Manufacturing industries and construction' is the third largest key source in the EU-15 accounting for 13.8 % of total GHG emissions in 2003. The CRF Sector 2 ('Industrial processes' – process related air emissions) accounts for about 6 % of total EU-15 GHG emissions. GHG emissions from transport and from waste treatment are excluded in the estimation as the appropriate allocation is not possible. The NAMEA air estimates are based on the sum of UNFCCC's "fuel combustion" and "process related air emissions". The inclusion of only 3 out of 6 Kyoto GHGs causes an underestimation of about 2% in the total GHG emissions.

EPE air: Appropriate NACE breakdown have been estimated based on either closest reporting year where data were available or in conjunction with the share of the particular industry based on their GVA.

The accounting framework – conflicts with other sources
GVA and GHG emissions (presented in the profiles) are fully consistent with the System of National Accounts (SNA93) and the European System of Accounts (ESA95). However the EU-15 estimate of GHG emissions is based on the UNFCCC inventory. The UNFCCC reporting follows the territorial principle while the National Accounts follows the residential principle described above. Another issue of using the UNFCCC reporting is due to the lack of appropriate allocation of the production processes. Several different industries use the same processes that cannot be identified in the UNFCCC tables. The data collection of NAMEA air and the build-up of times series through this form will enable appropriate results in the future.

Other sources
The European Pollutant Emissions Register (EPER) is a European-wide register of industrial emissions into air and water. The website (www.eper.ec.europa.eu), gives access to information on the annual emissions of industrial facilities in Europe. E-PRTR is the European Pollutant Release and Transfer Register, which will succeed the EPER. Further information is available under the website of the European Commission.

1. "Handbook of National Accounting – Integrated Environmental and Economic Accounting 2003". United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development and the World Bank. 2005

2. "Pilot studies for the development of Environmental Accounting: Norwegian Economic and Environmental Accounts (NOREEA) Project 2005". Statistics Norway 2006

3." EEA 2005: Annual European Community greenhouse gas inventory 1990-2003 and inventory report 2005. Submission to the UNFCCC Secretariat". European Environment Agency, Technical Report No 4/2005

Further information:

Data: EUROSTAT Website/Home page/Environment and energy/Data

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