BELGIUM'S GREENHOUSE GAS INVENTORY (1990-2001)

National Inventory Report
submitted under the United Nations Framework Convention on Climate Change

April 2003

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CHAPTER 1 : INTRODUCTION

1.1. Overview

This second National Inventory Report documents the Belgian greenhouse gas emission inventory in accordance with the reporting guidelines on annual inventories of the *United Nations Framework Convention on Climate Change* (UNFCCC). It is aimed at complying with decisions 3/CP.5 and 11/CP.4 of the *Conference of the Partie*s, and the Council Decision 1999/296/EC for a Monitoring Mechanism of Community CO_2 and other greenhouse gas emissions.

The greenhouse gas inventory presented here contains information on anthropogenic emissions by sources and removals by sinks for direct (CO_2, CH_4, N_2O, PFCs, HFCs, SF_6) and indirect (CO, NO_x, NMVOCs, SO_x) greenhouse gases. It covers the period 1990-2001. Inventory data for the years 1990 to 2000 have been recalculated, what constitutes a major update on the inventories reported previously.

This second National Inventory Report is presented according to the structure outlined in document FCCC/SBSTA/2002/L.5/Add.1, amended to fit to the Belgian national context. Complete CRF tables, for years 1990 to 2001, are provided as an annex to this report, under electronic format. Next to the emissions data, the CRF-tables are completed with – as requested - the standard indicators (notation keys), providing information on data gaps, methods applied, emission factors used, completeness and quality.

This national inventory report includes a description of the methodologies and data sources used for estimating emissions by sources and removals by sinks, a discussion of these estimates and their trends (including an analysis of the key source categories), and information on recalculation, uncertainties, quality assessment and quality control.

1.2. Institutional arrangements and process of inventory preparation

In the Belgian federal context, the major part of environmental responsibilities lies with the regions. Compiling greenhouse gas emissions inventories is one of these responsibilities. Each region implements the necessary means to establish their own emission inventory in accordance with the FCCC guidelines for the common reporting format. The emission inventories of the three regions are subsequently combined to form the national greenhouse gas emission inventory. Since 1980, the three regions have been developing different methodologies (depending on various external factors) for compiling their atmospheric emission inventories. Obviously, this requires some co-ordination to ensure the consistency of the data and the establishment of the national inventory. This co-ordination is one of the permanent duties of the Working Group on « Emissions » of the *Co-ordination Committee for International Environmental Policy* (CCIEP), where the different actors decide how the regional data will be aggregated to a national total and which data will be sent officially for Belgium – taking into account the specific characteristics and interests of each region as well as the available means. The *Interregional Environment Unit* (CELINE - IRCEL) is responsible for integrating the emission data from the inventories of the three regions and for compiling the national inventory to be submitted to the Conference of the Parties to the United Nations Framework Convention on Climate Change and to the EC, under the Council Decision 1999/296/EC of 26 April 1999 for a Monitoring Mechanism of Community CO_2 and other greenhouse gas emissions.

1.3. Description of methodologies and data sources used

As a consequence of the responsibility of the regions in compiling greenhouse gas inventories, concomitant methodologies have been developed by the three regions for compiling their inventory from basic data. This section describes the general approach developed by each region. A similar presentation of the three regions has been applied in the chapters 3 to 8 for each of the IPCC sectors, except for fluorinated gases, which are estimated at the national level only (see section 4.5).

As the QA/QC procedures and the uncertainty analysis are not fully implemented for the time being, these are not described in chapters 3 to 8 for each sector, but a general description is provided in section 1.5 and 1.6 below

1.3.1. Flemish Region

In Flanders, the greenhouse gas inventory is set up by the *Department Monitoring and Research* of the *Flemish Environmental Agency* (VMM).

CO_2 emissions

CO_2 emissions are mainly calculated on the basis of the energy balance, which is annually established by the *Flemish Institute for Technological Research* (VITO) [1] funded by the Flemish Region. This is based on available statistical data and models, on the information coming from the obliged annual reporting of industrial emissions (mainly class I and class II companies and for emissions exceeding a given treshold value, compulsory since 1993) and on a survey among energy suppliers, federations and individual consumers. The methodology is described in the annual reporting document and is fine-tuned whenever necessary. Starting from this energy balance, the CO_2 emissions are calculated using CO_2 emission factors. These are mostly the default IPCC emission factors from the Revised 1996 Guidelines, except for some special products (refinery gas, waste products).

The other CO_2 emissions (non-energy consumption, waste incineration) are also calculated using the IPCC methodology. Process emissions from steel production are calculated by using a country-specific methodology.

In general, mostly Tier 1 methodology, the sectoral approach, was used for estimating CO_2 emissions. No data on carbon sinks in the Flemish Region are available so far; sinks in Flanders are presumably small compared to Belgium.

CH_4 and N_2O emissions

CH_4 and N_2O emissions are calculated by multiplying an activity data with an emission factor. Some of the emission factors used originate from CITEPA [2], an institute that established these factors in the framework of the CORINAIR inventory. In some cases these emission factors correspond with the emission factors described in the joint EMEP/CORINAIR handbook [3]. Other sources of emission factors are TNO [4] and country specific emission factors. Emissions of road transport are estimated using the Copert methodology [5] and emissions of air traffic are calculated using the EMEP/CORINAIR-methodology [3].

Country-specific methodologies are developed for calculating the emissions of navigation and transport via railways and for agriculture (reference [6] for CH_4 and [7] for N_2O) and for solid waste disposal [8].

1.3.2. Walloon Region

The emission inventories of the Walloon Region are compiled by the *General Directorate for natural resources and environment* (DGRNE) using the IPCC methodology (or EMEP/CORINAIR for some sectors where IPCC does not provide emission factors). Emission factors used are examined with all industrial sectors. In some cases as agriculture and forestry, the emissions estimates are based on a specific study reflecting the Walloon environment.

1.3.3. Brussels-Capital Region

The emission inventories of the Brussels Capital Region are compiled by the *Brussels Institute for Environmental Management* (IBGE-BIM) using the CORINAIR methodology (or IPCC for some sectors). The emissions are calculated by multiplying an activity data by an emission factor. Generally, these activity data and emission factors used in the Brussels Inventory are estimated on the basis of research projects funded by IBGE-BIM. These projects combine the socio-economic Brussels specificities and the reference values found in the joint EMEP/Corinair handbook [3] as well as in other reference works (IPCC Guidelines, specific bibliographies like PARCOM, TNO, EPA, …). The different sectors taken into account in the Brussels emissions inventory reflect the characteristics of the particular urban environment.

1.4. Key sources categories

Key source categories were identified according to the Tier 1 method described in the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Both a Level Assessment (contribution of each source category to the total national estimate) and a Trend Assessment (contribution of each source category's trend to the total trend) were conducted.

The key source analysis was realised on the basis of a set of sub-categories, at the level of detail of the Sectoral Report Tables. When appropriate (detail for sub-categories not available), sub-categories were aggregated at a higher level. Sources that do not occur in Belgium, as well as those that are not estimated (no data), were excluded. LUCF sources were not considered for this analysis. Each greenhouse gas emitted from a single source category was considered separately, except for fluorinated gases. This procedure led to the determination of a set of forty seven source categories, covering 99.3% of the total aggregated emissions. The key source analysis was then performed, using CO_2-equivalent emissions calculated by means of the global warming potentials (GWPs) specified in the UNFCCC reporting guidelines on annual inventories.

The Level Assessment (see Annex 1) resulted in the identification of twenty four key sources, covering 95%[1] of the total national aggregated emissions. Twenty five key sources were identified from the Trend Assessment (see Annex 1), as those that contribute 95% to the trend of the inventory. Key source categories identified form the Level and the Trend Assessments overlap to a large extent. As a whole (Level and Trend Assessments), twenty nine key source categories were determined (Table 1.1). The absolute change in direct greenhouse gas emissions of these key sources over the period 1990-2001 is listed in Table 1.1 and shown in Figure 1.1.
Road transportation is the first key source of greenhouse gas emissions in Belgium (15.6% of total aggregated emissions). It constitutes one of the main drivers of emissions trends (Annex 1). The

[1] This threshold (95%) is recommended in the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, for both the Level Assessment and the Trend Assessment ; it was determined to be the level at which 90% of the uncertainty in a 'typical' inventory would be covered by key source categories, for the Tier 1 method.

absolute increase in CO_2 emissions from road transportation is the highest among the key sources (Table 1.1). Road transportation, electricity production, and fuel combustion in the residential sector are pointed out by the Level Assessment as the three main key source categories, each contributing to about 15% of the total national emissions (together, these three sources cover 44.2% of the total emissions). The iron and steel industry and the IPCC category 1.A.2.c (chemicals) also constitute major key sources, which respectively account for 8.2% and 6.1% of the total emissions.

The three most important key sources of non-CO2 emissions in Belgium are the N_2O emissions from agricultural soils (3.1% of the total emissions), the CH_4 emissions from enteric fermentation from cattle (2.7%), and the N_2O emissions from nitric acid production (2.7%). One may finally notice that the five key source categories which displayed the most important absolute changes in their emissions over the period 1990-2000 (figure 1.1,table 1.1), are the road transportation (+4524 Gg CO_2-eq.), chemicals (+3704 Gg CO_2-eq.), commercial and institutional sectors (+2053 Gg CO_2-eq.), .), iron and steel industries (+1799Gg CO_2-eq.), and residential (+1577 Gg CO_2-eq.). On the contrary, manufacturing industries and construction (1.A.2.f; -5174 Gg CO2-eq), manufacture of solid fuels and energy industries (-1640 Gg CO_2-eq) and solid waste disposal on land (-1062 Gg CO_2-eq.) are the source categories that displayed the most important drop in GHG emissions.

This key source analysis highlighted one main discrepancy between the inventory for the years 1990 and 2001: for the year 1990, the "Reporter" software automatically allocated the emissions from the utilities of the manufacturing industries (i.e. manufacture in metal, textile, cement, lime, asphalt concrete, glass, mineral wool, bricks and tiles, fine ceramic materials) in category 1.A.2.f. of the CRF. For the year 2001, these emissions were allocated in each sector. This discrepancy gives a wrong trend in those categories, especially in "iron and steel" and "chemicals" which appears as key source categories. For example, "iron and steel" emissions should have rather decreased since 1990, while the category "other" should be rather stable. This issue is also discussed in section 9.2.

IPCC Source Categories	**Direct Greenhouse Gas**	**Criteria for identification**	**Absolute emission trend (1990-2001)**
Energy			Gg CO_2-eq
1.A.1.a. Public Electricity and Heat Production	CO2	Level, Trend	-875
1.A.1.b. Petroleum Refining	CO2	Level, Trend	611
1.A.1.c. Manufacture of Solid Fuels and Other Energy Industries	CO2	Trend	-1640
1.A.2. Manufacturing Industries and Construction	N2O	Trend	-630
1.A.2.a. Iron and Steel	CO2	Level, Trend	1799
1.A.2.c. Chemicals	CO2	Level, Trend	3704
1.A.2.d. Pulp, Paper and Print	CO2	Level, Trend	449
1.A.2.e. Food Processing, Beverages and Tobacco	CO2	Level	-116
1.A.2.f. Manufacturing Industries and Construction - Other	CO2	Level, Trend	-5174
1.A.3.b. Road Transportation	CO2	Level, Trend	4524
1.A.3.b. Road Transportation	N2O	Trend	504
1.A.4. Fuel combustion activities - Other Sectors	N2O	Trend	-251
1.A.4.a. Commercial/Institutional	CO2	Level, Trend	2053
1.A.4.b. Residential	CO2	Level, Trend	1577
1.A.4.c. Agriculture/Forestry/Fisheries	CO2	Level, Trend	-442
Industrial Process			
2.A.1. Cement Production	CO2	Level, Trend	751
2.A.2. Lime Production	CO2	Level, Trend	556
2.B.1. Ammonia Production	CO2	Level, Trend	732
2.B.2. Nitric Acid Production	N2O	Level	472
2.C.1. Iron and Steel Production	CO2	Level, Trend	-281
2.F. Consumption of Halocarbons and SF6	HFC, SF6	Level, Trend	889
2.G. Other industrial processes	CO2	Level, Trend	322
Agriculture			
4.A.1. Enteric Fermentation from Cattle	CH4	Level, Trend	-402
4.B.1. Manure Management (Cattle)	CH4	Level	53
4.B.8. Manure Management (Swine)	CH4	Level	147
4.D. N2O emissions from Agricultural Soils	N2O	Level, Trend	-344
Waste			
6.A. Solid Waste Disposal on Land	CH4	Level, Trend	-1062
6.C. Waste Incineration	CO2	Level, Trend	548
6.D. Other	CH4	Trend	291

Table 1.1. : Source category analysis, summary of the key sources (see details in annex C)

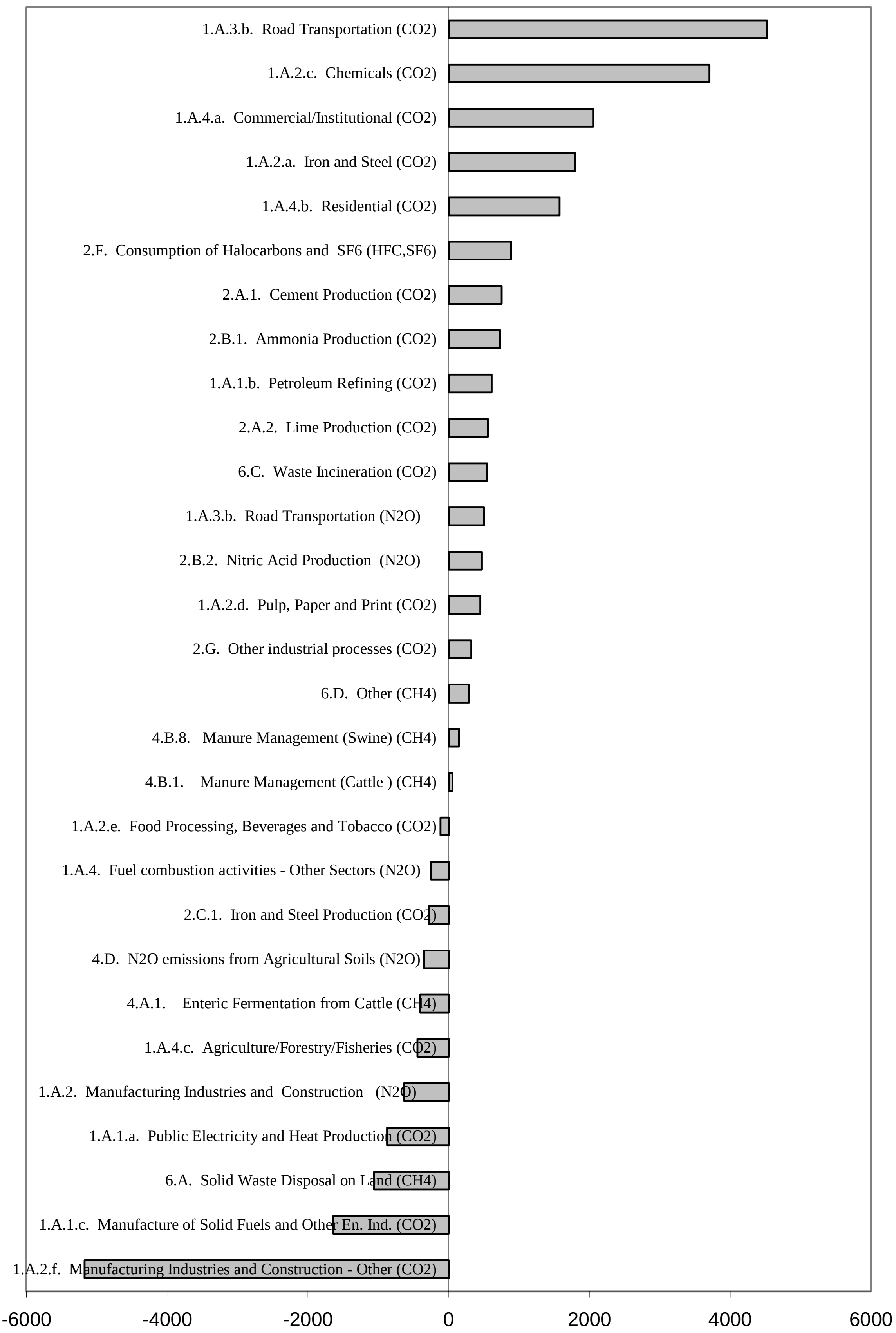

Figure 1.1. : Absolute GHG Emission Trends 1990-2001, key sources categories

1.5. QA/QC plan and related issues

The Working Group on « Emissions » of the *Co-ordination Committee for International Environmental Policy* (CCIEP) has conducted intern quality insurance and quality control work by continuously exchanging information about methodologies used and estimated results.

Following the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas inventories (june 2001), QC procedures (Tier 1) will be implemented to check the inventory on selected sets of data and processes. In a first approach, the key sources categories will be checked over their input data, their parameters and their calculations. In this view, several meetings are conducted since January 2003 with the three regions to identify for each sector on which level the Good Practice Guidance (e.g. uncertainty analysis, QA/QC,…) has to be implemented and to devise a work programme until the next submission.

Independent audits of the greenhouse gas inventories of the regions and the national inventory have started in the course of 2002. The purpose of these audits is to analyse the difficulties encountered while compiling the regional and national emission inventories in order to improve the quality and completeness of the Belgian national emission inventory. The audits are finalised for some regions, others will be realised in 2003.

The results of the audit of the Flemish emission inventory of greenhouse gases show clearly that - taking into account the limitations in available time, manpower and means - this inventory is of qualitative good value. The difference between the actual situation in Flanders and the fulfilling of the IPCC guidelines is mainly the absence of the complete implementation of the IPCC Good Practice Guidance. In this respect Flanders does not differ a lot of the most other member states. As mentioned already above working groups are set up since the beginning of 2003 to investigate in detail the implementation of the Good Practice Guidance for the different sectors in Belgium and to try to limit the inconsistencies between the 3 regional emission inventories in Belgium as much as possible.

In Flanders, the procedures to prepare the Flemish energy balance are part of a certified ISO9001 system but these procedures do not include all checks proposed in the IPCC guidelines.

In Wallonia, an independent inventory of greenhouse gas emissions is conducted yearly by external consultants, in the framework of the Air Plan elaboration. An harmonisation of the presentation of the results by sectors will be conducted in 2003, with the aim to allow a detailed comparison with the UNFCCC inventory. This independent inventory would then be used as a basis for the implementation of a QA procedure of the Walloon UNFCCC inventory.

1.6 General uncertainty evaluation

There has so far been no uncertainty analysis of the national greenhouse gas emission inventory in Belgium, although some attempts have been made at determining the uncertainty of CO_2 emissions from fossil fuel combustion in the Flemish Region on the basis of the IPCC guidelines (Tier 1). Furthermore an assessment of key sources in the CO2 emission inventory was carried out in Flanders. Key sectors, which have a large influence on the 2000 emissions on the one hand (level assessment) and on emission trends on the other hand (trend assessment), were identified. Improving the emission inventory for these particular sectors is a priority. Further work has to be done in order to refine approximations for these sectors, and where necessary for other categories and greenhouse gases. A better knowledge of the uncertainty on activity data and emission factors is therefore essential.

CHAPTER 2 : TRENDS IN GREENHOUSE GAS EMISSIONS

Information from the national greenhouse gas inventory for years 1990 to 2001 is discussed in this section. Emission trends by sources are commented for each greenhouse gas, as well as in an aggregated format, using global warming potential (GWP) values. A distance-to-target assessment, aiming at evaluating progress of Belgium towards fulfilling its greenhouse gas emission target, and the distribution of the emissions by gases and by sources are commented as well, both at national and regional levels.

2.1. Emission trends for aggregated greenhouse gas emissions

Aggregated emissions of the three major greenhouse gases (CO_2, CH_4, N_2O), expressed in CO_2 equivalent, have increased by 5.8 % during 1990-2001. Emissions of CO_2 increased 7.7% during 1990-2001 (Figure 2.1), while CH_4 and N_2O emissions have dropped with respectively 7.2% and 1.5 % during the same period (Table 2.2).

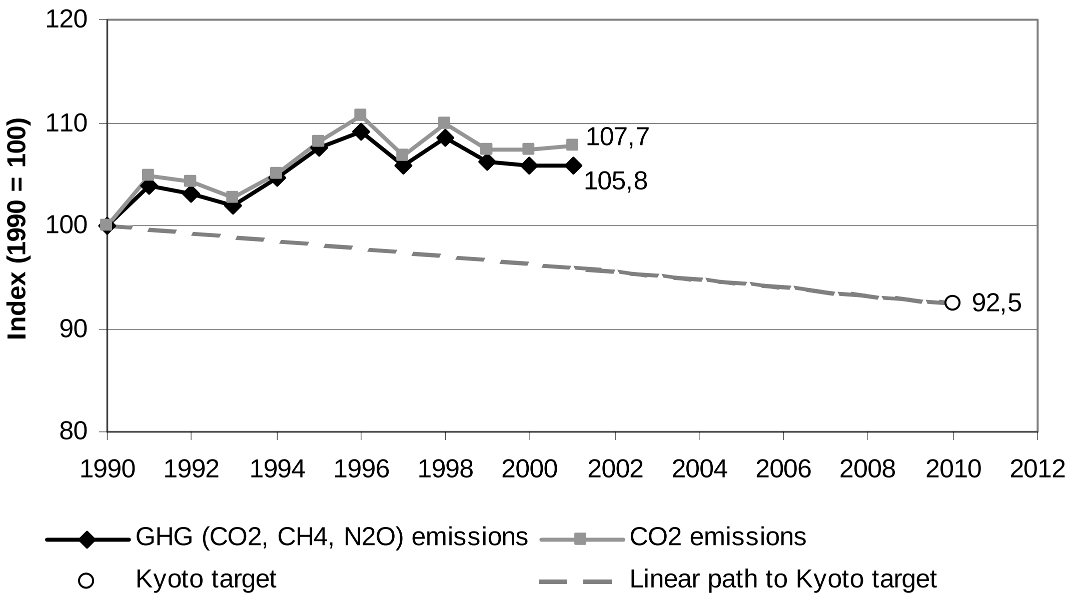

Figure 2.1. Belgium greenhouse gas emissions 1990-2001 compared with Kyoto target (excluding LUCF and F-gases)

The share of regional emissions in total national greenhouse gases emissions (excluding LUCF and fluorinated gases) in the period 1990-2001 is given in table 2.1. and the regional trends are given in figure 2.2. Trends observed in the three regions show quite different patterns: greenhouse gas emissions were more or less stable in Wallonia over the period 1990-2001 (-1.6%), whereas these emissions increased in Flanders and Brussels respectively by 10.5% and 7.6%.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Flanders	82534	85677	86863	86677	88368	90378	94095	91365	96210	91242	91161	91209
Wallonia	53990	55993	53706	52326	54409	56452	54514	52875	51893	53689	53156	53121
Brussels	4282	4650	4635	4601	4484	4604	5057	4638	4651	4583	4608	4608
Belgium	**140806**	**146320**	**145204**	**143603**	**147260**	**151434**	**153666**	**148879**	**152754**	**149514**	**148924**	**148938**

Table 2.1. : Overview of regions contribution to Belgium greenhouse gas emissions from 1990 to 2001 in CO_2 equivalent (Gg), excluding LUCF and fluorinated gases

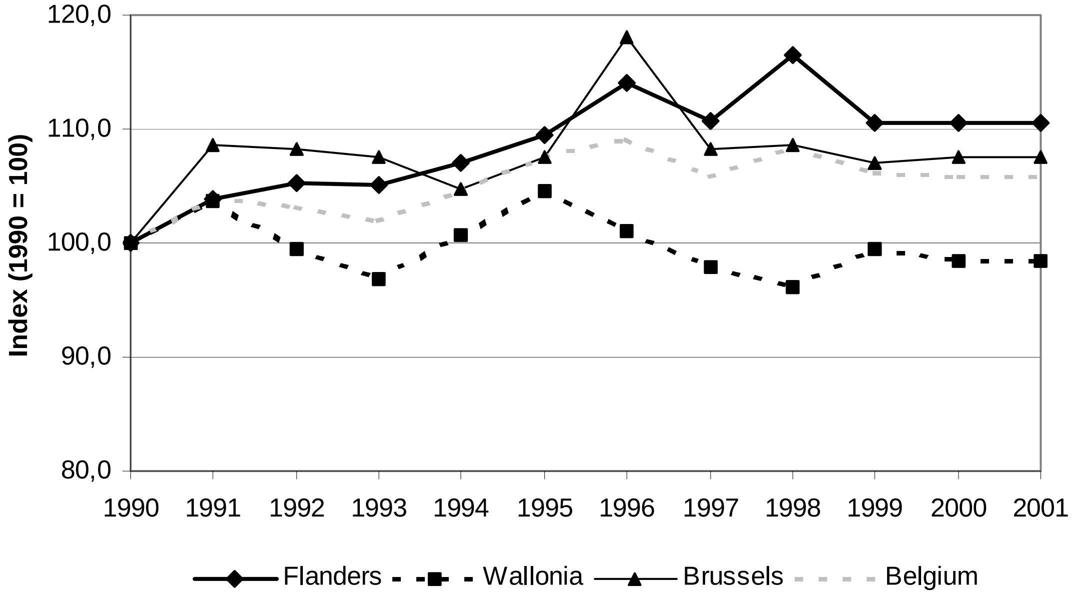

Figure 2.2. Belgium greenhouse gas emissions 1990-2001 : trends by Regions (excluding LUCF and fluorinated gases)

2.2. Emission trends by gas

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	CO_2 equivalent (Gg)											
Net CO_2 emissions/ removals	116149	121910	120896	119011	121872	125543	128344	123861	127477	124649	124509	124989
CO_2 emissions (without LUCF)	117749	123510	122714	120887	123805	127454	130233	125728	129322	126472	126331	126803
CH_4	11212	11293	11336	11286	11428	11261	11182	11108	11175	10919	10716	10401
N_2O	12164	11860	11500	11771	12306	12959	12472	12009	12511	12382	12122	11980
HFCs	NE	NE	NE	NE	NE	339	418	527	631	804	1014	1227
PFCs	NE	NE	NE	NE	NE	0	0	0	0	0	0	0
SF_6	NE	NE	NE	NE	NE	103	206	206	96	96	109	105
Total (with net CO_2 emissions/ removals)	139525	145063	143732	142068	145606	150206	152623	147711	151890	148850	148469	148702
Total (without CO_2 from LUCF)	141125	146663	145550	143944	147539	152117	154512	149578	153735	150673	150291	150516

Table 2.2. Overview of Belgium greenhouse gas emissions and removals from 1990 to 2001 in Gg CO_2 equivalent (NE : not estimated)

Overall emissions of greenhouse gases in Belgium are estimated at 150516 Gg CO_2 eq. (without CO_2 from LUCF) in 2001, i.e. a 6.7% increase relative to 1990 emissions (1995 for fluorinated gases) (Table 2.2, Figure 2.1). Carbon dioxide (CO_2) accounts for 84.3% of these emissions (2001), methane (CH_4) for 6.9%, and nitrous oxide (N_2O) for 8,0% (Figure 2.3). The share of total emissions between CO_2, CH_4 and N_2O in the Flemish and Walloon regions is quite similar to the share observed at the national level; in Brussels, CO_2 emissions account for 94% of the total emissions. F-gases (HFCs, PFCs, SF_6) account for 0.9% of total emissions. Absorption by sinks offers only a tiny compensation for these emissions (1,2%).

2.2.1. Carbon dioxide emissions

The carbon dioxide (CO_2) emissions in Belgium increased 7.7% during 1999-2001 (Figure 2.1) to 126 803 Gg. In 2001, CO_2 accounted for 84.3% of total greenhouse gas emissions. This percentage has changed little over time (Table 2.2). Accordingly, greenhouse gas emissions in Belgium are closely connected with the emissions of CO_2.

The sectoral distribution of CO_2 emissions, as well as trends both at the national and regional levels are documented in section 2.3. Industry and construction are the primary source of CO_2 in Belgium (27% in 2000), followed by space heating (residential, commercial, institutional and agriculture sector) (24% in 2000), energy industries (22% in 2000) and transport (19% in 2000). Among the primary sources of CO_2, the emissions caused by transport have grown most rapidly (+23%) over the decade. This growth continues unabated at the end of this period. The emissions from the energy sector have generally been on the decline since 1990 (-4%) as a result of improved energy efficiency and of the increased use of gas for the production of electricity.

The primary source of CO_2 emissions in the Flemish Region is the burning of fossil fuels: the energy industries alone generate 30% (in 2000) of overall emissions, followed by the residential and commercial sector (24%), manufacturing industry and construction (23%) and transport (19%). A smaller part is due to industrial processes (3%) and waste incineration (1%). In 2000, total CO_2 emissions in Flanders rose by 12.7% against the base year of 1990 (Table 2.2). The highest growths occurred in the transport sector (+ 2914 Gg), residential and commercial sector (+ 1627 Gg) and industrial processes (+ 1224 Gg).

Industry is the main source of CO_2 emissions in the Walloon Region (32 % in 2000). The other sectors contribute to a lesser extent: residential and commercial (19%), road transport (19%), industrial processes (16%) (basically cement and steel production), energy transformation (10%). The CO_2 emissions hardly changed in the Walloon Region between 1990 and 2000 (figure 2.5), while the increase in emissions from road transport (+21%), industrial processes (+13%) and combustion in the domestic and tertiary sector (+1.2%) is compensated for by cuts in the energy industries (-28%), which is increasingly doing better. Accounting for nearly 4% of CO_2 emissions in the Walloon Region, forests are a clear carbon sink.

In the Brussels Capital Region, two thirds of CO_2 emissions are generated by combustion related to space heating (domestic/tertiary sector); in general, these emissions have grown by 12% between 1990 and 1999. Obviously, these heating-related emissions strongly depend on temperatures, which may vary greatly from one year to another : the CO_2 emissions caused by the residential and commercial sectors, for example, reached a peak in 1996 (3375 Gg CO_2), a particularly cold year, and an all-time low in 1990 (2609 Gg CO_2), an extremely mild year. Transport causes 19% of CO_2 emissions in the Brussels Capital Region, followed by waste incineration (12%). The increase in transport-related emissions (+6,4% over 1990) is caused by the growth in traffic, estimated at 9.9% between 1990 and 1998. Nevertheless, this growth is still smaller than in the other Regions.

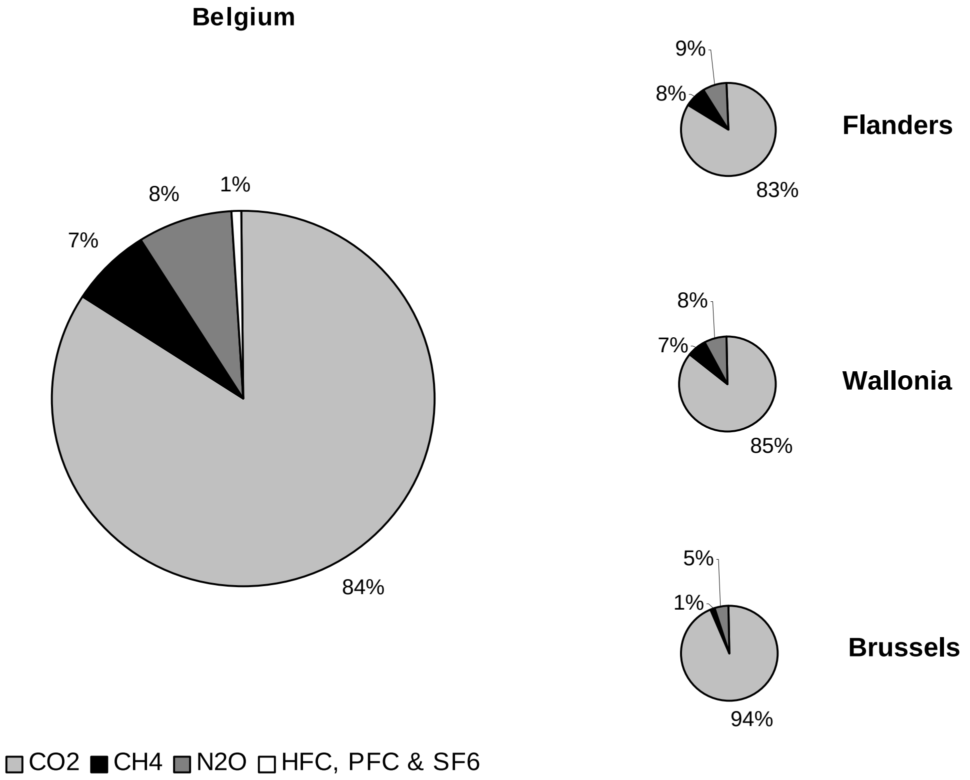

Figure 2.3. Greenhouse gas emissions by gas in 2001* for Belgium and the regions**
* 2000 for Brussels
** data for fluorinated gases are available for Belgium only

2.2.2. Methane emissions

Methane (CH_4) emissions have remained fairly stable during 1990-1998 (Table 2.2) at about 530 Gg, and then have substantially decreased from 1998 to 2001 (- 7 % in 2001 compared with 1998). In 2001, they accounted for 6.9% of greenhouse gas emissions in Belgium (Figure 2.3). The major source of CH_4 is agriculture (65% in 2000), followed by waste (22%) and fugitive fuel emissions (9%) (Figure 2.4). There are great variations among the Regions:

- In the Flemish Region, the CH_4 emissions remained virtually stable between 1990 and 2000 (-0.8%). Agriculture is responsible for over 60% of emissions (Figure 2.4), followed by landfill waste (15%) and fugitive emissions (9%).

- The majority of CH_4 emissions in the Walloon Region are due to agriculture (enteric fermentation in livestock) (63%). Landfilled waste and waste treatment plants are the second source of these emissions (28%). The fugitive emissions from the transport of natural gas are responsible for 6% of the emissions. Overall CH_4 emissions have diminished by 13.3% between 1990 and 2000, mainly as a result of the increased use of flaring.

- In the Brussels Capital Region, fugitive emissions from fuels caused by the distribution of gas are the major part of the CH_4 emissions (70% in 1999). These emissions rose by nearly 19% between 1990 and 1999, reflecting the developments of gas imports into the Brussels Capital region, which are mainly intended for space heating (domestic and tertiary sector). The other sources of CH_4 emissions in Brussels are energy consumption (high percentage of gas heating in the residential sector) and road transport, which in 1999 accounted for 17% and 11% respectively of total CH_4 emissions. These emissions have dropped sharply in the course of the decade, leading to an overall reduction of 10% of CH_4 emissions in Brussels between 1990 and 1999.

2.2.3. Nitrous oxide emissions

The nitrous oxide (N_2O) emissions account for 8.0% of total greenhouse gas emissions in Belgium in 2001. They have slightly decreased (- 1.5%) between 1990 and 2001 (Table 2.2). The two major sources of N_2O are agriculture (43% in 2000) and industrial processes (35% in 2000) (section 2.3). In the Walloon Region, the primary source of these emissions is agriculture, followed by emissions from industrial activities. The reverse applies to Flanders. In Brussels, the residential and commercial sector (heating) dominate the other sources of N_2O.

N_2O emissions in the Flemish Region remain fairly stable during the 1990-2000 period (+ 1%). The production of nitric acid and nature and farming land (both responsible for 38% in 2000) are the main contributors to these emissions. Although they have more than doubled in 10 years, N_2O emissions caused by transport accounted for only 7% of total N_2O emissions in Flanders in 2000.

In the Walloon Region, agricultural soils are responsible for the large majority of the N_2O emissions (70%), followed by the industrial processes (21%) (chiefly the production of ammonia, nitric acid, and ammonia nitrate). The increase of 8.8% in the N_2O emissions between 1990 and 2000 is mainly due to the development of the chemical industry and the increase in road transportation.

The most important sources of N_2O emissions in the Brussels Capital Region are the combustion processes for space heating (domestic and tertiary sector, 44%), transport (13%), and waste incineration (41%). The changes in N_2O emissions over the last decade have the following characteristics :
A reduction in emissions between 1990 and 1993 as a result of diminished production by the *Marly* cokes plant and its closure and 1993 ;
An increase in emissions starting in 1994 following the introduction of catalytic converters (the use of catalytic converters on all petrol-engine cars was made compulsory in Belgium in 1993); N_2O emissions from transport have more than tripled in 10 years.
On the whole, however, the N_2O emissions in the Brussels Capital Region have dropped 22% between 1990 and 1999 (Table 24).

2.3. Emission trends by source

Energy consumption is responsible for 79% of greenhouse gas emissions in Belgium (see CRF-2001 Table 10s5); Industrial processes, agriculture, waste treatment respectively account for 10.1%, 8.1% and 2.8% of the total emissions.

GHG source categories	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
	CO_2 equivalent (Gg)											
Energy Industries	28962	30448	30432	29656	29367	30648	29612	28280	30342	27324	27803	26998
Industry (energy)	34119	33145	30893	29665	33491	34420	31621	32686	34152	34414	34354	33937
Transport	19997	20773	22204	22161	22132	22364	22878	23617	24054	24693	24993	25116
Other (energy)	28800	31638	31625	31765	31570	32162	37251	32114	32634	31594	30136	31743
Fugitive Emissions	786	836	849	894	907	719	777	769	860	927	914	888
Industry (Processes)	11267	12770	12540	12862	13030	14566	15003	14921	14718	14633	15131	15197
Agriculture	12700	12633	12550	12699	12632	12782	12582	12431	12510	12533	12232	12146
Waste	4152	4077	4115	3902	4072	4121	4452	4425	4134	4224	4379	4143

Table 2.3. Overview of Belgium greenhouse gas emissions in the main source categories from 1990 to 2001 in CO_2 equivalents (Gg)

The four most important emission sources (based on figures from 2001) are (figure 2.4): industry and construction (22%); residential and commercial sector (21%); energy industries (22%) and transport (17%). Next come industrial processes and agriculture (10% and 8% respectively). Waste treatment generates 3 % of total emissions.

The sector that has shown the highest growth in GHG emissions in absolute terms over the last decade is the transport sector (+ 4996 Gg CO_2 eq.), followed by industrial (process) sector (+ 2742 Gg CO_2 eq.) and the residential and commercial sector (+ 1336 Gg CO_2 eq.). Greenhouse gas emissions coming from energy transformation and from energy consumption by industry and construction have nearly remained unchanged (– 1.5% in 2000 compared to 1990). By contrast, emissions from agriculture have declined with 3.7% during the same period.

Total GHG emissions in the Flemish Region have risen by 10.4% between 1990 and 2000. This growth is due in the first place to changes in CO_2 emissions (+ 12.7% in 2000) and to a lesser extent to a rise in N_2O emissions (+ 1%) (see Table 2.4). CH_4 emissions have slightly declined (- 0.8%). Energy industries contribute for 25% in 2000 to the total GHG emissions, space heating (residential, commercial, institutional and agriculture) sector for 20% in 2000, transport for 17% and industry (processes) for 6%. GHG emissions from transport have increased 27% in 10 years, thus contributing for a large part to the general growth. Industrial processes (essentially the production of ammonia and nitric acid) have also risen in the course of the decade (+ 40%), bringing their share to 6% of total emissions in 2000.

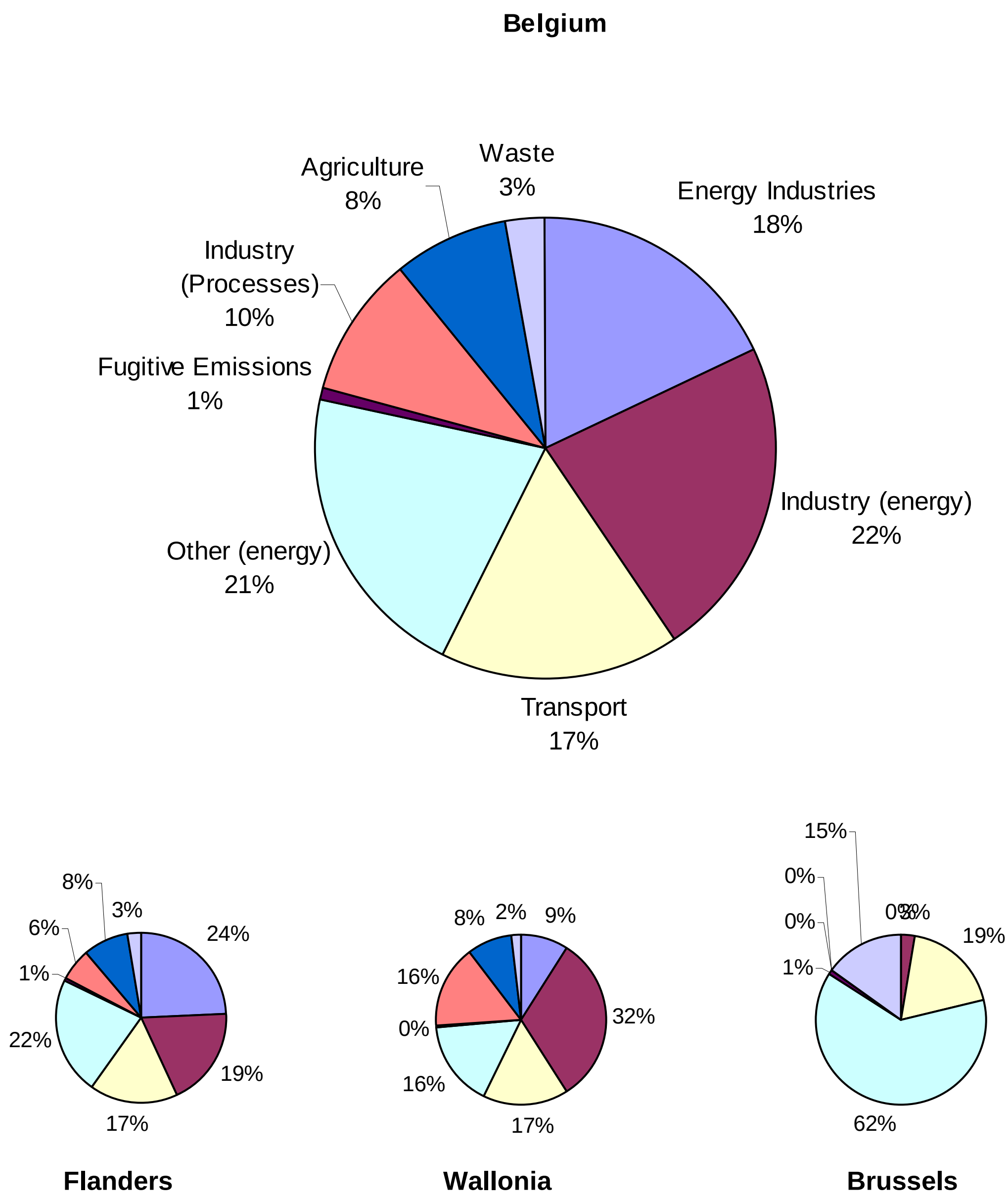

Figure 2.4. Greenhouse gas emissions by sector in 2001 for Belgium (2000 for Brussels) and the regions. The sector "Other (energy)" includes use of energy by households, small commercial businesses and services

In the Walloon Region, the combustion of fuels by the industrial sector is the primary source of GHG emissions (32% in 2001), followed by transport and space heating, industrial processes (around 16% each) and agriculture (11%). The overall development of GHG emissions in Wallonia is obviously largely determined by CO_2 emissions (84% of greenhouse gas emissions), which have slightly decreased between 1990 and 2000. The share of CH_4 and N_2O in total GHG emissions is 7% and 8% respectively. N_2O emissions have increased between 1990 and 2000, while CH_4 emissions have dropped, driving to a small decrease of the aggregate emissions of CO_2, CH_4 and N_2O.

The main greenhouse gas emitting sources in the Brussels Capital Region are combustion related to space heating (domestic and tertiary sector) (65%) and to transport (18%), and waste incineration (13%). Consequently, developments in greenhouse gas emissions in the Brussels Capital Region is closely linked to changes in CO_2 emissions, which made up 95% of total GHG emissions in 1999. However, the growth of CO_2 emissions between 1990 and 1999 (8.9%) is somewhat compensated for by a steep drop in CH_4 (-10%) and N_2O (-22,1%) emissions during the same period. On the whole, the

CO_2, CH_4 and N_2O emissions in the Brussels Capital Region have risen by 7% between 1990 and 1999.

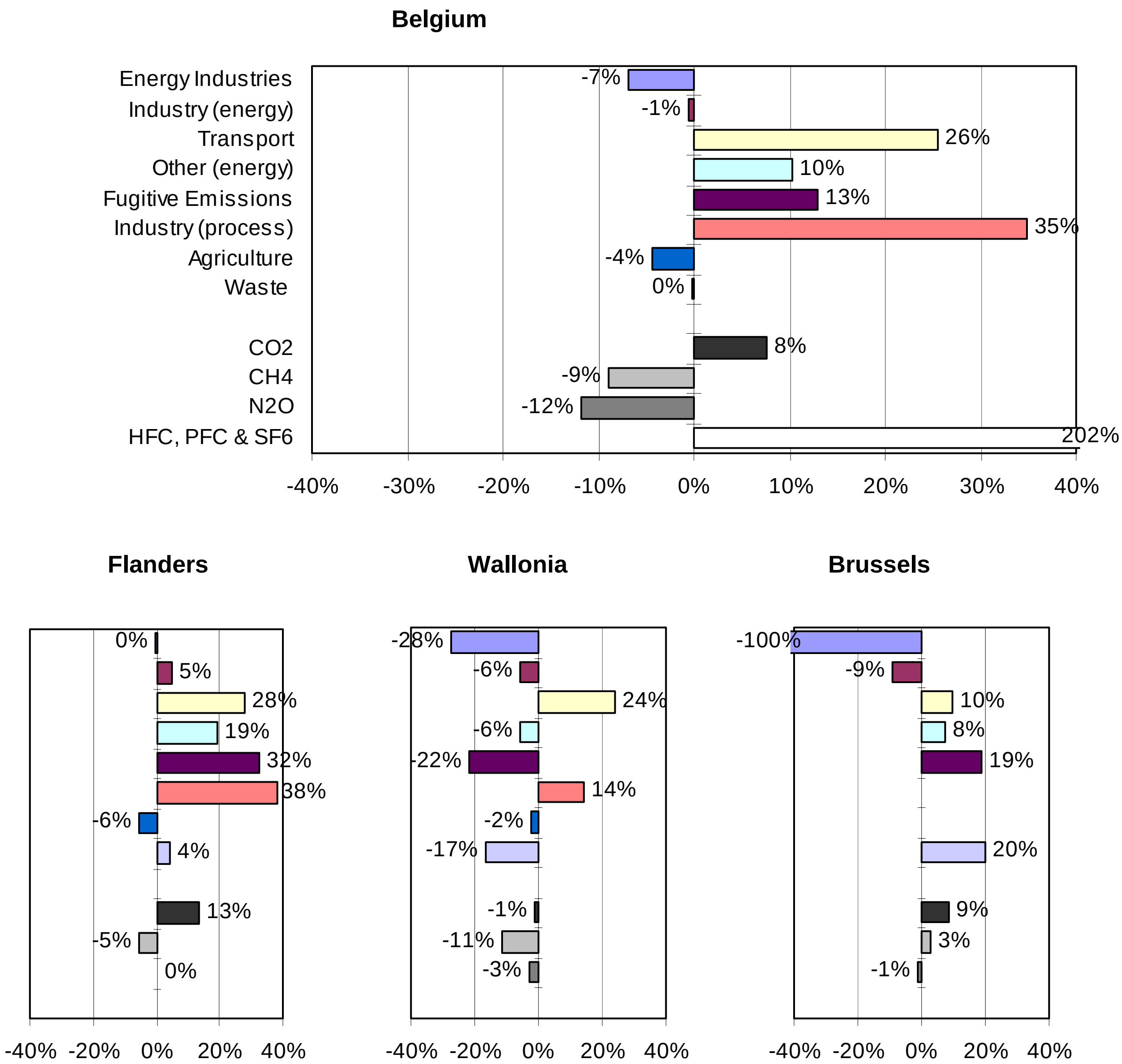

Figure 2.5. Change in greenhouse gas emissions by sector and by gas for Belgium and the regions (1990*-2001**)

* base year for fluorinated gases is 1995 (available for Belgium only)

** 2000 for Brussels

2.4. Emission trends for indirect greenhouse gases and SO_2

Emission figures relating to the ozone precursors (CO, NO_X, NMVOCs[2]) and to SO_2 are presented in figure 2.6., together with the distribution of these emissions over the various sources (sectors) and their global changes during 1990-2000. These data are discussed below.

2.4.1. Nitrogen oxides (NO_X)

The primary NOx emitting source in Belgium is transport (50% in 2000), followed by manufacturing industries (22%) and energy industries (14%). Total NOx emissions have slightly decreased (about -3% in 2000 compared with 1990) mainly as a result of improved performances in the production of electricity. Emissions from road traffic have, thanks to the use since 1993-94 of catalytic converters on petrol-engine cars, only increased with about 1% between 1990 and 2000.

Traffic in the Flemish Region is the main source of NOx (NO_2) emissions (53 % in 2000). In addition, aggregate emissions from electricity production, refineries and industry (individually and collectively) contribute substantially to NOx (NO_2) emissions (32 % in 2000). In 2000, total NOx (NO_2) emissions remain quasi unchanged in comparison with 1990.

In the Walloon Region, road transport accounted for nearly half of NOx emissions ; energy industries come second. Emissions have dropped by 9 % between 1990 and 1999, mainly due to road transport and, to a lesser extent, to the industrial sector. Emissions from the residential sector, on the other hand, have increased as a result of the more widespread use of natural gas for heating.

In the Brussels Capital Region, combustion linked to space heating (domestic and tertiary sector) and to waste incineration is a significant source of NOx emissions, in addition to transport. However, the introduction of catalytic converters and by production cuts in the Marly cokes plant between 1990 and 1992 and its subsequent closure have curtailed these emissions in 1993. NOx emissions consequently have dropped by 18 % between 1990 and 1999.

2.4.2. Carbon monoxide (CO)

The majority of CO emissions in Belgium come from transport (44% in 2000) and energy processes in industry (37%). Fuel combustion for space heating also contributes slightly (8%). These percentages change from one Region to another: in the Flemish and Brussels Capital Regions, transport-related emissions dominate, while in the Walloon Region industry is the main source of CO emissions, followed by road transport and, to a lesser extent, space heating.

Between 1990 and 2000, national CO emissions fell by 13.1%, chiefly as a result of the introduction in 1993 of catalytic converters and to some extent following efforts made by industry, particularly the steel industry and refineries, and the diminished use of coal for heating purposes.

2.4.3. NMVOC

NMVOC emissions are caused mainly by the combustion of petrol for transport (33% in 2000) and by the use of solvents (28% in 2000). Some industrial processes also contribute (12.8%), as well as fugitive emissions from fuels (10.0%) and forestry (5%). On the whole, these emissions decreased by 21% between 1990 and 2000, partly as a result of altered vehicle emission standards, and partly as a result of the prevention of solvent use.

In the autumn of 1998, the Flemish Region initiated a study (*Programma Beleidsgericht Onderzoek actie 16 MBP 1997-2001*) aimed at optimising the NMVOC inventory. The results of this study are fully integrated in the 2003 GHG emission inventory. The study was prolonged in 2000 (action 16 MBP 1997-2001) since an information-gathering concept had to be developed in addition to a general methodology for assessing emissions. The aim is to give a detailed survey of both the various sectors involved and of the types of pollutants. The information supplied by companies, partially based on the obliged annual emission report, is fully integrated into the emission inventory of NMVOC.

Finally, it should be noted that biogenic NMVOC emissions from forests in Wallonia, estimated using the CORINAIR methodology, represent nearly one third of total NMVOC emissions of Wallonia(the uncertainty about emission factors here is very high).

2.4.4. Sulphur dioxide (SO_2)

SO_2 emissions produced by the energy, industry and residential (space heating) sectors declined sharply in Belgium between 1990 and 2000, leading to a general drop of these emissions by 52%. These reductions basically coincide with fuel substitution and with cuts in the sulphur content of the oil products used. The energy sector still account for 35% of SO_2 emissions, followed by energy processes in industry (31%) and heating (19%).

In the transport sector, sulphur dioxide emissions have dropped (-66% in 2000 compared with 1990), mainly due to the constant reduction in the sulphur content of fuels since 1996. Moreover, SO_2 emissions in the Brussels Capital Region have dropped as a result of a diminished production by the *Marly* cokes plant between 1990 and 1992 and its closure in 1993, and by the reduced emissions from the regional incinerator after fitting (in the middle of 1999) a wet scrubbing system.

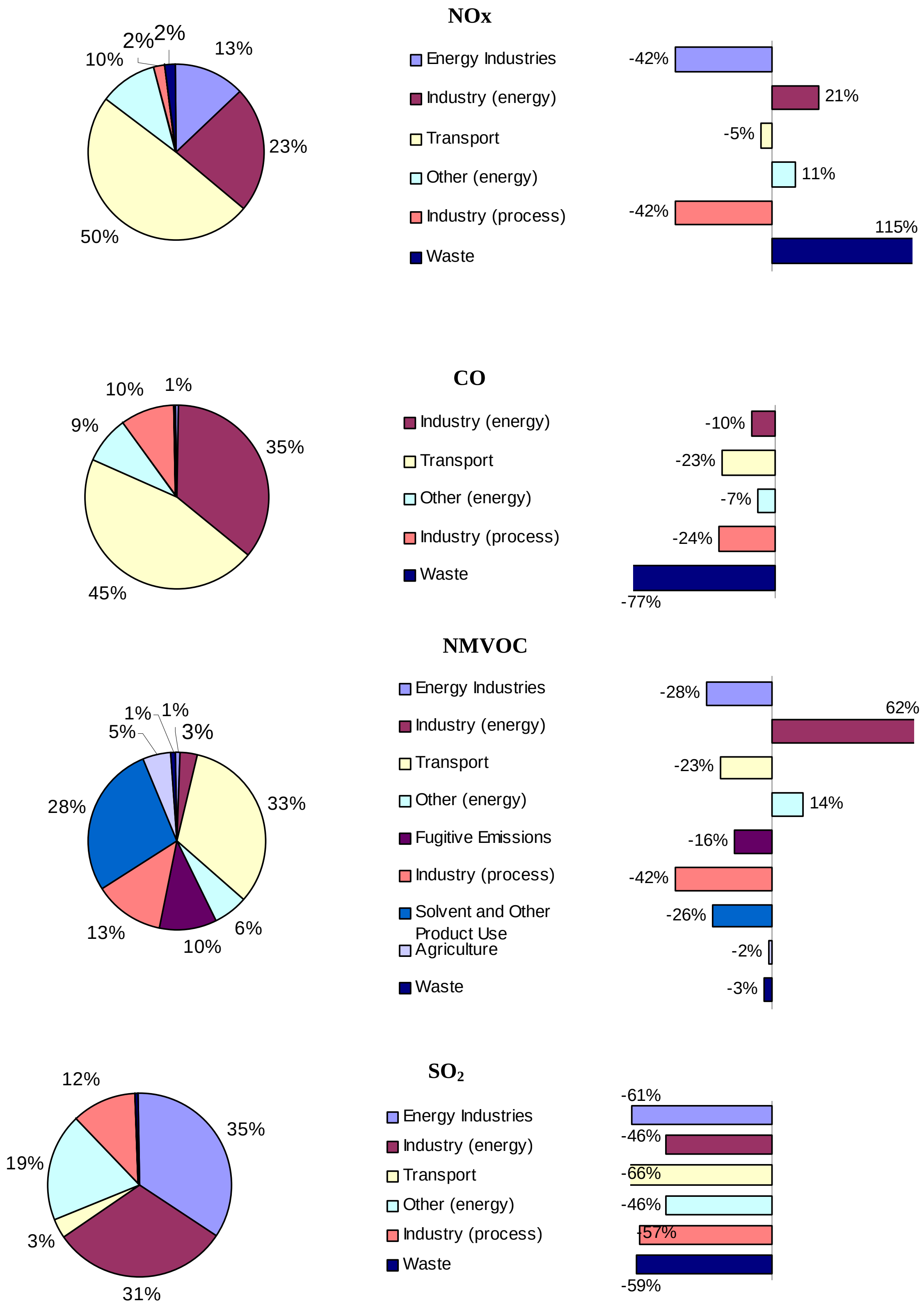

Figure 2.6. : Indirect greenhouse gas emissions. Share in 2001 and trends 1990-2001 by sector,.

CHAPTER 3 : ENERGY

3.1. Overview

Energy

In 1999, Belgium's apparent gross consumption of primary energy rose to 57.4 MTOE (Million tonnes oil equivalent), i.e. approximately 5.62 TOE per inhabitant. This level is higher than the consumption per inhabitant in neighbouring countries and above the European average. Nearly 80% of Belgium's energy needs are met by the import of fossil fuels (45.9 MTOE in 1999). This was made up of 7.4 MTOE of coal, 23.4 MTOE of oil (crude and petroleum products), and 15.0 MTOE of gas. In 1999, the primary production of energy, 95% of which was derived from nuclear fuels (whose use provided 58% of the electricity produced), amounted to 11.5 MTOE.

Although the hydroelectric potential is vigorously exploited in Belgium, its share in the production of energy remains negligible given the topography of the country. The production of wind energy is also very limited, due to the lack of open spaces exposed to the wind which greatly constrains the potential for the development of on-shore wind energy. Nevertheless, wind energy from offshore wind farms, could contribute significantly to the objective of 3% for the production of electricity from renewable energy sources in 2004. The use of other renewable sources of energy, in particular biomass, which is currently insignificant, could eventually represent at least 5% of the primary energy production, assuming regional objectives are met.

The industrial sector remains the largest overall consumer of energy in Belgium, ahead of the residential sector and transport. However it is in this last sector that the most spectacular increase has been recorded over last 20 years (+62%). During the same period, the iron and steel industry alone has experienced a reduction of 25.8% in its overall energy consumption while the industrial sector as a whole saw its overall consumption decrease by 8.1%. Structural and technological changes have undeniably played a dominant role in this evolution. At the same time, the overall consumption of the residential sector has remained relatively stable. The recent evolution of the energy market in Belgium is furthermore marked by a very strong reduction in the consumption of solid fuels, mainly on the part of industry (cokes, iron and steel). The primary consumption of gas is increasing sharply, especially because of a stronger demand for electricity generation.

Transport

Belgium is provided with a very dense road (4.7 km/km²) and rail (112 m/km²) network. These densities of road and rail networks should be looked at in conjunction with the very high density of population in Belgium: relative to the number of inhabitants the infrastructure is close to the European average.

The port of Antwerp is very important for Belgium. It is the second largest European seaport, and one of the 5
largest in the world. The port of Antwerp benefits from excellent connections to the hinterland and the large French and German industrial basins by waterway (1500 km of navigable routes). It has also been decided to strengthen the rail infrastructure giving access to the port of Antwerp. Road transport is the mean of transport the most generally used in Belgium, both for the transport of goods and passengers, generating severe traffic congestion. Even though congestion is lower than in the neighbouring countries, the number of road accident victims is very high, but is going down. Damages to the environment resulting from fuel use in road traffic are considerable. Goods are transported, on average, over a longer distance by railway (125.3 km in 1998) than by navigable waterways (58.4 km), but the gap between these two modes of transport has lessened in recent years.

3.2. Flemish region

3.2.1. Source category

Energy industries (category 1.A.1)

The allocation of CHP (Combined Heat and Power)plants needs more explanation : All fuel in the energy balance from CHP plants of independent auto-producers are included in the sector to which they belong (industry or other sectors). Most recent CHP units are in joint venture with the energy sector, in which all heat is delivered to the industrial plant and the electricity is sold to the energy sector. In this case, all fuel in the energy balance is included in the energy sector.

Manufacturing industry and construction (category 1.A.2)

The following industries are integrated in category 1.A.2.f (Other): non-metallic mineral products, metal products, textile, leather and clothing and other industry (wood industry, rubber and synthetic material, manufacturing of furniture, recycling and construction included).

Other sectors (category 1.A.4)

Agriculture, households and service sectors are included here.

Fugitive emissions from fuels (category 1.B)

To get a better tuning with the other regions in Belgium, some changes in celfillings or allocation of emissions are carried out compared with the previous submission : The emissions of CH4 from production of cokes are put in table 1.B.1.b (energy/fugitive emissions from fuels/solid fuels/solid fuel transformation) instead of table 2.C.1 (industrial processes/metal production/iron and steel production).

3.2.2. Methodological issues

Energy industries (category 1.A.1)

The activity data are collected from energy statistics and from surveys of the individual companies. The number of companies is limited and well known. Default CO_2 emission factors (see table 3-5 below) are used except for specific fuel types (for example: refinery still gas, waste products, etc.), in that case more detailed information of the individual companies is used.

Emission factors from TNO (Netherlands) [4] (Table 3-1) are now used to calculate the emissions of CH_4 and N_2O of installations for public electricity (in the past emission factors of CITEPA [2] were used). These TNO-emission factors are situated within the range of emission factors described in the EMEP/CORINAIR handbook [3] and are agreed with the electricity producers. CH_4 and N_2O emissions from petroleum refining (sector 1.A.1.b) are calculated using emission factors of CITEPA [2] based on the input of crude oil:
-0.24 g CH_4/ ton crude oil originating from 6% auto-combustion *4 g CH_4/ton crude oil,

-22 g N_2O/ton crude oil originating from 6% auto-consumption and an emission factor of 9g/GJ (50% fuel oil and 50% gas).

The activity data from the energy balance of Flanders is used instead of the data of the Ministry for Economic Affairs in previous submission to estimate the emissions originating from the refineries in order to get a better tuning between the emission inventory and the energy balance.

Fuel	**UNIT**	**CH_4**	**N_2O**
Coal	g/Gj	0.51	1.40
Fuel	g/Gj	0.59	0.60
gasoil (in gas turbine)	g/Gj	0.00	0.60
Gasoil (in steg)	g/Gj	0.00	0.60
Gasoil	g/Gj	0.00	0.60
natural gas (in gas turbine and in heat & gasturbines)	g/Gj	1.80	0.10
natural gas	g/Gj	1.14	0.10
Cokesgas	g/Gj	0.00	0.10
blast furnace-gas	g/Gj	0.00	0.10
H_2-gas	g/Gj	0.00	0.00
Dry sludge	g/Gj	0.00	0.60
Bisfenol-resin	g/Gj	0.00	0.60

Table 3-1: Emission factors of CH_4 and N_2O for sector 1.A.1.a : Public electricity and Heat Production (Source : TNO Netherlands)

Manufacturing industry and construction (category 1.A.2)

The energy consumption of this sector is based on general statistics for natural gas, supplemented with results from surveys for solid and liquid fuels and with the information extracted from the obliged annual reporting of industrial emissions (see 1.3.1). Default IPCC emission factors are used for CO_2 (see table 3-5 below), except for special products like waste or energy recovery products. When available in the surveys or in the obliged annual reporting of industrial emissions, emission factors provided by the companies themselves are used for these products.

The 'other fuel' use is probably underestimated because improvements need to be made in the future to estimate waste products used as energy source in industry.

The emissions of CH_4 and N_2O are calculated using emission factors originating from CITEPA [2] (Table 3-2).

So far the emissions of CH4 and N_2O (contrary to the emissions of CO_2) originating from the CHP plants which are in joint venture with the energy sector are included in category 1.A.2. Since the contribution of CH_4 and N_2O of these installations is roughly 0.01% of total emissions of CH_4 and N_2O no major changes are expected during the next submission.

Fuel	**Unit**	**CH_4**	**N_2O**
Coal	g/ton	7.8	360
Coke oven gas	g/1000 m^3	4.85	29.1
Natural gas	g/1000 m^3	12	116.2
blast furnace-gas	g/1000 m^3	1.75	10.5
Fuel	g/ton	4	560

Table 3-2 : Emission factors of CH_4 and N_2O for sector 1.A.2 : Manufacturing Industries and Construction (Source : CITEPA)

Transport (category 1.A.3)

Estimates of energy consumption from road transport are based on the TEMAT model [9]. In this model, emissions are calculated for different kind of vehicles, fuels, ages, technologies, etc. Specific emission factors for CO_2 are used, mainly based on literature, measurements and other sources. CH_4 and N_2O emissions from road transport are calculated using the international approved *COPERT* (Computer Programme to calculate Emissions from Road Transport) methodology [5].

Concerning air transport, only domestic air traffic is considered for calculating the CO_2-emissions. All kerosene used in air transport is assigned to the bunker fuels, all gasoline for air transport is allocated to domestic air transport. This approach was chosen because it is impossible to split these fuels otherwise and because, due to the small size of Belgium (and Flanders), most kerosene is used for international transport. A default IPCC emission factor for CO_2 is used to calculate the emissions.

CH_4 and N_2O emissions from air transport are calculated for the Landing and Take-Off cycle; the methodology is mainly based on the methodology described in the EMEP/CORINAIR-handbook [3]. These emissions are calculated for 3 airports for civil aviation (aviation (Antwerp, Ostend and the international airport of Brussels-National) and for 5 airports for military aviation (Kleine Brogel, Brasschaat, Koksijde, Sint-Truiden and Goetsenhove).

For railways, the fuel consumption is based on a proportional fraction of fuel used in Belgium for rail transportation. Default IPCC emissions factors are used for CO_2. Compared to previous submission, emissions of CH_4 are added and calculated with the results of a model developed by the VITO [1] and based on the registered kilometres with distinction between different types of trains.

For navigation, statistics are used to calculate the total freight kilometres. These are necessary to calculate the total amount of fuel used. Default emission factors are used to calculate the CO_2 emissions. Compared to previous submission, emissions of CH_4 and N_2O are added and calculated with the results of a model developed by the VITO [1] and based on the registered tonkilometres en calculated fuel consumption.

Other sectors (category 1.A.4)

Agriculture, households and service sectors are included here.

The fuel consumption of the service sector is based on general statistics of natural gas, supplemented with results from surveys for solid and liquid fuels. Default IPCC emission factors for CO_2 (see table 3-5 below) are then used for calculating CO_2 emissions, except for special products like waste, for which data from other literature of the companies themselves is used.

Agricultural fuel consumption is estimated from statistical information concerning area used, etc., combined with specific energy consumption from literature. For horticulture, data for energy consumption are available from surveys. Default emission factors for CO_2 are used.
For households, general statistics of natural gas are available. Liquid fuels and solid fuels are based on limited survey results. Default IPCC emission factors for CO_2 are used.

Other direct and indirect greenhouse gases in this sector are calculated by using the activity data of the energy balance (see above + difference with previous submission) to get a better tuning between the emission inventory and the energy balance. The emissions factors used are given in tables 3-3 and 3-4.

New - compared to previous submission - are the estimates of non-CO2 emission estimates made for the combustion emissions due to agricultural activities, also based on activity data of he energy balance (see above) and with the emission factors given in table 3-4 : emission factors of IPCC for the farming vehicles and emission factors of CITEPA for the heating activities.

Fuel	**Unit**	**CH_4**	**Unit**	**N_2O**
Natural gas	Kg/TJ	1	Kg/TJ	2
Fuel	Kg/TJ	3	Kg/TJ	12
Heavy fuel	Kg/TJ	3	Kg/TJ	12
Solid fuels	Kg/TJ	10	Kg/TJ	12
Propane/butane/LP	Kg/TJ	0	Kg/TJ	3
Others	Kg/TJ	150	Kg/TJ	4
Lamppetroleum	Kg/TJ	3	Kg/TJ	12

Table 3-3 : Emission factors of CH_4 and N_2O for category 1.A.4 : Other sectors (households and service sector) (Source : CITEPA)

Emission factors IPCC for farming vehicles :

Fuel : 4 kg CH4/TJ and 30 kg N2O/TJ

Emission factors IPCC for fishing activities :

Fuel : 5 kg CH4/ TJ and 0.6 kg N2O/TJ

Emission factors CITEPA for heating activities :

Fuel : 0.1 kg CH4/TJ and 14 kg N2O/TJ
Solid Fuels : 0.3 kg CH4/TJ and 14 kg N2O /TJ
Natural Gas : 0.3 kg CH4/TJ and 3 kg N2O/TJ
Propane/Butane/LPG : 0 kg CH4/TJ and 3 kg N2O/TJ

Table 3-4 : Emission factors of CH4 and N2O for category 1.A.4 : Other sectors (agriculture : farming vehicles and heating) (Source : IPCC and CITEPA)

Fugitive emissions from fuels (category 1.B.1 and 1.B.2)

Emissions of CH4 originating from the production of cokes (category 1.B.1.b) are estimated by using emission factors of CITEPA [2] which are in line with the emission factors of the EMEP/CORINAIR handbook (400 g CH4/ton cokes). Activity data (tons of cokes) are delivered by the corresponding industry.

Since the emission factor of CITEPA for calculating the emissions of CH_4 from refineries is divided into a part 'fugitive emissions' and a part 'combustion', the fugitive emissions are put under category 1.B.2.a (fugitive emissions from fuels/Oil) and the rest is put under category 1.A.1.b (energy industries/petroleum refining).

Fugitive CH_4 emissions from both the petroleum refineries (category 1.B.2.a) and the gas distribution (category 1.B.2.b) are estimated using emission factors of CITEPA [2]:
Petroleum refineries : 5 g CH_4 / ton crude oil
Gas distribution : 3.5 g CH_4 / m^3 gas

To estimate the fugitive emissions of CH4 of the refineries, the activity data of the energy balance are used instead of the data of the Ministry for Economic Affairs to get a better tuning between the emission inventory and the energy balance.

International bunkers (category Memo Items – International Bunkers)

To allocate the CO_2 emissions from international bunkers, all kerosene used in air transport is assigned to the bunker fuels and all gasoline for air transport is allocated to domestic air transport (see justification of this approach in the section of transport above). A default emission factor to calculate the CO_2 emissions is used. Since Flanders is the only region adjacent to the sea, all Belgian marine bunkers are assigned to Flanders. Default emission factors to calculate the CO_2 emissions for all products are used (see table 3-5 below).

Emissions of co-generation units

All fuel in the energy balance from co-generation of independent auto-producers are included in the sector to which they belong and so are the corresponding emissions.

Most recent co-generation units are in joint venture with the energy sector, in which all heat is delivered to the industrial plant and the electricity is sold to the energy sector. In this case, all fuel in the energy balance is included in the energy sector and so are the emissions of CO2. On the other hand the emissions of CH4 and N2O of these installations are allocated to the corresponding industrial plant. This inconsistency which is of minor importance, will be solved during the next submission.

CO2 emissions from biomass

Emissions of CO2 from Biomass are included in table 1s2 for all years. These emissions were formerly reported in table 1.A(a)s4 under 1.A.4.b 'other fuels' of the residential sector, while this is now included under 'biomass' in the residential sector.

Feedstocks and non energy use of fuels (categories 2.B.1 and 2.G)

The emissions of these activities are reported under chapter 4 'Industrial Processes'.

Emission factors used to calculate the emissions of CO_2

The calculation of energy related CO_2 emissions in Flanders is mainly based on default IPCC emission factors, corrected for the default fraction of carbon oxidised. There are a few exceptions: the emission factor for refinery gas is based on an inquiry with the refineries in Flanders and is an individual result for each refinery concerned. The emission factor for other products like for example the energy recovery products from a catalytic cracker are also based on information from the companies involved. For other (residual) products where no information is available the default CO_2 emission factor for other petroleum products (= 72,6 kton CO_2/PJ) is mostly used.
The emission factors used are listed in table 3-5.

Products	emission factors (kton CO_2/PJ)
coal tars	92,7
coking coal	92,7
coke oven coke	106,0
crude oil	72,6
Refinery gas	55,1 - 56,5 (1)
LPG	62,4
Gasoline	68,6
Kerosene	70,8
gas/diesel oil	73,3
lamp petroleum	71,1
residuel fuel oil	76,6
Naphta	72,6
petroleum coke	99,8
other petroleum products	72,6
natural gas	55,8
coke oven gas	47,4
blast furnace gas	240,8
other products	(2)

Table 3-5 Emission factors used to calculate energy related emissions of CO_2 in the Flemish Region
(1) inquiry with the refineries
(2) depending on the product in question, information through inquiries with the companies involved or default

3.2.3. Recalculations and planned improvements

In addition to the non-CO2 emissions of road trafic and aviation, calculated in the previous submission, non-CO2 emissions of railways and navigation are newly calculated in this submission.

The combustion emissions of non-CO2 gases due to agricultural activities are newly estimated in this submission using activity data of the energy balance of Flanders set up by the VITO [1].

To get a better tuning with the other regions in Belgium, some changes in celfillings or allocation of emissions are carried out compared with the previous submission : The emissions of CH4 from production of cokes are put in table 1.B.1.b (energy/fugitive emissions from fuels/solid fuels/solid fuel transformation) instead of table 2.C.1 (industrial processes/metal production/iron and steel production).

In sector 1.A.1.b (petroleumrefining), recalculations were made for all years to the activity data and accordingly to the amount of CO_2 emitted which resulted in changes for the years 1994, 1995,1996, 1999.
In sector 1.A.2.a (iron and steel), revisions were made to the amount of CO_2 from solid fuels (a partly double counting with process emissions was eliminated) which resulted in changes for all years.
In sector 1.A.2.c (chemicals), revisions were made to the amount of liquid fuels (activity data) and CO_2 from liquid fuels (all years). There also is a strong increase in the estimation of ‘other fuels’ (activity data and CO_2 emissions) in the chemical industry that was not included in the previous submissions (all years). More and better estimations are will have to be made in the next submissions.
Some smaller updates/corrections of activity data and CO_2 emissions in specific years were made.

The energy balance of Flanders is used as a basis for the estimation of non- CO_2 emissions by building heating to get a better tuning between the emission inventory and the energy balance.

To estimate the emissions of CH_4 and N_2O of the refineries (combustion and fugitive), the energy balance Flanders is used instead of the data of the Ministry for Economic Affairs to get a better tuning between the emission inventory and the energy balance (recalculation compared with previous submission).

The fugitive emissions of CH4 originating from the distribution of gas (1.B.2) are estimated by using emission factors of CITEPA based on the consumption of gas. A more accurate method based on measurements and taking into account the different causes of emission (compressors, installation of new pipelines, accidents) and the different materials used, will be carried out in the near future. Contacts with the industry involved is already going on.

Another project will optimise the inventory of energy-use from the tertiary and residential sectors. The study started in February 2003.

3.3. Walloon region

3.3.1. Source category

Energy industries (category 1.A.1)

The category 'Public Electricity and Heat production (1.A.1.a)' includes fuel combustion emissions associated with the generation of electricity for commercial or public sale. The Auto-generators category is mapped out in the IPCC category 1.A.2 'Manufacturing Industries and Construction'. The sub-category depends on the type of the industry where the energy is used.

The emissions originating from category 1.A.1.c 'Manufacture of Solid Fuels and Other Energy Industries' are the emissions coming form the combustion in the coking works. Only the CO_2 emissions are reported in this category. The emissions of the others pollutants are reported in the category 1.A.2.a to be consistent with the flemish inventory.

Manufacturing industry and construction (category 1.A.2)

The following industries contribute to the emissions of the source category 'other' (category 1.A.2.f) : manufacture in metal, textile, cement, lime, asphalt concrete, glass, mineral wool, bricks and tiles, fine ceramic materials.

The emissions from the compression stations in the natural gas network are included in the category 1.B.2.b instead of the category 1.A.3.e.

3.3.2. Methodological issues

In general, the emissions of CO_2, N_2O and CH_4 are calculated by multiplying an activity variable by an emission factor. Energy consumptions by sector (in kTOE[3]) and by fuel type are recorded in the "Walloon handbook of energy statistics"[4], which is the main reference used for quantifying the "activities".

Greenhouse gas emissions in the Walloon Region are mostly reported directly by the individual large companies on the basis of their specific fuel consumption. For each sector, the remainder of the emissions is calculated on the basis of the remaining fuel consumption (estimated as the difference

[3] Kilo tonnes oil equivalent
[4] published by the *Walloon Institute* on behalf of the *Directorate General for Technology, Research and Energy* (DGTRE)

between energy consumption reported in regional energy statistics for the whole sector and the fraction reported by these large companies) and standard emission factors.

Energy industries (category 1.A.1)

Power plants give directly their CO_2 emissions without emission factor. Emission factors given in Table 1.A(a)s1 are consequently derived from the energy consumption by each power plant and the reported emissions. CH_4 et N_2O are calculated using emission factors of the IPCC guidelines, except for the CH_4 emission factors for the production of cokes which comes from the EMEP/Corinair Guidebook (table 5).

Fuel	UNIT	CH_4	N_2O
Coal	g/Gj	1[i]	1.40[i]
Fuel	g/Gj	3[i]	0.60[i]
gasoil (in gas turbine)	g/Gj	1,5[i]	0.60[i]
Gasoil	g/Gj	1,5[i]	0.60[i]
natural gas (in gas turbine and in heat & gasturbines)	g/Gj	2,5[i]	0.10[i]
natural gas	g/Gj	1[i]	0.10[i]
Coke oven gas	g/Gj	1[i]	0.10[i]
blast furnace-gas	g/Gj	1[i]	0.10[i]
Coke	g/Gj	1,5[c]	4[i]

Table 3-6: CH_4 and N_2O emissions factors per fuel or plant type (Source : IPCC[i] et Emep/Corinair[c])

There are no petroleum refining plants (category 1.A.1.b) in the Walloon Region.
In the category 1.A.1.C, the emission factors for CO_2 and CH_4 are those proposed in the EMEP/CORINAIR guidebook [24]. The emission factor for CO_2 for the blast furnace-gas is given directly by the power plant. For N_2O, emission factors from the Table 1-8 of the Revised 1996 IPCC Guidelines [28] are used.

Fuel	UNIT	CO_2 x 10^3	CH_4	N_2O
Gasoil	g/Gj	76	1,5	0.60
natural gas	g/Gj	56	2,5	0.10
Coke oven gas	g/Gj	46	1	0.10
blast furnace-gas	g/Gj	252,2	0,16	0.10

Table 3-7 : Emissions factors by fuel in the coking works (Source : IPCC et EMEP/CORINAIR)

Manufacturing industry and construction (category 1.A.2)

The emission factors used to calculate the emissions of CO_2, CH_4 and N_2O originating from the iron and steel industry (category 1.A.2.a) are presented in table 3-8.

Fuel		UNIT	CO_2 x 10^3	CH_4	N_2O
Coke breeze	Sinter and pelletizing plants	g/Gj	106	50	4
Coke oven gas	Sinter and pelletizing plants	g/Gj	46	257	0,1
natural gas	Blast furnace	g/Gj	56	2,5	0,1
Coke oven gas	Blast furnace	g/Gj	44	57	0,1
blast furnace-gas	Blast furnace	g/Gj	252,2	112	0,1
Coal	Blast furnace	g/Gj	94	1,5	1,4
natural gas	Reheating furnaces steel and iron	g/Gj	56	2,5	0.10

Table 3-8 : Emissions factors per fuel in the Iron and Steel Plants (Source : IPCC (N_2O) and EMEP/CORINAIR (CO_2 and CH_4))

The consumption of coal not used as a reducing agent in the blast furnace is calculated by a CO_2 balance on the furnace and the emissions are reported in this section.
The emissions factors used for boilers are the same as those used in the power plants.
All the activity data of this category are collected at the plant-level.

The emission factors used for the combustion in boilers, gas turbines and stationnary engines in the categories 1.A.2.a to 1.A.2.f are those proposed in the EMEP/CORINAIR guidebook and the Revised 1996 IPCC Guidelines [28] and are listed in table 3-9.

Fuel	Power of the boiler	UNIT	CO_2 x 10^3	CH_4	N_2O
natural gas	> 50 MW	g/Gj	56 [c]	1 [i]	0,1 [i]
natural gas	< 50 MW	g/Gj	56 [c]	4 [c]	0,1 [i]
Gasoil	> 50 MW	g/Gj	74 [c]	1,5 [i]	0,6 [i]
Gasoil	< 50 MW	g/Gj	74 [c]	2 [i]	0,6 [i]
Fuel	> 50 MW	g/Gj	78 [c]	3 [i]	0,6 [i]
Fuel	< 50 MW	g/Gj	78 [c]	2 [i]	0,6 [i]
Coal	< 50 MW	g/Gj	94 [c]	10 [i]	1,4 [i]
Coke	< 50 MW	g/Gj	108 [c]	10 [i]	4 [i]
Biogas	< 50 MW	g/Gj	75 [c]	4 [c]	0,1 [i]
Waste gas	< 50 MW	g/Gj	65 [c]	2,5 [c]	0,1 [i]
Industrial waste	< 50 MW	g/Gj	86,6 [c]	10 [c]	2 [c]
Coke oven gas	> 50 MW	g/Gj	46 [c]	1 [i]	0,1 [i]
blast furnace-gas	> 50 MW	g/Gj	252,2 [c]	1 [i]	0,1 [i]
Black liquor	< and > 50 MW	g/Gj	100 [c]	15 [c]	0,6 [i]
Wood	< and > 50 MW	g/Gj	100 [c]	30 [i]	4 [i]

Table 3-9 : Emissions factors per fuel in boilers in manufacturing industries (Source : IPCC [i] and EMEP/CORINAIR[c])

The sector of glass making is subdivised into three subsectors : container glass, flat glass and glass wool/glass fibre. The adopted methodology divides the energy issue into two contributions :

- the energy consumption linked to the fusion of glass
- the energy consumption for other operations

The emission factors for the fusion of glass are those proposed in the EMEP/CORINAIR guidebook.
The factors for N_2O were intentionally not replaced by the lower IPCC factors for combustion because of the supposed longer residence time of the fumes above the hot glass baths (this hypothesis should be checked in the future by in-plant measurements).

Fuel	UNIT	CO_2 x 10^3	CH_4	N_2O		
				Container glass	Flat glass	Glass wool/fibre
Fuel	g/Gj	78	3	6	14	Not used
natural gas	g/Gj	56	2,5	1	3	2

Table 3-10 : Emissions factors per fuel for the fusion of glass (Source : IPCC et EMEP/CORINAIR)

The corresponding emission factors for the other combustions are those proposed in the EMEP/CORINAIR guidebook for CO_2 and CH_4 and the IPCC factors for N_2O.

Fuel	UNIT	CO_2 x 10^3	CH_4	N_2O
Gasoil	g/Gj	74	1,5	0,6
natural gas	g/Gj	56	2,5	0.10

Table 3-11 : Emissions factors per fuel in the other combustion processes in glass production
(Source : IPCC (N_2O) and EMEP/CORINAIR (CO_2 and CH_4))

In the case of lime and cement plants, the emissions are estimated by applying specific emission factors for CO_2 based on in-plant measurements.
To complete the CRF tables, emission factors for the combustion are recalculated on the basis of the CO_2 emission of each lime and cement plant and the fuel consumption as the CO_2 annual emission for each plant is known.
The emission factors for CH_4 are those proposed in the EMEP/CORINAIR guidebook.
The factors for N_2O in the cement plant were intentionally not replaced by the lower IPCC factors for combustion because of the supposed longer residence time of the fumes in the ovens.

Fuel		UNIT	CO_2 x 10^3	CH_4	N_2O
Fuel	cement	g/Gj	78	2	6
Gasoil	cement	g/Gj	74	2	6
Coal	cement	g/Gj	94	14	7
Petroleum coke	cement	g/Gj	100	7	6
Industrial waste	cement	g/Gj	116;6	0,2	4
Agricultural waste	cement	g/Gj	116,6	0,2	4
Gas naturel	cement	g/Gj	56	5	2
Coal	Lime	g/Gj	98-105	15	1,4
Coke	Lime	g/Gj	100	1	1,4
Fuel	Lime	g/Gj	78	3	0,6
natural gas	Lime	g/Gj	56	2,5-3	0,1

Table 3-12 : Emissions factors per fuel in lime and cement plants
(Source : Plant (CO_2), IPCC (N_2O-lime plant) and EMEP/CORINAIR (CH_4 and N_2O-cement plant))

Transport (category 1.A.3)

The emissions from road transportation (category 1.A.3.b) are estimated by means of the software COPERT III created by the European Environment Agency and dedicated to the preparation of the CORINAIR emission inventory. CH_4 and N_2O emissions from road transportation, calculated by COPERT [5], are recorded under the category A.3.b of the CRF Table 1. Consumption of gasoline, diesel oil and LPG, estimated by the Walloon Institute (DGTRE, 2001) [21], are reported in the CRF Table 1A(a).
CO2 emissions are calculated by multiplying the fuel consumption by an emission factor.
The annual consumption of the different fuels is derived from the fuel balance prepared by the *Walloon Institute*. These data are based on the fuel sales in the Walloon Region.

Monthly, minimum and maximum temperatures come from the records of the *Royal Meteorological Institute*, for a Walloon station.
The fleet of vehicles is based on the statistics published by the NIS (National Institute for Statistics). The NIS yearly publishes a "statistic on transport" (INS-transport, 2001) [27]. This document details the number of passenger cars, light duty vehicles, heavy duty vehicles, buses, mopeds and motorcycles by Region and by the year of registration. The FEBIAC statistics are also used to share out the heavy duty vehicles among the different sub-sectors (< 3.5 T, 3.5 - 7.5, 7.5 -16 T and > 16 T).
The estimation of the annual mileage by type of vehicle is calculated from two statistics sources. One is the transport statistics on vehicle-km for each type of vehicle and for each type of road (rural, urban and highways). These statistics are published yearly by the Ministry for Communications and Infrastructure (MCI, 2000) [29]. The second is the fleet data population published by the NIS (NIS-transport, 2001) [27].
The average speed for the different vehicle types was fixed arbitrarily, on the basis of the speed limitations in our country.
For all other parameters, the default values proposed by COPERT are used.

The emissions from civil aviation (category 1.A.3.a) are estimated on the basis of the number of LTO in two airports (Liège and Charleroi), following a very simple methodology described in the EMEP/CORINAIR guidebook [3]. Some information on the country's total number of LTO is available. Unfortunately, there is no general knowledge about the aircraft types carrying out the aviation activities. 25% of the LTO are supposed to be domestic flights. A distinction is also made between emissions from domestic and international LTO and cruise activities.
Emissions factors used to estimated emissions from domestic and international traffic are based on the table 8.2 in the EMEP/CORINAIR guidebook [3].

The emissions from domestic LTO and cruise activities are reported under the category 1.A.3.a (civil aviation), while emissions from international LTO and cruise activities are reported under "international bunkers : aviation". Kerosene used in international air-transport is assigned to the bunker fuels

Data on LTO activities and fuel consumption in the airports of Charleroi and Liège come from the statistics of these airports.

The emissions from railways are estimated by multiplying the trains fuel consumption [21] by the fuel specific emission factors. The emission factor for CO_2 is 74 Kg CO_2/GJ diesel. For CH_4 and N_2O, the specific emission factors are those described in the EMEP/CORINAIR guidebook [3], table 8.1.

The emissions from navigation are estimated by multiplying the fuel consumption for inland navigation by the fuel specific emission factors. The emission factor for CO_2 is 74 Kg CO_2/GJ diesel. For CH_4 and N_2O, the specific emission factors are those described in the EMEP/CORINAIR guidebook [3] table 8.1. The fuel consumption by inland navigation is extracted from the energy fuel balance in the Walloon region. The available data do not permit to separate national and international emissions.

Other sectors (1.A.4)

These sectors include agriculture (greenhouse heating, farm buildings heating, tractors, agricultural engines, …), households and service sectors.
The emission factors are listed in table 3-13.

Fuel		UNIT	CO_2 x 10^3	CH_4	N_2O
Coal	Commercial/Institutional	g/Gj	94[c]	10 [i]	1,4[i]
Wood	Commercial/Institutional	g/Gj	112,5 [c]	300 [i]	4 [i]
Gasoil	Commercial/Institutional	g/Gj	74 [c]	10 [i]	0,6 [i]
Natural gas	Commercial/Institutional	g/Gj	56 [c]	5 [i]	0,1 [i]
Coal	Residential	g/Gj	94 [c]	300 [i]	1,4[i]
Wood	Residential	g/Gj	100 [c]	300 [i]	4 [i]
Gasoil	Residential	g/Gj	74 [c]	10 [i]	0,6 [i]
Natural gas	Residential	g/Gj	56 [c]	5 [i]	0,1 [i]
Gasoil	Agriculture - heating	g/Gj	74 [c]	10 [i]	0,6 [i]
Gasoil	Agriculture - transport	g/Gj	74 [c]	4 [c]	30 [c]

Table 3-13 : Emissions factors by fuel ; Others sectors (Source : IPCC[i] and EMEP/CORINAIR[c])

The emissions of other non-road transport (forestry, industry, household,…) are not included in this category because there is not (yet) a possibility to split the fuels into the different sectors involved.

Fugitive emissions from fuels (category 1.B)

Fugitive emissions from fuels (category 1.B) concerns emissions in coking plants and from the natural gas distribution.

Emissions during coking operations are caused by the loading of the coal into the ovens, the oven/door leakage during the coking period, and by extracting the coke from the ovens. These emissions are put under category 1.B.1.b ‘Solid Fuel Transformation’. The emission factor used for CH_4 is 400 g/tonne of product coke.

The CH_4 emissions from the natural gas distribution (category 1.B.2.b) are caused by the transport (gas pipelines, storage and compression stations) and the distribution network. The gas pipeline of the transport network is normally airtight. The gas emissions are essentially caused by venting to purge the gas in a pipeline section when works take place on this section. These emissions are estimated at 290 t/year (Econotec, 1997) [22]. Emissions from compression stations only occur when important stoppings of the installations arise. These emission are estimated at 100 t/year (Econotec, 1997). Emissions from the distribution network are estimated on the basis of the pipeline material and the gas consumption. The overall emission factor is 1867 g/1000 m^3 of natural gas.

Feedstocks and non energy use of fuels

There is no feedstock in the Walloon region. The amount of fuel used in non energy use is given in table 3-14. A part of the emissions resulting from the non-energy use is reported under ‘industrial processes’.

Fuel	UNIT	N_2O
Coke	TJ	1 457
Solid fuel	TJ	532
Liquid fuel	TJ	9 167
Gas fuel	TJ	12 474

Table 3-14 : non energy use of fuels

3.3.3. Recalculations and planned improvements

Since the 1999 inventory, the emission factors for CH_4 and N_2O have been chosen, harmonised in each snap and fixed according to several sources : plant's information, IPCC and EMEP/CORINAIR. This revision of the emission factors has not been applied yet to the 1990-1999 time series. It is planned to do this recalculation for the 2004 submission

3.4. Brussels-Capital region

3.4.1. Source category

Some activities do not occur on the Brussels territory : energy industries (category 1.A.1), agriculture/forestry/fisheries (category 1.A.4.c) and civil aviation (category 1.A.3.a) as no airport is located on the Brussels territory.

3.4.2. Methodological issues

Manufacturing Industries and construction (category 1.A.2)

Atmospheric emissions from energy use in the industry sectors are estimated from activity variables based on energy consumption. The handbook of energy statistics, published annually on behalf of the IBGE-BIM shows energy consumption by sector (in ktoe) and fuel type [11]. A specific study has been funded on behalf of the IBGE-BIM [12] to determine the emission factors to take into account specific socio-economic Brussels conditions. Emission factors (CH_4, CO_2 and N_2O) for industrial combustion plants are given in table 3-15:

Pollutant	Units	Coal	Fuel	Fuel (heavy)	Natural Gas
CH_4	g/GJ	200	1	3,00	2,50
CO_2	g/GJ	94 000	74 000	78 000	56 000
N_2O	g/GJ	12	12,00	14,00	1,50

Table 3-15: Emission factors for industrial combustion plants

Road transportation (category y 1.A.3.b)

For atmospheric emissions from fuel combustion in the road transport sector, the activity variable is estimated on the basis of mileage and fuel consumption statistics (COPERT methodology)[5]. The handbook of mileage statistics published annually on behalf of the Federal Ministry of Transport shows mileage by vehicle types [13]. Specific studies have been funded on behalf of the IBGE-BIM [14] to take into account the specific socio-economical context of Brussels in the COPERT methodology.

Information about temperature comes from the records of the *Royal Meteorological Institute*, for a meteorological station located on the Brussels territory.

Information about the car fleet is based on statistics from the National Institute of Statistics. The NIS yearly publishes a "statistic on transport" [27]. This document details the number of passenger cars, light duty vehicles, heavy duty vehicles, buses, mopeds and motorcycles by region and by the year of registration. The FEBIAC statistics are also used to share out the heavy duty vehicles among the different sub-sectors (< 3.5 T, 3.5 - 7.5, 7.5 -16 T and > 16 T).

The average speed for the different vehicle types was fixed consistent with the Brussels mobility plan. The emission factors are extracted from the COPERT handbook[5].

Railways (category 1.A.3.c)

The emissions from railways are estimated by multiplying the trains fuel consumption by the fuel specific emission factors. The emission factor for CO_2 is 74 Kg CO2/GJ diesel. For CH_4 and N_2O, the specific emission factors are those described in the EMEP guidebook (EMEP, 1996), table 8.1 "bulk emission factors for other mobile sources and machinery : diesel engines" : railways. They are expressed in g/kg fuel. The fuel consumption by train is extracted from the fuel balance in the Brussels-Capital region.

Navigation (category 1.A.3.d)

The emissions from navigation are estimated by multiplying the fuel consumption for inland navigation by the fuel specific emission factors. The emission factor for CO2 is 74 Kg CO_2/GJ diesel. For CH_4 and N_2O, the specific emission factors are those described in the EMEP guidebook (EMEP, 1996) table 8.1 "bulk emission factors for other mobile sources and machinery : diesel engines" : inland waterways. They are expressed in g/kg fuel. The fuel consumption by inland navigation is extracted from the fuel balance in the Brussels-Capital region.

Commercial/Institutional (category 1.A.4.a)

Atmospheric emissions from energy use in the commercial/institutional sectors are estimated from activity variables based on energy consumption. The handbook of energy statistics, published annually on behalf of the IBGE-BIM shows energy consumption by sector (in kTOE) and fuel type [11]. A specific study has been funded on behalf of the IBGE-BIM [12] to determine the emission factors to take into account socio-economic Brussels specific conditions.

Emission factors (CH_4, CO_2 and N_2O) for commercial/institutional sector are given in table 3-16 :

Pollutant	Units	Coal	Fuel	Fuel (heavy)	Natural Gas
CH_4	g/GJ	200	7	3,00	5,00
CO_2	g/GJ	94 000	74 000	78 000	56 000
N_2O	g/GJ	12	12,00	14,00	2,00

Table 3-16: Emission factors for commercial and institutional combustion plants

Residential (category 1.A.4.b)

Atmospheric emissions from energy use in the residential sector are estimated from activity variables based on energy consumption. The handbook of energy statistics, published annually on behalf of the

IBGE-BIM shows energy consumption by sector (in ktoe18) and fuel type [11]. A specific study has been funded on behalf of the IBGE-BIM [12] to determine the emission factors to take into account socio-economic Brussels specificities.

Emission factors (CH_4, CO_2 and N_2O) for the residential sector are given in table 3-17 :

Pollutant	Unit	Coal	Wood	Butane/propan	Domestic Fuel	Natural Gas
CH_4	g/GJ	200	300	5,00	7,00	5,00
CO_2	g/GJ	94 000	100 000	66 000	74 000	56 000
N_2O	g/GJ	12	4,00	2,00	12,00	2,00

Table 3-17 : Emission factors for residential combustion plants

Distribution and transport of gasoil (category 1.B.2.a)

Distribution and transport of gasoil is considered as one of the priority sector in the Brussels Capital Region. The IBGE-BIM has funded a number of research projects in order to specify the emission factors of the priority sectors taking into account particular local conditions. The choice of priority sectors activities has been made after a thorough cross analysis of all environmental licences delivered by IBGE-BIM and their potential environmental impact. See Reference [18] for the detailed methodology.

Natural gas (category 1.B.2.b)

Fugitive CH_4 emissions from fuels in the Brussels-Capital Region come from the gas distribution networks. The emission factor is 2,492 ton CH_4/kTOE natural gas.

3.5. Reference approach

CO_2 emissions from fuel combustion were also estimated in accordance with the “Reference Approach” (Tier 1 Approach – IPCC guidelines). This estimation is based on the national energy balance[5], which is derived from national statistics of fuel supply. Default values recommended in the IPCC guidelines were adopted for carbon emission factors, fraction of carbon oxidized, and fraction of carbon stored (feedstocks). The details of this estimation are provided in Annex 3 (CRF tables 1.A(b), 1.A(c), 1.A(d)) for the year 2001.
The comparison with the sectoral approach (Table 1.A(c)) shows only a slight difference (1.4%) of the estimate of CO2 emissions. However, this result is not corroborated by the comparison between energy consumptions of solid, liquid and (to a lesser extent) gaseous fuels obtained by the two approaches. These consumptions, estimated on the basis of different data sources (fuel supply at the national level vs. final consumption at the regional level), and different assumptions, are not consistent with each other. This problem of inconsistency between regional and national energy balances is well known, and continuous efforts are made in order to harmonize the methodologies used by the different institutions. Since this work of harmonization is under progress, the data presented here should be considered provisional and further updates of these data are expected.

[5] National energy balance is provided by the Federal Public Service “Economy, SMEs, Self-employed and Energy”

CHAPTER 4 : INDUSTRIAL PROCESSES

4.1. Overview

The structure of the industrial sector has undergone profound changes over recent decades. The mining industries have practically disappeared with the closure of the last coal mines. The metallurgy and textile sectors have been relatively stable, after several waves of closures and restructuring. The metallurgy industry nevertheless remains one of the key sectors of Belgian industry, both in terms of employment and turnover. The two other key sectors of industrial activity are the chemical industry and the food processing industry, which contribute respectively 3.8% and 2.5% to the GDP.

4.2. Flemish region

4.2.1. Source category

The industrial processes in Flanders are covered by categories 2.B.1, 2.B.2, 2.C.1 and 2.G.

4.2.2. Methodological issues

Feedstocks and non energy use of fuels (categories 2.B.1 and 2.G)

Non-energy CO2 emissions (non-energy consumption) are calculated using the IPCC methodology.

Apart from the feedstock used for the production of ammonia (reported as CO2 from ammonia production – category 2.B.1), all CO2 emissions resulting from the use of feedstock are reported under ‘industrial processes, other’ (2.G).

The default IPCC methodology to calculate these emissions is not considered to be accurate enough for Flanders. The methodology to calculate these emissions was already adapted for this inventory. In the beginning of 2003 a study started in the Flemish region to further develop a more country specific methodology to calculate the emissions resulting from the non-energy use of fuels and feedstocks.

There is ammonia production in Flanders. CO_2 emissions are calculated based on the natural gas used as feedstock. 100% per cent of the carbon content of the natural gas is presumed to be emitted; the default IPCC emission factor for CO_2 for natural gas is used to calculate the total CO_2 emissions.

Other industrial process emissions (categories 2.B.2 and 2.C.1)

The N2O emissions from the production of nitric acid are estimated by using an emission factor from CITEPA [2] showed in table 4-1. The three plants involved in Flanders since 1990 agreed with this factor and give their activity data (nitric acid production). Since 2000 only one plant is still involved in this sector.

Process CO2 emissions from iron and steel production are calculated based on the production figures of fluid steel and pig iron and on the consumption of electrodes of the only two industrial plants in this sector in Flanders and with an emission factor approved by these plants.

CH_4 emissions from the production of sinter are estimated by using a emission factor of CITEPA [2] which is in line with the emission factor of the EMEP/CORINAIR handbook [3] and showed in table 4-1.

Category	gas	Emission factor
2.B.2 : Chemical industry – Nitric acid production	N_2O	8 kg N_2O / ton HNO_3
2.C.1 :Metal production – Iron and steel production	CH_4	Production of cokes : 400 g CH_4 / ton cokes Sinterplants : 300 g CH_4 / ton sinter

Table 4-1 : Emission factors used for Industrial processes in the Flemish Region (Source : plant specific / CITEPA)

4.2.3. Recalculations and planned improvements

To get a better tuning with the other regions in Belgium, some changes in cell-fillings or allocation of emissions have been carried out compared with the previous submission : The emissions of CH4 from production of sinter are put in table 2.C.1 whereas in previous submissions production of sinter and cokes was put in table 2.C.1.

Feedstocks and non-energy use are allocated under ‘industrial processes, other’. A recalculation of these emissions was done, especially for the nafta used as feedstock in the chemical industry for all years.
A new project will provide a better inventory methodology to estimate emissions of CO2 resulting from non-energy use (of energetic products). In the previous submission the Flemish energy balance used default IPCC percentages for the fixation of Carbon (for example 75% for naphta), whereas 25% from the total Carbon-input is supposed to be emitted in a short time as CO2. These fixation-percentages are a mean for several processes and can be extremely different from one country to another and in specific situations. In this submission the Flemish energy balance uses already another methodology (taking into account the amount of products recuperated i.e. going back into the cracker). This recalculation is done for all years. The new study started in the beginning of 2003 and will take into consideration the results of the International Network Non-energy use and CO2 emissions.

Emissions of N2O due to the production of caprolactam in the flemish region are not calculated so far. Contacts with the industry involved is going on and these emissions of N2O will be integrated in the next submission. This source will be responsible for about 4% of the total emissions of N2O in Flanders.

Investigation of the emissions of CO2 originating from the glass industry in Flanders will be also one of the points of attention in the future.

4.3. Walloon region

4.3.1. Source category description

The emissions are estimated for the following source categories : cement production (category 2.A.1), lime production (category 2.A.2), ammonia production (category 2.B.1), nitric acid production (category 2.B.2), other chemical industrial processes (category 2.B.5) and metal production (category 2.C.1).

4.3.2. Methodological issues

The main process emissions of CO_2, CH_4 and N_2O are calculated by using production data combined with emission factors presented in the EMEP/CORINAIR handbook [3] and in other reference works (IPCC Guidelines, specific bibliographies).

The CO_2 emissions of the cement production (category 2.A.1) are estimated by using a specific emission factor by plant based on the CaO content of raw materials (568-592 kg CO_2/T cement).

The emissions of lime production (category 2.A.2) are estimated by using a specific emission factor by plant (734-913 kg CO_2/T lime).

The CO_2 emission factor used in the glass production (category 2.A.7) for the decarbonation is provisional because there are still some discussions with the glass sector. This emission factor is 150 kg/t glass (container glass and glass wool) and 140 kg/t glass (flat glass).

During the ammonia production (category 2.B.1), ammonia is produced by a reaction between nitrogen and hydrogen. The hydrogen is produced by the steam reformation of natural gas. This reaction produces carbon dioxide as a by-product (1172 kg/t given by the industry). The emissions were estimated based on their production in 2000 and on monitoring in 2000. A part of the CO_2 emission by the process is used by two other plants and released after use. All CO_2 emissions are included in category 2.B.1.

The producer of nitric acid (category 2.B.2) provides the N_2O emissions based on their production in 2000 and on monitoring in 2000. The global emission factor is 6984 g/t.

In the other chemical industrial processes (category 2.B.5), the CO_2 emissions come from flares in the production of the following products : polypropylene, polystyrene, polyethylene and formaldehyde. The emission factor on each flare is calculated based on the composition of each gas provided by the industry.

In the metal production (category 2.C.1), iron is produced through the reduction of iron oxides (ore) with metallurgical coke (as the reducing agent) in a blast furnace to produce pig iron. Steel is made form pig iron and/or scrap steel using electric arc or basic oxygen.

The emission estimates in this sub-sector include emissions from the production of steel in electric arc or basic oxygen type furnaces but not emissions from the combustion of the fuel.

The emissions factors have been studied with the steel-manufacturing sector and are found in table 4-2.

Type of plant	**Emission factor**		
Basic oxygen furnace steel plant	140 kg CO_2/t steel		
Electric furnace steel plant	100 kg CO_2/t steel	10 g CH_4/t steel	5 g N_2O/t steel

Table 4-2 : Emission factors used in the iron and steel sector in the Walloon Region (Source : plant specific /ULG)

4.3.3. Recalculations and planned improvements

The CO_2 emission factor in the glass sector has been changed. It is planned to do the recalculation of the 1990-1999 time series in the 2004 submission.

There are some discussions actually with industrial sectors (lime, cement and iron and steel) to recalculate the CO_2 emissions during the year 1990 to 1999. Modifications will be integrated in the 2004 submission.

4.4. Brussels-Capital region

4.4.1. Source category and methodological issues

Industrial processes (category 2.D.2)

Emissions of NMVOC are estimated for bread making and beer production processes. The emission factor used for the bread making processes is 137g NMVOC/inhabitant/day ; for beer production processes it is 350g NMVOC/ton.

4.5. Fluorinated gases

4.5.1. Source category

No systematic inventories of the F-gases described in Annex A to the Kyoto Protocol (hydrofluorocarbons HFCs, perfluorocarbons PFCs, sulphur hexafluoride SF_6) have been made prior to 1995. These gases make only a negligible contribution (less than 0.6%) to the total greenhouse gas emissions in Belgium (CRF-2000 Table 10s5). Even so, HFC emissions have been gradually increasing (+142% between 1995 and 1999), reflecting the current regulations relating to CFCs substitution. HFCs are mainly used in the refrigeration sector, and for the production of synthetic foams.

4.5.2. Methodological issues

Emissions of ozone-depleting substances which also act as greenhouse gas are estimated on the basis of the use of the different substances for each application, the export, and the rate of elimination, recuperation or recycling in Belgium. A country-specific methodology was developed by Econotec and Ecolas based on the IPCC guidelines [34][35][10][28].

Potential emissions have been estimated on the basis of the consumption and destruction figures directly and not with the official statistics on external trade that are not complete. The actual emissions of HFCs comes from two categories : Refrigeration and air conditioning equipment and Foam blowing.

The SF6 emissions come during the manufacturing and the life of acoustic double glazing and also in some electric installations, this last one correspond only with 0,1 % of the total F-gas emissions in CO2-equivalents.

4.5.3. Recalculations and planned improvements

Some improvements were made to calculate the emissions of fluorinated gases compared to previous submission : emissions originating from air conditioning equipment were optimised by taking into account the emissions at the end of the lifecycle and the methodology to calculate the emissions of SF6 originating from transmission and production of electricity has been improved.

CHAPTER 5 : SOLVENT AND OTHER PRODUCTS USE

5.1. Flemish region

5.1.1. Source category

The emissions of NMVOC in the source category 'Solvent and other product use' include paint application (building industry & households), production of medicins, paints, inks and glues, domestic use of other products (incl. glues and adhesives), coating processes in general (incl. assembly of automobiles), printing industry, wood conservation, treatment of rubber, storage and handling of products, recuperation of solvents and extraction of oil.

5.1.2. Methodological issues

The emissions of NMVOC are strongly optimised compared with previous submission by using the results of a study started by the University of Gent in 1998 and continued by the Flemish Environment Agency (VMM).
Emissions of NMVOC are for the first time estimated for the following sectors : (1) production of medicins, paints, inks and glues (2) wood conservation (3) treatment of rubber (4) storage and handling of products (5) recuperation of solvents and (6) extraction of oil.

No estimation of the CO2 equivalent emissions of the solvent consumption is carried out in Flanders.

The emissions of N2O from anaesthesia is not calculated so far because no activity data (number of hospital beds) are available for the flemish region.

NMVOC emissions are estimated as follows. :

- All emissions of category 3.A (NMVOC emissions for Paint Application), and 3.C (Chemical Products, Manufacture and Processing) as well as some of category 3.D (coating of wood and textile, printing industry, wood conservation, extraction of oil seeds, recuperations of solvents) are estimated based on production figures. The emission factor used is the solvent content of the product.

- The remaining emissions of category 3.D (treating of rubber, coating of synthetic material and paper, storage and handling of products and assembly of automobiles) are estimated based on information gathered in the flemish industrial database mainly originating from the yearly reporting obligations of the industrial companies.

5.2. Walloon region

5.2.1. Source category

The emissions from paint application, degreasing, dry cleaning, chemical products, manufacture, aerosols cans and processing are not estimated. There is no estimate of the CO2 equivalent of the solvent consumption.

The emissions in this category are related to the use of N2O as an anaesthetic.

5.2.2. Methodological issues

The emission calculation for the emission of N_2O from anaesthesia (3D) is based on the number of hospital beds and the average consumption of anaesthetics per bed. The emission factor is 10,3 kg N_2O/bed/year.

It has been assumed that all of the nitrous oxide used for anaesthetics will eventually be released to the atmosphere.

The number of beds used for the emissions calculations was obtained from The DGASS (General Directorate for Health and Social Action).

5.3. Brussels-Capital region

5.3.1. Source category

For non-energy greenhouse gas emissions, activity data are estimated on the basis of production volumes. The main emissions of CO2, CH_4 and N_2O are calculated from the emission factors presented in the "Atmospheric Emission Inventory Guidebook" (EMEP/CORINAir)[3] as well as in other reference works (IPCC Guidelines, specific bibliographies)[10], but for various sectors considered as priority sectors in the Brussels Capital Region, the IBGE-BIM has funded a number of research projects in order to specify the emission factors taking into account particular local conditions (References [16], [17], [18], [19] and [20]) The choice of those priority sectors activities has been made after a thorough analysis of all environmental licences delivered by IBGE-BIM and their potential environmental impact.

5.3.2. Methodological issues

Paint Application (category 3.A) : NMVOC emissions are estimated for use of paint for vehicle coating.

Degreasing and Dry Cleaning(category 3.B) : NMVOC emissions are estimated for the Dry Cleaning processes. See Reference 42 for the detailed methodology

Chemical Products, Manufacture and Processing (category 3.C) : NMVOC emissions are estimated for the use of paint for car repairing and the use of solvents in the printing industry. See Reference 44 and reference 41 for the detailed methodology

Other (category 3.D) : NMVOC emissions are estimated for the domestic solvent use. The emission factor used is 2566 g/inhabitant.

CHAPTER 6 : AGRICULTURE

6.1. Overview

The main types of rearing and cultivation business and their numbers are represented in tables 6-1 and 6-2.

	Flemish region	Brussels-Capital region	Walloon region	Total
Number of businesses	41.047	36	20.843	61.926
Agricultural land (ha)	636.876	482	756.724	1.394.083
Grassland (ha)	241.313	82	378.859	620.254
Grains (ha, without maize)	95.563	207	181.933	277.703
Maize (ha)	34.033	7	1.743	35.783
Sugar beet (ha)	33.925	32	56.900	90.857
Potatoes (ha)	42.444	8	21.527	63.979
Others (ha)	189.598	146	115.762	305.506

Table 6-1 : Main types of cultivation in Belgium (NIS, 2000)

	Flemish region	Brussels-Capital region	Walloon region	Total
Bovine under 6 months	357.084	52	264.798	621.934
Male bovine between 6 months and 1 year	60.082	28	51.859	111.969
Female bovine between 6 months and 1 year	116.299	33	106.243	222.575
Fattening male bovine more than 1 year	82.663	79	83.186	165.928
Reproductive male bovine more than 1 year	45.878	11	24.161	70.050
Young female bovine more than 1 year	386.089	99	360.276	746.464
Dairy cattle	327.067	64	266.657	593.788
Brood cow	182.913	64	325.880	508.857
Total	1.558.075	430	1.483.060	3.041.565
Piglet under 20 kg	2.024.876		59.965	2.084.841
Piglet between 20 and 50 kg	1.699.215	2	94.768	1.793.985
Fattening pigs more than 50 kg	2.617.206	10	131.769	2.748.985
Swine	522.891		23.723	546.614
Fully grown male and female pigs	186.906	0	7.208	194.114
Total	7.051.094	12	317.433	7.368.539
Lambs	23.752	28	10.721	3.4501
Sheep under 1 year	22.720	50	12.078	34.848
Sheep more than one year	56.128	221	34.749	91.098
Total	102.600	299	57.548	160.447
Goat under 1 year	2.880		2.432	5.312
Goat more than one year	5.701	2	5.233	10.936
Horses	21.173	24	10.456	31.653
Total	29.754	26	18121	47.901
Broilers	21.632.697	160	2.864.647	24.497.504
Laying hens	8.197.870	12	778.920	8.976.802
Other poultry	6.832.751	155	329.714	7.162.620
Total	36.663.318	327	3.973.281	40.636.926

Table 6-2 : Number of heads in the main livestock categories in Belgium (NIS, 2000)

The land used for agriculture extends to 1,394,083 hectares (Table 6-1), or 42.8% of Belgium. In 2000, the number of agricultural and horticultural businesses amounted to 61,926. This number had dropped by 15% in 5 years, especially in the wake of successive crises that have hit the agricultural sector (BSE*[Bovine Spongiform Encephalitis*], dioxin). Nevertheless the land area used for agricultural purposes remained identical during this period. Wallonia has 54% of the land used for agriculture, but 66% of agricultural businesses are situated in Flanders. The land area used for farming is on average 15 ha per farm in the Flemish Region and 35 ha per farm in the Walloon Region.

Organic farming and the businesses in transition towards this type of farming only represent 1% of the total. The evolution of the Belgian agricultural sector is of course directly related to the Common Agricultural Policy of the European Union.

6.2. Flemish region

6.2.1. Source category

Some agricultural sectors such as rice cultivation, prescribed burning of savannahs (categories 4.C and 4.E) and field burning of agricultural residues (category 4.F) are not occurring in the Flemish Region. This inventory covers categories 4.A, 4.B and 4.D.

6.2.2. Methodological issues

Since cattle breeding is a major source of methane in Flanders, a country-specific study was developed by the VITO in 1994 [6] to calculate the emissions of CH_4 of enteric fermentation (the normal digestive process of the animals – category 4.A) and manure management (the anaerobic decomposition of organic material in livestock and poultry manure – category 4.B). Afterwards – from 1996 on - this study was optimised when the *Manure Action Plan* in Flanders became operational. The classification of the livestock in Belgium in this study was made according to the IPCC methodology.

The CH_4 emissions from agricultural soils (category 4.D) are calculated using statistical information combined with emission factors of CITEPA [2].

A country-specific study was also developed by the *University of Gent* in 2001 concerning the calculation of the N_2O emissions from agriculture (category 4.D) [7].

Category	**gas**	**Emission factor**
4.D : Agricultural soils	CH_4	Agricultural grassland : 15 kg CH_4 / ha / year
		Arable land : 5 kg CH4 / ha / year

Table 6-3 : Emission factors used for the agricultural sector in the Flemish Region (Source : CITEPA)

6.2.3. Recalculations and planned improvement

Compared to previous submission, the emissions of CH4 from manure management are recalculated from 1996 on, taking into account the real amounts of manure processed.

The methodology for the calculation of the emissions of N_2O caused by nature and agricultural soils (category 4.D) is optimised during this submission by using the results of a study set up by the University of Gent and actualised figures of the use of fertilisers from 1990 on.

6.3. Walloon region

6.3.1. Sources category

Some agricultural sectors such as rice cultivation, prescribed burning of savannahs (categories 4.C and 4.E) and field burning of agricultural residues (category 4.F) are not occurring in the Walloon Region.

The CO2 from agricultural soils has not been estimated, so no figures are accounted under category 4.D, neither in category 5.D in the LULUCF sector.

6.3.2. Methodological issues

All the necessary information needed to calculate emissions of agriculture originates from the national statistics (NIS-agriculture, 2001) [26] and from a study done by the research department Siterem who realised the Walloon model [30].

The emissions of CH_4 and N_2O in agriculture are estimated by using a model [30] taking into account the distinctive features of Walloon agriculture. The methodology is summarised below. The emission factors presented in the CRF tables 4 are an average of the emission factors used in the model.

In order to estimate CH_4 and N_2O emission factors, a statement of all potentially emissions sources was made and the causes of emissions were analysed. Four emissions sources were pointed : animal husbandry, the excreta of agricultural animals deposited in buildings and collected as either liquid slurry or solid manure, application of animal manure to land and mineral fertilisers.

The sources studied for the methane emissions are Enteric fermentation, Manure management (manure storage, spreading of excreta) and animal production.

The N_2O emission estimation depends on two major sources : the manure storage and the emission from agricultural soil (direct and indirect). The N_2O emissions are calculated according to IPCCC methodology.

The N_2O emission estimation from manure storage is based on the nitrogen excreted by each animal category, estimated through local production factors. The calculation takes into account the number of days in pasture and the ratio of liquid systems and solid storage, derived from the regional statistics published by the National Statistic Institute. The IPCC default emission factors for liquid systems and solid storage are then applied (respectively 0,001 and 0,02 kg N- N_2O / kg N excreted)

N_2O is also emitted as a by-product during soil nitrification and denitrification processes. There is a very high variability in the emission rates and the estimation methodologies try to take into account local conditions to reduce the uncertainty.

The N_2O direct soil emissions (category 4.D.1) include the N_2O emissions from daily spread, spreading of mineral fertilisers, spreading of organic fertilisers and nitrogen from crop residues.

The N_2O emissions from mineral fertilisers spreading are calculated by subtracting from nitrogen content fertilisers the nitrogen quantity volatilised as NH_3. The model use a volatilisation rate of 7 % from mineral nitrogen to NH_3. The N_2O emissions from organic fertilisers spreading are calculated in the same way that N_2O emission from mineral fertilisers spreading. The N_2O emissions from crop residues can vary according to the preceding culture. The nitrogen residual from soil is estimated by multiplying, for each culture, the cultivated area by the nitrogen residual average quantity for the culture considered. The N_2O emission from these 3 sources is estimated by applying the IPCC default emission factor (0.0125 kg N-N_2O/kg nitrogen).

The nitrogen from daily spread is estimated , taking into account the number of days in pasture and the nitrogen excreted by each animal category. Available nitrogen is the difference between the manure nitrogen content and the manure nitrogen volatilisation in NH_3 form. The IPCC default emission factor of 0.02 kg N-N_2O / kg N is then used to estimate the emissions.

The indirect emission (category 4.D.3) considers the N_2O emissions from atmospheric deposition, leaching and runoff.

The atmospheric deposition is estimated at 10.9 kg N/ha.year. It is considered that 1 % of this nitrogen is volatilised as N_2O. The N_2O emissions from leaching and runoff are estimated by multiplying available nitrogen quantity in soil (animals excreta from grazing, mineral and organic fertilisers spreading, crop residues decomposition, sludge and atmospheric deposition) by two emission factors. The first estimate the fraction of nitrogen lost by leaching and runoff, with a value coming from local studies and which falls into the IPCC range (0.18 kg N / kg N available). The second estimate the volatilisation rate in N_2O form with the IPCC default value (0.025 kg N-N_2O / kg N).

The category other (4D4) group N_2O emission from sludge spreading on agricultural soils. It's considered a fixed contribution of 0.1 kg N/ha x year and an emission factor equal to 0.0125 kg N-N_2O/kg N from sludge.

6.3.2. Recalculations and planned improvement

The CH_4 emissions in Wallonia were grouped under "enteric fermentation" in the previous submission. The emissions are now properly allocated to each category (enteric fermentation, manure management and agricultural soils).

For N_2O, the emissions factors for emissions from manure management have been deeply revised. It appeared that the emission factors used by the model were not sufficiently country-specific to be adopted, so they have been replaced by the default IPCC emission factors. This modifies substantially the figures for N_2O emission from manure management in Wallonia and Belgium.

Slight changes in the N_2O emissions from agricultural soils are due to small formula or data corrections in the model.

Since 2001, a study on agricultural emissions has been conducted by the General Directorate for Agriculture. The final results of this study will be compared to those published in this submission, and this comparison may lead to new improvements of the inventory.

6.4. Brussels-Capital region

The agricultural activities on the Brussels territory have been considered negligible in he light of the analysis explained in section 5.4.1. and of the comparison with the two other regions (see section 6.1. Overview). The emissions are not estimated.

CHAPTER 7 : LAND-USE CHANGE AND FORESTRY

7.1. Overview

Belgium has a temperate maritime climate, with moderate temperature variability, prevailing westerly winds, heavy cloud cover and regular rain. The distribution of forests in Belgium is shown in Table 7-1.

	Area [km^2]	Forest area [km^2]	% of the Area of the region	% of the total Forest area
Flemish region	13 521	1352	9.9	19.9
Brussels Capital Region	162	20	12.3	0.3
Walloon region	16 845	5 448	32.3	79.9
Belgium	30 528	6 820	22.3	100

Table 7-1 : Forest cover in Belgium (source : INS and regional forest inventories)

As shown in table 7-1, almost 80% of the Belgium forest is in the Walloon Region. The main annual biomass change in Belgium is considered to be in this forest part.

7.2. Flemish region

7.2.1. Source category

For the time being, the inventory covers category 5.B.2.

7.2.2. Methodological issues

CH_4 and N_2O emissions of coniferous, deciduous and marketing gardening (category 5.B) are calculated using statistical information combined with emission factors of CITEPA [2].

	Unit	CH_4	N_2O
Coniferous	Kg/ha/year	50	8.5
Deciduous	Kg/ha/year	20	1.5
Market	Kg/ha/year	25	7

Table 7-2 : Emission factors for the category 5.B “Forest and grassland conversion” in the Flemish Region (Source : CITEPA)

7.2.3. Recalculations and planned improvement

Flanders do have the basic data to make a LULUCF inventory. The regional forest inventory as well as the regional forest mapping have been concluded in 2001. However the translation of these data into a LULUCF inventory following the international guidelines is not yet realised and is an important project presented in the Flemish Climate Policy Plan that has been improved by the Flemish Government on the 28th of February 2003.

Meanwhile it is known that the contribution from sinks to the C-absorption capacity of Flanders is very limited. From satellite data of 1997, this capacity was estimated on 276 kt CO2/year or 0.35% from the CO_2 emissions in Flanders. Although the contribution of sinks to the C-absorption capacity in Flanders is very limited, this point requires more investigation in the future.

7.3. Walloon region

7.3.1. Source category

The CO_2 from agricultural soils has not been estimated, so no figures are accounted under category 4.D, neither in category 5.D in the LULUCF sector.

7.3.2. Methodological issues

The first forest inventory was conducted between 1980-1984 at the University of Gembloux. The inventory is drawn up by sampling to determine the surfaces by–categories of property (Private or Public: State, Province, Community), type of forest, species, age, size and quality.

The permanent Walloon Forest Inventory was set up by decree of the Walloon government in 1994. A ten-year period was adopted to carry out all the measurements. In order not to favour a given region, it was decided to cover the whole territory each year. The grid sampled each year is always the same as the previous years. By increasing the number of sampling points by 10 % each year, the original mesh is narrowed from year to year: 1 measurement per 500 ha in 1994, the first year of the inventory, to 250 hectares in 1995, to 166.67 hectares in 1996 etc.

By the end of 1999, 50% of the sample points had been measured hence, the data presented here represents a mesh of 62.5 ha over the whole territory. Walloon Forest Inventory data were processed using the conversion factors listed in Table 7-3 [33].

	Unit	Deciduous	Coniferous
Above ground biomass/ total hsolid wood	[/]	1.4	1.3
Below ground biomass/ aboveground biomass	[/]	0.26	0.26
Above ground biomass/ aboveground biomass	[$t \cdot m^{-3}$]	0.37-0.55	0.35-0.42
Below ground biomass/ below ground biomass	[$t \cdot m^{-3}$]	0.5	0.4
C / biomass	[/]	0.5	0.5
Wood growth	[$m^3 \cdot ha^{-1} \cdot y^{-1}$]	5.15	15.2
Carbon in biomass	[/]	0.5	0.5

Table 7-3 : Conversion factors used to derive forest inventory data for deciduous and coniferous forests [33]

Table 7-4 gives the annual potential carbon sequestration, according to the IPCC methodologies and a working hypothesis of a linear trend in forest areas and overall biomass increase between 1998 and 1999. A distinction was made between the deciduous and coniferous species allocation respectively 5.15 and 15.2 $m^3 . y^{-1} . ha^{-1}$. Lecomte (pers. comm.) extrapolates the annual solid wood harvests for harvests in the public forests and gives an estimate of 3 350 000 m^3. No statistics were considered acceptable, whether from the National Statistics Institute, the Ministry of Economic Affairs, the wood industry unions or the trade sector.

Year	Annual wood growth [m^3]	Wood harvest [m^3]	Annual biomass change	
			kt C	kt eq. CO_2
1998	5 203 811	3 350 000	501	1 834
1999	5 183 837	3 350 000	499	1 829
2000	5 163 863	3 350 000	497	1 822
2001	5 143 888	3 350 000	495	1 814

Table 7-4 : Annual carbon sequestration potential in the Walloon forests according to the IPCC methodology [33].

7.3.3. Recalculations and planned improvement

A slight revision of the conversion factors was conducted in 2002. The wood density (aboveground biomass/aboveground biomass in t/dm³ in table 7-3) is now specific for the main deciduous and coniferous species. The below ground biomass/aboveground biomass conversion factor has been revised according to the latest results available. The mean annual growth has also been slighly adapted according to the last results of the inventory.

7.4. Brussels-Capital region

Considering the very small forest area in the Brussels-Capital region, no inventory of the emissions has been conducted.

CHAPTER 8 : WASTE

8.1. Overview

The production of waste arising from the residential sector and from commercial activities ('municipal waste') amounted to 535 kg per inhabitant in 1999, 52% of which was not recycled. Manufacturing industry is the largest source of waste (13.8 Mt). The three regions have implemented waste management plans. The objectives and actions of the Flemish Region for waste are defined in the *MiNa [Flemish Environmental Policy Plan] plan 1997-2001*. The *Wallonia waste plan 'Horizon 2010'*, adopted in 1998, contains a series of 70 actions targeted on the prevention, the recycling and the recovery of energy, and the elimination of waste. The *Waste Prevention and Management Plan in Brussels-Capital Region 1998-2002* also subscribes to this double strategy of waste prevention and recovery.

In addition, a body (FOST Plus) has been created by the private sector to finance, co-ordinate and promote the selective collection, the sorting and recycling of household packaging waste. FOST Plus was created to enable industry to respond in a global and concrete way to the legislation on packaging and, more specifically, to the introduction of European Directive 94/62/EC of 20/12/1994, and the Co-operation Agreement between the Regions of 5/3/97 relating to the prevention and management of waste from household packaging. The recovery of used materials is becoming a major industry in Belgium and creates plenty of employment. The industries most intensive in manpower are: textile recycling, the recycling of paper and that of construction materials.

8.2. Flemish region

8.2.1. Source category

CH_4 emissions originating from the production of compost is put under category 6.D Waste/Other.
The waste emission inventory covers categories 6.A, 6.C and 6.D.

8.2.2. Methodological issues

CO_2 emissions from waste incineration (category 6.C) only include the fraction of waste burned that is considered 'plastics and other non biogenic waste'. This amount is calculated using specific information (composition, carbon content, emission factor) in Flanders concerning the incineration of waste.

CO2 emissions from solid waste disposal on land are calculated for the first time (as basis the emission of CH4 from solid waste disposal is used). Further investigation is necessary in the near future to optimise this methodology, especially with respect to the contribution organic/inorganic fraction. Since most of the CO2 release can be attributed to 'organic' decomposition, these emissions should not be included in the future inventory.

CH_4 and N_2O emissions from domestic waste incineration are calculated using activity data known from the individual companies involved combined with emission factors of CITEPA [2].

CH_4 emissions from solid waste disposal on Land (category 6.C) was studied by the VITO [1] in 1994 [8]. The data available for Flanders are specific and accurate, what allows a more refined methodology than the one proposed in the IPCC guidelines.

Since 1994 waste policies in Flanders (cfr Ladder of Lansinck which prefers waste burning over waste dumping) have made some results. The amount of waste of households dumped decreased since 1994 and from 1998 on, more waste was burned than dumped. A real moratorium in dumping organic waste is set up since 2000.
CH4 emissions from compost production is estimated using regional activity data combined with emission factors of CITEPA.

Category	Gas	Emission factor
6.C : Domestic waste incineration	CH_4	3 g/ton waste
6.C : Domestic waste incineration	N_2O	60 g/ton waste
6.D : Waste - Other (= production of compost)	CH_4	20 kg CH4 / ton compost

Table 8-1 : Emission factors used for the waste sector in the Flemish Region

8.2.3. Recalculations and planned improvements

The methodology for the calculation of the emissions of CH_4 of waste disposal is optimised by using the results of a study set up by the VITO taking into account the new situation of flaring and valorisation of the waste gas .

The emissions of CO_2 from managed waste disposal on land are included in table 6 for all years. These emissions were missing in the previous submission and are calculated starting from the emissions of CH4 in this sector, a study that is set up by the VITO.

The emissions of CO_2 from waste incineration are updated from 1998 on because of more accurate estimates in amounts of waste incineration.

Some points of attention to optimise the emissions of the waste sector in the future : (1) the methodology to calculate the emissions of CH4 originating from the production of compost, (2) methodology to calculate the emissions of CO2 due to waste incineration with special attention for the percentages organic/inorganic fraction and (3) methodology to calculate the emissions of CO2 due to landfilling (solid waste disposal on land) with special attention for the percentages organic/inorganic fraction.

8.3. Walloon region

8.3.1. Source category

The industrial wastewater (category 6.B.1) is not considered because a lack of data.

8.3.2. Methodological issues

The CO_2 and CH_4 emissions from managed waste disposal on land (category 6.A.1) are based on a model considering separately the emissions from industrial waste and household refuse. The two models are the same but some constants used by the models are different. These models developed by the VITO [1] in 1994 acknowledge the fact that methane is emitted over a long period of time rather than instantaneously. A kinetic approach is used to take into account the various factors that influence the rate and extent of methane generation and release from landfill. The data's for the model come from different sources : the statistics of the administration, the EMEP/Corinair guidebook [3] and specific data's from Walloon landfills. All known waste disposal sites are assumed to be managed.

The direct CO_2 emissions from solid waste disposal on land aren't reported because a large fraction of the carbon in waste landfilled derived from biomass raw materials, and there is no information about the CO_2 emissions from the non-biological or inorganic waste sources.

A survey of the amount of CH_4 recovered for energy utilisation or flaring is conducted yearly among the waste disposal sites. This CH_4 is assumed to be completely converted into CO_2 through the combustion process. This CO_2 emission was reported in this submission and included in national totals (see also section 8.3.3, planned improvements).

In the category domestic and commercial wastewater (category 6.B.2), the CO_2 emissions from municipal wastewater treatment plant are not reported because the carbon derives from biomass raw materials. In this category, two sources of methane emissions are taken into account : the CH_4 emissions from municipal wastewater treatment plant and from sceptic tank.

The methodology for the individual wastewater treatment plant (septic tank) is based on an article (Vasel, 1992) [32] which describes the characteristics and parameters of individual septic tank. For the CH_4 emission factor, the recommended default value of 0.25 kg CH_4 /kg BOD in the EMEP/Corinair handbook is used [3]. It is considered that only 10 % of the BOD loading is anaerobically metabolised (60*2/3*0.6*0.25). The emission factor becomes 1,5 g CH_4/inhab*day. The CH_4 emissions are estimated by multiplying these emission factors by the number of inhabitant link up to a sceptic tank.

In the municipal wastewater treatment plants, the CH_4 emissions are estimated by using the very simple methodology described in the EMEP/CORINIAR guidebook [3]. There is a distinction between the emissions from water treatment and sludge treatment.

The N_2O emission are estimated by using the methodology described in the IPCC guidelines. The default values for N fraction in protein and N_2O emission factor are 16 % and 0.01 kg N-N_2O / kg protein. The data's concerning the protein consumption come from the FAO statistic. The population comes from the INS.

In the category waste incineration (category 6.C), there is a distinction between the emission from municipal waste incineration and hospital waste incineration. The CO_2 emissions of municipal waste incineration are reported, assuming that 85 % of these waste are composed of organic material (CITEPA). The N_2O emissions are estimated using the values measured in the incinerator or by using the following emission factor : 60 g N_2O / T waste combusted. CH_4 emissions are not relevant here. The CO_2 emissions from hospital waste incineration have been measured by the Walloon incinerator and are reported in the CRF tables, Table 6. Emissions from the incineration of corpses is calculated using the EMEP/Corinair emission factors and statistical data on the number of corpses.

In the category other (sludge spreading) (category 6.D), the CO_2 emissions are not reported because carbon in sludge is derived from biomass raw materials. The CH_4 emissions are obtain by multiplying the sludge quantity spreading on agricultural soil by a CH_4 emission factor (2,9 kg CH_4 / T dry matter). The sludge quantity spreading on agricultural soil and the CH_4 emission factor come from the database of the Walloon region administration.

8.3.3. Recalculations and planned improvement

Concerning the ratio of biogenic waste in the waste incineration sector, the implementation of the Wallonia Waste Plan is now changing the picture, as the "green waste" are increasingly sorted by the citizens and collected for compost production, thus increasing the ratio of non-biogenic waste while reducing the total amount of waste to be treated in waste incineration plants or deposited in solid waste disposal sites. These new ratios will be taken into account in the following submission.

The allocation of emissions from sludge spreading will be further analysed, as there might be double-counting, considering that the sludge spreading is also taken into account in the agricultural sector.

The accounting for CO_2 emissions from landfill gas recovery combustion in the national totals is not required by the IPCC Good Practice Guidance (footnote 4 page 5.10). In the next submission, this CO_2 will be reported under memo items, CO_2 from biomass.

8.4. Brussels-Capital region

8.4.1. Source category

Only waste incineration (category 6.C) occur on the Brussels territory. The following incineration processes occur in Brussels : incineration of domestic or municipal wastes, incineration of hospital wastes and incineration of corpses

8.4.2. Methodology

The detailed methodology is explained in reference (19)

For the incineration of domestic waste, the emission factors is (1990-2000) 985000 gCO_2/ton waste ; 60,6 gCH_4/ton and 450 gN_2O/ton. For the incineration of hospital waste, the emission factors is (1990-2000) 985000 gCO_2/ton waste ; 27 gCH_4/ton and 450 gN_2O/ton. For the incineration of corpses, the emission factor is 13602 gCO2/cremation ; 41,50 gCH_4/crémation and 21,10 gN_2O/cremation.

CHAPTER 9 : RECALCULATIONS AND PLANNED IMPROVEMENTS

9.1. Recalculations and achieved improvements

The sector-specific recalculations and methodological improvements achieved since the last submission are presented in the respective chapters of this report. This chapter presents the general issues that have been addressed since the last submission.

The efficiency of the institutional arrangements for the preparation of the inventory has been improved. A detailed planning for the co-ordinated preparation of the inventory has allowed the timely submission of the inventory at the European and international level. On the technical side, the sectoral tables have been fulfilled in all cases where the regional methodologies were close enough to allow an harmonised presentation.

In the Flemish region, the emissions were completely updated for the time series 1990-2000 and provisional emissions are calculated for 2001. In the Walloon region, a large effort has been conducted to improve the inventory, with the aim to use methodologies approved by the IPCC guidelines. Due to a lack of time, some of the recalculations that have only been applied to the inventory years 2000 and 2001, so the time series 1990-1999 has not been completely updated at this point in time.

Several actions have been launched in the course of 2002 and will lead to further improvements of the inventory. These are explained in section 10.3 below.

9.2. Implication on emission levels and trends

As mentioned in section 3.3.1., the utilities emissions of the manufacturing industries (manufacture in metal, textile, cement, lime, asphalt concrete, glass, mineral wool, bricks and tiles, fine ceramic materials) are allocated in the source category ‘other’ (category 1.A.2.f) in Wallonia for the inventory year 1990. In 2001, these emissions were allocated to each sector category. This discrepancy has serious consequences on the key sources analysis (see section 1.4) and will be corrected in the next submission.

9.3. Planned improvements

On the national level, the ICE decision adopted in 2002 includes :
- extension of human resources devoted to the compilation of the national inventory
- establishment of a consolidated planning for the preparation of the annual inventory
- development of a procedure of quality control of the national inventory
- performance of an independent audit of the greenhouse gas inventories of the Regions and the national inventory

As explained in section 1.5, independent audits have started in 2002. They are finalised for some regions, others will be completed in 2003.

The planning for the preparation of the inventory has already been followed in 2002. Several meetings are conducted since January 2003 with the three regions to identify for each sector on which level the

Good Practice Guidance (e.g. uncertainty analysis, QA/QC,…) has to be implemented and to devise a work programme until the next submission.

A working group has been established in order to improve the consistency of the energy balances available at different levels (regional, national, Eurostat). This work should allow a more accurate calculation of the reference approach as explained in section 3.5.

A study on greenhouse gas fluxes in relation with LULUCF activities is conducted at the national level, one of the objectives being the assessment of carbon stock changes in soils, as this potential source and sink is excluded from the inventory for the time being (see annex 5).

On the regional level, two projects within the framework of the energy balance of Flanders will be carried out in the near future :

- A first project will provide a better inventory methodology to estimate emissions of CO2 resulting from non-energy use (of energetic products). In the previous submission the Flemish energy balance used default IPCC percentages for the fixation of Carbon (75%), whereas 25% from the total Carbon-input is supposed to be emitted in a short time as CO_2. These fixation-percentages are a mean for several processes and can be extremely different from one country to another and in specific situations. In this submission the Flemish energy balance uses already another methodology (taking into account the amount of products recuperated i.e. going back into the cracker). This recalculation is done for all years. The new study started in the beginning of 2003 and will take into consideration the results of the International Network Non-energy use and CO2 emissions.

- A second project will optimise the inventory of energy-use from the tertiary and residential sectors. A project proposal on this point is in preparation.

Some other projects planned in the near future to further optimise the flemish emission inventory of Greenhouse gases are :

- The fugitive emissions of CH4 originating from the distribution of gas are estimated by using emission factors of CITEPA based on the consumption of gas. A more accurate method based on measurements and taking into account the different causes of emission (compressors, installation of new pipelines, accidents) and the different materials used, will be carried out in the near future. Contacts with the industry involved are already going on.

- Emissions of N2O due to the production of caprolactam are not calculated so far. Contacts with the industry involved is going on and these emissions will be included in the next submission. This source will be responsible for about 4% of the N2O-emissions in Flanders.

In Wallonia, an independent audit conducted yearly by external consultants will be harmonised in order to be used as a basis for the implementation of a QA/QC procedure, as explained in section 1.5. Work is also going on to insure the consistency of the regional energy balance. The inventory years 1990-1999 will be revised according to the methodological improvements applied on the 2000 and 2001, with a view to insure the consistency of the time series.

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ANNEXES TO THE NATIONAL INVENTORY REPORT

Annex 1 : Key sources analysis

Level assessment

IPCC Source Categories[a]	Direct Greenhouse Gas	Sector	Base Year Estimate (1990^b)	Current Year Estimate (2001)	Level Assessment (2001)	Cumulative Total
			(Gg CO_2 eq.)			
1.A.3.b. Road Transportation	CO2	Energy	18976	23500	15,6%	15,6%
1.A.4.b. Residential	CO2	Energy	20573	22150	14,7%	30,4%
1.A.1.a. Public Electricity and Heat Production	CO2	Energy	21733	20858	13,9%	44,2%
1.A.2.a. Iron and Steel	CO2	Energy	10499	12298	8,2%	52,4%
1.A.2.c. Chemicals	CO2	Energy	5493	9197	6,1%	58,5%
1.A.2.f. Manufacturing Industries and Construction - Other	CO2	Energy	13732	8558	5,7%	64,2%
1.A.4.a. Commercial/Institutional	CO2	Energy	4287	6340	4,2%	68,4%
1.A.1.b. Petroleum Refining	CO2	Energy	4726	5337	3,5%	72,0%
4.D. N2O emissions from Agricultural Soils	N2O	Agriculture	5074	4730	3,1%	75,1%
4.A.1. Enteric Fermentation from Cattle	CH4	Agriculture	4469	4067	2,7%	77,8%
2.B.2. Nitric Acid Production	N2O	Industrial Processes	3559	4031	2,7%	80,5%
2.A.1. Cement Production	CO2	Industrial Processes	2760	3511	2,3%	82,8%
1.A.4.c. Agriculture/Forestry/Fisheries	CO2	Energy	2769	2327	1,5%	84,4%
1.A.2.e. Food Processing, Beverages and Tobacco	CO2	Energy	2339	2223	1,5%	85,8%
2.A.2. Lime Production	CO2	Industrial Processes	1581	2137	1,4%	87,3%
6.A. Solid Waste Disposal on Land	CH4	Waste	2829	1767	1,2%	88,4%
6.C. Waste Incineration	CO2	Waste	1084	1632	1,1%	89,5%
2.B.1. Ammonia Production	CO2	Industrial Processes	778	1510	1,0%	90,5%
4.B.8. Manure Management (Swine)	CH4	Agriculture	1302	1449	1,0%	91,5%
2.C.1. Iron and Steel Production	CO2	Industrial Processes	1671	1391	0,9%	92,4%
2.F. Consumption of Halocarbons and SF6	HFC, SF6	Industrial Processes	339	1227	0,8%	93,2%
4.B.1. Manure Management (Cattle)	CH4	Agriculture	963	1015	0,7%	93,9%
2.G. Other industrial processes	CO2	Industrial Processes	654	976	0,6%	94,6%
1.A.2.d. Pulp, Paper and Print	CO2	Energy	414	863	0,6%	95,1%
1.B.2.b. Fugitive Emissions from Natural Gas	CH4	Energy	744	860	0,6%	95,7%
1.A.4. Fuel combustion activities - Other Sectors	N2O	Energy	1064	812	0,5%	96,2%
1.A.3.b. Road Transportation	N2O	Energy	265	769	0,5%	96,8%
4.B. Manure Management	N2O	Agriculture	474	484	0,3%	97,1%
1.A.1.c. Manufacture of Solid Fuels and Other Energy Industries	CO2	Energy	2113	473	0,3%	97,4%
1.A.2.b. Non-Ferrous Metals	CO2	Energy	572	451	0,3%	97,7%
1.A.3.d. Navigation	CO2	Energy	312	438	0,3%	98,0%
6.D. Other	CH4	Waste	61	352	0,2%	98,2%
1.A.1. Energy Industries	N2O	Energy	379	324	0,2%	98,4%
1.A.2. Manufacturing Industries and Construction	N2O	Energy	904	274	0,2%	98,6%
1.A.3.c. Railways	CO2	Energy	203	156	0,1%	98,7%
4.D. CH4 emissions from Agricultural Soils	CH4	Agriculture	150	147	0,1%	98,8%
1.A.4. Fuel combustion activities - Other Sectors	CH4	Energy	106	114	0,1%	98,9%
4.A.8. Enteric Fermentation from Swine	CH4	Agriculture	114	103	0,1%	99,0%
6.B. Wastewater Handling	N2O	Waste	71	102	0,1%	99,0%
1.A.3.b. Road Transportation	CH4	Energy	76	97	0,1%	99,1%
6.C. Waste Incineration	N2O	Waste	95	95	0,1%	99,2%
4.B.9. Manure Management (Poultry)	CH4	Agriculture	103	95	0,1%	99,2%
1.A.2. Manufacturing Industries and Construction	CH4	Energy	34	74	0,0%	99,3%
1.A.3.e. Other Transportation	CO2	Energy	110	59	0,0%	99,3%
2.C.1. Iron and Steel Production	CH4	Industrial Processes	35	31	0,0%	99,3%
1.A.3.a. Civil Aviation	CO2	Energy	8	9	0,0%	99,3%
1.A.1. Energy Industries	CH4	Energy	11	5	0,0%	99,3%
Total			141464	150411	100,0%	
[a] LUCF sources are not included in this analysis						
[b] Base year for F-gases is 1995						

Trend assessment

IPCC Source Categories[a]	Direct Greenhouse Gas	Sector	Base Year Estimate (1990[b])	Current Year Estimate (2001)	Trend Assessment	Contribution to Trend	Cumulative Total
			(Gg CO_2 eq.)				
1.A.2.f. Manufacturing Industries and Construction - Other	CO2	Energy	13732	8558	0,038	19,7%	19,7%
1.A.2.c. Chemicals	CO2	Energy	5493	9197	0,021	10,9%	30,6%
1.A.3.b. Road Transportation	CO2	Energy	18976	23500	0,021	10,8%	41,5%
1.A.1.a. Public Electricity and Heat Production	CO2	Energy	21733	20858	0,014	7,3%	48,8%
1.A.4.a. Commercial/Institutional	CO2	Energy	4287	6340	0,011	5,8%	54,6%
1.A.1.c. Manufacture of Solid Fuels and Other Energy Industries	CO2	Energy	2113	473	0,011	5,8%	60,4%
6.A. Solid Waste Disposal on Land	CH4	Waste	2829	1767	0,008	4,0%	64,5%
1.A.2.a. Iron and Steel	CO2	Energy	10499	12298	0,007	3,7%	68,2%
2.F. Consumption of Halocarbons and SF6	HFC, SF6	Industrial Processes	339	1227	0,005	2,8%	71,0%
1.A.2. Manufacturing Industries and Construction	N2O	Energy	904	274	0,004	2,2%	73,2%
4.A.1. Enteric Fermentation from Cattle	CH4	Agriculture	4469	4067	0,004	2,2%	75,5%
2.B.1. Ammonia Production	CO2	Industrial Processes	778	1510	0,004	2,2%	77,7%
4.D. N2O emissions from Agricultural Soils	N2O	Agriculture	5074	4730	0,004	2,2%	79,9%
1.A.4.c. Agriculture/Forestry/Fisheries	CO2	Energy	2769	2327	0,004	2,0%	81,9%
2.A.1. Cement Production	CO2	Industrial Processes	2760	3511	0,004	1,9%	83,7%
1.A.3.b. Road Transportation	N2O	Energy	265	769	0,003	1,6%	85,3%
6.C. Waste Incineration	CO2	Waste	1084	1632	0,003	1,6%	86,9%
2.A.2. Lime Production	CO2	Industrial Processes	1581	2137	0,003	1,5%	88,4%
1.A.2.d. Pulp, Paper and Print	CO2	Energy	414	863	0,003	1,4%	89,8%
2.C.1. Iron and Steel Production	CO2	Industrial Processes	1671	1391	0,002	1,3%	91,0%
1.A.4. Other Sectors	N2O	Energy	1064	812	0,002	1,0%	92,1%
1.A.1.b. Petroleum Refining	CO2	Energy	4726	5337	0,002	1,0%	93,1%
6.D. Other	CH4	Waste	61	352	0,002	0,9%	94,0%
2.G. Other	CO2	Industrial Processes	654	976	0,002	0,9%	94,9%
1.A.4.b. Residential	CO2	Energy	20573	22150	0,002	0,9%	95,8%
1.A.2.e. Food Processing, Beverages and Tobacco	CO2	Energy	2339	2223	0,002	0,9%	96,7%
2.B.2. Nitric Acid Production	N2O	Industrial Processes	3559	4031	0,002	0,8%	97,5%
1.A.2.b. Non-Ferrous Metals	CO2	Energy	572	451	0,001	0,5%	98,0%
1.A.3.d. Navigation	CO2	Energy	312	438	0,001	0,3%	98,4%
1.A.1. Energy Industries	N2O	Energy	379	324	0,000	0,3%	98,6%
1.B.2.b. Fugitive Emissions from Natural Gas	CH4	Energy	744	860	0,000	0,2%	98,8%
4.B.8. Manure Management (Swine)	CH4	Agriculture	1302	1449	0,000	0,2%	99,1%
1.A.3.c. Railways	CO2	Energy	203	156	0,000	0,2%	99,2%
1.A.3.e. Other Transportation	CO2	Energy	110	59	0,000	0,2%	99,4%
1.A.2. Manufacturing Industries and Construction	CH4	Energy	34	74	0,000	0,1%	99,6%
6.B. Wastewater Handling	N2O	Waste	71	102	0,000	0,1%	99,6%
4.B. Manure Management	N2O	Agriculture	474	484	0,000	0,1%	99,7%
4.A.8. Enteric Fermentation from Swine	CH4	Agriculture	114	103	0,000	0,1%	99,8%
1.A.3.b. Road Transportation	CH4	Energy	76	97	0,000	0,1%	99,8%
4.B.9. Manure Management (Poultry)	CH4	Agriculture	103	95	0,000	0,0%	99,9%
4.D. CH4 emissions from Agricultural Soils	CH4	Agriculture	150	147	0,000	0,0%	99,9%
4.B.1. Manure Management (Cattle)	CH4	Agriculture	963	1015	0,000	0,0%	99,9%
2.C.1. Iron and Steel Production	CH4	Industrial Processes	35	31	0,000	0,0%	100,0%
1.A.1. Energy Industries	CH4	Energy	11	5	0,000	0,0%	100,0%
6.C. Waste Incineration	N2O	Waste	95	95	0,000	0,0%	100,0%
1.A.4. Fuel combustion activities - Other Sectors	CH4	Energy	106	114	0,000	0,0%	100,0%
1.A.3.a. Civil Aviation	CO2	Energy	8	9	0,000	0,0%	100,0%
Total			141464	150411	0,192		
[a] LUCF sources are not included in this analysis							
[b] Base year for F-gases is 1995							

Annex 2 : Detailed methodology

In some cases the methodologies applied by the three regions are too different to allow the presentation of one sectoral background table, with the sum of the regional activity data and mean implied emission factors. This annex addresses this issue and provides the crf sectoral background tables, if relevant, for the three regions. The tables included are listed hereunder :

Walloon region (inventory years 2000 and 2001)

Table 1.B.2
Table 2(I).A-GS1
Table 2(I)A-GS2
Table 4D
Table 5.A
Table 6.A, 6.C
Table 6.B

Brussels-Capital region (inventory year 2000)

Table 1.B.2
Table 6.A, 6.C
Table 6.B

Table 2(I).A-GS1, Table 2(I)A-GS2, Table 4D, Table 5.A are not relevant for the Brussels-Capital region. The inventory 2001 is mainly based on the same activity data.

Flemish region (inventory years 2000 and 2001)

Table 1.B.2
Table 2(I).A-GS1
Table 2(I)A-GS2
Table 5.B
Table 6.A, 6.C

TABLE 1.B.2 SECTORAL BACKGROUND DATA FOR ENERGY
Fugitive Emissions from Oil, Natural Gas and Other Sources
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA			IMPLIED EMISSION FACTORS			EMISSIONS		
	Description [1]	Unit	Value	CO_2 (kg/unit) [2]	CH_4 (kg/unit) [2]	N_2O (kg/unit) [2]	CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)
1. B. 2. a. Oil [3]							**0,00**	**0,00**	
i. Exploration	*(e.g. number of wells drilled)*			0,00	0,00				
ii. Production[4]	*(e.g. PJ of oil produced)*			0,00	0,00				
iii. Transport	*(e.g. PJ oil loaded in tankers)*			0,00	0,00				
iv. Refining / Storage	*(e.g. PJ oil refined)*			0,00	0,00				
v. Distribution of oil products	*(e.g. PJ oil refined)*			0,00	0,00				
vi. Other				0,00	0,00				
1. B. 2. b. Natural Gas							**0,16**	**9,60**	
Exploration				0,00	0,00				
i. Production [4] / Processing				0,00	0,00				
ii. Transmission				0,00	0,00				
Distribution		PJ	181,97	566,03	34.632,08		0,10	6,30	
iii. Other Leakage				0,00	0,00		**0,05**	**3,30**	
at industrial plants and power stations		PJ	124,30	233,31	14.328,24		0,03	1,78	
in residential and commercial sectors		PJ	57,67	433,51	26.287,95		0,03	1,52	
1. B. 2. c. Venting [5]							**0,00**	**0,00**	
i. Oil	*(e.g. PJ oil produced)*			0,00	0,00				
ii. Gas	*(e.g. PJ gas produced)*			0,00	0,00				
iii. Combined				0,00	0,00				
Flaring							**0,00**	**0,00**	**0,00**
i. Oil	*(e.g. PJ gas consumption)*			0,00	0,00	0,00			
ii. Gas	*(e.g. PJ gas consumption)*			0,00	0,00	0,00			
iii. Combined				0,00	0,00	0,00			
1.B.2.d. Other *(please specify)* [6]							**0,00**	**0,00**	**0,00**
				0,00	0,00	0,00			

Additional information

Description
Pipelines length (km)
Number of oil wells
Number of gas wells
Gas throughput [a]
Oil throughput [a]
Other relevant information *(specify)*

[a] In the context of oil and gas production, throug measure of the total production, such as barrels p of oil, or cubic meters of gas per year. Specify th of the reported value in the unit column. Take in account that these values should be consistent wi activity data reported under the production rows main table.

[1] Specify the activity data used and fill in the activity data description column, as given in the examples in brackets. Specify the unit of the activity data in the unit column. Use the document box to specify whether the fuel amount is based on the raw material production or on the saleable production. Note cases where more than one variable is used as activity data.

[2] The unit of the implied emission factor will depend on the units of the activity data used, and is therefore not specified in this column. The unit of the implied emission factor for each activity will be kg/unit of activity data.

[3] Use the category also to cover emissions from combined oil and gas production fields. Natural gas processing and distribution from these fields should be included under 1.B.2.b.ii and 1.B.2.b.iii, respectively.

[4] If using default emission factors these categories will include emissions from production other than venting and flaring.

[5] If using default emission factors, emissions from Venting and Flaring from all oil and gas production should be accounted for here. Parties using the IPCC software could report those emissions together, indicating so in the documentation box.

[6] For example, fugitive CO_2 emissions from production of geothermal power could be reported here.

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES
Emissions of CO_2, CH_4 and N_2O
(Sheet 1 of 2)

Walloon region
2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[2]					
	Production/Consumption quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description [1]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	[2]	(Gg)	[2]	(Gg)	[2]
A. Mineral Products						**5.874,69**		**0,00**		**0,00**	
1. Cement Production	Cement	6.088,63	0,58			3.511,17					
2. Lime Production		2.640,49	0,81			2.136,98					
3. Limestone and Dolomite Use		NE	NE								
4. Soda Ash						0,00					
Soda Ash Production		NE	NE								
Soda Ash Use			0,00								
5. Asphalt Roofing		NE	NE								
6. Road Paving with Asphalt		2.444,00	0,00								
7. Other *(please specify)*						226,54		0,00		0,00	
Glass Production			0,00								
	Molten glass	1.445,60	0,16	0,00	0,00	226,54					
B. Chemical Industry						**452,09**		**0,00**		**3,87**	
1. Ammonia Production [3]	confidential	conf	conf	conf	conf	397,08					
2. Nitric Acid Production	confidential	conf			conf					3,87	
3. Adipic Acid Production		NO			NO						
4. Carbide Production			0,00	0,00		0,00		0,00			
Silicon Carbide		NO	NO	NO							
Calcium Carbide			0,00	0,00							
5. Other *(please specify)*						55,01		0,00		0,00	
Carbon Black				0,00							
Ethylene			0,00	0,00	0,00						
Dichloroethylene				0,00							
Styrene				0,00							
Methanol				0,00							
polypropylène, polystyrène, polyéthylène, other		1.014,76	0,05	0,00	0,00	55,01					

[1] Where the IPCC Guidelines provide options for activity data, e.g. cement or clinker for estimating the emissions from Cement Production, specify the activity data used (as shown in the example in brackets) in order to make the choice of emission factor more transparent and to facilitate comparisons of implied emission factors.

[2] Enter cases in which the final emissions are reduced with the quantities of emission recovery, oxidation, destruction, transformation. Adjusted emissions are reported and the quantitative information on recovery, oxidation, destruction, and transformation should be given in the additional columns provided.

[3] To avoid double counting make offsetting deductions from fuel consumption (e.g. natural gas) in Ammonia Production, first for feedstock use of the fuel, and then to a sequestering use of the feedstock.

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES
Emissions of CO_2, CH_4 and N_2O
(Sheet 2 of 2)

Walloon region
2000
Submission 2.003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[2]					
	Production/Consumption Quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description [1]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	[2]	(Gg)	[2]	(Gg)	[2]
C. Metal Production [4]						**914,89**		**0,10**		**0,00**	
1. Iron and Steel Production			0,00			914,89		0,10			
Steel		7.155,17	0,13			914,89					
Pig Iron		4.835,17	0,00	0,00							
Sinter		6.567,92	0,00	0,00				0,10			
Coke		1.573,92	0,00	0,00							
Other *(please specify)*						0,00		0,00			
		0,00	0,00	0,00	0,00						
2. Ferroalloys Production		NE	NE	NE							
3. Aluminium Production		NE	NE	NE							
4. SF_6 Used in Aluminium and Magnesium Foundries											
5. Other *(please specify)*						0,00		0,00		0,00	
Zn and Copper production		133,00	0,00	0,00	0,00						
D. Other Production						**0,00**					
1. Pulp and Paper											
2. Food and Drink		NE	NE								
G. Other *(please specify)*						**0,00**		**0,00**		**0,00**	
		0,00	0,00	0,00	0,00						

[4] More specific information (e.g. data on virgin and recycled steel production) could be provided in the documentation box.

Note: In case of confidentiality of the activity data information, the entries should provide aggregate figures but there should be a note in the documentation box indicating this.

Documentation box:

TABLE 4.D SECTORAL BACKGROUND DATA FOR AGRICULTURE

Agricultural Soils[1]

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION		IMPLIED EMISSION FACTORS		EMISSIONS
	Description	Value	Unit		(Gg N_2O)
Direct Soil Emissions	**N input to soils (kg N/yr)**				**2,15**
Synthetic Fertilizers	Use of synthetic fertilizers (kg N/yr)	83.988.896	(kg N2O-N/kg N)[2]	0,0125	1,65
Animal Wastes Applied to Soils	Nitrogen input from manure applied to soils (kg N/yr)	25.342.203	(kg N2O-N/kg N)[2]	0,0125	0,50
N-fixing Crops	Dry pulses and soybeans produced (kg dry biomass/yr)	NE	(kg N2O-N/kg dry biomass)[2]	NE	NE
Crop Residue	Dry production of other crops (kg dry biomass/yr)	NE / IE ?	(kg N2O-N/kg dry biomass)[2]	NE	NE
Cultivation of Histosols	Area of cultivated organic soils (ha)	NE	(kg N2O-N/ha)[2]	NE	NE
Animal Production	**N excretion on pasture range and paddock (kg N/yr)**	**45.080.280**	**(kg N2O-N/kg N)[2]**	**0,0200**	**1,42**
Indirect Emissions					**1,53**
Atmospheric Deposition	Volatized N (NH_3 and NOx) from fertilizers and animal wastes (kg N/yr)	8.267.671	(kg N2O-N/kg N)[2]	0,0100	0,13
Nitrogen Leaching and Run-off	N from fertilizers and animal wastes that is lost through leaching and run off (kg N/yr)	35.599.920	(kg N2O-N/kg N)[2]	0,0250	1,40
Other *(please specify)*					**0,69**
Soil residue		35.022.613		0,0125	0,69
Boues		75.672		0,0125	0,0015

Additional information

Fraction [a]	Description
$Frac_{BURN}$	Fraction of crop residue burned
$Frac_{FUEL}$	Fraction of livestock N excretion in excrements burned for fuel
$Frac_{GASF}$	Fraction of synthetic fertilizer N applied to soils that volatilizes as NH_3
$Frac_{GASM}$	Fraction of livestock N excretion that volatilizes as NH_3
$Frac_{GRAZ}$	Fraction of livestock N excreted and deposited onto soil during grazing
$Frac_{LEACH}$	Fraction of N input to soils that is lost through leaching and runoff
$Frac_{NCRBF}$	Fraction of N in non-N-fixing crop
$Frac_{NCRO}$	Fraction of N in N-fixing crop
$Frac_R$	Fraction or crop residue removed from the field as crop

[a] Use the fractions as specified in the IPCC Guidelines (Volume 3. Reference Manual, pp. 4.92 - 4.113).

[1] See footnote 4 to Summary 1.A. of this common reporting format. Parties which choose to report CO_2 emissions and removals from agricultural soils under 4.D. Agricultural Soils category should indicate the amount [Gg] of these emissions or removals and relevant additional information (activity data, implied emissions factors) in the documentation box.

[2] To convert from N_2O-N to N_2O emissions, multiply by 44/28.

Documentation box:

TABLE 5.A SECTORAL BACKGROUND DATA FOR LAND-USE CHANGE AND FORESTRY

Changes in Forest and Other Woody Biomass Stocks
(Sheet 1 of 1)

Walloon region
2000
Submission
2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES			ACTIVITY DATA		IMPLIED EMISSION FACTORS	ESTIMATES
			Area of forest/biomass stocks (kha)	Average annual growth rate (t dm/ha)	Implied carbon uptake factor (t C/ha)	Carbon uptake increment (Gg C)
Tropical	Plantations	*Acacia spp.*			0,00	
		Eucalyptus spp.			0,00	
		Tectona grandis			0,00	
		Pinus spp			0,00	
		Pinus caribaea			0,00	
		Mixed Hardwoods			0,00	
		Mixed Fast-Growing Hardwoods			0,00	
		Mixed Softwoods			0,00	
	Other Forests	Moist			0,00	
		Seasonal			0,00	
		Dry			0,00	
	Other *(specify)*				0,00	
					0,00	
Temperate	Plantations				0,00	
					0,00	
	Commercial	Evergreen	226,16	9,50	4,75	1.074,18
		Deciduous	250,44	4,97	2,48	621,98
	Other *(specify)*				0,00	
					0,00	
Boreal					0,00	
			Number of trees (1000s of trees)	Annual growth rate (kt dm/1000 trees)	Carbon uptake factor (t C/tree)	Carbon uptake increment (Gg C)
Non-Forest Trees *(specify type)*						0,00
					0,00	
					Total annual growth increment (Gg C)	1.696,16
					$Gg\ CO_2$	6.219,25

	Amount of biomass removed (kt dm)	Carbon emission factor (t C/t dm)	Carbon release (Gg C)
Total biomass removed in Commercial Harvest	2.398,75	0,50	1.199,38
Traditional Fuelwood Consumed		0,00	
Total Other Wood Use		0,00	
		Total Biomass Consumption from Stocks [1] (Gg C)	1.199,38
		Other Changes in Carbon Stocks [2] (Gg C)	
		$Gg\ CO_2$	4.397,73

Net annual carbon uptake (+) or release (-) (Gg C)	496,78
Net CO_2 emissions (-) or removals (+) ($Gg\ CO_2$)	1.821,53

[1] Make sure that the quantity of biomass burned off-site is subtracted from this total.

[2] The net annual carbon uptake/release is determined by comparing the annual biomass growth versus annual harvest, including the decay of forest products and slash left during harvest. The IPCC Guidelines recommend default assumption that all carbon removed in wood and other biomass from forests is oxidized in the year of removal. The emissions from decay could be included under Other Changes in Carbon Stocks.

Note: Sectoral background data tables on Land-Use Change and Forestry should be filled in only by Parties using the IPCC default methodology. Parties that use country specific methods and models should report information on them in a transparent manner, also providing suggestions for a possible sectoral background data table suitable for their calculation method.

Documentation box:

TABLE 6.A SECTORAL BACKGROUND DATA FOR WASTE
Solid Waste Disposal
(Sheet 1 of 1)

Walloon region
2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION				IMPLIED EMISSION FACTOR		EMISSIONS[(1)]	
	Annual MSW at the SWDS (Gg)	MCF	DOC degraded (Gg)	CH_4 recovery [(2)] (Gg)	CH_4 (t /t MSW)	CO_2 (t /t MSW)	CH_4 (Gg)	CO_2 [(3)] (Gg)
1 Managed Waste Disposal on Land	1.932,66	1,00	267,87	22,19	0,02	0,03	41,86	61,02
2 Unmanaged Waste Disposal Sites	NO	NO	NO	NO	NO	NO	NO	NO
- deep (>5 m)	NO	NO	NO	NO	NO	NO	NO	NO
- shallow (<5 m)	NO	NO	NO	NO	NO	NO	NO	NO
3 Other *(please specify)*								
	NO	NO	NO	NO	NO	NO	NO	NO

Additional information

Description	Value
Total population (1000s)[(a)]	3.339,52
Urban population (1000s)[(a)]	NE
Waste generation rate (kg/capita/day)	NE
Fraction of MSW disposed to SWDS	0,24
Fraction of DOC in MSW	0,06/0,18
Fraction of wastes incinerated	NE
Fraction of wastes recycled	NE
CH4 oxidation factor (b)	0,10
CH_4 fraction in landfill gas	0,55
Number of SWDS recovering CH_4	12,00
CH_4 generation rate constant (k) [(c)]	NE
Time lag considered (yr) [(c)]	25,00
Composition of landfilled waste (%)	
Paper and paperboard	NE
Food and garden waste	NE
Plastics	NE
Glass	NE
Textiles	NE
Other *(specify)*	NE
other - inert	NE
other - organic	NE

[(a)] Specify whether total or urban population is used and the rationale for doing so.

[(b)] See IPCC Guidelines (Volume 3. Reference Manual, p. 6.9).

[(c)] For Parties using Tier 2 methods.

TABLE 6.C SECTORAL BACKGROUND DATA FOR WASTE
Waste Incineration
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA Amount of incinerated wastes (Gg)	IMPLIED EMISSION FACTOR			EMISSIONS		
		CO_2 (kg/t waste)	CH_4 (kg/t waste)	N_2O (kg/t waste)	CO_2 [(3)] (Gg)	CH_4 (Gg)	N_2O (Gg)
Waste Incineration *(please specify)*	329,51				42,44	0,00	0,02
(biogenic) [(3)]	280,08	0,00	0,00	0,07	0,00	0,00	0,02
(plastics and other non-biogenic waste) [(3)]	49,43	858,59	0,00	0,00	42,44	0,00	0,00
		0,00	0,00	0,00			

MSW - Municipal Solid Waste, SWDS - Solid Waste Disposal Site, MCF - Methane Correction Factor, DOC - Degradable Organic Carbon (IPCC Guidelines (Volume 3. Reference Manual, section 6.2.4)). MSW includes household waste, yard/garden waste, commercial/market waste and organic industrial solid waste. MSW should not include inorganic industrial waste such as construction or demolition materials.

[(1)] Actual emissions (after recovery).

[(2)] CH_4 recovered and flared or utilized.

[(3)] Under Waste Disposal, CO_2 emissions should be reported only when the disposed wastes are combusted at the disposal site which might constitute a management practice. CO_2 emissions from non-biogenic wastes are included in the totals, while the CO_2 emissions from biogenic wastes are not included in the totals.

Documentation box:
All relevant information used in calculation should be provided in the additional information box and in the documentation box. Parties that use country specific models should note this with a brief rationale in the documentation box and fill the relevant cells only.
The emission factor for CH4/waste incineration was modified in 2000

TABLE 6.B SECTORAL BACKGROUND DATA FOR WASTE
Wastewater Handling
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND RELATED INFORMATION[(1)]				IMPLIED EMISSION FACTOR			EMISSIONS[(2)]		
	Total organic product		CH_4 recovered and/or flared		CH_4		N_2O[(3)]	CH_4		N_2O[(3)]
	Wastewater	Sludge	Wastewater	Sludge	Wastewater	Sludge		Wastewater	Sludge	
	(Gg DC[(1)]/yr)		(Gg)		(kg/kg DC)	(kg/kg DC)	(kg/kg DC)	(Gg)	(Gg)	(Gg)
Industrial Wastewater	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Domestic and Commercial Wastewater	3,52	31,64	NE	NE	0,03	0,04	NE	0,10	1,20	0,00
Other *(please specify)*								0,00	0,03	0,00
	NE	NE	NE	NE	NE	NE	NE	NE	0,03	NE

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTOR	EMISSIONS
	Population[(4)] (1000s)	Protein consumption (protein in kg/person/yr)	N fraction (kg N/kg protein)	N_2O (kg N_2O-N/kg sewage N produced)	N_2O (Gg)
N_2O from human sewage[(3)]	3.340	39,79	0,16	0,01	0,33

(1) DC - degradable organic component. DC indicators are COD (Chemical Oxygen Demand) for industrial wastewater and BOD (Biochemical Oxygen Demand) for Domestic/Commercial wastewater/sludge (IPCC Guidelines (Volume 3. Reference Manual, pp. 6.14, 6.18)).

(2) Actual emissions (after recovery).

(3) Parties using other methods for estimation of N_2O emissions from human sewage or wastewater treatment should provide corresponding information on methods, activity data and emission factors used in the documentation box. Use the table to provide aggregate data.

(4) Specify whether total or urban population is used in the calculations and the rationale for doing so. Provide explanation in the documentation box.

Documentation box:

Additional information

	Domestic	Industrial
Total wastewater (m^3):	NE	NE
Treated wastewater (%):	NE	NE

Wastewater streams:	Wastewater output (m^3)	DC (kgCOD/m^3)
Industrial wastewater	NE	NE
Non-ferrous	NE	NE
Fertilizers	NE	NE
Food and beverage	NE	NE
Paper and pulp	NE	NE
Organic chemicals	NE	NE
Other *(specify)*	NE	NE
	DC (kg BOD/1000 person/yr)	
Domestic and Commercial	21.900	
Other		

Handling systems:	Industrial wastewater treated (%)	Ind. sludge treated (%)	Domestic wastewater treated (%)	Domestic sludge treated (%)
Aerobic	NE	NE	85,00	85,00
Anaerobic	NE	NE	15,00	15,00
Other *(specify)*				

TABLE 1.B.2 SECTORAL BACKGROUND DATA FOR ENERGY
Fugitive Emissions from Oil, Natural Gas and Other Sources
(Sheet 1 of 1)

Walloon region
2001
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA			IMPLIED EMISSION FACTORS			EMISSIONS		
	Description [1]	Unit	Value	CO_2 (kg/unit) [2]	CH_4 (kg/unit) [2]	N_2O (kg/unit) [2]	CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)
1. B. 2. a. Oil [3]							**0,00**	**0,00**	
i. Exploration	*(e.g. number of wells drilled)*			0,00	0,00				
ii. Production[4]	*(e.g. PJ of oil produced)*			0,00	0,00				
iii. Transport	*(e.g. PJ oil loaded in tankers)*			0,00	0,00				
iv. Refining / Storage	*(e.g. PJ oil refined)*			0,00	0,00				
v. Distribution of oil products	*(e.g. PJ oil refined)*			0,00	0,00				
vi. Other				0,00	0,00				
1. B. 2. b. Natural Gas							**0,16**	**9,60**	
Exploration				0,00	0,00				
i. Production [4] / Processing				0,00	0,00				
ii. Transmission				0,00	0,00				
Distribution		PJ	181,97	549,54	34.621,09		0,10	6,30	
iii. Other Leakage				0,00	0,00		**0,06**	**3,30**	
at industrial plants and power stations		PJ	124,30	241,35	14.320,19		0,03	1,78	
in residential and commercial sectors		PJ	57,67	520,20	26.356,86		0,03	1,52	
1. B. 2. c. Venting [5]							**0,00**	**0,00**	
i. Oil	*(e.g. PJ oil produced)*			0,00	0,00				
ii. Gas	*(e.g. PJ gas produced)*			0,00	0,00				
iii. Combined				0,00	0,00				
Flaring							**0,00**	**0,00**	**0,00**
i. Oil	*(e.g. PJ gas consumption)*			0,00	0,00	0,00			
ii. Gas	*(e.g. PJ gas consumption)*			0,00	0,00	0,00			
iii. Combined				0,00	0,00	0,00			
1.B.2.d. Other *(please specify)* [6]							**0,00**	**0,00**	**0,00**
				0,00	0,00	0,00			

Additional information

Description	Value	Unit
Pipelines length (km)	10.129,00	km
Number of oil wells		
Number of gas wells		
Gas throughput [a]		
Oil throughput [a]		
Other relevant information *(specify)*		

[a] In the context of oil and gas production, throughput is a measure of the total production, such as barrels per day of oil, or cubic meters of gas per year. Specify the units of the reported value in the unit column. Take into account that these values should be consistent with the activity data reported under the production rows of the main table.

[1] Specify the activity data used and fill in the activity data description column, as given in the examples in brackets. Specify the unit of the activity data in the unit column. Use the document box to specify whether the fuel amount is based on the raw material production or on the saleable production. Note cases where more than one variable is used as activity data.
[2] The unit of the implied emission factor will depend on the units of the activity data used, and is therefore not specified in this column. The unit of the implied emission factor for each activity will be kg/unit of activity data.
[3] Use the category also to cover emissions from combined oil and gas production fields. Natural gas processing and distribution from these fields should be included under 1.B.2.b.ii and 1.B.2.b.iii, respectively.
[4] If using default emission factors these categories will include emissions from production other than venting and flaring.
[5] If using default emission factors, emissions from Venting and Flaring from all oil and gas production should be accounted for here. Parties using the IPCC software could report those emissions together, indicating so in the documentation box.
[6] For example, fugitive CO_2 emissions from production of geothermal power could be reported here.

Documentation box:

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES

Emissions of CO_2, CH_4 and N_2O

(Sheet 1 of 2)

Walloon region
2001
Submission
2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[2]					
	Production/Consumption quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description [1]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	[2]	(Gg)	[2]	(Gg)	[2]
A. Mineral Products						**5.874,69**		**0,00**		**0,00**	
1. Cement Production	*cement*	6.088,63	0,58			3.511,17					
2. Lime Production		2.640,49	0,81			2.136,98					
3. Limestone and Dolomite Use		NE	NE								
4. Soda Ash						0,00					
Soda Ash Production		NE	NE								
Soda Ash Use			0,00								
5. Asphalt Roofing		NE	NE								
6. Road Paving with Asphalt		2.444,00	0,00								
7. Other *(please specify)*						226,54		0,00		0,00	
Glass Production			0,00								
	molten glass	1.445,60	0,16	0,00	0,00	226,54					
B. Chemical Industry						**478,30**		**0,00**		**3,49**	
1. Ammonia Production [3]	confidential	357,64	1,19	0,00	0,00	427,09					
2. Nitric Acid Production	confidential	533,40			0,01					3,49	
3. Adipic Acid Production					0,00						
4. Carbide Production			0,00	0,00		0,00		0,00			
Silicon Carbide			0,00	0,00							
Calcium Carbide			0,00	0,00							
5. Other *(please specify)*						51,21		0,00		0,00	
Carbon Black				0,00							
Ethylene			0,00	0,00	0,00						
Dichloroethylene				0,00							
Styrene				0,00							
Methanol				0,00							
	polypropylène, polystyrène, polyéthyl	982,10	0,05	0,00	0,00	51,21					

[1] Where the IPCC Guidelines provide options for activity data, e.g. cement or clinker for estimating the emissions from Cement Production, specify the activity data used (as shown in the example in brackets) in order to make the choice of emission factor more transparent and to facilitate comparisons of implied emission factors.

[2] Enter cases in which the final emissions are reduced with the quantities of emission recovery, oxidation, destruction, transformation. Adjusted emissions are reported and the quantitative information on recovery, oxidation, destruction, and transformation should be given in the additional columns provided.

[3] To avoid double counting make offsetting deductions from fuel consumption (e.g. natural gas) in Ammonia Production, first for feedstock use of the fuel, and then to a sequestering use of the feedstock.

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES
Emissions of CO_2, CH_4 and N_2O
(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[2]					
	Production/Consumption Quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description [1]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	[2]	(Gg)	[2]	(Gg)	[2]
C. Metal Production [4]						**922,97**		**0,11**		**0,00**	
1. Iron and Steel Production			0,00			922,97		0,11			
Steel		7.206,53	0,13			922,97					
Pig Iron		4.853,40	0,00	0,00							
Sinter		6.980,75	0,00	0,00				0,11			
Coke		1.597,77	0,00	0,00							
Other *(please specify)*						0,00		0,00			
		0,00	0,00	0,00	0,00						
2. Ferroalloys Production		NE	NE	NE							
3. Aluminium Production		NE	NE	NE							
4. SF_6 Used in Aluminium and Magnesium Foundries											
5. Other *(please specify)*						0,00		0,00		0,00	
Zn and Copper production		128,59	0,00	0,00	0,00						
D. Other Production						**0,00**					
1. Pulp and Paper											
2. Food and Drink		NE	NE								
G. Other *(please specify)*						**0,00**		**0,00**		**0,00**	
			0,00	0,00	0,00						

[4] More specific information (e.g. data on virgin and recycled steel production) could be provided in the documentation box.

Note: In case of confidentiality of the activity data information, the entries should provide aggregate figures but there should be a note in the documentation box indicating this.

Documentation box:

TABLE 4.D SECTORAL BACKGROUND DATA FOR AGRICULTURE

Agricultural Soils[1]

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION		IMPLIED EMISSION FACTORS		EMISSIONS
	Description	Value	Unit		(Gg N_2O)
Direct Soil Emissions	**N input to soils (kg N/yr)**				**2,15**
Synthetic Fertilizers	Use of synthetic fertilizers (kg N/yr)	83.404.077	(kg N2O-N/kg N)[2]	0,0125	1,64
Animal Wastes Applied to Soils	Nitrogen input from manure applied to soils (kg N/yr)	25.896.758	(kg N2O-N/kg N)[2]	0,0125	0,51
N-fixing Crops	Dry pulses and soybeans produced (kg dry biomass/yr)	NE	(kg N2O-N/kg dry biomass)[2]	NE	NE
Crop Residue	Dry production of other crops (kg dry biomass/yr)	NE	(kg N2O-N/kg dry biomass)[2]	NE	NE
Cultivation of Histosols	Area of cultivated organic soils (ha)	NE	(kg N2O-N/ha)[2]	NE	NE
Animal Production	**N excretion on pasture range and paddock (kg N/yr)**	**46.444.405**	**(kg N2O-N/kg N)[2]**	**0,0200**	**1,46**
Indirect Emissions					**1,54**
Atmospheric Deposition	Volatized N (NH_3 and NOx) from fertilizers and animal wastes (kg N/yr)	8.259.961	(kg N2O-N/kg N)[2]	0,0100	0,13
Nitrogen Leaching and Run-off	N from fertilizers and animal wastes that is lost through leaching and run off (kg N/yr)	35.844.366	(kg N2O-N/kg N)[2]	0,0250	1,41
Other *(please specify)*					**0,69**
Soil residue		35.054.566		0,0125	0,69
Boues		75.602		0,0125	0,0015

Additional information

Fraction [a]	Description	Value
$Frac_{BURN}$	Fraction of crop residue burned	NO
$Frac_{FUEL}$	Fraction of livestock N excretion in excrements burned for fuel	NE
$Frac_{GASF}$	Fraction of synthetic fertilizer N applied to soils that volatilizes as NH_3	0,07
$Frac_{GASM}$	Fraction of livestock N excretion that volatilizes as NH_3	0,3 lisier 0,06 fumier
$Frac_{GRAZ}$	Fraction of livestock N excreted and deposited onto soil during grazing	NE
$Frac_{LEACH}$	Fraction of N input to soils that is lost through leaching and runoff	0,18
$Frac_{NCRBF}$	Fraction of N in non-N-fixing crop	NE
$Frac_{NCRO}$	Fraction of N in N-fixing crop	NE
$Frac_R$	Fraction or crop residue removed from the field as crop	NE

[a] Use the fractions as specified in the IPCC Guidelines (Volume 3. Reference Manual, pp. 4.92 - 4.113).

[1] See footnote 4 to Summary 1.A. of this common reporting format. Parties which choose to report CO_2 emissions and removals from agricultural soils under 4.D. Agricultural Soils category should indicate the amount [Gg] of these emissions or removals and relevant additional information (activity data, implied emissions factors) in the documentation box.

[2] To convert from N_2O-N to N_2O emissions, multiply by 44/28.

Documentation box:

TABLE 5.A SECTORAL BACKGROUND DATA FOR LAND-USE CHANGE AND FORESTRY

Changes in Forest and Other Woody Biomass Stocks

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES			ACTIVITY DATA		IMPLIED EMISSION FACTORS	ESTIMATES
			Area of forest/biomass stocks (kha)	Average annual growth rate (t dm/ha)	Implied carbon uptake factor (t C/ha)	Carbon uptake increment (Gg C)
Tropical	Plantations	*Acacia spp.*			0,00	
		Eucalyptus spp.			0,00	
		Tectona grandis			0,00	
		Pinus spp			0,00	
		Pinus caribaea			0,00	
		Mixed Hardwoods			0,00	
		Mixed Fast-Growing Hardwoods			0,00	
		Mixed Softwoods			0,00	
	Other Forests	Moist			0,00	
		Seasonal			0,00	
		Dry			0,00	
	Other *(specify)*				0,00	
					0,00	
Temperate	Plantations				0,00	
					0,00	
	Commercial	Evergreen	224,81	9,50	4,75	1.067,86
		Deciduous	250,58	4,97	2,48	622,61
	Other *(specify)*				0,00	
					0,00	
Boreal					0,00	
			Number of trees (1000s of trees)	Annual growth rate (kt dm/1000 trees)	Carbon uptake factor (t C/tree)	Carbon uptake increment (Gg C)
Non-Forest Trees *(specify type)*						0,00
					0,00	
Total annual growth increment (Gg C)						1.690,47
Gg CO_2						6.198,39

	Amount of biomass removed (kt dm)	Carbon emission factor (t C/t dm)	Carbon release (Gg C)
Total biomass removed in Commercial Harvest	2.391,30	0,50	1.195,65
Traditional Fuelwood Consumed		0,00	
Total Other Wood Use		0,00	
Total Biomass Consumption from Stocks [(1)] (Gg C)			1.195,65
Other Changes in Carbon Stocks [(2)] (Gg C)			
Gg CO_2			4.384,05

Net annual carbon uptake (+) or release (-) (Gg C)	494,82
Net CO_2 emissions (-) or removals (+) (Gg CO_2)	1.814,34

[(1)] Make sure that the quantity of biomass burned off-site is subtracted from this total.
[(2)] The net annual carbon uptake/release is determined by comparing the annual biomass growth versus annual harvest, including the decay of forest products and slash left during harvest. The IPCC Guidelines recommend default assumption that all carbon removed in wood and other biomass from forests is oxidized in the year of removal. The emissions from decay could be included under Other Changes in Carbon Stocks.

Note: Sectoral background data tables on Land-Use Change and Forestry should be filled in only by Parties using the IPCC default methodology. Parties that use country specific methods and models should report information on them in a transparent manner, also providing suggestions for a possible sectoral background data table suitable for their calculation method.

Documentation box:

TABLE 6.A SECTORAL BACKGROUND DATA FOR WASTE
Solid Waste Disposal
(Sheet 1 of 1)

Walloon region
2001
Submission
2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION				IMPLIED EMISSION FACTOR		EMISSIONS[(1)]	
	Annual MSW at the SWDS (Gg)	MCF	DOC degraded (Gg)	CH_4 recovery [(2)] (Gg)	CH_4 (t /t MSW)	CO_2 (t /t MSW)	CH_4 (Gg)	CO_2[(3)] (Gg)
1 Managed Waste Disposal on Land	1.932,66	1,00	267,87	22,34	0,02	0,03	39,91	61,44
2 Unmanaged Waste Disposal Sites	NO	NO	NO	NO	NO	NO	NO	NO
- deep (>5 m)	NO	NO	NO	NO	NO	NO	NO	NO
- shallow (<5 m)	NO	NO	NO	NO	NO	NO	NO	NO
3 Other *(please specify)*							0,00	0,00
	NO	NO	NO	NO	NO	NO	NO	NO

Additional information

Description	Value
Total population (1000s)[(a)]	3.346,46
Urban population (1000s)[(a)]	NE
Waste generation rate (kg/capita/day)	NE
Fraction of MSW disposed to SWDS	0,24
Fraction of DOC in MSW	0,06/0,18
Fraction of wastes incinerated	NE
Fraction of wastes recycled	NE
CH4 oxidation factor (b)	0,10
CH_4 fraction in landfill gas	0,55
Number of SWDS recovering CH_4	12,00
CH_4 generation rate constant (k) [(c)]	NE
Time lag considered (yr) [(c)]	25,00
Composition of landfilled waste (%)	
Paper and paperboard	NE
Food and garden waste	NE
Plastics	NE
Glass	NE
Textiles	NE
Other *(specify)*	NE
other - inert	NE
other - organic	NE

TABLE 6.C SECTORAL BACKGROUND DATA FOR WASTE
Waste Incineration
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA Amount of incinerated wastes (Gg)	IMPLIED EMISSION FACTOR			EMISSIONS		
		CO_2 (kg/t waste)	CH_4 (kg/t waste)	N_2O (kg/t waste)	CO_2 [(3)] (Gg)	CH_4 (Gg)	N_2O (Gg)
Waste Incineration *(please specify)*	346,88				42,43	0,00	0,02
(biogenic) [(3)]	294,85	0,00	0,00	0,07	0,00	0,00	0,02
(plastics and other non-biogenic waste) [(3)]	52,03	815,49	0,00	0,00	42,43	0,00	0,00
		0,00	0,00	0,00			

MSW - Municipal Solid Waste, SWDS - Solid Waste Disposal Site, MCF - Methane Correction Factor, DOC - Degradable Organic Carbon (IPCC Guidelines (Volume 3. Reference Manual, section 6.2.4)). MSW includes household waste, yard/garden waste, commercial/market waste and organic industrial solid waste. MSW should not include inorganic industrial waste such as construction or demolition materials.

(1) Actual emissions (after recovery).

(2) CH_4 recovered and flared or utilized.

(3) Under Waste Disposal, CO_2 emissions should be reported only when the disposed wastes are combusted at the disposal site which might constitute a management practice. CO_2 emissions from non-biogenic wastes are included in the totals, while the CO_2 emissions from biogenic wastes are not included in the totals.

(a) Specify whether total or urban population is used and the rationale for doing so.

(b) See IPCC Guidelines (Volume 3. Reference Manual, p. 6.9).

(c) For Parties using Tier 2 methods.

Documentation box:
All relevant information used in calculation should be provided in the additional information box and in the documentation box. Parties that use country specific models should note this with a brief rationale in the documentation box and fill the relevant cells only.
The emission factor for CH4/Waste incineration was modified in 2000

TABLE 6.B SECTORAL BACKGROUND DATA FOR WASTE
Wastewater Handling
(Sheet 1 of 1)

Walloon region
2001
Submission
2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND RELATED INFORMATION[1]				IMPLIED EMISSION FACTOR			EMISSIONS[2]		
	Total organic product		CH_4 recovered and/or flared		CH_4		N_2O[3]	CH_4		N_2O[3]
	Wastewater	Sludge	Wastewater	Sludge	Wastewater	Sludge		Wastewater	Sludge	
	(Gg DC[1]/yr)		(Gg)		(kg/kg DC)	(kg/kg DC)	(kg/kg DC)	(Gg)	(Gg)	(Gg)
Industrial Wastewater	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Domestic and Commercial Wastewater	3,45	31,04	NE	NE	0,03	0,04	NE	0,09	1,18	0,00
Other *(please specify)*								0,00	0,03	0,00
	NE	NE	NE	NE	NE	NE	NE	NE	0,03	NE

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTOR	EMISSIONS
	Population[4] (1000s)	Protein consumption (protein in kg/person/yr)	N fraction (kg N/kg protein)	N_2O (kg N_2O-N/kg sewage N produced)	N_2O (Gg)
N_2O from human sewage [3]	3.346	39,79	0,16	0,01	0,33

[1] DC - degradable organic component. DC indicators are COD (Chemical Oxygen Demand) for industrial wastewater and BOD (Biochemical Oxygen Demand) for Domestic/Commercial wastewater/sludge (IPCC Guidelines (Volume 3. Reference Manual, pp. 6.14, 6.18)).

[2] Actual emissions (after recovery).

[3] Parties using other methods for estimation of N_2O emissions from human sewage or wastewater treatment should provide corresponding information on methods, activity data and emission factors used in the documentation box. Use the table to provide aggregate data.

[4] Specify whether total or urban population is used in the calculations and the rationale for doing so. Provide explanation in the documentation box.

Documentation box:

Additional information

	Domestic	Industrial
Total wastewater (m^3):	NE	NE
Treated wastewater (%):	NE	NE

Wastewater streams:	Wastewater output (m^3)	DC ($kgCOD/m^3$)
Industrial wastewater	NE	NE
Non-ferrous	NE	NE
Fertilizers	NE	NE
Food and beverage	NE	NE
Paper and pulp	NE	NE
Organic chemicals	NE	NE
Other *(specify)*	NE	NE
	DC (kg BOD/1000 person/yr)	
Domestic and Commercial	21.900	
Other		

Handling systems:	Industrial wastewater treated (%)	Ind. sludge treated (%)	Domestic wastewater treated (%)	Domestic sludge treated (%)
Aerobic	NE	NE	85,00	85,00
Anaerobic	NE	NE	15,00	15,00
Other *(specify)*				

TABLE 1.B.2 SECTORAL BACKGROUND DATA FOR ENERGY
Fugitive Emissions from Oil, Natural Gas and Other Sources
(Sheet 1 of 1)

Brussels-Capital Region
Inventory 2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA			IMPLIED EMISSION FACTORS			EMISSIONS		
	Description [1]	Unit	Value	CO_2 (kg/unit) [2]	CH_4 (kg/unit) [2]	N_2O (kg/unit) [2]	CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)
1. B. 2. a. Oil [3]							**0,00**	**0,00**	
i. Exploration	*(e.g. number of wells drilled)*		0,00	0,00	0,00				
ii. Production[4]	*(e.g. PJ of oil produced)*		0,00	0,00	0,00				
iii. Transport	*(e.g. PJ oil loaded in tankers)*		0,00	0,00	0,00				
iv. Refining / Storage	*(e.g. PJ oil refined)*		0,00	0,00	0,00				
v. Distribution of oil products	*(e.g. PJ oil refined)*		########	0,00	0,00				
vi. Other			0,00	0,00	0,00				
1. B. 2. b. Natural Gas							**0,00**	**1,45**	
Exploration				0,00	0,00				
i. Production [4] / Processing	*(e.g. PJ gas produced)*		0,00	0,00	0,00				
ii. Transmission	*(e.g. PJ gas consumed)*		36,33	0,00	40.000,00			1,45	
Distribution	*(e.g. PJ gas consumed)*			0,00	0,00				
iii. Other Leakage	*(e.g. PJ gas consumed)*			0,00	0,00		**0,00**	**0,00**	
at industrial plants and power stations				0,00	0,00				
in residential and commercial sectors				0,00	0,00				
1. B. 2. c. Venting [5]							**0,00**	**0,00**	
i. Oil	*(e.g. PJ oil produced)*			0,00	0,00				
ii. Gas	*(e.g. PJ gas produced)*			0,00	0,00				
iii. Combined				0,00	0,00				
Flaring							**0,00**	**0,00**	**0,00**
i. Oil	*(e.g. PJ gas consumption)*		0,00	0,00	0,00	0,00			
ii. Gas	*(e.g. PJ gas consumption)*		0,00	0,00	0,00	0,00			
iii. Combined				0,00	0,00	0,00			
1.B.2.d. Other *(please specify)* [6]							**0,00**	**0,00**	**0,00**
				0,00	0,00	0,00			

Additional information

Description	Value	Unit
Pipelines length (km)		
Number of oil wells		
Number of gas wells		
Gas throughput [a]		
Oil throughput [a]		
Other relevant information *(sp[illegible]y)*		

[a] In the context of oil and gas production, throughput is a measure of the total production, such as barrels per day of oil, or cubic meters of gas per year. Specify the units of the reported value in the unit column. Take into account that these values should be consistent with the activity data reported under the production rows of the main table.

TABLE 6.A SECTORAL BACKGROUND DATA FOR WASTE
Solid Waste Disposal
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION				IMPLIED EMISSION FACTOR		EMISSIONS[1]	
	Annual MSW at the SWDS (Gg)	MCF	DOC degraded (Gg)	CH_4 recovery [2] (Gg)	CH_4 (t /t MSW)	CO_2 (t /t MSW)	CH_4 (Gg)	CO_2[3] (Gg)
1 Managed Waste Disposal on Land	0,00				0,00	0,00		
2 Unmanaged Waste Disposal Sites					0,00	0,00	0,00	0,00
- deep (>5 m)	0,00				0,00	0,00		
- shallow (<5 m)					0,00	0,00		
3 Other *(please specify)*							0,00	0,00
					0,00	0,00		

Additional information

Description	Value
Total population (1000s)[a]	
Urban population (1000s)[a]	
Waste generation rate (kg/capita/day)	
Fraction of MSW disposed to SWDS	
Fraction of DOC in MSW	
Fraction of wastes incinerated	
Fraction of wastes recycled	
CH4 oxidation factor (b)	
CH_4 fraction in landfill gas	
Number of SWDS recovering CH_4	
CH_4 generation rate constant (k) [c]	
Time lag considered (yr) [c]	
Composition of landfilled waste (%)	
Paper and paperboard	
Food and garden waste	
Plastics	
Glass	
Textiles	
Other *(specify)*	
other - inert	
other - organic	

TABLE 6.C SECTORAL BACKGROUND DATA FOR WASTE
Waste Incineration
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA Amount of incinerated wastes	IMPLIED EMISSION FACTOR			EMISSIONS		
	(Gg)	CO_2 (kg/t waste)	CH_4 (kg/t waste)	N_2O (kg/t waste)	CO_2[3] (Gg)	CH_4 (Gg)	N_2O (Gg)
Waste Incineration *(please specify)*	535.000,00				508,25	0,03	0,24
(biogenic)[3]		0,00	0,00	0,00			
(plastics and other non-biogenic waste)[3]		0,00	0,00	0,00			
		0,00	0,00	0,00	508,25	0,03	0,24

MSW - Municipal Solid Waste, SWDS - Solid Waste Disposal Site, MCF - Methane Correction Factor, DOC - Degradable Organic Carbon (IPCC Guidelines (Volume 3. Reference Manual, section 6.2.4)). MSW includes household waste, yard/garden waste, commercial/market waste and organic industrial solid waste. MSW should not include inorganic industrial waste such as construction or demolition materials.

(1) Actual emissions (after recovery).

(2) CH_4 recovered and flared or utilized.

(3) Under Waste Disposal, CO_2 emissions should be reported only when the disposed wastes are combusted at the disposal site which might constitute a management practice. CO_2 emissions from non-biogenic wastes are included in the totals, while the CO_2 emissions from biogenic wastes are not included in the totals.

(a) Specify whether total or urban population is used and t rationale for doing so.

(b) See IPCC Guidelines (Volume 3. Reference Manual, p.

(c) For Parties using Tier 2 methods.

TABLE 6.B SECTORAL BACKGROUND DATA FOR WASTE
Wastewater Handling
(Sheet 1 of 1)

Brussles Capital region
Inventory 2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND RELATED INFORMATION[1]				IMPLIED EMISSION FACTOR			EMISSIONS[2]		
	Total organic product		CH_4 recovered and/or flared		CH_4		N_2O[3]	CH_4		N_2O[3]
	Wastewater	Sludge	Wastewater	Sludge	Wastewater	Sludge		Wastewater	Sludge	
	(Gg DC[1]/yr)		(Gg)		(kg/kg DC)	(kg/kg DC)	(kg/kg DC)	(Gg)	(Gg)	(Gg)
Industrial Wastewater	0,00				0,00	0,00				
Domestic and Commercial Wastewater	0,00				0,00	0,00				
Other *(please specify)*								0,00	0,00	0,00
					0,00	0,00				

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTOR	EMISSIONS
	Population[4] (1000s)	Protein consumption (protein in kg/person/yr)	N fraction (kg N/kg protein)	N_2O (kg N_2O-N/kg sewage N produced)	N_2O (Gg)
N_2O from human sewage [3]				0,00	

[1] DC - degradable organic component. DC indicators are COD (Chemical Oxygen Demand) for industrial wastewater and BOD (Biochemical Oxygen Demand) for Domestic/Commercial wastewater/sludge (IPCC Guidelines (Volume 3. Reference Manual, pp. 6.14, 6.18)).

[2] Actual emissions (after recovery).

[3] Parties using other methods for estimation of N_2O emissions from human sewage or wastewater treatment should provide corresponding information on methods, activity data and emission factors used in the documentation box. Use the table to provide aggregate data.

[4] Specify whether total or urban population is used in the calculations and the rationale for doing so. Provide explanation in the documentation box.

Additional information

	Domestic	Industrial
Total wastewater (m^3):		
Treated wastewater (%):		

Wastewater streams:	Wastewater output (m^3)	DC ($kgCOD/m^3$)
Industrial wastewater		
Non-ferrous		
Fertilizers		
Food and beverage		
Paper and pulp		
Organic chemicals		
Other *(specify)*		
	DC (kg BOD/1000 person/yr)	
Domestic and Commercial		
Other		

Handling systems:	Industrial wastewater treated (%)	Ind. sludge treated (%)	Domestic wastewater treated (%)	Domestic sludge treated (%)
Aerobic				
Anaerobic				
Other *(specify)*				

Documentation box:

TABLE 1.B.2 SECTORAL BACKGROUND DATA FOR ENERGY
Fugitive Emissions from Oil and Natural Gas
(Sheet 1 of 1)

Belgium/Flanders
2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA			IMPLIED EMISSION FACTORS			EMISSIONS		
	Description [1]	Unit	Value	CO_2 (kg/unit) [2]	CH_4 (kg/unit) [2]	N_2O (kg/unit) [2]	CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)
1. B. 2. a. Oil [3]								**0,19**	
i. Exploration	*(e.g. number of wells drilled)*								
ii. Production[4]	*(e.g. PJ of oil produced)*								
iii. Transport	*(e.g. PJ oil loaded in tankers)*								
iv. Refining / Storage	**1610,8 PJ oil refined**							0,19	
v. Distribution of oil products	*(e.g. PJ oil refined)*								
vi. Other									
1. B. 2. b. Natural Gas								**31,17**	
Exploration									
i. Production [4] / Processing	*(e.g. PJ gas produced)*								
ii. Transmission	*(e.g. PJ gas consumed)*								
Distribution	**8904654000 m3 gas**							31,17	
iii. Other Leakage	*(e.g. PJ gas consumed)*								
at industrial plants and power stations									
in residential and commercial sectors									
1. B. 2. c. Venting [5]									
i. Oil	*(e.g. PJ oil produced)*								
ii. Gas	*(e.g. PJ gas produced)*								
iii. Combined									
Flaring									
i. Oil	*(e.g. PJ gas consumption)*								
ii. Gas	*(e.g. PJ gas consumption)*								
iii. Combined									
1.B.2.d. Other *(please specify)* [6]									

Additional information

Description	Value	Unit
Pipelines length (km)		
Number of oil wells		
Number of gas wells		
Gas throughput [a]		
Oil throughput [a]		
Other relevant information *(specify)*		

[a] In the context of oil and gas production, throughput is a measure of the total production, such as barrels per day of oil, or cubic meters of gas per year. Specify the units of the reported value in the unit column. Take into account that these values should be consistent with the activity data reported under the production rows of the main table.

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES
Emissions of CO_2, CH_4 and N_2O
(Sheet 1 of 2)

Belgium/Flanders
2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[2]					
	Production/Consumption quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description [1]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	[2]	(Gg)	[2]	(Gg)	[2]
A. Mineral Products											
1. Cement Production	*(e.g. cement or clinker*										
2. Lime Production											
3. Limestone and Dolomite Use											
4. Soda Ash											
Soda Ash Production											
Soda Ash Use											
5. Asphalt Roofing											
6. Road Paving with Asphalt											
7. Other *(please specify)*											
Glass Production											
B. Chemical Industry						**1.046,04**				**9,72**	
1. Ammonia Production [3]						1.046,04					
2. Nitric Acid Production	kton HNO3 100%	1.214,91			0,01					9,72	
3. Adipic Acid Production											
4. Carbide Production											
Silicon Carbide											
Calcium Carbide											
5. Other *(please specify)*											
Carbon Black											
Ethylene											
Dichloroethylene											
Styrene											
Methanol											

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES
Emissions of CO_2, CH_4 and N_2O
(Sheet 2 of 2)

Belgium/Flanders
2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[2]					
	Production/Consumption Quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description [1]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	[2]	(Gg)	[2]	(Gg)	[2]
C. Metal Production [4]						**599,00**		**1,68**			
1. Iron and Steel Production						599,00		1,68			
Steel	fluid steel	447,90	0,04			18,23					
Pig Iron	pig iron	3.640,19	0,16			575,15					
Sinter	sinter	5.600,61		0,00				1,68			
Coke											
Other *(please specify)*						5,62					
use of electrodes	use of electrodes	1,53	3,67			5,62					
2. Ferroalloys Production											
3. Aluminium Production											
4. SF_6 Used in Aluminium and Magnesium Foundries											
5. Other *(please specify)*											
D. Other Production											
1. Pulp and Paper											
2. Food and Drink											
G. Other *(please specify)*						**872,38**					
non energy use						872,38					

[4] More specific information (e.g. data on virgin and recycled steel production) could be provided in the documentation box.

Note: In case of confidentiality of the activity data information, the entries should provide aggregate figures but there should be a note in the documentation box indicating this.

TABLE 5.B SECTORAL BACKGROUND DATA FOR LAND-USE CHANGE AND FORESTRY
Forest and Grassland Conversion
(Sheet 1 of 1)

Belgium/Flanders
2000
Submission 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA AND OTHER RELATED INFORMATION							IMPLIED EMISSION FACTORS					EMISSIONS				
		On and off site burning				Decay of above-ground biomass[1]												
		Area converted annually	Annual net loss of biomass	Quantity of biomass burned		Average area converted	Average annual net loss of biomass	Average quantity of biomass left to decay	Burning				Decay	Burning				Decay
									On site			Off site		On site			Off site	
				On site	Off site				CO_2	CH_4	N_2O	CO_2	CO_2	CO_2	CH_4	N_2O	CO_2	CO_2
Vegetation types		(kha)	(kt dm)	(kt dm)	(kt dm)	(kha)	(t dm/ha)	(kt dm)	(t/ha)					(Gg)				
Tropical	Wet/Very Moist																	
	Moist, short dry season																	
	Moist, long dry season																	
	Dry																	
	Montane Moist																	
	Montane Dry																	
Tropical Savanna/Grasslands																		
Temperate	Coniferous					56,39												
	Broadleaf					80,18												
	Mixed Broadleaf/ Coniferous					19,28												
Grasslands																		
Boreal	Mixed Broadleaf/ Coniferous																	
	Coniferous																	
	Forest-tundra																	
Grasslands/Tundra																		
Other *(please specify)*																		
Total																		

[1] Activity data are for default 10-year average. Specify the average decay time which is appropriate for the local conditions, if other than 10 years.

Emissions/Removals	On site	Off site
Immediate carbon release from burning		
Total On site and Off site (Gg C)		
Delayed emissions from decay (Gg C)		
Total annual carbon release (Gg C)		
Total annual CO_2 emissions (Gg CO_2)		

Additional information

Fractions	On site	Off site
Fraction of biomass burned (average)		
Fraction which oxidizes during burning (average)		
Carbon fraction of aboveground biomass (average)		
Fraction left to decay (average)		
Nitrogen-carbon ratio		

Note: Sectoral background data tables on Land-Use Change and Forestry should be filled in only by Parties using the IPCC default methodology. Parties that use country specific methods and models should report information on them in a transparent manner, also providing suggestions for a possible sectoral background data table suitable for their calculation method.

TABLE 6.A SECTORAL BACKGROUND DATA FOR WASTE
Solid Waste Disposal
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION				IMPLIED EMISSION FACTOR		EMISSIONS[1]	
	Annual MSW at the SWDS (Gg)	MCF	DOC degraded (Gg)	CH_4 recovery [2] (Gg)	CH_4 (t /t MSW)	CO_2 (t /t MSW)	CH_4 (Gg)	CO_2[3] (Gg)
1 Managed Waste Disposal on Land							53,09	
2 Unmanaged Waste Disposal Sites								
- deep (>5 m)								
- shallow (<5 m)								
3 Other *(please specify)*								

Additional information

Description	Value
Total population (1000s)[a]	
Urban population (1000s)[a]	
Waste generation rate (kg/capita/day)	
Fraction of MSW disposed to SWDS	
Fraction of DOC in MSW	
Fraction of wastes incinerated	
Fraction of wastes recycled	
CH4 oxidation factor (b)	
CH_4 fraction in landfill gas	
Number of SWDS recovering CH_4	
CH_4 generation rate constant (k) [c]	
Time lag considered (yr) [c]	
Composition of landfilled waste (%)	
Paper and paperboard	
Food and garden waste	
Plastics	
Glass	
Textiles	
Other *(specify)*	
other - inert	
other - organic	

TABLE 6.C SECTORAL BACKGROUND DATA FOR WASTE
Waste Incineration
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA Amount of incinerated wastes (Gg)	IMPLIED EMISSION FACTOR			EMISSIONS		
		CO_2 (kg/t waste)	CH_4 (kg/t waste)	N_2O (kg/t waste)	CO_2[3] (Gg)	CH_4 (Gg)	N_2O (Gg)
Waste Incineration *(please specify)*					1.090,11	0,00	0,05
(biogenic)[3]							
(plastics and other non-biogenic waste)[3]					1.090,11		
domestic	785,58		0,00	0,06		0,00	0,05

MSW - Municipal Solid Waste, SWDS - Solid Waste Disposal Site, MCF - Methane Correction Factor, DOC - Degradable Organic Carbon (IPCC Guidelines (Volume 3. Reference Manual, section 6.2.4)). MSW includes household waste, yard/garden waste, commercial/market waste and organic industrial solid waste. MSW should not include inorganic industrial waste such as construction or demolition materials.

(1) Actual emissions (after recovery).

(2) CH_4 recovered and flared or utilized.

(3) Under Waste Disposal, CO_2 emissions should be reported only when the disposed wastes are combusted at the disposal site which might constitute a management practice.

CO_2 emissions from non-biogenic wastes are included in the totals, while the CO_2 emissions from biogenic wastes are not included in the totals.

(a) Specify whether total or urban population is used and t rationale for doing so.

(b) See IPCC Guidelines (Volume 3. Reference Manual, p

(c) For Parties using Tier 2 methods.

TABLE 1.B.2 SECTORAL BACKGROUND DATA FOR ENERGY
Fugitive Emissions from Oil, Natural Gas and Other Sources
(Sheet 1 of 1)

Belgium/Flanders
2001
2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA			IMPLIED EMISSION FACTORS			EMISSIONS		
	Description [1]	Unit	Value	CO_2 (kg/unit) [2]	CH_4 (kg/unit) [2]	N_2O (kg/unit) [2]	CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)
1. B. 2. a. Oil [3]							**0,00**	**0,20**	
i. Exploration	*(e.g. number of wells drilled)*			0,00	0,00				
ii. Production[4]	*(e.g. PJ of oil produced)*			0,00	0,00				
iii. Transport	*(e.g. PJ oil loaded in tankers)*			0,00	0,00				
iv. Refining / Storage	**1690,5 PJ refined**			0,00	0,00			0,20	
v. Distribution of oil products	*(e.g. PJ oil refined)*			0,00	0,00				
vi. Other				0,00	0,00				
1. B. 2. b. Natural Gas							**0,00**	**29,90**	
Exploration				0,00	0,00				
i. Production [4] / Processing	*(e.g. PJ gas produced)*			0,00	0,00				
ii. Transmission	*(e.g. PJ gas consumed)*			0,00	0,00				
Distribution	**8542886400 m3 gas**			0,00	0,00			29,90	
iii. Other Leakage	*(e.g. PJ gas consumed)*			0,00	0,00		**0,00**	**0,00**	
at industrial plants and power stations				0,00	0,00				
in residential and commercial sectors				0,00	0,00				
1. B. 2. c. Venting [5]							**0,00**	**0,00**	
i. Oil	*(e.g. PJ oil produced)*			0,00	0,00				
ii. Gas	*(e.g. PJ gas produced)*			0,00	0,00				
iii. Combined				0,00	0,00				
Flaring							**0,00**	**0,00**	**0,00**
i. Oil	*(e.g. PJ gas consumption)*			0,00	0,00	0,00			
ii. Gas	*(e.g. PJ gas consumption)*			0,00	0,00	0,00			
iii. Combined				0,00	0,00	0,00			
1.B.2.d. Other *(please specify)* [6]							**0,00**	**0,00**	**0,00**
				0,00	0,00	0,00			

Additional information

Description	Value	Unit
Pipelines length (km)		
Number of oil wells		
Number of gas wells		
Gas throughput [a]		
Oil throughput [a]		
Other relevant information *(spe*		

[a] In the context of oil and gas production, throughpu measure of the total production, such as barrels per d of oil, or cubic meters of gas per year. Specify the ur of the reported value in the unit column. Take into account that these values should be consistent with th activity data reported under the production rows of th main table.

[1] Specify the activity data used and fill in the activity data description column, as given in the examples in brackets. Specify the unit of the activity data in the unit column. Use the document box to specify whether the fuel amour the raw material production or on the saleable production. Note cases where more than one variable is used as activity data.

[2] The unit of the implied emission factor will depend on the units of the activity data used, and is therefore not specified in this column. The unit of the implied emission factor for each activity will be kg/unit of activity data.

[3] Use the category also to cover emissions from combined oil and gas production fields. Natural gas processing and distribution from these fields should be included under 1.B.2.b.ii and 1.B.2.b.iii, respectively.

[4] If using default emission factors these categories will include emissions from production other than venting and flaring.

[5] If using default emission factors, emissions from Venting and Flaring from all oil and gas production should be accounted for here. Parties using the IPCC software could report those emissions together, indicating so in the documentation box.

[6] For example, fugitive CO_2 emissions from production of geothermal power could be reported here.

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES Belgium/Flanders

Emissions of CO_2, CH_4 and N_2O 2001

(Sheet 1 of 2) 2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[(2)]					
	Production/Consumption quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description [(1)]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	(2)	(Gg)	(2)	(Gg)	(2)
A. Mineral Products						**0,00**		**0,00**		**0,00**	
1. Cement Production	*(e.g. cement or clinker*		0,00								
2. Lime Production			0,00								
3. Limestone and Dolomite Use			0,00								
4. Soda Ash						0,00					
Soda Ash Production			0,00								
Soda Ash Use			0,00								
5. Asphalt Roofing			0,00								
6. Road Paving with Asphalt			0,00								
7. Other *(please specify)*						0,00		0,00		0,00	
Glass Production			0,00								
			0,00	0,00	0,00						
B. Chemical Industry						**1.083,21**		**0,00**		**9,51**	
1. Ammonia Production [(3)]			0,00	0,00	0,00	1.083,21					
2. Nitric Acid Production	kton HNO3 100%	1.189,02			0,01					9,51	
3. Adipic Acid Production					0,00						
4. Carbide Production			0,00	0,00		0,00		0,00			
Silicon Carbide			0,00	0,00							
Calcium Carbide			0,00	0,00							
5. Other *(please specify)*						0,00		0,00		0,00	
Carbon Black				0,00							
Ethylene			0,00	0,00	0,00						
Dichloroethylene				0,00							
Styrene				0,00							
Methanol				0,00							
			0,00	0,00	0,00						

(1) Where the IPCC Guidelines provide options for activity data, e.g. cement or clinker for estimating the emissions from Cement Production, specify the activity data used (as shown in the example in brackets) in or to make the choice of emission factor more transparent and to facilitate comparisons of implied emission factors.

(2) Enter cases in which the final emissions are reduced with the quantities of emission recovery, oxidation, destruction, transformation. Adjusted emissions are reported and the quantitative information on recovery, oxidation, destruction, and transformation should be given in the additional columns provided.

(3) To avoid double counting make offsetting deductions from fuel consumption (e.g. natural gas) in Ammonia Production, first for feedstock use of the fuel, and then to a sequestering use of the feedstock.

TABLE 2(I).A-G SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES

Belgium/Flanders

Emissions of CO_2, CH_4 and N_2O

2001

(Sheet 2 of 2)

2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS[(2)]					
	Production/Consumption Quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
	Description[(1)]	(kt)	(t/t)	(t/t)	(t/t)	(Gg)	(2)	(Gg)	(2)	(Gg)	(2)
C. Metal Production [(4)]						**467,55**		**1,36**		**0,00**	
1. Iron and Steel Production			0,00			467,55		1,36			
Steel	fluid steel	416,71	0,04			16,96					
Pig Iron	pig iron	2.815,86	0,16	0,00		444,91					
Sinter	sinter	4.523,93	0,00	0,00				1,36			
Coke			0,00	0,00							
Other *(please specify)*						5,68		0,00			
use of electrodes		1,55	3,67	0,00	0,00	5,68					
2. Ferroalloys Production			0,00	0,00							
3. Aluminium Production			0,00	0,00							
4. SF_6 Used in Aluminium and Magnesium Foundries											
5. Other *(please specify)*						0,00		0,00		0,00	
			0,00	0,00	0,00						
D. Other Production						**0,00**					
1. Pulp and Paper											
2. Food and Drink			0,00								
G. Other *(please specify)*						**976,06**		**0,00**		**0,00**	
non energy use			0,00	0,00	0,00	976,06					

[(4)] More specific information (e.g. data on virgin and recycled steel production) could be provided in the documentation box.

Note: In case of confidentiality of the activity data information, the entries should provide aggregate figures but there should be a note in the documentation box indicating this.

Documentation box:

TABLE 5.B SECTORAL BACKGROUND DATA FOR LAND-USE CHANGE AND FORESTRY

Belgium/Flanders

Forest and Grassland Conversion

2001

(Sheet 1 of 1)

2003

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA AND OTHER RELATED INFORMATION							IMPLIED EMISSION FACTORS					EMISSIONS				
		On and off site burning				Decay of above-ground biomass[1]												
		Area converted annually	Annual net loss of biomass	Quantity of biomass burned		Average area converted	Average annual net loss of biomass	Average quantity of biomass left to decay	Burning				Decay	Burning				Decay
									On site			Off site		On site			Off site	
				On site	Off site				CO_2	CH_4	N_2O	CO_2	CO_2	CO_2	CH_4	N_2O	CO_2	CO_2
Vegetation types		(kha)	(kt dm)	(kt dm)	(kt dm)	(kha)	(t dm/ha)	(kt dm)	(t/ha)					(Gg)				
Tropical	Wet/Very Moist								0,00	0,00	0,00	0,00	0,00					
	Moist, short dry season								0,00	0,00	0,00	0,00	0,00					
	Moist, long dry season								0,00	0,00	0,00	0,00	0,00					
	Dry								0,00	0,00	0,00	0,00	0,00					
	Montane Moist								0,00	0,00	0,00	0,00	0,00					
	Montane Dry								0,00	0,00	0,00	0,00	0,00					
Tropical Savanna/Grasslands									0,00	0,00	0,00	0,00	0,00					
Temperate	Coniferous					56,39			0,00	0,00	0,00	0,00	0,00					
	Broadleaf					80,18			0,00	0,00	0,00	0,00	0,00					
	Mixed Broadleaf/ Coniferous					19,28			0,00	0,00	0,00	0,00	0,00					
Grasslands									0,00	0,00	0,00	0,00	0,00					
Boreal	Mixed Broadleaf/ Coniferous								0,00	0,00	0,00	0,00	0,00					
	Coniferous								0,00	0,00	0,00	0,00	0,00					
	Forest-tundra								0,00	0,00	0,00	0,00	0,00					
Grasslands/Tundra									0,00	0,00	0,00	0,00	0,00					
Other *(please specify)*									0,00	0,00	0,00	0,00	0,00					
									0,00	0,00	0,00	0,00	0,00					
Total														**0,00**	**0,00**	**0,00**	**0,00**	**0,00**

[1] Activity data are for default 10-year average. Specify the average decay time which is appropriate for the local conditions, if other than 10 years.

Emissions/Removals	On site	Off site
Immediate carbon release from burning	0,00	0,00
Total On site and Off site (Gg C)	0,00	
Delayed emissions from decay (Gg C)	0,00	
Total annual carbon release (Gg C)	0,00	
Total annual CO_2 emissions (Gg CO_2)	0,00	

Additional information

Fractions	On site	Off site
Fraction of biomass burned (average)		
Fraction which oxidizes during burning (average)		
Carbon fraction of aboveground biomass (average)		
Fraction left to decay (average)		
Nitrogen-carbon ratio		

Note: Sectoral background data tables on Land-Use Change and Forestry should be filled in only by Parties using the IPCC default methodology. Parties that use country specific methods and models should report information on them in a transparent manner, also providing suggestions for a possible sectoral background data table suitable for their calculation method.

TABLE 6.A SECTORAL BACKGROUND DATA FOR WASTE
Solid Waste Disposal
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION				IMPLIED EMISSION FACTOR		EMISSIONS[(1)]	
	Annual MSW at the SWDS (Gg)	MCF	DOC degraded (Gg)	CH_4 recovery [(2)] (Gg)	CH_4 (t /t MSW)	CO_2 (t /t MSW)	CH_4 (Gg)	CO_2[(3)] (Gg)
1 Managed Waste Disposal on Land					0,00	0,00	44,25	
2 Unmanaged Waste Disposal Sites					0,00	0,00	0,00	0,00
- deep (>5 m)					0,00	0,00		
- shallow (<5 m)					0,00	0,00		
3 Other *(please specify)*							0,00	0,00
					0,00	0,00		

Additional information

Description	Value
Total population (1000s)[(a)]	
Urban population (1000s)[(a)]	
Waste generation rate (kg/capita/day)	
Fraction of MSW disposed to SWDS	
Fraction of DOC in MSW	
Fraction of wastes incinerated	
Fraction of wastes recycled	
CH4 oxidation factor (b)	
CH_4 fraction in landfill gas	
Number of SWDS recovering CH_4	
CH_4 generation rate constant (k) [(c)]	
Time lag considered (yr) [(c)]	
Composition of landfilled waste (%)	
Paper and paperboard	
Food and garden waste	
Plastics	
Glass	
Textiles	
Other *(specify)*	
other - inert	
other - organic	

TABLE 6.C SECTORAL BACKGROUND DATA FOR WASTE
Waste Incineration
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA Amount of incinerated wastes	IMPLIED EMISSION FACTOR			EMISSIONS		
	(Gg)	CO_2 (kg/t waste)	CH_4 (kg/t waste)	N_2O (kg/t waste)	CO_2 [(3)] (Gg)	CH_4 (Gg)	N_2O (Gg)
Waste Incineration *(please specify)*					1.081,07	0,00	0,05
(biogenic) [(3)]		0,00	0,00	0,00			
(plastics and other non-biogenic waste) [(3)]		0,00	0,00	0,00	1.081,07		
domestic	785,58	0,00	0,00	0,06		0,00	0,05

MSW - Municipal Solid Waste, SWDS - Solid Waste Disposal Site, MCF - Methane Correction Factor, DOC - Degradable Organic Carbon (IPCC Guidelines (Volume 3. Reference Manual, section 6.2.4)). MSW includes household waste, yard/garden waste, commercial/market waste and organic industrial solid waste. MSW should not include inorganic industrial waste such as construction or demolition materials.

(1) Actual emissions (after recovery).

(2) CH_4 recovered and flared or utilized.

(3) Under Waste Disposal, CO_2 emissions should be reported only when the disposed wastes are combusted at the disposal site which might constitute a management practice. CO_2 emissions from non-biogenic wastes are included in the totals, while the CO_2 emissions from biogenic wastes are not included in the totals.

(a) Specify whether total or urban population is used and the rationale for doing so.

(b) See IPCC Guidelines (Volume 3. Reference Manual, p. 6.9)

(c) For Parties using Tier 2 methods.

Annex 3 : CO_2 from fuel combustion activities - Reference approach

This annex provides an estimation of CO2 emissions from fuel combustion based on the 'Reference approach', for the year 2001. These data are reported following the Common reporting format.
The CRF tables presented hereafter are *:

Table 1.A(b) CO_2 from Fuel Combustion Activities - Reference Approach (IPCC Worksheet 1-1)
Table 1.A(c) Comparison of CO_2 emissions from fuel combustion
Table 1.A(d) Feedstocks and Non-Energy Use of Fuels

* These tables constitute an update of those reported in the CRF tables submitted on 15 April 2003

TABLE 1.A(b) SECTORAL BACKGROUND DATA FOR ENERGY

CO_2 from Fuel Combustion Activities - Reference Approach (IPCC Worksheet 1-1)

(Sheet 1 of 1)

FUEL TYPES			Unit	Production	Imports	Exports	International bunkers	Stock change	Apparent consumption	Conversion factor [1] (TJ/Unit)	[1]	Apparent consumption (TJ)	Carbon emission factor (t C/TJ)	Carbon content (Gg C)	Carbon stored (Gg C)	Net carbon emissions (Gg C)	Fraction of carbon oxidized	Actual CO_2 emissions (Gg CO_2)
Liquid Fossil	Primary Fuels	Crude Oil	Gj		1.337.304.490	0		-3.994.668,00	1.341.299.158,00	0,00	NCV	1.341.299,16	20,00	26.825,98		26.825,98	0,99	97.378,32
		Orimulsion							0,00		NCV	0,00		0,00		0,00		0,00
		Natural Gas Liquids							0,00		NCV	0,00		0,00		0,00		0,00
	Secondary Fuels	Gasoline	Gj		64.675.669	211.037.184		-197.824,00	-146.163.691,00	0,00	NCV	-146.163,69	18,90	-2.762,49		-2.762,49	0,99	-10.027,23
		Jet Kerosene	Gj		20.112.379	56.804.125	48.326.267,00	-2.528.256,00	-82.489.375,00	0,00	NCV	-82.489,38	19,50	-1.608,54		-1.608,54	0,99	-5.839,02
		Other Kerosene							0,00		NCV	0,00		0,00		0,00		0,00
		Shale Oil							0,00		NCV	0,00		0,00		0,00		0,00
		Gas / Diesel Oil	Gj		310.873.697	324.029.967	31.277.773,00	23.125.548,00	-67.339.592,00	0,00	NCV	-67.339,59	20,20	-1.364,70	0,00	-1.364,70	0,99	-4.953,27
		Residual Fuel Oil	Gj		117.183.134	138.389.451	176.199.880,00	-3.571.510,00	-194.052.687,00	0,00	NCV	-194.052,69	21,10	-4.094,51		-4.094,51	0,99	-14.863,08
		LPG	Gj		10.193.980	12.723.636		-299.997,00	-2.229.679,00	0,00	NCV	-2.229,68	17,20	-38,35	129,10	-167,45	0,99	-607,84
		Ethane							0,00		NCV	0,00		0,00	0,00	0,00		0,00
		Naphtha	Gj		69.031.620	11.496.100		701.844,00	56.833.676,00	0,00	NCV	56.833,68	20,00	1.137,07	2.386,26	-1.249,19	0,99	-4.534,55
		Bitumen	Gj		22.883.448	26.131.944		-1.031.397,00	-2.217.099,00	0,00	NCV	-2.217,10	22,00	-48,78	277,51	-326,29	0,99	-1.184,42
		Lubricants	Gj		23.479.390	19.340.956	644.102,00	330.321,00	3.155.451,00	0,00	NCV	3.155,41	20,00	63,11	43,86	19,25	0,99	69,87
		Petroleum Coke	Gj		8.625.737	284.610		-707.379,00	9.048.506,00	0,00	NCV	9.048,51	27,50	248,83		248,83	0,99	903,27
		Refinery Feedstocks							0,00		NCV	0,00		0,00		0,00		0,00
		Other Oil	Gj		153.854.478	112.890.885		-1.273.261,00	42.236.854,00	0,00	NCV	42.236,85	20,00	844,74	801,84	42,90	0,99	155,73
Liquid Fossil Totals												957.881,28		19.202,20	3.608,57	15.593,78		56.496,54
Solid Fossil	Primary Fuels	Anthracite [2]							0,00		NCV	0,00		0,00		0,00		0,00
		Coking Coal	Gj						0,00	0,00	NCV	0,00		0,00		0,00		0,00
		Other Bit. Coal	Gj		371.551.671	53.962.084		25.528.915,00	292.060.672,00	0,00	NCV	292.060,67	25,80	7.535,17		7.535,17	0,98	27.078,36
		Sub-bit. Coal	Gj	4.799.196,00		706.525		-3.984,00	4.096.665,00	0,00	NCV	4.096,67	26,20	107,33		107,33	0,98	385,65
		Lignite	Gj		4.433.329			3.321,00	4.430.008,00	0,00	NCV	4.430,01	27,60	122,27		122,27	0,98	440,33
		Oil Shale							0,00		NCV	0,00		0,00		0,00		0,00
		Peat							0,00		NCV	0,00		0,00		0,00		0,00
	Secondary Fuels	BKB & Patent Fuel	Gj		30.288.133	3.767.323		1.994.439,00	22.524.391,00	0,00	NCV	22.524,39	25,80	581,13		581,13	0,98	2.088,19
		Coke Oven/Gas Coke							0,00		NCV	0,00		0,00		0,00		0,00
Solid Fuel Totals												323.131,74		8.346,45	0,00	8.346,45		29.991,57
Gaseous Fossil		Natural Gas (Dry)	Gj		579.153.409,00	27.739.526,00		-1.901.840,00	553.315.733,00	0,00	NCV	553.315,73	15,30	8.465,73	157,09	8.308,64	1,00	30.312,69
Total												**1.834.328,77**		**36.014,53**	**3.765,66**	**32.248,87**		**116.800,80**
Biomass total												0,00		0,00	0,00	0,00		0,00
		Solid Biomass							0,00		NCV	0,00		0,00		0,00		0,00
		Liquid Biomass							0,00		NCV	0,00		0,00		0,00		0,00
		Gas Biomass							0,00		NCV	0,00		0,00		0,00		0,00

[1] To convert quantities expressed in natural units to energy units, use net calorific values (NCV). If gross calorific values (GCV) are used in this table, please indicate this by replacing "NCV" with "GCV" in this column.

[2] If Anthracite is not separately available, include with Other Bituminous Coal.

TABLE 1.A(c) COMPARISON OF CO_2 EMISSIONS FROM FUEL COMBUSTION
(Sheet 1 of 1)

Belgium
2001
2003

FUEL TYPES	Reference approach		National approach [1]		Difference [2]	
	Energy consumption (PJ)	CO_2 emissions (Gg)	Energy consumption (PJ)	CO_2 emissions (Gg)	Energy consumption (%)	CO_2 emissions (%)
Liquid Fuels (excluding international bunkers)	957,88	56.496,54	743,62	53.678,61	28,81	5,25
Solid Fuels (excluding international bunkers)	323,13	29.991,57	247,89	25.637,13	30,35	16,98
Gaseous Fuels	553,32	30.312,69	535,94	29.772,33	3,24	1,81
Other [3]			32,65	6.148,89	-100,00	-100,00
Total [3]	**1.834,33**	**116.800,80**	**1.560,11**	**115.236,96**	**17,58**	**1,36**

[1] "National approach" is used to indicate the approach (if different from the Reference approach) followed by the Party to estimate its CO_2 emissions from fuel combustion reported in the national GHG inventory.

[2] Difference of the Reference approach over the National approach (i.e. difference = 100% x ((RA-NA)/NA), where NA = National approach and RA = Reference approach).

[3] Emissions from biomass are not included.

Note: In addition to estimating CO_2 emissions from fuel combustion by sector, Parties should also estimate these emissions using the IPCC Reference approach, as found in the IPCC Guidelines, Worksheet 1-1(Volume 2. Workbook). The Reference approach is to assist in verifying the sectoral data. Parties should also complete the above tables to compare the alternative estimates, and if the emission estimates lie more than 2 percent apart, should explain the source of this difference in the documentation box provided.

Documentation Box:

TABLE 1.A(d) SECTORAL BACKGROUND DATA FOR ENERGY
Feedstocks and Non-Energy Use of Fuels
(Sheet 1 of 1)

Belgium
2001
2003

FUEL TYPE [1]	ACTIVITY DATA AND RELATED INFORMATION		IMPLIED EMISSION FACTOR	ESTIMATE
	Fuel quantity (TJ)	Fraction of carbon stored	Carbon emission factor (t C/TJ)	of carbon stored in non-energy use of fuels (Gg C)
Naphtha [2]	149.141,34	0,80	20,00	2.386,26
Lubricants	4.386,13	0,50	20,00	43,86
Bitumen	12.614,16	1,00	22,00	277,51
Coal Oils and Tars (from Coking Coal)			0,00	
Natural Gas[2]	31.113,05	0,33	15,30	157,09
Gas/Diesel Oil [2]			0,00	
LPG [2]	697,04	0,80	17,20	9,59
Butane [2]	8.685,20	0,80	17,20	119,51
Ethane [2]			0,00	
Other *(please specify)*				
petroleum coke, sulfur, special gasolines, white spirit, petrolatums, paraffins	36.447,07	0,80	27,50	801,84

Additional information [a]

FUEL TYPE	CO_2 not emitted ($Gg\ CO_2$)	Subtracted from energy sector *(specify source category)*
Naphtha	8.749,63	
Lubricants	160,82	
Bitumen	1.017,54	
Coal Oils and Tars (from Coking Coal)	0,00	
Natural Gas	576,00	
Gas/Diesel Oil	0,00	
LPG	35,17	
Butane	438,20	
Ethane	0,00	
Other *(please specify)*		
petroleum coke, sulfur, special gasolines, white spirit, petrolatums, paraffins	2.940,06	

[1] Where fuels are used in different industries, please enter in different rows.
[2] Enter these fuels when they are used as feedstocks.

[a] The fuel lines continue from the table to the left.

Note: The table is consistent with the IPCC Guidelines. Parties that take into account the emissions associated with the use and disposal of these feedstocks could continue to use their methodology, and provide explanation notes in the documentation box below.

Documentation box: A fraction of energy carriers is stored in such products as plastics or asphalt. The non-stored fraction of the carbon in the energy carrier or product is oxidized, resulting in carbon dioxide emissions, either during the use of the energy carriers in the industrial production (e.g. fertilizer production), or during the use of the products (e.g. solvents, lubricants), or in both (e.g. monomers). To report associated emissions use the above table, filling an extra "Additional information" table, as shown below.

Associated CO_2 emissions (Gg)	Allocated under *(Specify source category)* [a]

[a] e.g. Industrial Processes, Waste Incineration, etc.

Annex 4 : Completeness and potential source and sinks of greenhouse gas emissions and removals excluded

Emissions of N2O due to the production of caprolactam are not calculated so far. Contacts with the industry involved is going on and these emissions will be included in the next submission. This source will be responsible for about 4% of the N2O-emissions in Flanders.

For some sectors, the emissions are calculated for one region only. Work is going on (i.e. sectoral meetings described in section 1.5) to identify the areas where the completeness of the inventory should be improved, taking into account the specific socio-economic conditions of the 3 regions. In this view, some areas where improvement is planned have been described in chapter 9 and in chapters 3 to 8.

The CO_2 emissions and removals from soils (LUCF or agriculture) has not been estimated so far. According to the technical report n° 75 issued by the European Environment Agency ("Annual EC greenhouse gas inventory 1990-2000 and inventory report 2002"), only 5 Members States have delivered estimates for this crf source category. In Belgium, the ongoing research projects bring together a multidisciplinary team of researchers to develop a modelling framework capable of calculating greenhouse gas inventories for terrestrial ecosystems in Belgium, by addressing these fluxes for individual landscape units or areas. These projects attempt to :

- integrate different global change modelling approaches with a Geographic Information System Framework in order to simulate the impact of plausible future scenarios of climate and socio-economic driven land use change on greenhouse gas fluxes ;
- reduce the uncertainty concerning the emissions and the reduction of greenhouse gases by LULUCF activities as stipulated by the IPCC guidelines ;
- assess of forest carbon stock on the basis of forest inventory data and evaluation of the applied biomass expansion factors ;
- measure directly the CO2 exchanges between forest and atmosphere ;
- evaluate quantitative tools for projecting future impacts of climate change on vegetation ;
- establish budgets of organic carbon in forested soils ;
- analyse the effect of elevated CO2 concentrations on root production and turnover.

The results of these projects will eventually be used to assess the CO2 emissions and removals from soils, taking into account the IPCC Good Practice Guidance on LULUCF which is under elaboration.