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Greenhouse Gas Inventories, for England, Scotland, Wales and Northern Ireland: 1990, 1995, 1998 and 1999

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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 1999 (Salway *et al*, 2001). This report presents separate inventories of greenhouse gas emissions for England, Scotland, Wales and Northern Ireland for the years 1990, 1995, 1998 and 1999 that are consistent with the 1999 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 region of the UK. These 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.

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. In practice, such a set of statistics was not available for all sources and for all regions and it was necessary to disaggregate the UK emission into the four regions 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 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 fuel 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 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.

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-A1.8. 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
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
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, WS	Coke Consumed in blast Furnaces, ISSB, WS
	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 A1.9 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. 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 (2000), Scottish and Southern Energy (2000), Bell (2000), National Power (2000), PowerGen (2000), Eastern Generation (2000)) and data reported in the Pollution Inventory (Environment Agency, 2000).

Emissions from 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 two plant were commissioned in Scotland and so emissions were based on their capacities scaled on the period of operation.

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 and 1999 (UKPIA, 1998, 2000). They advised us that refinery throughput would not have varied since 1990. 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).

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 (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). The Welsh statistics are only available to

1993, so this data was used as an estimate of the Welsh non-iron and steel coal consumption in 1995. For 1998 and 1999, the non-iron and steel 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). 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 (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) 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 1999 Inventory there was a significant revision in the UK methodology. Now, the consumption of LPG and OPG by gas separation plant is allocated to oil terminals rather than refineries as in previous inventories. This has resulted in the removal of a 'double count' in emissions. The new 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. In the regional inventory, only the emissions from oil and gas terminals were reported based on data provided by SCOPEC (2000) and UKOOA (1999). The new 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 UKOOA data on gas consumption in terminals. Data is only available for 1995, 1998 and 1999 and so emissions for 1990 were extrapolated based on the arrivals of crude oil and natural gas in Scotland and England, (DTI, 1991, 1996).

A similar approach was adopted for gas production with the driver being based on the arrivals of natural gas in England and Scotland (DTI, 1991, 1996, 2000).

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) 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, which are accurately estimated.

1.3.2 Other Industry

DTI (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 has been revised in the 1999 Inventory. DTI (2000) 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 SPRU driver for industry is used to estimate industrial consumption in 1995. 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 the new method is that it should reflect the time trend in fuel oil consumption more reliably than the previous method.

The driver for gas oil was calculated differently. Here, consumption 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. Drivers were calculated for England, Scotland, Wales and Northern Ireland.

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 male employment in the construction industry (ONS, 1996, 2000).

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, 2000) less consumption by all other sources.

DTI (2000) estimate that 40% of lubricants sold are eventually used as a fuel. Hence, the driver was based on regional lubricant sales (DTI, 1991, 1996, 2000) with England and Wales being disaggregated based on regional manufacturing employment statistics (ONS, 2000).

Transco (2000) 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, the first year for which non-ESI supplies become significant. The approach adopted was to match the regional Transco/Phoenix totals with the NAEI totals and to apply the appropriate drivers for domestic and commercial consumption in GB. The consumption by other industry and autogenerators was then estimated by deducting all the other known sources from the totals. The same driver was used for autogenerators as for other industry. There were problems in combining the Phoenix and Transco data since the category definition for commercial and industry differed. Hence for Northern Ireland, it was necessary to combine the commercial and industrial categories to achieve a degree of consistency with the Transco data

Regional coal data is fairly sparse: sectoral data is available for Northern Ireland, NIO, (2000) up to the present and Wales (WO, 1998) to 1993. Published data for Scotland and England are entirely absent. Industrial coal consumption for 1995, 1998 and 1999 was estimated from sales data, gathered from major coal producers. A mass balance was performed on production, imports, stock-changes and imports.

Coal was allocated to sources where consumption was known or estimated using other drivers (power generation, iron & steel, cement kilns) and imports allocated to the most likely consumers (power generation, coking, domestic anthracite). English and Welsh sales data were fairly complete but Scottish data were incomplete and it was necessary to extrapolate Scottish industrial coal consumption using the SPRU data for other industry. Stock changes are significant and were disaggregated on regional production (Coal Authority, 2000). The estimates obtained are likely to be fairly approximate. Estimates for 1990 are based on WO (1998) and NIO (1996). Corrections were applied for the consumption by other industrial sectors (iron and steel, cement etc). The remaining consumption was allocated to England and Scotland on the basis of the 1995 England/Scotland split. The data collected for 1998 was not sufficiently complete to allow a balance to be made. Hence the 1995 driver was used for 1998 with a correction for Northern Ireland

Drivers for fuel consumption in cement kilns were based on regional capacity data for 1995 and 1998 supplied by British Cement Association (1999). These were applied to all fuels though a correction was applied to Northern Ireland to account for the absence of natural gas. Lime production occurs only in England and was assumed to be coal fired. 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
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	Regional oil consumption, DTI, WO Remainder after other uses	Regional oil consumption, DTI, WO Remainder after other uses
		Gas oil	SPRU database: Other Industry; oil	SPRU database: Other Industry; oil
		OPG	All Scotland, DTI	All Scotland, DTI
		Lime kiln coal	Lime kiln capacity - all England	Lime kiln capacity - all England
		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	Male employment in construction, ONS	Male employment in construction, ONS

1 See Table A1.9 for abbreviations

1.4 TRANSPORT

The drivers used for transport are summarised in Table A1.4.

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. However, in the regional inventories, terminal emissions are reported under 1B2 Oil and Gas Fugitives. Terminal emissions data were supplied by SCOPEC (2000), for 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 (DETR, 2000).

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 1995/98/99 inventories 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 II (1997) program and database, recommended for CORINAIR and form the basis of the IPCC Guidelines.

1.4.2.1 Emission factors

The emission and fuel consumption factors used for the regional inventories are reported in Salway *et al* (2001). These are broken down by vehicle type and emission standard which the vehicle was compliant with when manufactured and first registered. Figures for fuel consumption are shown in Table A1.3. The approximate dates of introduction of the emission standards in the UK are given in the NAEI Report (Goodwin *et al*, 2000). 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. In the case of fuel consumption factors, speed-emission functions were used to calculate emission factors at average speeds on urban, rural single carriageway, rural dual carriageway and motorway roads in the regions. The speed-dependency of emission factors of methane and nitrous oxide are not known, so the same values were used for all the road types.

1.4.2.2 Age and composition of the fleet

Information on the age and composition of the vehicle fleet in the regions in 1990, 1995, 1998 and 1999 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 DETR (2000b); 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 DETR 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 Environment for Northern Ireland which showed a newer fleet than in Great Britain (DoENI, 2000). 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 reflect a higher proportion of cars fitted with three-way catalysts on the road in Northern Ireland in 1995, 1998 and 1999 than in England, Scotland and Wales. This trend may be further reflected by the fact that fuel delivery statistics for 1998 suggest a slightly higher proportion of petrol was sold as unleaded in Northern Ireland (~84%, DoENI, 2000) compared with in Great Britain (78%, DTI, 2000). 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 (Road Services, NI, 2001). However, the proportion of diesel vehicles in the PLG class in Northern Ireland was 32% in 1999 (DoENI, 2000) compared with 18% in Great Britain (DETR, 2000). 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 (12.2% and 74.8%, respectively, for 1999 (DETR, 2000b)). This leads to the conclusion that 36.3% of the PLG fleet and, it is assumed, the PLG vehicle kilometres in Northern Ireland in 1999 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 DETR 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 (DETR, 2000c). These estimates are based on traffic counts from the rotating census and core census surveys (DETR, 2000).

Vehicle kilometre data for 1990, 1995, 1998 and 1999 were available from DETR 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 DETR 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 DETR from the national traffic census (DETR, 2000). 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. The way the calculations were made are 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 (Road Services, NI, 2001); for 1999, these were scaled up according to the proportional changes in vehicle kilometres in Great Britain from 1998 to 1999 by vehicles on roads of the same type.

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

1.4.2.4 Fuel consumption in the regions

Fuel delivery data are available for England & Wales, Scotland and Northern Ireland from DUKES (DTI, 2000). Separate fuel delivery data for Wales was available from the Welsh Office for 1990, but not for 1995, 1998 and 1999 (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, 1998 and 1999. 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. Furthermore, the current inventory uses methods for CH_4 and N_2O revised from the methods used in the last regional inventory compilation (Salway *et al*, 2000), drawing on information from the 1x1 km NAEI emission maps.

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 1999 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. The fuel-based emission factors were calculated from the vehicle kilometre based emission and fuel consumption factors in g/km. These result in figures in units g pollutant/kg fuel for each vehicle type which reflect 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. The latter were based on the DETR's vehicle kilometre data and affect average speed and hence emission factor.

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 come from the NAEI maps of fuel consumption by vehicles on major and minor roads in the UK in 1999 referred to earlier. This procedure ensures adequate coverage of vehicle activity on the minor roads which the vehicle kilometre data from DETR does 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 (2000) suggest a 35% reduction in petrol sales and a 40% reduction in diesel sales in Northern Ireland from 1995 to 1999 in spite of the fact that traffic had grown by around 10% 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 survey data provided by Road Services, Northern Ireland (2001) 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 (2000).

Table A1.4 Transport[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990	1995/1998/1999
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, DETR
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 A1.9 for abbreviations

Table A1.5 Other Sectors[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990	1995/1998/1999
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
		Landfill gas	Landfill methane Emissions	Landfill Methane Emissions
		Sewage gas	Sewage methane recovered	Sewage methane recovered
		fuel oil	SPRU database: miscellaneous	SPRU database: miscellaneous
		gas oil	Regional Oil Consumption, DTI, WO. Remainder after other uses.	Regional Oil Consumption, DTI, WO. Remainder after other uses.
		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 1995/99, 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, MAFF
		burning oil	Regional burning oil, DTI, WO	Regional burning oil, DTI, WO
		straw	Wheat production, MAFF	Wheat production, MAFF
	Agriculture Power Units	Gas oil, petrol	Agricultural employment, MAFF	Agricultural employment, MAFF
	Fishing	gas oil, fuel oil	Unallocated	Unallocated

1 See Table A1.9 for abbreviations

1.5 OTHER SECTORS

1.5.1 Commercial/Institutional

The NAEI categories, public administration and were combined because regional statistics are not available to this level of sectoral disaggregation. Only WO (1998) reports miscellaneous coal consumption, whereas NIO (2000) reports only an industrial category. Estimates for 1990,1995, 1998 and 1999 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 and 1999 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 (1999). Natural gas consumption data for Northern Ireland were supplied by Phoenix Natural Gas. However, the commercial category range was significantly higher than Transco, so for Northern Ireland commercial and industrial gas consumption are combined.

For fuel oil, the SPRU drivers for oil were used.

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.

1.5.2 Residential

Domestic coal consumption is reported in NIO (2000) up to the present and in WO (1998) to 1993. These data also include anthracite and for NI other solid smokeless fuels. Domestic coal consumption for 1995 and 1999 was estimated from sales data, gathered from major coal producers. A mass balance was performed on production, imports, stock-changes and imports. Coal was allocated to sources where consumption was known or estimated using other drivers (power generation, iron & steel, cement kilns) and imports allocated to the most likely consumers (steam coal to power generation; coking coal to coke production; anthracite to domestic anthracite). It was assumed that the degree of penetration of imported anthracite was the same for England, Scotland and Wales. All coal in Northern Ireland is imported, mostly from abroad. English and Welsh sales data was fairly complete but Scottish data was incomplete and only accounted for around 71% of Scottish production. Hence it was necessary to estimate Scottish consumption as the difference between the UK and the other regions. Stock changes are significant and were disaggregated on regional production (Coal Authority, 2000). The estimates obtained are likely to be fairly approximate. For 1990, data for Wales, Northern Ireland and UK are available; hence consumption in England and Scotland was

estimated by interpolation based on the 1995 split between England and Scotland. The 1998 coal sales data was not sufficiently complete to apply the mass balance method satisfactorily. The procedure adopted was to assume all imported domestic anthracite was used in Northern Ireland and to apply the 1995 driver to England, Scotland and Wales.

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 (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 (2000). 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, MAFF (2000). 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 (2000), 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. More research is required to obtain a reliable estimate.

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 (2000) data for 1999 and 1998 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 1999 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 (2000, 2000a, 2000b). 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 (2000) 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 and 1999. 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 A1.6 Fugitive Emissions from Fuels[1]

IPCC Category	NAEI Sources	Activity: Fuel Consumption	1990/1995	1998/1999
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 A1.9 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 A1.7

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). 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).

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).

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 the chemical inventory based on data in the Pollution Inventory (Environment Agency, 2000). This emission was allocated to England and Wales based on the site data in the Pollution Inventory. Data 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).

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).

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. New data has been collected by the Electricity Association which shows that the leakage rate from switchgear is higher than previously estimated. The National Grid have identified certain "rogue" installations with high leakage rates and it is targetting these installations to reduce emissions over the next few years. As a result of the new data, the estimate reported here is significantly higher in 1998 and 1999 than that reported in the UK Inventory (Salway *et al*, 2001).

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 A1.7 Industrial Processes[1]

IPCC Category	NAEI Sources	Activity Data	1990	1995/98/99
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
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
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 A1.9 for abbreviations

Table A1.8 Halocarbons and Sulphur Hexafluoride[1]

IPCC Category	NAEI Sources	Activity Data	1990	1995/98
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 A1.9 for abbreviations

Table A1.9 Summary of Abbreviations used in Tables A1.1to A1.8

BCA	British Cement Association
BGlass	British Glass
CA	Coal Authority
DTI	Department of Trade and Industry
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[1]
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[2]
WS	Welsh Statistics

1 Now the Department for Environment, Food and Rural Affairs

1.9 AGRICULTURE

The UK inventory was disaggregated to 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). 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). 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 June Agricultural Census for 1990, 1995, 1998, 1999 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 1999 describes the methods for estimating removals and emissions of carbon dioxide due to Land Use Change and Forestry (LUCF) (Salway *et al*. 2001).

The estimates for Land Use Change and Forestry are from work carried out by the Centre for Ecology & Hydrology[†] described in the scientific literature (Cannell et al 1999, Milne and Brown 1997, Milne et al. 1998) and in Contract Reports to DETR (Milne et al. 1999, 2000, Cruickshank & Tomlinson 2000). 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

[†] The land use change and forestry estimates were provided by the Centre for Ecology and Hydrology (Edinburgh). Technical enquiries on land use change and forestry should be addressed to Dr R Milne, Centre for Ecology and Hydrology (Edinburgh), Bush Estate, Penicuik, EH26 OQB, UK (tel +44 (0) 131 445 8575. fax +44 (0) 131 445 3943, E-mail, rmilne@ceh.ac.uk

Lands) as these are considered to be negligible, or not occurring, in the UK. Here further detail is provided on: a) revision of estimates of CO_2 from soil in Scotland, b) methods used for emissions from soils in Northern Ireland and c) disaggregation of UK fluxes in category 5E (Other).

1.10.2 Changes in Forests and Other Woody Biomass Stocks (5A)

The UK GHG estimates for carbon uptake relating to changes in forests are based on data for the areas of forest plantation published by the UK Forestry Commission and the Northern Ireland Department of Agriculture (for 1999 data see Forestry Commission 2001, Forest Service 2000). The carbon uptake is calculated by a carbon accounting model (Dewar and Cannell 1992, Cannell and Dewar 1995, Milne *et al*. 1998) as the net change in pools of carbon in standing trees, litter, soil in broadleaf forests and products. All commercial forest is assumed to be restocked. It should be noted that for consistency with previous reports those parts of the net uptake by litter, soils and products are included in the data reported in category 5A for the National Report (Salway *et al*. 2001), but are included as a removals under the Soils category (5D) in Common Reporting Format tables. The litter and soils components of these Removals are also provided in footnotes to the National Report tables to allow comparison with data from countries that report only changes in woody biomass and exclude soils etc.

For the estimates described here we used the combined area of new private and state planting from 1921 to 1999 for England, Scotland, Wales and Northern Ireland sub-divided into conifers and broadleaves. Restocking was dealt with in the model through the second and subsequent rotations for the 'new' areas and hence areas restocked each year did not need to be considered separately.

The carbon flow model uses Forestry Commission Yield Tables to describe forest growth. It was assumed that all new conifer plantations have the same growth characteristics as Sitka spruce (*Picea sitchensis* (Bong.) Carr.) under an intermediate thinning management and in Great Britain followed the growth pattern of Yield Class 12 $m^3\ ha^{-1}\ a^{-1}$, but in Northern Ireland Yield Class 14 $m^3\ ha^{-1}\ a^{-1}$. It was assumed that all broadleaf forests had the characteristics of beech (*Fagus sylvatica* L.) of Yield Class 6 $m^3\ ha^{-1}\ a^{-1}$.

1.10.3 CO_2 Emissions and Removals from Soils (5D)

Three processes are reported in this category: changes in soil stocks due to land use change, change in soil stocks due specifically to the change in land use from arable in Set Aside schemes and emissions due to the application of lime and dolomite.

1.10.3.1 Land Use Change

1.10.3.1.1 Land Use Change in Great Britain

The basic method for assessing changes in soil carbon due to land use change in Great Britain is to use a matrix of change from surveys of land linked to a dynamic model of gain or loss of carbon. A database of soil carbon density for the UK has been constructed (Milne and Brown 1997, Cruickshank *et al.* 1998) from information provided by the Soil Survey and Land Research Centre, the Macaulay Land Use Research Institute and Queen's University Belfast on soil type, land cover and carbon content of soil cores. Deep peats in the North of Scotland are identified separately and depths to 5 m are included but these play a minor role in relation to land use change. MLURI reviewed and revised downwards the values of soil carbon density for some peaty soils types in Scotland for this 1999 Inventory. The basis for estimating soil carbon densities in Scotland is the National Soil Map of Scotland at 1:250, 000 scale. For each 1:250, 000 map unit the area of different soil types is recorded in a database e.g.:

Map unit 153: Peaty podzols; humus iron podzols; some peat and peaty gleys
Map unit 310: peaty gleys; humic gleys; some shallow peat.

For each 1 km x 1 km square in Scotland the area of each component soil series within the map unit was calculated. The dominant soil series for each square was then assigned. If 2 soils occurred equally then that with the greater carbon content (generally more peaty) was assigned dominance. In the latest revision all carbon in layers below the junction of the B & C horizons was neglected to match the method adopted by SSLRC for the soils of England and Wales. A lower detection level (0.2 rather than 0.5 g cm^{-3}) was assumed for carbon content under the present review. The bulk densities of peats were also reassessed. Values previously used by MLURI of 0.35 g cm^{-3} (still used for peats in England and Wales) were probably too large. Peat topsoils are more likely to be about 0.2 g cm^{-3}, and even lower for basin and blanket peats. Bulk density for basin and blanket peat have already been modified in this way by Milne & Brown (1997) and incorporated into the database for flux calculations, but the other changes notes above were included for the 1999 GHG Inventory. In Scotland, there is no soil carbon data for urban areas. Previously a value of zero had been assumed for these areas, but here a representative value of 18.6 t ha^{-1} was calculated from data for England and Wales and applied to urban squares in Scotland. (Note that all improvements introduced for a new Inventory are applied retrospectively for estimates for all years from 1990 to the latest year in the new Inventory). Table A1.10 summarises the improved soil carbon density data for Scotland.

Table A1.11 shows average values of soils carbon density for different land covers in the four devolved areas of the UK. The data of Table A1.12a shows no strong evidence of a major difference in the soil carbon density of tilled cropland or actively managed grass hence the inclusion of both uses within the Farm category in the flux calculations described below.

Table A1.10. Soil carbon in Scotland showing effect of revisions noted in text.
** Revised values determined by relative occurrence of urban squares marked as 'No Data' or 'Not soils' in soil survey database, but assigned carbon value of 18.6 t ha^{-1} here.*
*** Total soil carbon in Scotland, if depth restricted to 1 m for peats.*

Soil type	Area km²	Original carbon kt	Revised carbon kt	Carbon above 1m kt
Alluvial soil (undiff)	1,161	27,438	20,382	
Alpine podzol	601	24,786	18,245	
Brown calcareous soil	435	2,309	7,382	
Brown forest soil	10,851	251,248	238,037	
Brown forest soil with gleying	3,628	72,570	57,652	
Brown magnesian soil	19	731	512	
Calcareous gley (GW)	77	505	1,167	
Complex	294	2,019	3,992	
Humus-iron podzol	9,315	359,547	214,156	
Immature raised beach soil	253	3,711	3,917	
Iron podzol	127	3,500	2,198	
Magnesian gley (SW)	91	2,051	1,905	
Noncalcareous gley	1,437	36,352	30,993	
Noncalcareous gley (GW)	10	199	137	
Noncalcareous gley (GW)?	32	516	413	
Noncalcareous gley (SW)	7,456	179,896	151,570	
Noncalcareous regosol	5	41	58	
Peat, basin	612	81,090	81,090	20,575
Peat, blanket	25,641	4,442,038	4,442,038	1,254,699
Peaty gley	4,620	363,846	157,746	
Peaty gley (GW)	13	270	307	
Peaty gley (SW)	2,998	229,961	107,938	
Peaty podzol	8,850	704,306	354,274	
Peaty ranker	656	46,617	18,218	
Podzolic ranker	78	4,560	1,706	
Saline alluvial soil	43	424	629	
Saline gley	90	317	1,665	
Subalpine podzol	2,900	101,584	84,422	
No data *	1,100	-	15,059	
Not soil *	1,408	-	5,032	
Miscellaneous	127	5,800	5,800	
TOTAL	**84,928**	**6,948,232**	**6,028,642**	**** 2,780,788**

Table A1.11. Average soil carbon density (t C ha^{-1}) for different land cover in the UK

Region Cover	England	Scotland	Wales	N. Ireland
Natural	487	1048	305	551
Woodland	217	580	228	563
Arable	153	156	93	151
Pasture	170	192	200	178
Other	33	141	43	102

Matrices from the Monitoring Landscape Change (MLC) data from 1947 & 1980 (MLC 1986) and the DETR/ITE Countryside Surveys (CS) of 1984 & 1990 (Barr et al. 1993) describe areas of land changing use. Land use in the UK can be placed into 4 broad groups – (Semi) Natural, Farming, Woodland and Urban. The land use change data from the CS surveys are used initially to weight the mean change in equilibrium soil carbon used for England, Scotland and Wales (Table A1.12a-c).

Table A1.12a. LUC area weighted mean change in equilibrium soil carbon (tC ha^{-1})for England

Initial Final	Farm	Natural	Urban	Woods
Farm		-79	-8	-39
Natural	78		71	-20
Urban	9	-63		-24
Woods	38	20	31	

Table A1.12b. LUC area weighted mean change in equilibrium soil carbon (tC ha^{-1}) for Scotland

Initial Final	Farm	Natural	Urban	Woods
Farm		-410	85	-260
Natural	279		324	-30
Urban	-63	-286		-551
Woods	204	30	396	

Table A1.12c. LUC area weighted mean change in equilibrium soil carbon (tC ha^{-1}) for Wales

Initial / Final	Farm	Natural	Urban	Woods
Farm		-30	40	-23
Natural	31		78	-10
Urban	-38	-72		-53
Woods	25	10	89	

The rate of loss or gain of carbon is also dependent on the type of land use transition (Table A1.13). For transitions where carbon is lost e.g. transition from Natural to Farmland, a 'fast' rate is applied whilst a transition which gains carbon occurs much more slowly. This 'slow' rate had in the 1998, and earlier, GHG Inventories been set such that 99% of the change occurred in 100 years throughout GB. This rate was based on an estimate for Rothamsted soil by Howard *et al*. (1994). However, it was noted that due to the high carbon densities in Scottish soils that the uptake rates of carbon in that country were unreasonably large when land moved to the Natural class from the Farm class. For the 1998 Inventory the rate of uptake was therefore reduced until the uptake of soil carbon in such transitions was less than the order of net primary productivity for cold temperate grasslands (about 300 g m^{-2} a^{-1}). Thus, a rate of soil carbon accumulation in Scotland equivalent to taking 800 years to reach 99% of a new value was used. Here, for the 1999 Inventory, a different approach to taking account of the uncertainty in such rates of transition was adopted. A literature search for information on measured rates of changes of soil carbon due to land use was carried out and, in combination with expert judgement, ranges of possible times for completion of different transitions were selected. These are shown in Table A1.14.

Table A1.13. Rates of change of soil carbon for land use change transitions. ("Fast" & "Slow" refer to 99% of change occurring in times shown in Table A1.16.

		1984			
		Farm	**Natural**	**Urban**	**Woods**
1990	**Farm**		*fast*	*slow*	*fast*
	Natural	*slow*		*slow*	*fast*
	Urban	*fast*	*fast*		*fast*
	Woods	*slow*	*slow*	*slow*	

Table A1.14. Range of times for soil carbon to reach 99% of a new value after a change in land use in England (E), Scotland (S) and Wales (W).

	Low (years)	**High (years)**
Carbon loss ("fast") E, S, W.	50	150
Carbon gain ("slow") E, W.	100	300

Carbon gain ("slow") S.	300	750

The rates of change of soil carbon between the equilibrium values were then combined with time series of land use change in a model to produce the net change in stored soil carbon for England, Scotland and Wales for each year from 1990 to 1999. Each of these changes is an estimate of emission or removal of CO_2 relating to soils in each region (Salway *et al*. 2001). The model of change in soil carbon was run 500 times with the time constant for change in soil carbon being selected separately, using a Monte Carlo approach, for England, Scotland and Wales from within the ranges of Table A1.14. The mean carbon flux for each region resulting from this imposed random variation was then used as the estimate for the Inventory. An adjustment was made after these calculations for each country to remove increases in soil carbon due to afforestation, because the value for this was considered to be better estimated by the C-Flow model used for the Changes in Forests and Other Woody Biomass Stocks (5A) category.
The range in the estimated changes in soil carbon is shown in Table A1.15. The large uncertainty in the estimates for each country due to uncertainty in the turnover rate of soil carbon and the importance of Scottish soils is clearly seen.

Table A1.15 Range of estimates of Emissions (+ve) / Removals (-ve) of CO_2 due to effect of land use change on soils from a Monte Carlo analysis.

ktC a^{-1}		**Minimum**	**Mean**	**Maximum**
Scotland	**1990**	1539	**2616**	3730
	1999	1385	**2732**	3879
England	**1990**	-1687	**186**	1845
	1999	-3226	**-438**	1580
Wales	**1990**	39	**159**	272
	1999	0	**151**	270

1.10.3.1.2 Land use change in Northern Ireland
For this region the default method of the IPCC Guidelines (IPCC 1997 a, b, c) continues to be used. A description of how the results are obtained is given by Cruickshank & Tomlinson (2000). A summary of the changes in land uses and the resulting changes in stored soil carbon for the 1999 Inventory are shown in Table A1.16.

For the 1999 Inventory the following points are relevant and illustrate some general difficulties with estimates of carbon emissions that depend on land use data:
Through the mid to late 1990s the 'total area farmed' in the Agricultural Census for N. Ireland remained constant, but in 1999 this showed an increase of 4,500 ha on 1998. This figure is entirely reliant on the farmers' census returns so that an area of land may be included one year but not in another, which may only be due to failure to let/rent land.

The Forest Service Annual Reports have become less informative recently and there is now no breakdown of the Forest Estate to enable semi-natural, peatland etc. to be estimated. In the absence of this information, it has been assumed that the trends of earlier years have continued.

Urban area is estimated as the residual after all other land uses have been accounted and the value in 1999 was initially found to less than for 1998. This is not sensible. This was corrected by ignoring the increase in the 'farmed area', which then gives a residual urban area not too different from 1997 and 1998.

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

Table A1.16. 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	
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	-262

1.10.3.1.3 Changes in soil carbon in the UK

UK time series of changes in soil carbon reported in the UK Inventory (Salway *et al*. 2001) were calculated by adding the mean, maximum and minimum data from Scotland, England, Wales and Northern Ireland together to provide aggregate, mean, maximum and minimum. Mean, maximum and minimum values for Northern Ireland were all assumed to be given by the data from the default method.

1.10.3.2 Set Aside

The estimation of changes in soil carbon calculated by the matrix method for all transitions does not fully include the effects of the policy of Set Aside from production of arable areas. The data reported here therefore make a separate estimation not only of the effect of soil carbon increasing in areas where set aside land is not used for arable purposes but also the subsequent loss of the extra accumulated carbon from the soil when land is returned to arable use. Set Aside areas are taken from the Annual Farm Census for Scotland, England and Wales separately. Scottish soils coming out of arable use are assumed to be able to take up 300 t/ha but that this happens at a rate that would only allow 99% of that change to occur in 500 years. For English and Welsh soils it is assumed that the change in equilibrium soil carbon density would be 60 t/ha and that 99% of this change would occur in 200 years. These times fall in the middle of the ranges used in the main calculation for the effect of land use change causing an increase in soil carbon. See Salway *et al*. (2001) for further information on these estimates. Northern Ireland has negligible change in soil carbon due to Set Aside

1.10.3.3 Emissions of CO_2 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 (2001). 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.

1.10.4 Other sources and sinks (Table 5E)

These are:

Sources

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

and a sink

- Changes in crop biomass

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

This value was originally derived for the UK by Adger & Subak (1995) using Agricultural Census and other data up to 1992. From the 1998 Inventory onwards

more recent data from the Agricultural Census were considered but did not support any change to the existing UK estimate. The rates for the devolved regions were estimated to be 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 1999 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 1999. Peat extraction is negligible in Wales. Activity data are from BGS (2001) and the emission factors are shown in Table 9. Further information is given by Cruickshank and Tomlinson (1997).

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 relate to England. The emission factor is shown in Table A1.17.

1.10.4.4 Upland (forestry) peat drainage

The area of forestry on peat is unlikely to change significantly under present afforestation policies. Emissions from planted areas tend to exist for considerable periods due to the large stock of carbon that is available for decomposition and hence the emissions included under this heading are reported as constant from 1990 to 1999. 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. The emission factor is shown in Table A1.17. For further information see Cannell et al. (1993) and Hargreaves and Fowler (1997).

Table A1.17 Summary of emission factor data for Deep Peat Drainage and Lowland Wetland Drainage

	Emission Factor g C/m^2/y
Deep Peat Drainage	200
Lowland Wetland Drainage	297

Table A1.18 Summary of emission factor data for Peat Extraction (GB Great Britain, NI Northern Ireland)

	Emission Factor	
	kg C m^{-3}	Gg C/Gg
GB Horticultural Peat	55.7	-

GB Fuel Peat	55.7	-
NI Horticultural Peat	44.1	-
NI Fuel Peat	-	0.3

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, 2000) 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* (1994) for the UK.

The Hobson *et al* (1994) 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. 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, DETR (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 DETR (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). Some of these incinerators generate electricity or heat and are reported as power stations. The total consumption of these incinerators is reported in DTI (2000, 1996, 1991). By 1998 all UK MSW incinerators generated electricity and are reported as power stations.

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

TABLE 1 SECTORAL REPORT FOR ENERGY (England, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		439467	1210	13
A Fuel Combustion Activities (Sectoral Approach)		437275	84	13
1 Energy Industries		181885	6	6
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	0.04
2 Manufacturing Industries and Construction		72028	7	3
a Iron and Steel		12284	3.8	0.22
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		59744	3.6	2.76
3 Transport		94446	24	3
a Civil Aviation	b	0	0	0
b Road Transportation		92972	24.1	2.5
c Railways		1447	0.1	0.55
d Navigation	b	0	0.0	0.00
e Other(Aircraft Support)		28	0.0	0.01

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		88915	47	1.2
a Commercial/Institutional		22933	2.7	0.21
b Residential		64093	43.1	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	1125	0
1 Solid Fuels		1911	741	NO
a Coal Mining		0	740.6	NO
b Solid Fuel Transformation		1911	0.4	NE
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	281	384	0
a Oil		0	6.0	0
b Natural Gas		0	377.2	NO
c Flaring		281	1.1	0.01
c Venting		0	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 (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	10830	2.3	92	11374	1608	0.024
A Mineral Products	7559	0	0	0	0	0
1 Cement Production	5422	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	138	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	NO	NE	NO	NO	NO	NO
B Chemical Industry	1358	2	92	0	0	0
1 Ammonia Production	1358	NE	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	10.81	NO	NO	NO
3 Adipic Acid production	NO	NO	81.09	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	1.8	NO	NO	NO	NO
C Metal Production	1912	0.4	0.0	0	1453	0.02
1 Iron and Steel Production	1726	0.4	0.02	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	186	NO	NO	NO	1452.7	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	616	67
A Enteric Fermentation	529	0.0
1 Cattle	422.6	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	0.0	NO
10 Other (Deer)	0.3	NO
B Manure Management	75	3.1
1 Cattle	45.4	0
2 Buffalo	NO	0
3 Sheep	2.3	0
4 Goats	0.0	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			0.19
12 Solid Storage and Dry Lot			2.49
13 Other (poultry litter, stables etc)			0.43
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	63.3
E Prescribed Burning of Savannas		NO	NO
F Field Burning of Agricultural residues	g	12	0.2
1 Cereals		11.6	0.2
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	0.0	-2295	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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	ik	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	604	958	3.2
A Solid waste Disposal on Land	0	927	0
1 Managed Waste Disposal on Land	0	927.4	NO
2 Unmanaged Waste disposal on Land	NO	NO	NO
3 Other	NO	NO	NO
B Wastewater Handling	0	31	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	604	0.0	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	455448	-3230	2786	175	11374	1608	0.0239
1 Energy		439467		1210	12.9			
A Fuel Combustion		437275		84	13			
1 Energy Industries		181885		6	5.6			
2 Manufacturing Industries and Construction		72028		7.5	3.0			
3 Transport		94446		24	3.1			
4 Other Sectors		88915		47	1.2			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		2192		1125	0			
1 Solid Fuels		1911		741	NO			
2 Oil and Natural Gas		281		384	0			
2 Industrial Processes		10830		2.3	92	11374	1608	0.0239
A Mineral Products		7559		NO	NO	NO	NO	NO
B Chemical Industry		1358		1.8	92	NO	NO	NO
C Metal Production		1912		0.4	0.02	NO	1452.681	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		616	67			
A Enteric Fermentation		0		529	NO			
B Manure Management		0		75	3.1			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	63			
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 Stock	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	ik	2025	-935	NE	NO			
6 Waste		604		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		604		0.03	0.13			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (England, 1990)

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 5A Removals include removals to forest soil & litter (-917 Gg CO2) and to forest products (-741 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-129 Gg CO2) and emissions from soils due to liming (1051 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (147 Gg CO2), lowland drainage (1650 Gg CO2) and peat extraction (229 Gg CO2)
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 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	416757	-3326	2261	141	15007	483	0.0398
1 Energy	404978		887	15.8			
A Fuel Combustion	403439		65	16			
1 Energy Industries	146608		11	5.2			
2 Manufacturing Industries and Construction	69209		7.5	2.8			
3 Transport	95868		19	6.9			
4 Other Sectors	91755		27	1.0			
5 Other b	0		0	0			
B Fugitive Emissions from Fuels	1539		823	0			
1 Solid Fuels	1350		461	NO			
2 Oil and Natural Gas	190		362	0			
2 Industrial Processes	9764		2.2	60	15007	483	0.0398
A Mineral Products	6814		NO	NO	NO	NO	NO
B Chemical Industry	1379		1.8	60	NO	NO	NO
C Metal Production	1572		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	63			
A Enteric Fermentation		0		511	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	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		355		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		355		0.03	0.10			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m](England, 1995)

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 5A Removals include removals to forest soil & litter (-722 Gg CO2) and to forest products (-264 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-1579 Gg CO2) and emissions from soils due to liming (1123 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (147 Gg CO2), lowland drainage (1467 Gg CO2) and peat extraction (323 Gg CO2)
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 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
		Gg				CO2 equivalent Gg	
Total National Emissions and Removals	a	412334	-3296	2002	145	19597	298
1 Energy		400830		753	19.6		
A Fuel Combustion		399600		66	20		
1 Energy Industries		134020		17	5.2		
2 Manufacturing Industries and Construction		67329		7.7	2.6		
3 Transport		101155		16	10.7		
4 Other Sectors		97095		26	1.0		
5 Other	b	0		0	0		
B Fugitive Emissions from Fuels		1231		687	0		
1 Solid Fuels		1088		333	NO		
2 Oil and Natural Gas		143		354	0		
2 Industrial Processes	n	9714		2.2	58	19597	298
A Mineral Products		7672		NO	NO	NO	NO
B Chemical Industry		1111		1.8	58	NO	NO
C Metal Production		932		0.3	0.02	NO	108
D Other Production		NO		NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	16533	0
F Consumption of Halocarbons and SF6	n	NO		NO	NO	3064	190
G Other		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		572	64			
A Enteric Fermentation		0		498	NO			
B Manure Management		0		74	3.0			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	61			
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		0		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		0		0.07	0.15			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (England, 1998)

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 5A Removals include removals to forest soil & litter (-770 Gg CO2) and to forest products (-282 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-87 Gg CO2) and emissions from soils due to liming (754 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (147 Gg CO2), lowland drainage (1357 Gg CO2) and peat extraction (191 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

TABLE 1 SECTORAL REPORT FOR ENERGY (England, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		391171	708	21
A Fuel Combustion Activities (Sectoral Approach)		389506	74	21
1 Energy Industries		126636	21	5
a Public Electricity and Heat Production		110845	20	5
b Petroleum Refining		12507	0.5	0.2
c Manufacture of Solid Fuels and Other Energy Industries		3284	0.9	0.10
2 Manufacturing Industries and Construction		65487	7	3
a Iron and Steel		11930	3.6	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		53558	3.8	2.42
3 Transport		101455	15	12
a Civil Aviation	b	0	0	0
b Road Transportation		99586	14.9	11.4
c Railways		1097	0.0	0.42
d Navigation	b	732	0.0	0.05
e Other(Aircraft Support)		39	0.0	0.02

TABLE 1 SECTORAL REPORT FOR ENERGY (England, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		95927	30	0.9
a Commercial/Institutional		24253	3.0	0.09
b Residential		69978	26.3	0.40
c Agriculture/Forestry/Fishing		1696	0.9	0.43
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		1665	634	0
1 Solid Fuels		1405	284	NO
a Coal Mining		0	283.9	NO
b Solid Fuel Transformation		1405	0.3	NE
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	260	350	0
a Oil		110	2.1	0
b Natural Gas		0	345.9	NO
c Flaring		149	0.4	0.01
c Venting		0	1.5	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, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
		Gg		CO2 Equivalent Gg		Gg
Total Industrial Processes	10349	2.2	10	5542	311	0.058
A Mineral Products	7293	0	0	0	0	0
1 Cement Production	4880	NO	NO	NO	NO	NO
2 Lime Production	1574	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	744	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	96	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	NO	NE	NO	NO	NO	NO
B Chemical Industry	1108	2	10	0	0	0
1 Ammonia Production	1108	NE	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	7.86	NO	NO	NO
3 Adipic Acid production	NO	NO	2.13	NO	NO	NO
4 Carbide Production	NO	NO	NO	NO	NO	NO
5 Other	NO	1.8	NO	NO	NO	NO
C Metal Production	1948	0.4	0.0	0	106	0.03
1 Iron and Steel Production	1705	0.4	0.02	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	243	NO	NO	NO	106.4	NO
4 SF6 Used in Aluminium and Magnesium Foundries	NO	NO	NO	NO	NO	0.03
5 Other	NO	NO	NO	NO	NO	NO

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES (England, 1999)
(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	1927	0	0
1 By-product Emissions	e	NO	NO	NO	1927	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	3616	204	0.031
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	2383	25	NO
2 Foam Blowing		NO	NO	NO	36	NO	NO
3 Fire Extinguishers		NO	NO	NO	12	3.0	NO
4 Aerosols	f	NO	NO	NO	1185	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	n	NO	NO	NO	NO	177	0.031
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (England, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	571	63
A Enteric Fermentation	498	0.0
1 Cattle	391.5	NO
2 Buffalo	NO	NO
3 Sheep	93.2	NO
4 Goats	0.3	NO
5 Camels and Llamas	NO	NO
6 Horses	3.8	NO
7 Mules and Asses	NO	NO
8 Swine	9.2	NO
9 Poultry	0.0	NO
10 Other (Deer)	0.3	NO
B Manure Management	73	3.1
1 Cattle	41.7	0
2 Buffalo	NO	0
3 Sheep	2.2	0
4 Goats	0.0	0
5 Camels and Llamas	NO	0
6 Horses	0.3	0
7 Mules and Asses	NO	0
8 Swine	18.5	0
9 Poultry	10.0	0
9a Deer	0.007	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (England, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CH4	N2O
		Gg	
B Manure Management (cont...)			
10 Anaerobic			NO
11 Liquid System			0.18
12 Solid Storage and Dry Lot			2.40
13 Other (poultry litter, stables etc)			0.51
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	59.5
E Prescribed Burning of Savannas		NO	NO
F Field Burning of Agricultural residues	g	0	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, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	1339	-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	0.0	-2347	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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	-377	0	NO	NO
E Other	ik	1716	-935	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (England, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
			Gg	
Total Waste		0	625	3.1
A Solid waste Disposal on Land		0	594	0
1 Managed Waste Disposal on Land		0	594.0	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	31	3.0
1 Industrial Wastewater	I	0	NE	NO
2 Domestic and Commercial wastewater	I	0	30.8	2.96
3 Other		NO	NO	NO
C Waste Incineration		0	0.1	0.15
D 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	402858	-3282	1907	96	5542	311	0.0584
1 Energy		391171		708	20.7			
A Fuel Combustion		389506		74	21			
1 Energy Industries		126636		21	5.3			
2 Manufacturing Industries and Construction		65487		7.3	2.6			
3 Transport		101455		15	11.9			
4 Other Sectors		95927		30	0.9			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		1665		634	0			
1 Solid Fuels		1405		284	NO			
2 Oil and Natural Gas		260		350	0			
2 Industrial Processes		10349		2.2	10	5542	311	0.0584
A Mineral Products		7293		NO	NO	NO	NO	NO
B Chemical Industry		1108		1.8	10	NO	NO	NO
C Metal Production		1948		0.4	0.02	NO	106.429	0.028
D Other Production		NO		NO	NO	NO	NO	NO
E Production of Halocarbons and SF6		NO		NO	NO	1927	0	NO
F Consumption of Halocarbons and SF6		NO		NO	NO	3616	204	0.0308
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		571	63			
A Enteric Fermentation		0		498	NO			
B Manure Management		0		73	3.1			
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	1339	-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	-377	0	NO	NO			
E Other	jk	1716	-935	NE	NO			
6 Waste		0		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		0		0.07	0.15			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (England, 1999)

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 5A Removals include removals to forest soil & litter (-810 Gg CO2) and to forest products (-352 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-210 Gg CO2) and emissions from soils due to liming (631 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (147 Gg CO2), lowland drainage (1320 Gg CO2) and peat extraction (249 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

TABLE 1 SECTORAL REPORT FOR ENERGY (Scotland, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		49968	88	2
A Fuel Combustion Activities (Sectoral Approach)		48779	18	2
1 Energy Industries		18793	0.52	0.5
a Public Electricity and Heat Production		14458	0	0
b Petroleum Refining		2787	0.1	0.05
c Manufacture of Solid Fuels and Other Energy Industries		1548	0.1	0.09
2 Manufacturing Industries and Construction		9739	1.5	0.4
a Iron and Steel		2981	0.9	0.05
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		6758	0.5	0.4
3 Transport		8560	2.9	0.4
a Civil Aviation	b	0	0	0
b Road Transportation		8226	2.9	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		11686	14	0.3
a Commercial/Institutional		4455	0	0.08
b Residential		6942	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	69	0.0297
1 Solid Fuels		272	26	NO
a Coal Mining		0	26	NO
b Solid Fuel Transformation		272	0.07	NE
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	917	43	0.0297
a Oil		0	8.5	0
b Natural Gas		0	31	NO
c Flaring		917	4.16	0.0297
c Venting		0	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 (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	1061	0.10	1.35	0	258	0.003
A Mineral Products	688	0	0	0	0	0
1 Cement Production	478	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	NO	NE	NO	NO	NO	NO
B Chemical Industry	0	0	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	NE	NE	NO	NO	NO
C Metal Production	373	0.10	0.0031	0	193	0
1 Iron and Steel Production	298	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	167	16
A Enteric Fermentation	153	0.0
1 Cattle	105	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	0.0	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			0.03
12 Solid Storage and Dry Lot			0.73
13 Other (poultry litter, stables etc)			0.06
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	15.3
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	0.0	-5434	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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		58	104	0.07
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		58	0	0
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	62940	-5570	359.4	19	0	258	0.0030
1 Energy		49968		88	2			
A Fuel Combustion		48779		18	2			
1 Energy Industries		18793		0.5	0.5			
2 Manufacturing Industries and Construction		9739		1.5	0.4			
3 Transport		8560		3	0.4			
4 Other Sectors		11686		14	0.3			
5 Other	b	0		0.0	0.0			
B Fugitive Emissions from Fuels		1189		69	0			
1 Solid Fuels		272		26	NO			
2 Oil and Natural Gas		917		43	0.0			
2 Industrial Processes		1061		0.1	1	0	258	0.0030
A Mineral Products		688		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	1	NO	NO	NO
C Metal Production		373		0.1	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		167	16			
A Enteric Fermentation		0		153	NO			
B Manure Management		0		14	0.8			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	15.3			
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	b	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		58		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		58		0	0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Scotland, 1990)

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 5A Removals include removals to forest soil & litter (-887 Gg CO2) and to forest products (-623 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-49 Gg CO2) and emissions from soils due to liming (172 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (1173 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (79 Gg CO2)
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 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	61866	-6450	333	17	109	506	0.0042
1 Energy		49401		83	2			
A Fuel Combustion		48829		12	2			
1 Energy Industries		21930		1.1	0.5			
2 Manufacturing Industries and Construction		7223		0.7	0.4			
3 Transport		8780		2	0.9			
4 Other Sectors		10897		8	0.2			
5 Other	b	0		0.0	0.0			
B Fugitive Emissions from Fuels		572		72	0.02			
1 Solid Fuels		0		26	NO			
2 Oil and Natural Gas		572		45	0.02			
2 Industrial Processes		515		0.0	0	109	506	0.0042
A Mineral Products		447		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	0	NO	NO	NO
C Metal Production		68		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	15			
A Enteric Fermentation		0		150	NO			
B Manure Management		0		14	0.8			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	14.5			
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	b	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		60		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		60		0.001	0.01			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Scotland. 1995)

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 5A Removals include removals to forest soil & litter (-829 Gg CO2) and to forest products (-407 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-412 Gg CO2) and emissions from soils due to liming (184 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (1173 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (143 Gg CO2)
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 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	62222	-6556	315	18	312	241	0.0049
1 Energy		49283		74	2.5			
A Fuel Combustion		48877		12	2.5			
1 Energy Industries		23052		1.8	0.8			
2 Manufacturing Industries and Construction		6450		0.6	0.3			
3 Transport		8454		1.7	1.2			
4 Other Sectors		10922		7.5	0.2			
5 Other	b	0		0.0	0.0			
B Fugitive Emissions from Fuels		406		62	0.01			
1 Solid Fuels		0		28	NO			
2 Oil and Natural Gas		406		34	0.01			
2 Industrial Processes		547		0.0003	0.0001	312	241	0.0049
A Mineral Products		470		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	0	NO	NO	NO
C Metal Production		77		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	14.2			
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		0		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		0		0	0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Scotland, 1998)

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 5A Removals include removals to forest soil & litter (-1085 Gg CO2) and to forest products (-616 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-39 Gg CO2) and emissions from soils due to liming (123 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (1173 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (28 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

TABLE 1 SECTORAL REPORT FOR ENERGY (Scotland, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		47974	60	2.5
A Fuel Combustion Activities (Sectoral Approach)		47224	13	2.5
1 Energy Industries		21371	2.4	0.7
a Public Electricity and Heat Production		15962	1.9	0.5
b Petroleum Refining		3401	0.1	0.07
c Manufacture of Solid Fuels and Other Energy Industries		2008	0.4	0.11
2 Manufacturing Industries and Construction		6866	0.7	0.3
a Iron and Steel		116	0.0	0.00
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		6750	0.6	0.3
3 Transport		8343	1.6	1.3
a Civil Aviation	b	0	0	0
b Road Transportation		8020	1.6	1.2
c Railways		166	0.01	0.06
d Navigation	b	151	0.003	0.010
e Other(Aircraft Support)		6.2	0.0003	0.003

TABLE 1 SECTORAL REPORT FOR ENERGY (Scotland, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		10644	8.1	0.18
a Commercial/Institutional		2926	0	0.02
b Residential		7404	7.8	0.08
c Agriculture/Forestry/Fishing		314	0.06	0.08
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		751	47	0.0124
1 Solid Fuels		0	17	NO
a Coal Mining		0	17	NO
b Solid Fuel Transformation		0	0	NE
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	751	30	0.0124
a Oil		429	0.4	0
b Natural Gas		0	28	NO
c Flaring		322	1.27	0.0124
c Venting		0.0	0.6	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, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
		Gg		CO2 Equivalent Gg		Gg
Total Industrial Processes	509	0.0002	0.0001	364	260	0.0048
A Mineral Products	436	0	0	0	0	0
1 Cement Production	409	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	11	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	16	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	NO	NE	NO	NO	NO	NO
B Chemical Industry	0	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	NE	NE	NO	NO	NO
C Metal Production	72	0.0002	0.00008	0	37.4	0.00
1 Iron and Steel Production	0.22	0.0002	0.00008	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	72	NO	NO	NO	37	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, 1999)
(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	364	222	0.005
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	243	2.5	NO
2 Foam Blowing		NO	NO	NO	3.7	NO	NO
3 Fire Extinguishers		NO	NO	NO	1.2	0.31	NO
4 Aerosols	f	NO	NO	NO	116	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	n	NO	NO	NO	NO	220	0.005
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Scotland, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	164	14
A Enteric Fermentation	150	0.0
1 Cattle	103	NO
2 Buffalo	NO	NO
3 Sheep	45	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)	0.009	NO
B Manure Management	14	0.8
1 Cattle	10	0
2 Buffalo	NO	0
3 Sheep	1.1	0
4 Goats	0.0011	0
5 Camels and Llamas	NO	0
6 Horses	0.03	0
7 Mules and Asses	NO	0
8 Swine	1.6	0
9 Poultry	0.9	0
9a Deer	0.0	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Scotland, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.03
12 Solid Storage and Dry Lot		0.74
13 Other (poultry litter, stables etc)		0.04
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	13.6
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, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	12409	-6615	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-6479	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0.0	-6479	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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	11147	0	NO	NO
E Other	jk	1261	-136	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Scotland, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Waste		0	70	0.27
A Solid waste Disposal on Land		0	67	0
1 Managed Waste Disposal on Land		0	67	NO
2 Unmanaged Waste disposal on Land		NO	NO	NO
3 Other		NO	NO	NO
B Wastewater Handling		0	2.8	0.27
1 Industrial Wastewater	I	0	NE	NO
2 Domestic and Commercial wastewater	I	0	2.8	0.27
3 Other		NO	NO	NO
C Waste Incineration		0	0	0
D 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	60892	-6615	293.3	17	364	260	0.0048
1 Energy		47974		60	2.5			
A Fuel Combustion		47224		13	2.5			
1 Energy Industries		21371		2.4	0.7			
2 Manufacturing Industries and Construction		6866		0.7	0.3			
3 Transport		8343		1.6	1.3			
4 Other Sectors		10644		8.1	0.2			
5 Other	b	0		0.0	0.0			
B Fugitive Emissions from Fuels		751		47	0			
1 Solid Fuels		0		17	NO			
2 Oil and Natural Gas		751		30	0.0			
2 Industrial Processes		509		0.0	0.00008	364	260	0.0048
A Mineral Products		436		NO	NO	NO	NO	NO
B Chemical Industry		0		NE	0	NO	NO	NO
C Metal Production		72		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		164	14			
A Enteric Fermentation		0		150	NO			
B Manure Management		0		14	0.8			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	13.6			
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	12409	-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	11147	0	NO	NO			
E Other	jk	1261	-136	NE	NO			
6 Waste		0		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		0		0	0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Scotland, 1999)

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 5A Removals include removals to forest soil & litter (-1107 Gg CO2) and to forest products (-609 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-82 Gg CO2) and emissions from soils due to liming (103 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (1173 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (88 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

TABLE 1 SECTORAL REPORT FOR ENERGY (Wales, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		37828	77	1.1
A Fuel Combustion Activities (Sectoral Approach)		37010	6.8	1.1
1 Energy Industries		15230	0.40	0.4
a Public Electricity and Heat Production		10955	0.2	0.3
b Petroleum Refining		3471	0.14	0.06
c Manufacture of Solid Fuels and Other Energy Industries		804	0.07	0.003
2 Manufacturing Industries and Construction		10719	2.6	0.3
a Iron and Steel		7564	2.30	0.129
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		3155	0.31	0.166
3 Transport		5062	1.5	0.2
a Civil Aviation	b	0	0	0
b Road Transportation		4859	1.54	0.162
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		5998	2.3	0.15
a Commercial/Institutional		1610	0.12	0.015
b Residential		4113	2.1	0.07
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	70	0
1 Solid Fuels		818	52	NO
a Coal Mining		0	52	NO
b Solid Fuel Transformation		818	0.22	NE
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	0	18	0
a Oil		0	0.00	0
b Natural Gas		0	18	NO
c Flaring		0.0	0.0	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, 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	1844	0.3	0.011	0.06	407	0.0031
A Mineral Products	918	0	0	0	0	0
1 Cement Production	539	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	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	NO	NE	NO	NO	NO	NO
B Chemical Industry	0	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	0.05	NE	NO	NO	NO
C Metal Production	926	0.25	0.011	0	386	0.002
1 Iron and Steel Production	736	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	141	10
A Enteric Fermentation	130	0
1 Cattle	78.2	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	8.2	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	0.0	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			0.03
12 Solid Storage and Dry Lot			0.46
13 Other (poultry litter, stables etc)			0.03
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	9.5
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	0.0
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		0.0	-1155	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0.0	-1155	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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	ik	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		0	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	0.10
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		NO	NO	NO
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	SF6
		Gg				CO2 equivalent Gg		Gg
Total National Emissions and Removals	a	40678	-1170	274	11.2	0.06	407	0.0031
1 Energy		37828		77	1.1			
A Fuel Combustion		37010		7	1.1			
1 Energy Industries		15230		0.4	0.4			
2 Manufacturing Industries and Construction		10719		2.6	0.3			
3 Transport		5062		1.5	0.2			
4 Other Sectors		5998		2.3	0.2			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		818		70	0			
1 Solid Fuels		818		52	NO			
2 Oil and Natural Gas		0		18	0.0			
2 Industrial Processes		1844		0.3	0.011	0.06	407	0.0031
A Mineral Products		918		NO	NO	NO	NO	NO
B Chemical Industry		0		0.05	0	NO	NO	NO
C Metal Production		926		0.3	0.011	NO	386	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	0.06	22	0.0011
G Other		NO		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	SF6
		Gg				CO2 equivalent Gg		Gg
3 Solvent and Other Product Use		0		NO	NO			
4 Agriculture		0		141	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	9.5			
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	0.00			
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		0		56	0.10			
A Solid Waste Disposal on Land		0.0		55	0			
B Wastewater Handling		0.0		1	0.10			
C Waste Incineration		NO		NO	NO			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Wales, 1990)

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 5A Removals include removals to forest soil & litter (-231 Gg CO2) and to forest products (-158 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-0 Gg CO2) and emissions from soils due to liming (119 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (0 Gg CO2)
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 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	39321	-1111	228	11.261	60	104	0.0030
1 Energy		36419		41	1.3			
A Fuel Combustion		35782		7	1.3			
1 Energy Industries		11505		0.6	0.3			
2 Manufacturing Industries and Construction		13330		3.5	0.3			
3 Transport		5151		1.3	0.5			
4 Other Sectors		5796		1.8	0.1			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		637		34	0			
1 Solid Fuels		637		17	NO			
2 Oil and Natural Gas		0		17	0.0			
2 Industrial Processes		1909		0.3	0.011	60	104	0.0030
A Mineral Products		958		NO	NO	NO	NO	NO
B Chemical Industry		0		0.05	0	NO	NO	NO
C Metal Production		951		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	9.4			
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	993	-1111	0.0	0.00			
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		0		46	0.10			
A Solid Waste Disposal on Land		0.0		45	0			
B Wastewater Handling		0.0		1	0.10			
C Waste Incineration		NO		NO	NO			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Wales. 1995)

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 5A Removals include removals to forest soil & litter (-238 Gg CO2) and to forest products (-198 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-16 Gg CO2) and emissions from soils due to liming (128 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (0 Gg CO2)
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 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	40964	-1034	219	12.631	176	111	0.0042
1 Energy	38278		37	1.7			
A Fuel Combustion	37678		8	1.7			
1 Energy Industries	12602		1.4	0.5			
2 Manufacturing Industries and Construction	13678		4.0	0.3			
3 Transport	5410		1.1	0.7			
4 Other Sectors	5989		1.6	0.1			
5 Other b	0		0	0			
B Fugitive Emissions from Fuels	600		29	0			
1 Solid Fuels	600		12	NO			
2 Oil and Natural Gas	0		17	0.0			
2 Industrial Processes	1730		0.4	0.011	176	111	0.0042
A Mineral Products	1084		NO	NO	NO	NO	NO
B Chemical Industry	0		0.05	0	NO	NO	NO
C Metal Production	646		0.3	0.011	NO	74	0.0024
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		133	NO			
B Manure Management		0		10	0.5			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	10.3			
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	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		0		39	0.10			
A Solid Waste Disposal on Land		0		38	0			
B Wastewater Handling		0		1.1	0.10			
C Waste Incineration		NO		NO	NO			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Wales. 1998)

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 5A Removals include removals to forest soil & litter (-249 Gg CO2) and to forest products (-216 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-10 Gg CO2) and emissions from soils due to liming (86 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (0 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

TABLE 1 SECTORAL REPORT FOR ENERGY (Wales, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O
	Gg		
Total Energy	38028	35	1.7
A Fuel Combustion Activities (Sectoral Approach)	37191	9	1.7
1 Energy Industries	11503	1.5	0.49
a Public Electricity and Heat Production	8016	1.4	0.43
b Petroleum Refining	2542	0.1	0.05
c Manufacture of Solid Fuels and Other Energy Industries	944	0.07	0.009
2 Manufacturing Industries and Construction	14359	3.9	0.28
a Iron and Steel	10751	3.5	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	3608	0.40	0.14
3 Transport	5386	1.0	0.81
a Civil Aviation b	0	0	0
b Road Transportation	5232	0.98	0.756
c Railways	153	0.01	0.059
d Navigation b	0	0	0
e Other(Aircraft Support)	0.42	0.00002	0.0002

TABLE 1 SECTORAL REPORT FOR ENERGY (Wales, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		5944	2.2	0.11
a Commercial/Institutional		1343	0.11	0.006
b Residential		4341	2.02	0.04
c Agriculture/Forestry/Fishing		261	0.02	0.06
5 Other (Military Aircraft & Naval Vessels))	b	0	0	0
B Fugitive Emissions from Fuels		837	26	0
1 Solid Fuels		836	10	NO
a Coal Mining		0	9.5	NO
b Solid Fuel Transformation		836	0.20	NE
c Other (please specify)		NO	NO	NO
2 Oil and Natural Gas	c	0.3	17	0
a Oil		0	0.05	0
b Natural Gas		0	16.6	NO
c Flaring		0.3	0.006	0.00001
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, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
	Gg			CO2 Equivalent Gg		Gg
Total Industrial Processes	2238	0.4	0.012	185	106	0.0043
A Mineral Products	1022	0	0	0	0	0
1 Cement Production	446	NO	NO	NO	NO	NO
2 Lime Production	NO	NO	NO	NO	NO	NO
3 Limestone and Dolomite Use	568	NO	NO	NO	NO	NO
4 Soda Ash Production and Use	8	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	NO	NE	NO	NO	NO	NO
B Chemical Industry	0	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	0.05	NE	NO	NO	NO
C Metal Production	1216	0.4	0.012	0	66.0	0.002
1 Iron and Steel Production	1109	0.36	0.012	NO	NO	NO
2 Ferroalloys Production	IE	NE	NO	NO	NO	NO
3 Aluminium Production	107	NO	NO	NO	66	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, 1999)

(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	185	40	0.002
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	139	1.5	NO
2 Foam Blowing		NO	NO	NO	2.1	NO	NO
3 Fire Extinguishers		NO	NO	NO	0.7	0.18	NO
4 Aerosols	f	NO	NO	NO	43	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	n	NO	NO	NO	NO	39	0.002
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	146	10
A Enteric Fermentation	135	0
1 Cattle	77.1	NO
2 Buffalo	NO	NO
3 Sheep	57.2	NO
4 Goats	0.03	NO
5 Camels and Llamas	NO	NO
6 Horses	0.63	NO
7 Mules and Asses	NO	NO
8 Swine	0.12	NO
9 Poultry	0	NO
10 Other (Deer)	0.010	NO
B Manure Management	11	0.5
1 Cattle	8.0	0
2 Buffalo	NO	0
3 Sheep	1.4	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	0.24	0
9 Poultry	0.83	0
9a Deer	0.0	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Wales, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CH4	N2O
		Gg	
B Manure Management (cont...)			
10 Anaerobic			NO
11 Liquid System			0.03
12 Solid Storage and Dry Lot			0.47
13 Other (poultry litter, stables etc)			0.04
C Rice Cultivation		NO	NO
D Agricultural Soils		NE	9.7
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, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	952	-1016	0	0
A Changes in Forest and Other Woody Biomass Stocks		0.0	-1001	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0.0	-1001	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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	878	0	NO	NO
E Other	jk	73	-15	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Wales, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O
	Gg		
Total Waste	0	36	0.11
A Solid waste Disposal on Land	0	35	0
1 Managed Waste Disposal on Land	0	35	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	NO	NO	NO
D 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	41166	-1016	217	12.069	185	106	0.0043
1 Energy		37976		35	1.7			
A Fuel Combustion		37140		8	1.7			
1 Energy Industries		11503		1.5	0.5			
2 Manufacturing Industries and Construction		14370		3.9	0.3			
3 Transport		5386		1.0	0.8			
4 Other Sectors		5881		2.0	0.1			
5 Other	b	0		0	0			
B Fugitive Emissions from Fuels		837		26	0			
1 Solid Fuels		836		10	NO			
2 Oil and Natural Gas	n	0		17	0.0			
2 Industrial Processes		2238		0.4	0.012	185	106	0.0043
A Mineral Products		1022		NO	NO	NO	NO	NO
B Chemical Industry		0		0.05	0	NO	NO	NO
C Metal Production		1216		0.4	0.012	NO	66	0.0024
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		146	10			
A Enteric Fermentation		0		135	NO			
B Manure Management		0		11	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	952	-1016	0.0	0.00			
A Changes in Forest and Other Woody Biomass Stocks	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		0		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		NO		NO	NO			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Wales, 1999)

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 5A Removals include removals to forest soil & litter (-260 Gg CO2) and to forest products (-246 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-5 Gg CO2) and emissions from soils due to liming (72 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (0 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

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		15377	8.9	0.5
A Fuel Combustion Activities (Sectoral Approach)		15377	8.9	0.5
1 Energy Industries		5339	0.15	0.1
a Public Electricity and Heat Production		5339	0.2	0.1
b Petroleum Refining		NO	NO	NO
c Manufacture of Solid Fuels and Other Energy Industries		NO	NO	NO
2 Manufacturing Industries and Construction		2091	0.12	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		2091	0.12	0.07
3 Transport		3003	0.8	0.12
a Civil Aviation	b	0	0	0
b Road Transportation		2982	0.8	0.1
c Railways		20	0.0007	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		4944	7.8	0.3
a Commercial/Institutional		775	0.07	0.006
b Residential		3929	7.7	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	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, 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	389	0	1.2	0.058	7.4	0.0004
A Mineral Products	389	0	0	0	0	0
1 Cement Production	389	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	NO	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 (Northern Ireland, 1990)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	113	8
A Enteric Fermentation	101	0
1 Cattle	87	NO
2 Buffalo	NO	NO
3 Sheep	13	NO
4 Goats	0.037	NO
5 Camels and Llamas	NO	NO
6 Horses	0.1	NO
7 Mules and Asses	NO	NO
8 Swine	1.0	NO
9 Poultry	0	NO
10 Other (Deer)	0.0	NO
B Manure Management	12	0.7
1 Cattle	9.0	0
2 Buffalo	NO	0
3 Sheep	0.3	0
4 Goats	0.0009	0
5 Camels and Llamas	NO	0
6 Horses	0.011	0
7 Mules and Asses	NO	0
8 Swine	2.1	0
9 Poultry	0.9	0
9a Deer	0.0	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Northern Ireland, 1990)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.03
12 Solid Storage and Dry Lot		0.57
13 Other (poultry litter, stables etc)		0.05
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	7.03
E Prescribed Burning of Savannas	NO	NO
F Field Burning of Agricultural residues g	0	0
1 Cereals	0.058	0.0011
2 Pulse	NO	NO
3 Tuber and Root	NO	NO
4 Sugar Cane	NO	NO
5 Other(Linseed)	0.0005	0.000010
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	0.0	-572	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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	0.9	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	0.9	0.000003	0.0001
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	17708	-587	154	9.5	0.06	7.4	0.0004
1 Energy		15377		9	0.5			
A Fuel Combustion		15377		9	0.5			
1 Energy Industries		5339		0.2	0.09			
2 Manufacturing Industries and Construction		2091		0.1	0.07			
3 Transport		3003		0.8	0.12			
4 Other Sectors		4944		8	0.3			
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		389		0	1.2	0.06	7.4	0.0004
A Mineral Products		389		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	7.7			
A Enteric Fermentation		0		101	NO			
B Manure Management		0		12	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		0.06	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	b	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		0.9		32	0.112			
A Solid Waste Disposal on Land		0.0		31	0			
B Wastewater Handling		0.0		1.1	0.112			
C Waste Incineration		0.9		0	0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Northern Ireland, 1990)

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 5A Removals include removals to forest soil & litter (-117 Gg CO2) and to forest products (-51 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-0 Gg CO2) and emissions from soils due to liming (89 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (484 Gg CO2)
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 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	18283	-642	149	10.2	29.2	1.0	0.0004
1 Energy		16275		4.5	0.8			
A Fuel Combustion		16275		4.5	0.8			
1 Energy Industries		6669		0.3	0.2			
2 Manufacturing Industries and Construction		1891		0.09	0.1			
3 Transport		2747		0.6	0.3			
4 Other Sectors		4968		3.6	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		335		0	1.5	29.2	1.0	0.0004
A Mineral Products		335		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
G Other		NO		NO	NO	NO	NO	NO

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	7.7			
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		0.9		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		0.9		0.000003	0.0001			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Northern Ireland, 1995)

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 5A Removals include removals to forest soil & litter (-121 Gg CO2) and to forest products (-44 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-0 Gg CO2) and emissions from soils due to liming (95 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (484 Gg CO2)
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 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	16510	-642	155	11.0	98	1.2	0.0008
1 Energy		14717		6.9	1.0			
A Fuel Combustion		14717		6.9	1.0			
1 Energy Industries		5978		0.7	0.3			
2 Manufacturing Industries and Construction		2349		0.11	0.09			
3 Transport		2177		0.5	0.5			
4 Other Sectors		4213		6	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		405		0	1.4	98	1.2	0.0008
A Mineral Products		405		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		112	NO			
B Manure Management		0		13	0.7			
C Rice Cultivation		NO		NO	NO			
D Agricultural Soils		NO		NO	7.8			
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	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		0		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		0		0	0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Northern Ireland. 1998)

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 5A Removals include removals to forest soil & litter (-139 Gg CO2) and to forest products (-84 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-0 Gg CO2) and emissions from soils due to liming (64 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (484 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

TABLE 1 SECTORAL REPORT FOR ENERGY (Northern Ireland, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
Total Energy		14459	6.0	1.1
A Fuel Combustion Activities (Sectoral Approach)		14459	6.0	1.1
1 Energy Industries		6207	0.76	0.28
a Public Electricity and Heat Production		6207	0.76	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		1956	0.10	0.08
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		1956	0.10	0.08
3 Transport		1743	0.48	0.49
a Civil Aviation	b	0	0	0
b Road Transportation		1723	0.47	0.49
c Railways		19	0.0008	0.007
d Navigation	b	0	0	0
e Other(Aircraft Support)		1.08	0.0001	0.0005

TABLE 1 SECTORAL REPORT FOR ENERGY (Northern Ireland, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2	CH4	N2O
		Gg		
4 Other Sectors		4554	4.6	0.2
a Commercial/Institutional		717	0.03	0.006
b Residential		3616	4.6	0.13
c Agriculture/Forestry/Fishing		221	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, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O	HFC	PFC	SF6
		Gg		CO2 Equivalent Gg		Gg
Total Industrial Processes	384	0	1.8	114.6	1.2	0.0008
A Mineral Products	384	0	0	0	0	0
1 Cement Production	379	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	3	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	NO	NE	NO	NO	NO	NO
B Chemical Industry	0	0	1.8	0	0	0
1 Ammonia Production	NO	NO	NO	NO	NO	NO
2 Nitric Acid Production	NO	NO	1.8	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, 1999)

(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	114.6	1.2	0.0008
1 Refrigeration and Air Conditioning Equipment		NO	NO	NO	77	0.8	NO
2 Foam Blowing		NO	NO	NO	1.2	NO	NO
3 Fire Extinguishers		NO	NO	NO	0.4	0.1	NO
4 Aerosols	f	NO	NO	NO	36	NO	NO
5 Solvents		NO	NO	NO	NO	NO	NO
6 Other (Electrical insulation, electronics applications, training shoes)	n	NO	NO	NO	NO	0.3	0.0008
G Other		NO	NO	NO	NO	NO	NO

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Northern Ireland, 1999)

(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
Total Agriculture	123	8
A Enteric Fermentation	110	0
1 Cattle	95	NO
2 Buffalo	NO	NO
3 Sheep	14	NO
4 Goats	0.017	NO
5 Camels and Llamas	NO	NO
6 Horses	0.2	NO
7 Mules and Asses	NO	NO
8 Swine	0.7	NO
9 Poultry	0	NO
10 Other (Deer)	0.003	NO
B Manure Management	13	0.7
1 Cattle	9.7	0
2 Buffalo	NO	0
3 Sheep	0.3	0
4 Goats	0.0004	0
5 Camels and Llamas	NO	0
6 Horses	0.014	0
7 Mules and Asses	NO	0
8 Swine	1.5	0
9 Poultry	1.2	0
9a Deer	0.0	0

TABLE 4 SECTORAL REPORT FOR AGRICULTURE (Northern Ireland, 1999)

(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4	N2O
	Gg	
B Manure Management (cont...)		
10 Anaerobic		NO
11 Liquid System		0.03
12 Solid Storage and Dry Lot		0.60
13 Other (poultry litter, stables etc)		0.06
C Rice Cultivation	NO	NO
D Agricultural Soils	NE	7.43
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, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 Emissions	CO2 Removals	CH4	N2O
		Gg			
Total Land-Use Change and Forestry	a	1571	-627	0	0
A Changes in Forest and Other Woody Biomass Stocks		0	-612	0	0
1 Tropical Forests		NO	NO	NO	NO
2 Temperate Forests	h	0.0	-612	NE	NE
3 Boreal Forests		NO	NO	NO	NO
4 Grasslands/Tundra		NO	NO	NO	NO
5 Other		NO	NO	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	1014	0	NO	NO
E Other	jk	557	-15	NO	NO

TABLE 6 SECTORAL REPORT FOR WASTE (Northern Ireland, 1999)

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2	CH4	N2O
	Gg		
Total Waste	0	21	0.136
A Solid waste Disposal on Land	0	20	0
1 Managed Waste Disposal on Land	0	20.0	NO
2 Unmanaged Waste disposal on Land	NO	NO	NO
3 Other	NO	NO	NO
B Wastewater Handling	0	1.2	0.116
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	0	0.010	0.02
D 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	16415	-627	150	11.1	115	1.2	0.0008
1 Energy	14459		6.0	1.1			
A Fuel Combustion	14459		6.0	1.1			
1 Energy Industries	6207		0.8	0.3			
2 Manufacturing Industries and Construction	1956		0.1	0.08			
3 Transport	1743		0.5	0.5			
4 Other Sectors	4554		4.6	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	384		0	1.8	115	1.2	0.0008
A Mineral Products	384		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	114.6	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		123	8.1			
A Enteric Fermentation		0		110	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	1571	-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	1014	0	NO	NO			
E Other	jk	557	-15	NE	NO			
6 Waste		0		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		0		0	0			
7 Other		NO		NO	NO			

Footnotes for Tables 1 to 7 [m] (Northern Ireland, 1999)

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 5A Removals include removals to forest soil & litter (-139 Gg CO2) and to forest products (-88 Gg CO2)
i 5D Emissions include removals to soils due to set aside of arable land (-0 Gg CO2) and emissions from soils due to liming (53 Gg CO2)
j 5E Emissions include emissions from soils due to upland drainage (73 Gg CO2), lowland drainage (0 Gg CO2) and peat extraction (484 Gg CO2)
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
n Emissions of SF6 exceed the official UK data owing to more recent data on electrical insulation emissions

SUMMARY REPORT FOR UK NATIONAL GREENHOUSE GAS INVENTORIES (1990)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6	
						P	A	P	A	P	A
		(Gg)				CO2 equivalent (Gg)				(Gg)	
Total National Emissions and Removals		**602826**	**-10556**	**3670.3**	**216**	**41.77**	**11373.84**	**250.18**	**2281.00**	**0.11**	**0.03**
1. Energy		**568692**		**1480.0**	**17.62**						
A. Fuel Combustion	Reference Approach	572762									
	Sectoral Approach	55655		119.8	17.31						
1. Energy Industries		228089		7.6	7.22						
2. Manufacturing Industries and Construction		94578		11.7	3.79						
3. Transport		116581		29.8	4.14						
4. Other Sectors		112041		70.4	1.95						
5. Other		5265		0.3	0.21						
B. Fugitive Emissions from Fuels		12138		1360.2	0.30						
1. Solid Fuels		3000		819.2	0.00						
2. Oil and Natural Gas		9138		541.0	0.30						
2. Industrial Processes		**14123**		**2.7**	**94.46**	**41.77**	**11373.84**	**250.18**	**2281.00**	**0.11**	**0.03**
A. Mineral Products		9555		0.0	0.00						
B. Chemical Industry		1358		1.9	94.42	0.00	0.00	0.00	0.00	0.00	0.00
C. Metal Production		3210		0.8	0.04				2031.00		0.02
D. Other Production		IE									
E. Production of Halocarbons and SF6							11373.17		0.00		0.00
F. Consumption of Halocarbons and SF6						41.77	0.67	250.18	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
3. Solvent and Other Product Use		**0**			**0.00**						
4. Agriculture		0		**1037.2**	**100.43**						
A. Enteric Fermentation				913.2	0.00						
B. Manure Management				111.3	5.11						
C. Rice Cultivation				0.0	0.00						
D. Agricultural Soils				0.0	95.07						
E. Prescribed Burning of Savannas				0.0	0.00						
F. Field Burning of Agricultural Residues				12.7	0.25						
G. Other				0.0	0.00						
5. Land-Use Change and Forestry		**19348**	**-10556**								
A. Changes in Forest and Other Woody Biomass Stocks			-9456								
B. Forest and Grassland Conversion		0									
C. Abandonment of Managed Lands		0	0								
D. CO2 Emissions and Removals from Soil		15439	0								
E. Other		3908	-1100								
6. Waste		**663**		**1150.4**	**3.47**						
A. Solid Waste Disposal on Land		0		1117.0	0.00						
B. Wastewater Handling		0		33.4	3.33						
C. Waste Incineration		663		0.0	0.13						
D. Other		0		0.0	0.00						
7. Other (please specify)		**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Memo Items: (7)											
International Bunkers		**21349**		**3.5**	**0.87**						
Aviation		14791		**2.9**	**0.45**						
Marine		6559		**0.6**	**0.42**						
Multilateral Operations		**NO**		**NO**	**NO**						
CO2 Emissions from Biomass		**3850**									

SUMMARY REPORT FOR UK NATIONAL GREENHOUSE GAS INVENTORIES (1995)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6	
					P	A	P	A	P	A
	(Gg)				CO2 equivalent (Gg)				(Gg)	
Total National Emissions and Removals	**563409**	**-11528**	**3053.5**	**182**	**4017.30**	**15205.03**	**753.81**	**1094.10**	**0.11**	**0.05**
1. Energy	**534255**		**1097.9**	**21.41**						
A. Fuel Combustion — Reference Approach	553172									
A. Fuel Combustion — Sectoral Approach	525044		90.9	21.17						
1. Energy Industries	197766		15.6	7.01						
2. Manufacturing Industries and Construction	91653		11.8	3.61						
3. Transport	117939		23.8	8.86						
4. Other Sectors	113815		39.6	1.54						
5. Other	3871		0.2	0.16						
B. Fugitive Emissions from Fuels	9211		1006.9	0.23						
1. Solid Fuels	1987		504.3	0.00						
2. Oil and Natural Gas	7224		502.7	0.23						
2. Industrial Processes	**12524**		**2.6**	**61.30**	**4017.30**	**15205.03**	**753.81**	**1094.10**	**0.11**	**0.05**
A. Mineral Products	8554		0.0	0.00						
B. Chemical Industry	1379		1.9	61.27	0.00	0.00	0.00	0.00	0.00	0.00
C. Metal Production	2591		0.7	0.03				372.35		0.03
D. Other Production	IE									
E. Production of Halocarbons and SF6						13959.75		0.00		0.00
F. Consumption of Halocarbons and SF6					4017.30	1245.28	753.81	721.75	0.11	0.02
G. Other	0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Solvent and Other Product Use	**0**			**0.00**						
4. Agriculture	0		**1006.6**	**95.44**						
A. Enteric Fermentation			896.8	0.00						
B. Manure Management			109.9	5.01						
C. Rice Cultivation			0.0	0.00						
D. Agricultural Soils			0.0	90.43						
E. Prescribed Burning of Savannas			0.0	0.00						
F. Field Burning of Agricultural Residues			0.0	0.00						
G. Other			0.0	0.00						
5. Land-Use Change and Forestry	**16215**	**-11528**								
A. Changes in Forest and Other Woody Biomass Stocks		-10428								
B. Forest and Grassland Conversion	0									
C. Abandonment of Managed Lands	0	0								
D. CO2 Emissions and Removals from Soil	12332	0								
E. Other	3883	-1100								
6. Waste	**415**		**946.4**	**3.50**						
A. Solid Waste Disposal on Land	0		912.0	0.00						
B. Wastewater Handling	0		34.3	3.39						
C. Waste Incineration	415		0.0	0.11						
D. Other	0		0.0	0.00						
7. Other (please specify)	**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Memo Items: (7)										
International Bunkers	**25611**		**4.0**	**1.01**						
Aviation	19012		**3.4**	**0.58**						
Marine	6599		**0.6**	**0.42**						
Multilateral Operations	**NO**		**NO**	**NO**						
CO2 Emissions from Biomass	**5223**									

SUMMARY REPORT FOR UK NATIONAL GREENHOUSE GAS INVENTORIES (1998)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6	
					P	A	P	A	P	A
	(Gg)				CO2 equivalent (Gg)				(Gg)	
Total National Emissions and Removals	**560253**	**-11528**	**2762.7**	**188**	**8607.30**	**20182.62**	**500.64**	**651.74**	**0.11**	**0.05**
1. Energy	**531332**		**942.1**	**26.33**						
A. Fuel Combustion — Reference Approach	546626									
Sectoral Approach	523367		95.5	26.13						
1. Energy Industries	188985		22.7	7.82						
2. Manufacturing Industries and Construction	89806		12.4	3.24						
3. Transport	122767		19.7	13.38						
4. Other Sectors	118627		40.5	1.56						
5. Other	3181		0.2	0.13						
B. Fugitive Emissions from Fuels	7966		846.6	0.20						
1. Solid Fuels	1688		372.3	0.00						
2. Oil and Natural Gas	6277		474.3	0.20						
2. Industrial Processes	**12397**		**2.5**	**59.45**	**8607.30**	**20182.62**	**500.64**	**651.74**	**0.11**	**0.05**
A. Mineral Products	9631		0.0	0.00						
B. Chemical Industry	1111		1.9	59.42	0.00	0.00	0.00	0.00	0.00	0.00
C. Metal Production	1656		0.6	0.03				223.41		0.03
D. Other Production	IE									
E. Production of Halocarbons and SF6						16532.71		0.00		0.00
F. Consumption of Halocarbons and SF6					8607.30	3649.91	500.64	428.33	0.11	0.02
G. Other	0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Solvent and Other Product Use	**0**			**0.00**						
4. Agriculture	**0**		**1006.9**	**98.44**						
A. Enteric Fermentation			895.0	0.00						
B. Manure Management			111.8	5.03						
C. Rice Cultivation			0.0	0.00						
D. Agricultural Soils			0.0	93.42						
E. Prescribed Burning of Savannas			0.0	0.00						
F. Field Burning of Agricultural Residues			0.0	0.00						
G. Other			0.0	0.00						
5. Land-Use Change and Forestry	**16523**	**-11528**								
A. Changes in Forest and Other Woody Biomass Stocks		-10428								
B. Forest and Grassland Conversion	0									
C. Abandonment of Managed Lands	0	0								
D. CO2 Emissions and Removals from Soil	12997	0								
E. Other	3527	-1100								
6. Waste	**0**		**811.2**	**3.64**						
A. Solid Waste Disposal on Land	0		774.0	0.00						
B. Wastewater Handling	0		37.2	3.50						
C. Waste Incineration	0		0.1	0.15						
D. Other	0		0.0	0.00						
7. Other (please specify)	**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Memo Items: (7)										
International Bunkers	**32910**		**4.8**	**1.30**						
Aviation	24122		**4.0**	**0.74**						
Marine	8788		**0.8**	**0.56**						
Multilateral Operations	**NO**		NO	**NO**						
CO2 Emissions from Biomass	**6118**									

SUMMARY REPORT FOR UK NATIONAL GREENHOUSE GAS INVENTORIES (1999)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		CO2 emissions	CO2 removals	CH4	N2O	HFCs		PFCs		SF6	
						P	A	P	A	P	A
		(Gg)				CO2 equivalent (Gg)				(Gg)	
Total National Emissions and Removals		**547800**	**-11539**	**2630.8**	**138**	**9653.09**	**6205.55**	**541.23**	**678.19**	**0.11**	**0.05**
1. Energy		**518049**		**874.2**	**27.55**						
A. Fuel Combustion	Reference Approach	541095									
	Sectoral Approach	509917		108.6	27.35						
1. Energy Industries		179116		32.8	7.80						
2. Manufacturing Industries and Construction		88668		12.0	3.31						
3. Transport		121576		18.4	14.68						
4. Other Sectors		117421		45.2	1.43						
5. Other		3136		0.2	0.13						
B. Fugitive Emissions from Fuels		8132		765.6	0.20						
1. Solid Fuels		2242		310.9	0.00						
2. Oil and Natural Gas		5891		454.7	0.20						
2. Industrial Processes		**13480**		**2.6**	**11.79**	**9653.09**	**6205.55**	**541.23**	**678.19**	**0.11**	**0.05**
A. Mineral Products		9136		0.0	0.00						
B. Chemical Industry		1108		1.9	11.76	0.00	0.00	0.00	0.00	0.00	0.00
C. Metal Production		3237		0.7	0.03				209.87		0.03
D. Other Production		IE									
E. Production of Halocarbons and SF6							1926.51		0.00		0.00
F. Consumption of Halocarbons and SF6						9653.09	4279.04	541.23	468.32	0.11	0.02
G. Other		0		0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Solvent and Other Product Use		**0**			**0.00**						
4. Agriculture		0		**1001.8**	**95.40**						
A. Enteric Fermentation				892.4	0.00						
B. Manure Management				109.5	5.15						
C. Rice Cultivation				0.0	0.00						
D. Agricultural Soils				0.0	90.25						
E. Prescribed Burning of Savannas				0.0	0.00						
F. Field Burning of Agricultural Residues				0.0	0.00						
G. Other				0.0	0.00						
5. Land-Use Change and Forestry		**16271**	**-11539**								
A. Changes in Forest and Other Woody Biomass Stocks			-10439								
B. Forest and Grassland Conversion		0									
C. Abandonment of Managed Lands		0	0								
D. CO2 Emissions and Removals from Soil		12663	0								
E. Other		3608	-1100								
6. Waste		**0**		**752.1**	**3.62**						
A. Solid Waste Disposal on Land		0		716.0	0.00						
B. Wastewater Handling		0		36.0	3.45						
C. Waste Incineration		0		0.1	0.17						
D. Other		0		0.0	0.00						
7. Other (please specify)		**0**	**0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Memo Items: (7)											
International Bunkers		**31896**		**4.9**	**1.19**						
Aviation		25539		**4.3**	**0.79**						
Marine		6357		**0.6**	**0.41**						
Multilateral Operations		**NO**		**NO**	**NO**						
CO2 Emissions from Biomass		**7000**									