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Report of the centralized in-depth review of the fourth national communication of Switzerland

CONTENTS

I. Introduction and summary

A. Introduction

1. Switzerland has been a Party to the UNFCCC since 1993 and to its Kyoto Protocol since 2003. Under the Kyoto Protocol, Switzerland committed itself to reducing its greenhouse gas (GHG) emissions by 8 per cent compared to the base year (1990) level during the first commitment period (2008–2012).

2. This report covers the centralized in-depth review (IDR) of the fourth national communication (NC4) of Switzerland, coordinated by the UNFCCC secretariat in accordance with decision 7/CP.11. The review took place from 5 to 10 June 2006 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Didier Goetghebuer (Belgium), Mr. David Lesolle (Botswana), Ms. Thelma Krug (Brazil), Mr. Ismael Concha[1] (Colombia), Mr. Naoki Matsuo (Japan) and Ms. Natalya Parasyuk (Ukraine). Ms. Krug and Mr. Matsuo were the lead reviewers. The review was coordinated by Mr. Sergey Kononov (UNFCCC secretariat).

3. During the IDR, the expert review team (ERT) examined each part of the NC4. The ERT also evaluated the information contained in Switzerland's report demonstrating progress (RDP) in achieving its commitments under the Kyoto Protocol, and the supplementary information provided by Switzerland under Article 7, paragraph 2, of the Kyoto Protocol.

4. 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, in this final version of the report.

B. Summary

5. The ERT found that Switzerland's NC4 was prepared in accordance with the UNFCCC reporting guidelines.[2] As required by decision 22/CP.8, the RDP provides information on the progress made by Switzerland in achieving its commitments under the Kyoto Protocol. Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol[3] is provided in both the NC4 and the RDP. The ERT acknowledged a high degree of coherency and consistency in Switzerland's reporting.

1. Completeness

6. The ERT noted that Switzerland's NC4 covers all sections required by the reporting guidelines and the RDP contains all parts stipulated by decisions 22/CP.7 and 25/CP.8. Furthermore, the ERT noted that the supplementary information provided by Switzerland under Article 7, paragraph 2, of the Kyoto Protocol was complete, except for two reporting elements (see section III.B).

2. Timeliness

7. The NC4 and RDP were submitted on 2 December 2005. Decision 4/CP.8 requested the submission of the NC4 by 1 January 2006. Decision 22/CP.7 set the same date for Parties to submit their RDPs.

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[1] Mr. Concha was not able to take part in the review visit to Bonn but supported the review from his office.
[2] "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications." Document FCCC/CP/1999/7, pages 80–100.
[3] Decision 15/CMP.1, annex, chapter II (FCCC/KP/CMP/2005/8/Add.2).

3. Transparency

8. The ERT acknowledged that Switzerland's NC4 is well structured, transparent and concise. In the course of the review, the ERT formulated a number of recommendations aimed at further increasing the transparency of the reporting, such as a recommendation that Switzerland include in its next national communication an explicit definition of "new and additional" financial resources.

II. Technical assessment of the reviewed elements

A. National circumstances relevant to greenhouse gas emissions and removals

9. In its NC4, Switzerland has provided a comprehensive and transparent description of its national circumstances affecting GHG emissions and removals. This description covers geographic profile, climate profile, population profile, government structure, education and research, building stock and urban structure, economic profile, industry, energy, transport, agriculture, forests and waste. Table 1 illustrates the national circumstances of the country by providing some indicators relevant to GHG emissions by sources and removals by sinks.

Table 1. Indicators relevant to greenhouse gas emissions and removals for Switzerland

	1990	1995	2000	2003	Change 1990–2000 (%)	Change 2000–2003 (%)	Change 1990–2003 (%)
Population (million)	6.80	7.08	7.21	7.41	6.1	2.7	9.0
GDP (billion USD 2000 PPP)	197	198	219	221	11.0	1.0	12.1
TPES (Mtoe)	25.1	25.3	26.5	27.1	5.5	2.2	7.8
GDP per capita (thousand USD 2000 PPP)	29.0	28.0	30.4	29.9	4.6	–1.7	2.9
TPES per capita (toe)	3.7	3.6	3.7	3.7	–0.6	–0.5	–1.0
GHG emissions without LULUCF (Tg CO_2 eq)	52.4	50.9	51.3	52.2	–2.3	1.9	–0.4
GHG emissions with LULUCF (Tg CO_2 eq)	51.2	48.6	51.4	50.5	0.5	–1.8	–1.4
CO_2 emissions per capita (Mg)	6.5	6.1	6.1	6.0	–7.2	–0.3	–7.5
CO_2 emissions per GDP unit (kg per USD 2000 PPP)	0.22	0.22	0.20	0.20	–11.4	1.4	–10.1
GHG emissions per capita (Mg CO_2 eq)	7.7	7.2	7.1	7.1	–7.9	–0.8	–8.6
GHG emissions per GDP unit (kg CO_2 eq per USD 2000 PPP)	0.27	0.26	0.23	0.24	–11.9	0.9	–11.2

Sources: GHG emissions data are from Switzerland's 2005 inventory submission; population, GDP and TPES data are from the IEA.
Note 1: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.
Note 2: For the abbreviations used, see annex II.

10. The NC4 contains summary information on GHG emission trends for the period 1990–2003. This information is consistent with Switzerland's 2005 national inventory submission. Summary tables, including trend tables for emissions in CO_2 equivalent (given in the common reporting format (CRF)), are provided in an annex to the NC4.

11. Total GHG emissions (excluding emissions/removals from land use, land-use change and forestry (LULUCF)) decreased by 0.4 per cent between 1990 and 2003, whereas total GHG emissions, including net emissions/removals from LULUCF, decreased by 1.4 per cent. CO_2 emissions increased by 0.8 per cent over that period (without LULUCF), whereas CH_4 and N_2O emissions decreased by 17.6 per cent and 7.9 per cent, respectively. Emissions of fluorinated gases, or F-gases (HFCs, PFCs and SF_6 taken together), almost tripled during this period (increase by 174.0 per cent), although they accounted for only approximately 1.5 per cent of total GHG emissions in 2003 (0.5 per cent in 1990). Table 2 provides an overview of GHG emissions by sector for the period 1990–2003.

12. During the period 1990–2003, total annual GHG emissions (without LULUCF) fluctuated between 50 and 54 Tg CO_2 equivalent, without a distinct trend upwards or downwards. Over the same period, national gross domestic product (GDP) increased by approximately 12 per cent (see table 1).

Table 2. Greenhouse gas emissions by sector for Switzerland, 1990–2003

	GHG emissions (Tg CO_2 equivalent)					Change (%)		Share[a] (%)	
	1990	1995	2000	2002	2003	1990–2003	2002–2003	1990	2003
1. Energy	41.0	40.9	41.2	41.3	42.4	3.4	2.7	78.1	81.1
A1. Energy industries	1.42	1.64	1.63	1.76	1.75	23.1	–0.5	2.7	3.4
A2. Manufacturing industries and construction	6.19	5.88	5.90	5.94	5.94	–4.1	0.0	11.8	11.4
A3. Transport	14.38	14.04	15.81	15.41	15.59	8.4	1.2	27.4	29.8
A4–5. Other	18.59	19.01	17.55	17.80	18.76	0.9	5.4	35.4	35.9
B. Fugitive emissions	0.38	0.35	0.35	0.35	0.33	–13.4	–4.1	0.7	0.6
2. Industrial processes	3.23	2.48	2.65	2.66	2.69	–16.8	1.1	6.2	5.1
3. Solvent and other product use	0.11	0.12	0.12	0.12	0.12	15.3	1.0	0.2	0.2
4. Agriculture	6.08	5.75	5.50	5.46	5.37	–11.7	–1.7	11.6	10.3
5. LULUCF	–1.27	–2.35	0.15	0.31	–1.77	38.7	–678.8	–2.4	–3.4
6. Waste	2.06	1.66	1.75	1.69	1.69	–18.2	–0.3	3.9	3.2
GHG total with LULUCF	51.2	48.6	51.4	51.5	50.5	–1.4	–2.0	–	–
GHG total without LULUCF	52.4	50.9	51.3	51.2	52.2	–0.4	2.0	–	–

[a] The shares of sectors are calculated relative to GHG emissions without LULUCF; the negative values for the LULUCF sector indicate the share of GHG emissions which was offset by GHG removals through LULUCF.
Note 1: The changes in emissions and the shares by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.
Note 2: For the abbreviations used, see annex II.

B. Policies and measures

13. As required by the UNFCCC reporting guidelines, Switzerland has provided in its NC4 comprehensive information on its climate-related policies and measures adopted to implement commitments under the UNFCCC and its Kyoto Protocol. Detailed explanations and a summary table are provided, including a description of Switzerland's strategic long-term vision called the 2000-Watt Society Vision. Table 3 summarizes the major policies and measures described in the NC4.

Table 3. Summary information on policies and measures

Major policies and measures	Examples / comments
Framework policies and cross-sectoral measures	
Integrated climate programme	CO_2 Act, Federal Energy Act/SwissEnergy programme
Energy/electricity/emissions taxation	CO_2 Tax and Climate Cent
Emissions trading	Domestic emissions trading scheme (under discussion)
Other	Federal Act on the Protection of the Environment; 2000-Watt Society Vision
Energy sector	
Energy efficiency improvements	Voluntary agreements under the SwissEnergy programme
Transport	
Transport fuels	Climate Cent
Agreements/partnerships	Agreement on biogas introduction by gas distributors; voluntary agreements under the SwissEnergy programme on new car energy efficiency
Modal shift	The RAIL 2000 project, new rail link through the Alps (NRLA), Modal Shift Act, heavy vehicle fee (HVF)
Industry	
Pollution prevention and control	Ordinance on Air Pollution Control
Agreements/partnerships	Ordinance Relating to Environmentally Hazardous Substances; voluntary agreements under the SwissEnergy programme
Agriculture	Agriculture reform
Waste management	Technical Ordinance on Waste Disposal
Forestry	National Forest Programme, Parliament decision to choose forest management as an activity under Article 3, paragraph 4, of the Kyoto Protocol

Note: For the abbreviations used, see annex II.

1. Policy framework and cross-sectoral measures

14. The Swiss national inventory system (NIS) is developed and managed under the guidance of the Federal Department of Environment, Transport, Energy and Communications. The NIS is hosted by the Federal Office for the Environment, which is the national entity with overall responsibility for the GHG inventory. The Economics, Research and Environmental Observation Division of the Federal Office for the Environment has the mandate to design and establish the NIS in order to ensure full compliance with the reporting requirements of the UNFCCC and its Kyoto Protocol by the end of 2006. Formal

procedures for official consideration and approval of the inventory will be defined in the summer of 2006 by a government decision concerning the implementation of the Kyoto Protocol in Switzerland. Activities relating to the flexibility mechanisms under the Kyoto Protocol are coordinated by an interdepartmental working group.

15. The key components of the legal framework for Switzerland's policies and measures are the Federal Act on the Protection of the Environment and the Federal Act on the Reduction of CO_2 Emissions (the CO_2 Act), supported by the Federal Energy Act. The CO_2 Act, as the principal legal basis for compliance with the Kyoto Protocol target (an 8 per cent reduction in GHG emissions during the period 2008–2012 compared to the 1990 level), focuses on CO_2 from fossil fuel combustion. In addition to the overall target of a 10 per cent reduction in CO_2 emissions in 2010 compared to 1990, the CO_2 Act sets sub-targets, such as to reduce the emissions from heating/process fuels by 15 per cent and those from transport fuels by 8 per cent compared to the 1990 level. The CO_2 Act is flexible as it allows the sectoral targets to be met not only by domestic measures (including the CO_2 tax) but also by means of the Kyoto Protocol mechanisms. The Federal Energy Act provides a legal framework for federal energy policy and regulates the responsibilities of federal and cantonal governments (e.g., the federal government provides funds for cantons to promote energy efficiency improvements and renewable energies).

16. Switzerland's preferred approach to mitigating climate change is to utilize voluntary agreements as the core instrument. If such agreements are deemed ineffective, mandatory and/or tax measures are implemented. For the period 1990–2004, the effect of voluntary measures (4.2 Tg CO_2 per year) is estimated to surpass that from mandatory measures (3.0 Tg CO_2 per year). The tax rate is determined by the shortfall in meeting the sectoral targets, as projected by energy projection models, and will be approved by the Parliament. The revenues will be distributed to the population (per capita) and to companies (per employee, except for those companies that are exempt from the tax). Following political discussions, a CO_2 tax (CHF 35 per tonne CO_2) was to be levied, on process/heating fuels only, and this is expected to reduce emissions by 700 Gg CO_2 per year in the residential and industry sectors.

17. After the NC4 was submitted, a political debate on the need for the CO_2 tax in the light of high energy prices resulted in consideration of an alternative model linking the introduction of the tax to a predefined level of emissions. Specifically, setting the tax lower initially – at CHF 12 per tonne CO_2 from 2008 – and raising it gradually to CHF 36 per tonne CO_2 (if the emissions are above 85 per cent of the 1990 level) was considered instead of the flat tax rate of CHF 35 per tonne CO_2 which is specified in the NC4. Following a decision by the National Council in June 2006, the issue will be forwarded to the State Council, which will start discussions in the autumn of 2006. If the State Council decides that the tax should be introduced, it will open the way to a domestic emissions trading scheme by target-setting.

18. On the other hand, the "Climate Cent", which is a surcharge on importers of transport fuels for the period up to 2007, will be applied voluntarily by the Swiss Oil Association and supported by industry. It amounts to CHF 15/kl of fuel and the revenue is to be used by a private foundation for domestic climate mitigation projects and for clean development mechanism (CDM)/joint implementation (JI) projects. If this approach of using "Climate Cent" revenues for mitigation projects fails, and the target set for 2007 is not met, the CO_2 tax on petrol will be introduced instead.

19. The Federal Energy Act provides the legal basis for voluntary initiatives by the private sector. To support voluntary actions, the Energy Agency for the Economy (EAEc) has been established, engaging more than 50 industry experts, with the objective of covering 40 per cent of CO_2 emissions from industry. As part of purely voluntary actions envisaged by the CO_2 Act, a package of agreements has been signed by 45 groups (around 600 entities, notably including energy-intensive companies), accounting for 25 per cent of industry's CO_2 emissions, with a view to winning exemption from the CO_2 tax. Another 400 companies are in the process of negotiating agreements under the umbrella of the EAEc. In elaborating a voluntary agreement, companies are assisted by the EAEc, which ensures that the targets submitted are in conformity with the existing guidelines. The stringency of an agreement depends

on the measures already implemented, industry benchmarks, and the economic viability of further reduction measures (usually the payback period is less than five years). The targets submitted by companies via the EAEc are checked in a formal audit consisting of desk reviews and random on-site visits.

20. As soon as the CO_2 tax is introduced, such voluntary agreements will become legally binding commitments with a cap and a retroactive penalty in the event of non-compliance. The system, integrating voluntary agreements, the CO_2 tax and a cap-and-trade domestic emissions trading scheme, is expected to start in the period 2008–2012, with a link to the international flexibility mechanisms under the Kyoto Protocol. A standardized company-level monitoring system for CO_2 emissions is already operational. The use of allowances/credits from abroad is limited to 8 per cent of the emission reduction target of each company and has been introduced to reflect the principle of supplementarity.

2. Policies and measures in the energy sector

21. The energy sector is responsible for the bulk of GHG emissions in Switzerland (approximately 81 per cent of the national GHG total in 2003; see table 2) and these emissions have been fairly stable over the period 1990–2003. Within the energy sector, transport accounted for approximately 30 per cent of national GHG emissions in 2003, and the residential/commercial sectors for approximately 36 per cent, while manufacturing industries and construction contributed only 11 per cent and the energy industries only 3 per cent due to the carbon-free (mostly hydro- and nuclear) power supply system and characteristic industrial structure of Switzerland. This means that measures in the energy industries, such as the promotion of electricity from renewable sources or combined heat and power (CHP), would have little effect on GHG emissions, whereas measures in transport and the residential/commercial sectors may have considerable impact.

22. The SwissEnergy programme, as an operating programme under the Energy Act and the CO_2 Act, implements a package of many measures. Among them, support for the voluntary measures taken by the private sector to meet its voluntary commitments through the EAEc is a key element. In addition to voluntary measures, energy and building legislation calls for more comprehensive promotional and mandatory measures, including those on fuel consumption by motor vehicles. A labelling system has been introduced for energy efficiency for cars and household appliances, and a certification system has been developed for energy-efficient buildings, as well as the Energy City label for model cities.

23. Mitigation measures in the transport sector, which accounted for approximately 30 per cent of total GHG emissions in 2003 (see table 2), consist of those under the SwissEnergy programme and those within the framework of the transport policy. The former includes compulsory energy labels for new motor vehicles and a target which has been agreed with the Association of Swiss Automobile Importers. These measures reduced energy consumption by new motor vehicles by 6.9 per cent over the five years in 2000–2004. The measures in the transport policy framework encourage a shift in modes of transport. Railway infrastructure has been modernized (RAIL 2000) and passenger numbers have increased by 12 per cent as a result. In addition, a market-based incentive framework has been introduced (the Modal Shift Act) including, for example, a distance-related heavy vehicle fee (HVF) accompanied by an increase in the vehicle weight limit to the European average, which has increased the load factor of trucks. Moreover, spatial planning and the development of transport infrastructure are ongoing. A biogas purchase agreement by gas distributors allowing producers to feed into the natural gas grid is to account for at least 10 per cent of all gas sold as a motor fuel.

24. The ERT noted that the Swiss policy-making process takes time, appears somewhat inflexible and is not well adapted to a change of course. On the other hand, the "conditional" agreement approach may compensate for these drawbacks. The ERT felt that the emission reductions to be achieved through additional measures will be sufficient to meet the Kyoto Protocol target. A future challenge is to

integrate Switzerland's domestic emissions trading scheme with the European Union (EU) Emissions Trading Scheme (ETS), possibly by setting a prohibitive penalty level.

3. Policies and measures in other sectors

25. During the period from the base year (1990) to 2003, GHG emissions from the non-energy sectors[4] taken together decreased by 14 per cent, as a result of decreases in emissions from industrial processes (by 17 per cent or 0.5 Tg CO_2 equivalent) and agriculture (by 12 per cent or 0.7 Tg CO_2 equivalent).

26. ***Industrial processes***. From 1990 to 2003, GHG emissions from industrial processes decreased by approximately 17 per cent (see table 2). The declines in cement production (by 30 per cent) and in aluminium production (by 50 per cent) between 1990 and 2003 are the primary reasons for that decrease. The Amendment of the Ordinance Relating to Environmentally Hazardous Substances regulates synthetic GHG emissions (HFCs, PFCs, and SF_6, which are also termed "substances stable in the air"). The regulation is based on three main lines of action: (a) limiting the use of substances stable in the air to those applications where there is no preferable alternative; (b) when such substances are still used, reducing emissions as far as possible; and (c) the adoption of voluntary binding agreements developed by the industry (for SF_6 emissions from electricity distribution equipment).

27. ***Agriculture***. From 1990 to 2003, GHG emissions from agriculture decreased by approximately 12 per cent, mainly due to a decrease in CH_4 and N_2O emissions caused by a reduction in the cattle population and reduced input of mineral fertilizers (see table 2). Switzerland's agricultural policy has been fundamentally reformed in a three-stage process. The first stage was the decision by the Parliament to introduce non-product-related direct payments to compensate for public interest and environmental services. The second was the elimination of all state-guaranteed prices and markets. Any disbursement of direct payments is now conditional on the required standard of ecological performance. The third stage of the reform was the decision to abolish the milk quota in 2009. The implementation of the first two stages has led to a decrease in livestock populations, optimization of manure management, "greener" farming practices and a concomitant reduction in N_2O and CH_4 emissions. There is potential for the recovery of fuels from biomass (biofuels), which is estimated to reduce emissions by 0.25 Tg CO_2 per year by the end of the first commitment period (2012). The possible use of biofuels will be driven by changes in the general conditions for the use of biofuels at the national level. An amendment to legislation on mineral oil to exempt biofuels from taxation was submitted to the Parliament in April 2006.

28. ***Forestry***. In 2003, the net sink reported under the LULUCF sector was approximately 1.8 Tg CO_2 equivalent, corresponding to approximately 3.4 per cent of total national GHG emissions without LULUCF. One goal of the National Forest Programme is to prevent further increases in growing stock and to help to keep the forests in good condition. In 2004, the Swiss Parliament decided to choose forest management as an activity under Article 3, paragraph 4, of the Kyoto Protocol and also to enhance the sink capacity in Switzerland. The NC4 mentions that there is a certain discrepancy between this decision and the National Forest Programme, because preventing further increases in growing stock and promoting sustainable use of timber (including the substitution of fossil fuels) will not necessarily enhance the sink capacity of the forests.

29. ***Waste***. GHG emissions from the waste sector decreased by approximately 18 per cent from 1990 to 2003, mainly due to a decrease in CH_4 emissions from solid waste disposal on land (see table 2). Since 1991, under the technical Ordinance on Waste Management, waste of all kinds has to be treated in an environmentally sound manner. Since 2000, there has been a legal requirement that non-recycled combustible waste should be incinerated rather than disposed of at landfill sites. Since January 2001,

[4] This includes industrial processes, agriculture, solvent and other product use, and waste, with the following shares in total GHG emissions in 2003: 5.1 per cent; 10.3 per cent; 0.2 per cent; and 3.2 per cent, respectively.

waste disposal at landfill sites in Switzerland has been taxed at a rate of CHF 15–20 per tonne (CHF 50 per tonne if the waste is exported). Incinerator plants have to be operated such that the heat produced by incineration is reused. Consequently, 40 per cent of the energy generated at waste incineration plants is currently used for district heating and electricity production.

C. Projections and the total effect of policies and measures

1. Projections

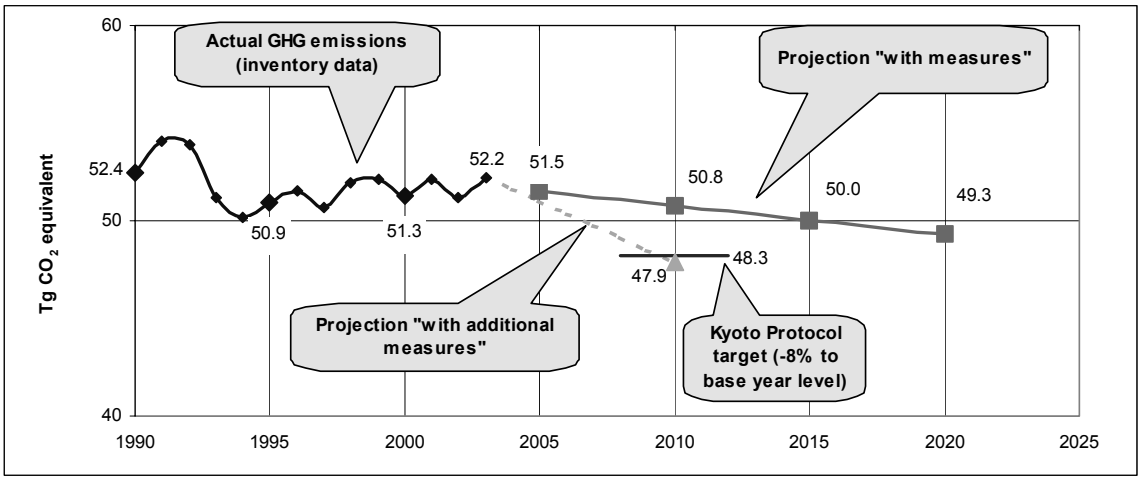
30. In its NC4, Switzerland has provided GHG projections for one scenario – a "reference" or "with measures" scenario, which is presented in five-year intervals for the period 2005–2020. The projections are presented relative to actual inventory data for the years 1990–2003. They are disaggregated by sector (for energy, transport, industry, agriculture, waste, and solvents and other product use) and by gas (for CO_2, CH_4, N_2O, PFCs, HFCs and SF_6). The projections are also presented as GHG totals, using the corresponding global warming potential (GWP) values, for each sector as well as for a national total. A complete "with additional measures" scenario is not provided in the NC4, but the potential effects of additional measures in 2010 are estimated.[5] Table 4 and figure 1 present summary information on the GHG projections provided by Switzerland in its NC4.

Table 4. Summary of greenhouse gas emission projections for Switzerland

	GHG emissions (Tg CO_2 equivalent per year)	Changes compared to base year level (%)
Inventory data 1990[a]	52.4	not applicable
Inventory data 2003[a]	52.2	–0.4
Kyoto Protocol base year[b]	52.4	not applicable
Kyoto Protocol target[c]	48.3	–8
"With measures" projection for 2010	50.8	–3.2

[a] *Source*: Switzerland's 2005 GHG inventory submission.
[b] *Source*: Switzerland's NC4.
Note 1: The GHG projections shown in the table are without LULUCF.
Note 2: For the abbreviations used, see annex II.

Figure 1. Greenhouse gas emission projections for Switzerland



Note 1: The GHG projections shown in the figure are without LULUCF.
Note 2: The projection "with additional measures" is estimated based on the information given in table 5-16 of the NC4.

31. The assumptions used in preparing the GHG projections are presented clearly and transparently in the NC4. The methodology is described, and references to additional methodological information are

[5] According to the information provided by Switzerland during the review, national GHG projections are under revision; the revised projections are expected to be available by the end of 2006.

included. A sensitivity analysis has been carried out for GHG emissions in 2010 under the "with measures" scenario. It indicates a margin of approximately ±2.1 Tg CO_2 equivalent for annual emissions (±4 per cent), or 0.4–0.6 Tg CO_2 equivalent, as a possible Kyoto Protocol target shortfall.

32. Table 4 and figure 1 show that total GHG emissions in 2010 (without LULUCF) under the "with measures" scenario are projected to exceed Switzerland's Kyoto Protocol target by approximately 2.5 Tg CO_2 equivalent. The implementation of additional measures, which includes the use of flexibility mechanisms under the Kyoto Protocol, would bring Switzerland in compliance with the target (see also section C.2 below).

2. Total effect of policies and measures

33. In its NC4, Switzerland has presented estimates for the potential effect of additional measures in 2010 (see table 5). As a result of the implementation of these measures, Switzerland is expected to comply with its Kyoto Protocol target, with a margin of approximately 0.4 Tg CO_2 equivalent.

Table 5. Total effect of additional policies and measures

	Reduction potential in 2010 (Tg CO_2 eq)
Incentive CO_2 tax on heating and process fuels	0.7
Climate Cent – domestic projects	0.2
Bonus/penalty system and preferential treatment of alternative fuels	0.4
Total effect of additional domestic measures	**1.3**
Climate Cent – international projects[a]	**1.6**
Total effect of additional policies and measures	**2.9**

[a] Use of the flexibility mechanisms of the Kyoto Protocol is implied by this measure.
Note 1: The total effect of policies and measures is presented in table 5-16 of the NC4.
Note 2: For the abbreviations used, see annex II.

34. The ERT encourages Switzerland to develop complete "with additional measures" and "without measures" scenarios and to include them in its next national communication to make it easier to estimate the total effects of policies and measures.

D. Vulnerability assessment, climate change impacts and adaptation measures

35. In its NC4, Switzerland has provided information on the expected impacts of climate change in the country, as required by the UNFCCC reporting guidelines. Switzerland expects that the average annual temperature will rise by 1–5º C in summer and 1–3º C in winter by 2050, and precipitation will increase by 5–25 per cent in winter and decrease by 5–40 per cent in summer by 2050. This would result in a decrease in snowfall and in the duration of snow cover, in a loss of approximately 25 per cent of glacier volume compared to the mid-1970s, and in increases in the intensity of the hydrological cycle, flooding, mud/landslides, rock falls and the incidence of vector-borne and water-borne diseases.

36. Switzerland identifies the following as being vulnerable to climate change: ecosystems, including forests (freshwater and mountain ecosystems); hydropower; agriculture; tourism; infrastructure and insurance business; and financial services. The NC4 outlines the action on adaptation taken by Switzerland. Table 6 summarizes the information on vulnerability and adaptation to climate change provided in the NC4.

37. Switzerland has a strategy in place, developed by the National Platform for Natural Hazards (PLANAT), consisting of six main elements: an integrated approach to disaster mitigation; hazards, vulnerabilities and risk assessment; disaster reduction mechanisms (prevention, response and recovery); joint action; sustainability of efforts; and solidarity. Switzerland's media provide weather hazard warnings on storms, heavy rain and heat waves.

38. As indicated in table 6, Switzerland has identified health as being vulnerable to climate change, but adaptation measures are not discussed in the NC4. Switzerland may wish to include such measures in its future national communications.

Table 6. Summary information on vulnerability and adaptation to climate change

Vulnerable area	Examples / comments / adaptation measures reported
Hydrological cycle and water management	***Vulnerability***: impacts on the cryosphere (snow glaciers permafrost) and the hydrological cycle ***Adaptation***: integrated river basin management; implementation of a flood protection strategy
Hydropower	***Vulnerability***: impacts on the cryosphere (snow glaciers permafrost) and the hydrological cycle ***Adaptation***: increase in lake-bottom cleaning; management of reservoirs (rinsing measures)
Ecosystems (including forests)	***Vulnerability***: plant and animal communities living at their ecological limits; high alpine plants in mountain ecosystems; aquatic plants and animals in freshwater ecosystems; forests in general and forestry services ***Adaptation***: addressing ecological imperatives through forestry (limiting clear-cutting, regenerating and ensuring sustainability); maintaining the vitality of forests (combating pests and parasites, damage repair); conservation of genetic resources (establishment of registries, gene conservation and seed orchards)
Agriculture	***Vulnerability***: changes in crop productivity; increase in the length of the growing season; increased frequency of droughts ***Adaptation***: selection of alternative crops; selection of cultivars; shifts in sowing dates; extension of irrigation
Tourism	***Vulnerability***: impact on winter tourism; extreme weather events ***Adaptation***: installation of snow-making equipment; moving ski stations to higher altitudes; diversification of the type and seasonal activities offered
Health	***Vulnerability***: more frequent extreme weather events; expansion of vector-borne and water-borne diseases
Infrastructure	***Vulnerability***: river valley erosion; impacts on villages, settlements and infrastructure (roads, railways, bridges) ***Adaptation***: integrated river basin management; implementation of a flood protection strategy, measures under the Hydraulic Engineering Act and the Forestry Act
Insurance	***Vulnerability***: increase in insured weather-related losses; impacts on project finance, real-estate finance, corporate banking, asset management and corporate finance services ***Adaptation***: development of catastrophe bonds and other capital market products; provision of incentives for behavioural changes (deployment of risk-adequate rates and insurance conditions); regulatory measures to reduce risks (changes in building and fire codes); CO_2 emissions trading (insurance and financial products)

E. Financial resources and transfer of technologies

1. Financial resources

39. In its NC4, Switzerland has provided the required information on measures relating to financial resources provided under the UNFCCC and its Kyoto Protocol. It has provided detailed information on the assistance it gives to developing country Parties in the areas of food security, natural resource management and local livelihoods. Furthermore, Switzerland has provided information on all financial resources related to the implementation of the Convention provided through bilateral, regional and other multilateral channels. This information is summarized in table 7.

Table 7. Summary information on financial resources

ODA	CHF 6.4 billion for the period 2000–2003
Climate-related aid in bilateral ODA	CHF 26.3 million for the period 2001–2004 (from the Swiss Global Environmental Programme)
Climate-related support programmes	The Swiss Global Environmental Programme (supports programmes in the areas of food security, natural resources management and local livelihoods), and the Climate Investment Partnership
Contributions to GEF (CHF million)	2001, 16.25; 2002, 16.25; 2003, 24.75; 2004, 24.75
Pledge for third GEF replenishment	USD 58.25 million
Activities implemented jointly (AIJ)	Swiss AIJ Pilot Programme (SWAPP); SWAPP Secretariat was launched in 1997; joint programme with the World Bank on financing 13 national CDM/JI strategies
JI and CDM under the Kyoto Protocol	Rehabilitation of a district heating network in Romania; capacity-building activities, networking, information support; membership in the CDM Executive Board

Note: For the abbreviations used, see annex II.

40. Although the NC4 does not give Switzerland's definition of "new and additional" resources, in the course of the review Switzerland clarified that it considers the contributions to the Global Environment Facility (GEF) and the contributions to new funds under the UNFCCC and its Kyoto Protocol as additional resources. The ERT recommends that Switzerland include an explicit definition of "new and additional" financial resources in its future national communications.

41. Switzerland's bilateral assistance generally aims to improve sustainability and reduce poverty. Specific target areas of assistance are emission reduction programmes for the transport sector (e.g., in Central America, Peru and Indonesia), energy (e.g., in India and Vietnam), soil protection, forest (West Africa) and watershed management, and cleaner production. The priority area of cooperation with Central and Eastern Europe and the countries of the Commonwealth of Independent States is energy. Bilateral financial cooperation is based on two instruments: grants and credit guarantees. Adaptation strategies and reducing the vulnerability to climate change of people engaged in occupations that yield only poor livelihoods are also priority areas for Swiss financial assistance.

2. Transfer of technology

42. In its NC4, Switzerland has provided details of measures related to the promotion, facilitation and financing of the transfer of environmentally sound technologies, and distinguishes clearly between activities undertaken by the public sector and those undertaken by the private sector. It has also reported activities related to technology transfer, including success stories and its activities in financing access by developing countries to "hard" or "soft" environmentally sound technologies (table 7-1 of the NC4).

43. Switzerland supports incentives for technology transfer in many areas: industry, infrastructure, capacity-building, health, and the development of administrative institutions. Switzerland also supports programmes relating to energy efficiency in transport, and in small and medium-sized enterprises. A comprehensive programme for the establishment of cleaner production centres has been set up. The aim of the centres is to offer private companies and the public sector a wide range of services including demonstration projects, capacity-building and workshops.

F. Research and systematic observation

44. Switzerland has provided information on its actions relating to research and systematic observation, and addressed both domestic and international activities, including the World Climate Programme, the International Geosphere–Biosphere Programme (IGBP), the Global Climate Observing System (GCOS), and the Intergovernmental Panel on Climate Change (IPCC). Switzerland reports three broad categories of research activities: climate and global change research; energy research; and transport research.

45. Switzerland contributes to international activities, including the IGBP and the UNFCCC, supporting, for example, the Special Climate Change Fund and the Least Developed Country Fund. The NC4 demonstrates action taken to support capacity-building in developing countries.

46. Swiss research is mainly funded by the National Science Foundation (140 projects in 2004), by the EU (about 100 projects in 2004) and COST[6] (about 50 projects in 2004). Two National Centres of Competence in Research (NCCRs) place special emphasis on climate change: the NCCR Climate and the NCCR North–South, which focus on international research and cooperation.

47. Switzerland has reported on systematic observations, in particular on its meteorological, atmospheric and terrestrial observation programmes, and on the national activities relating to the GCOS. A Swiss GCOS office has been established at the Federal Office for Meteorology and Climatology to coordinate the climate observation activities of federal agencies, universities and research institutes.

[6] COST is the abbreviation for European Cooperation in the Area of Scientific and Technical Research (a research programme of the EU).

G. Education, training and public awareness

48. Switzerland has provided information on the actions taken by federal, state and local authorities, and by the private sector, relating to education, training and public awareness of climate change. Public awareness of climate change in Switzerland is high. There are many different websites, magazines, publications, educational materials, brochures and leaflets, and special events in the context of various climate change aspects. A good example of a web-based tool is the ECO_2 calculator, which helps people assess their energy consumption and CO_2 emissions.

III. Evaluation of information contained in the report demonstrating progress and of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

A. Information contained in the report demonstrating progress

49. Switzerland's RDP includes four chapters that contain the information required by decisions 22/CP.7 and 25/CP.8. The ERT found the information contained in the RDP to be consistent with that provided in the NC4.

50. Switzerland's CO_2 emissions were relatively stable between 1990 and 2003, thanks to policies and measures influencing GHG emissions and to relatively weak economic growth in the 1990s. The ERT noted that total energy consumption increased by 11 per cent from 1990 to 2003. CH_4 emissions in 2003 were 18 per cent lower than in 1990, mostly because of changes in the agriculture sector (reduction in the number of cattle), industrial emissions and emissions from waste (due to the policy-driven decrease in waste disposal at landfills). N_2O emissions in 2003 were 8 per cent lower than in 1990, which reflects the net result of a reduction in the number of cattle (and thus decreased emissions from manure management) and increased emissions in the transport and waste sectors. Emissions of HFCs have increased substantially since 1990 and are projected to continue to increase.

51. Under the Kyoto Protocol, Switzerland's GHG emission reduction target is 8 per cent relative to the base year (1990) level. It is projected that under the current policy Swiss GHG emissions will be approximately 2.5 Tg CO_2 equivalent above the Kyoto Protocol target in 2010. Switzerland plans to close the gap by additional measures which are expected to provide reductions of 2.9 Tg CO_2 equivalent per year in total, consisting of domestic measures (1.3 Tg) and international projects (1.6 Tg) funded through the revenues from the Climate Cent. The domestic measures are (a) the CO_2 tax (0.7 Tg CO_2 equivalent in 2010), (b) domestic projects using Climate Cent revenue (0.2 Tg CO_2 equivalent in 2010), and (c) alternative fuel measures (0.4 Tg CO_2 equivalent in 2010). Currently, however, no budgetary allocation for investments in CDM or JI projects has been made. In case the shortfall after domestic measures is larger than the 1.6 Tg CO_2 equivalent per year (which are expected to be compensated by emission credits from international projects), Switzerland mentions two options: intensification of the use of the flexible mechanisms under the Kyoto Protocol (buying more emission reduction certificates); and the use of forest management under Article 3, paragraph 4, of the Kyoto Protocol (the annual cap for Switzerland on forest management activities, in the first commitment period, is 1.8 Tg CO_2 per year). On the other hand, if the target shortfall is less than expected, Switzerland envisages either selling emission reduction rights or carrying-over the reductions to the next commitment period.

52. The ERT noted that the sensitivity analysis for the 2010 projection shows that the Kyoto Protocol shortfall could range between 0.4 and 4.6 Tg CO_2 equivalent. Acquisition of emission reduction certificates through the flexibility mechanisms of the Kyoto Protocol may be a comparatively easy and quick option to compensate for the shortfall if the gap turns out to be larger than foreseen. On the other hand, the ERT understood that, if by 2007 the effect of voluntary measures is not satisfactory, the Climate Cent (which is the primary source of funds for purchasing emission reductions) will be replaced

by a CO_2 tax, which will not contribute to the funds for acquisition of emission reduction certificates. The ERT felt that it might be useful to consider measures to hedge against this risk of underfunding.

B. Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

53. Switzerland has provided most of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol in its NC4 and RDP. This information reflects the steps taken by Switzerland to implement the relevant provisions of the Kyoto Protocol. The supplementary information is placed in different sections of the NC4 and RDP. Table 8 provides references to the RDP and NC4 chapters in which supplementary information is provided.

Table 8. Overview on supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

Supplementary information	Reference
National system in accordance with Article 5, paragraph 1	NC4, pp. 68–74; RDP, pp. 30–31
Supplementarity relating to the mechanisms pursuant to articles 6, 12 and 17	NC4, p.131; RDP, pp. 9, 11, 16, 27, 28, 34
Policies and measures in accordance with Article 2	RDP, pp. 36–40
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	RDP, pp. 30–34
Information under Article 10	RDP, pp. 30–47
Financial resources	RDP, pp. 48–52

Note: For the abbreviations used, see annex II.

54. In the RDP, Switzerland has provided detailed information on measures that have already been implemented (a total of 15) and on measures adopted or planned (a total of nine). Information on the Swiss NIS, including the institutional setting for the inventory preparation process, is also provided, indicating that the design and establishment of the Swiss NIS should be completed by the end of 2006 in order to ensure full compliance with the reporting requirements of the UNFCCC.

55. Switzerland describes comprehensively its efforts in the areas of technology transfer and capacity-building, particularly the transfer of environmentally sound technologies through the cleaner production centres that have been established. Switzerland recognizes that technology transfer is an important element for economic development and poverty alleviation in developing countries and works on the basis of certain principles to ensure the full strength of this instrument. The principles include building up knowledge-based skills and capacities; supporting technology adaptation and "ownership"; and facilitating informed decisions and choices.

56. The financial resources allocated by Switzerland are multifold – from the GEF and multilateral institutions to multilateral scientific, technological and educational programmes – totalling more than CHF 350 million in the year 2004. Bilateral assistance amounted to more than CHF 9 million in the same year.

57. Switzerland has not reported the following elements of the additional information required under Article 7, paragraph 2, of the Kyoto Protocol: (a) a description of the national registry; and (b) information on the efforts Switzerland is making to implement policies and measures to minimize adverse effects, including effects of climate change, effects on international trade, and social, environmental and economic impacts on other Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention. The ERT recommends that Switzerland include these reporting elements in its next national communication.

IV. Conclusions and recommendations

58. During the period 1990–2003, GHG emissions in Switzerland fluctuated without a distinct trend upwards or downwards, and total emissions (without LULUCF) in 2003 were approximately 0.4 per cent

below the 1990 level (1.4 per cent with LULUCF). Over the same period, GDP increased by approximately 12 per cent. The energy sector accounts for the largest part of national emissions (approximately 81 per cent in 2003). Energy-related emissions have been stable, whereas emissions from industrial processes, agriculture and waste decreased between 1990 and 2003.

59. Under the Kyoto Protocol, Switzerland committed itself to reducing its GHG emissions by 8 per cent compared to the base year (1990) level during the first commitment period (2008–2012). GHG projections indicate that without additional measures GHG emissions in 2010 will amount to approximately 50.8 Tg CO_2 equivalent per year during that period, or 2.5 Tg CO_2 equivalent above the Kyoto Protocol target. The implementation of additional measures, which include the use of the flexibility mechanisms of the Kyoto Protocol, would bring Switzerland into compliance with the target. The additional measures are expected to provide reductions of 2.9 Tg CO_2 equivalent per year in total, and consist of domestic measures (1.3 Tg) and international projects (1.6 Tg), and would be funded through the revenues from the Climate Cent. The domestic measures are (a) the CO_2 tax (0.7 Tg per year), (b) domestic projects by using the Climate Cent revenue (0.2 Tg), and (c) alternative fuel measures (0.4 Tg).

60. During the course of the IDR, the ERT formulated a number of recommendations to Switzerland relating to the completeness and transparency of its reporting under the UNFCCC and its Kyoto Protocol. The key recommendations[7] are that Switzerland:

- Include, in its next national communication, an explicit definition of "new and additional" financial resources;

- Include the following elements of the additional information under Article 7, paragraph 2, of the Kyoto Protocol in its next national communication: (a) a description of the national registry; and (b) information on what efforts Switzerland is making to implement policies and measures to minimize adverse effects, including effects of climate change, effects on international trade, and social, environmental and economic impacts on other Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention.

61. The ERT also encourages Switzerland to develop complete "with additional measures" and "without measures" scenarios and include these in its next national communication in order to make it easier for the ERT to estimate the total effects of policies and measures.

[7] For a complete list of recommendations, the relevant sections of this report should be consulted.

Annex I

Documents and information used during the review

A. Reference documents

UNFCCC. Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications. FCCC/CP/1999/7. Available at <http://unfccc.int/resource/docs/cop5/07.pdf>.

UNFCCC. Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. Decision 15/CMP.1. FCCC/KP/CMP/2005/8/Add.2. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

UNFCCC. Guidelines for review under Article 8 of the Kyoto Protocol. Decision 22/CMP.1. FCCC/KP/CMP/2005/8/Add.3. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

UNFCCC. Report on the in-depth review of the third national communication of Switzerland. FCCC/IDR.3/CHE. Available at <http://unfccc.int/resource/docs/idr/che03.pdf>.

UNFCCC. Synthesis of reports demonstrating progress in accordance with Article 3, paragraph 2, of the Kyoto Protocol. FCCC/SBI/2006/INF.2. Available at <http://unfccc.int/resource/docs/2006/sbi/eng/inf02.pdf>.

UNFCCC. Report of the individual review of the greenhouse gas inventory of Switzerland submitted in 2005. FCCC/ARR/2005/CHE. Available at <http://unfccc.int/resource/docs/2006/arr/che.pdf>.

Federal Office for the Environment. Switzerland's Fourth National Communication under the UNFCCC. Available at <http://unfccc.int/resource/docs/natc/swinc4.pdf>.

Federal Office for the Environment. Switzerland's report on demonstrable progress. Available at <http://unfccc.int/resource/docs/dpr/swi1.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Markus Nauser, Federal Department of Environment, Transport, Energy and Communications; Climate Unit, Federal Office for the Environment.

Annex II

Acronyms and abbreviations

AIJ	activities implemented jointly
CDM	clean development mechanism
CH_4	methane
CHF	Swiss franc
CHP	combined heat and power
COST	European cooperation in the area of scientific and technical research
CO_2 eq	carbon dioxide equivalent
CO_2	carbon dioxide
CRF	common reporting format
EAEc	Energy Agency for the Economy
EC	European Community
EIT	economy in transition
ERT	expert review team
ET	emissions trading
ETS	emissions trading scheme
EU	European Union
F-gas	fluorinated gas
GCOS	Global Climate Observing System
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
GWP	global warming potential
HFCs	hydrofluorocarbons
HVF	heavy vehicle fee
IDR	in-depth review
IEA	International Energy Agency
IGBP	International Geosphere–Biosphere Programme
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1 thousand grams)
kgoe	kilograms of oil equivalent
kl	kilolitre (1 kl = 1000 litres)
JI	joint implementation
LULUCF	land use, land-use change and forestry
Mg	megagram (1 Mg = 1 tonne)
Mtoe	millions of tonnes of oil equivalent
N_2O	nitrous oxide
NC4	fourth national communication
NCCR	National Centre of Competence in Research
NIR	national inventory report
NIS	National Inventory System
NRLA	New Rail Link through the Alps
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PFCs	perfluorocarbons
PPP	purchasing power parities
R&D	research and development
RDP	Report demonstrating progress under the Kyoto Protocol
SF_6	sulphur hexafluoride
SWAPP	Swiss AIJ Pilot Programme
Tg	teragram (1 Tg = 1 million tonnes)
TPES	total primary energy supply
UNFCCC	United Nations Framework Convention on Climate Change
USD	US dollar
WCP	World Climate Programme
WCRP	World Climate Research Programme

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