



COMPLIANCE COMMITTEE

**CC/ERT/ARR/2010/7
29 January 2010**

**Report of the individual review of the annual submission of
Switzerland submitted in 2009**

Note by the secretariat

The report of the individual review of the annual submission of Switzerland submitted in 2009 was published on 26 January 2010. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2009/CHE, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.



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**Report of the individual review of the annual submission of Switzerland
submitted in 2009***

* In the symbol for this document, 2009 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the centralized review of the 2009 annual submission of Switzerland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 31 August to 5 September 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Anke Herold (European Union) and Mr. Harry Vreuls (Netherlands); energy – Ms. Maria Lidén (Sweden) and Mr. Jongikhaya Witi (South Africa); industrial processes – Mr. Teemu Oinonen (Finland) and Mr. Samir Tantawi (Egypt); agriculture – Mr. Steen Gyldenkerne (Denmark); land use, land-use change and forestry (LULUCF) – Mr. Rizaldi Boer (Indonesia) and Mr. Daniel Martino (Uruguay); and waste – Ms. Tatiana Tugui (Republic of Moldova). Ms. Herold and Mr. Martino were the lead reviewers. The review was coordinated by Mr. Javier Hanna (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. Emission profiles and trends

3. In 2007, the main greenhouse gas (GHG) in Switzerland was carbon dioxide (CO₂), accounting for 85.1 per cent of total GHG emissions¹ expressed in CO₂ eq, followed by methane (CH₄) (6.8 per cent) and nitrous oxide (N₂O) (6.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 1.7 per cent of the overall GHG emissions in the country. The energy sector accounted for 81.9 per cent of the total GHG emissions, followed by agriculture (10.4 per cent), industrial processes (6.0 per cent), waste (1.3 per cent), and solvent and other product use (0.5 per cent). Total GHG emissions amounted to 51,264.64 Gg CO₂ eq and decreased by 2.7 per cent between the base year² and 2007.

4. Tables 1 and 2 show total GHG emissions by gas and by sector, respectively. Table 1 includes emissions from Annex A sources only and excludes emissions and removals from the LULUCF sector.

¹ In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO₂ eq excluding LULUCF, unless otherwise specified.

² “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 1. Total greenhouse gas emissions by gas, 1990–2007^a

Greenhouse gas	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^b	1990	1995	2000	2005	2006	2007	
CO ₂	44 503.98	44 503.98	43 322.12	43 900.25	46 038.20	45 575.39	43 636.30	–1.9
CH ₄	4 348.06	4 348.06	3 959.73	3 668.86	3 515.83	3 505.09	3 511.26	–19.2
N ₂ O	3 613.15	3 613.15	3 483.15	3 360.28	3 219.84	3 228.21	3 235.07	–10.5
HFCs	0.02	0.02	168.76	421.72	629.35	609.50	629.52	2 794 236.7
PFCs	100.21	100.21	14.69	93.17	56.79	74.50	77.08	–23.1
SF ₆	143.62	143.62	95.00	203.36	204.95	180.62	175.41	22.1

^a Total GHG emissions includes emissions from Annex A sources only (excludes emissions/removals from the LULUCF sector).

^b “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 2. Greenhouse gas emissions by sector, 1990–2007

Sector	Gg CO ₂ eq							Change base year–2007 (%)
	Base year ^a	1990	1995	2000	2005	2006	2007	
Energy	42 085.55	42 085.55	41 651.33	42 432.64	44 389.61	43 952.67	41 966.40	–0.3
Industrial processes	3 258.04	3 258.04	2 558.95	2 788.63	3 081.34	3 041.11	3 058.37	–6.1
Solvent and other product use	467.93	467.93	371.23	281.72	230.00	229.16	230.83	–50.7
Agriculture	5 903.39	5 903.39	5 638.35	5 411.35	5 281.68	5 287.40	5 345.72	–9.4
LULUCF	NA	–2 339.97	–5 294.18	751.37	864.80	1 076.27	–647.24	NA
Waste	994.13	994.13	823.59	733.31	682.32	662.98	663.33	–33.3
Other	NA	NO	NO	NO	NO	NO	NO	NA
Total (with LULUCF)	NA	50 369.07	45 749.27	52 399.02	54 529.75	54 249.58	50 617.40	NA
Total (without LULUCF)	52 709.04	52 709.04	51 043.45	51 647.64	53 664.95	53 173.31	51 264.64	–2.7

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 include emissions from Annex A sources only.

C. Annual submission and other sources of information

5. The 2009 annual inventory submission was submitted on 15 April 2009; it contains a complete set of common reporting format (CRF) tables for the period 1990–2007 and a national inventory report (NIR); it also contains a supplementary report entitled *Description of the Quality Management System*. Switzerland also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including: information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units and information on changes in the national system and in the national registry. The standard electronic format (SEF) tables were submitted on 15 April 2009 and resubmitted on 21 April 2009. The annual submission was submitted in accordance with decision 15/CMP.1. Switzerland indicated that the 2009 submission is also its voluntary submission under the Kyoto Protocol.

6. During the centralized review, in its response to questions raised by the expert review team (ERT), Switzerland has agreed with a number of recommendations of the ERT that will result in revised estimates and announced its intention to include these revised estimates in its 2010 annual inventory submission.

7. In addition, the ERT used the Standard Independent Assessment Report (SIAR), Parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.³

8. During the review, Switzerland provided the ERT with additional information. The documents concerned are not part of the annual submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

Completeness of inventory

9. The inventory covers all source and sink categories for the period 1990–2007 and is complete in terms of years and geographical coverage. Switzerland reports actual and potential emissions for HFCs, PFCs and SF₆ for the whole period 1990 to 2007 and the ERT commends the Party for these efforts.

D. Main findings

10. The inventory is generally in line with the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the 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). The 2009 inventory submission is generally of a high quality, but the ERT identified a need for further methodological improvements in the following areas:

- (a) Revision of the country-specific CO₂ emission factor (EF) for lime (CaO) production;
- (b) Correction of the estimation of the average milk yield for the calculation of emissions from enteric fermentation and manure management;

³ The SIAR, Parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5 (a), 6 (c) and 6 (k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry. The SIAR is not publicly available.

- (c) Revision of the estimation of nitrogen excretion (N_{ex}) for estimates of N_2O emissions from manure management.

11. During the centralized review, Switzerland acknowledged these findings, announcing its intention to revise the parameters and estimates for its 2010 inventory submission. Furthermore, during the centralized review, Switzerland provided revised estimates for the average milk yield, which will be used in its 2010 submission.

12. By supplying the additional information requested by the ERT, Switzerland has demonstrated sufficient capacity to comply with 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) and the IPCC good practice guidance.

13. Switzerland has submitted in part on a voluntary basis supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with section I of the annex to decision 15/CMP.1. The Party did not submit information on minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol on a voluntary basis.

14. Switzerland has reported on a voluntary basis information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in accordance with section I.D of the annex to decision 15/CMP.1.

15. Switzerland has also submitted information on its accounting of Kyoto Protocol units in accordance with section I.E of the annex to decision 15/CMP.1, and has used the SEF tables as required by decision 14/CMP.1.

16. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

17. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

18. In the course of the review, the ERT formulated a number of recommendations relating to:

- (a) The implementation of quality assurance/quality control (QA/QC) procedures, in particular with regards to enlarging the scope of category-specific QA/QC activities (see para. 28 below);
- (b) The completeness of the information relating to carbon stock changes from biomass for forest conversions between productive and unproductive forests under forest management activities (see para. 71 below).

E. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

1. Overview

19. The ERT concluded that the national system continued to perform its required functions.

20. The NIR and additional information submitted by Switzerland describe the national system for the preparation of the inventory. The Federal Office for the Environment (FOEN), an agency of the Federal Department of the Environment, Transport, Energy and Communications, has overall responsibility for the national inventory. Other organizations are also involved in the preparation of the

inventory. The National Inventory System Supervisory Board (NISSB), established in 2006, oversees activities related to the GHG inventory and the national registry and works independently from the inventory preparation process, combining technical expertise with political authority through its composition. The GHG Inventory Working Group includes all technical personnel involved in the inventory preparation process, representing institutions that play a significant role as data suppliers. The GHG Inventory Core Group comprises the inventory experts, employed at FOEN or mandated on a regular basis, who are entrusted with specific major responsibilities related to inventory planning, preparation and/or management. The NIR states that there have been no changes in the national system since the previous inventory submission.

2. Inventory planning

21. The annual cycle for inventory preparation includes regular meetings of the NISSB and both GHG Inventory Groups, involving all relevant individuals participating in the inventory preparation. The GHG Inventory Core Group coordinates and integrates the activities of data suppliers within and outside the FOEN as well as those of mandated experts. Other data suppliers that contribute to the inventory preparation are research institutions and industry associations (e.g. the Swiss Federal Research Institute – WSL, the Swiss Petroleum Association, etc.). Industry associations are obliged by law to provide the authorities with the required information. Switzerland uses an inventory development plan which was updated in June 2008 and is included in the report entitled *Description of the Quality Management System*. The Air Pollution Control and Non-Ionizing Radiation Division at FOEN maintains the Swiss national air pollution database (EMIS), which contains all the basic data needed to prepare the GHG inventory and report the inventory data in the CRF tables. An interface transfers the data from the EMIS database to the CRF Reporter. The ERT considers that the Swiss institutional, procedural and legal arrangements for inventory planning and preparation ensure enough capacity for timely reporting of the GHG emissions estimates.

3. Inventory preparation

Key categories

22. Switzerland has reported key category tier 1 and tier 2 analyses, both level and trend assessments, as part of its 2009 submission. The key category analysis performed by Switzerland and that performed by the secretariat⁴ produced different results. For some important categories Switzerland uses a more detailed level of disaggregation in order to clearly identify and isolate the most important categories (e.g. categories from the energy sector, metal production, consumption of halocarbons and SF₆ and agricultural soils). Therefore the Swiss key category analysis results in more categories than the standard analysis by the secretariat. Switzerland has included the LULUCF sector in its key category analyses which were performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

23. In addition, Switzerland has identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Uncertainties

24. The NIR reports that an updated quantitative uncertainty analysis has been carried out following the tier 1 methodology included in the IPCC good practice guidance. This uncertainty analysis was

⁴ 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 IPCC good practice guidance for LULUCF. 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.

carried out for the first time including the LULUCF sector. Uncertainty estimates were provided by inventory experts and data suppliers for the relevant categories. For non-key categories the NIR provides qualitative estimates of uncertainties by gas, using the terms high, medium and low data quality and corresponding uncertainties as percentages (ranging from 2 to 150 per cent). In order to extend the quantitative uncertainty analysis to every non-key category, relative quantitative values are associated to these terms and used in the analysis. Compared with the results of the previous analysis for the 2006 inventory (overall uncertainty is 3.50 per cent and trend uncertainty is 1.73 per cent), as reported in the 2008 submission, the uncertainties for the 2007 inventory excluding the LULUCF sector are higher (overall uncertainty is 3.83 per cent and trend uncertainty is 3.64 per cent). The resulting overall inventory uncertainty including the LULUCF sector in 2007 is estimated to be 4.15 per cent and the trend uncertainty, 5.01 per cent.

25. In addition, in the NIR, Switzerland reports a tier 2 uncertainty analysis that is the same analysis presented in the NIR of previous submission. The resulting overall inventory uncertainty excluding the LULUCF sector in 2006 is estimated to be 4.02 per cent and the trend uncertainty to be on average 2.8 per cent.

Recalculations and time-series consistency

26. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by Switzerland of the time-series 1990 to 2006 have been undertaken mainly to take into account the availability of updated activity data (AD) in all sectors, but also revised EFs or parameters, the removal of double counting in fugitive emissions, improvements in the emissions modelling for consumption of halocarbons and SF₆, and the application of a land-use conversion period of 20 years for carbon stock changes in biomass and soils for land conversion categories. The major changes and impact of the recalculations in 2006 are in the category forest land, due to the incorporation of data from the third national forest inventory, which decreased net CO₂ removals by 97.1 per cent, from 3,351.53 Gg to 95,81 Gg, followed by changes in manufacturing industries and construction, which decreased GHG emissions from this category by 106.85 Gg CO₂ eq (1.8 per cent), and in other sectors, which increased GHG emissions by 100.53 Gg CO₂ eq (0.6 per cent), both caused by the availability of new industry AD. Overall, the impact of recalculations was a decrease in total GHG emissions excluding LULUCF by 0.2 per cent in 1990 and by 0.1 per cent in 2006. Whereas, the overall the impact of recalculations on total GHG emissions including LULUCF was an increase of 0.3 per cent in 1990 and of 6.4 per cent in 2006. The rationale for these recalculations is provided in the NIR and cross-referenced in CRF table 8(b).

Verification and quality assurance/quality control approaches

27. In its 2009 submission, Switzerland provided a supplementary report entitled *Description of the Quality Management System*, which describes the current status (April 2009) of the quality management system (QMS) for the national system. The QA/QC plan is one of the major elements of the QMS, which represents a quality manual, as required by the ISO 9001:2000 standard. Another important element of the QMS is the QA/QC Officer, who has the overall responsibility for enforcement of the defined quality objectives and oversees design, development, and operation of the QMS, ensuring continuous documentation of findings from QA/QC activities in the course of the inventory cycle. QA/QC activities conducted in the course of an inventory cycle include, inter alia, the completion of tier 1 QC checklists by data suppliers and members of the GHG Inventory Core Group, and QA procedures, such as an internal review of the inventory by members of the GHG Inventory Core Group prior to submission. In addition, the Inventory Project Manager and members of the GHG Inventory Core Group ensure the supervision or performance of tier 2 QC activities, including internal studies or co-funding of selected research projects.

28. The QMS includes QA procedures in the form of in-depth external reviews carried out by independent experts, conducted sector by sector in order to successively cover the entire inventory. In general, key categories are given priority in these external reviews. Thereafter, an episodic repetition of peer reviews is planned. In 2006, the energy and industrial processes sectors, as well as CH₄ emissions from the agriculture sector were subjected to a thorough domestic review. Currently, the waste sector is undergoing an expert peer review. In addition, an internal review is performed prior to official approval and inventory submission. During this process, members of the GHG Inventory Core Group and staff from the companies involved in the compilation of the inventory check a chapter of the NIR (including selective crosschecks of associated CRF tables) in which they were not directly involved. However, despite this detailed description of the activities under the QMS, the ERT noted that the category-specific tier 2 QA/QC activities reported in the NIR only cover the energy, agriculture, and LULUCF sectors, but not the industrial processes and waste sectors. Furthermore, in the energy sector, the information in the NIR is limited to the comparison of the reference approach with the sectoral approach. Therefore, the ERT recommends that, in its next annual inventory submission, Switzerland further elaborate category-specific QA/QC procedures and include information on these procedures in the energy, industrial processes and waste sectors.

Transparency

29. The NIR and CRF tables are in general transparent and sufficiently detailed to allow assessment of underlying assumptions and rationales for the choice of data, methods and parameters. In addition, Switzerland provides functioning internet links to most of the sources referenced in the NIR, as well as to calculations sheets and models used, which makes the replication of estimates possible. For some areas, the sectoral parts of this report provide more detailed recommendations on ways to further improve the transparency of the information in the NIR. Confidential information is limited to very few data sources and if necessary, Switzerland informed that they would be made available to the ERT upon request. During the centralized review, Switzerland provided the ERT with all the information requested, including confidential information, in a very transparent way. The ERT commends Switzerland for this constructive and open cooperation to the review process.

4. Inventory management

30. Switzerland has a centralized archiving system. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. Inventory data and background information on AD and EFs are archived by the National Inventory Compiler in the EMIS database. Information flows, documentation and archiving are specified by the QMS monitoring protocols. Information on the QMS, all QA/QC activities performed, decisions reached by the experts (minutes), reviews, results of key category analysis and uncertainty analysis, inventory development and all important inventory data are documented and archived by FOEN, in the Internal Document Management System.

F. Follow-up to previous reviews

31. The recommendations from the in-country review conducted in 2007 led to several recalculations that were included in the 2009 submission. In addition, some findings that were discussed during the centralized review in 2008 were incorporated into the inventory improvements; although the centralized review report was unpublished at the time of the editorial deadline for the NIR.

G. Areas for further improvement

1. Identified by the Party

32. The 2009 NIR identifies several areas for improvement in the sectoral chapters. These include inter alia:

- (a) Revision of CO₂ EFs for the use of waste-derived fuels in cement industry;
- (b) Incorporation of new data on the biogenic fraction of municipal solid waste (MSW) combusted;
- (c) Development of a country-specific CO₂ EF for cement production;
- (d) Revision of the CO₂ EF for ammonia production;
- (e) Revision of AD and the EF for nitric acid production;
- (f) Improvement of the model used in the forest sector by re-calibrating its outputs with more sites and climatic data, and by the stratification of the sites for more altitudinal levels;
- (g) Application of the Finnish YASSO model for soil carbon pools and improvement of data through case studies and additional verification by combining soil organic carbon measurements with modelled results;
- (h) Improvement of data on dead wood pool;
- (i) Use of single-tree biomass equations for forestry;
- (j) Updating AD for wood used in district heating, based on new data from the Swiss overall statistics for 2002–2005;
- (k) Improvement of the accuracy of emissions estimates from small aircraft engines and helicopters using comprehensive AD and the EF compiled from projects that will be completed in 2009;
- (l) Reporting separately emissions from pre-treatment of industrial effluents in wastewater handling;
- (m) Use of more country-specific parameters in the model for CH₄ emissions from landfills.

2. Identified by the expert review team

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

- (a) Reporting on category-specific QA/QC procedures in the energy, industrial processes and the waste sector;
- (b) Improvement of descriptions of variations in trends and fluctuations for different categories, including CO₂ emissions associated with feedstocks and non-energy use of fuels.

34. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.

II. Energy

A. Sector overview

35. The energy sector is the main sector in the GHG inventory of Switzerland. In 2007, emissions from the energy sector amounted to 41,966.40 Gg CO₂ eq, or 81.9 per cent of total GHG emissions. Since 1990, emissions have remained at almost the same level, showing a minor decrease of 0.3 per cent. There are noticeable fluctuations in this trend such as a 4.7 per cent increase for 1990–1991, a 5.3 per cent decrease for 1992–1993 and a 4.5 per cent decrease for 2006–2007. According to the NIR, these fluctuations are attributed to annual fluctuations in waste incineration, combustion activities in the petroleum refinery industry, strong correlation between the transport sector and economic development and the impact of climatic variations on demand for heating. Within the sector, 39.0 per cent of the emissions were from transport, followed by 36.8 per cent from other sectors, 14.0 per cent from manufacturing industries and construction and 8.2 per cent from energy industries. Other accounted for 1.4 per cent and the remaining 0.7 per cent were from fugitive emissions from fuels.

36. The CRF tables are complete in terms of gases and categories and the appropriate notation keys have been used. The NIR is generally transparent and provides explanations of methodologies, AD and EFs used to estimate emissions. For the energy sector, Switzerland has used a combination of country-specific and IPCC methods as well as EFs and has transparently documented in its NIR how EFs are derived and validated. Switzerland could further improve the transparency of the NIR by reallocating certain fuels or subcategories as indicated in paragraphs 43, 45 and 46.

37. The ERT welcomes the effort made by Switzerland to implement the extended measurement programme conducted in 2008 for its country-specific net calorific values (NCVs) and EFs for all fuels. Switzerland has reported in its NIR that the results of this programme have confirmed the assumption of constant NCVs for fuels sold within Switzerland. During the centralized review, the ERT requested Switzerland to provide information on steps taken to update the results of its measurement programme to include hard coal, lignite and natural gas, as recommended in the previous review report. In its response to the ERT, Switzerland indicated that a measurement campaign for solid fuels and natural gas is planned for 2010. The ERT recommends that Switzerland implement, in its annual inventory submission, the results of this measurement campaign as soon as they become available.

38. Switzerland reported recalculations in the energy sector in its 2009 submission. For example, these recalculations covered an updated modelling of disaggregated fuel consumption in the manufacturing industries and construction and commercial/institutional categories, based on the latest available industry data for the period 1990–2006. Recalculations performed by Switzerland also take into account the removal of double counting as a result of reporting fugitive emissions from transport, refining/storage and distribution of oil products under oil (1.B.2.a) instead of road transportation and updates to AD for off-road vehicles. The recalculations performed in the 2009 submission for the energy sector resulted in a decrease of 56.32 Gg CO₂ eq (0.1 per cent) in GHG emissions for 1990 and an increase of 28.81 Gg CO₂ eq (0.1 per cent) for 2006.

39. The ERT recognizes the efforts made by Switzerland to use higher tier methods in many categories in its 2009 submission, and in this regard recommends that Switzerland move towards category-specific QA/QC procedures for these categories in its next annual inventory submission.

B. Reference and sectoral approaches

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

40. Emissions of CO₂ from fuel combustion were calculated using both the reference approach and the sectoral approach. For the year 2007, there is a difference of 1.58 per cent in the CO₂ emissions estimates between the reference approach and the sectoral approach. Explanations are provided in the

documentation box of CRF table 1.A(c). In addition, the NIR provides explanations for the fluctuations in the differences between the two approaches over the years. The ERT noted that for 1990–2007 there is a difference of up to 7.0 per cent in apparent consumption between the reference approach and the International Energy Agency (IEA) data. In its response to previous review stages, Switzerland indicated that it will perform an additional study planned for 2010 to further explain the differences between the data in its CRF tables and the IEA data. The ERT acknowledges that Switzerland has made efforts to detect the reasons for these discrepancies and encourages Switzerland to continue to investigate the differences between the reference approach and the IEA data and report on its progress in its next annual inventory submission.

2. International bunker fuels

41. Switzerland reports that aviation international bunkers are estimated using a tier 3a method from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Switzerland collects detailed individual flight data by airport, which allows accurate distinction between domestic and international flights. The difference in fuel consumption modelled using the bottom-up approach and the fuel sales data is approximately 4.0 per cent (0.04 Mt). The ERT recommends that Switzerland continue to monitor this difference and also report a trend analysis of this difference in the NIR of its future submissions. For navigation, all fuel consumption is considered to be domestic, which is a reasonable assumption given the geographical location of Switzerland.

3. Feedstocks and non-energy use of fuels

42. Switzerland stated that it only considered bitumen under feedstocks and that it assumed that the use of other fuels as feedstocks is considered to be small. However, in the previous review report, the ERT indicated that the chemical industry in Switzerland is large and use of feedstocks should occur in the country. Switzerland, in its response to questions from the ERT during the centralized review, indicated that it will review the reporting of feedstocks in 2010. The ERT welcomes the additional efforts planned by Switzerland related to the estimation of feedstocks and recommends that the Party include such information and possible estimates in its future annual inventory submission.

C. Key categories

1. Stationary combustion: liquid and solid fuels – CO₂, CH₄ and N₂O⁵

43. In the CRF tables, combustion of petroleum coke, which is classified as liquid fuel, is reported under solid fuels both in the sectoral approach and in the reference approach. This is not in line with the Revised 1996 IPCC guidelines. The ERT reiterates the recommendations made in previous review reports that Switzerland report emissions from combustion of petroleum coke under liquid fuels in its next annual inventory submission.

2. Stationary combustion: other fuels – CO₂, CH₄ and N₂O⁶

44. For CO₂ emissions from combustion of MSW, Switzerland has used a proportion of MSW that is of biogenic origin of 60.0 per cent, with the remaining 40.0 per cent being of fossil origin. During the centralized review Switzerland provided the ERT with references for this factor, which was a study performed in 2001 (the factor is the same as the IPCC default factor). Switzerland also provided preliminary results from a new study indicating that the fraction should be lower in Switzerland.

⁵ Not all emissions under this category are identified as key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

⁶ Not all emissions under this category are identified as key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases and fuels are not assessed in separate sections.

The study will be finalized in 2010. Since this is a key category in the inventory of the Party, the ERT recommends that Switzerland utilize the final results from this new study in its future annual inventory submissions.

3. Other (mobile): liquid and gaseous fuels – CO₂, CH₄ and N₂O⁷

45. Emissions from construction and industry mobile machinery are currently reported under other (mobile (1.A.5.b)), which is not in line with the Revised 1996 IPCC Guidelines. The ERT recommends that Switzerland report these emissions under other (manufacturing industries and construction (1.A.2.f)) in its next annual inventory submission, and keep reporting military off-road vehicles under the other (mobile (1.A.5.b)) category.

4. Other transportation: liquid fuels – CO₂, CH₄ and N₂O⁸

46. Emissions from military aviation are currently reported under other transportation (military aviation (1.A.3.e)), which is not in line with the Revised 1996 IPCC Guidelines. The ERT reiterates the recommendation from the previous review report that Switzerland report these emissions under other (mobile (1.A.5.b)) in its next annual inventory submission.

D. Non-key categories

Stationary combustion: biomass – CO₂

47. In the NIR, Switzerland provides a table showing effective CO₂ emissions from biomass that are currently included in the CRF tables as memo items and those CO₂ emissions from biomass that are not included as memo items. Some figures reported in this table (table 3-43) are not consistent with the data reported in the CRF tables (use of waste derived fuels in cement industry (1.A.2.f), transport (1.A.3) and total energy-related biomass combustion (1.A)). Although for some of the biomass emissions not included in the CRF tables, the respective reporting categories are shaded or do not exist, some of the biomass emissions reported as not included in the CRF tables should be reported under biomass, such as the biogenic fraction from MSW incineration. For other biomass CO₂ emissions reported in this table (e.g. solid waste disposal on land, other waste (compost and fermentation of waste) (6.D)) it remains unclear which specific emission sources are included. The ERT recommends that, in its next annual inventory submission, Switzerland:

- (a) Report emissions from combustion of biomass in the CRF tables, particularly biogenic MSW under public electricity and heat production in the biomass fuel category;
- (b) Improve the consistency between the information reported in table 3-43 of the NIR and the data reported in the CRF tables;
- (c) Clarify the sources of emissions not included in the CRF tables.

III. Industrial processes and solvent and other product use

A. Sector overview

48. In 2007, emissions from the industrial processes sector amounted to 3,058.37 Gg CO₂ eq, or 6.0 per cent of total GHG emissions and emissions from the solvent and other product use sector

⁷ Not all emissions under this category are identified as key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

⁸ Not all emissions under this category are identified as key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

amounted to 230.83 Gg CO₂ eq, or 0.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 6.1 per cent in the industrial processes sector, and decreased by 50.7 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is the decrease in cement production, where clinker production has decreased by 27.0 per cent since 1990. Within the industrial processes sector, among the most important categories, 60.3 per cent of the GHG emissions were CO₂ emissions from cement production, followed by HFC emissions from the consumption of halocarbons and SF₆ (20.6 per cent), CO₂ and SF₆ emissions from metal production (7.9 per cent), and CO₂, CH₄ and N₂O emissions from chemical industry (3.4 per cent).

49. Most of the emissions from the industrial processes sector are CO₂, which amounted to 68.2 per cent of sectoral emissions, while fluorinated gases amounted to 28.8 per cent, N₂O to 2.7 per cent, and CH₄ to 0.2 per cent.

50. Beyond the general QA/QC measures implemented by Switzerland, no category-specific QA/QC activities have been carried out in the industrial processes sector. The ERT recommends that Switzerland implement category-specific QA/QC procedures in accordance with the IPCC good practice guidance and include information on this in the NIR of its next annual inventory submission. After the centralized review, Switzerland informed the ERT that category-specific QA/QC will be considered and introduced stepwise in its future annual inventory submissions.

51. Several recalculations were made in the 2009 inventory submission, mostly caused by revisions of AD (e.g. for ammonia (NH₃) production, nitric acid production and iron and steel production). For NH₃ production (1991–2006) and nitric acid production (1997–2006) AD have been revised, while for iron and steel production (2003–2006) AD from industry has been used to replace previous interpolation or AD. The most significant change occurred for N₂O emissions from nitric acid production, where, due to recalculations, emissions decreased by 52.12 Gg CO₂ eq (36.9 per cent) in 1997 (first year of recalculation) and by 45.85 Gg CO₂ eq (31.9 per cent) in 2006. The ERT encourages Switzerland to complete the explanatory information in CRF table 8(b) on recalculations, with brief summaries of the reasons for recalculations together with references to the NIR.

52. The ERT observed that information on CO₂ emissions associated with feedstocks and other non-energy use of fuels is not included in detail in the NIR. In order to allow the assessment of the possible omission or double counting of emissions in line with the UNFCCC reporting guidelines, the ERT recommends that Switzerland provide this information in the NIR of its next submission, listing:

- (a) All feedstocks and non-energy uses of fuels;
- (b) How and where associated CO₂ emissions have been accounted for in the inventory for each fuel type;
- (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 chapter of the NIR be provided in CRF table 1.A(d) and the related documentation box. After the centralized review, Switzerland informed the ERT that the reporting of feedstocks will be reviewed in the course of 2010 and that results will be considered in its future annual inventory submissions.

B. Key categories

1. Cement production – CO₂

53. Switzerland reported in the NIR that some measurements were carried out in 2006 and an EF of 528 kg CO₂/t of clinker was determined, but that this EF was not used in the emissions estimates in the 2009 submission. During the centralized review, Switzerland informed the ERT that, in 2006, the CaO

and magnesium oxide contents of the clinker produced were assessed in all cement plants in the country and that the average EF calculated was 527.9 kg CO₂/t of clinker. In addition, because the difference between the EF calculated by the Party and the EF provided by the World Business Council for Sustainable Development (525 kg/t), which is used in the estimates, is very small and within the measurement uncertainty, the EF had not been changed. The ERT reiterates the recommendation of the previous review report that Switzerland use the country-specific value of 528 kg CO₂/t in its next annual inventory submission.

2. Iron and steel production – CO₂

54. Switzerland stated in its NIR that the AD for steel production relate to electric arc furnaces. The ERT noted that CO₂ emissions increased by 60.0 per cent from 1990 to 2007 together with the increase of the CO₂ EF by 40.0 per cent. During the centralized review, Switzerland informed the ERT that the increase in the CO₂ EF for steel production in electric arc furnaces from 100 kg CO₂/t for 1990–1998 to 140 kg CO₂/t for 1999 onwards was caused by the installation of a thermal anti-pollution device and more organic impurities in the scrap material. Switzerland explained that organic impurities include for example rubber, plastics, wood, sludge, oils, lubricants, or chemicals. The estimated ratio of the mass of impurities to the related mass of CO₂ emissions is roughly 1:2, and it is estimated that approximately 70 kg of scrap material is used per tonne of steel produced. It is assumed that this corresponds to around 7 per cent of organic impurities in the scrap material. The ERT recommends that Switzerland include this explanation in the NIR of its next annual inventory submission. After the centralized review, Switzerland informed the ERT that the numbers provided during the centralized review will be reviewed and modified in its 2011 annual inventory submission.

C. Non-key categories

Lime production – CO₂

55. Switzerland uses a CO₂ EF of 560 kg CO₂/t for estimates of emissions from CaO production, which is much lower than the IPCC default values (785 kg/t and 913 kg/t for high calcium and dolomitic quicklime, respectively) and those of other Parties (650–790 kg/t). During the centralized review, in response to a question from the ERT regarding the types of CaO used in Switzerland, the Party informed that only high calcium quicklime is used. Therefore the ERT is of the view that the approach used by Switzerland in determining its country-specific EF may not be fully in line with the IPCC good practice guidance, since this value is unusually low and in addition no appropriate justification has been provided in the NIR. Switzerland agreed with this view and informed the ERT that it will revise the EF for CaO production and report revised emissions estimates accordingly in its next annual inventory submission.

IV. Agriculture

A. Sector overview

56. In 2007, emissions from the agriculture sector amounted to 5,345.72 Gg CO₂ eq, or 10.4 per cent of total GHG emissions. Between 1990 and 2007, emissions have decreased by 9.4 per cent. The key driver for the fall in emissions is a decrease in the cattle population and mineral fertilizer use. Within the sector, 43.4 per cent of the emissions were from enteric fermentation, followed by 39.4 per cent from agricultural soils, 17.0 per cent from manure management and 0.3 per cent from field burning of agricultural residues.

57. The emissions for the agriculture sector reported in the CRF tables cover all categories and gases and all years of the time series. Prescribed burning of savannas does not occur in Switzerland. Nevertheless, the ERT considers that, in order to improve completeness, some additional information tables in the CRF should be completed and explanations on the use of the notation key included elsewhere should be provided in table 9(a) or in one of the documentation boxes, as recommended in the

initial review report of Switzerland.⁹ The NIR provides detailed information on methods, but some explanations could be improved to further enhance the transparency of this information. In particular, the ERT recommends that Switzerland include, in the NIR of its next annual inventory submission, tables on the development of N_{ex} per head, NH_3 emissions, fertilizer consumption and annual milk yield per dairy cow. For some categories, the NIR states that a comparison of EFs used by Switzerland with the IPCC default EFs was undertaken, but no details of this comparison are provided in the NIR. Since Switzerland uses many country-specific values for feed consumption, the ERT encourages the Party to present comparisons with the IPCC default EFs and implied emission factors of other Parties in the category-specific QA/QC sections of the NIR, along with explanations for any significant differences. Switzerland indicated in the NIR that no improvements are planned for the agriculture sector.

58. In the 2009 submission, the emissions from enteric fermentation and manure management for 2005 and 2006 were recalculated using updated data from the Swiss Farmers Union (SBV). The impact of these recalculations is minor and in 2006 represents a decrease of 0.02 per cent in the total emissions from the agriculture sector.

B. Key categories

1. Enteric fermentation – CH_4

59. Switzerland uses a country-specific tier 2 methodology, which is consistent with the IPCC tier 2 methodology, and calculates emissions for this key category in accordance with the IPCC good practice guidance. The EFs used are a mixture of IPCC default EFs and country-specific EFs. The emissions from dairy cows are based, among other parameters, on the annual average milk yield of 5,770 litres/head/year and a population of 614,795 dairy cows in 2007. The total milk and dairy products produced in Switzerland is 4,008,000 t of milk¹⁰ (Verwertete Vollmilch). A simple division of the total amount of milk produced divided by the number of dairy cows gives an average milk yield of 6,519 litres/head/year. Hence it is likely that there is an underestimation in the total energy consumption of dairy cows and the subsequent CH_4 emissions from enteric fermentation and CH_4 emissions from manure management. During the centralized review Switzerland investigated this issue further and concluded that the reporting of the original data by the Swiss Farmers Union (SFU/SBV) was not sufficiently transparent and subsequently a mistake occurred in the calculation of the average milk yield for dairy cows. The correct figure would be 3,983,300 tons milk leading to an average milk yield of 6,479 kg/head/year. Switzerland agreed with the ERT views to revise the calculation of milk yield in the future and to improve the documentation of the milk yield. Switzerland intends to report separately milk-yield statistics for dairy cows and non-dairy mother-cows in the future. However, it is not clear when detailed data from the SFU/SBV will be available as this requires recalculations to be performed by the SFU/SBV. In addition, Switzerland informed the ERT that in the meantime, milk yield will be calculated by dividing the total milk production reported in table 3.18 of the report entitled *Statistics and estimations for agriculture and alimentation, 2006*¹¹ by the number of dairy cows. The ERT agrees with this approach for the next annual inventory submission and encourages Switzerland to make the necessary efforts to produce accurate information and documentation on milk yield and use these in its future annual inventory submissions.

2. Manure management – CH_4 and N_2O

60. Switzerland uses a mass-flow model (ART 2008) to estimate CH_4 and N_2O emissions from agriculture. Therefore the underestimation of the milk yield described in paragraph 59 above is also

⁹ FCCC/IRR/2007/CHE, paragraph 71.

¹⁰ <<http://www.bfs.admin.ch/bfs/portal/de/index/themen/07/03/blank/ind24.indicator.240301.2403.html>>.

¹¹ SBV. 2006. *Statistiques et évaluations concernant l'agriculture et l'alimentation, 2006*. [Statistische Erhebungen und Schätzungen über Landwirtschaft und Ernährung, 2006] (Statistics and estimations for agriculture and alimentation, 2006).

likely to have resulted in an underestimation of CH₄ emissions from manure management. The ERT recommends that Switzerland revise the emissions calculation for this category if emissions of CH₄ from enteric fermentation are revised based on the findings described in paragraph 59 above.

61. Country-specific methodologies and default EFs were used to estimate N₂O emissions from manure management in animal waste management systems (AWMS). No information is given in the NIR on the distribution of stable types. For all years from 1990 to 2007, Switzerland used the same AWMS distribution regardless of the fact that farming practices changed during this period. The ERT therefore reiterates the recommendation of previous review report that Switzerland verify and update information on AWMS distribution in the country for the period 1990–2007 and, if necessary, update the EFs and revise its emissions estimates in its next annual inventory submission.

62. During the review, the ERT assessed more thoroughly the ART 2008 model used for the estimation of CH₄ and N₂O.¹² The ERT noted that the N_{ex} value of 107.5 kg N_{ex}/head/yr in 2007 used in the model for dairy cows is also used for other cows. This N_{ex} value for dairy cows is maximized to 110 kg N/head/yr at a milk yield of 6,000 litres. Implementing a milk yield higher than 6,000 litres in the model as indicated in paragraph 59 above would result in a decreased N_{ex} and a subsequently lower N₂O emissions than currently reported, which is not a likely effect. Furthermore, another issue is that N_{ex} from dairy cows and non-dairy cows is not treated separately. During the centralized review, Switzerland agreed with the view of the ERT that there is an error in the equation, which will be corrected. Switzerland also informed the ERT that a major recalculation of the agricultural GHG emissions will be performed in the course of the adjustments to the new Swiss ammonia model AGRAMMON for the 2010 annual inventory submission. Nitrogen (N) flows for dairy-cows and non-dairy mother cows will be modelled separately as suggested by the ERT. The ERT recommends that Switzerland reports on these revisions and the subsequently revised N₂O emissions estimates in its next annual inventory submission.

3. Direct soil emissions – N₂O

63. Direct N₂O emissions from soils decreased by 11.4 per cent between 1990 and 2007, mainly as a result of the reduction of approximately 15.0 per cent in the input of mineral fertilizer to soils and a slightly lower input of N from animal manure. Switzerland has included N returned to soils from meadows and pastures in its estimate of crop residues, giving higher emissions from crop residues compared to other Parties. This is in accordance with the IPCC good practice guidance and the ERT commends Switzerland for these efforts in improving the completeness of the inventory.

C. Non-key categories

Field burning of agricultural residues – CH₄ and N₂O

64. CRF table 4.F 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, in the column where the residue to crop ratio should be reported, Switzerland reported the N content of plant residues. In order to better understand the calculations, the ERT recommends that Switzerland explain this more clearly in the NIR and remove these values from the residue to crop ratio column in its next annual inventory submission.

¹² <<http://www.bafu.admin.ch/climatereporting/00545/01913/index.html?lang=en&lang=en>>.

V. Land use, land-use change and forestry

A. Sector overview

65. In 2007, net removals from the LULUCF sector amounted to 647.24 Gg CO₂ eq, offsetting 1.3 per cent of the total GHG emissions. Between 1990 and 2007, net removals have decreased by 72.3 per cent. The key drivers for the fall in removals are the increase in the amount of wood harvested, inter-annual climatic variation and forest damage caused by storms and bark beetles. Within the sector, the most important sink of CO₂ was from forest land remaining forest land (1,722.75 Gg CO₂). Other categories were reported as CO₂ sources, being the most important cropland remaining cropland (559.03 Gg CO₂), followed by land converted to settlements (301.58 Gg CO₂).

66. In the 2009 submission, Switzerland recalculated estimates in the LULUCF sector following revisions of AD and EFs as well as the revision of methods. The impact of these recalculations was a decrease of 234.14 Gg CO₂ eq (9.1 per cent) in the estimate of the net sink for 1990, while for 2006 the sector changed from a net sink to a net source. The decrease in the net sink estimate for the year 2006 amounted to 3,306.75 Gg CO₂ eq (148.2 per cent). This significant recalculation was caused by the incorporation of the new third national forest inventory (NFI3) in source category 5.A forest land. In addition, a land-use conversion period of 20 years (instead of one year) was applied to carbon stock changes in living and dead biomass and in soil for “land converted to afforestations” and for soil carbon stock changes for “land converted to unproductive wetland”.

67. The inventory for the LULUCF sector is complete, as the CRF tables include estimates of CO₂ emissions and/or removals for all six land-use categories and N₂O emissions from disturbance associated with land-use conversion to cropland, CO₂ emissions from liming application and N₂O and CH₄ emissions from wildfires in forests. Direct N₂O emissions from N fertilization of forest land and other non-CO₂ emissions from drainage of soils and wetlands were reported as not occurring (“NO”).

68. 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. However, as identified in previous review reports, this assumption has not been consistently applied to settlements and other land. During the centralized review, Switzerland informed the ERT that the different conversion times will be harmonized in its next annual inventory submission.

69. Switzerland will further reduce the uncertainty of its AD for land areas by increasing the sample size of the AREA (Swiss land-use statistics) AD in the future. At present, spatially explicit AREA data cover 35.0 per cent of Swiss territory, and full coverage is expected in 2013. Through this improvement, it is expected that, while both extrapolation and substitution errors will converge to zero, the sampling error will decrease by 20.0–50.0 per cent depending on the category concerned. The ERT encourages Switzerland to implement the land-use assessment within the planned timelines.

B. Key categories

1. Forest land remaining forest land – CO₂

70. The annual net CO₂ removals from forest land remaining forest land from 1990 to 2007 shows high fluctuations and ranged between 104.12 Gg CO₂ and 6,410.70 Gg CO₂. The rate of carbon removal increased rapidly between 1992 and 1994. Within these two years the increase in carbon removal was 4,184.40 Gg CO₂. After 1994, it decreased rapidly and reached 284.47 Gg CO₂ in 2000, remaining relatively constant until the end of the time-series with exception of 2003 and 2007, when removals increased to 2,590.45 Gg CO₂ and 1,722.75 Gg CO₂, respectively. Switzerland explained in the previous review that such high inter-annual variations were a result of variations in the amount of wood harvested, inter-annual climatic variation and forest damage caused by storms and bark beetles. Based on data on wood harvesting provided in the NIR, the ERT considers that there is no dramatic change in the volume

of wood harvested between years in the time-series, while the area of forest remaining forest slightly increased from year to year. To improve the accuracy of the information on the trends of removals for this category, the ERT recommends that Switzerland provide more detailed information explaining the high fluctuations in the emissions/removals estimates in its next annual inventory submission.

71. In the current method used by Switzerland to estimate carbon stock changes in living biomass (equation 7.2.1 in the NIR), the loss of biomass due to change of forest with high carbon stock (CC12) to forest with lower carbon stock (CC13) and vice versa is ignored, as the weighted (W) factor applied to the equation is set to zero. Applying this assumption may lead to under- or overestimation of emissions. During the centralized review, Switzerland explained to the ERT that biomass loss is also ignored for conversions from CC13 to CC12, and because those occur over a larger area than those from CC12 to CC13, overall estimates of emissions and removals in this approach for changes within CC11 (afforestations), CC12 and CC13 are assumed to be conservative, using a W factor of 0. Switzerland also informed the ERT that the use of W factors is currently subject to review within the Swiss LULUCF group of experts. The ERT recommends that Switzerland gather data to estimate forest biomass losses for such carbon stock conversions between forests of high and low carbon densities. After the centralized review, Switzerland informed the ERT that, in its next annual inventory submission, the methodology for calculating emissions and removals caused by transitions within the forestry sector (from CC12 to CC13, CC12 to CC11 and CC13 to CC11) will be improved, and that it will provide revised estimates and transparent information. The ERT recommends that Switzerland include such revised estimates in its next annual inventory submission.

2. Cropland remaining cropland – CO₂

72. The tier 2 method of the IPCC good practice guidance for LULUCF and country-specific parameters were used to calculate carbon emissions from organic soils. Carbon stock changes in both living biomass and mineral soils are assumed to be zero and reported as “NO”. The ERT reiterates the recommendation from the previous review reports that Switzerland use a higher tier method to estimate carbon stock changes in mineral soils for this category in its next annual inventory submission.

3. Land converted to settlements – CO₂

73. In 2007, settlements were a net source of 330.79 Gg CO₂, mainly due to the net emissions from land converted to settlements (301.58 Gg CO₂). Carbon stock changes in dead organic matter are assumed to be zero for settlements remaining settlements and are reported as “NO”. For land converted to settlements, the IPCC tier 1a 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 reiterates the recommendation from the previous review reports that Switzerland reconsider the land-use conversion time in its next annual inventory submission.

C. Non-key categories

1. Land converted to forest land – CO₂

74. The rate of carbon removal in the category land converted to forest land has similar patterns to that of forest land remaining forest land, with high inter-annual variations, while the inter-annual variations of areas of land converted to forest land were small. The NIR does not provide sufficient information to explain such significant inter-annual variations in carbon removals. In order to improve the accuracy of the information on the trend for removals in this category, the ERT recommends that Switzerland provide additional information explaining the high fluctuations in its estimates of emissions/removals in its next annual inventory submission.

2. Land converted to other land-use categories – CO₂

75. The carbon stock changes in mineral soils caused by conversion of land to cropland and conversion of land to grasslands were all less than 10 Mg C/ha, but for land converted to wetlands, land converted to settlements and land converted to other land, carbon stock changes in soils were all very high, for example reaching 72.37 Mg C/ha for forest land converted to other land in 2007. For most of the other conversions of land to other land, the carbon stock changes in soils were higher than 50 Mg C/ha. These values are outside of the range of IPCC default values. During the centralized review, Switzerland explained to the ERT that such differences in carbon stock changes were caused by the use of different assumptions for the conversion period. The ERT recommends that Switzerland harmonize the different conversion periods in its next annual inventory submission.

VI. Waste

A. Sector overview

76. In 2007, emissions from the waste sector accounted for 663.33 Gg CO₂ eq, or 1,3 per cent of total GHG emissions. Between 1990 and 2007, emissions have decreased by 33.3 per cent. The key driver for the fall in emissions is the ban on landfilling and the implementation of waste recycling policies in the country. Within the sector, 42.1 per cent of the emissions were from solid waste disposal on land, followed by 32.2 per cent from wastewater handling, 18.2 per cent from other (composting and digestion of organic waste) and 7.5 per cent from waste incineration.

77. The information provided in the NIR and CRF tables is transparent and generally complete (see paras. 79 and 80 below). Recalculations were performed for the waste sector for the period 1992–2006, owing to the availability of updated waste statistics and taking into account recommendations made in the previous review reports. Recalculations do not affect emissions in 1990. The impact of these recalculations in 2006 is a decrease of 4.9 per cent in the total emissions from the waste sector.

78. A preliminary uncertainty analysis of the GHG emissions from the waste sector was performed based on expert judgement, resulting in uncertainties of 100.0, 60.0 and 50.0 per cent for wastewater handling, solid waste disposal on land and other (6.D), respectively. Category-specific QA/QC procedures have not yet been implemented. The ERT recommends that Switzerland develop category-specific QA/QC procedures and include information relating to these in its next annual inventory submission.

B. Key categories

1. Solid waste disposal on land – CH₄

79. Emissions of CH₄ from solid waste disposal on land are a key category by level and trend assessments and amounted to 279.30 Gg CO₂ eq in 2007. The IPCC first order decay method and country-specific EFs were used to estimate emissions of CH₄ from this category. AD and background information on waste management are well-described in the NIR. However, table 8-2 in the NIR does not contain any references to industrial waste and it is not clear how industrial waste is treated or disposed. During the centralized review, Switzerland informed the ERT that waste from industry is also included in table 8-2 under both different waste categories and their disposal options. The ERT recommends that Switzerland include the relevant explanations and more detailed information about industrial waste disposal in the NIR of its next annual inventory submission.

80. In its NIR Switzerland mentioned that domestic legislation implemented since January 2000 made waste incineration the mandatory option for waste treatment and banned waste disposal on landfills. According table 8-2 in the NIR, a small proportion of MSW (1Gg or 0.03 per cent) was still disposed on landfills in 2007. At the same time the notation key “NO” is used in the CRF table 6.A for

the fraction of MSW disposed to solid waste disposal sites (SWDS). The ERT recommends that Switzerland include the relevant value in CRF table 6.A, even if it is low.

81. In its 2007 submission, and following a recommendation from the previous review report, Switzerland recalculated GHG emissions from SWDS using updated waste statistics and provided updated data for the degradable organic content which now varies over time. This recalculation decreased CH₄ emissions from this category by 1.0 per cent in 2006.

2. Wastewater handling – CH₄ and N₂O¹³

82. A country-specific method based on the methodology of the core inventory of air emissions (CORINAIR) is used for GHG emissions from domestic and commercial wastewater. The ERT noted in the previous review report that Switzerland was planning to estimate separately emissions from pre-treatment of industrial effluent in future submissions. However, in the 2009 submission, industrial wastewater is still included in the category domestic and commercial wastewater. The ERT recommends that Switzerland report separately emissions from industrial wastewater in its next annual inventory submission, in order to improve the transparency of its estimates.

83. Emissions of CH₄ and N₂O from wastewater handling were recalculated as a result of the availability of updated AD and EFs for the entire time series. The impact of the recalculations in 2006 on CH₄ and N₂O emissions is a decrease of 72.1 and 5.9 per cent, respectively. Switzerland recalculated N₂O emissions from human sewage, based on the recommendations from the previous review report, but the value for protein consumption remains constant for the entire time-series. The ERT noted that the data on protein consumption for Switzerland in the Food and Agriculture Organization of the United Nations database (FAOSTAT) varies from 95 to 97 g/per/day during the period 1990–2003. The ERT recommends that Switzerland use year-specific values for protein consumption and provide background information in the NIR in order to improve accuracy in its next annual inventory submission. After the centralized review, Switzerland informed the ERT that it will provide such information in the NIR of its 2011 annual inventory submission.

3. Other (composting and digestion of organic waste) – CH₄

84. Switzerland reported CH₄ and N₂O emissions from waste composting, which amounted to 120.42 Gg of CO₂ eq or 0.2 per cent of total GHG emissions. A country-specific method is used for this estimation and covers the emissions from the composting and digestion plants for organic waste, based on statistical data. Backyard composting is also common practice in Switzerland. The amount of waste composted in individual households is assumed to represent 10.0 per cent of the total amount of waste treated in composting plants. The ERT commends Switzerland for its efforts to improve the completeness of the inventory by including this category in its estimates.

C. Non-key categories

Waste incineration – CO₂, CH₄ and N₂O

85. Emissions from waste incineration with energy recovery are included in the energy sector under public electricity and heat production, which is consistent with the IPCC good practice guidance.

86. The category waste incineration includes emissions from the incineration of hospital waste, illegal waste incineration and incineration of insulation material from cables, sewage sludge and crematoria. The emissions from this category were 50.00 GgCO₂ eq or 0.1 per cent of total GHG

¹³ Not all emissions under this category are identified as key categories, but only N₂O emissions. However, since the calculation procedures for and issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

emissions in 2007. A country-specific tier 2 method and country-specific EFs are used in the estimates, which is in line with the IPCC good practice guidance.

VII. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

A. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

87. In an annex to the NIR of its 2009 submission, Switzerland provided, on voluntary basis, supplementary information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. Switzerland has completed the Kyoto Protocol CRF tables from 2000 to 2007 and clearly distinguished these activities from emissions from sources listed in Annex A to the Kyoto Protocol.

88. The ERT noted that Switzerland, to a large extent, followed the annotated outline of the NIR, providing information on how the Party:

- (a) Ensures that units of land and areas of land are identifiable;
- (b) Determines units used for determining the area of accounting for afforestation and deforestation;
- (c) Demonstrates that carbon pools not accounted are not sources;
- (d) Distinguishes afforestation from deforestation and transient situations like harvesting or forest disturbance;
- (e) Demonstrates that the starting date for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is after 1990 and of the fact that these are human-induced;
- (f) Demonstrates that activities under Article 3, paragraph 4 are not included under activities under Article 3, paragraph 3, of the Kyoto Protocol.

89. In its next annual submission, the ERT encourages Switzerland to further improve the provision of appropriate and transparent information on all the required issues, following the annotated outline of the NIR and the guidance contained therein, that can be found on the UNFCCC website.¹⁴

90. Activities under Article 3, paragraph 3 have been reported as net sources for all years from 2000 to 2007, except 2004 and 2005, as the rate of deforestation was the lowest during those years. Forest management, which is the only activity elected by Switzerland under Article 3, paragraph 4 has been reported as a net sink. The rate of carbon removal fluctuated from year to year between 87.31 Gg CO₂ and 2,695.34 Gg CO₂.

91. The ERT believes that the approach described in paragraph 71, in which the loss of biomass for specific conversion categories is ignored since the W factor (W in equation 7.2.1) applied is zero, is not in line with the IPCC good practice guidance for LULUCF, because accounting under Article 3, paragraph 4, of the Kyoto Protocol is based on specific land units, and what happens in one specific unit of land should be independent from what happens in other land units. Therefore, while the assumption of W=0 is conservative for the particular situation of Switzerland in 2007, it may not be so if the areas under the different transitions are modified in the future. For the particular case of neglecting losses of biomass from the living biomass carbon pool in the transition from CC12 to CC13, the ERT has made a rough assessment of the potential underestimation of emissions in 2007 of approximately 73 kt CO₂. During the centralized review, the ERT recommended that Switzerland consider modifying the

¹⁴ <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/reporting_requirements/application/pdf/annotated_nir_outline.pdf>.

assumption of $W=0$ and revise accordingly the calculations for losses in carbon stocks in living biomass in lands under forest management in transitions between categories CC12 and CC13 for 2007, and provide a new estimate, if possible. After the centralized review, Switzerland informed the ERT that for its next annual submission it will improve the methodology for estimation of emissions and removals caused by transitions within the forestry sector, and that it will provide revised estimates and transparent information.

92. In estimating the carbon emissions and removals from afforestation, Switzerland used the tier 1 methodology from the IPCC good practice guidance for LULUCF and reported no changes in the litter, dead wood and soil carbon pools, thus only changes in living biomass are reported. For deforestation activities, Switzerland assumed that all living biomass, litter and dead wood are completely removed. Loss of soil carbon is assumed to be about 50.0 per cent. The ERT recommends that Switzerland justify and support these assumptions with appropriate references, and apply the conversion time of 20 years.

B. Information on Kyoto Protocol units

1. Standard electronic format and reports from the national registry

93. Switzerland has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the SIAR on the SEF tables and their comparison report.¹⁵ The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterates the recommendations contained in the SIAR that Switzerland should improve in its next annual submission its reporting on notifications and non-replacements by explicitly stating a non-occurrence of notifications and non-replacements if none occurred during the reporting period.

94. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with section I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraphs 88(a) to (j) of the annex to decision 22/CMP.1. The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

2. National registry

95. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate.

96. The registry of Switzerland provides practically all the public information referred to in paragraphs 44 to 48 of the annex to decision 13/CMP.1 on its website,¹⁶ however, a document containing Article 6 projects is missing. During the centralized review, Switzerland informed the ERT that information on acquiring and transferring accounts of companies (as legal persons) is regarded as

¹⁵ The SEF tables comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

¹⁶ <<https://www.national-registry.ch>>.

confidential. Article 19 of the Federal Act on Data Protection¹⁷ states that Federal bodies may disclose personal data if there is a legal basis for doing so or if there is an overriding public interest. For this reason, Switzerland indicated that these conditions are not fulfilled in this case and therefore the national registry cannot make the information on acquiring and transferring accounts publicly available and that it considers them to be confidential. Nevertheless, the ERT considers that reporting of Article 6 projects information could be strengthened by indicating clearly that no such projects exist in Switzerland, instead of providing no information through the user interface of the registry.

3. Calculation of commitment period reserve

97. Switzerland has reported its commitment period reserve in its 2009 annual submission. Switzerland reported that its commitment period reserve has not changed since the initial report review (218,554,562 t CO₂ eq), as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

C. Changes to the national system

98. Switzerland has reported no change in its national system since the previous annual submission. The ERT concluded that the Switzerland's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

D. Changes to the national registry

99. Switzerland has reported no change in its national registry since the previous annual submission. The ERT concluded that the Switzerland's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1.

VIII. Conclusions and recommendations

100. Switzerland made its annual submission on 15 April 2009. Switzerland indicated that the 2009 annual submission is a voluntary submission under the Kyoto Protocol. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, information on Kyoto Protocol units and information on changes to the national system and the national registry). This is in line with decision 15/CMP.1.

101. The ERT concludes that the inventory submission of Switzerland has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and Switzerland has submitted a complete set of CRF tables for the years 1990–2007 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as complete in terms of categories and gases.

102. The submission on a voluntary basis of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1. Switzerland has not submitted on a voluntary basis information on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol.

103. Switzerland's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, some methodological issues, such as developing a country-specific CO₂ EF for

¹⁷ FADP, SR 235.1 Bundesgesetz vom 19. Juni 1992 über den Datenschutz.

CaO production, the correction of the calculation of milk yield and the revision of the N_{ex} rates should be addressed by Switzerland in its next annual inventory submission.

104. The ERT noted that Switzerland, to a large extent, followed the reporting requirements and the guidance in relation to the reporting on Article 3, paragraph 3 and Article 3, paragraph 4 activities. However, the ERT identified two main areas for improvement: the calculations for losses in carbon stocks in living biomass in lands under forest management in transitions between categories CC12 and CC13 and the use of a conversion time of 20 years (or appropriate country-specific conversion time) for changes to soil carbon in afforestation and deforestation categories.

105. Switzerland has reported information on its accounting of Kyoto Protocol units in accordance with section I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

106. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

107. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions. However, with regard to publicly available information, the ERT considers that the reporting of information on Article 6 projects could be strengthened by indicating clearly that no such projects exist in Switzerland.

108. In the course of the review, the ERT formulated a number of recommendations¹⁸ relating to the QA/QC procedures, completeness and methodological issues of Switzerland's annual inventory submission. The key recommendations are that Switzerland:

- (a) Enhance the QA/QC procedures implemented, in particular through an enlarged scope of category-specific QA/QC activities;
- (b) Improve the completeness of the information in relation to carbon stock changes from biomass for forest conversions between productive and unproductive forests under forest management activities;
- (c) Improve the descriptions of variations in trends and fluctuations for different categories, as well as for CO₂ emissions associated with feedstocks and non-energy use of fuels;
- (d) Verify and update the information on AWMS and, if necessary, update the related EFs;
- (e) Harmonize different conversion periods used for land-use conversions.

IX. Questions of implementation

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

¹⁸ For a complete list of recommendations, the relevant chapters of this report should be consulted.

Annex I**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.html>>.

Intergovernmental Panel on Climate Change. Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories. Available at <<http://www.ipcc-ggip.iges.or.jp/public/gp/english/>>.

Intergovernmental Panel on Climate Change. Good Practice Guidance for Land Use, Land-Use Change and Forestry. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>>.

“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>>.

“Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”. FCCC/CP/2002/8. Available at <<http://unfccc.int/resource/docs/cop8/08.pdf>>.

“Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol”. Decision 19/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>>.

“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 2009. Available at <<http://unfccc.int/resource/docs/2009/asr/che.pdf>>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2009. Available at <<http://unfccc.int/resource/webdocs/sai/2009.pdf>>.

FCCC/ARR/2008/CHE. Report of the individual review of the greenhouse gas inventory of Switzerland submitted in 2007 and 2008. Available at <<http://unfccc.int/resource/docs/2009/arr/che.pdf>>.

UNFCCC. *Standard independent assessment report*, Parts I and II. Unpublished document.

B. Additional information provided by the Switzerland

Responses to questions during the review were received from Ms. Regine Röthlisberger (Federal Office for the Environment) and 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:

MISTA 2007: *Milchstatistik der Schweiz (Milk statistics of Switzerland)*. Eds.: Schweizer Milchproduzenten (SMP); TSM Treuhand GmbH; Schweizerischer Bauernverband, SBV Statistik. Brugg, August 2008.

SBV 2006: *Statistiques et évaluations concernant l'agriculture et l'alimentation, 2006. [Statistische Erhebungen und Schätzungen über Landwirtschaft und Ernährung, 2006] (Statistics and estimations for agriculture and alimentation, 2006).* Swiss Farmers Union, Brugg. [available in German and French]

SBV 2008: *Statistiques et évaluations concernant l'agriculture et l'alimentation, 2008. [Statistische Erhebungen und Schätzungen über Landwirtschaft und Ernährung, 2008] (Statistics and estimations for agriculture and alimentation, 2008).* Swiss Farmers Union, Brugg. [available in German and French]

Milk production statistics at online portal of Swiss Statistics. Available at
<<http://www.bfs.admin.ch/bfs/portal/de/index/themen/07/03/blank/ind24.indicator.240301.2403.html>>.

FOEN. 2009. *Description of the Quality Management System. Supplement to Switzerland's Greenhouse Gas Inventory 1990–2007.* Submission of 15 April 2009 under the UNFCCC and the Kyoto Protocol. Available at <<http://www.bafu.admin.ch/climatereporting/00545/07651/index.html?lang=en>>.

Annex II**Acronyms and abbreviations**

AD	activity data	kg	kilogram (1 kg = 1 thousand grams)
AWMS	animal waste management system	LULUCF	land use, land-use change and forestry
CH ₄	methane		
C	carbon	MSW	municipal solid waste
CaO	lime	N	nitrogen
CC	carbon stock	NA	not applicable
CO ₂	carbon dioxide	N _{ex}	nitrogen excretion
CO ₂ eq	carbon dioxide equivalent	NH ₃	ammonia
CRF	common reporting format	NO	not occurring
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	N ₂ O	nitrous oxide
EF	emission factor	NIR	national inventory report
ERT	expert review team	ODS	ozone depleting substances
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF	PFCs	perfluorocarbons
		QA/QC	quality assurance/quality control
		QMS	quality management system
		SEF	standard electronic format
		SF ₆	sulphur hexafluoride
		SIAR	Standard Independent Assessment Report
HFCs	hydrofluorocarbons	SWDS	solid waste disposal sites
IEA	International Energy Agency	UNFCCC	United Nations Framework Convention on Climate Change
IPCC	Intergovernmental Panel on Climate Change		
ITL	international transaction log	W	weighted
