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Greenhouse Gas Inventories, for England, Scotland, Wales and Northern Ireland: 1990 - 2000.

AG Salway, TP Murrells, R Milne, S Hidri

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Appendix 1
Methodology of the Estimates

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1.1 INTRODUCTION

The UK Greenhouse Gas Inventory compiles estimates of greenhouse gas emissions for submission to UN Framework Convention on Climate Change. The most recent version, reports emissions from 1990 to 2000 (Salway *et al*, 2002). This report presents separate inventories of greenhouse gas emissions for England, Scotland, Wales and Northern Ireland for the years 1990, 1995, 1998, 1999 and 2000 that are consistent with the 2000 UK Inventory. The six direct greenhouse gases are considered:

- carbon dioxide (CO_2)
- methane (CH_4)
- nitrous oxide (N_2O)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulphur hexafluoride (SF_6).

1.1.1 Reporting Format

Emissions are reported according to the Sectoral Tables in the IPCC Common Reporting Format with some modifications. It was not considered possible to allocate emissions from certain sources to any one constituent country of the United Kingdom. These sources were:

- Domestic Aviation
- Domestic Navigation
- Emissions from the offshore oil and gas industry
- Military Aviation
- Naval

Hence these emissions were calculated but were reported as unallocated. The UK Inventory also reports emissions from marine and aviation bunkers separately for information as required by the Intergovernmental Panel on Climate Change (IPCC). Again these were not allocated to any region but are not included in the unallocated total. Emissions from onshore oil and gas terminals are allocated to the country in which they occur.

1.1.2 General Approach

The UK Inventory is based on UK statistics for activities producing greenhouse gas emissions. These include fuel consumption, industrial production, agriculture and land use change and forestry. In principle, it would be necessary to obtain a complete set of equivalent statistics for each region to compile each inventory. Such a set of statistics was not available for all sources and for all constituent countries and it was necessary to disaggregate the UK emission into the four constituent countries by an estimation procedure. For most sources in the UK

Inventory, the emission of a pollutant from a source is calculated from the general equation

$$E = Ae$$

where

E	=	Emission of pollutant (tonnes)
A	=	Activity (unit activity)
e	=	Emission Factor (tonnes pollutant/unit activity)

The activity could be fuel combustion (tonnes), or production of product (tonnes) or numbers of animals. A modified equation was used for the regional inventories:

$$E_i = \frac{d_i Ae}{\sum_{j=1}^{5} d_j}$$

where

E_i	=	Emission from either 1.England; 2.Scotland; 3.Wales; 4. Northern Ireland or 5.Unallocated. (tonnes)
d_i	=	A driver representing the contribution of the region to UK emissions
i	=	1, 2....5

The driver, d_i can be any one of:

1. The value of the activity data for that region. Examples are actual consumption of specific fuels in the region or industrial production of a product.
2. The fraction of the UK activity in that region.
3. The value of a surrogate activity data statistic in that region. Where the required activity was unavailable on a regional basis, a surrogate value was used. Examples are employment statistics or production of a particular product used instead of fuel consumption data.
4. In cases where the emissions are derived from a complex model, the driver would be the actual emission for the region calculated from the model.

The equation ensures that the sum of the emissions from the regions and unallocated emissions equals the UK emission. Where the driver is fuel consumption, then the sum of the drivers should add up to the UK consumption. However, in practice this may not be the case if the data is taken from different sources or may be based on the financial rather than the calendar year. The estimation procedure removes these discrepancies.

Thus the compilation of the regional inventories reduces to the estimation of a set of drivers, each appropriate to a source. In the 2000 inventory, 126 drivers were used.

Subsequent sections discuss the estimation of the drivers for each source category. Most of the detailed discussion is concentrated on the more complex categories, whilst simpler sources are summarised in Tables A1.1-A1.10. The IPCC classification is used throughout (IPCC, 1997a)

Table A1.1 Energy Industries[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990	1995/1998/1999/2000
Electricity Production	Power Stations	Coal, oil, , natural gas	Consumption data from Power Generators	Consumption data from Power Generators, PI
		Unrefined natural gas	NO	All plant in S
		Sewage gas	Sewage methane recovered	Sewage methane recovered
		Landfill gas	As landfill methane	As landfill methane
		Orimulsion, MSW, poultry litter and tyres	All plant in E	All plant in E
Petroleum Refining	Refineries	All fuels	UKPIA CO_2 emission estimates for 1997	PI CO_2 emission estimates for 1998, UKPIA for 1999/2000
Manufacture of Solid Fuels	Coke Production	Colliery Methane	Assumed E	Assumed E
		Coke Oven gas, natural gas	Coal feed to coke ovens, ISSB, WS, DTI	Coal feed to coke ovens, ISSB, WS, DTI, PI
		Coke	Coke breeze consumption ISSB	Coke breeze consumption ISSB
		Blast Furnace gas	Coke Consumed in blast Furnaces, ISSB	Coke Consumed in blast Furnaces, ISSB
	SSF Production	All fuels	Coal feed to SSF plant, DTI, WS	Coal feed to SSF plant, DTI, WS
Other Energy Industries	Collieries	All other fuels	Deep mined coal prod., CA	Deep mined coal prod., CA
		Coke oven gas	Assumed E	NO
	Gas Production	Colliery methane	Deep mined coal prod., CA	Deep mined coal prod., CA
		Other fuels	Arrivals of natural gas, DTI	Arrivals of natural gas, DTI
	Offshore Own Gas Use/ Gas Separation Plant	Unrefined natural gas, LPG, OPG	Extrapolate from 95 on oil and gas arrivals, DTI	UKOOA/SCOPEC CO_2 estimates for terminals
	Nuclear Fuel Prod.	natural gas	All plant in E	Data not available

1 See Table A1.11 for abbreviations

1.2 ENERGY INDUSTRIES

The drivers used for the energy industries are summarised in Table A1.1. This shows the base sources used in the National Atmospheric Emissions Inventory (NAEI) database, which correspond to the IPCC sources. The activity data used in the UK Inventory are shown together with the drivers used in the regional inventory for 1990 and 1995/1998/1999/2000. In some cases the derivation of the drivers differs between years depending on the availability of data.

1.2.1 Electricity Production

Emissions are based on fuel consumption data provided by the major power generators in Great Britain and the Northern Ireland Office. (Scottish Power (2001), Scottish and Southern Energy (2002), Bell (2001), Innogy (2001), PowerGen (2001), TXU (2001), AES (2001), Edison Mission (2001) and data reported in the Pollution Inventory (Environment Agency, 2001).

Emissions from plant generating electricity from municipal solid waste combustion are less certain but all the plant are known to be in England for 1990-98 and so the emissions will correspond to the UK emissions. In 1999 a plant was commissioned in Scotland and so emissions were based on its capacity. A small number of plants generate heat rather than electricity and these are categorised as 1A4a commercial and institutional. Some generating plant burn poultry litter, meat and bone meal and scrap tyres, and these are located in England. The scrap tyre incinerator closed down in 2000.

The distribution of landfill gas and sewage gas generation was assumed to correspond to the distribution of landfill sites and sewage treatment plant (see Waste).

1.2.2 Petroleum Refining

UKPIA were able to provide a site by site breakdown of UK refining emissions for 1997, 1999 and 2000 (UKPIA, 1998, 2000, 2001). They advised us that refinery throughput would not have varied between 1990 and 1997. The CO_2 emissions data were used as a surrogate for all fuel consumption. A correction was applied to take account of the Gulf Oil Refinery, which closed in 1996, based on refinery distillation capacity reported by DTI (1996, 1991). Emissions for 1998 were based on CO_2 emissions reported in the Pollution Inventory (Environment Agency, 1999a). Scottish emissions were based on CO_2 emissions from Grangemouth Refinery (BP, 2000, 2001).

1.2.3 Manufacture of Solid Fuels

This category comprises the production of coke and solid smokeless fuel (SSF). Regional data on coke ovens in the iron and steel industry are reported in detail by

ISSB (2001, 2000, 1999, 1996, 1991). Recent issues of UK Iron and Steel Statistics are less detailed than earlier ones, though the additional detail is available on request. Two coke ovens in England and Wales are not attached to an integrated iron and steel facility. The consumption of coal by these plant was estimated from WO (1998) and UK data (DTI, 1991, 2000, 2001). The Welsh statistics are only available to 1993, so this data was used as an estimate of the Welsh non-iron and steel coking coal consumption in 1995. For 1998, 1999 and 2000, the non-iron and steel coking coal consumption data was apportioned between England and Wales using CO_2 emissions for the particular sites reported in the Pollution Inventory (Environment Agency, 1999a, 2000, 2001). Thus the generic driver for coke oven fuel consumption was the consumption of coking coal which is in effect the regional capacity of coke ovens. This driver was also used for natural gas consumption and coke oven gas consumption. Some coke ovens use blast furnace gas as fuel and the availability will depend on blast furnace gas capacity (see Industrial Processes). Tiny amounts of colliery methane are used and this was judged to occur in England where coking occurs near deep mining. Small amounts of coke breeze are used and this was disaggregated using data on other coke consumption in ISSB (2001, 2000, 1999, 1996, 1991).

The estimation of emissions from SSF production is rather uncertain, since there are a number of processes operating and the available fuel data are not detailed. Moreover, many of these are the new briquetting processes rather than coking processes and produce negligible emissions. SSF plant were operating in England and Wales over the period hence it was possible to estimate regional consumption using UK data: (DTI; 1991, 2000, 2001) and Welsh data (WO, 1998). Again it was necessary to estimate the Welsh data for 1995. By 1998 all SSF coking plant still operating were in England. Thus the driver used was coal consumed by SSF plant. This was applied to all fuel consumption.

1.2.4 Other Energy Industries

This category consists of a number of small emissions from collieries, the gas industry, the nuclear fuel industry and a large emission from offshore natural gas use. In the regional inventory, only the emissions from oil and gas terminals were reported based on data provided by SCOPEC (2001) and UKOOA (1999). Data are only available for 1995, 1998, 1999 and 2000 and so emissions for 1990 were extrapolated based on the arrivals of crude oil and natural gas in Scotland and England, (DTI, 1991, 1996). The category gas separation plant is assumed to be a subset of the gas used in oil and gas terminals and is treated in the same way as offshore own gas use with emissions allocated based on the SCOPEC data on gas consumption in terminals.

A driver was estimated for the category gas production based on the arrivals of natural gas in England and Scotland (DTI, 1991, 1996, 2000, 2001).

Other sources are minor and are covered in Table A1.1

1.3 MANUFACTURING INDUSTRIES AND CONSTRUCTION

The drivers used for manufacturing and construction are summarised in Table A1.2.

1.3.1 Iron and Steel

ISSB (1991, 1996, 1999, 2000, 2001) reports detailed regional consumption of fuel by the steel industry. Recent issues of UK Iron and Steel Statistics are less detailed than earlier ones, though the additional detail is available on request. The consumption of coke by sinter plant can be estimated as the non-blast furnace coke consumption as this is the main other use of coke. The consumption of coke oven gas was distributed as the coal feed to coke ovens and the consumption of blast furnace gas as the coke feed to blast furnaces. The production of these gases should be proportional to the fuel used as feedstock. ISSB reports the general consumption of coal, fuel oil, gas oil, LPG and natural gas by the primary iron and steel industry. This is a narrower definition than that used by DTI which includes foundries and finishing plant, so that the DTI data used in the UK GHGI is higher than the ISSB data. Nevertheless, the regional ISSB data was used as a surrogate, since it is likely that the distribution of the wider steel industry will be similar to the primary industry. Moreover, the emissions from these secondary plant are considerably lower than the primary plant.

1.3.2 Other Industry

DTI (2001, 2000, 1996, 1991) reports regional consumption of liquid fuels but only as totals for: England and Wales combined; Scotland and Northern Ireland. WO (1998) reports liquid fuel consumption up to 1993. The total consumption for Wales was extrapolated from 1993.

Burning oil is mainly consumed in the residential sector, but there is a significant use by industry. Hence industrial consumption of burning oil was distributed according to the remaining consumption after domestic consumption had been deducted.

Fuel oil has a significant use in industry. Here, consumption was distributed as the oil remaining after all other uses were deducted from the total. The consumption by the other uses was estimated from the use of the appropriate drivers, discussed in subsequent sections. The procedure for estimating the fuel oil totals for England, Scotland, Wales and Northern Ireland was revised in the 1999 Inventory. DTI (2001) reports total sales for England and Wales combined, Scotland and Northern Ireland, however these are not consistent with the totals used in the inventory because they include fishing and navigation but exclude refineries. The industrial consumption in 1995 was distributed according to the Science Policy Research Unit (SPRU) database. This is a database of around 6000 small boilers (<50 MW) based on insurance records collected in the period 1992-94. The database records a

grid reference, economic sector, nominal fuel consumption and fuel type. This then allows an estimate for total consumption for 1995 to be made on a basis consistent with the inventory (i.e. corrected for navigation, fishing and refineries). The totals are then extrapolated to other years based on the DTI totals for fuel oil. The advantage of this method is that it should reflect the time trend in fuel oil consumption more reliably than the previous method.

The driver for industrial gas oil was calculated in a similar manner as the fuel oil driver. DTI reports gas oil consumption on a similar basis to fuel oil, and the SPRU driver was used to distribute industrial gas oil consumption in 1995.

Some gas oil and petrol is used for off-road machinery mainly in the construction industry. The UK estimates themselves are uncertain, and regional drivers were based on employment in the construction industry (ONS, 1996, 2001).

Liquid Petroleum Gas (LPG) has a number of uses, which are more precisely characterised in other sources such as domestic use. Hence the industrial use of LPG was based on a mass balance based on total regional sales (DTI, 2001) less consumption by all other sources.

DTI (2001) estimate that 40% of lubricants sold are eventually used as a fuel. Hence, the driver was based on regional lubricant sales (DTI, 1991, 1996, 2001) with England and Wales being disaggregated based on regional manufacturing employment statistics (ONS, 2001).

Transco (2001) supplied data on sales of natural gas to consumers categorised by consumer size and region in Great Britain. However, this excluded consumption by large industrials and power generators which were not regionally allocated. Consumption data for Northern Ireland were supplied to us by Phoenix Natural Gas (2001) for 1999 and 2000. The approach adopted was to estimate the regional totals by matching the regional Transco/Phoenix totals with the NAEI UK total. The consumption by other industry and autogenerators in GB was then distributed as the natural gas consumption after all other uses were deducted from the totals. Northern Ireland consumption was estimated directly from the Phoenix data. The consumption by the other uses was estimated from the use of the appropriate drivers, discussed in subsequent sections. The same driver was used for autogenerators as for other industry.

Regional coal data is fairly sparse: sectoral data is available for Northern Ireland, NIO, (2001) up to the present and Wales (WO, 1998) to 1993. Published data for Scotland and England are entirely absent. Hence estimates will be very uncertain. The methodology for estimating regional coal consumption has been extensively revised in order to simplify it and to obtain a more consistent time series. Industrial coal consumption for 1995, 1998, 1999, 2000 was estimated from sales data, gathered from major coal producers. A mass balance was performed on production, imports, stock-changes and imports in order to estimate the amount of British coal not included in the sales data. This 'unknown' coal and anthracite was allocated to industrial consumption in proportion to the 'known' sales data. The remaining

coal, unaccounted for was assumed to be imports and allocated to England. English and Welsh sales data were fairly complete but Scottish data were incomplete. The methodology will work best when the discrepancies between 'known' regional sales data and the UK total consumption are small. This was the case in 1995 and 2000, however for 1998 and 1999 anomalies were encountered. These were removed by allocating consumption between England and Scotland on the basis of the 1995 England/Scotland distribution. Estimates for 1990 are based on WO (1998) and NIO (1996). The remaining consumption was allocated to England and Scotland on the basis of the 1995 England/Scotland split.

Drivers for fuel consumption in cement kilns were based on regional capacity data for 1995, 1998 and 2000 supplied by British Cement Association (2001). These were applied to all fuels though a correction was applied to Northern Ireland to account for the absence of natural gas. The UK estimate of fuel consumed in cement kilns has been revised hence regional consumptions have also been revised.

Autogeneration refers to electricity generation by industry for its own use. In the case of coal, the consumers were identified as Alcan and Brunner Mond, both of which are in England. Gas autogeneration was not a large source and was distributed according to the other industry: natural gas driver discussed above.

Table A1.2 Manufacturing Industry and Construction[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990	1995/98/99/00
Iron and Steel	Sinter Plant	Coke-breeze	Other coke consumption, ISSB	Other coke consumption, ISSB
	Iron & Steel	Blast furnace gas	Coke Consumed in blast furnaces, ISSB, WO	Coke Consumed in blast furnaces, ISSB, WO
		Coke oven gas	Coal feed to coke ovens, ISSB, WS	Coal feed to coke ovens, ISSB, WS
		Coke	Coke consumed in blast Furnaces, ISSB, WO[1]	Coke consumed in blast Furnaces, ISSB, WO
		Fuel oil, gas oil, LPG, natural gas, coal	Consumption of specified fuel, ISSB	Consumption of specified fuel, ISSB
Other Industry	Other Industry	Burning oil, fuel oil, gas oil	Regional oil consumption, DTI, WO Remainder after other uses	Regional oil consumption, DTI, WO Remainder after other uses
		OPG	All Scotland, DTI	All Scotland, DTI
		LPG	Mass balance, DTI	Mass balance, DTI
		Lubricants	Regional sales, DTI	Regional sales, DTI
		Natural gas	Natural gas consumed, Transco	Natural gas consumed, Transco, Phoenix
		Colliery Methane	Deep mined coal prod., CA	Deep mined coal prod., CA
		Coal, coke	Coal consumption, WO, NIO	Coal sales estimates, NIO
		Coke oven gas	Coal feed to coke ovens, ISSB, WO	Coal feed to coke ovens, ISSB, WS
		SSF	NAEI spatial inventory	NAEI spatial inventory
		Wood	SPRU database: non-traded fuel	SPRU database: non-traded fuel
	Cement	Coal, oil, gas, petrocoke, tyres, waste oil	Regional Cement capacity	Regional Cement capacity
	Ammonia (combustion)	Natural Gas	All plant in England	All plant in England
	Autogenerators	Coal	All plant in England	All plant in England
		Natural gas	As Other Industry	As Other Industry
	Other-Industry: Off-road	Gas oil, petrol	Employment in construction, ONS	Employment in construction, ONS

1 See Table A1.11 for abbreviations

1.4 TRANSPORT

The drivers used for transport are summarised in Table A1.6.

1.4.1 Aviation and Navigation

All domestic aviation and navigation emissions are reported as unallocated. The UK fuel statistics for coastal shipping contain oil consumption by the offshore industry which includes on-shore terminals and it is these emissions that are reported as navigation in England and Scotland. Terminal emissions data were supplied by SCOPEC (2001), for 2000, 1999 and1998 and UKOOA (1999) for 1995. Estimates for 1990 were extrapolated from 1995 based on landings of natural gas and crude oil in England and Scotland. Emissions from aircraft support equipment were distributed according to aircraft movement data at the major UK airports (DLTR, 2001).

1.4.2 Road Transportation

Carbon dioxide, methane and nitrous oxide are emitted from the exhaust of all road vehicles with internal combustion engines running on petrol and diesel fuels. CO_2 is the principal product of combustion and emissions are directly related to the fuel efficiency of the vehicle. Methane is a hydrocarbon emitted as a result of the incomplete combustion of the fuel. Nitrous oxide is a by-product of the combustion process and emitted from partial oxidation of nitrogen present in the air.

All these pollutants are emitted by different amounts from vehicles of similar size running on petrol and diesel fuel. For example, diesel cars tend to be more fuel efficient than petrol cars of a similar size, so their carbon emissions are lower. None of these pollutants are subject to regulatory type-approval emission limits, as are those, which have an impact on air quality. However, their emissions are affected by technologies introduced to reduce emissions of the regulatory pollutants. Methane emissions are lower from petrol vehicles fitted with a three-way catalyst, although the reduction in emissions of this pollutant by the catalyst is not as efficient as it is for other hydrocarbons. Measurements also suggest that a three-way catalyst, which is efficient at reducing NO_x emissions, actually increases emissions of N_2O, formed as a by-product of the catalyst NO_x reduction process.

Total emissions from road transport in a country or region are normally calculated from the following information:

- Emission factors for different types of vehicles. In the case of carbon emissions, fuel consumption factors can be used because the mass of carbon emitted is proportional to the mass of fuel consumed. Emission factors (g/km) and fuel consumption factors depend on the vehicle type and fuel type (petrol or diesel) and are influenced by the drive cycle or average speeds on the different types of

roads.

- Traffic activity, including distance and average speed travelled by each type of vehicle on each type of road.

- Fleet composition in terms of the age of the fleet and the petrol/diesel mix. The age of the fleet determines the proportion of vehicles manufactured in conformity with the different exhaust emission regulations which have been in effect and successively tightened up over the past 30 years. One of the defining factors for the inventories in the years between 1995-2000 is the proportion of petrol cars fitted with a three-way catalyst since this became mandatory for all new cars first registered in the UK from around August 1992, in accordance with EC Directive 91/441/EEC. The proportion of cars and vans running on diesel fuel is also an important factor. The sensitivity to the age of the fleet will be much less for the 1990 inventory because there were very few cars then fitted with catalysts and the difference in emissions from cars made to the earlier emission standards was much smaller.

- National or regional fuel consumption statistics. This provides a particularly good indicator of carbon dioxide emissions.

The emission factors and methodology followed for the regional inventory of emissions from road transport were those used for the UK National Atmospheric Emissions Inventory (NAEI). These are largely taken from the European COPERT III program and database, recommended for CORINAIR and form the basis of the IPCC Guidelines (European Environment Agency, 2000).

1.4.2.1 Emission factors

The current inventory uses new emission factors for CH_4 and N_2O, revised from those used in the last regional inventory compilation (Salway *et al*, 2001). The new factors were taken from COPERT III (European Environment Agency, 2000) which provided more detail on the effects of speed or drive cycle on emissions of these pollutants, information that was previously unavailable. For N_2O, different factors are now used for petrol cars and LGVs with three-way catalyst (meeting Euro I standards and on) on urban, rural and highway roads. For CH_4, functions relating emission factor to average speed were used for light duty vehicles and for heavy duty vehicles, different factors were used for journeys on urban, rural and highway roads. COPERT III provides emission factors for vehicles only up to Euro I standards. For the more modern Euro II and Euro III vehicles now on the road, the CH_4 emission factors were reduced by the same ratio as the Euro I to Euro II and III reductions in the NMVOC emission factors. The uncertainties in these factors can be expected to be quite large. However, the emission factors used reflect the fact that three-way catalysts are less efficient in removing methane from the exhausts than other hydrocarbons and also lead to higher N_2O emissions than non-catalyst vehicles.

Tables A1.3 to A1.5 show the emission and fuel consumption factors used for the inventory broken down by vehicle type, road type and emission standard which the vehicle was compliant with when manufactured and first registered. The approximate dates of introduction of the emission standards in the UK are given in the NAEI Report (Goodwin *et al*, 2001). The data are based on various European programmes of measurements of exhaust emissions from in-service vehicles made over defined drive cycles, usually on rolling roads or engine test beds. Where the factors from COPERT III were given as speed-emission factor equations, emission factors were calculated at average speeds typical of the road types shown in the tables.

1.4.2.2 Age and composition of the fleet

Information on the age and composition of the vehicle fleet in the regions from 1990 to 2000 were taken from vehicle licensing statistics. For England, Scotland and Wales, the data were taken from the Vehicle Licensing Statistics Report published for Great Britain each year by DTLR (2001a); this is based on the DVLA files of vehicles licensed in Great Britain at the end of each year.

Additional information had been obtained directly from DTLR which showed the post-town where the vehicles were registered and the year of first registration of vehicles currently licensed in 1995 (DoT, 1996). By grouping together the post-town data into the regions, it was possible to estimate the average age of the fleet based on registrations in England, Scotland and Wales. This tended to show that the age of the fleet was very similar in England and Wales, but somewhat newer in Scotland. However, because vehicles are not necessarily used on the roads in the regions where they are registered (this would be particularly true for company cars and commercial vehicles), the licensing data by post-town was not used for the regional inventories and it was assumed that the age of the fleet and petrol/diesel mix for Great Britain as a whole applied equally to England, Scotland and Wales.

For Northern Ireland, the situation was slightly different. Vehicle licensing statistics for private and light goods vehicles (PLG) were available from the Central Statistics and Research Branch of the Department of Regional Development in Northern Ireland. These showed a newer fleet of cars than in Great Britain (DoRDNI, 2001a). It is likely that most of the light duty vehicles on the road in Northern Ireland will be those licensed in Northern Ireland and *vice versa*. This means that a newer licensed fleet should result in a higher proportion of cars fitted with three-way catalysts on the road in Northern Ireland during 1995-2000 than in England, Scotland and Wales. This trend may be further reflected by the fact that fuel delivery statistics for 1998 suggested a slightly higher proportion of petrol was sold as unleaded in Northern Ireland (~84%, DoRDNI, 2001a) compared with in Great Britain (78%, DTI, 2001). This would be expected if a higher proportion of cars were fitted with catalysts that require them to be run on unleaded petrol.

Neither the vehicle licensing statistics nor traffic flow data for Northern Ireland were able to separate private cars from light goods vehicles (LGVs) or vans. However, the proportion of diesel vehicles in the PLG class in Northern Ireland was 34% in 2000 (DoRDNI, 2001a) compared with 19% in Great Britain (DTLR, 2001a). This was interpreted as indicating that a higher proportion of PLG vehicles in Northern Ireland were LGVs than in Great Britain. In the absence of any additional information, it was assumed that the proportions of diesels in the private car fleet and in the LGV fleet were the same in Northern Ireland as in Great Britain (12.9% for cars and 78.7%, for LGVs in 2000 (DTLR, 2001a)). This leads to the conclusion that 37.6% of the PLG fleet and, it is assumed, the PLG vehicle kilometres in Northern Ireland in 2000 were as LGVs.

1.4.2.3 Traffic data

The preferred indicators for road transport activity in emission inventories are traffic data in terms of vehicle kilometres travelled per year disaggregated by vehicle and road type. For the UK national inventory (the NAEI), vehicle kilometre data for the road network in Great Britain are provided by DTLR for each vehicle type on roads classified as trunk, principal and minor roads in built-up areas (urban) and non-built-up areas (rural) and motorways (DTLR, 2001b). These estimates are based on traffic counts from the rotating census and core census surveys.

Vehicle kilometre data for 1990 - 2000 were available from DTLR separated into the road networks in England, Scotland and Wales. However, these did not provide a good representation of vehicle kilometres on the many minor roads in these regions. In regions like Scotland, a significant proportion of vehicle kilometres is probably made on minor roads. Salway *et al* (2000) discuss how use of the minor road vehicle kilometres provided by DTLR can lead to anomalies in calculated fuel consumption trends for the regions.

The NAEI provides 1x1 km resolution maps of emissions for several pollutants and fuel consumption across the whole of the UK. For road transport, different methods are used to map emissions from major and minor roads. For major roads, emissions are calculated on individual road links from emission factors and traffic flow data (annual average daily flows) provided by DTLR from the national traffic census (DTLR, 2001b). Total UK emissions and fuel consumption on minor roads are calculated from estimates of the total vehicle kilometres on minor roads and are then spatially disaggregated on the UK minor road network using Ordnance Survey maps and estimated average traffic flows on minor roads in different area types.

UK maps of fuel consumption on the major and minor road network were used to estimate road transport emissions of methane and nitrous oxide in England, Scotland and Wales in 1999 and 2000. The way the calculations were made is described below.

Vehicle kilometre data in Northern Ireland for different road classes and vehicle categories were used to calculate methane and nitrous oxide emissions in Northern Ireland. Vehicle kilometre data were available for years up to 1998 (DoRDNI,

2001b); for 1999 and 2000, these data were not available, but were estimated from changes in the annual average daily traffic flows on road links in Northern Ireland covered by the Annual Traffic Census Report 2000 (DoRDNI, 2002).

1.4.2.4 Fuel consumption in the regions

Fuel delivery data are available for England & Wales, Scotland and Northern Ireland from DUKES (DTI, 2001). Separate fuel delivery data for Wales was available from the Welsh Office for 1990, but not for 1995-2000 (WO, 1998). Therefore, the split in petrol and diesel consumed between England and Wales in 1990 was assumed to apply to the DUKES England & Wales total for 1995-2000. This is a reasonable assumption to make on the basis that the model predictions of the relative proportions of fuel consumed in England and Wales based on traffic data in 1990 were very similar to the actual figures based on fuel deliveries in these regions and the model predictions were that the England/Wales split for 1995 would be very similar to 1990.

1.4.2.5 Method for calculating emissions of CO_2, CH_4 and N_2O from road transport in the regions

Different methods were used to derive the regional inventories of CO_2 and for CH_4 and N_2O.

Regional inventories of CO_2 emissions from road transport were calculated directly from the petrol and diesel fuel delivery figures for the regions in accordance with IPCC guidelines on reporting Greenhouse emissions. The calculated CO_2 emissions from the four regions were normalised so that the sum added up to the reported UK total CO_2 emissions from road transport. This small normalisation correction accounts for the very small proportion of these fuels consumed by off-road vehicles and machinery.

The trends in CO_2 emissions from road transport from 1990 to 2000 show a large decline in Northern Ireland not observed in the other regions. This reflects a large decline in petrol and diesel fuel deliveries in Northern Ireland since 1995, presumably due to cross-border purchasing of fuels by motorists at filling stations in the Irish Republic where the price of fuels are lower and the price differential has become increasingly larger.

Emissions of CH_4 and N_2O in England, Scotland and Wales were calculated from a combination of emission factors, traffic activity and fuel consumption data. First, fleet-average, fuel-based emission factors were calculated for the region in each year, for each main vehicle type. To do this, CH_4 and N_2O emissions were calculated for each vehicle type in each region from the emission factors and traffic data (vehicle kilometres per year) and divided by the fuel consumed calculated in the same way from fuel consumption factors. The results are factors in units g pollutant/kg fuel for each vehicle type reflecting the composition of the fleet that year, for example, the proportion of cars with three-way catalysts, and proportion of miles done on different types of roads (e.g. urban, rural, motorway) in the region.

Table A1.3 Fuel Consumption Factors for Road Transport (in g fuel/km)

	Emission Standard	Urban	Rural single c/way	Rural dual c/way	Motorway
Petrol cars	Pre-ECE	73.4	62.2	76.3	74.9
	ECE 15.00	62.3	48.9	61.6	60.0
	ECE 15.01	62.3	48.9	61.6	60.0
	ECE 15.02	57.5	49.5	63.5	61.8
	ECE 15.03	57.5	49.5	63.5	61.8
	ECE 15.04	51.8	47.1	57.1	55.6
	Euro I	57.6	46.8	72.3	69.0
	Euro II	57.6	46.8	72.3	69.0
Diesel cars	Pre-Euro I	55.7	41.5	61.7	58.9
	Euro I	42.4	30.1	36.2	35.1
	Euro II	42.4	30.1	36.2	35.1
Petrol LGVs	Pre-Euro I	76.6	60.4	90.7	86.6
	Euro I	76.6	60.4	90.7	86.6
	Euro II	76.6	60.4	90.7	86.6
Diesel LGV	Pre-Euro I	70.5	75.2	143.9	136.2
	Euro I	88.3	75.8	101.6	98.2
	Euro II	88.3	75.8	101.6	98.2
Rigid HGVs	Old	168	155	175	181
	Pre-Euro I	168	155	175	181
	Euro I	168	155	175	181
	Euro II	168	155	175	181
Artic HGVs	Old	364	299	311	319
	Pre-Euro I	364	299	311	319
	Euro I	364	299	311	319
	Euro II	364	299	311	319
Buses	Old	415	203	202	206
	Pre-Euro I	415	203	202	206
	Euro I	415	203	202	206
	Euro II	415	203	202	206
Motorcycles	<50cc	25.0	25.0	25.0	25.0
	>50cc 2st	30.1	33.1	38.7	38.2
	>50cc, 4st	28.5	30.7	39.8	38.8

Table A1.4 Methane Emission Factors for Road Transport (in g/km)

	Emission Standard	Urban	Rural single c/way	Rural dual c/way	Motorway
Petrol cars	Pre-ECE	0.085	0.026	0.043	0.039
	ECE 15.00	0.085	0.026	0.043	0.039
	ECE 15.01	0.085	0.026	0.043	0.039
	ECE 15.02	0.085	0.026	0.043	0.039
	ECE 15.03	0.085	0.026	0.043	0.039
	ECE 15.04	0.085	0.026	0.043	0.039
	Euro I	0.037	0.017	0.024	0.023
	Euro II	0.026	0.012	0.017	0.016
	Euro III	0.018	0.008	0.012	0.011
Diesel cars	Pre-Euro I	0.010	0.017	0.050	0.047
	Euro I	0.004	0.005	0.012	0.012
	Euro II	0.003	0.004	0.009	0.008
	Euro III	0.002	0.003	0.006	0.006
Petrol LGVs	Pre-Euro I	0.150	0.040	0.025	0.025
	Euro I	0.036	0.017	0.029	0.027
	Euro II	0.025	0.012	0.020	0.019
Diesel LGV	Pre-Euro I	0.005	0.005	0.005	0.005
	Euro I	0.004	0.004	0.004	0.004
	Euro II	0.003	0.003	0.003	0.003
Rigid HGVs	Old	0.418	0.100	0.091	0.091
	Pre-Euro I	0.120	0.045	0.039	0.039
	Euro I	0.071	0.022	0.017	0.016
	Euro II	0.066	0.020	0.015	0.015
Artic HGVs	Old	0.726	0.245	0.262	0.271
	Pre-Euro I	0.175	0.080	0.070	0.070
	Euro I	0.103	0.052	0.048	0.048
	Euro II	0.095	0.046	0.042	0.042
Buses	Old	0.525	0.390	0.363	0.324
	Pre-Euro I	0.175	0.080	0.070	0.070
	Euro I	0.173	0.097	0.073	0.071
	Euro II	0.162	0.084	0.064	0.062
Motorcycles	<50cc	0.219	0.219	0.219	0.219
Pre-2000	>50cc 2st	0.150	0.150	0.150	0.150
	>50cc, 4st	0.200	0.200	0.200	0.200
Motorcycles	<50cc	0.048	0.048	0.048	0.048
97/24/EC	>50cc 2st	0.104	0.107	0.089	0.091
	>50cc, 4st	0.084	0.079	0.058	0.059

Table A1.5 N_2O Emission Factors for Road Transport (in g/km)

	Emission Standard	Urban	Rural single c/way	Rural dual c/way	Motorway
Petrol cars	Pre-ECE	0.005	0.005	0.005	0.005
	ECE 15.00	0.005	0.005	0.005	0.005
	ECE 15.01	0.005	0.005	0.005	0.005
	ECE 15.02	0.005	0.005	0.005	0.005
	ECE 15.03	0.005	0.005	0.005	0.005
	ECE 15.04	0.005	0.005	0.005	0.005
	Euro I	0.053	0.016	0.035	0.035
	Euro II	0.053	0.016	0.035	0.035
	Euro III	0.053	0.016	0.035	0.035
Diesel cars	Pre-Euro I	0.027	0.027	0.027	0.027
	Euro I	0.027	0.027	0.027	0.027
	Euro II	0.027	0.027	0.027	0.027
	Euro III	0.027	0.027	0.027	0.027
Petrol LGVs	Pre-Euro I	0.006	0.006	0.006	0.006
	Euro I	0.053	0.016	0.035	0.035
	Euro II	0.053	0.016	0.035	0.035
Diesel LGV	Pre-Euro I	0.017	0.017	0.017	0.017
	Euro I	0.017	0.017	0.017	0.017
	Euro II	0.017	0.017	0.017	0.017
Rigid HGVs	Old	0.030	0.030	0.030	0.030
	Pre-Euro I	0.030	0.030	0.030	0.030
	Euro I	0.030	0.030	0.030	0.030
	Euro II	0.030	0.030	0.030	0.030
Artic HGVs	Old	0.030	0.030	0.030	0.030
	Pre-Euro I	0.030	0.030	0.030	0.030
	Euro I	0.030	0.030	0.030	0.030
	Euro II	0.030	0.030	0.030	0.030
Buses	Old	0.030	0.030	0.030	0.030
	Pre-Euro I	0.030	0.030	0.030	0.030
	Euro I	0.030	0.030	0.030	0.030
	Euro II	0.030	0.030	0.030	0.030
Motorcycles	<50cc	0.001	0.001	0.001	0.001
Pre-2000	>50cc 2st	0.002	0.002	0.002	0.002
	>50cc, 4st	0.002	0.002	0.002	0.002
Motorcycles	<50cc	0.001	0.001	0.001	0.001
97/24/EC	>50cc 2st	0.002	0.002	0.002	0.002
	>50cc, 4st	0.002	0.002	0.002	0.002

The fuel-based emission factors for each vehicle type were then combined with estimates of the total amount of petrol or diesel they each consumed in the region. For England, Scotland and Wales, the estimates for 1999 and 2000 come from the NAEI maps of fuel consumption by vehicles on major and minor roads in the UK referred to earlier. This procedure ensures adequate coverage of vehicle activity on the minor roads, which the vehicle kilometre data from DTLR do not cover well. At present, fuel consumption maps covering each vehicle type are not available for 1990, 1995 and 1998. For these years, the regional fuel consumption estimates were scaled relative to 1999 according to trends in the DUKES total fuel delivery figures for the regions each year relative to 1999 and then divided between each vehicle category according to their fuel consumption factors and approximate annual vehicle kilometre figures in the region. This procedure in effect uses DTI fuel delivery data as an indicator of traffic activity in England, Scotland and Wales in earlier years relative to 1999, but will be reasonably robust if there is a fairly equitable movement of fuel bought in neighbouring regions across borders.

This procedure (based on fuel deliveries) cannot be used to estimate CH_4 and N_2O emissions from road transport in Northern Ireland because of the extensive amount of cross-border purchasing of fuel in the Irish Republic, but used in the region. The fuel delivery statistics from DTI (2001) suggest a 42% reduction in petrol sales and a 54% reduction in diesel sales in Northern Ireland from 1995 to 2000 in spite of the fact that traffic had grown by around 20% over this period. The CH_4 and N_2O inventory needs to reflect the growth in traffic. Therefore, emissions were calculated from the vehicle kilometre and traffic survey data provided by the Department of Regional Development in Northern Ireland (DoRDNI ,2001b, 2002) and the vehicle kilometre-based emission factors. The calculations took account of the newer car fleet in Northern Ireland, compared with Great Britain, leading to a higher proportion of cars with three-way catalysts.

1.4.3 Railways

Emissions from railway locomotives in Great Britain were disaggregated based on diesel oil consumption data for 1997 supplied by Railtrack (1999). Data for earlier years was not available. The data is reported on the basis of railway companies whose area of operation could in most cases be allocated to one of the four regions. Some companies operations were spread across regions and it was necessary to allocate fuel consumption based on their advice. Emissions from railways in Northern Ireland were based on fuel consumption data supplied by Translink (2001).

Table A1.6 Transport[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990	1995/1998/1999/2000
Civil Aviation	NA	Aviation Gasoline, Jet Gasoline	Unallocated	Unallocated
Road Transportation	Road Transport	Petrol, diesel oil	Road fuel sales, DTI; vehicle km, DETR	Road fuel sales, DTI, vehicle km, DLTR
Railways	Railways	Gas oil,	gas oil consumption, 1997, Railtrack,: NIR	Regional GB gas oil consumption, 1997, Railtrack. Translink
Navigation	Coastal	gas oil, fuel oil	Unallocated except for terminals	Unallocated except for terminals
Other	Aircraft Support	gas oil	Regional aircraft movements	Regional aircraft movements

1 See Table A1.11 for abbreviations

Table A1.7 Other Sectors[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990	1995/1998/1999/2000
Commercial/Institutional	Miscellaneous, Public service,	Coal	SPRU database: Miscellaneous; coal	SPRU database: Miscellaneous; coal
		SSF	NAEI spatial inventory	NAEI spatial inventory
		Natural gas	Commercial Sales, DTI	Natural gas consumed, Transco, Phoenix
		Landfill gas	Landfill methane Emissions	Landfill Methane Emissions
		Sewage gas	Sewage methane recovered	Sewage methane recovered
		fuel oil, gas oil	Non-Industrial Employment, ONS	Non-Industrial Employment, ONS
		MSW	As MSW incinerators	As MSW incinerators
		Burning oil	As other industry	As other industry
	Railways(Stationary)	fuel oil, burning oil, coal	Regional gas oil consumption, 1997,Railtrack, Translink	Regional gas oil consumption, 1997,Railtrack, Translink
		Natural gas	England	England
Residential	Domestic	Coal, anthracite, wood	Coal consumption, NIO, WO	Coal sales data 1995/00, NIO
		SSF, coke	See text	See text
		Natural gas	Domestic gas, DTI	Customers < 73200 kWh, DTI for GB, Phoenix for NI
		Burning oil	Regional burning oil, DTI, WO. LRC data for NI.	Regional burning oil, DTI, WO. LRC data for NI.
		Gas oil, LPG	Regional population, ONS, LRC data for NI	Regional population, ONS, LRC data for NI
		Fuel oil	Regional population, ONS	Regional population, ONS
	House & Garden	DERV, petrol	Regional population, ONS	Regional population, ONS
Agriculture/Forestry/ Fishing	Agriculture	coal, coke, fuel oil, gas oil, natural gas	Agricultural employment, MAFF	Agricultural employment,DEFRA
		burning oil	Regional burning oil, DTI, WO	Regional burning oil, DTI, WO
		straw	Wheat production, MAFF	Wheat production, DEFRA
	Agriculture Power Units	Gas oil, petrol	Agricultural employment, MAFF	Agricultural employment, DEFRA
	Fishing	gas oil, fuel oil	Unallocated	Unallocated

1 See Table A1.11 for abbreviations

1.5 OTHER SECTORS

1.5.1 Commercial/Institutional

The NAEI categories, public administration and miscellaneous were combined because regional statistics are not available to this level of sectoral disaggregation. Only WO (1998) reports miscellaneous coal consumption, whereas NIO (2001) reports only an industrial category. Estimates for 1990,1995, 1998 to 2000 were based on the SPRU database for miscellaneous coal consumption.

DTI (1992) reports regional gas sales to the commercial sector for 1990. For 1995, 1998 to 2000 Transco data were used for regional gas consumption in the 73-732 MWh range. This is the closest data available for commercial/institutional consumers in these years but is rather smaller than the UK data reported by DTI (2001). This data was used as a driver to distribute the NAEI miscellaneous and public service gas consumption in GB. Natural gas consumption data for Northern Ireland were supplied by Phoenix Natural Gas for 1999 and 2000. The commercial consumption was used as an estimate for Northern Ireland miscellaneous and public service gas consumption.

For fuel oil and gas oil emissions were distributed using as a surrogate, regional employment statistics in non-industrial sectors taken from the ONS employment database, (ONS, 2000).

Stationary combustion by the railway sector is classified as commercial. Consumption of burning oil, fuel oil, and coke is tiny and was allocated according to the diesel oil driver used for locomotives. Natural gas consumption for electricity generation refers to the London Underground.

DTI (2001) reports a relatively small amount of municipal solid waste consumption for energy production in the commercial and miscellaneous sectors. Little is known about the distribution of these heat plant, so the emissions were distributed on the basis of MSW incinerators.

1.5.2 Residential

Domestic coal consumption is reported in NIO (2001) up to the present and in WO (1998) to 1993. These data also include anthracite and for NI other solid smokeless fuels. Published data for Scotland and England are entirely absent. Hence estimates will be very uncertain. The methodology for estimating regional coal consumption has been extensively revised in order to simplify it and to obtain a more consistent time series. Domestic coal consumption for 1995, 1998, 1999 and 2000 was estimated from sales data, gathered from major coal producers. A mass balance was performed on production, imports, stock-changes and imports in order to estimate the amount of British coal not included in the sales data. This 'unknown' coal and anthracite was allocated to domestic consumption in GB in

proportion to the 'known' sales data. Only small amounts of British Coal seem to be shipped to Northern Ireland so it was assumed that once known British coal shipments are accounted for, the remaining consumption of coal in Northern Ireland is foreign imports of anthracite and steam coal. Any remaining imported anthracite was allocated to England, Scotland and Wales in proportion to 'known' consumption. The remaining coal, unaccounted for was assumed to be imported steam coal and allocated to England. English and Welsh sales data were fairly complete but Scottish data were incomplete. The methodology will work best when the discrepancies between 'known' regional sales data and the UK total consumption are small. This was the case in 1995 and 2000, however for 1998 and 1999 anomalies were encountered. These were removed by allocating consumption between England and Scotland on the basis of the 2000 England/Scotland distribution. Estimates for 1990 are based on WO (1998) and NIO (1996). The remaining consumption was allocated to England and Scotland on the basis of the 1995 England/Scotland split.

The regional data available is not sufficiently detailed to report consumption of manufactured solid smokeless fuels (SSF). Hence a driver was estimated based the NAEI disaggregated inventory database. This uses the distribution of smoke control areas and assumes a distribution for areas where there is no gas consumption (i.e. population density < cut off value) and allocates the UK SSF consumption to these areas. The Northern Ireland data includes SSF imports under coal and anthracite and so a correction was applied to avoid double counting. The same driver was used for commercial and other industry.

Domestic natural gas data is available for 1990 (DTI, 1991), and a very similar category; customers consuming less than 73200 kWh is reported in later editions.

DTI (2001, 1999, 1991) reports regional consumption of liquid fuels but only as totals for: England and Wales combined; Scotland and Northern Ireland. WO (1998) reports similar data on liquid fuel consumption up to 1993. A large proportion of burning oil (76%) is consumed in the domestic sector and in the original inventory the regional totals were used as the domestic driver. However, this resulted in a very high estimate for domestic consumption in Northern Ireland in 1998. This could not be reconciled to the house conditions survey. An improved procedure was adopted which was to estimate Northern Ireland's domestic consumption from the house conditions survey and then to allocate consumption to England, Wales and Scotland according to the DTI totals. The Welsh consumption was extrapolated from 1993.

The consumption of fuel oil by the domestic sector is tiny and was distributed according to population ONS (2001). For gas oil, it was necessary to account for the pattern of consumption in Northern Ireland. Here data from the House Conditions Survey used in the Greater Belfast Local Inventory (LRC, 1999) suggested that most domestic oil consumption is burning oil. Hence as a simplifying assumption, domestic gas-oil consumption was taken as zero. Domestic gas oil consumption for England, Scotland and Wales was allocated on population.

The domestic consumption of liquid petroleum gas in Northern Ireland is proportionately higher than in Great Britain because of the historical lack of mains gas. The consumption for Northern Ireland was estimated using data on the consumption per household from the House Conditions Survey used in the Greater Belfast Local Inventory (LRC, 1999). Consumption for England, Scotland Wales was allocated on the basis of population.

1.5.3 Agriculture/Forestry/Fisheries

Regional fuel consumption by agriculture is not available. Emissions were allocated on the basis of employment, DEFRA (2001). Fishing emissions are unallocated.

1.6 MILITARY

Emissions from military aircraft and naval vessels were unallocated. Army emissions are included in the road transportation and public service categories and cannot be identified.

1.7 FUGITIVE EMISSIONS FROM FUELS

1.7.1 Coal Mining

Methane emissions arise from coal mining activities. Emissions are estimated based on the amounts of deep mined and open cast coal produced. Hence regional estimates were obtained on regional coal production derived from a number of sources: Coal Authority (2001), BGS (1991,1996), WO (1998), SO (1999), DTI (1996). A small emission occurs from coal storage and transport, which is based on deep mined coal production. Data suggests that only small amounts of coal are transported outside of the region of production and no attempt was made to allow for this. Hence, coal storage and transport emissions were distributed according to deep mined production. These estimates only include emissions from working mines and exclude closed mines. It was previously believed that emissions became negligible once a coal mine closed, particularly if the mine flooded (Williams, 1993). However, a recent review sponsored by DETR, suggests that these emissions may be significant (Sage, 2001). A number of estimates have been made ranging from 20 to 300 ktonnes methane in 1999. DEFRA is planning more research to establish a reliable estimate of emissions from this source.

1.7.2 Solid Fuels Transformation

For coke ovens, three fugitive emissions are estimated:

1. A 'residual' emission of CO_2 which reflects the difference between the carbon input to the coke oven and the carbon content of the coke and coke-oven gas produced.
2. Emissions from the flaring of coke-oven gas.

3. Emissions of methane from the process.

These were disaggregated based on the regional consumption of coking coal discussed in 1.1.3.3.

For solid smokeless fuel (SSF) plant, the only fugitive emissions estimated, were the 'residual' CO_2 emission and the process methane. The driver used was the regional consumption of coal by SSF plant (see 1.1.1.3). It is known that some petroleum coke is used in SSF production but the amount is uncertain. The same driver was applied to the petroleum coke consumption.

1.7.3 Oil and Natural Gas

All emissions from the offshore industry have been classified as unallocated. However some emissions occur from on-shore oil and gas terminals in England, Wales and Scotland and from the on-shore oil and gas fields.

The estimates of terminal flaring emissions are based on SCOPEC (2001) data for 1998-2000 and UKOOA (1999) for 1995. Data is unavailable for 1990, so these were extrapolated based on flaring volumes for Scottish Terminals and natural gas arrivals to gas terminals in England (DTI, 1991, 1996). The 2000 UK inventory includes a correction to account for flaring on onshore oil and gas fields excluded by the SCOPEC Inventory. This is based on flaring volume data in DTI (2001, 2001a, 2001b). In the UK their contribution is negligible but becomes significant in the regional inventory. Wytch Farm, which lies a few miles off the south coast of England, was classified as on-shore for this purpose.

SCOPEC (2001) was able to supply fugitive emissions of CO_2 and methane from terminals for 1999 and 1998. The methane emissions arise from venting, oil storage and tanker loading and unloading. The CO_2 emissions arise from venting and processes. A more aggregated set of data for 1995 was provided by UKOOA (1999). Estimates for 1990 were extrapolated using data on arrivals of oil and gas in England and Scotland (DTI, 1991, 1996). Fuel use in terminals is discussed in 1.1.3.4 and 1.1.5.1.

The UK Inventory estimates emissions of methane from leakage from the natural gas transmission system. The estimates are based on Transco estimates of specific leakage rates from the mains and services and data on the stock of mains and services. The baseline estimate is for 1991; subsequent years are based on the upgrading of the system. Recently Transco have developed a new model which produces regional leakage estimates from the low-pressure transmission system for 1998 -2000. The 1998 regional split was applied to the estimates of the 'old' model to obtain estimates for 1990 and 1995. Whilst leakage from low-pressure mains and services accounts for most of the emission, there is also a contribution from high-pressure mains, storage and other losses. These additional emissions were allocated using the same regional split as the low-pressure leakage.

Table A1.8 Fugitive Emissions from Fuels[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990/1995	1998/1999/2000
Coal Mining	Deep mined coal Coal storage & transport	Deep mine coal production	Regional deep mine production, CA	Regional deep mine production, CA
	Open cast coal	Open cast mine coal production.	Regional open cast mine production, CA	Regional open cast mine production, CA
Solid fuel transformation	Coke production	Coke production	Coal feed to coke ovens, ISSB, WS, DTI	Coal feed to coke ovens, ISSB, WS, DTI, PI
	Flaring	Coke oven gas	Coal feed to coke ovens, ISSB, WS, DTI	Coal feed to coke ovens, ISSB, WS, DTI, PI
	SSF production	Coal Petrocoke	Coal feed to SSF plant, DTI, WS	Coal feed to SSF plant, DTI, WS
Oil	Offshore Oil & Gas	NA	Fugitive emissions from Terminals (extrapolated to 1990), UKOOA	Process emissions from Terminals, SCOPEC
	Oil Terminal Storage	NA	1998 driver	Storage emissions, SCOPEC
	Onshore Loading	Oil loaded	1998 driver	Loading emissions, SCOPEC
Venting and Flaring	Offshore Flaring	Volume gas flared	Flaring at terminals and onshore fields, UKOOA, DTI	Flaring at terminals and onshore fields, SCOPEC, DTI
	Offshore Venting	NA	Fugitive emissions from Terminals (extrapolated to 1990), UKOOA	Venting emissions, SCOPEC
Natural Gas	Gas Leakage	Natural gas leakage	Transco estimate for LP mains	Transco estimate for LP mains

1 See Table A1.11 for abbreviations

1.8 INDUSTRIAL PROCESSES

These sources report process and fugitive emissions from industrial processes as opposed to the emissions from fuel combustion used to provide energy to these processes. Table A1.2 covers combustion emissions. The drivers used for these processes are summarised in Table A1.9

1.8.1 Minerals Industries

Large emissions of CO_2 arise from the degradation of limestone used in cement and limekilns. Cement emissions are estimated from the production of cement clinker, hence regional emissions were estimated based on percentage capacity data for the regions supplied by the British Cement Association (1999, 2001). Discussions with regulatory authorities (Environment Agency, Scottish Environmental Protection Agency, and in Northern Ireland, the Department of the Environment) suggested that, lime calcination only occurs in England.

Limestone and dolomite are also used in iron and steel production. Discussions with British Steel suggested it would be impossible to identify all the different uses of limestone and dolomite in iron and steel making. The major use is in blast furnaces, and so emissions were disaggregated on regional iron production (ISSB, 1991, 1996, 1999, 2000, 2001).

Limestone, dolomite and soda ash are also used in glass production. Emissions were disaggregated using plant capacity and emissions data for 1990, 1995, 1999 supplied by British Glass (2001).

The 2000 Inventory reports emissions from a new source: Fletton brick production. These bricks are made from Fletton clay which contains a significant amount of naturally occurring carbonaceous material. Emissions of carbon dioxide and methane are estimated and all production occurs in England.

1.8.2 Chemical Production

The UK Inventory reports emissions of carbon dioxide from ammonia production; nitrous oxide from adipic acid production and nitrous oxide from nitric acid production. The ammonia and adipic acid plants are in England. Nitric acid is produced in England and Northern Ireland and estimates were based on the plant capacities and estimated emission factors.

The UK inventory now reports emissions of methane from methanol production, ethylene production and the other chemical industry. The methanol plant is in England. Ethylene production occurs in England, Scotland and Wales. These emissions are distributed based on emissions reported in the Pollution Inventory (Environment Agency, 2001) and plant capacity. Emissions are extrapolated to 1990 and 1995 based on plant capacities. The emission from the other chemical

industry was allocated to England and Wales based on the site data in the Pollution Inventory. Data on emissions from other chemical processes are not available for Scotland.

1.8.3 Metal Production

In the iron and steel industry, emissions of CO_2 arise from electric arc furnaces through the consumption of the graphite anodes. Regional data on steel production from electric arc furnaces was used as the driver (ISSB, 1991, 1996, 1999, 2000, 2001). The flaring of waste blast furnace gas was distributed according to the distribution of blast furnaces. The driver used was coal consumption by blast furnaces. (ISSB, 1991, 1996, 1999, 2000, 2001).

Emissions of CO_2 from iron and steel making are estimated from a mass balance on the coke consumed in blast furnaces; the blast furnace gas produced; the pig iron produced; the pig iron used in steel making and the crude steel produced. The emissions are distributed using appropriate drivers for each source and sink taken from ISSB (1991, 1996, 1999, 2000, 2001). These include regional data on coke consumed in blast furnaces, pig iron production and crude steel production.

The electrolytic process used to produce aluminium results in a CO_2 emission as the petroleum coke anode is consumed. Emissions were based on plant capacity data for 1990,1995 and 1999 provided by Alcan (1998, 2000). The Kinlocheven plant uses the older Soderberg process, which results in a higher specific emission factor. Aluminium production also results in emissions of PFCs. Regional estimates were obtained by Enviros March (2001) from discussions with Alcan.

1.8.4 Use of Halocarbons and SF_6

The UK emissions of halocarbons and sulphur hexafluoride are based on estimates prepared by Enviros March (MCG (1999)). Enviros March performed a short study on regional emissions (Enviros March (2001)) which makes some revisions to the previously published UK Emissions. However, only where the revisions are significant, have they been adopted in this work. The allocation of the UK emissions to the constituent countries is based on the Enviros March (2001) work.

For some sources, the emission is equal to the consumption of fluid (e.g. aerosols) whilst for other sources, emissions occur during manufacture of a product, followed by leakage during the product lifetime, followed by a disposal emission. (e.g. refrigerators). In these cases emissions are estimated from a time dependent model of the bank of fluid held in products, accounting for product production and disposal.

It was felt that supermarket refrigeration was sufficiently different from other refrigeration to warrant a separate study. Emissions were based on a market review of the number and size of supermarkets in the regions plus discussions with gas manufacturers on the sales into this sector. Discussions with supermarket owners

also suggested that regional usage could be approximately equated to sales volume, which in turn could be approximated by regional population split.

Air conditioning systems in cars began to use HFC134a from around 1993. Data was supplied by SMMT on regional sales of new cars. Initially, installation of air conditioning was skewed towards company cars, which are broadly distributed according to population.

PFCs and SF_6 are used to cushion the soles of some training shoes. Data were gathered from discussions with Nike. Sales figures for the devolved regions of the UK were not available, so the regional split has been made according to population.

Sulphur hexafluoride is used in electrical switchgear used in the electricity transmission system. Estimates were based on discussions with gas manufacturers, equipment manufacturers and the Electricity Association. The regional split was based on the total electrical capacity of a particular region. Sulphur hexafluoride is used in electrical switchgear used in the electricity transmission system. Estimates were based on discussions with gas manufacturers, equipment manufacturers and the Electricity Association. The regional split was based on the total electrical capacity of a particular region.

For aerosols the split by region has been done on the basis of population. The aerosols containing these gases often have industrial applications, but it can be assumed that usage can be at least approximately equated with population. Making the split using this method also has the advantage of making the data directly comparable with the figures for the baseline years of 1990 and 1995.

Data for HFC emissions from metered dose inhalers in the UK have been taken from the March predictive model (MCG, 1999). The National Asthma Campaign's National Asthma Audit 1999/2000 concluded that, 'There is little variation in asthma prevalence among children or adults throughout Great Britain.' Therefore, the regional split of emissions is proportional to population.

Other sources such as fire extinguishers are very small and are likely to be distributed with the general population.

Most magnesium production takes place in England, with major factories in Manchester, Oxford & Birmingham. There is no production known in Scotland or Northern Ireland.

Emissions data for regional emissions from semiconductor wafer manufacture are estimated directly from manufacturing data since no semiconductor manufacturer in the UK has yet moved to NF_3 for etching.

Table A1.9 Industrial Processes[1]

IPCC Category	NAEI Sources	Activity Data	1990	1995/98/99/00
Cement Production	Cement (decarbonizing)	Clinker production	Regional cement capacity, BCA[1]	Regional cement capacity, BCA[1]
Lime Production	Lime (decarbonizing)	Limestone consumption	Plant in England	Plant in England
Limestone and Dolomite Use	Glass production	Limestone and dolomite consumption	Regional glass production 1990, BGlass	Regional glass production 1995/99, BGlass
	Blast Furnaces	Limestone and dolomite consumption	Iron production, ISSB	Iron production, ISSB
Soda Ash Production and Use	Glass production	Soda Ash Consumption	Regional glass production 1990 BGlass	Regional glass production 95/99, BGlass
Mineral Products: Other	Fletton Brick Production	Fletton Brick Production	Plant in England	Plant in England
Ammonia Production	Ammonia feedstock	Natural gas feedstock	Plant in England	Plant in England
Nitric Acid Production	Nitric Acid Production	Plant capacity	Regional plant capacity	Regional plant capacity
Adipic Acid Production	Adipic Acid Production	Adipic acid made	Plant in England	Plant in England
Chemical Industry: Other	Methanol Production	Production of Methanol	Plant in England	Plant in England
Chemical Industry: Other	Ethylene Production	Production of Ethylene	Plant Capacities	PI, Plant Capacities
Chemical Industry: Other	Chemical Industry	NA	PI data extrapolated	PI
Iron and Steel	Electric Arc Furnace	EAF steel production	Regional EAF production, ISSB	Regional EAF production, ISSB
	Flaring	Blast furnace gas	Coke Consumed in blast furnaces, ISSB, WO[1]	Coke Consumed in blast furnaces, ISSB, WO[1]
Aluminium Production	Aluminium production	Primary aluminium produced	Regional aluminium plant capacity, ALCAN	Regional aluminium plant capacity, ALCAN
SF_6 Used in Aluminium and Magnesium Foundries	SF_6 Cover gas	NA	Regional consumption, EM[1]	Regional consumption, EM[1]

1 See Table A1.11 for abbreviations

Table A1.10 Halocarbons and Sulphur Hexafluoride[1]

IPCC Category	NAEI Sources	Activity Data	1990	1995/98/99/00
Halocarbon & SF6 By-Product Emissions	Halocarbon Production	NA	All plant in England	All plant in England
Refrigeration and Air Conditioning	Refrigeration	NA	Regional population, ONS	Regional population, ONS
	Supermarket Refrigeration	NA	Regional population, EM	Regional population, EM[1]
	Mobile Air conditioning	NA	Regional population, EM	Regional population, EM
Foam Blowing	Foams	NA	Regional population, ONS	Regional population, ONS
Fire Extinguishers	Fire fighting	NA	Regional population, ONS	Regional population, ONS
Aerosols	Metered Dose Inhalers	NA	Regional population, ONS	Regional population, ONS
	Aerosols (halocarbons)	NA	Regional population, ONS	Regional population, ONS
Other	Electronics	NA	Regional electronics plant Consumptn, EM	Regional electronics plant Consumptn, EM
	Training shoes	NA	Regional population, EM	Regional population, EM
	Electrical Insulation	NA	Regional electrical capacity, EM	Regional electrical capacity, EM

1 See Table A1.11 for abbreviations

Table A1.11 Summary of Abbreviations used in Tables A1.1to A1.10

BCA	British Cement Association
BGlass	British Glass
CA	Coal Authority
DTI	Department of Trade and Industry
DEFRA	Department for Environment, Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions (now DEFRA)
DTLR	Department for Local Government, Transport and the Regions
E	England
EAF	Electric Arc Furnace
EM	Enviros March previously MCG
GB	Great Britain
IPCC	Intergovernmental Panel on Climate Change
ISSB	Iron and Steel Statistics Bureau
LPG	Liquefied petroleum gas
LRC	London Research Centre
MAFF	Ministry of Agriculture, Fisheries and Food (now DEFRA)
MCG	March Consulting Group now EM
MSW	Municipal Solid Waste
NA	Not Available
NAEI	National Atmospheric Emissions Inventory
NIO	Northern Ireland Office
NO	Not occurring
ONS	Office for National Statistics
OPG	Other petroleum gas
PI	Pollution Inventory
S	Scotland
SSF	Solid smokeless fuel
SPRU	Science Policy Research Unit
UKOOA	UK Offshore Operators Association
UKPIA	United Kingdom Petroleum Industry Association
WO	Welsh Office
WS	Welsh Statistics

1.9 AGRICULTURE

The UK inventory was disaggregated into England, Scotland, Wales and Northern Ireland. No methodological alterations were made in terms of emissions calculations, with defaults and emission factors carried over from the national inventory.

Regional crop areas were obtained from the MAFF June Agricultural Census for 1990, 1995, 1998 and 1999. (MAFF, 1991,1996,1999, 2000; DEFRA, 2001). Crop production data is taken from Agriculture in the UK and Basic Horticultural Statistics for the UK.

Fertiliser applications were derived using regional crop areas and average application rates published in the British Survey of Fertiliser Practice for 1990, 1995, 1998 and 1999, (BSFP, 1991, 1996, 1999, 2000, 2001). Application rates in Wales were assumed to be equivalent to those in England, and rates in Northern Ireland were assumed to be the same as Scottish applications. Where application rates were not available for particular crop types, the crop area was amalgamated with a similar crop with a known fertiliser application rate. Where annual applications were not available, fertiliser application for a different year was used.

Livestock numbers were obtained from the MAFF/DEFRA June Agricultural Census for 1990, 1995, 1998, 1999, 2000 with the exception of deer, which were derived from the distribution reported in *Economic Report on Scottish Agriculture*, (SO, 1996)

As in the national inventory, the area of cultivated histosols (soils of high organic content) was assumed to be equivalent to the area of Eutric Histosols. This was disaggregated according to a percentage split estimated by the Soil Survey and Land Research Centre (personal communication).

In general, the UK totals in the disaggregated inventory match well with those submitted in the national inventory. Any small differences are due to the derivation of disaggregated data that was not readily available. These small differences have been removed by in effect normalising the regional inventories so the sum of England, Scotland, Wales and Northern Ireland equals the UK Emission. The details of the normalisation procedure are explained in Section 1.1.2.

1.10 LAND USE CHANGE AND FORESTRY

1.10.1 Introduction

Appendix 6 of the UK National GHG Inventory for 1990 to 2000 describes the methods for estimating removals and emissions of carbon dioxide due to Land Use Change and Forestry (LUCF) (Salway *et al*. 2002).

The estimates for Land Use Change and Forestry are from work carried out by the Centre for Ecology & Hydrology described in the scientific literature (Milne and Brown 1997, Milne *et al*. 1998, Cannell *et al*. 1999) and in Contract Reports to DEFRA (see Milne *et al*. 2002). The data is reported under IPCC categories 5A (Changes in Forests and Other Woody Biomass), 5D (CO_2 Emissions from Soils) and 5E (Other). No data is included for Categories 5B (Forest and Grassland Conversion) or 5C (Abandonment of Managed Lands) as these are considered to be negligible, or not occurring, in the UK.

Here further detail is provided on: a) methods used for emissions from soils in Northern Ireland and b) disaggregation to the devolved regions of UK fluxes due to liming of agricultural land and in category 5E (Other).

1.10.2. Land use change in Northern Ireland

For this region the default method of the IPCC Guidelines (IPCC, 1997) continues to be used. Cruickshank and Tomlinson (2000) provide a general description of the method as applied to Northern Ireland.

Awareness of problems associated with this default method – (the statistics are really not good enough, and in some respects getting worse) has not abated (Milne, *et al*. 2002). A summary of the changes in land uses and the resulting changes in stored soil carbon are shown in Table A1.12. The estimate for 1999 has been revised upwards since the 1999 Inventory submission due to inclusion of data for Minor Holdings in 1979 that has only recently become available.

No uncertainty analyses have been carried out for the changes on soil carbon for Northern Ireland.

1.10.3 Emissions of CO2 from soil due to liming

Emissions of carbon dioxide from the application of limestone, chalk and dolomite to agricultural soils were estimated for the UK using the IPCC (1997a, b, c) default method. Data on the use of limestone, chalk and dolomite for agricultural purposes is reported in BGS (2002). It is assumed that all the carbon contained in the lime is released in the year of use. For limestone and chalk, a factor of 120 t C/kt is used, and for dolomite application, 130 t C/kt. These factors are based on the stoichiometry of the reaction and assume pure limestone and dolomite. The UK data was disaggregated to the four devolved regions on the assumption that application is in the proportions 73 : 12 : 8 : 6 to England, Scotland, Wales and Northern Ireland. These proportions are based on the areas of tilled and grass in each region and data from the British Survey of Fertilisers Practice for the fractions of each area that are limed in each region.

Table A1.12: Summary of changes in areas of land use and resulting changes in soil carbon in Northern Ireland using the IPCC "default" method.

kha	Arable	Grass	Semi-natural (not peat)	Semi-natural (peat/bog)	Urban	Carbon loss kt/yr
1970	96.9	740.3	249.9	149.0	40.4	
1971	94.4	745.2	248.0	148.4	40.6	
1972	84.2	759.5	233.5	147.8	47.7	
1973	77.6	754.5	227.8	147.1	65.2	
1974	74.8	761.1	239.1	146.5	49.6	
1975	73.4	758.5	226.5	145.9	65.7	
1976	79.2	773.9	226.1	145.3	44.6	
1977	82.9	772.5	214.8	144.7	53.3	
1978	79.9	776.1	210.1	144.1	57.4	
1979	76.8	777.1	219.0	143.5	50.4	
1980	77.5	791.2	212.9	142.9	43.1	
1990	61.5	797.9	212.6	136.9	67.7	-353
1991	62.8	806.1	210.9	135.5	61.2	-361
1992	64.0	800.3	202.6	134.9	70.9	-351
1993	63.0	817.2	199.9	134.9	57.2	-245
1994	57.6	814.8	197.2	134.9	66.6	-366
1995	56.4	819.1	191.0	134.9	68.7	-278
1996	56.5	821.0	188.9	134.9	67.8	-310
1997	58.1	826.7	184.2	134.9	64.4	-222
1998	57.4	832.3	177.7	134.9	65.3	-290
1999	54.8	835.2	177.3	134.9	64.7	-288
2000	52.5	831.0	175.0	134.9	74.1	-259

1.10.4. Other sources and sinks (Table 5E)

These are:

A sink

- Changes in crop biomass

and 3 sources

- Drainage of afforested deep peat
- Drainage of lowland wetlands
- Peat extraction.

The activity data and carbon fluxes for the devolved regions have been developed from estimates made for the UK.

1.10.4.1 Changes in Crop Biomass

The approach taken to estimating changes in stocks of biomass in crops at the UK level is described in Appendix 6 of Salway *et al*. (2002). The rates for the devolved

regions were estimated from the UK data in the proportions 85 : 12 : 1 : 1 for England, Scotland, Wales and Northern Ireland, based on the areas of cropland in each region.

1.10.4.2 Peat Extraction

Trends in peat extraction in Scotland and England over period 1990 to 2000 are included. In Northern Ireland no new data on use of peat for horticultural use was available and a recent survey of extraction for fuel use suggested that there is no significant trend for this purpose. The contribution of emissions due to peat extraction in Northern Ireland is therefore included as constant from 1990 to 2000. Peat extraction is negligible in Wales. Activity data are from BGS (2002) and Cruickshank and Tomlinson (1997) provide further information.

1.10.4.3 Lowland (fen) peat drainage

The trend in emissions due to changing areas of drainage is based on the work of Bradley (1997). All of the UK emission is assumed to be in England.

1.10.4.4 Upland (forestry) peat drainage

The UK total emission is allocated to each devolved region in proportion to an estimate of the area of afforested deep peat in each region (Cannell *et al*. 1993).

1.11 WASTE

1.11.1 Solid Waste Disposal on Land

In the UK Inventory, emissions are estimated based on a model of methane production in landfill sites. (Brown *et al*, 1999). The model classifies landfill sites into four different types depending on their age and the extent of methane recovery system installed. The generation of methane is assumed to follow a first order model with different decay rates for different types of waste. The model requires data on waste disposals and waste composition from 1945 onwards. The only available data are based on studies from 1995 onwards and previous year's data are extrapolated based on production indices.

The regional estimates were calculated using the Brown *et al* (1999) model. This involved estimating the input data for Wales, Scotland and Northern Ireland. The data estimated were:

- Annual arisings of MSW. Data for Scotland, Wales, Northern Ireland and England for 1995 are given in Brown *et al* (1999) and DETR (1997) and are consistent. Previous years' data were extrapolated using the model's estimates for UK arisings. The 3 components (household, civic amenity, co-collection) were allocated according to their proportions in 1995 or allocated as zero when they were known not to occur.
- The model uses data on the percentage composition of MSW and the proportion of each component landfilled. The UK data were taken as defaults for the regions but were scaled so that total MSW disposals matched the known 1995 data. For Scotland and Northern Ireland, this meant higher percentage disposals

than for England and Wales. The model assumes higher disposals in the past and these data were scaled using a single factor to produce a time series. For Northern Ireland, the average percentage of waste disposed of in 1995 was found to be 95%. Scaling this using the UK historic time series gave disposals in excess of 100%. Hence a fixed disposal rate of 95% was used for all years.

- Industrial and Commercial Waste. This includes some sewage sludge. Data for Scotland, Northern Ireland and England/Wales were taken from DETR (2000a) and entered directly back to 1991. The 1991 entry was used for all previous years. Welsh sewage disposals to landfill in 1996/97 were zero (Environment Agency, 2001) and this value was used for all years. The remaining waste categories were interpolated based on population and a time series produced by scaling on the UK time series.
- All other data on Degradable Organic Carbon contents distribution of landfill types etc was taken from the UK Model.

Emissions for England were estimated as the difference between the UK and the remaining regions. Landfill gas is recovered and used as a fuel for electricity generation. The methodology assumes that the degree of recovery was the same in all regions, so the methane emission driver could be used to distribute landfill gas consumption.

1.11.2 Waste Water Handling

The UK emission of methane from sewage treatment is based on a model reported by Hobson *et al* (1996). This breaks down the UK arisings of sewage into the amounts treated by up to 14 different disposal routes. Empirical emission factors are applied to each route to estimate methane emissions. Methane recovery is assumed for the anaerobic digestion route. The model requires estimates of the annual arisings of sewage and the proportion treated by the disposal routes. These data are taken from the UK Sewage Sludge Survey for 1990/91 (DOE, 1993). A more recent survey for 1995/96 has just been released (Environment Agency, 1999), however the Inventory estimates are based on the earlier work and so the regional disaggregation was also. The survey reports disposals of sewage for Scotland, Northern Ireland and England/Wales and gives data on disposal routes. However the data is incomplete and it was necessary to make assumptions to account for all disposals. Where assumptions had to be made, the UK defaults were adopted. Data for Wales were taken from the later survey since the earlier work did not specifically identify Wales. The Welsh estimates were based on data reported by Welsh Water whose area of activity does not exactly match the Welsh National Territory but should give a reasonable estimate. Using the regional data, estimates were made for 1990 and 1995 for Scotland, Northern Ireland and Wales. It was assumed that the percentage mix of disposal routes did not change between 1990 and 1998 but that regional sewage disposals increased in line with regional population and with the production of sewage per head assumed by Hobson *et al* (1996) for the UK.

The Hobson *et al* (1996) study includes estimates for 2000, that take account of projected changes in sewage disposal following the cessation of sea dumping in 1998. As far as possible the disposal routes assumed by Hobson *et al* were adopted

for 1999 and 2000. However, in some cases it was clear that some of these routes had not been adopted- for example sewage sludge incineration has not been adopted in Scotland in 1999. Hence, it was necessary to modify the Hobson *et al* assumptions given the available data, DEFRA (2000a).

The model also predicts the amount of sewage gas recovered for use or disposal. This data was used as the driver for sewage gas combustion.

1.11.3 Waste Incineration

The UK Inventory reports emissions from the incineration of sewage sludge and municipal solid waste. Regional estimates are based on DEFRA (2000a) which reports data for the amount sewage incinerated for Scotland, Northern Ireland and England/Wales. Wales is known to be zero (RCEP, 1993). Emissions from MSW Incinerators are based on capacity data for individual incinerators taken from RCEP (1993). It is assumed there were no significant changes between 1990 and 1995. Estimates for recent years are based on plant capacity data (Patel, 2000, EFW, 2001). Some of these incinerators generate electricity and are reported as power stations and some generate heat and are reported as commercial/miscellaneous. The total consumption of these incinerators is reported in DTI (2001, 1996, 1991). By 1998 all UK MSW incinerators generated electricity and are reported as power stations.

The 2000 Inventory includes emissions from clinical waste incineration. Emissions are allocated to the regions based on a set of plant capacity data for 1998.

1.12 UNCERTAINTIES

1.12.1 Introduction

The uncertainties in the UK Inventory were estimated using a Monte Carlo simulation. Eggleston *et al* (1998) and Salway *et al* (2001) describe this in detail. In general this involves estimating the uncertainties in the activity data and the emission factors for all the emission source categories and then using a Monte Carlo simulation package to calculate the uncertainty in the emission totals. In order to apply a similar approach to the regional inventories, it would necessary to estimate uncertainties for the regional activity data (i.e. fuel consumption, production data). The same emission factors are used in the regional inventories as in the UK Inventory, so their uncertainties are known. In the UK Inventory uncertainties in the activity data were estimated on the basis of the statistical differences between fuel supply and demand data reported in the energy statistics. However, such data is not available for the regional data used. Moreover, for some sources, no direct activity data is available at all, and it was necessary to distribute the UK data using surrogate data (e.g. employment statistics). In such cases, it is impossible to say whether the surrogate statistics are an accurate indicator of fuel consumption.

Given the difficulties inherent in estimating the uncertainties in the regional estimates it is evident that such estimates are likely to be tentative and should be treated as indicative rather than a precise estimate of uncertainties.

1.12.2 Regional Uncertainty Estimation

The uncertainties in the regional inventories were estimated by a Monte Carlo simulation. In order, to simplify the calculations the source categories were far broader than those used in the UK Inventory simulation. In the regional simulation, the combustion categories were effectively the total consumption of a particular fuel. This contrasts with the UK simulation where there was a further disaggregation into sectoral categories (e.g. power stations, refineries). The rationale for this was that it was far easier to form a view of the uncertainty in the total consumption of a fuel in a region than to attempt to estimate uncertainties in diverse sectors where in some cases surrogates were being used.

For each of the broad source categories an estimate of the activity uncertainty was made for Scotland, Wales, Northern Ireland and Unallocated. The approach adopted was to estimate a factor to scale the UK. For example, sales data is available for burning oil consumption in Scotland and Northern Ireland. Hence, it seems reasonable to assume that its uncertainty is similar to that of the UK burning oil data. Sales data is only available for England and Wales combined so that estimates for England and Wales were made by splitting the available data using population as a surrogate. Thus it was assumed that the uncertainty for Wales was twice that for Scotland and Northern Ireland which were the same as the UK.

It is important to note that the uncertainties in the inventories for the UK, England, Scotland, Wales, Northern Ireland, Unallocated are not independent. This is because:

Emissions from UK = Emissions from England, Scotland, Wales, Northern Ireland and Unallocated

Thus, in the simulation, the uncertainties for UK, Scotland, Wales, Northern Ireland and Unallocated were estimated and the total uncertainties for UK, Scotland, Wales, Northern Ireland, Unallocated and *England* were calculated. It was necessary to check that the calculated uncertainty for England appeared reasonable and could be reconciled to the uncertainties for the other regions.

In many of the non-combustion sources (e.g. LUCF, agriculture, coal mines) the overall uncertainty is dominated by the emission factor and the uncertainty in the activity data is not a determining factor. Moreover, it was unlikely there would be any variation in uncertainties between regions. The practice in these cases was to assume a low uncertainty for the activity data, say 1% for each region and to use the UK uncertainty for the emission factor.

In the case of halocarbon and SF_6 emissions it was not considered feasible to attempt to assume varying uncertainties across the regions. Hence it was assumed that the

uncertainty of each regional emission was the same as that of the UK. This is equivalent to assuming that the emissions are correlated or that the uncertainty in the regional activity data is very small. This is clearly not the case, but given that these emissions make a small contribution to the total GWP, this seemed a reasonable working approximation.

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Appendix 2
Regional Greenhouse Gas Inventories

CONTENTS

England 1990
England (Summary) 1995
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TABLE 1 SECTORAL REPORT FOR ENERGY (England, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		440399	1186	13
A Fuel Combustion Activities (Sectoral Approach)		438208	85	13
1 Energy Industries		181885	5.9	5.7
a Public Electricity and Heat Production		167750	5	5
b Petroleum Refining		11347	0.5	0.2
c Manufacture of Solid Fuels and Other Energy Industries		2788	0.5	0.07
2 Manufacturing Industries and Construction		70833	8.2	2.9
a Iron and Steel		12284	4.7	0.25
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		58548	3.5	2.7
3 Transport		94446	25	3.3
a Civil Aviation	b	0	0	0
b Road Transportation		92972	24.5	2.7
c Railways		1447	0.1	0.55
d Navigation	b	0.04	0.0	0.0
e Other(Aircraft Support)		28	0.0015	0.012

TABLE 1 SECTORAL REPORT FOR ENERGY (England, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		91044	47	1.3
a Commercial/Institutional		25034	2.7	0.24
b Residential		64121	43	0.53
c Agriculture/Forestry/Fishing		1889	0.9	0.50
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		2192	1101	0.013
1 Solid Fuels		1911	741	0.004
a Coal Mining		0	741	NO
b Solid Fuel Transformation		1911	0.4	0.004
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	281	360	0.01
a Oil		0	6.0	0.0
b Natural Gas		0	353	NO
c Flaring		281	1.1	0.01
c Venting		0.3	IE	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (England, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
Total Industrial Processes	11212	7.3	92	11374	1608	0.024
A Mineral Products	7668	1.1	0	0	0	0
1 Cement Production	5288	NO	NO	NO	NO	NO
2 Lime Production	1192	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	807	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	140	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other (Fletton Brick Production)	241	1.1	NO	NO	NO	NO
B Chemical Industry	1358	5.7	92	0	0	0
1 Ammonia Production	1358	NE	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	10.8	NO	NO	NO
3 Adipic Acid production	NO	NO	81.1	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	5.7	NO	NO	NO	NO
C Metal Production	2186	0.4	0.0	0	1453	0.02
1 Iron and Steel Production	2000	0.4	0.02	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	186	NO	NO	NO	1453	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	0.02
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (England, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O	HFC	PFC	SF6
		Gg			CO2 Equivalent Gg		Gg
D Other Production		0	0	0	0	0	0
1 Pulp and Paper		NO	NO	NO	NO	NO	NO
2 Food and Drink		IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride		0	0	0	11373	0	0
1 By-product Emissions	e	NO	NO	NO	11373	NO	NO
2 Fugitive Emissions	e	NO	NO	NO	IE	0	NO
3 Other		NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride		0	0	0	0	156	0.006
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	0	0	NO
2 Foam Blowing		NO	NO	NO	0	NO	NO
3 Fire Extinguishers		NO	NO	NO	0	0.0	NO
4 Aerosols	f	NO	NO	NO	0	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)		NO	NO	NO	NO	156	0.006
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (England, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	613	68
A Enteric Fermentation	527	0.0
1 Cattle	420	NO
2 Buffalo	NO	NO
3 Sheep	93.8	NO
4 Goats	0.4	NO
5 Camels and Llamas	NO	NO
6 Horses	2.8	NO
7 Mules and Asses	NO	NO
8 Swine	9.5	NO
9 Poultry	0	NO
10 Other (Deer)	0.3	NO
B Manure Management	75	3.0
1 Cattle	45.1	0
2 Buffalo	NO	0
3 Sheep	2.3	0
4 Goats	0.009	0
5 Camels and Llamas	NO	0
6 Horses	0.2	0
7 Mules and Asses	NO	0
8 Swine	18.9	0
9 Poultry	8.1	0
9a Deer	0.008	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (England, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.13
12 Solid Storage and Dry Lot		2.42
13 Other (poultry litter, stables etc)		0.43
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	65.1
E Prescribed Burning of Savannas	NO	NO
F Field Burning of Agricultural residues g	11.6	0.23
1 Cereals	11.6	0.23
2 Pulse	NO	NO
3 Tuber and Root	NO	NO
4 Sugar Cane	NO	NO
5 Other(Linseed)	0.07	0.0013
G Other	NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (England, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	4547	-3230	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-2295	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-1555	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Harvested Wood)		0	-741	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	*2522*	0	NO	NO
E Other	jk	2025	-935	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (England, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O
	Gg		
Total Waste	740	958	3.2
A Solid waste Disposal on Land	0	927	0
1 Managed Waste Disposal on Land	0	927	NO
2 Unmanaged Waste disposal on Land	NO	NO	NO
3 Other	NO	NO	NO
B Wastewater Handling	0	30.6	3.1
1 Industrial Wastewater I	0	NE	NO
2 Domestic and Commercial wastewater I	0	30.6	3.06
3 Other	NO	NO	NO
C Waste Incineration	740	0.031	0.13
D Other	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1990)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	456899	-3230	2765	177	11374	1608	0.0239
1 Energy		440399		1186	13.1			
A Fuel Combustion		438208		85	13			
1 Energy Industries		181885		5.9	5.7			
2 Manufacturing Industries and Construction		70833		8.2	2.9			
3 Transport		94446		25	3.3			
4 Other Sectors		91044		47	1.3			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		2192		1101	0.013			
1 Solid Fuels		1911		741	0.004			
2 Oil and Natural Gas		281		360	0.009			
2 Industrial Processes		11212		7.3	92	11374	1608	0.0239
A Mineral Products		7668		1.12	NO	NO	NO	NO
B Chemical Industry		1358		5.7	92	NO	NO	NO
C Metal Production		2186		0.4	0.02	NO	1453	0.018
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	11373	0	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	0	156	0.0059
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1990)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		613	68			
A Enteric Fermentation		0		527	NO			
B Manure Management		0		75	3.0			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	65			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		12	0.23			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	4547	-3230	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-2295	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	*2522*	0	NO	NO			
E Other	jk	2025	-935	NE	NO			
6 Waste		740		958	3.2			
A Solid Waste Disposal on Land		0.0		927	0.0			
B Wastewater Handling		0.0		31	3.1			
C Waste Incineration		740		0.03	0.13			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1995)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	417447	-3326	2238	143	15007	483	0.0398
1 Energy		405313		860	15.4			
A Fuel Combustion		403775		66	15			
1 Energy Industries		146608		11	5.2			
2 Manufacturing Industries and Construction		68098		8.4	2.8			
3 Transport		95858		19	6.3			
4 Other Sectors		93211		27	1.0			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		1538		795	0			
1 Solid Fuels		1349		461	0.0			
2 Oil and Natural Gas		190		334	0			
2 Industrial Processes		9973		5.6	60	15007	483	0.0398
A Mineral Products		6872		0.8	NO	NO	NO	NO
B Chemical Industry		1379		4.4	60	NO	NO	NO
C Metal Production		1722		0.4	0.02	NO	190	0.023
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	13960	0	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	1047	294	0.0168
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1995)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		584	64			
A Enteric Fermentation		0		511	NO			
B Manure Management		0		73	2.9			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	62			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1660	-3326	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-2391	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	*-276*	0	NO	NO			
E Other	jk	1936	-935	NE	NO			
6 Waste		501		788	3.2			
A Solid Waste Disposal on Land		0.0		757	0.0			
B Wastewater Handling		0.0		32	3.1			
C Waste Incineration		501		0.03	0.10			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1998)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	413601	-3296	1969	144	19597	298	0.0526
1 Energy		401804		719	18.2			
A Fuel Combustion		400257		68	18			
1 Energy Industries		134058		17	5.3			
2 Manufacturing Industries and Construction		66737		8.5	2.5			
3 Transport		101149		16	9.4			
4 Other Sectors		98314		27	1.0			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		1547		651	0.006			
1 Solid Fuels		1404		336	0.001			
2 Oil and Natural Gas		143		315	0.005			
2 Industrial Processes	n	9817		3.8	58	19597	298	0.0526
A Mineral Products		7703		0.7	NO	NO	NO	NO
B Chemical Industry		1111		2.7	58	NO	NO	NO
C Metal Production		1004		0.3	0.02	NO	108	0.023
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	16533	0	NO
F Consumption of Halocarbons and SF6	n	NO		NO	NO	3064	190	0.0296
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1998)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		571	65			
A Enteric Fermentation		0		497	NO			
B Manure Management		0		74	2.9			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	62			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1789	-3296	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-2361	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	*95*	0	NO	NO			
E Other	jk	1694	-935	NE	NO			
6 Waste		190		675	3.4			
A Solid Waste Disposal on Land		0.0		641	0.0			
B Wastewater Handling		0.0		34	3.2			
C Waste Incineration		190		0.07	0.15			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1999)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
	Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals a	407436	-3282	1868	102	7937	311	0.0537
1 Energy	395726		669	19.1			
A Fuel Combustion	393833		73	19			
1 Energy Industries	128068		22	5.4			
2 Manufacturing Industries and Construction	65402		8.2	2.4			
3 Transport	103284		15	10.3			
4 Other Sectors	97079		29	0.9			
5 Other b	0		0	0			
B Fugitive Emissions from Fuels	1893		595	0.007			
1 Solid Fuels	1624		284	0.0007			
2 Oil and Natural Gas	270		311	0.006			
2 Industrial Processes	10178		2.9	16	7937	311	0.0537
A Mineral Products	7276		0.6	NO	NO	NO	NO
B Chemical Industry	1113		1.9	16	NO	NO	NO
C Metal Production	1789		0.4	0.02	NO	106	0.023
D Other Production	NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6	NO		NO	NO	4321	0	NO
F Consumption of Halocarbons and SF6	NO		NO	NO	3616	204	0.0307
G Other	NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 1999)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		572	63			
A Enteric Fermentation		0		499	NO			
B Manure Management		0		73	3.0			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	60			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1342	-3282	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-2347	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	-375	0	NO	NO			
E Other	jk	1717	-935	NE	NO			
6 Waste		190		625	3.1			
A Solid Waste Disposal on Land		0.0		594	0.0			
B Wastewater Handling		0.0		31	3.0			
C Waste Incineration		190		0.07	0.15			
7 Other		NO		NO	NO			

TABLE 1 SECTORAL REPORT FOR ENERGY (England, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		399754	606	20
A Fuel Combustion Activities (Sectoral Approach)		397783	68	20
1 Energy Industries		133346	25	6
a Public Electricity and Heat Production		118065	23	5
b Petroleum Refining		11317	0.5	0.2
c Manufacture of Solid Fuels and Other Energy Industries		3964	0.8	0.17
2 Manufacturing Industries and Construction		63578	7.7	2.2
a Iron and Steel		10749	4.0	0.19
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		52829	3.7	2.0
3 Transport		102869	13	11
a Civil Aviation	b	0	0	0
b Road Transportation		101787	13.1	10.6
c Railways		1040	0.044	0.40
d Navigation	b	1.4	0.00008	0.00009
e Other(Aircraft Support)		41	0.002	0.02

TABLE 1 SECTORAL REPORT FOR ENERGY (England, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		97990	22	0.85
a Commercial/Institutional		25741	2.8	0.11
b Residential		70817	18.6	0.34
c Agriculture/Forestry/Fishing		1432	0.9	0.40
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		1971	538	0.012
1 Solid Fuels		1607	240	0.0010
a Coal Mining		0	240	NO
b Solid Fuel Transformation		1607	0.3	0.0010
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	363	297	0.011
a Oil		10	2.6	0
b Natural Gas		0	292	NO
c Flaring		353	0.8	0.011
c Venting		0	2.1	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (England, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
Total Industrial Processes	10280	2.4	18	8547	305	0.055
A Mineral Products	7004	0.6	0	0	0	0
1 Cement Production	4832	NO	NO	NO	NO	NO
2 Lime Production	1291	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	640	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	111	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other	129	0.6	NO	NO	NO	NO
B Chemical Industry	1389	1.5	18	0	0	0
1 Ammonia Production	1389	NE	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	13.1	NO	NO	NO
3 Adipic Acid production	NO	NO	5.3	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	1.5	NO	NO	NO	NO
C Metal Production	1887	0.3	0.02	0	103	0.02
1 Iron and Steel Production	1609	0.3	0.02	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	278	NO	NO	NO	103	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	0.02
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (England, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
D Other Production	0	0	0	0	0	0
1 Pulp and Paper	NO	NO	NO	NO	NO	NO
2 Food and Drink	IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride	0	0	0	4317	0	0
1 By-product Emissions e	NO	NO	NO	4317	NO	NO
2 Fugitive Emissions e	NO	NO	NO	IE	0.0	NO
3 Other	NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride	0	0	0	4230	202	0.032
1 Refrigeration and Air Conditioning Equipment	NO	NO	NO	2812	28	NO
2 Foam Blowing	NO	NO	NO	100	NO	NO
3 Fire Extinguishers	NO	NO	NO	14	3.7	NO
4 Aerosols f	NO	NO	NO	1303	NO	NO
5 Solvents	NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training s n	NO	NO	NO	NO	170	0.032
G Other	NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (England, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	549	60
A Enteric Fermentation	480	0.0
1 Cattle	379	NO
2 Buffalo	NO	NO
3 Sheep	88.2	NO
4 Goats	0.3	NO
5 Camels and Llamas	NO	NO
6 Horses	4.0	NO
7 Mules and Asses	NO	NO
8 Swine	8.2	NO
9 Poultry	0.0	NO
10 Other (Deer)	0.2	NO
B Manure Management	69	2.9
1 Cattle	40.4	0
2 Buffalo	NO	0
3 Sheep	2.1	0
4 Goats	0.01	0
5 Camels and Llamas	NO	0
6 Horses	0.3	0
7 Mules and Asses	NO	0
8 Swine	16.3	0
9 Poultry	9.8	0
9a Deer	0.006	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (England, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.12
12 Solid Storage and Dry Lot		2.39
13 Other (poultry litter, stables etc)		0.41
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	57.3
E Prescribed Burning of Savannas	NO	NO
F Field Burning of Agricultural residues g	0	0
1 Cereals	NO	NO
2 Pulse	NO	NO
3 Tuber and Root	NO	NO
4 Sugar Cane	NO	NO
5 Other(Linseed)	NO	NO
G Other	NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (England, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	343	-3282	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-2347	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-2028	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Harvested Wood)		0	-319	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	*-1344*	0	NO	NO
E Other	jk	1687	-935	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (England, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O
	Gg		
Total Waste	190	579	3.3
A Solid waste Disposal on Land	0	547	0
1 Managed Waste Disposal on Land	0	547	NO
2 Unmanaged Waste disposal on Land	NO	NO	NO
3 Other	NO	NO	NO
B Wastewater Handling	0	31.6	3.1
1 Industrial Wastewater I	0	NE	NO
2 Domestic and Commercial wastewater I	0	31.6	3.1
3 Other	NO	NO	NO
C Waste Incineration	190	0.1	0.15
D Other	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 2000)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	410568	-3282	1735	102	8547	305	0.0549
1 Energy		399754		606	19.8			
A Fuel Combustion		397783		68	20			
1 Energy Industries		133346		25	5.6			
2 Manufacturing Industries and Construction		63578		7.7	2.2			
3 Transport		102869		13	11.0			
4 Other Sectors		97990		22	0.8			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		1971		538	0.012			
1 Solid Fuels		1607		240	0.0010			
2 Oil and Natural Gas		363		297	0.011			
2 Industrial Processes		10280		2.4	18	8547	305	0.0549
A Mineral Products		7004		0.6	NO	NO	NO	NO
B Chemical Industry		1389		1.5	18	NO	NO	NO
C Metal Production		1887		0.3	0.02	NO	103	0.023
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	4317	0	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	4230	202	0.0319
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (England, 2000)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		549	60			
A Enteric Fermentation		0		480	NO			
B Manure Management		0		69	2.9			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	57			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	343	-3282	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-2347	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	*-1344*	0	NO	NO			
E Other	jk	1687	-935	NE	NO			
6 Waste		190		579	3.3			
A Solid Waste Disposal on Land		0.0		547	0.0			
B Wastewater Handling		0.0		32	3.1			
C Waste Incineration		190		0.07	0.15			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m]

a Net flux may be estimated as the sum of emissions and removals
b Emissions from military, off-shore industry, aviation and shipping are unallocated
c Fugitive emissions from oil and gas terminals and on-shore fields only
d Emissions given for information only and are not totalled
e Fugitive and byproduct emissions are combined.
f Includes metered dose inhalers
g Field burning ceased in 1994
h Sum of removals to forest biomass, forest litter and forest soil
i Sum of emissions from soils and removals to soils due to land use change (not forestry), Set Aside and liming of agricultural land
j Sum of emissions from soils due to upland drainage, lowland drainage and peat extraction
k 5E Removals are increases in crop biomass
l Emissions from own wastewater treatment by industry not estimated
m The following IPCC tables are omitted because they are not applicable: Tables 3, 7B sheet 3

TABLE 1 SECTORAL REPORT FOR ENERGY (Scotland, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		49420	85	1.8
A Fuel Combustion Activities (Sectoral Approach)		48232	18	1.8
1 Energy Industries		18793	0.52	0.56
a Public Electricity and Heat Production		14458	0.28	0.40
b Petroleum Refining		2787	0.11	0.06
c Manufacture of Solid Fuels and Other Energy Industries		1548	0.13	0.10
2 Manufacturing Industries and Construction		10405	1.6	0.5
a Iron and Steel		2981	1.2	0.06
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		7423	0.5	0.5
3 Transport		8560	2.7	0.4
a Civil Aviation	b	0	0	0
b Road Transportation		8226	2.7	0.3
c Railways		219	0.01	0.08
d Navigation	b	110	0.003	0.007
e Other(Aircraft Support)		4.9	0.0003	0.002

TABLE 1 SECTORAL REPORT FOR ENERGY (Scotland, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		10473	13	0.3
a Commercial/Institutional		3283	0.22	0.07
b Residential		6901	13	0.12
c Agriculture/Forestry/Fishing		289	0.06	0.08
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		1189	67	0.03
1 Solid Fuels		272	26	0.001
a Coal Mining		0	26	NO
b Solid Fuel Transformation		272	0.07	0.001
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	917	41	0.030
a Oil		0	8.5	0
b Natural Gas		0	29	NO
c Flaring		917	4.16	0.030
c Venting		0.2	IE	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Scotland, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
		Gg		CO2 Equivalent Gg		Gg
Total Industrial Processes	927	0.68	1.35	0	258	0.003
A Mineral Products	677	0	0	0	0	0
1 Cement Production	466	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	186	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	24	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other	0	NE	NO	NO	NO	NO
B Chemical Industry	0	0.58	1.3	0	0	0
1 Ammonia Production	NO	NO	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	1.3	NO	NO	NO
3 Adipic Acid production	NO	NO	NO	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	0.58	NE	NO	NO	NO
C Metal Production	250	0.10	0.0031	0	193	0
1 Iron and Steel Production	175	0.10	0.0031	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	75	NO	NO	NO	193	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	0
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Scotland, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O	HFC	PFC	SF6
		Gg			CO2 Equivalent Gg		Gg
D Other Production		0	0	0	0	0	0
1 Pulp and Paper		NO	NO	NO	NO	NO	NO
2 Food and Drink		IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride		0	0	0	0	0	0
1 By-product Emissions	e	NO	NO	NO	NO	NO	NO
2 Fugitive Emissions	e	NO	NO	NO	NO	NO	NO
3 Other		NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride		0	0	0	0	65	0.003
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	0	0.0	NO
2 Foam Blowing		NO	NO	NO	0.0	NO	NO
3 Fire Extinguishers		NO	NO	NO	0.0	0.00	NO
4 Aerosols	f	NO	NO	NO	0	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)		NO	NO	NO	NO	65	0.003
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Scotland, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	166	17
A Enteric Fermentation	152	0.0
1 Cattle	104	NO
2 Buffalo	NO	NO
3 Sheep	47	NO
4 Goats	0.11	NO
5 Camels and Llamas	NO	NO
6 Horses	0.3	NO
7 Mules and Asses	NO	NO
8 Swine	0.7	NO
9 Poultry	0	NO
10 Other (Deer)	0.079	NO
B Manure Management	14	0.8
1 Cattle	10	0
2 Buffalo	NO	0
3 Sheep	1.1	0
4 Goats	0.0026	0
5 Camels and Llamas	NO	0
6 Horses	0.02	0
7 Mules and Asses	NO	0
8 Swine	1.4	0
9 Poultry	1.2	0
9a Deer	0.002	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Scotland, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.02
12 Solid Storage and Dry Lot		0.71
13 Other (poultry litter, stables etc)		0.06
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	15.7
E Prescribed Burning of Savannas	NO	NO
F Field Burning of Agricultural residues g	0.9	0.02
1 Cereals	0.9	0.02
2 Pulse	NO	NO
3 Tuber and Root	NO	NO
4 Sugar Cane	NO	NO
5 Other(Linseed)	0.014	0.0003
G Other	NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (Scotland, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	11853	-5570	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-5434	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-4811	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Harvested Wood)		0	-623	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	10601	0	NO	NO
E Other	jk	1252	-136	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Scotland, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Waste		65	104	0.070
A Solid waste Disposal on Land		0	104	0
1 Managed Waste Disposal on Land		0	104	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	0.6	0.06
1 Industrial Wastewater	I	0	NE	NO
2 Domestic and Commercial wastewater	I	0	0.6	0.06
3 Other		NO	NO	NO
C Waste Incineration		65	0.0006	0.007
D Other		NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1990)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	62265	-5570	356.5	19.7	0	258	0.0030
1 Energy		49420		85	1.8			
A Fuel Combustion		48232		18	1.8			
1 Energy Industries		18793		0.5	0.6			
2 Manufacturing Industries and Construction		10405		1.6	0.5			
3 Transport		8560		3	0.4			
4 Other Sectors		10473		13	0.3			
5 Other	b	0		0.0	0.0			
B Fugitive Emissions from Fuels		1189		67	0.03			
1 Solid Fuels		272		26	0.0007			
2 Oil and Natural Gas		917		41	0.03			
2 Industrial Processes		927		0.7	1.3	0	258	0.0030
A Mineral Products		677		NO	NO	NO	NO	NO
B Chemical Industry		0		0.6	1.3	NO	NO	NO
C Metal Production		250		0.10	0.003	NO	193	0.0
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	0	65	0.0030
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1990)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		166	17			
A Enteric Fermentation		0		152	NO			
B Manure Management		0		14	0.8			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	15.7			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		0.9	0.02			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	11853	-5570	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-5434	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	10601	0	NO	NO			
E Other	jk	1252	-136	NE	NO			
6 Waste		65		104	0.07			
A Solid Waste Disposal on Land		0.0		104	0.0			
B Wastewater Handling		0.0		0.6	0.06			
C Waste Incineration		65		0.0006	0.007			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1995)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	62007	-6450	332	18	109	506	0.0042
1 Energy		49545		81	2			
A Fuel Combustion		48973		12	2			
1 Energy Industries		21930		1.1	0.6			
2 Manufacturing Industries and Construction		8295		0.7	0.5			
3 Transport		8779		2	0.8			
4 Other Sectors		9970		7	0.2			
5 Other	b	0		0.0	0.0			
B Fugitive Emissions from Fuels		572		70	0.02			
1 Solid Fuels		0		26	0.0			
2 Oil and Natural Gas		572		43	0.02			
2 Industrial Processes		509		0.8	0	109	506	0.0042
A Mineral Products		438		NO	NO	NO	NO	NO
B Chemical Industry		0		0.8	0	NO	NO	NO
C Metal Production		70		0.0002	0.0001	NO	102	0
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	109	405	0.0042
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1995)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		164	16			
A Enteric Fermentation		0		150	NO			
B Manure Management		0		14	0.8			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	15.0			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	11891	-6450	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-6314	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	10574	0	NO	NO			
E Other	jk	1317	-136	NE	NO			
6 Waste		63		86	0.07			
A Solid Waste Disposal on Land		0.0		85	0.0			
B Wastewater Handling		0.0		0.6	0.06			
C Waste Incineration		63		0.001	0.01			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1998)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	62843	-6556	311	18	312	241	0.0049
1 Energy		49898		70	2.4			
A Fuel Combustion		49493		11	2.4			
1 Energy Industries		22984		1.8	0.8			
2 Manufacturing Industries and Construction		7767		0.6	0.4			
3 Transport		8454		1.7	1.0			
4 Other Sectors		10288		6.9	0.2			
5 Other	b	0		0.0	0.0			
B Fugitive Emissions from Fuels		406		59	0.01			
1 Solid Fuels		0		28	0.0			
2 Oil and Natural Gas		406		31	0.01			
2 Industrial Processes		540		0.4891	0.0001	312	241	0.0049
A Mineral Products		460		NO	NO	NO	NO	NO
B Chemical Industry		0		0.5	0	NO	NO	NO
C Metal Production		80		0.0003	0.0001	NO	41	0.0
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	312	201	0.0049
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1998)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		167	15			
A Enteric Fermentation		0		153	NO			
B Manure Management		0		14	0.8			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	14.3			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	12392	-6556	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-6420	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	11190	0	NO	NO			
E Other	jk	1202	-136	NE	NO			
6 Waste		13		74	0.07			
A Solid Waste Disposal on Land		0.0		73	0.0			
B Wastewater Handling		0.0		0.7	0.07			
C Waste Incineration		13		0.0	0.0			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1999)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	61358	-6615	291.2	17	364	260	0.0048
1 Energy		48437		56	2.4			
A Fuel Combustion		47686		12	2.4			
1 Energy Industries		21634		2.4	0.7			
2 Manufacturing Industries and Construction		7407		0.6	0.4			
3 Transport		8348		1.6	1.1			
4 Other Sectors		10298		7.6	0.2			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		751		44	0.012			
1 Solid Fuels		0		17	NO			
2 Oil and Natural Gas		751		27	0.012			
2 Industrial Processes		502		0.7	0.00008	364	260	0.0048
A Mineral Products		428		NO	NO	NO	NO	NO
B Chemical Industry		0		0.7	0	NO	NO	NO
C Metal Production		74		0.0	0.00008	NO	37	0.0
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	364	222	0.0048
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 1999)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		165	14			
A Enteric Fermentation		0		151	NO			
B Manure Management		0		14	0.8			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	13.7			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	12406	-6615	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-6479	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	11146	0	NO	NO			
E Other	jk	1261	-136	NE	NO			
6 Waste		13		70	0.27			
A Solid Waste Disposal on Land		0.0		67	0.0			
B Wastewater Handling		0.0		2.8	0.27			
C Waste Incineration		13		0.0	0.0			
7 Other		NO		NO	NO			

TABLE 1 SECTORAL REPORT FOR ENERGY (Scotland, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		48058	54	2.5
A Fuel Combustion Activities (Sectoral Approach)		47156	10	2.5
1 Energy Industries		22960	2.8	0.8
a Public Electricity and Heat Production		18299	2.3	0.6
b Petroleum Refining		2580	0.11	0.05
c Manufacture of Solid Fuels and Other Energy Industries		2082	0.4	0.12
2 Manufacturing Industries and Construction		6837	0.6	0.3
a Iron and Steel		102	0.007	0.0002
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		6735	0.6	0.3
3 Transport		7386	1.3	1.2
a Civil Aviation	b	0	0	0
b Road Transportation		7074	1.3	1.1
c Railways		157	0.01	0.06
d Navigation	b	148	0.003	0.009
e Other(Aircraft Support)		6.3	0.0003	0.003

TABLE 1 SECTORAL REPORT FOR ENERGY (Scotland, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		9973	5.4	0.16
a Commercial/Institutional		2631	0.23	0.02
b Residential		7057	5.1	0.06
c Agriculture/Forestry/Fishing		286	0.06	0.08
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		902	43	0.011
1 Solid Fuels		0	14	NO
a Coal Mining		0	14	NO
b Solid Fuel Transformation		0.0	0.0	0.0
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	902	30	0.011
a Oil		535	1.15	0.0
b Natural Gas		0	26	NO
c Flaring		366	1.7	0.011
c Venting		0.0	0.51	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Scotland, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
Total Industrial Processes	418	1.0	0.00010	420	258	0.0047
A Mineral Products	346	0	0	0	0	0
1 Cement Production	318	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	10	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	18	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other	0	NE	NO	NO	NO	NO
B Chemical Industry	0	1.0	0	0	0	0
1 Ammonia Production	NO	NO	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	0	NO	NO	NO
3 Adipic Acid production	NO	NO	NO	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	1.0	NE	NO	NO	NO
C Metal Production	72	0.0002	0.00010	0	36	0.0
1 Iron and Steel Production	2.5	0.0002	0.00010	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	70	NO	NO	NO	36	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	0
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Scotland, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O	HFC	PFC	SF6
		Gg			CO2 Equivalent Gg		Gg
D Other Production		0	0	0	0	0	0
1 Pulp and Paper		NO	NO	NO	NO	NO	NO
2 Food and Drink		IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride		0	0	0	0	0	0
1 By-product Emissions	e	NO	NO	NO	NO	NO	NO
2 Fugitive Emissions	e	NO	NO	NO	NO	NO	NO
3 Other		NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride		0	0	0	420	222	0.005
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	286	2.9	NO
2 Foam Blowing		NO	NO	NO	10.2	NO	NO
3 Fire Extinguishers		NO	NO	NO	1.4	0.38	NO
4 Aerosols	f	NO	NO	NO	122	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	n	NO	NO	NO	NO	219	0.005
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Scotland, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	161	14
A Enteric Fermentation	148	0.0
1 Cattle	102	NO
2 Buffalo	NO	NO
3 Sheep	44	NO
4 Goats	0.04	NO
5 Camels and Llamas	NO	NO
6 Horses	0.4	NO
7 Mules and Asses	NO	NO
8 Swine	0.8	NO
9 Poultry	0	NO
10 Other (Deer)	0.061	NO
B Manure Management	14	0.70
1 Cattle	10	0
2 Buffalo	NO	0
3 Sheep	1.0	0
4 Goats	0.0009	0
5 Camels and Llamas	NO	0
6 Horses	0.03	0
7 Mules and Asses	NO	0
8 Swine	1.7	0
9 Poultry	1.1	0
9a Deer	0.002	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Scotland, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.02
12 Solid Storage and Dry Lot		0.63
13 Other (poultry litter, stables etc)		0.04
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	13.1
E Prescribed Burning of Savannas	NO	NO
F Field Burning of Agricultural residues g	0	0
1 Cereals	NO	NO
2 Pulse	NO	NO
3 Tuber and Root	NO	NO
4 Sugar Cane	NO	NO
5 Other(Linseed)	NO	NO
G Other	NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (Scotland, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	12186	-6747	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-6611	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-6094	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Harvested Wood)		0	-517	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	10938	0	NO	NO
E Other	jk	1248	-136	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Scotland, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Waste		13	65	0.29
A Solid waste Disposal on Land		0	62	0
1 Managed Waste Disposal on Land		0	62	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	2.9	0.29
1 Industrial Wastewater	I	0	NE	NO
2 Domestic and Commercial wastewater	I	0	2.9	0.29
3 Other		NO	NO	NO
C Waste Incineration		13	0.0	0.0
D Other		NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 2000)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	60674	-6747	280.8	17	420	258	0.0047
1 Energy		48058		54	2.5			
A Fuel Combustion		47156		10	2.5			
1 Energy Industries		22960		2.8	0.8			
2 Manufacturing Industries and Construction		6837		0.6	0.3			
3 Transport		7386		1.3	1.2			
4 Other Sectors		9973		5.4	0.2			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		902		43	0.011			
1 Solid Fuels		0		14	NO			
2 Oil and Natural Gas		902		30	0.011			
2 Industrial Processes		418		1.0	0.00010	420	258	0.0047
A Mineral Products		346		NO	NO	NO	NO	NO
B Chemical Industry		0		1.0	0	NO	NO	NO
C Metal Production		72		0.0002	0.00010	NO	36	0.0
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	420	222	0.0047
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Scotland, 2000)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		161	14			
A Enteric Fermentation		0		148	NO			
B Manure Management		0		14	0.7			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	13.1			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	12186	-6747	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-6611	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	10938	0	NO	NO			
E Other	jk	1248	-136	NE	NO			
6 Waste		13		65	0.29			
A Solid Waste Disposal on Land		0.0		62	0.0			
B Wastewater Handling		0.0		2.9	0.29			
C Waste Incineration		13		0.0	0.0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m]

a Net flux may be estimated as the sum of emissions and removals
b Emissions from military, off-shore industry, aviation and shipping are unallocated
c Fugitive emissions from oil and gas terminals and on-shore fields only
d Emissions given for information only and are not totalled
e Fugitive and byproduct emissions are combined.
f Includes metered dose inhalers
g Field burning ceased in 1994
h Sum of removals to forest biomass, forest litter and forest soil
i Sum of emissions from soils and removals to soils due to land use change (not forestry), Set Aside and liming of agricultural land
j Sum of emissions from soils due to upland drainage, lowland drainage and peat extraction
k 5E Removals are increases in crop biomass
l Emissions from own wastewater treatment by industry not estimated
m The following IPCC tables are omitted because they are not applicable: Tables 3, 7B sheet 3

TABLE 1 SECTORAL REPORT FOR ENERGY (Wales, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		38033	77	1.1
A Fuel Combustion Activities (Sectoral Approach)		37214	7.6	1.1
1 Energy Industries		15230	0.40	0.42
a Public Electricity and Heat Production		10955	0.2	0.33
b Petroleum Refining		3471	0.14	0.07
c Manufacture of Solid Fuels and Other Energy Industries		804	0.07	0.018
2 Manufacturing Industries and Construction		11047	3.1	0.31
a Iron and Steel		7564	2.81	0.14
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		3483	0.26	0.16
3 Transport		5062	1.6	0.25
a Civil Aviation	b	0	0	0
b Road Transportation		4859	1.57	0.17
c Railways		202	0.01	0.077
d Navigation	b	0	0	0
e Other(Aircraft Support)		0.41	0.00002	0.0002

TABLE 1 SECTORAL REPORT FOR ENERGY (Wales, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		5875	2.6	0.15
a Commercial/Institutional		1501	0.12	0.015
b Residential		4099	2.4	0.06
c Agriculture/Forestry/Fishing		275	0.02	0.07
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		818	69	0.002
1 Solid Fuels		818	52	0.002
a Coal Mining		0	52	NO
b Solid Fuel Transformation		818	0.22	0.002
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	0	17	0
a Oil		NO	NO	NO
b Natural Gas		0	17	NO
c Flaring		NO	NO	NO
c Venting		NO	NO	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Wales, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
		Gg		CO2 Equivalent Gg		Gg
Total Industrial Processes	1630	0.7	0.011	0.06	407	0.0031
A Mineral Products	905	0	0	0	0	0
1 Cement Production	526	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	376	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	3.0	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other	0	NE	NO	NO	NO	NO
B Chemical Industry	0	0.42	0	0	0	0
1 Ammonia Production	NO	NO	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	0	NO	NO	NO
3 Adipic Acid production	NO	NO	NO	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	0.42	NE	NO	NO	NO
C Metal Production	725	0.25	0.011	0	386	0.002
1 Iron and Steel Production	536	0.25	0.011	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	190	NO	NO	NO	386	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	0.002
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Wales, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O	HFC	PFC	SF6
		Gg			CO2 Equivalent Gg		Gg
D Other Production		0	0	0	0	0	0
1 Pulp and Paper		NO	NO	NO	NO	NO	NO
2 Food and Drink		IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride		0	0	0	0	0	0
1 By-product Emissions	e	NO	NO	NO	NO	NO	NO
2 Fugitive Emissions	e	NO	NO	NO	NO	NO	NO
3 Other		NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride		0	0	0	0.06	22	0.0011
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	0.06	0.0	NO
2 Foam Blowing		NO	NO	NO	0.0	NO	NO
3 Fire Extinguishers		NO	NO	NO	0.0	0.0	NO
4 Aerosols	f	NO	NO	NO	0.006	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)		NO	NO	NO	NO	22	0.0011
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	140	10
A Enteric Fermentation	130	0
1 Cattle	77.6	NO
2 Buffalo	NO	NO
3 Sheep	51.3	NO
4 Goats	0.06	NO
5 Camels and Llamas	NO	NO
6 Horses	0.48	NO
7 Mules and Asses	NO	NO
8 Swine	0.15	NO
9 Poultry	0	NO
10 Other (Deer)	0.017	NO
B Manure Management	10	0.5
1 Cattle	8.1	0
2 Buffalo	NO	0
3 Sheep	1.2	0
4 Goats	0.0015	0
5 Camels and Llamas	NO	0
6 Horses	0.04	0
7 Mules and Asses	NO	0
8 Swine	0.30	0
9 Poultry	0.57	0
9a Deer	0.0004	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CH4	N2O
		Gg	
B Manure Management (cont...)			
10 Anaerobic			NO
11 Liquid System			0.02
12 Solid Storage and Dry Lot			0.45
13 Other (poultry litter, stables etc)			0.03
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	9.8
E Prescribed Burning of Savannas		NO	NO
F Field Burning of Agricultural residues	g	0.09	0.002
1 Cereals		0.09	0.002
2 Pulse		NO	NO
3 Tuber and Root		NO	NO
4 Sugar Cane		NO	NO
5 Other(Linseed)		0.0021	0.00004
G Other		NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (Wales, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	1007	-1170	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-1155	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-997	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Harvested Wood)		0	-158	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	933	0	NO	NO
E Other	jk	73	-15	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Wales, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Waste		3.5	56	0.10
A Solid waste Disposal on Land		0	55	0
1 Managed Waste Disposal on Land		0	55	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	1.0	0.10
1 Industrial Wastewater	I	0	NE	NO
2 Domestic and Commercial wastewater	I	0	1.0	0.10
3 Other		NO	NO	NO
C Waste Incineration		3.5	0.0	0.0
D Other		NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1990)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs
		Gg				CO2 equivalent Gg	
Total National Emissions and Removals	a	40673	-1170	274	11.6	0.06	407
1 Energy		38033		77	1.1		
A Fuel Combustion		37214		8	1.1		
1 Energy Industries		15230		0.4	0.42		
2 Manufacturing Industries and Construction		11047		3.1	0.31		
3 Transport		5062		1.6	0.25		
4 Other Sectors		5875		2.6	0.15		
5 Other	b	0		0	0		
B Fugitive Emissions from Fuels		818		69	0.0018		
1 Solid Fuels		818		52	0.0018		
2 Oil and Natural Gas		0		17	0.0		
2 Industrial Processes		1630		0.7	0.011	0.06	407
A Mineral Products		905		NO	NO	NO	NO
B Chemical Industry		0		0.42	0	NO	NO
C Metal Production		725		0.3	0.011	NO	386
D Other Production		NO		NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	0.06	22
G Other		NO		NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1990)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs
		Gg				CO2 equivalent Gg	
3 Solvent and Other Product Use		0		NO	NO		
4 Agriculture		0		140	10		
A Enteric Fermentation		0		130	NO		
B Manure Management		0		10	0.5		
C Rice Cultivation		NO		NO	NO		
D Agricultural Soils		NO		NO	9.8		
E Prescribed Burning of Savannas		NO		NO	NO		
F Field Burning of Agricultural Residues		NO		0.1	0.002		
G Other		NO		NO	NO		
5 Land-Use Change and Forestry	a	1007	-1170	0	0		
A Changes in Forest and Other Woody Biomass Stocks	h	0	-1155	NE	NE		
B Forest and Grassland conversion		NO	NO	NO	NO		
C Abandonment of Managed Lands		NE	NE	NE	NE		
D CO2 Emissions and Removals from Soil	i	933	0	NO	NO		
E Other	jk	73	-15	NE	NO		
6 Waste		4		56	0.10		
A Solid Waste Disposal on Land		0.0		55	0		
B Wastewater Handling		0.0		1	0.10		
C Waste Incineration		4		0.0	0.00013		
7 Other		NO		NO	NO		

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1995)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	39249	-1111	228	11.603	60	104	0.0030
1 Energy		36557		40	1.3			
A Fuel Combustion		35921		8	1.3			
1 Energy Industries		11505		0.6	0.3			
2 Manufacturing Industries and Construction		13429		4.0	0.3			
3 Transport		5151		1.2	0.4			
4 Other Sectors		5836		1.8	0.1			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		637		32	0.0007			
1 Solid Fuels		637		17	0.0007			
2 Oil and Natural Gas		0		16	0.0			
2 Industrial Processes		1695		0.6	0.011	60	104	0.0030
A Mineral Products		947		NO	NO	NO	NO	NO
B Chemical Industry		0		0.32	0	NO	NO	NO
C Metal Production		748		0.3	0.011	NO	81	0.0020
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	60	22	0.0010
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1995)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		141	10			
A Enteric Fermentation		0		131	NO			
B Manure Management		0		10	0.5			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	9.7			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	993	-1111	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-1096	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	919	0	NO	NO			
E Other	jk	73	-15	NE	NO			
6 Waste		4		46	0.10			
A Solid Waste Disposal on Land		0.0		45	0			
B Wastewater Handling		0.0		1	0.10			
C Waste Incineration		4		0.0	0.0			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1998)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	41251	-1034	219	12.654	176	111	0.0038
1 Energy		38694		37	1.6			
A Fuel Combustion		38044		10	1.6			
1 Energy Industries		12792		1.4	0.6			
2 Manufacturing Industries and Construction		13794		4.5	0.3			
3 Transport		5409		1.0	0.6			
4 Other Sectors		6049		2.9	0.1			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		650		27	0			
1 Solid Fuels		650		12	0.0			
2 Oil and Natural Gas		0		15	0.0			
2 Industrial Processes		1598		0.5	0.011	176	111	0.0038
A Mineral Products		1073		NO	NO	NO	NO	NO
B Chemical Industry		0		0.19	0	NO	NO	NO
C Metal Production		525		0.3	0.011	NO	74	0.0020
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	176	37	0.0018
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1998)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		143	10.9			
A Enteric Fermentation		0		132	NO			
B Manure Management		0		10	0.5			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	10.4			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	955	-1034	0.0	0.00			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-1019	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	882	0	NO	NO			
E Other	jk	73	-15	NE	NO			
6 Waste		4		39	0.10			
A Solid Waste Disposal on Land		0		38	0			
B Wastewater Handling		0		1.1	0.10			
C Waste Incineration		4		0.000	0.00			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1999)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
	Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals a	41612	-1016	215	13.1	185	106	0.0039
1 Energy	38555		34	1.6			
A Fuel Combustion	37783		9	1.6			
1 Energy Industries	11718		1.5	0.5			
2 Manufacturing Industries and Construction	14785		4.5	0.3			
3 Transport	5482		0.9	0.7			
4 Other Sectors	5798		2.1	0.11			
5 Other b	0		0	0			
B Fugitive Emissions from Fuels	772		25	0.0005			
1 Solid Fuels	772		10	0.0005			
2 Oil and Natural Gas	0.3		15	0.0			
2 Industrial Processes	2102		0.4	0.012	185	106	0.0039
A Mineral Products	1012		NO	NO	NO	NO	NO
B Chemical Industry	0		0.05	0	NO	NO	NO
C Metal Production	1090		0.4	0.012	NO	66	0.0020
D Other Production	NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6	NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6	NO		NO	NO	185	40	0.0019
G Other	NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 1999)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		145	11			
A Enteric Fermentation		0		135	NO			
B Manure Management		0		11	0.5			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	10.9			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	952	-1016	0.0	0.00			
A Changes in Forest and Other Woody Biomass Stock	h	0	-1001	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	878	0	NO	NO			
E Other	jk	73	-15	NE	NO			
6 Waste		4		36	0.11			
A Solid Waste Disposal on Land		0.0		35	0			
B Wastewater Handling		0.0		1.1	0.11			
C Waste Incineration		4		0.0	0.0			
7 Other		NO		NO	NO			

TABLE 1 SECTORAL REPORT FOR ENERGY (Wales, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		41861	35	1.7
A Fuel Combustion Activities (Sectoral Approach)		41166	9	1.7
1 Energy Industries		15044	1.8	0.64
a Public Electricity and Heat Production		11446	1.7	0.56
b Petroleum Refining		2690	0.1	0.06
c Manufacture of Solid Fuels and Other Energy Industries		907	0.08	0.018
2 Manufacturing Industries and Construction		14546	4.3	0.28
a Iron and Steel		10407	4.0	0.16
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		4138	0.37	0.13
3 Transport		5496	0.8	0.71
a Civil Aviation	b	0	0	0
b Road Transportation		5350	0.80	0.65
c Railways		145	0.01	0.056
d Navigation	b	0	0	0
e Other(Aircraft Support)		0.48	0.00003	0.0002

TABLE 1 SECTORAL REPORT FOR ENERGY (Wales, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		6081	2.4	0.12
a Commercial/Institutional		1318	0.11	0.006
b Residential		4538	2.31	0.05
c Agriculture/Forestry/Fishing		225	0.02	0.06
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		695	26	0.0007
1 Solid Fuels		695	11	0.0007
a Coal Mining		0	10.5	NO
b Solid Fuel Transformation		695	0.21	0.0007
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	0.1	15	0.0
a Oil		0	0.05	0
b Natural Gas		0	15	NO
c Flaring		0.1	0.005	0.0
c Venting		0	0	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Wales, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
Total Industrial Processes	2198	0.40	0.011	217	104	0.0039
A Mineral Products	970	0	0	0	0	0
1 Cement Production	422	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	538	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	10	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other	0	NE	NO	NO	NO	NO
B Chemical Industry	0	0.06	0	0	0	0
1 Ammonia Production	NO	NO	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	0	NO	NO	NO
3 Adipic Acid production	NO	NO	NO	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	0.06	NE	NO	NO	NO
C Metal Production	1228	0.34	0.011	0	64	0.002
1 Iron and Steel Production	1106	0.34	0.011	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	122	NO	NO	NO	64	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	0.002
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Wales, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O	HFC	PFC	SF6
		Gg			CO2 Equivalent Gg		Gg
D Other Production		0	0	0	0	0	0
1 Pulp and Paper		NO	NO	NO	NO	NO	NO
2 Food and Drink		IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride		0	0	0	0	0	0
1 By-product Emissions	e	NO	NO	NO	NO	NO	NO
2 Fugitive Emissions	e	NO	NO	NO	NO	NO	NO
3 Other		NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride		0	0	0	217	40	0.002
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	164	1.6	NO
2 Foam Blowing		NO	NO	NO	5.9	NO	NO
3 Fire Extinguishers		NO	NO	NO	0.8	0.22	NO
4 Aerosols	f	NO	NO	NO	46	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	n	NO	NO	NO	NO	38	0.002
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	140	9
A Enteric Fermentation	130	0
1 Cattle	74.7	NO
2 Buffalo	NO	NO
3 Sheep	54.2	NO
4 Goats	0.03	NO
5 Camels and Llamas	NO	NO
6 Horses	0.65	NO
7 Mules and Asses	NO	NO
8 Swine	0.10	NO
9 Poultry	0	NO
10 Other (Deer)	0.009	NO
B Manure Management	10	0.43
1 Cattle	7.8	0
2 Buffalo	NO	0
3 Sheep	1.3	0
4 Goats	0.0008	0
5 Camels and Llamas	NO	0
6 Horses	0.05	0
7 Mules and Asses	NO	0
8 Swine	0.20	0
9 Poultry	0.80	0
9a Deer	0.0002	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CH4	N2O
		Gg	
B Manure Management (cont...)			
10 Anaerobic			NO
11 Liquid System			0.02
12 Solid Storage and Dry Lot			0.38
13 Other (poultry litter, stables etc)			0.03
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	9.0
E Prescribed Burning of Savannas		NO	NO
F Field Burning of Agricultural residues	g	0	0
1 Cereals		NO	NO
2 Pulse		NO	NO
3 Tuber and Root		NO	NO
4 Sugar Cane		NO	NO
5 Other(Linseed)		NO	NO
G Other		NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (Wales, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	923	-1001	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-986	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-748	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Harvested Wood)		0	-238	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	849	0	NO	NO
E Other	jk	73	-15	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Wales, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Waste		4	34	0.11
A Solid waste Disposal on Land		0	33	0
1 Managed Waste Disposal on Land		0	33	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	1.1	0.11
1 Industrial Wastewater	I	0	NE	NO
2 Domestic and Commercial wastewater	I	0	1.1	0.11
3 Other		NO	NO	NO
C Waste Incineration		4	0.0	0.0
D Other		NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 2000)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	44986	-1001	209	11.3	217	104	0.0039
1 Energy		41861		35	1.7			
A Fuel Combustion		41166		9	1.7			
1 Energy Industries		15044		1.8	0.6			
2 Manufacturing Industries and Construction		14546		4.3	0.3			
3 Transport		5496		0.8	0.7			
4 Other Sectors		6081		2.4	0.12			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		695		26	0.0007			
1 Solid Fuels		695		11	0.0007			
2 Oil and Natural Gas		0.1		15	0.0			
2 Industrial Processes		2198		0.4	0.011	217	104	0.0039
A Mineral Products		970		NO	NO	NO	NO	NO
B Chemical Industry		0		0.06	0	NO	NO	NO
C Metal Production		1228		0.3	0.011	NO	64	0.0020
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	217	40	0.0019
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Wales, 2000)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		140	9			
A Enteric Fermentation		0		130	NO			
B Manure Management		0		10	0.4			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	9.0			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		NO		NO	NO			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	923	-1001	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-986	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	849	0	NO	NO			
E Other	jk	73	-15	NE	NO			
6 Waste		4		34	0.11			
A Solid Waste Disposal on Land		0.0		33	0			
B Wastewater Handling		0.0		1.1	0.11			
C Waste Incineration		4		0.0	0.0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m]

a Net flux may be estimated as the sum of emissions and removals
b Emissions from military, off-shore industry, aviation and shipping are unallocated
c Fugitive emissions from oil and gas terminals and on-shore fields only
d Emissions given for information only and are not totalled
e Fugitive and byproduct emissions are combined.
f Includes metered dose inhalers
g Field burning ceased in 1994
h Sum of removals to forest biomass, forest litter and forest soil
i Sum of emissions from soils and removals to soils due to land use change (not forestry), Set Aside and liming of agricultural land
j Sum of emissions from soils due to upland drainage, lowland drainage and peat extraction
k 5E Removals are increases in crop biomass
l Emissions from own wastewater treatment by industry not estimated
m The following IPCC tables are omitted because they are not applicable: Tables 3, 7B sheet 3

TABLE 1 SECTORAL REPORT FOR ENERGY (Northern Ireland, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		14840	8.3	0.5
A Fuel Combustion Activities (Sectoral Approach)		14840	8.3	0.5
1 Energy Industries		5339	0.15	0.09
a Public Electricity and Heat Production		5339	0.15	0.09
b Petroleum Refining		NO	NO	NO
c Manufacture of Solid Fuels and Other Energy Industries		NO	NO	NO
2 Manufacturing Industries and Construction		1849	0.11	0.07
a Iron and Steel		NO	NO	NO
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		1849	0.11	0.07
3 Transport		3003	0.8	0.12
a Civil Aviation	b	0	0	0
b Road Transportation		2982	0.8	0.12
c Railways		20	0.0013	0.008
d Navigation	b	0	0	0
e Other(Aircraft Support)		0.91	0.00005	0.0004

TABLE 1 SECTORAL REPORT FOR ENERGY (Northern Ireland, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		4649	7.3	0.3
a Commercial/Institutional		453	0.06	0.006
b Residential		3957	7.2	0.18
c Agriculture/Forestry/Fishing		240	0.015	0.07
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		0	0	0
1 Solid Fuels		0	0	0
a Coal Mining		NO	NO	NO
b Solid Fuel Transformation		NO	NO	NO
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	0	0	0
a Oil		NO	NO	NO
b Natural Gas		NO	NO	NO
c Flaring		NO	NO	NO
c Venting		NO	NO	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Northern Ireland, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
Total Industrial Processes	380	0	1.2	0.058	7.4	0.0004
A Mineral Products	380	0	0	0	0	0
1 Cement Production	380	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	0	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	0	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other	0	NE	NO	NO	NO	NO
B Chemical Industry	0	0	1.2	0	0	0
1 Ammonia Production	NO	NO	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	1.2	NO	NO	NO
3 Adipic Acid production	NO	NO	NO	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	NE	NE	NO	NO	NO
C Metal Production	0	0	0	0	0	0
1 Iron and Steel Production	NO	NO	NO	NO	NO	NO
2 Ferroalloys Production	NO	NO	NO	NO	NO	NO
3 Aluminium Production	NO	NO	NO	NO	NO	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	NO
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Northern Ireland, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
D Other Production	0	0	0	0	0	0
1 Pulp and Paper	NO	NO	NO	NO	NO	NO
2 Food and Drink	IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride	0	0	0	0	0	0
1 By-product Emissions e	NO	NO	NO	NO	NO	NO
2 Fugitive Emissions e	NO	NO	NO	NO	NO	NO
3 Other	NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride	0	0	0	0.058	7.4	0.0004
1 Refrigeration and Air Conditioning Equipment	NO	NO	NO	0.054	0.0	NO
2 Foam Blowing	NO	NO	NO	0.0	NO	NO
3 Fire Extinguishers	NO	NO	NO	0.0	0.0	NO
4 Aerosols f	NO	NO	NO	0.003	NO	NO
5 Solvents	NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	NO	NO	NO	NO	7.4	0.0004
G Other	NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	140	10
A Enteric Fermentation	130	0
1 Cattle	77.6	NO
2 Buffalo	NO	NO
3 Sheep	51.3	NO
4 Goats	0.06	NO
5 Camels and Llamas	NO	NO
6 Horses	0.48	NO
7 Mules and Asses	NO	NO
8 Swine	0.15	NO
9 Poultry	0	NO
10 Other (Deer)	0.017	NO
B Manure Management	10	0.5
1 Cattle	8.1	0
2 Buffalo	NO	0
3 Sheep	1.2	0
4 Goats	0.0015	0
5 Camels and Llamas	NO	0
6 Horses	0.04	0
7 Mules and Asses	NO	0
8 Swine	0.30	0
9 Poultry	0.57	0
9a Deer	0.0004	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.02
12 Solid Storage and Dry Lot		0.45
13 Other (poultry litter, stables etc)		0.03
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	9.8
E Prescribed Burning of Savannas	NO	NO
F Field Burning of Agricultural residues g	0.09	0.002
1 Cereals	0.09	0.002
2 Pulse	NO	NO
3 Tuber and Root	NO	NO
4 Sugar Cane	NO	NO
5 Other(Linseed)	0.0021	0.00004
G Other	NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (Northern Ireland, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	1941	-587	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-572	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-521	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Harvested Wood)		0	-51	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	1383	0	NO	NO
E Other	jk	557	-15	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Northern Ireland, 1990)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Waste		2.7	32	0.112
A Solid waste Disposal on Land		0	31	0
1 Managed Waste Disposal on Land		0	30.8	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	1.1	0.11
1 Industrial Wastewater	I	0.0	NE	NO
2 Domestic and Commercial wastewater	I	0	1.1	0.11
3 Other		NO	NO	NO
C Waste Incineration		2.7	0.0	0.0
D Other		NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1990)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	17163	-587	153	9.7	0.06	7.4	0.0004
1 Energy		14840		8	0.54			
A Fuel Combustion		14840		8	0.54			
1 Energy Industries		5339		0.2	0.09			
2 Manufacturing Industries and Construction		1849		0.1	0.07			
3 Transport		3003		0.8	0.12			
4 Other Sectors		4649		7	0.25			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		0		0	0			
1 Solid Fuels		NO		NO	0.0			
2 Oil and Natural Gas		NO		NO	NO			
2 Industrial Processes		380		0	1.2	0.06	7.4	0.0004
A Mineral Products		380		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	1.2	NO	NO	NO
C Metal Production		NO		NO	NO	NO	NO	NO
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	0.06	7.4	0.0004
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1990)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		113	7.9			
A Enteric Fermentation		0		100	NO			
B Manure Management		0		12	0.6			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	7.3			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		0		0.06	0.0012			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1941	-587	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-572	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	1383	0	NO	NO			
E Other	jk	557	-15	NE	NO			
6 Waste		2.7		32	0.11			
A Solid Waste Disposal on Land		0.0		31	0			
B Wastewater Handling		0.0		1.1	0.11			
C Waste Incineration		2.7		0.0	0.00016			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1995)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	17706	-642	149	10.3	29.2	1.0	0.0004
1 Energy		15705		4.5	0.7			
A Fuel Combustion		15705		4.5	0.7			
1 Energy Industries		6669		0.3	0.2			
2 Manufacturing Industries and Construction		1831		0.09	0.1			
3 Transport		2747		0.6	0.2			
4 Other Sectors		4458		3.5	0.2			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		0		0	0			
1 Solid Fuels		NO		NO	NO			
2 Oil and Natural Gas		NO		NO	NO			
2 Industrial Processes		327		0	1.5	29.2	1.0	0.0004
A Mineral Products		327		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	1.5	NO	NO	NO
C Metal Production		NO		NO	NO	NO	NO	NO
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	29.2	1.0	0.0004

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1995)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		118	8.0			
A Enteric Fermentation		0		105	NO			
B Manure Management		0		13	0.7			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	7			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		0		0	0			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1672	-642	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-627	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	1114	0	NO	NO			
E Other	jk	557	-15	NE	NO			
6 Waste		2.7		26	0.113			
A Solid Waste Disposal on Land		0.0		25	0			
B Wastewater Handling		0.0		1.1	0.112			
C Waste Incineration		2.7		0.000004	0.0002			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1998)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	15717	-642	153	10.9	98	1.2	0.0008
1 Energy		13932		4.9	0.9			
A Fuel Combustion		13932		4.9	0.9			
1 Energy Industries		5900		0.7	0.3			
2 Manufacturing Industries and Construction		2136		0.10	0.09			
3 Transport		2177		0.5	0.4			
4 Other Sectors		3719		4	0.2			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		0		0	0			
1 Solid Fuels		NO		NO	NO			
2 Oil and Natural Gas		NO		NO	NO			
2 Industrial Processes		396		0	1.4	98	1.2	0.0008
A Mineral Products		396		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	1.4	NO	NO	NO
C Metal Production		NO		NO	NO	NO	NO	NO
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	98.1	1.2	0.0008
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1998)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		125	8.5			
A Enteric Fermentation		0		111	NO			
B Manure Management		0		13	0.7			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	7.9			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		0		0	0			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1387	-642	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-627	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	830	0	NO	NO			
E Other	jk	557	-15	NE	NO			
6 Waste		2		23	0.12			
A Solid Waste Disposal on Land		0.0		22	0			
B Wastewater Handling		0.0		1.2	0.12			
C Waste Incineration		2		0.0	0.0009			
7 Other		NO		NO	NO			

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1999)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
	Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals a	16008	-627	149	11.0	115	1.2	0.0008
1 Energy	13963		6.1	0.9			
A Fuel Combustion	13963		6.1	0.9			
1 Energy Industries	6023		0.7	0.3			
2 Manufacturing Industries and Construction	2104		0.1	0.08			
3 Transport	1690		0.4	0.4			
4 Other Sectors	4146		4.8	0.2			
5 Other b	0		0	0			
B Fugitive Emissions from Fuels	0		0	0			
1 Solid Fuels	NO		NO	NO			
2 Oil and Natural Gas	NO		NO	NO			
2 Industrial Processes	375		0	1.8	115	1.2	0.0008
A Mineral Products	375		NO	NO	NO	NO	NO
B Chemical Industry	0		NE	1.8	NO	NO	NO
C Metal Production	NO		NO	NO	NO	NO	NO
D Other Production	NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6	NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6	NO		NO	NO	115	1.2	0.0008
G Other	NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 1999)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		122	8.2			
A Enteric Fermentation		0		109	NO			
B Manure Management		0		13	0.6			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	8			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		0		0	0			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1667	-627	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-612	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	1110	0	NO	NO			
E Other	jk	557	-15	NE	NO			
6 Waste		2		21	0.14			
A Solid Waste Disposal on Land		0.0		20	0			
B Wastewater Handling		0.0		1.2	0.12			
C Waste Incineration		2		0.0	0.0			
7 Other		NO		NO	NO			

TABLE 1 SECTORAL REPORT FOR ENERGY (Northern Ireland, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
			Gg	
Total Energy		13260	4.5	1.0
A Fuel Combustion Activities (Sectoral Approach)		13260	4.5	1.0
1 Energy Industries		6324	0.83	0.28
a Public Electricity and Heat Production		6324	0.83	0.28
b Petroleum Refining		NO	NO	NO
c Manufacture of Solid Fuels and Other Energy Industries		NO	NO	NO
2 Manufacturing Industries and Construction		1550	0.08	0.10
a Iron and Steel		NO	NO	NO
b Non-Ferrous Metals		IE	IE	IE
c Chemicals		IE	IE	IE
d Pulp, Paper and Print		IE	IE	IE
e Food Processing, Beverages and Tobacco		IE	IE	IE
f Other		1550	0.08	0.10
3 Transport		1467	0.39	0.42
a Civil Aviation	b	0	0	0
b Road Transportation		1445	0.39	0.41
c Railways		21	0.0009	0.008
d Navigation	b	0	0	0
e Other(Aircraft Support)		1.0	0.0001	0.0005

TABLE 1 SECTORAL REPORT FOR ENERGY (Northern Ireland, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
			Gg	
4 Other Sectors		3919	3.2	0.2
a Commercial/Institutional		268	0.03	0.002
b Residential		3468	3.2	0.11
c Agriculture/Forestry/Fishing		184	0.013	0.06
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		0	0	0
1 Solid Fuels		0	0	NO
a Coal Mining		NO	NO	NO
b Solid Fuel Transformation		NO	NO	NO
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	0	0	0
a Oil		NO	NO	NO
b Natural Gas		NO	NO	NO
c Flaring		NO	NO	NO
c Venting		NO	NO	NO
Memo Items:				
International Bunkers		NA	NA	NA
Aviation		NA	NA	NA
Marine		NA	NA	NA
CO2 Emissions from Biomass		NE		

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Northern Ireland, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
Total Industrial Processes	214	0	1.5	133	1.2	0.0009
A Mineral Products	214	0	0	0	0	0
1 Cement Production	208	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	2	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	4	NO	NO	NO	NO	NO
5 Asphalt Roofing	NE	NO	NO	NO	NO	NO
6 Road Paving with Asphalt	NE	NO	NO	NO	NO	NO
7 Other	0	NE	NO	NO	NO	NO
B Chemical Industry	0	0	1.5	0	0	0
1 Ammonia Production	NO	NO	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	1.5	NO	NO	NO
3 Adipic Acid production	NO	NO	NO	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	NE	NE	NO	NO	NO
C Metal Production	0	0	0	0	0	0
1 Iron and Steel Production	NO	NO	NO	NO	NO	NO
2 Ferroalloys Production	NO	NO	NO	NO	NO	NO
3 Aluminium Production	NO	NO	NO	NO	NO	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	NO
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (Northern Ireland, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O	HFC	PFC	SF6
		Gg			CO2 Equivalent Gg		Gg
D Other Production		0	0	0	0	0	0
1 Pulp and Paper		NO	NO	NO	NO	NO	NO
2 Food and Drink		IE	NO	NO	NO	NO	NO
E Production of Halocarbons and Sulphur Hexafluoride		0	0	0	0	0	0
1 By-product Emissions	e	NO	NO	NO	NO	NO	NO
2 Fugitive Emissions	e	NO	NO	NO	NO	NO	NO
3 Other		NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride		0	0	0	133	1.2	0.0009
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	92	0.9	NO
2 Foam Blowing		NO	NO	NO	3.4	NO	NO
3 Fire Extinguishers		NO	NO	NO	0.5	0.1	NO
4 Aerosols	f	NO	NO	NO	37	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	n	NO	NO	NO	NO	0.2	0.0009
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Northern Ireland, 2000)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	119	7.6
A Enteric Fermentation	107	0
1 Cattle	93	NO
2 Buffalo	NO	NO
3 Sheep	13	NO
4 Goats	0.017	NO
5 Camels and Llamas	NO	NO
6 Horses	0.17	NO
7 Mules and Asses	NO	NO
8 Swine	0.6	NO
9 Poultry	0	NO
10 Other (Deer)	0.024	NO
B Manure Management	12	0.58
1 Cattle	9.5	0
2 Buffalo	NO	0
3 Sheep	0.31	0
4 Goats	0.0004	0
5 Camels and Llamas	NO	0
6 Horses	0.013	0
7 Mules and Asses	NO	0
8 Swine	1.2	0
9 Poultry	1.2	0
9a Deer	0.0006	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Northern Ireland, 2000)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CH4	N2O
		Gg	
B Manure Management (cont...)			
10 Anaerobic			NO
11 Liquid System			0.02
12 Solid Storage and Dry Lot			0.50
13 Other (poultry litter, stables etc)			0.05
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	7.02
E Prescribed Burning of Savannas		NO	NO
F Field Burning of Agricultural residues	g	0	0
1 Cereals		NO	NO
2 Pulse		NO	NO
3 Tuber and Root		NO	NO
4 Sugar Cane		NO	NO
5 Other(Linseed)		NO	NO
G Other		NO	NO

TABLE 5 SECTORAL REPORT FOR LAND-USE AND FORESTRY (Northern Ireland, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	1555	-623	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-609	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0	-532	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		0	-77	NO	NO
B Forest and Grassland Conversion		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NO	NO	NO	NO
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	NO	NO
C Abandonment of Managed Lands		0	0	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests		NE	NE	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other (Grassland & Woodland)		NO	NO	NO	NO
D CO2 Emissions and Removals from Soil	i	998	0	NO	NO
E Other	jk	557	-15	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Northern Ireland, 2000)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Waste		1.9	19	0.14
A Solid waste Disposal on Land		0	18	0
1 Managed Waste Disposal on Land		0	18.0	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	1.2	0.12
1 Industrial Wastewater	I	0.0	NE	NO
2 Domestic and Commercial wastewater	I	0	1.2	0.12
3 Other		NO	NO	NO
C Waste Incineration		1.9	0.010	0.02
D Other		NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 2000)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	15031	-623	143	10.2	133	1.2	0.0009
1 Energy		13260		4.5	1.0			
A Fuel Combustion		13260		4.5	1.0			
1 Energy Industries		6324		0.8	0.3			
2 Manufacturing Industries and Construction		1550		0.1	0.10			
3 Transport		1467		0.4	0.4			
4 Other Sectors		3919		3.2	0.2			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		0		0	0			
1 Solid Fuels		NO		NO	NO			
2 Oil and Natural Gas		NO		NO	NO			
2 Industrial Processes		214		0	1.5	133	1.2	0.0009
A Mineral Products		214		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	1.5	NO	NO	NO
C Metal Production		NO		NO	NO	NO	NO	NO
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	NO	NO	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	133	1.2	0.0009
G Other		NO		NO	NO	NO	NO	NO

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Northern Ireland, 2000)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O	HFCs	PFCs	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		119	7.6			
A Enteric Fermentation		0		107	NO			
B Manure Management		0		12	0.6			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	7			
E Prescribed Burning of Savannas		NO		NO	NO			
F Field Burning of Agricultural Residues		0		0	0			
G Other		NO		NO	NO			
5 Land-Use Change and Forestry	a	1555	-623	0	0			
A Changes in Forest and Other Woody Biomass Stocks	h	0	-609	NE	NE			
B Forest and Grassland conversion		NO	NO	NO	NO			
C Abandonment of Managed Lands		NE	NE	NE	NE			
D CO2 Emissions and Removals from Soil	i	998	0	NO	NO			
E Other	jk	557	-15	NE	NO			
6 Waste		2		19	0.14			
A Solid Waste Disposal on Land		0.0		18	0			
B Wastewater Handling		0.0		1.2	0.12			
C Waste Incineration		2		0.01	0.02			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m]

a Net flux may be estimated as the sum of emissions and removals
b Emissions from military, off-shore industry, aviation and shipping are unallocated
c Fugitive emissions from oil and gas terminals and on-shore fields only
d Emissions given for information only and are not totalled
e Fugitive and byproduct emissions are combined.
f Includes metered dose inhalers
g Field burning ceased in 1994
h Sum of removals to forest biomass, forest litter and forest soil
i Sum of emissions from soils and removals to soils due to land use change (not forestry), Set Aside and liming of agricultural land
j Sum of emissions from soils due to upland drainage, lowland drainage and peat extraction
k 5E Removals are increases in crop biomass
l Emissions from own wastewater treatment by industry not estimated
m The following IPCC tables are omitted because they are not applicable: Tables 3, 7B sheet 3

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)

Submission 2002

1990

GREENHOUSE GAS SOURCE AND SINK CATEGORIES			CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6		NOx	CO	NMVOC	SO2
							P	A	P	A	P	A				
			(Gg)		CO2 equivalent (Gg)								(Gg)			
Total National Emissions and Removals		c	**603052**	**-10556**	**3644.5**	**219**	**41.77**	**11373.84**	**250.10**	**2281.00**	**0.11**	**0.03**	**2767**	**7219**	**2500**	**3721**
1. Energy			**568745**		**1483.4**	**17.98**							**2742.7**	**6751.0**	**1554.7**	**3661.8**
A. Fuel Combustion	Reference Approach		572762													
	Sectoral Approach		556803		121.0	17.67							2736.9	6689.4	1088.8	3623.4
1. Energy Industries			228089		7.7	7.32							880.8	143.0	10.9	2884.1
2. Manufacturing Industries and Construction			94133		13.0	3.82							284.1	797.8	30.2	433.6
3. Transport			116381		30.2	4.34							1396.2	5262.2	944.7	90.1
4. Other Sectors			112538		69.9	1.98							140.3	473.1	100.8	206.4	
5. Other		b	5265		0.3	0.21							35.5	13.4	2.2	9.2
B. Fugitive Emissions from Fuels			12138		1362.5	0.31							5.8	61.6	465.9	38.4
1. Solid Fuels			3000		819.2	0.01							0.5	27.1	0.3	22.1
2. Oil and Natural Gas			9138		513.3	0.30							5.3	34.5	465.6	16.2
2. Industrial Processes			**14148**		**0.6**	**94.46**	**41.77**	**11373.84**	**250.10**	**2281.00**	**0.11**	**0.03**	**10.5**	**198.6**	**242.4**	**54.9**
A. Mineral Products			9629		1.1	0.00							0.0	5.2	13.0	14.1
B. Chemical Industry			1358		6.7	94.42	0.00	0.00	0.00	0.00	0.00	0.00	3.4	24.5	148.2	32.5
C. Metal Production			3161		0.8	0.04				2281.00		0.02	2.1	168.8	2.1	8.2
D. Other Production			IE										0.0	0.0	79.1	0.0
E. Production of Halocarbons and SF6								11373.17		0.00		0.00				
F. Consumption of Halocarbons and SF6		c					41.77	0.67	250.12	250.00	0.11	0.01				
G. Other			0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0
3. Solvent and Other Product Use		d	**0**			**0.00**									**665.7**	
4. Agriculture			0		**1032.1**	**103.05**							9.1	266.0	35.0	
A. Enteric Fermentation					908.5	0.00									0.0	
B. Manure Management					110.9	4.88									0.0	
C. Rice Cultivation					0.0	0.00									0.0	
D. Agricultural Soils					0.0	97.91									0.0	
E. Prescribed Burning of Savannas					0.0	0.00							0.0	0.0	0.0	
F. Field Burning of Agricultural Residues		a			12.7	0.25							9.1	266.0	35.0	
G. Other					0.0	0.00							0.0	0.0	0.0	
5. Land-Use Change and Forestry		a	**10348**	**-10556**												
A. Changes in Forest and Other Woody Biomass Stocks		f		-9456												
B. Forest and Grassland Conversion			0													
C. Abandonment of Managed Lands			0	0												
D. CO2 Emissions and Removals from Soil		g	15439	IE												
E. Other		ha	3908	-1100												
6. Waste			**812**		**1150.4**	**3.47**							**4.7**	**3.1**	**11.3**	**4.3**
A. Solid Waste Disposal on Land			0		1117.0	0.00							0.0	0.0	11.2	0.0
B. Wastewater Handling		i	0		33.4	3.33							0.0	0.0	0.0	0.0
C. Waste Incineration			812		0.0	0.13							4.7	3.1	0.1	4.3
D. Other			0		0.0	0.00							0.0	0.0	0.0	0.0
7. Other (please specify)			**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.0**	**0.0**	**0.0**	**0.0**
Memo Items: (7)																
International Bunkers		k	**21340**		**3.5**	**0.87**							**192.4**	**75.6**	**41.3**	**95.3**
Aviation		k	14791		**2.9**	**0.45**							**72.8**	**68.1**	**36.9**	**2.8**
Marine		k	6539		**0.6**	**0.42**							**119.6**	**15.5**	**4.4**	**92.5**
Multilateral Operations			**NO**		**NO**	**NO**							**NO**	**NO**	**NO**	**NO**
CO2 Emissions from Biomass		hl	**2979**													

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)

Submission 2002

1995

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6		NOx	CO	NMVOC	SO2
						P	A	P	A	P	A				
		(Gg)				CO2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**563590**	**-11528**	**3027.7**	**184**	**-4017.30**	**15205.03**	**753.81**	**1094.10**	**0.11**	**0.05**	**209.3**	**5531**	**2055**	**2363**
1. Energy		**534301**		**1067.7**	**20.90**							**2084.7**	**5328.5**	**1270.8**	**2312.4**
A. Fuel Combustion	Reference Approach	551806													
	Sectoral Approach	520091		92.4	20.67							2079.2	5281.8	819.9	2295.7
1. Energy Industries		197366		15.6	7.10							376.7	134.4	10.1	1736.3
2. Manufacturing Industries and Construction		91653		13.2	3.77							260.5	730.8	29.1	340.8
3. Transport		117928		23.8	8.09							1076.5	4023.5	705.0	80.1
4. Other Sectors		113874		39.6	1.54							137.9	383.3	74.0	130.9
5. Other	b	3871		0.2	0.16							27.6	9.8	1.6	7.6
B. Fugitive Emissions from Fuels		9110		975.3	0.23							5.6	46.6	450.1	16.7
1. Solid Fuels		1986		504.3	0.00							0.3	21.9	0.2	10.5
2. Oil and Natural Gas		7124		471.0	0.23							5.3	24.9	449.9	6.2
2. Industrial Processes		**12904**		**7.0**	**61.30**	**-4017.30**	**15205.03**	**753.81**	**1094.10**	**0.11**	**0.05**	**4.2**	**199.9**	**235.3**	**48.5**
A. Mineral Products		8385		0.8	0.00							0.0	3.6	11.7	12.2
B. Chemical Industry		1379		5.5	61.27	0.00	0.00	0.00	0.00	0.00	0.00	2.3	29.2	140.5	28.9
C. Metal Production		2540		0.7	0.03				372.35		0.05	1.9	167.1	2.0	7.4
D. Other Production		IE										0.0	0.0	81.2	0.0
E. Production of Halocarbons and SF6							13959.75		0.00		0.00				
F. Consumption of Halocarbons and SF6	c					4017.30	1245.28	753.81	721.75	0.11	0.00				
G. Other		0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0
3. Solvent and Other Product Use	d	**0**			**0.00**									**540.7**	
4. Agriculture		0		**1016.7**	**98.44**							0.0	0.0	0.0	
A. Enteric Fermentation				896.8	0.00									0.0	
B. Manure Management				109.9	4.82									0.0	
C. Rice Cultivation				0.0	0.00									0.0	
D. Agricultural Soils				0.0	93.62									0.0	
E. Prescribed Burning of Savannas				0.0	0.00							NO	NO	NO	
F. Field Burning of Agricultural Residues	e			0.0	0.00							0.0	0.0	0.0	
G. Other				0.0	0.00							0.0	0.0	0.0	
5. Land-Use Change and Forestry	a	**16215**	**-11528**												
A. Changes in Forest and Other Woody Biomass Stocks	f		-10428												
B. Forest and Grassland Conversion		0													
C. Abandonment of Managed Lands		0	0												
D. CO2 Emissions and Removals from Soil	g	12332	IE												
E. Other	h	3883	-1100												
6. Waste		**669**		**946.4**	**3.50**							**3.6**	**2.2**	**9.2**	**2.3**
A. Solid Waste Disposal on Land		0		912.0	0.00							0.0	0.0	9.1	0.0
B. Wastewater Handling	i	0		34.3	3.39							0.0	0.0	0.0	0.0
C. Waste Incineration		669		0.0	0.11							3.6	2.2	0.1	2.3
D. Other		0		0.0	0.00							0.0	0.0	0.0	0.0
7. Other (please specify)		**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.0**	**0.0**	**0.0**	**0.0**
Memo Items: (7)															
International Bunkers	k	**25611**		**0.8**	**1.01**							**216.6**	**89.0**	**49.4**	**95.9**
Aviation	k	19012		**3.4**	**0.58**							**94.3**	**73.4**	**44.9**	**4.8**
Marine	k	6599		**0.6**	**0.42**							**120.3**	**15.6**	**4.5**	**91.1**
Multilateral Operations		NO		NO	NO							NO	NO	NO	NO
CO2 Emissions from Biomass	h	**5223**													

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)

Submission 2002

1988

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6		NOx	CO	NMVOC	SO2
						P	A	P	A	P	A				
		(Gg)				CO2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**564639**	**-11528**	**2723.6**	**187**	**8607.30**	**20182.62**	**500.64**	**651.74**	**0.08**	**0.06**	**1737**	**4943**	**1785**	**1589**
1. Energy		**532556**		**902.4**	**24.72**							**1728.2**	**4751.3**	**1069.1**	**1539.9**
A. Fuel Combustion	Reference Approach	548245													
	Sectoral Approach	524224		96.6	24.52							1728.1	4709.6	644.6	1524.4
1. Energy Industries		189067		22.7	7.92							452.9	106.9	8.7	1177.5
2. Manufacturing Industries and Construction		90434		13.7	3.24							345.6	703.1	29.1	202.3
3. Transport		122363		19.3	11.66							868.9	3528.7	529.4	49.2
4. Other Sectors		118779		40.7	1.51							144.0	362.8	76.2	91.4
5. Other	b	3181		0.2	0.13							21.7	8.1	1.3	6.0
B. Fugitive Emissions from Fuels		8332		805.9	0.20							4.1	41.7	424.5	15.5
1. Solid Fuels		2054		375.6	0.00							0.3	21.6	0.2	8.6
2. Oil and Natural Gas		6277		430.3	0.20							3.8	20.1	424.3	6.9
2. Industrial Processes		**12352**		**4.7**	**59.45**	**8607.30**	**20182.62**	**500.64**	**651.74**	**0.08**	**0.06**	**4.0**	**187.9**	**205.1**	**48.5**
A. Mineral Products		9631		0.7	0.00							0.0	3.3	9.7	13.1
B. Chemical Industry		1131		3.4	59.42	0.00	0.00	0.00	0.00	0.00	0.00	2.2	17.7	113.3	36.5
C. Metal Production		1610		0.6	0.03				223.41		0.03	1.8	166.9	2.0	8.9
D. Other Production		IE										0.0	0.0	80.0	0.0
E. Production of Halocarbons and SF6							16332.71		0.00		0.00				
F. Consumption of Halocarbons and SF6	c					8607.30	3649.91	500.64	428.33	0.08	0.04				
G. Other		0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0
3. Solvent and Other Product Use	d	**0**			**0.00**									**503.2**	
4. Agriculture		0		**1015.2**	**99.17**							0.0	0.0	0.0	
A. Enteric Fermentation				893.7	0.00									0.0	
B. Manure Management				111.5	4.88									0.0	
C. Rice Cultivation				0.0	0.00									0.0	
D. Agricultural Soils				0.0	94.30									0.0	
E. Prescribed Burning of Savannas				0.0	0.00							NO	NO	NO	
F. Field Burning of Agricultural Residues	e			0.0	0.00							0.0	0.0	0.0	
G. Other				0.0	0.00							0.0	0.0	0.0	
5. Land-Use Change and Forestry	a	**16523**	**-11528**												
A. Changes in Forest and Other Woody Biomass Stocks	f		-10428												
B. Forest and Grassland Conversion		0													
C. Abandonment of Managed Lands		0	0												
D. CO2 Emissions and Removals from Soil	g	12997	IE												
E. Other	h	3527	-1100												
6. Waste		**208**		**914.2**	**3.86**							**1.0**	**3.3**	**7.9**	**0.7**
A. Solid Waste Disposal on Land		0		774.0	0.00							0.0	0.0	7.7	0.0
B. Wastewater Handling	i	0		37.2	3.50							0.0	0.0	0.0	0.0
C. Waste Incineration		208		0.1	0.16							1.0	3.3	0.2	0.7
D. Other		0		0.0	0.00							0.0	0.0	0.0	0.0
7. Other (please specify)		**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.0**	**0.0**	**0.0**	**0.0**
Memo Items: (7)															
International Bunkers	k	**32910**		**0.8**	**1.30**							**200.4**	**110.9**	**60.9**	**124.5**
Aviation	k	24122		**0.8**	**0.74**							**120.2**	**90.1**	**55.0**	**7.7**
Marine	k	8788		**0.0**	**0.56**							**160.2**	**20.8**	**5.9**	**116.8**
Multilateral Operations		NO		NO	NO							NO	NO	NO	NO
CO2 Emissions from Biomass	h	**5822**													

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)

Submission 2002

1999

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6		NOx	CO	NMVOC	SO2
						P	A	P	A	P	A				
		(Gg)				CO2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals		**552857**	**-11539**	**2580.6**	**145**	**9653.09**	**8080.54**	**541.23**	**678.19**	**0.08**	**0.06**	**1609**	**4727**	**1601**	**1210**
1. Energy		**523128**		**829.2**	**25.63**							**1083.8**	**4824.6**	**962.8**	**1169.7**
A. Fuel Combustion	Reference Approach	541765													
	Sectoral Approach	514839		103.7	25.43							1600.0	4495.3	597.9	1157.6
1. Energy Industries		180843		32.9	7.94							422.3	94.7	10.4	878.2
2. Manufacturing Industries and Construction		89698		13.4	3.20							230.4	717.3	29.0	156.1
3. Transport		123488		17.8	12.72							796.8	2309.5	479.2	35.2
4. Other Sectors		117674		43.5	1.44							137.5	365.8	78.1	81.8
5. Other	h	3136		0.2	0.13							22.9	7.9	1.3	6.3
B. Fugitive Emissions from Fuels		8286		721.5	0.20							3.8	29.4	364.9	12.1
1. Solid Fuels		2396		310.9	0.00							0.2	15.4	0.2	7.4
2. Oil and Natural Gas		5891		410.7	0.20							3.6	14.0	364.7	4.7
2. Industrial Processes		**13157**		**4.0**	**18.16**	**9653.09**	**8080.54**	**541.23**	**678.19**	**0.08**	**0.06**	**4.3**	**190.5**	**160.8**	**39.7**
A. Mineral Products		9091		0.6	0.00							0.0	1.5	8.3	9.0
B. Chemical Industry		1113		2.7	18.13	0.00	0.00	0.00	0.00	0.00	0.00	2.4	9.7	38.4	20.1
C. Metal Production		2953		0.7	0.03				209.37		0.03	1.9	187.2	1.9	7.6
D. Other Production		IE										0.0	0.0	80.1	0.0
E. Production of Halocarbons and SF6							4321.50		0.00		0.00				
F. Consumption of Halocarbons and SF6	c					9653.09	4379.04	541.23	468.32	0.08	0.04				
G. Other		0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0
3. Solvent and Other Product Use	d	**0**			**0.00**									**462.3**	
4. Agriculture		0		**1003.2**	**97.34**							0.0	0.0	0.0	
A. Enteric Fermentation				893.6	0.00									0.0	
B. Manure Management				109.7	4.94									0.0	
C. Rice Cultivation				0.0	0.00									0.0	
D. Agricultural Soils				0.0	92.40									0.0	
E. Prescribed Burning of Savannas				0.0	0.00							NO	NO	NO	
F. Field Burning of Agricultural Residues	e			0.0	0.00							0.0	0.0	0.0	
G. Other				0.0	0.00							0.0	0.0	0.0	
5. Land-Use Change and Forestry	a	**16367**	**-11539**												
A. Changes in Forest and Other Woody Biomass Stocks	f		-10439												
B. Forest and Grassland Conversion		0													
C. Abandonment of Managed Lands		0	0												
D. CO2 Emissions and Removals from Soil	g	12758	IE												
E. Other	hi	3608	-1100												
6. Waste		**208**		**752.1**	**3.62**							**1.1**	**3.7**	**7.3**	**0.0**
A. Solid Waste Disposal on Land		0		716.0	0.00							0.0	0.0	7.2	0.0
B. Wastewater Handling	j	0		36.0	3.45							0.0	0.0	0.0	0.0
C. Waste Incineration		208		0.1	0.17							1.1	3.7	0.2	0.8
D. Other		0		0.0	0.00							0.0	0.0	0.0	0.0
7. Other (please specify)		**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.0**	**0.0**	**0.0**	**0.0**
Memo Items: (7)															
International Bunkers	k	**32781**		**4.9**	**1.22**							**247.9**	**111.9**	**63.2**	**88.9**
Aviation	k	26424		4.3	0.81							132.1	96.8	58.9	5.9
Marine	k	6357		0.6	0.41							115.9	15.0	4.3	83.1
Multilateral Operations		NO		NO	NO							NO	NO	NO	NO
CO2 Emissions from Biomass	hl	**6489**													

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)

Submission 2002

2000

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6		NOx	CO	NMVOC	SO2
						P	A	P	A	P	A				
		(Gg)				CO2 equivalent (Gg)						(Gg)			
Total National Emissions and Removals	c	**557780**	**-11683**	**2426.7**	**142**	**10732.36**	**9316.30**	**534.78**	**668.23**	**0.00**	**0.06**	**1520**	**4170**	**1499**	**1106**
1. Energy		**529424**		**757.1**	**26.89**							**1814.4**	**1974.6**	**804.1**	**1130.0**
A. Fuel Combustion	Reference Approach	554084													
	Sectoral Approach	521612		98.3	26.44							1511.3	3946.0	522.1	1120.0
1. Energy Industries		190833		36.1	8.46							438.3	93.5	9.7	906.4
2. Manufacturing Industries and Construction		86510		12.7	2.97							216.3	607.0	38.6	117.2
3. Transport		123046		16.0	13.56							699.2	2901.9	413.3	25.8
4. Other Sectors		118322		33.3	1.32							135.4	336.3	69.2	64.6
5. Other	b	2902		0.2	0.12							22.0	7.3	1.2	6.1
B. Fugitive Emissions from Fuels		7812		658.7	0.15							3.1	28.5	362.0	10.0
1. Solid Fuels		2303		265.0	0.00							0.3	13.6	0.2	7.0
2. Oil and Natural Gas		5509		393.7	0.15							2.9	13.0	361.8	3.0
2. Industrial Processes		**13111**		**3.8**	**19.97**	**10732.36**	**9316.30**	**534.78**	**668.23**	**0.00**	**0.06**	**4.0**	**199.5**	**163.5**	**35.1**
A. Mineral Products		3534		0.6	0.00							0.0	2.7	9.6	10.6
B. Chemical Industry		1389		2.5	19.94	0.00	0.00	0.00	0.00	0.00	0.00	2.2	9.7	73.5	17.1
C. Metal Production		3187		0.7	0.00				200.10		0.03	1.8	187.0	1.8	7.4
D. Other Production		IE										0.0	0.0	78.7	0.0
E. Production of Halocarbons and SF6							4316.77		0.00		0.00				
F. Consumption of Halocarbons and SF6	c					10732.36	4999.53	534.78	465.13	0.00	0.04				
G. Other		0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0
3. Solvent and Other Product Use	d	**0**			**0.00**									**644.5**	
4. Agriculture		0		**968.9**	**91.17**							0.0	0.0	0.0	
A. Enteric Fermentation				863.7	0.00									0.0	
B. Manure Management				105.2	4.63									0.0	
C. Rice Cultivation				0.0	0.00									0.0	
D. Agricultural Soils				0.0	86.55									0.0	
E. Prescribed Burning of Savannas				0.0	0.00							NO	NO	NO	
F. Field Burning of Agricultural Residues	e			0.0	0.00							0.0	0.0	0.0	
G. Other				0.0	0.00							0.0	0.0	0.0	
5. Land-Use Change and Forestry	a	**16007**	**-11683**												
A. Changes in Forest and Other Woody Biomass Stocks	f		-10553												
B. Forest and Grassland Conversion		0													
C. Abandonment of Managed Lands		0	0												
D. CO2 Emissions and Removals from Soil	g	11441	IE												
E. Other	hi	3566	-1130												
6. Waste		**208**		**697.0**	**3.81**							**1.1**	**3.7**	**6.8**	**0.0**
A. Solid Waste Disposal on Land		0		660.0	0.00							0.0	0.0	6.6	0.0
B. Wastewater Handling	j	0		36.9	3.64							0.0	0.0	0.0	0.0
C. Waste Incineration		208		0.1	0.17							1.1	3.7	0.2	0.2
D. Other		0		0.0	0.00							0.0	0.0	0.0	0.0
7. Other (please specify)		**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.0**	**0.0**	**0.0**	**0.0**
Memo Items: (7)															
International Bunkers	k	**34137**		**5.0**	**1.24**							**244.8**	**116.7**	**66.7**	**75.9**
Aviation	k	28544		**4.5**	**0.80**							**142.9**	**103.4**	**62.9**	**6.5**
Marine	k	5594		**0.5**	**0.36**							**101.9**	**13.2**	**3.8**	**69.4**
Multilateral Operations		**NO**		**NO**	**NO**							**NO**	**NO**	**NO**	**NO**
CO2 Emissions from Biomass	hi	**6040**													