

# Liechtenstein

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## **1. SOURCES OF INFORMATION**

Liechtenstein's Fourth National Communication submitted to the UNFCCC, 2005 (submitted 7 April 2006).

Liechtenstein's Report on Demonstrable Progress under Article 3.2 of the Kyoto Protocol submitted to the UNFCCC, 2005 (submitted 25 September 2006).

Liechtenstein's Initial Report under the Kyoto Protocol, dated 22 December 2006.

Personal communications from the Office of Environmental Protection, July 2007.

**Base-year emissions**

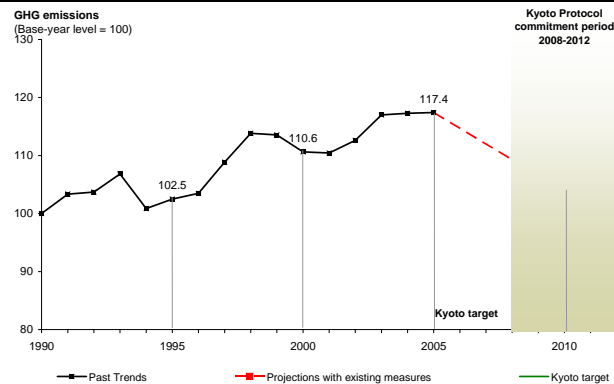
Base-year emissions of greenhouse gases are calculated using 1990 emissions for all greenhouse gases.

Base year data is 0.02 MtCO<sub>2</sub>-eq higher than data reported in Liechtenstein's Initial Report under the Kyoto Protocol, dated 22 December 2006. This data is currently undergoing a review procedure by UNFCCC and is therefore subject to change.

## 2. SUMMARY

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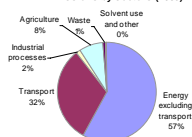
Emissions base year (initial report)	0.2 Mt
Emissions 2005	0.3 Mt
Emissions base year (for projections)	0.3 Mt
Projections 2010 with existing measures	0.3 Mt
No projections with additional measures	n.a.
Kyoto target (absolute)	0.2 Mt
Kyoto target (% from base year)	- 8.0 %
Change base year to 2005	- 17.4 %
Change 2004-05	+ 0.1 %
Change base year to 2010 with existing measures	+ 3.8 %
No projections with additional measures	n.a.
Distance to linear target path 2005	-23.4 index points
Use of Kyoto mechanisms	n.a.
Sinks (Articles 3.3. and 3.4)	n.a.
Emissions in 1990 (Article 3.7)	n.a.



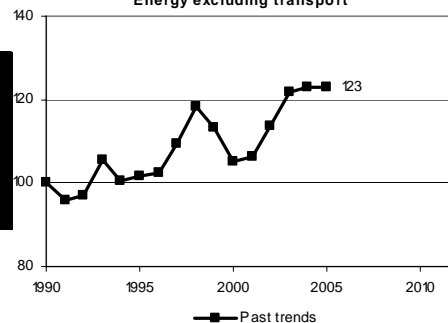
**Past emissions:** In 2005, Liechtenstein's GHG emissions were 0. % above those of 2004 and 17.4 % above base-year levels. In all sectors except agriculture 2005 emissions are higher than in 1990. since 2003 emission stabilised.

**Emission projections:** Emissions in 2005 were above based year levels and above the target. The 'with existing measures' scenario projects a decrease to 4 % above base year levels, which is not sufficient to reach the Kyoto target.

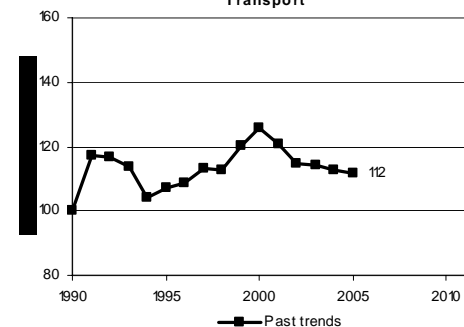
Emissions by sectors (2005)



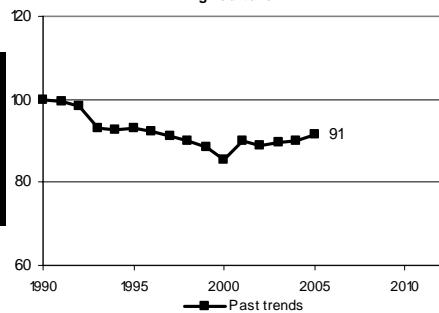
Energy excluding transport



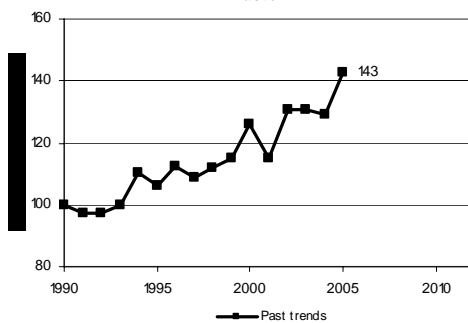
Transport



Agriculture



Waste



### 3. COMPLETENESS OF REPORTING

Table 1. Information provided on policies and measures

Information provided	Level of information provided	Comments
Policy names	+++	Clear names given
Objectives of policies	+++	Good description of objectives
Which greenhouse gases?	+++	Specifies which gases are affected by each PAM
Status of Implementation	+++	Clear for each PAM: implemented or planned
Implementation body specified	+++	Responsible authorities specified for nearly every PAM
Quantitative assessment of implementation	+	Limited quantification of PAMs in energy sector; indication of overall effect from graph of the effect of PAMs in DPR ("without measures" minus "with measures").
Interaction with other policies and measures discussed	0	Not discussed.

Table 2. Information provided on projections

Category of Information	Level of information provided	Comments
Scenarios considered		"With measures". "Without measures" shown in graph of effect of PAMs/total GHG emissions in the DPR. Discussion of planned PAMs but no quantification or "with additional measures" projections.
Expressed relative to base year	+++	Relative to 1990 base year
Starting year for projections	2004	
Split of projections	++	By gas (CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O) and sector (industry; transport; residential, institutional, commercial; agriculture; waste). Projections in the year 2010 only.
Presentation of results	+++	Clear, with both tables and graphs; however values (numbers) used in the graph of the effect of PAMs were not provided.
Description of model (level of detail, approach and assumptions)	+	Some description; refers the reader to the Swiss 4NC for more detail.
Sensitivity analysis (key inputs to model / high, central and low projections scenarios / robustness of model)	0	Not reported
Discussion of uncertainty	0	Not reported
Details of parameters and assumptions	+	Outlines the main modelling parameters/assumptions.

#### 4. ASSESSMENT OF POLICIES AND MEASURES

**Table 3a. Summary of the effect of policies and measures included in the 2010 projections (Mt CO<sub>2</sub>-eq.)**

This table summarises the emission saving attributed to each type of policy.

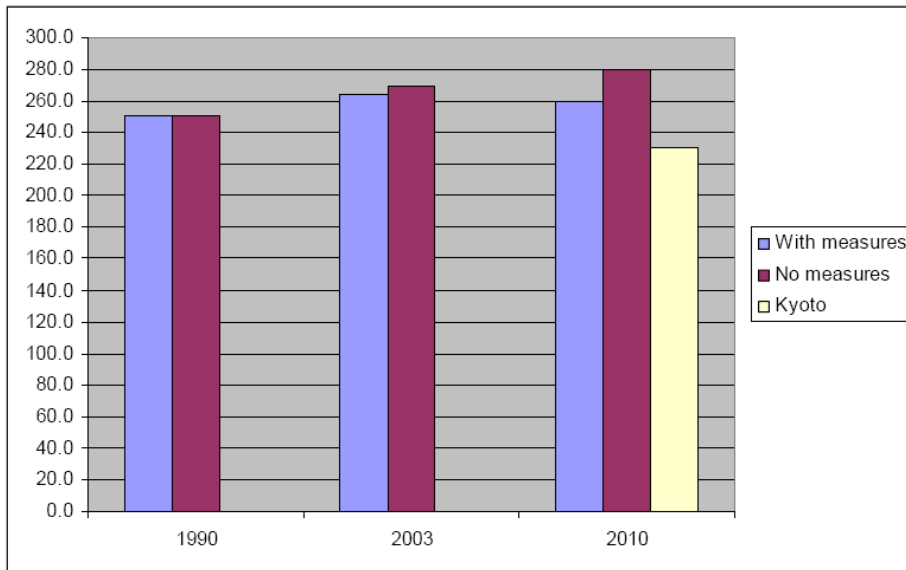
	With measures	With additional measures
Energy (total, excluding transport)	0.006	NE
Energy supply	NE	NE
Energy – industry, construction	NE	NE
Energy – other (commercial, residential, agriculture)	NE	NE
Transport (energy)	NE	NE
Industrial processes	NE	NE
Waste	NE	NE
Agriculture	NE	NE
Cross-sectoral	NE	NE
<b>Total (excluding LULUCF)</b>	<b>Approximately 0.020</b>	<b>NE</b>

The expected emissions savings due to policies and measures, either individually or by sector, are not quantified in the 4<sup>th</sup> National Communication or Demonstrable Progress Report. However personal communication from Liechtenstein's Office for Environmental Protection in July 2007 provided data for policies and measures adopted under the 'Energy Concept 2013' initiative which was included in the 4<sup>th</sup> National Communication. These data are summarized in Table 3b.

**Table 4b. Summary of the effect of 'Energy Concept 2013' policies and measures in 2010 (kt CO<sub>2</sub>-eq.)**

Policies and measures	Effect (ktCO <sub>2</sub> -eq.)
Restoration of old buildings	2270
Substitution of old combustion installations	423
Promotion of renewable energy	1136
- private households	289
- public buildings	847
Promotion of solar technology	1090
Green electricity	864
Promotion of natural gas as fuel subsidy	250
<b>TOTAL</b>	<b>6033</b>

The Demonstrable Progress Report provides the following graph of the effect of policies and measures implemented and adopted since 1990, in ktCO<sub>2</sub>-eq. Emissions under the "no measures" ("without measures") scenario are projected to be approximately 0.280 MtCO<sub>2</sub>-eq. in 2010, meaning that the effect of policies and measures is around 0.020 MtCO<sub>2</sub>-eq.



Source: Demonstrable Progress Report

**Table 5. Detailed information on policies and measures**

The 4<sup>th</sup> National Communication provides the following table summarising Liechtenstein's key policies and measures, both implemented and planned:

Policy / Measure	Goals / Approach	Affected gas	Responsible institution	Type of instrument	Status
<b>a) Energy</b>					
Energy Conservation Act	Promotion of the renovation of old buildings, heating systems (wood, solar energy, heat pumps), of renewable energies and demonstration facilities.	CO <sub>2</sub>	Office of Economic Affairs	Fiscal measure (subsidy)	In force since 1996
Heating regulations	Heated outdoor areas and ramps, outdoor heating and warm air curtains, electric room heating, and other stationary resistance heating of over 3kW are prohibited.	CO <sub>2</sub>	Building and Fire Authority	Regulation	Implemented since 1993 New Energy Ordinance since 2003
Heat insulation regulations	Buildings and installations must be planned as energy-efficient as possible (minimum insulation values), according to Ordinance / SIA Norm 380/1. If the building volume exceeds 2000 m <sup>3</sup> , the heating requirements may not exceed 80% of the SIA value.	CO <sub>2</sub>	Building and Fire Authority	Regulation	Implemented since 1993 New Energy Ordinance since 2003
Minergy standard for State buildings	Requirement that all new State buildings be constructed according to the Minergy standard.	CO <sub>2</sub>	Building and Fire Authority	Regulation	Implementation since 2003
Supply requirements	Determination of energy supply areas with requirement to join a district heating network.	CO <sub>2</sub>	Building and Fire Authority	Planning measure	Implemented since 1995 (Energy Ordinance)



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Liechtenstein Energy Concept 2013	Reduction of CO <sub>2</sub> emissions through appropriate measures. The Minergy standard now includes a subsidy, supplementing the Energy Conservation Act. Stronger promotion of heat insulation in old buildings and of photovoltaics. An additional measure is the construction of a biogas plant.	CO <sub>2</sub>	Office of Economic Affairs		Adopted by the Government in 2004
Green electricity (LiStrom Öko)	Auditing (SQS) and certification (VUE) of all domestic production sites according to "naturemade" product mixture of renewable energy sources (drinking water power plants) and new renewable energy sources (photovoltaic systems).	CO <sub>2</sub>	Liechtenstein Power Authority	Market-oriented supply, demand for ecological products (voluntary basis)	Since the beginning of 2004 (open-ended)
Promotion of photovoltaic systems of private owners	Through the sale of green electricity, the Liechtenstein Power Authority (LPA) pays 80 cents / kWh for energy generated from photovoltaic systems certified as "naturemade star" from 2004-2009.	CO <sub>2</sub>		Promotion by the LPA	Since the beginning of 2004
Promotion of energy generated by systems for efficient energy production	The conveyance price for the energy volume for own use may be waived in the case of production systems based on renewable energies or systems for efficient energy use.	CO <sub>2</sub>		Electricity Market Act	In force since 2002
Intelligent Energy Europe	Sustainable development in the field of energy. The EU program makes a balanced contribution to the attainment of general goals: energy supply security, competitiveness, and environmental protection.	CO <sub>2</sub>		EU program	Since 2003

Energy Star (labeling program for energy-saving office appliances)	The Energy Star label has already attained international significance. Appliances with the Energy Star label have a competitive advantage compared with non-labeled appliances. In a simple way, the label provides information to the consumer on the energy efficiency of the appliances.  Reduction of CO <sub>2</sub> emissions by preventing unnecessary stand-by of electric appliances.	CO <sub>2</sub>		Agreement between the US and the EU	In force
Participation of municipalities in the Energy City label <sup>1</sup>					Award of the label to the first municipality (Triesen)
Climate protection and energy platform, as part of the Environment Commission of the International Lake Constance Conference	Coordination, exchange of experiences, information	All	Office of Environmental Protection	Data collection	2005: Status report on climate protection on Lake Constance, with recommendations for activities  2005: Guidelines with practical examples
Elaboration of a hydrogeological map as a basis for using near-surface geothermal heat	Use of near-surface geothermal energy for heating purposes	CO <sub>2</sub> , precursor gases	Office of Environmental Protection	Foundations	2005: Completion of the map
<b>b) Transport</b>					

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Heavy Vehicle Fee	Relocation of goods transport from the road to railways, and reduction of transalpine road transport	CO <sub>2</sub> , precursor gases	Finance Administration	Fiscal measure (internalization of external costs)	Implemented since 1.1.2001
Promotion of solar, electric, natural gas, and/or hybrid vehicles	Vehicle tax waived for electric, natural gas, and/or hybrid vehicles	CO <sub>2</sub> , precursor gases	Driver and Vehicle Licensing Office	Fiscal measure	Implemented 1999
Conversion from diesel buses to natural gas buses in public transport	Purchase of new natural gas buses	precursor gases	Liechtenstein Bus Authority	Investment measure; Subsidy (using HFV funds)	Implemented 2001
Subsidies of electric scooters and electric bicycles	Promotion of light electric vehicles used for personal transport instead of private automobiles	CO <sub>2</sub> , precursor gases	Driver and Vehicle Licensing Office	Fiscal measure (subsidy)	Implemented 2002
Construction and operation of a public natural gas fueling station	Infrastructure for providing fuel to private vehicles	CO <sub>2</sub>	Building and Fire Authority; Bureau of Energy Consumption and Conservation	Investment measure; Infrastructure measure	Implemented since 2001
Supply of biogas into the natural gas fueling station	Supply of CO <sub>2</sub> -free fuel for the natural gas fueling station	CO <sub>2</sub>	Building and Fire Authority; Bureau of Energy Consumption and Conservation; Office of Environmental Protection	Investment measure; Infrastructure measure	Planned beginning 2006/07

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Design of motor vehicle tax according to specific CO2 emission	Incentive system for purchase of private vehicles with lower CO2 emissions	CO <sub>2</sub>	Driver and Vehicle Licensing Office; Office of Environmental Protection	Regulation, Fiscal measure	Planned beginning 2007
Promotion of public transport	Establishment of the Liechtenstein Bus Authority and introduction of the "Liechtenstein Takt" regional train schedule	CO <sub>2</sub> , precursor gases	Finance Administration	Institutional measure	Implemented since 2000
Exhaust regulations	Adoption of the European exhaust regulations (EURO norms), fuel regulations	precursor gases	Driver and Vehicle Licensing Office	Regulation	Ongoing (since 1993)
Promotion of slow transport	The bicycle and pedestrian network is being expanded continuously and made more attractive.	CO <sub>2</sub> , precursor gases	Ministry of Transport and Telecommunications; Office of Civil Engineering	Institutional measure	Ongoing
Zoning requirements	Limitation of the number of parking spaces for construction projects, where justified by municipal or national planning.	CO <sub>2</sub> , precursor gases	Building and Fire Authority	Regulation	Starting 2002
<b>c) Stationary facilities and waste</b>					
Emissions regulations	Emissions regulations for stationary facilities (heating, industry)	CO <sub>2</sub> , precursor gases	Office of Environmental Protection	Regulation	Implemented since 1987 Revised 1992 and 2005
Waste removal regulations in construction	Waste management: disposal concept and proof of recycling must be provided before construction begins.	CH <sub>4</sub> , CO <sub>2</sub>	Building and Fire Authority	Regulation	Implemented 1993 (Ordinance on the Construction Act)
<b>d) Agriculture</b>					

Ecological equalization payments in agriculture	Product-independent contributions for conversions to ecological cultivation methods	CH <sub>4</sub> , N <sub>2</sub> O	Office of Agriculture	Fiscal measure (direct payments)	Implemented since 1996
Preservation of soil for agricultural use	Agriculture: permanent protection of soil for agricultural use from misuse	CH <sub>4</sub> , N <sub>2</sub> O	Office of Agriculture	Regulation	Implemented since 1992
Water Protection Act	Cap on maximum number of cattle per land area	CH <sub>4</sub> , N <sub>2</sub> O	Office of Environmental Protection	Regulation	Implemented since 2003
<b>e) Planning</b>					
Foundations for a register	Establishment of a national energy register	CO <sub>2</sub>	Building and Fire Authority	Planning measure	Planned starting 2002
National guidance plan	Coordinated and sustainable development of the living and economic area of Liechtenstein on a inter-municipal and cross-border scale	-	Office of Land Use Planning	Planning measure, regulations, binding on State authorities	Planned (consultations beginning of 2006, adoption end of 2006)
<b>f) Forests</b>					
Cultivation regulations in the Forestry Act	Sustainable cultivation of forests	CO <sub>2</sub> (sinks)	Office of Forests, Nature and Land Management	Regulation	Implemented 1991
Ordinance on the scope and benefits of compensation and financial aid in the framework of the Forestry Act	Performance target	CO <sub>2</sub> (sinks)	Office of Forests, Nature and Land Management	Regulation	Implemented 1995

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Ordinance on forest reserves and protected areas	Performance target	CO <sub>2</sub> (sinks)	Office of Forests, Nature and Land Management	Regulation	Implemented 2000
Forest Inventory 1998 and National Forest Program (2002-2012)	Binding specifications for future use of forests; development of a Forest Inventory 2010	CO <sub>2</sub> (sinks)	Office of Forests, Nature and Land Management	Planning measure, Regulations	Implemented 2001
FSC certification of the entire forest stock	Performance target	CO <sub>2</sub> (sinks)	Office of Forests, Nature and Land Management; Forestry operations.	Operational planning	Implemented 2001

## 5. EVALUATION OF PROJECTIONS

The 4th National Communication and Demonstrable Progress Report provide “with measures” projections for 2010, alongside 1990 (base year) and 2003 historic data.

**Table 6. Summary of projections by gas in 2010 (Mt CO<sub>2</sub>-eq.)**

	Base-year	With measures	With additional measures
Carbon dioxide (excl. LULUCF)	0.227	0.238	NE
Methane	0.015	0.015	NE
Nitrous oxide	0.008	0.007	NE
HFCs	0	0	NE
PFCs	0	0	NE
SF <sub>6</sub>	0	0	NE
<b>Total (excl. LULUCF)</b>	<b>0.250</b>	<b>0.260</b>	<b>NE</b>
% change relative to base year (excl. LULUCF)		0.038	NE

**Table 7. Summary of projections (6 gas basket) by sector in 2010 (Mt CO<sub>2</sub>-eq.)**

	Base-year	with measures	% change relative to base-year	with additional measures	% change relative to base-year
Energy (total, excluding transport)	0.077	0.082	6%	NE	NA
Energy supply	0.000	0.000	NA	NE	NA
Energy – industry, construction	0.000	0.000	NA	NE	NA
Energy – other (commercial, residential, agriculture)	0.077	0.082	6%	NE	NA
Transport (energy)	0.091	0.092	2%	NE	NA
Industrial processes	0.063	0.068	7%	NE	NA
Waste	NO	NO	NA	NE	NA
Agriculture	0.019	0.018	-3%	NE	NA
<b>Total (excl. LULUCF)</b>	<b>0.250</b>	<b>0.260</b>	<b>4%</b>	<b>NE</b>	<b>NA</b>

NO: Not occurring. Waste from Liechtenstein is processed in a waste combustion plant in Switzerland and is therefore accounted for in the Swiss emissions and projections.

NE: Not estimated





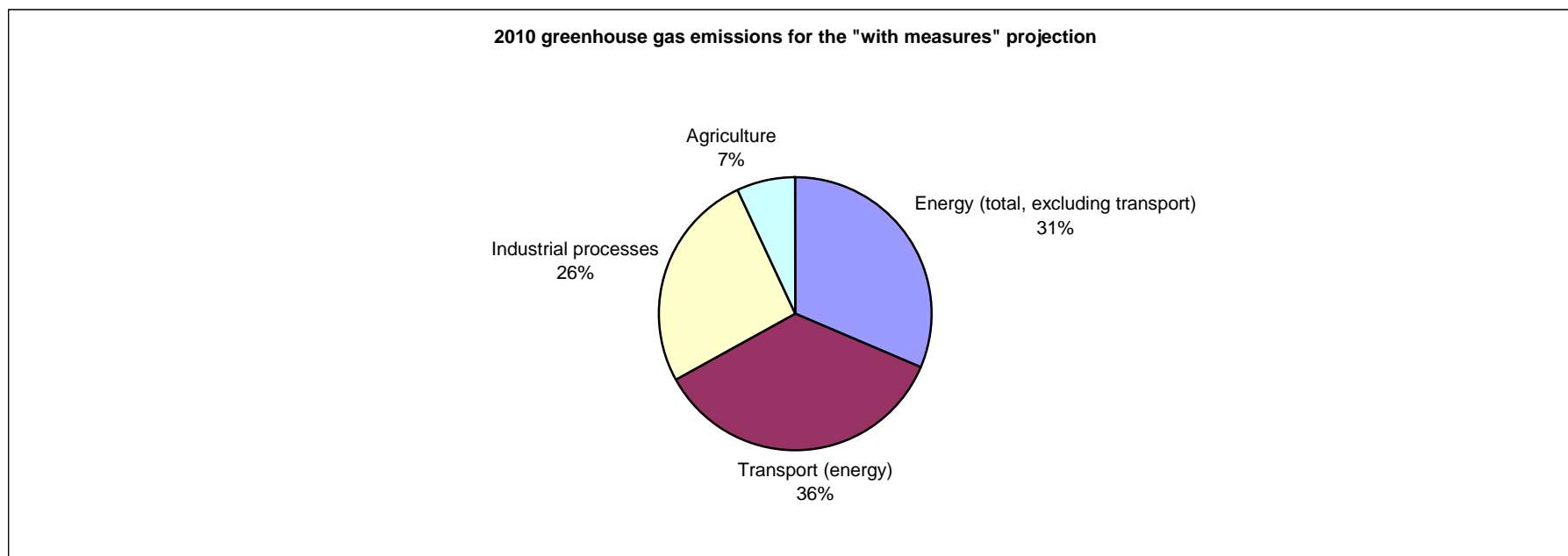
Table 8. Summary of projections by sector and by gas in 2010 (Mt CO<sub>2</sub>-eq.) compared to base-year emissions

	Carbon dioxide			Methane			Nitrous oxide			F-gases (SF <sub>6</sub> , HFCs and PFCs)		
	Base-year	With measures	With additional measures	Base-year	With measures	With additional measures	Base-year	With measures	With additional measures	Base-year	With measures	With additional measures
Energy (excl. transport)	0.077	0.081	NE	NE	0.000	NE	0.000	0.000	NE	0.000	0.000	0.000
Transport (energy)	0.088	0.090	NE	NE	0.000	NE	0.003	0.002	NE	0.000	0.000	0.000
Industrial processes	0.063	0.067	NE	0.001	0.001	NE	0.000	0.000	NE	0.000	0.000	0.000
Waste	NO	NO	NE	NO	NO	NE	NO	NO	NE	0.000	0.000	0.000
Agriculture	NE	NE	NE	0.014	0.014	NE	0.005	0.005	NE	0.000	0.000	0.000
<b>Total (excl. LULUCF)</b>	<b>0.227</b>	<b>0.238</b>	<b>NE</b>	<b>0.015</b>	<b>0.015</b>	<b>NE</b>	<b>0.008</b>	<b>0.007</b>	<b>NE</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>

NO: Not occurring. Waste from Liechtenstein is processed in a waste combustion plant in Switzerland and is therefore accounted for in the Swiss emissions and projections.

NE: Not estimated

Figure 1. Share by sector of 2010 greenhouse gas emissions according to the "with measures" projection



**Table 9. Summary of projections (6 gas basket) in 2010, 2015 and 2020 (Mt CO<sub>2</sub>-eq.)**

2015 and 2020 projections were not provided in Luxembourg's 4<sup>th</sup> National Communication.

	Base-year*	2010	2010 % of base- year level	2015	2015 % of base- year level	2020	2020 % of base- year level
Total (excl. LULUCF)	0.250	0.260	103.8%	NE	NA	NE	NA

\* Base year is 1990 for all gases

**Table 10. Assessment of the target (6 gas basket), with a comparison of 2010 projections in 2005, 2006 and 2007 national reports**

	Emissions in MtCO <sub>2</sub> -equiv., excluding LULUCF			
	2010 projections from 2005	2010 projections from 2006	2010 projections from 2007	2010 projections from 2007 % of base- year level
Base year emissions used for projections	0.218	0.250	0.250 *	100%
Kyoto Commitment/burden sharing	0.201	0.230	0.230	-8.0%
With existing P&Ms projections	0.219	0.260	0.260	104.0%
Gap (-ve means overachievement of target)	0.018	0.030	0.030	12.0%
With additional P&Ms projections	0.219	0.260	0.260	104.0%
Remaining gap	0.018	0.030	0.030	12.0%
Effect of flexible mechanisms	0	0	0	0.0%
Remaining gap (with use of flexible mechanisms)	0.018	0.030	0.030	12.0%

Above table excludes LULUCF. LULUCF will be covered in the main report, based on the questionnaire submissions.

Source for 2005 data is 3rd National Communication (2002). Source for 2006 and 2007 data is 4th National Communication (2005).

\* Base year data is 0.02 MtCO<sub>2</sub>-eq higher than data reported in Liechtenstein's Initial Report under the Kyoto Protocol, dated 22 December 2006. This data is currently undergoing a review procedure by UNFCCC and is therefore subject to change.

## 6. DESCRIPTION OF MODELLING APPROACH

### Overview of modelling approach

Because of its small size, Liechtenstein does not have a comprehensive system for predicting greenhouse gas emissions. The 2010 projections presented in the 4th National Communication and Demonstrable Progress Report are based mainly on cross references and analogous conclusions drawn from Swiss data.

The projections used by Liechtenstein are produced by the Swiss Federal Office of Energy (SFOE) for the energy sector and Swiss Federal Office for the Environment (FOEN) for non-energy sectors. However Liechtenstein's reports do not provide any further information about the models used, and refer the reader to the Swiss 4<sup>th</sup> National Communication for further details.

### Sensitivity analysis

Not reported.

### Details of the uncertainty assessment

Not reported.

## 7. PROJECTION INDICATOR REPORTING

Not reported.

## 8. REPORTING OF PARAMETERS ON PROJECTIONS

The 4<sup>th</sup> National Communication outlines the main modelling parameters/assumptions:

- 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%
- a nearly constant price of crude oil is assumed in the energy sector
- greater energy efficiency in households and industry
- in the transport sector, two opposing trends are assumed: the energy efficiency of vehicles will grow but automobiles will become increasingly larger and heavier
- the share of diesel vehicles and of natural gas and biofuel vehicles will increase, which will reduce "fuel tourism" in Switzerland and Liechtenstein (i.e., less petroleum "export" and less diesel "import").

Table 11. Indicators for projections to monitor and evaluate progress with policies and measures (2005/166/EC) Annex III

Not reported.

N°	Eurostat Sectors	Indicator	2005 2010 2015 2020				Numerator/denominator	2005 2010 2015 2020			
1	Macro	CO <sub>2</sub> intensity of GDP, t/Euro million					Total CO <sub>2</sub> emissions, kt GDP, bio Euro (EC95)				
2	Transport C0	CO <sub>2</sub> emissions from passenger cars, kt Number of kilometres by passenger cars, Mkm									
3	Transport D0	CO <sub>2</sub> emissions from freight transport (all modes), kt Freight transport (all modes), Mtkm									
4	Industry A1	Energy related CO <sub>2</sub> intensity of industry, t/Euro million					CO <sub>2</sub> emissions from fuel consumption industry, kt Gross value-added total industry, Bio Euro (EC 95)				
5	Households A1	Specific CO <sub>2</sub> emissions of households, t/dwelling					CO <sub>2</sub> emissions from fossil fuel consumption households, kt Stock of permanently occupied dwellings, 1000				
6	Services A0	CO <sub>2</sub> intensity of the services sector, t/Euro million					CO <sub>2</sub> emissions from fossil fuel consumption services, kt gross value-added services, bio Euro (EC95)				
7	Transformation B0	Specific CO <sub>2</sub> emissions of public and autoproducer power plants, t/TJ					CO <sub>2</sub> emissions from public and autoproducer thermal power stations, kt all products-output by public and autoproducer thermal power stations, PJ				
8	Agriculture	Specific N <sub>2</sub> O emissions of fertilizer and manure use, kg/kg					N <sub>2</sub> O emissions from synthetic fertilizer and manure use, kt use of synthetic fertiliser and manure, kt nitrogen				
9	Agriculture	Specific CH <sub>4</sub> emissions of cattle production,					CH <sub>4</sub> emissions from cattle, kt				

		kg/head					cattle populations, 1000 head			
10	Waste	Specific CH <sub>4</sub> emissions from landfills, kt/kt					CH <sub>4</sub> emissions from landfills, kt Municipal solid waste going to landfills, kt			

**Table 12. List of parameters on projections (Annex IV of Implementing Provisions<sup>2</sup>)**

Not reported.

<b>1. Mandatory parameters on projections</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Assumptions for general economic parameters</b>				
GDP (value at given years or annual growth rate and base year)				
Population (value at given years or annual growth rate and base year)				
International coal prices at given years in euro per tonne or GJ (Gigajoule)				
International oil prices at given years in euro per barrel or GJ				
International gas prices at given years in euro per m3 or GJ				
<b>Assumptions for the energy sector</b>				
Total gross inland consumption (PJ) (split by oil, gas, coal, renewables, nuclear, other)				
Total electricity production by fuel type (oil, gas, coal, renewables, nuclear, other)				
Energy demand by sector split by fuel (delivered)				
Assumptions on weather parameters, especially heating or cooling degree days				
<b>Assumptions for the industry sector</b>				
<i>For Member States using macroeconomic models:</i>				
The share of the industrial sector in GDP and growth rate				
<i>For Member States using other models:</i>				
The production index for industrial sector				
<b>Assumptions for the transport sector</b>				
<i>For Member States using macroeconomic models:</i>				
The growth of transport relative to GDP				
<i>For Member States using other models:</i>				
The growth of passenger person kilometres				
The growth of freight tonne kilometres				
<b>Assumptions for buildings (in residential and commercial or tertiary sector)</b>				
<i>For Member States using macroeconomic models:</i>				
The level of private consumption (excluding private transport)				
The share of the tertiary sector in GDP and the growth rate				
<i>For Member States using other models:</i>				
The rate of change of floor space for tertiary buildings and dwellings				
The number of dwellings and number of employees in the tertiary sector				
<b>Assumptions in the agriculture sector</b>				
<i>For Member States using macroeconomic models:</i>				
The share of the agriculture sector in GDP and relative growth				
<i>For Member States using other models:</i>				
Livestock numbers by animal type (for enteric fermentation beef, cows, sheep, for manure management pigs and poultry)				
The area of crops by crop type				
Emissions factors by type of livestock for enteric fermentation and manure management (t)				
<b>Assumptions in the waste sector</b>				
Waste generation per head of population or tonnes of municipal				

<sup>2</sup> Commission Decision of 10 February 2005 laying down rules implementing Decision No 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol

<b>1. Mandatory parameters on projections</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
solid waste				
The organic fractions of municipal solid waste				
Municipal solid waste disposed to landfills, incinerated or composted (in tonnes or %)				
<b>Assumptions in the forestry sector</b>				
Forest definitions				
Areas of:				
managed forests				
unmanaged forests				

<b>2. Recommended parameters on projections</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Assumptions for general economic parameters</b>				
GDP growth rates split by industrial sectors in relation to 2000				
Comparison projected data with official forecasts				
<b>Assumptions for the energy sector</b>				
National coal, oil and gas energy prices per sector (including taxes)				
National electricity prices per sector as above (may be model output)				
Total production of district heating by fuel type				
<b>Assumptions for the industry sector</b>				
Assumptions fluorinated gases:				
Aluminium production and emissions factors				
Magnesium production and emissions factors				
Foam production and emissions factors				
Stock of refrigerant and leakage rates				
<i>For Member States using macroeconomic models:</i>				
Share of GDP for different sectors and growth rates				
Rate of improvement of energy intensity (1990 = 100)				
<i>For Member States using other models:</i>				
Index of production for different sectors				
Rate of improvement or index of energy efficiency				
<b>Assumptions for buildings (in residential and commercial / tertiary sector)</b>				
<i>For Member States using macroeconomic models:</i>				
Share of tertiary and household sectors in GDP				
Rate of improvement of energy intensity				
<i>For Member States using other models:</i>				
Number of households				
Number of new buildings				
Rate of improvement of energy efficiency (1990 = 100)				
<b>Assumptions for the transport sector</b>				
<i>For Member States using econometric models:</i>				
Growth of transport relative to GDP split by passenger and freight				
Improvements in energy efficiency split by vehicle type				
Improvements in energy efficiency split by vehicle type, whole fleet/new cars				
Rate of change of modal split (passenger and freight)				
Growth of passenger road kilometres				
Growth of passenger rail kilometres				
Growth of passenger aviation kilometres				
Growth of freight tonne kilometres on road				
Growth of freight tonne kilometres by rail				
Growth of freight tonne kilometres by navigation				



<b>2. Recommended parameters on projections</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Assumptions for the agriculture sector</b>				
<i>For Member States using econometric models:</i>				
Agricultural trade (import/export)				
Domestic consumption (e.g. milk/beef consumption)				
<i>For Member States using other models:</i>				
Development of area of crops, grassland, arable, set-aside, conversion to forests etc				
Macroeconomic assumptions behind projections of agricultural activity				
Description of livestock (e.g. by nutrient balance, output/animal production, milk production)				
Development of farming types (e.g. intensive conventional, organic farming)				
Distribution of housing/grazing systems and housing/grazing period				
Parameters of fertiliser regime:				
Details of fertiliser use (type of fertiliser, timing of application, inorganic/organic ratio)				
Volatilisation rate of ammonia, following spreading of manure on the soil				
Efficiency of manure use				
Parameters of manure management system:				
Distribution of storage facilities (e.g. with or without cover):				
Nitrogen excretion rate of manures				
Methods of application of manure				
Extent of introduction of control measures (storage systems, manure application), use of best available techniques				
Parameters related to nitrous oxide emissions from agricultural soils				
Amount of manure treatment				

## 9. COUNTRY CONCLUSIONS

Liechtenstein's target for the First Kyoto period is an 8% reduction in emissions compared to the base year. The analysis of Liechtenstein's latest projections published in the 4th National Communication and Demonstrable Progress Report shows that Liechtenstein is predicted to exceed its Kyoto target by 0.03 MtCO<sub>2</sub>-eq., or 12% of base year emissions. Emissions in the industry, transport, and residential, institutional and commercial sectors are projected to increase between the base year and 2010 while those from the agriculture sector are projected to decrease slightly. Waste sector emissions and projections were not reported.

Liechtenstein provided a comprehensive and detailed description of policies and measures designed to reduce greenhouse gas emissions, and the reporting of projections was also clear in both table and graph format. Reporting could be improved by further quantifying the effect of policies and measures, individually and/or collectively; providing the actual number values used in all graphs; and further describing the modeling approach, assumptions, sensitivity and uncertainties.