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

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Under Articles 4 and 12 of the Convention, Parties are required to prepare national communications on their implementation of the Convention. Guidelines for the preparation of national communications and the process for their review were agreed on by the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, by its decisions 9/2 and 10/1, and by the Conference of the Parties, at its first session, by its decisions 2/CP.1 and 3/CP.1 (see FCCC/CP/1995/7/Add.1). In accordance with these decisions, a compilation and synthesis of the first 15 national communications from Annex I Parties was prepared (A/AC.237/81).

When reviewing the implementation of the Convention by Parties, the subsidiary bodies and the Conference of the Parties will have this report available to them in English as well as the summary of the report in the six official languages of the United Nations. (These bodies will also have before them the executive summary of the first national communication of Switzerland and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary¹

1. The in-depth review of the first national communication of Switzerland was carried out between August 1995 and January 1996 and included a country visit by the team from 11 to 14 September 1995. The team included experts from France and Mexico.
2. In Switzerland, political powers are shared between the federal Government and the 26 cantons comprising the Confederation, with responsibilities for the promulgation of laws for each level of government defined in the Constitution. The process of formulation of legislation is lengthy, with final decisions frequently taken by national referenda. There is thus an inherent uncertainty with regard to how fast policies can be implemented.
3. Approximately 85 per cent of Switzerland's primary energy supply is met through imports. About 60 per cent of the domestic production of electricity is generated through hydroelectric plants and about 40 per cent through nuclear plants. If the current moratorium on the construction of new nuclear plants in Switzerland is extended beyond 2000, part of the electricity demand would eventually have to be met through imports or by the combustion of fossil fuels, with major implications for carbon dioxide (CO₂) emissions. In 1990, per capita emissions of CO₂ were approximately 6.7 t, compared to an average of about 12 t in countries of the Organisation for Economic Co-operation and Development (OECD). In 1994, Switzerland had the 10th highest energy prices and the lowest CO₂ intensity of the 23 countries participating in the International Energy Agency (IEA).
4. The greenhouse gas inventory covered the three main greenhouse gases as well as the precursors. A mixture of IPCC and CORINAIR methodologies was used. Only aggregate emission factors were provided, rendering it difficult to reconstruct the inventory data. Total gross CO₂ emissions were 45,700 Gg in 1990. In estimating CO₂ emissions, the data from the "agriculture" and "residential/commercial" sectors were not separated. CO₂ emissions from biomass energy were not calculated. The inventory included sequestration by sinks, which amounted to 5,200 Gg of CO₂. In 1990, 274 Gg of methane (CH₄) were emitted, mostly in the agricultural sector, and partly from landfills. In per capita terms, these emissions are about half the OECD average. Up to 1995, the data for CH₄ emissions from energy combustion and industrial processes were not available separated from non-methane volatile organic compound (NMVOC) emissions, except for transport. 15.2 Gg of nitrous oxide (N₂O) were emitted in 1990, mainly from agriculture. Estimates were approximate except for those for the transport sector. Estimates of the precursors are based on a study carried out in 1987 in the context of the Clean Air Ordinance.
5. When signing the United Nations Framework Convention on Climate Change, Switzerland announced a self-imposed national target of stabilizing CO₂ emissions by the year 2000 at 1990 levels, and reducing them thereafter. The Strategy to Combat Air Pollution of

¹ In accordance with decision 2/CP.1 (see FCCC/CP/1995/7/Add.1), the full draft of this report was communicated to the Swiss Government, which had no further comments.

1986 establishes, *inter alia*, targets to return to 1960 emission levels for carbon monoxide (CO), nitrogen oxides (NO_x) and NMVOCs.

6. To a large extent, greenhouse gases are targeted by sectoral policies and measures, which have been introduced to implement several articles of the Constitution and federal and cantonal laws on energy, environmental protection, hazardous substances and forestry. General information was provided on the status of implementation of policies and measures. For example, the yearly evaluation of the programme Energy 2000 suggested that, after four years of the 10-year programme, approximately one third of the expected gains of renewable energy use and the stabilization of CO₂ emissions had been achieved, with studies indicating that policies and measures to improve energy efficiency were being broadly implemented, although with some variance as regards the coverage among cantons and energy consumption sectors. Switzerland expects that the programme's targets for the year 2000 will be met.

7. A number of important developments have occurred since submission of the first communication. Debate has progressed on the energy law that is expected to replace the Decree on Energy Use after 1998. Simultaneously, a proposal for a CO₂ reduction law is being elaborated, which would entitle a CO₂ tax to be introduced in the event that other measures fail to achieve specified targets. The approved "Alp Initiative" aims at shifting all trans-Alpine road freight to rail over the next 10 years; proposals are being discussed for an increase in tax on fuel and a revised tax system on road freight transport to help generate revenue for the construction of the planned New Alpine Rail Axis (NEAT). A tax on NMVOCs has been approved, and is expected to come into effect in 1997.

8. The national communication does not provide enough information to allow a third party to gain a full understanding of the projections analysis although some clarification was provided during the country visit. Projected emissions of CO₂, CH₄, N₂O, NO_x, CO and NMVOCs were provided for 2000.

9. The inventory figure for CO₂ used in the projections analysis was corrected for climate variability. Gross CO₂ emissions are projected to decrease by 2.5 per cent in 2000 compared to 1990 levels, but to increase by 1.3 per cent if the climate correction is not applied. Projections for 2030 are also provided for energy-related CO₂ assuming a continuation of the already agreed policy (in particular the Decree on Energy Use). These emissions decrease by 3.3 per cent in 2000 but show an increase of 5 per cent in 2030, compared to climate-corrected 1990 levels.

10. A decrease of 7 per cent in CH₄ emissions is projected for the year 2000, compared to 1990 levels. Data from the 1993 livestock inventory are used to derive a best guess for agricultural emissions in 2000, in the absence of a proper projection estimate. N₂O emissions - which include only data from the transport sector - are projected to increase sharply by 75 per cent because of the introduction of the catalytic converter.

11. The brief description of research on vulnerability assessment and on the expected impacts of climate change contained in the national communication was further developed

during the country visit. No adaptation measures have been taken yet, but there is awareness of the possible need for such measures. A workshop on "Climate change impacts and adaptation options" was held in June 1995 and a paper on specific research needs is under preparation at the Federal Office of Environment, Forests and Landscape. In addition, Switzerland submitted a paper to the IPCC suggesting that a workshop be held to update the IPCC Technical Guidelines for the Assessment of Impacts and Adaptation Options.

12. Swiss official development assistance (ODA) amounted to 0.34 per cent of GDP in 1994. A decision was taken in 1991 to create a special fund for international cooperation with developing countries in the global environmental area, in the amount of Sw F 300 million over five years. This "new and additional" funding was partly utilized for the Swiss contribution to the Global Environmental Facility (GEF) and partly for bilateral cooperation activities. As the special funding decided in 1991 is fully committed, funding from regular sources will be provided to continue bilateral activities, possibly at current levels. As to the GEF, a new frame-credit may be proposed in order to continue the Swiss contribution. The potential for the Swiss private sector to engage in activities implemented jointly (AIJ) was viewed as limited, as the bulk of Swiss emissions comes from the transport and residential sectors, which are characterized by small decentralized sources, rather than from utilities and industry. The in depth-review team also noted that Switzerland has provided financial support to the UNFCCC secretariat in the past, and continues to do so.

13. The information campaigns carried out by the government and by non-governmental organizations were described in greater detail during the in-depth review. Switzerland also supports UNEP's Information Unit on Conventions.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

14. Switzerland ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 10 December 1993. Its first national communication under the UNFCCC was received by the secretariat on 21 September 1994.

15. The in-depth review of the first national communication was carried out between August 1995 and January 1996 and included a country visit by the review team to Berne from 11 to 14 September 1995. The team included Mr. Mariano Bauer (Mexico), Mr. Jean-Jacques Becker (France), Mr. Aniket Ghai (UNFCCC secretariat) and Mr. Tahar Hadj-Sadok (UNFCCC secretariat, Coordinator). During the course of the visit, the team met with experts from a range of federal departments, as well as representatives of the non-governmental community.

16. Policies and measures to address climate change in Switzerland derive from several articles of the Constitution and from federal and cantonal laws on energy, environmental protection, hazardous substances and forestry. To a large extent greenhouse gases are controlled by sectoral policies and measures, which are introduced to implement the different laws. The team noted that instruments to cope with climate change in a cross-sectoral manner

- such as the proposed CO₂-reduction law which envisages the possible introduction of a CO₂ tax - were becoming increasingly apparent in the national response. Laws impacting on climate change are supported by programmes or sectoral plans; especially noteworthy are the Energy 2000 programme and, as regards emissions of precursors from combustion, the Strategy to Combat Air Pollution. A number of national targets are established in these programmes. Energy 2000, which was launched in 1990/91, sets a target, *inter alia*, to stabilize CO₂ emissions in 2000 at 1990 levels, and to reduce these levels thereafter, that was announced at the Second World Climate Conference in November 1990. The Strategy to Combat Air Pollution establishes, *inter alia*, targets to return to 1960 emissions levels for CO, NO_x and NMVOCs.

17. The response to climate change is organized through several committees, operating at various levels. The Interdepartmental Working Group (IWG) on the Evolution of the Climate System was set up in 1989 to prepare a strategy for combating global warming; its activities ended after publication of the document "Global Warming and Switzerland: Foundation for a National Strategy". A second committee, IWG-Rio Climate, is one of seven interdepartmental working groups established to follow up the work of the United Nations Conference on Environment and Development, but is devoted exclusively to climate change. The first national communication was elaborated in the framework of this group, which meets under the chairmanship of the Federal Office of Environment, Forests and Landscape.

18. At the political level, powers are shared between the federal Government and the 26 cantons comprising the Confederation, with responsibilities for the promulgation of laws for each level of government being defined in the Constitution. In general, the Constitution applies the principle of subsidiarity, under which competence for the implementation of all federal framework laws is devolved to the cantons, unless otherwise stated in the Constitution. The Clean Air Ordinance, for instance, requests the cantons themselves to establish targets and associated policies and measures. The Constitution may be modified at any stage by referendum, however, to transfer such powers to the federal level, as was illustrated by the vote on energy policy in 1990 which empowered the federal Government to pass certain laws on energy efficiency and renewable energy.

19. The process of formulation of national legislation is itself complex. Usually an expert group from the federal administration prepares draft legislation which is then presented to the different federal departments for comment. The text is passed to the Federal Council, which in turn engages in a consultation process with the public, including political parties and cantonal authorities. In the case of the initial proposal for a CO₂ tax, the consultation lasted six months. A revised version of the text is then presented to the parliament for approval. In general, laws may be challenged by the people if 50,000 signatures to this effect are collected; the question is then settled through a national referendum. Laws passed at the cantonal level are subject to a similar process of consultation and approval, although, in practice, the process is not as lengthy as for federal laws. There is thus an inherent uncertainty with regard to how fast policies can be implemented.

20. A number of features of Switzerland's geography also merit special consideration. Its situation in central Europe results in considerable transit traffic, which could greatly increase if certain transport regulations are harmonized with those in neighbouring countries.

21. The country's economy is largely dependent on services, with a relatively small industrial sector. Much of the demand for energy-intensive goods is supplied through importation. Generally, about 85 per cent of the primary energy supply is met through imports, almost entirely fossil fuels. The indigenous production of electricity involves very low greenhouse gas emissions, with about 60 per cent of the domestic production being generated through hydroelectric plants and about 40 per cent through nuclear plants. Final consumption typically consists of electricity (approximately 20 per cent), fossil fuels (approximately 75 per cent) and wood and wastes (approximately 5 per cent). The extension of the current moratorium on the construction of nuclear power plants beyond 2000 would be of considerable importance to Switzerland, as, if new plants cannot be built to replace old ones, part of the electricity demand would eventually have to be met by the combustion of fossil fuels or by imports. In 1990, per capita emissions of CO₂ were approximately 6.7 t, compared to an average of about 12 t in the OECD countries. In 1994, Switzerland had the 10th highest energy prices and the lowest CO₂ intensity of the 23 countries participating in the IEA.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

22. The greenhouse gas inventory covered the three main greenhouse gases as well as the precursors. In its first national communication, Switzerland could not yet follow the guidelines recommendation of reporting inventory data on perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆). As recommended, sinks were included separately and a base year of 1990 was used. A number of data gaps, however, are present in the national communication inventory information, not all of which were explained during the in-depth review. These gaps are discussed in detail in the paragraphs below. Information was presented on a gas-by-gas basis, and was aggregated using global warming potentials (GWPs), taking, as recommended, figures from the Intergovernmental Panel on Climate Change supplementary report of 1992 with a 100-year time horizon (IPCC 1992).

A. Carbon Dioxide (CO₂)

23. Total gross CO₂ emissions were 45,700 Gg in 1990. Energy-related CO₂ emissions for 1990 amounted to 42,900 Gg. In compiling the inventory, IPCC methodology was followed, but CORINAIR emission factors were used for calculating these emissions, as these figures were felt to be closer to Swiss values than the IPCC defaults. Only aggregate emission factors were provided, rendering it difficult to reconstruct the inventory data. The data from the "agriculture" and "residential/commercial" sectors were not separated, although this distinction will be made in subsequent updates. The 2,100 Gg of CO₂ from international aviation were presented separately as requested, but were added to totals. The Swiss experts indicated that totals also included emissions corresponding to car fuel purchased by residents of neighbouring countries in response to the lower prices in Switzerland, estimated at 870 Gg

CO₂ in 1990. The quality of data for energy-related CO₂ emissions was felt to be high. CO₂ emissions from biomass energy were not calculated.

24. Non-energy CO₂ emissions totalled 2,800 Gg in 1990. In the national communication, industrial emissions related only to the cement industry, as others were felt to be low. Recent work, which will also be presented in the next inventory, has broadened the coverage to include emissions from iron and steel production. The inventory included sequestration by sinks, with total sink capacity for 1990 estimated at equivalent to 5,200 Gg CO₂, or equivalent to about 12 per cent of CO₂ emissions from energy use, which was included in the total. No uncertainty range was provided in the national communication. The estimate of the carbon storage increment in forests was derived from the forest inventory of 1985, using average productivity values. There was no direct measurement of productivity, but this will be possible with the second forest inventory, expected in 1998. As a result, the sink capacity of the forests might be slightly overestimated. The sink estimate includes an approximation of the carbon stored in wood products; the associated annual increment might be overestimated because of a low estimate of wood products leaving the system, as current figures suggest an average life time of 60 to 100 years, which might be slightly high. Carbon stored in forest soils was not taken into consideration in the inventory although the forest area has increased from 825 to 1196 kha during the last 100 years. The team was informed that the absence of an estimate of CO₂ emissions and sinks related to agriculture rested on the assumption that for plant cultivation the amount of carbon fixed is equal to the amount of carbon released.

B. Methane (CH₄)

25. CH₄ emissions in 1990 totalled 274 Gg. In per capita terms, these emissions are about half the OECD average. They account for approximately 6.3 per cent of total greenhouse gas emissions, if calculated with direct IPCC 1992 GWPs as in the national communication. Using GWPs from the IPCC supplementary report of 1994 with a 100-year time horizon (IPCC 1994), that figure increases to 12.9 per cent of total greenhouse gas emissions. In the report, no uncertainty range was provided for these data. Of total CH₄ emissions, 78.4 per cent arises from the agricultural sector, 50.3 per cent from enteric fermentation of ruminants and 28.1 per cent from manure management. Estimates were made using IPCC default emission factors for enteric fermentation and manure management. It is possible that emissions from the storage of cattle manure are overestimated since the fact that the cattle spend a large part of their time in the pastures, when emissions are likely to be negligible, was not taken into account. Studies are under way to improve these estimates, which should be reflected in the next national communication to be provided in April 1997. Approximately 17 per cent of total CH₄ emissions occurs in landfills. A first order kinetic model was used for estimation, but no precise information was provided on the volume of waste and emission factors. The team was informed that the data for the 1996 inventory update are expected to have an uncertainty range of ± 20 per cent. Until 1995, methane emissions from energy combustion and industrial processes were not available separated from NMVOC emissions, except for transport, for which a figure was derived using CH₄/NMVOC ratios for different types of vehicles. Meanwhile, the data for all sources have been separated and will be reported in the next communication concerning greenhouse gas inventories.

C. Nitrous oxide (N₂O)

26. 15.2 Gg of N₂O were emitted in 1990. Using IPCC 1992 GWPs, these emissions contribute 8.6 per cent to total greenhouse gas emissions, or 9.2 per cent of total greenhouse gas emissions with IPCC 1994 GWPs. No uncertainty range was provided in the report. Data in the 1996 update are expected to have a range of ± 50 per cent. Agriculture is responsible for 87.5 per cent of total N₂O emissions. The estimates are based on an emission factor calculated for German conditions, which is two to three times higher than the IPCC default value. N₂O emissions from acid rain deposition were also included. Studies will be launched to improve the estimate. Fuel combustion and industrial processes contribute 12.5 per cent of total N₂O emissions. Very approximative estimates were made for each sector, except for transport, for which a figure was derived using ratios per kilometre for different types of vehicles. The amount of N₂O emitted from land use change and forestry and waste has not been estimated.

D. Precursors

27. Estimates of the precursors are based on a study carried out in 1987 in the context of the Clean Air Ordinance. Reported figures for NO_x, CO and NMVOCs were 184 Gg, 430 Gg and 297 Gg respectively. Differences in levels of activity in the various sectors in 1990 as well as the use of preliminary emission factors in the 1987 study suggest that the reported figures might differ significantly from actual 1990 emissions; this will be verified in an update to be published in early 1996. Uncertainty was addressed during the team's visit, but has not been discussed in the report.

E. Other gases

28. No inventory information was provided on HFCs, SF₆ or PFCs, but work is under way, in collaboration with Swiss industry, to calculate these data, which are expected to be included in the second national communication in 1997.

III. POLICIES AND MEASURES

29. In 1990, a major leap forward was achieved in energy policy through the programme Energy 2000. The programme was the result of the acceptance of an article on energy in the Federal Constitution and of a moratorium on the construction of new nuclear power plants. As a direct result, some important measures to improve energy efficiency and to promote renewable energy were implemented with the decree and the ordinance on energy use. The three main objectives of Energy 2000 are the stabilization of fuel consumption and CO₂ emissions by 2000, reduction in growth and stabilization after 2000 of electricity consumption and the increased contribution of renewable sources and capacity extension of existing nuclear power plants. The programme includes federal and cantonal legal instruments as well as voluntary actions undertaken in many cases jointly by industries, consumers and governments. Yearly reports provide overviews on the current progress of this programme. The Federal

Decree on Energy Use is valid up to 1998. It establishes regulations on the energy consumption of installations, vehicles and appliances, heating of water, metering and invoicing of heating costs in rented buildings, licensing for new electrical heating systems and conditions for independent power producers. The decree also provides for financial support for renewable sources of energy.

30. The Ordinance on Energy Use, which contains the specific provisions to implement the decree, establishes, *inter alia*, energy consumption targets for household appliances and other equipment and (as of January 1996) for passenger cars. Adherence to these targets varies from one appliance to another; information provided to the team for 1993/94 for refrigerators and freezers indicated a good performance. The federal regulations and principles in the building sector are to be implemented by the cantons. Since 1990, 24 of the 26 cantons have adopted new legal measures contributing to the Energy 2000 targets. Shortage of funding and lack of personnel at the cantonal level were reported as major obstacles to the implementation of energy-related policies and measures.

31. The team was informed that the yearly evaluation of Energy 2000 had recently been carried out to assess what had been achieved halfway through the programme. The broad conclusions were that a third of the total gains expected of renewable energy had been achieved, and that not all individual policies and measures had yet been implemented, although the broad sectoral targets were in place at the cantonal level. The team was also informed that implementation of some programmes required additional funding and expertise. Summaries of evaluation reports of the different policy measures taken in the frame of Energy 2000 were presented during the country visit. The Swiss Government expects that the targets for the year 2000 will be met.

32. Information was also provided on future policies and measures. After 1998, to succeed the Decree on Energy Use, a currently debated proposal for an energy law is expected to come into effect. The process of debate has resulted in broad-based approval for more stringent regulations on appliances, cars and installations. As regards federal requirements for heating of buildings, framework legislation for cantonal implementation found broad acceptance. Still under discussion is the proposal to establish a new energy agency. In support of the proposed energy law, a follow-up programme, "Energy 2000+", is being developed. The popular "Energy and Environment Initiative" and the "Solar Initiative" (on which the parliament and the public will have to vote) propose the establishment of an incentive energy tax (a counterproposal to the CO₂ tax) and of a subsidy programme targeting solar energy, respectively.

33. A proposal for a CO₂ reduction law is in preparation. An earlier project for a tax on CO₂ emissions was rejected in a public consultation in 1994, owing partly to disagreement over the appropriate instrument and partly to opposition to earmarking of revenues. The new proposal will be presented as a CO₂ reduction law, under which quantified CO₂ reduction targets will be set within specified time-frames, such as 2005, 2010 and 2020. The gradual implementation of a CO₂ tax, the revenues from which will be fully restored to the taxpayer, will be authorized only in the event that other measures, after a period of monitoring and

evaluation, prove to be inadequate to reach the specified targets. Thus, should the proposal be approved and should it become necessary to implement the tax, this would not occur before the year 2000. The CO₂ reduction tax proposal is to be presented to the Federal Council by mid-1996.

34. The transport sector is the largest consumer of primary energy, responsible for 32 per cent. The team was informed that environmental policy in the area of transport was driven mainly by factors such as concern over air pollution, and density of traffic and noise, rather than by aims to reduce CO₂. In February 1994, the "Alp Initiative", which aims, *inter alia*, at shifting all trans-Alpine road freight to rail over the next 10 years, was voted on and approved. The implementation of this constitutional amendment is envisaged through the approved NEAT project (New Alpine Rail Axis), coupled with other measures such as revision of the road tax system for heavy traffic. The whole strategy and its elements are under discussion. Nevertheless, some cornerstones in the strategy are clear: the construction of two new tunnels through the Alps for rail transport is needed to increase capacity and to reduce travel time. A proposal for the introduction of a revised taxation system for heavy vehicles (over 3.5 tonnes) has gone through the public consultation process. Implementation is planned at the earliest for 1998, but will probably take place later. At present, taxation is based on a flat fee for heavy vehicles over 3.5t to use roads. This is to be replaced by a new taxation scheme based on total permissible weight and kilometres driven. The revised system foresees tax rates that include the full coverage of the infrastructure costs, as well as some environmental costs (noise, damage to buildings due to air pollution) and uncovered costs of accidents. The total external costs of heavy vehicle road transport were calculated at about Sw F 600 million in 1993. There will be a decrease in total kilometres driven of 2-4 per cent when all calculated up to now external costs are taken into account.

35. In addition to the NEAT project, emission regulations for heavy vehicles have been strengthened, approaching EU levels, and limits for tractors have been established. A central concern is that harmonizing weight limits for heavy vehicles in Switzerland, currently at 28 t, with those in the EU, which are at either 40 t or 44 t, will result in a sharp increase in transit road transport and/or a shift from rail to road. Another project - Rail 2000 - which is currently in the phase of implementation, aims at improving intercity transport. Additional policies are in place, under cantonal jurisdiction, such as restrictions on parking and the establishment of speed limits in certain areas.

36. The Clean Air Ordinance of 1985 imposes limits on the emissions of precursors from combustion equipment. These limits are made more stringent periodically according to the gap between actual emissions and targets set out in the Strategy to Combat Air Pollution of 1986, namely a return to 1960 levels of NMVOCs, NO_x and CO. Control of local pollution is the main objective of the Clean Air Ordinance, which also establishes limits on emissions of precursors from vehicles. Catalytic converters were introduced in 1987. To control industrial emissions of NMVOCs, a proposal to introduce a pure incentive tax on NMVOCs in dyes, solvents and lacquer was approved by parliament in 1995, and is expected to come into effect in 1997. The tax will be implemented, commencing at a rate of Sw F1/kg NMVOC, moving up to Sw F2, and possibly reaching Sw F5 should it be necessary to achieve the emission

target specified in the Clean Air Ordinance. The revenue generated by this tax will be redistributed to the population on a per capita basis, possibly through the health care system. Provisions have been made to tax imported goods with a high content of NMVOCs and to exempt exported products, fossil fuels and harmless NMVOCs. Moreover, cantons are required to implement local plans in the transport sector, aiming at the control of local pollution. Apart from direct monitoring of projects, yearly reports are prepared on transport, including evaluation of performance and projections for future strategies. Implementation of the Clean Air Ordinance is monitored at both cantonal and federal levels.

37. In the agricultural sector, there are no specific measures directly aimed at climate change. A federal law on agriculture provides for support to farmers, and two ordinances provide farmers with specific financial incentives to meet environmental standards. Following the conclusion of the Uruguay Round of Multilateral Trade Negotiations, the old agricultural law of 1951 will be replaced by a new one, which is expected before 2002. Framework federal legislation on environmental protection, on the use of hazardous substances and on water pollution prevention also impacts on the agricultural sector, although implementation takes place at the cantonal level. For example, controls on the use of fertilizer and pesticides to safeguard the quality of water will have an impact on greenhouse gas emissions.

38. Forestry policy aims essentially at conservation. Deforestation, for example, is not allowed except in very specific circumstances and is then coupled with the duty of afforestation of an equivalent area elsewhere. The production of wood is only one objective among others, such as protection against natural hazards. There is no specific policy to increase the sink capacity of the forestry sector, for instance by support for afforestation of agricultural land. Afforestation has been occurring spontaneously, at the same rate over the last 50 years, as trees grow on unused agricultural land and cannot be cut down once they become "forests".

39. An ordinance on waste management regulates stringently the creation of new landfills, requiring all waste to be incinerated to the extent possible. The implementation of this ordinance is a cantonal responsibility, which can lead to some delay. Collection and use of CH₄ emitted by existing landfills is supported in the energy legislation. Both of these measures contribute indirectly to climate change mitigation.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

40. The national communication does not provide enough information to allow a third party to gain a full understanding of the projections analysis. Some clarification was provided during the country visit, but relevant documentation was not always available in an official language of the United Nations. The estimated effect of measures was indicated for the most important measures and for certain packages of measures. Due to synergies between measures, experts noted the difficulty of estimating the effects of all individual measures in a way that would avoid double-counting of expected emissions reductions. Projected emissions of CO₂, CH₄, N₂O, NO_x, CO and NMVOCs were provided for 2000. Uncertainty ranges on

estimates were not provided. CO₂ projections till the year 2000 included several scenarios. The expected emission development which took into consideration the measures already under implementation served as base scenario. The national communication did not provide any information on the cost of the policies and measures implemented by the Swiss Government. The team was informed that cost estimates had been elaborated for an earlier, not fully compatible, set of scenario studies. This point will, however, be taken up in the future in projections analysis involving the scenarios for 2030 in the context of the CO₂ reduction law and other pending proposals (e.g., Energy Law, popular initiatives), in which a general equilibrium model will be used, *inter alia*, to evaluate costs and, in particular, the burden sharing between income groups. Another study will assess the impact on the international competitiveness of Swiss industry.

A. Carbon Dioxide (CO₂)

41. Gross CO₂ emissions are projected to decrease by 2.5 per cent in 2000 compared to 1990 levels. Without the climate correction, gross CO₂ emissions increase by 1.3 per cent. These figures include emissions from bunker fuels in totals. If bunker fuels are subtracted, emissions are projected to increase by 0.5 per cent in 2000 compared to actual emissions in 1990. Projections for 2030 are also provided for energy-related CO₂. These emissions decrease by 3.3 per cent in 2000 but show an increase of 5 per cent in 2030, compared in both cases to 1990 levels.

42. The "with measures" scenario considers only policies and measures already agreed. Some information is also provided on an alternative "with measures" scenario, which includes some possible additional measures not yet implemented such as the law on energy and the CO₂ tax. During the country visit, three additional scenarios were described, namely: a scenario based on implementation of the law on energy alone; a scenario based on the popular "Energy and Environment Initiative" (under which a decrease of 1 per cent per year in non-renewable energy consumption is achieved between 2008 and 2030), and the "Solar Initiative".

43. In all scenarios, the inventory data for CO₂ emissions for 1990 have been corrected for temperature variations. The climate correction has been carried out as the addition of 1,800 Gg of CO₂ to actual 1990 emissions, which results in an increase of approximately 4 per cent in actual CO₂ emissions. Figures underlying the computation of this value are provided in Annex I to the national communication. 1970 has been selected as the base or "normal" year. Figures indicate a variation in temperature of +8 per cent to -13 per cent around this base value for the period 1970 to 1992. Other differences exist in inventory and projections data for 1990. Emissions from "small-sized" companies are included in the "industry" category in the projections data, but come under "services" in the inventory. Other minor differences, according to Swiss experts, probably arose from using figures derived from sales in the first case and actual consumption in the second case. Bunker fuels were added to totals in the projections analysis, as well as in the inventory.

44. The projections were the result of a major forecasting exercise led by the Federal Energy Office and coordinated by a consulting firm, and involving several other consultants

and experts. An evaluation of the impact of individual measures is available, although not in an official language of the United Nations. A highly disaggregated bottom-up approach was used, with considerable detail at the microeconomic level. The model relies on prospects for the Swiss economy up to the year 2030. Key variables include population, growth of gross domestic product (GDP), world energy prices, levels of exchange rates, Swiss industrial prospects, and so on. Sensitivity analyses made for a lower population growth scenario are available (subject to language restrictions).

45. The residential sector projection estimates heating requirements by considering total housing area up to 2030, types of buildings, age of buildings, population, size of families, etc., and also the division between energy carriers, based in particular on relative prices. Key variables include average energy requirements per square metre each year and for each energy source, according to the various buildings in service and their respective energy efficiency, the efficiency of burning devices, based on standards and technological progress, warm water requirements and details on cooking and electric appliances. A similar approach is used in the services sector as in the residential sector. The industrial sector analysis is based on the assessment of the level of activity in 40 subsectors, examining different product lines and up to 20 processes.

46. The transport model estimates traffic, disaggregated into passenger traffic (in millions of passenger-kilometres, with a division between private and public transport, each subdivided into car and motorcycle or bus and train categories) and freight traffic (in millions of tonne-kilometres, distinguishing between road and rail transport, and domestic, international and transit traffic). Specific energy consumption is also calculated considering, *inter alia*, the impact of standards (target values) and fuel prices. The projection assumes a constant growth rate in numbers of private cars and a sharp increase in freight.

47. The model for power generation is demand-derived and based on earlier analyses. In the reported scenario, supply analysis rests on the assumptions that the increase in hydropower is limited to 5 per cent until 2030 for physical reasons, that the number of nuclear plants remains constant, but that an increase of 10 per cent occurs in the capacity of existing plants, that electricity imports remain constant, and that renewable sources grow at a modest rate. A major part of the remaining gap between demand and supply will be met by the development of thermal power, mainly through combined heat and power stations.

48. A slight decrease in energy-related CO₂ emissions was projected for 2000 (-3.4 per cent with respect to 1990 corrected for climatic variations, but +4.9 per cent with respect to 1990 actual emissions). The increase of 8 per cent in the transport sector CO₂ emissions is more than offset by the decrease in the residential and services sectors (of -6.7 per cent with respect to the 1990 corrected figure) and industry (of -26 per cent). These trends largely reflect the 1990-1995 recession and the phasing-out of the aluminium industry. For 2030, an increase in energy-related CO₂ emissions is projected (of +5 per cent with respect to 1990 emissions corrected for climatic variations, or +9.5 per cent with respect to 1990 actual emissions). Emissions in the transport sector continue to grow (by +32 per cent compared to 1990), as the volume of traffic increases more rapidly than improvements in the energy

efficiency of vehicles and the shift from road to rail. The residential and services sectors' emissions are still decreasing (by -20.5 per cent with respect to 1990), but industrial emissions increase again (as production grows faster than energy efficiency, at +13 per cent with respect to 2000 but nevertheless -17 per cent with respect to 1990). Emissions from power generation, although still low in absolute terms, rise sharply because of the introduction of thermal plants (by +86 per cent with respect to 1990 figures).

49. The projected figure for CO₂ from industrial processes is extracted from a report written in 1987 and is in the process of being updated. The projection includes sequestration of CO₂ in forests, with a projected increase in net sinks. The same absorption factor for forests is assumed to apply in 2000 as in 1990. Total forest area is growing slightly, as indicated in chapter III above. Thus, the 3,600 hectares of forest added annually will increase the sink capacity of forests in Switzerland by less than 2 per cent in 2000. It is implicitly assumed that the harvest of wood will remain constant between 1990 and 2000, although the national communication seemingly contradicts this in asserting that is expected to increase by 18 per cent between 1995 and 2000 with respect to 1983-1987 figures. The latter would result in reducing or substituting fossil fuel consumption instead of increasing sequestration.

B. Methane (CH₄)

50. A decrease of 7 per cent in CH₄ emissions is projected for the year 2000, compared to 1990 levels. It should be noted, however, that this figure contains agricultural reductions that were already achieved in 1993. At present, a proper projection estimate is not considered feasible. Additional information will be generated, however, for instance by studies to evaluate the impact of the reform of agricultural policy on production and to arrive at more appropriate figures on emission factors.

C. Nitrous oxide (N₂O)

51. Emissions from transport are projected to increase sharply by 75 per cent because of the introduction of the catalytic converter. This figure, however, is provisional and will be updated in April 1996. There is no projection for 2000 for N₂O emissions from agriculture.

D. Precursors

52. Projections for 2000 and 2010 provided in the national communication were extracted from a report written in 1987, which was updated in 1988. This study is in the process of being further updated and the new information is expected to be ready for the April 1996 inventory. Broad trends are nevertheless expected to remain the same, notably a sharp decrease by 2000 of NO_x, CO and NMVOC emissions with respect to 1990 levels. As regards the recently agreed tax on NMVOCs, it is anticipated that a decrease of 75,000 t of emissions per year will be achieved, which would ensure that the Clean Air Ordinance target would be met.

V. PROJECTED PROGRESS IN GREENHOUSE GAS MITIGATION

53. A number of measures designed to mitigate greenhouse gas emissions, both to achieve current targets and to reduce emissions beyond 2000, are currently in various phases of discussion or implementation. At present, the major contribution to CO₂ reduction comes from the Energy 2000 programme, including the Decree on Energy Use, cantonal energy policies and voluntary action. Further measures will be the CO₂ reduction law, the energy law, the tax on NMVOCs, the tax on heavy traffic, the "Alp Initiative", intensification of air pollution controls and measures to reduce air traffic pollution. These measures are discussed, in varying detail, in chapters III and IV.

VI. EXPECTED IMPACTS OF CLIMATE CHANGE

54. The brief description given in the national communication of research on the expected impacts of climate change was amplified in discussions during the country visit. Research has been conducted in a number of areas on vulnerability assessment and on expected impacts of climate change. The main areas of research include the effects of varying CO₂ concentrations on plants, the response of glaciers to climate change, the impact on mountain ecosystems, the impact of flooding and past global changes. Much work has been done on sensitivity analysis and, to a lesser extent, on scenarios. Additional results are expected over the next one to two years from National Research Programme 31 "Climate Changes and Natural Disasters".

VII. ADAPTATION MEASURES

55. There is no specific government strategy on adaptation nor have any adaptation measures yet been taken. However, with the reinsurance sector playing a pioneering role, several branches of the Swiss economy are beginning to take the possible impacts of climate change into consideration in their operations. In addition, a meeting is being organized by the Swiss Academy of Sciences' Forum on Global Change on the expected impacts of climate change and the possible need for adaptation measures in which stakeholders from the agricultural, insurance, banking and tourism sectors will participate. With regard to commitments under Article 4.1(e) of the UNFCCC to cooperate in preparing for adaptation, there are no specific bilateral projects targeting adaptation, in part because Swiss bilateral aid is provided largely in response to proposals, and sound proposals on adaptation have not been forthcoming.

VIII. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

56. Swiss ODA amounted to 0.34 per cent of GDP in 1994. Consideration has been given by the Government to achieving a level of 0.4 per cent in 2000, but current trends make it unlikely that this objective will be met. Since 1991, ODA has fluctuated between 0.33 and

0.39 per cent of GDP, and is projected at 0.33 per cent in the short term. A decision was made in 1991, as part of the celebrations of the 700th anniversary of the Swiss Confederation, to create a special fund for international cooperation with developing countries in the global environmental area, in the amount of Sw F300 million over five years. This special funding was "new and additional", over and above ongoing assistance flows to developing countries and countries with economies in transition. Such funding was utilized for the Swiss contribution to the GEF, for bilateral cooperation activities, and for the Multilateral Fund for the Implementation of the Montreal Protocol.

57. In the pilot phase of the GEF, Switzerland made a contribution of Sw F80 million, about Sw F60 million to the core fund and about Sw F20 million to cofinance three projects, of which one - photovoltaics in India - was in the climate change focal area. An estimated 37 per cent of the GEF funding for the pilot phase was committed to activities in the climate change focal area. The Swiss contribution to the first replenishment of the restructured GEF was Sw F64 million in three years. As the special funding agreed in 1991 is fully committed, it is possible that a new frame-credit will be proposed in order to continue Swiss contributions to the GEF. Out of the Sw F300 million in the special fund, Sw F156 million served the needs of bilateral cooperation, 28 per cent of which (Sw F43 million) were dedicated to climate-change-related projects.

58. Information contained in the national communication on Swiss bilateral assistance was confirmed during the country visit. In addition, information was provided regarding two applications of solar energy for water desalination in northern Africa, as well as a study implemented jointly with an Indian institute regarding structural adjustment and the global environment. Cooperation projects promoted by the Federal Office of Foreign Economic Affairs, generally involving the application of Swiss technology, with financing on commercial or concessional terms, were also discussed. In bilateral activities relevant to climate change, emphasis is placed on technologies related to energy efficiency, renewable sources of energy, such as hydroelectric power and solar energy, and on capacity building in the forestry sector.

59. The potential for the Swiss private sector to engage in AIJ was viewed as limited, as the bulk of Swiss emissions comes from the transport and residential sectors, which are characterized by small decentralized sources, rather than from utilities and industry. Consideration is being given to AIJ involving the Swiss public sector and countries with economies in transition. In addition to initiatives for the transfer of technology from Switzerland to other countries, the Government gave an example of technology transfer from South to North, referring to a project that is under way to adapt to Swiss conditions a small biomass power plant originally developed in India.

60. The team also noted that Switzerland has provided financial support to the UNFCCC secretariat in the past, and continues to do so.

IX. RESEARCH AND SYSTEMATIC OBSERVATION

61. The in-depth review team was satisfied that recommendations for reporting had been followed. Switzerland's long tradition in research related to climate change is reflected in the national communication, including participation in international efforts. Commitments under Article 5(c) of the Convention concerned with improving developing countries' endogenous capacities and capabilities to undertake research and systematic observation have been explicitly honoured. For instance, one of seven modules of a major environmental research programme funded by the Swiss National Science Research Foundation is devoted to promoting research capacity in developing countries within four thematic areas, some of which are directly related to climate change. The team noted that programmes were also under way to build research capacity in countries with economies in transition. The Swiss National Committee of the International Geosphere-Biosphere Programme has taken the decision to foster research partnerships in parts of the globe that have been given relatively little attention, and the Commission on Research Partnerships with Developing Countries will be holding a major international meeting in spring 1996 on the subject of "Scientific Research Partnerships for Sustainable Development".

X. EDUCATION, TRAINING AND PUBLIC AWARENESS

62. The national communication describes a number of government information campaigns that have been carried out using a variety of media and targeting a range of groups in society. In addition, the team was informed of a planned project to build up awareness of climate change among political parties in communes and cantons.

63. At the international level, at the Second World Climate Conference Switzerland proposed the creation of an Information Unit on Climate Change, now the UNEP Information Unit on Conventions, and was initially the sole country to contribute funding. Swiss support for the Unit is maintained at Sw F100,000 per annum.

64. Non-governmental organizations also carry out public awareness campaigns. Non-governmental actors were consulted in the drafting of the national communication, and are also involved in policy formulation, in particular during the consultation phase of draft federal legislation.
