SLOVENIA'S FOURTH NATIONAL COMMUNICATION UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

Republic of Slovenia
Ministry of the Environment and Spatial Planning

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I am pleased to present the Slovenia's Fourth National Communication under the United Nations Framework Convention on Climate Change.

The communication contains information on the actions taken by Slovenia to meet its obligations under this convention. As only a short time has passed since the submission of the previous communication, this report is strongly tied to it, nevertheless it contains a lot of new information.

The data for 2003 show that Slovenia still has a lot to do to reduce its emissions especially in transport where they are still strongly increasing. Actions in transport are especially complex as an important share in emissions is represented by transit traffic. Stronger actions will be needed also in the sector of electricity and heat production as well as in other sectors.

Slovenia is firmly determined to fulfil its obligations from the Convention and the Kyoto Protocol to which it is bound also as an EU member. In 2006 a revision of the Action Plan for Greenhouse Gas Emissions Reduction will take place, and a new allocation plan for the period 2008–2012 in the framework of the EU emission trading scheme will be made. It is also important to mention the project concerning vulnerability and adaptation to climate change, which is already under way and will be presumably finished in 2007. It will contribute to the improvement of knowledge on climate change impacts on different sectors and to the identification of adaptation measures.

It is reasonable to look also into the future. The Kyoto Protocol, which covers the period 2008–2012, entered into force on February 16, 2005. All activities at the international level are now directed to achieving an agreement on the post-2012 period. For this period it will be necessary to achieve as broad agreement as possible on the GHG emissions reduction, which will include developed countries as well as developing ones. European Union, whose member is also Slovenia, has an important role in these endeavours.

Janez Podobnik
Minister of the Environment and Spatial Planning

1 EXECUTIVE SUMMARY

1.1 National Circumstances

- The Ministry of the Environment and Spatial Planning is responsible for preparation and implementation of environmental policies and legislation.
- In the period 1991–2002, the population increased slightly to 1,964,036. The population density is moderate.
- Slovenia is located in Central Europe. The surface area of the territory is 20,273 km^2. Its landscape and biosphere are very diverse. The majority of its surface is covered by forest (57 %[1]).
- Three climate types are found in the territory of Slovenia: sub Mediterranean, Alpine and continental. Average annual temperature ranges from 9 to 13 °C, and is decreasing with altitude; at Kredarica, the highest positioned meteorological station in Slovenia (2514 m a.s.l.) it is only –1.3 °C. Annual precipitation varies to a great extent; from 800 mm in the extreme northeastern and 1000 mm in the extreme southwestern part of the country, to over 3000 mm in the northwestern part of the country.
- Slovenia has been a full member of the European Union since 1 May 2004.
- From the second half of the 1990s to 2000, Slovenia had a high level of economic growth, which decreased in the years from 2001 to 2003, and again rose above 4 % in 2004. In the value added structure in 2004 the highest percentage is held by services, followed by industry, construction and agriculture. Since 1990, the share of services has increased, and the share of industry and agriculture has decreased.
- Consumption of primary energy has increased by 17 % since 1990, while the intensity of the consumption of primary energy at first increased up to 1995, and then decreased dramatically. The highest proportion is held by liquid fuels, followed by coal, which is the only domestic source of energy, nuclear energy and natural gas. Renewable sources (principally wood and hydroenergy) represent a 10 % share. Since 1990, consumption of final energy has increased due to the increased consumption of electricity, natural gas and liquid fuels, while intensity of consumption fluctuated similar to primary energy.
- The volume of road cargo and automobile traffic is increasing, as a consequence of a higher number of vehicles and the increased average number of kilometres driven. The number of passenger kilometres in public road transport is decreasing. Railway traffic has been increasing since 1992 after a substantial

[1] Data for 2003 (source: Slovenian Forest Service). Forest coverage data does not include data on areas being reclaimed and therefore does not correspond to the data on forest coverage.

decrease at the beginning of the 1990s. Due to its location, Slovenia is highly exposed to transit traffic, which makes up a substantial share especially of cargo transport.

- After a fall at the beginning of the 1990s, industrial production has been increasing since 1994. From the 1990s on a process of industrial restructuring has been underway tending towards the discontinuation of intensive activities. The intensity of consumption of final energy has decreased substantially. The highest proportion of final energy is held by electricity, followed by natural gas.
- The average amount of waste produced is increasing. The same trend holds for the amount of municipal waste collected by public removal services. The proportion of separately collected fractions is increasing due to the establishment of systems of separate collection and recycling throughout the country. The prevailing form of waste treatment is deposition (in 2003, 86 % of municipal waste collected by public removal services was deposited).
- In the period 1991–2002 the number of residential units increased by 14 %. The average floor area of residential units also increased. The final consumption of energy in households increased by 10 % between 2000 and 2004.
- The proportion of agriculture in value added amounted to 3 % in 2003. The most important branch is animal husbandry, which accounts for 56 % of agricultural production. In the period 1995–2003, the consumption of mineral fertilisers per hectare decreased. The number of organic farms increased substantially. Since 1990, Slovenia's forest coverage and timber supply have increased.

1.2 Greenhouse Gas Emissions Inventory

- The base year for Slovenia with regard to the gases CO_2, CH_4 and N_2O is 1986.
- Total emissions of greenhouse gases decreased by 2 % in 2003 in comparison with 1986 emissions.
- CO_2 emissions increased by 1 %, while CH_4 and N_2O emissions decreased by 12 % and 9 %, respectively.
- The base year for F-gas emissions is 1995. Total emissions in 2003 were 35 % lower in comparison with the base year. PFC and SF_6 emissions decreased (by 58 % and 17 %), however HFC emissions increased substantially (by 172 %).
- Sinks were estimated at 5.6 Tg CO_2 in 2003, which is much higher than the allowed sinks Slovenia may claim in the process of meeting the Kyoto commitment[2] (1.7 Tg CO_2).
- Lower GHG emissions in 2003 in comparison to the base year are the consequence of the decrease in emissions in agriculture due to the decrease in the number of animals, and in industrial processes mostly due to the lower production of cement and lime. Emissions in the Fuel Combustion sector in 2003 were practically identical to those in 1986, and within the sector emissions were lower in the Energy Supply sector (by 8 %) due to the replacement of liquid fuels with gaseous fuels and the improved efficiency of solid fuel units, and in the Industry and Construction sector (by 46 %) due to the restructuring of the economy and replacement of solid fuels, and were higher in the Other and Transport sectors (by 22 % and 105 % respectively) due to the increased use of liquid fuels. Waste emissions increased by 12 % due to the increased quantity of waste.

[2] This includes the permitted sinks in the field of forestry in the amount of 1.32 Tg CO_2 in accordance with Decision 11/CP.7 adopted at COP 7 in Marrakech, as well as other sinks (land use and land-use change).

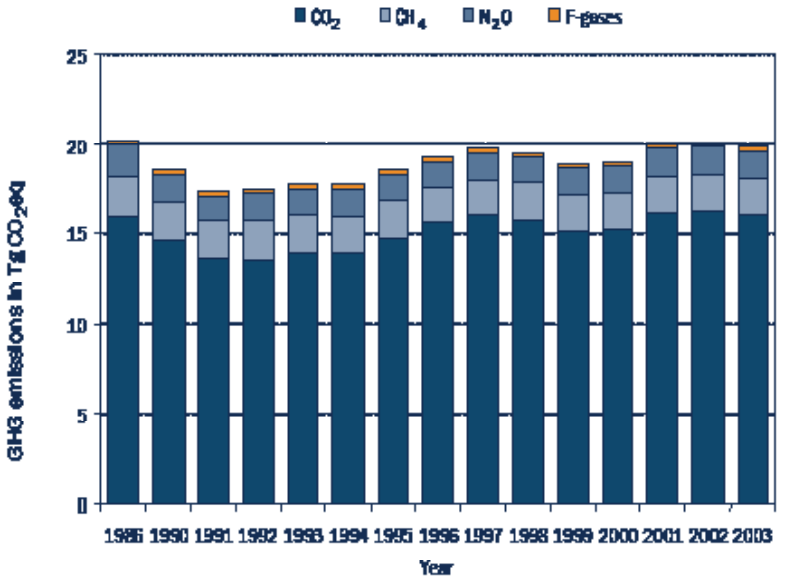


Figure 1-1: GHG emissions of individual gases in 1986 and 1990–2003

1.3 Emission Reduction Policies and Measures

- The Action Plan for Reducing GHG Emissions (AP-GHG) was adopted by the Slovenian Government in July 2003, and amended a year later.
- The plan is comprised of 22 instruments for carrying out measures which cover all sources of GHGs, energy, transport, agriculture, waste and industrial processes. The majority of the instruments stem from adapting to the legal framework of the EU during Slovenia's accession process, and from implementation of the European Common and Coordinated Policies and Measures (CCPM).
- The most important measures in the Action Plan are:
  - Switching from coal and liquid fuels to natural gas (instruments: opening of the electricity and natural gas market, emissions trading, CO_2 tax)
  - Increasing the proportion of renewable energy sources (RES) and cogeneration of electrical energy (instruments: feed-in tariffs, CO_2 tax)
  - Implementation of the efficient energy use (EEU) measures with regard to buildings, households, industry and the public sector (instruments: IPPC, emissions trading, regulations, public awareness, financial incentives)
  - Increasing the proportion of RES in consumption of final energy (instruments: CO_2 tax, financial incentives, public awareness)
  - Improving energy efficiency of vehicles (instruments: informing consumers about the CO_2 emission of motor vehicles and the Agreement between the European Commission and Car Manufacturers, regular vehicle inspections, public awareness)
  - Increasing the use of public transport (instruments: changes in the public transport system, public awareness)
  - Rehabilitation of existing and construction of new urban landfills (instrument: regulations)
  - Reducing the quantity of deposited waste (instruments: separate collection of waste, material consumption and incineration of waste)

- An audit of the AP-GHG will be performed in 2006.
- Objectives and measures affecting the decrease in GHG emissions are included in individual sector programmes (Resolution on the National Energy Programme, Resolution on Traffic Policy, Slovenia's Rural Development Programme for the period 2004–2006, Action Plan for treatment of packaging and packaging waste, Action Plan for waste removal with the objective of decreasing the amount of biodegradable waste) and Resolution on the National Programme of Environmental Protection for the period 2005–2012, which defined a reduction in GHG emissions as the top priority of the environmental policy.

1.4 Projections of Emissions and Assessment of Impacts of Policies and Measures

- Projections of GHG emissions have been prepared on the basis of the most probable macroeconomic scenario and two scenarios for implementation of the measures. The scenario "with measures" foresees the continuation of the present policy in the field of the reduction of GHG emissions, while the scenario "with additional measures" anticipates the increased intensity of the present policy and the introduction of additional measures.
- Figure 1-2 shows the trend of GHS emissions for both projections. According to both projections, CO_2 emissions will increase by 2005 due to the increased consumption of coal in thermo power plants, which will be followed by a decrease due to the replacement of coal with natural gas in the Energy Supply sector and a further increase in emissions due to increased consumption of final energy. After 2015, a substantial decrease in emissions is predicted due to the

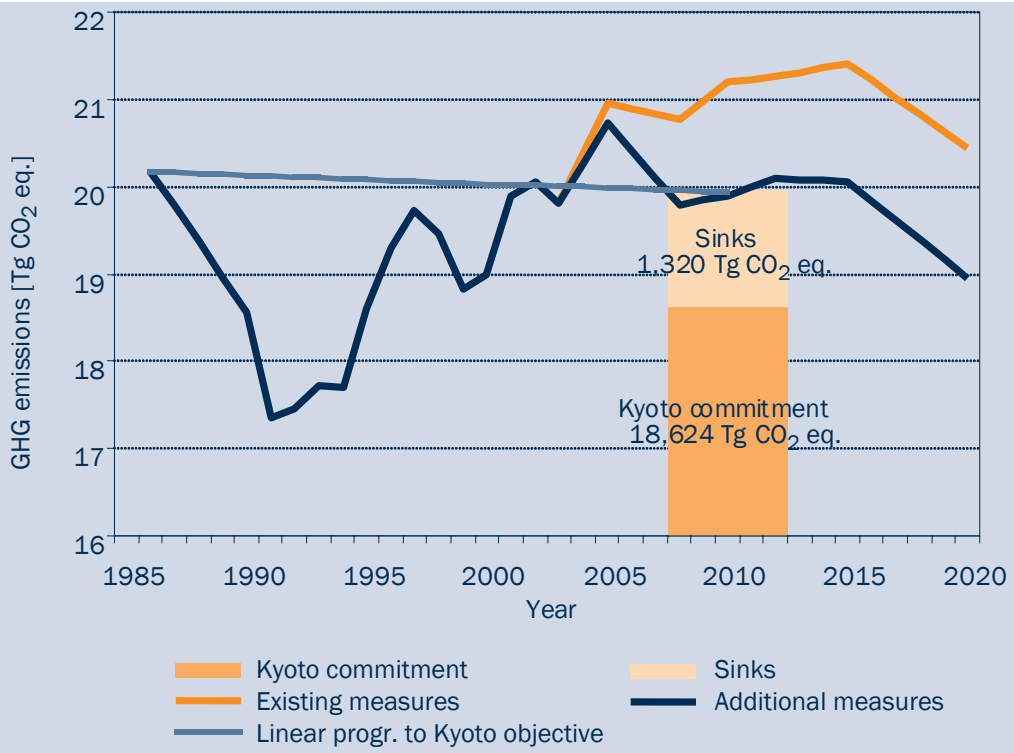


Figure 1-2: Actual levels of emissions in 1986 and 1990–2003, GHG emissions projections without sinks, and analysis of fulfilling the Kyoto commitment

decreased use of coal and fuel switch in the Energy Supply sector. CH_4 emissions will decrease according to both projections, mainly due to the decreased amount of deposited waste, while N_2O emissions will remain practically unchanged. The projections differ substantially with regard to F-gases, whereby according to the projection with measures the emissions will increase substantially, while according to the projection with additional measures they will decrease substantially due to the implementation of the regulations on F-gases.

- Slovenia's Kyoto commitment based on the emissions inventories presented in this report is 18.6 Mt CO_2 eq. Average emissions without taking into account the sinks in the period 2008–2012 according to the projection with additional measures amount to 19.9 Mt CO_2 eq. Taking into account sinks in the amount of 1.3 Mt CO_2, they amount to 18.6 Mt CO_2 eq. Hence it follows that with an additional increase in the intensity of measures as predicted in the scenario with additional measures, and making use of the sinks, Slovenia will meet its Kyoto commitment. However, the following has to be taken into consideration when drawing such a conclusion: in order to meet the Kyoto commitment, an AP-GHG revision will take place in 2006 where additional measures will be defined in more detail, and which will include new projections. In addition, a new plan for the allocation of emission coupons for the period 2008–2012 will be prepared in 2006, which will set quotas for the majority of emissions for the Energy Supply, Industrial Processes and Industry sectors.
- The total effect of all measures (implemented, adopted and additional) in 2010 amounts to 2.6 Mt CO_2 eq, and to 5.3 Mt CO_2 eq. in 2020. The largest share is a consequence of the effect of measures in the Energy sector, especially in Energy Supply.

1.5 Vulnerability Assessment, Climate Change Impacts and Adaptation Measures

- At the end of 2003, a project entitled Vulnerability of Agriculture and Forestry to Climate Change was concluded, in the framework of which it was established that:
  - The effects of the changed climate on food production will be positive (fertilising effect of CO_2, longer vegetation period and potential for heat-loving plants), conditionally positive (movement of locations of agricultural production, change in produce quality, changed species selection and changing agrotechnical practices), and negative (shortening of growing period, increased intensity of evapotranspiration, higher frequency of extreme weather conditions and changes in attacks of pests and diseases). Negative effects will prevail.
  - Climate changes will also affect animal husbandry, indirectly (feedingstuffs) and directly (higher temperatures, storm and weather damage). Negative effects will prevail.
  - Increased temperature, higher frequency of extreme weather conditions and more frequent attacks of diseases and pests will affect forest ecosystems as well.
  - The vulnerability of water sources, which are already highly vulnerable, will increase.
- Within the framework of the project, adaptation measures were identified with respect to the anticipated changes in the field of agriculture and forestry.

- At the end of 2005, a project entitled Vulnerability and Adaptation to Climate Change was introduced at the Environmental Agency of the Republic of Slovenia (ARSO) which will include all areas affected by climate change (e.g. energy, tourism, health, transport etc.) at the national and regional levels. The main stages of the project are vulnerability assessment, adaptation abilities assessment, and defining the range of potential adaptations measures.

1.6 Research and Systematic Observation

The following research is being conducted in Slovenia in connection with climate change:

- assessment of wind and solar energy potential in Slovenia, and production of tools for short-term weather forecasting and modelling of extreme weather conditions
- modelling and forecasting climate changes with general circulation models (reduction of large scales to regional and local scales)
- vulnerability assessment of several fields (agriculture, forestry, national security) to climate changes, and adaptation measures
- new technology research (in the field of RES, buildings, new technologies in industry, sustainable agriculture).

Systematic observations in Slovenia in 2005:

- meteorological network: 39 climatological stations, 179 precipitation stations, radiosounding station, sodar, meteorological radar
- air quality: 8 stations in populated areas, 2 stations for measuring background air pollution, automatic network, supplemental networks of major polluters and four urban municipalities, and lidar (end of 2005)
- oceanographic observation system: oceanographic meteorological GPS station, automatic measuring station and oceanographic buoy
- ground-based observation system: monitoring of the glacier under Skuta and the Triglav glacier, hydrologic monitoring (surface river flows - 165 stations; lakes - 2 stations, springs - 12 stations; groundwater - 133 stations); phenological observation - 61 stations.

1.7 Education, Training and Public Awareness

- Environmental education is conducted at all education levels, from kindergartens to secondary schools. In higher education, environmental topics are included in courses which are connected with such issues and within curricula which focus on this topic. Interdisciplinary approaches have also been introduced (health and ecology, management and ecology)

- The level of awareness and information provided to the public is increasing as a result of numerous publications and events with the topics of climate change, life-style changes, RES use and potentials for decreasing energy consumption. Consulting services are also widely available (ENSVET citizens' consulting network, fairs, workshops, seminars, lectures, presentations, websites). NGOs are also very active in this field. More activities will be required in the future in this field; the Government in particular should assume a more active role, and a more holistic approach to the issues is required.

2 NATIONAL CIRCUMSTANCES

2.1 State Organization

Slovenia became an independent state on 25 June 1991 following the break-up of the former Socialist Federal Republic of Yugoslavia. Its constitution was adopted on 23 December 1991. In terms of political structure it is a parliamentary democracy. Slovenia has become a full member of the European Union on 1 May 2004.

The president of country is elected in direct elections to a five-year term. The National Assembly, the highest legislative body, is composed of 90 members of the parliament, elected to a term of four years. The Government is formed by the Prime Minister; it is composed of 17 ministers, of whom two are ministers without portfolio.

The Ministry of the Environment and Spatial Planning is responsible for preparing and implementing environmental policies and pertaining legislation. It is composed of the Environment Directorate which is among other things responsible for the preparation and coordination of environmental policy and the field of climate change, the Spatial Planning Directorate and the European Affairs and Investments Directorate, which includes the Efficient Energy Use and Renewable Energy Resources Sector established in 2005 and which took over the majority of activities from the Agency for Efficient Energy Use and Renewable Energy Sources (AURE). The Ministry of the Economy is responsible for the field of Energy, including the production of electrical energy from renewable energy sources (RES). In preparing the policies, the Ministry also cooperates with other Ministries: Ministry of Transport, Ministry of Agriculture, Forestry and Food, Ministry of the Economy, Ministry of Finance and other ministries. The Environmental Agency of the Republic of Slovenia (ARSO) plays an important role in implementing environmental legislation and tasks in the field of environmental protection and monitoring. Two specific bodies are also active in the field of environmental protection, i.e. the Sustainable Development Council, chaired by the Minister responsible for local self-government and regional policy, and the Environmental Protection Council of the Republic of Slovenia, which was established by the National Assembly. In addition, in order to guide cooperation between representatives of Slovenia and the work of bodies of the United Nations Framework Convention on Climate Change, and to fulfil obligations arising from the Convention, Slovenian Government established in 1997 the Climate Change Committee, chaired by the Minister responsible for the environment.

There are 193 municipalities in Slovenia with their own administrations and budgets, of which 11 have the status of urban municipality. Municipal competencies in the field of reduction of GHG emissions are related to spatial development planning, local and public traffic regulations, preparing local energy use plans and waste collection and deposition. Urban municipalities are obliged to provide for emissions monitoring and adopt environmental protection programmes as well as action plans.

2.2 Population Profile

According to censuses, Slovenia had 1,913,355 inhabitants in 1991, and 1,964,036 in 2002. According to Eurostat projections for Slovenia the population will increase to 2,014,802 by 2010, and to 2,016,690 by 2020. Population growth in the period 1991–2002 is a result of immigration and changes in the status of people who moved to Slovenia from other parts of the former Yugoslavia before the census in 1991, since the average population growth per 1000 people is negative (– 0.14) in this period. Negative population growth influences the average age of the population as well. In 1991, the average age was 35.9, and in 2002 it was 39.5 years. The average household had 3.0 members in 1991 and 2.8 members in 2002. In the period 1991–2002 the number of households increased by 8.3 %.

Population density is moderate and amounts to 98 inhabitants per km^2.

A very dispersed type of settlement is characteristic for Slovenia, however the trend is moving towards settlement in the vicinity of larger cities. Ljubljana, the capital of Slovenia, had 260,543 inhabitants in 2002, i.e. 13 % of the entire population.

Life expectancy of the population in Slovenia in 2002 was 79.9 years for women and 72.3 years for men.

2.3 Geographic Profile

Slovenia is located in central Europe with geographic coordinates of approximately 46° north latitude and 15° east longitude. The surface area of the territory is 20,273 km^2. It borders Italy, Austria, Hungary and Croatia. Despite its small size, Slovenia is a very diverse country with three distinct types of landscape. To the north there are the mountain ranges of the Julian Alps, the Karavanke Mountains and the Kamniško-Savinjske Alps which gradually slope down to the Adriatic Sea towards the south. The hilly central part with its numerous valleys and basins, including the Ljubljana basin where the capital of Slovenia is located, is separated from the Adriatic Sea by the northernmost slopes of the Dinaric Mountain Range. In the northeast the country flattens out onto the Pannonian plain. The length of the coast is 46.6 kilometres. The variability of the terrain is illustrated by the average inclination of 25 %. The average altitude is 550 m.

Forests[3] cover the majority of Slovenia's territory (63.3 %). Total agricultural land[4] covers 30.5 % of the territory, developed areas[5] 2.8 %, open spaces[6] 1.6 %, transport infrastructure[7] 1.1 % and waters[8] 0.7 % of the territory. Terrain diversity, climate and pedological variety, large forests and the preservation of traditional ways of managing parts of the cultural landscape are the reasons for the high biodiversity, which is endangered due to potential climate change. 3000 ferns and flowers grow in Slovenia, along with 50,000 different animal species. Concern for preserving biodiversity is also evident in the

increased number of protected areas. Protected areas comprise 11 % of the entire territory, and include the Triglav National Park, Škocjan Caves Regional Park, Kozjansko Regional Park and Notranjska Regional Park, as well as 44 landscape parks. In addition, the Decree on Special Protection Areas (Natura 2000 Areas) in 2004 defined Natura 2000[9] areas which comprise 36 % of Slovenia's territory. Protected areas represent 25 % of Natura 2000 areas.

2.4 Climate

Slovenia's climate is extremely diverse. Near the coast, the prevailing type of climate is sub-Mediterranean, in mountains Alpine, while the continental climate prevails in the flat parts of eastern Slovenia. The above mentioned climate types interact and together with local influences form a wide range of local climatic conditions.

2.4.1 Temperature

The coastal area is the warmest, with an average annual temperature of 12.8 °C. The majority of the lower-lying regions behind the Alpine and Dinaric mountain ranges have an average annual temperature between 9 and 10 °C, and only in larger cities such as Ljubljana and Maribor is the average slightly higher due to temperature islands. At Kredarica, the highest meteorological measuring station in Slovenia (2514 m), the average annual temperature is – 1.3 °C. The listed average temperatures were measured in the period 1971–2000. Summers are hot in lower-lying regions, and sometimes humid as well. Winters are mild along the coast, and quite cold elsewhere, in mountains due to

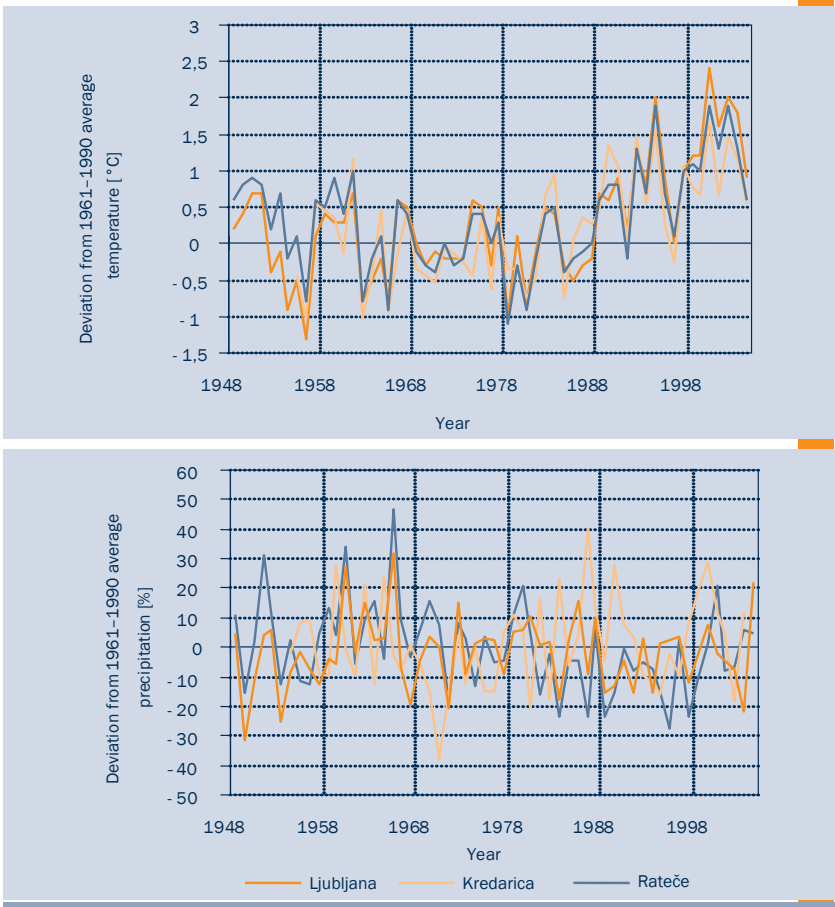


Figure 2-1: Deviations from average annual temperature and average annual precipitation in the period 1948–2004 from the average in the period 1961–1990.

[3] Forests: Commercial forests, protective forests, tree nurseries, bush, arboreal parks in urban areas, reclaimed areas

[4] Total agricultural land: meadows, pastures, permanent and annual plantations, grass surfaces not used for agricultural purposes, marshes

[4] Developed areas: buildings with courtyards, gardens, parking lots, warehouses

[6] Open areas: rocks and scree, non-overgrown river banks, construction sites, landfills, quarries

[7] Transport infrastructure – railways, national and main local roads

[8] Waters: rivers, lakes, reservoirs, industrial pools, saltpans

[9] Natura 2000 is a European network of Special Protection Areas declared in the Member States of the European Union with the main objective of preserving biodiversity for future generations. Special Protection Areas are intended for the preservation of animal and vegetation species and habitats which are rare or endangered at the level of Europe due to human activities. Most often this means that favourable conditions have to be maintained in these areas through various measures, either to merely continue the current activities, e.g. pasturing or mowing of dry and wet pastures after the flowering and nesting season, or discontinue some activities or prevent their introduction, e.g. agromelioration of wetlands by drainage etc.

the height, in lower-lying areas due to frequent temperature inversions accompanied by fog.
From the middle of the 1980s on, above-average warm years have been very common, and the majority of the warmest years starting from the middle of the last century occurred in the last few years. In the last few years the summer heat waves have been appearing earlier, usually as soon as the end of spring. The summer of 2003 was extremely hot; one would not expect summer that hot with respect to the usual temperature variations, and July and August stand out as exceptional months; with record monthly temperatures recorded in several places. In the summers of 2004 and 2005, the average temperature was again within the normal range.

2.4.2 Precipitation

Precipitation distribution in Slovenia indicates the high level of spatial and seasonal variability, which is the consequence of the geographic position of Slovenia, the variability of its terrain and the characteristics of the individual climate types. The maximum annual precipitation is in the northwest in the Julian Alps, where annual precipitation can exceed 3000 mm, the second, somewhat lower, is in the Kamniško-Savinjske Alps, and the third is in Pohorje. On the coast, the annual precipitation usually does not reach 1000 mm, increases towards the top of the Alpine-Dinaric mountain ranges, and then decreases with the increasing distance from the sea towards the northeast. In the extreme northeast the precipitation is usually below 800 mm per year.
In European terms, Slovenia is among areas with the highest number of storms. Each year these include several severe thunderstorms, during which more than 100 mm of precipitation may fall within one hour. Extreme daily precipitation may exceed 400 mm in the Posočje region. In 2005, torrential flooding caused major local damage on several occasions due to the intensity of precipitation. The other extreme is droughts. Longer periods of drought appear in Slovenia at the end of winter and in spring, however summer droughts are much more problematic due to faster evaporation. The worst summer droughts so far occurred in 2001 and 2003, which caused a great deal of damage to agriculture, and in places threatened sources of drinking water. Summer droughts in 1992, 1993 and 2000 were also of catastrophic proportions, and at the coast droughts usually occur every summer. In the summer of 2004, drought occurred only in the south-western part of the country, while precipitation in the summer of 2005 exceeded the average based on many years almost all over the country.

2.5 Economic Profile

At the beginning of the 1990s Slovenia underwent changes in its political and economic structure. After an initial transitional recession, which was reflected in negative growth rates of the gross domestic product and high inflation, in 1993 it again achieved positive economic growth. The second half of the 1990s up to 2001 was characterised by rapid economic expansion, while from that year on due to the global economic crisis the average annual economic growth has been below 3 %.

In 2004 economic growth again turned upward and reached 4.2 %, its highest level since 1999. Economic growth has above all encouraged a high level of export activity and the growth of internal consumption. In 2004 the gross domestic product in current prices was SIT 6,251,244 m (EUR 26,075 m), or SIT 3.12 m (EUR 13,210) per capita. The transitional period ended in a normative sense on 1 May 2004, when Slovenia became a member of the EU and adopted its acquis communautaire.

In 2004 the highest share of value added was created by services at 59.8 %, followed by industry (including mining, electricity, gas and water supply and construction) at 37.2 % and agriculture at 3 %. Since 1990 the share of services has increased by 5.5 percentage points, while the shares of industry and agriculture have decreased by 4.1 and 1.4 percentage points respectively.

During the transitional period, Slovenia's biggest problems were high inflation and maintaining employment. In the period from 1991 to 1994 the average annual inflation rate was 95 %; it was below 10 % for the first time in 1995, and it remained at a similar level until 2002. The period after 2003 is characterised by the harmonisation of the application of the macroeconomic policies of the Government and the Bank of Slovenia, especially the stabilisation of the exchange rate after joining ERM II, which had a positive effect on the continued slowing of the growth rate of the consumer price index. In addition, the abolition of customs duties on food products from the EU had a significant one-time effect on price increases. 2004 was also characterised by decreasing inflation, which despite the strong pressure of higher oil prices on consumer prices amounted to just 3.2 %. Unemployment in Slovenia since 1991 has fluctuated between 6 and 9 %, reaching 6.3 % in 2004.
Slovenia as a small free-market economy is highly involved in international economic currents, owing to which any sort of economic or political changes outside of Slovenia have direct and indirect effects on its economy and international competitiveness. In 2004, exports accounted for 48.6 % of GDP, and imports 53.7 % of GDP. Coverage of imports by exports in 2004 was 1.5 % percentage points lower than the previous year. Slovenia's most important export partner in 2004 was again the EU at 68 % of total exports, of which 70 % were exports to Germany, Italy, Austria and France. Upon joining the EU Slovenia adopted the common foreign trade policy of the EU, and the consequent cessation of bilateral free-trade agreements mainly affected trade with the countries of the former Yugoslavia.

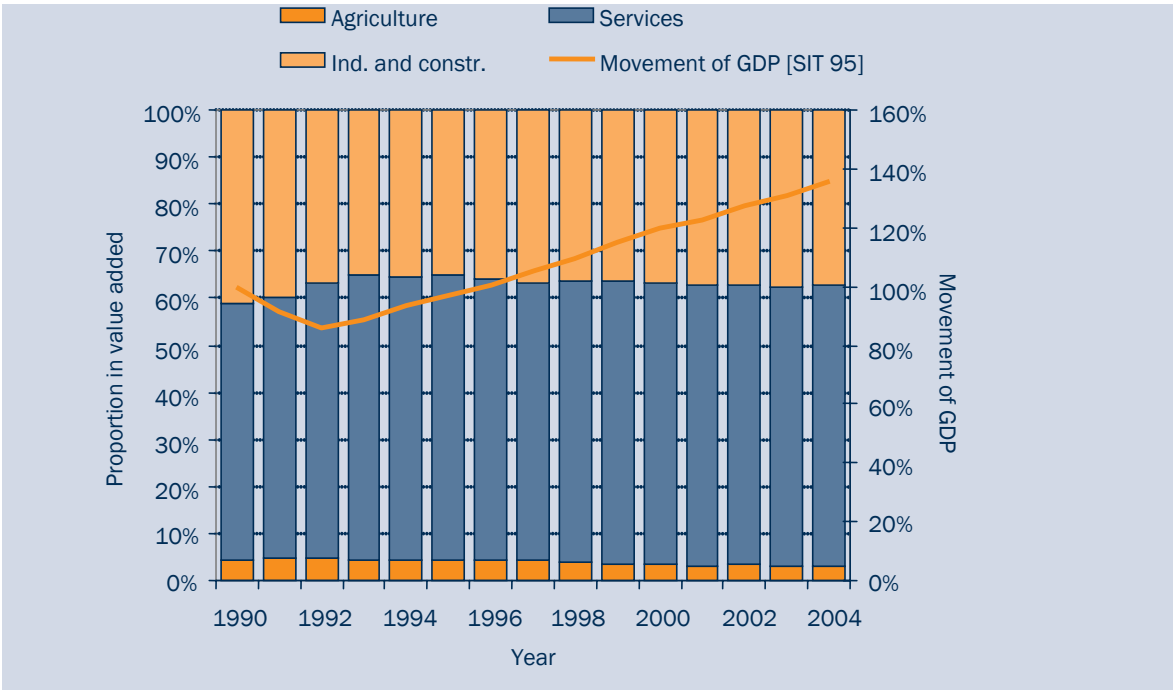


Figure 2-2: Shares of sectors in value added and GDP movement from 1990 to 2004.

2.6 Energy

In 2004 Slovenia consumed 302 toe of primary energy per unit of GDP as expressed in constant 2000 euros [toe/MEUR00]. The intensity of the consumption of primary energy in the period 1995–1999 decreased significantly, while in the last four years the decreasing trend has slowed. The lowering of the intensity is a consequence of increased energy efficiency, the exchange of fuels and changes in the value added structure (higher share of services and less energy-intensive activities in manufacturing). The intensity of the consumption of final energy has decreased since 1997, and amounted to 215 toe/MEUR00 in 2004[10]

Coal (brown coal and lignite) is the only fossil fuel which is won in Slovenia. The cessation of the mining of brown coal is planned for 2009. Lignite is used only in the Šoštanj Thermo Power Plant. Slovenia imports all of its liquid fuels and natural gas. The consumption of primary energy in 2003 amounted to 6.731 ktoe. The highest share was held by liquid fuels at 35 %, followed by coal, nuclear energy and natural gas. The share of renewable energy sources (RES) was 10 %, where combustible RES (wood being by far the most important) accounted for 64 % and hydroenergy 36 %. In the period 1990–2003 the consumption of primary energy increased by 17 %, mainly due to an increase in

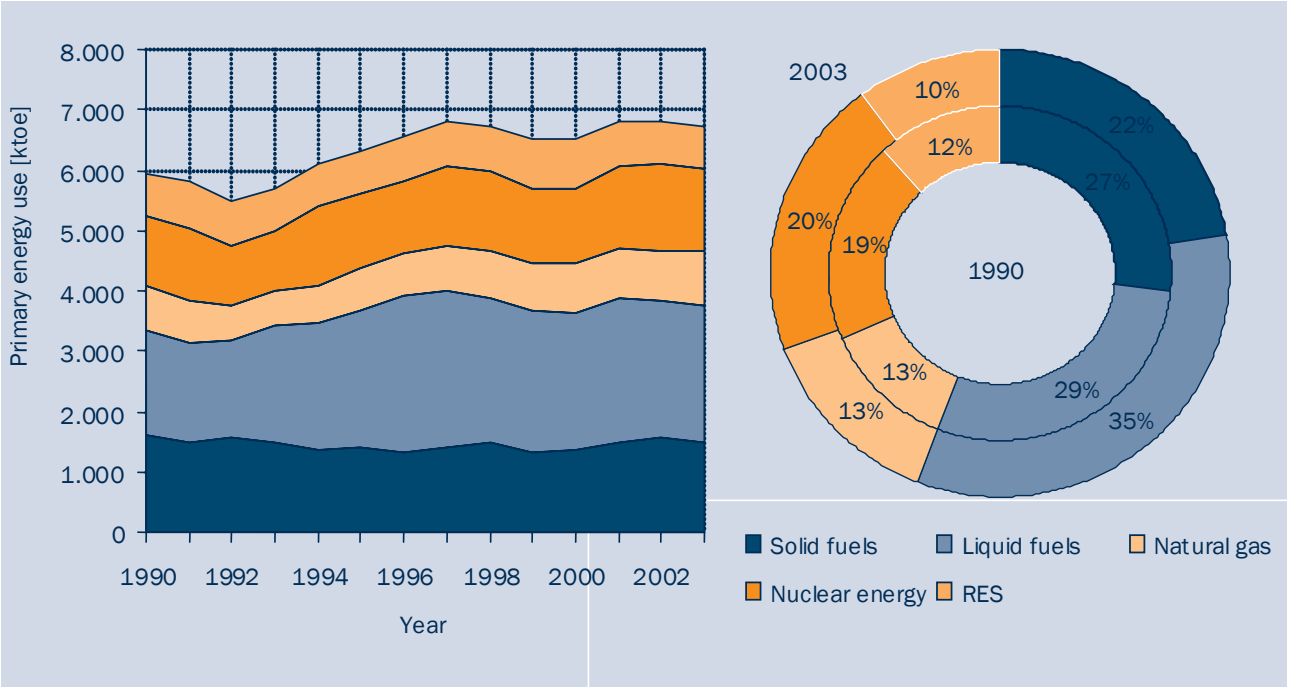


Figure 2-3: Consumption of primary energy by fuel in the period from 1990 to 2003 (in the figure at right the inner ring shows figures from 1990, the outer ring figures from 2003).
Source: GHG Emissions Inventory (ARSO) and Statistical Yearbook of Energy Economics (SLEG) (Ministry of the Economy)

the consumption of liquid fuels. The consumption of natural gas and nuclear energy also increased in this period.

The consumption of final energy amounted to 4.817 ktoe in 2003, a 22 % increase over 1990. In absolute terms the biggest increase was in the consumption of electrical energy (47 % increase in the consumption of final energy), followed by consumption of natural gas (36 %) and the growth of the consumption of liquid fuels (17 %). The biggest consumer of final energy is the Other Consumption sector (households and services), followed by transport and industry.

In 2004 37 % of electrical energy was produced in thermo power plants, 36 % at the Krško Nuclear Power Plant and 27 % at hydro power plants (HE). Net exports represented 5 % of electrical energy produced[11]. Production of electri-

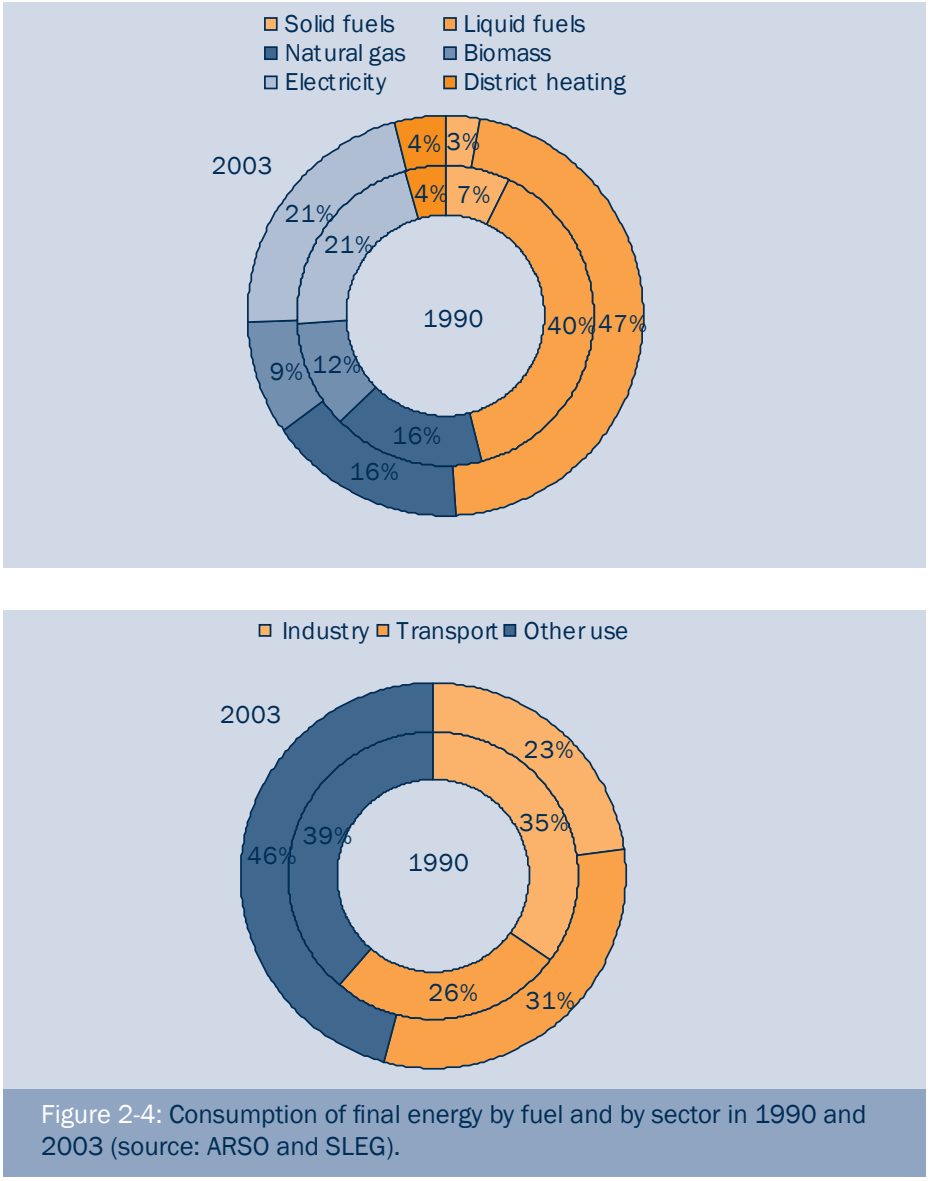
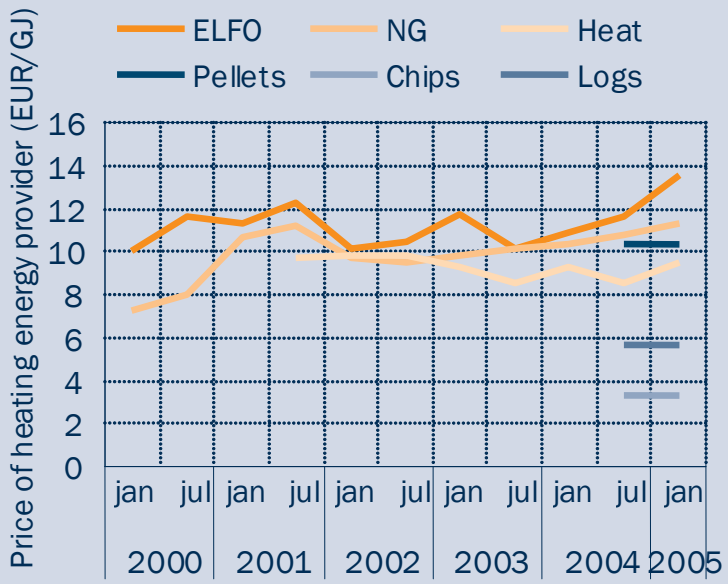


Figure 2-4: Consumption of final energy by fuel and by sector in 1990 and 2003 (source: ARSO and SLEG).

[10] Source: Statistical Office of the Republic of Slovenia (SURS)
[11] Threshold energy production of power plants



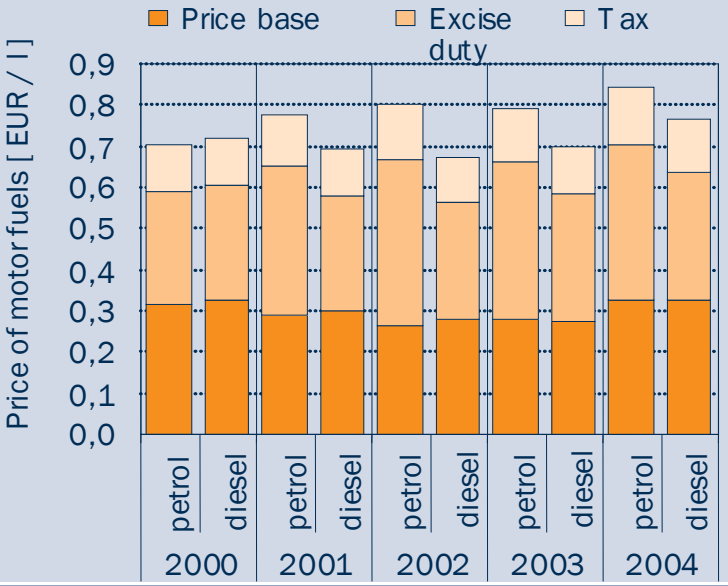


Figure 2-5: Fluctuations in the prices of heating energy providers (top) and fluctuations in the prices of motor fuels (bottom) from 2000 to 2004.

cal energy in HE power plants is highly dependent on hydrological conditions, which results in major fluctuations in production. In 2003 e.g. production at HE power plants amounted to only 21 % of total electrical energy produced.

The process of opening the electrical energy and natural gas markets in Slovenia, in accordance with the requirements of European directives and European energy policy instruments, began in 1999 with the adoption of the Energy Act On 1 January 2003 the electricity market was opened to all customers with a consumption threshold above 41 kW (around 8000 customers or 65 % of the market), and the natural gas market was opened to all customers with annual consumption of more than 25 million cubic metres. With amendments to the Energy Act in 2004, Slovenia fully incorporated the new directives on the regulation of internal markets of the EU (2003/54/EC and 2003/55 EC) into Slovenian laws, which meant that from 1 July 2004 the market was open to all customers except household customers, and will become 100 % open on 1 July 2007. The amendments to the Act introduce regulated access of third parties to the gas networks as well. Regulation of the prices for use of the networks is the competence of an independent regulator (Energy Agency of the RS), the Government regulates the prices for rate-paying customers of electrical energy, while the prices for rate-paying customers of natural gas are the competence of local communities (municipalities). State administrative control of prices on other markets as well (liquid fuels, district heating) is gradually decreasing (use of models for forming the maximum prices of oil derivatives, which enables continuous adaptation of the prices of motor petrol to fluctuations in the price of crude oil and the exchange rate of the US dollar, and a similar model is also used for district heating prices).
At the end of 2004 the price of household electrical energy[12] was 0.103 EUR/kWh, which is 75 % of the weighted average EU-25 price. Since 2000 the

price has nominally increased by 4.6 %, during which the highest growth was recorded in 2004 (2.3 %).
The price of electrical energy[13] at the end of 2004 was 0.061 EUR/kWh (80 % of the weighted average EU-25 price), and is practically unchanged since 2000; the price of natural gas[14] has nominally increased by 22.7 % since 2000, and at the end of 2004 was 5.89 EUR/GJ (90 % of the weighted average EU-25 price). Fuels used for heating, natural gas, extra light heating oil and thermal energy were nearly equal in terms of cost at the beginning of 2004, and nearly twice as cheap as electrical energy, which is in accordance with the principles of efficient energy consumption. Due to above-average growth of the price of extra light heating oil, at the end of 2004 the relative prices of fuels changed at the end of 2004. At the end of 2004 the most expensive fuel was heating oil at 14.3 EUR/GJ, followed by gas at 11.0 EUR/GJ and pellets at 10.4 EUR/GJ, while the cheapest were district heating at 9.7 EUR/GJ and firewood at 5.7 EUR/GJ.

The growth of the retail prices of liquid fuels were affected to the greatest extent by global fluctuations in oil prices and excise taxes. In Slovenia excise taxes on motor fuels are an important source of budgetary funds, approximately 4.3 % of budgetary revenues. In the period 2000–2004, excise taxes on the motor fuels 95 octane petrol and diesel grew faster than international oil prices; only at the end of 2004, when Slovenia joined ERM-2, did the Government reduce the effect of growing oil prices on inflationary trends within the country by reducing the growth of excise taxes.

2.7 Transport

The amount of road cargo and automobile traffic is increasing. The increase is the consequence of a higher number of vehicles and the increased average number of kilometres driven. The number of passenger kilometres in public road transport is decreasing. Due to its location, Slovenia is highly exposed to transit traffic, which makes up a substantial share especially of cargo transport. These trends entail the growth of greenhouse gas emissions.

The number of vehicles per inhabitant in Slovenia has increased steadily in the past decade. The number of registered personal vehicles per thousand inhabitants increased from 289 to 446 in the period from 1990 to 2003. There is also a noticeable trend of increase in the average engine power. The last few years has seen a strong trend towards increasing the number of vehicles with diesel engines. An increased number of vehicles can also be seen in cargo vehicles, while the number of buses is decreasing. The increased number of vehicles is approximately reflected in transport work (Figure 2-6). Transport work per personal vehicle is growing faster than the number of vehicles, from which we can conclude that the number of kilometres driven per vehicle is increasing. Based on the faster growth of transport work per cargo vehicle in comparison with the growth of the number of cargo vehicles in 2002 and 2003, we can also conclude that amount of transit transport is increasing.

[12] Data are for user group Dc
[13] Data are for user group Ie
[14] Data are for user group I3-1.

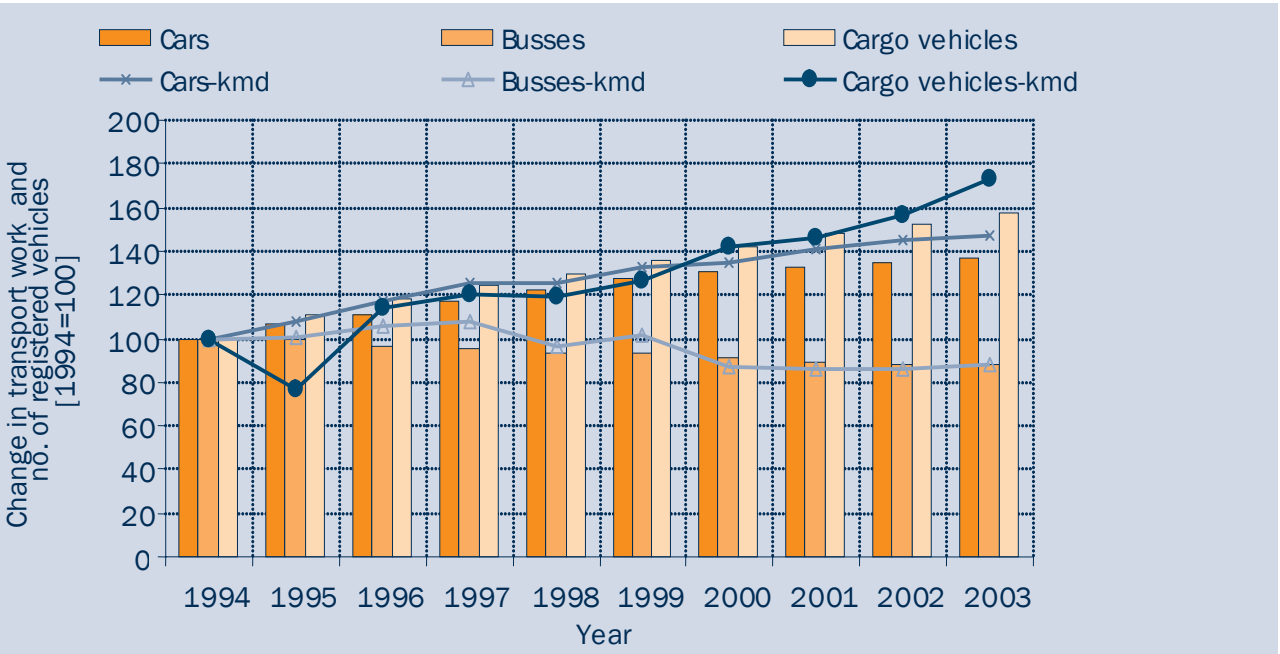


Figure 2-6: Change in the number of registered vehicles and transport work on national roads (kmd – kilometres driven obtained as the product of the length of the section times the average annual volume of traffic on the section).

Due to lower prices of motor fuels, lower parking costs and poor development and cancellation of routes, public road transport decreased from 1990 to 2003 from 6440 to 1065 million passenger kilometres (figures do not include taxis and chartered buses). The reduction of rail passenger traffic is smaller, from 1429 to 777 m pkm, whereby the drop is the consequence of economic recession and the break-up of former Yugoslavia, as the trend was falling until 1992, after which the number of passenger km has increased. The situation in air transport is similar to that of rail traffic.

Total cargo transport decreased dramatically from 1990–1993, while an increasing trend can be seen from 1996 onward. Rail cargo transport[15] fell in 1991 and 1992, reached its peak in 1995, was unchanged from 1996–2000, and has been on the increase since 2001. In 2003 it was 12 % lower than in 1990. Road cargo transport decreased until 1996, after which the trend reversed. In 2003 it was 29 % higher than in 1990. Due to its location at a crossroads of major traffic routes, Slovenia is exposed to intensive transit traffic as well as internal traffic. Nearly a third of all GHG emissions from heavy transport vehicles in Slovenia is produced by transit traffic. After the cooling down of conditions in the Balkans, the completion of the Slovenian motorway cross and the further expansion of the EU to the east and the Balkans will mean further increases in transit traffic, and therefore the redirection of as much transit cargo traffic as possible to the railways is a priority.

[15] The figures do not include transport by private carriers, who make up a significant part of cargo traffic.

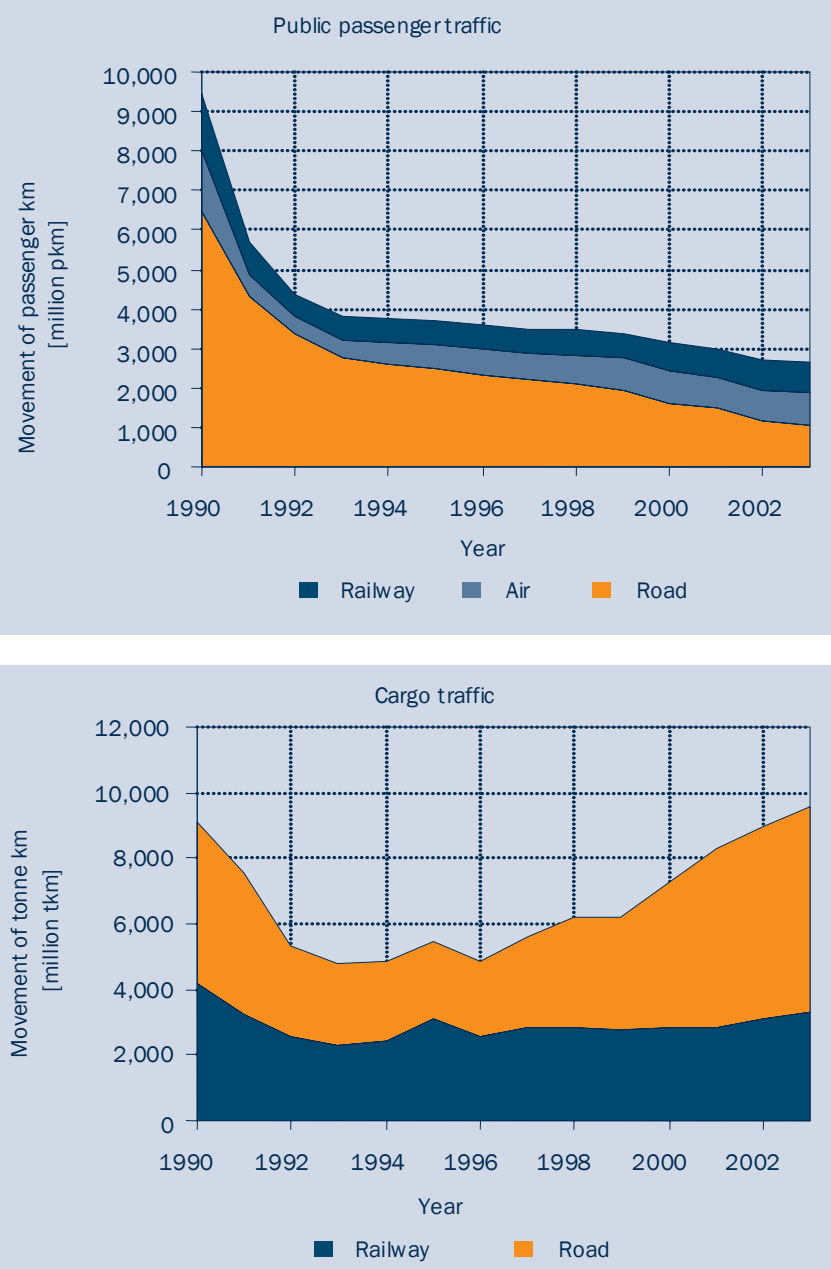


Figure 2-7: Levels of public passenger traffic (top) and cargo traffic (bottom) in 1990–2003.

In 2003 the consumption of fuel increased by 6.4 % in comparison with 2000. The greatest contributing factor to this was a 40 % increase in the consumption of diesel fuel, while petrol consumption decreased by 7 %. From 2000 to 2002 there was also a trend of increasing average speed, especially on motorways (MW) and high-speed roads (HR), for all types of vehicles except medium weight cargo vehicles. The highest increase in speed was among personal cars.

2.8 Industry

In 2003 the level of industrial manufacturing was 1.6 % higher than in 2002. The highest level of manufacturing growth was in the manufacturing of electrical and optical equipment and in the manufacturing of chemicals, chemical products and synthetic fibres, which is also reflected in value added (Figure 2-8). The level of manufacturing decreased the most in the tanning industry, textiles and textile products manufacturing, wood processing and the furniture industry. After a drop in the beginning of the 1990s, the share of processing activities in value added in permanent prices is increasing, from 26 % in 1995 to 29 % in 2004. In 2004 the greatest contributing factor to value added was the manufacturing of metal products, machines and equipment (Figure 2-8). Also significant from the point of view of greenhouse gas emissions is the increasing value added of metals manufacturing, which is an energy intensive activity.

The consumption of final energy in industry in the period 1995–2003 grew by 27 % in two jumps, the first in 1997 and the second in 2003. Large growth was also recorded in the same period by consumption of electrical energy in industry, which grew by 25 %, which is for the most part the consequence of growth in 2002 and 2003. In 2003 electrical energy accounted for the highest share of final energy (38 %) followed by natural gas (35 %), solid fuels[17] (13 %) and liquid fuels (12 %).

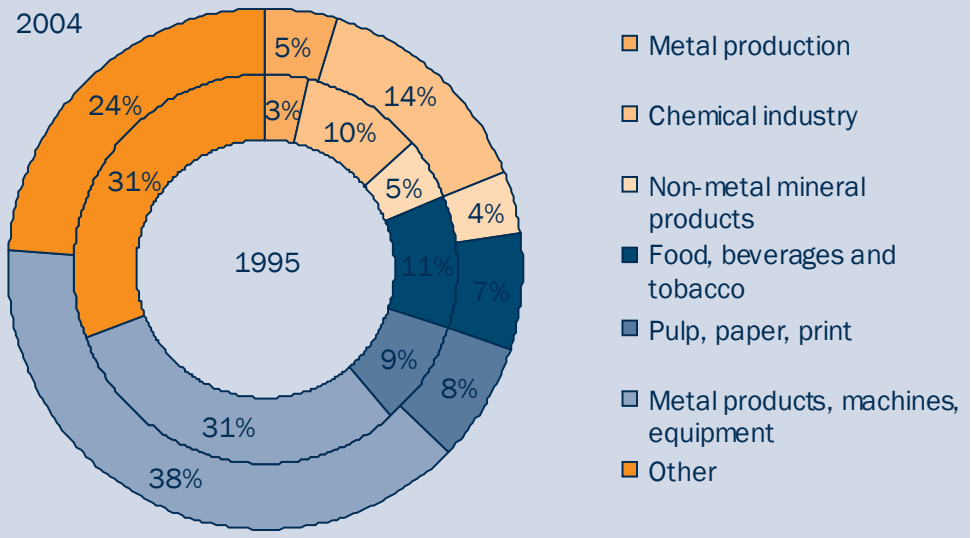


Figure 2-8: Shares of branches of processing activities[16] in value added of processing activities in 1995 and 2004.

[16] Processing activities were divided according to IEA classifications (Metals manufacturing (NACE classification – 27), Chemical industry (24), Non-metal mineral products (26), Food, beverages and tobacco (15, 16), Pulp, paper, print (21, 22), Metal products, machines, equipment (28, 29, 30, 31, 32, 34, 35), Other (17,18,19, 20,25,33,36,37)).

[17] Coal and other solid fuels (coke, etc.)

2.9 Waste

The average amount of wastes in 2003 was 418 kg/capita, in 2002 407 kg/capita. In 2003 public waste removal, which is used by 94 % of inhabitants, collected 394 kg of municipal waste per capita, in 2002 379 kg/capita. In 2003 the breakdown of types of waste was as follows: 86 % mixed municipal waste, 9 % separately collected fractions, 3 % garden and park waste and 2 % packaging. In comparison with 2002 the percentage of mixed municipal waste decreased, while the percentage of separately collected fractions increased, which can be attributed to the establishing of systems for separate collection of waste, which were required to be established throughout the country by 1 Jan. 2004 pursuant to the Decree on the treatment of separately collected fractions in the performance of the public service of treatment of municipal waste, and to the establishing of recycling centres. The main source of waste is households, which produce over 70 % of waste. Among the methods of waste treatment in Slovenia the most common is landfills, as 86 % of waste collected in 2003 was deposited in landfills for non-hazardous waste. In 2002 90 % of waste was deposited in landfills.

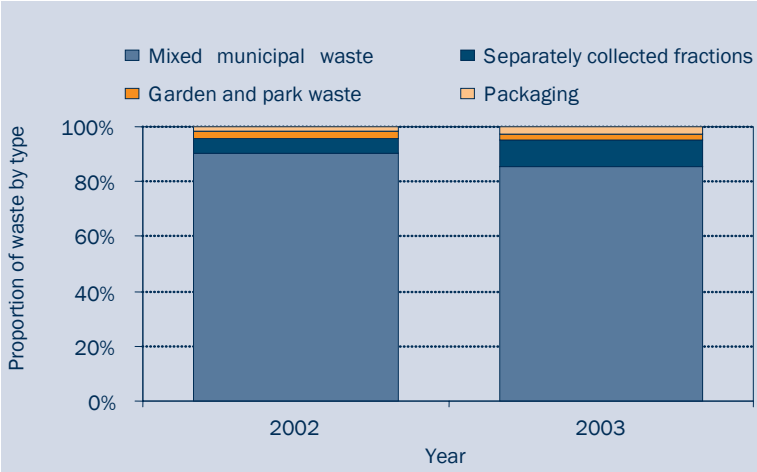


Figure 2-9: Waste collected by public waste removal services in 2002 and 2003, by type.

2.10 Building Stock and Urban Structure

In the period 1991–2002 the number of residential units increased by 13.9 % (94,635). The highest number of residential buildings were built in the period 1971–1980, at 23.8 %, and in the periods 1961–1970 (17.1 %) and 1981–1990 (16.4 %). The most common residential buildings are individual houses, which account for 60 % of total residential floor area and a 66 % share of available usable heat for heating. In the last few years there has been a trend of increased average size of residential units, which measured 73 m^2 in 1991 and 74.6 m^2 in 2002. The average size of residential units built in the period 1991–2002 was 93.6 m^2. The average energy figure for a single-family house is 156 kWh/m^2, while for blocks of flats it is 108 kWh/m^2.

The final consumption of energy in households increased by 10 % between 2000 and 2004. The highest increase was in consumption of natural gas, followed by consumption of liquid fuels and electrical energy. The consumption of renewable sources (wood) and solid fuels decreased (SURS).

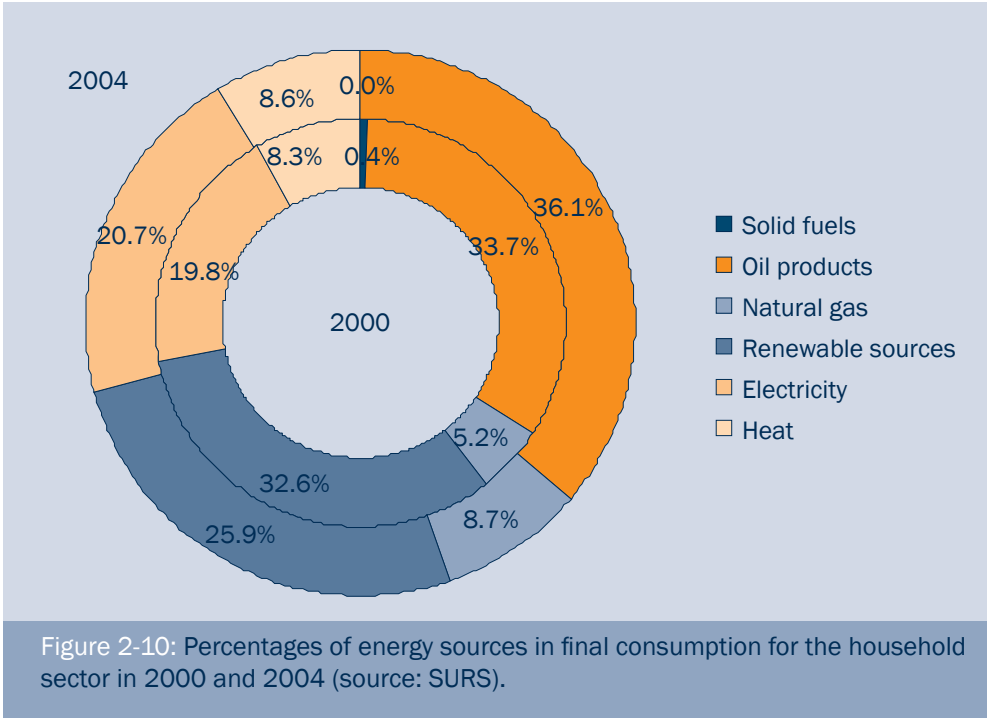


Figure 2-10: Percentages of energy sources in final consumption for the household sector in 2000 and 2004 (source: SURS).

2.11 Agriculture and Forestry

Agricultural land which is in use, not including overgrown and uncultivated land, amounts to 509,709 ha. Meadows and pastures make up 60 %, fields and gardens 34 % and permanent plantations 6 %. The percentage of agriculture in value added in 2003 was 3 %, which is 1.5 % less than in 1995.

The most important branch of Slovenian agriculture is animal husbandry, which accounts for 56 % of agricultural production, of which the highest share is of cattle breeding, followed by poultry and pig breeding. Farming contributes around 42 % to agricultural production.

178 thousand tons of mineral fertilisers were consumed in Slovenia in 2003, which is 397 kilograms per hectare of agricultural land in use. Consumption of fertiliser per hectare of land in use has decreased by 7 % since 1995. The consumption of mineral fertilisers per hectare of agricultural land in use on family farms is nearly three times less than in agricultural companies.

The number of farms included in monitoring of organic farms increased by a factor of 2.4 from 2000 to 2003. In 2003 there were 1415, which is 1.8 % of all farms. Organic farms cultivated 4.1 % of all cultivated agricultural land. Increased interest in organic farming is found in hilly terrain and among smaller and medium-sized family farms.

In 2003, 57 % of Slovenia's surface area was covered by forest. Since 1990 Slovenia's forest coverage has increased by 4 %, timber stocks by 42 %. The percentage of conifers and deciduous trees in timber stocks is nearly the same, at 48 % and 52 % respectively.

3 GREENHOUSE GAS INVENTORY INFORMATION

3.1 Total Greenhouse Gas Emissions

In 2003 a total of 19.8 Tg CO_2 eq. of greenhouse gases were emitted into the atmosphere in Slovenia. This is 2 % less than in 1986. The major contribution to total emissions came from carbon dioxide (81 %), followed by methane (10 %) nitrous oxide (8 %) and F-gases (1 %), which have a low emission level but great global warming potential.

A breakdown of emissions by sector shows that the biggest source is the Energy sector (80 %), followed by Agriculture (10 %), Industrial Processes (6 %) and Waste (4 %).

Greenhouse gas (GHG) emission trends in the period 1986–2003 indicate that meeting the Kyoto Protocol commitment will be no easy task for Slovenia. A drop in emissions at the beginning of the nineties was followed by equally rapid growth, which subsided after 1997. This in turn was followed by another decline, and then as the new millennium began, by renewed growth in emissions. Since 2001 emissions have remained practically unchanged. The highest growth in emissions, in 1997, points to a peculiarity of Slovenia, since it was a consequence of increased sales of motor fuels to foreigners owing to more favourable prices. The price of fuel might also have a major influence on GHG emissions in Slovenia in the future, since its favourable geographical location generates expectations of increased transit traffic through Slovenia, especially on the further enlargement of the European Union to the East and the Balkans. The decision to purchase fuel in a given country depends largely on the price of fuel.

A comparison by sector shows that GHG emissions in the Energy sector in 2003 were almost the same as in 1986. There were higher emissions in the Waste sector, but lower in the other three sectors. The greatest contribution in absolute terms to the lower total emissions in 2003 relative to 1986 came from the Agriculture sector, with the decrease resulting from a reduced number of animals.

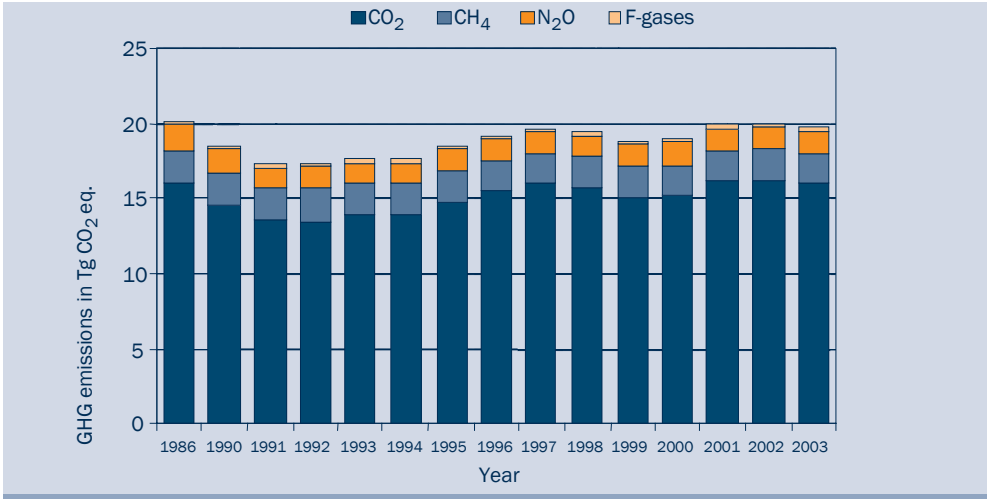


Figure 3-1: GHG emissions of individual gases in 1986 and 1990–2003.

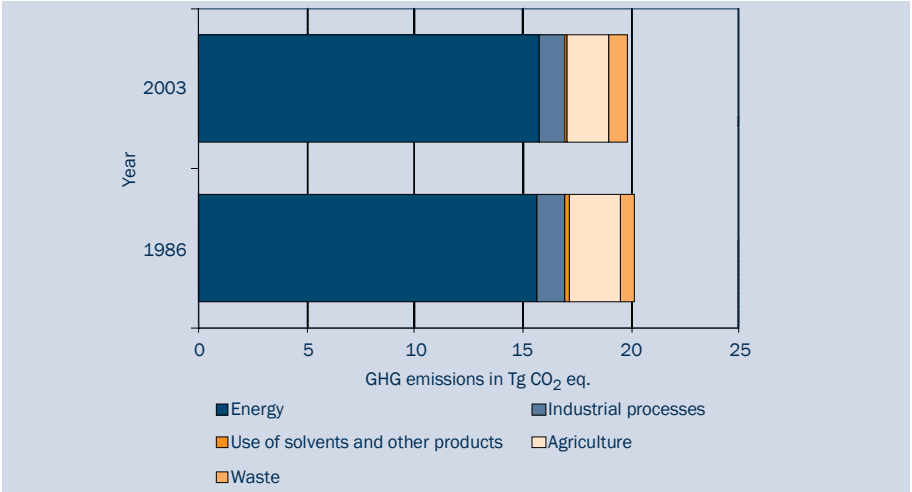


Figure 3-2: Comparative breakdown of GHG emissions by sector in 1986 and 2003.

3.2 Carbon Dioxide Emissions

Without taking into account the sinks, carbon dioxide emissions in 1986 amounted to 15,995 Gg, while in 2003 they were 1 % higher at 16,103 Gg. The biggest sources were Energy Supply at 41 % of all CO_2 emissions, Transport at 26 %, Other Sectors, which include emissions from households, services and the commercial sector and also from farming, at 18 %, and Industry and Construction at 15 %, and these fall within the Fuel Combustion sector. Industrial Processes contributed 6 % to emissions.

Emissions within the Fuel Combustion sector may also be broken down by fuels. The major share of emissions is accounted for by the combustion of liquid and solid fuels (46 % and 42 %), while the remainder is produced by the combustion of gaseous fuels.
The marked reduction in emissions at the beginning of the nineties was the result of economic upheavals associated with the transition to a new social order and with independence. The peak emissions in 1997 resulted from major growth in the sale of motor fuels to foreigners owing to the low fuel prices compared to neighbouring countries, while the growth in emissions in 2001 was for the most part the consequence of increased production of thermo power plants owing to the lower output from hydro power plants and increased consumption of electricity. In 2003 emissions fell compared to 1986 in the sectors of Energy Supply (by 8 %), Industry and Construction (46 %) and Industrial Processes (8 %), while they rose in Other Sectors and Transport (28 % and 100 %, respectively). Emissions from industrial processes fell primarily owing to the lower production of cement and lime.

The CO_2 sink was estimated in 2003 at 5.56 Tg, which is 88.5 % more than in 1986. The increase in sinks was the result primarily of an increase in timber growing stock in existing forests. In the future, owing to more precise methodology set out in the good practice guidance for the area of consumption and changes to soil use and of forestry activities, the estimates of sinks presented above will be corrected.

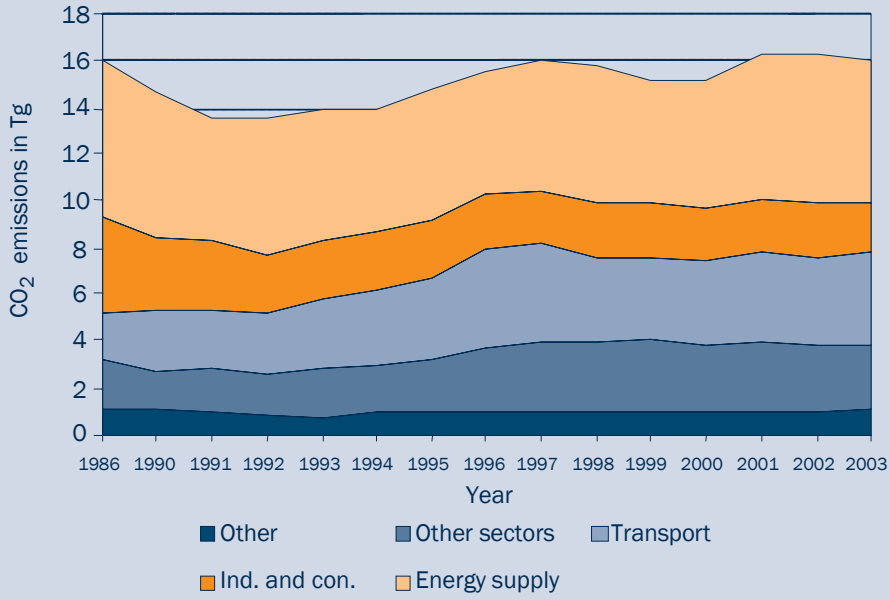


Figure 3-3: CO_2 emissions in 1986 and 1990–2003[18].

[18] The category Other takes into account emissions from these sectors: 1B Fugitive Emissions, 2 Industrial Processes and 3 Use of Solvents and Other Products. The relative shares contributed by these individual sectors in 2003 were as follows: 1B – 7 %, 2 – 90 %, 3 – 4 %.

3.2.1 Analysis of CO_2 Emission Trends

In 2003 primary energy consumption was 21 % higher than in 1990, while total CO_2 emissions were 0.7 % higher. Emissions from the Energy Supply sector were a percentage point lower in 2003 compared to 1990, while in the same period electrical energy production grew by 11 %. This is the result of increased electricity output from the nuclear power plant and increased efficiency of electricity generation at thermo power plants[19] . Following a decline up to 1993 and growth after that up to 2003, final energy consumption grew by 18 % over 1990, while total CO_2 emissions from Other Sectors, Industry and Construction and Transport grew by 8 %. The lower growth in emissions is the consequence of replacing solid fuels with liquid fuels.

Figure 3-4 shows the results of a breakdown analysis of CO_2 emission trends relative to emissions in 1990. The effect of five different factors on emission trends is analysed. The net sum contributed by all factors is equal to the change in emissions. The first factor, CO_2/TPES (TPES – total primary energy supply) relates to the CO_2 intensiveness of the entire energy system. The contribution of this factor is negative in 1991 and 1994–2003 and positive in 1992 and 1993. The positive contribution of the factor in 1992 and 1993 is the consequence of replacing part of the electricity production from the nuclear power plant with production from thermo power plants using solid fuel, and of the steep growth in the consumption of liquid fuels. The negative contribution of this factor is a consequence of the downward trend in the consumption of solid fuels and the downward trend in net exports of electricity (in 2003 this

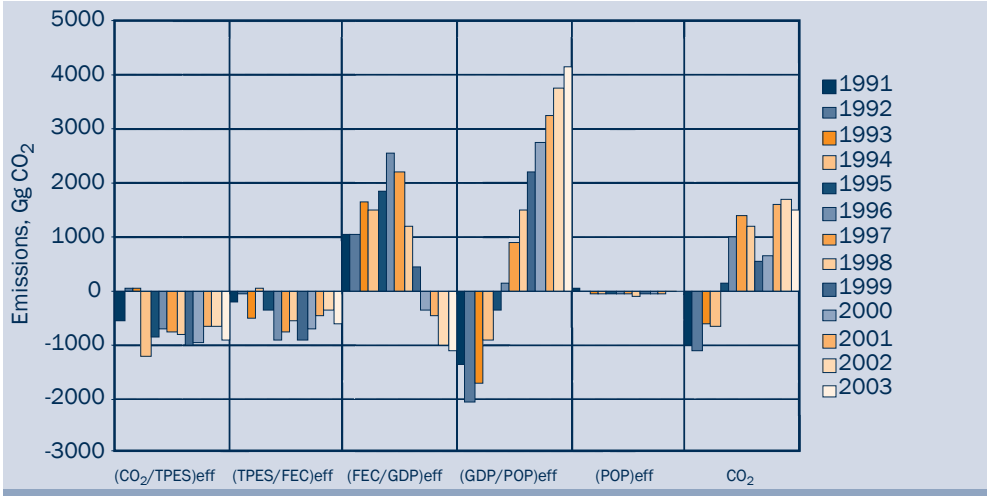


Figure 3-4: Breakdown of CO_2 emissions relative to 1990[20].

[19] 2003 was a very unfavourable year hydrologically, while in the long term the production of electrical energy from renewable sources is also rising.

[20] (CO_2/TPES)eff – effect of the change in CO_2 intensity of the energy system (emissions of CO_2 / total primary energy supply) in terms of a change in CO_2 emissions
(TPES/FEC)eff – effect of the change in efficiency of transformations (total primary energy supply/final energy consumption) in terms of a change in CO_2 emissions
(FEC/GDP)eff – effect of the change in energy intensiveness of the economy (final energy consumption/ gross domestic product) in terms of a change in CO_2 emissions
(GDP/POP)eff – effect of the change in economic growth (gross domestic product/number of inhabitants) in terms of a change in CO_2 emissions
(POP)eff – effect of the change in the number of inhabitants in terms of a change in CO_2 emissions

trend turned into net imports of electrical energy). Since 1998 there has also been a modest but noticeable downward trend in liquid fuel consumption and a modest growth in consumption of gaseous fuels (Figure 3-5).

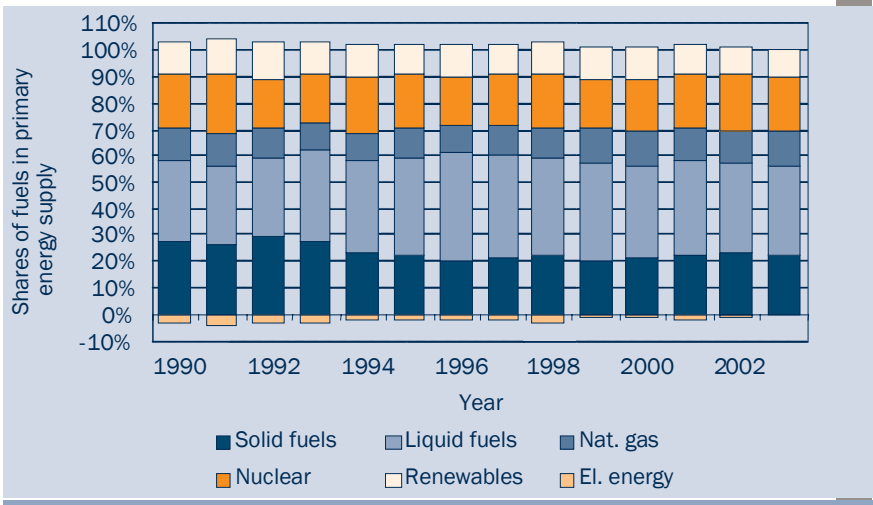


Figure 3-5: Breakdown of primary energy supply from 1990 to 2003.

The factor of TPES/FEC (FEC – final energy consumption) shows the efficiency of energy transformation. This factor is influenced, for example, by the transition from fuels to electricity in final consumption sectors, which causes a growth in the factor and thereby increased emissions, while a reduction in the factor is stimulated by improvements in the efficiency of thermo power plants or growth in the number of electricity cogeneration units, increased output of electricity from nuclear fuel and renewable sources, and increased imports of electricity. In Slovenia's case the contribution of the factor is negative (it is improving) owing to the increased efficiency of thermo power plants, increased production of electricity from nuclear fuel, the higher installed power of hydro power plants and the reduction in net exports of electrical energy.
The factor of FEC/GDP relates to the intensiveness of the entire economy. This factor is influenced by many things, for instance the transition in industry towards less energy-intensive activities, the transition in proportions of GDP from manufacturing to services, technological advances, the energy features of buildings, energy consumption in transport and so forth. Up to and including 1999 the contribution of this factor in Slovenia was positive, but since 2000 it has been increasingly negative. The main reason for the positive contribution of this factor was the growth in consumption of liquid fuels in transport, for the most part owing to low prices, and partly also owing to the growth in the level of motorisation. Since 2000 there has been a notable increase in the proportion of services in GDP and a reduction in the energy-intensiveness of industry.

The fourth factor shows the effect of GDP trends on emissions. Up until 1992 GDP was falling, but since that year it has shown constant growth. In 1996 it reached almost the same level as 1990, so the contribution of the factor is minimal, while continued growth in GDP has had the effect of increasing the positive contribution of the factor to CO_2 emissions relative to 1990. In the period 1990–2003 the population remained practically unchanged, and therefore contributed minimally to CO_2 changes.

3.3 Methane Emissions

Methane (CH_4) is the next most important greenhouse gas, since with 1,974 Gg CO_2 eq. in 2003 it accounts for 10 % of Slovenia's GHG emissions. The main sources are agriculture, waste and waste water treatment, mining and solid fuel combustion. Emissions in 2003 were 12 % lower than emissions in the base year.

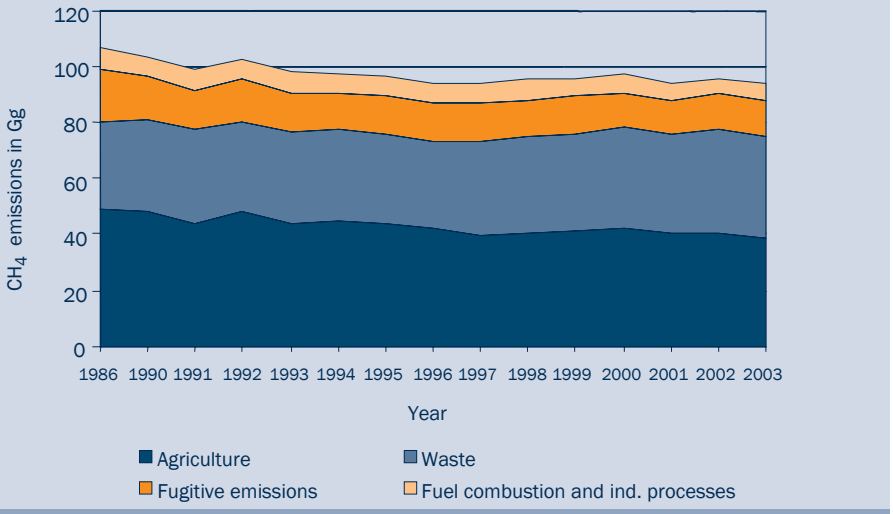


Figure 3-6: CH_4 emissions in 1986 and 1990 to 2003.

Methane emissions in agriculture, the biggest source, are generated by enteric fermentation and manure handling. Enteric fermentation contributes 80 % of agricultural emissions. Between 1986 and 2003 agricultural emissions fell by 20 %. This reduction was the result of a fall in the number of bovines, which was accompanied by growth in the productivity of milch cows. Solid waste disposal contributes 77 % of emissions in the Waste sector, the next biggest source, and this also includes emissions from waste water treatment. In the period 1986–2003 Waste sector emissions rose by 13 %, a consequence of higher emissions from solid waste disposal owing to the growth in the quantity of waste disposed up to 2001. Since 2001 the quantity of waste disposed has decreased, and a continuation of this trend is anticipated for the future, owing to the introduction of a system of separate waste collection and plans for waste incineration. Emissions from waste water treatment fell in this period. The third largest source of methane emissions is fugitive emissions, 95 % of which are contributed by the obtaining of solid fuels, and the remainder by emissions released in the distribution of natural gas. In 2003 fugitive emissions were 26 % lower than in 1986. Contributing to this reduction was a decline in the quantity of coal being mined. Methane emissions from fuel combustion are generated to the greatest extent by far in the household combustion of solid fuels. Emissions fell by 33 % owing to the drop in the use of solid fuels in households in favour of replacing coal with liquid fuels.

3.4 Nitrous Oxide Emissions

In 2003 nitrous oxide (N_2O) emissions accounted for 8 % of GHG emissions or 1,503 Gg CO_2 eq. The main sources are agricultural land and manure handling, which fall within the Agriculture sector, and fuel combustion. Waste water and the use of solvents and other products are also minor sources. In the period 1986–2003 emissions fell by 9 %. Total emissions of nitrous oxide from agriculture amounted to 3.7 Gg in 2003. Of this, 37 % was generated through the introduction of synthetic and animal fertilisers into the soil, 34 % was from indirect sources (the release of nitrogen from synthetic and animal fertilisers via atmospheric deposition and leaching), 21 % from handling animal manure (predominantly collection in the solid state) and 8 % was from raising grazing animals and other lesser sources.

In the period 1986–2003 agricultural emissions fell by 14 %, which resulted mainly from the reduction in emissions from handling animal manure, owing to the reduction in the number of animals. Emissions from fuel combustion contributed 0.82 Gg in 2003, which is 50 % higher than in 1986. The biggest proportion of emissions stems from combustion of liquid fuels in transport (61 %), followed by liquid fuel and biomass combustion in Other Sectors (20 %). The major contribution to the growth of emissions came from the growth in the number of vehicles with catalytic converters. Waste water treatment contributes 4 % of the total emissions of N_2O, while the use of solvents and other products contributes 2 %.

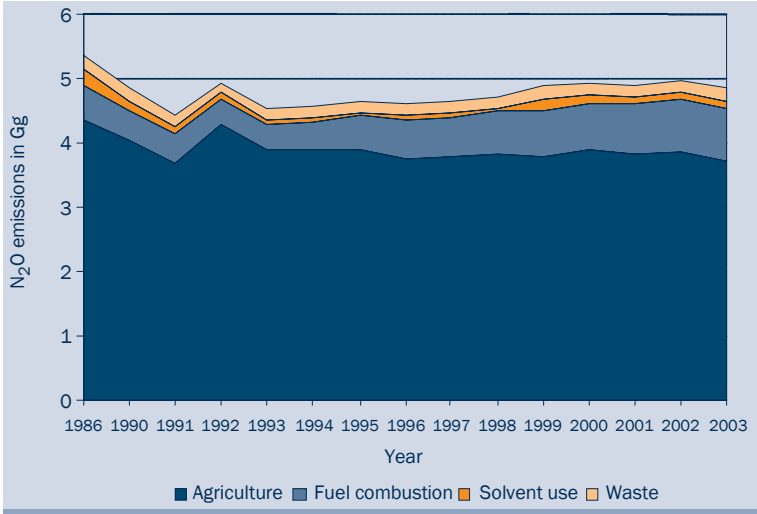


Figure 3-7: N_2O emissions in 1986 and 1990 to 2003.

3.5 Emissions of F-gases

In 1995[21] emissions of F-gases amounted to 342 Gg CO_2 eq., and in 2003 to 223 Gg CO_2 eq., which accounts for 1 % of GHG emissions. In 2003 the contributions of individual gases were as follows: perfluorocarbons (PFC) 53 %, hydrofluorocarbons (HFC) 37 % and sulphur hexafluoride (SF_6) 9 %.
The only recorded source of PFC emissions (CF_4 and C_2F_6) in Slovenia is the production of aluminium. Despite the increased production of aluminium, in the period 1995–2003 technical process improvements led to a 58 % reduction in emissions. The only gas to fall within the HFC group in Slovenia is the gas HFC-134a, which is used as a coolant in air conditioning and cooling apparatus. Its use began in 1993 as a replacement for CFC. In the period 1995–2003 emissions of this gas increased by 172 %, which is for the most part a consequence of the growing number of cooling and air conditioning units. The source of SF_6 emissions is the use of switchgear in the energy sector. In the period 1995–2003 emissions of this gas fell by 17 %.

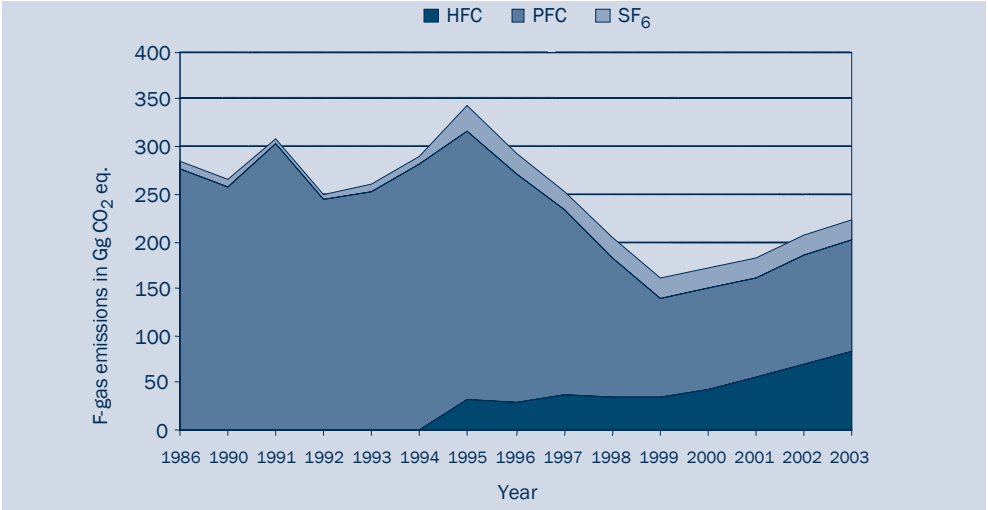


Figure 3-8: F-gas emissions in 1986 and 1990 to 2003.

[21] Slovenia took 1995 as the base year for F-gas emissions, as did the majority of countries.

3.6 Indirect GHG Emissions

A detailed presentation of emissions is given in the appendix.

NO_x: Total emissions of NO_x amounted to 56.0 Gg in 2003. The main sources are:

- 1A3 Transport 32.0 Gg
- 1A1 Energy Supply 16.9 Gg
- 1A2 Manufacturing Industries and Construction 3.9 Gg
- 1A4 Other Sectors 3.6 Gg

NMVOC: Total emissions of NMVOC amounted to 51.9 Gg in 2003. The main sources are:

- 1A3 Transport 13.5 Gg
- 3 Solvent and Other Product Use 11.6 Gg
- 2 Industrial Processes 10.0 Gg
- 1A4 Other Sectors 8.5 Gg
- 1B Fugitive Emissions 5.5 Gg

SO_2: Total emissions of SO_2 amounted to 66.3 Gg in 2003. The main sources are:

- 1A1 Energy Supply 51.1Gg
- 1A2 Manufacturing Industries and Construction 6.2 Gg
- 2 Industrial Processes 5.0 Gg
- 1A4 Other Sectors 3.3 Gg

CO: Total emissions of CO amounted to 96.8 Gg in 2003. The main sources are:

- 1A3 Transport 48.0 Gg
- 1A4 Other Sectors 29.9 Gg
- Industrial Processes 16.0 Gg

3.7 Methodology for Compiling Emissions Inventories

The greenhouse gas emissions inventories were made on the basis of IPCC methodology (IPCC 1996, 2000) for all gases and sectors, except in certain cases that are mentioned separately. Inventories and estimates were also made for certain emission sources that are not set out in the IPCC methodology. With regard to the importance of the source and available data, various approaches (Tier) were used within the framework of IPCC methodology. In estimating emissions, for emissions from domestic coal the national emission factors (Tier 2) were used, while for other energy products for the most part IPCC default emission factors were used.

The quantities of fuels and used energy values of fuels were taken from annual energy publications, which are published on the basis of data from the Slovenian Statistical Office by the ministry responsible for energy. In addition to this, data were obtained on the energy use of certain types of waste (waste tyres, oil and solvents). Data on the consumption of fuels in agriculture and forestry relate only to mobile sources, with the remaining consumption of fuels in these subsectors being included in the public and service subsector. In the energy consumption of fossil fuels, the IPCC default emission factors and oxidation shares were used for liquid fuels. Owing to the greater proportion

of methane in the natural gas used in Slovenia, for the entire period an appropriate CO_2 emission factor – slightly lower than the default – was used. CH_4 and N_2O emissions from road motor transport were determined in accordance with the more precise CORINAIR methodology and emission factors. For diesel vehicles we discounted from the possible emissions carbon contained in emitted solid particles, while for petrol vehicles we assumed 100 per cent oxidation of fuel. For fugitive emissions of CO_2in the energy sector we took into account emissions released in flue gas desulphurisation at thermo power plants, and these were calculated on the basis of data on consumption of calcium carbonate. Owing to a lack of data on desorption, emissions of CO_2 in mineral dressing were not estimated. It would appear, however, that they are greater than those released directly in the excavation of coal. Emission factors for fugitive emissions of CH_4 in mining were determined on the basis of measurements of methane concentrations in mine ventilation shafts and estimates of released quantities of methane. The resulting emission factor is lower than the IPCC default values. The IPCC regional default emission factor in the transmission and distribution of natural gas is not appropriate to the situation in Slovenia, so in order to calculate CH_4 emissions in natural gas transmission we used data from the company that manages the distribution network. Losses in distribution were estimated on the basis of the length of individual types of gas pipeline relative to the type of pipe, using specific losses per unit of length, such as were set out in the German report to the Conference of the Parties, which makes sense in view of the level of maintenance and the low average age of the gas pipeline network.

Emissions in industrial processes were for the most part determined on the basis of data received directly from producers and by using national emission factors. Indeed since 1997 the Slovenian Statistical Office has partly changed its method of collecting and presenting such data, so the majority of data required to calculate key sources were obtained during this time from companies. In the production of metals, the use of other reducing agents was taken into account alongside the use of anodes. Thus in the production of iron and steel we included the use of coke, and in the production of ferrous alloys the use of coke and petrol coke. Emissions in the primary production of aluminium were calculated from the use of anodes and from emissions of PFC, which were determined on the basis of the number and duration of anodic effects. In determining actual emissions owing to the use of HFC, data were obtained from companies using these substances, and data on exports and imports of cooling apparatus. For SF_6 emissions an estimate was made of the release of this gas from sound-proof windows and energy sector switchgear.

In the use of solvents and thinners, NMVOC emissions were estimated primarily on the basis of CORINAIR methodology. In line with the principle of deliberate double counting, relevant emissions of CO_2were also attributed to NMVOC emissions of fossil origin, since after several months in the atmosphere these substances transform into it.

In agriculture there was an especially accurate determination of methane emissions from bovine enteric fermentation, with the Tier 2 approach being enhanced by dividing herds into 18 categories depending on the intensiveness of husbandry. For emissions arising from manure handling we used the Tier 2 approach in pig and cattle raising. For other types of animal husbandry, which make up just a minor proportion of methane emissions, the Tier 1 approach was used. For N_2O emissions in manure handling and in direct emissions from applying animal fertilisers we used entry data obtained in the estimate of methane emissions. For N_2O emissions we used the IPCC default factors, which provide the transformation of nitrogen into N_2O.

Methane emissions in solid waste management were determined by using the first order decay method, which takes into account the time dynamic of methane release. Emissions of N_2O from waste water were determined with regard to the consumption of proteins in human food, which according to estimates did not change in the relevant period.

3.8 Main Changes in Inventories from the Previous Communication

3.8.1 Energy Management

We have used new data from the Statistical Office on the use of wood biomass, and these data are more consistent in terms of time than those used previously.

3.8.2 Industrial Processes

We calculated GHG emissions from cement production according to the Tier 2 methodology, where for the past five years we used the national emission factor for CO_2 for each year separately, while for the period prior to 1999 we used the average value.

We improved the calculations of CO_2 emissions from carbide production, by using entry data from the producer for the entire period, since the statistical data are not appropriate given the unharmonised methodology. In view of the considerable variances in the quantity of calcium carbide used, we smoothed over these variances by using the sliding average method.

We calculated the national emission factor for steel and used it to calculate CO_2emissions for the period 1990–2003, but owing to the different type of production this is not appropriate for calculating emissions in the base year.

3.8.3 Waste

All calculations of methane emissions from municipal waste were made again using the first order decay (FOD) model, where we used the prescribed parameters from IPCC GHG, 2000. In calculating emissions from municipal waste water we used the correct value for B0 (methane production capacity).

3.8.4 Agriculture

All calculations were made on the basis of single-year data instead of three-year averages.

3.8.5 Change of Emissions in the Base Year

These changes affected emissions throughout the time frame, in other words also in 1986, and this is especially important since the Kyoto commitment is tied to emissions of CO_2, CH_4 and N_2O in that year[22]. Table 3-1 shows the difference in emissions for 1986 between inventories reported in 2004 and 2005.

Table 3-1: Comparison of GHG emissions in 1986 in inventories reported in 2004 and 2005.

Gg CO_2 eq.	GHG emissions 1986		
	2004 inventory	2005 inventory	Difference
1. Energy	15,603	15.658	55
A. Fuel Combustion	15,218	15.218	0
1. Energy Supply	6,729	6.729	0
2. Manufacturing Industries and Construction	4,171	4.171	0
3. Transport	2.008	2.008	0
4. Other Sectors	2.311	2.366	55
B. Fugitive Emissions	384	384	0
2. Industrial Processes	1.309	1.306	-3
3. Solvent and Other Product Use	128	128	0
4. Agriculture	2.564	2.367	– 197
5. Land-Use Change and Forestry	– 2.503	– 2.950	
6. Waste	997	726	– 271
7. Other	0	0	0
TOTAL	20.601	20.185	– 416

[22] In determining the Kyoto objective for F-gases 1995 is taken as the base year.

4 POLICIES AND MEASURES

4.1 Programme Documents

Slovenia has committed itself with the ratification of the Kyoto Protocol to emit on the average yearly 8 % less greenhouse gases in the first commitment period (2008–2012) than in the base year. Much has already been done to achieve this goal, primarily in the area of drafting legislation and in measures and policies, but a great deal will need to be done in implementing measures and in the area of evaluating the implementation of measures. Slovenia's umbrella document in the area of reducing GHG emissions is the Action Plan for Reducing GHG Emissions (AP-GHG), which was adopted in July 2003 and supplemented in 2004. The document was drawn up at the Ministry of the Environment and Spatial Planning (MOP) with the collaboration of expert institutions and other ministries. It contains 22 instruments for implementing measures to reduce GHG emissions:

1. trading in GHG emissions;
2. trading in natural gas,
3. trading in electrical energy,
4. carbon dioxide emission tax,
5. adaptation of industry to environmental standards (IPPC),
6. introducing excise duties on fossil fuels and electrical energy,
7. stimulating cogeneration of heat and electrical energy (feed-in tariffs),
8. stimulating production of electrical energy from renewable sources (feed-in tariffs, green certificates),
9. stimulating increased use of renewable sources (subsidies and favourable investment crediting),
10. promotion of energy efficiency and energy efficiency of the public sector (energy inspections, Rules on thermal insulation and efficient energy use in buildings, Rules on the distri bution and calculation of costs of heat in residential and other buildings with more than one consumer, regular inspections of heating installations, third party financing),
11. demand side management,
12. energy labelling of household appliances,
13. energy performance of buildings,
14. thermal insulating properties of building materials,
15. regulations on regular control of composition of exhaust emissions of vehicles and adjusting internal combustion engines,
16. strategies of spatial and regional development, construction of appropriate transport infrastructure and transport regulation,
17. informing consumers of CO_2 emissions from motor vehicles,
18. stimulating the use of biofuels,
19. reduction of air pollution caused by traffic,
20. reduction of emissions of F-gases,
21. agricultural environmental polcy,
22. waste management.

In 2006 a review of the Action Plan for Reducing GHG Emissions will be performed, and this will include an evaluation of the implementation of the Action Plan and the achievement of the goals set, as well as an elaboration of new projected GHG emissions.

Among the programme documents an important place is occupied by the Resolution on the National Programme of Environmental Protection for the Period 2005–2012 (ReNVPO), which was adopted in November 2005 and is the basic strategic document in the area of environmental protection. For the area of climate change the following goals are important: emphasise climate change as a major challenge in the coming years and reduce emissions of greenhouse gases, and in this way contribute to the long-term goal of stabilising concentrations of greenhouse gases in the atmosphere, waste management and the use of renewable and non-renewable natural resources, which permit sustainable production and consumption, and contribute to reducing environmental pollution and energy consumption in such a way that does not exceed the capacity of the environment.

The goals and measures that contribute to reducing greenhouse gas emissions are included in sectoral programmes. Pursuant to the Energy Act this is a compulsory component of energy policy, and this was also accommodated in the Resolution on the National Energy Programme (Official Gazette of the Republic of Slovenia 57/04) (ReNEP), which sets out the following goals:

1. Increasing the efficiency of energy use by 10 % up to 2010 relative to 2004 in industry and the service sector, in the public sector by 15 %, in buildings by 10 %, and in transport by 10 %; a doubling of the proportion of electrical energy from cogeneration from 2000 to 2010.

2. Increasing the share of renewable energy sources in the primary energy balance from 8.8 % in 2001 to 12 % by 2010, in supplying heat from 22 % in 2002 to 25 % in 2010, electrical energy from RES from 32 % in 2002 to 33.6 % in 2010, reaching a 2 % share of biofuels in transport by the end of 2005. The Resolution on the Transport Policy of Slovenia, which is in parliamentary reading (the Government adopted it in July 2005), defines the principles, goals, measures for attaining the goals and the key managers of transport policy, and envisages implementing documents with detailed definitions of goals and activities. Among the priority goals third place is occupied by energy use efficiency and a clean environment, in the area of passenger transport the priority goal is an entire system of public transport whose price attractiveness and quality of services will encourage the transfer of passengers from private to public transport, and in the area of goods transport the securing of a greater share of international and transit goods by the railways. The resolution for the field of transport represents an important step towards sustainable mobility, since thus far in the transport area the emphasis has been mainly on constructing motorway transport infrastructure. For the area of agriculture we should highlight the Slovenian Agricultural Environmental Programme (SAEP), which in 2004 was included in the Rural Development Programme for Slovenia 2004–2006 (Official Gazette of the Republic of Slovenia 116/04), and in which an important place is occupied by measures to promote sustainable forms of farming. In the area of waste the Government adopted the Action Plan for Managing Packaging and Waste Packaging and the Action Plan for Removal of Waste with the Aim of Reducing Quantities of Biodegradable Waste for the period up to the end of 2008. The former provides goals (50 % recycling of the entire mass of waste packaging by the end of 2007, 60 % mass proportion of recycling by the end of 2012) and measures for managing packaging, while the latter covers waste disposal sites and the construction of new infrastructure for waste management, separate collection of

waste and recycling, waste incineration and disposal of biodegradable waste. It sets out the following goals: to direct into processes prior to waste removal at least 65 % or more of generated quantities of municipal waste and (in the net amount) secure material consumption of at least 42 %, separate all cooking waste and process it biologically, treat the remaining waste in such a way that the total organic carbon content will not exceed 5 %, and reduce the quantities of disposed biodegradable waste from 47 % to 16 % by 2013 or 2015.

4.2 EU Policy

As a Member State of the EU, Slovenia is committed to fulfilling the European climate policy and implementing common EU measures in this area (CCPM). Measures include Decision No 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol, which ensures that EU progress in fulfilling the Kyoto Protocol will be analysed yearly and that Member States will send the necessary data regularly to the Commission, and Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community. Other measures cover a wide spectrum of areas, and the link between them and national measures is set out in Appendix C.

4.3 Policies and Measures and Their Impacts

The measures presented below are taken from the AP-GHG and were presented in the 2/3 National Reports to the Conference of the Parties to the UN Framework Convention on Climate Change, since in the interim period no new measures have been identified. Changes have taken place, however, in the implementation of individual measures, so their description in the majority of cases has been corrected or supplemented.

4.3.1 Energy

Implemented Measures

(1) Promotion of electricity production from renewable sources and combined heat and power generation

Implementer:
Ministry of the Economy (MG)
GHG affected: CO_2
Type of measure: economic, regulatory

The Energy Act introduced a new term, that is, qualified production of electricity defined as production from renewables, waste and in power plants with extra high efficiency of combustion of fossil fuels with combined heat and power generation. The Decree on prices and rules for purchasing electricity from qualified producers established the feed-in tariff system. The purpose of this measure is to create a favourable environment for the construction of new capacities for exploiting renewable sources and combined heat and power generation plants through favourable fixed purchase prices determined by the Slovenian Government.

Production of electricity from RES in smaller qualified power plants is increasing only slowly (from 410 GWh in 2000 to 560 GWh in 2004), owing primarily to the higher production of electricity from small hydro power plants (favourable hydrology) and production from wood biomass, while for other

sources development is smaller (around 30 % attainment of projections from the ReNEP). Increasing the proportion of electrical energy from renewables to 33.6 % of gross consumption in line with the ReNEP and Directive 2001/77/EC will require the formulation of certain purchase prices (such as for biomass), and especially the elimination of other barriers hindering faster development in this area (spatial location etc.).

The current mechanism of purchase prices for cogeneration has allowed sufficient support primarily for the construction of smaller new cogeneration units in district heating systems (construction of new units already exceeds projections from the ReNEP), and there has also been marked development in recent years in the use of landfill gas and biogas, while current support for cogeneration in other activities (especially industry and in the service sector) is too small, something confirmed by the slow development to date. In order to double production by 2010 it will be necessary to improve the mechanism as soon as possible, especially for larger units in industry and in district heating systems.

The estimate of emission reduction owing to measures implemented for the promotion of electricity generation from renewables and combined heat and power generation in 2010 is put at 300 Gg CO_2.

(2) Opening the electricity market

Implementer: MG, HSE (Holding slovenske elektrarne – Slovenian Power Plants Holding company)
GHG affected: CO_2
Type of measure: regulatory

In line with the amendment to the Energy Act, since 1 July 2004 the electrical energy market has been open to all consumers except for households, and this accounts for 77 % of electricity consumed in Slovenia. With the development of the European market and the linking and inclusion of countries in SE Europe (linking up the two UCTE synchronous zones in 2004) there has been a marked increase in the scope of international electricity trading. Opening up the market influences GHG emissions indirectly through changes in the electricity production structure and through greater import possibilities or consumer selection in the event that domestic production is not competitive or ecologically suitable. Events on the market also fall under the influence of administrative oversight measures, which can have an important effect on production trends from individual types of power plants and in this way on overall CO_2 emissions. A major influence is also exerted on this by decisions regarding the functioning of emissions trading, since all the major power and heat plants have been included in the compulsory European trading scheme since 2005. The electrical energy market will open up to all consumers in 2007.

The estimated emission reduction owing to the changed structure of electricity production, which will be influenced not only by the opening of the electricity market but also by the opening of the natural gas market and emission trading, is put at around 660 Gg CO_2 in 2010.

(3) Opening the natural gas market

Implementer: MG, HSE, Trbovlje thermo power plant (TET)
GHG affected: CO_2
Type of measure: regulatory

The first stage of the market opening took place in 2003, when the market was opened for customers using more than 25 million m3 of natural gas or more annually, and on 1 July 2004 the market opened for all consumers except households. The conditions for operation of the market have been actually established in the transmission network, while for the distribution networks all the implementing regulations are still being drafted. Despite the slow development, the natural gas market represents an additional stimulus for the development of gas networks, price

competitiveness and increased use of this environmentally favourable energy product, primarily in the production of electricity. Given the long-term contracts concluded up to 2007 and the complete opening of the market for all consumers on 1 July 2007, the market will only be truly established after 2007, when we may also anticipate marked effects of this measure on CO_2 emissions.

With the construction of the necessary additional transmission capacities and a competitive market price for natural gas, we may realistically expect an increase in the current minimal share of natural gas in the generation of electricity, both through the partial transfer from coal to natural gas (Ljubljana combined heat and power plant (TE–TOL), Šoštanj thermo power plant (TEŠ), and possibly the Trbovlje thermo power plant (TET)) and through the construction of new power plants fuelled by natural gas, whereby specific CO_2 emissions in the production of electrical energy will be significantly reduced.

(4) Construction of large hydro power plants

Implementer: MG, HSE
GHG affected: CO_2

The gross energy potential of Slovenian river flow is estimated to be 19,400 GWh annually, of which harnessing 9,100 GWh annually is technically feasible and 7,000 to 8,500 GWh annually is economically feasible. Currently 3,970 GWh or 43 % of the potential is being used. These data also include small hydro power plants.

Currently two hydro power plants (HE Medvode on the Sava and HE Zlatoličje on the Drava) are being refurbished, and a project to construct five large hydro power plants on the lower Sava is underway. This project was initiated in November 2002 with the construction of the first plant at Boštanj, which is being completed in the first half of 2006, and is continuing with the construction of the HE Blanca (beginning of 2005), with the entire chain being completed by 2018. The plants on the lower Sava will generate 720 GWh of electricity annually, representing 6 % of current energy consumption. Alongside this, for the period between 2006 and 2011 plans call for the refurbishment of the last hydro power plant on the Drava (HE Formin). In the medium term the potential remains for the construction of hydro power plants on the Mura River, the middle Sava and in the Soča catchment.
Taking into account the HE Boštanj, in 2006 around 64 % or 115 kt CO_2 will be accounted for in the total planned development potential for reducing emissions by 180 kt CO_2 through the construction of large hydro power plants from 2000 to 2010, and given the current development the entire reduction fulfilment by 2010 is fairly certain (construction of HE Blanca and refurbishing of HE Zlatoličje).

(5) Incentives for implementing EEU measures and for investing in RES

Implementer: Ministry of the Environment and Spatial Planning (MOP), Slovenian Ecological Fund
GHG affected: CO_2
Type of measure: economic, promotional

Ministry of the Environment and Spatial Planning – Department of Efficient Energy Use and Renewable Energy Sources[23]

Financial incentives for investments and preparation of investments

In 2003 the Slovenian Agency for Energy Efficiency and Renewable Energy

[23] In 2005 the Department of Efficient Energy Use and Renewable Energy Sources took over the greater part of the activities of the Slovenian Agency for EEU and RES (AURE). AURE performed expert and associated administrative tasks relating to the implementation of national programmes to promote EEU and RES plus coordination and cooperation in the implementation of programmes.

Sources (AURE) allocated around SIT 495 million, and in 2004 SIT 463 million, for financial incentives to invest in EEU and the use of RES in households, companies and the public sector. The following investments were supported: investment in increasing the energy efficiency of older apartment buildings (window replacement), investment in the use of RES in households, companies and the public sector (installation of solar systems and heat pumps, use of geothermal energy) and within the Programme of Energy Use of Wood Biomass investments in the energy use of wood in households, companies and the public sector. Owing to investments in RES and EEU, in 2004 consumption of fossil fuels will decrease by 47 GWh (in 2003 by 78 GWh), while CO_2 emissions will decrease by 15 Gg annually (26 Gg in 2003).

The Department also provides a programme of promoting energy check-ups, preparation of feasibility studies and elaboration of municipal energy plans. In 2004 a total of 18 energy check-ups in companies and the public sector were co-financed, and 19 in 2003. Based on the findings of the energy check-up, it is possible through the implementation of EEU measures, the cost of which is returned in a period of three years, to save 10 GWh of energy, representing an annual reduction of CO_2 emissions of around 3.4 Gg.
Feasibility studies are aimed at a detailed examination of the feasibility of large energy supply projects and EEU projects from the technological, economic, environmental and financial perspective. In 2004 and 2003 AURE co-financed the preparation of 11 feasibility studies for EEU, RES and CHP projects.

Municipal energy plans represent an expert basis for the preparation of municipal development programmes in the field of energy supply and use, which is a duty of the municipalities under the Energy Act. In these plans special attention needs to be focused on analysing the possibilities for exploiting local energy sources, especially renewables, and energy management in the buildings owned by municipalities. In 2004 AURE supported the preparation of energy plans for 12 municipalities and for 6 in 2003.

In 2004 AURE also co-financed 12 international projects in which Slovenian partners are involved. These projects are being carried out within the EU SAVE and ALTENER energy programmes and the OPET network for the promotion of energy technology, as well as under other EU programmes. The projects relate to energy efficiency indicators in the countries of Central and Eastern

Table 4-1: AURE financial incentives for investment in EEU and use of RES, level of investments and reduction of CO_2 emissions for 2004.

Tenders for:	Incentives for:	AURE funds [million SIT]	Investment [10^9 SIT]	Reduction in fossil fuel use [MWh]	CO_2 emission reduction [t/year]
Citizens	- older buildings	64	0.71	6,000	1,987
	- RES	70	0.28	1,880	513
	- wood biomass	40	0.15	5,889	1,944
Legal persons and private entrepreneurs	- RES	89	0.26	2,738	705
	- wood biomass	200	0.84	30,660	10,118
SKUPAJ		436	2.20	47,167	15,267

Europe, energy labelling of household appliances, setting up exchanges for third party financing, promoting energy technology in buildings, industry, district heating and in the production of green electricity and clean technology in fossil fuel combustion and heating large buildings with wood biomass, exploiting wind energy in the Alpine countries and analysing lifecycle costs in the entire renovation of buildings.

Programme of wood biomass use

In 2003 and 2004, through financial incentives from the Slovenian budget AURE supported the investment projects Programme of Energy Use of Wood Biomass for Companies and the Public Sector and the Programme of Energy Use of Wood Biomass for Households. In 2004, within the programme for companies and the public sector, support was provided for projects to install five large boilers with a total installed power of 13.4 MW, 10 smaller boilers (1.8 MW) and one micro district system (80 kW). Within the programme for households support was provided for the installation of 112 heating appliances for wood biomass central heating. Emission reduction owing to the implementation of these programmes is estimated at 12 Gg CO_2 annually.

With the help of the UNDP Regional Support Centre in Bratislava, AURE is also carrying out the project "Removing Barriers to the Increased Use of Wood Biomass as an Energy Source[24] ", which is co-financed through a GEF donation. In 2004 support was provided for the implementation of two wood biomass district heating (DHWB) projects, in Kočevje and Vransko, and these were completed in 2005, while three smaller systems are in the preparation stage. Through the realisation of these two projects, the use of fossil fuel will be reduced by 28,590 MWh, and CO_2 emissions by 5 Gg annually. Eight feasibility studies for DHWB systems were co-financed. The GEF project also financed the preparation of a general informational web portal and web application for trading in wood biomass, which made access to information on wood biomass supply and demand easier and contributed to the potential creation of new supply and demand[25]. A range of educational and promotional activities were carried out under this project between 2003 and 2005[26] .

Ecological Fund of the Republic of Slovenia

The Ecological Fund of the Republic of Slovenia[27], a public fund, is the legal successor to the Ecological Development Fund of the Republic of Slovenia[28], a public fund (the Fund), and is the largest financial institution intended for the promotion of environmental investments in Slovenia . The primary activity of the Fund is providing favourable loans for a variety of investments in environmental protection at below-market interest rates. The Ministry of the Environment and Spatial Planning is responsible for the operation of the Fund. In 2004 the Fund provided loans for 5 investments by legal persons in RES amounting to SIT 840 million, and 33 investments by citizens in EEU amounting to SIT 57 million and 5 investments in RES amounting to SIT 12 million. The level of lending for investments by legal persons increased 3.2 times relative to 2003, but for investments by citizens it fell by 84 %.

[24] http://www.aure.si/index.php?MenuID=193&MenuType=E&lang=SLO&navigacija=on
[25] The portal and application have been operational since 15 April 2004 at http://ove.borzen.si.
[26] Communication activities of raising the awareness of local communities and other target groups, the informal advisory network LesEnSvet, training local experts to install, maintain and operate biomass-fuelled energy plants, promotion of modern technologies for the preparation and energy use of wood biomass among young people (primary schools, secondary schools, faculties), round tables, handbooks, and analysis of EEU measures on the part of heating consumers in district heating systems.
[27] http://www.ekosklad.si/index.html
[28] Pursuant to the new Environmental Protection Act the new name has been used since 1 January 2005.

(6) Information, education and awareness-raising activities

Implementer: MOP
GHG affected: CO_2
Type of measure: promotional, educational, informational

In the area of consultation the Department of Efficient Energy Use and Renewable Energy Sources (MOP) finances the programme ''Energy Consulting for Citizens" (ENSVET), which is aimed at advising, informing and awareness raising of local residents in the field of rational energy management and use of RES. Energy consultation and information, which is free for local residents, is provided by 48 qualified energy advisers in a network of 33 consultation offices throughout Slovenia. In the period 1993–2003 around 18,500 consultations were given, and in recent years there has been a marked rise in the number of consultations.
Through the co-financing of informational, awareness-raising and promotional activities and the preparation and publication of a variety of informational material (information sheets, folders, guidebooks) the Department of EEU and RES also provides an informational and promotional programme. The greater part of the supported projects are in the EEU field, and were carried out mainly in the form of conferences, consultations and workshops.

(7) Energy labelling of household appliances

Implementer: MOP
GHG affected: CO_2
Type of measure: informational, regulatory

By informing consumers about energy consumption, energy labelling of household appliances will facilitate increased energy efficiency in households. At the same time the requirement for ensuring minimum energy efficiency of any appliance that can be placed on the market is enforced. An energy label is put on every electric refrigerator, freezer, as well as any combination thereof, washing machine, dryer or dishwasher, incandescent and electric lamps and, since 2003 and 2004 respectively, electric ovens and air conditioners. The year 2004 saw a change in energy classes for refrigerators and freezers. In future, the EU is expected to see the energy labelling of office equipment and a change in energy classes for those household appliances where technological advances have already surpassed the classes stated in existing regulations (washing machines).

Despite the growing numbers of appliances, on the assumption of high public awareness the instrument of energy labelling will yield positive results in a maximum amount of 100 GWh, which would translate into 40 Gg of CO_2 equivalent in 2010.

(8) Regular inspections of small boilers and air-conditioning appliances

Implementer: MOP
GHG affected: CO_2
Type of measure: regulatory

Through annual check-ups of small boilers their optimal functioning is enabled (better fuel combustion, reduced thermal losses), which reduces fuel consumption and thereby emissions. Owing to the stricter requirements associated with air pollution, the new environmental protection act will transfer the obligatory commercial public service of checking, controlling and cleaning of boilers, flue gases and ventilation fans from municipalities to the state.

(9) Thermal insulation and energy labelling of buildings

Implementer: MOP
GHG affected: CO_2
Type of measure: regulatory, informational

In 2002 the Rules on thermal insulation and efficient energy use in buildings were adopted, thereby laying down stricter technical requirements for ther-

mal insulation and efficient use of energy in new and reconstructed buildings. Thus buildings built after 2002 will have at least a 30 % lower need for heating compared to buildings built according to the earlier regulations from 1980.

By January 2006, the EU Directive on the energy performance of buildings (EPBD) (2002/91/EC) will be transposed into Slovenian law. The 2002 Rules will thus be upgraded with the Rules on the energy efficiency of buildings. Currently in preparation, the new methodology for calculating the total energy performance of buildings includes not only heating, but also ventilation, hot water supply and energy required for lighting. More stringent minimum requirements with regard to the use of energy are being drafted, with the heating requirements in buildings to be cut by at least 15 % compared to the level in 2002 and the total supplied energy for the functioning of buildings to be reduced by 30 % compared to the current practice for buildings. The Rules will apply to new buildings and reconstructed buildings, while harmonisation with the minimum requirements is also envisaged for major renovations of existing buildings.

The 2002 Rules also introduced the obligatory building thermal characteristics certificate, a precursor of the building energy certificate. Since 2002, a pilot project for the certification of energy performance has been under way, as part of which by 2005 some 30 building energy certificates for buildings with a total of at least 300 apartments were issued. Currently being drafted on the basis of the EPBD is a regulation on obligatory certification of the energy performance of new buildings, which is due to enter into force in January 2006. Owing to the shortage of qualified professionals, the building energy certificate for existing buildings is expected to become obligatory in 2009, following a three-year transition period for transposition of the EPBD directive. The objective of energy performance certification and the building energy certificate is, firstly, to obtain a picture of energy quality of buildings on the real estate market and to provide market incentives for energy-efficient construction. Secondly, introducing the building energy certificate for existing buildings is aimed at stimulating building proprietors to invest in recommended measures for efficient use of energy.
The estimated emission reduction for 2010 is 310 Gg CO_2.

(10) Cost accounting for heating by actual consumption

Implementer: MOP
GHG affected: CO_2
Type of measure: stimulation

Heating costs are accounted automatically according to the heated size of the apartments in 95 % of units included in district heating systems. In 2005 the new Rules on the distribution and calculation of costs of heat in residential and other buildings with more than one consumer were adopted. Its implementation depends on the decision of apartment owners. Cost calculation for energy use represents an incentive for tenants to practice more efficient energy use. The pilot project in two buildings revealed the possibility of lowering energy use by up to 20 %. A saving of 19 Gg CO_2 would be achieved annually with 30 % penetration of the measure.

(11) Contracting

Implementer: MOP, public sector
GHG affected: CO_2
Type of measure: economic

Third party financing and contracting for efficient energy supply are measures that represent a possibility for renovating old energy systems and improving living conditions, as well as reducing the detrimental impact on the environment in cases where insufficient means are available for investing in new or improved energy systems, primarily in the public sector and in small and medium sized enterprises. In 2001, a pilot project of contractual supply of

energy savings was started in the City of Kranj, proving the possibility of reducing energy consumption in the public sector by up to 15 %. By 2005, there were several other minor examples of third party financing in Slovenia. Under the aegis of the AURE agency[29] sample documents were prepared for publicly accessible projects of third party financing. Without other incentives for developing the market for these services, the measure can only be implemented very slowly owing to various obstacles. These are primarily the continuing inadequate qualifications of customers, the high costs of project preparation, administrative barriers, low energy prices and a lack of service providers. Intensive introduction of third party financing in the public sector could lead by 2010 to 10 major projects in municipal and state buildings (chiefly in municipal offices and hospitals) and to savings amounting to 7 Gg CO_2 annually.

(12) Certification of energy source

Implementer: MG, Energy Agency of the Republic of Slovenia (AGEN-RS)
GHG affected: CO_2
Type of measure: regulatory

The advantages of green certificates are as follows: ensuring effective development of RES technologies with the aim of achieving the desired extent, enabling the market formation of the added value of 'green' electricity compared to 'traditional' electricity, proving the origin of generated or consumed energy, certification of energy sources and enabling international trading. The success of this instrument is strongly linked to public awareness. In Slovenia there are several mechanisms in place for certifying energy sources.
A system of certifying energy sources was prepared through the adoption of the Decree on the issuing of certificates of electrical energy sources (Official Gazette of the Republic of Slovenia No 121/05). The system of certification is based on directives 2001/77/EC (electricity from renewable energy sources) and 2004/08/EC (promotion of cogeneration).
There is also a Renewable Energy Certificate System (RECS) operating in Slovenia, and this is the most established commercial system of its kind. The certifying agency is the Energy Agency of the Republic of Slovenia. Several electricity suppliers have also produced their own trademarks for the sale of environmentally friendly energy.

Moreover, the production source structure is made public in Slovenia, with electrical energy suppliers showing the shares of different production sources in the total structure of electrical energy on electricity bills.

Planned measures

(13) Demand side management

Implementer: MG, MOP, energy supply companies, electricity distribution companies
GHG affected: CO_2
Type of measure: promotional

Providing efficient energy use programmes for consumers on the part of energy supply companies (Demand Side Management - DSM), which is defined in the Energy Act and more precisely in the Decree on the manner of providing commercial public services in the area of electrical energy distribution, represents one of the major instruments of energy and environmental policy for reducing greenhouse gas emissions, lowering costs and increasing the reliability of energy supply given the high growth in Slovenia's electricity consumption in recent years (an average of 4.5 % annually in the period 2000–2004). This instrument serves to include among the promoters of sustainable energy management important players characterised by high professional qualifications, familiarity with consumption patterns of individual consumer groups and so forth. The project "Programme of introducing DSM in Slovenia" was carried out, and within this proposals on legislative amendments relating to DSM were drafted. A project is under

way to produce a standard methodology for planning the implementation of programmes for energy supply companies. The annual reduction of electricity consumption owing to this measure is estimated at 1 %.

(14) Introducing excise duties on fossil fuels and electrical energy

Implementer: Ministry of Finance (MF)
GHG affected: CO_2
Type of measure: fiscal

The EU adopted a directive on taxation of energy products[30] , which supplements the directive on minimum excise rates for mineral oils and binds Member States to tax other energy products, primarily coal and electricity generation, using the specified minimum rates. Slovenia will have to transpose the provisions of the directive for electrical energy into its legal system by 2007, while for other energy products Slovenian legislation has already been harmonised.

4.3.2 Transport

Implemented measures

(15) Excise duties on motor fuels

Implementer: MF
GHG affected: CO_2
Type of measure: fiscal

Through excise duty on motor fuels and the price of the individual motor fuel the Government is working indirectly to reduce GHG traffic emissions. The level of excise is determined by the Government by aligning the prices of petroleum products with the trends in crude oil prices and the US dollar rate. The excise policy results in the increased difference between the price of motor oils and gas oils and in approximating the price of motor fuel to the European average. Excise duty on unleaded petrol rose by 56 % in the period 2000–2004, and that on diesel by 29 %. The impact of excise duties in terms of emission reduction is hard to assess, although higher fuel prices certainly represent a greater incentive for environment-friendly driving as well as for buying cars with diesel engines or with lower fuel consumption.

(16) Control of exhaust gas composition and engine adjustment in motor vehicles

Implementer: MOP
GHG affected: CO_2
Type of measure: regulatory

Those performing roadworthiness tests started measuring exhaust fume emissions on 1 December 2003. This measure will serve to achieve a direct reduction in GHG emissions, since cars will not be allowed to exceed values of such emissions defined by car manufacturers. The measure will also encourage better maintenance of vehicles, which will additionally contribute to emission reduction. CO_2 emissions will decrease by 185 Gg in 2010 according to estimates.

(17) Informing consumers of fuel consumption and CO_2 emissions of motor vehicles and the agreement between the European Commission and car manufacturers

Implementer: MOP
GHG affected: CO_2
Type of measure: informational, negotiated agreement

The Rules on the informing of consumers of the fuel economy and CO_2 emissions of new personal vehicles were adopted in 2003. The aim of these rules is to raise public awareness. In line with the rules, sellers of personal vehicles must display visibly for each vehicle at the point of sale information on fuel consumption and CO_2 emissions. The rules also envisage the drafting

[29] now part of the MOP, the Department of Efficient Energy Use and Renewable Energy Sources
[30] Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity

of a manual on fuel economy and CO_2 emissions, which alongside a list of all models of personal vehicles for sale in Slovenia, will contain advice to drivers and an explanation of the environmental consequences of traffic and the impact of greenhouse gases on the environment. A step towards producing the manual was taken with the production of a website offering this information. This can be found at http://co2.temida.si/. However the usefulness of the website is limited by the lack of updated information.

Another important instrument of CO_2 emission reduction is the agreement on CO_2 emission reduction from new personal cars, to which associations of European, Japanese and Korean manufacturers have acceded. Owing to these two measures, emission reductions in 2010 are estimated at 250 Gg CO_2.

(18) Promotion of biofuel consumption

Implementer: MOP, MF, motor fuel distributors
GHG affected: CO_2
Type of measure: fiscal, regulatory

Through the amendment to the Excise Duties Act adopted in December 2003, biofuels as propellants are defined as products subject to excise duty with an excise duty rate of 0 %. The next step in encouraging the use of biofuels was taken with the transposition into Slovenian law of the EU Parliament and Council Directive on the promotion of the use of biofuels or other renewable fuels for transport (2003/30/EC), which encourages Member States to increase the proportion of biofuels in total fuel consumption for transport to 2 % by the end of 2005 and to 5.75 % by the end of 2010. This was done through the Rules on the content of biofuels in fuels to power motor vehicles, which were published in the Official Gazette on 12 September 2005. These rules lay down the minimum annual average content of biofuels in all fuels placed on the Slovenian market as motor fuels, and this is at least 1.2 % in 2006, at least 2 % in 2007, at least 3 % in 2008, at least 4 % in 2009 and at least 5 % in 2010. Ensuring the minimum content of biofuel is the duty of motor fuel distributors. The ReNEP set the goal of a 2 % share of biodiesel in the consumption of motor fuel for transport by the end of 2005.

The expected reduction of GHG emissions in 2010 is estimated at 126 Gg CO_2 equivalent.

Planned measures

(19) Encouraging the use of public transport and development of non-motorised forms of transport

Implementer: Ministry of Transport (MzP, manager with primary competence), MOP, local communities
GHG affected: CO_2
Type of measure: regulatory, promotional

The encouragement of public transport on the state level is currently performed through a system of cost compensation for public transport providers, while a more active policy for this area is being planned for the future. The Resolution on Transport Policy devotes considerable attention to measures for increasing the use of public passenger transport, since the current trend points to a marked decline, and to the development of non-motorised forms of transport (cycling and walking). The main objective of the measures is to improve the linkage of different types of transport (rail, road, cycling and walking). This will be achieved through the establishing of intermodal terminals, the introduction of single tickets, the establishing of information centres offering information on all types of transport, and through public education. Another important measure contributing to the attractiveness of public transport is ensuring punctuality, which is possible by providing appropriate lanes and routes for public transport. The first step in implementing the Resolution on Passenger Transport was taken with the drafting of a public passenger transport act, which

will enter into force in 2006. The act should contain the above-mentioned measures and provide new regulation of financial support to public transport providers aimed at greater transparency and efficiency (currently the cost compensation for public road transport is determined per kilometre travelled, while in the future a calculation per passenger carried is envisaged, and this will encourage companies to increase their passenger numbers). The new public transport system to be introduced by the new act is expected to be in place in 2009. Mention should also be made of the National Programme of Railway Infrastructure Construction, which plans the development of railway infrastructure, something of great importance in the development of rail transport.

The rough estimate of the direct potential of GHG reduction with a 10 % replacement of urban personal transport by public transport is put at more than 100 Gg CO_2 eq. annually. This estimate does not take into account the second level effects, such as decreases in traffic congestion owing to the reduced numbers of motor vehicles in towns.

(20) Increasing the share of railways in goods transport

Implementer: Government, MzP
GHG affected: CO_2
Type of measure: promotional, regulatory

Compared to road transport, rail freight transport releases considerably smaller quantities of toxic and greenhouse gases per ton kilometre. This is why in the reduction of GHG emissions it is essential to shift a major proportion of freight transport, especially transit – which has increased markedly after Slovenia's accession to the EU owing to its position on the crossroads of traffic corridors V and X – to the railways, and to increase the number of passengers carried by train. In the future an additional increase in transit traffic is expected with the further enlargement of the EU to the east and the Balkans. A greater share of rail in freight transport will be achieved through investments in railway infrastructure (National Programme of Railway Infrastructure Construction), improved transport quality and improved logistics of transport companies.

CO_2 emissions will decrease by 50 Gg annually with a 50 % shift of the present traffic of foreign vehicles on public roads to the railway.

4.3.3 Industry

Implemented measures

(22) Efficient energy use in industry

Implementer: MOP
GHG affected: CO_2
Type of measure: economic, promotional

For the major energy consumers the MOP's European Affairs and Investments Directorate, Department of Efficient Energy Use and Renewable Energy Sources organises various promotional programmes of information and energy consultation. The MOP also subsidises energy check-ups at companies and feasibility studies for investments in EEU and RES. Moreover, numerous information leaflets on good practice projects and guides for energy management and energy technologies have been published. EEU measures are also supported by the Slovenian Ecological Fund through loans with favourable interest rates.

The industry has at its disposal various voluntary instruments, aimed at reducing CO_2 emissions (costs) through reduced energy consumption. These are:

- GreenLight Programme – a European voluntary initiative to save on lighting energy use
- MotorChallenge Programme – a European voluntary initiative for economical electric motor drives (in Slovenia this project is run within the framework of the Intelligent Energy for Europe programme)
- introducing energy management – improved energy management

- voluntary agreements for reduced payment of CO_2 tax

Some instruments stated in other fields exert a direct influence towards the efficient use of energy in industry, namely:
- environmental protection permit (IPPC) – companies must prove that they use energy efficiently
- ISO 14001 – certificate holders have prepared energy consumption reduction programmes.

Emission reductions in 2010 owing to greater energy efficiency in industry have been estimated at 400 Gg CO_2. This estimate takes into account the direct reduction from reduced emissions in industry and also the indirect reduction from the lower consumption of electricity.

(22) Incentives for the introduction of ISO 14001 environmental management systems and inclusion in the EMAS system

Implementer: MOP, MG, Chamber of Commerce and Industry (GZS)
GHG affected: CO_2
Type of measure: promotional, economic, voluntary

The environmental management system according to the standards of the ISO 14000 series is an internationally recognised business approach for companies and ensures all aspects of environmental protection management, from the use of raw materials and energy, management of technological processes, to requirements regarding product use (including final disposal or destruction) aimed at eliminating or at least reducing the impact on the environment. Some 290 Slovenian companies have been awarded the ISO 14001 certificate of environmental management. The EU Eco-Management and Audit Scheme (EMAS) stimulates organisations towards upgrading, greater efficiency and transparency of existing systems of environmental management (e.g. ISO 14001) and towards increasingly responsible operations aimed at sustainable development. One Slovenian company (Gorenje) is included in the EMAS inventory. The process of including organisations in the EMAS system could be stimulated through privileges and incentives relating particularly to reducing the frequency and extent of monitoring and reporting.

(23) IPPC Directive

Implementer: MG, MOP, GZS
GHG affected: CO_2
Type of measure: regulatory

The entry into force of the EU directive on integrated pollution prevention and control (the IPPC Directive, 96/61/EC) formulated uniform procedures for granting permits for the operation of industrial sources of pollution. The emphasis was on an integrated approach to pollution control, with the primary aim of preventing or reducing as much as possible emissions into the air, water and soil, while also taking waste management into account. Environmental protection permits were introduced into Slovenia's legal system through the 2004 amendment to the Environmental Protection Act. By April 2005, managers of large industrial plants had already submitted their (pre)applications for obtaining an integrated environmental protection permit, which envisages harmonisation with the BREF reference documents (use of the best available techniques (BAT) with regard to environmental protection by considering requirements related to efficient use of resources (energy included), preventing waste generation, promoting waste processing and recycling, and use of less hazardous materials). On the basis of these applications there are currently 203 industrial plants (or solid waste disposal sites) in operation in Slovenian territory which, according to the criteria of the IPPC Directive, require an integrated permit for their environmental loading. The procedures for issuing environmental protection permits in Slovenia are managed by the Environmental Agency of the Republic of Slovenia. It is estimated that the majority of these

industrial plants will adapt to the BAT standards by the deadline (2007, or for some exceptions 2011).

Implementing the IPPC directive will, depending on the type of activity, reduce the specific energy consumption per production unit by 20 %, hence it is estimated that in 2010, CO_2 emissions will decrease by 60 Gg.

(24) Eco–labelling of products

Implementer: MOP, GZS
GHG affected: CO_2
Type of measure: voluntary, promotional

This measure will have an indirect impact on GHG emissions, since the demands for acquiring the environmental label refer partly to the product manufacturing process (reduced energy consumption, GHG emissions in the production stage), and partly also to the effects of the product on the environment in its life cycle. This measure is voluntary. Only a limited number of production groups can be awarded the environmental label (EU ECO label).

4.3.4 Agriculture and Forestry

Implemented measures

(25) Rural development programme

Implementer: Ministry of Agriculture, Forestry and Food (MKGP)
GHG affected: N_2O, CH4, CO_2
Type of measure: economic, voluntary

Slovenia has an adopted Rural Development Programme for Slovenia for the period 2004–2006, and this includes the implementation of agricultural environmental measures under the Slovenian Agricultural Environmental Programme (SAEP). The main priorities of this programme are orientated towards co-natural, sustainable development and preservation of rural areas. This programme is not directly aimed at reducing GHG emissions, but some of its measures nevertheless make an important contribution to emission reduction. These are:

- financial compensation for areas with limiting factors,
- agricultural environmental measures;
- support for the implementation of EU standards on farm holdings.

The programme requires that all receivers of financial compensation in areas with limiting factors implement the prescribed good farming practices. Within the framework of agricultural environmental measures, direct payments are ensured for all farmers who observe stringent standards of environmental protection and conservation of the man-made environment. This involves stimulating organic and integrated farming, preserving crop rotation, erosion reduction, greening of arable land, stimulating mountain grazing and sustainable breeding of domestic animals as well as preserving extensive grasslands. Within the framework of support for the implementation of EU standards on farm holdings, financing the construction of storage spaces for animal fertilizers deserves special mention. The reduction of GHG emissions owing to the increased share of pasture, which is one of the targets of the Rural Development Programme, is estimated at 9 Gg CO_2 eq. for 2010.

(26) Good agricultural practice in fertiliser application

Implementer: MKGP, MOP
GHG affected: N_2O
Type of measure: regulatory

The two basic documents in the area of fertiliser use that contribute most to reducing N_2O emissions are the Decree on limit values for the input of hazardous substances and fertiliser into the soil, adopted in 2005 to replace the Decree on the input of hazardous substances and plant nutrients into the soil from 1996, and the Rules for implementing good agricultural practice in fertilising. The Decree declares the entire territory of Slovenia a sensitive area, thus limiting the annual introduction of

nitrogen through animal fertilizers to 170 kg/ha. The Rules for implementing good agricultural practice in fertilising lay down detailed rules on the storage of animal fertilizers and how to apply fertiliser by stipulating that fertilizers be used according to the needs of the plants. Expert and advisory work in this area also contributes to the professionally appropriate use of fertilizers and consequently to the reduction of emissions. The reduction in the consumption of mineral fertilizers will result in a decrease of N2O emissions in 2010 of 11 Gg CO2 eq.

(27) Promotion of biogas for electricity and heat production

Implementer: MOP
GHG affected: CH_4
Type of measure: economic, regulatory

The obtaining and use of biogas from animal and agricultural waste is an important measure for increasing the RES share and reducing GHG emissions, especially methane. Methane emissions from animal manure are estimated at 167 Gg CO_2 eq. annually in Slovenia, while the technical potential of biogas is estimated at a minimum of 56 million m3. Biogas is obtained from manure by anaerobic digesters. Animal husbandry in Slovenia is characterized by many small farms, which hinders the construction of large anaerobic digesters and biogas plants owing to the high costs. For this reason the construction of common plants for several smaller users is recommended. The state promotes investments in biogas plants through various financial mechanisms, such as subsidies and favourable loans and also through feed-in tariffs. The first private biogas plant in agriculture began operating in Slovenia in 2003. In the area of methane emission reduction the greatest achievement over the past year has been the construction of modern devices for capture of manure and the introduction of biogas collection on two large pig farms. Emission reductions owing to the installation of anaerobic digesters on large pig farms and pig and cattle-breeding farms have been estimated at 20 Gg CO_2 eq. for 2010.

(28) Sustainable forest management

Implementer: MKGP, Slovenian Forest Service
GHG affected: CO_2
Type of measure: regulatory

In 1996 Slovenia's forest development programme was adopted, and this sets out the national policy of co-natural forest management, the orientation towards preservation and development of forests, and the conditions for their exploitation or multi-purpose use. Taking into account the natural properties of forest ecosystems, public interests, the material capacity of the state and the needs and interests of forest owners, this programme lays the foundations for the preservation and development of all forests and their functions. It has formed the development strategy for individual areas of forest management, and it also indicates the expert orientations regarding cooperation with activities that interface with forestry. Owing to the relatively large share of forest in Slovenia (57 %), the programme focuses primarily on care for the existing forests and on better use of their growing potential, and also on preservation, and the designing and planning of individual trees and stands of forest trees outside forests.

The binding of CO_2 owing to the change in wood biomass stocks in Slovenian forests will account for 3,800 Gg CO_2 in 2010 according to the IPCC methodology, which exceeds almost threefold the permitted quota of 1,320 Gg CO_2 annually to fulfil the commitment under the

Kyoto Protocol in the first commitment period.

Planned measures

(29) Incentives for cultivating biodiesel crops

Implementer: MKGP
GHG affected: N_2O , CO_2
Type of measure: regulatory, economic

The cultivation of agricultural plants to obtain biodiesel is attractive from many perspectives in terms of GHG emission reduction. Including oilseed rape in crop rotation influences GHG emissions through the reduced use of fossil fuels in transport and by preserving humus in the ground and soil fertility, which contributes to lower fertiliser requirements.

4.3.5 Waste

Implemented measures

(30) Waste disposal tax

Implementer: MOP, MF
GHG affected: CH_4
Type of measure: fiscal

The Decree on the environmental tax for waste disposal was adopted in 2001. This tax is paid by landfill owners according to the quantity of inert, non-hazardous and hazardous waste dumped. The amount of the tax depends on the type of waste. The tax consists of tax on the quantity of waste and tax on landfill gas emissions, with the second part being approximately three times higher than the first one. The tax is reduced if the landfill has the installed capture and combustion or energetic use of landfill gas and upon a reduction in the quantities of dumped waste, including the biodegradable portion. It is possible to use it for the construction of buildings and installations (infrastructure), which reduces the quantity of dumped waste, and in infrastructure on landfills, including the capture and use of landfill gas. The tax will help to build a complete system of waste treatment facilities in conjunction with additional funds. The tax on environmental burdening represents one of the main instruments for halving emissions in a ten-year period in the field of waste management.

(31) Separate waste collection and packaging waste management

Implementer: Municipalities, MOP, GZS
GHG affected: CH_4
Type of measure: regulatory

The Order on the management of separately collected fractions in the public service of municipal waste management, adopted in 2001, provides that the municipal company must ensure separate collection and receival of separated fractions in collection centres, collection of bulky waste, sorting of municipal waste in a sorting centre and separate collection of hazardous fractions. The Order requires obligatory inventory management regarding separately collected fractions and promotional and awareness-raising actions. Systems of separate waste collection had to be established throughout the country by 1 January 2004. The separate waste collection is expected to result in a drastic reduction of the quantity of dumped waste. The targets call for reductions in the quantities of dumped waste through separate collection of waste fractions of 33 % by 2008 and 65 % by 2015 relative to 2000.

In 2002 the Action Plan of Packaging and Waste packaging Management was drafted. This set out the measures and dynamics of achieving the targeted goal, which complies with the demands of the Rules on packaging and waste packaging management, under which by the end of 2007 50 % of the total mass of waste packaging should be reprocessed and 25 % of the total mass of waste packaging should be recycled, and at least 15 % by individual materials. The programme of measures for achieving the goals of this Action Plan for the period from 2001 until the end of 2007 is presented from the perspective of individual fields of activities, that is, the formulation of policies in the

area of packaging and waste packaging management, institutional organisation, planning and setting up facilities and installations, monitoring, controlling and reporting, and including target groups.

Reducing the quantity of dumped waste also leads directly to a reduction in the quantity of dumped biodegradable waste (BIOO) , which is a source of GHG emissions. The target quantities of dumped biodegradable municipal waste are set out in the Rules on waste disposal. In 2010 the quantity will be half that of 2000. Through separate waste collection, estimates put the reduction in annual methane emissions in 2010 at 29 Gg CO_2 eq.

(32) Landfill gas extraction and combustion, energy exploitation or use

Implementer: MOP, municipalities
GHG affected: CH_4, CO_2
Type of measure: regulatory

The Rules on waste disposal require all landfills to arrange the capture and appropriate management of landfill gas by the end of 2005. In 2003 the capture and use of landfill gas was established only at the three biggest landfills (Ljubljana–Barje, Maribor–Pobrežje, Celje–Bukovžlak), which proportionally account for around 30 % of the total population. In 2003 15 % of the landfill gas was captured and used for energy. By the end of 2005 a 200 % increase in the capture and use of landfill gas is anticipated, since the degassing systems will still not be functioning completely. In the period 2006–2010 a linear increase in the quantity of the captured and used gas is planned from 30 to 50 % (4 % annual growth rate). Waste water treatment in treatment facilities is also an important source of biogas. In the future the establishing of additional treatment facilities and biogas power plants is planned.

Methane emission reduction due to the capture, combustion and energy use or consumption of gas, relative to the emissions if the measure were not implemented, is estimated at 74 Gg CO_2 eq. for 2010.

Planned measures

(33) Waste Incineration

Implementer: MOP
GHG affected: CH_4, CO_2
Type of measure: regulatory

Waste incineration is the most effective way of reducing the volume of waste. Incineration enables the energy use of waste and also the use of heat for district heating systems. The drawback of waste incinerators is the release of toxic substances that are harmful to humans and the consequent challenges in locating such facilities. In Slovenia there are plans to establish two incinerators, which should come on stream by 2008, while recent trends indicate the possibility of setting up several smaller incinerators.

Setting up one municipal waste incinerator will according to estimates reduce emissions by 26 Gg CO_2 eq. in 2010, while setting up two would reduce them by 52 Gg CO_2 eq.

4.3.6 F–Gases

Planned measures

(34) Regulations on F–gases

Implementer: Government
GHG affected: F–gases
Type of measure: regulatory

In the EU a regulation and a directive on F-gases are being drafted. Their aim is to enhance the EU efforts to reduce GHG emissions within the framework of the Kyoto Protocol. The proposed documents include the following categories:

- ensuring all the conditions for emission reduction in the planning, producing, locating, functioning and removing of systems and equipment;
- annual reporting from producers, importers, exporters and users on the quantities of F-gases that are placed on

the market, exported and used;
- restricting the trade and use of F-gases for certain purposes.

As a result of these regulations, F-gas emission reduction is estimated at 1.0 % of all annual GHG emissions up to 2010. The impact of the regulations will increase after 2010, since some restrictions on trading and consumption will only enter into force in the period 2008–2012.

4.3.7 Interdepartmental Measures

Implemented measures

(35) CO_2 tax

Implementer: MF, MOP
GHG affected: CO_2
Type of measure: fiscal

An environmental tax for burdening the air with CO_2 emissions was first introduced on 1 January 1997, and as an economic instrument this should contribute to reduced burdening of the air with CO_2 emissions. The new Decree on the environmental tax for polluting the air with carbon dioxide emissions, published on 29 April 2005 in the Official Gazette of the Republic of Slovenia No 43/05, allows a reduction in the payment of environmental tax only for those managers of plants that in connection with the operation of such plants have signed a contract with the ministry responsible for environmental protection on reducing the burden on the air from CO_2 emissions for the period 2005–2009. This significant new feature means that in exchange for a 'free' tax exemption, in the target period up to 2009 companies will have to reduce specific CO2 emissions by at least 2.5 % relative to the specific annual CO_2 emissions in the reference year, which for existing plants is the year between 1999 and 2002 in which the total annual specific CO_2 emission from the use of fuel and consumption of electricity at the plant was greatest. This reduction will be achieved through the implementation of contractually defined measures which, however, will not be confined to direct emission reduction, but might extend to the widest sphere of efficient energy use. Through a contract to reduce air pollution from CO_2 emissions the liable party also undertakes to return any environmental tax refund if the prescribed reduction in specific emissions is not achieved. The other important new feature introduced by the new Decree is that henceforth, companies included in the system of emission trading and which at the same time have obtained greenhouse gas emission permits, will be exempt from payment of the CO_2 tax. However, this applies only in the case of energy-intensive companies (where energy costs represent at least 3 % of the production price), and according to expectations this applies to all plants included in the scheme of emission coupon trading.

The general assessment of the Ministry of the Environment and Spatial Planning is that in the first year around 100 eligible operators will sign contracts. Currently the level of the tax is SIT 3 / kg CO_2 (EUR 15 / t CO_2).

(38) Emission trading scheme

Implementer: MOP
GHG affected: CO_2 (later also other gases)
Type of measure: economic

On 1 January 2005 the European Union saw the start of carbon dioxide (CO_2) emissions trading, and this is one of the most important mechanisms for meeting the Kyoto targets, although its reduction of GHG emissions is only indirect, since it enables polluters included in the scheme to achieve emission reductions in the most cost-effective manner. The functioning emission coupons market offers market players greater opportunities and free play; consequently, emission reduction will be achieved principally among those where it will prove economically justified, while the rest will buy additional emission coupons. In Slovenia, 96 plants in all are included in the trading system, accounting for

roughly 55 % of all CO_2 emissions in Slovenia.
In the second half of 2006 a new national allocation plan will be drawn up for the trading period 2008–2012. It is also envisaged that with the beginning of the first commitment period, in 2008, global greenhouse gas emissions trading will begin.

4.3.8 Kyoto Mechanisms

Planned measures

(37) Clean development mechanism (CDM) and Joint implementation (JI)

Implementer: Government
GHG affected: all GHG
Type of measure: regulatory, economic

Besides emissions trading, the Kyoto Protocol envisages two other flexible mechanisms as a supplement to domestic measures: Clean development mechanism (CDM) and Joint implementation (JI). By means of these two mechanisms industrialized countries (Annex I countries) can fulfil part of their Kyoto commitment by investing in emission reduction projects in other countries. CDM is meant for implementing projects in developing countries, while JI refers to projects in other Annex I countries. Since Slovenia has to reduce its own emissions it is more interested in investing in such projects that in hosting them.

Table 4-2: Policies and Measures – summary (estimate of the impact of the measure is for 2010)

Title of measure	Objectives or area of measure	GHG affected	Type of instrument	Status	Implementer	Emission reduction in 2010 [Gg CO_2 eq.]
Energy						1876
1.Promotion of electricity production from renewable sources and combined heat and power generation	Increasing the proportion of RES and cogeneration of electrical energy and heat	CO_2	Economic, regulatory	Implemented	MG	300
2.Opening the electricity market	Changing the structure of electricity production, greater import possibilities	CO_2	Regulatory	Implemented	MG, HSE	660
3.Opening the natural gas market	Partial replacement of coal with nat. gas (thermo power plants, CHP plants) and increased production of el. energy from nat. gas	CO_2	Regulatory	Implemented	MG, HSE, TET	
4.Construction of large hydro power plants	Increasing the proportion of RES in electricity generation	CO_2		Implemented	HSE, MG	180
5.Incentives for implementing EEU measures and for investment in RES	Greater energy efficiency and increased proportion of RES	CO_2	Economic, promotional	Implemented	MOP, Slovenian Ecological Fund	300
6.Informational, educational and awareness raising activities	Increasing the level of public awareness and public information	CO_2	Promotional, educational, informational	Implemented	MOP	100
7.Energy labelling of household appliances	Greater energy efficiency	CO_2	Informational, regulatory	Implemented	MOP	
8.Regular inspections of small boilers and air-conditioning units	Higher energy efficiency owing to improved efficiency of boilers and air-conditioning units	CO_2	Regulatory	Implemented	MOP	Not estimated
9.Thermal insulation and energy labelling of buildings	Increased energy efficiency	CO_2	Regulatory, informational	Implemented	MOP	310
10.Cost accounting for heating by actual consumption	Stimulating the public towards more efficient energy use	CO_2	Stimulation	Implemented	MOP	19

Table 4-2: Continued

Title of measure	Objective or area of measure	Na kateri TGP vpliva	Type of instrument	Status	Implementer	Emission reduction in 2010 [Gg CO2 eq.]
11. Contracting	Promoting investment in efficient energy use especially in the public sector	CO_2	Economic	Implemented	Public sector, MOP	7
12. Certification of energy source ("Green certificates")	Stimulating electricity production from renewable energy sources	CO_2	Regulatory	Implemented	MG, AGEN-RS	Not estimated
13. Demand Side Management	Encouraging consumers to use energy efficiently	CO_2	Promotional	Planned	MG, MOP, energy supply companies, electricity distribution companies	Not estimated
14. Introducing excise duties on fossil fuels and electrical energy	Increasing energy efficiency in households and the public sector	CO_2	Fiscal	Planned	MF	Not estimated
Transport						711
15. Excise duties on motor fuels	Reducing fuel consumption and, consequently, lowering CO_2 emissions	CO_2	Fiscal	Implemented	MF	Not estimated
16. Control of exhaust composition and engine adjustment in motor vehicles	Reducing emissions through technical improvement of vehicles	CO_2	Regulatory	Implemented	MOP	185
17. Informing consumers of fuel consumption and CO_2 emissions of motor vehicles and agreement between the European Commission and car manufacturers	Reducing emission through improved energy efficiency of vehicles	CO_2	Informational, negotiated agreement	Implemented	MOP	250
18. Promotion of biofuel consumption	Reducing GHG emissions through the use of environment-friendly fuel	CO_2	Fiscal, regulatory	Implemented	MF, MOP, motor fuel distributors	126
19. Encouraging the use of public transport and development of non-motorised forms of transport	Reducing emissions and air pollution in towns	CO_2	Regulatory, promotional	Planned	MzP, MOP, municipalities	100
20. Increasing the share of railways in goods transport	Reducing GHG emissions through the transport of goods and passengers by rail	CO_2	Promotional, regulatory	Planned	Government, MzP	50

Table 4-2: Continued

Title of measure	Objectives or area of measure	GHG affected	Type of instrument	Status	Implementer	Emission reduction in 2010 [Gg CO_2 eq.]
Industry						460
21.EEU in industry	Increasing energy efficiency in industry	CO_2	Promotional, economic	Implemented	MOP	
22.Promoting the introduction of ISO 14001 environmental management systems and joining the EMAS system	Greater energy efficiency and productivity (efficiency) in industry	CO_2	Promotional, economic, voluntary	Implemented	MOP, MG, GZS	460
23.IPPC Directive	Greater energy efficiency and productivity (efficiency) in industry	CO_2	Regulatory	Implemented	MOP, MG, GZS	
24.Eco–labelling of products	Greater energy efficiency	CO_2	Voluntary	Implemented	MOP, GZS	Not estimated
Agriculture and forestry						>40 [34]
25.Rural development programme	Encouraging sustainable practices in agriculture	N_2O, CH_4, CO_2	Economic, voluntary	Implemented	MKGP	>9
26.Good agricultural practice in fertiliser use	N_2O emission reduction through lower fertiliser application	N_2O	Regulatory	Implemented	MKGP, MOP	11
27.Promotion of biogas use for electricity and heat production	Reducing GHG emissions through the use of animal and agricultural waste for energy	CH_4	Economic, regulatory	Implemented / planned	MOP	20

Table 4-2: Continued

Title of measure	Objectives or area of measure	GHG affected	Type of instrument	Status	Implementer	Emission reduction in 2010 [Gg CO_2 eq.]
28. Sustainable forest management	Preserving the biodiversity, productivity, regeneration ability, volume and vitality of forests	CO_2	Regulatory	Implemented	MKGP, Slovenian Forest Service	1320
29. Incentives for cultivating biodiesel crops	Reducing consumption of fossil fuels in transport, conserving humus in the soil and soil fertility — reduced use of fertilizers	CO_2, N_2O	Regulatory, economic	Planned	MKGP	Not estimated
Waste						155
30. Waste disposal tax	Reducing the amount of waste	CH_4	Fiscal	Implemented	MOP, MF	Not estimated
31. Separate waste collection and packaging waste management	Reducing the amount of waste at source	CH_4	Regulatory	Implemented	Municipalities, MOP, GZS	29
32. Landfill gas extraction and combustion, energy exploitation or use of landfill gas	Reducing GHG emissions through exploitation of methanea	CH_4, CO_2	Regulatory	Implemented	MOP, municipalities	74
33. Waste incineration	Reducing the amount of waste and using waste for production of energy	CH_4, CO_2	Regulatory	Planned	MOP	52
F–gases						200
34. Regulations on F–gases	Reduction of F–gases emissions	HFC, PFC, SF_6	Regulatory	Planned	Government	200
Interdepartmental						
35. CO2 tax	More efficient energy use	CO_2	Fiscal	Implemented	MOP, MF	Not estimated
Kyoto mechanisms						
36. Emission trading scheme	Facilitating for polluters a more cost-effective way of reducing emissions	CO_2	Economic	Implemented	MOP	
37. Clean development mechanism (CDM) and joint implementation (JI)	GHG emission reduction	All GHG	Regulatory, economic	Planned	Government	Not estimated
Total						3442

5 EMISSION PROJECTIONS

5.1 Introduction

The emission projections in this report are the same as those presented in the previous report, except for the changes mentioned below. The projections were selected in 2000, when the National Energy Programme was prepared. Since then the projections have been modified with the preparation of the Allocation Plan for the first emission coupon trading period. A more thoroughgoing revision is planned for the projections in 2006, with the revision of the Action Plan for Reducing GHG Emissions. The corrections taken into account in the Fourth National Report, were implemented within the framework of preparing the Action Plan for Reducing Pollutant Emissions from the NEC Directive, which was produced in mid–2005. The following amendments were made:

- Lignite consumption at TEŠ was increased in line with a long-term contract for 2008, 2010, 2012 and 2015, amounting to 38.5 PJ in those years. This correction has only been taken into account in the additional measures projection, as the use of lignite is higher in the existing measures projection.
- The consumption of timber was increased, to coordinate the base year in the model with statistical data from SURS. Previously consumption was coordinated with SLEG data.
- Emission projections from transport have been calculated using the COPERT model. Furthermore the projection for fuel consumption in transport was corrected, as the older projection anticipated a very slow fall in the use of petrol, and a slow growth in the use of diesel, which does not reflect the actual situation, whereby since 2000 a steeper increase in diesel uptake has been expected, and a faster fall in the use of petrol.
- The proportion of biofuels in overall motor fuel consumption was increased in accordance with the Rules on the Content of Biofuels in Motor Vehicle Fuels.
- The projections for emissions from solid waste were calculated using new factors in accordance with the IPCC rules (GPG 2000).

5.2 Projections of Greenhouse Gas Emissions

5.2.1 Description of Scenarios

A scenario postulating moderate economic growth was used for emission projections, assuming 3.6 % annual growth in GDP in the period 2000 to 2010, and a lower growth of 2.2 % for 2010 to 2020. The population will gradually fall in this scenario at a rate of 0.1 % per year. Fuel prices were taken from international studies (IEA). A more detailed presentation of the assumptions is provided in Appendix D.

The implementation of emission reduction measures and policies was modelled by two scenarios: "with existing measures," and "with additional measures.". The existing measures scenario assumes the continuation of current policies, which are characterised by a low level of measure implementation. For the Energy sector this means a gradual transition from coal to natural gas, a less intense implementation of EEU measures and increasing capacity for RES use in line with the additional measures scenario. The latter only applies to Local Supply and Energy Use, while the production of electricity from large HE and JE is the same in both scenarios. For the Transport sector, the existing measures scenario anticipates the continued implementation of measures, with the exception of the measure to promote the use of biofuel in transport. This measure is taken into account in the additional measures projection, which also anticipates an additional reduction in emissions due to the increased use of public transport and rail transport. In the Industrial Processes, the existing measures scenario foresees implementation of the IPPC directive, while the additional measures scenario also includes implementation of Regulations on F-Gases. The existing measures scenario in the Waste sector anticipates the implementation of measures to reduce waste at source and a measure for collection and combustion of landfill gas. The additional measures scenario also includes waste incineration, which will lead to a reduction in the quantity of landfilled waste. In Agriculture, the existing measures scenario includes all the implemented measures, while in the additional measures scenario emissions are further reduced by 50 Gg CO_2 eq., which will be achieved via additional measures. No measures are envisaged in the Solvent Use sector.

5.2.2 Emission Projections by Gas and Sector

CO_2

In both projections CO_2 emissions will increase until 2005, followed by a fall by 2008, with growth again until 2015, falling again in the period up until 2020. In 2010 emissions in the additional measures scenario will be 1.9 % higher than emissions in 2003, and 1.8 % lower in 2020. The first and second fall in emissions are the consequence of a fuel changeover (coal replaced by natural gas) in the Energy Supply sector, the growth in emissions from 2008–2015 is the consequence of growth in final energy use in the Transport, Industry and Other Sectors. According to the additional measures scenario, 2010 primary energy use will be 9.1 % higher than in 2003, and 10.2 % higher in 2020, while final energy use will be 11 % and 15 % higher, respectively.

CH_4

CH_4 emissions will fall according to both scenarios. According to the additional measures scenario, they will fall by 21 % by 2020, with a 12 % fall in the existing measures scenario compared to 2003. The reduction in emissions is due to a reduction in the quantity of landfill waste, and the collection and combustion of landfill gases, and to a lesser extent the reduction in fugitive emissions due to a reduction in the domestic coal consumption.

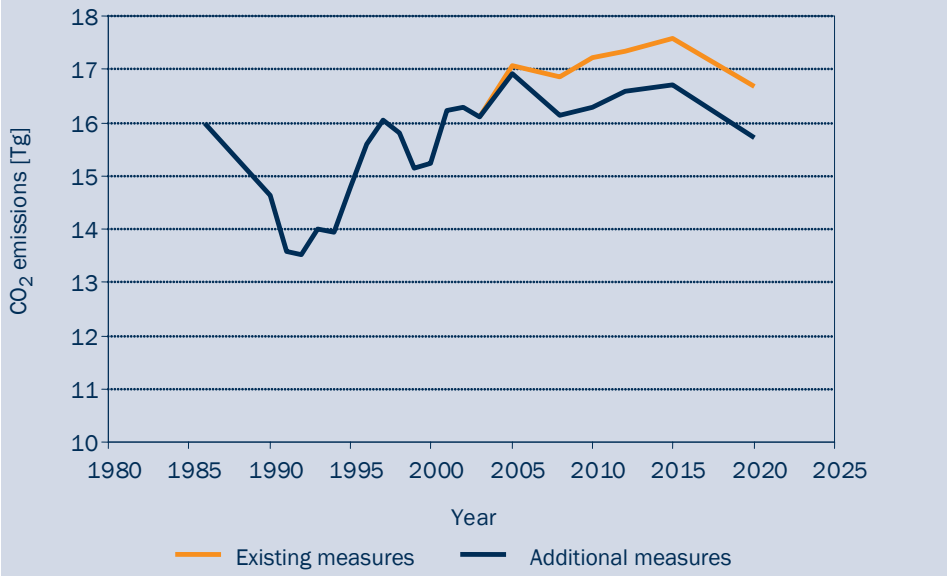


Figure 5-1: Actual Levels in 1986 and 1990–2003 and Projections by 2020 of CO_2 Emissions .

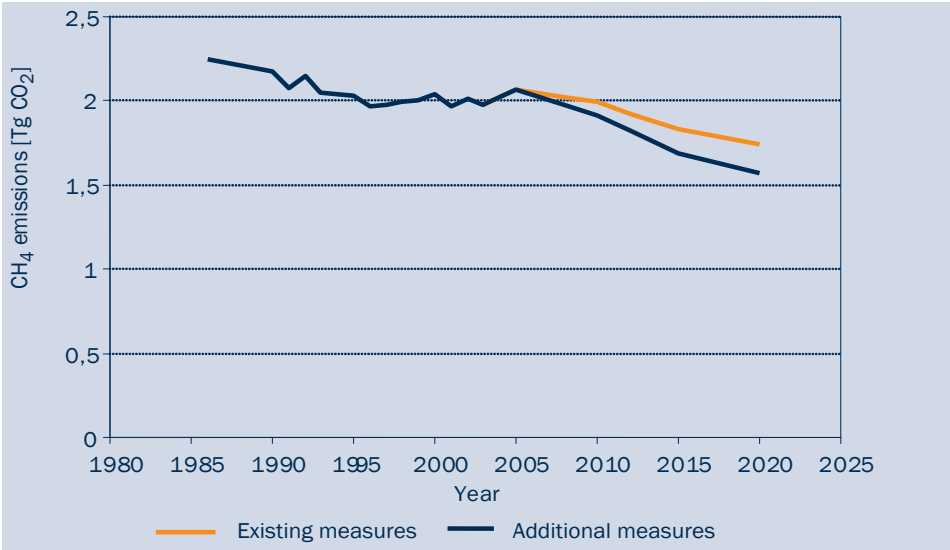


Figure 5-2: Actual Levels in 1986 and 1990–2003 and Projections by 2020 of CH_4 Emissions.

N_2O

N_2O emissions are expected to be practically constant for the period 2003 to 2020. The minimal difference between the scenarios is largely due to the additional measures in the Agriculture sector, which is by far the largest source of N_2O emissions.

F–Gases

F-gas emissions in the existing measures scenario will grow by 109 % by 2020, but will fall by 44 % in the additional measures scenario. The existing measures scenario does not anticipate a measure to reduce F-gas emissions, while the additional measures scenario anticipates the reduction in emissions due to the implementation of Regulations on F-Gases.

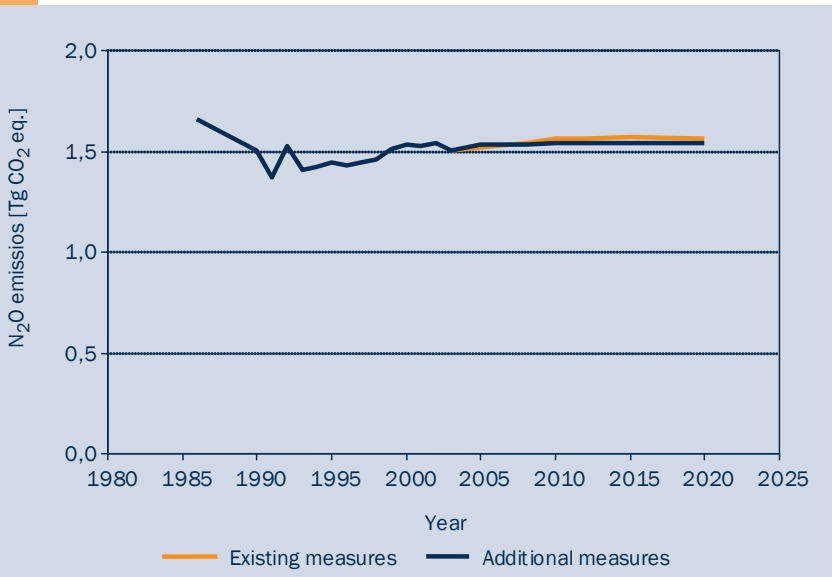


Figure 5-3: Actual Levels in 1986 and 1990–2003 and Projections by 2020 of N_2O Emissions.

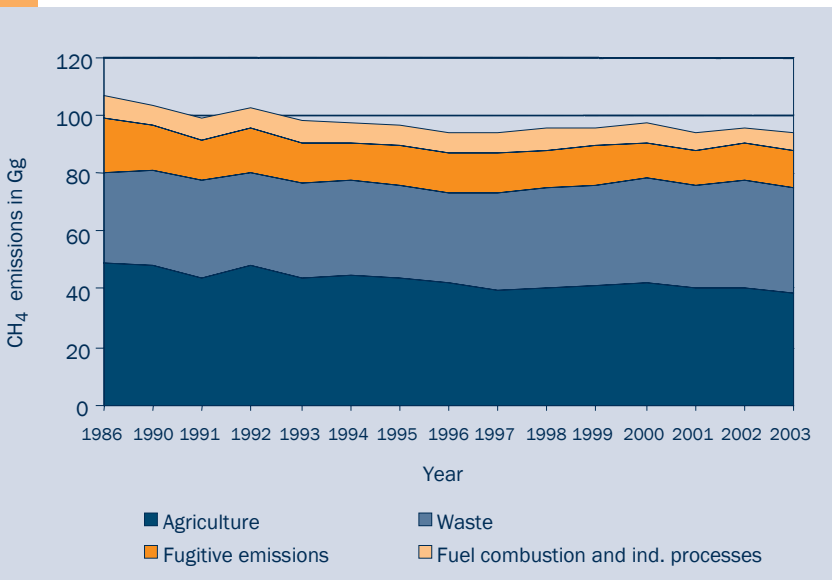


Figure 5-4: Actual Levels in 1986 and 1990–2003 and Projections by 2020 of F-Gas Emissions.

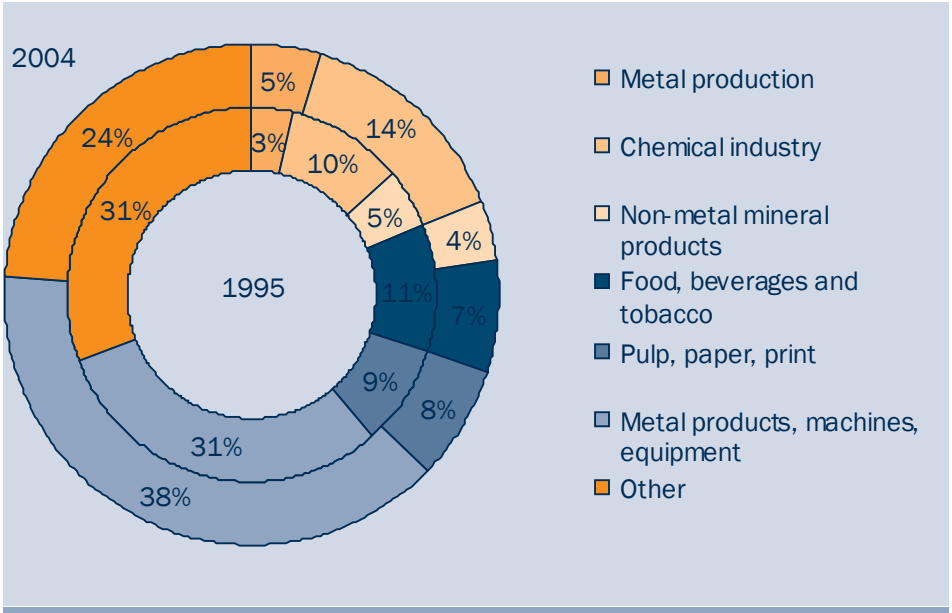


Figure 5-5: Actual Levels in 1986 and 1990–2003 and Projections by 2020 of GHG Emissions under Additional Measures Scenario by Sector[35].

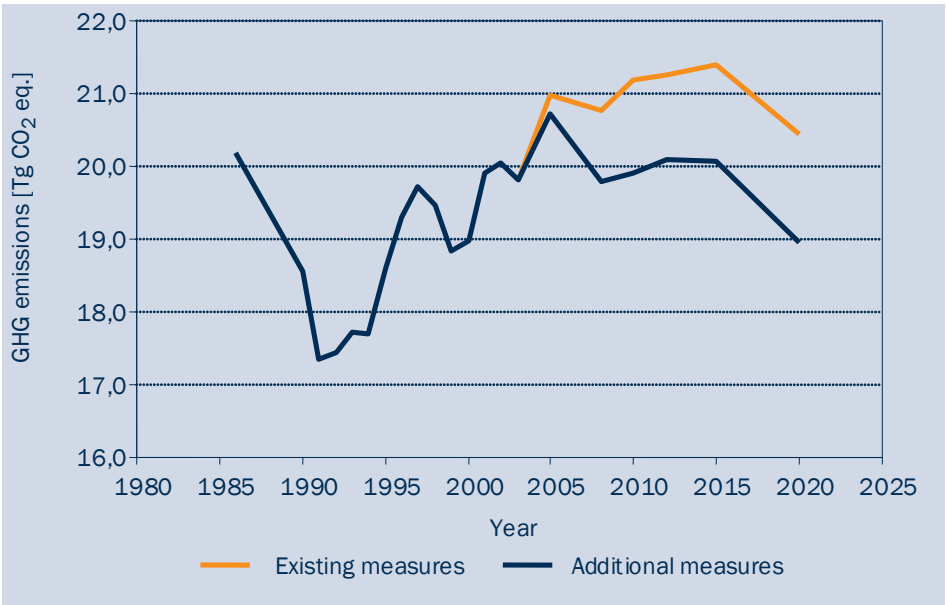


Figure 5-6: Actual Levels in 1986 and 1990–2003 and Projections by 2020 of GHG Emissions without Sinks.

[35] Energy – Energy Supply and Fugitive Emissions (1A1 and 1B), Transportation (1A3), Industry – Industry and Construction and Industrial Processes (1A2 and 2), Other Sectors (1A4), Solvents – Solvent and Other Product Use (3), Agriculture (4), Waste (6)

Table 5-1: Base Year Emissions (CO_2, CH_4 and N_2O in 1986; F-Gas in 1995) and Average Emissions in the period 2008–2012 according to the Additional Measures Projection

Gg CO_2 eq.	Emissions in base year	Average emissions 2008–2012	Difference from base year figure
CO_2	15.995	16.333	2,1%
CH_4	2247	1903	– 15,3 %
N_2O	1659	1539	– 7,2 %
F-gases	342	149	– 56,5 %
Total	20.243	19.924	– 1,6 %
Energy	15.658	16.078	2,7 %
Industrial Processes	1364	1098	– 19,5 %
Solvent and Other Product Use	128	35	– 72,5 %
Agriculture	2367	2145	– 9,4 %
Waste	726	568	– 21,8 %
Sinks		–1320	
Total emissions with sinks		18.604	– 8,1 %
Kyoto commitment		18.624	– 8,0 %

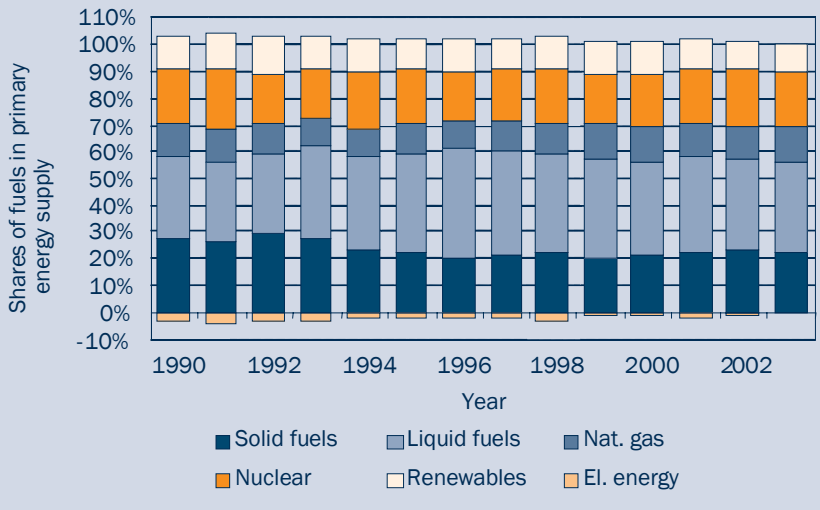


Figure 5-7: Actual levels of emissions in 1986 and 1990–2003, GHG emissions projections without sinks, and analysis of fulfilling the Kyoto commitment.

Emissions by Sector

Emissions from the Energy Sector (Energy Supply and Fugitive Emissions) will significantly decrease due to a reduction in fuel exchange. In 2020 emissions in this sector will be 18 % lower than in 2003 according to both projections. Emissions from the Waste sector will also significantly decrease due to a large reduction in the quantity of landfilled waste. According to the existing measures scenario, Waste sector emissions will be 41 % lower in 2020 that in 2003, while according to the additional measures scenario they will be 67 % lower in 2020 than in 2003. Increased emissions are expected in the Transport sector (18 % higher according to the existing measures scenario, and 11 % according to the additional measures projection) due to an increase in transport activity. They are also expected in Agriculture (by 12 % - existing - and 8 % - additional) due to increasing numbers of animals, in Industry (Use of Fuel for Power and Industrial Processes – by 16 % and 5 %) due to increased production and also in the Other Sectors category (by 24 % and 5 %) due to increase final energy use.

Total GHG Emissions

Total GHG emissions without considering sinks will total 21.2 Tg CO_2 eq. in 2010 according to the existing measures scenario, which is 7 % more than in 2003, while by 2020 they fall to 20.4 Tg CO_2 eq.. According to the additional measures scenario, total GHG emissions without considering sinks in 2010 (19.9 Tg CO_2 eq.), will be almost the same as in 2003, falling to 18.9 Tg CO_2 eq. by 2020.

Projections and Kyoto Commitment for Slovenia

By ratifying the Kyoto protocol Slovenia committed itself to reducing GHG emissions in the first commitment period (2008–2012) by 8 % compared to the base year (1986 for CO_2, CH_4, N_2O and 1995 for F-gases). The additional measures projection indicates that average

yearly emissions in the first commitment period, without considering sinks, will total 19.92 Tg CO_2 eq. In accordance with Decision 11/CP.7 of the Conference of Parties in Marrakech, Slovenia can deduct CO_2 emissions in the yearly amount of 1.32 Tg CO_2 due to sinks from forests in order to meet its Kyoto commitment. In the previous report a conservative sink use assessment of 0.84 Tg CO_2 was used to assess first commitment period emissions, while the latest studies from the Slovenian Forestry Institute indicated that Slovenia could use its entire quota as the actual sink was higher than the quota. Average yearly emissions in the first commitment period, taking sinks into account, total 18.60 Tg CO_2 eq, while Slovenia's commitment is 18.62 Tg CO_2 eq. Hence it follows that implementing the measures as predicted in the additional measures scenario, and continuing forest management to increase sinks, Slovenia will fulfil its Kyoto commitment. However, the following factors must be considered when drawing such a conclusion:

- In 2006 the Action Plan for Reducing GHG Emissions (AP-GHG) will undergo a revision that will include an analysis of AP-GHG measure implementation up to 2005, following which new emission projections will be prepared, which will fully take into account the new conditions regarding measure implementation, the macro-economic situation, and the corrected projections used in this report.
- In 2006 a new emission coupon allocation plan for 2008 to 2012 will also be prepared. Over the period 2005 to 2007 a total of 96 facilities were involved in emission trading in Slovenia, which is approximately 55 % of all CO_2 emission in Slovenia. The proportion of emissions from facilities included in emission trading in the period 2008 to 2012 will be similar. The Allocation Plan sets out a quota of free emission coupons distributed to facility operators. Administrators must buy cover for excess emissions or insufficient emission coupons on the market. Setting the quota for free coupons will take place simultaneously with the revision of the Action Plan.

5.3 Evaluation of Total Potential of Measures

The total potential of measures was defined by means of the models used for emission projection calculation. The models were used to first define the effect of individual measures, while the total potential was calculated by uniting these effects. The difference between the total evaluation for the effect of all measures for 2010 in Table 4-2 and the evaluation in this chapter arises from the method of evaluating the effects. The effects in the Policies and Measures chapter were assessed on the basis of the current situation (in 2005) and the expected state in 2010 (e.g. the effect of incentives to implement EEU measures and invest in RES was assessed on the basis of reduced fossil fuel use due to subsidised investment in EEU and RES in 2002 and 2003), while the model evaluations of measure effects were calculated on the basis of assumptions within the model. The evaluation of the effect of additional measures was calculated as the difference between the existing measure projection and additional measure projection.

The table (Table 5-2) gives the total potential of measures implemented and adopted by sector and by gas. The table indicates that measures to reduce emissions in the energy sector will make by far the largest contribution to reducing emissions in the existing measures projection. Emissions will fall least in the Agriculture sector. The gas the measures will reduce most is CO_2.

Table 5-2: Estimate of the Total Effect of Implemented and Adopted Measures (Measures taken into account in the Existing Measures Projection) by Individual Sector and Gas

	2005	2010	2015	2020
			Gg CO_2 eq.	
Energy	242	1234	1923	3489
Ind. Processes	0	147	147	147
Agriculture	20	39	59	62
Waste	23	103	198	276
			Gg CO_2 eq.	
CO_2	232	1246	1905	3421
CH_4	39	154	277	391
N_2O	14	30	50	68
F-Gases	0	94	94	94
Total	285	1523	2327	3974

Table 5-3: Estimate of the Total Effect of Additional Measures (Measures taken into account in the Additional Measures Projection) by Individual Sector and Gas

	2005	2010	2015	2020
			Gg CO_2 eq.	
Energy	167	713	898	756
Ind. Processes	91	274	270	341
Agriculture	0	50	50	50
Waste	0	82	158	197
			Gg CO_2 eq.	
CO_2	166	726	910	771
CH_4	0	105	180	219
N_2O	0	15	16	13
F-Gases	91	274	270	341
Total	258	1119	1375	1344

5.4 Methodology

5.4.1 Energy

To prepare emission projections in the IPCC sector Energy – excluding Transport – a set of models was used in which the main tool is a reference energy ecological model called REES-SLO, made in the MESAP environment. In addition to the REES-SLO model this set of models consists of other models as well: a model to assess the market penetration of energy-saving final use technologies (PET-SLO), a simulation model for electrical load curves (ELAM-SLO) and a model for calculating electricity production balance on a free market (ELBIVIM).

The main information flow between programme packages takes place in the following order:

1. Firstly, the market shares of certain energy-saving technologies with final users are calculated using a PET-SLO model as the response to the changed price signals, financial incentives and information campaigns. The assessment of market shares of certain technologies and their costs serve as input data in the basic model of the reference energy system (REES-SLO) in MESAP.
2. MESAP calculates envisaged final energy use balances and assesses the local production of electricity based on the proportions of different technologies in the final use structure and connections with influential parameters (levels of economic activity in different sectors, number of households, etc.). The final use of electricity divided by sector, purpose, and production in local supply systems (in industrial, distribution and private units) is transferred for processing in the program to analyse the load shape.
3. The ELAM-SLO program simulates the time course of load on the electricity transmission system, taking into account typical users and local producers.
4. By using ELBIVIM model, electricity production balances can be calculated

on the free electricity market, based on domestic demand, available transmission import/export capacities, international prices of electricity and other assumptions (EIMV).
5. The proportions of electricity production in individual units calculated in Point 4 and related costs are transferred to the MESAP / REES-SLO model.

Other balances are calculated for the whole planning period in the MESAP model: primary and secondary energies, balances of emissions (CO_2, CH_4, N_2O, SO_2 and NO_X) and total costs.
Reference Energy Ecological Model– REES-SLO

The technology orientated REES-SLO model was developed in the MESAP environment in the form of a linear network model for processes and connections (reference energy system), which enables consistent modelling of energy use based on the needs of energy services and energy supply according to the Integrated Resource Planning method. A calculation of emissions, costs and other influential phenomena is made simultaneously. The logical process-technological model enables the simulation and evaluation of anticipated instruments and their influences, as the set of instruments are connected within strategies. The calculation model with a transparent model presentation prevents double counting and unconnected consideration of effects, and provides a framework for consistent and equal access to the identification of instruments, measures and outputs in different sectors and subsectors.
The model has been used before in the preparation of energy strategies and the National Energy programme, as well as for specialist papers used as the basis for assessing potential GHG emission reduction and to prepare the Action Plan on Reducing GHG Emissions.

Transport

The COPERT[36] model enables the calculation of direct GHG emissions (CO_2, CH_4, N_2O), indirect GHGs (CO, NO_x, NMVOC, SO_2) and emissions of NH_3, PM, PAH, POPs and heavy metals in various vehicle categories (cars, light goods, heavy goods, motorbike and moped) based on fuel consumption. Emissions are roughly divided into three sources: Emissions that occur during thermally stabilised engine operation (hot emissions); emissions occurring during engine start from ambient temperature (cold start and warming-up effects) and NMVOC emissions due to fuel evaporation. Total emissions are calculated as a product of fuel consumption and emission factors calculated by the model.
The version of the software model used is COPERT III v.2.3.

5.4.2 Industrial Processes

The projection of CO_2 emissions in industrial processes, except for production of primary aluminium, was made on the basis of industrial production growth projection, taking different emission factors for different activities into account. CH_4 emissions are constant, as their only source is ethanol production, which was considered to be constant. Emissions from the production of primary aluminium (CO_2, CF_4 and C_2F_6) were used in line with projections by the Talum company, which is the only primary aluminium producer in Slovenia. HFC and SF_6 projections were summarized in line with the first national report, while HFC emissions in the projection with additional measures were additionally reduced due to regulations on F-gases.

[36] http://vergina.eng.auth.gr/mech/lat/copert/copert.htm

5.4.3 Waste

Solid waste emission projections were made using IPCC methodology. Emissions for waste deposited before 1977 that were mainly in disorganized or badly compressed condition, where the covering of landfill was only realised after they were closed, were estimated according to the simplified IPCC methodology. When assessing landfills emissions with waste dumped after 1977, which was partly compressed and compacted, where most landfills were covered at the time, a more accurate IPCC methodology, with time series, was used. The calculation assumed a constant quantity of waste produced since 2001 and a gradual reduction in the quantity of landfilled waste. The composition of waste and the structure of biologically degradable part was constant and was summarised according to the results of screening analyses in Slovenia and international data.

For waste water emissions calculation an IPCC methodology was used. The following input data were used to assess CH_4 emissions: planned biological treatment of municipal and industrial organically loaded waste water until 2015 in Slovenia, organic burden, the proportion of actually decomposed organic substances, conversion factor and use of produced gas. N_2O emissions were assessed according to the IPCC methodology with the assumption that all wastewater nitrogen ends up in water environment.

5.4.4 Agriculture

Agriculture emission projections were carried out according to the methodology prescribed by the IPCC (1997). The IPCC methodology anticipates agriculture emission projections based on statistical data on the physical volume of crop and animal production taking into account specific procedures characteristic of particular countries or areas. Data on the extent of crop production and animal breeding are treated separately, despite their interdependence. The model based on IPCC methodology does not therefore enable optimization at the level of the agriculture sector as a whole, but only on separate segments. SURS statistical data and information obtained from experts in agricultural sector were used for the assessment.

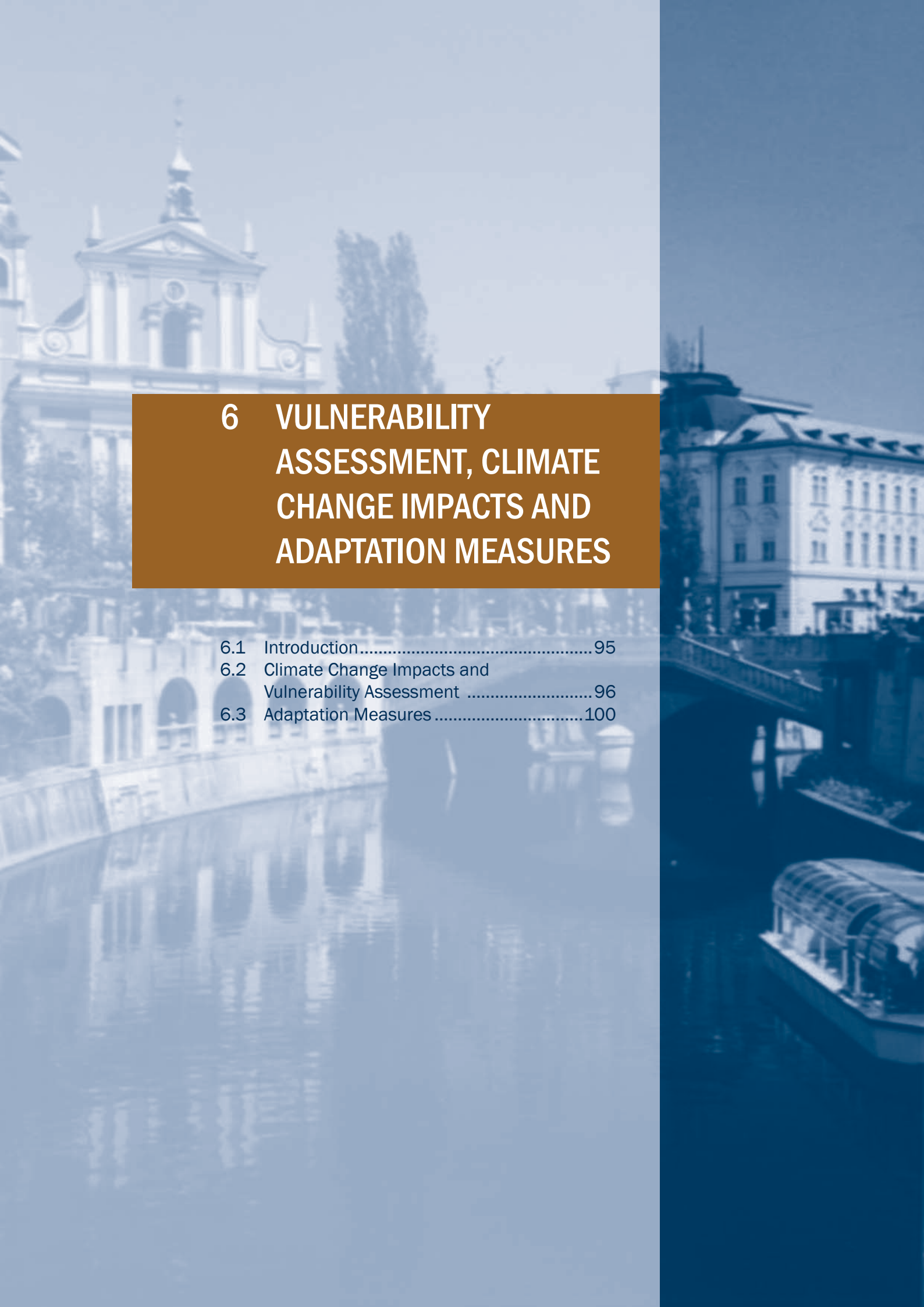
Projection uncertainty arises from: the uncertainty of statistical data used as the basis for projections (statistical data, emission factors); the models used for projections presenting a simplified picture of actual events; the uncertainty of policy and measure implementation scenarios, as these change over time, and the actual effect of the measures can be difficult to anticipate given the large number of relevant factors, and uncertainty of future economic, technology and social development, which includes uncertainly over the price of energy, the growth of supply

5.5 Evaluation of Projection Uncertainty

and demand for energy, behaviour of major actors in the energy market, etc.

The result of Energy emission projections depends especially on the realisation of measures taken into consideration in the field of RES and EEU where availability of budget finances will be a major factor and where in recent years a large gap between the planned and realised activities has been noticed. The dynamics of the transition to natural gas in electricity production depends largely on future market trends and social problems with reducing the domestic coal production. As a consequence of the uncertainty of future coal mining development, fugitive emission projections are uncertain. Uncertainty in the projection of transport emissions are due to uncertainties in Slovenia's transport development scenario, the potential increase in transit transport, and possible greater influence from neighbouring countries. The comparison of emissions with projections in the Energy sector according to the higher economic development scenario, which anticipates a 4 % growth in GDP in the 2000 to 2020 period (1.2 % higher than in the development scenario used and a subsequent higher physical production in industry and services) and a faster growth in residential space and the number of residences (+ 0.22 % per annum) shows a range of GHG emissions from 16.0 to 17.2 Tg CO_2 eq. in 2010.

The uncertainty of emission assessments in agriculture was assessed according to IPCC criteria (2000). Uncertainties were assessed according to individual emission sources, while the combined uncertainty was estimated according to Rule A, if additive quantities were used, or according to Rule B when assessments were a product of activity data and emission coefficients (IPCC, 2000). The EMEP/CORINAIR (2002) manual was also used to assess the uncertainty of input data and emission factors. Uncertainty in methane emissions was estimated at 19 %, and uncertainty in nitrous oxide emissions at 230 %. Uncertainty in emissions for both gases in agriculture was assessed at 135 %.



6 VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

6.1 Introduction

Slovenia's geographic and climatic features mean it is at threat from climate change. Based on the results of general circulation models, Slovenian territory can expect an increase in air temperature of 1 to 4 °C in the first half of the 21st century, and a change in precipitation of –20 % to +20 % compared to the average figures for 1961 to 1990. The most probable climate development in Slovenia in future is towards warmer and drier summers, warm winters with a similar quantity of precipitation and a higher frequency of extreme weather events. The impact of climate change will be wide ranging. The higher temperature, different water balance and more frequent extreme weather events will affect agriculture, forests will be exposed to increased stress, biodiversity will be threatened, the threat of floods will increase and there will be problems ensuring the supply of drinking water, risks in Alpine and other mountainous areas will increase, while the rise in sea levels and sea temperature will threaten coastal areas. Negative direct and indirect impact on people's health and well-being is expected, e.g. increased heat load, and increased populations of disease hosts and carriers, while patterns of energy consumption will change, reduced river flow will lead to problems in generating electricity. Tourism, winter tourism in particular, will also be affected.

At the end of 2005 the Environmental Agency (ARSO) launched a climate change adaptation project. The project was based on an interdisciplinary approach, and ARSO will work closely with all the relevant specialist and scientific institutions and individual experts. The project consists of these phases:

- collecting and reviewing existing literature and knowledge;
- defining the dependence of various factors on climate on the basis of collected data and knowledge, and where possible tests for the entire state and its individual regions;
- defining the vulnerability or poten tial threat assessment if no measu res are taken, and for various anti cipated forms of climate change for the entire state and its individu al regions;
- adaptation capability assessment, i.e. finding possible alternative means of adaptation at the state and regional levels;
- defining the interdependence of different sectors and conditions for the state and its individual regions;
- collating findings from preliminary phases and on that basis selecting possible adaptation measures by individual sectors at the state and regional levels.

Below are presented the results of the Vulnerability of Agriculture and Forestry to Climate Change project, which was carried out in 2003.

6.2 Climate Change Impacts and Vulnerability Assessment

The physical impact of climate change and higher atmospheric levels of CO_2 on flora and fauna will be numerous. The physiological effects of increased concentrations of CO_2 will have a significant impact on crop production and forest growth, while the most pertinent impact will be from changing weather conditions. The changing water balance will have a decisive impact on agricultural production. The economic impact of climate change on Slovenian agriculture is harder to predict, as it is also dependent on political decisions – particularly in relation to changing the centres and hubs of agricultural production, increased risk in agricultural production, different subsidy structures, the import and export of food, etc. Global assessments suggest that the price of agricultural products will rise by 10 to 20 % due to climate change. Studies indicate that various risks affecting agriculture will significantly increase, such as increased likelihood of weather damage from drought, storms and floods.

6.2.1 Food Production

The impact of climate change on food production in Slovenia can be divided into three broad categories: positive impacts, conditionally positive impacts and negative impacts (Table 6-1). Conditionally positive impacts are those where the consequences are unclear and depend on other specific factors.

The positive impacts include the effects that greater CO_2 concentrations will have on plants. With an optimal supply of nutrients, water and plant protection, and optimal temperatures, plants increase their photosynthetic activity and their leaf surface. Another important direct impact of higher CO_2 concentrations is the partial closure of stomata (pores) which reduces transpiration, both effects decreasing the need for water. Environmental warming will also extended the potential vegetation period for agricultural plants. Spring will start earlier and autumn end later, regardless of altitude or the heat requirements of the plants. The quantity of heat that plants accumulate during growth will also increase. The extended vegetation period and greater heat accumulation could mean areas currently too cold could improve their heat characteristics leading to an increase in cultivated land. The increase in temperature will also affect the possibility of cultivating heat-loving plants. It must be remembered that higher air temperatures in summer also engender unfavourable meteorological phenomena and even the physiological impact of drought. The positive impacts will only occur if other growth inputs are not in short supply.

The conditionally positive impacts include the fact that an increase in air temperature will lead to changes in the location of agricultural production: migration of vegetation belts, change in size of cultivated land, improvement in temperature profile of areas now too cold or deterioration of those already too warm, migration of cultivated land to higher altitudes, etc. Changes in altitude will be important for Slovenia, as higher areas will become more suitable for crop production, if other criteria are met such as sufficient soil depth, nutrient levels and land configuration. This new land will be smaller than at present, and the altitude will make it more exposed to risk from meteorological phenomena, such as low winter temperatures, unpredictable late spring frosts, lengthier period of snow cover, and stronger winds. Climatic changes could also affect the quality of produce, through the increased CO_2 concentrations and different weather; for example, higher temperatures will cause grains to mature too early, and the reducing matura-

tion period could lower the quality of grasses as fodder. Different varieties will be sought, ones that are resistant to drought and other extreme phenomena (forest, and wind damage).

Climate change demands that particular attention be paid to potential negative impacts such as: reduced growing period and maturation occurring too early; plants moving from vegetative to generative phase too quickly, which means fewer days available for assimilation and potentially reduced leaf surface, and hence smaller products of lower quality, accelerated phenological development (earlier leafing, flowering and maturation), which increases the risk of frost damage. Climate changes can also be expected to lead to increased pressure from pests and disease. One can predict that the rising temperature will cause some pests to increase with more annual generations, and pests from currently warmer climes can be expected to encroach on areas in which they have not been present to date. Insects can also be expected to move to higher altitudes (pastures, meadows), which will lead to greater damage to fodder crops.

6.2.2 Livestock

Climate change will have direct and indirect impacts on livestock, primarily through changes to pastures and grazing, and the health and nutrition of livestock. There will be numerous negative impacts such as: more frequent summer droughts and changes in the composition of the green cover on pastures, more energy will be required to ventilate and cool barns, heat distress will be more common, the probability of bacterial infections will increase, parasite problems will increase, and weather damage will increase livestock mortality.

Table 6-1: Selected Impacts of Climate Change on Food Production

Positive Impacts	Conditionally Positive Impacts	Negative Impacts
Fertilising effect of increased CO_2 concentrations Longer vegetation period Better temperatures for heat-loving plants	*Changes in location of agricultural production:* • *migration of vegetation belts* • *change in size of cultivated land, changes in altitude* • *improvement/deterioration of temperature profile of areas now too cold or already too warm* *Changes in product quality* *Different species selection* *Changes in agro-technical practice:* • changes in dates of seeding/planting, harvest… • other soil processing methods, changes to fertilising	*Reduced growing period (faster plant development) Faster evapotranspiration* *Increased frequency of extreme weather events:* • *storms with wind, hail, heavy rainfall,* • *considerable damage due to spring frost* • *droughts, fires,* • *floods, landslides* *Changes in frequency and intensity of pest and disease incidents:* • *increased development of insects and fungi,* • *new pests and diseases*

Climate change could also reduce availability of drinking water, reduce animal appetite, make fodder harder to digest, and make fodder production riskier and consequently more expensive.

6.2.3 Forest Ecosystems

Most of Slovenia's forest, which covers 57 % of its territory, will be exposed to stresses due to climate change. Low and medium high sites are particularly vulnerable, where the composition of the forests in past centuries has been anthropogenically changed through the introduction of spruces that are otherwise found in cooler climes. The protective role of forests will also be threatened in exposed sites. The advantage of Slovenian forests in adapting to climate change is the traditional sustainable approach to forest management, which has always avoided vulnerable composition such as over-predominance of a single species. Possible responses from the forest eco-system to climate change are changes in location, composition and forest production. The reduced possibilities for adaptation mean that the damage caused by climate change will be particularly great in areas with pure forest composition (spruce forest), and isolated forests with poorer environmental conditions. It is anticipated that the forests most at risk will be conifers, particularly fir and spruce. The general conditions in the forest eco-systems will change concurrently with the change in forest composition, while higher temperatures and longer dry periods will increase the risk of forest fires.

Table 6-2: Impact of Climate Change on Livestock

	Positive Impacts	*Negative Impacts*
PASTURE AND GRAZING	Extending grazing period expansion of grazing to higher altitudes Extending grazing period expansion of grazing to higher altitudes	More frequent summer droughts Changed composition of pasture
LIVESTOCK HEALTH	Cold stress less frequent Less energy needed to heat barns in winter	More energy to ventilate and cool barns in summer
FEEDING LIVESTOCK	Increased production of heat-loving crops	Lack of drinking water Reduced appetite Fodder harder to digest fodder production riskier fodder more expensive

It is the biodiversity of Slovenia's forest that is most threatened by climate change. Species in the periphery of the high Alpine habitats will be threatened (alpine and subalpine vegetation and animals), and will only survive in extreme circumstances. Also threatened will be peripheral sites where species requiring colder weather grow. Under particular threat will be all the smaller, fragmented eco-system remnants without the genetic, spatial and ecological potential to shift location.

6.2.4 Water Resources

Climate change projections forecast meteorological droughts will be more frequent in certain regions. According to data from the World Meteorological Organisation (WMO, 2003) in recent years the entire globe has been subject to catastrophic droughts with greater intensity and duration. Droughts have also occurred more frequently in Slovenia, even in areas that did not previously experience them. The shortage of water from April to the end of September indicates that agricultural crops in most of Slovenia have been affected by drought 11 times in the last 40 years: 1967, 1971, 1973, 1977, 1983, 1992, 1993, 1994, 2000, 2001 and 2003.

The mean annual water potentially available in Slovenia[37] , is 32.1 km3, though there have been large fluctuations in the available water over the period 1961–2000, and there is also an observable trend towards a reduction in available water of 0.15 km3 per year. This decline is not just the consequence of increased water consumption but is mainly due to changes in climatic conditions, especially those that affect the quantity, and time and spatial distribution of precipitation. The same trend is found for mean annual river flow, with the exception of a few larger rivers. In 2004 an assessment of the vulnerability of agriculture to the changing water balance for agricultural land was carried out. It was found that every region in Slovenia was experiencing increasing shortages, most of all in northern Slovenia (19 % / 10 years) and least in South-East Slovenia (2 % / 10 years), while the average for the rest of the country was around 6 % / 10 years. The trends are all statistically significant, except in SE Slovenia. There is also an observable increase in the daily consumption of water from the soil and plants in the past ten years.

Although it cannot accurately be stated how the changing climate will affect regional water resources, it is clear that they are already very vulnerable. Each further problem caused by climate change or increased variability will increase competition between sectors for access to water resources. A warmer climate could make droughts and floods more frequent, more serious and longer lasting. The forecast higher air temperature will also increase the reference figure for evapotranspiration, which will lead to further and more intense droughts.

6.2.5 Extreme Phenomena

Climate change and higher temperatures will also have an impact on the frequency of extreme weather phenomena. The frequency of heavy rainfall, hailstorms, floods, lengthy droughts (increased fire risk), and extremes of air temperature will increase. Outdoor activities are most susceptible to extreme phenomena, e.g. agriculture, tourism, transport, though many other sectors will also be affected. Increased economic damage is also therefore to be expected.

[37] This quantity includes inflow from neighbouring countries, with 41% of water annually flowing through Slovenian territory being inflow from Austria.

6.3 Adaptation Measures

6.3.1 Agriculture

A range of adaptations will be necessary in the sphere of crop production. These include: changing sowing dates; changing varieties used (exchanging later crops with earlier); more intense fertilisation to compensate for the reduced growing time and water shortage; changes in sowing structure, farm production policy and production technology; changes to crop rotation; improving soil state during droughts by increasing humus/topsoil; construction of irrigation systems to combat negative environmental impact and if suitable water resources exist for irrigation, guided irrigation using irrigation models and taking into account meteorological conditions and weather forecasts to optimise water use, and ensuring permanent and natural balancing of agricultural crop production on irrigated surfaces, and finally protecting agricultural land from extreme conditions. For plant protection measures, the conclusion is that it will only be possible using a sound observation network to monitor increases in the number of infection or increasing generations of pests, and using appropriate prognostic models to forecast the appropriate time and method for action.

The modernisation of the agro-meteorological information system is vital for users and to update analyses. Users must be provided with information from current monitoring systems in a more efficient manner.
The future adaptation to variability and climate change depends largely on informing the public. The numerous problems relating to the area require training in long-term planning including climate risk analyses, the impact of climate change and variability, methodological recommendations (e.g. water management and quality, and microclimate) and operative decision-making (e.g. crop forecasts, irrigation management, and control of disease and pests). Only in this manner will effective measures be found to prevent or mitigate the consequences of climate change.

The following policies will have to be pursued in relation to supplying agricultural plants with water, given the anticipated changes: preparing preventive measures (i.e. using indicators to monitor agricultural drought), preparing drought management measures (interdisciplinary approach), ongoing analyses of climate change impact in Slovenia (new general circulation models (GCM/MSC), regional analyses) and updating the methodology for assessment of drought damage.

6.3.2 Forestry

It is possible to adapt forests to climate change to some extent. The measures include provisions to preserve forest vegetation, preventing progressive forest succession onto abandoned agricultural land, and directing artificial restocking of forests from conifers to deciduous trees, which will demand the development of new technologies to grow deciduous saplings. A methodology must be prepared immediately to categorise forest composition and their growing sites according to sensitivity to the forecast climate changes, and produce a cartographic record of forest composition and growing sites with respect to that sensitivity. The increased threat of forest fire demands the planning, set up and maintenance of appropriate fire prevention breaks, particularly in forest areas where conifers predominate. Policies that ensure that timber stocks continue to increase will continue. Increased forest phytobiomass will absorb more carbon that would otherwise increase global warming in the atmosphere in the form of carbon dioxide. All measures to increase forests will be beneficial, although the level of natural forest or naturally adapted forest in Slovenia is generally high.

7 RESEARCH AND SYSTEMATIC OBSERVATION

7.1 General Policy on Research and Systematic Observation

The central role in research and development (RRD) is played by the Ministry of Higher Education, Science and Technology (MVZT), the Slovenian Research Agency (ARRS) and the Ministry of the Economy (MG). The MVZT is responsible for preparing policy documents and legislation on research policy and overall analysis and monitoring of research work. ARRS is responsible for financing scientific research from the national budget, while the MG mainly operates in the field of promoting RDD in the economy, where the Chamber of Commerce and Industry is also active (GZS). The basic legal document for RRD is the Research and Development Act, while the further development of RRD is defined in the National Research and Development Plan for 2003 to 2007. A draft has already been prepared of the Resolution on the National Research and Development Plan for 2006 to 2010, in which one of the most promising areas of research is research on technology relating to the sustainable economy.

International cooperation by Slovenia in research activities largely takes place within European programmes. Slovenia participates in the following: the European Co–operation in the field of Scientific and Technical Research (COST), the Intelligent Energy for Europe programme (EIE), EUREKA, which is intended to promote technological development and high technology, the EU's Sixth Framework Programme, within which one of the priority areas is Sustainable Development and Global Changes, Intereg III, in the joint research centre of the European Commission and preparations for the Seventh Framework Programme. Slovenia also participates in the UN development programme. Regional cooperation also takes place within the Central European Initiative (CEI/SEP) and the TriCo initiative. A wide range of bilateral cooperation is also underway. International cooperation in systematic observation is taking place within a wide range of programmes that in most cases operate under the auspices of the WMO or UN. In 2005 the Slovenian Government adopted a decision for Slovenia to join the Intergovernmental Group on Earth Observation – GEO.

Gross domestic expenditure on RRD has increased year on year since independence. In 2002 it was worth SIT 81.4 billion, which is 9.5 % more than in 2001, and represents 1.5 % of GDP. The main source of financing was from companies (60 %), followed by direct government funding (36 %) and foreign funding (4 %). Most of the state funding

for RDD projects in 2002 was allocated to basic research (59 %), with 26 % allocated to applied research, and 15 % to experimental research. In 1994 the Slovenian Research Foundation was established to promote scientific work and financial support.

7.2 Research

7.2.1 Climate Processes and Systems

The following projects have taken place or are ongoing on the subject of climate processes and systems:

- the international project CONEX-II

The aim of the project is to research and produce tools relating to very short-term and current weather forecasting.

- The international project COST 719 – GIS on climatology and meteorology.

The aim of the project is to put GIS (Geographic Information System) tools into operative use in meteorological services in Europe.

- Project on “Wind and Solar Conditions in Slovenia”. The aim of the project is to use modern tools to assess the potential for wind and solar energy in Slovenia.
- Meso-Meteorological Modelling programme. The purpose of the programme is to improve meso-meteorological models that will enable detailed modelling of phenomena in the meso-scale, which are largely affected by relief. Anthropogenic impact on climate and weather will also be taken into account. The emphasis will include modelling exceptional weather events.

7.2.2 Modelling and Forecasting Climate Change

Modelling and forecasting climate change takes places under the auspices of the Chair of Agro-Meteorology at the Ljubljana Biotechnical Faculty and the Centre for Atmospheric Research at the Nova Gorica Polytechnic. General Circulation Models (MSC/GCM) are used to model the response of the climate system to atmospheric changes (e.g. increased concentrations of GHG). The models provide a satisfactory description of climatic patterns on large spatial scales (e.g. over Europe). Primarily due to poor horizontal resolution (2° x 2° or more) the reliability of GCM results at the regional or local scale is low, as it does not include regional surface features or map their impact on climate diversity. These factors are very significant in Slovenia. The focus of research is therefore on bridging the gap found in climate change impact studies between GCM results and local level climate change assessments. The research employed empirically reduced scales to bridge this gap. In this method the connection between climate variables on the local scale and the larger scale was made by use of various mathematical models based on previously measured values. A key assumption is that the mathematical description of dependence between local and large scale variables will still be valid in changed climatic conditions. The plan in the future is to improve the scenarios for changes in precipitation quantity, especially in the warmer half of the year, and to replace the empirically reduced scales with more complex dynamic scale reduction based on nested models. This approach is worth testing on Slovenian and wider territory together with other European centres covering the area.

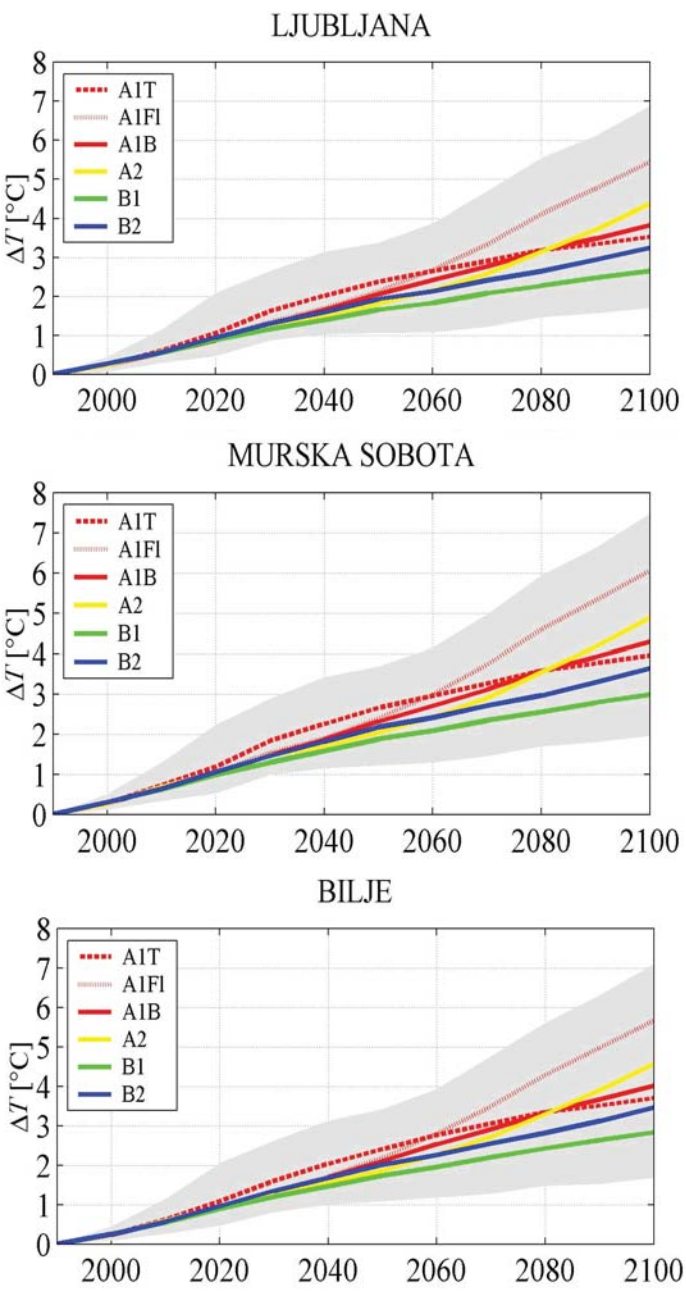


Figure 7-1: Forecast Increase in Average Annual Air Temperature (ΔT in °C) in Ljubljana, Novo Mesto, Murska Sobota, Rateče and Bilje.
The locations selected represent different regions of Slovenia – central, SE, and NE with mild-continental climate, NW with mountainous climate and SW with sub-Mediterranean climate. The grey area represents the spread of values taking into account the results of simulations with four GCMs. The results of the simulations, based on the SRES A2 and B2 scenarios, were also applied to SRES A1FI, A1B, A1T and B1. No large differences in average annual air temperature were expected between Slovenian regions.

7.2.3 Impact of Climate Change

Research into the impact of climate change generally focuses on areas that are very important to Slovenia such as forests, agriculture, water, etc. In 2005 a project started in Slovenia that will be an interdisciplinary study of the impact of climate change, assessing vulnerability and identifying adaptation measures across a wide selection of areas (e.g. transport, energy, tourism, agriculture, human health and economic development, forestry, water management, and construction). Below are presented some projects that have been completed or are still underway:

- The project on the vulnerability of agriculture and forestry to climate change and impact assessment. The aim of the project is to study climate change scenarios on the regional scale and the possible impact on agriculture and forestry. The project included a study of climate change impact on the water balance.
- The international INTERREG IIIB project METEORISK. The aim of the project is to set up a standard information tool to support a warning system for Alpine countries.
- Climate Change and Forests. The purpose of the project is to improve understanding of material cycles and the accumulation of biomass in forest ecosystems, which presents a basis for studying the response of forests to changing climatic indicators, carbon cycle studies within and outside forest ecosystems, and studying the suitability of forest management measures in relation to climate change.
- The impact of climate change on crop production in Slovenia – A Case Study of the Vipava Valley.
- Climate change and national security in Slovenia.
- Forest biology, ecology and technology. The basic objective of the programme is to maintain healthy forests and natural, sustainable, multi-functional forest management.
- Applied botanics, genetics, and ecology. The programme covers research into the biological and environmental bases for crop production and the use and processing in relation to spatial planning.

7.2.4 Social–Economic Analyses

The preparation of the Action Plan for Reducing GHG Emissions included cost analyses of the measures the program envisages. The analyses produced cost assessments that will be needed to meet Slovenia's Kyoto Protocol commitment. Numerous studies were also carried out into the economic impact of using RES and implementing EEU measures at the regional, local and individual levels. Most studies were carried out on the use of wood biomass which is vital issue for Slovenia.

7.2.5 Research and Development of Technology for Adaptation to Climate Change and Mitigation of its Consequences

The research work investigated the use of solar energy (developing solar absorption media, developing new forms of building insulation to utilise solar energy, solar powered electricity generators, solar panels), buildings (natural illumination, heating and cooling, production of green energy (renewable sources), bioclimatic design) use of other renewable resources (wind energy, geothermal energy, biomass), optimising industrial processes and new technologies in industrial processes, sustainable farming, etc. Technology platforms organised on the basis of European technology platforms will have an important role in further research and development work into environmentally friendly technologies. The platforms include all the key stakeholders required to transfer knowledge into new technological solutions, from commerce to institutions and universities, and

public institutions including the state. To date the following national technology platform initiative groups have been recognised. They address various issues relating to climate change: Solar Panels, Fuel Cells, Construction, Timber, New Materials, Production Technologies of the Future, Slovenian Technology Platform for Vehicles, Roads and Transport, and Sustainable Development – Water.

Adaptation to climate change is a relatively new subject so activity in the field is still rather low key. The most important document in Slovenia addressing the theme is the study on the vulnerability of agriculture and forestry to climate change and impact assessment, which included adaptation measures for the two sectors in addition to the assessments of vulnerability.

7.3 Systematic Observation

7.3.1 Systematic Observation and Atmospheric Measurement

Systemic observations and measurements have been made in Slovenia since 1850, when measurements started in Ljubljana. In 2005 the meteorological station network includes 39 climatological stations, 14 of which are synoptic, 179 precipitation stations, as well as a radio-sounding station, sodar and meteorological radar. Most of the 30 automatic meteorological stations operate at climatological-meteorological stations.

Although temperature measurements go back over 150 years in Slovenia the data sets are not homogenous as the measuring points have moved and observational protocols and instrumentation changed. Changes in the local environment of the measuring station have also led to the non-homogeneity of meteorological data. The most stable has been the Rateče meteorological station. Conditions in mountainous areas are described well by data from the Kredarica observatory, just below the summit of Mt Triglav, Slovenia's highest mountain. Ljubljana has expanded quickly over recent decades, expanding its urban heat island, which is reflected in temperature records. Counterbalancing divergence in the data is being carried out through re-analysis based on a new analysis of weather in the past to produce a long and more homogenous data set than that provided by the measurement data alone. The weakness of this method is that due to a lack of high quality satellite, ground-based and altitude measurements it can only go back to 1957. More detailed homogenisation methods must still be applied to data from ARSO archives to determine climate trends and changes in Slovenia. Six reference climatological stations are planned for monitoring climate conditions in unchanged conditions, as at present Slovenia does not have any measuring stations that can provide the same measurement method for an extended time period in an unchanged local environment.

Slovenia's international cooperation in data exchange is taking place within a wide range of projects and programmes that in most cases operate under the auspices of the WMO, a member of which is also Slovenia . Slovenia is participating in the Europe-wide Global Climate Observing System (GCOS) project with its observation points in Kredarica and Ljubljana. Ozone measurements are taken at the Krvavec and

Table 7-1: Cooperation in Global Atmospheric Observation System

	GAW	GCOS	WWW	WCRP	CLRTAP
How many observation posts are within the contracting party's competence?	2	2	19	19	2
How many participate in the international exchange of data?	2	2	19	19	2
How many will be functioning in 2005?	2	2	20	20	2

Iskrba measurement stations within the Global Atmosphere Watch (GAW) and EMEP projects. Slovenia is also exchanging data from its 14 synoptic stations and radio-sounding measurements within the World Weather Watch (WWW) programme, and within the GPCC programme is submitting data from the synoptic stations and archive data from its precipitation stations.
In 2004 the Centre for Atmospheric Research was established at the Nova Gorica Polytechnic, the work of which includes remote sensing of atmospheric data. In 2005 the Centre opened a LIDAR observatory at Otlica nad Ajdovščino, with an aerosol detecting LIDAR system. Systematic observations are expected to start at the end of 2005, and the data will be submitted to the EARLINET network. Cooperation with ARSO is also planned.

Air quality measurements are taken at the following measuring stations in Slovenia: an automatic measurement network with eight stations in populated areas; a network measuring background air pollution in areas remote from large pollution sources, with stations at Iskrba pri Kočevski Reki and Krvavec, which are also part of the international measuring network EMEP and GAW; the network of stations measuring 24-hour smoke concentrations and an index of acidic gas air pollution expressed by the concentration of SO_2 and a measurement network for precipitation quality. Supplementary networks are used to measure large polluters (TE Šoštanj, TE Trbovlje, TE Brestanica) and the cities of Ljubljana, Maribor and Celje as well as the municipality of Krško, location of Slovenia's nuclear power plant. The network is denser in areas near larger sources of air pollution.

7.3.2 Oceanographic Observation System

Systematic maritime observation is implemented by the Marine Biology Station (MBP), the National Institute of Biology (NIB) and the Monitoring Office of the Environmental Agency (ARSO). The MBP, which is also the National Oceanographic Data Centre–NODC, carries out observations from the oceanographic buoy in the Gulf of Trieste. Testing started in 2000 before it became fully functional in 2002. It is used to measure wind speed and direction, air temperature, air humidity, sea temperature and salinity at a depth of 2m, temperature at a depth of 23m and the speed of sea currents at depths of 2 to 23m at one metre intervals. Real time measurement data is accessible via a website, while archived data can be accessed by logging in on the website; data on sea temperature and sea currents are also sent to the ARSO monitoring office. Observations of the vertical profile of temperature, salinity, oxygen, and chlorophyll are taken using a vessel with a CTD probe. Slovenia cooperates in the following international projects: the ADRICOSM multilateral project (ADRIatic sea integrated COastal areaS and river basin Management system pilot project), the EU project MFSTEP (Mediterranean Forecasting System Toward Environmental Predictions) and

the MAMA project (Mediterranean network to Assess and upgrade Monitoring and forecasting Activity in the region), which is an important component within MedGOOS – the Mediterranean Global Ocean Observing System.

The Monitoring Office measures sea level and temperature at two coastal measuring stations (the Luška kapetanija/Harbour Master's Office in Koper since 1958 and the Port of Koper automatic measurement station since 1990. This was being shut down at the end of 2005, with plans to set up a new oceanographic station in the Bay of Piran). In 2005 the oceanographic station of the Harbour Master's Office was upgraded and became the Koper Oceanographic Meteorological GPS Station (MMGPS). The station upgrade was carried out within the EU FP5 project. Since that time the station has functioned within the European Sea Level Service (ESEAS) network. As part of work to identify climatic changes due to increased anthropogenic GHG emissions, sea level analyses are carried out monthly, annually and multi-annually and frequency analyses carried out into extreme deviations from normal sea level due to intense local meteorological phenomena. Data on the monthly and annual sea levels including current metadata are sent to the PSMSL in the UK, one of the two largest centres for sea level data in the world. Sea level data and the related meteorological and surveying data are also exchanged with the ESEAS. Regular reports and data are published in the ARSO Monthly Bulletin, the Hydrological Annual Report, and the ARSO web portal. In November 2005 the revision of a long-term set of sea level data was concluded, and the production of a uniform controlled set of sea temperature, air pressure, wind and salinity according to a standardised method. A link up to the ESEAS[38] database was completed. The Office cooperated in Mediterranean variability studies, including the Adriatic Sea, Black Sea and Aegean Sea.

7.3.3 Ground-Based Observation System

Glacier observations take place on the glacier below Mt Skuta and the Triglav glacier, which are the most southerly glaciers in the Alps at relatively low altitude, which means they are particularly sensitive to climatic conditions. Regular observations are carried out by the Anton Melik Geographic Institute at ZRC SAZU, taken from the end of the melting period. Until the mid-1990s the Triglav glacier was measured with the traditional method acquiring data on changes in thickness and length at set points, while in 1995 and 1999 surveying measurements were taken. Since 1999 aerial surveys have been made every two years. A lack of funds required to adapt data has meant the institute is not part of the international exchange of data within GCOS. Inclusion in the World Glacier Monitoring Service (WGMS), part of Global Terrestrial Network–Glaciers (GTN–G), is planned in 2005.

Table 7-2: Cooperation in Global Land-Based Observation System

	Oceanographic buoy	Sea level measuring devices
How many stations are the responsibility of the Party?	1	2
How many are providing data to international data centres now?	1	2
How many are expected to be operating in 2005?	1	2

Table 7-3: Cooperation in Global Land-Based Observation System	
	GTN–G
How many stations are the responsibility of the Party?	2
How many are providing data to international data centres now?	2
How many are expected to be operating in 2005?	0

The network of measurement points for national hydrological monitoring comprises 165 observation stations for surface water courses (water level (165), flow (160), water temperature (50), content and transport of suspended material (5)), 2 lake observation stations, 12 source observation stations and 133 underground water observation points (water level, temperature). The observations are carried out by the Monitoring Office that operates within ARSO. The start of the measurement network for surface waters and lakes can be traced back to the second half of the 19th century. Underground water observations began in 1952 and source observations at the end of the 1990s. International data exchange takes place within the Global Runoff Data Centre (GRDC)[39] « (flow), European Environmental Agency - EEA[40] (flow) and within MedHycos[41] .

Phenological observations take place under the professional supervision of the Meteorology Office at ARSO. The start of phenological observations goes back to 1950/51, when the network of special phenological observation stations was set up. At present there are 61 stations distributed to ensure regional climate coverage.

38 http://www.eseas.org/
39 http://grdc.bafg.de
40 http://www.eea.eu.int/
41 http://medhycos.mpl.ird.fr/

8 EDUCATION, TRAINING AND PUBLIC AWARENESS

8.1 Introduction

Public awareness of the causes and consequences of climate change and the possibility of preventing them is relatively poor in Slovenia. The results of a public opinion poll carried out in May 2005 indicate that only 25 % of the Slovenian population are aware of the consequences of climate change and only 11 % are well-informed about the Kyoto Protocol. A total of 47% of the population was aware that the global air temperature is rising; older people and people with higher education were somewhat better informed[42] . There are also gaps in knowledge about the impact of people's life-styles on GHG emissions and how individuals can contribution to their reduction. There is also a need to increase the sense of responsibility to future generations in how we manage natural resources. The most obvious consequences of climate change seen on Slovenian territory and further afield are a positive incentive to increase public interest, and to encourage people to think about changing their behaviour. The Government and its ministries do not have systematic approach to informing the public about issues relating to greenhouse gas emissions. A general government campaign is needed to provide a comprehensive presentation of the issue, the state in Slovenia and Slovenia's contribution to reducing GHG emissions. To date the Ministry of the Environment and Spatial Planning (MOP) has addressed this topic most, particularly in the energy sector. The Ministry of the Economy, Ministry of Transport, Ministry of Agriculture, Forestry and Food and Ministry of Finance have been involved to a lesser extent, but are all key players in implementing the Kyoto Protocol. Since climate changes affect everyone, public awareness of the issue of climate change is vital as well as familiarity with measures required to prevent or mitigate these changes. This will make it essential to implement exhaustive and continuous promotion, informational and educational activities aimed a range of target publics. The Government has a key role to play in setting an example in this field.

[42] Source: Paper by Luèka Kajfež-Bogataj entitled "Podnebne spremembe in prihodnost Slovenije" (Climate Change and the Future of Slovenia) within Discussions on the Future of Slovenia with the President of the Republic of Slovenia, 18.11.2005. The paper is accessible at http://www.prihodnost-slovenije.si/up-rs/ps.nsf/krf/61945F3137873F3AC12570BD002FB45A?OpenDocument

8.2 Education

Responsibilities and powers relating to the development and operation of an education and training system have been allocated to the Ministry of Education and Sport (MŠŠ), local communities (municipalities), expert panels appointed by the Government, and institutions established to develop and provide advice on education (Slovenian Education Institute, Slovenian Vocational Education Centre, Slovenian Adult Education Centre, and the State Examination Centre).

In recent years Slovenia carried out a curriculum review, which led to a special emphasis being placed on environmental education and study at all levels of education within the national curriculum.

Environmental education is part of the elementary school programme, including interdisciplinary work implemented within general education subjects and in the final three-year cycle as a selective subject. It also features in daily activities (especially in relation to natural sciences), field trips and extra-curricular activities, and within various projects that schools can join independently (e.g. eco-schools, UNESCO-schools, healthy schools) and within young-researcher activities. Environmental education is included in the curriculum of *gimnazije* (academic high schools), within natural science subjects, geography, and sociology and as part of the compulsory content of the selective subject Environmental Studies. The syllabus for this selective subject is planned to enable high school pupils to find out about new content and to link it to content they study in other subjects. The basic message of the subject is that environmental problems do not just require technical or technological solutions, but urgently requires a change in behaviour. In professional and vocation education, environment studies are part of the general education system in the natural science subject, and other general subjects in secondary professional education, professional theoretical subjects and practical education, as well as in interest group activities, and extra-curricular activities. Teaching work is based on providing a wide overview of the problem across different content areas. Learning is based on acquiring skills and practical applying knowledge, including content relating to specific professions and the development of sensitivity to environmental threats in the professional sphere. Gimnazije and the professional and vocational schools are independently included in various projects (e.g. the healthy schools and eco-schools projects) and in young-research projects. Since 2002 the MŠŠ has been implementing a programme known as “Hidden Treasure,” which is used to encourage innovative and developmental activities in kindergartens, elementary and secondary schools at the national and international level, with environmental education one of the central thematic areas.

The “Eco-School as a Way of Life” project is part of the European Eco-Schools project, which 21 countries participate in. “Eco-School as a Way of Life” includes comprehensively planned environmental education in kindergarten and elementary and secondary schools. According to data from the 2003/2004 academic year, 210 kindergartens, elementary and secondary schools and other educational centres were involved in the project. A school that successfully passes the seven prescribed steps and achieves visible results in improving their own environment is awarded an eco-flag. To date 159 institutions have received the award. The project promotes environmental protection cooperation between schools in Slovenia and abroad. Since 1993 Slovenia has been cooperating in the European Healthy Schools Network. Twelve Slovenian schools are included in the European

network, while 130 are involved in the Slovenian Healthy Schools Network. Schools that promote health have undertaken to actively contribute to creating a health-friendly environment. They change the way they function in a manner that has a positive impact on the health and life of school pupils, teachers and parents. The third project that Slovenian schools are involved in is the UNESCO schools project (ASPNet – Associated Schools Project Network). UNESCO schools are committed to four basic themes, one of which is "environmental problems". The "environmental problems theme" allows pupils to link international issues affecting the global environment to their local or national situation. Activities in this field include studying environmental pollution, energy use, preservation of forests, ocean and atmosphere research, erosion and preservation of natural resources, impact of global warming, sustainable development, and Agenda 21 etc. A total of 81 Slovenian schools participated in the project.

Teacher training is very important to the implementation of environmental education, which is a relatively new interdisciplinary field of study (natural and social science teachers), so the MŠŠ pays particularly attention to this within its annual seminar programme for continual professional training. The Slovenian Education Institute also issues the review "Okoljska vzgoja v šoli" (Environmental Education in School).

The MŠŠ formed a commission for Education and Sustainable Development, including members from the MŠŠ, as well as the MK, MDDSZ and MOP. According to the Strategy for Education for Sustainable Development of the United Nation's Economic and Social Council (Economic Commission for Europe) a Slovenian version of the strategy will be prepared.

The Nova Gorica Polytechnic offers an undergraduate course in the Environment within its Environmental Science School. The interdisciplinary university study programme on the Environment covers all major environmental subject areas, such as pollution of water, air and ground, ecotoxicology, health ecology, waste management, nature protection, environmental impact assessment, environmental economics and environmental law. It also includes education on specific segments of the environment and environmental protection within a range of different study streams within different subject areas that cover climate change, environmental protection, EEU and RES, and also includes an interdisciplinary approach (e.g. the connections between health and ecology, or management and ecology). Postgraduate studies directly related to the environment are offered at the Nova Gorica Polytechnic, in the form of an interdisciplinary and research-oriented study programme entitled Environment Science, and also at the University of Ljubljana within the university postgraduate study programme Environment Protection. The studies are organised to ensure that it provides as wide an overview of the environmental protection issue as possible.

8.3 Public Information and Awareness

The Ministry of the Environment and Spatial Planning (MOP) plays the most important role in public information and awareness relating to climate change. Below is a presentation of activities by the Ministry and ARSO over the period 2003 to 2005:

- the professional consultation The Issue of Climate Change and Medium and Long-Term Strategies and Objectives in Reducing Greenhouse Gas Emissions (MOP) and consultation Climate Change and It Importance for Europe Waters (MOP);
- publication: Kazalci okolja/Environmental Indicators (ARSO), Dan podnebnih sprememb / Climate Change Day leaflet (ARSO), Environmental collection Flupi in voda, Flupi in zrak[43] (MOP), Vzemite manj, imejte več, Zbirka namigov za neškodljivo življenje (Take Less, Get More – Tips on Less Harmful Living) (MOP);
- bulletin: ARSO monthly bulletin (containing reviews of monthly data on meteorology, agrometeorology, hydrology, air pollution and water course and underground water quality)(ARSO), Učinkovito z energijo/Energy Efficiency (information on innovative legislation in EEU and RES, presenting current tenders for financial initiatives and co-financing for EEU and RES measures, and presentation of different EEU and RES projects, events and news)(EEU and RES Sector, MOP), Okolje in prostor/The Environment and Spatial Planning (presents current environmental themes) (MOP)
- internet: www.arso.gov.si (meteorological data, climatological data, publications), http://eionet-si.arso.gov.si/Dokumenti/GIS/zrak and http://eionet-si.arso.gov.si/kazalci/index_html?Sku_naziv=UVOD&tip_skup=1&Sku_id=12 (data and information used to assess air quality, the impact of climate change, defining efficiency indicators for implementing environmental policy, and for the purposes of international data exchange based on ratified international agreements, protocols, and EU legislative obligations), www.aure.si (EEU and RES based web portal – online energy library, information on tenders, events, etc.), www.gov.si/mop (Ministry of the Environment and Spatial Planning website)
- events: European Mobility Week and European Car Free Day (The objective of the initiative is to inform the public of the consequences of excess use of cars and road transport in general, and changes in mobility habits; the event included: two consultations (Use of Electric Vehicles in Personal and Public Transport and Sustainable Transport Policy in Slovenia), a workshop (Integration of European and National Transport Policy and promoting environmentally friendly forms of transport) and a round table (Biodiesel in Slovenia: Challenges and Opportunities).

The MOP and its EEU and RES Sector also issued tenders for co-financing for projects to promote environmental protection and spatial planning, to co-finance information, awareness-raising and promotional activities for EEU and RES and co-financing activities by environmental non-governmental organisations.

NGOs have an important role to play in public information and awareness. Mention should be made of two of the most active: Fokus[44] (Sustainable Development project; Spreminjam navade, ne pa podnebja /Change Your Habits, Not the Climate (web portal on climate change: http://www.focus-ngo.org/index.php?node=15; Preventing Waste Generation; Renewable Energy Sources for Local Communities (web portal on renewable sources of energy: http://www.prihodnostjeobnovljva.

[43] The Flupi collection is aimed at children aged 3 to 10 years and includes manuals for teachers, environmental games, puppets, posters and stickers for children.

[44] www.focus-ngo.org/index.php

org/); Environmental Centre; Environmentally and Society Friendly Mobility); and E-forum[45] (REALISE (Renewable Energy and Liberalisation in Selected Electricity Markets) – Forum; PRIME (Private Investments Move Ecopower); CLARITY - Climate Action Reaching and Teaching the Young; Smo res čez les, če kurimo les (We're Silly, If We're Burning Wood); Reševanje podnebja za mularijo (Climate Protection for Kids); Promocija sodobnih tehnologij priprave in energetske izrabe lesne biomase (Promoting Modern Technologies and Energy Use of Wood Biomass); Promocija energetske izrabe bioplina (Promotion Energy Use of Biogas); Celostni sistem motiviranja za ravnanje z energijo v osnovnih šolah ljubljanske regije (Overall Motivation System for Energy Management in Ljubljana Elementary Schools)). Cycling societies and organisations also have a visible role in promoting cycle use, actively cooperating in the expansion and improvement of cycle routes, etc.

8.4 Consulting

Since 1993 Slovenia operates a network of consultancy offices within the ENSVET project. In 2004 the network was expanded to include 33 offices in all larger Slovenian towns, with 48 certified energy consultants working in them. The consultancy offices offer free, professional advice on EEU and RES in buildings and possibilities of acquiring cash subsidies. The project is financed by the European Affairs and Investments Directorate (MOP). In 2003 a total of 4500 consultations were held with citizens, while the consultants also prepared over 200 professional articles, participation in radio programmes, etc. Heat insulation for buildings is undoubtedly one of the dominant themes. On the office network's 10 year anniversary an analysis was carried out of the impact of consultation services, based on feedback from the public. Implementing the measures proposed in the consultancy offices has contributed to reducing annual final energy or fuel use by 19 %. A large amount of information and publications is available on their website at: www.gi-zrmk.si/ensvet.htm.

Consulting and education also takes place at the biennial Energetika (Energy) fair, which is aimed at foreign and domestic experts in the energy sector, and the general public seeking information on installations (electrical, water, air conditioning, gas and central heating) and product and service users in the energy sector. Furthermore, various institutions organise exhibitions of products and thematic presentations in collaboration with manufacturers, e.g. the Construction Centre within the Institute for Material and Structure Research (ZRMK) Construction Institute prepared a range of thematic events including exhibiting products, public lectures, consultancy and information on credits and subsidies and specialist workshops on insulation and renovation of roofs and facades, and ventilation, cooling and heating homes, and roofs and roofing. The EEU and RES Sector organises presentation of modern preparations and use of timber as fuel, within the GEF project, LesEnDemo.

There is a large number of websites offering information and advice on EEU and RES and climate change. It is worth mentioning the website energetika.net, which is a hub for information on current events (seminars, tenders, subsidies), publications on EEU and RES and current energy-related news.

A large number of seminars, workshops and conferences have also been organised including annual events, such

[45] www.ljudmila.org/sef/index.html

as: Energy Days, aimed at a wide group of experts and covering the following subject areas: environmental and energy legislation, the energy market, GHG emissions, energy in buildings, EEU and IPPC environmental permits, contractual reductions in energy costs, energy management in practice. Awards for Energy Efficient Company of the Year and Energy Efficiency Project of the Year were presented at the meetings; the international consultation Komunalna energetika (Municipal Energy), covering the following themes: RES, cogeneration, and EEU; Transport; Reliable Energy Supply; Energy Appliances and Devices; IT in Energy, and Municipal Services. The following were organised in 2005: specialist consultation on buildings, energy and environment; seminar on Photovoltaic systems – from Regulations to Use in Practice; seminar on resources and technologies to acquire green energy; Future of Energy conference; international conference on Renewable Energy Sources in South-East Europe until 2020; conference on Economics of Biomass Use for Energy Purposes in Slovenia; Energy Saving in Transport.

The EEU and RES Sector organises training on small wood-biomass fuelled boilers, within the GEF – biomass project. Training has been organised for project designers, installation engineers, heating service engineers and consultants on use of wood biomass as fuel. Training was also provided on the use of solar energy and photovoltaic systems within the ALTENER project.

8.5 Non-Governmental Organisations

Although around 110 environmental non-governmental organisations (NGO/NVO) operate in Slovenia (around 60% at the local level), only a small number focus in detail on climate and / or related themes (energy, transport, agriculture, etc.). Slovenia does not have a single NGO that focuses on the climate only. The climate subject is often of little interest to NGOs as it is a very complex area that is difficult to present to the general public, and it is harder still to make concrete steps in this sector. NGOs that deal at least in part with the climate are usually oriented towards sustainable development, and very occasionally towards environmental protection. Some environment protection organisations even consider some measures to reduce GHG emission (increasing the proportion of renewable energy sources) as a threat to preserving biodiversity.

NGOs that systematically address the climate issue include Slovenski E Forum, Fokus (association for sustainable development), and Umanotera (The Slovenian Foundation for Sustainable Development). Other organisations cover the sector with individual events and campaigns, but do not have a continual approach to the subject. NGOs usually offer information and awareness work, provide education and training, monitoring and holding governmental and commercial institutions accountable, doing field work and collecting and publishing environmental information, and promoting cases of good practice.

The Government NGO Cooperation Strategy includes a cooperation programme involving both sides, though in practice this is limited to periodic contributions and comments from NGOs on programmes, policies or measures in preparation. The Government used this document to emphasise the importance of NGOs and establishing a lasting foundation for resolving problems appearing in their work and development. Nevertheless, more effort is needed to realise the strategy, as within the economy at large NGOs play a very marginal role in relation to the climate. It is important to point out that NGOs have two representatives on the Slovenian Climate Change Committee, and that an NGO representative was part of the national delegation at recent negotiations in Montreal, which is an indication that the role and status of NGOs are improving in the climate change sector.

Alongside the Strategy, a programme called Partnerstvo za okolje (Environmental Partnership) has also been set up between the Ministry of the Environment and Spatial Planning to promote creative cooperation in resolving environmental issues, though this has not yet taken off in practice.

NGOs meet a range of financial and personnel problems in their operations. The Government does provide incentives for some climate-related NGO activities, but not on a project basis. There is no financing programme available, which is the reason NGO actions are periodic and un-coordinated. Given that NGOs support the implementation of most of Article 6 of the Convention and assist the state in meeting its obligations arising from Point 1i from Article 4 of the Convention, it should be in the interest of the state to provide more support for NGO operations in this sector, and to involve them more in creating and implementing climate policies, programmes and measures. To date most NGO activities were co-financed by foreign foundations and programmes, and their withdrawal has not been adequately replaced by increased budget funding. This means that existing NGO activity, which itself is not on a very large scale, is threatened with stagnation.

Appendix A: Abbreviations and Units of Measurement

Abbreviations

AC	Motorway
AGEN-RS	Energy Agency of the Republic of Slovenia
ALTENER	EU programme that exclusively promotes renewable en ergy sources ALTENER was concluded in 1997, ALTENER II in 2002.
ARSO	Environmental Agency of the Republic of Slovenia
ARRS	Slovenian Research Agency
AURE	Agency of the Republic of Slovenia for Renewable Energy Sources and Efficient Energy Use
BAT	Best Available Techniques
BČN	Biological waste water treatment plant
BDP	Gross Domestic Product
BIOO	Bio-degradable municipal waste
BREF	BAT reference document
CFC	Chlorofluorocarbons
CH_4	Methane
CLARITY	Climate Action Reaching and Teaching the Young
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CO	Carbon monoxide
COGEN	Association for the Promotion of Cogeneration
COP	Conference of the Parties (to the United Nations Frame work Convention on Climate Change)
CORINAIR	Coordination d'information enviromentale project partiel air
COST	European Co–operation in the field of Scientific and Tech nical Research
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2 eq.	CO_2 equivalent (greenhouse gas emissions expressed in a common unit; calculations are based on the global warming potential (GWP) of specific gases prepared by the IPCC. The following values must be used in line with UN FCCC instructions to prepare national reports and green house gas emission inventories: GWPCO2 1, GWPCH4 21, GWPN2O 310, GWPHFC134a 3800, GWPCF4 6500, GW PC2F6 9200
CRF	Common Reporting Format
DOLB	Wood biomass district heating system
DSM	Demand Side Management – Execution of EEU programmes for consumers by energy supply companies
EIMV	Milan Vidmar Electrical Power Research Institute

EIE	Intelligent Energy for Europe programme
EMAS	Environmental Management Audit Scheme
EMEP	European Monitoring and Evaluation Programme
ENSVET	Citizens' energy advice
EPBD	European Directive on Energy Performance of Buildings (2002/91/EC)
ERM-2	European Exchange Rate Mechanism
EU	European Union
EUREKA	Europe-wide network for industrial research and development
F–Gases	Hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF6)
FEC	Final Energy Consumption
FOD	First order decay method for calculating CH4 emissions from waste
GAW	Global Atmosphere Watch
GCM	Global Circulation Model, see also MSC
GCOS	Global Climate Observing System
GDP	Gross Domestic Product, see also BDP
GEF	Global Environment Facility
GHG	Greenhouse gases, see also TGP
GPCC	Global Precipitation Climatology Centre
GPG 2000	Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, IPCC 2000
GTN–G	Global Terrestrial Network–Glaciers
GZS	Slovenian Chamber of Commerce and Industry
HC	Highway / high-speed road
HE	Hydro power plant
HFC	Hydrofluorocarbons
HSE	Holding Slovenske elektrarne – Slovenian Power Plants Holding company
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
JE	Nuclear power plants
MAP	Mesoscale Alpine Programme
MAMA	Mediterranean network to Assess and upgrade Monitoring and forecasting Activity in the region
MBP	Marine Biology Station
MedGOOS	Mediterranean Global Ocean Observing System
MF	Ministry of Finance
MFSTEP	Mediterranean Forecasting System Toward Environmental Predictions
MG	Ministry of the Economy
mHE	Small hydro power plant
MK	Ministry of Culture
MKGP	Ministry of Agriculture, Forestry and Food

MOP	Ministry of the Environment and Spatial Planning
MVZT	Ministry of Higher Education, Science and Technology
MzP	Ministry of Transport
MSC	Global circulation model – see GCM
MŠŠ	Ministry of Education and Sport
NEK	Krško Nuclear Power Plant
NEP	National Energy Programme
NH_3	Ammonium hydroxide
NIB	National Institute of Biology
NMVOC	Non Methane Volatile Organic Compounds
NO_x	Nitrogen oxides
NVO	Nongovernmental organisations, i.e. NGOs
N_2O	Nitrous oxide
OVE	Renewable energy sources, i.e. RES
OP-TGP	The Action Plan for Reducing GHG Emissions (July 2004)
OPET	Organisations for the Promotion of Energy Technologies
OZN	United Nations Organisation, i.e. UN
PAH	Polycyclic aromatic hydrocarbons
PFC	Perfluorocarbons (CF_4 and C_2F_6)
PM	Dust particles
POP	Population
POPs	Persistent organic pollutants
REALISE	Renewable Energy and Liberalisation in Selected Electricity markets
RECS	Renewable Energy Certificate System
ReNEP	Resolution on the National Energy Programme (OGRS, No 57/2004)
ReNPVO	Resolution on the National Energy Programme (OGRS, No 2/2006)
RRD	Research and Development
RS	Republic of Slovenia
SAVE	EU energy efficiency programme
SEP	Central European Initiative, i.e. – CEI
SF_6	Sulphur hexafluoride
SKOP	Slovenian Agricultural-Environmental Programme (SAEP)
SLEG	Statistical Yearbook of Energy Economics
SMO	World Meteorological Organization, see also WMO
SO_2	Sulphur dioxide
SURS	Statistical Office of the Republic of Slovenia
TE	Thermo power plants
TE–TOL	Ljubljana heat and power plant
TEŠ	Šoštanj thermo power plant
TET	Trbovlje thermo power plant
TGP	Greenhouse gases, see also GHG
TOE	Tonne of oil equivalent
TPES	Total Primary Energy Supply

UMAR	Institute of Macroeconomic Analysis and Development (aka IMAR)
URE	Energy efficiency
WGMS	World Glacier Monitoring Service
WMO	World Meteorological Organization
WCRP	World Climate Research Programme
WWW	World Weather Watch
ZN	United Nations - UN
ZRC-SAZU	Scientific Research Centre of the Slovenian Academy of Sciences and Arts (SRC SASA)
ZRMK	Institute for Material and Structure Research

Units of Measurement and Exchange Rate

k...	kilo (10^3)
M...	Mega (10^6)
G...	Giga (10^9)
T...	Tera (10^{12})
P...	Peta (10^{15})
g	gram
t	tonne
J	joule
ha	hectare
.../a	per annum

Appendix B: Greenhouse Gas Emission Inventories for 1986 and 1990–2003

Table B-1: CO_2 Emissions for 1986 and the period 1990–2003 (CRF Table 10s1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
1. Energy	14,929.89	13,547.55	12,679.90	12,702.47	13,322.71	13,110.58	13,959.73	14,764.46	15,202.33	14,956.20	14,298.69	14,362.67	15,306.60	15,383.57	15,131.85
A. Fuel combustion (by sector)	14,929.89	13,547.55	12,679.90	12,682.67	13,307.19	13,094.48	13,929.73	14,734.66	15,168.53	14,928.06	14,263.74	14,325.95	15,246.24	15,325.46	15,062.09
1. Energy supply	6,700.55	6,238.48	5,321.23	5,840.03	5,762.00	5,230.32	5,564.41	5,284.44	5,680.78	5,919.28	5,213.47	5,487.78	6,233.14	6,403.62	6,159.86
2. Manufacturing Industries and Construction	4,119.36	3,025.93	2,912.30	2,549.64	2,364.29	2,467.70	2,473.45	2,361.11	2,257.06	2,327.54	2,334.35	2,299.58	2,254.72	2,291.55	2,216.44
3. Transport	1,970.94	2,660.38	2,514.02	2,589.57	2,990.14	3,297.69	3,624.50	4,199.26	4,267.53	3,687.13	3,507.39	3,653.30	3,786.21	3,799.98	3,940.63
4. Other Sectors	2,139.04	1,622.75	1,932.35	1,703.42	2,190.76	2,098.77	2,267.38	2,889.85	2,963.17	2,994.11	3,208.52	2,885.29	2,972.17	2,830.30	2,745.15
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions	0.00	0.00	0.00	19.80	15.51	16.10	30.00	29.80	33.80	28.15	34.96	36.72	60.36	58.11	69.76
1. Solid fuel	0.00	0.00	0.00	19.80	15.51	16.10	30.00	29.80	33.80	28.15	34.96	36.72	60.36	58.11	69.76
2. Liquid and gas fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Industrial Processes	1,019.00	1,041.36	877.69	783.53	649.25	800.85	796.22	802.44	814.67	809.55	821.47	840.16	879.64	871.39	934.31
A. Mineral products	778.08	711.15	594.26	515.07	415.18	532.69	549.18	570.35	588.22	602.43	603.09	606.75	630.54	559.87	571.12
B. Chemical industry	53.73	45.50	35.97	29.88	28.32	38.03	36.26	36.36	41.75	44.92	45.38	47.83	57.58	55.90	63.98
C. Metal production	187.19	284.71	247.46	238.58	205.75	230.13	210.78	195.72	184.70	162.20	173.00	185.59	191.53	255.62	299.22
D. Other Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
E. HFC and SF_6 production															
F. HFC and SF_6 consumption															
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Solvent and Other Product Use	46.19	37.58	34.05	33.13	30.95	33.12	30.60	34.42	34.51	35.45	35.11	36.38	36.53	36.70	37.06
4. Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Enteric fermentation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Manure management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. Rice cultivation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Agricultural land	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Prescribed burning of savannas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F. Field burning of agricultural residues	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table B-1: Continued CO_2 Emissions for 1986 and the period 1990–2003 (CRF Table 10s1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
5. Land-Use, Land-Use Change and Forestry	-2,950.39	-4,338.58	-4,751.08	-5,088.42	-5,174.58	-5,332.25	-5,675.08	-5,561.42	-5,561.42	-5,561.42	-5,561.42	-5,561.42	-5,561.42	-5,561.42	-5,561.42
A. Changes in forest and other wood biomass stocks	-1,631.30	-3,039.67	-3,452.17	-3,789.50	-3,879.33	-4,037.00	-4,398.17	-4,284.50	-4,284.50	-4,284.50	-4,284.50	-4,284.50	-4,284.50	-4,284.50	-4,284.50
B. Forest and meadow conversion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. Set aside of arable land	-223.67	-220.00	-220.00	-220.00	-216.33	-216.33	-216.33	-216.33	-216.33	-216.33	-216.33	-216.33	-216.33	-216.33	-216.33
D. CO_2 emissions and sinks from soil	-1,095.42	-1,078.92	-1,078.92	-1,078.92	-1,078.92	-1,078.92	-1,060.58	-1,060.58	-1,060.58	-1,060.58	-1,060.58	-1,060.58	-1,060.58	-1,060.58	-1,060.58
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0..00	0.00	0.00	0.00	0.00	0.00
6. Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Solid waste disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Waste water management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. Waste incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Emissions/Removals with LUCF	13,044.68	10,287.91	8,840.55	8,430.72	8,828.32	8,612.29	9,111.47	10,039.90	10,490.09	10,239.79	9,593.86	9,677.80	10,661.36	10,730.24	10,541.80
Total Emissions without LUCF	15,995.07	14,626.49	13,591.64	13,519.13	14,002.90	13,944.54	14,786.55	15,601.32	16,051.51	15,801.20	15,155.27	15,239.22	16,222.77	16,291.66	16,103.22
Memo items															
Fuels in international transportation	97.49	79.26	27.54	34.27	48.35	53.86	57.53	53.28	56.23	51.76	61.80	71.09	80.27	82.64	79.02
Aviation	97.49	79.26	27.54	34.27	48.35	53.86	57.53	53.28	56.23	51.76	61.80	71.09	80.27	82.64	79.02
Maritime transportation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO_2 emissions from biomass	2,253.74	2,087.74	2,030.14	2,040.96	2,028.15	2,055.19	2,028.95	2,072.08	2,103.24	2,122.57	1,802.12	1,877.43	1,831.84	1,864.64	1,978,88

Table B-2: CH_4 Emissions for 1986 and the period 1990–2003 (CRF Table 10s2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
Total emissions	107.02	103.48	98.75	102.23	97.60	97.14	96.59	93.65	94.17	94.97	95.34	97.19	93.78	95.74	93.99
1. Energy	26.61	22.07	21.32	22.17	20.92	20.12	20.36	19.87	20.58	20.15	19.07	18.83	17.34	18.78	19.14
A. Fuel combustion (by sector)	8.31	7.07	7.32	7.04	7.01	6.81	6.77	6.87	6.65	6.40	6.19	6.16	5.57	5.55	5.56
1. Energy supply	0.09	0.09	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.07	0.06	0.06	0.07	0.07	0.07
2. Manufacturing Industries and Construction	0.50	0.38	0.31	0.28	0.27	0.26	0.26	0.27	0.29	0.30	0.21	0.23	0.28	0.30	0.33
3. Transportation	0.51	0.70	0.69	0.76	0.91	0.97	1.01	1.09	0.96	0.72	0.59	0.63	0.65	0.64	0.64
4. Other Sectors	7.21	5.90	6.24	5.93	5.75	5.51	5.42	5.44	5.35	5.30	5.33	5.24	4.58	4.54	4.52
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions	18.30	15.00	14.00	15.13	13.91	13.31	13.59	13.00	13.93	13.75	12.88	12.67	11.77	13.23	13.59
1. Solid fuel	17.09	14.42	13.45	14.57	13.38	12.77	12.96	12.37	13.26	13.11	12.23	12.01	11.08	12.56	12.94
2. Liquid and gas fuels	1.21	0.58	0.55	0.55	0.54	0.54	0.63	0.63	0.67	0.64	0.66	0.66	0.69	0.67	0.64
2. Industrial Processes	0.18	0.16	0.17	0.01	0.03	0.12	0.19	0.16	0.25	0.26	0.27	0.26	0.28	0.24	0.30
A. Mineral products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Chemical industry	0.18	0.16	0.17	0.01	0.03	0.12	0.19	0.16	0.25	0.26	0.27	0.26	0.28	0.24	0.30
C. Metal production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. HFC and SF6 production															
F. HFC and SF6 consumption															
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Solvent and Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Agriculture	48.45	47.67	44.06	47.38	44.28	44.51	43.76	41.38	39.71	40.19	40.90	42.25	40.14	40.54	38.53
A. Enteric fermentation	36.11	34.71	31.98	34.70	32.06	32.29	33.87	32.13	30.28	30.71	31.61	33.10	32.30	32.54	30.96
B. Manure management	12.34	12.96	12.08	12.69	12.22	12.22	9.89	9.25	9.43	9.49	9.29	9.15	7.84	7.99	7.58
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural land	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table B-2: Continued: CH_4 Emissions for 1986 and the period 1990–2003 (CRF Table 10s2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
5. Land-Use Change and Forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Changes in forest and other wood biomass stocks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Forest and meadow conversion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. Set aside of arable land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. CO_2 emissions and sinks from soil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6. Waste	31.78	33.57	33.19	32.67	32.37	32.38	32.29	32.24	33.62	34.37	35.10	35.86	36.02	36.18	36.01
A. Solid waste disposal	21.84	24.40	24.67	24.93	25.19	25.45	25.39	25.43	25.92	26.42	26.95	27.50	27.85	27.89	27.81
B. Waste water management	9.94	9.17	8.52	7.73	7.17	6.93	6.90	6.81	7.71	7.95	8.15	8.36	8.17	8.29	8.20
C. Waste incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Memo items															
Fuels in international transportation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maritime transportation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO_2 emissions from biomass															

Table B-3: N_2O Emissions for 1986 and the period 1990–2003 (CRF Table 10s3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986 (Gg)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total emissions	5.35	4.84	4.42	4.93	4.53	4.58	4.65	4.62	4.65	4.71	4.88	4.94	4.91	4.98	4.85
1. Energy	0.54	0.47	0.45	0.42	0.42	0.48	0.54	0.61	0.63	0.65	0.69	0.73	0.78	0.81	0.82
A. Fuel combustion (by sector)	0.54	0.47	0.45	0.42	0.42	0.48	0.54	0.61	0.63	0.65	0.69	0.73	0.78	0.81	0.82
1. Energy supply	0.09	0.08	0.07	0.08	0.08	0.07	0.08	0.07	0.08	0.08	0.07	0.07	0.08	0.09	0.09
2. Manufacturing Industries and Construction	0.13	0.08	0.07	0.06	0.06	0.06	0.07	0.08	0.08	0.09	0.06	0.08	0.08	0.07	0.07
3. Transportation	0.08	0.11	0.10	0.09	0.10	0.15	0.21	0.29	0.30	0.31	0.38	0.40	0.45	0.49	0.50
4. Other Sectors	0.24	0.20	0.21	0.19	0.18	0.19	0.17	0.17	0.17	0.18	0.18	0.17	0.17	0.16	0.16
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1. Solid fuel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Liquid and gas fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Mineral products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Chemical industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. Metal production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. HFC and SF_6 production															
F. HFC and SF_6 consumption															
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Solvent and Other Product Use	0.26	0.14	0.12	0.09	0.06	0.06	0.06	0.06	0.06	0.05	0.19	0.14	0.12	0.12	0.11
4. Agriculture	4.35	4.04	3.67	4.27	3.89	3.87	3.88	3.76	3.78	3.83	3.80	3.89	3.83	3.87	3.73
A. Enteric fermentation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Manure management	1.21	1.16	1.05	1.10	0.98	0.94	0.94	0.89	0.86	0.84	0.82	0.82	0.81	0.82	0.78
C. Rice cultivation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Agricultural land	3.14	2.89	2.63	3.18	2.91	2.94	2.94	2.87	2.91	2.98	2.98	3.06	3.02	3.05	2.95
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table B-3: Continued: N_2O Emissions for 1986 and the period 1990–2003 (CRF Table 10s3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
5. Land Use, Land-Use Change and Forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. A. Changes in forest and other wood biomass stocks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Forest and meadow conversion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. Set aside of arable land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. CO_2 emissions and sinks from soil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6. Waste	0.19	0.19	0.18	0.14	0.16	0.17	0.18	0.19	0.18	0.18	0.20	0.19	0.19	0.19	0.19
A. Solid waste disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Waste water management	0.19	0.19	0.18	0.14	0.16	0.17	0.18	0.19	0.18	0.18	0.20	0.19	0.19	0.19	0.19
C. Waste incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Memo items															
Fuels in international transportation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maritime transportation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO_2 emissions from biomass															

Table B-4: Emissions of halogenated hydrocarbons (HFCs, PFCs and SF_6) for 1986 and the period 1990–2003 (CRF Table 10s4)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
HFC emissions - CO_2 equivalent (Gg)	0.00	0.00	0.00	0.00	0.00	0.00	30.65	30.27	37.60	33.92	34.06	44.68	55.74	69.19	83.47
HFC-23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-32	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-43-10mee	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-134	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-134a	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0236	0.0233	0.0289	0.0261	0.0262	0.0344	0.0429	0.0532	0.0642
HFC-152a	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-143	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-143a	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-227ea	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-236fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-245ca	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PFC emissions - CO_2 equivalent (Gg)	276.29	257.44	302.58	243.02	251.14	281.60	285.68	239.53	194.41	149.30	105.61	105.61	105.61	116.44	118.99
CF_4	0.0372	0.0347	0.0408	0.0328	0.0338	0.0380	0.0385	0.0323	0.0262	0.0201	0.0140	0.0140	0.0140	0.0155	0.0159
C_2F_6	0.0037	0.0035	0.0041	0.0033	0.0034	0.0038	0.0039	0.0032	0.0026	0.0020	0.0016	0.0016	0.0016	0.0017	0.0017
C_3F_8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C_4F_{10}	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$c\text{-}C_4F_8$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C_5F_{12}	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C_6F_{14}	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SF_6 emissions - CO_2 equivalent (Gg)	7.17	7.17	7.17	7.17	7.17	7.17	25.33	21.51	21.03	21.03	21.03	21.03	21.03	21.03	21.03
SF_6	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0011	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009

Table B-5: GHG emissions in CO_2 equivalents for 1986 and the period 1990–2003 (CRF Table 10s5)

GREENHOUSE GAS EMISSIONS	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	CO_2 equivalent (Gg)														
Net CO_2 emissions/removals	13,045	10,288	8,841	8,431	8,828	8,612	9,111	10,040	10,490	10,240	9,594	9,678	10,661	10,730	10,542
CO_2 emissions (without LUCF)	15,995	14,626	13,592	13,519	14,003	13,945	14,787	15,601	16,052	15,801	15,155	15,239	16,223	16,292	16,103
CH_4	2,247	2,173	2,074	2,147	2,050	2,040	2,028	1,967	1,978	1,994	2,002	2,041	1,969	2,011	1,974
N_2O	1,659	1,502	1,372	1,528	1,405	1,420	1,441	1,432	1,442	1,461	1,512	1,532	1,523	1,544	1,503
HFCs	0	0	0	0	0	0	31	30	38	34	34	45	56	69	83
PFCs	276	257	303	243	251	282	286	240	194	149	106	106	106	116	119
SF_6	7	7	7	7	7	7	25	22	21	21	21	21	21	21	21
Total (with net CO_2 emissions/removals)	17,235	14,227	12,596	12,356	12,541	12,361	12,923	13,730	14,162	13,899	13,269	13,422	14,336	14,491	14,242
Total (without CO_2 emissions from LUCF)	20,185	18,566	17,347	17,444	17,716	17,694	18,598	19,291	19,724	19,460	18,830	18,983	19,898	20,053	19,803

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	CO_2 equivalent (Gg)														
1. Energy	15,658	14,156	13,267	13,299	13,891	13,681	14,553	15,372	15,830	15,581	14,913	14,983	15,913	16,029	15,787
2. Industrial Processes	1,306	1,309	1,191	1,034	908	1,092	1,142	1,097	1,073	1,019	988	1,017	1,068	1,083	1,164
3. Solvent and Other Product Use	128	81	71	61	51	52	48	53	53	51	94	79	73	73	70
4. Agriculture	2,367	2,255	2,064	2,319	2,136	2,135	2,122	2,034	2,004	2,031	2,038	2,092	2,030	2,050	1,967
5. Land-Use Change and Forestry (LUCF)	-2,950	-4,339	-4,751	-5,088	-5,175	-5,332	-5,675	-5,561	-5,561	-5,561	-5,561	-5,561	-5,561	-5,561	-5,561
6. Waste	726	765	753	731	730	733	733	735	763	778	798	812	815	818	814
7. Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B-6: NO_x Emission for 1986 and 1990–2003

Sources of NO_x emissions	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Gg														
Total emissions	58.00	63.68	57.97	58.52	63.25	66.13	66.83	70.70	70.98	63.96	58.43	59.97	59.38	59.92	56.27
1. Energy	57.70	63.44	57.82	58.38	63.09	65.92	66.59	70.44	70.69	63.69	58.15	59.67	59.09	59.63	56.00
A. Fuel combustion (by sector)	57.70	63.44	57.82	58.38	63.09	65.92	66.59	70.44	70.69	63.69	58.15	59.67	59.09	59.63	56.00
1. Energy supply	19.70	17.06	14.52	16.86	16.59	15.99	16.52	16.30	16.30	16.99	15.11	15.34	16.38	17.35	16.52
2. Manufacturing Industries and Construction	5.80	4.63	4.33	3.13	3.04	3.43	2.90	2.61	3.36	3.13	3.23	3.71	3.57	3.98	3.89
3. Transport	30.70	40.21	37.41	37.13	41.69	44.58	45.13	48.87	48.25	40.75	36.74	36.67	35.09	34.39	31.98
4. Other Sectors	1.50	1.54	1.57	1.27	1.77	1.92	2.04	2.67	2.79	2.82	3.07	3.96	4.06	3.91	3.60
2. Industrial Processes	0.30	0.24	0.14	0.14	0.16	0.21	0.24	0.26	0.28	0.27	0.28	0.30	0.29	0.29	0.27
A. Mineral products	0.07	0.00	0.00	0.00	0.08	0.11	0.10	0.14	0.12	0.09	0.09	0.10	0.10	0.10	0.09
C. Metal production	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
D. Other Production	0.23	0.22	0.13	0.13	0.06	0.09	0.12	0.11	0.16	0.17	0.18	0.18	0.17	0.17	0.17

Table B-7: Carbon Monoxide Emission for 1986 and 1990–2003

Sources of CO emissions	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
Total emissions	78.82	93.85	78.79	89.57	97.82	102.82	101.52	105.23	102.83	87.36	80.29	109.11	103.28	103.11	96.76
1. Energy	77.90	80.57	67.04	78.50	87.22	92.85	91.43	95.39	92.82	77.32	70.21	99.01	93.21	89.09	80.78
A. Fuel combustion (by sector)	77.90	80.57	67.04	78.50	87.22	92.85	91.43	95.39	92.82	77.32	70.21	99.01	93.21	89.09	80.78
1. Energy supply	1.20	0.98	0.81	0.98	0.97	0.93	1.00	1.00	0.90	0.94	0.87	1.13	1.19	1.33	1.11
2. Manufacturing Industries and Construction	1.80	1.19	1.10	0.78	0.74	0.73	0.68	0.68	0.76	0.68	0.73	1.55	1.57	1.72	1.71
3. Transport	54.70	69.27	64.32	67.49	78.34	85.49	85.76	89.69	87.70	72.56	65.04	63.20	57.23	53.08	48.04
4. Other Sectors	20.20	9.13	0.81	9.25	7.18	5.70	3.99	4.01	3.45	3.14	3.57	33.14	33.22	32.96	29.91
2. Industrial Processes	0.92	13.28	11.75	11.08	10.60	9.98	10.09	9.85	10.01	10.04	10.09	10.10	10.07	14.02	15.98
A. Mineral products	0.03	0.00	0.00	0.00	0.03	0.04	0.04	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.04
C. Metal production	0.02	12.44	11.27	10.60	10.34	9.59	9.59	9.38	9.38	9.38	9.38	9.38	9.38	13.33	15.33
D. Other Production	0.87	0.84	0.48	0.48	0.23	0.34	0.45	0.41	0.59	0.63	0.68	0.68	0.65	0.65	0.62

Table B-8: NMVOC Emission for 1986 and 1990–2003

Sources of NMVOC emissions	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
Total emissions	55.83	44.20	40.64	40.44	42.55	45.49	46.21	49.83	50.47	45.95	44.52	56.34	54.66	54.48	51.86
1. Energy	35.46	26.52	24.77	25.37	28.54	30.57	30.91	32.96	32.59	27.72	25.23	35.38	33.61	32.79	30.23
A. Fuel combustion (by sector)	33.61	22.46	21.06	21.66	24.30	26.00	25.81	27.14	26.55	22.38	20.14	30.12	28.21	27.41	24.70
1. Energy supply	1.83	1.61	1.42	1.60	1.56	1.50	1.54	1.53	1.63	1.70	1.52	1.53	1.63	1.73	1.65
2. Manufacturing Industries and Construction	1.72	0.20	0.18	0.13	0.12	0.13	0.12	0.11	0.13	0.12	0.13	1.60	1.20	1.32	1.14
3. Transport	20.88	19.48	18.04	18.79	21.69	23.65	23.61	24.91	24.34	20.16	18.07	17.60	16.00	15.01	13.45
4. Other Sectors	9.17	1.17	1.42	1.14	0.92	0.71	0.54	0.58	0.45	0.40	0.42	9.40	9.38	9.36	8.46
B. Fugitive Emissions	1.85	4.06	3.71	3.71	4.24	4.57	5.10	5.82	6.04	5.34	5.09	5.26	5.40	5.38	5.54
2. Industrial Processes	5.89	5.90	5.20	4.68	4.31	4.54	5.71	6.08	7.06	7.11	8.28	9.56	9.60	10.19	10.01
A. Mineral products	0.80	0.68	0.55	0.61	0.68	0.87	0.82	1.02	1.57	1.60	1.74	1.69	1.35	1.36	0.94
B. Chemical industry	2.74	2.75	2.51	2.14	2.02	1.97	2.95	3.13	3.53	3.71	4.31	6.23	6.56	7.13	7.20
D. Other Production	2.35	2.47	2.15	1.93	1.61	1.70	1.94	1.93	1.96	1.80	2.23	1.64	1.69	1.69	1.87
3. Solvent and Other Product Use	14.48	11.78	10.67	10.39	9.70	10.38	9.59	10.79	10.82	11.11	11.01	11.40	11.45	11.51	11.62

Table B-9: Sulphur Dioxide Emission for 1986 and 1990–2003

Sources of SO_2 emissions	1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	(Gg)														
Total emissions	252.54	203.72	184.08	191.17	187.02	181.35	129.67	116.20	123.08	128.08	109.45	99.70	69.75	72.40	66.28
1. Energy	246.80	196.27	179.77	186.28	182.54	176.51	124.73	111.60	118.12	122.67	103.94	96.32	65.93	68.20	61.29
A. Fuel combustion (by sector)	246.80	196.27	179.77	186.28	182.54	176.51	124.73	111.60	118.12	122.67	103.94	96.32	65.93	68.20	68.20
1. Energy supply	172.90	153.72	134.02	152.83	148.56	145.09	105.05	96.45	104.25	111.91	90.54	83.78	53.12	57.61	51.10
2. Manufacturing Industries and Construction	41.00	21.05	18.78	14.73	13.12	12.88	8.28	5.78	6.01	4.05	6.65	6.42	6.77	6.46	6.24
3. Transport	3.00	3.80	3.54	3.15	3.33	3.41	2.13	2.30	2.43	2.16	1.98	2.10	2.23	0.62	0.66
4. Other Sectors	29.90	17.70	23.44	15.58	17.54	15.13	9.28	7.07	5.44	4.55	4.76	4.03	3.81	3.52	3.29
2. Industrial Processes	5.74	7.45	4.31	4.89	4.47	4.84	4.94	4.60	4.96	5.41	5.51	3.38	3.82	4.20	4.99
A. Mineral products	0.47	0.37	0.29	0.24	0.33	0.42	0.44	0.51	0.47	0.46	0.47	0.50	1.10	1.17	1.95
B. Chemical industry	4.14	4.14	1.71	2.44	2.28	2.54	2.47	2.16	2.33	2.75	2.77	0.58	0.48	0.33	0.34
C. Metal production	0.05	1.89	1.71	1.61	1.57	1.46	1.46	1.43	1.43	1.43	1.43	1.46	1.44	1.88	1.92
D. Other Production	1.08	1.05	0.60	0.60	0.29	0.42	0.57	0.52	0.73	0.78	0.85	0.85	0.81	0.81	0.78

Appendix C: Linking National Measures to reduce GHG Emissions to Comon European Policies and Measures

Table C-1: Presentation of implementation of EU Common and Coordinated Policies and Measures (CCPM)

CCPM	Implementation of measure in Slovenia	Remark
Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC	Environment Protection Act (OGRS, No 41/2004) Ordinance on the National Plan for the Allocation of Emission Coupons for 2005-2007 (OGRS, Nos 112/2004, 131/2004, 53/2005) Regulation on Detailed Method and Conditions for Establishing and Keeping the Emission Coupon Register (OGRS, No 56/2005) Rules on the General Operating Conditions for the Emission Coupon Register (OGRS, No 82/2005)	Amendments to the law, ordinance and regulation were made after the directive was adopted.
Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity	Excise Duty Act - official consolidated text /ZTro-UPB1/(OGRS, No 20/2004) Rules on the Implementation of the Excise Duty Act (OGRS, Nos 49/2004, 47/2005)	The Rules were adopted before the adoption of the directive. At their adoption they were harmonised with the requirements of the directive. The final adoption of the directive will be implemented in 2007, when the interim period for taxing electrical energy comes to an end.
Directive 2001/77/EC on the promotion of the electricity produced from renewable energy source in the internal electricity market and Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market	Energy Act (OGRS, No 79/99 (8/00 - corr.), 110/02, 50/03 CC. Dec.: U-I-250/00-14, 51/04)-official consolidated text (Official Gazette of the Republic of Slovenia, no 26/2005) Decree on the Rules for Determining Prices and Purchasing of electricity from Qualified Electricity Producers (OGRS, No 25/2002) Decree on the Conditions for Acquisition of the Status of Qualified Electricity Producer (OGRS, Nos 29/2001, 99/2001) Decision on Prices and Premiums for the Purchase of Electricity from Qualified Electricity Producers (OGRS, No 8/2004) Resolution on the National Energy Programme/ReNEP/ (OGRS, No 57/2004) Decree on the Issue of Certificate of Origin for Electricity (OGRS, no 121/2005)	The Energy Act has introduced a new term, qualified energy producer, thus setting the basis for stimulating the production of electricity from renewable energy sources and cogeneration even before the adoption of the directive. ReNEP sets the target of increasing the share of RES in the production of electrical energy to 33.6 % by 2010, and doubling the production of electricity from cogeneration by 2010.
Motor Challenge Programme (improving energy efficiency in motor-powered systems in industry)		IJS is the Slovenian representative in the DEXA-MCP project, launched in 2005.
Cooperation in the European Environmental Management and Certification System (EMAS), Regulation (EC) 761/2001.		The measure was adopted after the adoption of the CCPM.

Table C-1: Continued: Presentation of implementation of EU Common and Coordinated Policies and Measures (CCPM)

CCPM	Implementation of measure in Slovenia	Remark
Directive (2002/91/EC) on Energy Performance of Buildings	Rules on Heat Insulation and Efficient Energy Use in Buildings (OGRS, Nos 42/2002, 29/2004) Decree on the Manner, Subject of and Conditions for performing the Mandatory Public Utility of Measuring, Checking and Cleaning of Combustion Plants, Flue Ducts and Ventilation Devices for the Purposes of Environmental Protection and Efficient Energy Use, Human Health Protection and Fire Protection (OGRS, No 129/2004)	Action plan for transferring the directive into Slovenian law has been prepared. The directive calls for harmonising national regulations by 4 January 2006.
Energy labelling of household appliances	Order on Energy Labelling of Electric Refrigerators, Freezers, and Combinations Thereof (OGRS, Nos 104/2001, 64/2004) Rules on Energy Labelling of Household Electric Ovens (OGRS, No 89/2003) Rules on Energy Labelling of Household Air Conditioning Systems (OGRS, No 5/2004) Order on Energy Labelling of Household Dishwashers (OGRS, No 104/2001) Order on Energy Labelling of Household Lamps (OGRS, No 104/2001) Order on Energy Labelling of Household Washing Machines (OGRS, No 104/2001) Order on Energy Labelling of Household Electric Dryers (OGRS, No. 104/2001 (4/2002 - corr.)) Order on Energy Labelling of Household Combined Washer-Driers (OGRS, No 104/2001) Rules on Energy Labels for Certain Types of Household Appliances (OGRS, No 104/2001)	The measure was adopted after the adoption of the CCPM.
Directive 92/42/EEC on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels	Order on Efficiency Requirements for New Hot-Water Boilers Fired with Liquid or Gaseous Fuels (OGRS, Nos 107/2001, 20/2002)	The measure was adopted after the adoption of the CCPM.

Table C-1: Continued: Presentation of implementation of EU Common and Coordinated Policies and Measures (CCPM)

CCPM	Implementation of measure in Slovenia	Remark
Change in relations between forms of transport, particularly in favour of rail transport	Railway Transport Act /ZZelP/ (OGRS, Nos 92/1999, 11/2001, 33/2001, 110/2002, 110/2002, 56/2003, 29/2005 CC. Dec.: U-I-316/04-6) Decree on the Mode of Providing the Mandatory Public Utility of Inland Railway Passenger Transport (OGRS, No 12/01) Decree on the Qualification Criteria for Safety Certificate Acquisition and the Procedure for Issuing the Safety Certificate (OGRS, Nos 4/01 and 48/04) Instructions on the Contents of Separate Accounts to be kept by the Beneficiaries of State Grants for Railway Transport and the Account Keeping Method (OGRS, No 11/01) Decree on Combined Transport (OGRS, No 4/01) Decree on the Method of Providing the Mandatory Public Utility of Maintenance and Modernisation of Public Railway Infrastructure and the Operation of Control and Safety Systems (OGRS, No 29/01) Decree on the Allocation of Train Routes and User Fees for the Use of Public Railway Infrastructure (OGRS, No26/01) Decree amending the Decree on the Allocation of Train Routes and User Fees for the Use of Public Railway Infrastructure (OGRS, No 91/01) Decree on the Qualification Procedure for Licensing of Railway Undertakings, the Withdrawal or Extension of a Licence, and the Procedure for Notifying Foreign Licensing Authorities (OGRS, No 34/01)	Regulation (EC) 881/2004, and Directives 2004/49/EC, 2004/50/EC, and 2004/51/EC (Second Railway Package) will be transposed into Slovenian law within the deadlines required of member states. The deadline is 30 April 2006. Currently under preparation are the amendments of the Railway Transport Act and Safety of Railway Transport Act, and, consequently, implementing regulations.

Table C-1: Continued: Presentation of implementation of EU Common and Coordinated Policies and Measures (CCPM)

CCPM	Implementation of measure in Slovenia	Remark
Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport	Rules on the Content of Biofuels in Motor Vehicle Fuels (OGRS, Nos 83/2005 (108/2005-appr.)	The following objectives are written in the Rules: Annual average content of biofuel in all fuels placed on the market in the Republic of Slovenia for motor vehicles: – 2006: at least 1.2 % -2007: at least 2 % -2008: at least 3 % -2009: at least 4 % -2010: at least 5 %
	Resolution on the National Energy Programme/ReNEP/ (OGRS, No 57/2004)	The ReNEP lays down the targets for biodiesel fuel introduction (ensuring a 2 % biofuel share for transport by the end of 2005). In 2003, biofuels were exempt from excise duties.
	Excise Duty Act - official consolidated text /ZTro-UPB1/ (OGRS, No 20/2004)	
European Commission agreement with car manufacturers from the EU, Japan and Korea on reduction of CO_2 emissions from new vehicles to 140 g/km by 2008/2009		
Directive 1999/94/EC relating to the availability of consumer information on fuel economy and CO2 emissions in respect of the marketing of new passenger cars	Rules on Consumer Information on Fuel Economy and CO2 Emissions in respect of New Passenger Cars (OGRS, Nos 86/2003, 133/2003, 41/2004, 43/2004)	The measure was adopted after the adoption of the CCPM.
Regulation 1782/2003/EC establishing common rules for direct support schemes under the CAP and establishing certain support schemes for farmers	Regulation on Direct Payments for Producers of Certain Arable Crops (OGRS, Nos 10/2005, 48/2005)	The measure was adopted after the adoption of the CCPM.
	Decree on Direct Payments for Sheep and Goats (OGRS, Nos 10/2005, 21/2005)	
Regulation 1782/2003/EC establishing common rules for direct support schemes under the CAP and establishing certain support schemes for farmers	Rural Development Programme for the Republic of Slovenia 2004-2006 (OGRS, No 116/2004)	The measure was adopted after the adoption of the CCPM.
Directive 1999/31/EC on the landfill of waste	Rules on Waste Management (OGRS, Nos 84/1998, 45/2000, 20/2001, 13/2003, and 41/2004)	The measure was adopted after the adoption of the CCPM.

Appendix D: Parameters on Projections (pursuant to Commission Decision 2005/166/EC)

Table D-1: Parameters on Projections with Existing Measures and Additional Measures

				2005	2010	2015	2020
GENERAL ECONOMIC PARAMETERS							
GDP			MEUR[95]/a	21,412	25,618	28,700	31,837
POPULATION			[1000 inhab.]	1,985	1,980	1,975	1,964
INTERNATIONAL PRICES	COAL		EUR[95] / t	46.6	46.6	46.6	46.6
	OIL		EUR[95] / barrel	22.8	20.8	23.8	27.7
	GAS		EUR[95] / m^3	2.8	2.7	3.1	4.0
ENERGY							
with existing measures							
PRIMARY ENERGY	Liquid fuel		[PJ]	107.14	114.10	119.62	121.16
	Natural gas		[PJ]	40.45	48.89	52.73	61.15
	Coal		[PJ]	65.46	57.75	55.59	41.10
	RES		[PJ]	33.77	36.20	37.64	38.01
	Nuclear power		[PJ]	63.38	59.45	58.51	58.51
TOTAL ENERGY CONSUMPTION	TRANSFORMATIONS	Liquid fuel	[PJ]	1.34	1.12	2.51	2.88
		Natural gas	[PJ]	6.51	12.03	14.48	21.66
		Coal	[PJ]	61.61	53.70	51.78	37.42
		RES	[PJ]	15.67	18.23	20.12	21.00
		Nuclear power	[PJ]	63.38	59.45	58.51	58.51
FINAL ENERGY USE	INDUSTRY	Liquid fuel	[PJ]	7.67	7.85	7.18	6.84
		Natural gas	[PJ]	26.51	27.90	27.84	27.81
		Coal	[PJ]	3.27	3.57	3.45	3.45
		RESEARCH	[PJ]	3.14	3.21	3.13	3.09
		Electricity	[PJ]	22.45	22.08	22.17	22.51

Table D-1: Continued: Parameters on Projections with Existing Measures and Additional Measures

				2005	2010	2015	2020
	SERVICES	Liquid fuel	[PJ]	24.49	26.17	27.32	28.21
		Natural gas	[PJ]	4.20	5.24	6.14	6.89
		Coal	[PJ]	0.24	0.20	0.14	0.08
		RES	[PJ]	2.25	2.48	2.63	2.74
		Electricity	[PJ]	10.90	12.59	13.61	14.32
	HOUSEHOLDS	Liquid fuel	[PJ]	15.79	15.89	16.03	16.21
		Natural gas	[PJ]	3.22	3.73	4.27	4.79
		Coal	[PJ]	0.33	0.27	0.21	0.15
		RES	[PJ]	12.70	12.28	11.77	11.18
		Electricity	[PJ]	10.17	11.02	11.58	12.24
	TRANSPORT	Liquid fuel	[PJ]	57.84	63.07	66.59	67.02
		Coal	[PJ]	0.01	0.01	0.01	0.01
		RES	[PJ]	0.00	0.00	0.00	0.00
		Electricity	[PJ]	0.70	0.78	0.86	0.87
with additional measures							
PRIMARY ENERGY	Liquid fuel		[PJ]	105.43	105.89	107.87	107.99
	Natural gas		[PJ]	40.34	49.85	58.51	68.45
	Coal		[PJ]	65.15	53.95	51.81	36.90
	RES		[PJ]	35.72	43.38	46.25	47.89
	Nuclear power		[PJ]	63.38	59.45	58.51	58.51
TOTAL ENERGY CONSUMPTION	TRANSFORMATIONS	Liquid fuel	[PJ]	1.33	0.87	0.72	1.36
		Natural gas	[PJ]	6.99	14.39	22.09	31.31
		Coal	[PJ]	61.32	49.95	48.05	33.28
		RES	[PJ]	16.62	19.96	22.05	23.11
		Nuclear power	[PJ]	63.38	59.45	58.51	58.51

Table D-1: Continued: Parameters on Projections with Existing Measures and Additional Measures
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				2005	2010	2015	2020
FINAL ENERGY USE	INDUSTRY	Liquid fuel	[PJ]	7.54	7.68	6.98	6.64
		Natural gas	[PJ]	26.05	26.80	26.53	26.25
		Coal	[PJ]	3.25	3.53	3.41	3.40
		RES	[PJ]	3.19	3.29	3.27	3.30
		Electricity	[PJ]	22.45	22.08	22.17	22.51
	SERVICES	Liquid fuel	[PJ]	18.99	19.04	18.43	17.48
		Natural gas	[PJ]	4.14	5.08	5.84	6.44
		Coal	[PJ]	0.24	0.19	0.13	0.07
		RES	[PJ]	2.49	3.03	3.43	3.73
		Electricity	[PJ]	10.90	12.59	13.61	14.32
	HOUSEHOLDS	Liquid fuel	[PJ]	14.99	14.26	13.56	12.90
		Natural gas	[PJ]	3.16	3.58	4.04	4.46
		Coal	[PJ]	0.32	0.27	0.20	0.14
		RES	[PJ]	13.43	13.73	13.93	14.10
		Electricity	[PJ]	10.16	11.00	11.56	12.21
	TRANSPORT	Liquid fuel	[PJ]	62.59	64.04	68.18	69.60
		Coal	[PJ]	0.01	0.01	0.01	0.01
		RES	[PJ]	0.00	3.36	3.57	3.65
		Electricity	[PJ]	0.73	0.86	1.00	1.08
TEMPERATURE DEFICIT			[°C day]	2836	2836	2836	2836
INDUSTRY							
INDUSTRY AS % of GDP			[%]	28.5	28.6	28.8	28.7
				2001-2005	2006-2010	2011-015	2016-2020
PHYSICAL VOLUME OF PRODUCTION BEFORE ACTIVITY	Real growth		[%]	2.5	2.2	0.2	0.6
VALUE ADDED BEFORE ACTIVITY	Real growth		[%]	4.0	3.7	1.5	2.0

Table D-1: Continued Parameters on Projections with Existing Measures and Additional Measures

			2005	2010	2015	2020
TRANSPORTATION						
km driven (cars)		[kmd million]	16,784	16,747	16,677	16,269
km driven (freight)		[kmd million]	2,356	2,986	3,154	3,170
no. of cars		[million cars]	0.90	0.93	0.92	0.93
		[million cars/ popl.]	0.456	0.471	0.467	0.473
BUILDINGS						
RESIDENTIAL SURFACE		[1000 m2]	54,970	60,046	64,401	68,560
AGRICULTURE						
CATTLE	Dairy		133,986	123,996	114,000	114,000
	Suckler cow		66,777	86,384	86,384	86,384
	Other cattle		290,803	309,889	327,316	327,316
PIGS			657,819	661,410	665,000	665,000
POULTRY			5,111,769	5,331,385	5,551,000	5,551,000
HORSES			15,000	15,000	15,000	15,000
SHEEP			100,000	100,000	100,000	100,000
GOATS			22,000	22,000	22,000	22,000
MINERAL FERTILIZER CONSUMPTION		[t]	34,267	33,662	33,100	33,100
WASTE						
SOLID MUNICIPAL WASTE		[t]	1,217	837	989	989
PROPORTION OF ORGANIC WASTE		[%]	47	47	47	47
WASTE MANAGEMENT	Landfill	[%]	94	0	0	0
	Incinerated	[%]	0	63	50	50
	Separate collection	[%]	6	38	50	50
PRODUCTION OF ELECTRICITY	TE - thermoelectrical	[TWh]	5.42	5.92	7.06	8.01
	HE (hydro) – wind generated	[TWh]	3.94	4.51	4.95	5.16
	JE - nuclear	[TWh]	5.81	5.45	5.36	5.36

Appendix E: Policies and Measures in "With Existing Measure" and "With Additional Measure" Scenarios

Table E-1: Policies and Measures in Scenarios

Sector	Measures		Scenario with existing measures	Scenario with additional measures
Energy supply				
	Promotion of electricity production from renewable sources and combined heat and power generation	1. Local supply 2. Increasing production of electricity from RES by 2015 3. Increasing cogeneration of electrical energy and heat in industry and district heating systems by 2015	by 430 GWh by 50 MWe (340 GWhe)	by 580 GWh by 120 MWe (680 GWhe)
	Opening electricity and natural gas market – exchange of energy products	1. Coal use in 2010: 2. Natural gas use in 2010:	54 PJ 12 PJ	50 PJ 14 PJ
	Construction of large hydro power plants		Compliance	Compliance
Energy use				
Households and services				
	Incentives for carrying out the EEU measures and for investment in RESEARCH Contractual financing	1. RES use: Increasing use of geothermal energy by 2015 Installation of solar panelling by 2015 2. fuel exchange (increasing proportion of wood biomass, natural gas and LPG, maintaining proportion of district heating, and reducing proportion of coal and fuel oil) 3. Renovation of old residential accommodation: 4. School construction measures (proportion of renovated area): 5. Measures on other buildings	16 % 41,300 m2 0.5 % annually 16 %	16 % 82,600 m2 1.0 % annually 28 % 0.5 % annually
	Thermal protection and energy labelling of buildings	1. Proportion of above standard construction: Individual houses Multi-dwelling houses	20 % 15 %	55 % 55 %

Table E-1: Continued: Policies and Measures in Scenarios

	Regular inspections of small boilers and air-conditioning systems		Compliance	Compliance
	Energy labelling of household appliances	Market share of more efficient air-conditioners (15 % less intensity)	16 %	26 %
	Education, training and public awareness	Market share of energy efficient lighting:	23 %	29 %
		1.		
Industry and Industrial Processes				
	Efficient energy use in industry	Reducing intensity on electric arch furnaces for steel production until 2015:	3.5 % (19 kWh/t)	13.3 % (73 kWh/t)
	Giving incentives for the introduction of systems of environment management according to ISO 14001 and joining the EMAS System	Reducing specific heat use by improving thermal processes in paper production by 2015:	8 %	31 %
		Reducing consumption of compressed air by 2015:	6 %	15 %
	IPPC directive	Installing frequency regulators in electric motors (electricity savings of up to 30 %):	5–8 %	90 %
		Market share of energy saving motors (efficiency improved by ~5 %) do 2015:	8 %	80 %
		Realising measures by increasing efficiency of industrial boilers (increasing efficiency by 2–6 %):	30 %	90 %
		Reducing energy intensity of all other processes:	0.5 % annually	0.5 % annually
	Regulations on F–gases		No compliance	Compliance

Table E-1: Continued: Policies and Measures in Scenarios				
Transportation				
	Excise duties on fuels		Compliance	Compliance
	Control of exhaust composition and engine adjustment in motor vehicles		Compliance	Compliance
	Informing consumers about fuel consumption and CO2 emissions of motor vehicles & agreement between the European Commission and car manufacturers		Compliance	Compliance
	Promotion of biofuel consumption	Proportion of biofuels by 2010 (2020)	0 % (0 %)	5 % (5 %)
	Promoting use of public transport and development of non-motor transport and increasing proportion of rail in goods transport		No compliance	Compliance
Agriculture				
	Rural Areas Development Programme – pasture promotion		Anticipating long-term increase in proportion of animals in pasture	Same as in “with existing measures” scenario
	Promotion of biogas use – construction of anaerobic digesters		Introducing anaerobic digesters to two of largest pig farms that do not have them, and on cattle farms with over 50 animals and pig farms with over 100 animals	Same as in “with existing measures” scenario

Table E-1: Continued: Policies and Measures in Scenarios			
	Good agricultural practice in manuring	Reducing nitrogen in mineral fertilizers by 5 % by 2015	Same as in “with existing measures” scenario The additional measures scenario anticipates an additional reduction of 50 Gg CO2 equivalent compared to the “with existing measures” scenario
Waste			
	Landfill gas extraction and combustion, energy exploitation or use of landfill gas	Increasing the proportion of gas captured and used for energy purposes from landfills from 15 % to 50 % by 2010	Same as in “with existing measures” scenario
	Separate waste collection and packaging waste management	Reducing quantities of landfill waste by half by 2012 with a linear progression to the objective	Same as in “with existing measures” scenario
	Waste incineration	No compliance	Planned set up of two incinerators - – no more landfill

Appendix F: Projection Results by Year and Scenario

With Existing Measures

Table F-1: Projection of Emissions "with Existing Measures" for 2005

2005	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	6,646	386	0	0	0	0	7,033
Transport	3,987	11	176	0	0	0	4,174
Industry	3,241	9	4	152	117	37	3,559
Use of Fuel for Power	2,283	2	4				2,289
Processes	958	6	0	152	117	37	1,270
Other Sectors	3,178	93	34	0	0	0	3,305
Solvents	22	0	17	0	0	0	39
Agriculture	0	891	1250	0	0	0	2,141
Waste	0	680	35	0	0	0	715
TOTAL	17,074	2,070	1,516	152	117	37	20,965

Table F-2: Projection of Emissions "with Existing Measures" for 2010

2010	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	6,127	350	1	0	0	0	6,478
Transport	4,367	7	198	0	0	0	4,571
Industry	3,380	9	4	286	23	120	3,821
Use of Fuel for Power	2,437	2	4				2,443
Processes	943	6	0	286	23	120	1,378
Other Sectors	3,315	84	34	0	0	0	3,433
Solvents	16	0	19	0	0	0	35
Agriculture	0	924	1,275	0	0	0	2,199
Waste	0	620	35	0	0	0	655
TOTAL	17,205	1,994	1,564	286	23	120	21,192

Table F-3: Projection of Emissions "with Existing Measures" for 2015

2015	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	6,174	310	1	0	0	0	6,485
Transport	4,624	5	208	0	0	0	4,837
Industry	3,377	9	4	355	23	29	3,796
Use of Fuel for Power	2,396	2	4				2,402
Processes	981	6	0	355	23	29	1,394
Other Sectors	3,402	81	34	0	0	0	3,517
Solvents	16	0	19	0	0	0	35
Agriculture	0	914	1,269	0	0	0	2,183
Waste	0	516	35	0	0	0	551
TOTAL	17,593	1,835	1,570	355	23	29	21,405

Table F-4: Projection of Emissions "with Existing Measures" for 2020

2020	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	5,096	301	1	0	0	0	5,398
Transport	4,654	4	207	0	0	0	4,866
Industry	3,460	9	4	412	23	31	3,938
Use of Fuel for Power	2,441	2	4				2,447
Processes	1,019	6	0	412	23	31	1,492
Other Sectors	3,448	77	35	0	0	0	3,560
Solvents	16	0	19	0	0	0	35
Agriculture	0	915	1,265	0	0	0	2,181
Waste	0	433	35	0	0	0	468
TOTAL	16,674	1,739	1,566	412	23	31	20,445

With Additional Measures

Table F-5: Projection of Emissions "with Additional Measures" for 2005

2005	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	6,623	386	1	0	0	0	7,010
Transport	3,989	11	176	0	0	0	4,176
Industry	3,219	9	21	75	117	23	3,464
Use of Fuel for Power	2,261	3	21	0	0	0	2,285
Processes	958	6	0	75	117	23	1,179
Other Sectors	3,054	92	34	0	0	0	3,180
Solvents	22	0	17	0	0	0	39
Agriculture	0	891	1,250	0	0	0	2,141
Waste	0	680	35	0	0	0	715
TOTAL	16,907	2,069	1,534	75	117	23	20,725

Table F-6: Projection of Emissions "with Additional Measures" for 2010

2010	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	5,816	351	2	0	0	0	6,168
Transport	4,079	6	185	0	0	0	4,271
Industry	3,333	9	26	108	23	24	3,523
Use of Fuel for Power	2,390	3	26				2,419
Processes	943	6	0	108	23	24	1,104
Other Sectors	3,051	96	36	0	0	0	3,183
Solvents	16	0	19	0	0	0	35
Agriculture	0	903	1,246	0	0	0	2,149
Waste	0	545	27	0	0	0	572
TOTAL	16,295	1,910	1,541	108	23	24	19,901

Table F-7: Projection of Emissions "with Existing Measures" for 2015

2015	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	6,043	301	2	0	0	0	6,346
Transport	4,322	5	195	0	0	0	4,523
Industry	3,323	9	32	92	23	22	3,501
Use of Fuel for Power	2,342	3	32				2,376
Processes	981	6	0	92	23	22	1,124
Other Sectors	2,996	98	38	0	0	0	3,132
Solvents	16	0	19	0	0	0	35
Agriculture	0	893	1,240	0	0	0	2,133
Waste	0	377	16	0	0	0	393
TOTAL	16,700	1.684	1.541	92	23	22	20,062

Table F-8: Projection of Emissions "with Additional Measures" for 2020

2020	[Gg CO_2 equiv.]						
Sector	CO_2	CH_4	N_2O	HFC	PFC	SF_6	TOTAL
Energy	5,036	301	2	0	0	0	5,339
Transport	4,354	4	194	0	0	0	4,553
Industry	3,398	9	40	83	23	19	3,571
Use of Fuel for Power	2,379	3	40				2,421
Processes	1,019	6	0	83	23	19	1,150
Other Sectors	2,906	100	39	0	0	0	3,046
Solvents	16	0	19	0	0	0	35
Agriculture	0	894	1,236	0	0	0	2,131
Waste	0	259	12	0	0	0	271
TOTAL	15,709	1,568	1,543	83	23	19	18,945