REGIERUNG
DES FÜRSTENTUMS LIECHTENSTEIN

Liechtenstein's Report on Demonstrable Progress 2005

under Article 3.2 of the Kyoto Protokol and in line with Decisions 22/CP.7 and 25/CP.8 of the UNFCCC

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1. Introduction

This report has been prepared in response to Article 3.2 of the Kyoto Protocol and in line with Decisions 22/CP.7 and 25/CP.8 of the UN Framework Convention on Climate Change. As required by these decisions, the report provides the Conference of the Parties with the basis for reviewing progress in four domains, namely:

• policies and measures, including arrangements for domestic compliance and enforcement;

• trends in, and projections of, national greenhouse gas emissions;

• the impact of domestic policies and measures on emission trends and projections;

• activities undertaken in fulfilment of the commitments under Articles 10 and 11 of the Kyoto Protocol.

The report provides an overview of the steps taken by Liechtenstein to meet its Kyoto Protocol commitments since the adoption of the Protocol in 1997 and, in particular, since the adoption of the Marrakech Accords in 2001. It has been compiled on the basis of Liechtenstein's National Climate Report 2005 and is fully consistent with the content thereof.

2. Description of domestic measures

2.1. Overall policy context

Liechtenstein has integrated its climate policy very strongly into the individual sectoral policies. The focus is on energy policy, environmental policy, transport policy, agricultural policy, and forestry policy. All of these areas encompass measures that contribute to the reduction of climate gases. When determining the measures to reduce greenhouse gases, the highest priority is given to measures that also entail additional local benefits, especially with respect to air pollution control. The Fourth National Communication gives a detailed description of policies and measures.

Because of the small size of the country, cross-border cooperation plays an important role. Especially important is the relationship with Switzerland and cooperation among the countries in the Lake Constance area. Thanks to the Customs Union Treaty with Switzerland, cross-border measures and bilateral execution are simplified in many areas, since various Swiss enactments are directly applicable in Liechtenstein pursuant to the Treaty. In these cases, Liechtenstein executes the provisions similarly to a Swiss canton (e.g., mineral oil tax, regulations for environmental substances). Accordingly, most policy areas are very closely linked with Swiss policy, in terms of both content and execution.

Liechtenstein endeavors to enshrine the principle of sustainability in its policies. This includes provident use of resources and maintenance of a high quality of life. To the extent possible, Liechtenstein also tries to make a contribution to the solution of global environmental problems. Climate protection enjoys a high political priority in this regard, constituting a primary field of action in Liechtenstein's environmental policy.

A parliamentary motion called for the drafting of CO2 legislation. This mandate was implemented with the revision of the Clean Air Act. The new Clean Air Act of 2003 encompasses climate protection and climate policy targets similar to the Swiss CO2 Act. In particular, the possibility of introducing a CO2 tax has been included in the Act. The concrete structure of a CO2 tax will again, however, be undertaken in close collaboration with Switzerland.

Pursuant to the joint economic area with Switzerland, the climate cent levied on engine fuel in Switzerland since October 2005 is also being levied in Liechtenstein. The Government has signed an agreement with the Swiss "Climate Cent Foundation" to this effect, governing the administrative and organizational measures. Questions concerning the use of the revenue for climate protection projects must still be developed in detail. In principle, the revenue will be earmarked for climate protection projects in Liechtenstein and abroad.

2.2. Environmental policy

The deliberate decision was made not to establish superordinate environmental protection legislation; the relevant provisions are to be found in the individual sectoral policies. With respect to technical

implementation, Liechtenstein is bound by the Customs Treaty with Switzerland in some areas (e.g., Substance Ordinance, VOC tax, SO2 tax). Air pollution thresholds are also largely identical with those of Switzerland; in some areas, however, they have been adapted to the thresholds provided by relevant EU directives, pursuant to the EEA Agreement.

In Liechtenstein, the comprehensively revised Clean Air Act (2003) and the Waste Prevention and Disposal Act (1988) substantially influence environmental policy and climate policy.

2.3. Energy policy

The commitment to saving energy was legally enshrined in the Energy Ordinance in 1993 and further consolidated in 1996. The focus is on the following elements:

- Target values for the insulation of buildings (heat insulation requirements), for devices such as heaters, air conditioners, and ventilation systems, and requirements for the maintenance of such devices. These measures are governed by the revised Construction Act and relevant ordinances.
- An Energy Commission advises the Government on energy policy and communicates its views on all fundamental questions of energy policy. The Energy Commission consists of experts from all relevant areas (architecture, energy industry, other industries, manufacturing and trades, administrative offices, environmental organizations).
- A Bureau of Energy Consumption and Conservation has been established within the Office of Economic Affairs. The Bureau advises municipalities and private parties on all areas of energy conservation, is responsible for the content and administration of subsidy applications, and elaborates and implements energy policy strategies. The Bureau provides information to the public through lectures, radio discussions, and personal talks.
- The promotion of energy conservation is a central concern of Liechtenstein's energy policy. Energy conservation in buildings is supported financially, especially with regard to renovation of old buildings, building services installations, block heating plants, and solar collectors.

2.4. Transport policy

Transport policy in Liechtenstein takes into account the interests of society, the economy, and the environment. In this way, the Government has implemented or prepared a wide range of projects to promote public transportation and to reduce emissions arising from transport (expansion of the Liechtenstein Bus Authority, "Liechtenstein Takt" regional train schedule, preferential treatment of buses at traffic lights, subsidies of electric scooters and electric bicycles, tax exemptions for solar, hybrid, electronic, and natural gas vehicles, security measures along the way to school, mobility campaigns, studies on a new, high-performance public transport system, and medium-term expansion of the railway offerings).

Goods transport policy also plays an important role. As of 1 January 2001, Liechtenstein introduced a Heavy Vehicle Fee, analogous to Switzerland. This fee is based on the polluter-pays-principle and is differentiated according to distance driven and the total weight of the vehicle. It increases productivity in road traffic, contributes to a large-scale shift of heavy goods traffic from road to rail, and in this way also eases the burden on roads in Liechtenstein.

In the framework of the Customs Treaty, Liechtenstein also supports the efforts of importers to reduce specific fuel consumption in accordance with the Swiss rules, and Liechtenstein is also required to declare consumption in accordance with EU directives. Based on the data that has been collected so far in this way, it now appears possible to undertake taxation of automobiles also with respect to specific CO_2 emissions. The Government is currently examining this option.

The public bus fleet has largely been converted to natural gas. A natural gas fueling station has also been built. The Government is examining the establishment of a biogas facility to generate gas from organic waste, which again could significantly improve the climate balance.

2.5. Agriculture

A working group has elaborated a new agricultural policy concept, which was considered by Parliament in November 2004. Policy messages were formulated for the target areas of soil, ecology, economy, markets, society, education, and social welfare. Future agricultural policy will be based on these guidelines.

The guidelines promote the trend toward greater ecological agriculture in Liechtenstein. In addition to maintaining soil fertility, the environmental impact will also be minimized. Environmentally friendly forms of production, such as integrated production and organic farming, will be promoted in a targeted manner. Landscape conservation is also considered a responsibility of agriculture, and its importance will continue to increase.

By means of the Direct Payment Act, the Law on Compensation for Ecological and Animal-Friendly Practices in Agriculture (Compensation Act), and the Ordinance on the Compensation Act, Liechtenstein aims to promote environmentally friendly and animal-friendly agriculture as well as the cultivation of natural habitants and permanent pastures on swampy and mixed soils. In the case of wildflower meadows, the preservation of which is of particular interest to nature conservation, the demands on ecological cultivation are even higher. In parallel with Switzerland, the Ecological Performance Certificate was introduced for environmentally friendly and animal-friendly cultivation. 121 of 131 registered farms operated according to these principles. Direct payments are only made if the cultivation corresponds to the provisions of the animal protection legislation and the environmental protection provisions. The use of agricultural aids (fertilizers, pesticides) is strictly regulated; in forests and in the Alpine areas, the use of these aids (with the exception of manure) is prohibited.

In 2002, the promotion of farm animals consuming roughage was included in the Direct Payment Act. Livestock has increased over the past five years, which can be explained with reference to structural changes and the switch to mother cow husbandry. (Liechtenstein agriculture primarily relies on animal husbandry, which generates 70% of agricultural revenue.)

The new Water Protection Act, which entered into force in 2003 and is comparable to the Swiss law, specifies the thresholds for cattle and horses per area unit.

With respect to the storage and distribution of manure, subsidies of open liquid manure containers have been abolished. As an alternative, the Government is considering subsidies of flexible tube systems to distribute liquid manure.

2.6. Forestry

Forests are very important to Liechtenstein. 43% of the country's territory is covered by forests, and this area is still growing. For this reason, sustainability in forestry has been accorded great importance ever since the introduction of the Forestry Regulations in 1865. Important goals of the current Forestry Act (1991) include the qualitative and quantitative (prohibition of clearing) preservation of the forest stocks and the promotion of nature-friendly forest management. In addition to the Forestry Act, international agreements (such as the 1993 Helsinki Ministerial Conference on the Protection of Forests in Europe) provide the basis for modern forest management. The natural rejuvenation of forests with local tree species appropriate to the location, the promotion of graded forest stock structures, and the ecological improvement of the edges of forests are examples of this. In general, the promotion of biological diversity in forests is becoming an increasingly important part of Liechtenstein forest management. For instance, Liechtenstein now maintains forest reserves on one fifth of the forest area, where all forms of forestry activities are prohibited.

In June 2001, Liechtenstein published a National Forest Program. With the program, Liechtenstein reacted to international obligations to promote sustainable forest management. With a view to meeting sustainable development goals, the National Forest Program encompasses the following principles in particular: respect for national sovereignty and self-responsibility in the use of resources, compatibility with the domestic legal provisions, compliance with obligations arising from international conventions and agreements, establishment of partnerships and participation of all interested groups, use of a holistic approach to the preservation and cultivation of forests, and selection of a long-term and iterative planning, implementation, and monitoring process.

The entire Liechtenstein forest stock is certified according to the criteria of the Forest Stewardship Council (FSC) (SGS-FM/COC-0764).

2.7. International cooperation

International cooperation is an important pillar of Liechtenstein climate policy, given the small size of the country and its limited capacities. Liechtenstein ratified the Climate Convention on 22 June 1994 and the Kyoto Protocol on 3 December 2004, thereby taking on the obligation of reducing its greenhouse gas emissions during the period of 2008-2012 by 8% relative to 1990.

Liechtenstein is also State party to several other environmental agreements. The following agreements more or less closely related to climate should be mentioned in this context:

Vienna Convention for the Protection of the Ozone Layer.

Montreal Protocol on Substances that Deplete the Ozone Layer.

Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa.

Convention on Long-Range Transboundary Air Pollution. Liechtenstein has also ratified seven of the eight protocols, namely those concerning Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 percent, Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes, Further Reduction of Sulphur Emissions, Persistent Organic Pollutants (POPs), Heavy Metals and Control of Nitrogen Oxides or their Transboundary Fluxes. In 1999, Liechtenstein also signed the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone.

Convention on Environmental Impact Assessment in a Transboundary Context.

Convention on the Protection of the Alps and its protocols on spatial planning and sustainable development, mountain farming, conservation of nature and landscape preservation, mountain forests, tourism, soil protection, energy, transport, and settlement of disputes.

3. Trends in, and projections of greenhouse gas emissions

3.1. General observations

The United Nations Climate Convention requires that the climate reports of the States Parties include trends in recent years and projections for the future (UNFCCC 1999). In view of its small size, however, Liechtenstein does not have such comprehensive projections at its disposal. The results presented for the year 2010 therefore rely primarily on comparisons and analogies with Switzerland (FOEN 2005).

The Swiss Federal Office of Energy periodically determines energy scenarios (SFOE 2005). The energy perspectives include a reference scenario ("with measures implemented") and a further-reaching scenario ("with measures adopted or planned") for the period 2000 to 2010. The reference scenario is based on the following assumptions concerning the development of important structural parameters:

- the population will grow by approx. 4%,
- GDP will grow by approx. 1.5% annually,
- industrial added value and production will increase by approx. 10%.

In the energy sector, a nearly constant price of crude oil is assumed. The increased implementation of energy policy measures will lead to greater energy efficiency in households and industry. In the transport sector, two opposing trends are assumed: on the one hand, the energy efficiency of vehicles will grow; on the other hand, automobiles will become increasingly larger and heavier. At the same time, the share of diesel vehicles and the share of natural gas and bio-fuel vehicles will increase, which will reduce "fuel tourism" in Switzerland and Liechtenstein (i.e., less petroleum "export" and less diesel "import").

Details on both energy scenarios and their effects can be found in the fourth national climate report of Switzerland (FOEN 2005).

The following figures and tables show the aggregated greenhouse gas emissions for 1990, 2003, and 2010 in CO2 equivalent. The sum of the climate gas emissions increased by almost 4% from 1990-2003. A decrease in N2O and CH4 emissions is opposed by an increase in CO_2 emissions, which dominates the overall picture. In considering this result, however, it should be noted that the 1990 estimate is incomplete.

Using these assumptions for the development from 1990 to 2010, there will still be an increase of climate gas emissions, despite all efforts and instead of the reduction required by the Climate Convention and especially by the Kyoto Protocol. Rough estimations showtaht this increase og climate gas emissions varies considerably depending on the assumptions underlined for the missing data in the inventory.

Sectors	CO_2 Gg CO_2 eq.			CH_4 Gg CO_2 eq.			N_2O Gg CO_2 eq.			Total Gg CO_2 eq.		
	1990	**2003**	**2010**	**1990**	**2003**	**2010**	**1990**	**2003**	**2010**	**1990**	**2003**	**2010**
Industry (incl. fugitive emissions)	62.5	66.4	66.8	0.63	0.79	0.75	0.09	0.09	0.09	63.22 100%	67.28 106.4%	67.61 106.9%
Transport	87.8	91.6	90.3	NE	0.19	0.13	3.10	3.27	1.90	90.87 100%	95.10 104.7%	92.32 101.6%
Residential, institutional, commercial	77.0	81.8	81.1	NE	0.25	0.27	0.31	0.31	0.31	77.33 100%	82.39 106.5%	81.72 105.7%
Agriculture	NE	NE	NE	14.28	13.95	13.71	4.65	4.93	4.58	18.93 100%	18.87 99.7%	18.29 96.6%
Waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (rounded)	227.3	239.9	238.2	14.9	15.2	14.9	8.2	8.6	6.9	250.4 100%	263.7 105.3%	260.0 103.8%

Table 1: Trend and projection of climate gases in CO_2 equivalent, 1990–2010.

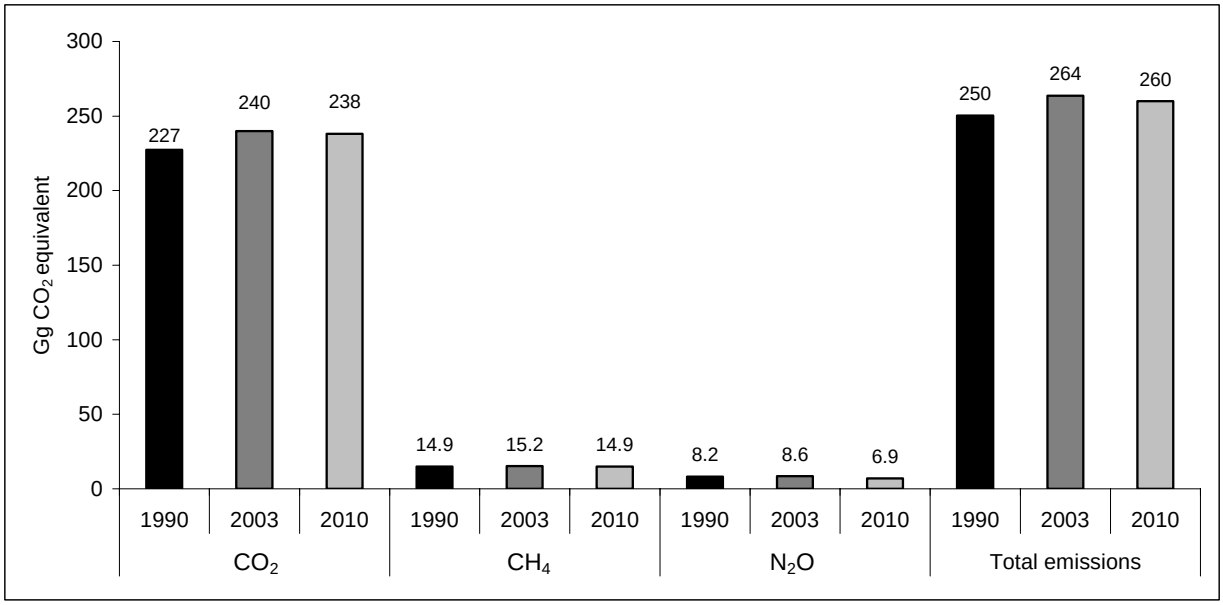

Fig. 1: CO2, CH4, und N2O emissions 1990, 2003 and 2010 in Gg CO2 equivalent (corresponds to Table 1 above).

3.2. CO_2

Table 2 provides an overview of the CO2 emissions between 1990 and 2010. From 1990 to 2003, the emissions increased by 5.5%; a slight decrease is expected from 2003 to 2010. For the whole period from 1990 to 2010, however, an increase of 4.8% is assumed.

The results reflect the development under the assumption that the adopted measures will be effective (reference scenario). If the planned measures would also be taken into account, especially the introduction

of a CO_2 tax, then the emissions could be reduced slightly relative to 1990. More detailed calculations for the aggregated effects of the individual measures are not possible, however.

Carbon dioxide CO_2	**1990 (Gg) (1990 = 100%)**	**2003 (Gg)**	**2010 (Gg)**
Industry	62.5 (100%)	66.4 (106.3%)	66.8 (106.8%)
Transport	87.8 (100%)	91.6 (104.4%)	90.3 (102.9%)
Residential, institutional, commercial	77.0 (100%)	81.8 (106.2%)	81.1 (105.3%)
Agriculture	NO	NO	NO
Waste	NO	NO	NO
Gross total emissions	227.3 (100%)	239.9 (105.5%)	238.2 (104.8%)

Table 2: Trend and projection of CO_2 emissions, 1990–2010.

CO_2-emissions in the transport sector increased since 1990 by 4.4%, in the industrial and the residential, institutional, and commercial sector by 6.3%. In particular with respect to room heat production, which constitutes the largest share of the residential, institutional, and commercial sector, climate variation plays an important role. In colder winters, it is natural that more fuel will be used than in warmer winters. In 2003, heating degree-days in Switzerland were 4.8% higher than in 1990. This would explain the bulk of the increase by 6.3% with reference to climatic conditions. The remaining increase represents real growth (especially an increase of the heated building volume). The increase in transport also represents real growth and results from the combination of greater specific driving output and larger, heavier vehicles.

3.3. CH_4

Table 3 shows the development of the CH_4 emissions between 1990 and 2010. At 0.723 Gg, CH_4 emissions in 2003 are about 2% higher than in 1990 (0.710 Gg). The reason for this increase in not real growth, but rather methodological. Not all sources could be calculated for 1990. In particular, 1990 data is lacking for industry, transport, and the residential, institutional, and commercial sector. Presumably, these emissions have been effectively reduced (higher share of vehicles with catalytic converters[1]). Due to the reduction of the number of farm animals, agricultural methane emissions have decreased by 2%. If all emissions were known for 1990, the development from 1990 to 2003 would most probably be a reduction, not growth.

Since so far, not all emissions for the base year 1990 have been able to be estimated, the trend of the total emissions can only be qualitatively estimated. To a high degree of certainty, however, it can be assumed that the emissions will decrease, since the emissions from the transport, residential, institutional, and

[1] In Switzerland, methane emissions in the transport sector were reduced by a factor of 3 from 1990-2003.

commercial sectors in 1990 were higher than in 2003, so that all sectors exhibit a decrease, whether thanks to improved exhaust technologies or because of a decreasing number of agricultural animals.

Methane CH_4	**1990 (Gg) (1990 = 100%)**	**2003 (Gg)**	**2010 (Gg)**
Industry and network losses in gas supply	0.030 (100%)	0.038 (125%)	0.036 (120%)
Transport	NE	0.009	0.006
Residential, institutional, commercial	NE	0.012	0.013
Agriculture	0.680 (100%)	0.664 (98%)	0.653 (96%)
Waste	NO	NO	NO
Gross total emissions	0.710 (incomplete)	0.723	0.708

Table 3: Trend and projection of CH_4 emissions, 1990–2010.

3.4. N_2O

Table 4 shows the development of N2O emissions between 1990 and 2010. The figures indicate an increase in emissions from 0.0263 Gg in 1990 to 0.0277 Gg in 2003, which corresponds to 5.5%. In both sectors contributing significantly to emissions – petroleum vehicles and agricultural soils – there has been an increase by 5-6%.

Nitrous oxide N_2O	**1990 (Gg) (1990 = 100%)**	**2003 (Gg)**	**2010 (Gg)**
Industry	0.00030 (100%)	0.000286 (95.2%)	0.00029 (96.7%)
Transport	0.01000 (100%)	0.01056 (105.6%)	0.00612 (61.2%)
Residential, institutional, commercial	0.00100 (100%)	0.001006 (100.6%)	0.00101 (101.3%)
Agriculture	0.01500 (100%)	0.01589 (105.9%)	0.01478 (98.6%)
Waste	NO	NO	NO
Gross total emissions	0.02630 (100%)	0.02775 (105.5%)	0.02221 (84.4%)

Table 4: Trend and projection of N_2O emissions, 1990–2010.

3.5. Precursor substances and SO2

A comparison is only possible for the energy sector. Thanks to the reduction of the sulfur content in diesel and heating oil, the SO2 emissions decreased from 1990 to 2003, but at the same time, the use of both energy sources has risen.

Table 5 shows the trends and projections of the precursor gases NO_x, CO, and NMVOC and of SO_2 between 1990 and 2010. The emissions of the precursors gases are decreasing thanks to the exhaust regulations for road traffic and other clean air measures. The SO_2 emissions, however, are increasing slightly due to the current trend toward more diesel vehicles instead of petrol vehicles.

Gas (Gg)	1990	2003	2010
NO_x	0.390 (100%)	0.416 (107%)	0.330 (85%)
CO	1.600 (100%)	1.665 (104%)	1.237 (77%)
NMVOC	0.150 (100%)	0.148 (99%)	0.092 (61%)
SO_2	0.080 (100%)	0.085 (106%)	0.081 (102%)

Table 5: Trend and projection of precursor gases and SO_2 for 1990–2010.

3.6. Landuse, land use change and forestry

The total net sequestration from the land-use, land-use change and forestry sector has not been estimated. Therefore it is also uncertain wether the net contribution from afforestation, reforestation and deforestation activities will be positive or negative in 2008-2012.

3.7. Use of the Kyoto mechanisms

According to projections, the gap to be covered through further national measures or acquisitions of AAUs, CERs and or ERUs (“Kyoto units”) is currently about 25 thousend tonnes annually, or about 125 thousend tonnes for the perid 2008-2012. This takes into account the effects of recently introduced policy and instruments and measures.

Liechtenstein has commissioned a report (Factor 2000) on the foundation of the country's future climate strategy (implementation of the Kyoto Protocol). At that time, the report concluded that a purely national strategy would be difficult to implement, and that the marginal costs of additional reductions would be relatively high, based on the already high existing level of climate-control measures. The report recommended an internationally oriented strategy based on the Kyoto Mechanisms (Joint Implementation, Clean Development Mechanism, Emission Trading). These mechanisms would allow a significant improvement of the cost-effectiveness of climate policy. Liechtenstein is currently examining its level of engagement and participation in these international instruments and taking the necessary preparatory steps. The focus is on the requisite implementation of the National Register under Liechtenstein's obligations arising from the Kyoto Protocol; in accordance with the Marrakech Accords, Liechtenstein is striving for a hosting solution in collaboration with Switzerland. Administrative cooperation is also being considered with respect to the assessment and implementation of projects in the framework of Joint Implementation and the Clean Development Mechanism.

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4. Evaluation of the contribution of domestic measures

It is estimated that without the policy instruments and measures introduced since 1990, emissions growth from 1990 to 2010 would be about 20 percentage points higher. These figures are based on the assessment reflected in the fourth National Communications. A detailed estimation of the contribution of all the measures is not available, however.

The comprehensively revised Clean Air Act (2003) now also specifies climate policy objectives. It lays down ongoing reduction of greenhouse gases and a reduction of CO_2 emissions from the energy-related use of fossil energy sources of at least 10% by the year 2010, relative to 1990. With regard to technical aspects, the Clean Air Act governs the limitation of emissions for stationary installations, the maximum air pollution level, measures to be taken in the event emissions thresholds are exceeded, and the requirements on engine and heating fuel. Important elements include the polluter-pays-principle and the obligation to provide information to the public. The ordinance on the Clean Air Act was amended in 1999. The amendments lay down new requirements on petrol and diesel oil, but also a new threshold for particulate matter in air. The annual average for sulfur dioxide (threshold) was reduced from 30 micrograms/m^3 to 20 micrograms/m^3. Beginning on 1 January 2000, the ordinance prohibits the sale of leaded supreme petrol. The lead content in unleaded petrol has also been reduced from 0.013g/l to 0.005 g/l, and the share of carcinogenic benzene in petrol has been reduced from 5% to 1%. The sulfur content in diesel has been reduced from 0.5 to 0.35 g/kg.

The Waste Prevention and Disposal Act (1988) requires the separate disposal of different types of waste. At the level of an ordinance, the Government may require that certain waste be recycled, if such recycling improves the ecological balance. This law is also based on the polluter-pays-principle. Almost no waste is disposed of in reactor dumps. All trash is incinerated in the waste incineration plant in Buchs, Switzerland, and the energy generated is reused.

The Energy Conservation Act of 18 September 1996 (Liechtenstein Law Gazette LGBl. 1996 No. 193) and the relevant Ordinance of 26 November 1996 (LGBl. 1996 No. 202) as well as the Energy Ordinance of 23 September 2003 on the Construction Act (LGBl. 2003 No. 193) constitute the legal framework for the implementation of measures relating to buildings. It is estimated that this effects a yearly reduction of 10 Gg CO_2 emission within the next 20 years.

A gratifying development is also that municipalities now supplement national Energy Conservation Act subsidies with their own funds. The Government intends to promote the measures for implementing the objectives laid down in the energy strategy with financial resources and advice. The increase of energy efficiency and in particular the increased use of renewable energies are of central importance for the reduction of greenhouse gas emissions and accordingly for a long-term climate policy.

In the beginning of 2004, the Government adopted an energy strategy that will provide future-oriented impulses for the national energy policy of the coming ten years. The focus areas of the concept are the promotion of efficient energy use, the use of renewable energies, and energy conservation. The goal is to increase the share of renewable energy in total energy use from 8% to 10% by 2013.

A further goal is to triple the use of solar energy through thermal solar panels, and to increase the production of electricity from solar energy through photovoltaic systems by a factor of 2.5. A significant portion of fuel consumption takes place in buildings. Measures are envisaged in this area as well. For instance, heat insulation in old buildings and the Minergy standard in both old and new buildings will be supported. An energy controlling system will be established for public buildings.

Almost all Liechtenstein municipalities provide additional funds to projects subsidized at the national level pursuant to the Energy Conservation Act. In collaboration with the forestry sector, an increasing number of wood chip plants are used in public buildings to generate heat. The new Act and the Ordinance on the Liberalization of the Electricity Market provide mechanisms to support the conveyance of renewable energies. The Liechtenstein Power Authority also offers a "Green Electricity" label.

The Energy Market Act entered into force in 2002. In October 2004, the Liechtenstein electricity market was opened up and liberalized 100%. This means that every approved client may now freely choose which electricity supplier to buy electricity from.

Pursuant to the measures envisaged by the Energy Concept 2013, the Energy Conservation Act and its ordinance will be amended as of the middle of 2006. The Energy Concept 2013 lists a package of measures contributing to the achievement of the Kyoto goals. In particular, energy conservation for room heating will be reached through targeted thermal renovations of buildings. An important objective is also the increase in the share of renewable energies to over 10% of total energy consumption by 2013. A further point is the expanded use of domestic biomass, also in the form of biogas, as well an increased use of solar energy.

The total emissions of N_2O will decrease by about 15.6% until 2010. The greatest decrease (almost 40%) will be in the transport sector: While the first generations of three-phase catalytic converters still generated a relatively high amount of nitrous oxide, the new catalytic converters have been improved in this regard. In the coming years, agriculture will also generate less nitrous oxide, thanks to reductions in the use of fertilizers containing nitrogen and decreasing numbers of farm animals.

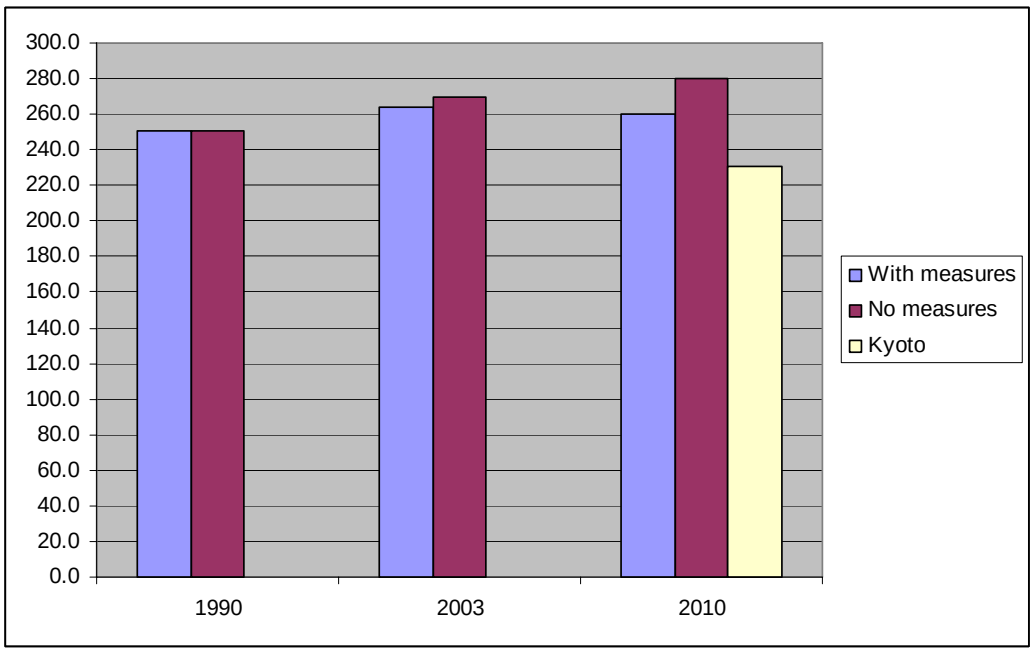

Fig. 2: Effects on domestic emissions of policy instruments and measures that have been implemented and adopted since 1990 and the Kyoto target. Gg CO_2 equivalents.

5. Description of the activities under Articles 10 and 11 od the Kyoto Protocol

5.1. Improvement of national greenhouse gas inventory

The climate inventory for the Principality of Liechtenstein is still under development. The work is primarily linked to the development of an emissions register for air pollution control. Detailed values are not yet available for all sectors. The emission data and the values for 1990 and 2010 are therefore based on estimates. The most important steps and assumptions are illustrated in the following table:

IPCC	Category	Procedure for calculating the emissions	Data quality
1	Energy	Fuel sales statistics by energy source (petrol, diesel, heating oil, natural gas, firewood, liquid gas) and emission factor	Natural gas: good Other fuels: medium
1A	Fuel combustion activities	Sales statistics fueling stations, heating oil dealers, Customs Authority (refund of mineral oil tax for agricultural vehicles)	See 1A1-1A4
1A1+1A2	Industries	1A1 Energy industries: no emissions 1A2 Other industries: Sales statistics heating oil dealers, estimates of shares of 1A2, 1A4 CO_2 emission factors from carbon content or Swiss emission factors	good medium good medium
1A3	Transport	Sales statistics fueling stations, carbon content of the fuels (CO_2 emissions factor), Swiss emission factors for CH_4, N_2O	good CO_2 good CH_4, N_2O medium
1A4	Residential, institutional, commercial	Petroleum statistics Sales statistics heating oil dealers, carbon content of the fuels (CO_2 emissions factor), Swiss emission factors for CH_4, N_2O	good medium CO_2 good CH_4, N_2O medium
1A5	Others (off-road)	Data included in Transport (1A3)	---
1B	Fugitive emissions	Estimate of losses via sales volume	poor

2	Industrial processes	No estimate Except for SF_6 from LPA transformer	--- good
3	Solvents	Figures are not estimated; the emissions volumes are certainly low	---
4	Agriculture	Activity data (number of livestock, surface data, land use) and Swiss emission factors.	good Soil emissions: poor
5	Land use and forestry (sinks)	Simplifying assumption of equilibrium (source capacity = sink capacity)	poor
6	Waste	No emissions: waste incineration in Switzerland; former waste disposal sites no longer generate gas.	good
Memo items	CO_2 emissions from biomass	Report and energy statistics of the Office of Forests	good

Table 6: Overview of the most important methodological assumptions for the calculation of the climate gas inventory (the structure corresponds to the IPCC categories, see coding in leftmost column).

Status of the Liechtenstein climate gas inventory

So far, Liechtenstein has compiled inventories in the Common Reporting Format (CRF) for 1990 and 2003. Both of them are not yet complete, but they cover the most important sources. Because of the state of the data, the 1990 emissions could not be calculated consistently with the 2003 emissions for some sources. The data will be supplemented and adjusted for the next submission in 2006. For some calculations, emission factors from the Swiss greenhouse gas inventory were used, where it made sense to do so (FOEN 2005).

5.2. Measures to mitigate climate change and facilitate adequate adaptation to climate change

5.2.1 Education at schools

The Ministry of Education is responsible for the coordination of education. The relevant legislative provisions are the Education Act and the Vocational Training Act, along with the relevant ordinances. In addition, it is particularly significant that the various relevant special laws, especially the more recent ones such as the Forestry Act and the Nature Conservation Act, lay down the binding requirement for implementing authorities to promote regular basic and ongoing training for the affected bodies, to ensure information for the public, and in general to strengthen public awareness for sustainable development, in addition to comprehensive monitoring.

Also after the 1992 Earth Summit, various school projects on environmental education were conducted at Liechtenstein schools. These included:

The use of environmental focal points at various schools: Teachers are exempted from one teaching period in exchange for assuming responsibility for instruction on environmental issues. The environmental focal points initiate and support concrete environmental projects at their schools. This has resulted in forest days, school gardens, environmentally friendly recess areas, field trips, and much more.

Environment days: Environment days take place at all schools in the country. For instance, a secondary school class visited a hydroelectric power plant on "The Day of Water", and other classes built waterwheels and a small biotope.

Eco-friendly office and school supplies: A specific catalogue recommends eco-friendly office and school supplies to teachers (paper, notebooks, writing implements, etc.).

Various other support activities: With the publication of various teaching materials (e.g., "School on the Farm"), the organization of specific continuing education courses for teachers, etc., the Office of Education promotes environmental consciousness that fulfills the goals of the new curriculum.

During mandatory schooling, the "People and the Environment" cluster constitutes a fixed component of the curriculum along with other teaching areas.

5.2.2 Public outreach

Public outreach is the responsibility of the administrative office assigned to the area in question. In addition, some tasks are delegated to external institutions, and individual outreach campaigns by NGOs are supported. In 2005, an NGO organized an exhibition entitled "Glaciers in the Greenhouse" and received financial support from the Government. Local authorities conduct public events. The population is also provided with information on individual environmental concerns through reports in the newspapers. Research and survey results concerning the condition of the mountain region and information on environmental developments and changes are regularly brought to the attention of the public by authorities and public authorities via publication series, thematic brochures, posters, and reports in newspapers. Specialized excursions with school classes, population groups, and professional organizations conducted by various authorities constitute an important component of public outreach. An audit is currently under development with the goal of improving the compatibility of winter sports facilities with the landscape and the environment.

The Office of Environmental Protection annually distributes an environmental protection calendar to the public. Each year, the environmental protection calendar focuses on a different environmental topic. School children are included in the development of the calendar, by asking them to contribute a drawing to the calendar's theme. In this way, children are already sensitized to the environment. The 2006 environmental calendar is explicitly dedicated to the theme of climate protection.

5.2.3 Cooperation with private institutions an NGOs

Various institutions are also engaged in public information and education. In particular, these include the Liechtenstein Environmental Protection Society (www.lgu.li), the Solar Society, and the Liechtenstein Traffic Association (VCL).

CIPRA (International Commission for the Protection of the Alps), which is headquartered in Liechtenstein, has conducted the "Summary Academy on the Alps" each year since 1998. The Summer Academy is a valuable continuing education program for young people with a university or technical college degree who are interested in an interdisciplinary, transnational approach to Alpine issues. The Summer Academy consists of a three-week basic course on the Alps and an optional four-week practice-oriented project component. Experts from all the Alpine countries are hired as instructors. The State of Liechtenstein supports this project financially.

An important focus area of the "Lake Constance Agenda 21" of the International Lake Constance Conference (ILCC), of which Liechtenstein has been a member since 2000, is the atmosphere. In this context, the Office of Environmental Protection has established a special contact bureau for municipalities, business sectors, and NGOs for questions concerning sustainable development. In 2004, the bureau was assigned to the Office of Future Trends, which reports directly to the Government.

5.3. Co-operation in scientific and technical research and observation

Basic research

Liechtenstein maintains its own University of Applied Sciences, at which institutes (Institute for Architecture and Planning) also examine sustainable development. Currently, the Institute is working in concert with other organizations on a project entitled "Alpine Rhine Valley: Future Concepts for Settlement, Nature and Networking". One goal of this project is sustainable regional development for settlement, transport, and landscape. In the context of natural scientific research on the country, national authorities and private organizations are also collaborating with foreign university research facilities and institutes. The goal is to gain ecological insights on a scientific basis that constitute a basis for formulating a sustainable development policy, in conjunction with insights gained from economic and socio-cultural surveys and research.

Liechtenstein supports research activities abroad by making annual contributions in the total amount of 250,000 CHF each to Switzerland (Swiss National Science Foundation, SNSF) and Austria (Austrian Science Fund, FWF). As a member of the EEA, Liechtenstein also participates in the European research programs (5th and 6th Framework Programme on Research).

Technological research

Public institutions in Liechtenstein are also indirectly engaged in technology research. The Liechtenstein University of Applied Sciences contributes a budget of 7.6 million CHF (2004) to the training of experts.

Liechtenstein also supports the Interstate University of Applied Sciences of Technology Buchs (NTB) with an annual contribution of 854,000 CHF.

Direct international engagement

Liechtenstein is interested in cooperation with its neighboring States and with international bodies and advocates cross-border coordination of land use planning. Liechtenstein is involved in the Interreg III B program "Alpine Space". Through the various Interreg projects, Liechtenstein supports the focus areas of water protection (including agricultural measures) and joint monitoring of air pollutant emissions in the Lake Constance region. Because of its small size, Liechtenstein's focus is on regional linkages. Liechtenstein is in contact with Switzerland, Austria, and Germany through various international agreements.

5.4. Provision of financial resources, co-operation in education and training programmes and co-operation in the transfer of climate change technologies

In 2004, Liechtenstein contributed about 14 million Swiss francs or about 400 francs per capita to International Humanitarian Cooperation (IHC). Liechtenstein expects to steady increase contributions over the coming years.

On the occasion of Liechtenstein's ratification of the Kyoto Protocol, the Government decided to support a climate project as a sign of solidarity and climate policy engagement. In 2005, Liechtenstein therefore supported the project of the Central Asian Mountain Partnership (CAMP) in Central Asia on "Saving energy, protecting natural resources, improving quality of life" with 100,000 Swiss francs.

The following table provides an overview of the most important contributions relating to the environment in 2004.

Contributions and projects	**Partner**	**Amount (CHF)**
Climate Convention: contribution to general budget	UNFCC	1,300
Multilateral fund of the Montreal Protocol (Ozone Fund): annual contribution		17,300
World Conservation Union (IUCN): contribution to general budget	IUCN	13,700
Permanent Secretariat of the Alpine Convention: contribution to the annual budget		24,000
UNEP: contribution to the general budget / Environment Fund	UNEP (UN Environment Programme)	5,900

Basel Convention: contribution to the general budget		7,500
Sustainable development of mountain regions in the Caucasus – Pilot projects for the creation of a regional strategy (financial contribution and Liechtenstein advisor/expert)	Regional Environmental Centre for the Caucasus (REC)	32,000
Campaign for better insulation of homes in Central Asia	Central Asian Mountain Partnership (CAMP)/SDC	75,000
Establishment of an information-protection cabin in the Borjomi Kharagauli National Park	WWF (Borjomi Kharagauli National Park)	30,000
TOTAL		206,700

Table 7: Overview of the most important contributions as part of Liechtenstein's international engagement in environmental protection, 2004.

With the strategy report already mentioned (Factor 2000), an important foundation has been laid for Liechtenstein's international climate policy. Currently, a number of options are under detailed consideration for expanding Liechtenstein's engagement in the area of climate.

5.5. Assistance to developing countries in implementing the convention

Liechtenstein takes its international humanitarian responsibility seriously. Solidarity with poor countries and with countries affected by disasters and armed conflicts is a traditional focus of Liechtenstein foreign policy. The Office for Foreign Affairs is responsible for the overall coordination of International Humanitarian Cooperation (IHC) in Liechtenstein.

The Liechtenstein engagement focuses on the three areas of emergency assistance, reconstruction assistance, and development cooperation.

Emergency assistance provides assistance and support after catastrophes and in the wake of armed conflicts. It is primarily granted in the form of contributions to programs of international aid organizations such as the ICRC and UNHCR, as well as bilaterally, especially through the Swiss Agency for Development and Cooperation (SDC) and the Austrian Development Agency (ADA). In addition, the Government employs the instrument of "doubling" the donation campaigns of the Liechtenstein aid organizations (especially the Liechtenstein Red Cross, Caritas Liechtenstein, and the Liechtenstein Aid Society) and of private persons.

Reconstruction assistance for refugees was established at the beginning of the 1990's as a consequence of the crisis in the former Yugoslavia, which precipitated a wave of refugees that brought several hundred refugees to Liechtenstein. As its name indicates, it focuses on the reconstruction of infrastructure and social institutions (schools, roads, housing, healthcare, etc.) in the home countries of refugees housed in

Liechtenstein. Due to the increasing diversification of refugees in Liechtenstein, it will no longer be possible in the near future to sustain such a clear geographic focus.

Development cooperation constitutes the largest share of IHC. Through economic, social, and cultural development, it aims to sustainably eradicate poverty in developing countries and transitional economies, elevate the standard of living in the population, and improve the rule of law and democratic structures in these countries. The focus is on the principle of "helping countries help themselves". The public funds for bilateral development cooperation are administered by the independent "Liechtenstein Development Service Foundation" (LDS), whose mandate is annually approved by the Government. Overall, LDS currently administers 60 development projects and programs in its traditional focus countries of Bolivia, Peru and Nicaragua, Niger, Mali, Burkina Faso, Senegal, Mozambique, Malawi, Zambia, and Zimbabwe. Recently, LDS has also taken on Liechtenstein's Eastern European assistance projects and will now also become active in Eastern European and CIS countries as well as Asia. Multilateral development cooperation consists in the support of general or topic-specific humanitarian and development policy programs of international organizations or institutions as well as non-governmental organizations. The focus areas of IHC and of development cooperation in particular are public health, social security, education, protection and sustainable use of natural resources, rural development, and good governance. A particular emphasis is placed on the promotion of women.

Of particular note from the perspective of environmental policy is Liechtenstein's engagement through financial and human resources, such as the provision of experts and the promotion of sustainable mountain region development in the Carpathians, the Caucasus, and Central Asia.

Within the framework of **international solidarity**, Liechtenstein also regularly makes general contributions to international organizations with humanitarian or development policy objectives. Liechtenstein especially supports UN programs, but also programs run by the Council of Europe and the OSCE. Liechtenstein also contributes to funds of the European Free Trade Association (EFTA) and the World Trade Organization (WTO) that support the development of poor countries through technical cooperation. Finally, Liechtenstein regularly makes contributions to the Cohesion Fund as part of its membership in the EEA.