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Report of the individual review of the greenhouse gas inventories of Switzerland submitted in 2007 and 2008*

* In the symbol for this document, 2008 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the centralized review of the 2007 and 2008 greenhouse gas (GHG) inventory submissions of Switzerland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. In accordance with the conclusions of the Subsidiary Body for Implementation at its twenty-seventh session, the focus of the review is on the most recent (2008) submission.[1] The review took place from 15 to 20 September 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. William Kojo Agyemang-Bonsu (Ghana) and Mr. Vlad Trusca (Romania); energy – Ms. Branca Americano (Brazil), Mr. Frank Neitzert (Canada) and Mr. Matej Gasperic (Slovenia); industrial processes – Mr. Jos Olivier (Netherlands) and Mr. Teemu Oinonen (Finland); agriculture – Ms. Penny Reyenga (Australia) and Mr. Washington Zhakata (Zimbabwe); land use, land-use change and forestry (LULUCF) – Mr. Zhang Xiaoquan (China) and Mr. Aleksi Lehtonen (Finland); and waste – Ms. Kyoko Miwa (Japan) and Mr. Eduardo Calvo (Peru). Ms. Americano and Ms. Reyenga were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa and Mr. Matthew Dudley (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Switzerland, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Inventory submission and other sources of information

3. The 2008 inventory was submitted on 15 April 2008; it contains a complete set of common reporting format (CRF) tables for the period 1990–2006 and a national inventory report (NIR) supplemented by a description of the quality management system. This is in line with decision 15/CMP.1. The Party indicated that the 2008 submission is also its voluntary submission under the Kyoto Protocol.[2] In its 2007 submission, which was submitted on 13 April 2007, Switzerland included a complete set of CRF tables for the period 1990–2005 and an NIR supplemented by a description of the quality assurance/quality control (QA/QC) system. Where needed the expert review team (ERT) also used the 2006 submission, additional information provided during the review and other information. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2006 (as reported in the 2008 annual inventory submission), the main GHG in Switzerland was carbon dioxide (CO_2), accounting for 85.6 per cent of total GHG emissions[3] expressed in CO_2 eq, followed by methane (CH_4) (6.6 per cent) and nitrous oxide (N_2O) (6.2 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.6 per cent of the overall GHG emissions in the country. The energy sector accounted for 82.5 per cent of the total GHG emissions, followed by agriculture (9.9 per cent), industrial processes (5.8 per cent), waste (1.3 per cent), and solvent and other product use (0.4 per cent). Total GHG emissions amounted to 53,209.07 Gg CO_2 eq and increased by 0.8 per cent between the base year[4] and 2006. In 2005 (as reported in the 2007 annual inventory submission), total GHG emissions amounted to 53,635.80 Gg

[1] FCCC/SBI/2007/34, paragraph 104.
[2] Parties may start reporting information under Article 7, paragraph 1, of the Kyoto Protocol from the year following the submission of the initial report, on a voluntary basis (decision 15/CMP.1).
[3] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.
[4] Base year refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

CO_2 eq. The shares of gases and sectors in 2006 (2008 annual inventory submission) were similar to those of 2005 (2007 inventory submission).

5. Tables 1 and 2 show GHG emissions by gas and by sector, respectively.

D. Key categories

6. Switzerland has reported a tier 1 key category analysis, both level and trend assessment, as part of its 2008 submission. The key category analysis performed by the Party and that performed by the secretariat[5] produced similar results. Switzerland has included the LULUCF sector in its key category analysis, which was performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). For 2006, 36 key categories were identified in the Party's level and trend analysis, covering 97.3 per cent of total GHG emissions. Out of these 36 key categories, 21 were in the energy sector. The same key categories were identified for 2005 in the 2007 inventory submission. The ERT encourages Switzerland to continue using the results of key category analysis in its planned improvements.

E. Main findings

7. Switzerland uses mainly country-specific or higher-tier methods to estimate emissions and removals, and has used the latest scientific findings. The 2006 inventory, as submitted in the 2008 annual submission, is of high quality and shows a great improvement on the previous year's submission. For example, the institutional arrangements are well developed and properly documented, especially for the QA/QC and archiving system, which was certified to ISO 9001:2000 standard by the Swiss Association for Quality and Management Systems (SQS) on 6 December 2007. However, the ERT recommends that Switzerland further improve its uncertainty estimates for some of its key data sources, especially energy statistics, and that the Party improve the explanation of, and justification for, the selection of country-specific methods and emission factors (EFs) in the NIR.

F. Cross-cutting issues

1. Completeness

8. The inventory submitted on 15 April 2008 covers all source and sink categories for the period 1990–2006. Where data are not provided, appropriate notation keys are used. Switzerland submitted an NIR based on the structure set out in the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines). The ERT noted that the completeness of the 2008 annual submission has been improved by including more comprehensive information on uncertainty analyses, and a description of QA/QC and verification procedures.

[5] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

Table 1. Greenhouse gas emissions by gas, 1990–2006

Greenhouse gas emissions	Gg CO_2 eq								Change base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
CO_2	44 557.63	44 557.63	43 337.74	43 915.84	44 905.85	45 359.82	46 067.19	45 560.92	2.3
CH_4	4 373.82	4 373.82	3 986.74	3 696.71	3 542.42	3 526.72	3 541.17	3 538.37	–19.1
N_2O	3 624.84	3 624.84	3 494.95	3 424.70	3 319.03	3 320.47	3 291.16	3 273.97	–9.7
HFCs	0.02	0.02	168.80	425.29	582.26	648.77	637.94	617.43	2 740 569.1
PFCs	100.21	100.21	14.69	93.11	87.05	74.11	56.33	56.16	–44.0
SF_6	143.62	143.62	95.00	203.36	194.97	176.21	196.45	162.22	13.0

[a] Base year refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account for when the assigned amount is calculated.

Table 2. Greenhouse gas emissions by sector, 1990–2006

Sectors	Gg CO_2 eq								Change base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
Energy	42 141.87	42 141.87	41 671.21	42 448.43	43 449.61	43 798.52	44 398.14	43 923.86	4.2
Industrial processes	3 258.05	3 258.05	2 559.56	2 846.13	2 949.20	3 095.21	3 159.14	3 061.18	–6.0
Solvent and other product use	467.31	467.31	367.70	280.95	250.13	237.00	238.04	238.35	–49.0
Agriculture	5 903.39	5 903.39	5 638.35	5 411.35	5 284.77	5 258.67	5 280.82	5 288.41	–10.4
LULUCF	NA	–2 574.11	–3 773.60	839.40	1 495.65	–1 356.20	–853.68	–2 230.48	NA
Waste	1 029.53	1 029.53	861.10	772.16	697.88	716.70	714.10	697.27	–32.3
Other	NO	NO	NO	NO	NO	NO	NO	NO	NA
Total (with LULUCF)	NA	50 226.03	47 324.31	52 598.40	54 127.24	51 749.89	52 936.56	50 978.59	NA
Total (without LULUCF)	52 800.14	52 800.14	51 097.91	51 759.00	52 631.59	53 106.09	53 790.25	53 209.07	0.8

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring.

[a] Base year refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

2. Transparency

9. The information provided in the NIR is consistent with the information in the CRF tables. Thus, the NIR provides a good basis for the inventory review. The notation keys used are better explained with background information than in the previous submission.

3. Recalculations and time-series consistency

10. The ERT noted that recalculations reported by the Party in the 2008 submission of the time series 1990–2005 have been undertaken to take into account recommendations made by previous ERTs. All sectors have been recalculated for the full time series. Switzerland has transparently documented all of the recalculations reported in the NIR and in CRF table 8, and has provided the relevant cross references. The ERT noted that the recalculations resulted in a marginal increase in the total base year emissions of 0.1 per cent expressed in CO_2 eq. For 2005, there is an increase of 0.3 per cent, excluding emissions/removals from LULUCF.

4. Uncertainties

11. Switzerland has updated its uncertainty analyses in the 2008 submission. IPCC tier 1 and tier 2 uncertainty analyses have been carried out. These uncertainty analyses are in line with the UNFCCC reporting guidelines and the IPCC good practice guidance. The main focus of the update was on the agriculture sector, since this sector accounts for half of the total uncertainty. The ERT noted that no quantitative uncertainty estimates were reported for the following LULUCF categories: forest land, cropland, wetlands, settlements, and other land. The ERT further noted that Swiss Federal Office of Energy (SFOE) statistics do not include estimates of uncertainties. Since as many as 21 of the 36 key categories in Switzerland's inventory are in the energy sector, the ERT strongly recommends that the Party intensify its efforts to improve its uncertainty analyses, and that it integrate this into the inventory planning process in order to increase the accuracy of its emissions estimates and the transparency of its reporting in its next inventory submission.

5. Verification and quality assurance/quality control approaches

12. Significant improvements have been made to Switzerland's verification and QA/QC system since the 2007 submission. The national inventory system has been certified by the SQS as compliant with the ISO 9001:2000 standard (Quality Management System). The ERT recommends that Switzerland update the description of its national system in the NIR in the next annual submission, taking into consideration the improvements made to the QA/QC plan in 2008 and documenting any additional changes made to the national system. The ERT also recommends that Switzerland undertake category-specific QA/QC activities that go beyond checking between the data used for calculations saved in the Swiss air pollution database (EMIS) and those saved in internal GHG files, and general QC.

6. Follow-up to previous reviews

13. Switzerland has implemented most of the recommendations made by previous ERTs, which has led to a considerable improvement in the 2008 submission. The major improvements include the establishment of a certified QA/QC system, transparency in uncertainty estimates, and the improvement in the documentation, reporting, and recalculation of emissions. The consumption of coal and heavy fuel oil has been corrected in the 2008 submission by including data from the SFOE statistics instead of data produced in a model by Basics AG for absolute emissions of coal and heavy fuel oil in the category other (manufacturing industries and construction). Activity data (AD) for the amount of municipal solid waste (MSW) used as a fuel in energy production in public electricity and heat production have been corrected. The 2005 and 2006 data have been recalculated for emissions from enteric fermentation, manure management and agricultural soils owing to the availability of updated AD.

14. However, the ERT noted that several recommendations from previous reviews have not yet been implemented, including:

(a) The application of country-specific average EFs for CO_2 emissions from cement production;

(b) Explanations for the use of the notation key included elsewhere ("IE") for the agriculture sector (especially enteric fermentation) in CRF table 9(a);

(c) The use of a higher-tier method to estimate of carbon stock changes in forest soils;

(d) The estimation of uncertainty for LULUCF.

G. Areas for further improvement

1. Identified by the Party

15. The 2008 NIR identifies several areas for improvement, including:

(a) The updating and inclusion of AD for the use of wood in district heating;

(b) The use of country-specific data on calcium oxide (CaO) content when calculating the CO_2 EF for cement production, instead using the World Business Council for Sustainable Development (WBCSD) default weight fraction;

(c) The further revision of the CO_2 EF for ammonia production in future submissions;

(d) The re-evaluation of the N_2O EF for nitric acid production, working in conjunction with industry;

(e) The recalculation of gross growth rates and losses by amounts of wood harvested and mortality in the LULUCF sector for the year 1995 onwards using updated information contained in the third National Forest Inventory (NFI 3). These are currently extrapolated from the NFI 1 (1983–1985) and NFI 2 (1993–1995).

2. Identified by the expert review team

16. The ERT identifies the following cross-cutting issues for improvement:

(a) The further improvement of data quality by working in conjunction with industry to reduce uncertainty and provide uncertainty estimates for energy statistics;

(b) The improvement of transparency by providing more precise descriptions of, and information on, the appropriateness and justification for the use of the country-specific methodologies, AD and EFs that differ significantly from those provided and/or recommended by the IPCC.

17. Recommended improvements relating to specific source/sink categories are presented in the relevant sector chapters of this report.

II. Energy

A. Sector overview

18. In 2006, the energy sector accounted for 43,923.86 Gg CO_2 eq, or 82.5 per cent of total GHG emissions. Within the sector, CO_2 accounted for 98.5 per cent of total emissions. Since the base year, emissions from the sector have increased by 4.2 per cent, mainly owing to an increase of 46.5 per cent in

emissions from energy industries. Other sectors (mainly residential) and transport (mainly road transport) were the largest source categories, contributing 39.3 and 36.5 per cent to total sectoral emissions, respectively.

19. The CRF tables and the NIR are complete in terms of the gases and categories covered. The CRF tables provided are complete and the appropriate notation keys have been used. AD and emissions from gasoline in navigation and biomass in agriculture/forestry/fisheries are reported as "IE" with an explanation on where these emissions are included and the rationale for this. The ERT commends the effort made by Switzerland to provide complete CRF tables.

20. The NIR is generally transparent; however, transparency could be improved by providing more background information on assumptions and detailed calculation processes, which may include specific values of EFs and related parameters (see paras. 26, 28, 31, 32, 33, 37 and 38 below).

21. AD for the energy sector are taken from the official Swiss energy balance. Additional procedures using energy-economic modelling and bottom-up data are used to allocate AD to the categories in the CRF tables. Switzerland uses country-specific calorific values and CO_2 EFs that are considered to be constant for the whole time series (1990–2006). The ERT recommends that Switzerland update the net calorific value (NCV) and EFs, at least for lignite, because the CO_2 EF may vary significantly, or that the Party provide an assessment of uncertainty associated with the use of constant EFs. During the review, Switzerland informed the ERT that it had an extended measurement programme to compare the values of the NCV and EFs with previous measurements and showed that the assumption of a constant NCV is valid for almost all fuels sold in Switzerland. Only small deviations between the measured values and constant NCV values were identified. However, these deviations are within the uncertainty range of the measurements. The Party informed the ERT that the results of the study will be included in the next submission.

22. In the 2007 submission, the time series was recalculated using the results from more accurate modelling for fuel consumption. In the 2008 submission, the time series for GHG emissions was recalculated following changes in AD and methods, and the reallocation of emissions from the waste sector. The result of the 2008 recalculations was an increase in emissions of 49.88 Gg CO_2 eq for 1990 and 86.06 Gg CO_2 eq for 2005.

23. Tier 1 and tier 2 uncertainty analyses have been performed for all categories. Full coverage and a thorough analysis of the uncertainties associated with each fuel type and GHG in each category are provided in the NIR. Switzerland has provided sector-specific uncertainty analysis for CO_2 emissions from fuel combustion with the uncertainty of the NCVs for liquid fuels as proxy for the uncertainty of the CO_2 EF for liquid fuels.

24. Category-specific QA/QC activities are clearly indicated in the NIR. Sector-specific QA/QC procedures have improved since the previous submission. Some examples include: a comparison of the results from the old system used to calculate emissions with the figures in the EMIS; an annual comparison of AD using relevant outputs from the SFOE; and a peer assessment of the energy sector inventory by an independent company. The ERT welcomes the effort made by Switzerland with regard to these activities. The ERT encourages Switzerland to continue its efforts and to elaborate on these activities in order to ensure that its estimates are complete and accurate.

B. Reference and sectoral approaches

1. Comparison of the reference approach with the sectoral approach and international statistics

25. CO_2 emissions from fuel combustion were calculated using the reference and sectoral approaches. For 2006, the CO_2 emissions estimates calculated using the reference approach were 1.7 per cent higher than those calculated using the sectoral approach. An explanation for this is provided in the

documentation box of table 1.A(c) of the CRF. In addition, the NIR provides an explanation for differences between the two approaches over the years.

26. The values for apparent consumption reported to the UNFCCC secretariat differ from those reported to the International Energy Agency (IEA), with discrepancies of up to 7 per cent (IEA values are higher for most years). In response to a question raised by the ERT during the review, the Party provided the relevant data derived using the sectoral approach even the discrepancies are between those of IEA and those derived using the reference approach. However, it did not provide a clear explanation for why these data differ from the IEA values.

2. International bunker fuels

27. Aviation is the only category of international bunker emissions in Switzerland. Emissions from international bunkers are calculated using a tier 3a method, developed by the Federal Office for Civil Aviation; the same method is used for national civil aviation. The EFs are country-specific with the exception of N_2O, for which the IPCC default is used. The ERT recommends that Switzerland provide in the NIR a more transparent description of the country-specific method used.

3. Feedstocks and non-energy use of fuels

28. The ERT observed that detailed information on CO_2 emissions associated with feedstocks and non-energy use of fuels, including CO_2 capture from flue gases and subsequent CO_2 storage, is not included in the NIR (see para. 46 below). Since the Party has a large chemical and petrochemical industry, the ERT recommends that Switzerland address the issue of non-energy use of fuel and fuel used as feedstocks in its next annual submission.

4. Country-specific issues

29. The NIR is not completely transparent with respect to if and how emissions from imported MSW are included in GHG emissions estimates. In CRF table 1.A(b), MSW imports are reported as not occurring ("NO"). During the review, Switzerland informed the ERT that the MSW amount includes the imported waste from Germany, Italy, France and Austria. It is assumed that the composition of the imported waste is similar to that in Switzerland, that is, 60 per cent is biogenic and 40 per cent is of fossil origin. The ERT recommends that Switzerland revise the reporting of MSW imports in table 1.A(b) of the CRF to reflect this and that the Party include information on assumptions regarding MSW composition in its NIR.

30. MSW incineration in public electricity and heat production can be considered a country-specific source because of its dominant share among fuels consumed in this subsector (71.7 per cent in 1990 and 84.8 per cent in 2006, including special wastes). MSW is an important fuel because the landfill of certain types of waste is forbidden in Switzerland. The CO_2 EF is based on the following parameters: (a) the fraction of carbon content, which is based on measurements taken by environmental offices in the different cantons, the results of which have been statistically analysed and documented in the EMIS (370 kg C/t waste in 1990 and 327 kg C/t waste in 2005); (b) the fraction of fossil carbon, which is 40 per cent (the IPCC default value) and remains constant from 1990 to 2004; and (c) the oxidation factor, which is 0.99 (within the range given in the IPCC good practice guidance) and remains constant from 1990 to 2006. The ERT recommends that Switzerland use available information to determine the carbon content of imported MSW and, if possible, determine the fraction of fossil carbon in the MSW. During the review, Switzerland informed the ERT that it plans to assess the fossil carbon fraction of the solid waste incinerated in MSW incineration plants in Switzerland.

C. Key categories

1. Stationary combustion: liquid fuels – CO_2

31. As indicated in the previous review report, the combustion of liquid fuels occurs mainly in the other sectors, followed by manufacturing industries and construction. The NCVs and the CO_2 EFs remain constant for all years of the time series for the relevant liquid fuels. During the initial review, Switzerland explained that these values are based on measurements taken in 1998. The ERT recommends that Switzerland take such measurements at regular intervals, in order to improve the accuracy of the inventory and to obtain more reliable information on the uncertainties of these parameters. During the review, Switzerland informed the ERT that an extended measurement programme compared measured values with former measurements and showed that the assumption of constant NCV is widely fulfilled for fuels sold in Switzerland, only small deviations were found, which are hardly larger than the uncertainties of the measurements. The consumption of solid fuels in Switzerland is low compared with other fuels. The Party informed the ERT that the results of the study will be included in the next submission.

32. As recommended by the ERT during the previous review, the information concerning the NCVs and the CO_2 EFs given in annex A2.2 to the NIR should be presented in a more detailed and transparent manner, including the number of analyses for each fuel type and the year in which the analysis was undertaken. The CO_2 EF for light fuel oil includes the CO_2 EF for liquefied petroleum gas. In order to improve transparency, the ERT recommends that Switzerland provide CO_2 EFs at the appropriate level in the NIR in its next annual submission.

2. Stationary combustion: solid fuels – CO_2

33. As indicated in the previous synthesis and assessment report, the 2004 value of the CO_2 implied emission factor (IEF) (94.0 t/TJ) is outside of the IPCC default range (94.6–106.7 t/TJ). Switzerland explained that the value is taken from the normal petroleum coke EF as reported in SFOE statistics. This value is representative of conditions in Switzerland. Petroleum coke is delivered from liquid fuels not solid fuels. Therefore, the ERT recommends that Switzerland report the consumption of petroleum coke in petroleum refining under liquid fuels instead of solid fuels in line with the Revised 1996 IPCC Guidelines. Furthermore, according to the NIR, the CO_2 EF for coal includes the CO_2 EF for hard coal, petroleum coke and lignite. The ERT also recommends that Switzerland report the CO_2 EF for petroleum coke under liquid fuels. The ERT further recommends that Switzerland take measurements at regular intervals of NCVs for solid fuels in accordance with similar recommendation for liquid fuels (para. 31).

3. Stationary combustion: gaseous fuels – CO_2

34. During the initial review, an error was identified that arose from the assumption that fugitive losses during the transmission and distribution of natural gas should be subtracted from the amount of gas that is combusted and generates CO_2 emissions. According to the NIR, this error has been corrected. Switzerland noted in the NIR that for reasons of simplicity, the total amount of leaking natural gas had been subtracted from the residential sector, as it is the category with the largest amount of leakages.

4. Road transport – CO_2

35. The AD for this category are taken from the SFOE statistics and are calculated by subtracting the amount of fuel used in off-road transport from the amount of fuel sold in Switzerland. CO_2 emissions from road transport are estimated using a tier 1 method, in line with the IPCC good practice guidance. Country-specific EFs derived from the carbon content of fuels are used. Non-CO_2 emissions are modelled using a traffic model, which is described in the NIR. CO_2 emissions from gasoline represent 20.1 per cent of total GHG emissions in Switzerland; these emissions have decreased by 5.9 per cent

since 1990. CO_2 emissions from diesel represent 8.9 per cent of total GHG emissions in Switzerland; these emissions have increased by 80.7 per cent since 1990.

5. Other mobile (1.A.5.b) – CO_2

36. Military aviation is reported under other transportation (1.A.3.e) and not under other mobile (1.A.5.b) as recommended in the CRF tables. Switzerland explained that the reason for this is that military aviation is considered to be a form of transportation. The ERT recommends that Switzerland follow the instructions in the CRF and that it reallocate emissions from military aviation to the category other mobile.

6. Oil and natural gas fugitive emissions – CO_2 and CH_4

37. Many categories of fugitive emissions from fuels are reported as "IE", indicating a high level of aggregation. The ERT encourages Switzerland to further disaggregate fugitive oil and gas emissions, in particular venting from oil into the appropriate categories in the CRF.

38. Fugitive CO_2 emissions from the distribution of oil products and natural gas transmission are higher than expected. The description of the methodology in the NIR (page 106) indicates that non-methane volatile organic compounds (NMVOCs) emissions are converted to CO_2. The Party confirmed that almost 10 Gg of CO_2 emissions from this category are a result of the conversion of NMVOCs to CO_2. This methodology is country-specific, as it is not provided in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance. The ERT recommends that Switzerland describe the method for the conversion of NMVOCs to CO_2 in its next inventory submission.

39. The ERT commends Switzerland on its new tier 3 methodology for estimating fugitive emissions from natural gas systems, an improvement that was introduced in 2008.

D. Non-key categories

Stationary combustion: all types of fuel – CH_4 and N_2O

40. The EFs for CH_4, nitrogen oxides (NO_X), carbon monoxide (CO) and NMVOCs used only to estimate emissions from heat boilers that use biomass fuels in the residential sector are calculated using country-specific methods based on comprehensive life cycle analysis of combustion boilers, turbines and engines in the residential, commercial, institutional and agriculture sectors. These methods are documented in the report *Handbuch Emissionsfaktoren für stationäre Quellen* (the Swiss Agency for the Environment, Forests and Landscape, 2000) and the EMIS.

III. Industrial processes and solvent and other product use

A. Sector overview

41. In 2006, the industrial processes sector accounted for 3,061.18 Gg CO_2 eq, or 5.8 per cent of total GHG emissions, and the solvent and other product use sector accounted for 238.35 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Emissions from the industrial processes sector decreased by 6.0 per cent between 1990 and 2006, and emissions from the solvent and other product use sector decreased by 49.0 per cent between 1990 and 2006. The key driver for the fall in emissions is CO_2 from cement production, where clinker production has decreased by 28.2 per cent since 1990. Within the industrial processes sector, 59.2 per cent of GHG emissions were from cement production, followed by 20.2 per cent from HFC emissions from the consumption of halocarbons and SF_6, 7.7 per cent from metal production, and 5.4 per cent from chemical industries.

42. Most of the industrial processes emissions came from CO_2, which accounted for 67.8 per cent of sectoral emissions, while fluorinated gases (F-gases) accounted for 27.3 per cent, N_2O for 4.7 per cent, and CH_4 for 0.2 per cent. CO_2 from NMVOCs and N_2O are reported under the solvent and other product use sector.

43. In general, the description in the NIR of the methods and country-specific EFs used is insufficiently transparent to ascertain whether or not they are in line with the IPCC good practice guidance. However, during the review, the ERT received a large amount of information on the methodologies used and the source of the EFs, which enabled the ERT to conclude that the country-specific EF values were appropriate. The ERT strongly recommends that the Party improve transparency in the NIR by providing more detailed and complete information, particularly for key categories. Currently, there are no source-specific QA/QC procedures in place to verify plant-specific information. The ERT recommends that the Party implement source-specific QA/QC procedures, at least for the larger key categories and recently added source categories.

44. The sections on the industrial processes sector in the NIR provide information on the EFs for indirect GHGs (CO, NO_X and NMVOCs, and sulphur oxide), which decreases the transparency of reporting of GHG emissions. To improve the transparency of reporting of GHG emissions, the ERT recommends that Switzerland delete in chapter 4 of the NIR all of the information on indirect GHGs or that it move this information to an annex to the NIR in its next inventory submission.

45. In the 2007 submission, several recalculations were made, the most significant of which was HFC emissions from the consumption of halocarbons and SF_6, which increased in 2004 by 23.65 Gg CO_2 eq (3.83 per cent). In the 2008 submission, a few minor recalculations were made to CO_2 emissions estimates from iron and steel production for 2003–2005 (interpolation was used instead of extrapolation), and to the consumption of halocarbons and SF_6. In the 2008 submission, the CRF tables are complete for all years and include potential emissions of F-gases. The ERT recommends that the Party use correctly and consistently notation keys and provide transparent explanation on the use of these notation keys in its next inventory submission.

46. The ERT observed that detailed information on CO_2 associated with feedstocks and other non-energy use of fuels, including CO_2 capture from flue gases and subsequent CO_2 storage, is not included in the NIR. In order to allow the assessment of possible non-counting or double counting of emissions in line with the UNFCCC reporting guidelines, the ERT strongly recommends that Switzerland provide this information by listing: (a) all of the feedstocks and non-energy uses of fuels; (b) how and where associated CO_2 emissions have been accounted for in the inventory for each fuel type; and (c) how consistency with regard to the amounts of fuel reported for combustion in the energy sector was maintained. Moreover, the ERT recommends that consistent additional information on the corresponding sectoral part of the NIR be provided in CRF table 1.A(d) and the documentation box.

47. The CRF and the NIR are not fully consistent with respect to the use of the notation key "NO". For example, the NIR states that SF_6 is used in aluminium foundries but this is reported as "NO" in the CRF. In addition, the allocation of sources does not always comply with the UNFCCC reporting guidelines (e.g. reporting blasting for limestone production under energy industries instead of the category other (industrial processes); reporting ferroalloy production under "iron and steel production" instead of "ferroalloys production" and including consumption of fossil fuels under this category when it should preferably be reported under iron and steel; and reporting charcoal production emissions under the category other (industrial processes) instead of "solid fuel transformation"). The ERT recommends that Switzerland allocate emission categories in accordance with the UNFCCC reporting guidelines in its next annual submission.

B. Key categories

1. Cement production – CO_2

48. Switzerland uses a tier 2 method and an EF of 0.525 t/t clinker provided by the WBCSD instead of the IPCC default EF of 0.510. The ERT noted that the WBCSD EF applied was not developed specifically for Switzerland and its use as a country-specific EF should be justified in the NIR. During the initial review, the ERT was informed that Switzerland had obtained a country-specific average EF for 2006 of 0.528 t/t based on an assessment of the CaO and magnesium oxide (MgO) content of the clinker produced at all of the plants in the country. Therefore, the ERT recommends that the Party use this country-specific value instead of the WBCSD value, from 2006 onward, as recommended in the initial review report. In addition, the ERT recommends that the Party provide in the NIR the rationale for the selection of the parameters that determine the CO_2 EF for all years.

2. Consumption of halocarbons and SF_6 – HFCs

49. The ERT observed that the product life factors (PLFs) reported for commercial refrigeration show a decreasing trend, falling from 8.5 per cent in 1995 to 6.0 per cent in 2006. The PLFs are based on expert judgement that takes into account improvements in commercial refrigeration products and improved training in product maintenance. During the review, the ERT asked whether this expert judgement had been supported by monitoring or survey data and it was informed by the Party that the total amount of HFCs used in the application of new products and used for maintenance are known. The recorded data on the amounts used for new products and maintenance (refill) were used in the tier 2 approach and fed into the models, which created the PLFs. The ERT recommends that the Party include in the NIR the information provided during the review to show that the assumed decrease in leakage rates in the subcategories is based on monitored data.

C. Non-key categories

1. Lime production – CO_2

50. The CO_2 EF of 560 kg CO_2/t for emissions from lime production is much lower than the IPCC defaults (785 and 913 kg/t for high calcium and dolomitic quicklime, respectively) and that of other Parties (650–790 kg/t). During the review, Switzerland provided an explanation for the calculation of this EF. Since the measured country-specific EF of 370 kg/t was lower than expected, this value was averaged with a non-country specific and non-IPCC default value of 750 kg/t (from the European Union Best Available Techniques Reference document (BREF)), resulting in the value of 560 kg CO_2/t lime (with an uncertainty of approximately 170 kg/t). The ERT concluded that the approach used by the Party determining a country-specific EF value is not in line with the IPCC good practice guidance, since it is not based on reliable country-specific data and is still unusually low without proper justification. In the absence of a justified country-specific EF, the ERT strongly recommends that Switzerland use the appropriate IPCC default EF to estimate emissions from lime production.

2. Ammonia production – CO_2

51. The rationale for the CO_2 EF of 0.008 t CO_2/t ammonia is not included in the NIR. The ERT pointed out that according to the Revised 1996 IPCC Guidelines, CO_2 captured and stored in urea should not be subtracted from the CO_2 emissions from ammonia production, as the Revised 1996 IPCC Guidelines state that CO_2 storage in urea is only short-term and that CO_2 is released when urea is applied to fields as fertilizer. During the review, the ERT was informed that the value was taken from a draft United Nations Economic Commission for Europe document from 1999 and was not developed specifically for Switzerland. The EF is much lower (0.5 per cent of the normal value) than the IPCC default of 1.6 and is lower than that of most other Parties. The ERT recommends that Switzerland

provide a clear justification for this country-specific EF or that the Party apply the IPCC default factor in its next annual submission.

52. The ERT recommends that the Party provide in the NIR the rationale for using the tier 1a method (EF based on ammonia production) instead of the recommended tier 1b method (based on natural gas consumption). In addition, the ERT recommends that the Party use available actual production data to estimate emissions instead of a fixed value for all years. During the review, Switzerland informed the ERT that annual production data would be used for the next submission.

3. Nitric acid production – N_2O

53. During the initial review, the previous ERT was informed that an EF of 0.08 kg/t was available from the industry for two years 1996 and 2003. Then the previous ERT recommended that the Party verify the data from the industry and recalculate these N_2O emissions from 1990 onward using the verified EF. However, this EF has not been used in the 2008 submission. Using the new data would result in a significant a decrease in about 86 Gg for 2006. The ERT reiterates the recommendation from the previous review that Switzerland use the country-specific EF for the year 1996 onwards, including by interpolation and extrapolation of data for years where no new measured data are available. The ERT further recommends that the Party implement source-specific QA/QC for the plant data. If a country-specific EF is not available for years before 1995, an IPCC default EF should be applied. During the review, the rationale provided for selecting the value of 5 kg/t (in line with IPCC default values for the United States of America and Norway/low pressure plants) is not transparent, as it does not explain why only these values (5 kg/t) are selected instead of the European dual pressure plants values that are in the 8–10 range, which are described in the IPCC good practice guidance. Switzerland pointed out during the review that the emissions are being re-evaluated and that the Party was working in conjunction with industry on this matter. The ERT recommends that Switzerland provide in the NIR a description of the production technology and abatement technology used in nitric acid production, in order to justify its selection of EFs both with some abatement technology installed or without.

4. Silicon carbide – CO_2

54. The NIR does not clearly demonstrate the primary source of the EFs in this category, which inhibits the assessment of the applicability of country-specific EFs and their trends. The ERT recommends that the Party include information, such as that provided during the review, in the NIR (whilst ensuring confidentiality) in its next annual submission.

5. Iron and steel – CO_2

55. In the NIR, reference is made to the core inventory of air emissions (CORINAIR) method that is used to calculate CO_2 emissions from this source, without indicating to which IPCC method this corresponds. The primary source of the EFs is not described, which inhibits the assessment of the applicability of country-specific EFs and their trends. The ERT recommends that the Party: (a) improve the process description of sources, including the IPCC tier method applied and the formulas used to calculate the CO_2 emissions; (b) provide the rationale for and basis of the EFs selected; and (c) provide the rationale for reporting emissions under industrial processes or energy and for reporting emissions under a sector other than that recommended in the IPCC good practice guidance.

6. Aluminium and magnesium foundries – SF_6

56. For this category, the sources of SF_6 emissions are not sufficiently described in the NIR and the incorrect notation keys are used in the CRF. The ERT recommends that Switzerland, in its next annual submission, provide more detailed, accurate and complete information, as provided during the review, in the NIR and CRF regarding where SF_6 is used and where emissions are reported.

IV. Agriculture

A. Sector overview

57. In 2006, the agriculture sector accounted for 5,288.41 Gg CO_2 eq, or 9.9 per cent of total GHG emissions. Emissions from the sector decreased by 10.4 per cent between 1990 and 2006. The key driver for the fall in emissions is the reduction in the number of cattle and the reduced consumption of mineral fertilizers.

58. Within the sector, 43.6 per cent of the emissions were from enteric fermentation, followed by 39.1 per cent from agricultural soils and 17.1 per cent from manure management. The remaining 0.3 per cent was from field burning of agricultural residues.

59. In the 2007 submission, the time series was recalculated following the regrouping of livestock categories and the correction of rounding errors. In the 2008 submission, there was a recalculation of emissions from agricultural soils from 1995 onwards following a correction to AD. In addition, the provisional AD for 2005 for all categories were replaced with actual data. The impact of this recalculation was an increase in emissions estimates of 48.03 Gg CO_2 eq for 2005.

60. The section on the agriculture sector covers all major sources and gases. In order to improve completeness, the additional information tables in the CRF should be completed and explanations on the use of the notation key "IE" should be provided in CRF table 9(a) or one of the documentation boxes, as described in the initial review report. The NIR provides detailed information on methods, but some explanations could be improved to further enhance transparency. In particular, the ERT recommends that Switzerland improve its justification for the selection of country-specific EFs in its next annual submission.

61. For some categories, the NIR states that a comparison of EFs used by the Party with the IPCC defaults EFs was undertaken, but no details are provided in the NIR. Since Switzerland uses many country-specific values, the ERT encourages the Party to present comparisons with IPCC default EFs and IEFs of other Parties in the source-specific QA/QC sections of the NIR along with explanations for any significant differences.

62. The ERT noted some minor inconsistencies between AD and the published Food and Agriculture Organization of the United Nations (FAO) data. The ERT recommends that Switzerland check these inconsistencies and provide an explanation in the NIR. The ERT encourages Switzerland to provide explanations for large inter-annual variations in emissions and IEFs in the discussion on trends (e.g. introduction of laws prohibiting the application of sewage sludge, a change in the classification of cattle).

B. Key categories

1. Enteric fermentation – CH_4

63. The NIR states that for a number of the juvenile cattle classes a conversion factor for net energy for lactation (NEL) is used; however, since these are non-lactating animals, it would be expected that the conversion factor used would be net energy for growth, not NEL. The Party indicated that this was a translation issue, as in Switzerland the acronym NEL is also used to describe net energy performance (*nettoenergie leistung*). The ERT recommends that Switzerland review its explanation of this conversion factor in the NIR in its future annual submissions.

64. For the period 1990–1998, emissions from mature non-dairy cattle are reported as "NO". Switzerland has indicated that mature non-dairy cattle were removed from the mature dairy cattle category in 1999. If mature non-dairy cattle were included in the dairy cattle category prior to 1999, this should be reported as "IE" for the period 1990–1998 with an explanation provided in CRF table 9(a).

2. Manure management – CH_4 and N_2O

65. The CH_4 IEF for dairy cattle (24 kg/head/year) and mature non-dairy cattle (8 kg/head/year) is higher than the IPCC default values. This is adequately explained by the different manure management systems (MMS) used and the fact that the non-dairy cattle category includes only mature animals with high levels of milk production. However, the volatile solids, values of methane-producing capacity, MMS allocations, and methane conversion factor (MCF) data provided in the CRF tables would produce EFs of 22.4 and 10 kg/head/year for dairy and mature non-dairy cattle, respectively. The ERT recommends that Switzerland review the reported information and emissions estimates in order to confirm the results of this calculation. The ERT also recommends that Switzerland report the MMS allocation for mature non-dairy cattle and the MCFs for all categories in CRF table 4.B(a)s2.

66. The average nitrogen (N) excretion rate for sheep (6 kg/head/year) is significantly lower than the IPCC defaults. A different population breakdown is used to estimate N_2O emissions from sheep and goats; the NIR states that only ewes and goats over 18 months old are included. Switzerland explained that the values include lambs, rams, and goats under 18 months old. Excretion rates per 'sheep/goat place' are 12 and 16 kg/head/year, respectively. The ERT recommends that Switzerland revise the text of the NIR in order to clarify this matter. In addition, the ERT encourages the Party to include comparisons with IPCC default EFs and IEFs of other Parties in the source-specific QA/QC section of the NIR.

67. The N excretion rate for a 'sheep place' changes from 16 to 12 kg/head in 1994. The excretion rate used from 1994 onwards is based on a feeding regime consisting mainly of roughage from meadows and pasture; however, it is not clear if this is representative of feeding regimes in the country. Switzerland is currently undertaking further research in this area. The ERT recommends that Switzerland review the N excretion rates for the entire time series when the data become available.

3. Agricultural soils – N_2O

68. The $FRAC_R$ values (0.618 to 0.663) are significantly higher than the IPCC default (0.45). Since crops are not burnt and there is no information in the NIR to indicate that a fraction of the residue is removed, the $FRAC_R$ values appear to be too high. For most crops, the crop product represents less than 50 per cent of total above-ground biomass. It is difficult to check what the Swiss values should be, as there appears to be an error in the reporting of residue to crop ratios in CRF table 4F (see para. 69). The ERT recommends that Switzerland review the reported fractions and emissions estimates for crop residues and N-fixing crops, and that it provide in the NIR crop-specific $FRAC_R$, $FRAC_{NCRO}$ and $FRAC_{NCRBF}$ values in its future annual submissions.

C. Non-key categories

Field burning of agricultural residues – CH_4 and N_2O

69. CRF table 4F provides the data on crop production, residue to crop ratios and dry matter fractions needed to review the estimates reported under direct soil emissions. However, the residue to crop ratio differs in order of magnitude from other Parties and is less than 1.00. The IPCC defaults for most crops are greater than 1.00. The ERT recommends that Switzerland review the reported values.

V. Land use, land-use change and forestry

A. Sector overview

70. In 2006, the LULUCF sector in Switzerland was a net sink of 2,230.48 Gg CO_2 eq, offsetting 4.2 per cent of total GHG emissions. Since 1990, emissions by sources and removals by sinks in the LULUCF sector have ranged from 1,495.65 Gg CO_2 eq of net sources (in 2003) to 5,662.85 Gg CO_2 eq of net sinks (in 1999), with high inter-annual variability throughout the inventory time series. The key

drivers for this high level of variability are the changes in the harvest amounts of wood harvested as well as inter-annual climatic variation and forest damage owing to storms and bark beetles.

71. Within the LULUCF sector, forest land remaining forest land accounted for 3,286.30 Gg CO_2 eq of net removals. Cropland remaining cropland and land converted to settlements accounted for 572.40 Gg CO_2 and 315.35 Gg CO_2 of net emissions, respectively. Other land-use categories accounted for a small portion of the total removals/emissions in the LULUCF sector.

72. There were no recalculations in the 2007 submission. In the 2008 submission, there was a significant recalculation following revisions made to AD, methods and EFs. The impact of this recalculation was an increase in the estimate of the net sink of 869.89 Gg CO_2 eq for 1990 and 605.09 Gg CO_2 eq for 2005.

73. Following the IPCC approach 3 for the representation of land areas, land use and land-use change, matrices for six IPCC land-use categories and 18 subcategories of land-use/land-cover types have been established for the inventory years 1990–2006, based on the 2004 Swiss Land Use Statistics (AREA) of the Swiss Federal Statistical Office land-use and land-cover categories, and aerial photographs taken between 1979 and 1985, between 1992 and 1997, and since 2004 (ongoing AREA analysis). These matrices are interpreted stereographically into a one-hectare grid. For the purposes of the inventory, the land-use and land-cover categories were further disaggregated into five regions, three altitudinal zones and two soil types. The method and procedures for developing the land-use and land-cover matrices were transparently documented in the NIR.

74. The inventory for the LULUCF sector is complete, as the CRF includes estimates of CO_2 emissions and/or removals for all six land-use categories in the LULUCF sector and N_2O emissions from disturbance associated with land-use conversion to cropland, as well as N_2O and CH_4 emissions from wildfire in forests.

75. Carbon stock changes in living biomass, dead organic matter (DOM) and mineral soils caused by land-cover transition under grassland remaining grassland, wetland remaining wetland and settlements remaining settlements were estimated. With the exception of organic soils in cropland and grassland, the carbon stock changes in DOM and soils are assumed to be zero for all remaining land categories, based on the tier 1 method in the IPCC good practice guidance for LULUCF. The ERT recommends that the Party collect data and use higher-tier methods to estimate carbon stock changes in DOM and mineral soils in future inventory submissions.

76. A conversion time of 20 years has been applied to carbon stock changes in mineral soils for land converted to forest land, cropland and grassland, which is a substantial improvement on the 2007 submission. However, it has not been consistently applied to settlements and other land. The ERT recommends that the Party use a conversion time of 20 years for all land-use categories in future annual submissions.

77. The Party did not carry out a quantitative uncertainty analysis for forest land, wetland, settlements, and other land. There was no category-specific QA/QC procedure for the inventory, but QA/QC has been implemented using AREA for AD and the NFI, and using field measurements for parameters. The ERT recommends that the Party quantify the uncertainties of the key categories in its future annual submissions. The ERT encourages the Party to establish category-specific QA/QC and to describe this in the NIR.

B. Key categories

1. Forest land remaining forest land – CO_2

78. Carbon stock changes in living biomass are transparently estimated using the tier 2 method and are reported for two forest types and three altitudinal zones in five regions. The carbon stock changes in

living biomass of unproductive forests are assumed to be zero. Carbon stock changes in soils in the forest land remaining forest land category are assumed to be zero based on the tier 1 method in the IPCC good practice guidance for LULUCF. The ERT recommends that the Party use a higher-tier method to estimate carbon stock changes in forest soils.

2. Cropland remaining cropland – CO_2

79. The tier 2 method in the IPCC good practice guidance for LULUCF and country-specific factors were used to calculate carbon emissions from organic soil. Carbon stock changes in both living biomass and mineral soils are assumed to be zero. The ERT recommends that Switzerland develop a higher-tier method to estimate carbon stock changes in living biomass and mineral soils for this category in future annual submissions.

3. Settlements – CO_2

80. Settlements were a net source of 339.91 Gg CO_2, mainly from the land converted to settlements category. Carbon stock changes in DOM are assumed to be zero for settlements remaining settlements. For land converted to settlements, the IPCC method and country-specific parameters were used to estimate carbon stock changes in all carbon pools. However, the carbon stock changes in mineral soils were assumed to occur in the year of land-use conversion, which is inconsistent with the IPCC good practice guidance for LULUCF. The ERT recommends that the Party reconsider the land-use conversion time in future annual submissions.

C. Non-key categories

1. Land converted to cropland and grassland – CO_2

81. The tier 2 method in the IPCC good practice guidance for LULUCF and country-specific parameters were used to estimate carbon stock changes in all carbon pools for land converted to cropland and grassland. A conversion time of 20 years was used for the soil carbon pool but not for pools of living biomass and DOM, where carbon gain or loss were assumed to occur in the year of conversion. However, the Party reports the cumulative area in CRF tables 5.B.2 and 5.C.2, which is inconsistent with CRF tables 5.D.2, 5.E.2 and 5.F.2 that reported annual changes in cumulative area. The ERT recommends that the Party report areas of annual land-use change consistently in future annual submissions.

2. Land converted to wetland – CO_2

82. The tier 2 methods in the IPCC good practice guidance for LULUCF and country-specific parameters have been used to estimate carbon stock changes in living biomass and DOM for land converted to wetland. Carbon stock changes in mineral soils are not estimated, as the IPCC good practice guidance for LULUCF does not provide any methods for this category. The Party assumed that carbon gain or loss occurs in the year of the conversion, which is likely to lead to an overestimation of the carbon gain or loss. The ERT recommends that the Party review these methods and the assumption that carbon gain or loss occurs in the year of the conversion in future annual submissions.

VI. Waste

A. Sector overview

83. In 2006, the waste sector accounted for 697.27 Gg CO_2 eq, or 1.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 32.3 per cent. Key drivers for the fall in emissions are waste management policies (1986 and 1992), which promoted waste reduction and encouraged recycling, and increased CH_4 recovery.

84. Within the sector, 41.7 per cent of the emissions were from solid waste disposal, followed by 35.2 per cent from wastewater handling, 16.8 per cent from the category other (waste). The remaining 6.3 per cent is from waste incineration. CH_4 accounted for 61.0 per cent of sectoral emissions, while N_2O accounted for 36.8 per cent and CO_2 for 2.2 per cent.

85. In the 2007 submission, the 2003 and 2004 estimates were recalculated with updated AD for burning of sewage sludge, and CH_4 recovered and used as fuel for power generation. In the 2008 submission, the time series was recalculated, as the emissions from landfill gas recovery in heat and power generation from managed waste disposal on land, as well as emissions from gas recovery in heat and power generation from digesting organic waste were moved to the energy sector. In addition, the population used to estimate emissions from wastewater handling was revised. The result of the recalculation in the 2008 submission was a decrease in emissions estimates of 0.01 Gg CO_2 eq for 1990 and 0.03 Gg CO_2 eq for 2005.

B. Key categories

1. Solid waste disposal – CH_4

86. Since 2005, Switzerland has included in the NIR a table of AD by waste type, which helps give an overview of the situation regarding waste in Switzerland. The table would be more useful if it were linked with other tables of AD used for emissions estimates.

87. Switzerland conducted systematic data collections in the waste sector in 1992 and 2003. The values for methane generation potential (Lo) for the years 1994–2003 were obtained by linear interpolation between the value for 1950–1993 (Lo = 0.061 Gg CH_4/Gg waste) and values for 2003 (Lo = 0.05 Gg CH_4/Gg waste) when composition data was last obtained. The Lo is constant from 2003 onwards. The same degradation velocity (k value) 0.139 is applied for all years. The volume of waste disposed of in managed landfills has declined significantly since the late 1990s (534.4 Gg in 1999 to 91.5 Gg in 2002 and 24.8 Gg in 2006, after taking out the amount of waste that is open burned on-site). This change is mainly due to the introduction of legislation that makes it mandatory to incinerate MSW, and the increased composting and digesting of organic waste. The profile of waste in landfills may be changing significantly. The ERT encourages Switzerland to undertake its planned work to obtain country-specific parameters such as Lo and k values, and degradable organic carbon (DOC), so that these changes may be reported in future annual submissions.

88. CH_4 recovered for energy use is estimated using renewable energy statistics data, and is subtracted from the total CH_4 emissions from landfills and then allocated to the energy sector. Switzerland assumes that 10 per cent of the CH_4 generated is flared each year. However, justification for this assumption is not provided in the NIR or in the reference provided by Switzerland. The ERT recommends that Switzerland include the explanation for the basis used to determine the amount of gases flared and recovered in the NIR of its next annual submission. During the review, Switzerland informed the ERT that 10 per cent is a conservative and the Party informed the ERT that flaring is used only in emergency cases.

2. Wastewater handling: domestic and commercial wastewater – N_2O

89. According to the explanation given to the ERT, the protein consumption per capita used in the emissions estimates is based on data from Germany. Germany uses the same AD as reported in the FAO statistics. The reference in the NIR provides no explanation as to why Switzerland uses German data rather than its own data as reported to the FAO, particularly as the values are not significantly different. The ERT recommends that Switzerland estimate these emissions using the country-specific data and provide background information in the NIR. During the review, Switzerland informed the ERT that country-specific data will be used for the 2009 submission.

3. Other – composting and digesting organic waste – CH_4 and N_2O

90. Switzerland estimates and reports CH_4 and N_2O emissions from the biological treatment of solid waste, such as composting and digesting organic waste, under the category other (waste). Due to the increasing use of these treatment methods, CH_4 from the category other is identified as a key category. For this reason and because the methods are not sufficiently transparent, the ERT recommends that Switzerland provide more information on the EFs and the methods used to estimate recovered gases in the NIR.

91. In CRF table 6, the category other is subdivided into car shredding and biological treatment of waste (including composting and digesting organic waste). Given that only biological treatment of waste is increasing, and that CH_4 and N_2O is recovered and subtracted from this category, the ERT recommends that the Party disaggregate this category for its key category and uncertainty analyses in order to make further improvements.

C. Non-key categories

1. Wastewater handling – CH_4 and N_2O

92. Switzerland does not estimate emissions from industrial wastewater separately. Most industrial wastewater is treated in municipal wastewater treatment plants and emissions are included under domestic and commercial wastewater. In the 2008 submission, Switzerland indicated that it plans to estimate emissions from the pre-treatment of industrial effluent separately in future submissions. The ERT encourages Switzerland to report on this in future submissions.

2. Waste incineration – CO_2, CH_4 and N_2O

93. Switzerland estimates CO_2, CH_4 and N_2O emissions using country-specific EFs, as well as country-specific methods. In the NIR, tables showing EFs are provided; however, there is insufficient information to justify the use of these EFs. The ERT encourages Switzerland to provide background information on the country-specific EFs used in order to demonstrate how Switzerland provides more accurate estimates than the IPCC default methods with default EFs.

94. In order to estimate CH_4 emissions from waste incineration, the EFs applied to the year 2003 onwards are based on an interpolation between measured data in 2002 and a projected EF for 2020 (which is based on projected future improvements in equipment and operation/maintenance). The ERT believes that interpolation between historic data and unknown values that rely on a potential future scenario is inconsistent with the IPCC good practice guidance. The ERT recommends that Switzerland revise these estimates based on the 2002 data or that it use expert judgement on current practices. In addition, the ERT recommends that Switzerland collect updated information on equipment and operation/maintenance.

VII. Other issues

1. Changes to the national system

95. The Party has not reported any changes to its national system in the 2008 submission. However, the NIR indicates that significant improvements were made to the QA/QC plan, which constitutes a change to the national system. The ERT considers these changes to be in accordance with the requirements of national systems as defined in decision 19/CMP.1. The ERT recommends that Switzerland update description of the national system and that it provide the relevant information in its next inventory submission.

2. Changes to the national registry

96. The Party has not reported on any changes to its national registry in the 2008 submission. In response to questions raised by the ERT during the review the Party confirmed that no changes to the national registry have taken place. The ERT recommends that Switzerland provide updated information on its national registry under supplementary information under Article 7, paragraph 1, of the Kyoto Protocol.

3. Commitment period reserve

97. Switzerland has not reported its commitment period reserve in the 2008 submission. In response to questions raised by the ERT during the review Switzerland reported that its commitment period reserve has not changed since the initial report review (218,554,562 t CO_2 eq). The ERT agrees with this figure. The ERT recommends that the Party include information on its commitment period reserve in its next inventory submission.

VIII. Conclusions and recommendations

98. The ERT concluded that the 2008 inventory submission is generally of high quality and shows significant improvement with regard to major issues such as QA/QC. The submission is complete in terms of coverage of source/sink categories and gases, and in terms of geographic coverage. The NIR provides much of the information required to assess the inventory, but a number of areas were identified where the transparency could be improved.

99. The inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance, and the IPCC good practice guidance for LULUCF. The ERT identified instances of under- and overestimations of emissions (see paras. 48, 50, 51, 65 and 67). The ERT requests that Switzerland resolve these problems and report on them in its next inventory submission.

100. The key recommendations are that Switzerland:

(a) Further improve the quality of the energy statistics, by working in conjunction with industry to estimate and reduce uncertainty;

(b) Provide a detailed description in the NIR of how feedstocks and non-energy use of fuels are treated and reported;

(c) Enhance the methodology descriptions, and explanation of, and justification for, the adoption of country-specific EFs and methods to ensure transparency, particularly in the industrial processes and agriculture sectors;

(d) Update NCVs and EFs, at least for lignite;

(e) Revise the estimates for lime and ammonia production and waste incineration in the next inventory submission;

(f) Check the reported fractions and N_2O emissions estimates for crop residues and N-fixing crops;

(g) Use a higher-tier method to estimate carbon stock changes in forest land and cropland mineral soils.

IX. Questions of implementation

101. No questions of implementation were identified by the ERT during the review.

Annex

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

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"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

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"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Switzerland 2007. Available at <http://unfccc.int/resource/docs/2007/asr/che.pdf>.

Status report for Switzerland 2008. Available at <http://unfccc.int/resource/docs/2008/asr/che.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2007. Available at <http://unfccc.int/resource/webdocs/sai/2007.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2008. Available at <http://unfccc.int/resource/webdocs/sai/2008.pdf>.

FCCC/ARR/2006/CHE. Report of the individual review of the greenhouse gas inventory of Switzerland submitted in 2006. Available at <http://unfccc.int/resource/docs/2007/arr/che.pdf>.

FCCC/IRR/2007/CHE. Report of the review of the initial report of Switzerland. Available at <http://unfccc.int/resource/docs/2007/irr/che.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Paul Filliger (Federal Office for the Environment), including additional material on the methodology and assumptions used. The following documents were also provided by Switzerland:

Carbotech. 2008. *Swiss Greenhouse Gas Inventory 2006: PFCs, HFCs and SF_6 Emissions*. Confidential report no. 251.09 for internal use on behalf of the Federal Office for the Environment, Bern.

Swiss national air pollution database (EMIS), 2005. Comments to EMIS database: Kalk-Produktion; Em. aus Rohmaterial. 2A2; 16. November 2005.

EMIS, 2005. Comments to EMIS database: Sprengen und Schiessen. 2 G; 27. February 2007.

Additional information on industrial processes sector P (iron and steel, limestone emissions separated). Spreadsheet.

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