ENVIRONMENTAL AGENCY
OF THE REPUBLIC OF SLOVENIA

SLOVENIA'S NATIONAL INVENTORY REPORT 2011
(selected chapters)

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Executive Summary

An emissions inventory that identifies and quantifies a country's primary anthropogenic sources and sinks of greenhouse gases is essential for addressing climate change. This inventory adheres to both: a comprehensive and detailed set of methodologies for estimating sources and sinks of anthropogenic greenhouse gases, and a common and consistent mechanism that enables Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to compare the relative contribution of different emission sources and greenhouse gases to climate change.

In 1992, the Republic of Slovenia signed and in 1995, ratified the UNFCCC. As stated in Article 2 of the UNFCCC, "The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. "2 Parties to the Convention, by ratifying, "shall develop, periodically update, publish and make available…national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the *Montreal Protocol*, using comparable methodologies…"3 The Republic of Slovenia views this report as an opportunity to fulfil these commitments.

This chapter summarizes the latest information on Slovenian anthropogenic greenhouse gas emission trends from 1986 through 2008. To ensure that the Slovenian emissions inventory is comparable to those of other UNFCCC Parties, the estimates presented here were calculated using methodologies consistent with those recommended in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC/UNEP/OECD/IEA 1997), the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (IPCC 2000), and the IPCC *Good Practice Guidance for Land Use, Land-Use Change, and Forestry* (IPCC 2003). The structure of this report is consistent with the UNFCCC guidelines for inventory reporting.

1 INTRODUCTION

1.1 Background information on greenhouse gas inventories and climate change

At the Second World Climate Conference in Geneva in October and November 1990, a clear need was expressed for standard methodology for monitoring emissions of greenhouse gases, which was to enable comparing and enhancing inventories in individual countries. Under the auspices of OECD and International Energy Agency and with the support of the United States of America, United Kingdom, and Norway, a draft methodology was set up. That document comprised six direct and indirect greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), nitrogen oxides (NO_x), carbon monoxide (CO), and non-methane volatile organic compounds (NMVOCs). The methodology was adopted in Paris in March 1991 at the Fifth Session of the Intergovernmental Panel on Climate Change (IPCC) and it became the starting point for individual states in creating their national inventories of greenhouse gases.

The methodology for the calculation of greenhouse gases kept developing all the time and is even today a project under development. In the IPCC inventory of greenhouse gases for Slovenia, first the 1996 version was applied (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996), which in some parts also takes into account the emissions of direct greenhouse gases that have been encompassed by the Kyoto Protocol (CF_4, C_2F_6, PFCs, HFCs and SF_6). Later the inventory has been permanently improving with implementation of GPG (Intergovernmental Panel on Climate Change: Good practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000)

The guidelines for the implementation of the inventory of greenhouse gases contain prescribed methods for calculation of emissions, providing a unified framework for reporting and documenting sources for all inventories. One of the main aims of this method is to ensure comparability of data gathered in individual states and that calls for a definition of at least a minimum scope of equal methods, criteria, and estimating procedures.

The report presents estimates for the 6 greenhouse gases included in Annex A to the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro fluorocarbons (HFCs), per fluorocarbons (PFCs) and sulphur hexafluoride (SF_6), as well as estimates for indirect GHGs, including carbon monoxide (CO), nitrogen oxides (NOx), and non-methane volatile organic compounds (NMVOC). Data are also reported for sulphur oxides (SOx).

Global warming potential

The GWP of a greenhouse gas is defined as the ratio of the time-integrated radiative forcing from the instantaneous release of 1 kg of a trace substance relative to that of 1 kg of a reference gas (IPCC 2001). Direct radiative effects occur when the gas itself is a greenhouse gas. The reference gas used is CO_2, and therefore GWP-weighted emissions are measured in Tg of CO_2 equivalents (Tg CO_2 eq.). 9 All gases in this executive summary are presented in units of Tg CO_2 equivalent.

While any time period may be selected, this report uses the 100-year GWPs recommended by the IPCC, and adopted by the UNFCCC for reporting purposes (IPCC 1996). GWP values are listed below in Table 1.1.1.

Table 1.1 Global Warming Potentials (100 Year Time Horizon) Used in this Report

Gas	GWP
Carbon dioxide (CO_2)	1
Methane (CH_4)*	21
Nitrous oxide (N_2O)	310
HFC-23	11,700
HFC-32	650
HFC-125	2,800
HFC-134a	1,300
HFC-143a	3,800
HFC-152a	140
HFC-227ea	2,900
HFC-236fa	6,300
HFC-4310mee	1,300
CF_4	6,500
C_2F_6	9,200
C_4F_{10}	7,000
C_6F_{14}	7,400
SF_6	23,900

Source: IPCC (1996)
* The methane GWP includes the direct effects and those indirect effects due to the production of tropospheric ozone and stratospheric water vapour. The indirect effect due to the production of CO_2 is not included. Global warming potentials are not provided for CO, NOx, NMVOCs, SO_2 or aerosols because there is no agreed upon method to estimate the contribution of gases that are short-lived in the atmosphere, spatially variable, and have only indirect effects on radiative forcing (IPCC 1996).

1.2 A description of the institutional arrangement for inventory preparation

In Slovenia, the institution responsible for GHG inventories is the Environmental Agency of the Republic of Slovenia. In accordance with its tasks and obligations to international institutions, the Environmental Agency is charged with making inventories of GHG emissions, as well as emissions that are defined in the Convention on Long Range Transboundary Air Pollution within the specified time limit. In making the inventories, the Environmental Agency cooperates with numerous other institutions and administrative bodies which relay the necessary activity data and other necessary data for the inventories.

Table 1.2 Inventory Institutional Arrangements and Data Sources

IPCC category	IPCC sub-category	Sources of data
CRF 1 A – Energy. Fuel Combustion	CRF 1A1 - Energy Industry	• Statistical Office of the Republic of Slovenia: Joint Questionnaires, Energy Balances. annual energy statistics • Environmental Agency of the Republic of Slovenia: ETS data
	CRF 1A2 - Manufacturing Industries and Construction	• Statistical Office of the Republic of Slovenia: Joint Questionnaires, Energy Balances. annual energy statistics • Environmental Agency of the Republic of Slovenia: ETS data
	CRF 1A3 – Transport	• Statistical Office of the Republic of Slovenia: Joint Questionnaires, Energy balances • Ministry of Transport, Directorate for National Roads (DRSC) • Ministry of Internal affairs (vehicle stock)
	CRF 1A4 – Other Sectors	• Statistical Office of the Republic of Slovenia:
CRF 1 B – Fugitive Emissions from Fuels		• Statistical Office of the Republic of Slovenia: • natural gas distributors
CRF 2 – Industrial Processes	CRF 2A – Mineral Products	• Statistical Office of the Republic of Slovenia: • Environmental Agency of the Republic of Slovenia
	CRF 2B – Chemical Industry	• Statistical Office of the Republic of Slovenia: • Environmental Agency of the Republic of Slovenia
	CRF 2C – Metal Production	• Statistical Office of the Republic of Slovenia: • Environmental Agency of the Republic of Slovenia
	CRF 2D – Other Production	• Statistical Office of the Republic of Slovenia: • Environmental Agency of the Republic of Slovenia
	CRF 2F – Consumption of Halocarbons and SF_6	• Environmental Agency of the Republic of Slovenia
CRF 3 – Solvent and Other Product Use		• Statistical Office of the Republic of Slovenia • Environmental Agency of the Republic of Slovenia
CRF 4 – Agriculture		• Statistical Office of the Republic of Slovenia • Agricultural Institute of Slovenia
CRF 5 – Land Use, Land Use Change, and Forestry		• Slovenian Forestry Institute
CRF 6 – Waste	CRF 6A – Solid Waste Disposal on Land	• Environmental Agency of the Republic of Slovenia
	CRF 6B – Wastewater Handling	• Statistical Office of the Republic of Slovenia • Environmental Agency of the Republic of Slovenia

In Slovenia, the institution responsible for GHG inventories is the Environmental Agency of the Republic of Slovenia. In accordance with its tasks and obligations to international institutions, the Environmental Agency is charged with making inventories of GHG emissions, as well as emissions that are defined in the Convention on Long Range Transboundary Air Pollution within the specified time limit. In making the inventories, the Environmental Agency cooperates with numerous other institutions and administrative bodies which relay the necessary activity data and other necessary data for the inventories.

The chief sources of data are the Statistical Office of the Republic of Slovenia (SORS) and the Ministry of Environment and Spatial Planning; however, the Environmental Agency obtains much of its data through other activities which it performs under the Environmental Protection Act. Emissions from Agriculture are calculated in cooperation with the Slovenian Agriculture Institute (KIS), and sinks in the LULUCF sector are calculated by the Slovenian Forestry Institute (GIS).

1.3 Brief description of the process of inventory preparation

Owing to the ever-increasing obligations of Slovenia with regard to reporting, the Environmental Agency of the Republic of Slovenia has decided to implement a unified system of data collection for the purposes of making inventories, as well as secure reliable financing in accordance with the annual program of its work. The ability to fulfil its obligations with regard to reporting was also improved by the participation of Environmental

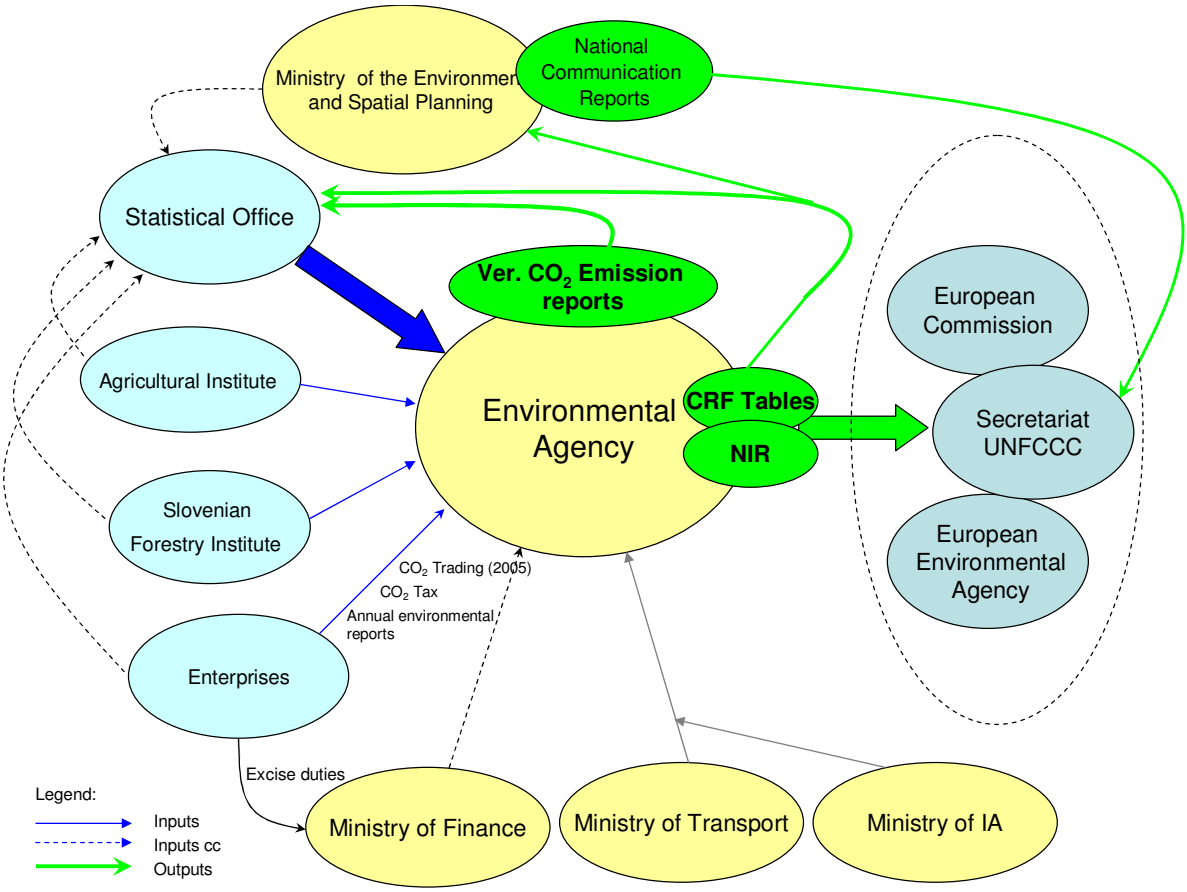

Figure 1.1: Data flow in the Slovenian Inventory System

Agency in the GEF project "Capacity building for improving GHG inventories", which ended in June 2006, and thus Slovenia made the inventories in due time and sent them in the required form to the UNFCCC Secretariat.

A Memorandum of Understanding has been concluded with institutions that participate in inventory preparation, binding these institutions to submit quality and verified data to the Environmental Agency in due time, because the time limits for inventories and the NIR have shortened with the entry of Slovenia into the EU, since inventories and part of the NIR for the year before last must be made by 15 January, and with corrections and final submission of the NIR by 15 March. In view of this, an agreement has been reached with the participating institutions to shorten the time limits for submitting data. For reasons of complexity, attention was mostly focused on the Joint Questionnaires of the Statistical Office of the Republic of Slovenia, on the basis of which the Statistical Office produces the Energy Balance of the Republic of Slovenia, wherein the most important data on the energy sector are to be found.

The year 2003 saw the end of the process of harmonisation of data collection among the Directorate of Energy, Ministry of Environment and Spatial Planning, and the Statistical Office of the Republic of Slovenia. An end was put to previous parallel double collecting of data. The competence of collecting data has, by law, passed to the Statistical Office of the Republic of Slovenia, which checks the data and eliminates potential reporting errors, and submits consolidated data to the Directorate of Energy, which has been publishing data until 2005 in its Energy Yearbook of the Republic of Slovenia. In terms of content, the data were identical to those submitted in the Joint Questionnaires to the IEA.

At the beginning of 2007, the agreement between Statistical Office of the Republic of Slovenia and the Environmental Agency came into force. Accordingly, all statistical data which are necessary for preparing GHG inventories are available each year by October 30 at the latest. In exchange, ETS data and emission estimates are reported to the Statistical Office within a defined time frame.

Experts from the Slovenian Forestry Institute and the Agricultural Institute of Slovenia work on GHG inventories according to the standing rules of institutes (ordinance). Financing is assured by governmental institutions according to the yearly work plan. All data from external institutions are submitted to the Environmental Agency, where they are archived. The detailed process from gathering data to emissions calculation and reporting is described in our Manual of Procedures, which was prepared in 2005 and updated in 2008. In 2009, the QA/QC plan as part of the Manual was developed and mostly implemented.

For submitting reports to different institutions, various report formats have been devised, since the same data are used to report to the UNFCCC, EEA, EC, and CLRTAP. All external reports of the Environmental Agency of the Republic of Slovenia are prepared in accordance with ISO 9001 via the Agency's reporting service, which keeps inventories of reports. Parallel to this, emissions data are submitted to the Statistical Office of the Republic of Slovenia, which makes this data available in its publications and submits them to EUROSTAT and the IEA.

In 2006, we started to develop a joint database for GHGs and other pollutants. It already contains all activity data, emission factors and other parameters together with a description of sources from 1980 on for other pollutants, and from 1986 on for GHG emissions. At defined control points, QC procedures are included. In the final stage we are going to develop a direct bulk import file from the database to CRF Reporter. Some phases of the database were concluded, but the whole process is planned to be finished in 2011. More information in Slovenian language about database is available in the Annex 8 to the NIR.

1.4 Brief general description of methodologies and data sources used

Inventories of GHG emissions were presented on the basis of the IPCC (IPCC 1996, GPG 2000) methodology for all gases and sectors. Due to the importance of the source and accessible data, different approaches (tiers) from within the IPCC methodology were used. National emission factors were used for assessment of emissions from domestic coal and natural gas (Tier 2), while for other fuels, default IPCC emission factors were mainly used.

The quantities of fuels and consumed fuel energy values were taken from the Statistical Office of the Republic of Slovenia. Additional data on the energy use of some types of waste (waste tyres, oils and solvents) were acquired from verified ETS reports. Data on fuel consumption in agriculture and forestry refer to mobile sources only, while the rest of the fuel consumption of these sub-sectors is included in the public and service sub-sector. Default IPCC emission factors and oxidation fractions were used for energy consumption of liquid fossil fuels. GHG emissions in road transport were determined with the COPERT 4 model.

Emission factors for fugitive emissions of CO_2 and CH_4 in mining activities were determined on the basis of measurements of methane concentrations in ventilation shafts in mines and estimated quantities of released methane. The emission factor that was determined in this manner was lower than the default IPCC emission factor. CO_2 emissions in post-mining activities were not assessed, as no estimation method is available. The regional default IPCC emission factor for transmission and distribution of natural gas does not correspond to the conditions in Slovenia; consequently, in calculating CH_4 emissions from the distribution of natural gas, data from the companies that manage the distribution and transportation network were used. Losses were estimated according to the length of individual types of transmission or distribution pipelines with regard to the pipe type, applying specific losses per unit of length, as presented in the German Inventory, and this appears to be a sensible solution considering the level of maintenance and low average age of the distribution network.

Emissions from industrial processes were mostly determined on the basis of statistical data on production and consumption of raw materials and by applying country-specific emission factors. After 1997, the Statistical Office of the Republic of Slovenia partly changed the manner of collecting and presenting these data, and therefore most of the data were obtained directly from individual companies. These data have also been used for preparing our National Allocation Plan for the EU-ETS. Since 2005, data from verified reports have mostly been used. In some cases (aluminium and ferroalloy production), the plant data still have to be obtained. Emissions from primary aluminium production were estimated from anode consumption and from PFC emissions, which were determined on the basis of the number and duration of anode effects. In determining actual emissions caused by the use of HFCs, data were obtained from companies that use or sell these materials, as well as data on the export and import of refrigerators. For SF_6 emissions, the release of this gas from gas-insulated switchgear in the Energy sector was assessed. Emissions from the consumption of solvents and diluents consisted only of N_2O, which arises from evaporation during the use of N_2O, mostly for anaesthesia.

In agriculture, methane emissions from enteric fermentation in bovine animals were determined using Tier 2 approach. For emissions from manure management, the Tier 2 approach was used for pig production and bovine animal production. The Tier 1 approach was used for other animals that represent a smaller fraction in methane emissions. Input data for N_2O emissions from manure handling and from indirect emissions from fertilisation with animal fertilisers were obtained in the process of estimating methane emissions.

Table 1.3: Summary report for methods and emission factors used from CRF tables

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2		CH_4		N_2O		HFCs		PFCs		SF_6	
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor
1. Energy	**M,T1,T2,T3**	**CS,D,M,PS**	**M,T1,T3**	**CS,D,M**	**M,T1**	**D,M**						
A. Fuel Combustion	M,T1,T2	CS,D,M,PS	M,T1	D,M	M,T1	D,M						
1. Energy Industries	T1,T2	CS,D	T1	D	T1	D						
2. Manufacturing Industries and Construction	T1	CS,D,PS	T1	D	T1	D						
3. Transport	M,T1	D,M	M,T1	D,M	M,T1	D,M						
4. Other Sectors	T1	CS,D	T1	D	T1	D						
5. Other	NA	NA	NA	NA	NA	NA						
B. Fugitive Emissions from Fuels	T1,T3	CS	T1,T3	CS,D	NA	NA						
1. Solid Fuels	T3	CS	T3	CS	NA	NA						
2. Oil and Natural Gas	T1,T3	CS	T1,T3	CS,D	NA	NA						
2. Industrial Processes	**CS,D,T2,T3**	**CS,D,PS**	**D**	**D**	**NA**	**NA**	**T2**	**CS,D**	**T3**	**PS**	**T2**	**CS,D**
A. Mineral Products	CS,D,T2	CS,D	NA	NA	NA	NA						
B. Chemical Industry	D	D	D	D	NA	NA						
C. Metal Production	D,T2,T3	D,PS	NA	NA	NA	NA	NA	NA	T3	PS	NA	NA
D. Other Production	NA	NA										
E. Production of Halocarbons and SF_6							NA	NA	NA	NA	NA	NA
F. Consumption of Halocarbons and SF_6							T2	CS, D	NA	NA	T2	CS,D
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NA**	**NA**			**D**	**D**						
4. Agriculture			**T1,T2**	**CS,D**	**D,T1, T1a,T1b**	**CS,D**						
A. Enteric Fermentation			T1,T2	CS,D								
B. Manure Management			T1,T2	CS,D	D	CS,D						
C. Rice Cultivation			NA	NA								
D. Agricultural Soils			NA	NA	D,T1, T1a,T1b	CS,D						
E. Prescribed Burning of Savannas			NA	NA	NA	NA						
F. Field Burning of Agricultural Residues			NA	NA	NA	NA						
G. Other			NA	NA	NA	NA						
5. Land Use, Land-Use Change and Forestry	**CS,D,T1,T2,T3**	**CS,D,PS**	**D,T1**	**D**	**D,T1**	**D**						
A. Forest Land	CS,D,T1,T2,T3	CS,D,PS	D,T1	D	D,T1	D						
B. Cropland	D,T1,T2	CS,D	NA	NA	NA	NA						
C. Grassland	D,T1,T2	CS,D	NA	NA	NA	NA						
D. Wetlands	NA	NA	NA	NA	NA	NA						
E. Settlements	NA	NA	NA	NA	NA	NA						
F. Other Land	NA	NA	NA	NA	NA	NA						
G. Other	NA	NA	NA	NA	NA	NA						
6. Waste	**D**	**D**	**T1,T2**	**D**	**D,T1**	**D**						
A. Solid Waste Disposal on Land	NA	NA	T2	D								
B. Waste-water Handling			T1	CS,D	T1	D						
C. Waste Incineration	D	D	NA	NA	D	D						
D. Other	NA	NA	NA	NA	NA	NA						

For N_2O emissions, default IPCC factors for determining the conversion of nitrogen into N_2O were used.

Emissions and removals from the LULUCF sector are calculated for forest land, crop land and grassland. For other land use categories, emissions and removals are not reported and are negligible. Reported calculations are based on the Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC 2003) completed by country-specific methodologies. The land areas from are represented by geographically explicit land-use data with a resolution of 0.25 ha. Study of land use by Slovenian Forestry institute enables to calculate spatially explicit land-use change matrices.

Methane emissions from solid waste handling were determined by the FOD method, which takes into account the time dynamics of methane release. Emissions of CH4 and N2O from wastewater were calculated with default method as well as emissions from waste incineration.

1.5 Brief description of key categories

The analysis of key source categories was performed on the basis of sectoral distribution and using the Tier 1 approach. This approach was used both for the base year and for the year 2009. A level assessment was undertaken for 1986 and 2009, and a trend assessment was performed for 2009. The LULUCF sector is included in the analysis of key categories.

On the basis of the analysis, 24 categories were selected as a key, representing 95.2% of emissions in 2009 according to the level assessment, and 13 were chosen which are key categories according to the trend assessment. As many as 20 categories are key sources according to level and trend key source analysis.

From 24 key categories the most are from Energy sector: 9 categories are CO2 emissions from fuel combustion and one is CH4 emissions from Coal mining and handling, their contribution to the level is 46.7%. The second most representative sector is Agriculture with 7 key categories; four are related to methane emissions and 3 to N2O emissions. In LULUCF sector are 4 key categories with 40.3% contribution to the level, in Waste sector are 2 key categories and in Industrial processes is one.

On the following pages Tier 1 key categories estimates are presented on the first tables and EFs and methodology used for key categories are presented on the second one

Table 1.4: Brief description of IPCC KS Categories for 2009 Tier 1.

rank KS level 2009	Main Sector	Subsector	Source	Gas	GHG Emissions in 2009 Gg CO2 eq.	Contr. to Level (2009) %	Cumulative %	Contr. to Trend (2009) %	KS in 2009	KS in 1986	rank KS level 1986	Method used	EF Used
1	5. LULUCF	A. Forest land	1. Forest Land remaining Forest Land	CO2	10792,241	33,11	33,11	7,27	L,T	L	1	CS, D, T1, T3	CS, D, PS
2	1. Energy / A Fuel Comb.	1. Energy Industries	a. Public Electricity and Heat Production	CO2	6043,779	18,54	51,65	5,81	L,T	L	2	T1, T2	CS, D
3	1. Energy / A Fuel Comb.	3. Transport	b. Road Transportation	CO2	5204,228	15,97	67,62	29,43	L,T	L	3	M	M
4	5. LULUCF	C. Grasland	2. Land converted to Grassland	CO2	1484,889	4,56	72,17	4,54	L,T	L	7	D, T1, T2	CS, D
5	1. Energy / A Fuel Comb.	4. Other Sectors	b. Residential	CO2	1133,987	3,48	75,65	0,07	L	L	6	T1	CS, D
6	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	f. Other	CO2	928,809	2,85	78,50	8,04	L,T	L	4	T1	CS, D
7	1. Energy / A Fuel Comb.	4. Other Sectors	a. Commercial/Institutional	CO2	712,816	2,19	80,69	0,78	L,T	L	9	T1	CS, D
8	5. LULUCF	B. Cropland	2. Land converted to Cropland	CO2	600,036	1,84	82,53	1,93	L,T	L	16	D, T1, T2	CS, D
9	2. Industrial Processes	A. Mineral Products	1. Cement Production	CO2	433,253	1,33	83,86	0,85	L,T	L	10	T2	CS
10	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	d. Pulp, Paper and Print	CO2	408,188	1,25	85,11	2,32	L,T	L	8	T1	CS, D
11	4. Agriculture	D. Agricultural Soils	1. Direct Soil Emissions	N2O	386,250	1,18	86,29	0,53	L,T	L	12	D, T1, T1b	CS, D
12	4. Agriculture	A. Enteric Fermentation	1. Non-Dairy Cattle	CH4	381,840	1,17	87,47	1,02	L,T	L	22	T2	CS
13	6. Waste	A. Solid Waste Disposal on Land	1. Managed Waste Disposal on Land	CH4	361,260	1,11	88,57	0,50	L,T	L	19	T2	D
14	4. Agriculture	D. Agricultural Soils	3. Indirect Emissions	N2O	300,956	0,92	89,50	0,37	L	L	18	D, T1a	D
15	5. LULUCF	B. Cropland	1. Cropland remaining Cropland	CO2	266,444	0,82	90,31	1,51	L,T	L	14	D, T1, T2	CS, D
16	1. Energy / B Fugitive	1. Solid Fuels	a. Coal Mining and Handling	CH4	249,253	0,76	91,08	1,07	L,T	L	17	T3	CS
17	4. Agriculture	A. Enteric Fermentation	1. Dairy Cattle	CH4	244,159	0,75	91,83	1,34	L,T	L	15	T2	CS
18	1. Energy / A Fuel Comb.	4. Other Sectors	c. Agriculture/Forestry/Fisheries	CO2	201,875	0,62	92,45	2,11	L,T	L	13	T1	D
19	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	c. Chemicals	CO2	171,411	0,53	92,97	0,64	L,T		32	T1	CS, D
20	4. Agriculture	B. Manure Management	1. Non-Dairy Cattle	CH4	162,846	0,50	93,47	0,86	L,T		37	T2	CS
21	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	a. Iron and Steel	CO2	154,543	0,47	93,95	9,18	L,T	L	5	T1	CS, D
22	4. Agriculture	B. Manure Management	13. Solid Storage and Dry Lot	N2O	140,222	0,43	94,38	1,18	L,T	L	21	D	CS, D
23	6. Waste	B. Waste Water Handling	2. Domestic and Commercial Waste Water	CH4	139,709	0,43	94,81	0,22	L		29	T1	D
24	4. Agriculture	B. Manure Management	1. Dairy Cattle	CH4	132,848	0,41	95,21	0,21	L	L	26	T2	CS
25	4. Agriculture	B. Manure Management	8. Swine	CH4	124,683	0,38		0,94	T	L	24	T1	CS
26	2. Industrial Processes	F. Consumption of Halocarbons and	1. Refrigeration and Air Conditioning Equipm	HFC	120,688	0,37		1,09	T		NO	T2	CS, D
27	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	e. Food Processing, Beverages and Tobacco	CO2	114,323	0,35		1,26	T	L	23	T1	CS, D
29	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	b. Non-Ferrous Metals	CO2	110,965	0,34		3,08	T	L	11	T1	CS, D
30	2. Industrial Processes	A. Mineral Products	3. Limestone and Dolomite Use	CO2	92,080	0,28		0,66	T		52	D	D
31	1. Energy / A Fuel Comb.	4. Other Sectors	b. Residential	CH4	88,409	0,27		0,45	T	L	27	T1	D
33	2. Industrial Processes	A. Mineral Products	2. Lime Production	CO2	71,000	0,22		1,40	T	L	25	D	CS
39	3. Solvent and Other Product U	D. Other	1. Use of N2O for Anaesthesia	N2O	31,000	0,10		0,48	T		35	D	D
48	6. Waste	B. Waste Water Handling	1. Industrial Wastewater	CH4	15,693	0,05		0,75	T		33	T1	D
55	2. Industrial Processes	C. Metal Production	3. Aluminium Production	PFC	7,433	0,02		2,49	T	L	20	T3	PS
57	1. Energy / A Fuel Comb.	1. Energy Industries	b. Petroleum Refining	CO2	6,260	0,02		0,52	T		38	T1	D
68	1. Energy / A Fuel Comb.	1. Energy Industries	c. Manufacture of Solid Fuels and Other Energ	CO2	2,101	0,01		0,95	T		31	T1	D
75	2. Industrial Processes	B. Chemical Industies	4. Carbide Production	CO2	0,827	0,00		0,41	T		43	T1	D

Table 1.5: Key categories according Tier 1 analyse – methods and EF used.

rank KS level 2009	Main Sector	Subsector	Source	Gas	GHG Emissions in 2009 Gg CO2 eq.	KS in 2009	Method used	EF Used
1	5. LULUCF	A. Forest land	1. Forest Land remaining Forest Land	CO2	10792,241	L,T	CS, D, T1, T3	CS, D, PS
2	1. Energy / A Fuel Comb.	1. Energy Industries	a. Public Electricity and Heat Production	CO2	6043,779	L,T	T1, T2	CS, D
3	1. Energy / A Fuel Comb.	3. Transport	b. Road Transportation	CO2	5204,228	L,T	M	M
4	5. LULUCF	C. Grasland	2. Land converted to Grassland	CO2	1484,889	L,T	D, T1, T2	CS, D
5	1. Energy / A Fuel Comb.	4. Other Sectors	b. Residential	CO2	1133,987	L	T1	CS, D
6	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	f. Other	CO2	928,809	L,T	T1	CS, D
7	1. Energy / A Fuel Comb.	4. Other Sectors	a. Commercial/Institutional	CO2	712,816	L,T	T1	CS, D
8	5. LULUCF	B. Cropland	2. Land converted to Cropland	CO2	600,036	L,T	D, T1, T2	CS, D
9	2. Industrial Processes	A. Mineral Products	1. Cement Production	CO2	433,253	L,T	T2	CS
10	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	d. Pulp, Paper and Print	CO2	408,188	L,T	T1	CS, D
11	4. Agriculture	D. Agricultural Soils	1. Direct Soil Emissions	N2O	386,250	L,T	D, T1, T1b	CS, D
12	4. Agriculture	A. Enteric Fermentation	1. Non-Dairy Cattle	CH4	381,840	L,T	T2	CS
13	6. Waste	A. Solid Waste Disposal on Land	1. Managed Waste Disposal on Land	CH4	361,260	L,T	T2	D
14	4. Agriculture	D. Agricultural Soils	3. Indirect Emissions	N2O	300,956	L	D, T1a	D
15	5. LULUCF	B. Cropland	1. Cropland remaining Cropland	CO2	266,444	L,T	D, T1, T2	CS, D
16	1. Energy / B Fugitive	1. Solid Fuels	a. Coal Mining and Handling	CH4	249,253	L,T	T3	CS
17	4. Agriculture	A. Enteric Fermentation	1. Dairy Cattle	CH4	244,159	L,T	T2	CS
18	1. Energy / A Fuel Comb.	4. Other Sectors	c. Agriculture/Forestry/Fisheries	CO2	201,875	L,T	T1	D
19	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	c. Chemicals	CO2	171,411	L,T	T1	CS, D
20	4. Agriculture	B. Manure Management	1. Non-Dairy Cattle	CH4	162,846	L,T	T2	CS
21	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	a. Iron and Steel	CO2	154,543	L,T	T1	CS, D
22	4. Agriculture	B. Manure Management	13. Solid Storage and Dry Lot	N2O	140,222	L,T	D	CS, D
23	6. Waste	B. Waste Water Handling	2. Domestic and Commercial Waste Water	CH4	139,709	L	T1	D
24	4. Agriculture	B. Manure Management	1. Dairy Cattle	CH4	132,848	L	T2	CS
25	4. Agriculture	B. Manure Management	8. Swine	CH4	124,683	T	T1	CS
26	2. Industrial Processes	F. Consumption of Halocarbons and	1. Refrigeration and Air Conditioning Equipm	HFC	120,688	T	T2	CS, D
27	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	e. Food Processing, Beverages and Tobacco	CO2	114,323	T	T1	CS, D
29	1. Energy / A Fuel Comb.	2. Manufacturing Industries and Cor	b. Non-Ferrous Metals	CO2	110,965	T	T1	CS, D
30	2. Industrial Processes	A. Mineral Products	3. Limestone and Dolomite Use	CO2	92,080	T	D	D
31	1. Energy / A Fuel Comb.	4. Other Sectors	b. Residential	CH4	88,409	T	T1	D
33	2. Industrial Processes	A. Mineral Products	2. Lime Production	CO2	71,000	T	D	CS
39	3. Solvent and Other Product U	D. Other	1. Use of N2O for Anaesthesia	N2O	31,000	T	D	D
48	6. Waste	B. Waste Water Handling	1. Industrial Wastewater	CH4	15,693	T	T1	D
55	2. Industrial Processes	C. Metal Production	3. Aluminium Production	PFC	7,433	T	T3	PS
57	1. Energy / A Fuel Comb.	1. Energy Industries	b. Petroleum Refining	CO2	6,260	T	T1	D
68	1. Energy / A Fuel Comb.	1. Energy Industries	c. Manufacture of Solid Fuels and Other Energ	CO2	2,101	T	T1	D
75	2. Industrial Processes	B. Chemical Industies	4. Carbide Production	CO2	0,827	T	T1	D

1.6 Information on the QA/QC plan, verification and treatment of confidentiality

In 2009, Slovenia developed and mostly implemented a Quality Assurance and Quality Control plan as recommended by the IPCC Good Practice Guidelines (IPCC 2000). The QA/QC plan is part of the Manual of Procedures, elaborated in 2005 and updated in 2009. At the beginning of 2009, a QA/QC manager at the inventory agency was designated.

Quality Control (QC) is a system of routine technical activities to measure and control the quality of the inventory as it is being developed. The QC system is designed to:
- provide routine and consistent checks to ensure data integrity, correctness and completeness;
- identify and address errors and omissions;
- document and archive inventory material and record all QC activities.

The general part of this system is incorporated in an Oracle database (ISEE – "Emission inventory" information system) established at the end of 2008. The main purpose of ISEE is:

- to enable collection and archiving of activity data, emission factors and other parameters including descriptions of sources from 1980 on for other pollutants, and from 1986 on for GHG emissions;
- to calculate GHG and other pollutant emissions;
- to automatically fill in reporting tables (CRF Reporter).

In late 2008, the first two stages of development of ISEE were finished, while bulk importing into CRF Reporter is still in the testing phase. ISEE enables and ensures that all necessary built-in QA/QC checks have been performed before data and emission estimates are entered in the reporting format tables. It also keeps a record of all changes made to data in the database.

As all calculations are performed in the database with software generated for this purpose, no human errors, common in calculations made in Excel spreadsheets, are expected. After these procedures, the activity data (fuel consumption and NCV) are transferred into the database, while EFs are imported manually. Then emissions are calculated automatically according to the built-in formulas. For 2008, GHG emissions were also calculated in Excel spreadsheets. Both estimates were compared and all differences were carefully investigated and corrected.

<u>During development of the database, the following QC was performed:</u>

Check of methodological and data changes resulting in recalculations
- Check for temporal consistency in time series input data for each source category.
- Check for consistency in the algorithm/method used for calculations throughout the time series.

Completeness checks
- Confirm that estimates are reported for all source categories and for all years from the appropriate base year to the period of the current inventory.
- Check that known data gaps that result in incomplete source category emissions estimates are documented.

- Compare estimates to previous estimates: for each source category, current inventory estimates should be compared to previous estimates. If there are significant changes or departures from expected trends, recheck estimates and explain any differences.

Check of activity data, emission factors and other parameters
- Cross-check all input data from each source category for transcription errors.
- Check that units are properly labelled in calculation sheets.
- Check that units are correctly carried through from beginning to end in calculations.
- Check that conversion factors are correct.
- Check that temporal and spatial adjustment factors are used correctly.

Check of emissions estimates
For the entire period 1986–2007, GHG emissions are also calculated in the old way using Excel spreadsheets and in the database using built-in formulas. Both estimates were compared and all differences carefully investigated.
The reasons for differences were the following:
- Formulas for calculation of emissions were not correct.
- Data field was not properly labelled.
- Data relationship was not correct.
- Emissions data were not correctly aggregated from lower reporting levels to higher reporting levels.

All errors were corrected and the accuracy of emissions calculations on all levels is now assured.

<u>QA/QC checks not performed in the database:</u>

Documentation and archiving
All inventory data are now stored in a joint database. Supporting data and references are stored in electronic form and/or hard copy form. Inventory submissions are stored mostly in electronic form at various locations and on various media (network server, RAM, computer hard disk). Access to files is limited in accordance with the security policy. Backup copies on the server are made at regular intervals in accordance with the requirements of the information system.

All relevant data from external institutions are also stored at the Environmental Agency in one place. The older studies are available in hard copies only; some newer studies are available also in electronic format. In 2010 all studies will be scanned and transformed to pdf file and will be stored also on network server, RAM and computer hard disk.

QA/QC checks of documentation and archiving procedures:
- Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review.
- Check that there is detailed internal documentation to support the estimates and enable duplication of the emissions estimates.
- Check that documentation of the database is adequate and archived.
- Check that bibliographical data references are properly cited in the internal documentation and archived.

Uncertainty
Checks of uncertainty were not performed in 2009 but are foreseen for 2011 according to the QA/QC plan. The checks consist of the following:
- Check that the qualifications of individuals providing expert judgement for uncertainty estimates are appropriate.
- Check that qualifications, assumptions and expert judgements are recorded. Check that calculated uncertainties are complete and calculated correctly.

- Check that there is detailed internal documentation to support the uncertainty estimates.

Preparation of NIR
- Check that all chapters from annotated NIR are included in the NIR
- Check that AD, EF and other numerical information mentioned in the text is correct
- Check all AD data presented in the tables in the NIR
- Check all EF and other parameters used in the tables in the NIR
- Check that AD, EF and other numerical information mentioned in the text is correct
- Check all graphs that are accurate and for the whole period
- Check all titles for tables and pictures
- Check that all Annexes to the NIR are updated

For 2010 the whole NIR have been cross-checked and errors, mostly in energy sector have been put off.

In 2006, an additional quality control check point was introduced by forwarding the assessment of verified emission reports from installations included in the National Allocation Plan to the Statistical Office of the Republic of Slovenia (SORS). The role of SORS is to compare data from installations included in the EU-ETS with data from their reporting system and to propose corrective measures, if necessary. The outcome of data consistency checks is used as preliminary information for the Ministry of the Environment and Spatial Planning to perform on-site inspections. The use of (EU) ETS data is described in more detail in the relevant chapter on Energy and Industrial Processes sectors.

QA
QA generally consists of independent third-party review activities to ensure that the inventory represents the best possible estimates of emissions and removals, and to support the effectiveness of the QC program. In the past we have performed only one peer review. In 2006, we received many useful comments from the team preparing our fourth National Communication Report. Although the comments were not presented as an official report, we accepted many of the suggestions and corrected a number of errors. We are planning a sectoral review of our inventory on a yearly basis – one sector per year. In May 2009, a peer review of the Slovenian inventory was performed for the energy sector.

For 2010 the peer review for waste sector has been planned, but upon series reflection the decision was taken, to improve our emission estimates from waste waters. As project is financial demanding it was divided into two parts. In 2009 emissions from industrial waste waters have been renewed and for 2010 the revision of domestic and commercial waste water treatment is planned. We will perform the peer review of waste sector afterwards.

The Energy sector and Industrial processes sector is regularly checked by experts from Energy efficiency centre (CEU/IJS) and many useful advices were given how to improve HFC estimates from mobile AC.

For Agriculture and LULUCF sector it is very hard to perform peer review as the main institutions (Slovenian Forestry Institute and Agricultural Institute of Slovenia) are already involved in the inventory preparation.

QA/QC procedures performed by other institutions (Slovenian Forestry Institute and Agricultural Institute of Slovenia) are described in the relevant chapters in the NIR (LULUCF, Agriculture). Data based on forest statistics are produced by the Slovenian Forestry Institute and SORS. Data based on agricultural statistics are mainly from SORS and the Agricultural Institute. All data were checked.

The Statistical Office of Slovenia (SORS) is our main data provider. In 2005, the European Statistics Code of Practice was adopted, bringing considerable changes to the SORS QA/QC system. The main pillars (factors) of quality are defined and thoroughly described in the Medium-term Programme of Statistical Surveys 2008–2012 (http://www.stat.si/doc/drzstat/SPSR-ang.pdf). The strategic directions from the Medium-term Programme of Statistical Surveys are presented in detail at http://www.stat.si/doc/drzstat/kakovost/TQMStrategy_2006_eng.doc in the Total Quality Management Strategy 2006–2008.

The examples of Tier 1 QC tables are available in the Annex 8 to the NIR.

1.6.1 Official consideration and approval of the inventory

Before the inventory is reported to the EU, EEA or UNFCCC Secretariat, it goes through an approval process. The institution designated for approval is the Ministry of Environmental and Spatial Planning. The inventory is sent to the Ministry according the following plan:

- draft CRF tables on 3 January
- final CRF tables and draft NIR on 1 March
- final report on 1 April

1.6.2 Public availability of the inventory

The inventories are public available on the web. Every submission is accompanied with a short description in Slovene language. The estimates are presented in more simple way with the table similar to Table 2.3.1 in the NIR. GHG emissions are also presented as indicator. It is very common that yearly submission of GHG inventory is followed by press conference, where our last estimates are presented in connection with our Kyoto goal.

Web page address:
http://www.arso.gov.si/podnebne%20spremembe/emisije%20toplogrednih%20plinov/

1.7 General uncertainty evaluation, including data on the overall uncertainty for the inventory totals

In 2005 the uncertainties of activity data and emission factors in sector 1.A.1.a Public Electricity and Heat Production have been reduced. In this sector, because of the introduction of CO_2 emission trading within the EU, we have re-verified the input data and the procedure of determining the consumption of fuels. In calculating emissions from this sector, the national emission factors based on coal sampling and ascertaining the carbon contents have also been applied. All analyses have been done in the accredited laboratory in accordance with the EN ISO 17025 ("General requirements for the competence of testing and calibration laboratories"). Public power plants have presented their plan of measures to ensure that fuel consumption will be measured without intermediate storage before combustion in the installation applying measuring devices resulting in a maximum permissible uncertainty of less than +/- 2.5% for the measuring process.

The combined uncertainty was derived from Tier 1 method. The uncertainties of individual activity data and emission factors are based on expert judgment or 2000 GPG. Since expert judgments of individual experts are at variance, the highest individual uncertainties

have been taken into account. The total uncertainties have been derived both for Level Uncertainty as well as for Trend Uncertainty.

For 2010 submission the recalculation of LULUCF sector including uncertainty estimates have been performed. Because of relatively high uncertainty of this sector and very high amount of sinks comparing to emissions (40%), the total combined uncertainty is rather high. The detailed results are in the table below.

In the 1986 the uncertainty of the inventory was 43.66% (8.96 w/o LULUCF).

In the 2009 the uncertainty was 30.55% (7.08 w/o LULUCF). The biggest contributions to the lower uncertainty have the energy and LULUCF sector.

Table 1.6: Inventory Institutional Arrangements and Data Sources

	1986	2009
1A Energy	6.77%	2.69%
1B Fugitive	40.18%	39.67%
2&3 Processes/Solvents emissions	7.42%	8.84%
4 Agriculture	64.58%	63.29%
5 LULUCF	61.33%	35.17%
6 Waste	45.59%	46.98%
TOTAL COMBINED UNCERTAINTY	**43.66%**	**30.55%**

TOTAL trend uncertainty (2009/1986) = 4.57%

The detailed results of uncertainty analyse are in the Annex 7 to the NIR.

1.8 General assessment of the completeness

An assessment of completeness for each sector may be found in the Sector Overview part of the corresponding subchapters; here some aggregated information is presented.

Sources and sinks
All sources of direct GHG gases, included in the IPCC Guidelines, are covered in inventory. There are some gaps in estimations. There are also some gaps in estimations of NMVOC emissions in Solvent Use Sector.

Gases
All direct GHGs as well as the postulated precursor gases are covered by the Slovenian inventory.

Geographic coverage
The geographic coverage is complete. No territory in Slovenia has been left uncovered by the inventory.

Notation keys

IE (included elsewhere):
There are few categories marked with IE because relevant data are not available on the reporting level but are included in other category. These sources are:

- GHG emissions from inland navigation (included in road transport)
- in solvent use sector N20 emissions from Fire Extinguishers and Other use (included in anaesthesia)
- All GHG emission from forest fires are reported under Forest land remaining Forest Land
- All CO2 emissions from agricultural lime application are reported under cropland as limestone (all other categories are reported as IE)

NE (not estimated):

There are few categories marked with NE because methodologies for estimating GHG emissions are not available in IPCC manuals from 1996 or in GPG from 2000. These sources are:

- GHG emissions in solvent use sector
- CH_4 from enteric fermentation from poultry

The potential emissions of SF6 have still not been estimated, because of lack of data. Potential emissions for HFC have been evaluated for 1995-2009 for the whole sector only while the estimation for sub-sectors are missing.

There are still few missing sources in the LULUCF sector in Wetlands, Settlements and Other land. The emissions and sinks are not estimated because of lack of relevant data but they are expected to be negligible.

NA (not applicable):
The increase of this number is due to improved completeness of the CRF- tables.

NO (not occurring)
The highest number of source categories marked with NO is found in agriculture and LULUCF sector, but there are some in industrial processes and energy industries.

C (confidential)
Statistical low considering confidentiality is very strict in Slovenia. All data which are gathered from three or less reporting unit are confidential. It is good practise in national statistic that this boundary is even higher (five units). As Slovenia is a small country almost all relevant categories from industrial processes sector and in less extend also in energy sector are confidential. Nevertheless no data in our report is marked with C. The confidentiality problem in activity data has been solved on individual level with each relevant plant. After 2005 verified reports from installations included in ETS, have resolved this problem generally for most cases.

2 TRENDS IN GREENHOUSE GAS EMISSIONS

2.1 Description and interpretation of emission trends for aggregated GHG emissions

The total emissions of GHG in 2009, sinks not considered, amounted to 19,312.14 kt CO_2 eq., which represents a 9.3% decrease of emissions compared to the year 1986. In the period 1986-1991, a reduction of emissions was recorded due to the economic conditions at that time and the Republic of Slovenia gaining its independence. In the period 1992-1997, a strong increase of emissions was recorded, which was a consequence of increasing economic growth and revival of industrial production. In the second half of that period, the increased emissions were a consequence of "gasoline tourism" (25% of the total sale of motor fuels in the Republic of Slovenia), since the prices of motor fuels in the Republic of Slovenia were appreciably lower than in the neighbouring countries.

In the period 1998-1999, emission decreased due to the measures undertaken by the neighbouring countries to curb the "gasoline tourism" and due to the increased supply of electrical energy from the Krško Nuclear Power Plant. In the 2000-2002 period, emission kept increasing again due to the renewal of obligatory export of electrical energy from the Krško Nuclear Power Plant to the Republic of Croatia. After joining the EU in 2004 and after acceptance of Romania and Bulgaria into EU in 2007, emissions from road transport have increased drastically and has prevailed over decrease in other sectors which have happened due to the policies and measures in manufacturing industry, agriculture and waste sector.

In 2009 emissions from fuel used and industrial processes emissions started to decrease due to the global financial crisis.

2.2 Description and interpretation of emission trends by gas

CO_2 emissions in 2009 represented 82.9% of overall emissions of greenhouse gases. CO_2 emissions excluding LULUCF followed the consumption of energy and with regard to their fraction exerted a major influence on total emissions. Compared to 1986 in 2009 they decreased by 1.7%. CH_4 emissions represented 10.4% of total emissions in 2009 (11.2% in 1986) and were lower than in 1986 by 10.7%. N_2O emissions represented 5.9% of total emissions and were lower than N_2O emissions in 1986 by 17.5%. F-gases represent 0.7% of total emissions and some (HFCs and SF_6) have shown significant increases since 1995 (base year for F-gases) while PFC decrease drastically in 2008 and has continued to decrease in 2009.

***Carbon dioxide* – CO_2**

CO_2 emissions in the period 1986–2009 arise mostly from Energy sector and may be split into five segments. In the first segment, 1986–1991, emissions diminished due to a reduction in industrial production and the war for independence in 1991. Emissions rose strongly in the 1991–1997 period, when emissions also increased due to gasoline tourism. Then came a short period of emission reduction as a consequence of a reduction in gasoline tourism and decreased consumption of fossil fuels for the production of electrical energy. After 1999, emissions again rose, mainly as a consequence of the production of electrical energy. CO_2 emissions in 2002 thus amounted to 16.24 Mt of CO_2, which is nearly the same as in the 1986 base year. Although in 2003, CO_2 emissions decreased by 1.5% (mainly due to lower emissions from Energy Industries) on 2004 started a period of

constant increase (in 2004 by 2.2%, in 2005 by 1.7%, in 2006 by 1.1%, in 2007 by 0.7% and in 2008 as much as 5.7%), mainly due to transport. In 2009 CO2 emissions started decreasing due to global financial crisis.

In entire period of time, the strongest increase in CO_2 emissions was in transport, by as much as 202%, from 2.0 Mt CO_2 eq. in 1986 to 6.2 Mt CO_2 eq. in 2008. In 2009 emissions from this sector have decreased for 13.6% compare to 2008 but are still above base year emissions for 160.9%.

The Industrial Processes sector contributed 4,3% to total CO2 emissions in 2009, while contribution of other sector is negligible or zero. The LULUCF sector represents sink for CO2 emissions, in the 1986-2009 the level of sinks is rather constant and amounted to nearly half of CO2 emissions.

Methane – CH_4

Between 1986 and 2009, methane emissions were slightly decrease, from 2.26 Mt CO_2 eq. in 1986 to 2.01 Mt CO_2 eq. in 2009. CH_4 emissions diminished by 10.7% in spite of increased emissions from waste by 2.3%, compared to the base year. The larger contribution to decrease has a reduction of methane emissions in Fugitive emissions from fuel.

Nitrous oxide – N_2O

N_2O emissions were down from 1.39 Mt CO_2 eq. in 1986 to 1.15 Mt CO_2 eq. in 2009. In Agriculture, which is the main source of N_2O emissions, emissions diminished chiefly due to fewer animals and less arable crop production, particularly legumes and N-fixing plants. This reduction was partly due to a changed manner of manure storage, since the fraction of straw-based systems is diminishing on account of the increasing use of slatted floors. Recently, an increase of the fraction of traffic in total N_2O emissions has been observed, this fraction rising from 2.7% in 1986 to 5.8% in 2009.

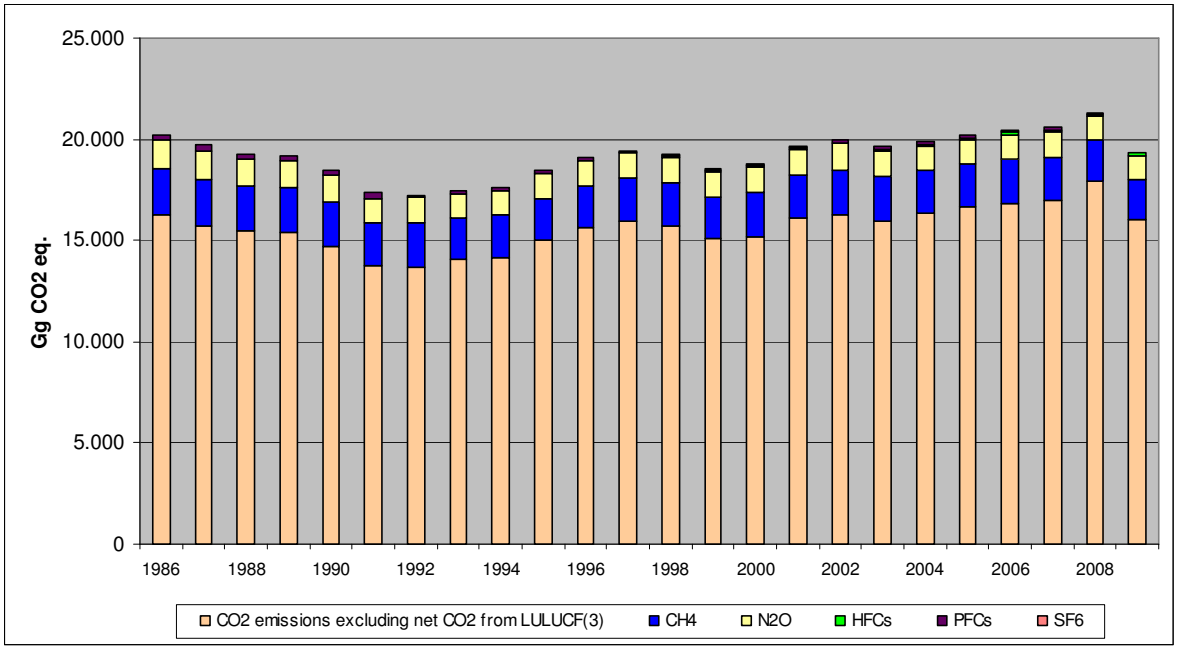

Figure 2.1: GHG Emissions in Slovenia by gas

Hydro-fluorocarbons – HFC

HFC emissions have grown from year to year. In 2009, emissions increased by 3.9% compared to the previous year, which is mostly the consequence of an increasing number of air conditioners in motor vehicles.

Per-fluorocarbons – PFC

The only source of PFCs in Slovenia is the primary production of aluminium. Improving the technology of aluminium production since 1992 has more than halved the then emissions, which diminished from 276 kt CO_2 eq. in 1986 to 106 kt in 1995 base year and finally to 21 kt in 2008. In 2009 emissions further decreased to 7 kt due to reduction in the aluminium production.

Sulphur-hexafluoride – SF_6

The main source of SF_6 emissions is high-voltage gas-insulated switchgear and circuit breakers. SF_6 emissions represent only 0.1% of total GHG emissions.

2.3 Description and interpretation of emission trends by source

According to the UNFCCC Reporting Guidelines, emissions estimates are grouped into six IPCC categories: Energy, Industrial Processes, Solvent Use, Agriculture, Land Use, Land-Use Change and Forestry, and Waste.

By far the most important sector is Energy, which in 2009 accounted for 82.1% of total GHG emissions. Emissions in this sector decreased by 1.3%, compared to the base year. Within this sector, in the period 1986–2009, GHG emissions from the Energy Industry, as the biggest sub-sector, decreased by 9.4%. In the most recent period, 1999–2007, steep growth (+23%) has been recorded due to the increased consumption of electrical energy. Undoubtedly the greatest increase in GHG emissions has been in the transport sector, by as much as 201.8% until 2008, due to an increase in road transportation, while emissions from other kinds of traffic have slightly declined. In 2009 GHG emissions from transport decreased for 13.6% compare to 2008. There was an appreciable reduction of GHGs from industry between 1986 and 2000 (-52%). After 2000, a stabilisation of emissions has been observed.

Since 1986, GHG emissions from Industrial Processes at first fell sharply to reach their lowest value in 1993, but then started to rise again. Due to the global financial crises and lower industrial production emissions are below the base year, in 2009 by 34.7%. The most important GHG of this sector was carbon dioxide, with 82.5% of emissions from this category, followed by HFCs with 14.4%, PFCs and SF_6 with 2.6% and CH_4 with 0.5%. In 2009 N_2O emissions in this sector did not occur.

The main source is Mineral Production, of which the production of cement and lime alone contributed more than a half of the emissions in this sector.

The Solvent and Other Product Use sector represents 0.2% of total emissions. Emissions in this sector keep diminishing, since Slovenia has ceased all production in which GHG emissions could arise. Thus, GHG emissions have been reduced from 82 kt CO_2 eq. to 31 kt CO_2 eq., only from N_2O emissions.

In Agriculture as the second most important sector, emissions in 2009 amounted to 1996 Gg, which represents 10.3% of all emissions. Agriculture represents the main source of methane and N_2O emissions, namely 54.9% of all methane emissions and 77.9% of all N_2O

emissions. In the agricultural sector, N_2O emissions account for 44.7% of emissions, and CH_4 emissions account for 55.3% of emissions.

GHG emissions from agriculture show small oscillations for individual years, but the general trend is on the decrease. In 2009, emissions were 10% below the base year. The most important sub-sector is emissions from agricultural soils, which contribute 37.2% of all emissions from agriculture, followed by emissions from enteric fermentation, with 33.8%; the rest is contributed by emissions of methane and N_2O from animal manure (29.1%).

In the LULUCF sector, the CO_2 sink was estimated in 2009 at 8,525 Gg, which is 5.2% more than in 1986. The increase in sinks was primarily the result of an increase in timber growing stock in existing forests.

Methane emissions from the Waste sector are the second largest source of methane and represent 25.7% of all methane emissions in Slovenia. The fraction of methane emissions in this sector amounts to 89.1%, while the remaining part represents N_2O (10.2%), CO2 emissions are nearly negligible (0.8%). Solid waste handling contributes 62.3% to the total emissions from this sector, wastewater handling 37.0% and incineration of waste 0.8.

Compared to the base year, emissions have risen by 2.3%, which is mostly due to emissions from SWDSs, which show an increase of 20.9%. The increase in emissions from this source is a consequence of the increase in the amount of disposed municipal waste and the application of the FOD method for calculating emissions. Emissions from wastewaters are lower than in the base year by 20.1%, which is mostly due to the recovery of gas in wastewater treatment plants and the decrease in industrial production.

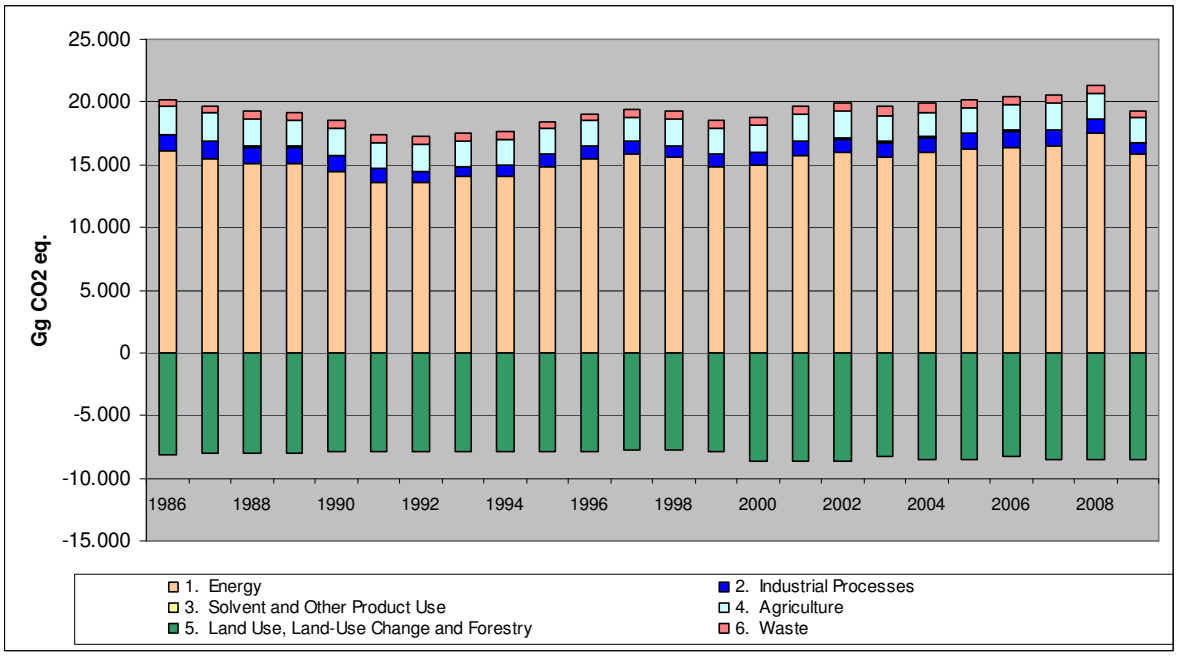

Figure 2.2: GHG Emissions in Slovenia by sector

Table 2.1: GHG emissions and removals in Slovenia by sectors and sub-sectors 1986-2009 are on the following two pages.

GHG SOURCE AND SINK CATEGORIES	1986	1990	1995	2000	2005	2008	2009	Change (%)
TOTAL net emissions (with LULUCF) in Gg CO2 eq.	**12121**	**10.553**	**10.604**	**10.162**	**11703**	**12752**	**10788**	**-11**
1. Energy	**16072**	**14.400**	**14.848**	**14.954**	**16194**	**17474**	**15863**	**-1**
A. Fuel Combustion	15537	13.941	14.436	14.579	15824	17107	15505	0
1. Energy Industries	6729	6.265	5.627	5.498	6325	6388	6081	-10
2. Manufacturing Industries and Construct.	4404	3.119	2.615	2.269	2486	2305	1918	-56
3. Transport	2040	2.749	3.757	3.763	4442	6156	5322	161
4. Other Sectors	2363	1.808	2.437	3.050	2571	2259	2184	-8
5. Other	NA	NA	NA	NA	NA	NA	NA	NA
B. Fugitive Emissions from Fuels	536	459	413	374	370	367	358	-33
1. Solid Fuels	479	401	358	331	337	336	329	-31
2. Oil and Natural Gas	57	58	55	43	33	31	29	-48
2. Industrial Processes	**1289**	**1.292**	**960**	**1.005**	**1281**	**1200**	**841**	**-35**
A. Mineral Products	766	699	572	635	714	840	608	-21
B. Chemical Industry	49	40	31	33	52	18	5	-89
C. Metal Production	463	542	318	291	408	210	93	-80
D. Other Production	NA	NA	NA	NA	NA	NA	NA	NA
E. Production of Halocarbons and SF6	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
F. Consumption of Halocarbons and SF6	10	10	40	45	106	132	136	1224
G. Other	NA	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**82**	**43**	**17**	**43**	**43**	**28**	31	**-62**
4. Agriculture	**2218**	**2.140**	**2.046**	**2.137**	**2006**	**1965**	**1996**	**-10**
A. Enteric Fermentation	681	656	647	694	662	679	674	-1
B. Manure Management	744	737	638	630	595	576	581	-22
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	793	747	762	812	749	710	742	-6
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NO	NO	NO	NO	NO	NO	NO	NO

GHG SOURCE AND SINK CATEGORIES	1986	1990	1995	2000	2005	2008	2009	Change (%)
5. Land Use, Land-Use Change and Forestry (LULUCF)	**-8107**	**-7926**	**-7.854**	**-8.660**	**-8533**	**-8533**	**-8525**	**5**
A. Forest Land	-9874	-9.832	-9.887	-10.823	-10854	-10913	-10900	**10**
B. Cropland	801	840	833	829	861	870	866	**8**
C. Grassland	966	1.066	1.203	1.334	1459	1509	1509	**56**
D. Wetlands	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
E. Settlements	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO
F. Other Land	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NO	NO	NO	NO	NO	NO	NO	NO
6. Waste	**567**	**603**	**585**	**683**	**713**	**619**	**580**	**2**
A. Solid Waste Disposal on Land	299	345	376	439	486	400	361	21
B. Waste-water Handling	268	256	208	242	224	215	214	-20
C. Waste Incineration	NO	1	0	2	2	4	4	NA
D. Other	NA	NA	NA	NA	NA	NA	NA	NA
7. Other	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Memo Items:								
International Bunkers	**98**	**80**	**58**	**72**	**65**	**343**	**196**	**99**
Aviation	98	80	58	72	65	105	78	-20
Marine	NA	NA	NA	NA	NA	238	117	NA
Multilateral Operations	**NA**	**NA**	**NA**	**NA**	**NA**	**0**	0	**NA**
CO2 Emissions from Biomass	**2254**	**2.088**	**2.029**	**1.880**	**2130**	**2263**	2127	**-6**
Total CO2 Equivalent Emissions without LULUCF	**20228**	**18478**	**18457**	**18821**	**20237**	**21286**	**19312**	**-4**

2.4 Comparison of the sectoral approach with the reference approach

Table 2.2: Emissions of CO_2 in Slovenia (reference approach) for the period 1986 to 2009.

Gg CO_2	1986	1990	1995	2000	2005	2006	2007	2008	2009
Crude Oil	679	710	1610	3	0	0	0	0	0
Lubricants	NE	NE	NE	NE	13	13	13	12	12
LPG	123	97	99	230	253	238	240	243	238
Gasoline	1330	1654	2149	2509	2065	2011	1949	2016	1901
Jet Kerosene, Kerosene	1	-1	2	2	0	0	0	3	6
Gas / Diesel Oil	1001	937	1160	1522	2642	3000	3567	4425	5221
Fuel Oil	1486	1815	1799	2692	2181	1971	1377	1637	52
Petroleum Coke	74	137	94	74	341	176	156	166	130
Total Liquid Fuels	**4,692**	**5,323**	**6,912**	**7,032**	**7,497**	**7,410**	**7,303**	**8,504**	**7,561**
Sub-bituminous coal	NO	NO	475	800	1144	986	965	940	849
Other Bituminous Coal	123	1	2	0	113	110	149	142	51
Lignite and domestic Brown Coal	7977	6576	5114	4690	4857	5252	5472	5231	4971
Coke Oven/Gas Coke	695	216	176	146	183	175	163	123	64
Anthracite	154	88	54	0	0	0	0	0	0
Solid Fuel Totals	**8,949**	**6,882**	**5,821**	**5,636**	**6,296**	**6,523**	**6,749**	**6,437**	**5,935**
Natural gas	1407	1627	1465	1642	1848	1810	1795	1802	1707
Gaseous Fuel Totals	**1,407**	**1,627**	**1,465**	**1,642**	**1,848**	**1,810**	**1,795**	**1,802**	**1,707**
Fuel wood	2021	1872	1819	1959	1796	1809	1729	2069	1796
Biomass Total	**2,021**	**1,872**	**1,819**	**1,959**	**1,796**	**1,809**	**1,729**	**2,069**	**1,796**
TOTAL (w/o biomass)	**15,048**	**13,858**	**14,198**	**14,311**	**15,641**	**15,744**	**15,847**	**16,744**	**15,202**
Stored carbon:									
Natural gas	125	131	173	258	292	261	311	221	209
Lubricants	NE	NE	NE	NE	39	75	52	35	22
TOTAL	**17,194**	**15,861**	**16,190**	**16,528**	**17,768**	**17,889**	**17,939**	**19,069**	**19,001**

The total difference of CO_2 emissions between the sectoral approach and the reference approach in 2009 amounted to -0.22% which is deemed more than satisfactory.

Table 2.3: Differences in energy consumption (Reference approach/National Approach)

	1986	1990	1995	2000	2005	2006	2007	2008	2009
liquid	-1.15	3.50	1.86	0.03	2.27	3.34	-0.12	-0.36	0.32
solid	0.24	1.76	0.32	1.18	-0.49	0.75	0.04	-0.03	0.00
gaseous	4.46	4.52	11.11	15.85	16.49	14.41	4.41	-0.001	-0.002
total	**0.30**	**2.94**	**2.69**	**2.87**	**3.60**	**4.01**	**0.48**	**-0.44**	**-0.11**

Table 2.4: Differences in CO_2 emissions (Reference approach/National Approach)

	1986	1990	1995	2000	2005	2006	2007	2008	2009
liquid	-1.33	3.54	1.45	-0.11	2.95	0.26	-0.26	0.23	0.18
solid	0.17	1.80	0.39	1.22	-1.15	1.65	1.39	0.12	-0.09
gaseous	-4.15	-3.34	-0.57	0.17	0.58	-0.04	-0.03	0.06	-0.07
total	**-0.80**	**1.76**	**0.75**	**0.45**	**0.79**	**0.54**	**0.53**	**-0.28**	**-0.22**

3 RECALCULATIONS AND IMPROVEMENTS

Only a few recalculations have been performed for the January submission 2011. We are still waiting on the draft report from UNFCCC review process 2010 to perform some necessary improvements if possible. These improvements will be mostly related to the LULUCF sector. For January submission KP-LULUCF tables have not been updated and all values except emissions from forest wildfires are the same as reported for 2008.

Excluding LULUCF sector recalculations occurred for the period 2005-2008 only. The impact of recalculations on total GHG emissions is presented in the table 3.1 and more detailes are available in the table 3.2.

Table 3.1: Total changes due to recalculation with respect to the previous submission.

year	Difference in Gg CO2 eq.	Difference in % of the total
2005	12.73	0.06
2006	-27.29	-0.13
2007	-6.72	-0.03
2008	-0.78	0.00

Table 3.2: Changes due to recalculation with respect to the previous submission disaggregated by sectors and categories.

GHG SOURCE AND SINK CATEGORIES	2005	2006	2007	2008
1. Energy	**0.00**	**0.29**	**0.58**	**0.89**
B. Fugitive Emissions from Fuels	0.00	0.29	0.58	0.89
2. Oil and Natural Gas	0.00	0.29	0.58	0.89
2. Industrial Processes	**21.01**	**22.42**	**10.88**	**14.47**
C. Metal Production	21.01	23.06	14.86	21.09
F. Consumption of Halocarbons and SF6	0.00	-0.64	-3.98	-6.61
4. Agriculture	**0.00**	**-11.11**	**-13.36**	**-13.24**
A. Enteric Fermentation	0.00	0.00	0.00	0.84
B. Manure Management	0.00	-11.11	-13.36	-14.09
6. Waste	**-1.09**	**-1.47**	**-1.38**	**-1.39**
B. Waste-water Handling	-1.09	-1.47	-1.38	-1.39
Total CO2 Equivalent Emissions without LULUCF	**12.73**	**-27.29**	**-6.72**	**-0.78**

Energy

Recalculations have been performed in category Fugitive emissions from natural gas distribution in households, where number of appliances was updated from 2006 on.

Industrial processes

During collection of data for ETS, very detailed data have been obtained from Slovenian only aluminium plant and GHG emissions have been recalculate from 2005-2008. Calculations

are now in line with the methodology described in IPCC 2006 Guidelines and also in line with the methodology described in the EU-MRG which will come into force for EU-ETS after 2012.

Recalculations have also occurred in category related to the consumption of SF6. For 2009 data about SF6 used in electrical equipment has been obtained and emissions for 2006-2008 have been interpolated accordingly.

Solvent use

No recalculations have been performed for this category.

Agriculture

Updated value for allocation of manure for the period 2006-2008 have been obtained for cattle and swine which now take in to account more increase in manure treated in anaerobic digesters. For this reason CH4 and N2O emissions from manure management have been recalculated.

Very minor recalculation in 2008 has also occurred due to updated value on fat in milk yield.

Waste

Emissions of N2O from human sewage have been recalculated for 2005-2008 due to the updated value of protein consumption in the period 2005-2007.

LULUCF

In LULUCF sector the recalculations have been performed for 1988-2008 due to the updated values on forest wild fires and new methodology which is now harmonized with the IPCC 2003 GPG for LULUCF.

Table 3.3: Changes due to recalculation with respect to the previous submission in Land use, land use change and Forestry sector.

year	Difference in Gg CO2 eq.	Difference in % of sec. total	Difference in % of the total	year	Difference in Gg CO2 eq.	Difference in % of sec. total	Difference in % of the total
1988	2.02	-0.03	0.01	**1999**	-8.23	0.10	-0.04
1989	0.91	-0.01	0.00	**2000**	-5.75	0.07	-0.03
1990	3.30	-0.04	0.02	**2001**	-7.64	0.09	-0.04
1991	1.55	-0.02	0.01	**2002**	-3.74	0.04	-0.02
1992	-0.16	0.00	0.00	**2003**	-50.62	0.61	-0.26
1993				**2004**	-3.44	0.04	-0.02
1994				**2005**	-7.20	0.08	-0.04
1995	37.89	-0.48	0.21	**2006**	-37.41	0.45	-0.18
1996	43.03	-0.55	0.23	**2007**	-3.43	0.04	-0.02
1997	75.43	-0.98	0.39	**2008**	-1.51	0.02	-0.01
1998	-20.48	0.26	-0.11				

4 Legal entities authorised to participate in mechanisms under Article 6, 12 and 17 of the Kyoto Protocol

In order to reduce GHG emissions installation operators may use up to 15,761 % of their issued allowances in the period 2008-2012.They can surrender emission reduction units (ERU) from the projects of joint investment (JI) and certified emission reductions (CER) from the projects of clean development mechanism (CDM).

There is no project under Article 6, 12 or 17 of the Kyoto Protocol in Slovenia.

5 Methodology and EFs used for EC key categories

According to the instruction from EC the Annex I template has not been filled in.
All data needed are available in xml file which is included in this submission.