



**UNITED  
NATIONS**

---



**Framework Convention  
on Climate Change**

Distr.  
**RESTRICTED**

FCCC/IDR.2/CHE  
6 May 1999

**ENGLISH ONLY**

---

## **SWITZERLAND**

Report on the in-depth review of the second national communication of Switzerland

Review team:

Cesar Pizarro (Peru)

Eugenia Kupcinskiene (Lithuania)

Manfred Ritter (Austria)

June Budhooram, UNFCCC secretariat, coordinator

Tina Dallman, UNFCCC secretariat, coordinator

GE.99

## I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

1. Switzerland ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 10 December 1993. Its first national communication (NC1) under the UNFCCC was received by the secretariat on 21 September 1994. It submitted the second national communication (NC2) on 21 April 1997.

2. The in-depth review of the NC2 was carried out from January to May 1998 and included a country visit by the review team to Bern from 10 to 13 March 1998. The team included Mr. Cesar Pizarro (Peru), Ms. Eugenia Kupcinskiene (Lithuania), Mr. Manfred Ritter (Austria), and Ms. June Budhooram and Ms. Tina Dallman, UNFCCC secretariat, coordinators. The Swiss Agency for the Environment, Forests and Landscape (SAEFL) assisted the secretariat in making the necessary arrangements for the review. The SAEFL and other government agencies provided the review team with updated and additional information, both during and after the visit, for added transparency on a number of key issues covered by the NC2. During the visit, the team met with federal government officials involved in the preparation of the NC2, academics and representatives from non-governmental organizations. Business and environmental non-governmental organizations were well represented and provided insight on issues raised by the review team.

3. The principles of the Swiss environment policy are laid down in a law relating to the protection of the environment (EPL) dated 7 October 1983. An amendment to this law made by the federal parliament in December 1995 entered into force on 1 July 1997. Among the amendment's most important changes, aimed at reducing carbon dioxide (CO<sub>2</sub>) emissions, is the introduction of economic instruments to supplement the regulatory approach which has traditionally been the focus of environmental law.

4. The Swiss national climate change programme described in the NC2 dates back to 1990. At the Second World Climate Conference, held in Geneva, Switzerland in 1990, Switzerland adopted a target of stabilizing its gross CO<sub>2</sub> emissions by 2000 at their 1990 levels and reducing them thereafter. New measures are in preparation, aimed at obtaining further reductions in greenhouse gas (GHG) emissions after 2000. This is reflected in the draft federal law on the reduction of CO<sub>2</sub> emissions dated 17 March 1997. In this draft law, the Federal Council proposes a new target to reduce CO<sub>2</sub> emissions by 10 per cent by 2010 compared to 1990 levels.

5. Climate change abatement policies and measures are derived from several articles of the Constitution. An important basis for their implementation is federal and cantonal legislation on energy and environmental protection. To a large extent, GHG mitigation policies were formulated on a sectoral basis through the Energy 2000 programme. This programme, which is composed of voluntary initiatives, regulatory measures and the provision of information, was adopted in 1990 in response to a referendum which gave the federal Government constitutional authority to pursue specific energy objectives. However, responsibility for the implementation of energy measures remains to a large extent with Switzerland's cantons.

6. On 1 January 1997, the Advisory Body on Questions relating to Climate and Climate Change was formed under the auspices of the Swiss Academy of Science. It is functioning as an advisory body of the Federal Department of the Interior as well as the Federal Department of Environment, Transport, Energy and Communications on climate change research and policy.

7. Swiss experts were optimistic that the Government would meet its stabilization target. Total gross CO<sub>2</sub> emissions were slightly above or below 1990 levels between 1991 and 1995. Emissions data for 1996 and preliminary data for 1997 confirm this trend. Based on the yearly ex-post analyses of the Energy 2000 programme, the incremental development of emission levels mainly reflects the effects of measures, the development of the economy and the population, as well as climate variability. In 1995 total gross CO<sub>2</sub> emissions were 2 per cent below the 1990 level, having fallen from 45,070 Gg in 1990 to 44,170 Gg in 1995. Beyond the year 2000 the team was doubtful as to whether a substantial decrease from current trends could be achieved unless measures such as the proposed CO<sub>2</sub> law are implemented. Real GDP has been stagnant since 1991. Switzerland, like some other European countries, is facing an increasing level of unemployment (6 per cent of the labour force in 1997 compared with 0.6 per cent in 1990) and a growing deficit in the national budget. In its projections for the development of the economy, the Government expects some improvement in GDP with average yearly real growth ranging between 1.3 and 2.1 per cent from 1995 to 2010.

8. The Swiss gas industry intends to increase the share of natural gas in total primary energy consumption to over 20 per cent by 2010. Increased use of gas may, depending on the technology, have implications on emissions levels. Electricity is at present almost entirely hydro or nuclear in origin (61 per cent and 37 per cent of installed generating capacity, respectively). To achieve the national CO<sub>2</sub> target, additional measures in the field of energy efficiency and the promotion of renewable energies in particular may be required to reduce emissions after 2000, especially taking into account the fact that the present nuclear capacity will be technically obsolete (after 40 years of service) and phased out after 2010.

9. Another important consideration is the fact that although not a member of the European Union (EU), Switzerland is considering the liberalization of the electricity sector. In 1995 a special commission was established to evaluate the impacts of liberalization. In its report, the commission recommended the gradual implementation of third-party access to the grid, unbundling of generation, transmission and distribution lines, and privatization of state-owned companies. A bill was drafted in 1997 which advocates a gradual approach to opening the Swiss electricity market, by which it would become completely liberalized nine years after the law enters into force. The law, which is still under consideration by the Government, also contains companion measures that would give preferential treatment to electricity generated from renewable energy sources, including hydropower.

10. The team was informed that only rough estimates are possible of the effects of the liberalization of the electricity market. Thus, these effects are not taken into account in the long-term energy outlooks. The cantons and municipalities currently own more than 75 per cent of Swiss electricity production and distribution utilities/networks; the rest is privately owned. At

the moment, utilities have monopolies in exclusive supply areas. Energy prices are set by the cantons and municipalities, and prices vary considerably from place to place. This situation may change with liberalization.

11. Switzerland's laws are based on its federal Constitution, which gives the cantons considerable authority and legal responsibilities, traditionally including energy issues. An interesting feature of the political system is that voters legislate directly by referendum. They have so far authorized the federal Government to carry out a national energy policy in pursuit of specific goals, such as energy efficiency and the development of renewables. The Swiss population also adopted a moratorium on licensing new nuclear power plants until 2000, but rejected the phase-out of nuclear power.

12. Switzerland was the first Annex I Party to sign the Kyoto Protocol to the Convention on 16 March 1998. This is a clear indication that it is ready to undertake legally binding greenhouse gas reduction targets for the post-2000 period. The fact that the Government has exercised its constitutional powers and submitted legally binding targets to the parliament, in the form of a draft CO<sub>2</sub> law with a subsidiary CO<sub>2</sub> tax and other regulatory measures with a view to backing up the soft targets and voluntary agreements, may result in some future reduction of GHG emissions.

## II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

13. The inventory data presented in the second national communication of Switzerland were compiled by the SAEFL. The NC2 contains the inventory for 1995 as well as the updated inventories for 1990-1994 of anthropogenic emissions for the three major greenhouse gases: CO<sub>2</sub>, methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), and the precursor gases: nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and non-methane volatile organic compounds (NMVOCs) and sulphur oxides. Estimates of CO<sub>2</sub> removals were reported separately. The team was informed that available data on hydrofluorocarbon (HFC), perfluorocarbon (PFC), and sulphur hexafluoride (SF<sub>6</sub>) emissions were considered too preliminary to be integrated into the total GHG emissions for 1995.

14. Switzerland has utilized the CORINAIR methodology to develop its GHG inventories and has presented this information in the standard data table format of the Intergovernmental Panel on Climate Change (IPCC). In general, emissions of GHGs were calculated using the CORINAIR methodology and then converted to the IPCC 1995 reporting framework using a combination of national and default emission factors. The 1996 IPCC guidelines were used only for calculating N<sub>2</sub>O and CH<sub>4</sub> emissions from the agricultural sector. The review team was of the opinion that, in general, the information provided by Switzerland in the NC2, as well as in supplementary documentation presented during the review week, was of good quality, transparent and consistent, and sufficient to allow a third party to reconstruct the national GHG inventory.

15. There have been many improvements in inventory data since the preparation of the first national communication. The most noteworthy of these include:

(a) The application of a new system for estimating CH<sub>4</sub> and N<sub>2</sub>O emissions from the agriculture sector, although uncertainty still remains medium for CH<sub>4</sub> and high for N<sub>2</sub>O;

(b) The improved completeness, level of detail and transparency compared with the NC1. Energy consumption data are consistent with the national energy statistics except for data on coal and wood consumption;

(c) The agricultural data in the 1995 inventory were brought more in line with the IPCC guidelines by reporting three-year average values.

16. As energy statistics will form one basis for monitoring the effectiveness of the proposed CO<sub>2</sub> law, the Federal Office of Statistics, in cooperation with the Federal Office of Energy will be conducting a survey of energy consumption in all industries from 1999 to 2000. Following this, the Swiss experts expect that overall data on energy will be further improved. With the application of new methodologies for the determination of CH<sub>4</sub> and N<sub>2</sub>O emissions from agriculture and the application of measured emission factors for some activities, a comparison of the emissions of GHG and precursor gases for 1990 contained in the first and second national communications, reveals marked differences as shown in table 1. The most notable are CO emissions, the estimate of which increased by 64 per cent due to a new traffic model as well as improved data completeness. The estimate of N<sub>2</sub>O emissions was reduced by 24 per cent as a result of using the phase II methodology of the IPCC 1996 Guidelines.

17. In terms of 1995 global warming potentials (GWP), aggregate Swiss greenhouse gas emissions for 1995 were reported at 52,800 Gg of CO<sub>2</sub> equivalent. If removals by sinks are included, this amount falls to 47,700 Gg. CO<sub>2</sub> accounted for 84 per cent of the total, CH<sub>4</sub> for 9 per cent and N<sub>2</sub>O for 7 per cent. The "new gases" HFCs, PFCs and SF<sub>6</sub> are not accounted for in these figures, since available data were considered too preliminary.

#### **A. Carbon dioxide**

18. In the NC2, gross CO<sub>2</sub> emissions in 1995 are estimated at 44,170 Gg, a value slightly below its 1990 estimates. Table 2 shows that in 1995, 73 per cent of these emissions (14,580 Gg) originated in the transport and small-scale combustion sectors, 18 per cent in industry, and 9 per cent in other categories. International aviation bunkers were reported separately and amounted to 2,400 Gg. Data on CO<sub>2</sub> emissions are reported with a high degree of reliability as uncertainty is estimated at ± five per cent, with the exception of the land-use change and forestry category, where the uncertainty level is estimated at ± 20 per cent.

Table 1. Comparison of estimates of 1990 emissions between the NC1 and NC2 (Gg)

Gases	First national communication	Second national communication	Variation %
CO <sub>2</sub>	45 700	45 070	-1.3
CH <sub>4</sub>	274	244	-10.9
N <sub>2</sub> O	15.2	11.5	-24.3
NO <sub>x</sub>	184	163	-11.4
CO	430	707	64.4
NMVOG	297	281	-5.4

Note: N<sub>2</sub>O estimates have been revised in the NC2 as a result of using the Phase II Methodology of the IPCC 1996 Guidelines.

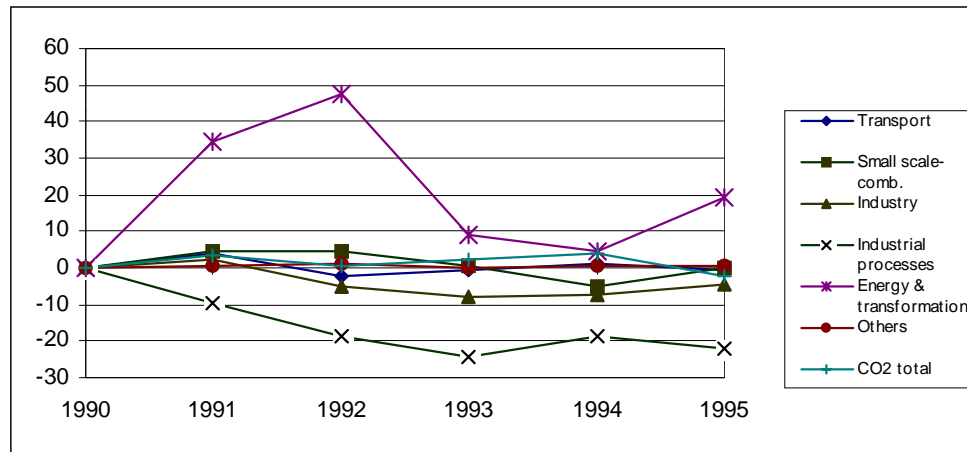
Table 2. Carbon dioxide emissions by source, 1990-1995 (Gg)

	1990	1991	1992	1993	1994	1995
Transport	14 668	15 238	14 641	14 623	14 865	14 580
Small-scale combustion	18 320	19 190	19 120	18 430	17 370	18 290
Industry	5 406	5 523	5 137	4 964	5 007	5 170
Industrial processes*	3 360	3 030	2 740	2 550	2 730	2 620
Energy and transformation	963	1 297	1 420	1 051	1 006	1 150
Others	2 353	2 372	2 375	2 352	2 362	2 360
<b>Total</b>	<b>45 070</b>	<b>46 650</b>	<b>45 433</b>	<b>43 970</b>	<b>43 340</b>	<b>44 170</b>
LUCF	-4 360	-4 380	-4 430	-5 160	-5 150	-5 100

\* Refers to non-combustion processes in industry

19. CO<sub>2</sub> emissions by sector were more or less constant over the 1990 to 1995 period, except for energy and transformation, as shown in Figure 1. The yearly variation was largely attributed to changes in the number of heating degree-days per year as well as to changes in the price difference of petrol and diesel with neighbouring nations and the “tank tourism” that has resulted from this difference. The sink capacity in the LUCF sector is higher in 1995 given that in 1990 there was excessive damage to some forest areas, temporarily reducing its sink capacity. Estimates of CO<sub>2</sub> removals were reported separately and estimated at 5,100 Gg in 1995. These estimates were calculated using the Swiss national forestry inventory for 1988, as was done in the NC1. Inventory experts informed the team that the second national forestry inventory will be completed in 1998. By that time it will be possible to verify and update forestry data for the 1997 GHG inventory. At the same time, carbon fixation in forest soils will be assessed and included.

Figure 1. Carbon dioxide emissions, percentage change from 1990, by source



## B. Methane

20. In 1995, a total of 235 Gg of CH<sub>4</sub> (see table 3) were emitted, with 63 per cent originating in the agriculture sector from enteric fermentation and manure management and 28 per cent from waste, the remainder being mainly from fugitive fuel emissions. In the NC1, CH<sub>4</sub> emissions from agriculture were estimated using the IPCC tier 1 methodology. In the NC2, the tier two approach was used, and emission factors were adjusted for a cool climate with a mean average temperature of less than 15°C. These estimates of methane emissions have an uncertainty level of ±20 per cent. In the 1990-1995 inventories, CH<sub>4</sub> emissions from agricultural soils are not included, since Swiss inventory experts consider that the reliability of these data and present methods of estimation are unsatisfactory.

21. Overall CH<sub>4</sub> emissions declined from 244 Gg in 1990 to 235 Gg in 1995. This 3.7 per cent decline can be attributed primarily to a reduction in livestock numbers owing to federal regulations. For the period 1990 to 1995, total methane emissions declined as shown in Figure 2.

Table 3. Methane emissions by source, 1990-1995 (Gg)

	1990	1991	1992	1993	1994	1995
Waste	69	68	68	67	67	67
Agriculture	151	153	151	150	147	148
Others	24	24	23	22	22	21
<b>Total</b>	<b>244</b>	<b>244</b>	<b>242</b>	<b>240</b>	<b>236</b>	<b>235</b>

Figure 2. Methane emissions, percentage change from 1990, by sector

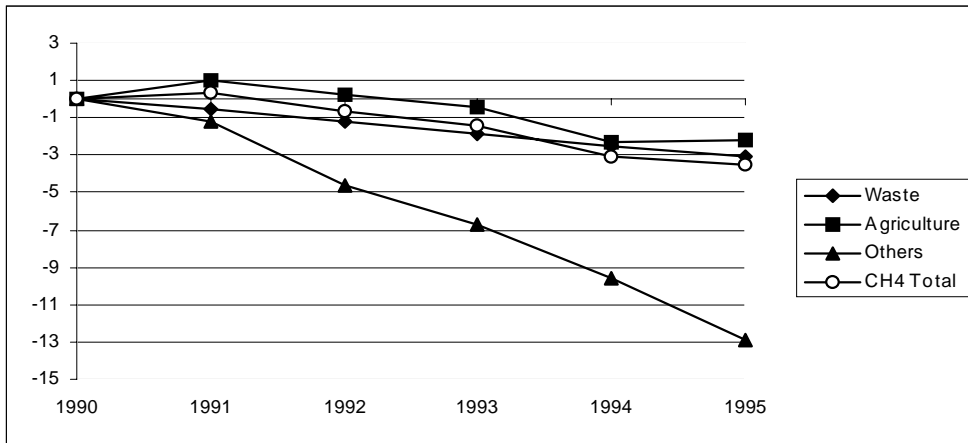
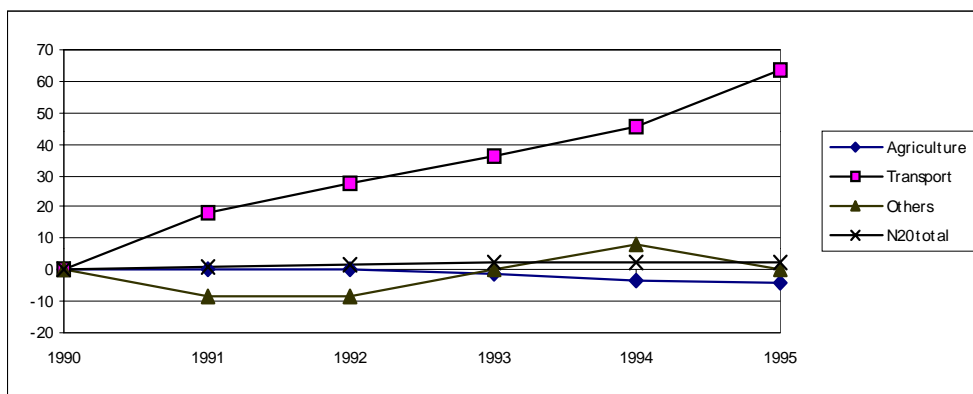


Figure 3. Nitrous oxide, percentage change from 1990, by sector



### C. Nitrous oxide

22. Supplementary information provided to the team on N<sub>2</sub>O describes a number of changes that have been made in the methods of estimating N<sub>2</sub>O since the submission of inventories in the NC1. The Phase II IPCC methodology was adopted for calculating N<sub>2</sub>O emissions from agriculture, which accounted for 75 per cent of these emissions in 1995. Inventory data presented in table 4 show a slight increase in N<sub>2</sub>O emissions from 11.5 Gg in 1990 to 11.8 Gg in 1995. While emissions in the agricultural sector declined by 4.2 per cent during the same period, there was a noticeable increase in the production of N<sub>2</sub>O from catalytic converters in private cars, which resulted in a net increase in total N<sub>2</sub>O emissions. Figure 3 shows the trends from 1990 to 1995. Uncertainty for N<sub>2</sub>O is estimated as medium ( $\pm 20$  per cent) for the transport and waste categories and high, at about  $\pm 50$  per cent, for emissions from agriculture.



Table 4. Nitrous oxide emissions by sector, 1990-1995 (Gg)

	1990	1991	1992	1993	1994	1995
Agriculture	9.2	9.2	9.2	9.1	8.9	8.8
Transport	1.1	1.3	1.4	1.5	1.6	1.8
Others	1.2	1.1	1.1	1.2	1.3	1.2
<b>Total</b>	<b>11.5</b>	<b>11.6</b>	<b>11.7</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>

#### **D. Precursors**

23. Emission estimates of the three precursor gases, NO<sub>x</sub>, CO and NMVOC, originating from mobile sources and small-scale combustion, have been showing a tendency to decline as a result of air pollution control measures in Switzerland over the past decade. NO<sub>x</sub> emissions declined by four per cent annually from 163 Gg in 1990 to 134 Gg in 1995. The bulk of CO (63 per cent) is emitted by motor vehicles. Both CO and NMVOC emissions declined annually by 6 per cent. CO dropped from 707 Gg in 1990 to 510 Gg in 1995 and NMVOCs from 281 Gg in 1990 to 201 Gg in 1995. It is estimated that the uncertainty for NO<sub>x</sub>, CO and NMVOC emissions is about ±20 per cent. At present no quality improvement activities are foreseen for these gases. The overall decline in emissions of precursor gases was due mainly to the increased use of catalytic converters in private cars since the early nineties and stringent emission limits for volatile substances at storage tanks and filling stations.

#### **E. New gases (HFCs, PFCs, SF<sub>6</sub>)**

24. As in the case of the NC1, Switzerland was unable to follow the guidelines recommendation of including data on hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride in the inventory contained in the NC2. Inventory experts explained that available data on HFC, PFC and SF<sub>6</sub> emissions were considered complete but still too preliminary to be integrated into the inventory. Recent data from a pilot survey conducted in 1995/1996 indicated that 0.2 Gg HFC and 0.005 Gg PFC were emitted in 1995. The use of HFCs is increasing for refrigeration and air-conditioning. PFC emissions from heavy industry are declining as aluminium plants are reducing their operations, while emissions from PFC-based solvents are steadily increasing. SF<sub>6</sub> emissions are reported as constant at 0.003 Gg. Given the importance of monitoring these substances and the widespread use of the new gases in many sectors, the SAEFL has earmarked SwF 30,000 for carrying out an in-depth study during 1998 on the consumption of these gases in all sectors. With the aim of meeting the requirements of the guidelines, the data obtained from this study will ensure a considerable improvement in the data quality and completeness.

### **III. POLICIES AND MEASURES**

25. The information about policies and measures in the NC2 is more comprehensive than in the NC1. The NC2 covers national, regional and local Government actions as well as private

sector activities and, where relevant, the wider European policy context. The team found it helpful that the NC2 contained a table, as recommended in the FCCC guidelines, categorizing each existing policy by type, objective, sector, status of implementation, estimate of mitigation impact, monitoring and responsibilities. The mitigation impact is only described in terms of low, medium or high; there is no quantitative estimate, and additional information was limited during the visit. There is no information in the NC2 on the costs of policies, although some information was made available about Government expenditure. The NC2 also describes policies and measures under consideration and, during the visit, most attention was given to this area.

26. The team noted that many policies which mitigate GHG emissions are not primarily motivated by climate change concerns; air pollution controls are an obvious example. The Swiss Government has established minimum reduction requirements for nationwide emissions of sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs). The 1985 Clean Air Ordinance has made a considerable contribution toward reducing energy consumption for example, thanks to the obligation to replace old boilers. Greatest success has thus far been achieved in reducing SO<sub>2</sub> levels, but NO<sub>x</sub> and ozone loads, caused by the interaction of NO<sub>x</sub> and VOCs, still exceed the thresholds at which impacts are considered tolerable, so greater efforts are required to reduce both NO<sub>x</sub> and VOC emissions.

#### A. Energy

27. Excluding transport, energy accounted for 67 per cent of CO<sub>2</sub> emissions in Switzerland and 57 per cent of the three main greenhouse gas emissions combined, namely CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, on a GWP basis in 1995. The Government conducts an annual, ex-post evaluation of energy consumption. This allows it to consider whether policy is on course to achieve targets. The latest results were provided in the course of the in-depth review. Overall, there was a 48.1 peta-Joule (PJ) increase in energy use between 1990 and 1996. As the 1990 winter was relatively mild, about 39 PJ of this is attributed to lower average temperatures. Structural changes in the economy caused consumption to grow by approximately 49 PJ, whilst changes in technology and the effect of Government policies resulted in a similar-sized reduction. The effect of lower real heating oil, petrol and natural gas prices outweighed higher prices for electricity, over the period, resulting in a 5.2 PJ increase in energy use.

28. In 1990, the Swiss electorate endorsed a ten-year moratorium on the construction of new nuclear power stations and voted to incorporate an 'energy article' in the federal Constitution. This resulted in the Decree on Energy Use, relating to the efficient use of energy and the establishment of the Energy 2000 programme. This programme consists, to a large extent, of voluntary measures, supported by regulation, financial incentives and the provision of information. These are known as the three pillars. It incorporates procedures to evaluate and monitor the effects of measures. The programme has four main goals, namely to stabilize CO<sub>2</sub> emissions at the 1990 level by 2000, to reduce the rate at which electricity consumption grows, to add an extra 300 GWh (or 0.5 per cent) to electricity generation from renewables and to increase heat generation by the same amount by 2000. In addition, hydro generation is expected to increase by five per cent to 1,650 GWh of annual production, and nuclear power is to be

uprated by 10 per cent, thanks to an increase in thermal and electrical output. An annual report quantifies and describes progress on various goals. Details are given about changes in the energy balance, measured fuel savings at sectoral level and commentary on measures which cannot easily be quantified.

29. Between 1990 and 1996, consumption of fossil fuels increased by 5.2 per cent and that of electricity by 4.5 per cent. This is lower than the rates of increase in the preceding five-year period and there is some confidence on the part of Government, industry and environmental non-governmental organisations that the CO<sub>2</sub> stabilization goal will be achieved, in part because of the prolonged economic recession and also because of the lag between the implementation of policies and CO<sub>2</sub> reductions. Between 1990 and 1996, electricity production from renewables increased from about 400 GWh to 600 GWh such that 64 per cent of the target level has already been achieved and 45 per cent in terms of progress toward the heat production target. Hydro-power production accounted for 53 per cent of its target level and nuclear power production expanded by five per cent, owing to an uprating of 149 MW, or 51 per cent compared to its target level.

30. It is difficult to establish the impact of voluntary measures. The ex-post analysis of the Energy 2000 programme for 1996 indicates that such measures had reduced total energy consumption by only 0.8 per cent, whereas regulations are estimated to have had twice this impact. So, according to energy sector modelling results, the programme has, thus far, produced a 2.4 per cent energy saving reduction compared to a reference scenario without such policies, resulting in a 1.2 to 1.7 million tonne CO<sub>2</sub> reduction. The Energy 2000 programme is also assessed on a sectoral basis. The team was provided with the latest results for the period July 1996 to June 1997. A selection of achievements, to date, compared with the objective for the year 2000 is presented in table five, which indicates varying degrees of progress.

Table 5. Selected results from the Energy 2000 programme

	Achieved as of June 1997 (TJ/ y)	Objective for 2000 (TJ/ y)
Public authorities	690	2,880
Residential buildings	33	780
Industry	2,065	10,500
Services	511	1,982
Hospitals	460	1,730
Motor fuels	5,148	16,500
Renewable sources of energy	5,685	11,880

Source: Swiss Federal Department of Environment, Transport, Energy and Communications

31. The NC2 does not present information about the costs of the Energy 2000 programme. Additional information was obtained during the visit about Government funding, but there is no separate analysis of the costs to firms and consumers for compliance with measures, or the associated benefits from lower fuel bills. The funds of about SwF 55 million per annum actually

disbursed are considerably less than the annual SwF 170 million originally envisaged in the 1991 Energy 2000 programme. This was apparently attributable to pressure to reduce the Government's budget deficit, given the recession. Available funds are budgeted to increase to SwF 96 million in 1999. Studies have tried to put a monetary value on the damages associated with pollution. The Government has estimated that pollution costs associated with energy consumption, excluding climate change damages, were reduced by between SwF 265 and 385 million in 1996, which exceeded Government expenditure on the Energy 2000 programme.

32. Between 1990 and 1997, the renewable energy subprogrammes benefiting the most from funds were waste heat, active solar, wood, geothermal energy and photovoltaics. The most substantial energy savings were achieved with waste heat and wood projects. Lightweight electric vehicles received the greatest amount of pilot and demonstration project funds. Significant funding also went to the innovative new energy application of technologies such as the construction of low-energy homes and the optimization of heating systems in flats. About a third of the 1997 budget was spent on the direct promotion of renewables and approximately a quarter on pilot and demonstration projects.

33. Within the Energy 2000 programme, a federal decree of April 1997 made available additional funds for a private sector programme intended to both contribute towards economic recovery and reduce energy consumption. A sum of SwF 64 million is available until 2000 for exemplary projects, especially for building renovation and renewables. An additional SwF 200 million is available for the maintenance of public infrastructure, which will, in part, be targeted towards energy efficiency measures.

34. The third pillar of the programme, which relates to dialogue between Government, cantons, trade unions, energy consumer representatives and environmental organizations, has been successful in establishing that hydroelectric power should form the backbone of future electricity supply. Other forms of renewables and energy efficiency should also be given priority in future. Nuclear energy and the proposed energy tax are the most significant areas of continued discussion.

35. Effective implementation of the Energy 2000 programme is linked to the political structure in Switzerland. Some cantons lack the necessary personnel and financial resources to enact federal measures and others leave the implementation of such measures to local Government. At the local level there is, typically, insufficient knowledge and technical expertise. Furthermore, the cantons cut the funds available for the programme by 57 per cent from 1992 to 1997 and simultaneously reduced staff numbers. However, at the local level, there are a number of initiatives, including so-called 'energy towns' and energy audit programmes.

36. In June 1998, the parliament adopted the Energy Law. This law replaces the old decree on energy use which expired in 1998, and allows for the continued existence of the Energy 2000 programme. It includes regulations on energy consumption of installations, vehicles and appliances, which the Government may enact if voluntary measures fail. In the building sector there will be no federal responsibility, but instead more autonomy will be given to the cantons.

In addition to the Energy Law, there are a number of parallel proposals directly affecting energy use under parliamentary consideration. Amongst these there are two so-called 'popular' initiatives which propose taxes on energy (an incentive tax and a tax with earmarked use of revenue for energy policy).

37. The Swiss Government is prepared to follow the example of the EC in opening up the electricity market to competition both across national borders and within the country itself. The Electricity Market bill has undergone public consultation. The results indicate disagreement on the types of customer participating in and the pace of the deregulation process. There is also a general concern about so-called 'stranded assets', which are the most costly of existing electricity generation plants. Older hydropower stations, in particular, will need support in a competitive market to afford renovation expenditure. This has stimulated discussions on the introduction of an energy tax, which at the time of the review was under consideration in parliament. Renewables, in general, will require Government support in order to retain and gain market share.

38. Two popular initiatives have been launched by environmental organizations. The energy-environment initiative calls for an energy tax to achieve a one per cent per annum reduction in energy consumption over the 25 years following its entry into force. Parliamentary views will be sought before it is subject to public vote. The solar initiative proposes a tax on non-renewable forms of energy to raise funds for solar energy and enhanced energy efficiency. As a counter-proposal, the parliament began evaluation of a tax on non-renewable energy sources. The revenue from such a tax would be earmarked for promotion of renewables, increased energy efficiency as well as the maintenance and renewal of hydroelectric power plants.

39. Beyond 2000, a significant reduction in CO<sub>2</sub> emissions would require additional measures. For this reason the Federal Council proposed a federal law on the reduction of CO<sub>2</sub> emissions (CO<sub>2</sub> law). In March 1997 the Federal Council submitted the draft law to the parliament. The State Council (the second house of parliament) approved the draft CO<sub>2</sub> law in May 1998. Debate was expected to continue in the National Council (first house of parliament) until winter 1998/99. During parliamentary discussions revisions are possible. The draft law envisages a reduction of 10 per cent in CO<sub>2</sub> emissions by 2010, compared to the 1990 level. This should be sufficient for Switzerland to attain an overall reduction in greenhouse gas emissions of eight per cent in the 2008 to 2012 commitment period under the Kyoto Protocol. Swiss officials noted that the implementation of a broader-greenhouse gas tax would be complex. The draft law includes the possibility to use flexibility mechanisms according to the Kyoto Protocol (emissions trading, joint implementation, clean development mechanism) as measures supplementing domestic actions.

40. The tax will be implemented only if other measures, for instance the Energy Law, and the Energy 2000 programme, do not produce the expected CO<sub>2</sub> savings, so although the CO<sub>2</sub> law is likely to enter into force in 2000, the tax will not be applied before 2004 at the earliest. If the tax is imposed, the resultant revenue will be recycled to industry and domestic consumers in proportion to their respective contributions, uniformly in the case of the general population. The

draft CO<sub>2</sub> law foresees a separate 15 per cent reduction target for combustibles and an 8 per cent target for motor fuels, excluding bunker fuels. Consumers are supposed to take voluntary measures to limit their emissions. These may be large companies, groups of consumers or energy-intensive companies. Businesses are already being asked to take on voluntary commitments which, if achieved, could allow for exemption from the tax. This will involve refinement of statistics on industrial energy use. The voluntary undertaking would include an agreed CO<sub>2</sub> limitation, an action plan, federal monitoring of the effect of the action plan and regular reports. In making such agreements, the Government will take into account what measures firms have already taken, the costs of reduction measures, the degree of exposure to international competition and expected production growth rates.

41. If required, all combustibles and motor fuels will be subject to the CO<sub>2</sub> tax which may be applied incrementally up to a maximum of SwF 210/tonne of CO<sub>2</sub> emitted. As an 'input' tax it should provide incentives for fuel switching and improved energy efficiency within Switzerland. The tax cannot be imposed on imports of electricity. There are various tax proposals currently under discussion in Switzerland, such as an eco-tax reform, a possible energy tax and transport-related taxes. Officials explained that one tax will not be imposed on top of another, but rather that the CO<sub>2</sub> tax should be subsidiary to the others.

### **B. Transport**

42. In 1995, transport accounted for approximately 33 per cent of Switzerland's CO<sub>2</sub> emissions and 29 per cent of the three main greenhouse gases combined, namely CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. Between 1990 and 1995, the recession slowed the growth of private road transport, but freight transport by air and rail grew significantly, expressed in terms of tonne-kilometres, as did transalpine freight traffic. Switzerland has recorded a relatively high number of passenger miles travelled by rail compared to other OECD countries, although rail only accounted for about 13.5 per cent of the total passenger kilometres in 1995. The number of motor vehicles grew substantially between 1990 and 1995 and, in 1995, the car was used for an estimated 79 per cent of total distances travelled in Switzerland. In recent years, the number of small delivery vans has increased more sharply than the number of heavy goods vehicles, so the average quantity transported in terms of tonnes per vehicle is falling rapidly. Almost one third of transalpine traffic crossing the central section of the Alps passes through Switzerland. About 80 per cent of goods in transit are carried by rail, which is considerably higher than in France and Austria. This is attributable to the ban on night and Sunday travel along with a 28-tonne heavy goods vehicle limit.

43. Officials explained that the only significant policy in transport targets the freight sector, which is projected to register the highest growth rate. Most federal policies to limit growth in private car transport have failed, so the emphasis is now on measures at the local level. No information was provided in the NC2 about the costs of policies, but as none were directly intended to reduce greenhouse gas emissions, it was noted that the cost per tonne of CO<sub>2</sub> saved would be higher than for policies in most other sectors.

44. The article in the federal Constitution relating to protection of the Alps requires that 'transalpine freight transit traffic from frontier to frontier be shifted from road to rail'. Most of the freight transport policies are geared toward this objective. Planned measures include the introduction of a distance and weight-dependent charge on heavy goods vehicles, the levying of an alpine transit charge and a development programme for rail freight traffic. The team was informed that legislation to impose a new distance and weight-dependent charge on heavy goods vehicles (above 3.5 tonnes in total weight) had been passed by the parliament. In September 1998 the corresponding law was adopted by public vote. The change should be introduced in 2001. The policy rationale is the concern that freight transport will be cheaper by road than rail when and if the existing weight limit is raised in line with the EC. In the view of Swiss officials, such a development would run counter to the Government's intention to fully internalize the cost of heavy goods traffic and promote a shift from road to rail transport. The Federal Council stated its willingness to gradually raise the weight limit to 40 tonnes, if the EC agreed, in exchange, to the gradual imposition of these charges. The corresponding agreement between the EC and Switzerland was accepted by the EC Council of Ministers in December 1998.

45. Taxation proposals are described as the 'cornerstone' of the Alpine Initiative to attain a modal shift in transalpine lorry traffic to rail, in particular because the resultant revenues will, *inter alia*, be used to construct two new transalpine rail lines. However, the decree on financing large infrastructure investments, which was adopted by public vote in November 1998, will not involve an increase in the excise duty on petrol, as originally envisaged. A special charge for alpine lorry transport is planned under the Alpine Initiative and a consultation procedure on a related bill was carried out in late 1998. In addition to tax proposals, supporting measures include so-called 'combined transport' initiatives, involving railway reform and the construction of new terminals, to make the transfer of containers from road to rail cheaper.

46. Taxes in the transport sector are supposed to be established at a level that takes account of external costs, in addition to infrastructure expenditure. Studies on the costs associated with air pollution effects on buildings, expenditure associated with accidents, noise and adverse health impacts estimate external damages at over SwF 4 billion per annum, of which rail is only responsible for about 15 per cent. The NC2 does not include information about the new Railways Law, of which the first stage came into effect on 1 January 1996. The team was informed that a second, more substantive stage will enter into force on 1 January 1999. It is supposed to improve the efficiency of public transport, ensure a basic level of service, improve coordination between the Confederation, the cantons and transport companies and create more entrepreneurial freedom. However there are difficulties in promoting rail transport. The team was informed that pressure to reduce public expenditure may result in subsidies for public transport being further eroded. In addition, shifting the maximum weight limit from 28 to 40 tonnes could increase the number of non-Swiss firms operating on transalpine routes, which could reduce road freight prices and cause a further shift from rail to road.

47. In the early 1990s, the federal parliament rejected legislative proposals to provide incentives for fuel-efficient cars, in the context of clean air policy. One canton varies its annual vehicle tax according to the fuel efficiency of the cars, but in four other cantons similar projects

failed because of the lack of relevant statistics. The 1995 Ordinance on the Lowering of Specific Fuel Consumption for Passenger Cars requires importers to voluntarily reduce the average specific fuel consumption of the car fleet, with the threat of regulation of the fuel consumption of new cars if the goal of a 15 per cent reduction, between 1996 and 2001, is not attained. As part of this effort, a new car labelling scheme has been agreed with the car importers, but their representative association argues it should not adopt a system of car labelling before the EC has such a scheme. In 1997 there had only been a 1.8 per cent improvement when a 3 per cent improvement was expected. The proposed legislation would limit the models that could be imported and officials noted this could open up the possibility of a legal challenge by the EC or the World Trade Organization.

48. As part of the Energy 2000 programme, an eco-driving course has been in operation which has so far trained 13,000 people. Initially, a 15 to 20 per cent fuel saving was attained, but this figure has been found to fall to 6 per cent on the basis of follow-up evaluation studies. Other transport-related activities within the programme have not had a significant impact. The NC2 explains how the Federal Ordinance on Air Pollution Control, adopted in 1985 and implemented at the cantonal level, has resulted in various measures to combat NO<sub>2</sub>, O<sub>3</sub>, NO<sub>x</sub> and VOC emissions. Although there has been some progress, additional efforts will be required to fulfil the prescribed national air quality targets.

49. Differences between petrol and diesel prices result in so-called 'tank tourism'. Whilst 20 per cent of diesel used in Switzerland is purchased abroad, an estimated 9 per cent of petrol sold in Switzerland is to drivers from neighbouring countries taking advantage of lower prices. Post- 2004, the CO<sub>2</sub> law could, in principle, affect petrol prices, with increases of up to 30 per cent possible.

### **C. Agriculture**

50. About 38 per cent of land in Switzerland is devoted to agriculture, although in 1995 it only contributed approximately 1.4 per cent to GDP. The team explored how the policies listed in the NC2 could result in lower GHG emissions, even though this was not their primary purpose. Switzerland has been replacing price support with income support and is attempting to align this sector more closely with the EC. Since the Federal Ordinance relating to Ecological Subsidies came into force in 1993 there has been a significant effort to reform farming towards less intensive methods. About 75 per cent of so-called 'integrated' farms now apply good environmental practice thanks to better education and incentive payments. As a result, there is less use of synthetic fertilizer, so N<sub>2</sub>O emissions may decline. There is very limited potential to reduce agricultural emissions of CH<sub>4</sub> as many improvements have already been made in this sector. CH<sub>4</sub> emissions have been falling for several decades thanks to improvements in feed quality and adjustments to the milk quota system. In 1991 water protection measures set new limits for the number of cattle per hectare so the total number of cattle was to be reduced by about 122,000 or approximately 7 per cent by late 1997.

51. As part of the Energy 2000 programme, systems to convert energy from CH<sub>4</sub> can be



installed on farms, but so far the uptake has been minimal. At the end of June 1996, an agricultural bill was submitted to the parliament providing for environmental goals to be reached through the use of direct subsidies. To qualify, farmers have to provide proof of best environmental practices relating to a balanced use of fertilizer, an appropriate percentage of set-aside land, a suitable approach to soil conservation and a selective approach to the use of pesticides. It has not been possible for officials to estimate the effects of GHG mitigation measures in the agricultural sector.

52. Soil protection has only been practised in Switzerland for the past 15 years. The Environmental Protection Law was amended in 1995 to broaden the scope of soil protection. Amongst the objectives is that soil erosion should not exceed the rate of new soil formation, as it currently does, and no living organisms or toxins foreign to soil should be allowed to enter the soil if they might permanently damage its flora and fauna and thus endanger its ability to function.

#### **D. Forestry**

53. Almost 30 per cent of Switzerland has forest coverage and, according to existing policy, the total area is not in danger of being reduced. About 73 per cent of woodland is in public ownership and the rest in private hands, but this does not limit the application of policies. A new federal Law on Forests was enacted in 1993 and cantons are bringing their own legislation into line with this. The Law enshrines several basic principles including forestry planning, safeguarding forest functions and near-natural silviculture. For any deforestation there is an obligation to afforest an equal area. Also, reforestation of devastated areas or clearings is required if natural regeneration is uncertain. Felling of timber is permitted at a rate which must not exceed the replacement rate. The annual growth of wood in Swiss forests is estimated at about 7 to 8 million cubic metres, but only about 4.5 million cubic metres are harvested. In the long run, the quality of the forests is under threat and their vitality and biodiversity are diminishing because of acid rain and nitrogen deposition. An annual survey of forest owners is conducted to obtain information on forest cover, exploitation, financial yields and trees planted. A wood processing survey is carried out every ten years, most recently in 1991.

#### **E. Waste**

54. Switzerland is running out of room to landfill its waste, so policies are aimed primarily at reducing the volume of waste. Nevertheless, these measures also have a significant impact in reducing CH<sub>4</sub> emissions. Switzerland plans to stop disposing untreated municipal waste and other combustible waste in landfill sites after 1 January 2000. All combustible waste will then have to be burnt. Furthermore, under existing legislation, CH<sub>4</sub> from landfills and waste water treatment has to be captured and burnt. Currently, in some regions there is overcapacity in waste incinerators, whereas in other regions large quantities of waste end up untreated in landfill sites. The aim is to provide increased capacity in these regions so that long-distance waste transport is not required. In 1996, nearly all building and construction waste went to landfill sites. From households and industry about 1.7 million tonnes of waste was collected separately for recycling, approximately 2.6 million tonnes was incinerated, producing 3,000 MWh of electricity and heat in

the process, and only around 600,000 tonnes went to landfill sites.

55. Switzerland has relatively high recovery rates for separately collected wastes. Special measures are being taken to minimize air pollution from incineration. The cantons are responsible for implementing the Technical Ordinance for Waste Management which requires all kinds of waste to be treated in an 'ecological' manner. Some provide incentives for consumers to reduce the volume of waste by charging for collection, and various additional means to 'make the polluter pay' are under consideration. The burning of domestic waste by householders is forbidden. The team was impressed by the Swiss approach to waste management and observed that the technical potential to reduce CH<sub>4</sub> emissions is being well exploited.

#### **F. Fugitive emissions**

56. Fugitive emissions from the gas distribution network are projected to decrease as local distribution systems are replaced through necessity, given the change from town gas to natural gas.

#### **G. Industry**

57. It was explained that companies have been offering perfluorinated and other highly fluorinated compounds such as perfluorocarbon, partially halogenated fluorocarbon and sulphur hexafluoride on the Swiss market, as alternatives to ozone-depleting substances. To a large extent the Government is relying on the relevant industrial sectors to forgo using these substances on a voluntary basis, as the federal law on environmental protection forbids the marketing of any substance which, through normal use, directly or indirectly, could endanger man or his natural environment. It is up to the manufacturers or importers to ensure that their products comply. Within the existing relevant ordinances the federal Government is able to impose regulations on these substances if the self-supervision principle is not sufficiently adhered to.

#### **H. Conflicting areas**

58. In reporting actions taken to implement commitments under Article 4.2 (e)(ii) of the Convention, several so-called 'conflicting areas' of policy are discussed in the NC2. The most obvious problem, in terms of increasing CO<sub>2</sub> emissions, is the proposed phase-out of nuclear power. There are also concerns that the implementation of taxation measures, especially related to transport, may be complicated by the need to achieve EC compatibility.

### **IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES**

59. Discussion of projections was limited during the visit, which restricted the team's ability to attain a good understanding about how the projections were constructed and to form an opinion of their robustness. As there had been no major changes since the publication of the NC2, officials regarded the projections as still valid at the time of the review visit. However, officials noted that the underlying assumption for GDP growth now appears somewhat over-optimistic,

although this will offset overly generous assumptions about the success of all measures implemented. In the NC2, projections of CO<sub>2</sub> emissions are compared with temperature-adjusted figures for 1990 and it is only possible to make a comparison with non-adjusted figures by extracting data from the annexes. In the year 2000, compared to unadjusted 1990 levels, emissions of CO<sub>2</sub> are projected to be 2.6 per cent lower and CH<sub>4</sub> 6.1 per cent lower, while N<sub>2</sub>O emissions are expected to be 1.7 per cent higher. There is little information available about the other direct greenhouse gases. If HFC use is not controlled, then very rapid growth in emissions is predicted. PFC use in the solvent sector could grow by 10 to 50 per cent per annum, but meanwhile the aluminium industry is being closed down, with resulting reductions. No trend information was reported in the NC2 for SF<sub>6</sub>. As a result of a voluntary initiative by the electricity industry, SF<sub>6</sub> emissions are expected to remain stable over the next decade. Emissions of the indirect greenhouse gases NO<sub>x</sub>, CO and NMVOCs are projected to decline by 29 per cent, 42 per cent and 42 per cent respectively between 1990 and 2000. Further reductions are projected for CO whilst emissions of NO<sub>x</sub> and NMVOCs are expected to stabilize at around their 2000 level up to 2010. Projections for the three main greenhouse gases are illustrated in Figure 4.

60. Officials use long-term energy outlooks to prepare energy policy legislation and as the basis for energy policy decisions. A whole series of energy scenarios have been considered. Scenario I only includes measures already adopted. So, for example, the fuel efficiency target for cars is assumed to be fully met and the targets of the Energy 2000 programme achieved. The effects of legal and voluntary measures are incorporated in the projections, but no additional effect is assumed for the impact of information programmes which are assumed to complement other measures. Efficient implementation of the Clean Air Act is also assumed. As far as possible, double counting of policy impacts has been avoided inasmuch as, when two instruments such as tax and regulation are applied, the effect of the second is only partially taken into account.

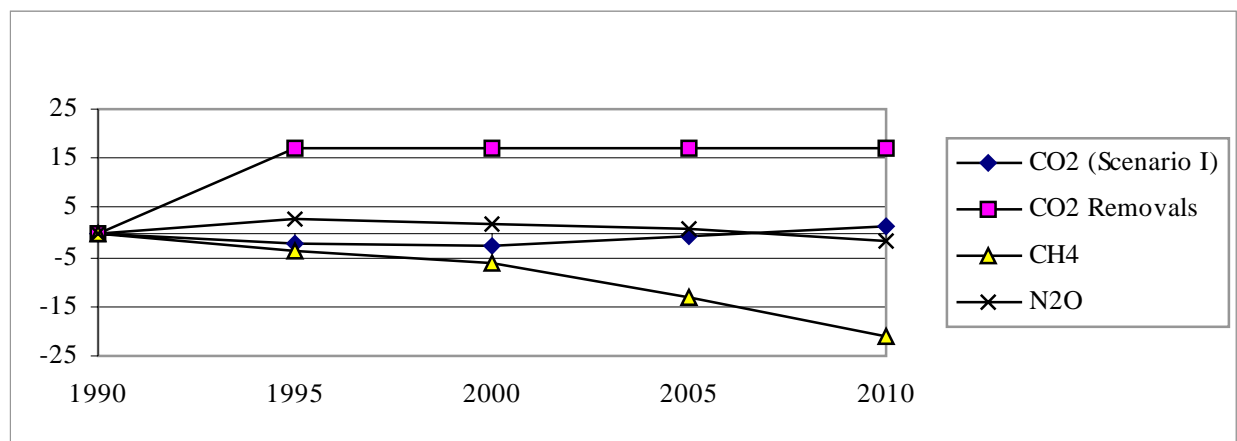


Figure 4. Greenhouse gas emissions, projected percentage change relative to 1990

61. There are no explicit assumptions about the future effect of energy market liberalization on electricity prices. The reference scenario assumes that Swiss nuclear power capacity remains

unchanged and electricity continues to be imported on the basis of existing contracts. Switzerland imports electricity from France, the amount depending in part upon the level of hydroelectricity generation. In the modelling it is assumed that, in 50 per cent of all winter half-years, demand will be met by indigenous production. Scenario IIa incorporates proposed measures, including the Energy Law, the distance- and weight-dependent charge on heavy goods vehicles and increased support for public transport. A variant of this, scenario IIb, includes the CO<sub>2</sub> tax as well. The results of these three scenarios are shown in table 6.

Table 6. Projected (percentage) variation in selected parameters compared to 1990

Scenario	Total final energy demand		Electricity demand		CO <sub>2</sub> emissions*	
	2010	2020	2010	2020	2010	2020
<b>I</b>	8	10	19	23	0	1
<b>IIa</b>	1	1	9	10	-7	-6
<b>IIb</b>	2	3	18	19	-10	-11

\* Compared to a temperature-adjusted figure for 1990

62. A sensitivity analysis has been conducted for scenario I, assuming that GDP grows between 1995 and 2010 at 1.3 per cent, instead of an average 2.1 per cent per annum. In this case, energy consumption remains virtually unchanged throughout the period. In a further variant to scenario I, it is assumed that as new electricity generation capacity is required, existing nuclear reactors and import contracts are replaced with electricity generated from fossil fuels (using CHP and gas turbines), which results in a 13 per cent increase in CO<sub>2</sub> emissions by 2030, compared to the temperature-adjusted 1990 level. However, in this circumstance, the enactment of the energy and CO<sub>2</sub> laws is projected to reverse this result and lead to a 2 per cent reduction in CO<sub>2</sub> emissions. If existing nuclear reactors are not replaced at the end of 40 years of service and if existing contracts to import electricity are not renewed then, given favourable economic growth, from 2015 onwards new generating capacity will be needed. However, if economic growth is slower then there is sufficient domestic electricity generation capacity until 2020. In all scenarios, hydroelectricity remains the backbone of Swiss electricity supply, accounting for between 57 per cent and 66 per cent of demand.

63. Although the projection work is conducted by a number of private enterprises and academic institutions, they have official status. Different approaches using several models are employed. Economic equilibrium models determine the effects of energy policy on the economic and demographic framework and energy demand is determined in partial equilibrium models. The estimates of the economic models are used by a variety of Government departments. Bottom-up models provide detailed information on energy use. An input-output model and two general equilibrium models are used to estimate the economic feedbacks associated with two of the scenarios considered. There is a separate transport model. The models are not directly linked but the work on different models is coordinated. The effects of the energy policy on the general economy were found to be small, so it was not necessary to create a feedback loop.

64. The bottom-up models contain detailed information about industry, the Swiss building stock and the composition of the automobile fleet. An essential element is the inclusion of energy efficiency technologies, which allows the marginal costs of energy savings to be calculated in each sector. Saturation effects in the ownership of white goods and cars is also taken into account. The models do not take account of the so-called rebound effects whereby consumers may enjoy a higher standard of heating in preference to energy savings, following the installation of insulation, for example. This implies that the results of the models may be over-optimistic, although the officials believe that such rebound effects are not significant in Switzerland.

65. The Swiss have not constructed a baseline scenario of what would have happened to emissions in the absence of policies. Nor have they used their model work to illustrate the individual effect of particular policies. All energy-related emissions are projected on the basis of the models. Emissions from non-energy sources are estimated on the basis of historical trends plus additional information about implemented policies. For example, non-energy CH<sub>4</sub> emissions are based on estimates of future animal numbers, assuming stable meat and milk production with some adjustments for improved feeding practices.

## **V. EXPECTED IMPACTS OF CLIMATE CHANGE AND ADAPTATION MEASURES**

66. The NC2 states that, to date, a comprehensive assessment of the climate vulnerability of various ecological and human systems in Switzerland has not been undertaken in a systematic manner. However, the Swiss National Science Foundation, within the framework of the National Research Programme 31, ran a research programme on “Climate Changes and Natural Disasters”, from 1991 to 1996. It invested SwF 20 million in 55 studies on climate, hydrology, natural disasters, ecosystems and society. The team was informed that experts are currently consolidating the information collected so far, in order to assess the possible adjustments associated with the various adaptation options. As a first step, a paper is under preparation to identify the sensitive processes and key sectors which will be affected. Initial data from global climate models predict that the Swiss economy may potentially suffer chiefly from climate change effects in sectors where the natural environment plays a significant part as a production factor, specifically in tourism, farming and forestry.

67. Adverse effects are expected from the greater occurrence of heavy rainfall, especially on the southern side of the Alps, from precipitation in the form of rain instead of high-altitude snowfall, and from a decrease in snow cover during winter at lower altitudes. Scientists also expect an increase in winter flooding and, consequently, more erosion and landslides. After the Brig floods of 1993, insurance companies, which have played a pioneering role in alerting Swiss companies to the risk of damage caused by natural disasters, are reported as recording more claims and larger amounts paid for natural disasters in the past few years. The NC2 does not report any specific Government strategy on adaptation nor have any adaptation measures been taken since the time the NC1 was prepared. During the review, the Swiss experts explained that, despite the great amount of research done under the National Research Programme 31, it is still difficult to estimate the regional effects of climate change from climate models, and as a consequence, it is still equally difficult to formulate appropriate and reliable adaptation strategies.

Work in this area will be continued and wider response strategies will be studied with the collaboration of banks and insurance companies.

## **VI. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER**

68. The review team was satisfied that recommendations for reporting in this area were adhered to, as was the case in the NC1. During the review, the team was provided with some additional information on the subject.

69. The Federal Council had set a medium-term target for Swiss official development assistance (ODA) of 0.4 per cent of GNP in 1990. However, the present figure is 0.32 per cent compared with 0.39 in 1992. In 1991, to mark the 700<sup>th</sup> anniversary of the Swiss Confederation, the federal parliament granted a five-year ODA credit of SwF 300 million. Contributions to the Global Environment Facility (GEF) and the Montreal Protocol account for about 45 per cent of this credit. From 1991 to 1996, Switzerland contributed SwF 80 million to the overall funds of the GEF, making it the sixth largest donor country of the facility. Parliament has already agreed to replenish funds to the GEF amounting to SwF 85 million. The bilateral component of ODA, which is managed by the Swiss Directorate of Development and Cooperation, amounted to SwF158 million for the five-year period. During the period from 1991 to 1996, SwF148 million were committed, with SwF 112 million disbursed and projects under way. These funds will continue to be disbursed until 2000 and possibilities for their renewal were to be discussed in parliament in October 1998.

70. The team was provided with additional information on technology transfer, in the form of projects and programmes that facilitate and finance the transfer of hard and soft technologies. These projects account for 28 per cent of funds allocated to bilateral cooperation, and involve 15 developing countries and economies in transition. The projects are relevant to climate change and focus on the power sector and energy efficiency, renewable energy technologies (photovoltaic, solar thermal and hydropower), and capacity-building in forestry. The review team was also informed that these initiatives are constantly monitored to assess the impacts and benefit of projects to recipient countries.

## **VII. RESEARCH AND SYSTEMATIC OBSERVATION**

71. The NC2, like the NC1, followed the recommendations for reporting in this area. A comprehensive climate change research programme is under way and is described adequately in NC2. Additional information was also communicated to the team during the review. At the beginning of 1997, the head of the Federal Department of the Interior commissioned the Swiss Academy of Sciences to set up the Organe consultatif du DFI et du DETEC en matière de recherche sur le climat et les changements climatiques (OCCC), an advisory body on climate change. This body has the task of constantly assessing scientific findings, keeping the Government and the public informed, and making recommendations on research and policy.

72. Climate research in Switzerland is chiefly concerned with the areas of background

research, the history of climate, impacts of rapid climate change, and climate observation. Scientists informed the team that the Swiss Government spends SwF 10 to 15 million each year on climate research and observation. The National Research Programme 31 came to an end in 1997. The results of this effort will be presented to the scientific community and to young people through a series of workshops. Several insurance companies have agreed to finance the incorporation of these results into a compact disc in four languages for distribution to high schools. In 1998, Proclim, a subgroup of the Swiss Academy of Sciences Forum for Climate and Global Change, initiated an information service to technical and secondary schools on climate-related research findings.

73. In 1998, Proclim, a sub group of the Swiss Academy of Sciences' Forum for Climate and Global Change, initiated an information service to journalists on results of research, including a calendar of short courses and seminars, as a means of involving them more in the subject of climate change. In addition, as a means of promoting the interest of politicians as well as lobbying for support from Government for research activities, scientists are interacting with groups of Members of Parliament four times a year. To this effect, a parliamentary group on climate change was founded in 1996.

74. At the international level, the team was informed of several important international research programmes, funded *inter alia* by Switzerland. Recently, Switzerland established links with several Baltic countries in the area of long-term registration of climate data, and in the establishment of a climate-change data bank. Research links in meteorology have been established with many developing countries. In Kenya, an ozone measuring station was installed and nationals were trained by Swiss specialists; 51 satellite-receiving stations were installed in several developing countries; and in Colombia, refurbishing of the hydrological and meteorological observation networks was in the planning stage.

### **VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS**

75. With its emphasis on voluntary action to reduce GHG emissions, the Government of Switzerland attaches great importance and allocates substantial funds to activities in the field of education, training and public awareness. The team was informed that, from 1995 to 1997, the Government had given substantial financial support to public awareness campaigns in the field of climate change.

76. The Climate Change Information Centre of the Swiss Meteorological Institute began operations in January 1998 and is expected to provide material on specific climate change related subjects and prepare reviews and background papers on request. Non-governmental organizations are also active and instrumental in raising public awareness in schools, for example, by conducting workshops and competitions. The team was informed of a new Government-financed project to train teachers on climate issues who in turn will provide counselling to schools. This project will have a duration of three years and will be partially funded by the school chapters.

## IX. CONCLUSIONS

77. The review team was of the view that the preparation of the national communication in Switzerland is a process that involves all stakeholders and as a result there is a high degree of coordination among them in providing the information contained therein. The team felt that Switzerland has placed considerable importance on improving its national data base on inventory data, as work is in progress to harmonize national statistics and improve methodological aspects of preparing the national inventory.

78. The new Energy Law will result in the continuation of existing policies plus some additional measures. Due to recent decisions concerning the transport sector, several new measures are in the early stage of implementation. A second piece of legislation, the new CO<sub>2</sub> law, which would allow the Government to impose a CO<sub>2</sub> tax should the Energy Law and other measures prove insufficient, is seen as being potentially effective in meeting national targets for the post-2005 period.

79. With the exception of the Energy 2000 programme, there is no monitoring system currently in place for systematically evaluating the effects of policies and measures related to climate change. Nevertheless, the review team was generally of the view that Switzerland has been partially successful in implementing, in several sectors, policies and measures to mitigate CO<sub>2</sub> emissions. There are also some policies that reduce the emissions of other GHGs and enhance sinks, although this is generally not their main motivation.

80. Transport emissions are growing, especially in the road freight sector. There are a number of small-scale initiatives at the local level relating to private car travel. As of 2001, federal measures will impose a charge on heavy goods vehicles and use the subsequent revenues to build additional rail infrastructure. A related agreement was reached with EC authorities in late 1998.

81. The team reviewed several scenarios showing possible options that would lead to increased emissions in the energy sector. As the Swiss public is generally opposed to the construction of new nuclear power stations, present nuclear generating plants will, at retirement, be replaced by gas-fired plants, and this could increase CO<sub>2</sub> emissions.

82. With respect to other gases, the team felt that, if fully implemented, the waste management strategy would exploit a significant part of the technical potential for reducing CH<sub>4</sub> emissions from waste and fugitive CH<sub>4</sub> emissions from gas pipes. There is little information about the new gases, but indications are that emissions of HFC, in particular, could grow rapidly, especially since measures to limit emissions of the new direct greenhouse gases, HFC, PFC and SF<sub>6</sub>, are primarily of a voluntary nature.

83. Given that Swiss nationals can legislate directly by referendum, there is a high level of public awareness about environmental and climate-change issues. Public awareness programmes have recently been targeting primary and secondary schools. Although there is no systematic mechanism in place for monitoring the effects of these programmes, surveys conducted by



non-governmental organizations have demonstrated that there is a high level of public awareness on climate change.

-----