



# OECD Environmental Performance Reviews

## SWITZERLAND



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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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## FOREWORD

The principal aim of the OECD's Environmental Performance Reviews programme is to help *member countries improve their individual and collective performances in environmental management* with the following primary goals:

- to help *individual governments* assess progress;
- to promote a continuous policy *dialogue among member countries*, through a peer review process; and
- to stimulate *greater accountability* from member countries' governments towards their public opinion, within developed countries and beyond.

Environmental performance is assessed with regard to the degree of achievement of *domestic objectives and international commitments*. Such objectives and commitments may be broad aims, specific qualitative goals, precise quantitative targets or a commitment to a set of measures to be taken. Assessment of environmental performance is also placed within the context of historical environmental records, the present state of the environment, the physical endowment of the country in natural resources, its economic conditions and demographic trends.

These systematic and independent reviews have been conducted for all member countries as part of the first cycle of reviews. The OECD is now engaged in the second cycle of reviews directed at *promoting sustainable development*, with emphasis on implementation of domestic and international environmental policy, as well as on the integration of economic, social and environmental decision-making.

The present report reviews environmental performance of Switzerland. The OECD extends its most sincere thanks to all those who helped in the course of this review, to the representatives of member countries to the Working Party on Environmental Performance, and especially to the examining countries (Austria, Greece and Italy) and their experts. The OECD is particularly indebted to the Government of Switzerland for its co-operation in expediting the provision of information and the organisation of the experts' mission to Switzerland, and in facilitating contacts with many individuals both inside and outside administrative and governmental structures. The present review benefited from grant support from Japan and Austria.

The OECD Working Party on Environmental Performance conducted the review of Switzerland at its meeting on 26 September 2006 and approved its conclusions and recommendations.

Lorents G. Lorentsen  
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## Signs

The following signs are used in figures and tables:

. . : not available

– : nil or negligible

. : decimal point

\* : indicates that not all countries are included in totals.

## Country Aggregates

OECD Europe: All European member countries of the OECD (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and United Kingdom).

OECD: The countries of OECD Europe plus Australia, Canada, Japan, the Republic of Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

## Currency

Monetary unit: Swiss Franc (CHF).

In 2005, 1.55 CHF = 1 EUR and 1.25 CHF = 1 USD.

## Cut-off Date

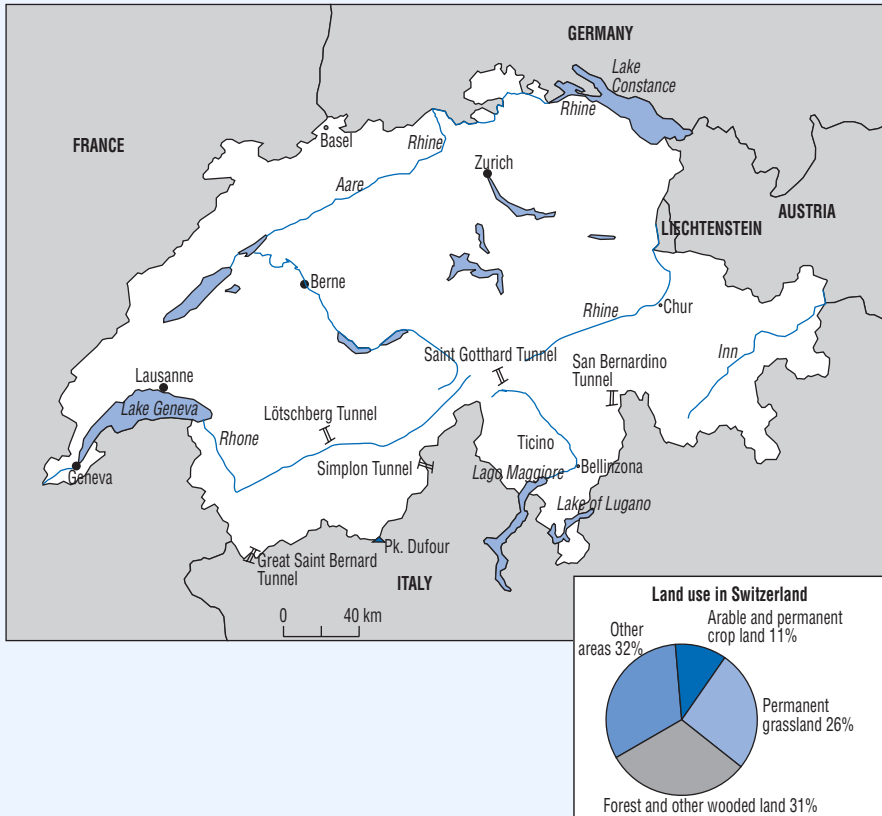
This report is based on information and data available up to April 2006.

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### Map of Switzerland



Source: OECD, Environment Directorate.



# 1

## CONCLUSIONS AND RECOMMENDATIONS\*

This report examines Switzerland's progress *since the previous Environmental Performance Review* by the OECD in 1998, and the extent to which the country has *met national objectives and honoured international commitments*. The report also reviews Switzerland's progress in the context of the *OECD Environmental Strategy*.\*\* Some 46 recommendations are made that could contribute to further environmental progress in Switzerland.

Switzerland's environment is subject to *severe pressures* (pollution, extraction of natural resources, spatial restructuring), due in particular to industry, agriculture, transport and tourism. These pressures stem from very high population densities and a high level of economic activity, and from Switzerland's location at the heart of Europe.

For over 30 years, the ambitious environmental policies promoted by the *Confederation* have been implemented by the *cantons* and the *communes*. They have been based on a prescriptive approach, sustained government funding and active public opinion that is deeply concerned about the environment (especially following certain major industrial accidents, the environmental impact of intensive farming, the deforestation debate and the 1987 floods). These policies have yielded remarkable results in combating pollution and natural hazards. More recently, and during the period under review, environmental policies have focused on *partnerships* with economic interests and civil society as a whole, on application of the *polluter pays principle* and on *prevention* (e.g. in risk management and management of natural resources).

---

\* Conclusions and Recommendations reviewed and approved by the Working Party on Environmental Performance at its meeting on 26 September 2006.

\*\* The objectives of the OECD Environmental Strategy for the First Decade of the 21st Century covered in these Conclusions and Recommendations are: maintaining the integrity of ecosystems (Section 1), decoupling of environmental pressures from economic growth (Sections 2.1 and 2.2), and global environmental interdependence (Section 3).

Despite the progress made in factoring the imperatives of sustainable development into sectoral policies, including energy, transport and agricultural policies, it is still difficult to translate the concept of sustainable development into *consumption patterns*, e.g. the *consumption of space, transport and recreational activities*. There has been continued regression with regard to *biodiversity*, nature and landscapes. Concerns about sluggish or weak economic growth, and about *international competitiveness*, are tending to lessen the priority given to environment-related issues in the short term.

## 1. Environmental Management

### *Strengthening the implementation of environmental policies*

In many respects, Switzerland's performance in fighting pollution is *among the best* of any OECD country. This is the result, in particular, of an ambitious, long-term legislative and institutional policy regarding the environment. The federal Law on the Protection of the Environment (LPE), revised in the mid-1990s, stresses the *principles of co-operation, causality* (the polluter pays and user pays principles) and *prevention*. On the whole, there is *very good co-operation among all stakeholders*, including civil society (e.g. environmental NGOs, businesses, farmers' associations), as well as between the Confederation and the cantons and communes. The *cantons* implement most environmental policies and related measures and supervise environmental actions at the local level. The federal authorities (including the Federal Council) also formulate wide-ranging planning documents that incorporate environmental issues. Economic *instruments* (e.g. charges for water and waste management services) are being used with growing effectiveness within the framework of *greater internalisation of external costs*. A number of environmental taxes and budget-neutral fiscal measures have been explored and/or adopted (e.g. the VOC incentive tax, the proceeds of which are returned to households via health insurers). The creation of the Federal Office for the Environment (FOEN) on 1 January 2006 demonstrates the determination to expand *sustainable management of natural resources* (forests, nature, water) and to encompass the management of natural hazards and technological risks. Government and business spending on the environment (pollution abatement and nature protection) has remained stable at around *1.4% of GDP*. These outlays have yielded *economic benefits* with regard to: i) health (avoided expenses, improved productivity at work); and ii) the Swiss economy in sectors such as tourism, engineering, electrical equipment, the environmental industry and agri-food (thanks to Switzerland's ecology-friendly international image). All these changes are taking place within an economy that is very open to trade with the European Union and the rest of the world.

However, Switzerland is faced with numerous environmental challenges resulting from non-point source pollution (e.g. of agricultural origin) and unsustainable consumption patterns (e.g. in transport, recreational activities and land use). Its biodiversity and landscapes are threatened. There is a need to focus on the *actual results* of environmental policies and to strengthen co-ordination among different levels of government, based on reliable data. An integrated and harmonised system should be devised for authorising industrial activities. Switzerland's overall *enforcement of environmental legislation* is not being documented. Companies with plants in more than one canton sometimes face different environmental regulations and/or enforcement levels. *Regional development* policy has not been able to contain rapid growth on the outskirts of cities. Thus, there has been considerable construction of farm buildings and transformation of existing structures *outside designated zones*. Greater use should be made of economic instruments (e.g. the CO<sub>2</sub> tax) to increase the effectiveness of environmental policies and sustainable management of natural resources. Even though progress has been made regarding water and waste, the polluter pays and user pays principles are not applied sufficiently in the realms of climate, air, noise and the protection of nature.

*Recommendations:*

- step up efforts to promote *more sustainable consumption patterns* by adopting appropriate regulatory and economic instruments, and through adequate demand management;
- continue efforts to implement the *principle of causality* (the polluter pays and user pays principles);
- further improve the effectiveness and efficiency of environmental policies with improved *monitoring of the environment* and its interactions with the economy (environmental data and economic analysis), expanded use of *economic instruments* and documentation of compliance with environmental legislation;
- continue efforts to strengthen co-ordination between the Confederation and the cantons, so as to implement *harmonised and efficient environmental policies* throughout the country (e.g. by adopting an integrated system for authorising industrial activities, along the lines of the European Union's IPPC approach);
- adopt strategies that are more highly integrated to *manage natural hazards and technological risks*, taking into account other sectoral policies (e.g. regional planning, transport, forests); accelerate completion of cantonal cadastres of *contaminated sites* and begin to decontaminate priority sites.

## Air

Since the first review, there have been further reductions in concentrations of the main air pollutants, and air quality has continued to improve. The results obtained by Switzerland are *among the best* in any OECD country (e.g. lowest emissions of SO<sub>x</sub> and NO<sub>x</sub> per unit of GDP). Thanks to strict management and significant financial support, the *public transport system* (interurban, suburban and urban transport) is one of the most highly developed networks in any OECD country, giving public transport a large share of the modal split. With regard to transalpine transport, the *Overland Transport Agreement* promotes a shift from road to rail in order to cope with the growth in heavy vehicle traffic. Recent data show a nearly 30% increase in combined transport, while heavy vehicle traffic decreased by around 10% in the last three years. This agreement, like the continuous modernisation of *railway infrastructure* and the introduction of a distance-related *heavy vehicle fee*, can be seen as a model. Switzerland's energy intensity is lower than that of any other OECD country. Launched in 2001, the SwissEnergy programme has helped to reduce energy consumption by 6.5% and CO<sub>2</sub> emissions by 7%. In addition, the share of *renewable energy sources* in the total energy supply has increased to 17.5%.

### *Recommendations:*

- implement further measures to combat *fine particulates and ground-level ozone* from transport (on-road and off-road vehicles), industry and households, and *ammonia* generated by agriculture (e.g. by adopting tougher emissions limits, promoting innovation and increasing the use of particulate filters on diesel engines);
- further exploit the *multiple benefits* associated with air quality, climate change and energy efficiency objectives;
- continue to *internalise the external environmental costs of road passenger transport* (e.g. by introducing distance-related incentives or combining energy labels with a bonus/malus system applicable at the time of purchase);
- pursue a *freight traffic shift* from road to rail through targeted investment, financial support for public transport and intermodality, and extension of the heavy vehicle fee;
- pursue implementation of the *SwissEnergy* programme; consider increasing taxes on gasoline and diesel fuel to improve internalisation of external costs; further promote energy efficiency in buildings and industrial installations.

However, in recent years it has become more difficult to *maintain the levels achieved* or to make *further substantial improvements*, due mainly to budget restrictions. Important challenges remain: *PM<sub>10</sub>*, *ground level ozone*, *NO<sub>2</sub>*, ammonia and greenhouse gases (e.g. CO<sub>2</sub>). High levels of particulates are one of the most serious threats to the health of people living in cities and near major traffic routes. Ambient air quality standards for ozone are frequently exceeded in summer. The massive *increase in mobility* offsets the effects of pollution abatement measures and technological progress. Incentives to promote sustainable mobility and environmentally responsible consumption patterns and production may help to improve air quality. The two essential elements in this regard are *green tax reform* and a policy to make transport bear the external costs of air pollution.

### Noise

Switzerland has long been *in the forefront* of noise abatement efforts. In addition to government investment, the country is stepping up development and implementation of the best possible technologies to reduce sonic emissions. The use of *technical and operational measures* to eliminate or reduce these emissions and protect the population from noise is well advanced. A *clear strategy*, based on six principles, provides orientations for further progress. During the review period, *some progress* has been observed in respect of noise emissions from transport (e.g. from individual heavy vehicles, aircraft and railway rolling stock) and noise abatement measures (e.g. noise barriers, road repairs). Modal shift policy has also contributed to a reduction in the number of people exposed to severe noise pollution. Switzerland uses *cost-benefit analysis*. Countrywide, the external costs of transport noise (e.g. health impacts and loss of property value) are estimated at CHF 1 billion per year. In general, neighbourhood noise (over which the communes have jurisdiction) is not seen as a serious problem.

However, the population's exposure to noise is being exacerbated by increasing traffic volumes, which offset the benefits of technological advances and of stricter noise abatement measures. Consumption patterns are the main reason for this increase. People who live near airports are exposed to more aircraft noise due to increases in air traffic as well as airport expansion. There should be continued harmonisation of the noise monitoring being carried out by cantonal and federal authorities. Financing problems are one reason for the postponement of some noise reduction measures. The basic noise policy objective set forth in the federal Law on the Protection of the Environment (LPE) is relatively modest. Noise pollution should be reduced at natural sites and in recreational areas. The polluter pays principle is not being fully applied, and economic instruments ought to be used more extensively.

*Recommendations:*

- establish a countrywide integrated noise monitoring system;
- expand efforts to establish noise limits (e.g. for motor vehicles, aircraft and household appliances) and take further measures to reduce noise from road transport (e.g. economic instruments, speed limits, construction of noise barriers);
- extend the concept of noise abatement to encompass natural sites and recreational and residential areas.

*Water*

Switzerland's performance is still among the best of any OECD country. The quality of *drinking water* remains high, as does that of national and international lakes (e.g. Lake Constance and Lake Geneva). Nearly 97% of the Swiss population (and much of Swiss industry) is connected to *waste water treatment*. Waste water undergoes advanced (tertiary) treatment in the watersheds of the lakes and the Rhine. This level of performance is the result of many years of continuous capital investment in water-related infrastructure (supply, sewerage and waste water treatment) operating at high standards. Between 1990 and 2003, the recovery rate for the cost of waste water treatment (sewerage and waste water treatment) increased from 43 to nearly 70% following the incorporation of the polluter pays principle in federal legislation (in 1997). In addition, *water pricing* helps finance the *renewal of sewerage systems* (many of which are a century old) and the incineration of waste water sludge (a legal obligation since 2006). The loads of industrial pollutants have been estimated and their environmental costs internalised in the water prices charged to businesses connected to public sewerage systems. The first national inventory of groundwater quality was made public in 2004. The cantons routinely monitor the ecomorphology of watercourses (i.e. the extent of their artificialisation). *Institutional integration* of issues involving water quality and volume has been facilitated by the merger in 2006 of much of the Federal Office for Water and Geology with the Federal Office for the Environment, Forests and Landscape, when the Federal Office for the Environment was created.

Nevertheless, non-point source pollution from agriculture and excessive concentrations of inputs are found in inland lakes and aquifers. Little has been done to address growing concerns about the presence of *micropollutants* (e.g. endocrine disruptors and drugs) in water. Despite recent severe flooding in the



country, land use planning has not paid enough attention to flood prevention, despite legal obligations to do so (e.g. with regard to flood-prone areas). Only rarely does the hydroelectricity sector meet its obligations (in force since 1992) to maintain a *minimum flow in rivers*, or “residual flow”, and few fish ladders have been installed at dams, which has had adverse consequences for aquatic ecosystems. The renaturing of rivers (i.e. returning them to a more natural state) and the restoration of nature along river banks suffer from lack of funding, other than what is allocated to protect against flooding. *Water basin management* is progressing, but without any legislative or strategic framework at the federal level. Industry does not seem eager to assume *responsibility for environmental problems arising from accidental spills* to rivers, insofar as Switzerland has not signed the Kiev Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters.

*Recommendations:*

- promote *integrated water basin management*, in particular by combining objectives for water quality and for the quantity of water resources, as well as the objectives of nature conservation and guaranteed minimum space for watercourses so they can perform their ecological functions;
- make further progress in *financing the upkeep and renewal of water treatment infrastructure*, including through pricing measures;
- establish funding mechanisms for the *renaturing of watercourses*;
- prepare national *flood management* plans by water basin, in co-operation with the cantons; help avert flood risks by implementing the recommendations of cantonal master plans for land use;
- identify sources of *micropollutants* from cities, industry and agriculture; introduce preventive measures in line with the polluter pays principle; continue to reduce *non-point source pollution from agriculture*, especially in small lakes and in groundwater;
- harmonise *water quality monitoring* by the cantons and the Confederation.

### *Nature, landscapes and biodiversity*

Switzerland has set up a very high-quality biodiversity *monitoring network*; based on systematic scientific work, this network measures the dynamics of biodiversity and is used in particular to update “red lists” of endangered species.

*Planning documents* regarding the landscape, nature and forests (e.g. the “Swiss Landscape Concept”) have been adopted and the corresponding plans implemented. Progress has been made towards *sustainable forest management* and wetland conservation. The Swiss Landscape Fund, which provides financial support for projects to protect and promote the landscape, has been extended until 2011. The process for developing a *natural parks system*, including the creation of a Regional Natural Park (PNR) category, is about to be completed; dozens of PNR projects are already being prepared. Roughly 40% of farmland consists of semi-natural habitats (ecological compensation areas and Alpine pastures) that help preserve the biotope for the fauna and flora.

Nevertheless, as the updated “red lists” show, the *erosion of biodiversity* has not been curbed; on the contrary, most of the species monitored (e.g. flowering plants, amphibians and reptiles) have regressed since the lists were last published. Little progress has been recorded in identifying meadows and dry pastures to be

*Recommendations:*

- prepare and adopt a *National Biodiversity Strategy* (which could succeed the Swiss Landscape Concept), along with corresponding plans of action; set precise objectives and timetables which anticipate, inter alia, the effects of climate change;
- limit consumption of agricultural and natural space; contain dispersed urbanisation by enhancing the integration of biological and landscape diversity goals into spatial planning by cantons and communes, based on *reform of the federal law on regional development* and adjusted property taxation;
- clarify the *federal inventory of natural landscapes, sites and monuments* so that landscapes can be factored more rigorously into cantonal and communal planning;
- set up *Regional Natural Parks*, peri-urban natural parks, a national ecological network and a second national park; extend international *networks of protected areas*, such as Ramsar, Man and the Biosphere, and World Heritage sites, and establish the Emerald Network (Bern Convention); expand *financial resources* to invigorate policy for the development of protected areas;
- strengthen sustainable *forest management*; expand forest reserves and ensure the “public good” function of forests;
- do a better job of evaluating, taking into account and remunerating *services rendered by ecosystems*.

protected by the inventories of nationally important biotopes. Urbanisation, tourism activities and transport infrastructure exert increasing pressure on natural and agricultural areas. The diversity and quality of landscapes continue to be threatened by progressive urbanisation, building outside construction zones, and the commoditisation and increasing uniformity of buildings. Forest reserves should be expanded, and the environmental services rendered by *forests* should be financed. Spatial planning cannot stem the *consumption of new land*, which is proceeding at a rate of one square metre per second. The federal landscape inventory lacks clarity and effectiveness. Moreover, delays have been recorded in the adoption of certain inventories (e.g. dry grassland) and in the implementation of the Emerald Network, despite the work carried out by NGOs. A *National Biodiversity Strategy* ought to be drawn up and adopted. Without such a strategy, it is difficult to see how Switzerland can possibly meet its own objectives and honour its commitments (e.g. with regard to the Earth Summit in 2002, the Convention on Biological Diversity and pan-European biodiversity objectives).

## 2. Towards Sustainable Development

### *Integration of economic and environmental decisions*

While concerns about sluggish or weak economic growth and the international competitiveness of its economy are very real, Switzerland has made significant progress in *decoupling* environmental pressures and economic growth, in particular with regard to conventional air pollutants (SO<sub>x</sub>, NO<sub>x</sub>), water abstraction and the use of fertiliser and pesticides. The two *sustainable development* strategies at the federal level (1997 and 2002) have spurred better collaboration among federal government agencies and have been accompanied by evaluation and monitoring procedures. Indicators of sustainable development have been adopted at the federal level and developed by certain cantons and cities. The federal authorities prepare *sectoral strategy or planning documents* that cover environmental issues. Progress has been made in *internalising external costs* in waste management and water treatment, and in *integrating environmental concerns* into policies for sectors such as agriculture (required ecological services) and transport (shifts of passenger and freight traffic from road to rail). The economic instruments implemented since the previous review, such as the VOC tax and the heavy vehicle fee, have proven effective.

However, problems related to decoupling remain, in particular with regard to *road transport* and the *consumption of space* by dispersed urbanisation and by infrastructure. The federal strategy for sustainable development has few quantified

objectives (apart from that of limiting urbanisation to 400 square metres of built-up area per capita), is disconnected from sectoral strategies and needs to be better implemented, e.g. with respect to the consumption of transport, recreational activities and space. A *long-term vision* is lacking in the environmental policy area. The *green tax reform* recommended in the previous review and by the 2002 federal strategy for sustainable development has yet to be introduced. The taxation of energy, in particular gasoline, is still too low and cannot prompt changes in behaviour. The gasoline price differential between Switzerland and the neighbouring countries should be reduced to encourage savings on fuel consumption and cut back on emissions resulting from “gasoline tourism”.

#### *Recommendations:*

- implement the *green tax reform* called for in the 2002 federal strategy for sustainable development; identify and eliminate subsidies and tax provisions that are potentially detrimental to the environment (in particular, eliminate the planned deductibility of expenses for commuting by car);
- formulate a pro-active, long-term *environmental policy* vision;
- improve the use and *integration of strategic instruments in the areas of transport, energy, the environment and regional development*, from a sustainable development standpoint;
- promote the use of environmental indicators and indicators of sustainable development in government strategies, paying special attention to *regional development and land use planning*;
- associate the *federal strategy for sustainable development* with sectoral strategies; set quantified objectives; encourage the *cantons* to implement strategies for sustainable development in liaison with their sectoral policies.

### *Agriculture*

The interconnections between agriculture and the environment have been even more central to Swiss agricultural policy since a referendum held in 1997. Except for the nitrogen balance at national level and the protection of lowland biodiversity, *agri-environmental objectives* have on the whole been achieved, including those of the “Agricultural Policy 2007” programme. Agriculture’s *negative effects* on the environment (e.g. from phosphorus and greenhouse gases) have been reduced in most areas, with some exceptions remaining. The *positive*

*effects* (e.g. with regard to biodiversity, landscapes) have been increased. The use of *natural resources* seems to have become more efficient. Monitoring and evaluation activities have been expanded, as has scientific and quantitative analysis of policy impacts. As a result, new programmes, including “*Agricultural Policy 2011*”, are being prepared based on more solid information. Professionals and NGOs contribute actively to this effort and often take initiatives themselves in the agri-environmental area.

However, the overall level of support for agriculture (as measured by the “producer support estimate”, calculated by the OECD) remains very high. The form of this support is nevertheless shifting in a direction favourable to the environment, as *direct payments, essentially targeting environmental services*, are increasing to the detriment of price supports, which have been a major source of distortions. This policy shift ought to be continued so as to improve the competitiveness of Swiss agriculture and support the pursuit of environmental objectives. Problems involving *specific regional pollution* (e.g. ammonia, nitrates, pesticides, etc.) persist and ought to be addressed by actions that are targeted more precisely. In a number of cases in recent years, the pace of pollution abatement seems to have slowed. Despite progress in monitoring and evaluation, certain areas are not yet covered by reliable indicators, and on some

*Recommendations:*

- pursue *agricultural policy reform* in order to enhance economic competitiveness and, at the same time, ecological efficiency; in this context, continue to give high priority to meeting agri-environmental objectives;
- continue to *reduce pollution of agricultural origin*, in particular through targeted and regional actions;
- maximise *agriculture’s beneficial effects* on the environment, especially with regard to biodiversity and the landscape;
- develop a market conducive to trade in more environmentally friendly products by applying the principles of integrated product policy to the entire *agri-food chain*, and by heightening consumer awareness;
- continue to develop *monitoring and evaluation*, especially in areas for which indicators are insufficient, and base the formulation of future objectives on extensive analysis and on close co-operation among all the parties involved;
- bolster co-ordination between *agricultural and other policies* (e.g. environmental, regional, forestry) and between actions taken by federal and cantonal authorities.

points evaluations still do not agree. The *integration of various other policies* (e.g. regional, forestry) with agricultural policy is still insufficient, and the cantons' implementation of the regional programmes of federal policies, as well as their participation in monitoring and evaluation, are still unsatisfactory. The environmental components of activities along the entire agri-food chain (e.g. transformation, marketing) are not well understood, nor is *consumer demand*, and labelling techniques are not always uniform.

### *Integration of environmental and social decisions*

In Switzerland, *environmental democracy* is based primarily on the practice of holding referenda, on the accessibility of environmental information to all interested parties and to the general public, and on appeals to the Federal Supreme Court by environmental NGOs. *Environmental education* is dispensed at all levels, from elementary school to adult education, and it is characterised by innovative approaches and great thematic richness. The economic consequences of pollution-related *health* problems have been studied, as have the effects of environmental measures on *employment*.

However, Switzerland has not yet ratified the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (*Aarhus Convention*), and practices concerning dissemination of information, access to the courts and public participation will

#### *Recommendations:*

- ratify the *Aarhus Convention* and ensure that practices at the federal and cantonal levels concerning access to environmental information, public participation, and access to justice comply with obligations under this convention; ensure that NGOs have access to the courts and can participate in decision-making related to EIA procedures at an early stage;
- continue efforts to disseminate *environmental information*; continue to ensure high-level *environmental education* at all stages;
- fully implement the ongoing *Environment-Health action plan*; formulate and implement complementary measures that are cost-effective;
- make further efforts to achieve *sustainable mobility and recreational activity*, in particular by integrating protection of the environment, nature and landscapes into transport and regional planning at all levels; extend *Agenda 21* programmes to rural and scarcely populated areas.

need to be harmonised with this convention. Public participation in *environmental impact assessments* (EIAs) is limited. Draft legislation on public access to information is in the pipeline. In general, there are insufficient countrywide, harmonised *monitoring and economic data*. The *use of indicators* is still only partial. Efforts to set up a *national environmental data network* need to be continued. Although local Agenda 21 programmes now cover 30% of the population, there is a need to develop them further, especially in sparsely populated areas. Scant attention has been paid to the *redistributive aspects* of exposure to pollution. While protection of the environment continues to be the Swiss population's top priority for the future, it is not being given high priority at present. *Recreational traffic* is one of the main problems that Swiss transport and environmental policy ought to address, as it accounts for a high proportion of automobile traffic and is growing rapidly.

### 3. International Co-operation

Switzerland has an effective system for co-ordinating international environmental activities, based on formal consultations (at federal level and between the Confederation and the cantons) and on various processes for informal consultations. It maintains extensive co-operative relations with *neighbouring countries and the EU* as a whole, including with regard to harmonisation of environmental legislation. It has transposed the provisions of a number of *multilateral environmental agreements*, including: the Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) and its amendments, the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, the Stockholm Convention on Persistent Organic Pollutants (POPs), the Convention on Biological Diversity and the International Treaty on Phytogenetic Resources for Food and Agriculture. It actively promotes environmental protection and sustainable development in *international fora*. Swiss *official development assistance*, as a percentage of gross national income, has been increasing (0.44% in 2005). ODA for environmental purposes and other environmental expenditure at the international level (e.g. for activities in the countries of Eastern Europe, Caucasus and Central

Asia) have been substantial. In addition, some CHF 250-300 million per year is collected by *NGOs and the private sector* (e.g. the Swiss Alliance of Development Organisations) and is invested primarily in international co-operative activities with strong environmental relevance.

Nevertheless, there is room for improvement. Concerning *climate change*, there are problems meeting targets for reducing emissions of *CO<sub>2</sub> and other greenhouse gases* (internationally agreed targets as well as domestic ones). It is true that Switzerland has low energy and CO<sub>2</sub> intensities. Likewise, it has adopted voluntary measures that have to some extent reduced CO<sub>2</sub> emissions, although these have been insufficient. The *CO<sub>2</sub> tax* envisioned in the federal law on CO<sub>2</sub> has yet to be implemented. Switzerland is also having trouble meeting the targets established for several *air pollutants* (e.g. PM<sub>10</sub> and NO<sub>x</sub> from automobiles) under the Convention on Long-range Transboundary Air Pollution. *It has not ratified* the Aarhus Convention and its Protocol on Pollutant Release and Transfer Registers, the Protocol on Strategic Environmental Assessment to the Espoo Convention, the Water and Health and Civil Liability Protocols to the Water Convention, or the Protocols to the Convention on the Protection of the Alps. Even though Switzerland is in fact prepared to comply with the provisions of certain multilateral environmental agreements, reluctance to enter into binding international agreements has recently increased, reflecting a lack of consensus across the country. Certain international commitments have not been fully met at the cantonal level.

*Recommendations:*

- take steps to meet Switzerland's targets under the Kyoto Protocol, including introduction of a *CO<sub>2</sub> tax*;
- implement the measures needed to further reduce *emissions of NO<sub>x</sub>, VOCs and PM<sub>10</sub>* so as to meet the targets in the Ordinance on Air Pollution Control and the Convention on Long-range Transboundary Air Pollution;
- improve *implementation of the provisions of multilateral environmental agreements (MEAs)*, including at federal and cantonal levels;
- expand *Alpine co-operation*, in particular concerning transport, energy and tourism;
- ratify and implement *recent MEAs* to which Switzerland is not yet a party;
- further increase overall *official development assistance (ODA)* and improve reporting on ODA in the area of environmental protection (e.g. water).



# 2

## AIR, NOISE AND WATER\*

### Features

- Further reducing air emissions
- Transalpine transport policy
- Noise: major trends and measures
- Consumption patterns and transport pressures
- Nitrates and pesticides
- Restoration of watercourses
- Hydropower and residual flows
- Integrated management of water resources
- Pricing and the polluter pays principle

\* The present chapter reviews progress in the last ten years, and particularly since the previous OECD Environmental Performance Review of 1998. It also reviews progress with respect to the objectives of the 2001 OECD Environmental Strategy.

## Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of Switzerland:

### *Air*

- implement further measures to combat *fine particulates and ground-level ozone* from transport (on-road and off-road vehicles), industry and households, and *ammonia* generated by agriculture (e.g. by adopting tougher emissions limits, promoting innovation and increasing the use of particulate filters on diesel engines);
- further exploit the *multiple benefits* associated with air quality, climate change and energy efficiency objectives;
- continue to *internalise the external environmental costs of road passenger transport* (e.g. by introducing distance-related incentives or combining energy labels with a bonus/malus system applicable at the time of purchase);
- pursue a *freight traffic shift* from road to rail through targeted investment, financial support for public transport and intermodality, and extension of the heavy vehicle fee;
- pursue implementation of the *SwissEnergy* programme; consider increasing taxes on gasoline and diesel fuel to improve internalisation of external costs; further promote energy efficiency in buildings and industrial installations.

### *Noise*

- establish a countrywide integrated noise monitoring system;
- expand efforts to establish noise limits (e.g. for motor vehicles, aircraft and household appliances) and take further measures to reduce noise from road transport (e.g. economic instruments, speed limits, construction of noise barriers);
- extend the concept of noise abatement to encompass natural sites and recreational and residential areas.

### *Water*

- promote *integrated water basin management*, in particular by combining objectives for water quality and for the quantity of water resources, as well as the objectives of nature conservation and guaranteed minimum space for watercourses so they can perform their ecological functions;
- make further progress in *financing the upkeep and renewal of water treatment infrastructure*, including through pricing measures;
- establish funding mechanisms for the *renaturing of watercourses*;

- prepare national *flood management* plans by water basin, in co-operation with the cantons; help avert flood risks by implementing the recommendations of cantonal master plans for land use;
- identify sources of *micropollutants* from cities, industry and agriculture; introduce preventive measures in line with the polluter pays principle; continue to reduce *non-point source pollution from agriculture*, especially in small lakes and in groundwater;
- harmonise *water quality monitoring* by the cantons and the Confederation.

## Conclusions

### *Air*

Since the first review, there have been further reductions in concentrations of the main air pollutants, and air quality has continued to improve. The results obtained by Switzerland are *among the best* in any OECD country (e.g. lowest emissions of SO<sub>x</sub> and NO<sub>x</sub> per unit of GDP). Thanks to strict management and significant financial support, the *public transport system* (interurban, suburban and urban transport) is one of the most highly developed networks in any OECD country, giving public transport a large share of the modal split. With regard to transalpine transport, the *Overland Transport Agreement* promotes a shift from road to rail in order to cope with the growth in heavy vehicle traffic. Recent data show a nearly 30% increase in combined transport, while heavy vehicle traffic decreased by around 10% in the last three years. This agreement, like the continuous modernisation of *railway infrastructure* and the introduction of a distance-related *heavy vehicle fee*, can be seen as a model. Switzerland's energy intensity is lower than that of any other OECD country. Launched in 2001, the SwissEnergy programme has helped to reduce energy consumption by 6.5% and CO<sub>2</sub> emissions by 7%. In addition, the share of *renewable energy sources* in the total energy supply has increased to 17.5%.

However, in recent years it has become more difficult to *maintain the levels achieved* or to make *further substantial improvements*, due mainly to budget restrictions. Important challenges remain: *PM<sub>10</sub>*, *ground level ozone*, *NO<sub>2</sub>*, ammonia and greenhouse gases (e.g. CO<sub>2</sub>). High levels of particulates are one of the most serious threats to the health of people living in cities and near major traffic routes. Ambient air quality standards for ozone are frequently exceeded in summer. The massive *increase in mobility* offsets the effects of pollution abatement measures and

technological progress. Incentives to promote sustainable mobility and environmentally responsible consumption patterns and production may help to improve air quality. The two essential elements in this regard are *green tax reform* and a policy to make transport bear the external costs of air pollution.

### Noise

Switzerland has long been *in the forefront* of noise abatement efforts. In addition to government investment, the country is stepping up development and implementation of the best possible technologies to reduce sonic emissions. The use of *technical and operational measures* to eliminate or reduce these emissions and protect the population from noise is well advanced. A *clear strategy*, based on six principles, provides orientations for further progress. During the review period, *some progress* has been observed in respect of noise emissions from transport (e.g. from individual heavy vehicles, aircraft and railway rolling stock) and noise abatement measures (e.g. noise barriers, road repairs). Modal shift policy has also contributed to a reduction in the number of people exposed to severe noise pollution. Switzerland uses *cost-benefit analysis*. Countrywide, the external costs of transport noise (e.g. health impacts and loss of property value) are estimated at CHF 1 billion per year. In general, neighbourhood noise (over which the communes have jurisdiction) is not seen as a serious problem.

However, the *population's exposure to noise* is being exacerbated by increasing traffic volumes, which offset the benefits of technological advances and of stricter noise abatement measures. Consumption patterns are the main reason for this increase. People who live near airports are exposed to more *aircraft noise* due to increases in air traffic as well as airport expansion. There should be continued harmonisation of the noise monitoring being carried out by cantonal and federal authorities. Financing problems are one reason for the postponement of some noise reduction measures. The *basic noise policy objective* set forth in the federal Law on the Protection of the Environment (LPE) is relatively modest. Noise pollution should be reduced at natural sites and in recreational areas. The *polluter pays principle* is not being fully applied, and *economic instruments* ought to be used more extensively.

### Water

Switzerland's performance is still among the best of any OECD country. The quality of *drinking water* remains high, as does that of national and international lakes (e.g. Lake Constance and Lake Geneva). Nearly 97% of the Swiss population (and much of Swiss industry) is connected to *waste water treatment*. Waste water undergoes

advanced (tertiary) treatment in the watersheds of the lakes and the Rhine. This level of performance is the result of many years of continuous capital investment in water-related infrastructure (supply, sewerage and waste water treatment) operating at high standards. Between 1990 and 2003, the recovery rate for the cost of waste water treatment (sewerage and waste water treatment) increased from 43 to nearly 70% following the incorporation of the polluter pays principle in federal legislation (in 1997). In addition, *water pricing* helps finance the *renewal of sewerage systems* (many of which are a century old) and the incineration of waste water sludge (a legal obligation since 2006). The loads of industrial pollutants have been estimated and their environmental costs internalised in the water prices charged to businesses connected to public sewerage systems. The first national inventory of groundwater quality was made public in 2004. The cantons routinely monitor the ecomorphology of watercourses (i.e. the extent of their artificialisation). *Institutional integration* of issues involving water quality and volume has been facilitated by the merger in 2006 of much of the Federal Office for Water and Geology with the Federal Office for the Environment, Forests and Landscape, when the Federal Office for the Environment was created.

Nevertheless, non-point source pollution from agriculture and excessive concentrations of inputs are found in inland lakes and aquifers. Little has been done to address growing concerns about the presence of *micropollutants* (e.g. endocrine disruptors and drugs) in water. Despite recent severe flooding in the country, land use planning has not paid enough attention to flood prevention, despite legal obligations to do so (e.g. with regard to flood-prone areas). Only rarely does the hydroelectricity sector meet its obligations (in force since 1992) to maintain a *minimum flow in rivers*, or “residual flow”, and few fish ladders have been installed at dams, which has had adverse consequences for aquatic ecosystems. The renaturing of rivers (i.e. returning them to a more natural state) and the restoration of nature along river banks suffer from lack of funding, other than what is allocated to protect against flooding. *Water basin management* is progressing, but without any legislative or strategic framework at the federal level. Industry does not seem eager to assume *responsibility for environmental problems arising from accidental spills* to rivers, insofar as Switzerland has not signed the Kiev Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters.



## 1. Objectives

### 1.1 Air pollution

Switzerland's air pollution control policy is based on the 1983 federal *Law on the Protection of the Environment* (LPE) and the 1985 *Ordinance on Air Pollution Control* (OAPL),<sup>1</sup> together with the 1997 *Ordinance on Incentive Taxes on VOCs*, the 1997 *Ordinance on the Incentive Tax on Extra Light Fuel Oil*, the 1999 federal *Law on the Reduction of CO<sub>2</sub> Emissions* and the 2003 *Ordinance on the Incentive Tax on Sulphur-Containing Motor Vehicle Fuel*.

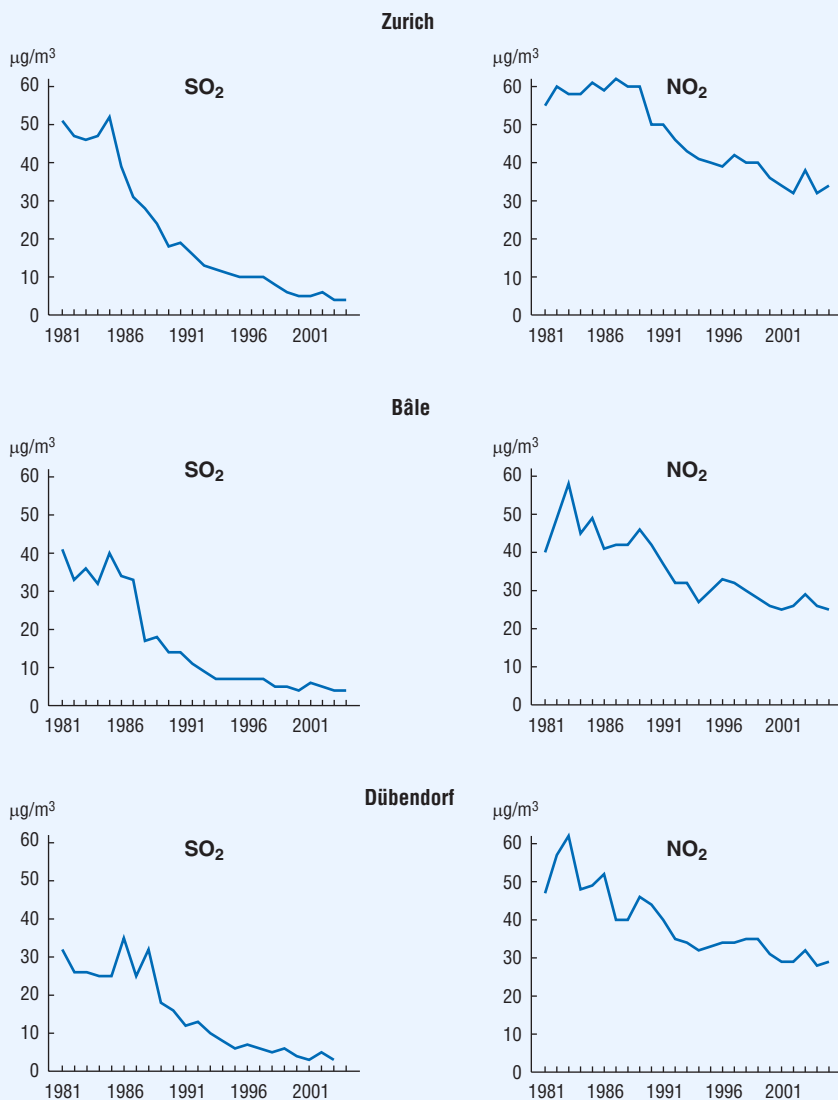
The *Air Pollution Control Strategy* (1986 and 1999) is currently under review. A first technical report was published in 2005. Also in 2005, a strategy for controlling nitrogen compounds, e.g. nitrogen oxides (NO<sub>x</sub>) and ammonia (NH<sub>3</sub>), was submitted to the Federal Council for consideration.

*Ambient air quality standards* have been set for those pollutants considered most significant (Table 2.1; Figure 2.1). Their limit values are consistent with UNECE and WHO recommendations. *Emission reduction targets* have been established by the Air Pollution Control Strategy (Table 2.2). In 1999, these targets were confirmed in a report to Parliament and supplemented by commitments for ozone precursors (NO<sub>x</sub> and volatile organic compounds, or VOCs) and particulate matter (PM<sub>10</sub>). At the *international level*, emission reduction targets for 2010 are established in the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone, which entered into force in 2005. It aims to cut emissions of NO<sub>x</sub>, NH<sub>3</sub>, VOCs and sulphur dioxide (SO<sub>2</sub>). To comply with all of the air quality standards currently in effect in Switzerland, emission reduction efforts will need to continue beyond 2010.

The assessment of air management performance here includes consideration of the recommendations of the 1998 *OECD Environmental Performance Review* of Switzerland:

- pursue the use of economic instruments for air management by implementing the redistributed charges on VOCs and the sulphur content of heating fuel and by increasing taxes on gasoline in order, inter alia, to reduce NO<sub>x</sub> emissions;
- define a strategy to control fine particulates, especially from mobile sources, and improve data on their emission and concentration;
- reinforce co-operation at all levels of government so as to better integrate air quality concerns in transport, energy, regional planning and taxation policies;
- better explain the objectives of air protection (both health and environmental) and secure greater involvement of NGOs in issues relating to the environment, tourism and cars;
- pursue the implementation of the Energy 2000 action programme, and increase efforts concerning renewable energy sources.

Figure 2.1 Trends in urban air quality<sup>a</sup>



a) SO<sub>2</sub>, NO<sub>2</sub> concentrations: annual means.  
Source: FOEN.

Table 2.1 Ambient air quality standards

	Ambient air quality standard	Definition
Sulphur dioxide (SO <sub>2</sub> )	30 µg/m <sup>3</sup>	annual mean
	100 µg/m <sup>3</sup>	95% of the half-hourly averages in a given year ≤ 100 µg/m <sup>3</sup>
Nitrogen dioxide (NO <sub>2</sub> )	100 µg/m <sup>3</sup>	24-hour average; not to be exceeded more than once a year
	30 µg/m <sup>3</sup>	annual mean
	100 µg/m <sup>3</sup>	95% of half-hourly averages in a given year ≤ 100 µg/m <sup>3</sup>
Carbon monoxide (CO)	80 µg/m <sup>3</sup>	24-hour average; not to be exceeded more than once a year
	8 mg/m <sup>3</sup>	24-hour average; not to be exceeded more than once a year
Ozone (O <sub>3</sub> )	100 µg/m <sup>3</sup>	98% of half-hourly averages in a given month ≤ 100 µg/m <sup>3</sup>
	120 µg/m <sup>3</sup>	hourly average; not to be exceeded more than once a year
Suspended particulates (PM <sub>10</sub> )	20 µg/m <sup>3</sup>	annual mean
	50 µg/m <sup>3</sup>	24-hour average; not to be exceeded more than once a year
Lead (Pb) <sup>a</sup>	500 ng/m <sup>3</sup>	annual mean
Cadmium (Cd) <sup>a</sup>	1.5 ng/m <sup>3</sup>	annual mean
Dust fallout, total	200 mg/m <sup>2</sup> × day	annual mean
Lead (Pb) <sup>b</sup>	100 µg/m <sup>2</sup> × day	annual mean
Cadmium (Cd) <sup>b</sup>	2 µg/m <sup>2</sup> × day	annual mean
Zinc (Zn) <sup>b</sup>	400 µg/m <sup>2</sup> × day	annual mean
Thallium (Tl) <sup>b</sup>	2 µg/m <sup>2</sup> × day	annual mean

a) In suspended particulates.

b) In dust fallout.

Source: OFEV/NABEL (national air pollution monitoring network).

Table 2.2 National emission reduction targets

	Targets	Base year	According to
SO <sub>2</sub>	60%	1980	Air Pollution Control Strategy
	no emission increase	2000	CL <sup>a</sup> for acidity
NO <sub>x</sub>	64%	1985	Air Pollution Control Strategy
	approx. 60%	2000	CL <sup>a</sup> for nutrient N AQS <sup>b</sup> for ozone
NMVOCs	55%	1985	Air Pollution Control Strategy
	approx. 60%	2000	AQS <sup>b</sup> for ozone
PM	approx. 45%	2000	AQS <sup>b</sup> for PM <sub>10</sub>
NH <sub>3</sub>	approx. 45%	2000	CL <sup>a</sup> for nutrient N

a) Critical load (CL) established under the UNECE Convention on Long-range Transboundary Air Pollution.

b) Air Quality Standard.

Source: OFEV/NABEL (national air pollution monitoring network).



## 1.2 Noise abatement

The legal basis for noise abatement in Switzerland is the 1983 *Law on the Protection of the Environment (LPE)*, which includes a section on noise and vibrations, together with the 1986 *Noise Abatement Ordinance*. The main *objective* of noise abatement efforts is to protect the population from hazardous or undesirable effects, so that its well-being is not seriously affected by residual exposure.<sup>2</sup>

To achieve this objective, *six principles* are in effect (SAEFL, 2002a). These are: the *assessment principle*, which is concerned with quantifying noise and nuisance; the *source principle*, which requires noise abatement to be carried out primarily at source; the *prevention principle*; the *remediation principle*; the *polluter pays principle*; and the *co-operation principle*.

*Exposure limits* have been defined for sources of noise including roads, railways, civil and military airports, industrial and commercial installations and civil firing ranges (Table 2.3). *Planning values* are specified in connection with new building zones and new, noisy stationary installations. *Impact thresholds* are set low enough to ensure that the well-being of the population will not be substantially affected; *alarm values* support assessments of the urgency of remediation.

Table 2.3 Planning values, impact thresholds and alarm values for road noise<sup>a</sup>

Sensitivity category	Planning value		Impact threshold		Alarm value	
	Day	Night	Day	Night	Day	Night
ES I <sup>b</sup>	50	40	55	45	65	60
ES II <sup>c</sup>	55	45	60	50	70	65
ES III <sup>d</sup>	60	50	65	55	70	65
ES IV <sup>e</sup>	65	55	70	60	75	70

a) Rating sound level in dB(A), day = 06-22 hr; night = 22-06 hr.

b) Zones with high sensitivity to noise (e.g. recreational areas).

c) Zones free of noisy installations (e.g. residential areas and areas with public buildings and installations).

d) Zones with limited noise impact (e.g. combined residential areas, industrial zones and agricultural areas).

e) Zones with heavy noise impact (e.g. industrial zones).

Source: OFEV.

### 1.3 Water management

The aim of Switzerland's water policy is to ensure the protection of surface and groundwater and the sustainable use of water resources. To achieve this aim, urban and industrial pollution and non-point source pollution from agriculture must be reduced; watercourses must also be preserved and restored as natural habitats. Federal legislation concerning water protection and the improvement of watercourses is designed to ensure: i) sufficient water quality; ii) enough space for watercourses; and iii) adequate flows (Box 2.1). These *three key objectives* have recently been restated (SAEFL/FOWG/FOAG/FOSD, 2003).

Moreover, Switzerland must fulfil its *international commitments*, especially within the framework of the five international commissions in which it actively participates: protection of the Rhine (ICPR), Lake Constance (IGKB), Italian-Swiss waters (CIPAIS), Lake Geneva (CIPEL) and the North-East Atlantic (OSPAR Commission).

Performance may also be assessed in relation to the recommendations of the *1998 OECD Environmental Performance Review* of Switzerland:

- continue to implement the new water pricing system; envisage the application of new economic instruments such as effluent charges and taxes on polluting agricultural inputs;
- ensure funding for the maintenance and renewal of waste water treatment facilities;
- accelerate the application of measures to control non-point source pollution, notably from agriculture;
- improve the protection of withdrawal points for drinking water supply, for example against harmful or persistent substances (nitrates, pesticides);
- give higher priority to the restoration of watercourses; improve target definition in this area and seek a broad consensus in regard to such programmes;
- speed up improvement of the federal network for monitoring groundwater quality so as to obtain a better understanding of trends in this area, as well as of the influence of measures taken in other sectors such as agriculture;
- with a view to sustainable development of water resources, develop a system of integrated, partnership-based management for all water users; this should include inter-sectoral interests and policies such as nature and biodiversity.

### Box 2.1 Federal legislation relating to water

The 1991 Law on Water Protection applies to surface water (including beds, bottoms and banks and the flora and fauna that live there) and groundwater. Its purpose is to prevent and remedy any damage to human health, the water supply (for drinking, industrial use, irrigation or fish farming), natural biotopes, the landscape, leisure activities and the natural operation of the hydrological system. This law covers water quality (discharge authorisations) and the maintenance of appropriate residual flows (withdrawal authorisations). It requires cantons to protect the perimeters of drinking water withdrawal points. A 1997 amendment states that water protection measures should be financed according to the polluter pays principle, with rare exceptions, and aims to harmonise industrial and urban waste water management measures with European standards. The 1998 Ordinance on Water Protection sets water quality standards, including ecological objectives, and regulates the elimination of sewage sludge and the recycling of slurry and manure. In view of the high safety standards applied nowadays to facilities for storing polluting liquids (limited risk of leakage) and the Confederation's budget difficulties, the Federal Council has decided to repeal the 1998 Ordinance on the Protection of Waterways against Liquids Hazardous to Water, with effect from 1 January 2007. As a result of this decision, the supervisory obligations of the Confederation (FOEN) and the obligation to obtain cantonal authorisation are limited to facilities (reservoirs) that present a potential threat to groundwater. Other facilities are subject to a reporting requirement (a register is maintained) to facilitate investigations of the causes of any pollution incident. These measures do not apply to pollution of agricultural origin (liquid manure).

The 1991 Law on Improvement of Watercourses requires cantons to ensure protection against flooding by taking measures that respect nature.\* The 1994 Ordinance on the Improvement of Watercourses requires cantons to define watercourse hazard zones and to determine the space needed to provide protection against flooding and enable watercourses to fulfil their ecological functions. Depending on the size of the watercourse, this zone comprises a strip 5 to 15 metres wide along each bank. Cantons must take this minimum space into consideration in their structural and land use planning. Land in agricultural use affected by these measures may qualify as an ecological compensation area (Chapter 5).

The 1916 Law on the Exploitation of Hydropower states that hydropower plants should cause the least possible disfigurement of the landscape. The 1995 Ordinance on Compensation for Losses in the Use of Hydropower compensates local authorities for lost earnings resulting from the creation of a protected zone on a site where hydropower generation would have been possible.

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\* The Confederation may grant financial aid to cantons for revitalisation of watercourses.

## 2. Air Pollution

### 2.1 Atmospheric emissions

In addition to its previous accomplishments with respect to reducing air pollutant emission intensity, during the review period Switzerland succeeded in further decoupling emissions of these pollutants from GDP. Between 1998 and 2004, *sulphur dioxide* ( $SO_2$ ) emissions decreased by 31% (Table 2.4).  $SO_2$  emission intensities per unit of GDP (0.1 kg/USD 1 000) and per capita (2.6 kg/cap) are the *lowest in the OECD* (Figure 2.2). Small-scale combustion was the leading contributor to  $SO_2$  emissions (34%), followed by industry (30% of emissions from industry were energy related and 19% were non-energy related).

Emissions of *nitrogen oxides* ( $NO_x$ ) decreased by 17% during the same period (Table 2.4). Emission intensities per unit of GDP (0.4 kg/USD 1 000) and per capita (12 kg/cap) are again the lowest in OECD (Figure 2.2). The major shares of emissions are from transport (56%) and combustion (30%).

Emissions of *non-methane volatile organic compounds* (NMVOCs) decreased by 31% (Table 2.4). Solvent use in industry accounted for a little over half of total emissions. VOC emissions subject to the VOC tax (in effect since 2000) were reduced from 78 400 tonnes in 1998 to 51 900 tonnes in 2004.

Table 2.4 Emissions of conventional air pollutants, 1990-2004

	$SO_2$	$NO_x$	NMVOCs	CO	$PM_{10}$
1990 kt	42	157	283	693	36
1998 kt	24	102	149	446	32 <sup>a</sup>
2004 kt	17	84	103	354	30 <sup>b</sup>
Change (1990-2004) (%)	-60	-46	-64	-49	-16 <sup>c</sup>
Change (1998-2004) (%)	-31	-17	-31	-21	-6 <sup>d</sup>

a) 1995.

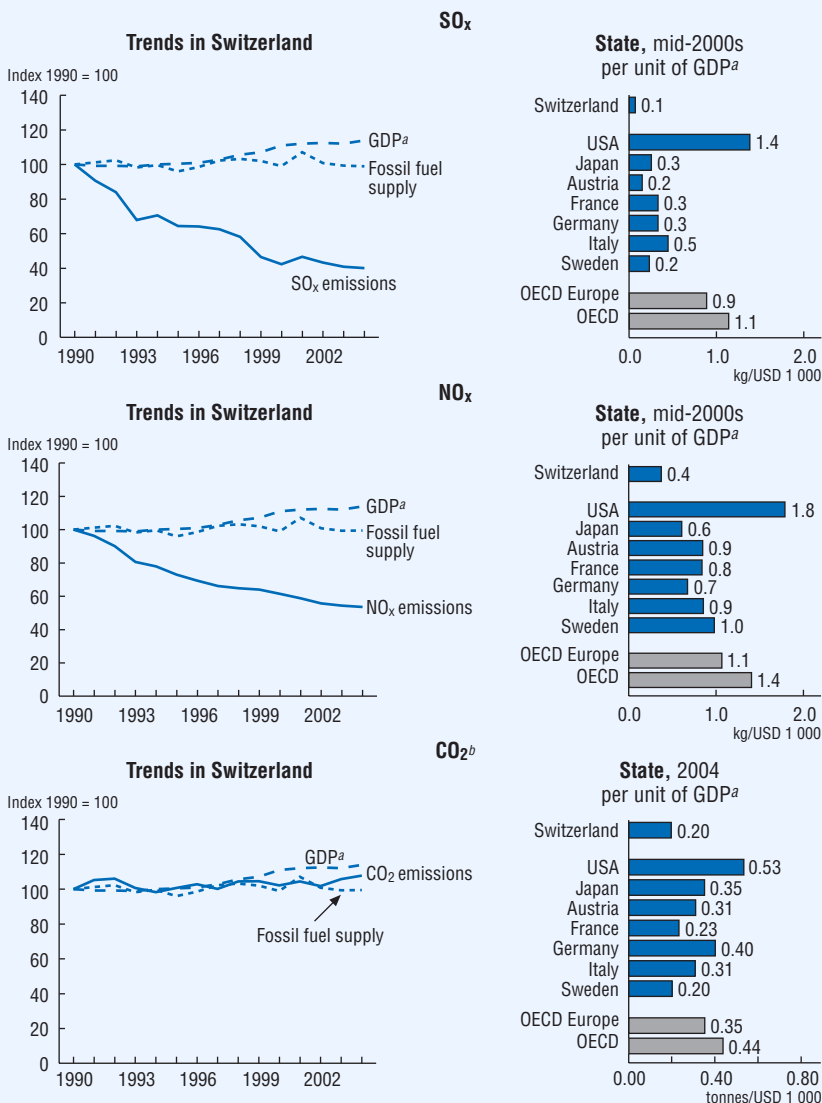
b) 2000.

c) 1990-2000.

d) 1995-2000.

Source: OECD, Environment Directorate.

Figure 2.2 Air pollutant emissions



a) GDP at 2000 prices and purchasing power parities.

b) Emissions from energy use only; excludes international marine and aviation bunkers; Sectoral approach; 2004: estimate.

Source: OECD, Environment Directorate; OECD-IEA (2006), CO<sub>2</sub> emissions from fuel combustion; OECD (2005), OECD Economic Outlook No. 77; OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004.

*Carbon monoxide (CO)* emissions decreased by 21% (Table 2.4). CO emissions in urban areas have been reduced by almost 60% since 1995. These emissions are far below the OECD average. Approximately 55% of CO emissions are from motor vehicles; 26% are from heating systems.

*Methane (CH<sub>4</sub>)* emissions decreased by 5%, mainly reflecting a reduction in the number of cattle in agriculture (a major contributor to these emissions) (Table 7.1). Landfill phase-out and improvements regarding vehicle exhaust emissions have also contributed to a reduction of methane emissions.

*Carbon dioxide (CO<sub>2</sub>)* emissions remained at 1990 levels (the Kyoto base year) during the review period (45 436 million tonnes in 2004). Three-quarters of CO<sub>2</sub> emissions are from transport (34%) and small-scale combustion (26% residential, 12% commercial/institutional). Industry accounts for 24%. CO<sub>2</sub> intensity has fallen in the past ten years, partly due to decreased emissions from industrial processes and the associated optimisation of material flows. CO<sub>2</sub> emission intensity per unit of GDP (0.20 tonnes/USD 1 000) was the *lowest in OECD* in 2004 (Figure 2.2; Figure 7.1; Table 7.1). This value is more a reflection of electricity production methods that generate virtually no CO<sub>2</sub><sup>3</sup> and the absence of heavy industry than of any specific measures on Switzerland's part.

Emissions of *particulate matter (PM<sub>10</sub>)* decreased by 6% between 1995 and 2000 (Table 2.4). Carcinogenic exhaust emissions from diesel engines account for 29% of current levels, followed by emissions from agriculture (37%), trade and industry (27%) and burning of wood and domestic waste.<sup>4</sup> *Heavy metal* emissions have been reduced, mainly through reductions of dust emissions from industrial processes, the phase-out of leaded gasoline and the introduction of regulations for batteries (cadmium and mercury content; collection, recycling and disposal). *Lead* emissions have fallen dramatically, reflecting the introduction of lead-free and the banning of leaded gasoline. Lead is currently released mainly during certain industrial processes.

## 2.2 Air quality

After a sharp fall in the late 1980s and the first half of the 1990s, *SO<sub>2</sub> concentrations* in major cities (e.g. Zurich, Basel) decreased modestly until 2000, followed by slight fluctuations (Figure 2.1). *NO<sub>2</sub> concentrations* clearly decreased in the first half of the 1990s, followed by further modest decreases until 2000; they increased after 2000 due to growth in the use of private and diesel cars. In 2000, 16% of the population lived in areas with a mean NO<sub>2</sub> concentration level above the air quality standard of 30 µg/m<sup>3</sup>. In some areas the mean concentration level is almost twice as high as the air quality standard. Exceedences of the short-term standard (80 µg/m<sup>3</sup>) and of the 95th percentile (100 µg/m<sup>3</sup>) also occur.

*Acidifying deposition* is still too high, mainly affecting alpine regions with highly sensitive vegetation and aquatic ecosystems. It is more than 50% due to emissions from neighbouring countries for SO<sub>2</sub> and NO<sub>x</sub> and to emissions from inside Switzerland for ammonia (NH<sub>3</sub>).

The air quality standard for *ozone* has frequently been exceeded in summer because of emissions of ozone precursors (NO<sub>x</sub>, VOCs) from road transport and industry. High summer temperatures in 2003 resulted in increased ozone pollution (1 626 one-hour exceedences in the Prealps (Rigi) and 1 110 one-hour exceedences in Lugano). On 28 June 2005 an ozone level of 180 µg/m<sup>3</sup> (1.5 times the ozone impact threshold) was recorded at several locations. There is still a marked difference between levels on the northern side of the Alps and the southern side, which receives pollution from highly industrialised areas in Italy (e.g. Milan).

During the review period annual mean concentrations of PM<sub>10</sub> reached 40 µg/m<sup>3</sup> (twice the air quality standard) in cities and along motorways and 25 µg/m<sup>3</sup> in rural areas. In 2004 the daily average threshold was exceeded in cities (15 to 18 days) and rural areas (seven to nine days). Higher PM<sub>10</sub> levels were recorded at measuring stations on the southern side of the Alps, primarily due to higher emission densities and topographical factors. Cantonal authorities might consider introducing traffic restrictions when daily standards are exceeded.

### 2.3 Air quality management

Measures adopted by federal, cantonal and local authorities to improve air quality have been effective. Substantial investments have been made in modernising waste incineration plants and industrial installations. Because strict standards have been imposed, fuel oil contains far less sulphur and combustion equipment burns more cleanly. Tougher exhaust emission controls for motor vehicles have also brought about substantial improvements. While emissions of SO<sub>2</sub>, CO and lead have declined substantially over the past ten years, there has been only a slight decrease in emissions of NO<sub>x</sub> and suspended particulates and of dust fallout. Switzerland's air quality management objectives have therefore only been *partly met*.

In 1998, the Federal Council tightened the Ordinance on Air Pollution Control (OAPL) and ambient air quality standards for PM<sub>10</sub> were set. Particulate matter from burning of diesel fuel has since been listed in the OAPL as a carcinogenic substance. Many new measures have been taken, including a strategy to control levels of particulate matter, emission inventories related to transport and the presentation of an action plan. However, to meet PM<sub>10</sub> threshold values, emissions of PM<sub>10</sub> as well as particulate matter precursors should be reduced by half compared with 1997 levels. To

better characterise the effects of particulate matter, several studies have been carried out under the Swiss Study on Air Pollution and Lung Diseases in Adults and the Swiss Study on Childhood Allergy and Respiratory Symptoms with Respect to Air Pollution.

Steps have been taken to reduce emissions of other hazardous air pollutants such as *persistent organic pollutants* (POPs). OAPL requirements for municipal waste incineration plants have brought about a remarkable reduction in emissions. Improvements to incineration processes (i.e. complete incineration combined with purification and denitrification of exhaust emissions) have led to a reduction of dioxin levels to below 0.1 ng TEQ/m<sup>3</sup>. Switzerland has endeavoured to avoid harmful impacts from old products containing POPs, including through issuing directives on the handling of PCBs.

Additional *actions by cantons* brought about a 10% reduction in emissions of SO<sub>x</sub> and NO<sub>x</sub> during the review period. Only a 5% reduction in emissions of VOCs was achieved, however, as a large part of these emissions originate from diffuse sources which cantons cannot control through their remediation orders.

*Economic instruments* have been introduced in the form of incentive taxes on solvents (1997), extra light sulphur-containing fuel oil (1997) and sulphur-containing motor vehicle fuel (2003), and the *heavy vehicle fee* (Box 2.2; Table 4.9). The *VOCs tax* (CHF 2/kg VOCs in 2000-02, CHF 3/kg VOCs after 2003) is intended to reduce use of solvents by replacing them with solvent-free substitutes or encouraging the use of water-based technologies. Emissions of VOCs decreased following the introduction of this tax, but emissions of both NO<sub>x</sub> and VOCs are still too high. The *tax on extra light oil* (sulphur content above 0.1%) is CHF 12 per tonne. This tax is expected to reduce SO<sub>x</sub> emissions by 6 000 tonnes per year. To ensure fiscal neutrality, the revenue from the two taxes is redistributed to households through health insurance bodies; revenue collected in 2004 (CHF 124 million) was distributed in 2006.

The Federal Office for Spatial Development (ARE) estimates *health damage<sup>5</sup> due to air pollution from transport* at CHF 1.6 billion per year. It is necessary to internalise the external costs of this type of pollution. Since the heavy vehicle fee was introduced, private car transport is now the main area where internalisation of the external costs of air pollution from transport are not covered; incentives to encourage environmentally appropriate behaviour in this area should be introduced.

#### 2.4 Environmental measures in the energy sector

Concerning *total primary energy supply*, the shares of coal and oil have decreased while those of gas and renewable energy have steadily increased (Table 2.5). *Electricity* is produced using hydro and nuclear power, but very little fossil fuel.



### Box 2.2 Charging for transalpine road freight traffic

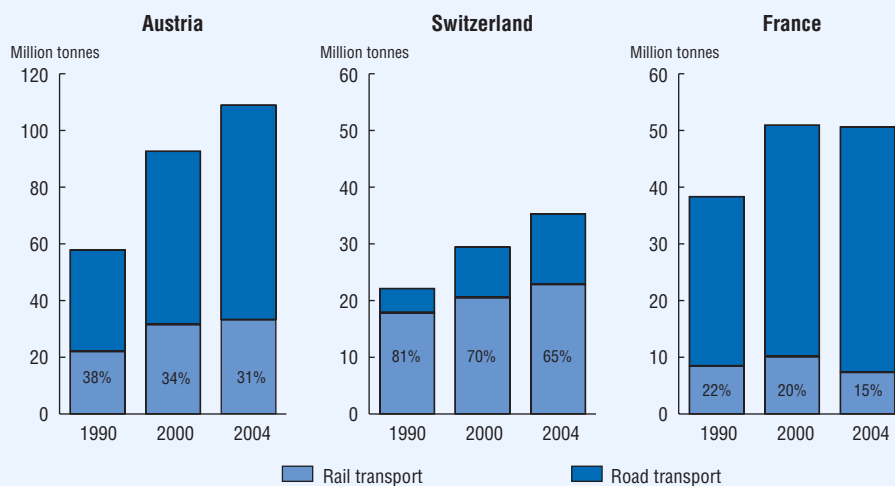
Transalpine road freight traffic has continually increased in recent years. It includes goods traffic originating in (or destined for) Switzerland and transit traffic. Freight transport by road has increased more rapidly than that by rail (Figure 2.3). Overland transport has been one of the main challenges in bilateral negotiations with the EU. The *Transport Agreement*, supplementing the 1992 Transit Agreement, is an important step towards convincing the EU that switching heavy goods traffic from road to rail will be possible, ensuring long-term agreement between Switzerland and the EU.

Under the *New Transalpine Railways Axes (NEAT)* programme, two transalpine tunnels are being constructed. The Lötschberg base tunnel (34 km) is scheduled to open in 2007. The Gotthard base tunnel will be the world's longest railway tunnel (57 km, expected to open in 2015). Travel times between Zurich and Milan are expected to be cut by almost two hours, mainly due to the Gotthard tunnel. NEAT is financed by revenue from the heavy vehicle fee, two-thirds of which is earmarked for this programme, and tax revenue from sales of fuel oil. One-tenth is financed from VAT. In addition, a maximum financing debt of 25% of the programme's cost is permitted.

The 28-tonne limit for trucks increased to 34 tonnes in 2001 and 40 tonnes in 2005. The *heavy vehicle fee (HVF)* gradually replaces a flat-rate heavy vehicle tax. Trucks crossing Switzerland pay according to weight, pollutant emissions and distance travelled. The full tax rate will be introduced once the Lötschberg tunnel opens. A 40-tonne EU truck will then pay an average of CHF 325 (or 2.7 cents per tonne-kilometre) for using the Basel-Chiasso route. Trucks with high emission levels will pay up to CHF 380, 13 to 15 times the amount a 28-tonne vehicle would have paid in the past. Estimated revenue will be around CHF 1.7 billion per year. Two-thirds of this amount will finance NEAT infrastructure projects; one-third will go to cantons for infrastructure projects.

The federal Modal Shift Law (1999) sets a *target for heavy goods vehicles crossing the Alps* of a maximum 650 000 per year by 2010. This means the number of these vehicles will be reduced by half compared with 1999. In the transitional period 2001-04 Switzerland provided EU hauliers with quotas for 40-tonne vehicles: 300 000/year in 2001 and 2002; 400 000/year in 2003 and 2004. From 2001 to 2004 the EU was assigned a quota per year of 220 000 reduced-rate empty and light transit journeys (at between CHF 50 and 80 each). Swiss hauliers were assigned the same 40-tonne quotas as those from the EU. Hauliers from the EU will contribute about one-third of HVF revenue, financing a major part of the NEAT construction costs.

*Greater co-operation between Switzerland and the EU* on railway infrastructure and combined transport will create market incentives to use environmentally friendly railways. Owing to several vigorous measures, recent figures show an increase in use of combined transport by volume (nearly 30% growth in the last three years), while the volume of heavy road traffic decreased by around 10%.

Figure 2.3 Trends in transalpine freight transport<sup>a</sup>

a) Total transalpine freight traffic by road and rail.

Source: ARE.

Table 2.5 Total primary energy supply, by source

	1990		2004	
	Mtoe	(%)	Mtoe	(%)
Coal	0.4	1	0.1	0
Oil	13.5	53	12.5	46
Gas	1.6	6	2.7	10
Nuclear	6.2	25	7.1	26
Renewables	3.5	14	4.8	18
Total <sup>a</sup>	25.2	100	27.2	100
Energy intensity <sup>b</sup>	0.13	0.22	0.12	0.19

a) Excluding electricity trade.

b) TPES per unit of GDP.

Source: OECD-IEA, 2006, Energy Balances of OECD Countries 2002-2004.

*Energy consumption* has increased (in 2004 it was 11.6% above the 1990 level), although consumption by the heating sector has remained stable. In 2004, oil products accounted for 58% of final energy consumption, electricity for 23% and gas for 12%. By sector, residential/commercial accounts for 44% of total final energy consumption followed by transport (33%) and industry (20%). The share of *renewable energy* in total energy consumption increased to 16.5% in 2004.<sup>6</sup> *Electricity consumption* has increased in all consumer categories; the sharpest increases during the review period were in the service and household sectors.

*Energy intensity* per unit of GDP (0.12 toe/USD 1 000 in 2004) is the *lowest in OECD* (Table 2.5; Figure 4.2). For both industry and households, electricity and natural gas prices are relatively high compared with the OECD average. Vehicle fuel prices are relatively low (Table 4.3).

### *Objectives in the energy sector*

Sustainable energy and climate change policies are based on the 1998 *Energy Law* and the 1999 federal *CO<sub>2</sub> Law*. Under the latter, CO<sub>2</sub> emissions from the use of fossil fuels are required to be 10% below 1990 levels by 2010; subsidiary targets are set for heating/processing fuels (15% reduction) and transport fuels (8% reduction).

In 2001, to promote energy conservation and renewable energy use, the Federal Council launched the *SwissEnergy programme* (2001-10) (Chapter 4). This programme succeeded the Energy 2000 programme (1991-2000). Objectives for 2010 are: consumption of fossil fuels in Switzerland and CO<sub>2</sub> emissions from the use of these fuels to be reduced by 10%; growth in electricity demand not to exceed 5% in relation to the level in 2000; the share of hydroelectric power in total energy supply to be maintained; 1% more electricity (500 GWh) than the 2000 level to be produced from renewable energy; 3% more heat (3 000 GWh) than the 2000 level to be produced from renewable energy (excluding hydraulic energy); the general public to be made more aware of energy issues; the market share of MINERGIE certified buildings to be 15% (new buildings) and 4% (renovated buildings).

### *Environmental measures in energy policy*

The *SwissEnergy* programme has been effective. Energy consumption has been estimated at 6.5% less, and CO<sub>2</sub> emissions at roughly 7% less, than if actions under these programmes had not been taken (Tables 2.6 and 7.2). Electricity produced from renewable sources (excluding conventional hydropower) increased by 43.5 GWh in 2004, with 30% of the target set for 2010 in the *SwissEnergy* programme being reached in that year. Heat produced from renewable energy increased by 229 GWh in 2004, with 38% of the target set for 2010 being reached (Energie Schweiz, 2005).

Concerning *energy efficiency*, considerable energy consumption reductions were achieved as a result of CO<sub>2</sub> objectives agreed with industry sectors, use of the Energy Town label, promotion of wood as an energy source, use of heat pumps and adoption of the MINERGIE standard for buildings. An increase of approximately 10% in energy efficiency was brought about by legislative command and control measures. Overall energy efficiency increased by 29% in 2004, taking all measures into account.

The *building sector* accounts for a large share of heating fuel consumption. The cantons are responsible for energy conservation measures in public and private buildings. Important measures related to energy conservation include federal subsidies to cantons, harmonisation of cantonal energy legislation and support programmes, and the *MINERGIE* standard. In 2002 the Swiss Federal Office of Energy (SFOE) signed a performance agreement with the MINERGIE Association, under which the latter is committed to develop a joint strategy with the cantons and support is provided for implementation.

*Total spending* on SwissEnergy projects by SFOE in 2005 was CHF 45 million. In addition to contributions from SwissEnergy, the cantons allocated CHF 26 million to finance their promotional programmes. Funds available to promote renewable energy use amounted to CHF 11.9 million. About CHF 48 million was spent by the private sector (SFOE, 2005).

Table 2.6 **Key measures under the SwissEnergy programme, 2001-10**

In-house	Privately run Energy Agency for the Economy (EAEC) helps companies to identify in-house measures to reduce energy consumption and CO <sub>2</sub> emissions
Household appliances	Introduction of energy efficiency label for household appliances
Buildings	Launch of new quality assurance system to improve MINERGIE certification procedure for MINERGIE label, which is awarded to buildings that use only one-third of total energy consumed by average existing building
Public buildings	Services offered to large-scale consumers to reduce energy consumption in public buildings by at least 10%
Cars	Introduction of energy efficiency label for cars, enhancing transparency for consumers selecting or buying a new vehicle
Energy City	Further promotion of Energy City label (more than one in four Swiss residents already lives in an Energy City)
Renewable energy and energy efficiency	Creation of network of several private agencies and centres of competence to promote renewable energy and energy efficiency (rational energy use)

Source: OFEN.

## 2.5 Sustainable transport

### *Trends in the transport sector*

Road traffic per unit of GDP (275 veh.-km/USD 1 000 in 2004) is well below the OECD average. However, *traffic per network length* (867 000 veh.-km/km in 2004) is well above this average. Motorway density is especially high, with Switzerland ranked fifth among OECD countries (327 km/10 000 km<sup>2</sup> in 2004). The external health costs of air pollution attributable to transport were estimated at CHF 1.6 billion in 2000 (ARE, 2004). Transport accounts for about one-third of energy consumption and of CO<sub>2</sub> emissions. Road traffic is responsible for three-quarters of energy consumption by the transport sector (Figure 2.4). Increases in CO<sub>2</sub> emissions from transport will make it more difficult for Switzerland to meet its Kyoto emission reduction target.

The number of *passenger cars* grew by 14.2% in the period 1998-2005. Most households (80%) have at least one car and almost one in three (30%) has more than two. Leisure activities account for approximately 44% of distances travelled. In 2000 roughly two-thirds of the active population working outside their home commune travelled to work by car (intercommunal commutes).

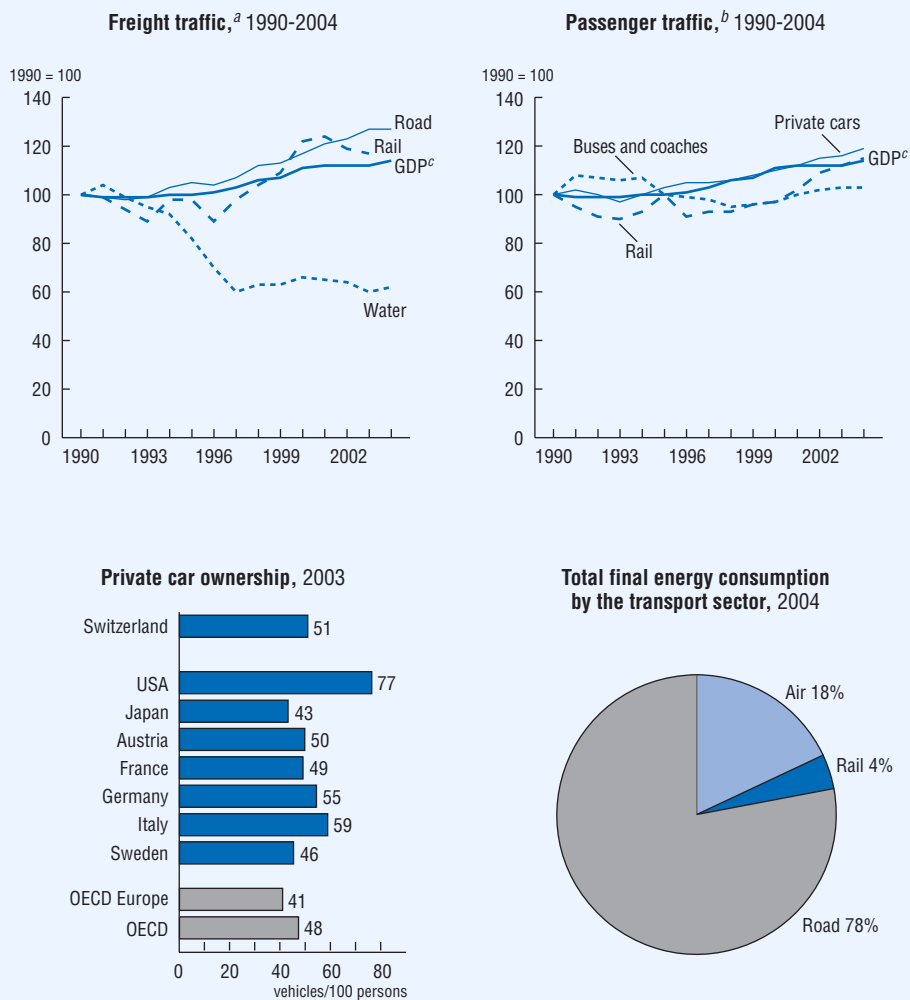
The number of *diesel-fuelled cars* has quadrupled since 1990. Consumption of diesel fuel by road vehicles has increased by 25% in the last five years. To internalise the externalities of diesel emissions, the price of diesel fuel is set slightly higher than that of gasoline (OFEFP, 2004a).

As regards the *modal split*, public transport (18%) and slow modes such as cycling or walking (7%) accounted for approximately one-quarter of passenger traffic (expressed in passenger-kilometres) in 2000. The half-price pass introduced by Swiss Federal Railways (SBB) has been a great success. Valid for one (CHF 150), two (CHF 250) or three years (CHF 350), it allows passengers to travel half-price on a rail, road and waterway network covering over 18 000 kilometres in urban and interurban areas. The half-price pass covers most private and mountain railways, except for mountain cable cars.

### *Environmental measures in the transport sector*

There is wide public support for a *sustainable transport policy* which meets economic, social and environmental needs. A number of key initiatives were taken during the review period, including bilateral agreements between Switzerland and the EU on land and air transport; railway reform; the heavy vehicle fee; and the *Fund for Public Transport Infrastructure Projects* (FinÖV). FinÖV consists of four elements: the New Transalpine Railways Axes (NEAT) programme, the Rail 2000 project, noise abatement measures and integration with the European high-speed rail network.

Figure 2.4 Transport sector



a) Index of relative change since 1990 based on values expressed in tonne-kilometres.

b) Index of relative change since 1990 based on values expressed in passenger-kilometres.

c) GDP expressed in 2000 prices and purchasing power parities.

Source: OECD, Environment Directorate; OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004.

To enhance co-ordination of *transport policy and spatial development*, planning tools have been improved. Programmes for urban areas have been developed to help relieve pressures on cities and to combat urban sprawl. It is intended that the use of each transport mode should consider environmental and economic factors. With a focus on *optimal capacity management* of existing infrastructure, the road network is to be improved in areas with high traffic density. The next extension of the rail network will be capacity oriented. Regional priorities will be taken into account in tackling capacity problems in urban areas.

The groundwork for a *sustainable mobility policy* was created by proposing eight strategies: i) technical optimisation; ii) increased efficiency; iii) traffic transfer; iv) traffic avoidance; v) co-ordination/integration; vi) international co-operation; vii) information on sustainable mobility; and viii) research and development.

### *Measures on vehicles and fuels*

In the late 1980s, Switzerland was ahead of its European neighbours with regard to introducing stringent *emission standards*. Current exhaust emission limits for vehicles are in line with European limits and are being implemented simultaneously in Switzerland and the EU. For passenger cars, Euro 4 came into force in 2006; for heavy goods vehicles, Euro 4 has been in force since 2005 and Euro 5 will come into effect in 2008. Emissions of regulated pollutants decreased during the review period. Reductions of emissions of particulates (PM<sub>10</sub>), acidifying substances (SO<sub>x</sub>, NO<sub>x</sub>, NH<sub>3</sub>) and ozone precursors (NO<sub>x</sub>, NMVOCs) have been achieved, mostly through innovations in treatment of exhaust emissions from road vehicles and improvements in fuel quality. Average specific emissions from new passenger cars are on the way to meeting the 140 g CO<sub>2</sub>/km emission target. In 2002 an agreement to reduce average fuel consumption by new cars was signed by the Federal Department of Environment, Transport, Energy and Communications (DETEC) and the automobile industry (Box 2.3).

Tax measures to promote the use of *sulphur-free motor fuels* (Table 4.9) have been in place since 1 January 2004. These measures encourage use of more efficient gasoline engines and the installation of fine particulate filters on diesel-fuelled vehicles. As of 2007, the Federal Council envisions promoting less harmful motor fuels. This would include exempting motor fuels derived from primary renewable sources from the oil tax. Taxes on natural and liquid gas used as motor fuel would be reduced by 40 cents per equivalent litre of gasoline. Gasoline tax rates would be increased by about one or two cents in 2007 to offset the loss of revenue.

### Box 2.3 Voluntary approach: reducing new cars' average fuel consumption

Further to a 2002 agreement between the Federal Department of Environment, Transport, Energy and Communications (DETEC) and the automobile industry, *average fuel consumption by new cars* will be reduced by 3% per year, from 8.4 litres/100 km in 2000 to 6.4 litres/100 km in 2008. SwissEnergy supports this effort with a compulsory energy label for new motor vehicles, introduced in 2003, and an information campaign. Purchasers can thereby give greater consideration to energy. The energy label has been criticised for allowing heavy cars to obtain the highest rating, as it ignores the impact of car weight on absolute fuel consumption and, consequently, absolute CO<sub>2</sub> emissions. Average fuel consumption by new cars was below 8 litres/100 km in 2004, a decrease of 6.9% compared with 2000 and of 2.1% compared with 2003. However, the agreed mid-term target of 7.4 litres/100 km was not met despite technological improvements and increased purchases of diesel vehicles.

A Swiss study has shown that fuel consumption is just one criterion among many for consumers, and that it is a major factor for only 5 to 10% of new car buyers. The energy label stimulated an *increase of around 1.5%* (or 4 000 new vehicles per year) in the market share of category A and B motor vehicles (those with lower fuel consumption). This resulted in a direct reduction in energy use of 40 TJ per year, the equivalent of a 3 050 tonnes cut in CO<sub>2</sub> emissions.

#### *Modal shift policy*

One of the main objectives of Swiss transport policy is to bring about a shift from road to rail in passenger and freight transport. An initiative to protect the Alps from transit traffic was approved by voters in 1994, but transport policy instruments since then have been unable to bring about a significant road-to-rail switch (Figure 2.3).<sup>7</sup> In 1998 voters approved the introduction of a distance-related *heavy vehicle fee (HVF)*.<sup>8</sup> The impact of the new traffic regime (the HVF and higher weight limits) is demonstrated by changes in traffic levels (truck-kilometres). After rising by 7% over the period 1996-2000, indigenous heavy vehicle traffic has fallen back to its 1996 level since the new fee was introduced in 2001. As the amount of the distance-related fee depends on a truck's weight and emissions, the HVF also prompted a significant move towards fleet renewal in the year before the fee was introduced. Estimates are that the new traffic regime will result in a decrease of about 6-8% in CO<sub>2</sub> and NO<sub>x</sub> emissions by 2007.

Further measures have been introduced for *freight transport*: route price reductions, higher company contributions to goods transport by rail, contributions to



rail loading terminals across borders and stricter heavy vehicle checks and minimum speeds for trucks on mountain routes. Vehicles weighing over 3.5 tonnes are not allowed to operate at night or on Sundays. Increased enforcement (e.g. of speed limits, drivers' rest periods) and penalties for violations would help to minimise distortions to road-rail competition.

Although there are chronic and severe budgetary constraints, financing of major infrastructure projects is secured on a legal basis through the *FinÖV public transport fund*. Changes in railway operation since 1999 have stimulated competition in the Swiss railway system. Under the *New Transalpine Railways Axes (NEAT)* programme, two transalpine base tunnels will be completed: Lötschberg (2007) and Gotthard (2015). These tunnels will increase the speed of and capacity for transalpine freight and passenger transport between Switzerland/Northern Europe and Italy (Box 2.2). Benefiting from an initial investment of around CHF 7.4 billion (at 1995 prices), the *Rail 2000* project was introduced in December 2004.<sup>9</sup> It will increase rail service levels by 12% (more trains and more rapid connections between Swiss cities). Better connections to the European *high-speed rail network* will encourage shifts from both road and short-distance air traffic to rail. Efforts are being made to reduce travel times between Switzerland and Munich, Stuttgart, Paris and Lyon.

As far as *expenditure* is concerned, Switzerland has continued to give rail transport priority over road transport. Between 2000 and 2006, federal spending on public transport (mainly rail) rose from CHF 3.5 billion to CHF 4.6 billion, while federal subsidies for road transport (mostly private) fell from CHF 2.9 billion to CHF 2.8 billion.

### 3. Noise

In Switzerland noise continues to be an issue despite long-standing policy attention and actions initiated over a considerable period. These actions have traditionally been taken in five areas:

- FOEN, together with other enforcement authorities in the Confederation and in the cantons, is responsible for managing “outside noise from installations”, including transport noise;
- the Swiss National Accident Insurance Organisation is responsible for managing “workplace noise”, which is covered by employee protection legislation;
- the Swiss Federal Office of Public Health is responsible for managing “hazardous noise exposure from installations” (e.g. clubs and concerts) and implements the Sound and Laser Ordinance;

- communal regulations and regulations concerning rented accommodation cover “neighbourhood noise and noise in homes”;
- FOEN is responsible for managing *vibrations*; the greater part of the technical and legislative documentation concerned with protection from vibrations is in preparation. A directive already exists on vibrations associated with railways.

### 3.1 Trends

*Exposure to noise* worsened during the review period. Increasing traffic volumes offset both the technological progress and noise reductions already achieved. Some progress has been made with respect to noise emissions from individual transport (e.g. trucks, aeroplanes and railway rolling stock) and the application of control measures. *Traffic* (particularly road traffic) is the main source of noise emissions. Increases in traffic volumes are linked to consumption patterns. Since 1990, freight transport has increased by more than 90% (road) and 30% (rail); passenger transport has increased by 16% (road) and 15% (rail). The external costs of transport noise are estimated at around CHF 1 billion per year (Table 2.7).

Table 2.7 **External damage costs of transport noise**

(CHF million per year)

	Passenger	Freight	Total
Road	550	319	869
Rail	102	27	129
Total	652	346	998

Source: ARE.

#### *Industrial and commercial buildings*

In the case of industrial and commercial buildings, most remediation work has been completed for existing buildings. Noise reduction measures are currently introduced at the *design phase* for new buildings. Guidelines on structural and operational measures to limit building noise were issued in 2000 and tightened up in March 2006 (FOEN). They include noise exposure assessment methods.

### *Road traffic*

Some 1.75 million dwellings are exposed to traffic noise over 55 dB(A) during the day. (This represents about 57% of the total residential area and almost 60% of the population.) Over half of these dwellings are exposed to 60 dB(A) and above. At night, almost two-thirds of dwellings are exposed to noise levels above 45 dB(A). *Motor and tyre noise* is increasing due to the use of heavier cars with more powerful engines and wider tyres.

The greatest noise remediation problem concerns roads. CHF 1.2 billion has already been spent on this problem, out of a total planned investment of CHF 3.4 billion. Delays in investment have occurred (e.g. for road resurfacing and construction of noise barriers). *Vehicle* certification is based on EU legislation. In this regard, the federal Law on Technical Barriers to Trade has been harmonised with EU regulations.

### *Rail traffic*

Some 265 000 people (less than 5% of the population) are affected by noise along the 3 000 km of SBB track. Of these, 38 000 are exposed to levels above the alarm value and 227 000 to levels above the impact threshold. *Railway noise* includes that of wheels and brakes, curve squeal and shunting operations. Goods wagons from other countries, which make up over 75% of transit traffic, contribute significantly to railway noise.

Under legislation introduced in 1987, remedial measures must be taken on railway lines where noise emissions exceed the maximum permitted values. However, railway noise remediation has been far behind schedule, mainly for financial reasons. Following a 1998 referendum in which the *Fund for Public Transport Infrastructure Projects (FinÖV)* was approved, the federal *Law on Railway Noise Abatement* was passed in 2000. This law aims at remediation of all rolling stock (13 000 units) by 2009, completion of construction of noise barriers (260 km) by 2015 and installation of sound-insulating windows (45 000 units) by 2015. By the end of 2005, 70% of passenger cars had been modified. The programme to modify goods cars began in 2005 and 10% of rolling stock had been modified by the end of that year (OFT, 2006). Over the past five years about 30 km of SBB track has been equipped with noise barriers. The total cost of noise remediation associated with railways will amount to CHF 1.3 billion. The entire programme is funded by the Confederation.

### *Air traffic*

*Aircraft noise* above 60 dB(A) affects 158 km<sup>2</sup> of Swiss territory. Noise is emitted from civilian and military airfields and mountain airstrips. Private aircraft and helicopters make a significant contribution. Over 50 000 people live in areas where the impact threshold is exceeded. The three large domestic airports (Zurich, Geneva

and Basel-Mulhouse) account for the majority (60%) of the area exposed to noise, although these airports are responsible for only 38% of total aircraft movements. Problems have arisen with Germany concerning aircraft flying over German territory on their approach to Zurich airport. Technical advances have not compensated for increases in air traffic volume. Noise from aircraft is expected to become worse in the medium term. Plans to ease authorisations of ultralight aircraft will add to the noise problem, also in the medium term.

Progress concerning aircraft noise remediation has been slower than expected. Work at major airports began in 2001; limit values are specified for all civilian airfields. The target date for completion remains 2016, with a total investment of CHF 300 million.

### *Neighbourhood noise*

*Neighbourhood noise* has generally increased, reflecting social changes (e.g. flexible working hours, shifts in businesses' opening hours). However, this type of noise is not perceived as a serious problem in Switzerland. Neighbourhood noise abatement can only be enforced by municipal authorities or municipal regulations.

## 3.2 *Effectiveness of measures*

### *Progress made*

Government efforts to reduce noise in Switzerland have resulted in substantial policy advances. Technical, operational, structural and planning measures to avoid or reduce noise and protect the population have been identified. Implementation of these measures has begun. Policies on *modal shifts* can contribute to reducing the number of people exposed to high noise levels.

In a number of policy areas *noise abatement measures* have been identified and have started to be implemented. In the case of new plants, noise reduction measures are introduced at the design stage; measures to reduce noise at existing plants have successfully reduced exposure levels. Emissions from individual trucks have been reduced, noise barriers have been constructed, roads have been resurfaced, quieter rolling stock has been acquired for railways and aircraft noise has been reduced.

### *Areas for progress*

Despite the application of the prevention principle and initiation of rehabilitative measures, protection of the public from noise has been only partially successful. A survey on *attitudes to noise* revealed that some 64% of the population is disturbed by noise (Lorenz, 2000). *Road traffic noise* was considered the worst. Respondents considered road noise to be an even more serious problem than air pollution. Aircraft

noise was in second place among the types of objectionable noise, presumably related to current public interest in national airports. Workplace and industrial noise shared second place. Neighbourhood noise and railway noise were perceived as less serious.

*Noise exposure registers* have been prepared for roads, railways, airfields and (to some extent) civil firing ranges. These registers are mainly maintained for remediation purposes (i.e. data acquisition is restricted to cases where limit values are exceeded). They provide a rough estimate of the number of persons affected. Noise exposure at industrial and commercial installations is recorded if there is cause to believe that limit values are being exceeded, or if there have been complaints. To facilitate policy definition and implementation, cantonal and federal authorities should extend and harmonise *noise monitoring*.

It will be important to concentrate on noise reduction at source if further noise abatement is to be achieved. However, *reduction at source* has not progressed to the extent envisaged. Individual vehicle engines are generally quieter, but this improvement has been offset by overall increases in road traffic. Classic measures along the path of *noise propagation*, such as construction of noise barriers, are not always feasible (e.g. in urban areas). Mitigation measures may be limited to installation of noise insulation for windows. The situation is similar regarding air traffic noise. Additional measures such as the use of *economic instruments* should be implemented more widely (Box 2.4).

#### Box 2.4 Internalising the external costs of transport noise

In 2000, the Federal Office for Spatial Development (ARE) estimated the total *external costs of damage from road and rail traffic noise* at nearly CHF 1 billion per year (costs associated with road traffic at CHF 869 million, those associated with rail traffic at CHF 129 million) (Table 2.7). This includes damage costs associated with *housing* (reduced rental income), estimated at CHF 874 million, of which CHF 770 million is attributable to road traffic, and with *health* (higher incidence of illness and death), estimated at CHF 124 million, of which CHF 99 million is attributable to road traffic. Three-quarters of health costs result from disorders associated with high blood pressure and the remainder from ischaemic heart disease. The costs of damage resulting from noise exposure are generally higher than the costs of abatement measures would have been.

*Economic instruments* have been used in the form of a noise bonus on the price of train paths for noise-reduced rolling stock. In 2005, a study was begun to examine the economic impacts of a “silence label” indicating the quality of an apartment with respect to exposure to noise from roads, railways, etc. It is also planned to examine the use of economic instruments in order to expand implementation of the polluter pays principle.

Where the introduction of effective operational or technical measures is impossible, or is unacceptable for economic reasons, current legislation allows *threshold values to be ignored*. It has been pointed out that this provision weakens the effectiveness of noise abatement. Noise levels in Switzerland's Law on the Protection of the Environment may not fully reflect its citizens' current *health and quality of life expectations*.

## 4. Water Management

### 4.1 Water quality management

#### *Drinking water*

Drinking water must meet the quality requirements set by the 1992 *federal Law on Foodstuffs and Everyday Items*. Minimum requirements are established by WHO standards, except in the case of arsenic in drinking water in areas where levels are naturally high. The 2005 ordinance on drinking, spring and mineral waters emphasises consumer protection through the principle of self-regulation (by water distributors) and independent inspections (by cantonal laboratories) to ensure that supplies are safe to consume. This control system applies by analogy to all establishments producing foodstuffs. Swiss drinking water is *generally of good quality*. In 2001, over 1 400 independent inspections of water distributors were carried out. Drinking water quality was irreproachable or acceptable in 94% of cases (Table 2.8). This success rate is slightly above the average, for all establishments in

Table 2.8 **Drinking water quality, 2001**

(%)

	Water distributors <sup>a</sup>	Food sector <sup>b</sup>
Water quality/food safety		
Guaranteed	64.1	67.2
Minor defects	29.9	25.6
Questionable	5.6	6.6
Not guaranteed	0.4	0.6
Total	100	100

a) Water quality at source, on leaving the treatment plant and in distribution networks.

b) Quality of drinking water used by establishments producing foodstuffs (restaurants, bakeries, butcher shops, etc.).

Source: Swiss Gas and Water Industry Society (SSIGE).

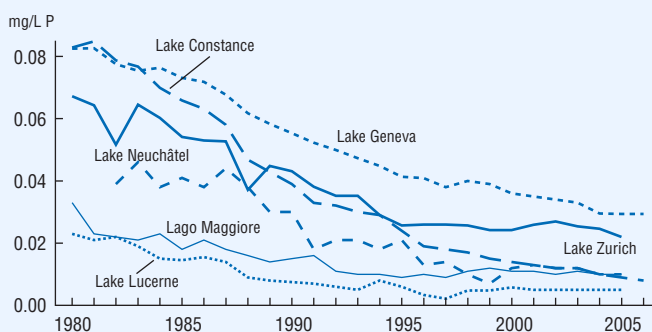
the food sector, of 92.8%. To date, no residues of antibiotics, or of hormonal and other medications, have been detected in Swiss drinking water.

### Surface water

The National River Monitoring and Survey Programme (NADUF)<sup>10</sup> monitors water quality in major Swiss rivers at 17 measuring stations. A compilation of results recorded between 1977 and 1998 (OFEFP *et al.*, 2000) shows that the *quality of surface water has been improving*. The quality is good to very good in watercourses whose watersheds are mainly in the Alps, and in major rivers, whose flow is sufficient to strongly dilute the substances discharged to them. However, significant pollutant loads may still be found in some streams and small rivers on the densely populated plateau. *Phosphorus* loads have decreased following the introduction of the prohibition on phosphates in detergent washing products (1985), extension of the water treatment network and the use of new treatment technologies, and ecological measures in agriculture. *Nitrate* loads, which increased until the mid-1990s, appear to have levelled off due to greater *nitrification capacity* at treatment plants, ecological measures in agriculture and lower atmospheric nitrogen levels. Loads of *heavy metals* are tending to fall, reflecting generalisation of treatment, greater retention of suspended matter at treatment plants and reduced discharges of metals by metalworking firms.

Since the Rhine drains about two-thirds of Switzerland's surface area, trends in *phosphorus* concentrations at Basel on the downstream border are representative of much of the country. Between 1990 and 2003 phosphorous concentrations in lakes declined steadily (by 35%) (Figure 2.5). *Nitrates* (mostly from agriculture) are present,

Figure 2.5 Trends in phosphorus<sup>a</sup> concentrations in main lakes of Switzerland



a) Annual means of total phosphorus concentrations.

Source: FOEN.

above all, in groundwater but may also reach streams and rivers. In 1999-2000 a study was carried out on suspended matter and fine sediment in the Rhine, Thur, Aar, Reuss, Limmat, Birs, Rhone, Tessin and Inn rivers (OFEFP, 2003c). Concentrations of *metals* (cadmium, chrome, cobalt, copper, lead, mercury, nickel and zinc) had decreased significantly compared with the period 1986-90. This study also demonstrated the effectiveness of measures taken against pollution by *organic micropollutants*: e.g. hexachlorobenzene (HCB), polychlorobiphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs).

The total volume of *phytosanitary products* in water is around 1 tonne. As 52 000 million m<sup>3</sup> of water per year flows in Swiss watercourses, and there is 56 000 million m<sup>3</sup> of groundwater, the assumed average concentration of phytosanitary products is 0.02 g/l of water. In case of precipitation, concentrations may be 10 to 20 times higher. *Micropollutants* are substances produced by human activities that reach water in concentrations in the order of 1 µg or 1 ng/l. They include, in addition to organic micropollutants, hormones<sup>11</sup> and residues from fire-resistant agents and beauty products. While the environmental impact of micropollutants remains poorly understood, it is clear that new substances continually reach water and may affect aquatic organisms. It is currently impossible to know whether new measures need to be initiated at treatment plants.

In order to better assess self-cleansing by watercourses, especially after renaturing, it would be *desirable to expand ongoing measurements* to include pesticides, synthetic organic products, specific pollutants and endocrine substances, whose use has become common over time, as well as substances in waste water.

### Lakes

Water quality in *large Swiss lakes* has improved appreciably in recent decades. Pollutant and nutrient levels have fallen considerably, following extension of the water treatment network and the use of new treatment technologies and more environmentally friendly farm management. Phosphorus concentrations in lakes have decreased sharply since 1980 (Figure 2.5), also reflecting the 1985 prohibition on phosphates in detergent washing products. However, there is still room for progress on pesticides, heavy metals and micropollutants (e.g. mercury, PCBs), as the example of Lake Geneva demonstrates (Table 2.9).

Some lakes continue to suffer from *eutrophication*.<sup>12</sup> In areas where crop rotation is widely practised or animals are reared intensively (fattening of productive livestock), phosphorus concentrations are still excessive in certain lakes. Under the Water Protection Ordinance, the condition to which lakes are to be re-established should correspond to an average production of biomass. The water's oxygen



Table 2.9 **Water quality in Lake Geneva, 2004**  
(%)

	Unit	State 2004	Trend 2001-04 <sup>a</sup>	Target 2010 <sup>b</sup>	Attainment of target <sup>c</sup>	Comments
<b>LAKE WATER</b>						
Phosphorus level	µgP/l	29.5	↑	20	±	Linked to waste water treatment and agricultural fertilisers
Oxygen level	mgO <sub>2</sub> /l	2.25	↔	4.0	±	Linked to phosphorus discharges and water mixing
Worm species indicating oligotrophic condition (in sediments)	%	30	↑	50	±	Linked to phosphorus discharges; target more difficult to achieve at depth (> 200 m)
All pesticides	µg/l	0.38	↓	0 <sup>d</sup>	✗	Maximum tolerated value for drinking water: 0.5 µg/l
Heavy metals	µg/l	..	↑	0 <sup>e</sup>	✗	Only copper is still detected
Mercury in fish flesh (char)	µg/kg	50	↔	20-30	✗	Statutory limit value: 500 µg/kg
PCBs in fish flesh (char)	µg/kg	221	↔	0	✗	Statutory limit value: 1 000 µg/kg
Quality of bathing water	%	2.2	↔	0	✓	Percentage of temporarily polluted sites
<b>WATERCOURSES<sup>f</sup></b>						
Biological quality	%	10	↑	6	✓	Percentage of sites classified as poor or very poor quality
Pesticides	%	23	↑	0	✗	Percentage of sites classified as poor quality
Renaturing	%	45	↑	75	✓	Percentage of knowledge of watercourse boundaries
<b>SEWAGE TREATMENT<sup>f</sup></b>						
Population connected to a sewage plant	%	95	↑	100	✓	
Separate collection of waste water and rainwater	%	38	↑	60	✗	Percentage of sewerage networks collecting less than 300 l/inh/day
Elimination of phosphorus in sewage plants	%	90	↑	95	✗	
Phosphorous discharges to the lake	%	71	↑	75	..	Percentage of phosphorus eliminated from domestic, industrial and agricultural waste
<b>AGRICULTURE<sup>f</sup></b>						
Agro-environmental measures	%	81	↑	100	✓	Percentage of useful agricultural surface area
Management of manure	%	80	↑	100	✗	Percentage of livestock whose manure is stored in compliance with standards

a) ↑: improvement; ↔: stable; ↓: deterioration.

b) Targets of the International Commission for the Protection of Lake Geneva.

c) ✓: attainable; ±: partially attainable; ✗: unattainable.

d) Not detectable.

e) Natural content.

f) In the Lake Geneva basin.

Source: International Commission for the Protection of Lake Geneva (CIPEL).

concentration should not fall below 4 mg/l at any time or at any depth. The less sensitive animals, like worms, should be able to inhabit the lake bottom the year round. Oxygen content is determined by factors over which there is little human influence (e.g. temperature, wind and depth) and by internal biological processes related to phosphorus levels. Depending on the characteristics of each lake, the indicative values in effect are between 10 and 25 µg/l of phosphorus.

### *Groundwater*

Since 2002-03 an overview has been available of the quality of Swiss groundwater resources (NAQUA, 2004). Their quality is generally good, but the *presence of pollutants at many stations* is a cause for concern. Traces of pesticides have been detected at 60% of stations analysed, traces of hydrocarbons at 45% and excessive nitrate concentrations<sup>13</sup> at 20%. Although these concentrations do not present a health risk, the situation creates concern and groundwater (the source of 80% of drinking water) needs to be better protected. Particularly on the plateau, which is densely populated and intensively used, loads of nitrates, pesticides and hydrocarbons have been detected at a large number of withdrawal points. Problems are especially evident in areas where there is intensive farming and in urban areas. Large-scale agriculture is by far the leading cause of high nitrate concentrations: excessive levels have been detected at 52% of stations in areas where it takes place.

### *Nitrates and phosphorus*

*Agriculture accounts for about 75%* of the 46 000 tonnes of nitrogen (204 000 tonnes of nitrates) per year that reach Switzerland's groundwater. Despite the shift in agricultural policy since 1998, with a greater focus on the market and ecological factors, and although the vast majority of farms are managed in compliance with the criteria for "required ecological services", nitrate concentrations in groundwater remain particularly high on the Swiss plateau. There is a target of reducing nitrate emissions from agriculture to between 67 000 and 90 000 tonnes (from the current 151 000 tonnes).

In 1998, to reduce water pollution by nitrates, the Federal Office of Public Health (FOPH), the Federal Office for Agriculture (FOAG) and the Federal Office for the Environment, Forests and Landscapes (SAEFL) launched a *Nitrate Strategy* based on Article 62a of the Law on Water Protection. When nitrate concentrations over 25 mg/l are detected in a groundwater body from which drinking water is abstracted, cantons must undertake remediation projects. The Confederation compensates farmers (up to 80%) for costs and eventual losses resulting from remediation measures. Such measures have been taken in several cantons on the Swiss plateau (e.g. Aargau, Bern, Freiburg, Schaffhausen, Solothurn, Vaud and Zurich). Most have

basically involved conversion of cultivated land to meadow and pasture.<sup>14</sup> However, the scope has not met federal authorities' expectations: contracts with farmers concern only 3 000 out of 50 000 hectares potentially covered by the Nitrate Strategy. Federal support in 2000-05 reached CHF 12 million.

Since 1998 farmers have been required to comply with criteria for “*required ecological services*” (Chapter 5), which contribute to water protection. Since 2000 they have benefited from specific contributions for water protection (Table 5.1), especially in areas of central Switzerland where lakes have been polluted by phosphorus of agricultural origin. To meet the criteria for required ecological services, the cantons should ensure that farms store their farmyard manure (e.g. slurry and solid manure) in an environment friendly way, that their nutrient balance is correct (for both nitrogen and phosphorus) and that fertilisation plans are followed. In sensitive areas near lakes, small farmers should be required to adapt livestock numbers to the usable surface area that can be fertilised. A proposal to tax surplus farmyard manure was rejected by the Federal Council in 2003 (Chapter 5). There are no plans to introduce tradable pollution permits.

Concerning protection of the Rhine and the North Sea,<sup>15</sup> since 2005 cantons in the Rhine basin have been committed to reduce the quantities of nitrogen discharged to watercourses from downstream treatment plants by 2 600 tonnes per year, compared with 1995 levels. The countries on the North Sea and the International Commission for the Protection of the Rhine (ICPR) had previously undertaken to reduce nitrogen and phosphorus inputs to the North Sea by 50% between 1985 and 1995 (*OSPAR Convention*<sup>16</sup>). As an ICPR member, Switzerland committed itself to take the necessary measures to achieve this objective. Nevertheless, in 1995 the results showed that this reduction had been achieved for phosphorous inputs but not for those of nitrogen. A national programme to reduce nutrient inputs to Swiss waters (Nitrogen Strategy) was launched, combining measures related to agriculture, air protection and waste water disposal.

### *Pesticides*

There are still *significant quantities of phytosanitary products in lakes and watercourses*. For example, a study (EAWAG, 2005) has shown that for Lake Greifensee (canton of Zurich), although the quantities of pesticides applied had clearly been reduced, measures aimed at reducing pesticide run-off from fields had generally failed.

Following the adoption of environmental protection measures in 1993, the volume of phytosanitary products used in agriculture fell between 1988 and 2003, with the quantities of active substances applied decreasing from around 2 500 to

1 500 tonnes per year. Switzerland is currently studying the *ecotoxicity of phytosanitary products* in lakes and watercourses (Chèvre *et al.*, 2005). This work is proving very difficult due to the behaviour of concentrations of these products in surface water and the large number of products authorised for use in Switzerland (400 active substances).

The Water Protection Ordinance establishes a limit value for concentrations of phytosanitary products in surface and groundwater (if used or destined to be used as drinking water) of 0.1 g/l for each substance. Of course, phytosanitary products *behave much differently in groundwater and in surface water*: concentrations change very slowly in groundwater; in lakes their behaviour is determined by the volume of water and by inputs and outputs; in watercourses they show the greatest variations, e.g. they can reach very high levels after rainfall.

Use of phytosanitary products in *groundwater protection areas* is strictly regulated. They may not be used in withdrawal areas (S1); in inner (S2) and outer (S3) protection zones their use is regulated by the ordinance on phytosanitary products. The Federal Office for Agriculture (FOAG) publishes a list of phytosanitary products whose use is prohibited in both zones. Cantons are responsible for regulating these products' use in catchment areas. The new chemicals legislation prohibits the use in zone S2 of phytosanitary products which, due to their mobility, could easily reach the withdrawal area.

Introducing an *incentive tax* to limit the use of mineral fertilisers, farmyard manure and phytosanitary products, has been considered. However, the Federal Council rejected this tax in 2003. Its view was that existing agricultural policy instruments, in particular where they were concerned with ecological services, would ensure effective protection of the environment from harmful substances, even if implementation and evaluation could be improved.

## 4.2 Management of water resources

### *Restoration of watercourses*

Until the mid-1990s the *space available to watercourses and their ecological functions was steadily reduced*. Construction of residential areas and roads, and the intensification of agriculture, were the main factors. Awareness of this development has increased in the last ten years or so, with the result that flood protection and nature protection requirements are now taken into consideration when determining the space necessary for watercourses. Currently 24% of the 12 000 km of Swiss watercourses is artificial or has been greatly altered or embanked. However, variations in a bed's morphological structure ensure exchanges between watercourses

and the dry land. Switzerland's water protection policy aims, in particular, at returning sections of watercourses to close to their natural state, with adequate space, water flow and water quality.

No matter how pure the water in a river is, there are aquatic organisms that cannot survive if their habitat is too greatly interfered with by inflexible embankments, narrow channels or serious disturbances associated with hydropower use. *Smaller catches of game fish* are an example of the consequences of such alterations. At the end of 1998, the Swiss Federal Institute for Aquatic Science and Technology (EAWAG) and SAEFL initiated a joint fish-watch project, called "Fischnetz" (fishing net), to study the dramatic fall in fish catches.

A tool (the "ecomorphological module") has been created to track changes in watercourses' banks and beds and their spatial needs. Its purpose is to provide a basis for revitalisation of denatured watercourses and restoration of natural habitats (e.g. in alluvial zones). Sections of watercourses can be divided into five categories: natural/semi-natural (I), little impacted (II), heavily impacted (III), not natural/artificial (IV) and enclosed (V). The cantons have used this tool since 1998 to evaluate, using a point system, the following ecomorphological parameters: variability in the width of wet beds; changes in bed bottoms; reinforcement of the foot of banks; the width and nature of banks. SAEFL has helped to finance ecomorphological surveys of the cantons. Use of the model has led to an intermediate assessment of the *ecomorphological condition of watercourses*, based on data from 18 cantons:<sup>17</sup> watercourses in intensively farmed flat areas are the most affected; 85% of watercourses in urbanised areas have insufficient structural diversity. The 88 000 artificial obstacles (over 50 cm high) are further impediments to watercourses' ecological functions.

A practical method has been developed to determine the amount of *space to reserve for watercourses*. Since 1999, the cantons have been required to determine how much space watercourses require and to ensure that this space is preserved for them. Many watercourses have been widened or will be soon, particularly in protected alluvial zones (e.g. canton of Aargau), along the Thur (canton of Zurich) and in the Linth Regional Park (canton of Glaris).

In 2005 the Swiss Fishing Federation launched a popular initiative, "*Living Waters*", to request the cantons to act rapidly to renature water bodies in order to improve the habitats of fish and other aquatic organisms. As the initiative was successful (enough signatures were collected), on 3 July 2006 it was tabled with the Federal Council, which must now decide how to proceed (adoption, rejection, or a counter-project), taking into account economic and energy related aspects.

Since 1995, cantons that are committed to managing watercourses for nature conservation purposes, rather than exploiting their hydroelectric potential, benefit from *annual compensation* over a forty-year period. Financing is ensured through a federal fund, which is supported by a tax on licensed hydroelectric companies. The amounts concerned are nevertheless small. Compensation should be based instead on the provision of positive externalities, and associated with the new mechanisms envisaged to finance watercourse renaturing, e.g. an additional charge on water bills in downstream urban areas (which receive better quality water).

### *Restoration of lakeshores*

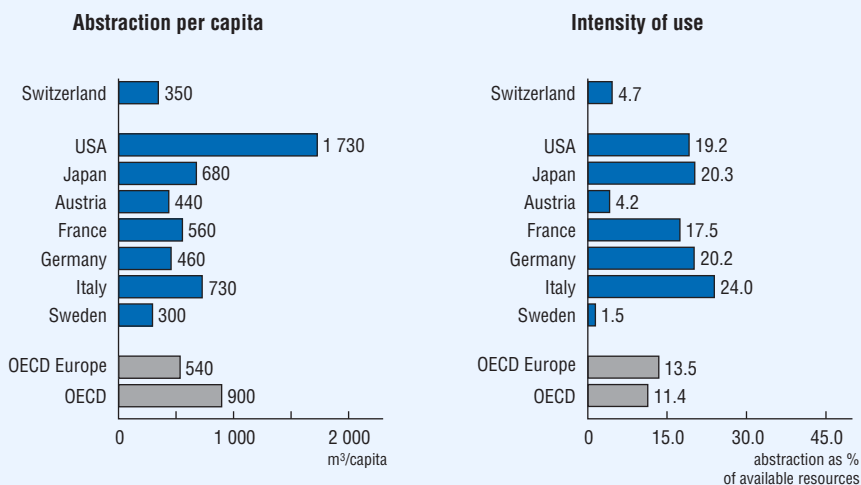
Harbours and walls are a feature of many lakeshores in Switzerland. While these structures provide protection against erosion, they also impair the lakes' self-cleaning function and degrade the *habitats of numerous animal species*. The greatest biodiversity is protected in shallow areas near the shore: soil from the lake bottom, combined with air and water, forms habitats that are suitable for vegetation (trees, bushes, reeds) and animal life (insects, birds, small mammals, fish, crustaceans, amphibians). If lakes' ecosystems are to function properly, it is important to protect and renature these areas.

The University of Geneva, designated by SAEFL, evaluated the general condition of Swiss lakeshores (between 1984 and 1992) as well as the condition, preservation and protection of 80 ponds and small lakes. Steps have been taken towards renaturing the shores of *Lake Constance*.

### *Drought management*

Intensity of use of water resources in Switzerland is low compared with the OECD average (Figure 2.6). Nevertheless, certain watercourses suffer from hydrological stress. There are provisions in the 1991 Law on Water Protection concerning *residual flows* when hydropower is used. A residual flow is the water remaining in the bed following a withdrawal. An "appropriate" residual flow is defined as the flow required to preserve the various functions of a watercourse (e.g. habitats for fauna and flora, structuring of the landscape, supply of groundwater bodies, pollutant degradation). A legal requirement exists that appropriate residual flows will be ensured downstream of withdrawal points, no matter what use is made of the water (e.g. hydroelectricity production,<sup>18</sup> cooling water supply, irrigation, drinking water supply).

With regard to *existing hydroelectric plants*, there is no requirement to remediate sections which do not have an appropriate residual flow until it is time for licence renewal. As licenses are generally granted for 80 years, many sections of watercourses in the Alps will not be remediated until the period 2030-50. Meanwhile,

Figure 2.6 **Freshwater use, early 2000s<sup>a</sup>**

a) Or latest available year.

Source: OECD, Environment Directorate.

sections with insufficient residual flows must be partially remediated by 2012 provided that this does not impose unreasonable economic demands.<sup>19</sup> Under the Law on Water Protection, the cantons are required to submit to the Confederation an inventory of existing water withdrawals. With the help of this information, FOEN is in the process of drawing up a national map of residual flows on a scale of 1:200 000.

Larger, temporary water withdrawals are possible during *droughts*, but residual flows must be established based on a balance between economic and ecological interests. Following the drought in 2003 (Box 2.5) recommendations were made to the cantons, which are responsible for managing their own water: to improve the basis for decision-making, to elaborate a concept for possible future droughts and to ensure good communications among the authorities involved.

Since 1992, residual flows have been established for a large number of hydroelectric plants. Studies (OFEFP, 2004c) have shown that it is possible, under the regulations in effect, to ensure conditions allowing the survival and development of a wide variety of organisms and to conserve watercourses as precious biotopes downstream of withdrawals, even though there is room for improvement (Table 2.10).

### Box 2.5 The 2003 drought

Although Switzerland has abundant water resources, the 2003 heat wave had many consequences for water and water use. In *watersheds without glacier coverage*, especially in the Jura and on the Swiss plateau, 350 rivers dried up, either in stretches or totally, along a distance of 245 km; 85 000 fish were found dead and real losses were probably much greater; 120 000 fish had to be transferred to watercourses with sufficient flow; conflicts of interest arose between withdrawals for irrigation and for water protection. On the Rhine, navigation had to be restricted between Basel and Rotterdam. Warmer water also had harmful consequences (temperatures rose to as much as 26 °C at a depth of 4 metres in the middle of the Rhine), causing the death of 50 000 grayling in the Rhine downstream from Lake Constance.

Conversely, in *watersheds with glacier coverage* watercourses carried an exceptional quantity of water due to heavy melting; mountain hydroelectric plants recorded a significant rise in output; and navigation companies in the northern Alps carried more passengers. At the end of the drought (the worst since 1947) federal authorities considered that no new legislative measures were required.

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Source: OFEFP, 2004c.

Not only do water shortages downstream of withdrawals affect the ecology of watercourses, but very irregular flows also destroy the habitats of many aquatic organisms. Thus 30% of hydrologically monitored watercourse sections are affected by *hydropeaking operations*.<sup>20</sup> Hydropeaking produces artificial flooding. When the flow increases (surges), aquatic organisms may be carried away by the current; when it decreases (low-water phase) they may be stranded close to the banks. To mitigate the effects of hydropeaking, it is possible to “divert” the surge (e.g. by irrigating alluvial zones); reduce fluctuations between surges and low-water phases (e.g. by increasing the minimum amount of water returned from the plant); and smooth the transition between surge and low-water phases (e.g. by starting and shutting down turbines more gradually). In any case, considerable fluctuations in water flows remain, even downstream of plants where such measures have been taken.

To reduce the impacts of hydropeaking on watercourses, the Swiss Council of States’ Commission for the Environment, Spatial Development and Energy (CESDE) is preparing legislation to make the rules governing residual flows more flexible. The National Council has also adopted a motion which, as part of a revision of the Law on Water Protection, aims at the establishment of significantly lower residual flows



(taking into account information about climate change). The “Living Waters” popular initiative requests, in addition to the renaturing of public water bodies, that measures be put into effect to mitigate the harmful effects of artificial fluctuations in water levels associated with hydroelectric plants.

### *Flood management*

Flooding in watercourses caused *major damage* in 1987, 1993, 1999, 2000 and 2005 (Figure 2.7). The main causes were: construction, which had been frequent in the past in threatened areas (particularly flood plains); narrow or canalised beds in which flows were accelerated, producing a rise in peak levels downstream; and an insufficient number of designated areas for retention or evacuation of floodwater during extreme events.

**Table 2.10 Impacts of hydropower stations on watercourses, role of residual flows**

Watercourse <sup>a</sup>	Canton <sup>b</sup>	Parameters <sup>c</sup>							Score <sup>l</sup>	
		Fish		Macroinvertebrates		Morphology <sup>h</sup>	Aspect <sup>i</sup>	Depth <sup>j</sup>		Water quality <sup>k</sup>
		Quality <sup>d</sup>	Quantity <sup>e</sup>	Rheophile <sup>f</sup>	Quantity <sup>g</sup>					
Flembach	GR		↓↓↓	↓	..	↓	↓	↓↓↓	2	
Schächen	UR			↓	..			↓↓	1	
Bockibach	UR			↓	..			↓↓↓	2	
La Vièze	VS	↓		↓	..				1	
Aar, Interlaken	BE		↓		↓	↓		↓	1	
Aar, Bern	BE	↓↓↓	↓↓↓				↓↓↓	↓	3	
La Suze	BE		↓						1	
Aabach	AG	↓↓↓		..		↓		↓	2	

a) Residual flow stretches.

b) AG: Aargau; BE: Bern; GR: Graubunden; UR: Uri; VS: Valais.

c) Compared with reference stretches (subject to as little influence as possible, mostly on the same watercourse) which represent the target value: ↓↓↓: clear deterioration; ↓↓: deterioration. The absence of a symbol indicates that the parameters are practically identical to those of the reference stretch.

d) Conservation of species diversity.

e) Conservation of populations.

f) Conservation of species capable of living in water disturbed by fast-flowing currents.

g) Conservation of small organisms serving as food for fish.

h) Conservation of the biotope: composition of the substrate, type of current and shelter for fish.

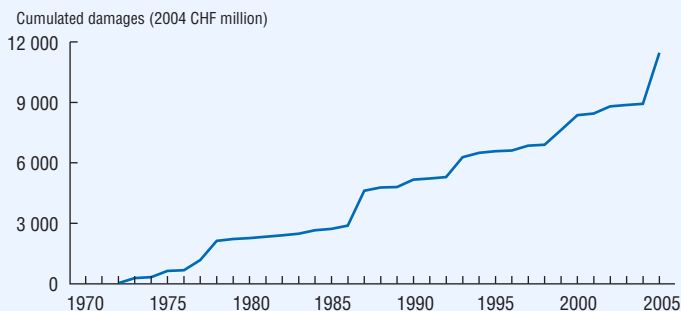
i) Smell, turbidity, formation of mud, proliferation of algae.

j) Minimum depth necessary for fish migration.

k) Physical and chemical qualities.

l) Ecological functions of the watercourse: 1) largely fulfilled; 2) partially fulfilled; 3) not fulfilled.

Source: OFEFP, 2004e.

Figure 2.7 Damages<sup>a</sup> related to river floods, 1972-2005

a) In 2005, cumulated damages added up to 3% of the annual GDP.

Source: FOEN.

After the events of 1987, the Swiss authorities concluded that there is no absolute protection against flooding. *Prevention entails, above all, rational use of space* in order to minimise impacts. If this is impossible, correct use should be made of existing measures. Under the flood control ordinance (promulgated 1994, revised 1999), cantons must designate: i) hazardous areas; and ii) the space to be allocated to watercourses, not only for flood control purposes but also to allow the watercourses to carry out their ecological functions. In practice, this means that the areas in question should be integrated into master plans and land use planning at the cantonal and communal level; they should also be taken into account with regard to all activities affecting land use. Flood management is thus closely *linked to watercourse restoration*. A natural or renatured watercourse, with sufficient space to carry out its multiple ecological functions, will be less likely to damage its environment when flooding occurs.

With regard to *technical protection against flooding*, the period 2000-05 may be regarded as one of consolidation. The effect of protective measures during an overload must be controlled, since the protective effect ceases or is greatly reduced if the flow capacity is exceeded. In August 2005, for example, in the vicinity of Buochs (canton of Lucerne), when the flow of the Engelberger Aa river greatly exceeded the riverbed capacity, the excess water was evacuated by means of an upstream emergency spillway into an area used for less sensitive activities (airfield, playing fields). The spillway thus prevented damage estimated at CHF 100 million, whereas spending on flood protection measures amounted to CHF 26 million.

The total *resources allocated* by the Confederation to flood protection, revitalisation and combined projects between 1995 and 2005 amounted to approximately CHF 640 million. As the Confederation contributes 40% on average to the total cost, some CHF 960 million from cantons and communes should be added to this sum.

*Hazard maps* are basic land use planning documents. They should be completed by 2011. Yellow zones are low-risk areas where landowners need only be informed of the risks. New construction zones may be authorised; conditions are nevertheless imposed for sensitive uses or for high-density housing. Blue zones are moderate-risk areas where construction is authorised only under certain conditions and sensitive structures may not be built. Red zones are high-risk areas for construction and for people inside houses, no new construction is authorised and construction zones must be reclassified.

In Switzerland “*protective forests*” help to reduce flooding as well as providing protection against avalanches, rockfalls, erosion, etc. Forests cover between 23 and 43% of the Swiss Alps. According to the national inventory of forests, at least 10 to 30% of them serve a protective function.<sup>21</sup> Under the 1876 Law on Forest Policing, the Confederation laid the legal foundations for large-scale protection and improvement of mountain forests, which had been over-exploited at many locations, to furnish protection against natural hazards, e.g. avalanches, rockfalls, landslides, mudslides and floods. The Confederation continues to give priority to protective forests and encourages their conservation (Chapter 3). It has spent an average of CHF 90 million per year over the last five years on protection against natural hazards.<sup>22</sup> Around 40% of that amount has been used to maintain or improve forests’ protective effect, to which may be added some CHF 90 million from cantons and communes.

In the context of ecological compensation schemes, farmers are required to create or maintain *grassy strips without fertilisers* at least 3 metres wide along watercourses and lakes. Although the measure is designed to limit fertiliser and pesticide run-off and leaching to lakes and watercourses, it also helps to reduce flooding. The draft Agricultural Policy 2011 document considers extending this strip to 6 metres.

Under the law and ordinance on flood control, the *Confederation provides financial support for flood protection and revitalisation measures*.<sup>23</sup> However, certain conditions must be met. Coordination with other policy areas that influence land use planning needs to be ensured. Projects must achieve their environmental objectives at least cost. Subsidies are granted for the following projects: production of basic hazard assessment documents; planning and construction of structures and facilities for flood protection, as well as their rehabilitation; clearing of beds and re-establishment of an adequate flow following a natural event; setting up and operation of measurement systems within the framework of flood protection; installation of warning systems;

land acquisition; revitalisation of denatured watercourses. Priority is given to maintenance and planning measures.

The 1982 *flood protection guidelines* were updated in 2001. The flood protection strategy is based on the sustainability principle, with the aim of preserving natural resources (ecological aspect), managing the use of water resources without generating an excessive economic burden (economic aspect) and protecting people against hazards (social aspect). The third correction of the Swiss Rhone provides a good example of this strategy (Box 2.6). Concerning *prevention against natural dangers*, in 1997, the Federal Council created an extra-parliamentary committee<sup>24</sup> to promote a genuine risk reduction policy rather than a policy concerned only with protecting property.

### Box 2.6 The third correction of the Swiss Rhone

The Swiss Rhone rises at a height of 2 300 m on the Furka glacier, on the slopes of the Saint Gotthard, then travels 150 km before flowing into Lake Geneva. The Third Swiss Rhone Correction was initiated after *the floods of 1987 and 1993*. The principles and objectives of the project were approved by the canton of Valais only a few days before the great flood of October 2000, the flood of the century. The aim of this large project is to secure the Rhone plain between Brigue and Martigny on a lasting basis. It will take almost 30 years and cost CHF 1 billion. Flooding threatens assets worth CHF 10 billion, to say nothing of human lives.

As with the first two corrections, the project is being carried out in partnership with representatives of communes and associations. Almost 11 000 hectares have been identified as under threat from flooding, the space which needs to be set aside along the river has been defined and maintenance of the watercourse, as well as flood alarms and emergency systems, has been improved. Work has begun at priority sites. The overall project, from the glacier to Lake Geneva, is still in preparation. It will define the future face of the Rhone, that of a *safer but also a more natural and people-friendly river*. The project represents a very considerable technical and human challenge.

*Source:* Département des transports, de l'équipement et de l'environnement, Canton of Valais, 2006.

## 4.3 Water basin management

Efforts to promote *integrated management of water resources* have been based on partnerships between users, while ensuring conservation of ecosystems. Some water basins are already being managed according to these principles.<sup>25</sup>

In the Swiss Jura, 37 departments in five cantons (Solothurn, Basel City, Basel Country, Bern and Jura) have drawn up a joint strategy to define a concept for sustainable management of water resources in the *Birs basin*, within the framework of the general waste water management plan (PGEE) (Box 2.7). Sections of the river will be identified for revitalisation, evaluation of zones at risk and optimisation of treatment plants' operation. The REP integrates a broad concept, the first of its type in Switzerland, based on a cross-disciplinary approach. The project covers the entire hydrological system, particularly surface and groundwater, nature and landscape, fish populations, watercourse corrections, land use planning, drinking water supply and waste water treatment.

The *canton of Geneva* has given priority to the renaturing of its watercourses since 1997, supported by a bold (CHF 31 million) programme and five specific laws.<sup>26</sup> Through transfrontier agreements known as “river contracts”, Geneva ensures,

### Box 2.7 Organisation of water services

Concerning *water supply*, the vast majority of operators are public bodies operating in a variety of legal forms: communal enterprises, public law institutions, co-operatives, limited liability companies. Water pricing is a matter for local or cantonal authorities. The federal government has no regulatory powers in this respect. Most cantons encourage operators to work together in regional associations.

Concerning *waste water treatment*, however, cantons are willing to surrender their autonomy. The task is often complex and benefits greatly from economies of scale. Consequently, there has been a rapid rise in the number of consortia treating waste water for several communes (as many as 30 in some cases). Some of these consortia have taken the form of limited liability companies, with local authorities as their shareholders. Privatisation of waste water treatment is allowed (though not encouraged) by federal law.

In 1994, within the framework of a general *waste water management plan* (PGEE), the Swiss Association of Water Protection Professionals (VSA) and the Union of Swiss Cities (UVS) issued *sewerage financing guidelines* for communes and groupings of communes. The guidelines contain suggestions concerning the preparation of *plans for renovating the sewerage network* and for financing. Federal subsidies granted until 2002 enabled over 80% of communes, or 90% of the Swiss population, to draw up such plans. In 2002, VSA, in co-operation with SAEFL, issued recommendations for drawing up *regional waste water management plans* (PREE) as part of an integrated water planning process. Federal subsidies are available for the preparation of such plans.

using a coherent overall approach, the revitalisation of the many streams and rivers that run through the canton and empty into Lake Geneva and the Rhone. Measures taken include those related to reserved spaces, habitats and landscape quality, and water quality.

In the canton of Zurich a number of newly remediated sections of the *downstream part of the Thur* provide another example of cross-disciplinary policy applied to watercourse management. Flood protection, bed load management and optimisation of the river's natural value have been successfully combined. The Alpine Rhine development project and the third correction of the Swiss Rhone in the canton of Valais (Box 2.6) may also be cited as examples.

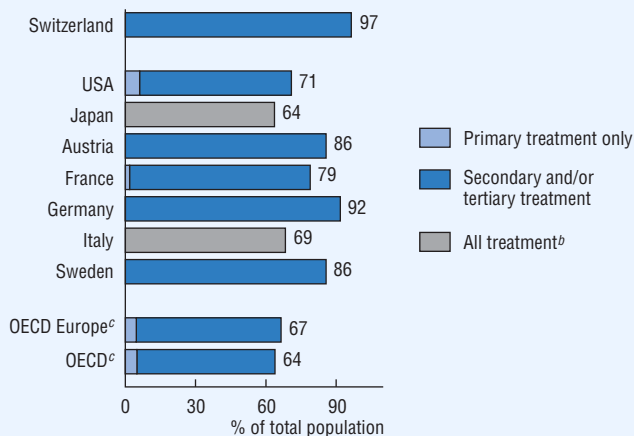
More generally, an important step towards river basin management was taken with the 1997 amendment of the Law on Water Protection, which introduced integrated management of waste water treatment (Box 2.1), followed in 2002 by the introduction of *regional waste water management plans* (PREE) (Box 2.7). These plans represent a good start for water basin management, although they do not cover water supply aspects as does *flood management planning by the cantons*.

Regrouping the management of water quality, water resources and risk within the *Federal Office of the Environment* (FOEN) on 1 January 2006 has also helped to promote water basin management. FOEN's mission is not only to protect the environment, but also to use natural resources according to the principles of sustainable management and protection of the population against natural disasters.

#### 4.4 Pricing of waste water treatment

In 2005, 97% of the population was connected to a treatment plant, one of the highest shares in any OECD country<sup>27</sup> (Figure 2.8); another 1% could still be connected. Connection is not economically desirable for the remaining 2%, who live in remote and sparsely populated areas (other methods are available to treat their waste water). Charges are used to finance sewerage and treatment. They are paid by both industry and households.

Under Article 60a of the 1991 federal *Law on Water Protection*, waste water treatment charges (sewerage and treatment) are designed primarily to cover investment and operating costs. They comprise a one-off connection charge and two annual charges (flat-rate and metered). The connection charge increases with the surface area of the property concerned, weighted according to the type of construction zone. The flat charge is levied per household or business (e.g. industry, workshop, provision of services), while the metered charge is based on water consumption. A rainwater charge has theoretically been added to the existing charges.<sup>28</sup>

Figure 2.8 Population connected to public waste water treatment plant, mid-2000s<sup>a</sup>

a) Or latest available year.

b) Primary, secondary and/or tertiary treatment.

c) Secretariat estimates.

Source: OECD, Environment Directorate.

A growing number of communes apply *mixed pricing* (combined flat and metered charges). This is the case in 10 cantons (out of 26), especially in the canton of Bern (28% of communes in 1997, 70% currently, with a target of 100% by 2010) and in the cities of Basel and Zurich. Other communes have opted for metered pricing only, as in the cantons of Basel Country and Solothurn and the cities of Geneva, Lausanne and Neuchâtel. Others, especially small communes, levy only a flat charge. In 2003, the annual average charge where there was mixed pricing, across all communes using this method, was CHF 150 per inhabitant equivalent (IE),<sup>29</sup> with the flat charge amounting to CHF 80/IE/year and the metered charge to CHF 2 per m<sup>3</sup>. Overall, the waste water treatment bill in Switzerland in 2003 for all communes, including the connection charge, was CHF 120/IE/year, comparable to the average in France and slightly below the average in Germany. By comparison, in 2003 the drinking water bill in Switzerland was around CHF 95/IE/year.<sup>30</sup>

### *Operating costs*

The *rate of recovery* of operating costs for waste water treatment has increased significantly, following changes in the organisation of water services (Box 2.7) and

the introduction of the polluter pays principle (PPP) in the Law on Water Protection in 1997 (Box 2.1). By 1 January 2005, 71% of communes had incorporated PPP into their regulations, compared with 41% at the beginning of 2000. Large cities were the first to comply with the changes, where they were not already in compliance. The goal is to achieve 100% compliance by 2007. In the canton of Bern the cost recovery rate has improved considerably, rising to 89% in 2003. The prohibition on use of sewage sludge as fertiliser,<sup>31</sup> introduced in 2006, has generated an additional cost for treatment plant operators estimated at CHF 40 million per year, or the cost of incinerating around 80 000 extra tonnes of sludge.

### *Capital costs*

The emphasis in recent years has been on obtaining better coverage of *capital costs* based on amortisation, calculated on future replacement value. The replacement value is equivalent to the investment that would currently be required to newly build sewerage equipment of the same size. An annual allocation to a special fund (“maintenance of value special financing”) has been created. It is calculated on the basis of an average operating life: 33 years (treatment plant) and 80 years (sewerage).

In the canton of Bern an *effluent charge* was also introduced in 2000. It has been successful as an incentive: many treatment plants have been able to reduce the amount of their charges by improving efficiency. Charges are paid into a “sewerage fund”: 92% of the fund is used to finance new sewerage or treatment plants or extensions to existing plants; the remaining 8% is allocated to the cantonal budget.

Despite these efforts, *taxpayers are still too often called upon* to cover capital costs, especially for improvements to treatment plants (e.g. transition to tertiary treatment). For some time (since 1976) this mainly concerned plants discharging phosphorus and ammonia to lakes and sensitive watercourses. Since 1997, the focus has shifted to reducing nitrogen and phosphorus inputs to the North Sea. In each case *federal subsidies* have covered up to 50% of the capital cost.



## Notes

1. OAPL was amended in 1999 and 2003.
2. WHO defines health as “a state of complete bodily, mental and social well-being”; under this definition LPE uses a concept of noise according to which it is de facto detrimental to health.
3. Hydroelectric power produces 57% of electricity, nuclear 40% and fossil fuels only 2%.
4. Incineration of domestic waste is prohibited.
5. Including indirect damage.
6. Hydroelectric power represents 11.5% of total energy consumption, followed by biomass (2.6%), waste treatment (1.3%), ambient heat (0.6%) and solar power (0.1%).
7. If Switzerland had continued to use earlier instruments (e.g. 28-tonne limit, flat-rate heavy vehicle tax), it could have expected transalpine road haulage to increase to 1.7 million vehicles by 2007.
8. The heavy vehicle fee is being implemented in three stages: 1.6 Swiss cents per tonne-km (2001-04); 2.5 Swiss cents per tonne-km (2005-07); thereafter, amount to be decided.
9. A second phase of Rail 2000 is scheduled to start in 2011-12, with a further investment of CHF 5.9 billion (at 1995 prices).
10. National programme for the continuous analytical study of Swiss watercourses, established in 1972.
11. Even weak concentrations of endocrine disruptors are sufficient to disrupt the hormonal systems of living creatures. For example, they are suspected of being responsible for the feminisation of male fish.
12. Excessive discharges of nutrients, especially phosphorus and nitrates, cause proliferation of algae and, in deep water, a lack of oxygen.
13. Higher than the requirement set by the Water Protection Ordinance (25 mg/l maximum).
14. Transforming land under crop rotation to grassland reduces nitrate seepage by 60%, from approximately 50 to 20 kg per hectare per year.
15. Excessive discharges of nutrients from the Rhine can cause eutrophication of North Sea coastal waters.
16. Convention for the Protection of the Marine Environment of the North-East Atlantic.
17. Extrapolated to Switzerland’s entire hydrographic network on a scale of 1:25 000, using a geographical information system.
18. There are over 1 600 hydropower plants in Switzerland.
19. Cantons are responsible for carrying out remedial work and must assume the costs. Under the Law on Nature and Landscape Conservation, the Confederation helps to finance additional measures designed to remediate landscapes or biotopes listed in an inventory.
20. Hydropeaking refers to fluctuations in water flow through turbines according to variations in electricity demand (e.g. lower at night and on weekends).

21. Delimiting protective forests is a cantonal responsibility, and uniform delimiting criteria are still lacking.
22. Within the framework of the Swiss National Forest Programme (PFS), the Confederation has defined its future forestry objectives and its proposed response to the increasingly strained financial situation of silviculture and the forestry industry. Adaptations of the Forest Act are being prepared.
23. Up to 45% for work and up to 70% for the preparation of the hazard maps, with rates varying according to the financial situation of the individual canton. The reform of the financial equalisation system and of task-sharing between the Confederation and the cantons, which comes into effect in 2008, will entail a complete reorientation of the promotion of projects.
24. The National Platform “Natural Hazards” (PLANAT).
25. Efforts have also been made at international level, especially in the framework of the International Commission for the Protection of the Rhine (Box 7.2).
26. The canton won the Swiss watercourse prize in 2001, awarded jointly by the Swiss Water Economy Association, the Biological Engineering Association and Pro Natura.
27. Only the Netherlands has a higher rate (98%).
28. An additional charge is theoretically levied for rainwater running from courtyards and roofs into drains. This charge is based on the drained surface area. However, many communes (over half those in the canton of Bern) do not levy it (yet).
29. For consumption of 60 m<sup>3</sup> per year.
30. Drinking water and waste water treatment services are generally billed separately.
31. Because of the pollutants and pathogens it is suspected of containing. “This change seemed inevitable: even without a ban, the amount of sludge used as fertiliser had been falling steadily since 1990” (OFEFP, 2003c).

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# 3

## NATURE, LANDSCAPES AND BIODIVERSITY\*

### Features

- National biodiversity strategy
- Adoption and implementation of a new natural parks system
- Evaluation and recognition of the services rendered by biodiversity
- Recognition of biodiversity and landscapes in spatial planning
- Sustainable forest management

\* The present chapter reviews progress in the last ten years, and particularly since the previous OECD Environmental Performance Review of 1998. It also reviews progress with respect to the objectives of the 2001 OECD Environmental Strategy.

## Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of Switzerland:

- prepare and adopt a *National Biodiversity Strategy* (which could succeed the Swiss Landscape Concept), along with corresponding plans of action; set precise objectives and timetables which anticipate, inter alia, the effects of climate change;
- limit consumption of agricultural and natural space; contain dispersed urbanisation by enhancing the integration of biological and landscape diversity goals into spatial planning by cantons and communes, based on *reform of the federal law on regional development* and adjusted property taxation;
- clarify the *federal inventory of natural landscapes, sites and monuments* so that landscapes can be factored more rigorously into cantonal and communal planning;
- set up *Regional Natural Parks*, peri-urban natural parks, a national ecological network and a second national park; extend international *networks of protected areas*, such as Ramsar, Man and the Biosphere, and World Heritage sites, and establish the Emerald Network (Bern Convention); expand *financial resources* to invigorate policy for the development of protected areas;
- strengthen sustainable *forest management*; expand forest reserves and ensure the “public good” function of forests;
- do a better job of evaluating, taking into account and remunerating *services rendered by ecosystems*.

## Conclusions

Switzerland has set up a very high-quality biodiversity *monitoring network*; based on systematic scientific work, this network measures the dynamics of biodiversity and is used in particular to update “red lists” of endangered species. *Planning documents* regarding the landscape, nature and forests (e.g. the “Swiss Landscape Concept”) have been adopted and the corresponding plans implemented. Progress has been made towards *sustainable forest management* and wetland conservation. The Swiss Landscape Fund, which provides financial support for projects to protect and promote the landscape, has been extended until 2011. The process for developing a *natural parks system*, including the creation of a Regional Natural Park (PNR) category, is about to be completed; dozens of PNR projects are already being prepared. Roughly 40% of farmland consists of semi-natural habitats (ecological compensation areas and Alpine pastures) that help preserve the biotope for the fauna and flora.

Nevertheless, as the updated “red lists” show, the *erosion of biodiversity* has not been curbed; on the contrary, most of the species monitored (e.g. flowering plants, amphibians and reptiles) have regressed since the lists were last published. Little progress has been recorded in identifying meadows and dry pastures to be protected by the inventories of nationally important biotopes. Urbanisation, tourism activities and transport infrastructure exert increasing pressure on natural and agricultural areas. The diversity and quality of landscapes continue to be threatened by progressive urbanisation, building outside construction zones, and the commoditisation and increasing uniformity of buildings. Forest reserves should be expanded, and the environmental services rendered by *forests* should be financed. Spatial planning cannot stem the *consumption of new land*, which is proceeding at a rate of one square metre per second. The federal landscape inventory lacks clarity and effectiveness. Moreover, delays have been recorded in the adoption of certain inventories (e.g. dry grassland) and in the implementation of the Emerald Network, despite the work carried out by NGOs. A *National Biodiversity Strategy* ought to be drawn up and adopted. Without such a strategy, it is difficult to see how Switzerland can possibly meet its own objectives and honour its commitments (e.g. with regard to the Earth Summit in 2002, the Convention on Biological Diversity and pan-European biodiversity objectives).



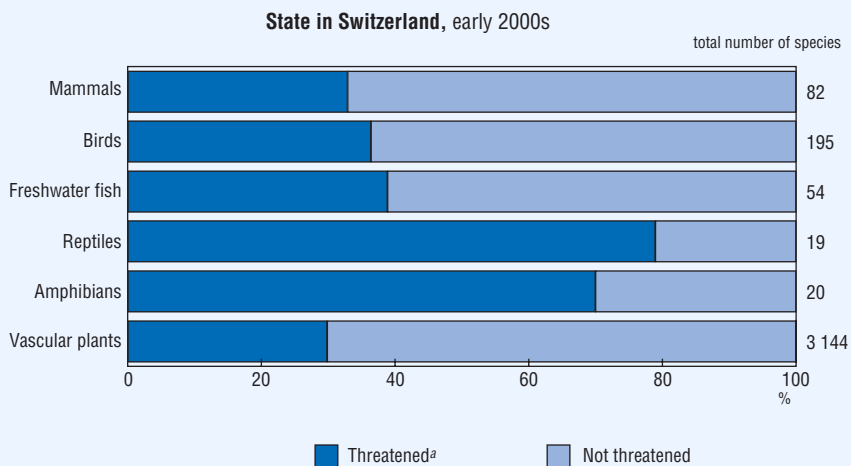
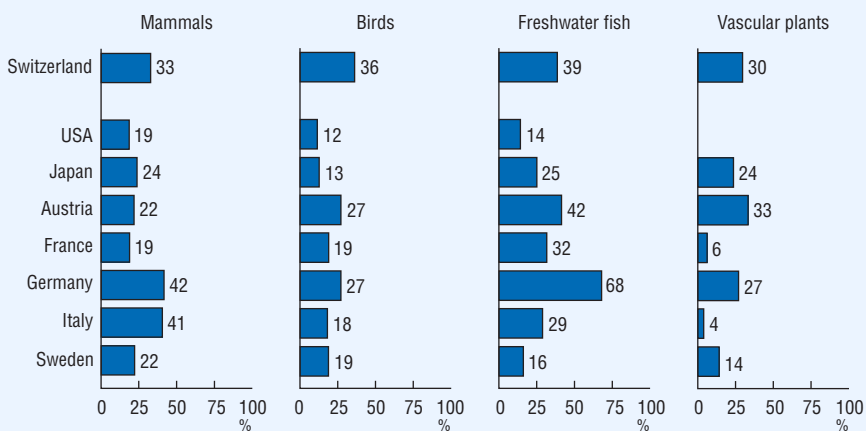
## 1. Biodiversity and Landscape Features

Switzerland’s varied geography and climate have produced a *great wealth of biodiversity* in terms of species and natural settings, but it is unevenly distributed. In total, Switzerland is home to more than 40 000 animal species and over 3 000 species of flowering plants and ferns (Figure 3.1). To these may be added 1 030 species of mosses, 412 of lichens and nearly 5 000 of fungi.

The *natural settings* that are richest in biodiversity are the aquatic ones (e.g. watercourses, large and small lakes, streams) and wetlands, which can be subdivided into high mires, raised and transitional mires, alpine ecosystems, forests and dry grasslands. Cultivated land and orchards have long supported rich flora and fauna, in particular abundant populations of birds.

Switzerland also has a rich variety of natural and cultural *landscapes*: the great massifs of the Bernse Oberland and of the Valais, the typical landscapes of the Prealps with their succession of upland meadows and forests, rural areas valued for their characteristic architecture, and the high alpine valleys – all these landscapes are recognised and cherished and contribute to the reputation of Switzerland’s tourism and, consequently, to its economic development.

Figure 3.1 Fauna and flora

Threatened species<sup>a</sup>

a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species.

Source: OECD, Environment Directorate.



Nature, biodiversity and landscapes have significant *economic dimensions*. Not only are they a source of natural resources, but they are also the basis of much of Swiss tourism. They help to defend against natural hazards and climate change.

The previous OECD Environmental Performance Review of Switzerland noted *trends of concern*, related to biodiversity and landscape, caused by the intense pressure of human activity on the national territory and on natural settings; these pressures continue to be intense (Box 3.1).

## 2. Objectives

The objectives that Switzerland has adopted regarding its landscape and biodiversity policies are set out in legislation or in conceptual and planning documents. The Law on Nature and Landscape Conservation (LPN, 1966, with regular additions) contributes to decisions taken at the federal level; its implementation is the responsibility of the cantons. Concepts, strategies or plans adopted at the federal level are also implemented through actions at the cantonal and communal level. These policies have a clear territorial dimension. Their effectiveness requires active co-operation among relevant authorities of the *Confederation, the cantons and the communes*.

With respect to strategic documents, the *Swiss Landscape Concept* (SLC), adopted by the Federal Council in 1997 and in force between 1998 and 2006, set objectives that address, on one hand, activities affecting the landscape and biodiversity, and on the other, policies for spatial planning, landscape and biodiversity. In the latter area, specific objectives have been established related, in particular, to monitoring of biotopes and landscapes, desired Red List changes and protected areas.

The SLC was given further definition in 2003 with the publication of the *Landscape Strategy 2020*, which, without being limiting, contains objectives for the coming years and calls, in particular, for the early adoption of new legislation on natural parks. This strategy's landscape objectives are inspired by the principles of sustainability enshrined in the federal sustainable development strategy, adopted in 2002 (OFEFP, 2003). A mid-term status report on the implementation of the SLC, published in 2002, presented a positive picture, with 80% of the 220 planned measures and projects then under way and on schedule. There will be a final assessment of its implementation in 2007.

Performance can also be assessed against the recommendations in the previous *OECD Environmental Performance Review of Switzerland* in 1998:

- increase funding for a more vigorous policy in regard to protected areas and intensify efforts to establish inventories and to manage designated areas effectively;

### Box 3.1 Origin and intensity of pressures on landscape and biodiversity

The Landscape 2020 project, prepared with a view to *implementing the Swiss Landscape Concept*, produced a detailed analysis of trends shaping the landscape, with special attention to threatened beauty spots (OFEFP, 2003).

*Urbanisation* is the main factor producing change: it has been spectacular on the Swiss plateau, where built area increased from 13 to 14.6% over 12 years and population density is 450 inhabitants/km<sup>2</sup>. The trend towards urban sprawl reflects: i) population growth; and ii) an increase in the built area per person, which has grown by 4% in 12 years (from 382 to 397 m<sup>2</sup>/inhabitant). Agricultural land and natural areas are being consumed at an estimated rate of 0.9 m<sup>2</sup>/second. These two figures seem to have struck a chord with the public by demonstrating the growing scarcity of open space.

*Agriculture* has contributed to loss of biodiversity through restructuring of farms, use of chemical products and the trend towards monoculture. *Forestry* presents a more complex situation: forested areas (which expanded by 4% between 1985 and 1995) occupy 31% of Swiss territory but are dominated by conifers and “improvements” such as forest roads, which expanded sharply (by 2 700 km) between 1985 and 1995 and have taken a heavy ecological toll; the presence of recreational vehicles has increased, and incursions into the forest fringe are diminishing these areas’ rich ecological diversity.

The biodiversity of the great river valleys and of smaller watercourses has been damaged by damming, modifications and flood prevention works throughout the *hydrological network*; the rare stretches of free-flowing rivers that remain are increasingly threatened, in particular by hydroelectric development. *Transport and infrastructure* also have an impact. Automobile traffic has increased steadily, from 51.71 billion km travelled in 1993 to 56.87 billion in 2002, to a 65.5 billion forecast by 2010, on a road network that is among the densest in Europe (71 000 km). Although this situation is stabilising, the resulting spatial fragmentation tends to impoverish biodiversity (Table 3.1).

*Tourism and recreation* aggravate these pressures, especially in the mountains where there are 15 000 mechanised ski lifts and 120 000 km of groomed downhill ski runs. Ski stations are becoming increasingly interconnected, and sports and recreational practices affect natural settings. Over the last ten years, the introduction of artificial snowmaking has required the construction of water reservoirs. These changes impact fragile mountain environments.

*Scientific studies* have been undertaken in order to develop an index to measure fragmentation of the landscape, which appears to be one of the key issues with respect to ecological change. The problem of landscape fragmentation in Switzerland is among the worst in Europe.

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Source: OECD, Environment Directorate.

- increase the surface area devoted to biotope protection; establish an ecological network;
- set realistic quantitative targets for biotope and species preservation;
- improve monitoring and assessment of results achieved in the area of biodiversity and nature conservation;
- strengthen the partnership between the authorities and scientific and economic actors concerning the development and implementation of biological diversity policy;
- ensure progress towards the implementation of the Swiss Landscape Concept by setting precise or numerical targets together with time schedules and by making sure sufficient funding will be available;
- pursue the implementation of sustainable agricultural practices; in particular, assess the effects of direct ecological payments on nature and landscapes and promote the creation of “green” corridors in rural areas;
- continue to apply sustainable forestry practices, giving high priority to biodiversity in forest biotopes;
- integrate environmental concerns more systematically in tourism policies and practices.

**Table 3.1 Expansion of the Swiss road network**

(km/yr)

	1972-83	1978-89	1984-95	1990-2001
New roads, classes 1 and 2	315	96	44	53
New local streets				157 <sup>a</sup>
New roads, class 3	212	108	80	149
Elimination of roads, classes 1 and 2	-16	-10	-6	-23
Elimination of local streets				-45 <sup>a</sup>
Elimination of class 3 roads	-18	-14	-8	-21
<b>Total annual</b>	<b>493</b>	<b>181</b>	<b>110</b>	<b>270</b>

a) Formerly, urban streets were not counted separately but grouped with class 2 or 3 roads.

Source: ARE/OFEFP, 2001.

Switzerland does not have a National Biodiversity Strategy. At the end of the SLC implementation period in 2006, and in conformance with the recommendations adopted within the framework of the Convention on Biological Diversity, it is important for Swiss authorities to draw up an ambitious and detailed *National Biodiversity Strategy* that is: i) based on available *scientific data* (from Red Lists, scientific studies, particularly the priority environmental programme completed in 2002, the work of the Biodiversity Forum and other sources); ii) carried out in a *participative spirit* with NGOs, professional organisations, and academic and scientific bodies; and iii) supported by *relevant work at the cantonal level*.

This strategy should establish *precise objectives* and timetables in the policy areas concerned. Over time, it should be harmonised with sectoral strategies and international activities (e.g. the Johannesburg Plan of Implementation and the Pan-European Biological and Landscape Diversity Strategy). A proposal to this effect by the Swiss Biodiversity Forum has not yet been acted upon by the Federal Council.

### 3. Protective Measures and Outcomes

#### 3.1 Understanding biodiversity

##### *Biodiversity monitoring*

The 1998 OECD Environmental Performance Review recommended that increased efforts be made in this field, particularly in order to allow better assessment of the effectiveness of conservation policies. A *Biodiversity Monitoring Programme* (BDM) was put in place in 2001 with an annual budget of CHF 3 million. A network of 200 experts conducts regular surveys of the species in representative zones. This work is co-ordinated at the central level by the BDM (Biodiversity Monitoring in Switzerland) Office and data are widely disseminated. There is currently a better understanding of population dynamics, and national Red Lists can be updated in accordance with IUCN methods and recommendations.

##### *Biodiversity and landscape research*

Switzerland has a Federal Institute for Forest, Snow and Landscape Research; other university and private institutions also participate in biodiversity research. A priority environmental research programme (CHF 100 million) completed in 2002, identified major gaps related to biodiversity. Another research programme, PNR 48, launched in 1999 and focused more specifically on *Alpine landscapes and ecosystems*, is nearing completion; oriented towards economic and management issues, the summary now under way of the many research projects pursued should provide information concerned with objectives and strategies for landscape development corresponding to social demands.

The Swiss Biodiversity Forum created in 1999 (Box 3.2) and part of the Swiss Academy of Sciences, has identified *biodiversity research gaps and needs*, including: What are the benefits of biodiversity? Under what circumstances would an integrative or segregative approach be more appropriate in order to conserve biodiversity in the long term? How should spatial use be defined in order to encourage biodiversity? How can an understanding of biodiversity's usefulness, and of possible actions, be strengthened in order to promote land use that encourages biodiversity? How can the most efficient use be made of the means employed by government in favour of biodiversity?

Given the limited effectiveness of its biodiversity protection policy, it would be desirable for the Confederation to launch a *new research programme* in this field, drawing on the relevant disciplines.

### 3.2 Protection of natural areas

In the 1998 review the OECD recommended increasing the total surface area under protection, improving the management of protected areas, increasing their funding and moving towards the creation of a national ecological network. The SLC does not set specific objectives in this field, and the mechanisms called for in the Law on Nature and Landscape Conservation have been implemented only modestly. Specific habitats are protected under federal legislation (the LPN) of 1987 that provides for the establishment of *inventories designating biotopes of national importance* after consultation with the cantons. Mires and marshlands are also protected, even more strongly, by the federal Constitution. In contrast to the Federal Inventory of Landscapes, Sites and Natural Monuments (IFP), which concerns only actions at the federal level, *biotope inventories establish protection goals that are binding at all levels*. Their enforcement is the responsibility of the cantons.

#### *Protected areas*

Switzerland has one of the highest percentages of protected area of any OECD country, but its record is less good when it comes to the strength of the protection afforded (Figure 3.2). Since the previous OECD review, there has been little change in total protected area (Table 3.2). An increase occurred in strongly protected areas whose size is limited. No new national park has been created: the expansion of the Swiss National Park has incorporated less than 150 new hectares since 1997. Inventories of high and raised mires, flood plains and swampy areas (published initially between 1991 and 1996) have all been revised (Box 3.3) (Bauer *et al.*, 2004). An *inventory of the breeding sites of threatened amphibians* was published in 2001 and revised in 2003; it covers 772 sites with a surface area of 117 km<sup>2</sup>. The ordinance concerning the inventory of *dry grassland* is not yet in force; that is planned for 2008. It is to be hoped that this long-awaited inventory will finally be completed.

### Box 3.2 The Swiss Biodiversity Forum

The Swiss Biodiversity Forum seeks to *promote knowledge* about the origin, protection and sustainable use of biodiversity and to make it widely accessible. Created in 1999, this network of scientists and practitioners is part of the Swiss Academy of Sciences (SCNAT).

“Visions in Biodiversity Research” (Swiss Biodiversity Forum, 2002) identified knowledge gaps and discussed some important issues on which *research* had been sorely lacking. It also made proposals concerning the future directions of biodiversity research in Switzerland.

To make the understanding of biodiversity *accessible to the general public*, the Biodiversity Forum has developed instruments targeted to different groups. The popular scientific journal HOTSPOT is devoted to dialogue between researchers and practitioners and follows progress in biodiversity monitoring, the national action plan for the protection of phylogenetic resources, and international developments related to the Convention on Biological Diversity.

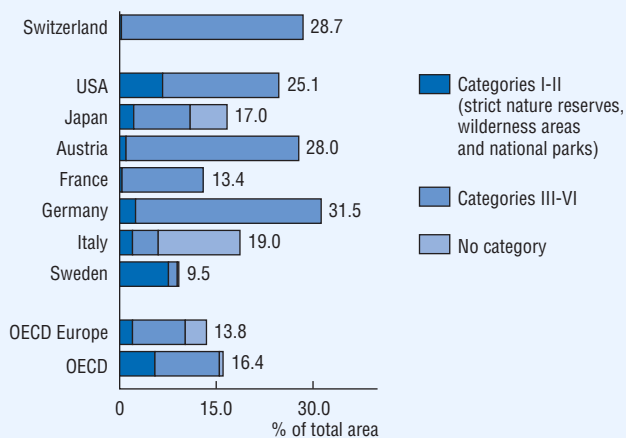
The Forum has a *network of specialists* who contribute their expertise in various fields. They advise the government on implementation of the Convention on Biological Diversity and provide policy-makers with scientifically sound inputs for decision-making. In the context of consultations, they also prepare position papers on proposed legislation.

Through its “Assessments” the Biodiversity Forum presents advances in research on topical issues and formulates *recommendations to practitioners and to the government*. For example, it has shown that Switzerland does not yet comply with the Biodiversity Convention’s guidelines on agricultural biodiversity and has called for action in this regard (Swiss Biodiversity Forum, 2002). Biodiversity’s impact on the functioning of ecosystems is a particularly important question at present, and the Forum has prepared a policy paper on it.

The Biodiversity Forum, based in Bern, provides an interface among researchers, conservationists, government and society as a whole. It is supported by a committee of 23 members of different scientific disciplines, field workers and government representatives. The Swiss Clearing-House Mechanism for biodiversity ([www.ch-chm.ch](http://www.ch-chm.ch)) is one of its key partners. The Biodiversity Forum is supported by the Academy of Sciences and by the Federal Office for the Environment (FOEN), the Federal Office for Agriculture (FOAG) and the Swiss Academy of Human and Social Sciences (ASSH).

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Source: Baur, 2004.

Figure 3.2 Protected areas,<sup>a</sup> 2004

a) Terrestrial and marine areas. IUCN management categories I-VI and protected areas without IUCN category assignment. National classifications may differ.

Source: IUCN/UNEP-WCMC (2005), World Database on Protected Areas.

An accurate status report on the implementation of inventories of high and raised mires, flood plains and swampy areas at cantonal level is expected in 2007. In 2002 it was found that 75% of the sites designated in the inventory of high mires benefited from legal protection at this level, four times the number in 1994, and that the ecological compensation mechanism worked well in the case of raised mires. In the case of marshlands, 60% of sites were partly or fully inventoried in 2004 (compared to 43% in 2001); data on trends since 2002 in construction, farming, forestry and birdlife will be available soon. While some major disputes, such as those over drainage projects, are in the past, questions remain about the future of these *marshlands and wetlands*: persistent fertiliser runoff changes their ecology; the access roads needed for managing Alpine raised bogs are ultimately harmful because they make possible an influx of recreational vehicles.

### *Creating a national ecological network*

The *project for a National Ecological Network (REN)*, launched in 1999, has moved forward with the publication in 2004 of a report designating potential candidate areas; cantonal master plans should provide operational support for this exercise. Although not strictly part of the REN, 18 *reserves for water fowl and migrating birds* of

national importance were designated in 2001 under the hunting law, bringing to 80% the proportion of migratory waterfowl wintering in Switzerland that are protected in refuges<sup>1</sup> (the proportion drops to 50% when all waterfowl are taken into account). A concept for natural corridors allowing large animals to travel safely has been elaborated.

Article 104 of the federal Constitution requires the Confederation to ensure that *agriculture* contributes substantially to the conservation of natural resources and maintenance of the rural landscape (Box 5.2). Over the last decade, agricultural policy has placed great emphasis on encouraging farming practices that are respectful of the environment, nature and biodiversity. Thus, most farms devote at least 7% of their land to ecological offsets (such as extensive or only moderately intensive grassland, high-branched fruit trees, hedges and litter meadows). Moreover, the Federal Office of Agriculture, in co-operation with FOEN, provides specific financial support for the establishment of networks of these offsets or when their ecological quality is of particular interest (Chapter 5).

Table 3.2 Protected natural and landscape areas, 1997-2005

Type of biotope <sup>a</sup>	1997			2005 <sup>b</sup>		
	(Number)	Surface (ha)	(%) <sup>c</sup>	(Number)	Surface (ha)	(%) <sup>c</sup>
National park (1980)	1	16 887	0.40	1	17 033	0.41
Waterfowl and migratory bird reserves (1991)	11	11 293	0.20	28	18 920	0.46
High mires (1991)	514	1 470	0.04	549	1 524	0.04
Flood plains (1992)	169	11 021	0.27	282	22 632	0.54
Raised mires (1994)	1 092	17 534	0.42	1 163	19 189	0.46
Swampy areas (1996)	88	87 365	2.10	89	17 374	2.12
Forest reserves	42	7 000	0.17	42	7 000	0.17
Landscapes, sites and natural monuments (1977)	152	706 674	17.11	162	780 704	18.91
Amphibian breeding sites (2001)				772	11 744	0.28
Federal hunting reserves ( <i>districts francs</i> ) <sup>d</sup>	41	150 920	3.63	41	150 920	3.63
World Natural Heritage Sites <sup>e</sup>				2	13 938	0.34
Biosphere Reserve (2001)				1	39 659	0.96

a) The year in which this biotope was first protected is shown in parentheses.

b) Additional protection zones are being created based on the following inventories: historic roads and paths; amphibian breeding sites; dry grassland.

c) Percentage data include some overlap between protected zones.

d) No-hunting areas.

e) UNESCO.

Source: OFEFP.



### Box 3.3 Flood plains: difficult to protect

The first *inventory* of flood plains of national importance listed 169 sites with a total area of 110 km<sup>2</sup> to be protected. A second inventory, in 2001, listed 65 additional Alpine flood plains and proglacial margins,\* increasing total protected area to 200 km<sup>2</sup>. A third (supplementary) inventory added 55 sites to the protected list in 2003. The inventory currently covers 280 sites with a total area of 226 km<sup>2</sup>.

The 1992 ordinance on flood plains requires the cantons to *preserve and promote fauna and flora* typical of these areas, and to maintain or, where possible, restore the natural dynamics of the hydrological and alluvial system. The cantons were to have provided protection for inventoried sites by 1998. Four years later (in 2002) only 41% of 169 sites were sufficiently protected. For a further 53%, protection was deemed inadequate or only partially adequate: that is, some areas were not protected or protection standards were not consistent with the rules in the ordinance. No information is available on the remaining sites.

While the canton of Aargau is taking steps to protect alluvial areas covering 1% of its surface, protection efforts have stalled in many other cantons. Efforts to date have focused above all on *revitalisation*, in order to restore the natural or initial dynamics of affected flood plains. Revitalisation measures have been completed in only 5% of the protection projects.

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\* Areas freed of ice by the gradual retreat of glaciers.  
Source: Baur, 2004.

#### *The Federal Inventory of Landscapes, Sites and Natural Monuments (IFP)*

The percentage of inventoried sites and landscapes has remained stable at 19% since 1998. The inventory, first published in 1977, is *binding only on the Confederation*, within the framework of its responsibilities, and is not legally applicable to the cantons. The lack of precision in its objectives, and the large size of many of the landscapes concerned are technical weaknesses.

The *effectiveness* of the IFP appears to be limited. Work by the Management Commission of the National Council and the Federal Statistics Office shows that the total area occupied by housing and infrastructure has increased as rapidly in areas covered by the IFP as outside these areas, and sometimes a little more rapidly between 1983 and 1995.

Drawing on information resulting from the work cited above, the *IFP's conceptual and legal basis* needs to be re-examined and reformulated to make its

objectives and their legal scope more specific, and greater efforts need to be made to put this policy, which is important for the future of the Swiss landscape, into effect, in liaison with the communes responsible for its implementation.

### *The role of NGOs*

Swiss NGOs are very active in the field of biodiversity. Bird Life has worked for the establishment of a network of bird reserves (Important Bird Areas, IBAs) that could be part of the proposed Emerald Network, a preliminary study for which was conducted by WWF and which would be implemented by the Confederation, within the framework of the Bern Convention. Pro Natura has taken steps to create protected areas and to manage them more effectively. These initiatives, together with the report “Biodiversity in Switzerland and its Perspectives”, published in 2004 by the Swiss Biodiversity Forum (Box 3.2), *could be useful contributions to the National Biodiversity Strategy* (Baur *et al.*, 2004).

### *Towards a new natural parks system*

The period under review saw the beginning of debate on a future system of natural parks, which would be of three types: *national parks*, *regional natural parks* (DNRs) and *peri-urban natural parks*, with a very strong emphasis on DNRs.

In this context, many rural areas have already prepared *DNR plans* which, if they come to fruition, could help to develop the natural heritage; create synergies among existing protected areas; reassert the values of landscape and architectural heritage; and support sustainability policies in agriculture, tourism and other policy areas.

The process of adopting the *federal law concerning the new system of regional natural parks* is under way, although there has been some delay because of its potential budgetary impact on the Confederation. If the federal contribution to these new parks has to be funded from a frozen budget, other biodiversity conservation activities will be affected.

## **3.3 Species protection**

The biodiversity trend indicators for species protection are not encouraging. Indeed the *Red Lists*, being updated based on recent IUCN methodology and recommendations, confirm fairly negative trends; this is true for nesting birds, amphibians, reptiles, ferns and flowering plants, dragonflies and bryophytes (small plants). In all cases these trends are stagnant at best, and more often than not lists of threatened species are getting longer while increasing numbers of species are moving from the “less threatened” to “more threatened” categories (Table 3.3).

Data on fish species confirm this alarming trend; *fish catches* in watercourses have been diminishing steadily since 1985, and there is no end in sight to this decline. The “Fishnetz” research project should help to explain the causes. In commercial fishing annual yields are down sharply, from 3 600 tonnes in 1975 to 1 660 tonnes in 2000 for all Swiss lakes, and from 1 080 tonnes to 290 tonnes for Lake Geneva. Between 1990 and 1999, river trout catches fell by 40%.

These indicators suggest that *natural settings have been subject to long-standing and profound stress*. Spatial fragmentation, low residual flow rates in modified watercourses and inadequate protection of biotopes are among the main causes. Concerning wildlife, illegal lynx hunting has been detected; motorised vehicles are still driven on forest roads for recreational purposes, although this has been banned. It appears that the human resources devoted to the surveillance of these activities are too limited.

The Confederation has responded, in part, by adopting specific plans for certain species. The *bird* conservation programme seeks to improve the situation for 50 priority bird species, and to pursue national action plans for the Eurasian grouse or capercaillie, the hoopoe and the spotted woodpecker. With respect to *mammals*, management plans have been adopted for the lynx, wolf,<sup>2</sup> beaver and bear. Indemnisation mechanisms are

Table 3.3 Summary of national Red Lists

National Red Lists	Number of taxa <sup>a</sup> evaluated				Number of taxa <sup>a</sup> reproducing
	Disappeared or extinct	On the brink of extinction, threatened or vulnerable	Potentially threatened	Not threatened	
Animals (2001-05); revised total	9	124	37	135	306
Breeding birds (2001)	6	71	24	94	195
Reptiles (2005)	0	15	0	4	19
Amphibians (2005)	1	13	1	3	20
Dragonflies (2002)	2	24	12	34	72
Vascular plants (2002)	51	939	429	1 534	3 144
Bryophytes (2004)	15	401	67	512	1 093
Lichens (2002)	38	257	107	311	787

a) Taxon: species or sub-species.

Source: Swiss authorities, communication.

in place to cover damage to sheep or goat rearing. However, people in rural areas do not welcome the presence of large carnivores (e.g. the lynx, wolf, bear) protected by the Bern Convention, and growth in populations of these species remains problematic.

With respect to *flora*, more specifically ferns and flowering plants, 990 of 3 144 taxa studied (31.5%) are on the Red List and 13.6% are potentially threatened. Between 1991 and 2002, the share of taxa on the Red List increased from one-quarter to about one-third, an alarming rate of deterioration. Publication of the inventory of flood plains and mires is only a partial response to this trend. It is imperative that the inventory of dry grassland and of amphibian breeding sites, planned for 2008, be published and put into effect. Information sheets have been available since 1996 on the most endangered species of lichens, mosses and vascular plants, and there is a national action plan on butterflies (available to the cantons since 2000). These tools have proven quite useful and have led to very successful protection efforts at the cantonal level, with the exception of lichens and mosses, for which very little has been done.

### 3.4 *International aspects*

Switzerland has *ratified the main international agreements* on the protection of nature and species: the Ramsar Convention on Wetlands, the Washington Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Bonn Convention on the Conservation of Migratory Species of Wild Animals, the Bern Convention on the Conservation of European Wildlife and Natural Habitats, and the Convention on Biological Diversity signed at Rio de Janeiro (References II.A and II.B). Switzerland takes part in international activities under these conventions (Chapter 7). It is home to IUCN headquarters, as well as to the CITES and Ramsar Convention secretariats, and provides them with substantial financial support.

Since 2001, two *Biosphere Reserves*, covering 1.36% of the national territory, have been designated under the UNESCO Man and the Biosphere (MAB) programme, as well as one UNESCO World Heritage Site. Since the last OECD review three new wetland areas have been designated under the Ramsar Convention, in 2005, bringing the total to 11, covering 87 km<sup>2</sup>.

Nevertheless, the Emerald Network established within the framework of the *Bern Convention* is not yet in place. Plans for the Swiss portion have encountered obstacles, particularly regarding the Important Bird Areas (IBAs), examined by NGOs, and the 108 sites proposed by WWF. Switzerland is not a party to the 1991 Agreement on the Conservation of Bats in Europe, which came into effect in 1994.

Switzerland has ratified the *Alpine Convention* but not *its protocols*, which it actively helped to draft, on the basis of the need for consultation with the cantonal authorities. In particular, it has not ratified the protocol on the conservation of nature and the landscape. In 2000 Switzerland signed the *European Landscape Convention* (the Florence Convention), which came into force in 2004. Parliament will be asked to ratify it upon conclusion of the current debate (under way for some time now) concerning the nature and landscape protocol of the Alpine Convention.

### 3.5 The financial and economic approach

The *Confederation* allocated CHF 49.9 million in 2004 to support its policy of protection of nature and the landscape, and CHF 51.1 million in 2005. The 2006 budget contains CHF 50.4 million (Table 3.4). It is unlikely that allocations of this size will be sufficient to fund the significant developments planned for the next few years; further work needed to follow up on the existing inventories, new inventories, and support for a new generation of national parks and regional natural parks. There is a risk that, within the framework of a no-growth budget, trade-offs will be made to the detriment of monitoring and support for protected sites.

Table 3.4 **Biodiversity: allocation of federal funding, 2006**

(CHF '000)

Support for cantonal activities (Articles 13, 18d, 23c, 23j <sup>bis</sup> , 25a LPN)	43 297
Conservation and revitalisation of biotopes and landscapes worthy of protection	20 867
Subventions for maintenance and nature-friendly exploitation of biotopes	15 000
Advice to cantons and federal agencies for execution of the LPN (data centres, advisory services, monitoring, implementation assistance)	5 000
Natural and landscape parks (support for specific projects)	2 430
Inventories and other federal databases (Articles 5, 14a, 18a, 23b LPN)	4 400
Inventories: meadows and dry grassland, amphibian breeding sites, flood plains	2 400
Protection of species: Red Lists, information sheets on species protection, etc.	2 000
Support for organisations and institutions (Articles 14, 14a LPN)	1 635
Miscellaneous: sectoral allocations (CFNP, protection of marshes, re-evaluation of the IFP)	1 118
<b>Total</b>	<b>50 450</b>

Source: Swiss authorities, communication.

Particular mention should be made of the *Swiss Landscape Fund* (SLF), created in 1991 for a period of ten years with funding of CHF 50 million. It has been extended to 2011, with an additional infusion of CHF 50 million. The Fund provides straightforward support for pilot projects, at the regional or local level, aimed at preserving and maintaining traditional rural landscapes. This is a positive initiative, and its long-term nature is an additional bonus.

Little information concerning the *economic value of the services provided by ecosystems and landscapes* is available, although the protection of natural and cultural settings is important from the point of view of hydrology and helps to *defend against natural hazards* and climate change. Natural landscapes are important for the development of *tourism* and other economic activities, and the services provided by ecosystems have been inventoried by many scientific publications.

The approach to *financing nature protection* is primarily administrative and political, and virtually no attention has been given by this policy to the concept of the services provided. Thus the tourism industry, which benefits from nature protection at the rate of CHF 2.5 billion (according to SECO, the State Secretariat for Economic Affairs), makes almost no direct contribution to it. Similarly, the quality that this policy helps give to Switzerland's image, and to its output of goods and services, is not properly evaluated or remunerated.

## 4. Nature, Landscapes and Biodiversity in Spatial Planning and Forestry Management

### 4.1 The “nature and landscape” dimension of spatial planning

The cantons and communes carry out spatial planning within the framework of the 1979 Law on Spatial Planning (LAT). Anticipating the concepts of sustainable development, this law made a *clear distinction between urban, agricultural and natural areas* in order to avoid disperse urbanisation. This provision was made more flexible in 1988, and Parliament is considering further flexibility in favour of farmers.<sup>3</sup>

Properly implemented and used at the cantonal and federal levels, the LAT could be a powerful tool for nature and landscape conservation and sustainable spatial development when cantonal and communal plans are prepared. This is the meaning of the *ordinance of 2000*, which requires communal authorities that prepare land use plans to justify their decisions with reference to environmental legislation and to the concepts and plans of the Confederation. Thus, when it is time for a plan to be approved, the canton will be able to exercise this control (Box 3.4).

### Box 3.4 Sectoral, master and land use plans

*Sectoral plans and concepts* establish the manner of conducting activities that have impacts on spatial organisation, and ways to harmonise these impacts with competing interests. The *Confederation's* sectoral plans, for example, address land under cultivation or air traffic. One of the main federal concepts is the Swiss Landscape Concept.

In their *master plans*, the cantons decide on a broad plan for spatial development. In them they may define priority protection zones, provide for the networking of habitats or set aside sufficient space for watercourses. Master plans are *binding* on cantonal and communal authorities.

*Land use plans* regulate specific land uses at the *communal level*, one parcel at a time, and are *binding* on property owners. They define construction zones and agricultural and protected areas.

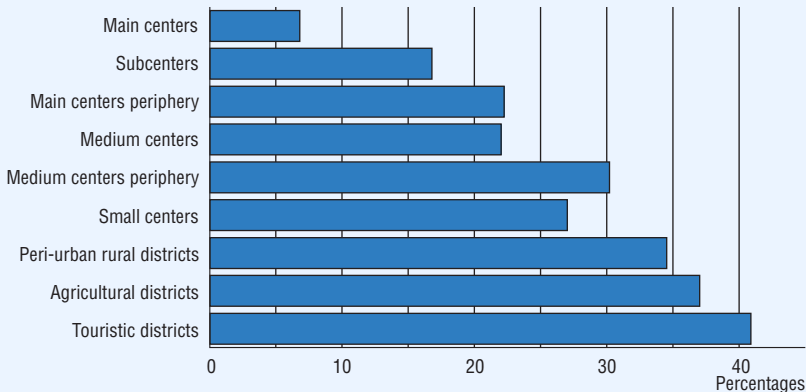
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Source: OFEV, 2006.

However, the Spatial Development Report published in 2005 by the Federal Office for Spatial Development (ARE) shows that *urban sprawl continues unabated*, primarily at the expense of agricultural land; out of 280 000 ha of urbanised land, 175 000 ha (63%) lies in construction zones and 105 000 ha (37%) outside these zones (ARE, 2005).

Land available for building in legally approved construction zones occupies 220 000 ha, primarily in rural and tourism areas (Figure 3.3), and could potentially accommodate 2.5 million additional people, to which must be added the potential to build in areas that are not zoned for construction. It would seem, therefore, that *land use plans may provide for disproportionate construction zones* and, moreover, that possibilities to build outside these zones are greater than was anticipated in the LAT.

The report finds that current trends in spatial development, towards continuing urban sprawl, are leading the country in a *direction contrary to the principles of sustainable development*, particularly regarding transport. It examines four scenarios with a horizon of 2030, using sustainability indicators. The scenario proposed is based on moderate economic growth, sharply higher energy prices, decentralised development coupled with the emergence of regions, dense and concentrated urbanisation that makes full use of the existing urban fabric, a moderate increase in mobility and little expansion of urbanisation. The presentation of these analyses represents a very concrete, forward-looking approach to the challenges of sustainable spatial planning and should help to clarify future choices.

Figure 3.3 Building area reserves,<sup>a</sup> 2000

a) Share not built (in % of areas to be built).

Source: DETEC-2005 report on territorial development.

The planned revision of the LAT should move in this direction: avoiding further relaxation of rules governing building outside construction zones, and creating measures to avoid disperse urbanisation. The existing *fiscal instrument* which provides mechanisms for capturing capital gains generated by urban planning decisions has been used in only two cantons. It could be used more widely to encourage greater density in existing construction areas and to slow the creation of new ones.

It would currently be advisable to take steps to ensure: i) that all *cantonal master plans* reflect more effectively the objectives of sustainable development; and ii) that cantons use their powers and capacities *vis-à-vis the communes* to enforce the principles of sustainable land use.

## 4.2 Sustainable forestry management

Switzerland's forests cover 12 340 km<sup>2</sup>, having increased by 4% between 1985 and 1995; the density of standing timber also increased, from 333 to 354 m<sup>2</sup> per hectare, over the same period. Of the total, 57% is mixed forest close to its natural state. On the plateau the forest, still predominantly coniferous in places, is yielding to an increasing diversity of species. In forests, where 35% of the country's animal and plant species live, the share of threatened species is relatively low.



The *1991 Law on Forests* takes a multifunctional approach, favouring a near-natural type of forestry; it encourages the creation of forest reserves by the cantons. These reserves totalled 33 437 ha in 2005 (2.7% of forested area), including 10 709 ha of natural forest reserves.<sup>4</sup> If the National Park's 4 800 ha of natural forest reserves is included, the reserves as a whole cover 3.1% of the forested area. They will amount to 10% of total forested area by 2030.

In its 1998 review the OECD recommended that sustainable forestry practices be adopted. In this spirit the *Swiss National Forest Programme (2004-15)*, which was adopted in 2003, establishes 12 precise and ambitious objectives, of which five are priorities; it includes provisions on forest biodiversity, calling in particular for an increase in forest reserves to 70 000 ha, including 15 reserves of more than 500 ha each (Table 3.5; OFEFP, 2004). This goal, while modest, may not be achieved if budgetary allocations for forest reserves continue to decline and if the budget-cutting programme, which calls for substantial cutbacks in allocations for forests, results in cantons' designations of reserves not receiving sufficient funding.

Table 3.5 **Forest biodiversity**

Indicator	Target status in 2015
Growth in populations of originally more abundant species	50% of species that had become rare but are increasing 50% no further decline
Number of species on Red Lists (as published by SAEFL using IUCN criteria)	10% reduction from previous Red List
Number of saplings of priority species and colonisation by these species	Consistent with specific programmes for the main distribution areas
Number, surface area and representativeness of forests subject to special interventions (special forest reserves, genetic reserves) to promote biodiversity	Consistent with special programmes to sustain or promote certain species, hereditary predisposition and special management approaches
Proportion of natural regeneration in rejuvenation area	Increase in all regions
Proportion of deadwood in volume of standing timber	At least 1.5% per km <sup>2</sup> on the plateau, 2% in the Jura and Prealps, 5% in the Alps
Total area of forest reserves currently 28 237 ha, of which 15 509 ha in natural forest reserves	70 000 ha
Number and distribution of large natural forest reserves	At least 15 natural forest reserves > 500 ha, distributed proportionately in the main regions (or natural parks with corresponding forest area)
Species promotion programmes under way	For at least two-thirds of priority species

Source: OFEFP, 2004.

Since 1988, despite gains in labour productivity, management of public forests has produced growing deficits because of falling timber prices. In terms of both investment and management, cantonal and communal forests have been losing an average of CHF 80 million per year since 2000. Moreover, two-thirds of companies are losing money. Thus the *forest economy* is in a critical situation, which could compromise prospects for sustainable management.

Yet forest ecosystems produce important *positive externalities* with respect to hydrology, reduction of flooding and other natural disasters, biodiversity, tourism and recreation. The value of the recreational services provided by Swiss forests is estimated at *CHF 3.2 to CHF 10.5 billion* per year (Ott and Bauer, 2005). The ecological and social services provided by forest ecosystems would justify the Confederation and local governments in devoting to them an appropriate level of financing.

## Notes

1. Switzerland already has 11 reserves for migratory waterfowl of international importance.
2. However, Switzerland proposed unsuccessfully that wolves be reclassified in an appendix of the Bern Convention, which would have resulted in a reduced level of protection.
3. Relating to agrotourism, biomass-based energy generation facilities, and the conversion of obsolete farm buildings.
4. Also known as “total reserves”, i.e. fully off-limits to any forestry activity.

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# 4

## ENVIRONMENTAL-ECONOMIC INTERFACE\*

### Features

- Low pollution and energy intensity
- Federal sustainable development strategy
- Environmental taxes
- Sustainable energy management
- Sustainable transport management
- Use of economic instruments
- Environmental referenda
- Industrial risk management and its liability

\* The present chapter reviews progress achieved in the last ten years and particularly since the previous OECD Environmental Performance Review of 1998. It also reviews progress with respect to the objectives of the 2001 OECD Environmental Strategy.

## Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of Switzerland:

### *Integration of economic and environmental decisions*

- implement the *green tax reform* called for in the 2002 federal strategy for sustainable development; identify and eliminate subsidies and tax provisions that are potentially detrimental to the environment (in particular, eliminate the planned deductibility of expenses for commuting by car);
- formulate a pro-active, long-term *environmental policy* vision;
- improve the use and *integration of strategic instruments in the areas of transport, energy, the environment and regional development*, from a sustainable development standpoint;
- promote the use of environmental indicators and indicators of sustainable development in government strategies, paying special attention to *regional development and land use planning*;
- associate the federal *strategy for sustainable development* with sectoral strategies; set quantified objectives; encourage the *cantons* to implement strategies for sustainable development in liaison with their sectoral policies.

### *Strengthening the implementation of environmental policies*

- step up efforts to promote *more sustainable consumption patterns* by adopting appropriate regulatory and economic instruments, and through adequate demand management;
- continue efforts to implement the *principle of causality* (the polluter pays and user pays principles);
- further improve the effectiveness and efficiency of environmental policies with improved *monitoring of the environment* and its interactions with the economy (environmental data and economic analysis), expanded use of *economic instruments* and documentation of compliance with environmental legislation;
- continue efforts to strengthen co-ordination between the Confederation and the cantons, so as to implement *harmonised and efficient environmental policies* throughout the country (e.g. by adopting an integrated system for authorising industrial activities, along the lines of the European Union's IPPC approach);
- adopt strategies that are more highly integrated to *manage natural hazards and technological risks*, taking into account other sectoral policies (e.g. regional planning, transport, forests); accelerate completion of cantonal cadastres of *contaminated sites* and begin to decontaminate priority sites.

## Conclusions

### *Integration of economic and environmental decisions*

While concerns about sluggish or weak economic growth and the international competitiveness of its economy are very real, Switzerland has made significant progress in *decoupling* environmental pressures and economic growth, in particular with regard to conventional air pollutants (SO<sub>x</sub>, NO<sub>x</sub>), water abstraction and the use of fertiliser and pesticides. The two *sustainable development* strategies at the federal level (1997 and 2002) have spurred better collaboration among federal government agencies and have been accompanied by evaluation and monitoring procedures. Indicators of sustainable development have been adopted at the federal level and developed by certain cantons and cities. The federal authorities prepare *sectoral strategy or planning documents* that cover environmental issues. Progress has been made in *internalising external costs* in waste management and water treatment, and in *integrating environmental concerns* into policies for sectors such as agriculture (required ecological services) and transport (shifts of passenger and freight traffic from road to rail). The economic instruments implemented since the previous review, such as the VOC tax and the heavy vehicle fee, have proven effective.

However, problems related to decoupling remain, in particular with regard to *road transport* and the *consumption of space* by dispersed urbanisation and by infrastructure. The federal strategy for sustainable development has few quantified objectives (apart from that of limiting urbanisation to 400 square metres of built-up area per capita), is disconnected from sectoral strategies and needs to be better implemented, e.g. with respect to the consumption of transport, recreational activities and space. A *long-term vision* is lacking in the environmental policy area. The *green tax reform* recommended in the previous review and by the 2002 federal strategy for sustainable development has yet to be introduced. The taxation of energy, in particular gasoline, is still too low and cannot prompt changes in behaviour. The gasoline price differential between Switzerland and the neighbouring countries should be reduced to encourage savings on fuel consumption and cut back on emissions resulting from “gasoline tourism”.

### *Strengthening the implementation of environmental policies*

In many respects, Switzerland’s performance in fighting pollution is *among the best* of any OECD country. This is the result, in particular, of an ambitious, long-term legislative and institutional policy regarding the environment. The federal Law on the Protection of the Environment (LPE), revised in the mid-1990s, stresses the *principles of co-operation, causality* (the polluter pays and user pays principles) and *prevention*. On the whole, there is *very good co-operation among all stakeholders*, including civil society

(e.g. environmental NGOs, businesses, farmers' associations), as well as between the Confederation and the cantons and communes. The *cantons* implement most environmental policies and related measures and supervise environmental actions at the local level. The federal authorities (including the Federal Council) also formulate wide-ranging planning documents that incorporate environmental issues. Economic *instruments* (e.g. charges for water and waste management services) are being used with growing effectiveness within the framework of *greater internalisation of external costs*. A number of environmental taxes and budget-neutral fiscal measures have been explored and/or adopted (e.g. the VOC incentive tax, the proceeds of which are returned to households via health insurers). The creation of the Federal Office for the Environment (FOEN) on 1 January 2006 demonstrates the determination to expand *sustainable management of natural resources* (forests, nature, water) and to encompass the management of natural hazards and technological risks. Government and business spending on the environment (pollution abatement and nature protection) has remained stable at around 1.4% of GDP. These outlays have yielded *economic benefits* with regard to: i) health (avoided expenses, improved productivity at work); and ii) the Swiss economy in sectors such as tourism, engineering, electrical equipment, the environmental industry and agri-food (thanks to Switzerland's ecology-friendly international image). All these changes are taking place within an economy that is very open to trade with the European Union and the rest of the world.

However, Switzerland is faced with numerous environmental challenges resulting from non-point source pollution (e.g. of agricultural origin) and unsustainable consumption patterns (e.g. in transport, recreational activities and land use). Its biodiversity and landscapes are threatened. There is a need to focus on the *actual results* of environmental policies and to strengthen co-ordination among different levels of government, based on reliable data. An integrated and harmonised system should be devised for authorising industrial activities. Switzerland's overall *enforcement of environmental legislation* is not being documented. Companies with plants in more than one canton sometimes face different environmental regulations and/or enforcement levels. *Regional development* policy has not been able to contain rapid growth on the outskirts of cities. Thus, there has been considerable construction of farm buildings and transformation of existing structures *outside designated zones*. Greater use should be made of economic instruments (e.g. the CO<sub>2</sub> tax) to increase the effectiveness of environmental policies and sustainable management of natural resources. Even though progress has been made regarding water and waste, the polluter pays and user pays principles are not applied sufficiently in the realms of climate, air, noise and the protection of nature.





## 1. Decoupling of Environmental Pressures and Economic Growth

During the review period, GDP growth was quite slow (1.5% per year). Switzerland's economy grew by 13% while its population grew by 5% (Box 4.1; Figure 4.1). Industrial output (+20%) grew more strongly than GDP, while agricultural output fell by 3% (Table 4.1). Growth in the supply and consumption of energy was much lower than growth in GDP (+7 and +6%, respectively). Energy intensity fell by 6%. Carriage of goods by road increased almost twice as fast as GDP (+22%) and private car traffic also rose faster than GDP (+18%).

### Box 4.1 Economic context

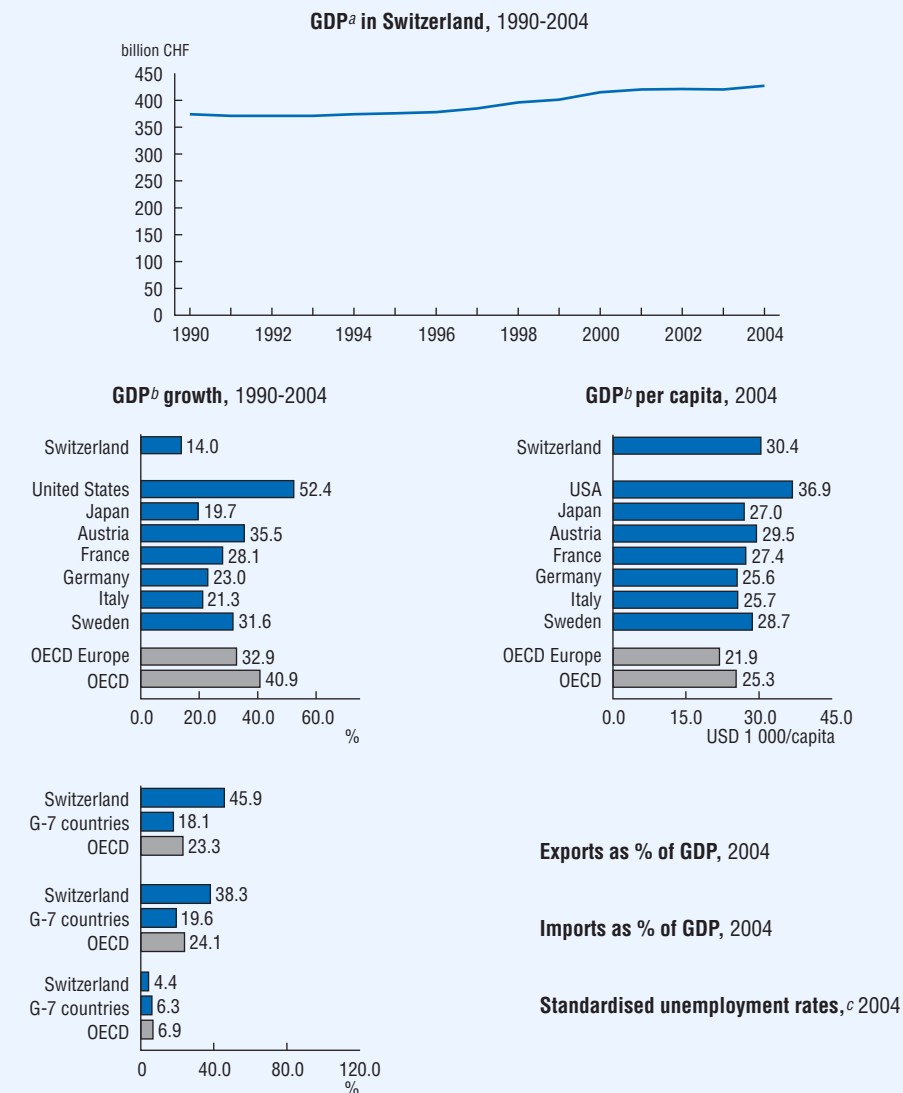
Switzerland is a *rich country*. In 2004, its GDP was USD 360 billion. Adjusted for purchasing power parities, its GDP per inhabitant is one of the highest in the OECD (USD 30 400). *Switzerland's economy has grown by 14% since the early 1990s, the slowest growth rate among the OECD countries.* Its GDP grew by an average of 1.5% between 1996 and 2004, falling by 0.3% in 2002-03 before recovering subsequently (Figure 4.1).

Concerning the *structure of the Swiss economy*, industry accounts for 21.8% of GDP. Sectors such as chemicals, pharmaceuticals, clock and watch making and machinery are of international importance. In 2003, services generated 71.2% of GDP and primary activities, including agriculture, generated 3%. Switzerland is a major financial centre (banks and insurance). Tourism represents 7% of total revenues in the country's balance of payments. Switzerland hosts the headquarters of over 300 international organisations.

*Switzerland has an open economy.* Trade features prominently, with exports accounting for 45.9% of GDP and imports for 38.3% (Figure 4.1). The European Union is Switzerland's main economic partner, for imports (83.4% of the total) and exports (62.6% of the total), with Germany accounting for almost half of this trade. However, Switzerland is not a member of the European Union nor of the European Economic Area. On 6 December 1992 the Swiss population and the cantons rejected Swiss membership in the European Economic Area by referendum.

In the absence of significant improvement in productivity, growth in production will decline further because of ageing of the population. Against this background, the authorities are faced with two major challenges: to *improve the performance of the economy* and to *restore better control of public expenditure*. Overall, public expenditure is slightly in deficit (1.4% of GDP in 2004). Inflation is low (0.78%), as is unemployment (4.4%).

Figure 4.1 Economic structure and trends



a) GDP at 2000 prices.

b) GDP at 2000 prices and purchasing power parities.

c) % of civilian labour force.

Source: OECD (2005), OECD Economic Outlook No. 77.

Table 4.1 **Economic indicators and environmental pressures**

(% variation)

	1990-2004	1996-2004
Selected economic indicators		
GDP <sup>a</sup>	14	13
Population	10	5
GDP <sup>a</sup> /inhabitant	4	8
Agricultural production	-5	-3
Industrial production <sup>c</sup>	25	20
Road freight traffic <sup>d</sup>	111	50
Passenger car traffic volume <sup>e</sup>	24 <sup>b</sup>	16 <sup>b</sup>
Pollution		
CO <sub>2</sub> emissions from energy use <sup>f</sup>	8	5
Emissions of SO <sub>x</sub>	-60	-38
Emissions of NO <sub>x</sub>	-46	-23
Energy		
Total primary energy supply	9	7
Total final consumption of energy	12	6
Resources		
Water extraction	-6 <sup>g</sup>	-1 <sup>g</sup>
Nitrogenous fertiliser use	-17 <sup>g</sup>	-15 <sup>g</sup>
Pesticide use	-39	-21
Municipal waste	20	16

a) At 2000 prices and purchasing power parity.

b) To 2003.

c) Including mining, quarrying and the manufacturing sector.

d) Values expressed in tonnes-kilometres.

e) Values expressed in vehicle-kilometres.

f) Excluding marine and aviation bunkers; sectoral approach.

g) To 2002.

Source: OECD, Environment Directorate; IEA-OECD.

### 1.1 Emissions intensity

During the period under review, emissions of SO<sub>x</sub> and NO<sub>x</sub> fell by 38 and 23%, respectively, while those of CO<sub>2</sub> rose by 5%. Emissions intensities of SO<sub>x</sub>, NO<sub>x</sub> and CO<sub>2</sub> (emissions per unit of GDP) are *the lowest in the OECD*.

## 1.2 Energy intensity

Switzerland's energy intensity (total supply of primary energy per unit of GDP at purchasing power parity prices in 2000) is 0.12 tep per USD 1 000 (Figure 4.2). With that of Italy, it is the *lowest in the OECD*. This low energy intensity is largely explained by industry being a low energy consumer. Combined with electricity generation that is almost entirely nuclear or hydro, this contributes to very low pollutant emissions intensities. Since 1990, energy intensity has been relatively stable.

*Energy consumption* increased by 6% between 1996 and 2004 (and by 12% between 1990 and 2004). Final annual energy consumption per person is around 32 750 kWh. In absolute terms, it is still rising in line with the population despite continuous improvement in the energy yields of equipment and processes involving fossil fuels. One objective of the Energy 2000 action programme, drawn up in 1991, was to stabilise consumption in 2000 at 1990 levels, and subsequently to reduce it. Total consumption of solid combustible fuels increased by 8.6% between 1990 and 2004.

## 1.3 Resource intensity and material efficiency

*Water extraction* declined slightly during the review period (–1%), and intensity of water consumption remains well below the average for OECD Europe and the OECD average (4.7% against 13.5% and 11.4%, respectively).

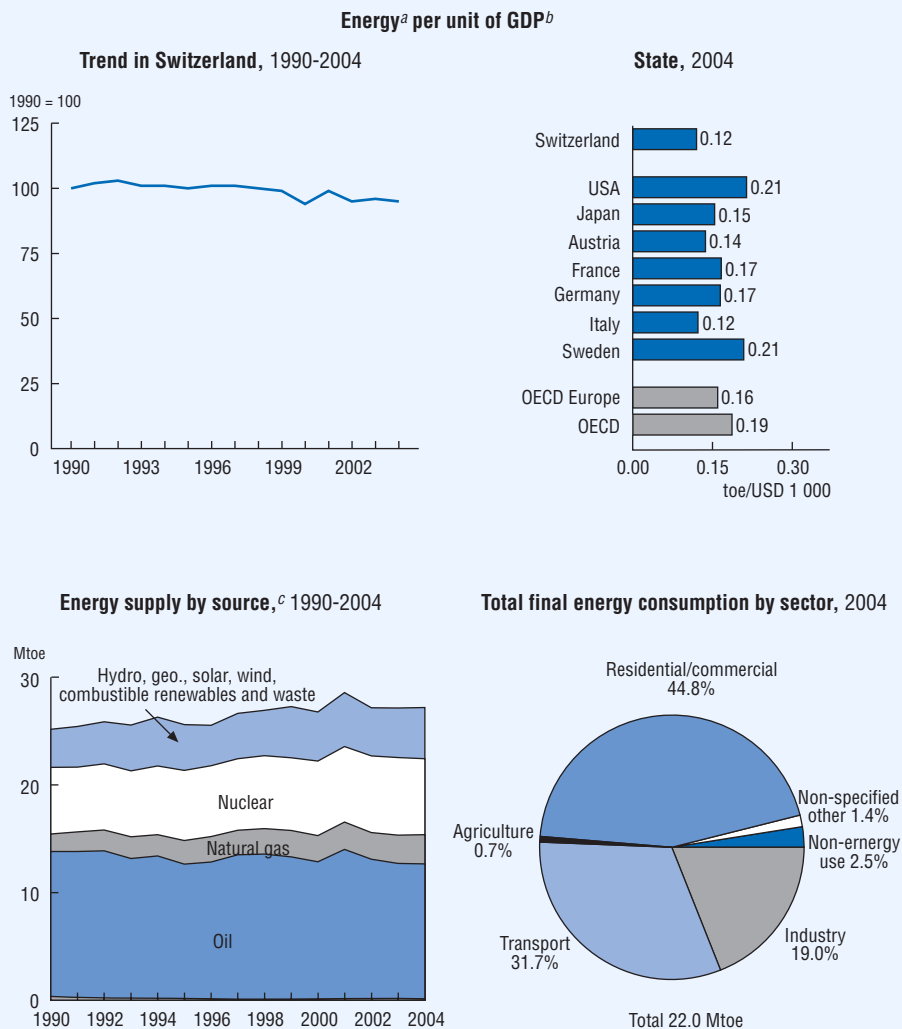
*Use of nitrogenous fertilisers and pesticides* declined further between 1996 and 2004 (–15 and –21%). Consumption of nitrogenous fertilisers was 3.5 tonnes/km<sup>2</sup> of agricultural land, compared with the OECD Europe average of 5.6. Consumption of pesticides is also lower than the OECD Europe average (0.10 tonne/km<sup>2</sup> of agricultural land against 0.17).

Between 1979-85 and 1992-97, the *area of habitation and infrastructure* increased considerably. The Federal Council therefore set a target in its 2000 sustainable development strategy of stabilising built-on area at 400 m<sup>2</sup> per inhabitant (Box 3.1).

*Municipal waste* has increased faster than GDP (+16% against 13%) (Figure 4.3). This can be explained by the increase in population (+5%) and the elimination of fly-tipping. Waste generation per inhabitant (660 kg) is higher than in neighbouring countries.<sup>1</sup> Relatively high per capita income is one explanatory factor. In 2003, 352 kg of waste per inhabitant was incinerated or dumped and 308 kg was collected and recycled. The recycling rate rose from 26% in 1988 to 48% in 2004.

More than *100 million tonnes of materials* per year is used directly in Switzerland, over 14 tonnes per inhabitant (OFS, 2005a).<sup>2</sup> Only a quarter of this amount is renewable. Materials efficiency, representing value added per unit of

Figure 4.2 Energy structure and intensity



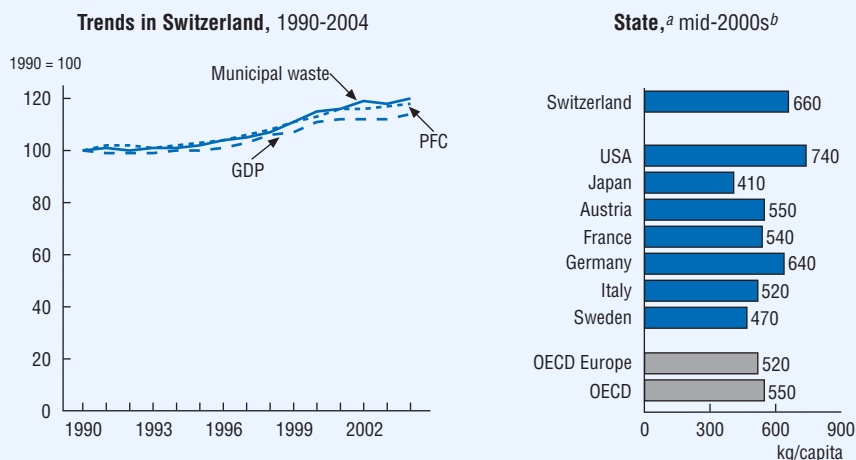
a) Total primary energy supply.

b) GDP at 2000 prices and purchasing power parities.

c) Breakdown excludes electricity trade.

Source: OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004; OECD (2005), OECD Economic Outlook No. 77.

Figure 4.3 Municipal waste generation



a) In interpreting national figures, it should be borne in mind that survey methods and definitions of municipal waste may vary from one country to another. According to the definition used by the OECD, municipal waste is waste collected by or for municipalities and includes household, bulky and commercial waste and similar waste handled at the same facilities.

b) Or latest available year.

Source: OECD, Environment Directorate.

materials directly consumed (CHF/kg), has risen constantly since the early 1990s. This improved material efficiency can be explained by: i) efficiency gains in certain production processes or methods, and increased re-use or recycling of certain materials; ii) a shift in the Swiss economy towards service activities, which are more economical in terms of materials; and iii) relocation of a certain number of factories to other countries (and thus a transfer abroad of pressure on the environment)

#### 1.4 Overall evaluation

In the period 1996-2004 decoupling of economic growth from environmental pressures continued in Switzerland, against a background of weak economic growth. The most positive results concern  $SO_x$  or  $NO_x$  emissions, water extraction, and use of nitrogenous fertilisers and pesticides. Dematerialisation of domestic production is also favourable to the environment. Switzerland remains the country with the lowest  $SO_x$ ,  $NO_x$  and  $CO_2$  emissions intensities per unit of GDP in the OECD and the lowest energy intensity of any OECD country.

However, transport *trends* continue to be of *concern* despite efforts already made, particularly with regard to *road freight traffic*. It has also been shown that urbanisation is absorbing land that is not built-on at a rate of about 1 m<sup>3</sup> per second (Box 3.1).

## 2. Institutional Integration and Sustainable Development

### 2.1 *The federal sustainable development strategy*

The *first sustainable development strategy* was adopted in 1997, based on the work of the Interdepartmental Committee Rio (CI-Rio), which was set up after the Rio Conference to develop and implement the sustainable development concept in Switzerland. This first strategy focused on a small number of selective measures that strengthened and complemented activities already being carried out in the framework of the 1995-99 legislative programme. In 2000 the Federal Council mandated the administration to rework these into a new *sustainable development strategy 2000*. The overall set of actions was developed by working groups involving several offices or departments. Cantons and interest groups (private sector and NGOs) were consulted on a preliminary version.

The *new sustainable development strategy 2000*, Articles 2 and 73 (Conseil fédéral suisse, 2002) is more comprehensive than that of 1997. It seeks to incorporate the principles of sustainable development throughout the country in all political sectors. It is based on the revision of the *Federal Constitution* (1999), which raises sustainable development to the status of a national objective. This strategy is based on a number of guidelines: taking responsibility for the future; seeking a balance between environment, economy and society; recognising the specific dimensions of sustainable development; incorporating sustainable and more coherent development in all policy areas; achieving sustainable development through partnership. It comprises an implementation plan with 22 actions, organised into ten areas of intervention. Only three actions have quantified targets.<sup>3</sup>

*Implementing* the sustainable development strategy at Confederation level is the responsibility of the Interdepartmental Sustainable Development Committee (ISDC),<sup>4</sup> which includes some 20 federal services. Its directing body, the ISDC Bureau, is made up of representatives of the Swiss Agency for Development and Co-operation (SDC), the Federal Office for the Environment (FOEN), the Federal Office of Public Health (FOPH) and the Federal Office for Spatial Development (ARE), the latter serving as chair. The State Secretariat for Economic Affairs (SECO) formerly participated but withdrew in 2005. The Federal Office for Agriculture (OFAG) has been a member of the Bureau since 2006.

The *report* for 2004 on the progress of the ISDC's work is mixed. On the plus side, the first concrete results of a number of measures were recorded: finalisation of a system of sustainable development and monitoring indicators, and development of a methodology to evaluate sustainability. On the down side, current budget-cutting programmes are compromising the initial goals of certain actions: promotion of clean vehicles, and partial revision of the Law on Nature and Landscape Conservation, which has been deferred. Obstacles to implementation have appeared repeatedly in political decision-making.

The sustainable development *indicators* developed by the MONET (Monitoring der Nachhaltigen Entwicklung) project allow observation and documentation of Switzerland's social, economic and environmental development. The MONET system's 120 indicators (OFS/ARE/OFEFP, 2003a and b) are available online ([www.monet.admin.ch](http://www.monet.admin.ch)) and regularly updated. From these, 17 key indicators were extracted, centred around four themes: satisfaction of needs, equity, preservation of resources and decoupling (Confédération suisse, 2005).

A *methodology* for evaluating sustainability (ARE, 2004a) follows up Action 22 of the sustainable development strategy 2000. It is used to estimate the social, economic and ecological consequences of the Confederation's projects and political activities, identify conflicting objectives and seek solutions as early as possible in the decision-making process. This methodology is currently being applied in various fields, for example at federal level in the sectoral plan for transport and the Agricultural Policy 2011.

In summary, both the sustainable development strategies developed at the federal level have stimulated *better collaboration between federal services* while monitoring procedures have allowed evaluation of the extent of their implementation. *Sustainable development indicators* have been developed and a method of evaluating sustainability has been devised. However, cross cutting work within the federal administration still needs to be developed, and a coherent philosophy of sustainable development is not yet in place within the federal administration as a whole. The Federal Office for Spatial Development, which chairs the ISDC, does not have the authority to arbitrate but plays a co-ordinating role. The sustainable development strategy at federal level lacks *quantified targets* with deadlines to meet and, above all, is *divorced from existing sectoral policies* (transport plan, Agricultural Policy 2007). It could also be observed that environmental policy lacks a long-term vision.

## 2.2 Implementation by cantons and communes

In June 2001, the *Forum for Sustainable Development* was created at the initiative of the Federal Office for Spatial Development (ARE), the Swiss Conference



of Managers of Public Works, Local Development and Environment (DTAP) and the Union of Swiss Cities (UVS) in order to: associate cantons and cities in implementing sustainable development policy; strengthen collaboration between the Confederation/cantons/cities as partners, in order to ensure effective co-ordination and create a maximum of synergies; develop the cantons' role in supporting the communes as catalysts for initiating sustainable development measures at local level (Agenda 21); constitute a platform for information exchange, especially between cities with experience and those seeking to embark on a sustainable development process.

The *elaboration* and *implementation* of sustainable development actions at cantonal and communal level vary enormously. Specific sustainable development activities have been undertaken by 14 cantons. Some 150 cities and smaller municipalities, representing 30% of the Swiss population, are engaged in Agenda 21 type measures. Regularly updated information on all these measures is available on line.

In the framework of the Forum for Sustainable Development, various measures were taken to support local initiatives in this area. Thus, the *Indicators Circle* was created. As a national platform open to all cantons and cities, it had a membership of 14 cities and 8 cantons in June 2006. The Indicators Circle has developed two systems of core sustainable development indicators, one for cities and the other for cantons (ARE, 2005a). Using 30 indicators, the participating cantons and towns can measure their sustainability status, monitor its evolution and compare their performance. Furthermore, the project evaluation tools of public authorities based on sustainable development principles have been made available to the cantons and towns (ARE, 2004b) and a working group has been established to standardise their use. In addition, another working group resulting from the Forum has defined quality criteria which can be applied to current processes or new measures (ARE, 2005b). Finally, an incentive programme provides financial support to projects aimed at achieving sustainable development. Since 2001, around 100 projects have been supported in this way.

### 3. Integration via the Market

#### 3.1 Environment-related taxes

Today there are 27 different *tax charges* related to the environment (taxes or levies) at federal, cantonal or communal level, 12 more than in 1990. The bulk of them were levied at federal (Table 4.2) and cantonal level. The total revenues amounted to some CHF 11.2 billion.

Table 4.2 **Environment-related taxes** (Confederation)  
(CHF million)

Base	Name of tax	Type of tax	1998	1999	2000	2001	2002	2003	2004
Emissions	Tax on VOCs	Taxes			67.6	91.6	86.1	104.4	123.9
	Tax on polluted sites	Taxes				28.0	28.9	27.3	31.6
	Advance tax on disposal of glass packaging for drinks	Mixed				0.0	24.9	29.4	29.4
	Advance tax on disposal of batteries and accumulators	Mixed	11.6	13.0	12.5	17.2	20.3	21.4	15.1
	Advance tax on recycling of aluminium cans and packaging for food (and for animals)	Pr. vol. sol. <sup>a</sup>	5.6	6.2	7.0	7.4	7.3	7.7	7.6
	Advance tax on recycling of PCB bottles	Pr. vol. sol. <sup>a</sup>	21.5	22.5	23.8	24.3	34.8	42.3	41.2
	Advance tax on recycling of electrical or electronic appliances (SWICO)	Pr. vol. sol. <sup>a</sup>	17.5	17.4	17.3	16.5	24.0	33.7	40.9
	Advance tax on recycling of used vehicles	Pr. vol. sol. <sup>a</sup>	4.8	5.2	5.2	5.2	9.5	8.7	8.7
	Advance tax on food cans	Pr. vol. sol. <sup>a</sup>	1.3	1.3	1.3	1.5	2.2	2.3	2.1
	Advance tax on refrigerators, water heaters, electrical or electronic appliances (SENS)	Pr. vol. sol. <sup>a</sup>	11.7	11.6	12.1	12.5	9.0	38.0	43.8
Energy	Taxes on mineral oils and motor fuels	Taxes	2 792.5	2 862.2	2 949.2	2 901.5	2 854.2	2 895.4	2 926.7
	Taxes on heating oil	Taxes	27.0	24.7	22.6	26.0	25.0	23.5	23.5
	Surtax on mineral oils and motor fuels	Taxes	1 892.3	1 944.4	2 003.4	1 967.4	1 933.1	1 960.7	1 978.7
	Incentive tax on heating oil EX-L	Taxes	0.0	0.0	0.4	0.4	0.2	0.1	0.3
	Taxes on heavy vehicles	Taxes	283.5	316.6	323.3	340.3	313.9	306.0	311.8
Transport	Duties on heavy goods traffic (up to 2000)	Taxes	184.1	186.1	360.9				
	(after 2000)	Taxes				770.2	882.6	843.2	844.7
	Levy on road use (vignette)	Taxes	286.5	291.3	298.8	306.6	302.1	305.9	307.2

a) Private voluntary solution.

Source: OFS, 2003.

### *Environment-related taxes*

*Environment-related taxes* (excluding charges), mixed forms<sup>5</sup> and private voluntary solutions<sup>6</sup> totalled CHF 9.06 billion in 2004. In volume, *taxes on energy* produced the most revenues (some CHF 5 billion, or over 50% of tax collected), followed by *taxes on transport* (CHF 3.3 billion, over 36%) and *taxes on resources* (CHF 480 million, about 5.3%). Taxes on emissions are gaining in importance: revenues from these taxes have more than doubled since 1995, representing CHF 267 million (or some 3% of total revenue from environment-related taxes).

Between 1990 and the new decade, the *increase in revenues from environment-related taxes* was greater (87%) than that of the tax revenues of the Confederation, cantons and communes, and social contributions as a whole (53%). This can be explained by the increase in fuel taxes since 1993 and the increase in transport-related revenues.

### *Environment-related taxes in the strict sense*

The increase in revenues from *environment-related taxes strict sense* (such as emissions taxes) has occurred very rapidly, but they represent barely 0.4% of total tax revenues and social contributions. The rapid increase is essentially due to the introduction of the distance/weight-related heavy vehicle fee (HVF) and the tax on volatile organic compounds (VOCs), both instruments having proved to be an incentive.

The *distance/weight-related heavy vehicle fee* (HVF) introduced in 2001 replaces the annual flat rate formerly levied on heavy vehicle traffic. It seeks to internalise external costs and to finance the cost of rail infrastructure. It applies to vehicles weighing over 3.5 tonnes and averages 2.44 cents/km, based on three criteria (distance travelled in Switzerland, total vehicle weight, emissions). While traffic had been increasing since 1996, a reduction was observed following the introduction of the charge. This fall in traffic coincides with an increase in the weight limit on heavy goods vehicles from 28 to 44 tonnes. This increase resulted not in an increase in the fleet of light goods vehicles, which are exempt from the levy, but an increase in the load factor.

The *tax on VOCs* was introduced in 2000 with the aim of reducing solvent wastes, some of which are carcinogenic or ozone precursors. It was set at CHF 2 per kg in 2002 and raised to CHF 3 in 2003. This tax resulted in the collection of CHF 124 million in 2004. Revenues from the tax are redistributed equally among individuals through the health insurance system, membership in which is compulsory for each inhabitant. VOC wastes subject to the incentive tax (78 400 tonnes in 1998) fell to 51 900 tonnes in 2004.<sup>7</sup>

### *Towards a green tax reform?*

The share of revenues from *environment-related taxes* in the total revenues of the Confederation, cantons and communes, and social contributions, rose from 5.7 to 6.9%

between 1990 and 2004. Environment-related taxes, however, are increasing less rapidly in Switzerland than in the European Union. This difference is mainly due to the fact that tax rates on energy are lower in Switzerland, where their share in total taxes and social contributions was 3.8% in 2004.

In 2004, 25% of revenues from environment-related taxes was paid into the *Confederal State budget*. The remainder was allocated for other purposes (70%), for the environment (3%) or returned (2%). While they represented only 3% of total environment-related taxes in 2004, revenues allocated to environmental protection have more than doubled since 1990, from CHF 148 million to CHF 309 million. At the same time, revenues allocated to other purposes (such as road infrastructure, which received 50% of these revenues in 2004) and those which contribute to the Confederal State budget have risen by 69% and 138%, respectively. Finally, in 2004, the share returned was CHF 175 million.

In the 1998 Environmental Performance Review, the OECD recommended that a *green tax reform* be promoted to favour environmental protection, natural resources and employment. The Federal Council, in the sustainable development strategy 2000, despite rejection by the people of the 2000 energy projects, envisaged re-examining and presenting in a report in 2003 the possibility of strengthening ecological incentives within the tax system, taking into account the possible introduction of a CO<sub>2</sub> tax. This report did not see the light of day, but in 2005 the Federal Council proposed to Parliament that a tax on CO<sub>2</sub> be adopted. *Efforts aimed at introducing green tax reform should continue*, e.g. by introducing an ecological dimension into the project under discussion on growth and taxes: ZUWACHS (Zukunfts und wachsumsorientiertes Steuersystem für die Schweiz).

### 3.2 Sectoral subsidies

An exploratory study was carried out to identify and quantify *subsidies potentially damaging to the environment*, but this study was not followed up because of methodological and statistical difficulties. A few tax benefits exist, such as reimbursement of the tax on mineral oils when they are used by farmers, foresters, professional fishermen or even transport companies licensed by the Confederation.

The level of *support to agriculture*, as measured by the Producer Support Estimate (PSE), fell from 78% in 1986-88 to 71% in 2002-04, or twice the OECD average (Chapter 5). Since 1986-88 the gap between domestic and export prices has shrunk considerably, due to progressive replacement of market price support in favour of payments based on area or head of livestock: thus the share of market price support, payments for production and payments for use of inputs fell from 92% of the total PSE in 1986-88 to 66% in 2002-04, a positive trend with regard to the environment.

The introduction of payments to support *organic agriculture* and *animal welfare* is a response to consumer concerns. These payments are subject to compliance with environmental standards and the application of ecological management practices. They are among the forms of subsidy that create the least distortions of production and trade. However, they represent only a small part of total support and are implemented in the context of policies related to production.

## 4. Integration of Environment in Sectoral Policies: Energy, Transport

### 4.1 Energy

#### *Energy efficiency*

In 2001, the Federal Council adopted the SwissEnergy programme (which succeeded the Energy 2000 programme) with a view to continuing efforts to *save energy and use renewable energy*. Its targets for 2010 are: to reduce consumption of fossil energy and CO<sub>2</sub> emissions by 10%; to restrict the increase in electricity consumption to 5%; not to reduce hydropower production; to produce 1% more electricity and 3% more heat, on average, from renewable energy sources each year (excluding hydropower), and to heighten awareness of energy issues among the population by providing good information.

Following the austerity measures decided by the federal government, the *budget allocated to the SwissEnergy programme* was reduced. Federal expenditure thus fell from CHF 75 million in 2001 to CHF 45 million in 2005. Against the background of these cuts, federal expenditure on energy efficiency programmes remained almost stable (falling from CHF 24 million in 2003 to CHF 22 million in 2005) while the budgets allocated to renewable energy programmes were drastically reduced (from CHF 25.3 million in 2003 to CHF 9 million in 2005). The measures adopted under the SwissEnergy programme concern the residential and services sectors, transport and industry (Table 2.6).

In the *residential and services sectors* the bulk of measures concern construction standards (promotion by the Confederation and cantons of the MINERGIE standards for new and renovated buildings), individual measurement of heat and hot water (fewer than 500 000 homes out of a total 1.2 million currently measure their heating and hot water consumption), labelling of electrical appliances (several labelling systems have been introduced at the initiative of the Confederation) and harmonisation of measures under cantonal policies (through the efforts of the Conference of Cantonal Energy Directors).

In the *transport sector*, SwissEnergy aims to reduce the level of fuel consumption by 8% in 2010, compared with 2000. In addition to the levy on heavy vehicles applied at federal level since January 2001, many cantons have imposed taxes on vehicles proportional to the vehicles' power or weight but few have adopted taxes related to CO<sub>2</sub> emissions. Some have adopted innovative transport-related programmes (hybrid vehicles, electric bicycles, etc.) (Chapter 2).

In the *industrial sector*, measures are essentially voluntary and are co-ordinated by the Agency for Energy for the Economy (AEnEc), created in 1999 to help companies improve their energy efficiency. In the context of the voluntary measures envisaged by the federal CO<sub>2</sub> Law, a series of agreements was signed in 2004 by 45 industrial groups (some 600 companies) covering 25% of industrial CO<sub>2</sub> emissions. Most of these companies have made voluntary commitments in order to be exempt from a CO<sub>2</sub> tax if such a tax is adopted by Parliament. Once the tax is introduced, the voluntary agreements will become legally binding, which would entail penalties for companies that fail to comply with emission reduction objectives. During the summer of 2005 some 400 companies were in the process of negotiating a voluntary agreement under the auspices of the Agency for Energy for the Economy.

Despite the many policies and measures already in place through the Energy 2000 and SwissEnergy programmes, *it will be very difficult for Switzerland to achieve the targets for consumption of fossil energy and electricity*. Its energy intensity per unit of GDP is the lowest in the OECD, but it is slightly higher than in 1990, while the average for IEA countries has fallen steadily. An evaluation of current programmes highlights the need for the Confederation to adopt additional, stricter measures such as the incentive tax on CO<sub>2</sub> if existing measures prove inadequate to achieve the SwissEnergy targets.

#### *Federal Law on the Reduction of CO<sub>2</sub> Emissions*

Under the Law on the Reduction of CO<sub>2</sub> Emissions, adopted in 1999, CO<sub>2</sub> emissions from fossil fuels are to be reduced by 10% by 2010, compared with 1990. Determining progress to have been inadequate, the Federal Council, in accordance with the provisions of this law and after consultation with the interested parties, decided in March 2005 to propose to Parliament the adoption of a tax of CHF 35 per tonne of CO<sub>2</sub>, chargeable on *heating fuel*. This measure should lead to a reduction in CO<sub>2</sub> emissions of an additional 0.7 million tonnes by 2010. The revenues, estimated at an average CHF 650 million, are to be redistributed to the population through the health insurance schemes (some CHF 50 per inhabitant), and to areas of the economy as a percentage of wages paid. It is possible for *large companies* with emissions to obtain exemption from the tax, provided they formally undertake to limit their emissions of CO<sub>2</sub>. Those undertaking to do so will receive emission rights for the period 2008-12, which they can sell to other companies or carry forward as credits against the following period.

It has not been proposed to tax fuel, but to levy from October 2005 a *climate cent for each litre of fuel* distributed. The climate cent levied on fuel (1.3 to 1.9 cents per litre) is a voluntary measure proposed by the oil industry. The annual revenues (estimated at CHF 70-115 million) are to be used to finance measures in Switzerland and abroad to reduce CO<sub>2</sub> emissions by 1.8 million tonnes by 2010, of which 0.2 million through measures undertaken in Switzerland. Foreign certificates can be obtained for a maximum of 1.6 million tonnes. If those promoting the climate cent are unable to prove between now and the end of 2007 that this measure can achieve the target fixed for 2010, the Federal Council will extend the tax on CO<sub>2</sub> to fuel.

The *initiative taken by the Federal Council is a step in the right direction*, as by fixing a price for use of fossil fuels based on CO<sub>2</sub> released to the atmosphere upon combustion, the CO<sub>2</sub> tax internalises external costs and is an incentive to reduce emissions in the long term. It is regrettable that the Federal Council decided not to apply this tax on fuel when it accepted the voluntary measure proposed by the private sector, which introduces distortions between sectors. Ideally, all emitters should be subject to the same incentive to reduce their emissions.

### *Renewable energy sources*

The SwissEnergy programme set two objectives for renewable energy sources: the share of electricity produced from non-hydropower sources should rise from 1.3% in 2000 to 2.3% in 2010 (an increase of 500 GWh) and the share of heat generated from renewable sources should increase by 3% (an increase of 3 000 GWh).

At the end of 2004, the fourth year of the SwissEnergy programme, *electricity generated from renewable sources* totalled 997 GWh (1.57% of total generation) or *only 30% of the target set* in this ten-year programme. However, the *share of heat from renewable sources was increasing at a rate consistent with achieving the target for 2010*, showing an increase of 1 153 GWh compared with 2000 due mainly to the use of biomass (49%), wood and waste (27%) and heat pumps (18%). In 2003 sales of green electricity represented 4.6% of consumption, of which 98% was hydro. Sales of heat pumps rose in 2003 and 2004 at record rates of 15 to 20%, partly due to the high price of oil, and represented a 23% share of the market for all heating installations in 2004.

Various additional measures have been adopted or proposed to promote renewable energy, such as the obligation to indicate on *electricity bills* the origin and source of electricity from 2006, or the *fuel tax reform*, which should help extend the market share of *bioethanol* in order to achieve a market share of 5.75% in 2020. In addition, the 1998 Law on Energy should be amended to include renewable electrical energy targets up to 2030.

The share of renewable sources (including hydroelectricity) should rise from 67 to 77% by 2030. To stimulate the market, the Federal Council could put in place a system of price guarantees or mandatory quotas.

### Energy prices

Available data on energy prices in Switzerland show that *households* pay higher prices for energy from all sources (electricity, oil, natural gas) than does *industry*, but that these prices are lower than the average in OECD Europe. On the other hand, the prices paid for electricity by industry are higher than those in the OECD Europe average (Table 4.3).

In Switzerland the *price of gasoline* is lower than in neighbouring countries and lower than the OECD Europe average. Gasoline taxes account for 60.2% of the total price (Figure 4.4) (IEA, 2005). *Diesel prices*, though, are higher due to higher

Table 4.3 Energy prices in selected OECD countries, 2005

	Electricity		Oil		Natural gas	
	Industry (USD <sup>c</sup> /kWh)	Households (USD <sup>d</sup> /kWh)	Industry <sup>a</sup> (USD <sup>e</sup> /tonne)	Households <sup>b</sup> (USD <sup>e</sup> / 1 000 litres)	Industry (USD <sup>e</sup> /10 <sup>7</sup> kcal)	Households (USD <sup>e</sup> /10 <sup>7</sup> kcal)
Switzerland	0.083	0.103	..	416.4	402.0	496.1
United States	0.055 <sup>e</sup>	0.094	291.7	571.6	336.4	520.9
Japan	0.127 <sup>f</sup>	0.159 <sup>f</sup>	350.3	495.5	392.5 <sup>f</sup>	1 027.9 <sup>f</sup>
Austria	0.096 <sup>f</sup>	0.160 <sup>f</sup>	..	688.3	..	662.3
France	0.050	0.126	302.6	645.7	316.3	527.2
Germany	0.077 <sup>f</sup>	0.171 <sup>f</sup>	..	572.3	..	..
Italy	0.161 <sup>f</sup>	0.181 <sup>f</sup>	220.7 <sup>f</sup>	1 231.7	..	..
OECD Europe	0.059 <sup>g</sup>	0.148 <sup>g</sup>	..	661.7	..	..
OECD	..	..	205.8 <sup>f</sup>	637.0	249.2 <sup>f</sup>	464.7 <sup>f</sup>
Switzerland/OECD Europe (%)	..	..	..	63	..	..
Switzerland/OECD (%)	124 <sup>g</sup>	68 <sup>g</sup>	..	65	141 <sup>f</sup>	95 <sup>f</sup>

a) Fuel oil with high sulphur content.

b) Light fuel oil.

c) At current exchange rates.

d) At current purchasing power parity.

e) Excluding tax.

f) Data for 2004.

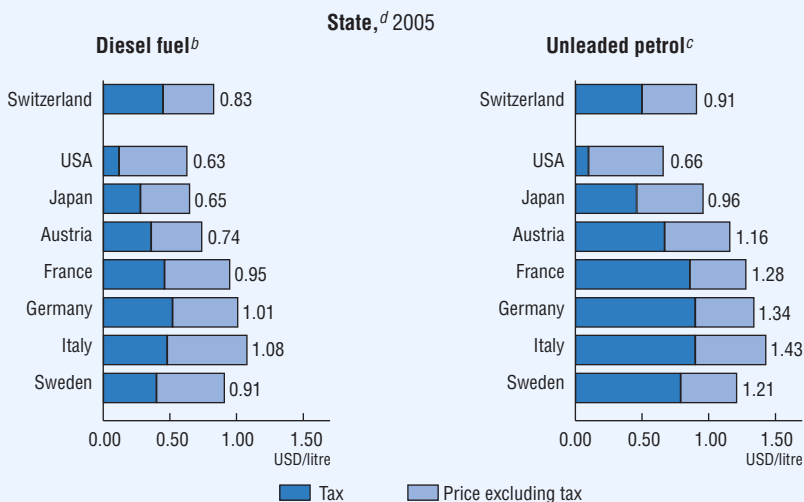
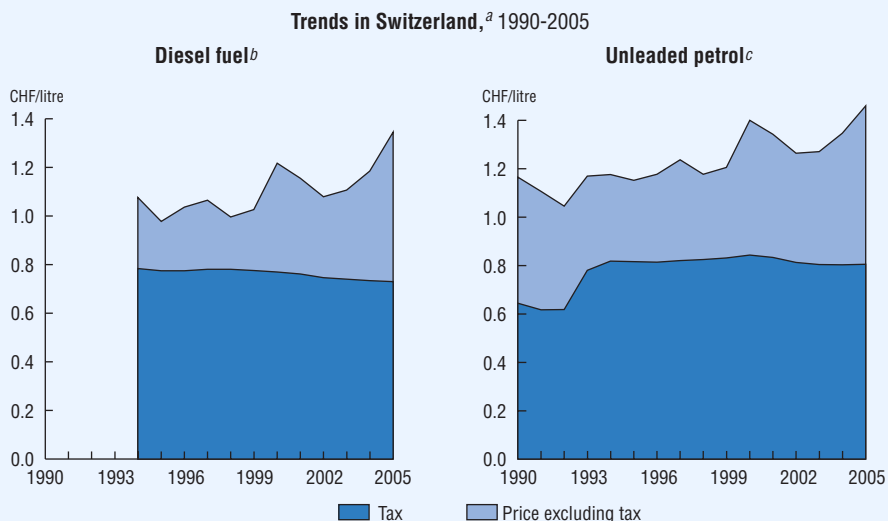
g) Data for 2002.

h) Data for 2003.

Source: IEA-OECD, Energy Prices and Taxes, 1st quarter 2006.



Figure 4.4 Road fuel prices and taxes



a) At constant 2000 prices.  
 b) Automotive diesel for commercial use.  
 c) Unleaded premium (RON 95); Japan: unleaded regular.  
 d) In USD at current prices and purchasing power parities.  
 Source: IEA-OECD (2006), database of end-use prices.

taxation, which partly takes into account certain external factors related to diesel. Lower gasoline prices have led to cross-border gasoline tourism, with 15% of all gasoline sold in Switzerland bought by drivers from other countries. The difference between gasoline prices in Switzerland and in neighbouring countries should be reduced to encourage savings on gasoline consumption and reduce emissions due to “gasoline tourism”.

Current discussions concerning the *reform of fuel taxes*, which is envisaged for 2007, could lead to an increase in the price of gasoline. Indeed, the aim of this reform is to reduce the tax on natural gas and exempt biofuels (mainly bioethanol), offsetting the reduction with an increase in the gasoline tax to maintain revenues from fuel taxes at a constant level.

## 4.2 Transport

In 2001, the Federal Department of the Environment, Transport, Energy and Communication (DETEC) developed a *sustainable transport strategy*. Under this strategy, mobility needs should be satisfied in the most ecological way possible by internalising external costs; mobility should not increase indefinitely at the expense of the environment (ecological sustainability); and mobility needs should be satisfied in the most efficient way possible, so that the financial burden for the Confederal State can be justified (economic sustainability). All economic sectors and all parts of the country should have access to mobility (social sustainability).

Environmental protection continues to be an important element of Switzerland’s sustainable transport strategy, which gives high priority to the development of *public transport* and the *shifting of passenger and goods traffic from road to rail* (Chapter 2; Figure 2.4).

The existence of a dense and coherent public transport network is a major advantage for Switzerland. *Investment* in public transport rose from CHF 3.6 billion in 2000 to CHF 4.5 billion in 2005, and investment in road transport increased from CHF 2.8 billion to CHF 3.6 billion over the same period. Financing of road infrastructure, 96% of which was formerly provided by fuel taxes, is now financed only 50% from that source.

*Reform of the railways* in 1999 is making rail transport increasingly attractive and more efficient by achieving greater flexibility in the management of the transport companies and modernising rail infrastructure. Four main projects concern the railways: modernisation of rail infrastructure, with implementation of the first and second phases of Rail 2000; construction of the new transalpine axes (NLFA) with two new tunnels, Gotthard (57 km) and Lötschberg (34 km); connection of eastern

and western Switzerland with the new European high-speed rail network, and noise protection along the railways. With the entry into service in December 2004 of the first phase of Rail 2000, which is intended to improve provision of rail service throughout the country, the level of service provided by the railways increased by 12% (more trains, faster journeys between Swiss cities).

The federal Law on Traffic Transfer 1999 establishes as a target a *maximum of 650 000 trucks a year crossing the Swiss Alps by road* two years after the opening of the main Lötschberg tunnel or, at the latest, by 2009. This target assumes that half the heavy vehicles crossing the Alps each year will have been eliminated by *shifting of freight from road to rail*. Between 2001 and 2004 there was a combined increase in transport volumes of almost 30%, but a reduction in the volume of heavy vehicle traffic of some 15%. Rail stabilised its market share at a high level (65%, compared with 20-30% in Austria and France). The first results are encouraging, but truck traffic is not declining fast enough to achieve this ambitious target. That can only be achieved when all European countries adopt additional measures for the north-south axis (Alpine Transit Exchange, heavy vehicle levy) which respect the reality of costs between rail and road.

To encourage the shift of freight from road to rail, financing of *combined transport* is ensured up to 2010 by subsidies of CHF 1 billion. Total funding necessary to ensure the transfer of goods transport to rail is over CHF 2.8 billion for the period 2001-10. The *financing of major public transport infrastructure projects* is only partly ensured. Uncertainties remain over financing rail infrastructure against a background of budgetary difficulties. The government has therefore embarked on discussions to put in place a new fund, to be financed from taxes on mineral oils. The transport agreement between *Switzerland and the European Union*, renewing the 1993 transit agreement, allows Switzerland to continue to control heavy goods traffic and to implement the Law on Traffic Transfer. The levy charged on trucks, depending on distance travelled in Switzerland, total vehicle weight and emissions (some CHF 1.7 billion annually), should ensure financing of the NEAT (New Transalpine Transit Axes) project and other major public transport infrastructure projects (Box 2.2).

## 5. Expenditure on Protection of the Environment and Financing

### *Expenditure*

Switzerland does not yet have a consolidated account for all expenditure on protection of the environment, in the sense of the accounting framework developed by the OECD and Eurostat.<sup>8</sup> Available data concern *government expenditure on*

*environmental protection* (waste water management, waste management, protection of the air and noise prevention, environmental research, nature protection – including ecological subsidies paid directly to agriculture) (Table 4.4). This expenditure does not include water supply costs. The level has remained stable in volume since the last review, at around CHF 3.5 billion in current currency or some 0.8% of GDP. Over 50% of this expenditure is associated with waste water management, and 31% relates to waste management (Table 4.5). The communes still bear the highest share of this expenditure (over 65%), while the cantons and the Confederation share the rest equally (over 17% each).

*Expenditure by companies* was estimated at CHF 2.5 billion in 2003 (68% current expenditure, 32% investment) or about 0.6% of GDP. This represents 1.4% of gross added value from industry, a percentage comparable to that observed in the countries of the European Union. Over 80% of expenditure is allocated to waste management (40%), waste water management (29%) and protection of air and climate (19%). The remaining 12% covers noise prevention, protection of biodiversity, soils, groundwater and the landscape, and R&D expenditure. Despite the decline in investment compared with the first pilot study in 1993, 55% of investment in 2003 concerned clean technology. Among companies, those belonging to the chemical industry spend the most, at more than CHF 5 300 per employee.

Total *public and private expenditure on protection of the environment* can be estimated at around CHF 5.5 billion (1.4% of GDP).<sup>9</sup>

### *Financing*

*Financing* of expenditure on environmental protection, especially for waste water management and waste management, is increasingly provided from duties (Table 4.4), which *reflects increasing implementation of the polluter pays principle* in these two sectors. Thus, concerning evacuation and treatment of waste water, the share of expenditure by cantons and communes covered by duties rose from 54.4% in 1998 to 68.7% in 2003.

### *Damage*

Despite this progress, *deficits in coverage of the principle of causality (polluter pays and user pays principles)* persist in almost all areas of environmental protection (Ott *et al.*, 2005). While the cost of this external damage could be estimated as at least CHF 8.9 billion, probably only CHF 1.3 billion is internalised, representing a coverage deficit of at least CHF 7.6 billion. Overall, environmental costs not covered vary, depending on estimates, between CHF 9.7 billion and CHF 20.9 billion (Table 4.6).

Table 4.4 Public expenditure on protection of the environment<sup>a</sup>

(CHF million)

	1990	1995	1998	1999	2000	2001	2002	2003
Total	2 401.9	3 249.4	3 453.2	3 437.4	3 457.5	3 500.4	3 497.6	3 550.3
By area								
Waste water management <sup>b</sup>	1 503.7	1 769.1	1 908.6	1 853.6	1 784.6	1 790.9	1 771.8	1 793.6
Waste management <sup>c</sup>	671.6	1 070.1	1 018.4	1 028.4	1 071.2	1 082.6	1 088.9	1 089.4
Protection of the air and noise prevention	129.4	188.8	227.0	239.8	232.4	234.0	247.1	287.9
Environmental research	34.3	37.0	35.9	33.5	65.9	62.7	42.6	28.7
Nature protection <sup>d</sup>	62.8	184.4	263.4	282.2	303.4	330.0	347.3	350.6
By administrative level								
Confederation	251.3	439.0	554.1	551.9	558.8	609.7	604.9	603.8
Cantons	578.1	676.8	578.3	654.5	615.2	631.2	592.3	623.7
Communes	1 572.6	2 133.7	2 320.8	2 231.0	2 253.5	2 259.5	2 300.4	2 322.8

a) Gross expenditure after deduction of transfers between public authorities.

b) Elimination of waste water and public toilets.

c) Elimination of waste and animal carcasses, excluding household waste incineration plants.

d) Including direct ecological subsidies paid to agriculture since 1993; 202 out of a total of 350.6 in 2003.

Source: OFS.

Table 4.5 Charges for waste water management and waste management

(CHF million)

	Cantons		Communes		Total
	Waste water management <sup>a</sup>	Waste management <sup>b</sup>	Waste water management <sup>a</sup>	Waste management <sup>b</sup>	
1990	54.7	14.9	593.4	285.6	948.5
1995	82.7	71.9	809.8	579.2	1 543.5
1998	97.2	78.7	998.7	549	1 723.5
1999	105.3	77.4	999.5	562.2	1 744.4
2000	118.6	90.7	1 002.1	605	1 816.5
2001	112.7	87.6	1 012.1	624.6	1 837
2002	120.3	69.9	1 055.1	621.9	1 867.3
2003	124.7	64.5	1 108.1	614.4	1 911.7

a) Elimination of waste water and public toilets.

b) Elimination of waste and animal carcasses, excluding household waste incineration plants.

Source: OFS.

Table 4.6 **Evaluation of environmental damages and external costs, 2001**  
(CHF million)

	Expenditure companies/ households/ agr. (without taxes)	Public expenditure	Taxes <sup>a</sup>	Financed by other taxes <sup>b</sup>	Damages		Inter- nalisation <sup>c</sup>	External costs <sup>d</sup>	
					Min.	Max.		Min.	Max.
	A	B	C	D=B-C	E	F	G	H=D+E-G	I=D+F-G
Water protection	681	1 782	1 130	652	391	475	9	1 034	1 119
Soil protection	24	27	2	25	386	454	9	402	469
Waste	530	1 500	1 081	418	0	0	0	418	418
Climate	460	117	9	107	2 495	6 769	413	2 189	6 463
Air protection	1 361	117	14	103	3 260	7 230	519	2 844	6 814
Protection against noise	41	536	23	512	998	1 568	138	1 372	1 942
Nature and landscapes	335	443	128	315	1 323	3 526	221	1 417	3 620
Environmental research	0	63	11	52	0	0	0	52	52
<b>Total</b>	<b>3 432</b>	<b>4 583</b>	<b>2 400</b>	<b>2 184</b>	<b>8 853</b>	<b>20 022</b>	<b>1 308</b>	<b>9 729</b>	<b>20 898</b>

a) Taxes associated to expenditure A of private actors.

b) Public expenditure to be financed by general revenue.

c) Internalised damage.

d) Non-internalised damage, or "external costs".

Source: OFEFP.

## 6. Institutional Environmental Framework

### 6.1 Foundations

The 1999 *Federal Constitution*, which replaced that of 1874, describes the purpose of the Swiss Confederation as including the promotion of sustainable development and support for long-term preservation of natural resources. One section is devoted to the environment and regional planning.<sup>10</sup> This section provides the fundamental principles for Switzerland's environmental protection policy, including the prevention principle, the causality principle (which includes the polluter pays principle) and the principle of delegating implementation to the cantons.

General Policy Guidelines, as defined in the *legislative programme* prepared every four years by the Federal Council, refer to general government policy. These guidelines are essentially qualitative rather than legally binding. The latest programme (2003-07) includes environmental provisions aimed at sustainable and equitable development of the territory and preservation of air and soil quality, as well as response to climate change.

*Policy goals* consistent with the General Policy Guidelines are established every year by the Federal Council. These goals are not legally binding, but can be seen as declarations of intent. Generally they do not have a quantitative dimension. They are established by the competent government departments; the Federal Department of the Environment, Transport, Energy and Communication (DETEC) is responsible for general environmental policies.

## 6.2 Levels of environmental administration

Switzerland is a Confederation. The subsidiarity principle<sup>11</sup> applies to environmental administration. The main institutions with specific competence for environmental matters are divided into *federal, cantonal and communal* administrations.

The main *federal authority* in charge of implementing environmental policy is the *Federal Office for the Environment* (FOEN), established in January 2006 when the Swiss Agency for the Environment, Forests and Landscape (SAEFL) was integrated with parts (i.e. water, risks) of the Federal Office for Water and Geology (FOWG) (Box 4.2). FOEN, which is under DETEC, is responsible for protection of the environment against harm (from noise, hazardous substances, etc.), management of environmental resources, prevention of natural hazards, support for cantonal authorities in their enforcement of environmental legislation, and provision of information concerning the state of the environment.

*Other federal departments* are also involved in management of environmental issues: in particular, the Federal Department for Economy (Federal Office for Agriculture and State Secretariat for the Economy, SECO), the Federal Home Office Department (Federal Office of Public Health, FOPH; Swiss Federal Statistical Office, SFSO) and the Federal Department for Foreign Affairs (International Public Law Directorate, Development and Co-operation Directorate), as well as the Federal Office for Spatial Development (ARE) which is placed under the umbrella of DETEC.

*Twenty-six cantons*<sup>12</sup> constitute the intermediate level of the Swiss administration (Table 6.4). Each canton has its own institutions (i.e. constitution, parliament, government and courts). Cantons are the main competent authorities for carrying out implementation, control and administration of national environmental legislation. Complementary legislation and measures consistent with federal law can be issued by cantonal authorities.

### Box 4.2 The new Swiss Federal Office for the Environment (FOEN)

FOEN was established on 1 January 2006, when the Swiss Agency for the Environment, Forests and Landscape (SAEFL) was integrated with parts (concerning water quantity and risk management) of the Federal Office for Water and Geology (FOWG). FOEN aims to meet the essential needs of society and the economy in the following areas: security of humans and goods regarding the possible consequences of *natural hazards*; preservation of *human health* regarding adverse effects of noise, dangerous substances and organisms, non-ionising radiation and atmospheric pollutants; *biodiversity conservation*; long-term conservation and wise exploitation of *natural resources* (e.g. soil, landscape and biodiversity, air, forests).

FOEN's expenditure is around CHF 650 million per year, compared to expenditure of about CHF 54 billion per year for the whole federal administration) and to public environmental expenditure of about CHF 3.5 billion for Switzerland as a whole (Table 4.4). It has about 400 employees (compared with about 30 000 persons employed in the whole federal administration).\*

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\* FOEN communication.

At the lower level of the Swiss administration, there were 2 758 *communes* in 2005; this number is declining. Around one-fifth of communes have their own parliament; in the others decisions are taken by a process of direct democracy (Confédération suisse, 2006). The degree of autonomy granted to the communes depends on individual cantons and varies considerably. Communes have some legislative and operational competence for environmental matters, including delivery of waste and water services.

### 6.3 Environmental legislation

The 1983 *Law on the Protection of the Environment* (LPE), substantially amended in 1995, is the framework legislation for environmental protection. Four principles of environmental policy are identified: i) *prevention*: environmental management should be preventive rather than curative, with limitation of pollution at source; ii) *causality* (or PPP): the entity responsible for environmental damage shall pay for the damage, i.e. bear the costs of remedial measures; iii) *collaboration* among interested parties: looking for consensus with industry and other stakeholders on environmental policies and measures; and iv) *comprehensive approach*: attention to economic aspects of environmental measures and policy instruments. The LPE



contains further specific environmental provisions. A number of other federal laws also relate to the environment (Table 4.7).

Specific environmental legislation at the federal level uses *implementation ordinances* in areas such as air protection, water protection, noise, especially hazardous substances, waste, nature and landscape protection, watercourse settlement, fishing, forests and forest management, and reduction of CO<sub>2</sub> emissions. During the review period, regulations and legislation on *waste management and chemical substances* were consolidated to a significant extent.

Concerning *air*, a 1997 law on a capacity-based levy on heavy goods vehicles introduced the heavy vehicle fee (Boxes 2.2 and 4.3). Incentive taxes were introduced through the 1997 Ordinance on Incentive Taxes on Volatile Organic Compounds (VOCs), the 1997 ordinance on extra low sulphur fuel oil and the 2003 ordinance on sulphur fuels. Under the 1991 federal Law on Water Protection, the 1998 Ordinance on *Water Protection*, the 1998 Ordinance on the Protection of Waterways against Liquids Hazardous to Water and the 1995 Ordinance on Compensation for Losses in the Use of Hydropower were adopted. The legal basis for *nature and landscape protection* is found in the Federal Constitution. The 1966 federal Law on of Nature and Landscape Conservation establishes a general framework for protective measures (landscape, biotope and species protection). The 1986 federal Law on Hunting and Protection of Wild Mammals and Birds and its implementing ordinance concern species protection. Other laws also have provisions that contribute to species protection. For example, the federal Law on Forests is intended to help preserve forests as natural habitats.

#### Box 4.3 Further use of economic instruments

During the review period, Switzerland promoted the use of *economic instruments*. Environmental taxes are widely used at federal level (e.g. taxes on VOCs and extra-light heating oil) and cantonal level (e.g. energy tax in Basel-City). Some examples are provided below.

##### *Instruments already implemented*

The *VOCs incentive tax* was introduced in 2000. By increasing the costs of emitting VOCs included in some solvents that harm the environment, the tax aims to provide an incentive to shift to more environmentally friendly substances and technologies. This tax is fiscally neutral, as its revenues are given back to households by reducing the cost of their compulsory health insurance.

### Box 4.3 Further use of economic instruments (cont.)

An *advance disposal charge* was introduced in 1996 on *PET bottles, used batteries and metallic boxes* as a private voluntary measure. The Swiss PET recycling association collected CHF 5 cents per bottle; the contribution was reduced to CHF 4 cents in 1999; this charge finances collection, transport, cleaning and recycling of PET bottles (Iten and Pulli, 2001).

*Charges* are commonly used to cover the costs of a service. Municipalities are responsible for waste management, water supply and sewage treatment, the costs of which should be entirely covered by revenues from these charges. Considerable differences still exist among the waste disposal costs incurred by individual municipalities, owing to different transport costs and other factors. These charging systems seem open to improvements in order to fully apply the polluter pays and user pays principles.

A very innovative *fee has been introduced on heavy vehicles (HVF)* since 2001. This fee is levied on heavy vehicles (more than 3 500 kg) according to weight, pollutant emissions and distances travelled. There are three rates, according to the vehicle's emission category: categories EUR 0 and 1 (2.88 cents), EUR 2 (2.52 cents), EUR 3, 4 and 5 (2.15 cents). The revenues are being used to finance construction of transalpine railway tunnels and to cover external costs in the transport sector (Box 2.1).

At the federal level, a *motor vehicle purchase tax* exists for vehicles not weighing more than 1 600 kg, fixed at 4% of the vehicle's value. In addition, most Swiss cantons have introduced (and revised) a *motor vehicle tax* levied on owners of motor vehicles, which varies according to cylinder volume, function and total weight (EEA-OECD, 2006).

#### *Recent proposals*

The *proposed CO<sub>2</sub> tax* is an alternative for businesses that have not committed themselves to reduce CO<sub>2</sub> emissions or to participate in a tradable permits system. A debate is currently taking place on the details of this "carbon tax" (Box 7.1).

The *proposed mineral oil tax* is an incentive tax promoting the use of less polluting fuels in order to reduce CO<sub>2</sub> emissions from traffic. Prices of biogas and other alternative fuels would be reduced while mineral oils would be more highly taxed, compensating for the lack of revenues from "cleaner fuels".

The "*climate cent*" is a voluntary fuel consumption measure designed to meet CO<sub>2</sub> reduction targets in the transport sector, as discussed by the federal government and the business community. The revenues would flow to a fund to finance Swiss mitigation projects. Ultimately, it appears that the impact of the climate cent would be substantially less than that of fuel/CO<sub>2</sub> taxation.

A *system of transferable emission permits* is envisaged by the CO<sub>2</sub> Law. Its purpose is to reduce CO<sub>2</sub> emissions. Companies could commit themselves to trade a certain amount of their CO<sub>2</sub> emissions in order to be exempt from the CO<sub>2</sub> tax. A transferable emission permits system has been established in the Basel-City canton without achieving substantial results, as no exchange of permits has yet taken place (OFEFP, 2002).

Table 4.7 Principal federal laws relating to the environment

1902	Law on forest protection
1955	Law on water protection
1958	Law on road transport
1966	Law on nature and landscape conservation
	1991 Ordinance on protection of nature and landscape
1979	Law on spatial planning
1980	Law on the national park in the canton of Gisors (Graubünden)
1983	Law on the protection of the environment (LPE)
	1985 Ordinance on air pollution control
	1986 Ordinance on substances that are dangerous for the environment
	1986 Ordinance on soil contaminants
	1986 Ordinance on movements of special wastes
	1986 Ordinance on noise abatement
	1988 Ordinance on environmental impact assessments
	1990 Ordinance on waste treatment
	1991 Ordinance on prevention of major accidents
1986	Law on hunting and protection of wild mammals and birds
1991	Law on forests
1991	Law on fishing
1991	Law on improvement of watercourses
	1994 Ordinance on improvement of watercourses
	1998 Ordinance on protection of waterways against liquids hazardous to water
1991	Law on water protection (revised) <sup>a</sup>
1995	Law on the protection of the environment (LPE) (revised)
	1997 Ordinance on incentive taxes on VOCs
	1997 Ordinance on the incentive tax on extra-light fuel oil
	2003 Ordinance on the incentive tax on sulphur-containing motor vehicle fuel
	2005 Ordinance on chemical products
	2005 Ordinance on a tax putting into effect federal legislation on chemical products
	2005 Ordinance on chemical risk reduction
	2005 Ordinance on movements of waste
1995	Law on nature and landscape conservation (revised)
	1998 Ordinance on rehabilitation of contaminated sites
	2000 Ordinance on a tax for clean-up of contaminated sites
1996	Law on water protection (revised)
	1998 Ordinance on protection of water from liquids that can pollute <sup>b</sup>
1997	Law on the heavy vehicle tax
1998	Law on energy
1998	Law on agriculture
	1998 Ordinance on direct benefits to agriculture
	2001 Ordinance on quality and interrelationships of environment/agriculture
1999	Federal Constitution <sup>c</sup>
1999	Law on the reduction of CO <sub>2</sub> emissions
	2005 Ordinance on tax on CO <sub>2</sub>
1999	Law on traffic transfer
2000	Law on railway noise remediation
2003	Law on genetic engineering

a) In force since 1 July 1997.

b) Repealed from 1 January 2007

c) Replaces the Constitution of 1874.

Source: OFEV.

## 6.4 Environmental referenda in Switzerland

The Swiss play an active part in the State's activities. Any amendment to the Constitution or Switzerland's accession to certain international organisations is subject to a *mandatory referendum*. The adoption of such a proposal requires a dual majority: a majority of the people and a majority of the cantons. Citizens may request an amendment to the Constitution. For a popular initiative (PI) to succeed, it must collect 100 000 signatures within a period of 18 months. Often, the authorities draw up a counter-proposal (CP) following the submission of a popular initiative. The adoption of a PI or a CP requires the dual majority.

Federal laws, federal resolutions of general application, and international treaties for an indefinite term are subject to a *facultative referendum* if at least 50 000 citizens petition for such a referendum within a period of 100 days following their publication. The facultative referendum is the most common type and is mostly initiated by interest groups. Only a majority vote of the people is required for their adoption.

Since 1996, some 20 referenda have had *environmental aspects* (Table 4.8). Very few PI have achieved a simple majority of the voters and a majority of the cantons, but CPs are often adopted. In the last ten years, only the 2005 PI for food produced without genetic technology has been adopted. Other recently adopted facultative referenda include those on the 1998 federal Law on the Heavy Vehicle Tax, the 1998 federal Ordinance Concerning the Creation and Financing of Infrastructure Projects for Public Transport, the 1999 federal Law on Land-use Planning and the 2000 federal Ordinance Concerning the Approval of Sectoral Agreements with the EU. Almost half the environmental proposals subject to referenda have been adopted (23 out of 50 adopted in 1986-2005), although the ratio of adoption has been decreasing (3 out of 12 adopted in 2000-05). The average participation rate for environmental referenda fell from 47% in 1986-95 to 41% in 1996-2005.

## 7. Implementation of Environmental Policies

### 7.1 Enforcement of environmental legislation

Through the subsidiarity principle, all levels of government making up the Confederation are able to introduce laws and regulations on environmental issues. Implementing regulations at the cantonal level concerning EIA, disaster prevention, improvement of installations, soundproofing of buildings and waste issues requires Federal Council approval. Permits for new buildings and plants are issued, on a case-by-case basis, through a system involving offices at the capable communal and

Table 4.8 Referenda relating to the environment

No.	Subject <sup>a</sup>	Date	Participation (%)	Results				Decision <sup>b</sup>
				People's vote		Cantons' vote		
			Yes	No	Yes	No		
343	PI for a just taxation of heavy vehicle traffic (fee)	7/12/86	34.74	485 930	948 612	0	20 <sup>6/2</sup>	-
348	FO of 19/12/86 on the Rail 2000 project	6/12/87	47.69	1 140 857	860 893			+
349	PI for wetlands protection, Rothenthurm initiative	6/12/87	47.67	1 153 448	843 555	17 <sup>6/2</sup>	3	+
351	FO of 20/3/87 for an amendment of the Federal Constitution in order to establish the basis for a co-ordinated transport policy	12/6/88	41.92	797 955	955 300	3 <sup>2/2</sup>	17 <sup>4/2</sup>	-
353	PI town-country against land speculation	4/12/88	52.83	686 398	1 543 705	0	20 <sup>6/2</sup>	-
356	PI for protection of small holdings and against factory farming (initiative in favour of small farms)	4/6/89	35.95	741 747	773 718	7 <sup>2/2</sup>	13 <sup>4/2</sup>	-
358	PI pro-speed 130/100	26/11/89	69.15	1 126 458	1 836 521	6	14 <sup>6/2</sup>	-
359	PI to halt excessive real estate development in order to stabilise the road system	1/4/90	41.13	500 605	1 255 175	0	20 <sup>6/2</sup>	-
360	PI for a region without motorway between Morat and Yverdon	1/4/90	41.10	571 640	1 175 333	0	20 <sup>6/2</sup>	-
361	PI for a motorway-free district in Knonau	1/4/90	41.14	547 353	1 197 678	0	20 <sup>6/2</sup>	-
362	PI against construction of a motorway between Biel and Solothurn/Zuchwil	1/4/90	41.06	592 231	1 147 434	0	20 <sup>6/2</sup>	-
365	PI for phase-out of nuclear energy	23/9/90	40.42	816 289	915 739	6 <sup>2/2</sup>	14 <sup>4/2</sup>	-
366	PI for halt to construction of nuclear power plants (moratorium)	23/9/90	40.44	946 077	789 209	17 <sup>5/2</sup>	3 <sup>1/2</sup>	+
367	FO of 6/10/89 concerning a constitutional article on energy	23/9/90	40.34	1 214 925	493 841	20 <sup>6/2</sup>	0	+
368	FA on road traffic, amendment of 6/10/89	23/9/90	40.30	899 051	803 621			+
370	PI for encouragement of public transport	3/3/91	31.24	496 645	840 374	1 <sup>1/2</sup>	19 <sup>5/2</sup>	-
377	FA of 24/1/91 on water protection	17/5/92	39.23	1 151 706	591 240			+
378	FO concerning PI against excessive application of reproduction and genetic engineering techniques to human beings	17/5/92	39.20	1 271 052	450 635	19 <sup>6/2</sup>	1	+
381	PI for water conservation	17/5/92	39.22	644 083	1 093 987	0	20 <sup>6/2</sup>	-
382	FO of 4/10/91 regarding construction of Swiss rail line across the Alps (Federal Order on Alpine transit)	27/9/92	45.90	1 305 914	747 048			+

Table 4.8 Referenda relating to the environment (cont.)

No.	Subject <sup>a</sup>	Date	Participation (%)	Results				Decision <sup>b</sup>
				People's vote		Cantons' vote		
				Yes	No	Yes	No	
385 <sup>c</sup>	FA of 4/10/91 on rural land law	27/9/92	45.65	1 058 317	917 091			+
388 <sup>c</sup>	FO of 9/10/92 on European Economic Area	6/12/92	78.74	1 762 872	1 786 708	6 <sup>2/2</sup>	14 <sup>4/2</sup>	-
389	FA of 9/10/92 concerning increased import duties on motor fuel	7/3/93	51.28	1 259 373	1 051 067			+
392	PI concerning the army, which "should also conform with the legislation on environmental protection"	6/6/93	55.58	1 124 893	1 390 812	6 <sup>2/2</sup>	14 <sup>4/2</sup>	-
405 <sup>c</sup>	FO of 18/6/93 on extension of fee for use of national highways	20/2/94	40.83	1 259 609	579 877	18 <sup>6/2</sup>	2	+
406	FO of 18/6/93 on extension of charge on heavy vehicle traffic	20/2/94	40.81	1 324 242	509 222	20 <sup>6/2</sup>	0	+
407	FO of 18/6/93 on introduction of heavy vehicle traffic charge related to services or consumption	20/2/94	40.79	1 221 630	597 911	18 <sup>6/2</sup>	2	+
408	PI for protection of Alpine regions from transit traffic	20/2/94	40.87	954 491	884 362	13 <sup>6/2</sup>	7	+
409 <sup>c</sup>	Civil Aviation Act, amendment of 18/6/93	20/2/94	40.67	1 081 844	689 715			+
418	FO concerning PI for competitive and environmentally friendly small holdings	12/3/95	37.94	836 215	866 107	8 <sup>2/2</sup>	12 <sup>4/2</sup>	-
420 <sup>c</sup>	FA on agriculture, amendment of 8/10/93	12/3/95	37.92	569 950	1 126 721			-
429 <sup>c</sup>	FO of 24/3/95 concerning abolition of federal contributions to parking spaces in vicinity of railway stations	10/3/96	30.98	741 219	632 792	11 <sup>6/2</sup>	9	+
430	Federal Assembly CP of 21/12/95 relating to PI "Farmers and consumers – agriculture in harmony with nature"	9/6/96	31.42	1 086 534	313 874	20 <sup>6/2</sup>	0	+
431	PI for protection of life and the environment from genetic manipulation (Genetic Protection Initiative)	7/6/98	41.32	624 964	1 252 302	0	20 <sup>6/2</sup>	-
442	FA concerning performance-related tax on heavy vehicles (Law on the Heavy Vehicle Tax)	27/9/98	51.8	1 355 735	1 014 370			+
443	PI for inexpensive food and ecological farms	27/9/98	51.57	535 873	1 793 591	0	20 <sup>6/2</sup>	-
445	FO concerning creation and financing of infrastructure projects for public transport	29/11/98	38.31	1 104 294	634 714	19 <sup>3/2</sup>	1 <sup>3/2</sup>	+
452	FA on land-use planning	7/2/99	37.96	952 482	750 130	18 <sup>3/2</sup>	2 <sup>3/2</sup>	+

Table 4.8 Referenda relating to the environment (cont.)

No.	Subject <sup>a</sup>	Date	Participation (%)	Results				Decision <sup>b</sup>
				People's vote		Cantons' vote		
				Yes	No	Yes	No	
462	PI for protection of people from reproductive technology manipulations (Initiative for reproduction respecting human dignity)	12/3/00	42.2	539 795	1 371 372	0	20 <sup>6/2</sup>	–
463	PI to halve motorised road traffic in order to maintain and improve living areas (initiative to halve traffic)	12/3/00	42.37	415 605	1 532 518	0	20 <sup>6/2</sup>	–
464	FO concerning approval of sectoral agreements between the Swiss Confederation and the European Union together with its member States if appropriate or the European Atomic Community	21/5/00	48.3	1 497 093	730 980	18 <sup>6/2</sup>	2	+
465	PI for the introduction of a solar cent (Solar Initiative)	24/9/00	44.7	636 848	1 364 751	0	20 <sup>6/2</sup>	–
465	CP: Constitutional article concerning a tax to encourage renewable forms of energy	24/9/00	44.7	922 481	1 055 977	4 <sup>1/2</sup>	16 <sup>5/2</sup>	∠
465	CP: Constitutional article concerning an energy charge for the environment	24/9/00	44.89	898 050	1 119 697	2 <sup>1/2</sup>	18 <sup>5/2</sup>	–
481	PI to ensure old-age pensions – tax energy, not work	2/12/01	37.85	397 747	1 342 001	0	20 <sup>6/2</sup>	–
498	PI for one Sunday per season without car – a four-year trial (Sunday Initiative)	18/5/03	49.8	881 953	1 460 794	0	20 <sup>6/2</sup>	–
501	PI for a change in the area of energy and for progressive shutting down of nuclear power plants (non-nuclear power)	18/5/03	49.71	783 586	1 540 566	1 <sup>2</sup>	20 <sup>5/2</sup>	–
502	PI Moratorium Plus – for extension of the moratorium on the construction of nuclear power plants and the limitation of nuclear risk (Moratorium Plus)	18/5/03	49.59	955 624	134 163	2 <sup>2</sup>	20 <sup>4/2</sup>	–
516	FA of 19.12.2003 concerning research on embryonic stem cells (Law on stem cell research)	28/11/04	37.02	1 156 706	585 530	20 <sup>6/2</sup>	0	+
520	PI for food produced without genetic technology	27/11/05	42.24	1 125 835	896 482	20 <sup>6/2</sup>	0	+

a) PI = popular initiative; FO = Federal Order; FA = Federal Act; CP = counter-proposal.

b) + = adopted; – = rejected.

c) Referendum with environmental aspects.

Source: Swiss Chancellery.

cantonal levels. The Confederation *supervises and co-ordinates the execution of environmental legislation* by the cantons<sup>13</sup> and directly executes some measures (e.g. prescriptions on heating oils and fuels).

*Cantons are the main authorities* capable of enforcing environmental laws in Switzerland. Each canton decides how to enforce environmental legislation and how to carry out inspections. No specialised service for environmental inspections has yet been established at cantonal level. The cantons often share this task with municipalities. Controls may be undertaken periodically to guarantee the quality of a service (e.g. provision of drinkable water in the Fribourg canton), but no obligation exists to do so.

Often at cantonal level, *emissions control* measures are developed jointly by administrations and industries, followed by information sharing on emissions to the environment. Automatic systems that monitor pollutant emissions have been installed for industrial plants in the canton of Basel-City (where a large part of the Swiss chemical industry is located), along with an early warning system for industrial accidents. This positive public-private co-operation has led to minimisation of random plant inspections. Unlike in most other OECD countries, no specialised inspection services have been established in Switzerland.

## 7.2 Industrial risk management and its liability

The *prevention principle* is the guiding principle of the 1991 Ordinance on Prevention of Major Accidents (OMA). Owners of installations subject to the OMA must reduce risk by taking all appropriate measures that are economically viable and consistent with the latest safety technology and experience. Switzerland became a Party to the 1992 Helsinki Convention on the Transboundary Effects of Industrial Accidents in 1999. The risk study of an installation includes preventive and mitigation measures.

However, greater *transparency* is needed in provision of information on health risks. Since the OMA does not oblige the competent cantonal authority to actively publicise information on risks associated with industrial sites, the practices adopted differ widely. As a minimum practice, cantonal authorities must disclose (on request) reports on inspections of industrial sites subject to the OMA, and, if applicable, the risk study summary established (for some industrial sites).

The *environmental liability* of enterprises and plants was established by the LPE in 1983.<sup>14</sup> With respect to civil liability, it is intended that the originator of environmental damage shall be liable for the costs of the damage. Other recent laws (e.g. the Law on Genetic Engineering) introduce different types of mandatory



compensation for environmental damage, sometimes as a result of international commitments.<sup>15</sup> In 2001, the Swiss Confederation promoted an international civil liability regime for transboundary environmental damage caused by industrial accidents. Although the PPP has not yet been fully implemented, there is a strong political will to introduce a wider environmental liability regime in Switzerland.

*Insurance coverage* in Switzerland is limited to legal liability for damage to persons or property resulting from a sudden accidental event. Primary environmental damage and gradual environmental impairment do not come under the normal liability coverage for businesses. The LPE suggests the possibility that insurance could cover the civil liability of owners of plants and installations, but no such insurance for environmental damage currently exists.

### 7.3 Economic instruments

*Use of economic instruments* has increased significantly in Switzerland in the past ten years (Box 4.3; Table 4.9). The sustainable development strategy 2000 identifies their use as a way to enhance implementation of the polluter pays principle (PPP), to internalise environmental externalities, and to promote efficiency in the mix of instruments used to achieve environmental objectives.

An economic evaluation of the *external environmental costs* incurred in various sectors has been carried out. The highest are for air pollution (e.g. related to health care costs deriving from energy consumption and traffic pollution), climate (e.g. related to energy consumption), nature and landscape protection (e.g. related to traffic, infrastructures and agriculture) and noise (e.g. related to traffic) (Table 4.6).

The main economic instruments currently used in Switzerland are the performance-linked heavy vehicle fee<sup>16</sup> (HVF), incentive taxes (e.g. VOCs tax, tax on sulphur content of extra-light heating oil and fuels), remedial taxes (e.g. landfill tax to finance remediation of contaminated sites), advanced disposal charges (e.g. on batteries and PET bottles), charges for financing public utility services (e.g. municipal waste and sewage taxes) and voluntary contributions (e.g. the proposed climate cent). An increasing amount is *levied by local authorities* through charges for environmental services (e.g. waste management and water services) (Iten and Pulli, 2001).

It is clear that *progress towards implementing the PPP has been made*. Many instruments adopted during the review period go in this direction, including fees for distances driven by heavy vehicles, incentive taxes on VOCs and on the sulphur content of extra-light oil, increased use of charges to cover water sanitation and waste services, the charge on waste disposal for businesses and households, and introduction of an anticipated disposal charge on batteries and glass.

Table 4.9 Economic instruments

Instrument	Level	Rates and totals	Notes	
<b>Air</b>				
Incentive tax on VOCs	Federal	2000/02 from 2003	CHF 2/kg (approx. CHF 180 million/year) CHF 3/kg (CHF 124 million in 2004)	Redistribution to households Exemptions until end 2008 if emissions are reduced
Incentive tax on extra-light sulphur heating fuel	Federal	from 1999	CHF 12/t if sulphur content > 0.1% (CHF 0.3 million in 2004)	Redistribution to households
Tax on sulphur fuels	Federal	from 2004	CHF 0.03/l if sulphur content > 0.001% (CHF 56 000 in 2004)	Redistribution to households Applies to petrol and diesel
Heavy vehicle fee (HVF)	Federal	2001/04 from 2005	1.68 cts per tonne-kilometre 2.44 cts per tonne-kilometre (CHF 845 million in 2004)	On average, the tax varies according to the vehicle's emissions category (EURO classification)
Fee for use of national roads	Federal		CHF 40 per year	Levied on vehicles whose total weight is less than 3.5 tonnes
Leaded/unleaded differential tax	Federal		CHF 0.734/l unleaded CHF 0.814/l leaded	
Aircraft charge (NO <sub>x</sub> , VOCs)	Zurich		CHF 119- 3 145/landing (CHF 4.5 million)	
<b>Water</b>				
Waste water charge	Communal		Rates rapidly increasing (over CHF 1 billion in 2003)	No charge on releases to the environment or on abstraction
<b>Noise</b>				
Aircraft landing charge	Geneva Zurich		CHF 100-800/landing	Earmarked revenue
Railway	Federal		CHF 0.01/axle-km	Noise premium on rail prices for improved rolling stock
<b>Waste</b>				
Per-bag tax	Communal		CHF 0.91-2.27/5 kg bag	Finances clean-up and rehabilitation of contaminated sites
Landfill tax	Federal		CHF 30-40 million/year	
Advance disposal charge	Federal		On packaging, batteries, refrigerators, etc.	
Deposit-refund	Private sector		On packaging products	

Source: OFEFP, 2005b; OECD database.

## 7.4 Land-use planning

In 1996, the Federal Council adopted the Swiss Planning Policy Guidelines, *aligning land-use planning with the goals of sustainable development*. The five orientations of these guidelines are: town and country planning, planning of urban spaces, strengthening of rural areas, protection of nature and landscape, and integration of Switzerland with the European urban network. Further to the Swiss Landscape Concept (1997 and 2003), SAEFL published the guiding principles “Landscape 2020” (Chapter 3). In the sustainable development strategy 2000, the Federal Council identified ten areas for action and 22 measures, one of which is a programme for sustainable spatial planning to respond to shortcomings in this area.

However, in practice spatial planning has *not been able to cope with urban and transportation infrastructure* so far (Box 4.4). In 2005, the Federal Office for Spatial Development (ARE) published the Spatial Concept for Switzerland, which consists of both nationwide framework strategies and specific spatial strategies. It aims to achieve a balance among the spatial needs of households and businesses, infrastructure, efficient use of land, protection of natural resources and social cohesion. Currently ARE is examining the use of economic instruments (i.e. tradable area-certificates, or handelbare Flächenzertifikate) and the freezing of some approved construction zones (ARE, 2005c).

## 7.5 Environmental impact assessment

As an essential part of decision-making, an *environmental impact assessment* (EIA) is requested in Switzerland for projects that could noticeably affect the environment, i.e. 73 types of installations classified in eight categories (transport, energy, hydraulic infrastructure, waste disposal sites, military buildings and infrastructure, sports-tourism-leisure, industry and other installations).<sup>17</sup>

*Co-operation* is required between the applicant, the main contractor responsible for drafting the environmental impact report (EIR), and the federal and cantonal authorities responsible for evaluating the EIR. The EIR aims at verifying conformity with environmental legislation. So far, most assessed projects have been approved with *conditions and modifications* (Table 4.10).

In Switzerland, the EIA is seen as a *vital co-ordination tool* that ensures enforcement of environmental legislation, especially as a preventive tool and in connection with consent procedures (OFEFP, 2004). EIAs also help to minimise environmental impacts of major construction projects at the design phase.

### Box 4.4 Urbanisation and spatial planning trends

In Switzerland there is continuing suburbanisation, urban sprawl and dispersion despite spatial planning. The last two decades have seen an *expansion of urban areas* (primarily at the expense of agricultural land), at a rate of one square metre per second. One-third of growth in urban areas is due to the construction of detached housing. The resident population is falling in city centres and rising in suburban areas. Economic development of medium-sized and small towns is weak, while economic activities tend to be concentrated in larger cities. The diversity of nature and the countryside is under threat (Chapter 3).

Urbanisation reflects an evolution in Swiss *consumption patterns* (e.g. with large-scale land consumption for settlement, transport and recreation intruding into agricultural areas, or near-natural areas and landscapes, and fragmenting plant and animal habitats). The result is higher infrastructure and maintenance costs and stress on the environment and landscapes.

Switzerland's *legally approved areas for building* currently encompass 220 000 hectares (excluding roads, railways, airports, etc.). Almost three-quarters of this area has already been developed. The remaining 60 000 ha could provide living space for as many as 2.5 million people (i.e. one-third of the Swiss population) (Figure 3.3). *Outside these legally approved areas for building*, and despite legal restrictions, there is still considerable construction activity: 13% of buildings planned for 2002 were outside approved areas (ARE, 2005b).

Table 4.10 Environmental impact assessments: actions by OFEFP<sup>a</sup>

	1990	1995	1998	1999	2000	2001	2002	2003
Preliminary phase	2	6	9	3	13	6	3	11
Preliminary inquiries	23	19	22	14	19	18	17	28
Environmental impact report (EIR)	23	57	67	83	63	61	45	53
Subsequent procedures	0	0	16	19	16	43	36	35
Result control							1	6
Total	48	82	114	119	111	128	102	133

a) Number of actions.

Source: OFEFP.

The Federal Council intends to *simplify procedures* for EIAs and EIRs. The workload could be reduced if some key environmental questions were addressed in the spatial planning stages.

## 7.6 Voluntary approaches

The *principle of collaboration* plays an important role in environmental policy in Switzerland. The experience of strong co-operation between industry and authorities (e.g. through sectoral agreements and flexible implementation) has fostered deeper involvement of industry and brought about positive policy performance. The commonly accepted rationale for voluntary approaches includes: i) allowing industry to decide how best to implement new environmental policies; ii) allowing industry time to evaluate the costs of meeting new environmental requirements; iii) involving industry directly in the process of policy design; and iv) providing a consistent and equitable allocation of costs and benefits in a market context. It should be noted that measures prepared by authorities (e.g. the federal proposal for a CO<sub>2</sub> tax) are expected to be substituted for voluntary measures if the latter are not effective (Box 7.1).

Industry has been associated with the *introduction of various incentive taxes* (e.g. on VOCs, the sulphur content of heating oil, gasoline and diesel fuel) and the design of recycling fees (e.g. on tin and aluminium packaging, PET bottles, batteries, recovered glass, and waste electric and electronic equipment). Industry is also associated with the promotion of environmental technology.

Examples of *implemented voluntary agreements* are:

- the “climate cent” (promoted by the Swiss Oil Association and supported by other business and transport associations) on transport fuels, levied by retailers and paid into a fund supporting mitigation projects and flexible mechanisms;
- voluntary measures by firms to reduce their CO<sub>2</sub> emissions (in order to avoid a CO<sub>2</sub> tax);
- voluntary measures by firms to reduce their VOCs emissions (in order to avoid a VOC<sup>18</sup> tax);
- voluntary measures by cement works to reduce NO<sub>x</sub> emissions.

## 7.7 Green public procurement and eco-labels

The government (i.e. the Confederation, cantons, municipalities) purchases goods and services worth about CHF 36 billion per year, more than 10% of national GDP. Switzerland promotes *green public procurement*. The legal basis for green

procurement of goods and services is provided by the 1994 federal Law on Public Procurement. In 2000 a survey conducted by the Federal Council showed that: i) measures to reinforce procurement guidelines (outlined in the 1997 sustainable development strategy), had yet to fully take effect; ii) efforts to implement the Federal Resources and Environmental Management Programme needed to be continued; and iii) incentives for green purchasing needed to be considered. The sustainable development strategy 2000 states that this measure is to be pursued and implemented in the course of normal administrative activities.

Led by FOEN, *criteria for public procurement* have been developed and harmonised through collaboration with the two largest associations of public purchasers in Switzerland, the Interest Group for Ecological Purchasing (IGöB) and the Co-ordination Group for Ecological Building (KöB). Training courses for federal purchasers are provided by the Federal Procurement Commission (BKB), enabling sustainable development and life-cycle analysis criteria to be taken into account.

Switzerland regards *eco-labels* as an effective way to promote sustainable consumption. This is one of eight core measures of the 1997 sustainable development strategy. Switzerland has pursued participation in EU eco-labelling. The Interdepartmental Committee Rio (IDC-Rio) insists on the Confederation's role in promoting eco-labels and provides 12 promotion measures to make production and consumption patterns more sustainable. A survey revealed that Swiss industry generally would prefer to adopt *EU eco-labels*. Certain consumer organisations and cantons would, however, welcome a Swiss eco-label in addition to the European ones (CI-Rio, 2000).

## Notes

1. It increased by 9% between 1990 and 2004 (by 11% between 1996 and 2004).
2. Materials directly consumed do not include those from domestic mining and quarrying not used in Switzerland but exported, or raw materials and energy used to produce goods imported into Switzerland.
3. Action 9, “Developing the energy and climate policy”, seeks in the long term to reduce greenhouse gas emissions to 1 tonne per person per year, and to meet energy consumption needs per person per year with 500 watts produced from fossil fuels and 1 500 watts from renewable energy. Action 10, “Promotion of clean vehicles”, states that the Federal Council wants first, during an interim period of ten years, to fit 400 000 motor vehicles with fuel-saving means of propulsion and 1.5 million private cars with noise-absorbent tyres. Action 13, “Programme of spatial planning measures”, states that the Federal Council will pursue the objective of stabilising built-on area at the current level of around 400 m<sup>2</sup> per inhabitant.
4. Previously the Interdepartmental Committee Rio (CI-Rio).
5. Payments to the Confederation or to a semi or non-state organisation which cannot be clearly classified as taxes or levies.
6. Payments to sectoral associations, made on a voluntary basis without any prescription by the Confederation (e.g. advance or non-advance contributions to recycling).
7. VOC wastes not subject to the tax declined in similar proportions (from 70 300 tonnes in 1998 to 50 400 in 2004).
8. It is currently being prepared for the reference years 1993 and 2003 (government, business and household expenditure).
9. Excluding household expenditure, for which data are not available, and with the double counting resulting from the addition of government expenditure to business expenditure estimated at CHF 568 million.
10. According to Article 73, the Confederation and the cantons “shall strive to establish a durable equilibrium between nature (in particular its capacity to renew itself) and its use by man”.
11. The “subsidiarity principle” means that federal authorities do not take action (except on matters for which they alone are responsible) unless such action would be more effective than that taken at the cantonal or municipal level.
12. Twenty cantons and six “half cantons”.
13. Article 38 of the LPE.
14. Article 59.
15. For example, the Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal (1999) provides a comprehensive liability regime.
16. Linked to environmental performance.
17. Another category was added in 1999: enterprises with activity implying GMOs of a certain type.
18. The tax is only reimbursed if the enterprise uses the VOCs in conformity with the requirements and proves it.

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# 5

## ENVIRONMENT AND AGRICULTURE\*

### Features

- The environment in Switzerland's agricultural policy priorities
- Cross compliance of agricultural support and agri-environmental measures
- Negative environmental effects of agriculture
- Positive environmental effects of agriculture
- Consumer expectations

\* The present chapter reviews progress achieved in the last ten years and particularly since the previous OECD Environmental Performance Review of 1998. It also reviews progress with respect to the objectives of the 2001 OECD Environmental Strategy.

## Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of Switzerland:

- pursue *agricultural policy reform* in order to enhance economic competitiveness and, at the same time, ecological efficiency; in this context, continue to give high priority to meeting agri-environmental objectives;
- continue to *reduce pollution of agricultural origin*, in particular through targeted and regional actions;
- maximise *agriculture's beneficial effects* on the environment, especially with regard to biodiversity and the landscape;
- develop a market conducive to trade in more environmentally friendly products by applying the principles of integrated product policy to the entire *agri-food chain*, and by heightening consumer awareness;
- continue to develop *monitoring and evaluation*, especially in areas for which indicators are insufficient, and base the formulation of future objectives on extensive analysis and on close co-operation among all the parties involved;
- bolster co-ordination between *agricultural and other policies* (e.g. environmental, regional, forestry) and between actions taken by federal and cantonal authorities.

## Conclusions

The interconnections between agriculture and the environment have been even more central to Swiss agricultural policy since a referendum held in 1997. Except for the nitrogen balance at national level and the protection of lowland biodiversity, *agri-environmental objectives* have on the whole been achieved, including those of the “Agricultural Policy 2007” programme. Agriculture’s *negative effects* on the environment (e.g. from phosphorus and greenhouse gases) have been reduced in most areas, with some exceptions remaining. The *positive effects* (e.g. with regard to biodiversity, landscapes) have been increased. The use of *natural resources* seems to have become more efficient. Monitoring and evaluation activities have been expanded, as has scientific and quantitative analysis of policy impacts. As a result, new programmes, including “*Agricultural Policy 2011*”, are being prepared based on more solid information. Professionals and NGOs contribute actively to this effort and often take initiatives themselves in the agri-environmental area.

However, the overall level of support for agriculture (as measured by the “producer support estimate”, calculated by the OECD) remains very high. The form of this support is nevertheless shifting in a direction favourable to the environment, as *direct payments, essentially targeting environmental services*, are increasing to the detriment of price supports, which have been a major source of distortions. This policy shift ought to be continued so as to improve the competitiveness of Swiss agriculture and support the pursuit of environmental objectives. Problems involving *specific regional pollution* (e.g. ammonia, nitrates, pesticides, etc.) persist and ought to be addressed by actions that are targeted more precisely. In a number of cases in recent years, the pace of pollution abatement seems to have slowed. Despite progress in monitoring and evaluation, certain areas are not yet covered by reliable indicators, and on some points evaluations still do not agree. The *integration of various other policies* (e.g. regional, forestry) with agricultural policy is still insufficient, and the cantons’ implementation of the regional programmes of federal policies, as well as their participation in monitoring and evaluation, are still unsatisfactory. The environmental components of activities along the entire agri-food chain (e.g. transformation, marketing) are not well understood, nor is *consumer demand*, and labelling techniques are not always uniform.



## 1. Evaluation of Environmental Performance

### 1.1 Objectives

Agricultural output as a share of the Swiss economy is steadily shrinking (Box 5.1). The *new article on agriculture in the Federal Constitution* (Article 104), adopted by referendum in 1996, specifies that agriculture should not only provide quality products but also environment friendly public goods and services (Box 5.2). In addition, it refers to conservation of natural resources and to maintaining the rural landscape. These objectives with regard to agriculture are part of the broader goal of sustainability written into the new Constitution in 1999.

*Environmental objectives*, which have become an essential element of Swiss agricultural policy, figure in the 1998 Law on Agriculture and successive reform programmes (Agricultural Policy 2002, Agricultural Policy 2007). Agricultural Policy 2007 sets out specific agri-environmental objectives for 2005 (for nitrogen, ammonia, phosphorus, plant protection products, nitrates, biodiversity and farming practices).

### Box 5.1 Swiss agriculture

Agriculture as a share of Switzerland's GDP (1%) is among the lowest in the OECD area (the OECD average is 3%). Similarly, agricultural employment as a share of the labour force is 3.7% (compared with an OECD average of 6.1%). Agricultural policy accounts for some 7% of the federal budget. Agricultural expenditure by the Confederation, cantons and communes accounts for 2.6% of total public expenditure in Switzerland. The agro-food sector as a whole accounts for 8% of GDP and 12% of labour.

Agricultural land covers 37% of the country (1.52 million hectares). It includes land under cultivation (less than 30%) and permanent meadows and pasture (over 70%). Most permanent meadows and pasture are natural (84%), while 16% are artificial. The agricultural area in use covers some 1 million hectares, 47% in the lowlands and 53% in the uplands. There are 500 000 hectares of summer pasture, a feature specific to Switzerland. The amount of land devoted to agriculture has remained relatively stable over the decade. However, a growing share of peri-urban arable land is being converted for development.

Agricultural output has fallen by almost 5% since 1990, in contrast to a rise in most OECD countries. The decline has occurred in both livestock rearing and crop farming. Milk and beef account for one-third of gross output, other animal products for 15% and special crops (fruit trees, vineyards) for 12%. Arable crops account for only 8%.

There has been a strong, steady decline in the number of farms. From 1990 to 2005 losses amounted to 30 000 units. As of 2005 there were 64 000 farms, at 72% of which farming was designated the main activity, and 35 000 of which were in the lowlands. Farm size averages 17 hectares (excluding summer pasture).

In 2004, average agricultural income was CHF 60 000. Earned income per unit of household labour was CHF 40 000, around two-thirds of the comparable average income in other economic sectors. Extra-agricultural income averaged CHF 22 000.

The self-sufficiency rate is 59%: 94% for animal products and 44% for plant-based products. In 2004 Switzerland's agricultural imports were worth CHF 8.9 billion and its exports CHF 4 billion; 77% of its imports came from the EU and 69% of its exports went to the EU.

The draft *Agricultural Policy 2011* (AP 2011), drawn up by the federal government for forthcoming submission to Parliament by the Federal Council, confirms the shift in agricultural policy that has been under way for several years now. One of the five orientations of AP 2011 includes specific support for pursuing environmental objectives (Box 5.3). The broad aim of AP 2011 is to cut costs and

### Box 5.2 Article 104 of the Federal Constitution

The Confederation shall ensure that agriculture makes a substantial contribution, through sustainable and market-oriented production: to secure provisioning of the population; to conservation of natural resources and maintenance of the rural landscape; to decentralised habitation of the country.

In addition to the self-help measures that could reasonably be expected from agriculture and, if necessary, in derogating the principle of economic freedom, the Confederation shall promote cultivation of the land by farms.

It shall conceive measures in such a way that agriculture is able to fulfill its multiple functions. Its powers and tasks shall be the following, in particular:

- it shall complement agricultural revenues by direct payments to secure fair and adequate remuneration for services rendered, provided that compliance with ecological requirements is proven;
- it shall promote, through economic incentives, forms of production which are particularly close to nature and friendly to the environment and to animals;
- it shall legislate on the declaration of foodstuffs' origin, quality, production and processing methods;
- it shall protect the environment against pollution due to excessive use of fertilisers, chemicals and other auxiliary substances;
- it may encourage agricultural research, counseling and education, and subsidise investments;
- it may legislate on the consolidation of rural property.

To these ends, it shall invest dedicated funds from the agricultural sector and general federal funds.

improve the competitiveness of Swiss agriculture by narrowing the price gap with other countries. This responds to economic pressures at home and abroad, particularly in the context of budgetary pressure and food tourism, as well as to the possible free trade agreement on agriculture between Switzerland and the European Community currently under study. One option being considered is to reallocate, to direct payments, all export subsidies and over half the funds now used for market support. The steady decline of controlled prices is expected to lead to more extensive farming. AP 2011 seeks to promote efficient resource use within the framework of “project initiatives” (OFAG, 2006).

### Box 5.3 The five orientations of Switzerland's Agricultural Policy 2011

1. *Make production and processing more competitive* through the reallocation of financial resources earmarked for market support to direct payments, and through cost-cutting measures.
2. Use a simplified system of direct payments to guarantee the services rendered by agriculture for the public good and to *promote ecological development*.
3. Foster the creation of *value-added and sustainable development in the countryside* by increasing possibilities to differentiate products and grant investment support, and by backing community initiatives.
4. Curb the impact of structural adjustment at the *social level* and make rural property law and farm tenancy law more flexible in order to support that trend.
5. *Cut red tape* and streamline controls.

## 1.2 Measures

For over a decade the growth of direct payments as a share of agricultural support<sup>1</sup> has been the *essential element of reform* of agricultural policy and, in particular, the main incentive to achieve environmental objectives. Direct payments account, on average, for 20% of gross farm income and for as much as 35% in upland areas.

In 1998, Switzerland introduced procedures for *cross compliance*, whereby financial support is withdrawn from producers that fail to comply with specific management practices. Farmers must meet six criteria for “required ecological services”. The criteria are: i) to achieve a good fertiliser balance; ii) to leave at least 7% of agricultural area in use (excluding mountain pasture) as semi-natural habitat (“ecological compensation areas”<sup>2</sup>); iii) to implement “appropriate” crop rotation (in order to reduce pesticide use, for instance, and improve soil fertility); iv) to ensure that there is minimum plant cover (in order to prevent the risk of soil erosion and farm input leaching); v) to practise limited and targeted use of pesticides; and vi) to rear livestock in accordance with animal welfare-friendly methods. In 2004, 97% of Swiss farms met these criteria.

*Ecological payments* remunerate services that go beyond the required ecological services scheme and are provided as part of optional programmes. They include additional ecological compensation areas, or ecological compensation areas of higher ecological quality, organic farming<sup>3</sup> and additional animal welfare measures<sup>4</sup> (Table 5.1). Payments are also made to farmers who take additional steps to prevent input leaching.<sup>5</sup>



In 2004, *expenditure on direct payments by FOAG (Federal Office for Agriculture)* was some CHF 2.5 billion, 80% in “general direct payments” and 20% (CHF 0.5 billion) in ecological payments (Table 5.1). Since (and despite) the introduction of cross compliance (which applies to all general direct payments), ecological payments have been steadily increasing as a share of total direct payments (17% in 2000). Ecological payments account for a smaller share of total direct payments in upland areas, where other types of direct payment are becoming increasingly significant, including “payments for rearing livestock under harsh conditions”.

*Total producer support* is still among the highest in the OECD area. The Producer Support Estimate (PSE), which measures transfers as a percentage of gross farm receipts, has remained around 70% for the past ten years (68% in 2004, compared with the OECD average of 30%). The share of market price support and

Table 5.1 Trends in direct payments,<sup>a</sup> 2000-04  
(CHF 000)

Type of payment	2000	2001	2002	2003	2004
“General direct payments”	1 803 658	1 929 094	1 994 838	1 999 091	1 993 915
– area payments	1 186 770	1 303 881	1 316 183	1 317 956	1 317 773
– livestock rearing on rough fodder	258 505	268 272	283 221	287 692	286 120
– livestock rearing under harsh conditions	251 593	250 255	289 572	287 289	284 023
– sloping land	96 714	96 643	95 811	95 630	95 308
– vineyards on steep slopes and terraces	10 076	10 043	10 051	10 524	10 691
“Ecological direct payments”	361 309	412 664	452 448	476 724	494 695
Ecological payments:	278 981	329 886	359 387	381 319	398 109
– ecological compensation areas	108 130	118 417	122 347	124 927	125 665
– OEQ areas (Ordinance on Ecological Quality)	–	–	8 934	14 638	23 007
– extensive cereal and rapeseed crops	33 398	35 526	31 938	31 255	30 824
– extensive grassland on land set aside	17 150	–	–	–	–
– organic farming	12 185	23 488	25 484	27 135	27 962
– animal welfare-friendly livestock housing	108 118	155 455	170 684	183 363	190 651
Summer grazing payments	81 238	80 524	89 561	91 381	91 066
Water protection payments	1 090	2 254	3 500	4 024	5 521
Deductions	22 542	16 763	21 143	17 138	18 120
Total direct payments	2 142 425	2 324 995	2 426 143	2 458 677	2 470 490

a) These figures are not comparable with national accounts. The figures concerning direct payments refer to a full year of payments, whereas the national accounts show expenditure for the calendar year. Deductions are those based on ceilings and legal and administrative penalties.

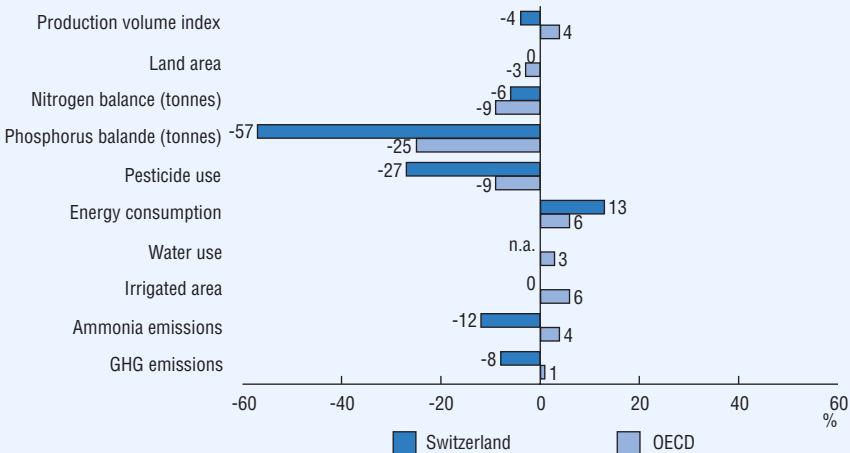
Source: OFAG.

payments based on output or on input use, which was 90% in 1990, fell from 69% in 2000 to 64% in 2004.<sup>6</sup> These forms of support are the most closely coupled to output and therefore put the greatest pressure on the environment.

### 1.3 Progress and outlook

By and large, Swiss agriculture has made notable progress with regard to management of the environment, against a background of slightly slower activity (Figure 5.1). Some very comprehensive reports assess whether the *environmental objectives in Agricultural Policy 2007* have been achieved (OFAG, annual report). They conclude that most of the objectives for 2005 set by the Federal Council have been met, except in the case of lowland biodiversity and the nitrogen balance (Table 5.2). Some of the objectives in AP 2007 are considered to be “stage targets”, as they do not represent the “ecological optimum”. Hence the higher targets for ammonia and phosphorus in the draft *Agricultural Policy 2011* (Table 5.3). AP 2011 sets the same objectives as AP 2007 for lowland biodiversity and nitrogen surpluses but with longer time horizons (2009 and 2015, respectively). In late 2005 FOAG and FOEN began working together to define longer-term objectives (2015-20) as possible input for a future agricultural policy programme.

Figure 5.1 Agri-environmental performances of Switzerland, 1990-2002<sup>a</sup>



a) Change in per cent from 1990-92 to 2000-02.

Source: OECD, Environmental indicators for agriculture, Volume 4 (in progress); FOEN.

Table 5.2 **Agri-environmental objectives, up to 2005**

Parameter	Unit	Year		Objective (%)
		Base	2005	
Nitrogen balance				1994-2005
Losses <sup>a</sup>	Lost tonnes	96 000	74 000	-23
Surpluses	Surplus tonnes <sup>b</sup>	123 000	95 000	-23
Ammonia emissions				1990-2005
	Tonnes of nitrogen in NH <sub>3</sub> emissions	53 300	48 500	-9
Nitrates				1990-2005
	% of drinking water withdrawal points <sup>c</sup> < 40 mg/l	..	90	..
Phosphorus balance				1990/92-2005
	Surplus tonnes <sup>b</sup>	-20 000	10 000	-50
Pesticide use				1990/92-2005
	Tonnes active ingredients	2 220	1 500	-30
Biodiversity				1993-2005
Total	Hectares of ECAs <sup>d</sup>	19 300	108 000	460
Lowlands	Hectares of ECAs <sup>d</sup>	5 700	65 000	104
Land use				
	Ratio of PER <sup>e</sup> and organic farming to agricultural area in use <sup>e</sup>	0.9	98	

a) Losses relevant to the environment.

b) Using the OSPAR method.

c) Withdrawal points in drainage basins used by agriculture.

d) Ecological compensation areas.

e) PER: *prestations écologiques requises* (required environmental services).

Source: OFAG, 2006, AP 2007, AP 2011.

Table 5.3 **Agri-environmental objectives of Agricultural Policy 2011**

Parameter	Unit	Year		Objective (%)
		Base	Target	
Nitrogen balance				1994-2015
	Surplus tonnes <sup>a</sup>	123 000	95 000	-23
Ammonia emissions				1990-2009
	Tonnes of nitrogen in NH <sub>3</sub> emissions	53 300	41 000	-23
Phosphorus balance				1990/92-2009
	Surplus tonnes <sup>a</sup>	-20 000	5 000	-75
Lowland biodiversity				1993-2009
	Hectares of ECAs <sup>b</sup>	..	65 000	104

a) Using the OSPAR method.

b) Ecological compensation areas.

Source: OFAG, 2006, AP 2011.

Among farmers, the *extent of their participation* in direct ecological payments is a good indicator of their “environmental commitment”, in that the programme is optional. Land set aside for “ecological compensation”, for example, covers some 100 000 hectares,<sup>7</sup> or about 10% of usable farmland, a figure that exceeds the 7% target set for the ecological services scheme. In upland areas, where ecological payments have a strong financial appeal, the figure is as high as 14%, whereas in the lowlands it is below target at 7%.<sup>8</sup> Some 110 000 ha is given over to *organic farming* on 6 000 holdings (9% of the total), most of which are located in upland areas.

As ecological compensation areas (ECAs) do not always meet environmental standards, an *Ordinance on Ecological Quality* (OEQ)<sup>9</sup> was issued in 2001. It provides for special payments<sup>10</sup> for ECAs of special biological quality and their integration into networks (Box 5.4). In 2004 this programme covered 42 700 hectares

#### Box 5.4 Implementing the Ordinance on Ecological Quality in the Intyamon area (canton of Fribourg)

The Ordinance on Ecological Quality sets out the *basic organic quality requirements* to be met by ecological compensation areas (ECAs). In particular, extensive and low-intensity grassland, as well as litter meadows, should contain a number of indicative plant species. High-branched fruit trees should be in an orchard (of at least ten trees), which should in turn be combined with another ECA. Hedgerows, copses and riparian woodland should be at least 2 metres wide (excluding grass strips) and should be confined to species from the area. The ordinance also prescribes *basic requirements for creating networks of ECAs* to establish biodiversity corridors. Specifically, ECAs should be located along watercourses or next to woodland, or adjoin existing ECAs.

The ordinance is complied with in the *Intyamon area*, where there are some 50 farms. By 2005, 37 farmers had registered ECAs that satisfied the network criteria and accounted for 12% of the surface area. The network has helped to maintain land of little economic but great ecological value (e.g. 74 species of butterfly). Objectives have generally been met for pastures and extensive grassland (most of the network), but not for wetlands and alluvial areas or for high-branched fruit trees and grass strips. Although they comply with mowing restrictions to protect certain species of birds, farmers have not been persuaded to locate ECAs in the lowlands on high-yield farmland.

Farming in the Intyamon reflects agricultural trends in Switzerland (and elsewhere in Europe) in that the farmers are adopting more intensive methods in the lowlands, which are easily accessible and easy to farm, but neglecting marginal land where woodland is encroaching. The network project is an attempt to respond to this, as: i) the sides of the valley provide very valuable habitats for insects, reptiles and some birds, together with substantial meadows and pastures of national importance; and ii) the valley floor is a nesting area for the whinchat (on the Red List of endangered species). Educational activities, targeting all sections of the population, include paths with information panels, organised talks and press releases. Special studies are being conducted on the whinchat.

and 20 000 farms (30% of the total). The draft *Agricultural Policy 2011* proposes an increase in direct payments for OEQ areas, to the detriment of other land of a poorer environmental standard. There are also plans to simplify the required environmental services scheme, without reducing the current level of service provision, and to step up controls.<sup>11</sup> It is expected that these measures, combined with the fall in controlled farm gate prices, will lead to a sharp increase in ECAs.

The most innovative feature of AP 2011, with regard to the environment, is a new programme to promote “sustainable resource use” which recommends a *project approach* that is more targeted (to specific areas or sectors) and more integrated than current measures (it would address environmental management as a whole). The idea is to promote environment friendly innovations<sup>12</sup> at a certain (e.g. regional) level by offering start-up support. This programme would supplement current measures and would be optional, based on an agreement between the Confederation and both private and public bodies, and between these bodies and farmers. Studies are under way on a possible framework for such projects, e.g. in the potato sector. Projects would be limited to six years.

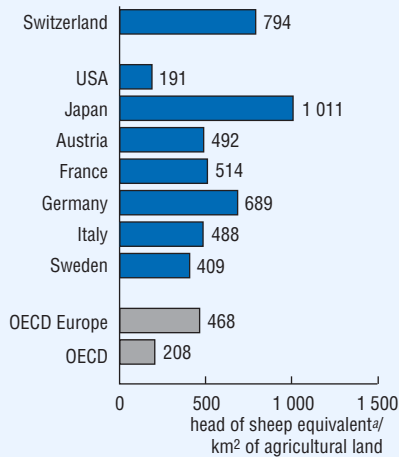
## 2. Better Management of Farm Inputs

### 2.1 Nitrogen

This is one of the areas in which the agri-environmental objectives for 2005 have not been met. The soil surface *nitrogen balance*, as estimated by the OECD, has remained relatively stable over the decade, falling from an annual surplus of 77 kg/ha of agricultural land<sup>13</sup> in 1990-02 to 76 kg/ha in 2000-04. The decrease in inputs (reduction of cattle headage,<sup>14</sup> special measures to reduce excess nitrogen from livestock rearing and to restrict the use of chemical fertilisers) has been offset by a decrease in outputs (growth of ecological compensation areas, increase in organically farmed land). In terms of nitrogen outputs,<sup>15</sup> Switzerland is in the highest third of OECD countries at around 55%.

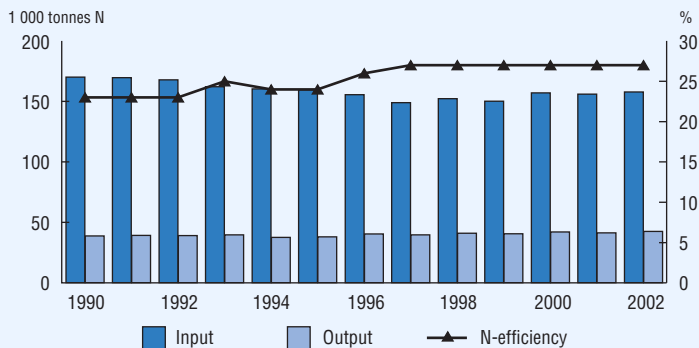
Nevertheless, further reductions of surplus agricultural nitrogen are possible. Switzerland is in the lowest third of OECD countries in respect to its nitrogen balance. The main source of agricultural nitrogen is *livestock manure*, which accounts for around half of total inputs.<sup>16</sup> Livestock density is very high in Switzerland compared with the OECD average (Figure 5.2). Here, too, there has been progress: slurry spreading has decreased<sup>17</sup> (by almost 10% over ten years). However, the first inventory of surplus farmyard manure<sup>18</sup> (SFM) for the year 2003 shows that 9% of farms with livestock are running surpluses,<sup>19</sup> which combine to produce the equivalent of some 1 400 tonnes of phosphorus. In 2003, the Federal Council turned down a proposal to impose a penalty on SFM.

Figure 5.2 Livestock density, 2005



a) Based on equivalent coefficients in terms of manure: 1 horse = 4.8 sheep; 1 pig = 1 goat = 1 sheep; 1 hen = 0.1 sheep; 1 cow = 6 sheep.

Source: FAO (2006), FAOSTAT data.

Figure 5.3 Management of agricultural inputs<sup>a</sup>

a) Trend in N input and output and in N-efficiency according to the OSPAR methodology.

Source: Agroscope FAL Reckenholz.

The measures in Agricultural Policy 2011, such as targeting the fertiliser balance as part of required ecological services and adopting a new “project approach”, may *improve future efficiency*, as nitrogen surpluses are concentrated in specific parts of the country. Nitrogen efficiency, measured using the OSPAR method, i.e. ratio of outputs to inputs, has been stable at 27% since the mid-1990s (Figure 5.3). It would require 31% efficiency to meet the objective for 2005 for reducing nitrogen surpluses, which has been extended to 2015.

## 2.2 Phosphorus

Switzerland has reduced its agricultural phosphorus surplus by half and is currently at the OECD average: soil surface *phosphorus balance* has been cut from 12 kg/ha of agricultural land<sup>20</sup> (1990-92) to 5 kg/ha (2002-04). In terms of phosphorus output, Switzerland ranks in the highest third of OECD countries, at around 70%.

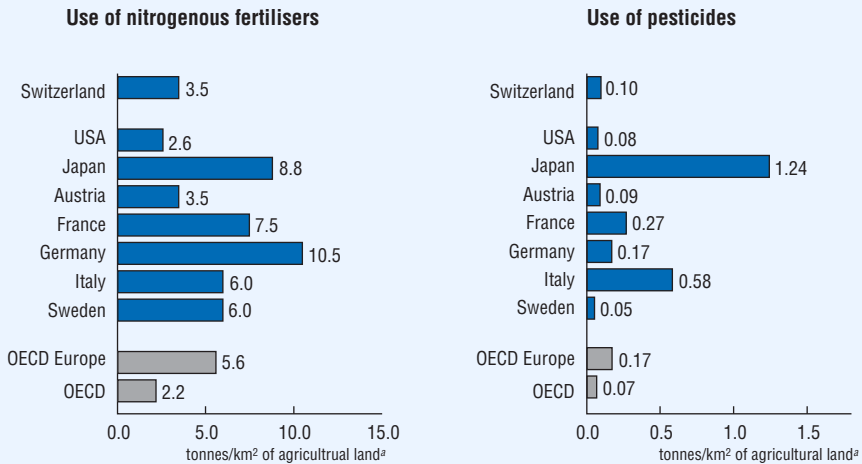
However, *regional problems persist*, particularly in the area of small lakes on the Swiss plateau where the soil’s phosphorus load is extremely high.<sup>21</sup> Hence the recommendation in the draft AP 2011 that surplus phosphorus be further reduced, by around 20% in the period 2002-09. As in the case of nitrogen, the main source of agricultural phosphorus is livestock manure. The measures taken to reduce surplus farmyard manure, together with other measures in AP 2011, also target phosphorus.

## 2.3 Plant protection products

Switzerland has reduced *pesticide use* (per tonne of active ingredient) by 27% over the decade. All categories of plant protection products have been affected (fungicides, herbicides and insecticides). This trend is due mainly to the introduction of active ingredients that are effective at much lower doses (particularly in the case of herbicides) and to the implementation of subsidised extensification schemes (insecticides, fungicides and growth regulators). The decrease in crop production, growth in the share of arable land and perennial crops treated with Integrated Pest Control (very high in Switzerland, at around 90%) and the sharp increase in organic farming have also helped to reduce pesticide use.

AP 2011 does not set any objectives for reducing the use of plant protection products, as the objectives in AP 2007 have been met. Yet the rate of decline in pesticide use has slowed in recent years and intensity of pesticide use is above the OECD average (Figure 5.4). There is some groundwater contamination by pesticides (Chapter 2). Efforts to reduce the use of plant protection products should therefore continue, with targets that reflect the *toxicity* of pesticides<sup>22</sup> (rather than just volume of sales, as in AP 2007).

Figure 5.4 Agricultural inputs, early 2000s



a) Arable and permanent crop land and permanent grassland including upland meadow.

Source: FAO (2004), FAOSTAT data; OECD, Environment Directorate.

### 3. Reducing the Negative Effects

#### 3.1 Air and climate

The agriculture sector accounts for 96% of total *emissions of ammonia* (NH<sub>3</sub>), virtually all of which are from livestock rearing (90%). Switzerland reduced its NH<sub>3</sub> emissions from 67 700 tonnes in 1990-92 to 59 000 tonnes in 2005, meeting its commitments (for 2010) under the Gothenburg Protocol.<sup>23</sup> Two thirds of this reduction is attributable to a decline in livestock headage. However, the concentrations of ammonia in the air and precipitation have remained virtually the same over the period in question. Reducing NH<sub>3</sub> emissions to 30-35 000 tonnes/year would be desirable in order to comply with the critical loads<sup>24</sup> specified in the Protocol. Furthermore, there are very marked *regional disparities* and emissions are still high in central and north-eastern Switzerland, where stocking density and manure-spreading are significant. AP 2011 proposes to reduce ammonia emissions to 41 000 tonnes/year by 2009 (Table 5.3).

Agriculture's share of *emissions of greenhouse gases* (GHG) in Switzerland is around 12% (compared with the OECD average of 9%). Agricultural GHG emissions decreased by 8% between 1990-92 and 2000-02, mainly due to the reduction in livestock



headage. This decrease of 550 000 tonnes of CO<sub>2</sub> equivalent (compared with 1990) satisfies 13% of Switzerland's commitments (up to 2010) under the Kyoto Protocol. It includes methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) (a 10% decrease for each), while CO<sub>2</sub> emissions increased by 8% (the same percentage increase as for fuel combustion in agriculture). Livestock rearing remains the leading source of GHG emissions (52%), followed by crop growing (33%) and fuel combustion (15%) (Chapter 7).

Agriculture accounts for only 0.7% of total final energy consumption (or 0.14 Mtoe) and its *energy consumption* (fuel and electricity) has risen by 13% over the past ten years, in spite of the fall in agricultural output. The agricultural energy balance shows that energy efficiency in agriculture<sup>25</sup> has remained stable over the past decade at around 40%. It also shows significant potential for energy savings (and hence lower production costs) on the least efficient farms. To date, there has been no marked substitution of *renewables* for fossil fuels in agriculture, although this would be highly beneficial. Farmers who undertake renewable energy production<sup>26</sup> receive a special grant (since 1993), but resource allocation is low (around CHF 1 million per year). Since 1999 payments have been available to reduce the price of raw materials for ethanol and other fuels produced from biomass. Few applications have been submitted. AP 2011 proposes encouraging the use of biomass for energy purposes, in particular biogas production from crop residues and slurry or solid manure.

With regard to *ozone-depleting substances*, methyl bromide use has long been prohibited in Switzerland.

### 3.2 Water

The share of agricultural *nitrates* in surface water is around 40% (compared with 22% for phosphorus). Water pollution by agricultural nitrates, a major long-term environmental issue, has declined; nitrate levels in 97% of drinking water withdrawal points located in mainly agricultural drainage basins are below the 40 mg/l ceiling, a performance that exceeds the target for 2005. The remaining 3% are located mainly in arable areas. Nitrate concentrations in groundwater remain above the Swiss norm for drinking water (25 mg/l) in 350 mainly agricultural communes. Switzerland does not publish a list of "vulnerable" zones as defined in the EU Nitrates Directive, nor does it designate areas as such. However, Swiss water quality legislation is based on a definition identical to that of the EU. AP 2011 will broaden the riparian buffer zones (from 3 to 6 metres) required under the 2005 Ordinance on Chemical Risk Reduction (Chapter 2).

At 20% of National Groundwater Quality Monitoring Network (NAQUA) stations, which are located mainly in arable areas, recorded *pesticide* levels exceed the 0.1 mg/l drinking water standard. Groundwater contamination is mainly due to

atrazine,<sup>27</sup> reportedly because of its extensive use over a long period as an herbicide to protect maize (Chapter 2).

### 3.3 Soil

*Soil erosion* is not a major problem for Swiss agriculture in general. However, localised erosion<sup>28</sup> has been responsible for a decline in agricultural productivity and for damage to aquatic environments. Improving ground cover has been one of the required ecological services since 1998, in particular maintenance of a winter plant cover.<sup>29</sup> Combined with other soil conservation practices (Swiss agricultural policy promotes the continued cultivation of slopes), this should contribute to reducing the risks of soil erosion and pesticide leaching.

A greater cause for concern is the problem of *heavy metal concentrations* on agricultural land: at least 10% of these concentrations exceed the standard. The 2006 ban on the use of sewage sludge as agricultural fertiliser should help to improve the situation.

## 4. Increasing the Positive Effects of Agriculture

### 4.1 Biodiversity

Red Lists of *endangered species* are not specific to agriculture, but Switzerland has identified species that are endangered and are particularly associated with agriculture. The share of wild species using agricultural land as habitats<sup>30</sup> is 75% for mammals, 55% for butterflies and 22% for wild birds. Agricultural practices are reducing the ecological functions of 55% of the country's most important bird conservation areas (Chapter 3).

*Semi-natural habitats* increased by some 20 000 hectares over the review period,<sup>31</sup> to 624 000 hectares (almost 40% of all agricultural land), while the total amount of land devoted to agriculture remained stable. Most of these habitats are extensive Alpine pasture<sup>32</sup> (86%), extensive grassland (7%) and low-intensity grassland (7%). Arthropods (spiders, beetles, butterflies, wasps and bees) with semi-natural habitats are far more numerous than those that use more intensively farmed land (intensive grassland, fields of cereals).

Crop diversity has declined sharply, with food supply provided mainly by 12 crop varieties and 5 species of domesticated animal. Under the National Action Plan for the Conservation and Sustainable Use of *Phytogenetic Resources* (PAN), launched in 1997, there has been a complete inventory of crops and of the pressures threatening them, covering 2 800 varieties or lines of fruit and almost 2 000 varieties

or lines of cereal. This is speeding up their conservation *ex situ* (in vitro, in gene and seed banks, and in field collections of fruits and vines). A programme for the conservation and sustainable use of Switzerland's animal genetic resources (commercial breeds) is also under way.

## 4.2 Landscape

Landscape maintenance and decentralised settlement patterns are two of Switzerland's agricultural policy objectives. *In the absence of specific indicators*, however, it is difficult to judge whether the landscape maintenance objective has been met. Over the past few decades, both usable farmland and Alpine areas have been shrinking at a rate of 3% per year (the sharpest decline has been on the southern slopes of the Alps), while built-up areas and woodland have expanded by 13.3% and 1.4% per year, respectively. However, the encroachment of woodland on usable farmland appears to have slowed substantially in recent years. Alpine areas are continuing to shrink (Chapter 3).

*Ecological payments* contribute to the maintenance of typical features of the Swiss landscape, such as summer pastures and ecological compensation areas (ECAs). Summer grazing payments have been an integral part of Swiss agricultural policy for many years (Table 5.1). Ecological compensation measures were introduced in 1992. There are 3 million fruit trees in Switzerland. Not only are they a fundamental part of the landscape, but they are particularly important to wild bird habitats and entitle farmers to ecological payments.

The *national research project* on Alpine landscapes and habitats (PNR 48) should provide additional insight into how agriculture, and specific agricultural policy measures, actually help to maintain the landscape. A study in the Geneva area demonstrates the importance of hedgerows, extensive flowered meadows and fruit trees (the Geneva agri-environmental network) in landscape diversification, whether the landscapes are new or older elements are being restored (Bischofberger and Viollier-Schaerrer, 2006).

## 4.3 Animal welfare

Swiss agricultural policy gives *high priority to animal welfare*. Two programmes have been put in place: regular access to fresh air (SRPA) in 1993, and improved animal housing (SST) in 1996. Participation in these programmes has grown rapidly, with 40 000 and 20 000 farms, respectively, joining them. No fewer than 68% of animals are reared according to the SRPA system, and 37% benefit from better housing conditions. Some 80% of cattle are covered by the SRPA programme. Around 80% of poultry are covered by the SST programme, which is well developed owing to quality labelling.

Although animal welfare measures are not primarily ecological in nature, they have *beneficial environmental effects* since more extensive and more natural animal rearing methods tend to be promoted. However, they may also have an adverse impact by increasing ammonia emissions or unpleasant smells. It would therefore be interesting to analyse the effects of these measures on environmental management.

## 5. The Agro-Food Sector and Consumer Expectations

Attention has been focused on agriculture's impact on the environment, but it would be useful, given the growing importance of distribution, to pay more attention to the *environmental impact of the entire agro-food sector*. In view of the lack of relevant data, however, a comprehensive assessment of that impact is impossible.

The need for a comprehensive approach to the whole *agro-food sector* has nevertheless been acknowledged in the *Swiss Charter for the Rural Economy up to 2015*, drawn up in 2004 by a stakeholder institution, the Agricultural Advisory Board. The Charter includes sections that are directly relevant to the environment. It specifies that "Swiss agriculture shall preserve soil fertility, shape rural landscapes through maintenance and farming, and preserve diversity of flora and fauna", and that "farm households, along with their processing and distribution partners, shall assume their responsibilities vis-à-vis society and the environment". Moreover, the Federal Council's sustainable development strategy includes the concept of *Integrated Product Policy* (IPP), as defined at the Johannesburg Summit in 2002. The agro-food sector is currently working on an ecological balance which should allow a product's environmental effects to be assessed over its entire life cycle. Some specific aspects of consumer expectations are addressed below.

### 5.1 Consumer expectations

Without comprehensive studies, it is hard to know the extent to which the behaviour of food consumers is *influenced by ecological considerations*. The importance of the environment can be seen to be increasing, as shown by the growth in market share (now tending to level out) of organic products and of quality labelled products, all of which have environmental connotations.

One *opinion survey* (Demoscope) has indicated that a range of ecological characteristics (e.g. organic, GMO-free, short transport distances) are among the most important considerations for purchasers of Swiss food products. According to the same survey, some 80% of consumers perceived Swiss agriculture to be environment friendly. On the other hand, only 50% of those questioned perceived it to be

competitive. Another survey (GfK) has indicated that information about country of origin is important to consumers, 20% because of transport distances and 10% because of other environmental protection issues.

The *Environment and Health* Action Plan (PAES), launched in 1998 by the relevant federal entities, has three parts: mobility, habitat and nature. The third refers explicitly to food (organic or environment friendly products). Numerous private initiatives have also been taken recently to raise awareness of health and environmental factors with regard to food, e.g. promotion of organic produce for children, launching of a Taste Week targeted mainly at children, organic menus and the “Goût Mieux” (Taste Better) restaurant promoted by WWF, to say nothing of the expanding Swiss “slow food” movement. All these initiatives focus to some degree on quality, health, taste and environmental considerations associated with agricultural products.

## 5.2 Organic agriculture and quality labels

The legal framework is provided by the *1997 Ordinance on Organic Farming and the Designation of Organic Products and Foodstuffs*. It is based on the principle of whole farm approaches, which requires closed cycles where possible. In particular, it bans auxiliary materials, and synthetic chemical and irradiated ingredients, and imposes requirements concerning animal rearing. The value of the market for organic products has more than doubled since 1997, amounting to CHF 1 200 billion in 2004. But this figure corresponds to no more than *approximately 4% of the total food market* and growth has been slowing in recent years.

### *Awarding labels*

In Switzerland, *organic inspection and certification* are carried out by private bodies. These are accredited every five years, based on the requirements of standards EN45011/ISO65, by the Swiss Accreditation Service (SAS), which reports to the State Secretariat for Economic Affairs. The SAS supervises the work of the certification bodies on an annual basis, in conjunction with FOAG.

Some organic products are marketed by a private organisation, Bio Suisse, established in 1981, which awards its own “bud” label. This label has been attributed to some 6 400 organic farms (representing around *10% of all Swiss farm enterprises and usable farmland*) and some 800 licensed agro-food and other companies. The specifications are based on the principle of integration and the requirements laid down by the ordinance on organic farming.

*Major distributors* have their own organic programmes and labels. The programmes must comply with the ordinance on organic farming. For one such distributor, Migros, the “Bio” organic label is one of eight under the umbrella label

“Commitment”. The others designate, for example, Swiss meat produced to animal welfare specifications, or “IP-Suisse” products. Another distributor, Coop, awards the “Naturaplan” label, which covers two distinct product lines: organic products produced in accordance with the integration requirement and marketed under the dual label “Naturaplan” and “Bio-Suisse”, and animal welfare-friendly meat and eggs that carry only the “Naturaplan” label. Generally speaking, the main organic agriculture sectors are fruit, vegetables and dairy products. While 80% of Swiss meat is sold under various quality labels, very little is sold as “bio” (organic). The two major distributors have also developed lines of regional products, some of which are organic. Ecological considerations, particularly *shorter transport distances, have been a factor.*

Labelling schemes are therefore *fairly complex* but are always based on environmental and animal welfare-related goals. Directives and implementation are transparent, and certification is usually by independent bodies. As for organic agriculture, it is clearly defined by the ordinance on organic farming and the very widespread use of the “bud” label.

#### *Quality labels and international trade*

Ecological labels could, however, present an *obstacle to agricultural trade*. The Codex Alimentarius guidelines for the production, processing, labelling and marketing of organically produced foods<sup>33</sup> are a sound basis for quality labelling, as they introduce the principle of equivalence among countries.

### **5.3 Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI)**

Since the entry into force of the ordinance on PDO and PGI in 1997, *13 PDO and 6 PGI have been listed on the Federal Register*. They mainly concern cheese and meat specialities. Some applications are still being processed, and around 30 products could eventually be registered.

Under the definition of a PDO, there should be objective and very close links between a product’s quality and its geographical origin in a broad sense, i.e. taking into account both human and natural factors (the “*terroir*”). The link between the “*terroir*” and the typical nature of the product at various stages of its production, processing and manufacture is therefore of the greatest importance. In the case of a PGI, this link may be looser.

Among the many elements that may make a product *typical*, several are ecological in nature, such as similar soil and climatic conditions throughout the production area,

grassland management, feeding methods and the manufacturing process. Although these are not the most important criteria, they may help to develop production methods that are more demanding ecologically and in terms of animal welfare.

The Draft AP 2011 also proposes a *wider range of official labels* to further characterise products with a view to consumer expectations. Making quality specifications public would enhance the visibility and credibility of producers' commitments, benefiting producers and consumers alike. It is therefore proposed to make more information public, particularly on "mountain" and "farm" products. Although no detailed proposals have yet been made, considerations of an ecological nature should clearly be taken into account.

#### 5.4 *Genetically modified organisms (GMOs)*

On 27 November 2005, the Swiss approved a *referendum* proposing an amendment to the Constitution to prohibit Swiss farmers from growing genetically modified plants or rearing genetically modified animals commercially in the following five years. This initiative was adopted with a dual majority, by the people (56%) and the cantons (100%).

The 2003 Law on Genetic Engineering prohibits the production and movement of genetically modified animals, and the authorisation procedures for plants would in any case have taken several years to complete. Moreover, such procedures may be initiated during the moratorium, notably for seeds, although no companies have applied to do so. The five-year moratorium does not affect imports of GM-derived products, as the use of such products in human foodstuffs or in animal feed is not subject to the moratorium. However, statistics show that because of consumer resistance, there are very few such imports. The referendum in November 2005 had *little real impact*, but it revealed Swiss society's perception of GMOs.

Under the 2003 law, the Federal Council launched a *national research programme* concerning the usefulness and risks of releases of genetically modified plants, with the aim of reviewing biosecurity and socio-economic aspects. Consequently, some experimental releases may occur, subject to conditions that are still being defined.

## Notes

1. Direct payments as a share of producer support rose from 24% in 1992-94 to 46% in 2003-05.
2. Ecological compensation areas are intended to conserve vital space for wildlife in agricultural areas and to maintain typical structures and landscape features. These include extensive and less intensive grassland, litter meadows, floral set-aside, fruit trees, hedgerows, copses, woodland grazing and dry stone walls.
3. A special ordinance sets out the rules governing organic farming.
4. Such as animal housing systems that go beyond legal requirements in terms of animal welfare, or systems that promote regular access to outdoor facilities, particularly grazing.
5. These payments are based on the Law on Water Protection (Article 62a) and are available under regional schemes evaluated jointly by the Federal Office for the Environment (FOEN) and the Federal Office for Agriculture (FOAG).
6. The OECD average in 2004 was 74%.
7. Mainly in the form of extensive and less intensive grassland.
8. FOAG had hoped for 65 000 hectares, i.e. more than the requisite 57 000 hectares.
9. Ordinance on the Regional Promotion of Quality and Networks of ECAs.
10. Although funded by FOAG, the OEQ was implemented and evaluated in close collaboration with FOEN.
11. For example, by adopting a more targeted approach to fertiliser balances according to farm type.
12. For example, building significant biogas plants and transforming digester sludge into concentrated fertiliser, in order to reduce a region's ammonia and phosphorus emissions.
13. Defined as arable land and land under permanent crops plus permanent meadows and pastures.
14. Beef cattle headage fell from 1.8 million in 1995 to 1.6 million in 2002; a similar trend is visible in pig farming.
15. Measured by the OECD as percentage of uptake (for crops and fodder) in total inputs.
16. The remainder comes from fertiliser use, together with airborne deposits and biological fixation.
17. Slurry spreading is banned on land that is waterlogged, frozen, snow-covered or dry.
18. A farmyard manure surplus occurs when fertilizable land is insufficient for fertiliser to be applied in a way that is compatible with crop needs, the soil's water retention capacity and water protection. If surpluses occur, the 1991 Law on Water Protection stipulates that written contracts for their removal must be drawn up and approved by the canton. Under the 1998 Ordinance on Water Protection, the canton may approve the contract if there is a guarantee that the contractor will comply with the fertiliser application rules set out in the 2005 Ordinance on Chemical Risk Reduction.
19. It has been estimated that some 20% of the farmyard manure surplus is moved to other cantons.
20. Defined as arable land and land under permanent crops plus permanent meadows and pastures.
21. In many cases the soil's available phosphorus content does not limit crop and pasture yields (OFEFP, 2005).



22. AP 2011 recommends the re-approval of plant protection products according to European Union standards.
23. Convention on Long-Range Transboundary Air Pollution (LRTAP). The commitment is to a ceiling of 63 000 tonnes of NH<sub>3</sub> emissions in 2010.
24. The maximum nitrogen deposition (in kg N/ha/year) that an ecosystem can support.
25. The ratio between energy used for production and food energy produced.
26. Of the 2 000 hectares of crops entitling farmers to payments, 83% are used to grow oilseed rape, 14% miscanthus and the remainder hemp, sun seed, soya and kenaf.
27. Its application on railway embankments has been banned since 1990.
28. A 1994 report estimated that some 30% of agricultural land is affected by moderate water erosion (over 6 tonnes/ha/year).
29. Sowing an autumn crop, or leaving a bridging crop or green-manure crop in place until 15 November. Applies to farms with over 3 ha of open land.
30. As a “primary” habitat (species highly dependent on habitat) or “secondary” habitat (species using but not dependent on habitat).
31. This trend should be confirmed with the planned growth in ecological compensation areas and OEQ areas.
32. Extensive Alpine pasture (or summer grazing) is not included in usable farmland or ecological compensation areas (ECAs).
33. Established under the joint FAO/WHO Food Standards Programme. Adopted in 1999, the guidelines were extended to cover animal products in 2001.

## Selected Sources

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# 6

## ENVIRONMENT-SOCIAL INTERFACE\*

### Features

- Environmental democracy
- Health and environment
- Environmental awareness and education
- Changing consumption patterns: mobility and leisure

\* The present chapter reviews progress in the last ten years, and particularly since the previous OECD Environmental Performance Review of 1998. It also reviews progress with respect to the objectives of the 2001 OECD Environmental Strategy.

## Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of Switzerland:

- ratify the *Aarhus Convention* and ensure that practices at the federal and cantonal levels concerning access to environmental information, public participation, and access to justice comply with obligations under this convention; ensure that NGOs have access to the courts and can participate in decision-making related to EIA procedures at an early stage;
- continue efforts to disseminate *environmental information*; continue to ensure high-level *environmental education* at all stages;
- fully implement the ongoing *Environment-Health action plan*; formulate and implement complementary measures that are cost-effective;
- make further efforts to achieve *sustainable mobility and recreational activity*, in particular by integrating protection of the environment, nature and landscapes into transport and regional planning at all levels; extend *Agenda 21* programmes to rural and scarcely populated areas.

## Conclusions

In Switzerland, *environmental democracy* is based primarily on the practice of holding referenda, on the accessibility of environmental information to all interested parties and to the general public, and on appeals to the Federal Supreme Court by environmental NGOs. *Environmental education* is dispensed at all levels, from elementary school to adult education, and it is characterised by innovative approaches and great thematic richness. The economic consequences of pollution-related *health* problems have been studied, as have the effects of environmental measures on *employment*.

However, Switzerland has not yet ratified the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (*Aarhus Convention*), and practices concerning dissemination of information, access to the courts and public participation will need to be harmonised with this convention. Public participation in *environmental impact assessments* (EIAs) is limited. Draft legislation on public access to information is in the pipeline. In general, there are insufficient countrywide, harmonised *monitoring and economic data*. The *use of indicators* is still only partial. Efforts to set up a *national environmental data network* need to be continued. Although local *Agenda 21*

programmes now cover 30% of the population, there is a need to develop them further, especially in sparsely populated areas. Scant attention has been paid to the *redistributive aspects* of exposure to pollution. While protection of the environment continues to be the Swiss population's top priority for the future, it is not being given high priority at present. *Recreational traffic* is one of the main problems that Swiss transport and environmental policy ought to address, as it accounts for a high proportion of automobile traffic and is growing rapidly.



## 1. Environmental Democracy

### 1.1 Access to environmental information

Under the federal Law on the Protection of the Environment (LPE), Swiss authorities are required to provide environmental information. Nevertheless, the *right of access to environmental information* has not been made explicit. The new federal Law on Access to Federal Administration Information, which entered into force in 2006, is expected to make access to environmental information easier at the federal level; many cantons continue to restrict access to this information. Switzerland has signed but not yet ratified the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (*Aarhus Convention*). It became a *full member of the European Environment Agency* (EEA) in 2006; this will help to improve dissemination of environmental information and make Swiss and EU data more comparable.

At the federal level, Swiss authorities provide the targeted public (cantons, communes, economic circles, the media and the general public) with a *vast amount of information* on environmental policy and its application (aids to implementation) in printed documents (more than 50 per year) and in electronic format (more than 20 titles). The vast majority of these documents are aimed at environmental specialists and are intended to facilitate the application of environmental legislation. Also involved is information on the state of the environment and reports on specific environmental issues. The number of visitors to the Federal Office for the Environment (FOEN) website is increasing (20 000 in January 2002, 150 000 in January 2006), and the same is true of the environment section on the Federal Statistical Office (OFS) website. Environmental information is provided in Switzerland's official languages (German, French and Italian), as well as in English, which is indicative of the desire to communicate at international level. Information is supplemented at federal level by the cantonal and local information services.

Environmental information systems have been strengthened in the past few years. *National state of the environment reports* sum up the state of the environment and the implementation of environmental policy for the benefit of decision-makers and the public. In future, the provision of data and of a series of online indicators will extend access to environmental information. A strategy adopted recently at Confederation level is designed to provide better and more useful information to a clearly defined public and to other interested partners.

The *MONET* (Monitoring Nachhaltiger Entwicklung) indicator system has been created to monitor progress related to sustainable development. (The indicators are available online and are regularly updated.) The OFS web portal also contains detailed and up-to-date information on the environment.

## 1.2 Public participation

In Switzerland, within the framework of a highly democratic system, there is very good co-operation among stakeholders including civil society (e.g. environmental NGOs, industry and farmer associations). The *right to take part in referenda and public initiatives* is highly developed; environmental democracy benefits from this right. A number of cantons allow immigrants to participate in referenda and public initiatives. According to the federal Law on Spatial Planning, public participation should be envisaged at all levels of spatial planning (national, cantonal, communal). In most cantons, communal land-use plans are approved through a process of direct democracy or by the communal parliament.

However, public participation in *environmental impact assessments* (EIAs) is limited. Under the LPE only people directly affected by projects, or environmental organisations in existence for at least ten years, may take part in EIA procedures; only organisations which participated in consultations have the right of appeal to the courts. The purpose of a revision of EIA provisions (in the process of being approved by Parliament) is to simplify these provisions and to shorten procedures. Under the proposed provisions, if no major impacts are foreseen in a preliminary study, a full EIA will not be necessary. Complete integration of the provisions of the Aarhus Convention would provide more balance to the lack of stakeholder participation at early stages.

A few years ago, SAEFL and the *World Economic Forum* (WEF) began co-operation to strengthen dialogue and collaboration between public authorities, business and environmental organisations. A first conference in that year dealt with how environmental and social concerns could be promoted in the process of globalisation. A second conference, in 2005, addressed climate policy at the national

and international level. With reference to the second conference, SAEFL and WEF issued a joint statement on climate policy. This openness would be even more fruitful if it were the starting point for closer co-operation with national stakeholders.

Initiatives like the *Day of Reflection*, in which representatives from business, environmental organisations, science and cantons, as well as politicians, take part are a good way to bring about direct participation at the national level, strengthen co-operation among stakeholders and facilitate consensus-building on future environmental policy.

### 1.3 Access to courts

Article 55 of the LPE gives environmental organisations the right to appeal regarding the planning, construction or alteration of stationary installations when an EIA is required. Between 1996 and 1998, only 1% of administrative law appeals heard by the Federal Supreme Court were submitted by environmental organisations. However, appeals by these organisations had a *higher than average success rate*; 63% of collective appeals by these organisations were allowed, while the average success rate for all Supreme Court case appeals was 18%. The success rate for environmental organisations' appeals to the *Federal Council* was 3.5 times the average. Among cantonal courts surveyed, the approval rate for collective appeals ranged from 31 to 85%.

However, many stakeholders feel strongly that NGOs' collective right of appeal (and the EIA process itself) slow down economic development. If revised EIA provisions are approved, EIAs will be simplified. More important, *NGOs' right to appeal to the courts will be further restricted*. Such a measure would be a step backward with respect to Switzerland's tradition of direct democracy and its environmental progress.

### 1.4 Agenda 21

Switzerland has chosen to *include under the Agenda 21 heading* all processes similar to those of Agenda 21 which go in the direction of sustainable development. Considerable efforts related to Agenda 21 programmes have been made since 2001.

However, in 2005 only 4% of Swiss municipalities (including major cities such as Basel, Bern, Geneva, Lausanne, Lucerne and Zurich), corresponding to 29% of the population, were involved in Agenda 21 type programmes.<sup>1</sup> Large areas which are important and fragile from the point of view of *nature conservation, biodiversity or tourism* are still not covered by local sustainable development programmes. These

areas are also relatively poor: 31% of unemployment in 2001 was concentrated in 10% of the country (of which more than 90% was in intermediate and rural regions) (OECD, 2005a).

The issues most commonly addressed by Swiss Agenda 21 programmes are *mobility* and *spatial development*, together with *nature conservation and landscape*. Communication and awareness-raising are also strongly emphasised. The more obvious social issues addressed are health and integration. International co-operation and gender equality (although included in the Rio Agenda 21) are addressed only rarely.

### 1.5 Role of NGOs

Environmental NGOs play an important role in ensuring that federal law is correctly applied through a *collective right of appeal*. This right of appeal is restricted in two ways: i) it can be exercised by only 30 national environmental organisations, each of which must have existed for at least ten years; ii) it is applicable only in clearly defined areas, and only to projects subject to an EIA and to federal projects. Thus, the right of collective appeal is denied in the case of a significant proportion of projects that could have adverse environmental impacts. It has been pointed out that the right of collective appeal is an appropriate, *cost-effective instrument* for supporting enforcement of environmental laws, and that abolition of this right (which would necessitate closer monitoring of enforcement by the state) would be more costly than retaining the present system (OFEFP, 2002). Recent proposals to restrict NGOs' right of appeal would be a step backwards for environmental protection in Switzerland.

Environmental NGOs contribute to *environmental education*. Based on its contract with the FOEN, the WWF education centre supports professional training (e.g. professional development, environment at work, school management, environmental standards and accreditation). It offers modular training related to environment protection. The WWF education centre also offers technical courses, visits, and training of teachers and volunteers. A contract with SILVIVA concentrates on forest training.

At the *international level*, Swiss NGOs operate quite successfully. Some CHF 250-300 million per year, collected by the NGO/private sector (e.g. the Swiss Alliance of Development Organizations) has been invested, mostly in activities with strong environmental relevance. Concerning fair trade, the Max Havelaar Foundation, founded by Swiss NGOs with the assistance of the Swiss government, works to provide market access under fair and sustainable conditions to products grown by farming co-operatives and agricultural workers in poor regions of developing countries.



## 2. Health and Environment

### 2.1 Environmental health

In Switzerland *life expectancy* at birth (81.2 years) is among the highest in OECD (Figure 6.1). Only 7.7% of the population is obese,<sup>2</sup> the lowest share in OECD Europe (OECD, 2005b). Nearly 40% of deaths are attributable to circulatory system disease, followed by neoplasm (25%) and respiratory disease (6%) (Table 6.1).

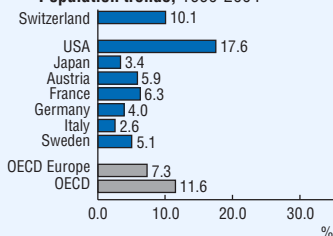
As a complement to the federal sustainable development strategy, an *Environment-Health action plan* was adopted in 1997 with a time horizon of 2007 (Table 6.2). The action plan has already generated nearly CHF 20 million in health benefits at a cost of CHF 14 million. Switzerland has the third highest health expenditure per capita in OECD countries; pharmaceutical expenditure as a percentage of total health expenditure is the third lowest. In the last decade health expenditure increased from 9% to more than 11.5% of GDP (Table 6.1).

It is estimated that existing *air pollution control measures* avoid health costs of about CHF 1 billion per year. Fine particulates are a major preoccupation, they are estimated to be responsible for 3 700 premature deaths and health costs of nearly CHF 4.2 billion per year. *Water quality* in Switzerland is generally good and no adverse effects on human health are known. No data have been collected on the relation between water quality and disease or death rates. There are no estimates of the extent to which adverse health effects are avoided through water pollution control measures. It is well-established that *noise* has adverse health effects, including reduction of well-being, disturbance of communications and sleep, and increased risk of cardiovascular diseases. The public perceives these adverse effects as increasingly important. In 2000, 17 000 out-patients were treated for hypertension related diseases in which noise was a contributory factor (Table 6.3).

### 2.2 Contaminated sites

Of *some 50 000 contaminated sites* in Switzerland, around 3 000 are in need of decontamination. FOEN estimates the costs of decontaminating them at a minimum of CHF 5 billion. Under the 1995 revision of the LPE, cantons have the obligation to establish cadastres of contaminated sites. These cadastres were to have been completed by the end of 2003. No canton has met this target; only two cantons have established such cadastres. According to the polluter pays principle, a site owner is required to cover the costs of an investigation, monitoring and eventual remedial action. If the owner cannot be identified or is unable to bear the costs, the state pays these costs. The federal contribution to the costs of remediation amounts to 40% of

Figure 6.1 Social indicators

**Population and ageing****Population trends, 1990-2004****Population change**

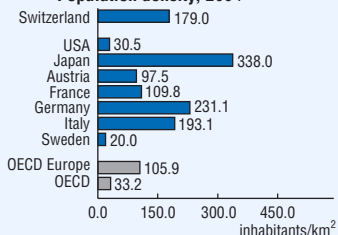
	1996	2004
natural increase	% 2.9	1.7
net migration	% -0.8	5.6

**Foreign population**

	1996	2004
	% 18.9	20.2

**Ageing**

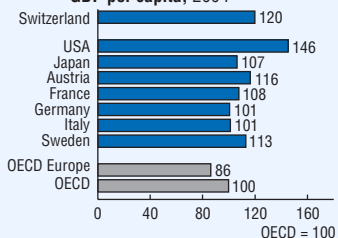
	1996	2003
over 64/under 15	ratios 0.89	1.01

**Settlement and mobility****Population density, 2004****Population by type of region**

	2004		
	% population	% area	density
urban	41.3	12.1	612
intermediate	49.8	50.1	178
rural	9.0	37.8	43

**Mobility**

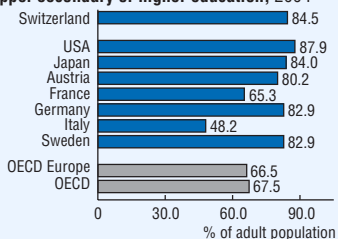
	1996	2004
car ownership	veh./100 inh. 46	52
rail traffic	billion pass.-km 11.4	14.7

**Income and employment****GDP per capita, 2004****Labour force participation (% pop. 15-64)**

	1996	2004
total rate	% 85.9	86.8
female rate	% 73.9	77.8

**Unemployment (standardised rate)**

	1996	2004
total rate	% 3.9	4.4
female rate	% 4.2	4.9

**Health and education****Upper secondary or higher education, 2004****Educational attainment**

	2004
upper secondary	% 84.5

**Life expectancy**

	1996	2004
at birth: total	years 79.0	81.2
female	years 82.0	83.7
at age 65: male	years 16.4	18.1
female	years 20.3	21.5

Source: OECD, Environment Directorate.

Table 6.1 Health and environmental health data, 2003

Health care expenditure		Health in Switzerland			
11.5% of GDP		Life expectancy	83.7 years for women 77.8 years for men <sup>a</sup>		
Financed by:	(%)		Total <sup>b</sup>	Male <sup>b</sup>	Female <sup>b</sup>
Health insurance	50.5	Annual deaths, of which:	61 280	29 920	31 360
General government	18.0	Diseases of the circulatory system	24 150	10 800	13 360
Households	31.5	Neoplasm (cancer)	15 400	8 700	6 750
		of which lung cancer	2 800	2 050	750
		Diseases of the respiratory system	3 730	2 000	1 730
		of which influenza and pneumonia	1 400	600	800
		Diseases of the digestive system	2 400	1 120	1 270
		Diseases of the nervous system	2 500	1 000	1 500
		Endocrine, nutritional and metabolic diseases	1 900	800	1 100
		Certain infectious and parasitic diseases	650	370	280
		Infant mortality	4.3 per 1 000		

a) In 2002.

b) In 2001.

Source: OECD, Environment Directorate.

Table 6.2 Main targets of the Swiss Environment-Health action plan

Nature and well-being	By 2007, three-quarters of the population should be able to apply the principles of consuming healthy, balanced and tasty food, thus contributing to sustainable agriculture.
Transport and well-being	By 2007, the current negative repercussions of motor vehicle use will be reduced through a significant reduction in emissions harmful to human health and the environment and an increase in the proportion of non-motorised transport.
Housing and well-being	By 2007, a habitat favourable to health and the environment should be ensured in 90% of inhabited areas.

Source: OFEV.

decontamination costs. *Priority* should be given to the decontamination of: i) sites in or close to inhabited areas, to prevent adverse health impacts; and ii) sites which present a danger of groundwater contamination by chemicals.

Table 6.3 Selected health impacts of noise, 2000

	Ischemic cardiac diseases <sup>a</sup>			Hypertension-related diseases <sup>b</sup>		
	Road	Rail	Total	Road	Rail	Total
Number of years of life lost	274	56	330	708	188	896
Number of years of activity lost	21	4	26	31	8	40
Number of days in hospital	757	153	910	3 647	966	4 613
Number of out-patient treatments	101	20	121	10 569	2 800	13 369
Daily doses of medicines (thousands per year)				13 370	3 542	16 912

a) By source of noise during the day.

b) By source of noise during the night.

Source: ARE, 2004.

### 2.3 Managing natural risk

In the last several years, Switzerland has experienced a number of natural disasters with serious economic and social consequences. In 1997 the Federal Council created *PLANAT*, a national advisory commission made up of specialists representing the federal administration, the cantons, research and professional associations, the private sector and major insurance companies. This commission serves as a platform for natural disaster prevention. It is responsible for co-ordinating concepts in the field of protection against natural hazards (e.g. floods, storms, landslides, avalanches) and promotes a change in emphasis from a narrow focus on protection against hazards to integrated and holistic risk management, including preparedness, response and recovery (reconstruction) measures (DDC, 2005). In 2003, *PLANAT* presented a strategy to the Federal Council for improving protection against natural hazards, in line with its sustainability policy.

Risk management is among FOEN's priorities. Effective management of risk requires *approaches that are better integrated* with other sectoral strategies and plans (e.g. for land use, forest management, transport, climate change). Flooding is a major theme, especially since the floods of 2005. Analyses of events and of lessons learned support mapping of areas under threat and the elaboration of sustainable strategies for endangered areas by FOEN in co-operation with the cantons.

### 3. Environment and Employment

After reaching a historic high level in 1997 (4.2%), *unemployment* in Switzerland fell to 2.6% in 2001. It has risen since (4.4% in 2004) (Box 6.1). Unemployment is comparatively high among unskilled workers and foreigners. No environmental policy programmes explicitly aim to provide new jobs, nor is there any *plan to integrate environmental and employment policies*. Switzerland tries to create new jobs through: i) a growth policy with a long-term perspective; ii) a labour market and educational policy which aim to optimise the matching process between labour demand and supply.

#### Box 6.1 Social context

##### *Human context*

Switzerland had a population of a little over 7 million in 2004. With 179 inhabitants per km<sup>2</sup>, it is *very densely populated* (Figure 6.1). Two-thirds of the population lives in urban areas, and nearly one-third in the main five urban areas (Zurich, Basel, Geneva, Bern and Lausanne). The cantons of Zurich (over 1 million inhabitants), Bern (nearly 1 million) and Vaud (647 400) are the most populated (Table 6.4). The rate of population increase has been low (0.7% per year on average between 1996 and 2004). With a declining birth rate and an ageing population, Switzerland's demographic growth is mainly due to net immigration.

Switzerland has *four official languages*: German (spoken by 64% of the population), French (20%), Italian (6%) and Romansch (0.5%).

##### *Revenue*

Switzerland is a *prosperous country*. In 2004 its GDP was USD 358 billion. Adjusted for purchasing power parities, its per capita GDP (USD 30 400) is one of the highest in OECD. However, growth of per capita income has been weak and considerably below the OECD average for a number of years, mainly because of low productivity gains.

##### *Employment*

In 2004, 4 185 000 people were employed in Switzerland, primarily in the tertiary sector (72.6%), followed by the secondary (23.7%) and primary sectors (3.7%). The foreign labour force represented 18.7% of the total labour force in 2003 (the fifth highest share in OECD). In the 1970s and 1980s Switzerland's *unemployment rate* was very low (under 1%). In the decade after 1994 it climbed to 4.4% (2004), which was still below the OECD average (6.9% in 2004).

Some studies indicate that *environmental measures generate both employment and economic development*. Recently 61 000 persons (1.9% of the total number employed) worked full-time in the environmental protection field, producing CHF 6.7 billion of GDP (1.6% of total GDP) (OFEFP, 2005b). Exports by environmental technology companies amount to CHF 1.4 billion, providing employment to an additional 12 500 people. It has been shown that if this CHF 6.7 billion were devoted to economic sectors other than the environment, GDP would not be higher and employment would

Table 6.4 **Switzerland's cantons: population, land area and income, 2004**

Cantons	Population ('000)	Land area (km <sup>2</sup> )	Population density (inhab./km <sup>2</sup> )	Foreigners (%)	Income <sup>a</sup> (CHF million)
Zurich	1 261.8	1 729	730	22.2	66 050
Bern	955.4	5 961	160	12.4	43 066
Lucerne	354.7	1 493	238	15.4	41 219
Uri	35.1	1 077	33	8.4	45 630
Schwyz	136	908	150	16.2	46 696
Obwalden <sup>b</sup>	33.2	491	68	11.2	35 359
Nidwalden <sup>b</sup>	39.5	276	143	9.5	61 934
Glarus	38.3	685	56	20.3	64 318
Zug	105.2	239	440	20.3	86 499
Fribourg	250.4	1 671	150	15.3	38 342
Solothurn	247.4	791	313	17.8	43 902
Basel-City <sup>b</sup>	186.8	37	5 049	29.3	99 865
Basel-Country <sup>b</sup>	265.3	518	512	17.7	51 849
Schaffhausen	73.8	299	247	20.7	52 781
Appenzell Outer Rhoden <sup>b</sup>	52.8	243	217	13.2	42 232
Appenzell Inner Rhoden <sup>b</sup>	15	172	87	9.7	42 633
St. Gallen	458.8	2026	226	20.4	43 388
Graubünden	187.8	7 106	26	14.0	45 565
Aargau	565.1	1 404	402	19.9	48 145
Thurgau	233	991	235	19.5	43 121
Ticino	319.9	2 812	114	25.0	38 745
Vaud	647.4	3 212	202	28.3	51 332
Valais	288	5 225	55	17.6	37 367
Neuchâtel	167.9	803	209	22.9	45 474
Geneva	427.4	282	1 516	37.8	59 123
Jura	69.1	839	82	11.9	36 901
Total Switzerland	7 415.1	41 285	179.6	20.6	51 230

a) 2003.

b) Half-canton.

Source: OFS.

fall by approximately 0.4% (13 000 fewer full-time jobs). There is a strong annual increase in the environmental market and strong potential for growth in a number of environmental activities (WWF, 2005). The strongest growth is expected in the natural resources market, with the objective of sustainable use of natural resources according to well-defined environmental standards.

#### 4. Environmental Awareness and Education

In general, *environmental awareness* is high in Switzerland. Environment is no longer an immediate priority among the population, but it still has the highest priority for the future (Gfs, 2002). People of voting age perceive an entire series of environmental problems (e.g. global warming and air pollution, contaminated food, use of chemicals in agriculture) as dangerous or very dangerous. *Disparity* continues between environmental awareness and willingness to take appropriate action. People's preference for products with "lean" packaging shows a diminishing trend. Willingness to use public transport is still high, but declining. Readiness to economise on heating is also declining. Over the past three years, people have begun to pay more attention to energy consumption when they purchase electrical appliances. Only a minority of citizens take part in environmental organisations or environmental campaigns (OFEFP, 2002).

*Environmental education* exists at all levels, and is characterised by innovative approaches and thematic richness. The majority of cantons have integrated environmental education in curricula at *primary and secondary* level; it is included in the subject "Man and the Environment".<sup>3</sup> Important learning goals are related to nature's beauty and diversity, as well as to taking responsibility for oneself and others and for the environment. In *secondary school* environmental issues are emphasised in biology, chemistry, physics and geography courses.

Environmental studies have been introduced at *technical colleges and universities* and in *vocational training*. Although sustainable development is not part of educational programmes, it has been integrated in the curriculum of the University of Bern. The outline curriculum for commercial-industrial technical colleges links environment with aspects of politics, economics or ethics; thus, it becomes a compulsory subject. FOEN supports the integration of environmental training in professional training by the Federal Office for Professional Education and Technology (OPET).

To carry out environmental education jointly, three-year performance agreements are drawn up between FOEN and the Swiss Foundation for Environmental Education (SUB), the Swiss Education Centre for the Protection of Nature and of the Environment

(Sanu), SILVIVA and the WWF education centre. In addition, FOEN supports and advises the cantons and private individuals. In this way, it promotes school projects of a pilot nature and inter-cantonal and regional continuous training programmes.

A FOEN publication provides information on more than 80 entities concerned with environmental education and training in Switzerland (OFEFP, 2005c).

## 5. Changing Consumption Patterns: Mobility and Leisure

Changes in consumption patterns put heavy pressure on the environment. *Energy consumption* has increased (in 2004 it was 11.6% above the 1990 level), although consumption by the heating sector has remained stable. By sector, residential/commercial accounts for 44% of total final energy consumption, followed by transport (33%) and industry (20%). *Electricity consumption* has increased in all consumer categories; the sharpest increases during the review period were in the service and household sectors. In both industry and households, electricity and natural gas prices are relatively high compared with the OECD average; prices of vehicle fuel are relatively low (Table 4.3). *Transport* accounts for about one-third of energy consumption and of CO<sub>2</sub> emissions. Transport infrastructure covers 2% of Switzerland's total surface area, of which roads represent almost 90% (OFS, 2002). *Road traffic* is responsible for three-quarters of energy consumption by the transport sector (Figure 2.4). The number of passenger cars grew by 12.6% in the period 1998-2005. Three-quarters of households have at least one car; one-quarter have more than two. The number of diesel-fuelled cars has quadrupled since 1990. Traffic per network length (867 000 veh.-km/km in 2004) is well above the OECD average. Motorway density is especially high, with Switzerland ranked fifth among OECD countries (327 km/10 000 km<sup>2</sup> in 2004) (Chapter 2). Air traffic shows a significantly high rate of growth (Figure 2.4). The *public transport system* (intercity, regional, suburban and city) is one of the most highly developed in OECD; public transport accounts for a large share of modal split. Rail traffic increased from 11.4 billion passenger-km in 1996 to 14.7 billion in 2004 (Figure 6.1). Aiming at achieving *sustainable mobility*, SAEFL has made eight policy proposals: technical optimisation, increased efficiency, traffic transfer/modal shift, traffic avoidance (e.g. using spatial planning to reduce distances to key amenities for no-car households), co-ordination/integration in the mobility sector, international co-operation (e.g. with the EU), information dissemination, and research and development. Over the last two years, urban areas have vastly expanded (Box 4.4).

*Leisure* activities play a key role in the life of the Swiss population. In 1999 they were rated as almost as important as work (GfS, 2000). These activities are increasing, driven by such factors as a shorter working week, a growing proportion of pensioners,



expanding transport infrastructure and falling prices associated with mobility (Box 6.2). Recent trends include: development of activities based on nature and landscape, more frequent and shorter leisure periods, more travel destinations in the sun, the development of cheaper leisure and travel offers, and the expansion of *leisure activities into undeveloped areas*. In response to these trends, the development of extensive commercially operated facilities (e.g. adventure parks, sports facilities) has been occurring. In the typical holiday cantons, land used for tourism purposes occupies one-third to one-quarter of built-up area (OFS, 2002). Given the high proportion accounted for by automobile travel and its rapid growth, *recreational traffic* is one of the main problems of Swiss transport and environmental policy. According to the findings of the National Research Programme on Transport and Environment (NRP 41), recreational traffic currently accounts for 60% of person-kilometres travelled in Switzerland. The growth of leisure traffic is likely to continue. For many years transport planning and policy were concerned almost exclusively with commuter traffic. The main challenge now is growth in leisure traffic. Considerable efforts have been made to reduce pressures from leisure activities, including initiatives by private individuals, tourism organisations, and regional groups and authorities (Chapter 3).

### Box 6.2 Drivers of leisure growth

Working week	Over the next few years, the working week will probably be further shortened. Leisure activities are also likely to be increasingly influenced by flexible working hours.
Pensioners	Pensioners will make up a growing proportion of the total population. The mobility of one relatively affluent demographic group, the <i>troisième âge</i> (third age), will increase.
Transport infrastructure	Expansion of the transport infrastructure (road network, Rail 2000) will stimulate new demand.
Prices	Prices will tend to fall in the mobility sector.
Leisure attractions	New leisure attractions are being developed (e.g. casinos, theme parks, multiplex cinemas, drive-in restaurants, open-air concerts, sports facilities).
Unspoiled nature higher	People appreciate unspoiled nature. There is a risk that ever more remote areas at ever altitudes will be developed for recreational purposes.

Source: OFEFP, 2002.

## Notes

1. In comparison, 70% of Swedish municipalities (covering 75% of the population) are operating local sustainable development programmes. The shares for Italy are 6% and 13%, respectively.
2. Body mass index (BMI) > 30 kg/m<sup>2</sup>.
3. Depending on the canton, the curriculum may have a different name.

## Selected Sources

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# 7

## INTERNATIONAL CO-OPERATION\*

### Features

- Climate change policy
- Transboundary pollution (air, water)
- International trade and the environment (ODS, chemicals, hazardous waste)
- Bilateral, regional and multilateral co-operation

\* The present chapter reviews progress in the last ten years, and particularly since the previous OECD Environmental Performance Review of 1998. It also reviews progress with respect to the objectives of the 2001 OECD Environmental Strategy.

## Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of Switzerland:

- take steps to meet Switzerland's targets under the Kyoto Protocol, including introduction of a *CO<sub>2</sub> tax*;
- implement the measures needed to further reduce *emissions of NO<sub>x</sub>, VOCs and PM<sub>10</sub>* so as to meet the targets in the Ordinance on Air Pollution Control and the Convention on Long-range Transboundary Air Pollution;
- improve *implementation of the provisions of multilateral environmental agreements (MEAs)*, including at federal and cantonal levels;
- expand *Alpine co-operation*, in particular concerning transport, energy and tourism;
- ratify and implement *recent MEAs* to which Switzerland is not yet a party;
- further increase overall *official development assistance (ODA)* and improve reporting on ODA in the area of environmental protection (e.g. water).

## Conclusions

Switzerland has an effective system for co-ordinating international environmental activities, based on formal consultations (at federal level and between the Confederation and the cantons) and on various processes for informal consultations. It maintains extensive co-operative relations with *neighbouring countries and the EU* as a whole, including with regard to harmonisation of environmental legislation. It has transposed the provisions of a number of *multilateral environmental agreements*, including: the Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) and its amendments, the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, the Stockholm Convention on Persistent Organic Pollutants (POPs), the Convention on Biological Diversity and the International Treaty on Phytogenetic Resources for Food and Agriculture. It actively promotes environmental protection and sustainable development in *international*

*fora*. Swiss *official development assistance*, as a percentage of gross national income, has been increasing (0.44% in 2005). ODA for environmental purposes and other environmental expenditure at the international level (e.g. for activities in the countries of Eastern Europe, Caucasus and Central Asia) have been substantial. In addition, some CHF 250-300 million per year is collected by *NGOs and the private sector* (e.g. the Swiss Alliance of Development Organisations) and is invested primarily in international co-operative activities with strong environmental relevance.

Nevertheless, there is room for improvement. Concerning *climate change*, there are problems meeting targets for reducing emissions of *CO<sub>2</sub> and other greenhouse gases* (internationally agreed targets as well as domestic ones). It is true that Switzerland has low energy and CO<sub>2</sub> intensities. Likewise, it has adopted voluntary measures that have to some extent reduced CO<sub>2</sub> emissions, although these have been insufficient. The *CO<sub>2</sub> tax* envisioned in the federal law on CO<sub>2</sub> has yet to be implemented. Switzerland is also having trouble meeting the targets established for several *air pollutants* (e.g. PM<sub>10</sub> and NO<sub>x</sub> from automobiles) under the Convention on Long-range Transboundary Air Pollution. *It has not ratified* the Aarhus Convention and its Protocol on Pollutant Release and Transfer Registers, the Protocol on Strategic Environmental Assessment to the Espoo Convention, the Water and Health and Civil Liability Protocols to the Water Convention, or the Protocols to the Convention on the Protection of the Alps. Even though Switzerland is in fact prepared to comply with the provisions of certain multilateral environmental agreements, reluctance to enter into binding international agreements has recently increased, reflecting a lack of consensus across the country. Certain international commitments have not been fully met at the cantonal level.



## 1. Objectives

*Densely populated and industrialised*, Switzerland is confronted by all the problems common to the most advanced OECD countries, particularly with regard to trade and the environment. *Located in the heart of Western Europe*, it has major trading relations with the EU, attracts heavy tourist flows and is crossed by large-scale movements of persons and goods. A *wealthy country*, it provides developing countries with large amounts of official development assistance and private funding. It continues to maintain its long tradition of good neighbour relations, undisturbed by armed conflict for nearly two centuries.

Switzerland *actively promotes environmental protection and sustainable development* in international fora. *Accession to the UN* in 2002 has allowed it to expand its international activities, for example those related to sustainability issues. Although it is not a member of the EU or the European Economic Area (EEA), it has harmonised its environmental policy with that of the EU and its other principal trading partners and seeks further harmonisation.

### *1.1 Priorities and challenges*

In a report by the Federal Council in 2000, environmental policy was reconfirmed as *one of five foreign policy priorities* for the first decade of the 21st century. Switzerland's international environmental policy has recently placed increasing emphasis on environmental threats.

The 2005 UNDP Progress Report on the *Millennium Development Goals* (MDGs) indicates that, in the area of international environmental co-operation, Switzerland gives highest priority to sustainable natural resource use (including agro-biodiversity), water related issues (including access to safe drinking water and basic sanitation), environmentally sound management of chemicals, sustainable development of mountain regions and the transfer of environmentally friendly technologies to developing countries.

In fulfilling its *international commitments*, Switzerland faces a number of challenges. Under the *Kyoto Protocol*, it is required to reduce its emissions of greenhouse gases by 8% by 2008-12 (compared with 1990). The federal Law on the Reduction of CO<sub>2</sub> Emissions (1999) establishes a domestic target of cutting emissions from energy use by 10% by 2010. Subsidiary targets for heating/process fuels (15% reduction) and transport fuels (8% reduction) are also established in the CO<sub>2</sub> Law. To meet these targets by 2010, additional efforts will be required.

At the *bilateral and multilateral levels*, Switzerland pays particular attention to international environmental governance, climate change, biodiversity conservation, management of chemicals and hazardous waste, ozone layer protection, transboundary air pollution and sustainable management of forestry and water resources. Co-operation with developing countries is based on the North-South Guidelines (1994), in which sustainable development is emphasised. The Swiss Agency for Development and Co-operation (SDC) of the Federal Department of Foreign Affairs (DFA) and the State Secretariat for Economic Affairs (SECO) of the Federal Department of Economic Affairs (DFE) are in charge of revising these guidelines.

Performance will be assessed here in relation to: i) international objectives for climate change response, transboundary air and water pollution, trade and the



environment and official development assistance; and ii) the recommendations made by the OECD in the *1998 Environmental Performance Review*:

- ratify and implement the recent international agreements on environmental protection (References II.A and II.B);
- develop action to associate the cantons more closely in the preparation of international conventions;
- continue and reinforce environmental co-operation with the European Union;
- encourage the development of a plan of action for the preservation of Lake Lugano through harmonised actions;
- pursue the development of Alpine co-operation with a view to reinforcing the Convention on the Protection of the Alps, notably with regard to transport, energy and tourism;
- introduce charges and taxes that will positively affect CO<sub>2</sub> emission reduction and make precise arrangements for future imposition of a CO<sub>2</sub> tax, in the event that this should prove necessary;
- strengthen co-operation between federal offices that deal with development aid, foreign economic affairs and environment;
- increase development aid so as meet the national target of 0.4% of GNP, move towards the international aid objective of 0.7% and increase environmental aid.

## *1.2 Mechanisms for co-operation and decision-making at federal and cantonal levels*

### *Co-operation at the federal level*

The *Federal Office for the Environment* (FOEN) in the Federal Department of the Environment, Transport, Energy and Communications (DETEC), co-operates with the other federal bodies involved in sustainable development: the Federal Office of Public Health (FOPH), the Federal Statistical Office (FSO) in the Federal Department of Home Affairs (DHA), the Swiss Agency for Development and Co-operation (SDC) and the Directorate of Political Affairs in the Department of Foreign Affairs (DFA), the State Secretariat for Economic Affairs (SECO) and the Federal Office of Agriculture (FOAG) in the Federal Department of Economic Affairs (DEA). Areas of co-operation include response to climate change, air pollution, ozone layer protection, biological diversity, sustainable forestry, water management, management of chemicals and waste, and the risks associated with chemical substances and waste. Consultations take place in the Interdepartmental Committee for Development and International Co-operation (ICDIC) and the Interdepartmental

Sustainable Development Committee (ISDC), respectively, on common issues related to development policy and sustainable development policy (Chapter 4). Regular meetings and contacts at all levels in the departments involved help to ensure the coherence of environmental policy and development co-operation, including strategies and action programmes.

Since 1998, the federal bodies responsible for development aid (SDC), international economic relations (SECO) and the environment (FOEN) have *enhanced their procedures for co-operation*, including with respect to multilateral initiatives such as multilateral environmental agreements (MEAs) and the Global Environment Facility (GEF). However, in certain areas the division of responsibilities among federal bodies may not be optimal.<sup>1</sup> The departments and services in the federal administration are aware of this problem and will take measures to remedy the situation.

### *Co-operation at federal/cantonal and cantonal levels*

International agreements may only be negotiated and ratified by federal authorities. Implementation of environmental policies is the responsibility of the cantons. Institutional procedures for *co-operation between the federal and cantonal levels* work well. These procedures include a written consultation phase involving cantons and other stakeholders (e.g. the private sector, NGOs) when a law or policy is being developed. The Federal Council encourages cantons to develop cross-border relations as autonomously as possible. It also promotes their collaboration with other parts of Europe. Additional forms of co-operation include regular meetings of experts (e.g. on energy) at the cantonal level, in which representatives of federal bodies participate.

Problems arise from the fact that *cantons have the primary responsibility for environmental protection*. In some cases, cantons are not using the same methods to report on pollutants. Levels of implementation and awareness of MEAs may also differ among cantons.

## **2. Climate Change**

### **2.1 CO<sub>2</sub> tax**

In the 20th century, temperatures in Switzerland's Alpine region increased by an estimated 1 °C to 1.5 °C, compared with a world average increase of about 0.6 °C (Swissinfo/SRI Webfactory, 2004). Switzerland's ratification of the Kyoto Protocol in 2003 committed it to reduce GHG emissions by 8% compared with 1990 levels by 2008-12. These emissions are to be cut from 52.76 million tonnes (Mt) of CO<sub>2</sub> equivalent (1990 level) to 48.25 Mt (Table 7.1). Pursuant to the *Law on the Reduction*

of CO<sub>2</sub> Emissions (CO<sub>2</sub> Law) (1999), CO<sub>2</sub> emissions from energy use are to be reduced by 10% compared with 1990 levels by 2010, with subsidiary targets for emissions from the use of heating/process fuels and transport fuels. Switzerland's CO<sub>2</sub> emissions intensities (per unit and per capita GDP) are the lowest or *among the lowest in OECD*, respectively. Therefore, further reductions could be more costly than in most other OECD countries (Figure 7.1).

During the first stage of implementation of the CO<sub>2</sub> Law, priority was given to *voluntary actions* to lower fossil fuel consumption. The *climate cent* on road fuel was proposed by the Swiss Oil Association as an additional voluntary measure to meet the CO<sub>2</sub> emission reduction target in the transport sector. Retailers are to levy a surcharge of CHF 0.01-0.02 per litre on transport fuels and pay the revenues into a fund for financing mitigation projects. The fund is to be managed by a newly established private body, the Climate Cent Foundation (Box 7.1).

Projections in 2004 indicated that measures then in effect would not be adequate to meet the 2010 GHG reduction target. The CO<sub>2</sub> Law envisions the introduction of an *incentive tax on CO<sub>2</sub>* by the Federal Council after 2004. Rates, to be determined by shortfalls in meeting fuel-based emission targets, would require parliamentary approval. Net revenues would be fully redistributed to the population on a per capita basis and to businesses as a percentage of wages paid. Exemption from the tax would be granted to energy-intensive and high-emitting industries that had already entered

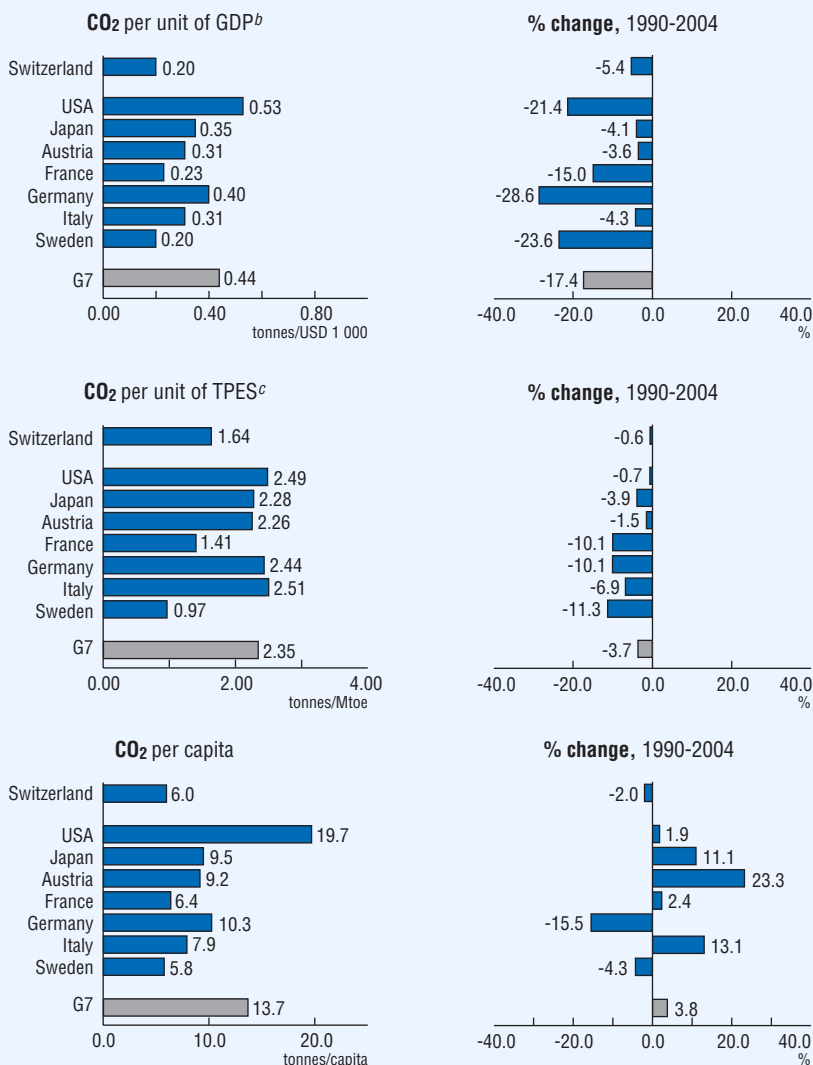
Table 7.1 **Emissions of major greenhouse gases (GHGs)**

(1 000 tonnes CO<sub>2</sub> equivalent)

	1990	1998	2004	Change (%)	
				2004/1990	2004/1998
Total GHG <sup>a</sup>	52 761	52 224	53 034	+0.5	+1.6
of which:					
CO <sub>2</sub>	44 517	44 666	45 436	+2.1	+1.7
CH <sub>4</sub>	4 536	3 859	3 661	-19.3	-5.1
N <sub>2</sub> O	3 464	3 200	3 075	-11.2	-3.9
HFCs	–	311	618	..	+98.8
PFCs	100	28	67	-32.9	+137.3
SF <sub>6</sub>	143	161	176	+22.8	+9.7

a) Excluding emissions from land use change and forestry.

Source: Switzerland's Greenhouse Gas Inventory, April 2006.

Figure 7.1 CO<sub>2</sub> emission intensities,<sup>a</sup> 2004

a) Includes CO<sub>2</sub> emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.

b) At 2000 prices and purchasing power parities.

c) Total primary energy supply.

Source: OECD-IEA (2006), CO<sub>2</sub> emissions from fuel combustion; OECD (2005), OECD Economic Outlook No. 77; OECD-IEA (2006), Energy Balances of OECD Countries 2003-2004.

### Box 7.1 CO<sub>2</sub> emission reduction measures

The federal 1999 CO<sub>2</sub> Law gives high priority to *voluntary measures*. The 2001 SAEFL/FOEN Guidelines outline a framework for efforts by the business community. Companies can opt for one of two tracks: either entering into an agreement or signing a formal commitment. Agreements are designed for industries ready to take voluntary action to limit energy consumption and CO<sub>2</sub> emissions, thereby avoiding the introduction of a CO<sub>2</sub> tax. Formal commitments, which establish more stringent requirements concerning measures to be taken, entitle companies to exemption from a possible CO<sub>2</sub> tax.

The Swiss Oil Association, supported by other business and transport associations, has proposed the private *climate cent* as an additional voluntary measure to help meet the CO<sub>2</sub> target in the transport sector. Retailers are to levy a surcharge of CHF 0.01–0.02 per litre on transport fuels and pay the revenues into a fund for financing mitigation projects in Switzerland and project-based flexible mechanisms abroad. The funds will be managed by the newly established and private Climate Cent Foundation, which is likely to become the major user of the flexible mechanisms.

It has been decided that the Federal Council will *introduce a tax on fossil fuels* if, before the end of 2007, it appears unlikely that the reduction targets for 2010 will be met through voluntary actions alone. The rate will be set according to shortfalls calculated on the basis of updated energy projections, taking voluntary measures into account. According to various models, voluntary measures will make it possible to reduce emissions from combustibles by 7% while emissions from motor fuels will increase by 8%. Thus, to meet the CO<sub>2</sub> Law's overall target, it will be necessary to reduce emissions by an *additional 2.5 million tonnes*.

In 2005, the Federal Council *proposed a carbon tax on heating oil, coal and gas* (9 cents per litre of heating oil, 9 cents per kg of coal and 7 cents per m<sup>3</sup> of gas). To remain competitive, companies can obtain exemption from this tax by formally committing themselves to limit CO<sub>2</sub> emissions. The tax rate has not yet been approved by Parliament. Instead of levying a CO<sub>2</sub> tax on *motor fuels*, the Confederation and the Climate Cent Foundation signed an agreement in 2005. Under this agreement, 1.3–1.9 cents per litre of gasoline could be used to finance CO<sub>2</sub> reduction measures (reduction of 1.8 million tonnes up to 2010). Foreign certificates could be acquired (up to 1.6 million tonnes); reduction measures (at least 0.2 million tonnes) should be implemented in Switzerland.

The envisaged *domestic emission trading scheme* is a voluntary initiative, based on the CO<sub>2</sub> Law, which sets legally binding reduction targets for energy related CO<sub>2</sub> emissions. Allowances are allocated to firms aiming for exemption from the CO<sub>2</sub> tax according to negotiated CO<sub>2</sub> caps for 2008–12, derived using a bottom-up approach. To date, targets have been agreed with some 300 entities (e.g. cement, ceramics, glass, pulp and paper, lime kilns, the chemical industry, sugar mills, food, transport, appliance manufacturing, graphic arts, textile finishing, foundries, aluminium, steel, plastics, machine tooling). Applications from some 200 other entities are under consideration.

The climate cent and, in particular, exclusion of motor fuels from the carbon tax have been criticised by many independent organisations. *It remains questionable* whether this measure will be sufficient, and whether it was appropriate to exclude gasoline and diesel from the new CO<sub>2</sub> tax.

into legally binding CO<sub>2</sub> reduction commitments. The Federal Council, having decided in March 2005 to introduce a CO<sub>2</sub> tax, requested that Parliament approve a rate of CHF 35 per tonne of CO<sub>2</sub>. During the summer of 2006, the National Council (the first chamber) approved the introduction of the CO<sub>2</sub> tax in principle, at rates of CHF 12, 24 and 36 according to progress made in meeting fuel-based emissions targets. The draft was submitted to the Council of State (second chamber) for examination. Regarding fuel, the Federal Council has decided to apply the climate cent as a provisional measure until 2007.

## 2.2 Other measures

The *Swiss emission trading scheme* is designed for companies seeking exemption from a CO<sub>2</sub> tax. They sign a legally binding commitment to reduce energy related CO<sub>2</sub> emissions. *Emission allowances* are allocated according to targets negotiated for 2008-12. In the event of non-compliance, the CO<sub>2</sub> tax is to be paid retroactively for each tonne of CO<sub>2</sub> emitted since the exemption was granted. The emission trading scheme is expected to cover nearly 40% of emissions from industry (5 Mt CO<sub>2</sub> in total allowances) (OFEFP, 2004). Whether this scheme is finally introduced will depend on the fate of the CO<sub>2</sub> tax. Switzerland plans to create a national registry<sup>2</sup> and to conduct an analysis of the scope for joining other schemes such as the EU Greenhouse Gas Emission Trading Scheme (EU ETS).

The *Swiss AIJ Pilot Programme* (SWAPP) was established in 1997 for the purpose of participating in the pilot phase of Activities Implemented Jointly (AIJ) under the UN Framework Convention of Climate Change (UNFCCC), as well as to gain experience with joint implementation with other countries of climate change mitigation projects.

Introduction of a *heavy vehicle fee* in 2001 has provided a strong incentive to increase average truck loads, reduce traffic volumes and shift freight from road to rail. It can help to meet CO<sub>2</sub> emission reduction targets and to reduce other types of air pollution from road transport. Beginning in 2007, support for the use of clean fuels will take the form of tax relief. The Federal Council has proposed an amendment to the 1996 Mineral Oil Tax Law that would introduce tax incentives to use these fuels (Chapter 2).

National *energy policy* supports the reduction of CO<sub>2</sub> emissions, in accordance with the 1998 Law on Energy. The *SwissEnergy* programme, a follow-up to the Energy 2000 programme, promotes rational energy use, increased use of renewable energy sources and development of a sustainable energy supply. The intermediate outcome of implementing this programme has been positive: energy consumption at the end of 2004 was 6.5% less and CO<sub>2</sub> emissions 7% less than if no action had been taken (Table 7.2; Chapter 2).

Under the Kyoto Protocol, Switzerland has decided to take account of forestry management (in the sense of Article 3.4 of the Kyoto Protocol) in meeting its obligations. It is allowed to count its *forests as carbon sinks* for up to a maximum of 1.8 million tonnes of CO<sub>2</sub> equivalent per year. Taking into account current average sequestration by these carbon sinks of an estimated 2.7 million tonnes of CO<sub>2</sub> equivalent per year, Switzerland can count the maximum allowable value while increasing wood production by 0.8 million m<sup>3</sup> (equivalent to 0.9 million tonnes of CO<sub>2</sub> equivalent). Additional CO<sub>2</sub> emission reductions could potentially be achieved through substituting wood for other construction materials or other energy sources. It is estimated that in 2001 the use of approximately 1.5 million m<sup>3</sup> of wood in construction avoided emissions of about 1.6 million tonnes of CO<sub>2</sub> equivalent. Burning wood instead of heating oil avoids some 0.6 tonnes of emitted CO<sub>2</sub> equivalent per cubic metre of wood.

The use and *emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>)*, although minor compared to those of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, have risen sharply since 1990 (Table 7.1). To curb this increase, in 2003 the Federal Council decided to regulate all uses of these substances, particularly in cooling equipment, synthetic foams, fireproofing, aerosols, solvents, cooling fluids and insulating gases.

Table 7.2 **CO<sub>2</sub> emissions from energy use**  
(million tonnes)

	1990	1998	2000	2004
Total <sup>a</sup>	41 275	42 681	41 842	43 300
of which:				
Energy industries	2 492	3 036	2 787	3 257
Manufacturing industries and construction	6 036	5 715	5 843	5 796
Transport	14 323	14 672	15 545	15 486
Other sectors (residential and commercial)	17 835	18 526	16 916	18 004
Other (incl. fugitive emissions from fuels)	588	731	751	757
International bunkers (aviation)	3 226	4 285	4 766	3 477

a) Excluding bunkers.

Source: Switzerland's Greenhouse Gas Inventory, April 2006.

Switzerland supports international *follow-up to the Kyoto Protocol* after 2012 and broadening of the multilateral framework under the UNFCCC and the Protocol. Its views on the future regime include support for the following principles: industrialised countries should adopt quantified reduction targets; emerging countries should adopt regimes appropriate to their level of economic growth; there should be incentives to reduce all countries' emissions and to increase their adaptation efforts; and the use of lower-emitting technologies and relevant market mechanisms should be encouraged.

### 3. Transboundary Pollution

#### 3.1 Transboundary air pollution

Switzerland has ratified the *Convention on Long-range Transboundary Air Pollution* (LRTAP) and its eight protocols. Their requirements have become an integral part of Swiss legislation, particularly regarding limit values for emissions from stationary sources and road vehicles. Switzerland ratified the Aarhus Protocol on Persistent Organic Pollutants (POPs) in 2000, and the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone in 2005. Emission inventories under the LRTAP Convention are currently under revision so that they will cover the period 1980-2004, with projections for 2010, 2015 and 2020.

Switzerland has reduced *sulphur emissions* by more than 80% compared with their highest level in the early 1980s, meeting its target. Emissions of *NO<sub>x</sub> and VOCs* have been reduced by between 40 and 50% compared with the mid-1980s. The incentive tax on VOCs (1997) has contributed to a significant decrease in emissions of VOCs. However, projections show that the national targets for reducing emissions of NO<sub>x</sub> and VOCs will not be met by 2020 (Chapter 2). This is also true for emissions of particulate matter (PM<sub>10</sub>) and NH<sub>3</sub>. Other measures to reduce air pollution include support for railway transport in new Alpine tunnels, the heavy vehicle fee and increasing the weight limit for trucks (the latter two measures provide incentives to reduce the number of trucks on the road).

Despite a decrease in emissions per vehicle, there has been a *significant increase in kilometres driven* and some shift to diesel vehicles, which emit less CO<sub>2</sub> than gasoline fuelled vehicles but more NO<sub>x</sub>. The volume of road freight transport has not been reduced as expected; overall energy consumption by road vehicles remains high. With respect to other types of air pollution, high levels of ammonia emissions are attributed to intensive agricultural practices. High ground-level ozone levels reported in southern Switzerland (Ticino canton) may be partially due to cross-border pollution originating in industrialised areas of northern Italy.



### 3.2 *Transboundary water pollution*

Switzerland makes *significant efforts to maintain good water quality*. The quality of the water in its rivers has a direct impact on that of five major European river systems downstream: the Aar and the Inn (tributaries of the Danube), the Rhine, the Rhone and the Ticino (tributary of the Po). Switzerland has ratified the Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes. It actively participates in various international commissions, including the International Commission for the Protection of Lake Constance (IGKB), the International Commission for the Protection of Italian-Swiss Waters (CIPAIS) (Lakes Maggiore and Lugano), the International Commission for the Protection of Lake Geneva (CIPEL), the Commission for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the International Commission for the Protection of the Rhine (ICPR) (Box 7.2).

There has been some progress towards *dephosphorisation* of waste water discharges to Lake Lugano. The discharge limit value is 0.3 mg P/l for purification plants serving over 10 000 inhabitants (IE); monitored values are in the range of 0.1-0.2 mg P/l. While phosphorous concentrations are still high, they are decreasing (10% reduction compared to 2003). The recommendation in the 1998 OECD review to develop and implement an action plan to protect Lake Lugano has not been followed.

The quality of drinking water from Lake Geneva (about 80 million m<sup>3</sup> abstracted per year) meets national standards. The concentration of *nitrates* in the lake has decreased over the last 15 years, although there was a slight increase in 2004. The joint *Swiss-French action plan* for Lake Geneva for 2001-10 is being implemented by three Swiss cantons (Geneva, Vaud and Valais) and two French departments. Drinking water of satisfactory quality will be provided through simple treatment, the lake's ecosystem will be protected and preserved, phosphorous concentrations will be reduced and micropollutants will be limited.

The Protocol on *Civil Liability* and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters (the Kiev Protocol) has been the subject of consultations with professional associations (particularly the chemical industry and insurance companies), which have expressed reservations about the Protocol being signed by Switzerland. Industries whose activities are covered by the Protocol would like to know more about the cost of extending insurance coverage (or other financial guarantees) to meet the responsibilities stipulated in the Protocol.

### 3.3 *Environmental impact assessment*

Switzerland works closely and effectively with neighbouring countries to implement the *Convention on Environmental Impact Assessment in a Transboundary Context* (Espoo

### Box 7.2 Co-operation in Protection of the Rhine

The Rhine Action Programme for 1987-2000 has *met most of its targets*. In particular, water quality has improved considerably. Point source inputs of most pollutants were reduced by between 70 and 100% from 1985 to 2000. Municipalities and industrial plants connected to waste water treatment plants rose from 85 to 95%. Rhine fauna have mostly recovered, with 63 fish species now living in the river (CIPR, 2003). Migratory fish (salmon, sea trout) may migrate to the Upper Rhine through fish passages in dams. However, they cannot reach Basel and the introduction of sturgeon has not yet taken place. Long-standing international co-operation to protect the Rhine can be seen as an effective model of international river basin management.

Accidents involving dangerous substances have also been considerably reduced. The *Warning and Alert Plan Rhine (WAP)* is designed to inform all countries concerned in case of an accident. Seven main warning centres between Basel and Arnhem (the Netherlands) relay information to warning centres downstream, local authorities and water utilities. The ICPR monitoring stations, including one in Basel operated by Baden-Wurttemberg (Germany), carry out continual chemical monitoring of Rhine water. Remaining problems include nitrate leakage from agriculture and non-compliance with target values for some heavy metals and pesticides.

In the framework of the *Convention on the Protection of the Rhine* (signed in 1999 and in force since January 2003), the contracting Parties (Germany, France, Luxembourg, the Netherlands, Switzerland and the European Commission) and observer countries (Austria, Belgium, Italy and Lichtenstein) agreed to implement the Programme on the Sustainable Development of the Rhine (*Rhine 2020*). This programme's four main targets are: i) improvement of the Rhine ecosystem; ii) flood prevention and protection; iii) further improvement of water quality; and iv) groundwater protection. The programme includes 45 concrete measures, of which one-third have quantitative targets. The cost of the first phase (until 2005) was estimated at EUR 5 billion (CIPR, 2001). France, Germany and Switzerland also co-operate within the framework of the Conference of the Upper Rhine.

Convention). Support to its implementation has been established at the federal level (with Austria and Liechtenstein) and cantonal level (within the German-Franco-Swiss Conference of the Upper Rhine). There is also project-related co-operation (e.g. with France on the Basel-Mulhouse airport and the planned highway between Thonon and Evian). Experience shows that the earlier a potentially affected neighbouring country is informed about a potential project, the easier it is to address that country's concerns. Switzerland promotes this type of co-operation, including implementation of the Convention by countries in South-Eastern Europe and Central Asia.

## 4. Trade and Environment

Switzerland works with the governments of other countries to ensure the *implementation of laws regulating the import and export of substances* that are harmful to human health and the environment, particularly hazardous wastes, toxic chemical products and ozone-depleting substances (ODS). It works towards specific objectives in WTO negotiations with the aim of ensuring that environmental concerns are taken into account. One of Switzerland's priorities, during the Doha round of negotiations, has been to ensure that there is *no hierarchy between WTO agreements and MEAs* that favours trade at the expense of the environment. Another priority has been to establish a list of environmental products in order to reduce or eliminate tariffs and non-tariff obstacles to trade. Switzerland also promotes recycling, ecolabelling, and norms and technical standards for environmental products.

### 4.1 Protection of the ozone layer

Switzerland, a signatory of the 1985 Vienna Convention and the 1987 Montreal Protocol, has taken part since the beginning in efforts to protect the ozone layer. It ratified the two most recent amendments to the Montreal Protocol (adopted in Montreal and Beijing) in 2002. It is an ODS consumer, but not a producer. National legislation regulates the import, export, sale, use and destruction of ODS and *encourages the replacement of these substances through favouring the most environmentally friendly solutions*.<sup>3</sup> There is an active policy of eliminating halons in existing fire protection equipment and banning use of hydrochlorofluorocarbons (HCFCs) in existing cooling equipment after 2015. These two uses, along with that of synthetic foams for thermal insulation of buildings and appliances (dating from the 1960s-90s), are the last remaining sources of ODS emissions in Switzerland. ODS are no longer used in aerosols, synthetic foams or solvents. Imports fell from over 14 000 tonnes in 1986 to less than 200 tonnes in 2004. To better control imports and exports, an authorisation system was introduced in 2004.<sup>4</sup> About 30 companies use this system, mainly for imports of HCFC-based refrigerant fluids, synthetic intermediaries (e.g. methyl bromide) and solvents for use in analyses.

At the *international level*, Switzerland also has a policy supporting the substitution of ODS by environmentally friendly products or techniques. In addition, its contribution to the Multilateral Fund for the Implementation of the Montreal Protocol for the period 2006-08 will be CHF 2.47 million (1.5% of total country contributions). It promotes the use of less harmful technologies and products by organising seminars and implementing refrigeration pilot projects (e.g. in India, Argentina, Indonesia and Senegal). Financing of bilateral projects is in addition to contributions to the Multilateral Fund.

## 4.2 Hazardous waste

Switzerland *fully complies with the Basel Convention and with OECD Council Acts on movements of hazardous waste*. It does not restrict imports of hazardous and other wastes for final disposal and recovery. However, exports to non-Annex VI countries are prohibited. For final disposal, Switzerland follows Annex IV-A of the Basel Convention; for recycling, it follows Annex IV-B and the OECD Decision (OECD, 2001). In 2002, with the industry, it launched the Mobile Phone Partnership Initiative for environmentally sound management of used and end-of-life telephones. Other activities related to the Basel Convention include capacity building and workshops on liability in South America and Asia.

In 2004, Switzerland joined the network of enforcement authorities in the EU and other European countries concerned with transfrontier shipments of waste under the Network for the Implementation and Enforcement of Environmental Law (*IMPEL-TFS*). The Seaport Project launched by IMPEL-TFS uncovered an important number of illegal movements of waste. Countries exchange experience within this network. In co-operation with Germany, Switzerland has implemented large-scale controls in the Basel area in order to detect illegal activities. However, no illegal waste movements have been detected.

## 4.3 Management of hazardous chemicals

Switzerland ratified the *Rotterdam Convention on Prior Informed Consent (PIC)* in 2002 and has implemented it since 2005 through the PIC Ordinance. This ordinance lists 77 substances or substance groups<sup>5</sup> which are banned in Switzerland, and for which industry must file prior export notifications to other Parties to the Convention. Swiss industry is required to respect import decisions on chemicals by other Parties. Even before the Convention and PIC Ordinance came into force, a PIC procedure was mandatory for members of the Swiss Society of Chemical Industries. Implementation of the PIC Ordinance is carried out in close co-operation with the Swiss Federal Customs Administration and customs officials at the border.

Switzerland ratified the *Stockholm Convention on Persistent Organic Pollutants (POPs)* in 2003 and has developed a National Implementation Plan (NIP). All of its obligations under the Convention have been met; all intentionally produced POPs covered by the Convention have been banned. Production and use of the main precursors that could lead to generation of dioxins during manufacturing or disposal have also been banned. Decommissioning and disposal of condensers and transformers containing pollutants listed in the Convention for elimination by 2025 are regulated.

Ratification of the *Kiev Protocol on Pollutant Release and Transfer Registers* (PRTRs) and the Aarhus Convention on Access to Information is currently in progress. It was decided that data should be collected on emissions of 50 pollutants, with quantity thresholds, using procedures similar to those followed for the European Pollutant Emission Register (EPER). Facilities in 12 industrial sectors reported data on emissions to air and water on a voluntary basis in 2000 (31 facilities) and 2001 (50 facilities). These data were validated by SAEFL, which published them in 2004. The Swiss Pollutant Release and Transfer Register (SwissPRTR) will be similar to that of the EU.

Switzerland plays an important role in the Strategic Approach to International Chemicals Management (SAICM) process launched by UNEP. Switzerland proposed the SAICM structure (ministerial declaration, global strategy and global action plan) and funded all its regional conferences until the process was established. Switzerland is also developing a convention on heavy metals to close gaps in the international regime. Other trade measures include initiatives related to protection of human health and the environment.<sup>6</sup>

Switzerland is strongly committed to strengthening *co-ordination among the various conventions relating to chemical substances and waste*. Although the Secretariat of the Montreal Protocol is not located there, the Secretariats of the Rotterdam PIC and Stockholm POP Conventions, as well as several international institutions actively working on issues related to the control of chemicals and wastes, are in Geneva, creating a centre of competence where synergies and coherence are enhanced and reinforced.

#### 4.4 *Endangered species*

Switzerland is in compliance with the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Over 72 000 CITES licences were issued in Switzerland in 2004, twice the number issued five years earlier (some 10% of all CITES licences worldwide are issued to Swiss entities). A further increase is expected in the next few years. Shipments of watch straps (made of leather from reptiles such as alligators, spectacled caimans or Nile crocodiles) account for over 90% of the licences issued. Customs officials and staff of the Swiss Federal Veterinary Office (SFVO), which is responsible for CITES implementation, receive regular training and co-operate with FOEN on a regular basis (OVF, 2005). FOEN is not involved in addressing scientific or policy issues related to CITES.

#### 4.5 *Forestry*

Switzerland is actively involved in promoting sustainable forestry management at the national (certification programmes) and international levels through processes such

as the United Nations Forestry Forum (UNFF) and the Ministerial Conference on the Protection of Forests in Europe (MCPFE). It supports the activities of the United Nations Food and Agriculture Organisation (FAO), the United Nations Economic Commission for Europe (UNECE) and the International Tropical Timber Organization (ITTO). It is also actively involved in forestry discussions under the Convention on Biological Diversity and the Framework Convention on Climate Change.

## 5. Regional Issues

### 5.1 *Environmental co-operation with neighbouring countries*

Switzerland *collaborates with its neighbours* in many policy areas, including water and cross-border lakes management, information exchange, and consultation on projects with potential environmental impacts. Regional co-operation is supported by meetings with all neighbouring countries (Austria, France, Germany, Italy and Liechtenstein) to address common issues. Switzerland often co-operates with these countries in international fora to develop common positions.

FOEN, together with industry associations and researchers, is involved in *PREPARE* (Preventive Environmental Protection Approaches in Europe), a European network which aims to be a catalyst for sustainable development. Between 1997 and 2001, 31 demonstration and pilot projects on cleaner technology in Switzerland were supported by PREPARE. Annual expenditure on these projects was in the range of CHF 2 million to CHF 3.8 million.

### 5.2 *Convention on the Protection of the Alps*

Around 60% of Swiss land (25 000 km<sup>2</sup>) is subject to the Convention on the Protection of the Alps (*Alpine Convention*). This represents 13% of the total land area covered by the Convention (190 600 km<sup>2</sup>) and 13% of the total population of 13.6 million population. The Swiss Alpine region (which includes the cantons of Appenzell Inner-Rhodes, Appenzell Outer-Rhodes, Bern, Fribourg, Glarus, Grisons, Lucerne, Nidwalden, Obwalden, Schwyz, St. Gall, Ticino, Uri, Vaud, Valais) produces one-sixth of the country's GDP (Secrétariat permanent de la Convention alpine, 2005).

Switzerland *ratified the Alpine Convention* in 1999. Eight protocols have come into force under international law since 2002. Switzerland has *not ratified these protocols*, as redefinitions of its regional policy have not yet been adopted by Parliament. Existing national legislation is being reviewed, under the authority of the Permanent Secretariat of the Alpine Convention, for conformity to the requirements of these protocols. In 2004, three protocols (Land Conservation, Transport, Land

Planning and Sustainable Development) were approved by the Council of State (second chamber). It has been noted that in this instance NGOs presented their input at an early stage in the process, whereas direct involvement by the Alpine cantons came late (Brem and Bruno, 1997).

Environment ministers of relevant Alpine countries meet every two years to discuss current issues and to establish regional objectives. *Cross-border issues* include transport (e.g. switching freight traffic from road to rail), ecotourism, nature conservation and natural hazards. In August 2005 Switzerland published the first report on implementation of the Alps Convention, which concludes that the Convention plays an important role for Switzerland through creating *common minimum standards* with respect to key transport and tourism issues, as well as placing Switzerland on an equal footing with other countries which are Parties to the Convention (ARE, 2005).

### 5.3 Regional co-operative mechanisms

#### *Environmental co-operation with the European Union*

Since Switzerland is not a member to the European Union (EU), co-operation with the EU is mainly based on *bilateral negotiations* and agreements on specific issues. Currently Switzerland is invited to participate in some specific committees at the EU level. In international negotiations Switzerland and the EU often develop joint positions or maintain similar positions. Switzerland became a member of the European Environment Agency (EEA) in 2006. EEA membership will help it to improve technical co-operation on emissions surveys and monitoring of environmental quality.

National *environmental legislation is harmonised* with that of the EU, above all because it is Switzerland's main trading partner. Switzerland reacts quickly at the national level when EU Directives are adopted. Liberalisation and the opening of European markets have led Switzerland to participate in some limited regional free-trade agreements.

One of the greatest challenges arising in bilateral negotiations with the EU concerns *freight transport* and transalpine movements of goods, as shown in the 1999 agreement (Box 2.2). Switzerland has played a pioneer role by introducing a heavy vehicle fee.

Traditionally, Switzerland has transposed EU legislation on chemicals into its own laws and regulations, reflecting the important trade in chemicals between Switzerland and EU markets. The proposed EU REACH Directive<sup>7</sup> has significant implications for the Swiss *chemical industry* and its trade with EU members.

Switzerland is a *Clean Air for Europe (CAFE)* programme observer. The results of this work are intended inter alia to contribute to a review of the Gothenburg Protocol. The Swiss Biological Diversity Monitoring (BDM) programme works closely with SEBI (Streamlining European 2010 Biodiversity Indicators) in the working group on indicators for species.

*Environmental co-operation with Central and Eastern Europe  
and within the Pan-European process*

Switzerland takes part in the *Environment for Europe (EfE)* process, particularly through contributions to the work of the EAP Task Force and to UNECE environmental activities. Swiss priorities for funding in the EECCA region (Eastern Europe, the Caucasus and Central Asia) include water resource management and water sector reform (Central Asia), environmental infrastructure, sustainable mountain development, capacity building of government organisations and NGOs related to MEAs, chemical management, biodiversity conservation, access and benefit sharing, and rational exploitation of biodiversity products (certification, market access). Within the EECCA region, Switzerland focuses mainly on the South Caucasus, Central Asia and Ukraine. As defined by the Swiss Agency for Development and Co-operation (SDC), priority in South-East Europe is given to Albania, Bosnia and Herzegovina, Bulgaria, Kosovo, Macedonia, Montenegro, Romania and Serbia.

SDC reports that the *amount spent on energy and environment* in 2003 was CHF 5.5 million (South-East European countries) and CHF 9.7 million (EECCA countries). FOEN reports that assistance to the EfE process and to EECCA countries was CHF 1 million in 2003 and CHF 0.9 million in 2004.

*Status of ratification of UNECE Conventions and Protocols*

Switzerland actively participates in the EfE process. It has signed the Protocol on Pollutant Release and Transfer Registers (PRTRs), which it is currently in the process of ratifying, but has *not yet signed the two other Protocols approved at the UNECE Kiev Ministerial Conference* in 2003 relating to strategic environmental evaluation, and to civil liability and indemnification in the event of damage caused by the transboundary impacts of industrial accidents on transboundary waters. Regarding the Protocol on civil liability, this partly reflects the position of influential stakeholders such as industry groups, which have argued that Switzerland's environmental legislation is among the world's best and that there is no need to introduce restrictions with the potential to negatively impact the country's competitiveness.



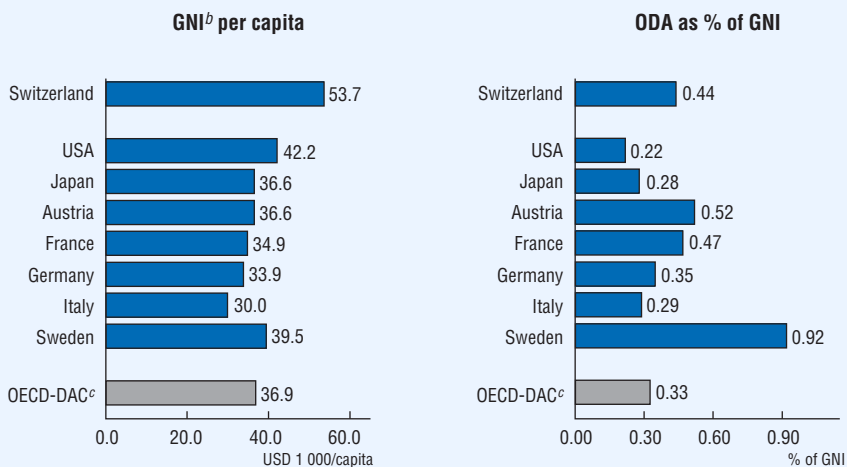
Reluctance to ratify the *Aarhus Convention* is linked to the ongoing national discussion of NGOs' role in decision-making on economic activities, including their participation in EIA. Although it is unlikely that the Aarhus Convention or the Espoo Convention *Protocol on Strategic Environmental Assessment (SEA)* will be ratified soon, Swiss legislation is already largely in compliance with both.

## 6. Official Development Assistance (ODA)

ODA as a percentage of GNI was 0.41% in 2004 (CHF 1.92 billion) and 0.44% in 2005 (CHF 2.21 billion) (Figure 7.2).<sup>8</sup> These percentages, *higher than the OECD-DAC average*, reflect Switzerland's commitment to bring its ODA levels to 0.4% in 2010. They remain below the UN target of 0.7%. The increase is partly due to a policy decision to include assistance to asylum-seekers during their first year in the host country, thus making full use of OECD-DAC reporting rules. Under the reporting scheme before 2004, Switzerland's ODA had been stable at about 0.34% over the previous decade. By region, Sub-Saharan Africa receives nearly 40% of total ODA, followed by South and Central Asia (22%) and Latin America and the Caribbean (13%) (Table 7.3).

Several government bodies, most importantly SDC, FOEN and SECO, are responsible for *development assistance related to environmental protection*. SDC is primarily responsible for bilateral assistance (traditional ODA); FOEN provides funding for contributions to international environmental organisations (except UNEP) and other types of multilateral assistance; and SECO is responsible for ODA in the area of economic development. In particular, SECO encourages transferable innovations and was one of the first bodies to finance National Strategy Studies concerning use of the Kyoto Protocol flexible mechanisms, to promote Biotrade,<sup>9</sup> to support the creation of Cleaner Production Centres<sup>10</sup> in developing countries, and to encourage fair trade (cotton, coffee, soya) and open trade in tropical timber based on sustainable resource management.

Official data provided by Switzerland to OECD-DAC show that the amount of bilateral assistance related to general environmental protection in 2004 was CHF 61 million. SAEFL reported that its 2004 ODA expenditures (all environmentally related) were CHF 39.4 million. Some CHF 250-300 million per year, collected by the *NGO/private sector* (e.g. the Swiss Alliance of Development Organizations), has also been invested, mostly in activities with strong environmental relevance.

Figure 7.2 Official development assistance, 2005<sup>a</sup>

a) Preliminary data.

b) Gross national income in USD at current exchange rates.

c) Member countries of the OECD Development Assistance Committee.

Source: OECD-DAC.

Table 7.3 Regional distribution of ODA<sup>a</sup>

(%)

	1993-94	1998-99	2003-04
Sub-Saharan Africa	40.2	38.0	39.5
South and Central Asia	20.2	20.2	22.1
Other Asia and Oceania	13.4	7.9	8.2
Middle East and North Africa	6.9	6.5	5.3
Europe	6.3	12.8	11.6
Latin America and Caribbean	13.0	14.6	13.3

a) Including imputed multilateral flows, i.e. making allowance for contributions through multilateral organisations, calculated using the geographical distribution of multilateral disbursements for the year of reference. Excluding amounts unspecified by region.

Source: OECD/DAC, Statistical Annex of the 2005 Development Co-operation Report.

## 7. Multilateral Co-operation

### 7.1 *Follow-up to the World Summit on Sustainable Development*

National activities related to WSSD follow-up are co-ordinated by the *Interdepartmental Sustainable Development Committee* (ISDC) (Chapter 4), which is responsible for preparations prior to sessions of the Commission on Sustainable Development (CSD) at regional and global levels. Priority topics for WSSD follow-up at the international level are enhancing international environmental governance, the Strategic Approach to International Chemicals Management (SAICM), and sustainable consumption and production patterns. Regarding the latter, an “environmentally sustainable public procurement” initiative has been initiated in Switzerland.

Another priority topic is *integrated water resources management*. Switzerland played a key role in elaborating this concept, which has led to a more holistic approach that also takes account of the protection and sustainable use of terrestrial ecosystems such as soils, forests and wetlands that capture, filter, store and release water, in order to guarantee high-quality water in sufficient quantities. Special programmes were implemented by Switzerland in 2003, the International Year of Fresh Water.

Switzerland actively supports two other types of partnership launched by the WSSD. The first is the Globally Harmonized System for Chemical Classification and Labelling, whose general development and implementation at the national level are funded by Switzerland, and the other is the Asian Forest Partnership, for which Switzerland provides know-how in terms of forestry governance and decentralisation, as well as funding for seminars in Asia.

Switzerland strongly supports the *Mountain Partnership* initiative launched at the WSSD to improve and strengthen co-operation between the main actors engaged in mountain development. It co-operates with mountainous countries, including Bhutan, Bolivia, Nepal and several in Central Asia, focusing on natural resources protection and biodiversity conservation.

### 7.2 *UNEP and the GEF*

Switzerland considers the United Nations Environment Programme (UNEP) to be *central to environmental protection at the international level*. It actively participates in the high-level experts group seeking to reinforce international environmental governance. Switzerland supports universal membership of the UNEP Board of Directors and UNEP’s efforts to base its finances on an indicative scale of contributions. Within the UNEP framework, Switzerland’s priorities are chemicals policy and water strategy. It supports an ecosystem approach to water management.

The Swiss *contribution to the Global Environment Facility* (GEF) for the current phase (2002-06) is CHF 99 million (its share of GEF financing is 2.43%). Within the GEF financing framework for countries in transition and developing countries, Switzerland exercises its right to review projects and suggest improvements where necessary. It supports the fourth renewal of the GEF's mandate and corresponding contributions.

### 7.3 *Multinational guidelines*

Switzerland shares the view that *increasing the volume of FDI* in developing countries is crucial if the MDGs are to be met. It supports international initiatives including the OECD Guidelines for Multinational Enterprises, the UN Global Compact and the ILO Declaration of Principles concerning Multinational Enterprises and Social Policy. These initiatives provide a framework for business enterprises with respect to human rights and social and environmental standards. SECO's division for foreign investment and multinational enterprises is responsible for compliance with the OECD Guidelines by Swiss companies operating in other countries. A number of Swiss companies participate in the Global Compact. A member of the OECD *Export Credit Group*, Switzerland follows the OECD Recommendation on Common Approaches on Environment and Officially Supported Export Credits.

Switzerland is a major base country for FDI, ranking *ninth in the world* in 2004<sup>11</sup> (CNUCED, 2005). Developed countries are the main destination for outward FDI. However, the share received by developing countries (especially in Central and Eastern Europe) has increased in recent years. Between 2001 and 2003, Swiss companies invested an average USD 725 million per year in developing countries. There are no data concerning the amount of FDI invested in environmentally related projects or the share of investments that could be classified as environmentally related.

## Notes

1. For example, while FOEN is responsible for most expenditure on multilateral organisations and conventions in the area of environment, the Department of Foreign Affairs is responsible for Switzerland's annual contribution to UNEP.
2. Required under the Kyoto Protocol, this registry is expected to be operational in 2007.
3. Large companies have generally been able to obtain a transitional period, until 2008, in order to complete conversion or replacement of large-scale installations.
4. The import and export control system, mandatory for all Parties to the Protocol, has primarily been adopted at the request of developing countries, which will have to halt their imports by 2010. In Switzerland this system helps to verify the legality of the most recent ODS imports and to avoid illegal imports.
5. As of 15 December 2005.
6. For example, carbon-zinc batteries containing more than 0.01% mercury or 0.015% cadmium (by weight) cannot be imported. Neither can alkali-manganese batteries or accumulators containing more than 0.025% mercury.
7. The REACH (Registration, Evaluation, and Authorisation of Chemicals) Directive was formally adopted on 18 December 2006 by the Council of Environment Ministers, following the vote in second reading of the European Parliament on 13 December 2006. REACH will enter into force on 1 June 2007. The text of the Regulation was published on 30 December 2006 in the Official Journal of the European Union L 396.
8. These ODA figures do not include financial assistance to East European, Caucasian or Central Asian countries, nor to South-East European countries.
9. The Biotrade initiative, launched by the United Nations Conference on Trade and Development (UNCTAD) in 1996, aims at stimulating trade and investment in biological resources in compliance with the three objectives of the Convention on Biological Diversity, namely conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits of using genetic resources.
10. Cleaner Production Centres provide companies with expert advice and training to help them adopt eco-efficient production techniques that will allow them to reduce operating costs, enhance competitiveness and find new international markets.
11. In terms of Outward FDI Performance Index ranking.

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## **REFERENCES**

- I.A Selected environmental data
- I.B Selected economic data
- I.C Selected social data
- II.A Selected multilateral agreements (worldwide)
- II.B Selected multilateral agreements (regional)
- III. Abbreviations
- IV. Physical context
- V. Selected environmental websites

**1.A: SELECTED ENVIRONMENTAL DATA (1)**

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN
<b>LAND</b>													
Total area (1000 km <sup>2</sup> )		9971	1958	9629	378	100	7713	270	84	31	79	43	338
Major protected areas (% of total area)	2	8.7	9.2	25.1	17.0	9.6	18.5	32.4	28.0	3.4	15.8	11.1	9.1
Nitrogenous fertiliser use (t/km <sup>2</sup> of agricultural land)		2.7	1.1	2.6	8.8	18.9	0.2	2.1	3.5	10.8	6.8	7.6	6.0
Pesticide use (t/km <sup>2</sup> of agricultural land)		0.06	0.04	0.08	1.24	1.20	-	0.02	0.09	0.69	0.10	0.11	0.06
Livestock densities (head of sheep eq./km <sup>2</sup> of agr. land)		192	256	191	1011	1560	62	685	492	1790	287	912	290
<b>FOREST</b>													
Forest area (% of land area)		45.3	33.9	32.6	68.9	63.8	21.4	34.7	41.6	22.4	34.1	12.7	75.5
Use of forest resources (harvest/growth)		0.4	0.2	0.6	0.4	0.1	0.6	..	0.7	0.9	0.7	0.7	0.7
Tropical wood imports (USD/cap.)	3	1.6	0.2	2.2	10.7	6.1	4.0	3.4	0.4	24.2	0.3	3.8	1.4
<b>THREATENED SPECIES</b>													
Mammals (% of species known)		31.6	34.0	18.8	24.0	17.9	24.7	18.0	22.0	30.5	18.9	22.0	11.9
Birds (% of species known)		12.9	17.0	11.6	12.9	13.3	12.5	21.0	27.3	28.1	49.5	13.2	13.3
Fish (% of species known)		7.3	34.4	14.4	25.3	9.2	0.8	10.0	41.7	23.8	40.0	15.8	11.8
<b>WATER</b>													
Water withdrawal (% of gross annual availability)		1.5	15.5	19.2	20.3	35.6	6.4	1.7	4.2	32.5	11.9	4.4	2.1
Public waste water treatment (% of population served)		72	25	71	64	78	..	80	86	46	70	89	81
Fish catches (% of world catches)		1.2	1.6	5.4	5.0	1.9	0.2	0.6	-	-	-	1.4	0.2
<b>AIR</b>													
Emissions of sulphur oxides (kg/cap.)		76.3	12.2	49.4	6.7	10.4	126.9	18.6	4.4	14.6	22.2	4.5	16.4
(kg/1000 USD GDP)	4	2.6	1.4	1.4	0.3	0.6	4.6	0.8	0.2	0.5	1.4	0.2	0.6
change (1990-early 2000s)		-27	..	-31	-14	-46	59	39	-55	-58	-88	-86	-64
Emissions of nitrogen oxides (kg/cap.)		78.4	12.0	63.9	15.8	24.4	84.2	39.0	24.7	26.3	32.3	35.5	40.5
(kg/1000 USD GDP)	4	2.7	1.4	1.8	0.6	1.3	3.0	1.7	0.9	1.0	2.0	1.2	1.5
change (1990-early 2000s)		-6	18	-19	-2	47	29	16	-3	-24	-40	-31	-32
Emissions of carbon dioxide (t./cap.)	5	17.2	3.6	19.7	9.5	9.6	17.6	8.1	9.2	11.2	11.6	9.4	13.2
(t./1000 USD GDP)	4	0.57	0.39	0.53	0.35	0.50	0.63	0.36	0.31	0.41	0.71	0.32	0.47
% change (1990-2004)		29	27	20	15	105	36	49	31	7	-23	-	25
<b>WASTE GENERATED</b>													
Industrial waste (kg/1000 USD GDP)	4, 6	..	..	..	40	40	..	10	..	50	50	20	130
Municipal waste (kg/cap.)	7	380	320	740	410	390	450	400	550	470	280	670	450
Nuclear waste (t./Mtoe of TPES)	8	4.0	0.1	1.1	1.6	3.0	-	-	-	1.9	1.4	-	1.9

.. not available. - nil or negligible.

1) Data refer to the latest available year. They include provisional figures and Secretariat estimates.

Partial totals are underlined. Varying definitions can limit comparability across countries.

2) IUCN management categories I-VI and protected areas without IUCN category assignment; national classifications may differ.

3) Total imports of cork and wood from non-OECD tropical countries.

4) GDP at 2000 prices and purchasing power parities.

Source: OECD Environmental Data Compendium.

## OECD EPR / SECOND CYCLE

FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD*	OECD*
549	357	132	93	103	70	301	3	42	324	313	92	49	506	450	<b>41</b>	779	245	35042
13.3	31.5	5.2	8.9	9.5	1.2	19.0	17.1	18.9	6.4	29.0	8.5	25.2	9.5	9.5	<b>28.7</b>	4.3	30.1	16.4
7.5	10.5	3.0	6.2	0.5	8.1	6.0	-	14.6	9.6	4.5	2.6	3.6	3.6	6.0	<b>3.5</b>	3.1	6.8	2.2
0.27	0.17	0.14	0.14	-	0.05	0.58	0.33	0.41	0.08	0.06	0.40	0.16	0.14	0.05	<b>0.10</b>	0.06	0.21	0.07
514	689	245	207	65	1139	488	4351	2142	845	315	498	226	339	409	<b>794</b>	290	674	208
31.6	30.2	22.8	19.5	1.3	9.4	23.3	34.5	9.5	39.2	30.0	36.9	41.6	33.3	73.5	<b>30.8</b>	27.0	11.6	34.4
0.6	0.5	0.6	0.5	-	0.7	0.5	0.5	0.6	0.5	0.6	0.8	0.5	0.5	0.7	<b>0.8</b>	0.5	0.6	0.6
6.8	1.8	2.7	0.1	2.8	11.2	7.1	-	15.6	3.6	0.3	17.6	0.1	6.2	2.2	<b>0.6</b>	0.5	2.7	4.0
19.0	41.8	37.8	71.1	-	1.8	40.7	51.6	18.6	3.4	14.1	17.7	22.2	26.3	22.4	<b>32.9</b>	22.2	6.3	..
19.2	27.3	1.9	18.8	44.0	5.4	18.4	50.0	21.5	7.7	8.6	13.7	14.4	25.5	19.1	<b>36.4</b>	30.8	15.4	..
31.9	68.2	26.2	32.1	-	23.1	29.0	27.9	48.9	-	7.0	22.9	24.1	52.9	16.4	<b>38.9</b>	9.9	11.1	..
17.5	20.2	12.1	4.7	0.1	2.3	24.0	3.7	9.9	0.7	18.6	15.1	1.4	34.7	1.5	<b>4.7</b>	17.0	20.8	11.4
79	92	56	32	50	73	69	95	98	73	55	41	53	55	86	<b>97</b>	17	95	64
0.7	0.3	0.1	-	2.2	0.3	0.3	-	0.5	2.9	0.2	0.2	-	1.0	0.3	-	0.6	0.7	27.9
9.0	7.4	46.3	35.3	35.0	24.5	11.5	6.7	5.3	4.9	38.1	28.4	19.0	37.3	6.5	<b>2.3</b>	31.3	16.9	27.8
0.3	0.3	2.6	2.7	1.3	0.8	0.5	0.1	0.2	0.1	3.6	1.6	1.6	1.8	0.2	<b>0.1</b>	4.6	0.6	1.1
-60	-89	4	-64	22	-48	-63	-80	-58	-58	-55	-9	-81	-29	-45	<b>-60</b>	33	-73	-40
22.7	17.2	28.9	17.7	90.5	31.0	21.8	38.1	26.6	46.9	20.8	27.8	19.0	34.7	27.1	<b>11.4</b>	14.1	26.8	34.3
0.8	0.7	1.7	1.4	3.3	1.0	0.9	0.8	1.0	1.3	2.0	1.6	1.6	1.7	1.0	<b>0.4</b>	2.1	1.0	1.4
-29	-48	11	-24	-2	5	-34	-27	-28	-5	-38	13	-53	14	-25	<b>-46</b>	48	-43	-17
6.4	10.3	8.5	5.6	7.7	10.2	7.9	24.9	11.4	7.9	7.8	5.7	7.0	7.7	5.8	<b>6.0</b>	2.9	9.0	11.1
0.23	0.40	0.45	0.40	0.26	0.31	0.31	0.47	0.42	0.21	0.66	0.33	0.54	0.36	0.20	<b>0.20</b>	0.40	0.33	0.44
9	-12	33	-19	19	37	16	7	18	26	-15	52	-34	59	-	<b>8</b>	63	-4	17
70	20	..	20	-	60	20	..	40	20	140	50	40	20	90	<b>10</b>	30	30	60
540	640	430	460	730	750	520	660	600	700	260	450	300	640	470	<b>660</b>	360	620	550
4.1	1.4	-	1.8	-	-	-	-	0.1	-	-	-	3.1	1.5	3.8	<b>2.1</b>	-	4.0	1.5

UKD: pesticides and threatened species: Great Britain; water withdrawal and public waste water treatment plants: England and Wales.

5) CO<sub>2</sub> from energy use only; sectoral approach; international marine and aviation bunkers are excluded.

6) Waste from manufacturing industries.

7) CAN, NZL: household waste only.

8) Waste from spent fuel arising in nuclear power plants, in tonnes of heavy metal, per million tonnes of oil equivalent of total primary energy supply.

**I.B: SELECTED ECONOMIC DATA (1)**

	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK
<b>GROSS DOMESTIC PRODUCT</b>											
GDP, 2004 (billion USD at 2000 prices and PPPs)	964	957	10842	3447	921	561	91	241	285	168	160
% change (1990-2004)	47.2	49.7	52.4	19.7	116.2	59.5	53.7	35.5	31.0	15.1	32.1
per capita, 2004 (1000 USD/cap.)	30.2	9.2	36.9	27.0	19.2	27.9	22.4	29.5	27.4	16.5	29.6
Exports, 2004 (% of GDP)	38.2	30.1	10.0	13.1	44.1	18.2	29.2	50.6	83.5	71.3	43.5
<b>INDUSTRY</b> 2											
Value added in industry (% of GDP)	32	27	23	31	43	26	25	32	27	40	27
Industrial production: % change (1990-2003)	42.3	42.2	43.4	-3.2	164.7	29.8	26.9	53.2	17.6	3.0	36.1
<b>AGRICULTURE</b>											
Value added in agriculture (% of GDP)	3	4	2	1	4	4	7	2	1	4	3
Agricultural production: % change (1990-2005)	25.6	41.5	27.6	-12.3	19.3	25.4	47.9	9.9	13.0	..	0.7
Livestock population, 2005 (million head of sheep eq.)	118	275	787	53	30	283	99	17	25	12	24
<b>ENERGY</b>											
Total supply, 2004 (Mtoe)	269	165	2326	533	213	116	18	33	58	46	20
% change (1990-2004)	28.5	33.1	20.7	19.6	129.9	32.2	28.2	32.6	17.5	-7.1	12.2
Energy intensity, 2004 (toe/1000 USD GDP)	0.28	0.17	0.21	0.15	0.23	0.21	0.19	0.14	0.20	0.27	0.13
% change (1990-2004)	-12.7	-11.1	-20.8	-0.1	6.3	-17.1	-16.6	-2.1	-10.3	-19.3	-15.1
Structure of energy supply, 2004 (%)	4										
Solid fuels	10.6	4.3	23.5	21.8	23.5	42.7	10.7	12.0	10.2	44.7	21.5
Oil	36.4	58.1	40.8	47.8	47.6	32.0	39.9	43.3	40.4	20.5	41.3
Gas	28.9	26.4	22.1	13.2	11.9	19.6	19.6	23.1	25.5	16.6	22.8
Nuclear	8.7	1.4	9.1	13.8	16.0	-	-	-	21.6	14.6	-
Hydro, etc.	15.3	9.8	4.5	3.4	1.0	5.6	29.9	21.5	2.3	3.5	14.4
<b>ROAD TRANSPORT</b> 5											
Road traffic volumes per capita, 2002 (1000 veh.-km/cap.)	10.1	0.7	15.9	6.2	2.3	9.8	11.2	8.3	8.8	4.4	8.9
Road vehicle stock, 2003 (10 000 vehicles)	1850	2051	23139	7254	1454	1279	255	490	544	409	232
% change (1990-2003)	11.7	107.5	22.6	28.4	328.4	30.8	38.1	32.7	27.7	57.8	22.7
per capita (veh./100 inh.)	58	20	80	57	30	64	64	60	52	40	43

.. not available. - nil or negligible.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Value added: includes mining and quarrying, manufacturing, gas, electricity and water and construction;  
production: excludes construction.

Source: OECD Environmental Data Compendium.

## OECD EPR / SECOND CYCLE

FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD
145	1650	2109	210	141	9	132	1495	24	446	175	446	181	70	910	258	<b>225</b>	529	1649	29441
31.6	28.1	23.0	48.7	24.4	43.6	144.4	21.3	91.1	36.6	54.6	60.2	34.0	30.7	44.2	31.6	<b>14.0</b>	63.6	39.4	40.9
27.8	27.4	25.6	19.0	14.0	29.9	32.7	25.7	53.3	27.4	38.1	11.7	17.2	12.9	21.3	28.7	<b>30.4</b>	7.4	27.6	25.3
37.1	25.9	38.2	20.2	64.9	36.8	80.2	26.7	146.2	65.4	43.7	39.1	30.9	76.8	27.0	46.2	<b>45.9</b>	28.9	24.7	23.3
32	25	30	23	31	27	42	29	20	26	38	30	29	32	30	28	<b>27</b>	31	26	29
71.3	13.4	9.7	11.7	67.4	..	302.4	11.8	39.3	16.5	33.6	81.5	17.7	10.9	24.1	45.0	<b>19.4</b>	65.9	9.0	<u>26.2</u>
4	3	1	7	4	9	3	3	1	3	2	3	4	5	3	2	<b>1</b>	12	1	3
-3.9	0.9	-4.7	10.1	-10.5	5.4	2.6	10.7	13	-9.2	-9.4	-15.8	1.1	..	7.4	-10.2	<b>-4.3</b>	18.2	-8.0	..
8	156	117	21	12	1	50	64	6	42	9	58	19	6	100	13	<b>12</b>	111	113	2639
38	275	348	30	26	3	15	184	5	82	28	92	27	18	142	54	<b>27</b>	82	234	5508
30.6	21.1	-2.3	37.4	-7.7	61.0	46.1	24.6	33.0	23.1	28.7	-8.1	49.6	-14.0	56.1	13.4	<b>8.6</b>	54.6	10.1	21.7
0.26	0.17	0.17	0.15	0.19	0.40	0.12	0.12	0.20	0.18	0.16	0.21	0.15	0.26	0.16	0.21	<b>0.12</b>	0.15	0.14	0.19
-0.7	-5.5	-20.6	-7.6	-25.8	12.1	-40.2	2.8	-30.4	-9.9	-16.8	-42.6	11.6	-34.2	8.3	-13.9	<b>-4.7</b>	-5.5	-21.0	-13.6
20.0	5.0	24.6	30.1	13.6	2.9	15.1	9.2	2.1	10.8	3.5	58.6	13.0	24.5	14.8	5.5	<b>0.5</b>	27.3	16.1	20.5
29.8	32.8	36.0	57.2	24.9	25.0	58.5	46.2	69.4	39.6	39.7	23.4	59.3	17.4	49.7	28.8	<b>46.1</b>	36.7	35.9	40.7
10.5	14.3	22.6	7.4	45.5	-	24.2	36.6	26.9	45.5	16.7	12.8	12.7	29.7	17.7	1.6	<b>10.0</b>	22.8	37.5	21.7
15.7	41.6	12.5	-	12.1	-	-	-	-	1.2	-	-	-	24.3	11.6	37.5	<b>25.9</b>	-	8.9	11.0
24.0	6.2	4.3	5.3	3.8	72.0	2.2	8.0	1.6	2.9	40.2	5.2	15.0	4.2	6.3	26.5	<b>17.5</b>	13.2	1.6	6.1
9.4	8.7	7.2	7.5	2.3	8.2	8.8	8.3	7.9	7.7	7.3	3.6	6.3	2.4	4.4	8.5	<b>7.8</b>	0.8	8.1	8.2
263	3563	4736	500	320	19	179	3848	33	787	240	1364	542	154	2311	451	<b>406</b>	645	3296	62611
17.6	25.2	27.0	98.1	..	41.5	88.2	28.6	64.7	37.3	23.8	113.2	146.5	56.9	60.0	15.0	<b>25.0</b>	173.2	30.7	33.3
50	59	57	45	32	66	45	66	73	48	53	36	52	29	55	50	<b>55</b>	9	55	54

3) Agriculture, forestry, hunting, fishery, etc.

4) Breakdown excludes electricity trade.

5) Refers to motor vehicles with four or more wheels, except for Italy, which include three-wheeled goods vehicles.

**I.C: SELECTED SOCIAL DATA (1)**

	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK
<b>POPULATION</b>											
Total population, 2004 (100 000 inh.)	319	1040	2939	1277	481	201	41	82	104	102	54
% change (1990-2004)	15.3	28.0	17.6	3.4	12.2	17.8	20.8	5.9	4.3	-1.5	5.1
Population density, 2004 (inh./km <sup>2</sup> )	3.2	53.1	30.5	338.0	482.8	2.6	15.0	97.5	340.6	129.5	125.3
Ageing index, 2004 (over 64/under 15)	72.3	18.6	59.7	140.3	44.4	65.4	54.9	97.1	97.2	91.6	79.5
<b>HEALTH</b>											
Women life expectancy at birth, 2004 (years)	82.4	77.6	80.1	85.6	80.8	83.0	81.3	82.1	81.7	79.0	79.9
Infant mortality, 2004 (deaths /1 000 live births)	5.3	19.7	6.9	2.8	5.3	4.7	6.2	4.5	4.3	3.7	4.4
Expenditure, 2004 (% of GDP)	9.9	6.5	15.3	8.0	5.6	9.6	8.4	9.6	10.1	7.3	8.9
<b>INCOME AND POVERTY</b>											
GDP per capita, 2004 (1000 USD/cap.)	30.2	9.2	36.9	27.0	19.2	27.9	22.4	29.5	27.4	16.5	29.6
Poverty (% pop. < 50% median income)	10.3	20.3	17.0	15.3	..	11.2	10.4	9.3	7.8	4.4	4.3
Inequality (Gini levels)	2	30.1	48.0	35.7	31.4	..	30.5	33.7	26.0	26.0	24.0
Minimum to median wages, 2000	3	42.5	21.1	36.4	32.7	25.2	57.7	46.3	x	49.2	32.3
<b>EMPLOYMENT</b>											
Unemployment rate, 2004 (% of civilian labour force)	4	7.2	3.0	5.5	4.7	3.7	5.5	3.9	4.9	8.4	8.3
Labour force participation rate, 2004 (% 15-64 years)	79.6	59.9	74.9	77.5	67.8	76.1	78.0	79.7	66.2	70.6	80.3
Employment in agriculture, 2004 (%)	5	2.6	15.9	1.6	4.5	8.1	3.7	7.5	5.0	2.0	4.3
<b>EDUCATION</b>											
Education, 2004 (% 25-64 years)	6	84.3	22.6	87.9	84.0	74.4	64.1	77.6	80.2	63.6	89.1
Expenditure, 2003 (% of GDP)	7	6.1	6.8	7.5	4.8	7.5	5.8	6.8	5.5	6.1	4.7
<b>OFFICIAL DEVELOPMENT ASSISTANCE</b>											
ODA, 2005 (% of GNI)	0.34	..	0.22	0.28	..	0.25	0.27	0.52	0.53	..	0.81
ODA, 2005 (USD/cap.)	116	..	93	103	..	82	67	189	189	..	389

.. not available. - nil or negligible. x not applicable.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (including all incomes, taxes and benefits) for the entire population.

3) Minimum wage as a percentage of median earnings including overtime pay and bonuses.

Source: OECD.

## OECD EPR / SECOND CYCLE

FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD
52	603	825	111	101	3	40	582	5	163	46	382	105	54	427	90	<b>74</b>	718	598	11617
4.9	6.3	4.0	9.6	-2.6	14.8	15.4	2.6	17.6	8.9	8.3	0.2	6.4	1.6	9.9	5.1	<b>10.1</b>	27.8	4.4	11.6
15.5	109.8	231.1	83.8	108.6	2.8	57.5	193.1	174.8	391.9	14.2	122.1	114.2	109.8	84.4	20.0	<b>179.0</b>	92.1	244.1	33.2
89.6	88.5	134.5	121.5	98.7	52.2	53.5	133.1	75.3	74.2	74.3	76.9	107.8	66.8	116.0	97.3	<b>100.8</b>	19.4	87.1	70.2
82.3	83.8	81.4	81.4	76.9	82.7	80.7	82.5	81.0	81.4	82.3	79.4	80.5	77.8	83.8	82.7	<b>83.7</b>	73.8	80.7	..
3.3	3.9	4.1	4.1	6.6	2.8	4.9	4.1	3.9	4.1	3.2	6.8	4.0	6.8	3.5	3.1	<b>4.2</b>	23.6	5.1	..
7.5	10.5	10.6	10.0	8.0	10.2	7.1	8.8	8.0	9.2	9.2	6.5	10.1	5.9	8.1	9.1	<b>11.6</b>	7.7	8.4	..
27.8	27.4	25.6	19.0	14.0	29.9	32.7	25.7	53.3	27.4	38.1	11.7	17.2	12.9	21.3	28.7	<b>30.4</b>	7.4	27.6	25.3
6.4	7.0	9.8	13.5	8.2	..	15.4	12.9	5.5	6.0	6.3	9.8	13.7	..	11.5	5.3	<b>6.7</b>	15.9	11.4	10.2
25.0	28.0	28.0	33.0	27.0	35.0	32.0	33.0	26.0	27.0	25.0	31.0	38.0	33.0	31.0	23.0	<b>26.7</b>	45.0	34.0	30.7
x	60.8	x	51.3	37.2	x	55.8	x	48.9	47.1	x	35.5	38.2	..	31.8	x	<b>x</b>	..	41.7	..
8.9	9.6	9.5	10.5	6.1	3.1	4.5	8.0	4.8	4.6	4.4	19.0	6.7	18.2	10.6	6.4	<b>4.4</b>	10.2	4.7	6.9
74.1	69.6	77.0	64.8	59.2	83.6	71.0	62.2	66.6	78.6	79.4	63.8	76.9	69.4	69.2	77.8	<b>87.3</b>	51.7	75.9	70.9
4.9	3.5	2.4	12.6	5.3	6.3	6.4	4.5	1.3	3.0	3.5	18.0	12.1	5.1	5.5	2.1	<b>3.7</b>	34.0	1.3	6.1
77.6	65.3	83.9	56.2	75.4	60.0	62.9	48.2	62.3	70.7	88.3	50.1	25.2	84.7	45.0	82.9	<b>84.5</b>	26.1	65.1	67.5
6.1	6.3	5.3	4.2	6.1	8.0	4.4	5.1	3.6	5.0	6.6	6.4	5.9	4.7	4.7	6.7	<b>6.5</b>	3.7	6.1	5.8
0.47	0.47	0.35	0.24	..	..	0.41	0.29	0.87	0.82	0.93	..	0.21	..	0.29	0.92	<b>0.44</b>	..	0.48	0.33
171	165	120	48	..	..	168	86	580	314	600	..	35	..	72	363	<b>238</b>	..	179	121

4) Standardised unemployment rates; MEX, ISL, TUR: commonly used definitions.

5) Civil employment in agriculture, forestry and fishing.

6) Upper secondary or higher education; OECD: average of rates.

7) Public and private expenditure on educational institutions; OECD: average of rates.

8) Official Development Assistance by Member countries of the OECD Development Assistance Committee.

## II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE)

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA		
1946	Washington	Conv. - Regulation of whaling	Y	D	R	R
1956	Washington	Protocol	Y	D	R	R
1949	Geneva	Conv. - Road traffic	Y	R		R
1957	Brussels	Conv. - Limitation of the liability of owners of sea-going ships	Y	S		
1979	Brussels	Protocol	Y			
1958	Geneva	Conv. - Fishing and conservation of the living resources of the high seas	Y	S	R	R
1959	Washington	Treaty - Antarctic	Y	R		R
1991	Madrid	Protocol to the Antarctic treaty (environmental protection)	Y	R		R
1960	Geneva	Conv. - Protection of workers against ionising radiations (ILO 115)	Y		R	
1962	Brussels	Conv. - Liability of operators of nuclear ships	Y			
1963	Vienna	Conv. - Civil liability for nuclear damage	Y		R	
1988	Vienna	Joint protocol relating to the application of the Vienna Convention and the Paris Convention	Y			
1997	Vienna	Protocol to amend the Vienna convention	Y			
1963	Moscow	Treaty - Banning nuclear weapon tests in the atmosphere, in outer space and under water	Y	R	R	R
1964	Copenhagen	Conv. - International council for the exploration of the sea	Y	R		R
1970	Copenhagen	Protocol	Y	R		R
1969	Brussels	Conv. - Intervention on the high seas in cases of oil pollution casualties (INTERVENTION)	Y		R	R
1973	London	Protocol (pollution by substances other than oil)	Y		R	R
1969	Brussels	Conv. - Civil liability for oil pollution damage (CLC)	Y	D	D	S
1976	London	Protocol	Y	R		R
1992	London	Protocol	Y	R		R
1970	Bern	Conv. - Transport of goods by rail (CIM)	Y			
1971	Brussels	Conv. - International fund for compensation for oil pollution damage (FUND)	Y	D	D	S
1976	London	Protocol	Y	R		R
1992	London	Protocol (replaces the 1971 Convention)	Y	R		R
2000	London	Amendment to protocol (limits of compensation)	Y	R		R
2003	London	Protocol (supplementary fund)	Y			
1971	Brussels	Conv. - Civil liability in maritime carriage of nuclear material	Y			
1971	London, Moscow, Washington	Conv. - Prohib. emplacement of nuclear and mass destruct. weapons on sea-bed, ocean floor and subsoil	Y	R	R	R
1971	Ramsar	Conv. - Wetlands of international importance especially as waterfowl habitat	Y	R	R	R
1982	Paris	Protocol	Y	R	R	R
1987	Regina	Regina amendment	Y	R		R
1971	Geneva	Conv. - Protection against hazards of poisoning arising from benzene (ILO 136)	Y			
1972	London, Mexico, Moscow, Washington	Conv. - Prevention of marine pollution by dumping of wastes and other matter (LC)	Y	R	R	R
1996	London	Protocol to the Conv. - Prevention of marine poll. by dumping of wastes and other matter		R		S
1972	Geneva	Conv. - Protection of new varieties of plants (revised)	Y	R	R	R



OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
D	D				D		D	D	D	D			R		S		D	D	R	R		R	D	R		D	
					R		R		S		S					R			R	R		R		R		D	
					R	S		R	R	R	R			S	S		R			R	R		R		R		R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	S	R	R	S	R	R	R	R	S			R		R	R	R		S	R	R	S		R	
R					R	R	R	R	R	R	R	R			R		R	R	R	R	R	R	R	R	R	R	R
S					S				S					S		R			R								
						R				R								R		R	S					S	
					S	R	R	R	S	R	R	R			R		R	R	R	S	R	S	R	S	R	S	S
					S					S				S						S							
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R
					R		R	R	R	R		R	R			R	R	R	R	R		R	R		R		R
					R		R	R	R	R		R	R			R	R	R	R	R		R	R		R		R
R	S	R	R		R		R	R	R	R	S		R	R	R		R	R	R	R	R	R	R	R	R	R	R
					R	S		R	R	R	R	R			R	R		R	R	R	R	R	R	R	R	R	R
D	D	D	D		D		D	D	D	D	D		D	D	D	R	D	D	D	D		D	D	D		D	
R	R	R	R		R		R	R	R	R	R	R	D	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R		R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
					R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
D	D	D	D		R		D	D	D	D	D		D	D	D		D	D	D	R		D	D	D		D	
R	R	R	R		R		R	R	R	R	R	R	D	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R		R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R		R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R					R		R	R	R	R	R				R		R	R	R		S	R	R			S	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
					R		R	R	R	R	R				R						R	R		R			
R	R	R	R		R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
					R	R		R	S	R	R				R	R		S	R			R	R	R		R	
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

**II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)**

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA
1978 Geneva	Amendments	Y	R	R R
1991 Geneva	Amendments	Y		R
1972 Geneva	Conv. - Safe container (CSC)	Y	R	R R
1972 London, Moscow, Washington	Conv. - International liability for damage caused by space objects	Y	R	R R
1972 Paris	Conv. - Protection of the world cultural and natural heritage	Y	R	R R
1973 Washington	Conv. - International trade in endangered species of wild fauna and flora (CITES)	Y	R	R R
1974 Geneva	Conv. - Prev. and control of occup. hazards caused by carcinog. subst. and agents (ILO 139)	Y		
1976 London	Conv. - Limitation of liability for maritime claims (LLMC)	Y		R
1996 London	Amendment to convention	Y	S	
1977 Geneva	Conv. - Protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration (ILO 148)	Y		
1978 London	Protocol - Prevention of pollution from ships (MARPOL PROT)	Y	R	R R
1978 London	Annex III	Y	R	R
1978 London	Annex IV	Y		
1978 London	Annex V	Y		R R
1997 London	Annex VI	Y		S
1979 Bonn	Conv. - Conservation of migratory species of wild animals	Y		
1991 London	Agreem. - Conservation of bats in Europe	Y		
1992 New York	Agreem. - Conservation of small cetaceans of the Baltic and the North Seas (ASCOBANS)	Y		
1996 Monaco	Agreem. - Conservation of cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area	Y		
1996 The Hague	Agreem. - Conservation of African-Eurasian migratory waterbirds	Y		
2001 Canberra	Agreem. - Conservation of albatrosses and petrels (ACAP)	Y		
1982 Montego Bay	Conv. - Law of the sea	Y	R	R
1994 New York	Agreem. - relating to the implementation of part XI of the convention	Y	R	R S
1995 New York	Agreem. - Implementation of the provisions of the convention relating to the conservation and management of straddling fish stocks and highly migratory fish stocks	Y	R	R
1983 Geneva	Agreem. - Tropical timber	Y	R	R
1994 New York	Revised agreem. - Tropical timber	Y	R	R R
1985 Vienna	Conv. - Protection of the ozone layer	Y	R	R R
1987 Montreal	Protocol (substances that deplete the ozone layer)	Y	R	R R
1990 London	Amendment to protocol	Y	R	R R
1992 Copenhagen	Amendment to protocol	Y	R	R R
1997 Montreal	Amendment to protocol	Y	R	R
1999 Beijing	Amendment to protocol	Y	R	R
1986 Vienna	Conv. - Early notification of a nuclear accident	Y	R	R R
1986 Vienna	Conv. - Assistance in the case of a nuclear accident or radiological emergency	Y	R	R R
1989 Basel	Conv. - Control of transboundary movements of hazardous wastes and their disposal	Y	R	R S



## II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA
1995 Geneva	Amendment			
1999 Basel	Prot. - Liability and compensation for damage			
1989 London	Conv. - Salvage		Y	R R R
1990 Geneva	Conv. - Safety in the use of chemicals at work (ILO 170)		Y	R
1990 London	Conv. - Oil pollution preparedness, response and co-operation (OPRC)		Y	R R R
2000 London	Protocol - Pollution incidents by hazardous and noxious substances (OPRC-HNS)			
1992 Rio de Janeiro	Conv. - Biological diversity		Y	R R S
2000 Montreal	Prot. - Biosafety (Cartagena)		Y	S R
1992 New York	Conv. - Framework convention on climate change		Y	R R R
1997 Kyoto	Protocol		Y	R R S
1993 Paris	Conv. - Prohibition of the development, production, stockpiling and use of chemical weapons and their destruction		Y	R R R
1993 Geneva	Conv. - Prevention of major industrial accidents (ILO 174)		Y	
1993	Agreement - Promote compliance with international conservation and management measures by fishing vessels on the high seas		Y	R R R
1994 Vienna	Conv. - Nuclear safety		Y	R R R
1994 Paris	Conv. - Combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa		Y	R R R
1996 London	Conv. - Liability and compensation for damage in connection with the carriage of hazardous and noxious substances by sea (HNS)			S
2000 London	Protocol - Pollution incidents by hazardous and noxious substances (OPRC-HNS)			
1997 Vienna	Conv. - Supplementary compensation for nuclear damage			S
1997 Vienna	Conv. - Joint convention on the safety of spent fuel management and on the safety of radioactive waste management		Y	R R
1997 New York	Conv. - Law of the non-navigational uses of international watercourses			
1998 Rotterdam	Conv. - Prior informed consent procedure for hazardous chemicals and pesticides (PIC)		Y	R R S
2001 London	Conv. - Civil liability for bunker oil pollution damage			
2001 London	Conv. - Control of harmful anti-fouling systems on ships			S
2001 Stockholm	Conv. - Persistent organic pollutants		Y	R R S

Source: IUCN; OECD.

OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
			R	R	R	R	R	R	R	R		R				R	R	R	R	R	R	R	R	R	R	R	R
							S	S	S			S				S							S	S		S	
	R		R		R		R	S	R	R	R		R	R	R		R	R	S				R	R	R	R	
R	R	R	R												R			R	R				R				
							S	S	S	S	R						R		R				R				
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R		R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
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**II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL)**

Y = in force S = signed R = ratified D = denounced

		CAN MEX USA			
1885 Berlin	Treaty - Regulation of Salmon Fishery in the Rhine River Basin	Y			
1950 Paris	Conv. - Protection of birds	Y			
1950 Brussels	Protocole to establish a tripartite standing committee on polluted waters	Y			
1957 Geneva	Agreem. - International carriage of dangerous goods by road (ADR)	Y			
1975 New York	Protocol	Y			
1958 Geneva	Agreem. - Adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipments and parts	Y			
1958 Bucharest	Conv. - Fishing in the waters of the Danube	Y			
1960 Paris	Conv. - Third party liability in the field of nuclear energy	Y			
1963 Brussels	Supplementary convention	Y			
1964 Paris	Additional protocol to the convention	Y			
1964 Paris	Additional protocol to the supplementary convention	Y			
1982 Brussels	Protocol amending the convention	Y			
1982 Brussels	Protocol amending the supplementary convention	Y			
1988 Vienna	Joint protocol relating to the application of the Vienna Convention and the Paris Convention	Y			
1960 Steckborn	Agreem. - Protection of Lake Constance against pollution	Y			
1966 Bern	Regulation (water withdrawal)	Y			
1961 Paris	Prot. - Constitution of an int'l commission for the protection of the Mosel against pollution	Y			
1990 Brussels	Complementary protocol (int'l commi. for the protection of Mosel and Sarre)	Y			
1992 Maria Laach	2d compl.prot. (to int'l commi. protec. of Mosel and Sarre, and to first compl. prot.)	Y			
1963 Bern	Agreem. - International commission for the protection of the Rhine against pollution	Y			
1976 Bonn	Supplementary agreement	Y			
1976 Bonn	Conv. - Protection of the Rhine against chemical pollution	Y			
1976 Bonn	Conv. - Protection of the Rhine from pollution by chlorides (modified by exchanges of letters)	Y			
1991 Brussels	Protocol	Y			
1964 Brussels	Agreem. - Measures for the conservation of Antarctic Fauna and Flora	Y			R
1964 London	Conv. - Fisheries	Y			
1966 Rio de Janeiro	Conv. - International convention for the conservation of Atlantic tunas (ICCAT)	Y	R	R	R
1967 London	Conv. - Conduct of fishing operations in the North Atlantic	Y	S		S
1968 Strasbourg	Agreem. - Restriction of the use of certain detergents in washing and cleaning products	Y			
1983 Strasbourg	Protocol	Y			
1968 Paris	Conv. - Protection of animals during international transport	Y			
1979 Strasbourg	Protocol	Y			
1969 London	Conv. - Protection of the archaeological heritage	Y			
1972 London	Conv. - Conservation of Antarctic seals	Y	R		R
1973 Oslo	Agreem. - Conservation of polar bears	Y	R		R
1978 Ottawa	Conv. - Future multilateral co-operation in the Northwest Atlantic fisheries (NAFO)	Y	R		R
1979 Bern	Conv. - Conservation of European wildlife and natural habitats	Y			



**II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL) (cont.)**

Y = in force S = signed R = ratified D = denounced

		CAN MEX USA			
1979	Geneva	Conv. - Long-range transboundary air pollution (CLRTAP)	Y	R	R
1984	Geneva	Protocol (financing of EMEP)	Y	R	R
1985	Helsinki	Protocol (reduction of sulphur emissions or their transboundary fluxes by at least 30%)	Y	R	
1988	Sofia	Protocol (control of emissions of nitrogen oxides or their transboundary fluxes)	Y	R	R
1991	Geneva	Protocol (control of emissions of volatile organic compounds or their transboundary fluxes)	Y	S	S
1994	Oslo	Protocol (further reduction of sulphur emissions)	Y	R	
1998	Aarhus	Protocol (heavy metals)	Y	R	R
1998	Aarhus	Protocol (persistent organic pollutants)	Y	R	R
1999	Gothenburg	Protocol (abate acidification, eutrophication and ground-level ozone)	Y	S	R
1980	Madrid	Conv. - Transfrontier co-operation between territorial communities or authorities	Y		
1995	Strasbourg	Additional protocol	Y		
1998	Strasbourg	Second protocol	Y		
1980	Canberra	Conv. - Conservation of Antarctic marine living resources	Y	R	R
1980	Bern	Conv. - International carriage of dangerous goods by train (COTIF)	Y		
1982	Paris	Memorandum of understanding on port state control	Y	R	
1982	Reykjavik	Conv. - Conservation of salmon in the North Atlantic Ocean	Y	R	R
1983	Bonn	Agreem. - Co-operation in dealing with poll. of the North Sea by oil and other harmful subst.	Y		
1989	Bonn	Amendment	Y		
1991	Espoo	Conv. - Environmental impact assessment in a transboundary context	Y	R	S
2001	Sofia	Amendment			
2003	Kiev	Prot.- Strategic environmental assessment			
1991	Salzburg	Conv. - Protection of Alps	Y		
1994	Chambery	Prot. - Nature protection and landscape conservation	Y		
1994	Chambery	Prot. - Town and Country Planning and Sustainable Development	Y		
1994	Chambery	Prot. - Mountain agriculture	Y		
1996	Brdo	Prot. - Mountain forests	Y		
1996	Brdo	Prot. - Tourism	Y		
1998	Bled	Prot. - Energy	Y		
1998	Bled	Prot. - Land conservation	Y		
2000	Lucerne	Prot. - Transport	Y		
2000	Lucerne	Prot. - Dispute settlement	Y		



OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRCHUN	ISL	IRL	ITA	LUX	NLD	NORPOL	PRT	SVK	ESP	SWE	CHE	TUR	UK	DEU
				R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
				R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
				R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
				R	R	R	R	R	R	R	R	R	R	R	R	R	S		R	R	R	R	R	R	R
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				S	S	R	R	R	S	R	S	S	S	S	R	R	R	S	R	R	R	R	R	R	S
				R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R
				R	S			R	R		S	S	R	R		S	R		S	R		R	R	R	
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				S			S	R	S	R	S	S	S	S	S	S	S	S	S	S	S	S	R		S
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				R				R	R					S								S			S

**II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL) (cont.)**

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA
1992 Helsinki	Conv. - Transboundary effects of industrial accidents	Y	S	S
2003 Kiev	Prot. - Civil liability and compensation for damage caused by the transboundary effects of industrial accidents on transboundary waters			
1992 Nuuk	Agreem. - Co-op. on research, conservation and managt of marine mammals in the N. Atlantic	Y		
1992 Helsinki	Conv. - Protection and use of transboundary water courses and international lakes	Y		
1999 London	Prot. - Water and health	Y		
2003 Kiev	Prot. - Civil liability and compensation for damage caused by the transboundary effects of industrial accidents on transboundary waters			
1992 La Valette	European Conv. - Protection of the archaeological heritage (revised)	Y		
1992 Vienna	Agreem. - Forecast, prevention and mitigation of natural and technological disasters			
1992 Moscow	Conv. - Conservation of anadromous stocks (North Pacific Ocean)	Y	R	R
1993 Lugano	Conv. - Civil liability for damage resulting from activities dangerous to the environment			
1993 Copenhagen	Agreem. - Co-op. in the prevention of marine poll. from oil and other dangerous chemicals	Y		
1993 Rome	Agreem. - Establishment of the Indian Ocean Tuna Commission	Y		
1994 Lisbon	Treaty - Energy Charter	Y		
1994 Lisbon	Protocol (energy efficiency and related environmental aspects)	Y		
1994 Sofia	Conv. - Co-operation for the protection and sust. use of the Danube river			
1994 Charleville-Mézières	Agreem.-Protection of the Meuse	Y		
1994 Charleville-Mézières	Agreem.-Protection of the Scheldt	Y		
1996	Agreem. - Transfrontier co-operation with Saarlorlux-Rhineland-Palatinate regions			
1996 Karlsruhe	Agreem. - Transfrontier co-operation	Y		
1996 Strasbourg	Conv. - Disposal of waste and waste water generated from navigation on the Rhine			
1998 Aarhus	Conv. - Access to env. information and public participation in env. decision-making	Y		
2003 Kiev	Prot. - Pollutant Release and Transfer Registers (PRTR)			
1998 Strasbourg	Conv. - Protection of the environment through criminal law			
1999 Bern	Conv. - Protection of the Rhine	Y		
2000 Florence	Conv. - European landscape convention	Y		
2000 Geneva	Agreem. - International carriage of dangerous goods by inland waterways (AND)			

Source: IUCN; OECD.

OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GR	CUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UK	DEU		
	R	R	R	R	R	R	R	R	R	R	R	R			R	R	S	R	R	R	R	R	R	R	R	R	R	R	
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	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
		R	R	S	R	R	S	S	S	R	S	S	S	S	S	R	S	S	S	R	S	S	S	S	S	S	S	S	
	S	S		S	S				S	R					S		S	S	S	S			S		S		S	S	
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R	S		R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R
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## Reference III

### ABBREVIATIONS

AIJ	Activity(ies) implemented jointly
ARE	Federal Office for Spatial Development
BDM	Biological diversity monitoring
BKB	Federal Procurement Commission
BUWAL	Bundesamt für Umwelt, Wald und Landschaft
CAFÉ	Clean Air for Europe
CIPAIS	International Commission for the Protection of Italian-Swiss Waters
CIPEL	International Commission for the Protection of Lake Geneva
CITES	Convention on International Trade in Endangered Species
CSD	Commission on Sustainable Development
DAC	Development Assistance Committee of the OECD
DDC	Directorate for Development and Co-operation
FDEA	Federal Department of Economic Affairs
DETEC	Department of Environment, Transport, Energy and Communications
FDFA	Federal Department of Foreign Affairs
EfE	Environment for Europe
EEA	European Environment Agency
EECCA	Eastern Europe, the Caucasus and Central Asia
EIA	Environmental impact assessment
ETS	Emission trading scheme
FDI	Foreign direct investment
FinÖV	Fund for Public Transport Infrastructure Programmes
FOEN	Federal Office for the Environment
FOWG	Federal Office for Water and Geology
GEF	Global Environment Facility
GHG	Greenhouse gas
GNI	Gross national income
HCFCs	Hydrochlorofluorocarbons
HVF	Heavy vehicle fee
ICPR	International Commission for the Protection of the Rhine
IDC Rio	International Committee Rio
IGKB	International Commission for the Protection of Lake Constance

IGöB	International Group for Ecological Purchasing
IKEZ	Interdepartmental Committee for Development and International Co-operation
IMPEL-TFS	Network for the Implementation and Enforcement of Environmental Law
ISDC	Interdepartmental Sustainable Development Committee
IUCN	World Conservation Union
KöB	Co-ordination Group for Ecological Building
LPE	Law on the Protection of the Environment
LRTAP	Long-range Transport of Atmospheric Pollutants
MDGs	Millennium Development Goals
MEA	Multilateral environmental agreement
MINERGIE	Energy efficiency certification scheme
NABEL	National air pollution monitoring network
NEAT	New Transalpine Axes
NIP	National Implementation Plan
NMVOCs	Non-methane volatile organic compounds
OAPL	Ordinance on Air Pollution Control
ODA	Official development assistance
ODS	Ozone depleting substance
OFEFP	Federal Office for the Environment, Forests and Landscapes
OPET	Office for Professional Education and Technology
OSPAR	Commission for the Protection of the Marine Environment of the North-East Atlantic
PET	Polyethylene terephthalate (plastic)
PIC	Prior informed consent
PLANAT	National advisory commission on natural disaster prevention
PM <sub>10</sub>	Particulate matter ten microns or less in diameter
POPs	Persistent organic pollutants
PREPARE	Preventive Environmental Protection Approaches in Europe
PRTR	Pollutant release and transfer register
REACH	Registration, Evaluation and Authorisation of Chemicals
SAEFL	Swiss Agency for the Environment, Forests and Landscape
SAICM	Strategic Approach to International Chemicals Management
Sanu	Swiss Education Centre for the Protection of Nature and of the Environment
SBB	Swiss Federal Railways
SDC	Swiss Agency for Development and Co-operation
SEA	Strategic environmental assessment
SEBI	Streamlining European 2010 Biodiversity Indicators

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SECO	State Secretariat for Economic Affairs
SFOE	Swiss Federal Office of Energy
SFVO	Swiss Federal Veterinary Office
SILVIVA	Swiss educational foundation
SUB	Swiss Foundation for Environmental Education
SWAPP	Swiss AIJ Pilot Programme
TPES	Total primary energy supply
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIVOX	Swiss annual poll
VOCs	Volatile organic compounds
WEF	World Economic Forum
WHO	World Health Organisation
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation

## Reference IV

### PHYSICAL CONTEXT

Located in the middle of Western Europe, Switzerland is bordered by Austria, France, Germany, Italy and Liechtenstein. Its *territory* of 41 285 km<sup>2</sup> lies in an approximate rectangle of around 350 by 220 kilometres. A *mountainous country* with a peak elevation of 4 634 metres at the centre of the Alpine arc, Switzerland controls several major transalpine passages connecting northern and southern Europe: the passes and tunnels of Saint Gotthard, Simplon and Great Saint Bernard. These are three main regions: the Jura in the north-west (12% of the national territory), the Alps in the south (40%) and the Mittelland Plateau in between.

Switzerland has a *varied and transitional climate*. Precipitation increases with altitude and is generally high, with an average of 1 456 mm annually over the country as a whole. The permanent snow line is at 3 600 metres in the south of the Alpine region and at 3 000 metres in the north. The Alpine cantons experience some 10 000 avalanches a year.

Switzerland has considerable *water resources*. The Rhine and its tributary the Aare carry 66% of the country's water to the North Sea, the Rhone and its Swiss tributaries, the Po and the Adige, carry about 30% to the Mediterranean, and the waters of the Inn drain to the Black Sea via the Danube. Switzerland shares its two largest lakes with France (Lake Geneva) and with Austria and Germany (Lake Constance); Switzerland's other large lakes (Neuchâtel, Biel and Zurich) are also on the Mittelland Plateau. In addition to large reserves of groundwater, Switzerland has about 3 000 km<sup>2</sup> of glaciers and *névé*.

As regards *land use*, arable and permanent crop land covers 11% of Swiss territory. Permanent grassland occupies about 26% while forests cover 31% of the country. The remaining 32% is a composite of buildings, infrastructure, industry, and other areas.

Switzerland is poor in *mineral raw materials* and in energy resources other than water.

## Reference V

### SELECTED ENVIRONMENTAL WEBSITES

<b>Website</b>	<b>Host institution</b>
<i>Government</i>	
<a href="http://www.umwelt-schweiz.ch">www.umwelt-schweiz.ch</a>	Federal Office for the Environment (FOEN)
<a href="http://www.blw.admin.ch">www.blw.admin.ch</a>	Federal Office for Agriculture (FOAG)
<a href="http://www.bfs.admin.ch">www.bfs.admin.ch</a>	Swiss Federal Statistical Office (SFSO)
<a href="http://www.uvek.admin.ch">www.uvek.admin.ch</a>	Federal Department of the Environment, Transport, Energy and Communications (DETEC)
<a href="http://www.are.admin.ch">www.are.admin.ch</a>	Federal Office for Spatial Development (ARE)
<a href="http://www.admin.ch/ch/index.fr.html">www.admin.ch/ch/index.fr.html</a>	The Federal Authorities of the Swiss Confederation
<a href="http://www.bfe.admin.ch/index.html">www.bfe.admin.ch/index.html</a>	Federal Office for Energy (SFOE)
<a href="http://www.monet.admin.ch">www.monet.admin.ch</a>	Database of sustainable development
<a href="http://www.evd.admin.ch">www.evd.admin.ch</a>	Federal Department of Economic Affairs (DEA)
<a href="http://www.seco-admin.ch">www.seco-admin.ch</a>	State Secretariat for Economic Affairs (SECO)
<a href="http://www.eda.admin.ch">www.eda.admin.ch</a>	Federal Department of Foreign Affairs (DFA)
<a href="http://www.edi.admin.ch">www.edi.admin.ch</a>	Federal Department of Home Affairs (DHA)
<a href="http://www.efd.admin.ch">www.efd.admin.ch</a>	Federal Department of Finance (FDF)
<a href="http://www.kvu.ch/index.cfm">www.kvu.ch/index.cfm</a>	Conférence Suisse des chefs des services et offices de protection de l'environnement (CCE)



***Other***

<a href="http://www.cipais.org/home.html">www.cipais.org/home.html</a>	International Commission for the protection of Italian-Swiss Waters (CIPAIS)
<a href="http://www.cipel.org/sp/">www.cipel.org/sp/</a>	International Commission for the Protection of Lake Geneva (CIPEL)
<a href="http://www.vcs-ate.ch">www.vcs-ate.ch</a>	Transports and Environment Association (ATE)
<a href="http://www.greenpeace.ch">www.greenpeace.ch</a>	Greenpeace Switzerland
<a href="http://www.wwf.ch">www.wwf.ch</a>	World Wildlife Foundation Switzerland (NGO)

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