PART III. NATIONAL REPORTING GUIDELINES FOR CSD-14/15 THEMATIC AREAS

A. ATMOSPHERE/AIR POLLUTION

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Current emission situation in Lithuania

Evolution 1990-2000

The reorganisation and modernisation of Lithuania's economy over the last decade has caused a decrease in operations of different industries, which also had a direct impact on emissions of pollutants into the air. Changes in industry have been of a particularly great influence. After 1990, the Soviet Union critically curtailed the supplies of energy and other resources. During the period 1991 – 1993, there was effectively a blockade of the economy. In 1994 GDP only amounted to 56% of its value in 1990 and started to grow again only in 1995. Emissions of sulphur dioxide, whose main sources are the sectors of industry and energy, decreased nearly 5-fold from 1990 to 2000. Once the economy starte d growing again, emission rose but this was in part compensated for by reductions achieved through energy efficiency and measures taken to reduce emissions.
Emission of all pollutants under National Emission Ceilings for Lithuania (NEC) show a reducing tre nd since 1990 mainly due to decrease of economic activities: energy sector, agriculture sector and industrial sector. Although the number of mobile sources in Lithuania has been increasing, emissions of NO_x have been reduced by a factor of 3 over the last decade (from 1990 to 2000) due to the better fuel quality and improvement of the mobile sources.

Evolution beyond 2000

Within the framework of its international obligations (LRTAP, Göteborg Protocol), Lithuania is required to calculate and report its total emissions of a number of pollutants (including SO_2, NO_x, VOC and NH_3) on a yearly basis. Emissions are calculated using the methodology prescribed by EMEP/CORINAIR, using the CollectER software package. The emissions of the pollutants SO_2, NO_x, VOC and NH_3, as calculated by the national emission inventory, shows a modest growth of emissions since 2000, but the emissions of the individual pollutants in 2003 were still way below the set emission ceilings(Table 1):

SO_2: 67,7 % under the ceiling;
NO_x: 44,5 % under the ceiling;
VOC: 18,8 % under the ceiling;
NH_3: 59,5 % under the ceiling.

Table 1: National Emission Ceilings for Lithuania by 2010

National Emission Ceiling (kton/year)			
SO_2	NO_x	VOC	NH_3
145	110	92	84

Factor that will strongly influence the future evolution of the emissions of SO_2, NO_x, NH_3 and VOC in Lithuania will be the successful implementation of existing national and EU legislation and of the national programmes for sustainable development in the various sectors. Factor that will strongly influence the future evolution of the emissions of SO_2, NO_x, NH_3 and VOC in Lithuania will be the

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National policies and measures

A number of national policies and measures are related to the reduction of emissions of SO_2, NO_x, NMVOC and NH_3. The national policies and measures prescribed are over viewed below by economic sector. Input is used in particular from the Sustainable Development Strategy, National Energy Strategy, National Energy Efficiency Programme, Special Programme for the Implementation of Energy Saving Measures, Long-term Economic Development Strategy of Lithuania until 2015, The Lithuanian Agriculture and Rural Development Plan 2000-2006, The Code for Good Agricultural Practice (CGAP).

Energy sector

The main measures identified in the strategic documents for the energy sector are promotion of economically efficient energy use, enhancement of energy security and diversification of energy sources, renewable energy sources (RES), combined heat and power generation (CHP), promotion of efficient use of resources through „green tax" reform and implementation of the EU framework for the taxation of energy products.

Economically efficient energy use

Economically efficient energy use is promoted by the implementation of the EC Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity. This Directive has been implemented in Lithuania by the amendment of the Excise law in 2004. The excise taxes have been increased since April 1, 2004. Only exemptions are applied for electricity until January 1, 2010, coal and coke until January 1, 2007 and orimulsion until January 1, 2016. Natural gas is exempted from excise taxes.

Promotion of renewable energy sources

Promotion of RES will be done using the following measures:

- programmes for consumption of indigenous energy resources, that will be updated on a regular basis;
- economic and financial measures (financial support to enterprises):
  - feed-in prices for electricity produced using RES:
    - 5.8 €ct/kWh for hydro;
    - 6.4 €ct/kWh for wind;
    - 5.8 €ct/kWh for biomass.
  - rojects for the use of wind, water and solar energy as well as for the consumption of other renewable sources and energy resources from waste will be implemented;
  - pecial conditions provided for developing the production of biofuels (denatured dehydrated ethylalcohol, oils of biological origin, methyl- and ethylester). Legal and natural persons using biofuels and documenting this usage, are exempted from the tax for pollution from mobile pollution, which is based on the fuel consumption and is levied per tone of fuel consumed.
  - he aim is to increase the share of renewable and indigenous energy resources (wood,

peat, various combustible wastes, wind and hydro energy, etc.) in the primary energy balance to up to 12 % of the total primary energy balance by 2010.

Combined heat and power

The existing district heating systems create favourable conditions to expand combined heat and power generation thereby enabling more efficient consumption of primary energy. According to the plans, the share of the electricity generated in the combined heat and power operation mode will account for at least 35 % in the electricity generation balance by the end of 2010. Moreover, the efficiency of district heating systems will be increased.

Measures necessary to ensure the least-costs development and operation of power and district heating systems and reliability of electricity supply are as follows (as foreseen in the National Energy Strategy):

e) modernisation of the Lithuanian Power Plant, the major electricity source, and of the Vilnius and Kaunas CHP plants: installation of new burners, modern control and management equipment, flue gas cleaning equipment;
f) renovation of the Kaunas Hydro Power Plant by 2007;
g) should new capacities be required and be economically justified, the construction of CHP plants in Klaipeda, Šiauliai and Panevežys, a combined cycle gas turbine condensing power plant and additional CHP plants in other cities;
h) reconstruction of the existing boiler-houses: installation of gas turbines and generators or small CHP plants using indigenous fuel, provided that their installation would be economically feasible taking into account the local conditions and that they could compete with renewed large power plants.

Residential sector

About 75 % of residential sector has centralised district heating systems. The district heating systems are not sufficiently effective and rehabilitation is required. Thus a combination of a centralized and a decentralized system has been applied. The focus, however is to meet the heat demand at least cost and minimal environmental pollution. Moreover, heat production from local and renewable energy sources as well as use of domestic waste for the generation of heat and electricity is being encouraged.

As regards liquefied gas consumption in households, it is estimated that this will increase to a small extent. However, the consumers whose demand for fuel is not high are recommended to use liquefied gas as a type of ecological fuel. To ensure a stable supply of liquefied gas, advanced technologies are to be applied. There is a great potential for energy saving in residential sector. Therefore renovation of buildings and modernisation of their energy facilities as well as further development of information, education and consulting activities are foreseen. The renovation of residential houses and public buildings as well as the modernisation of their energy facilities will be further financed by the residents, using soft credits administered by the public agency Housing and Urban Development Foundation as well as drawing on other possible sources of financing. Funds of the Housing and Urban Development Foundation are comprised of allocations from the state budget and loans granted by the World Bank and foreign countries.

The National Energy Efficiency Programme (Ministry of Economy, 2001) estimated the energy saving potential in residential buildings and in commercial and servicing sector buildings at 0.52 TWh or 45 % of all final energy consumption in these sectors.

The amount of energy used for domestic heating in Lithuania is 1.8 times higher than in other EU countries with similar climatic conditions. One of the objectives laid down in the Lithuanian

Housing Strategy (21 January 2004 Resolution No 60 of the Government of the Republic of Lithuania) is to ensure efficient use of energy sources. In order to achieve this goal, heating systems of multi-family buildings will be modernized, roof structures will be renovated and insulated, windows and external doors will be replaced or renovated, and joint defects of large-block construction buildings will be remedied. These measures will make it possible to achieve an up to 30% reduction in relative heat and fuel costs calculated per unit of surface area by 2020. This also reduces sulphur dioxide emissions generated due to domestic heating. Furthermore, national laws based on the EU terms, require that statistical accounting documentation be kept for energy use in buildings. This legislation also requires that energy audits and monitoring of activities are planned in case of building renovation or modernization. Building insulation, energy facilities renovation programs are foreseen. 'Energy passports' for buildings will be issued indicating energy performance characteristics.

Transport sector

According to the forecasts, the most noticeable increase in the consumption of light petroleum products is in the transport sector. Currently available processing, storage and distribution facilities for transport fuels are sufficient to meet the future demand.

Increase of energy efficiency, transport safety and use of alternative and more environmental friendly fuels are among the objectives set for the transport sector in the Sustainable Development Strategy. The long–term objectives include the increase of the use of less polluting fuels (liquid petroleum gas (LPG) and compressed natural gas (LNG) and low sulphur heavy fuel oil for ships) and alternative fuels. One goal is to ensure that biofuels (biodiesel, bioethanol) comprises not less than 15 % of fuel used by road transport by 2020. The use of more environment-friendly transport means is emphasized, as well as the creation of multi-modal transport systems.

The implementation measures for the long-term objectives are as follows (as set in the Sustainable Development Strategy):

- To promote modernization of transportation means with the help of economic and legal measures by giving priority to those means, which are less fuel consuming and less polluting for the environment.
- To economically promote the development of a network of petrol stations, which sell less polluting and biological fuels.
- To implement measures for the development of the infrastructure for different types of transport, and for improving their interaction as well as programs for the development of a network of bicycle tracks as foreseen in the Long-term Economic Development Strategy of Lithuania until 2015.

It is foreseen to widen the application of economic and legal measures reducing air pollution and noise from motor transport.

The National Energy Efficiency Programme (Ministry of Economy, 2001) states that the energy efficiency potential in the transport sector is on average 1,7 TWh or 0.15 Mtoe per year.

In implementing principle objectives of sustainable development of transport Lithuania follows the requirements of the Europe Agreement, international treaties and conventions, the UN Framework Convention on Climate Change and its 1997 and Kyoto protocols, the Convention on the Baltic Sea Protection HELCOM, Vienna regional conference "Transport and Environment" organised by the UN European Economic Commission in co-operation. Since 1998 only unleaded petrol has been sold in Lithuania.

Industry sector

The main emission reduction measures for the industry sector are the increase of efficiency of industrial processes, reduction of gasses emitted as by-products in industrial processes as well as improved health and safety conditions. Those results are achieved through implementation of ISO

14001, increase of efficiency and eco-efficiency, implementation of preventive environmental protection measures and cleaner production measures.
The Sustainable Development Strategy sets a long-term objective for industry as to direct the development of the industrial sector to advanced and environment-friendly technologies, increasing not only the economic but also the ecological efficiency of enterprises, saving resources and minimizing negative impact on the environment. The main long-term tasks are:

- To increase economic and ecological efficiency of production and ensure that consumption of energy and water in industry per production of GDP unit is reduced by a factor of about 2 and, according to eco-efficiency indicators, to reach the current average level in the EU.
- To increase production based on new technologies up to 20.25 % of the total amount of production and, according to this indicator, to reach the current average level in the EU.
- To substitute materials hazardous to the environment and human health used in production with non- or less hazardous materials.

In addition, the Sustainable Development Strategy sets mid-term objectives among others to develop equipment and installations minimizing impact to the environment and enlarge the implementation of cleaner production methods.
The Long-term Economic Development Strategy of Lithuania until 2015, Policy of Industry Development highlights among its priorities the importance of better technologies in any branch of industry and the balanced development of industry, ensuring a more rational use of energy and natural resources; the reduction of the impact of waste and pollution; the creation of products with lower impact on the environment during their whole life cycle; a more coherent development of regions and better use of their of potential.
The list of strategic goals is presented in the Strategy of Economic Factors of Environmental Protection (EFEP). This EFEP is a part of the Long Term Economic Development Strategy of Lithuania until 2015 and includes the reform of pollution charges with the aim to strengthening their incentive character; the introduction of the possibility of emissions trading via the transferability of pollution permits; the implementation of an efficient waste management system accompanied and promoted by the wider application of product charges and deposit-refund systems; the initiation of "green budget reform" and the establishment of the "green procurement" rule for the public purchases; the promotion of the subsidiary principle by enhancing municipal rights and responsibilities for local environmental control. The extensive substantiation and feasibility evaluation of the indicated strategic guidelines for the development of the EFEP is backed by a proposal for the necessary actions warranting timely achievement of the goals set in the strategy.

Measures in industrial sector

The privatisation of industrial enterprises, the introduction and entrenchment of market-driven economic relations have influenced production efficiency in most of the industries. *Preventive environmental protection measures and cleaner production methods* are also being introduced. The number of companies certified under ISO 9000 (421 on 1st July 2004) and ISO 14001 (111 on 1st July 2004, source: Lithuanian Standardization Department) has rapidly increased. During the last decade a number of bilateral technical assistance projects (mainly with partners from the Scandinavian countries) were carried out on training and implementation of cleaner production; waste minimization and environmental management. A recent example of those if the international project "Eco Forum Baltica", financed by the Stockholm County Administration, EU Programmes PHARE SPF and INTERREG III B, Ministry of Economy (Lithuania).
Eco-efficiency in the industrial sector has significantly increased in the last decade, the average energy consumption per GDP unit has decreased by a factor of 1.7; water consumption by almost a factor of 2; emissions of pollutants into the atmosphere by more than a factor of 2 (Sustainable Development Strategy, 2003). However, consumption of energy, raw materials and water per

production unit still exceeds the corresponding average rates of EU countries by 1.5-2 times.
Introduction of the best available technologies as part of the requirements for Integrated Pollution Prevention and Control (IPPC) will, to a certain extent, reduce emissions from IPPC installations. EU environmental requirements for BAT and requirements in the field of minimization of environmental impact by industry will speed up the implementation of environmental friendly technologies and cleaner production methods, as well as application of more effective environmental protection measures.
At the governmental level there are initiatives to promote sustainable production and consumption. The number of products labelled, as environmental friendly, has increased. In addition, a first pilot project on eco–design and life cycle assessment has been recently undertaken. A good example of awareness raising was the Baltic Conference on Sustainable Production and Consumption facilitated by UNDP and hosted by Lithuania in June, 2004.

Despite positive progress there is still room for improvements. There are neither methods in place yet for Lithuanian industries to use life cycle analysis, nor for the design of environment-friendly products. Very few enterprises use recycled materials and the ones that do import them from foreign countries. There is a lack of economic mechanisms promoting broader use of local secondary raw materials.

Solvent use in industry

Management and information on solvent used in Lithuania severely depends upon the implementation of the provisions of EC Directive 1999/13/EC on the limitation of emissions of volatile organic compounds (VOC) due to the use of organic solvents in certain activities and installations. A strategy of implementation of aforementioned Directive was prepared in 2001 (AAPC, 2001), that included preliminary inventory of VOC sources, estimation of amounts of solvents used and identification of ways to reduce and manage VOC emissions from these sources in the future.

The number of installations in Lithuania covered by the Directive 1999/13/EC is evaluated at 123. The total solvent use is approximately 2600 ton per year. The evaluated figures are only approximate and need to be adjusted in the future. Current system for issuing permits for use of natural resources, and the newly developed rules for granting IPPC permits in particular, also involve VOC control. A substantial number of installations subject to the Directive 1999/13/EC will be covered by the permitting system but some small installations, especially dry cleaning and vehicle refinishing plants, will be operated without permits.

Agriculture

A number of initiatives should reduce the NH_3 emissions from the agricultural sector. The main measures will be the application of agri-environmental schemes, the implementation of the EU Nitrates Directive as well as the implementation of the IPPC Directive.
As far as husbandry practices and evaporation of ammonia are concerned, it is important to secure proper management of grassland and pastures, forage preparation and storage, building of animal shelters, sustainable feeding and proper manure/slurry storages. All of these measures are very important in minimising the release of ammonia.
The Lithuanian Agriculture and Rural Development Plan 2000-2006 sets guidelines and priorities for the development of the agricultural sector in Lithuania. One of the most important documents for environmental protection in the agricultural sector is The State Program for Reduction of Water Pollution from Agricultural Sources (Valstybes Žinios (Official Gazette) 2003, No 83-3792), which implements the requirements of the EU Nitrates Directive regarding proper manure storage and regulates the application of organic fertilizers.

Another reference document is The Code for Good Agricultural Practice (CGAP). The CGAP has been prepared in 2000 under the guidance of the Water Management Institute of Lithuania and the Danish Agricultural Consultancy Centre and is a compendium of compulsory and recommended measures for the management of agricultural production. The CGAP is the first document in Lithuania, which provides the framework for a sustainable and environmentally friendly agricultural management system. It is a compendium of regulations and advices set up by legal acts of the European Commission, the Helsinki Commission and national legislation on sustainable and profitable farming without infringing the environmental regulations and damaging the environment.

Capacity building and training of farmers about environmental requirements in farming (following the Code of Good Agricultural Practice) is one of the indirect measures to mitigate emissions of GHG from agricultural sector. For example, the Code of Good Agricultural Practice prescribes the requirement of tilling and growing of agricultural crops.

Implementation of legislation

The main Law that regulated protection of air and introduces measures to limit air pollution and reduce the negative effects of anthropogenic activity is the Law on Protection of Air (adopted by the Parliament, No. VIII-1392, 4 November 1999).
The NEC Directive has been transposed into the Order of the Minister of the Environment "On Approval of National Ceilings for Sulphur dioxide, Nitrogen Oxides, Volatile Organic Compounds and Ammonia" (No. 468, 25 September 2003). The order sets the national emission ceilings as negotiated during the accession negotiations. Definition and methodology of calculation of critical loads are defined in Order of the Minister of the Environment "On the Methodology of Calculation of Critical Strain on Ecosystems by Sulphur and Nitrogen Compounds" (No. 157 issued on 4 October 1995).
The Law of Environmental Impact Assessment and the relevant orders set procedures and principles for environmental impact assessment for planned activities. Legal basis for strategic impact assessment that transposed provisions of Directive 2001/42/EC on assessment of the effects of certain plans and programs on the environment is under preparation. The environmental impact assessment require to assess emissions from planned point sources and geographical distribution of air pollution. The assessment takes into consideration a level of pollution and current ambient air quality in the area where the planned activity will take place.
Requirements for Integrated Pollution Prevention and Control have been transposed into the legal basis and available BREFs have been made available for the companies involved.
Regulation of the emissions from large point sources has been imposed through the implementation of the Large Combustion Plant (LCP) Directive (2001/80/EC Directive on the limitation of emissions of certain pollutants into the air from large combustion plants). This directive has been implemented by the normative document LAND 43-2001. Emission norms from LCP have been set by order of the Minister of Environment Nr. 486, 28 September 2001.
on amendments of the Norms of emissions from large combustion plants and norms LAND 43-2000 for emissions from large combustion plants' (Nr. 712, 24 December 2004). This order implied the provision that since 1 May 2004 limit value of SO2 shall not exceed 1700 mg/Nm^3 in all combustion plants that combust liquid fuel.
Fuel quality is regulated through fuel environmental indices. On 26 April 2004 the fuel environmental indices has been amended by the inter-ministerial order of the Minister of Environment, Minister of Economy and Minister of Communication No. D1-201/4-128/3-170. Following the provisions of the Directive 2003/17/EC it implies that since 1 January 2005 trade of petrol and diesel oil with sulphur content more than 10 mg/kg is prohibited. For diesel oil used in tractors and non road machinery, content of sulphur shall be less than 2000 mg/kg and from 1 January 2008 - 1000 mg/kg.
Emissions of NO_x from transport are defined by a number of normative documents. Order of the

Minister of the Environment "On Approval of the Assessment Methodology for the Atmospheric Pollution by Machines with the Internal Combustion Engines" (No. 125, 13 July 1998) includes methodology for calculating of pollution by NO_x.
VOC emissions from solvent use is regulated by the procedure prescribed in the Rules of the limitation of VOC emissions from solvent use in certain equipment' (Valstybes Žinios, 2003, Nr.15-634; and amendment of the Rules (Valstybes Žinios, 2003, Nr. 64-2913). By those legal acts Directive 1999/13/EC is transposed. Amendments of the directive 1999/13/EC on limiting the VOC content of paints, varnishes and vehicle refinishing products have been made by the directive 2004/42/EC. One impetus behind this directive is the difficulty in reducing substances in the air that negatively affect human health (specifically tropospheric ozone), under the National Emissions Ceiling Directive. Transposition of the directive 2004/42/EC is under preparation.
European Parliament and Council Directive 94/63/EC of 20 December 1994 on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations has been transposed by several legal acts. Order of the Minister of Environment No, 341 of 25 June 2001 has set the requirements for new mobile tanks used for petrol transportation and new service stations.
VOC emissions are regulated by normative document LAND 35 - 2000 "Limitation of VOC from new equipments for gasoline storage, filling and transportation (Order No. 520/104/360, 11 December 2000) amended by Order of the Minister of Environment, Minister of Social Affairs, Minister of Communication No. 600/172/454, 18 December 2001. This interministerial order set limitation for VOC emissions resulting from storage of petrol, distribution from terminals to service stations at existing equipment. Calculation methodology for VOC from storage, filling and transportation of light fuel oil is defined by normative document LAND 31-99/M-11.
Emissions of ammonia is prescribed by normative document LAND 33-99, Environmental requirements of manure and waste water management at farms (Order of the Minister of Environment No. 426, 27 December 1999).

Programmes designed to reduce consumption of ozone-depleting substances and promote alternatives under the Montreal Protocol

Lithuania is a Party to the Montreal Protocol, has ratified London, Copenhagen, Montreal and Beijing amendments.
Lithuania has implemented the National Programme on Phase-out of Ozone Depleting Substances (ODS). In the framework of the Programme investment project have been implemented, which allow to discontinue use of ODS in production of aerosols and refrigerators, and also to give rise and promote ODS recovery and recycling activities in the country. Due to these and other relevant activities consumption of Annex A and B substances was ceased by 2001.
Lithuania does not produce any ODS. According to the legislation in force, import of ODS from non-EU countries as well as export of the substances to non-EU countries is a subject to quota setting and licensing, as required by Decision IX/8 of the Parties to the Montreal Protocol. Import of CFC, halons, carbon tetrachloride and 1,1,1-trichloroethylene as well as products and equipment containing the substances or relying on them is prohibited.
Use of Annexes A, B C (II) and C (III) is prohibited in almost all areas with exemption of some specific minor areas of application. Establishment of the halon bank (in Estonia) under the Regional Halon Bank Project for Baltic States (implemented with assistance of UNEP) was a perquisite for decommissioning of the halon containing fire fighting systems. In the framework of the project workshops on alternatives for halons was conducted.
In 2002-2004 the Government took further steps reducing the consumption and use of ODS, namely HCFC and methyl bromide. Import of methyl bromide for uses other than approved critical uses or quarantine and pre-shipment applications has been prohibited since beginning of 2005. Lithuania actively participates in Regional methyl bromide projects. The first one was designed to provide more information of methyl bromide alternatives in different areas. Currently Lithuania participates

in the second project on phase-out of methyl bromide in the countries in transition. The main benefits are expected in training of governmental officials and industry and also investments in implementing alternatives for grain fumigation.
According to the legislation in force, use HCFC (Annex C (I) substances) is severely restricted and is allowed mainly for servicing of the existing refrigeration and air conditioning equipment. It is foreseen to cease consumption of virgin HCFC by 2010 that is earlier then set out in the Montreal Protocol.
Attention is paid for awareness raising by means of training the governmental officials and industry on legislative requirements and possible alternatives, issuing different kind of information sheets and booklets.

Future evolution of the emissions of SO_2, NO_x, VOC and NH_3

Fuel consumption

Projections of emissions from fossil fuel combustion were conducted based on the energy development scenarios of the Lithuanian Energy Strategy (2002). These projections are based on final energy demand and primary energy supply projections developed in the National Energy Strategy (2002). Forecasts of final energy demand include energy saving potentials evaluated in the National Energy Efficiency Programme and primary energy demand includes measures foreseen in the National Energy Strategy (measures to promote renewable energy source utilization, promotion of CHP, fuel standards etc). Implementation of the EU emission trading scheme can be seen as "additional measures".
Forecast of final energy demand and primary energy consumption was developed up to 2020. The projection of final energy demand was made based on a new version (2000) of the simulation model MAED (Model of Analysis of Energy Demands). General growth of economy and income has a significant impact on the introduction of new technologies and the possibility to reduce energy consumption. Thus, three scenarios of economic growth were selected:

1) fast economic growth (annual growth rate of 7 % up to 2010 and 3% from 2010 to 2020;
2) baseline scenario (4.7 % up to 2010 and 3 % from 2010 to 2020);
3) slow economic growth (2 % up to 210 and 3 % from 2010 to 2020).

Final energy consumption has been presented in detail not only by economic sectors (industry and its sectors, agriculture, transport, services and household sector) but also according to certain industrial processes, branches of transportation and social needs of the population. The year 2000 was taken as the base year. Projections of the final energy demands have been presented in detail according to sectors of economy and energy sources. Final energy demand has been predicted by estimating energy saving potential in particular economic sectors in accordance with the executive summary of the National Energy Efficiency Programme, revised and updated in 2001. It has been estimated when revising and updating the National Energy Efficiency Programme that20-50% of the currently consumed energy resources may be saved in particular economic sectors of Lithuania.
The total increase in energy efficiency has been predicted by taking into account a reduction in energy intensity, i.e. a decrease in the final energy consumed per GDP unit. Final energy is directly consumed by final consumers (industrial and agricultural enterprises, enterprises in the transport and services sector, individual consumers, etc.) in their equipment. Thorough analysis shows that in all cases the final energy demand in 2020 would not exceed the demand in 1990. At the end of the forecasting period, the consumption of fuel and energy in the basic scenario would be 6.2 million tons of oil equivalent, or 71 % of the amount consumed in 1990. In this case, the energy intensity index in 2020 would constitute only 49 % of the 1990 level, while energy efficiency according to this indicator would be close to the current average level in the European Union. Over the period till 2020, we can expect final energy intensity of GDP in Lithuania to converge to EU levels.
After the closure of the Ignalina Nuclear Power Plant, the existing capacities will be sufficient to

meet the national demand for a period beyond the year 2010 in all economic growth scenarios, provided the Lithuanian Power Plant is maintained and modernised. The modernisation of the existing combined heat and power plants and the construction of the new ones (of about 400 MW capacity) will facilitate the solution of the problem relating to the growing demand. After the closure of both the units of the Ignalina NPP, the Lithuanian Power Plant will become the major source of electricity. All the four 300 MW units should be prepared for operation before the closure of Unit 2 of the Ignalina NPP. Having modernised the existing thermal power plants, the cheapest electricity generating sources would be combined heat and power plants and their share of electricity generated (also taking into account the contribution of new CHP plants) in the total electricity balance could increase up to 35-45 % by 2015-2020. A greater contribution of CHP plants would correspond to a scenario of high fuel prices as CHP plants enable to increase the total fuel consumption efficiency.
Final energy demand and electricity demand forecast is the primary and very important information used in the primary energy demand forecast carried out within scope of National energy strategy. Primary energy demand is influenced by both internal factors (rate of economic development, increase of energy efficiency, fuel and energy losses, importance of the energy sector, fuel consumption in the production of fertilisers and other non-energy production), and external factors, such as the volume of power surplus export. For the primary energy supply forecast a mathematical model was developed at LEI for modelling of energy sector development for 25-30 years. This model was based on the Message mathematical model that originally was elaborated by International Institute of Applied System Analysis (IIASA) and its enhanced version currently is distributed by the International Atomic Energy Agency (IAEA). The mathematical model prepared for analysis of the Lithuanian energy system development represents the whole energy system of the country including all processes from primary energy extraction or import to the supply of final energy in different end-use sectors along the energy conversion chain. The model is a flexible instrument for energy and environmental analyses. The model was adjusted to specific Lithuanian conditions in order to represent correctly peculiarities of the energy system.

Livestock

Calculation projections of emissions of greenhouse gases from agriculture were based on the European Union's Clean Air for Europe (CAFÉ) Programme. The baseline agricultural scenario was developed by IIASA and local experts. Projected development of livestock shows a slight decrease.

Waste

Emissions projections from municipal solid waste disposal were calculated taking into account future trends in waste management in Lithuania and particularly the impact of the implementation of Directive 99/31/EC on waste, which limits the amount of biodegradable waste disposed in landfills. Projections of emissions from combustion of municipal waste and other activities were not calculated, as there is no combustion of municipal waste at the moment.

The National Strategic Waste Management Plan (2002) sets limits for municipal biodegradable waste as follows:
Until 2010 – not more than 75 % of the amount in 2000;
Until 2013 – not more than 50 % of the amount in 2000;
Until 2020 – not more than 35 % of the amount in 2000.

The decrease of biodegradable waste is mainly due to the implementation of waste minimisation, separation and recycling tasks and improved waste collection and management.

Emission prognosis by the RAINS model

Energy consumption

The total primary energy consumption, including hydro-electric and nuclear energy, export of electricity and heat, losses during fuel distribution and non-energy use of fuels, for Lithuania, as used for calculations with the RAINS model, is shown in Table 2.

Table 2: Total primary energy consumption in Lithuania

	Total primary energy consumption (PJ)
2000	301,7
2005	287,24
2010	297,18

If only the energy consumption, that can give rise to combustion emissions, is considered; the evolution of energy consumption is shown in **Error! Reference source not found.**. This means that hydro-electric and nuclear energy, export of electricity and heat, losses during fuel distribution and non-energy use of fuels are disregarded. Total energy consumption, that can give rise to combustion emissions will rise by 52,4% over the period 2000-2010. Increase in solid fuels consumption shows the highest increase, while increase in gaseous fuel consumption shows the lowest increase.
Division along the various sectors (power plants, combustion in industry, domestic and transport) is shown in **Error! Reference source not found.**. The largest increase in primary energy consumption is noticed in the sectors of power plants (replacement of the share that is currently produced by nuclear energy) and of transport.

Emission forecast for SO_2, NO_x, NMVOC and NH_3

SO_2

The evolution of the SO_2-emissions for the various sectors, as forecasted by the RAINS model, is shown in Table 3. It is clear that a reduction of emissions is reached in all sectors, leading to a global reduction of 15,9 % in 2010 compared to the base year 2000.

The emission ceiling for SO_2 for Lithuania in 2010, as discussed during the accession negotiations, has been set at 145000 tonnes. Forecasted emissions in 2010 are only 25 % of this ceiling. It is clear that the emission ceiling for SO_2 will be met.

Table 3: Evolution of the SO_2-emissions over the period 2000-2010 for the various sectors in Lithuania

	2000		2005		2010		Increase 2000-2010
	Emission ton	Share %	Emission ton	Share %	Emission ton	Share %	%
Power plants	16483	38,0	12424	35,0	14276	39,2	-13,4
Combustion in industry	11525	26,6	10122	28,5	10751	29,5	-6,7
Process emissions	8121	18,7	6162	17,3	6718	18,4	-17,3
Domestic	5981	13,8	5134	14,5	4279	11,7	-28,5
Transport	964	2,2	1395	3,9	136	0,4	-85,9
Agriculture	-	-	-	-	-	-	-
Others	290	0,7	290	0,8	290	0,8	0,0
Total	**43364**	**100,0**	**35527**	**100,0**	**36450**	**100,0**	**-15,9**

NO_x

Significant emission reductions are realised in the power plants and transport sector, while the emissions from domestic heating are predicted to raise significantly. Overall, a global reduction of 10,9 % in 2010 is obtained compared to the base year 2000.
The emission ceiling for NO_x for Lithuania in 2010, as discussed during the accession negotiations, has been set at 110000 tonnes. Forecasted emissions in 2010 are only 40 % of this ceiling. It is clear that the emission ceiling for NO_x will be met.

Table 4: Evolution of the NO_x-emissions over the period 2000-2010 for the various sectors in Lithuania

	2000		2005		2010		Increase 2000-2010
	Emission ton	Share %	Emission ton	Share %	Emission ton	Share %	%
Power plants	9502	19,4	6313	13,0	6325	14,5	-33,4
Combustion in industry	3198	6,5	3126	6,4	3160	7,2	-1,2
Process emissions	3232	6,6	2982	6,1	3234	7,4	0,1
Domestic	2139	4,4	2290	4,7	2536	5,8	18,6
Transport	30323	61,8	33224	68,4	27786	63,6	-8,4
Agriculture	-	-	-	-	-	-	-
Others	662	1,3	662	1,4	662	1,5	0,0
Total	**49056**	**100,0**	**48597**	**100,0**	**43703**	**100,0**	**-10,9**

NMVOC

Significant emission reductions are realised in most important sectors (process emissions, domestic use and transport (including evaporation losses)). Overall, a global reduction of 24,2 % in 2010 is obtained compared to the base year 2000.
The emission ceiling for NMVOC for Lithuania in 2010, as discussed during the accession negotiations, has been set at 92000 tonnes. Forecasted emissions in 2010 are only 61 % of this ceiling. It is clear that the emission ceiling for NMVOC will be met.

Table 5: Evolution of the NMVOC-emissions over the period 2000-2010 for the various sectors in Lithuania

	2000		2005		2010		Increase 2000-2010
	Emission ton	Share %	Emission ton	Share %	Emission ton	Share %	%
Power plants	222,74	0,30	195,1	0,30	272,07	0,48	22,1
Combustion in industry	146,122	0,20	146,619	0,23	158,092	0,28	8,2
Process emissions	32926,99	44,39	27333,156	42,47	24887,121	44,26	-24,4
Domestic	16831,847	22,69	16158,394	25,11	15342,267	27,29	-8,8
Transport*	19912,461	26,85	16398,208	25,48	11434,836	20,34	-42,6
Agriculture	-	-	-	-	-	-	-
Others	4129,928	5,57	4129,928	6,42	4129,928	7,35	0,0
Total	**74170,088**	**100,0**	**64361,405**	**100,0**	**56224,314**	**100,0**	**-24,2**

* Including evaporation losses

NH_3

Significant increases in emissions are projected for the power plants, transport and agricultural sectors. Overall, a global increase of 10,5 % in 2010 is obtained compared to the base year 2000. The emission ceiling for NH3 for Lithuania in 2010, as discussed during the accession negotiations, has been set at 84000 tonnes. Despite the forecasted increase, emissions in 2010 will only be 66% of this ceiling. It is clear that the emission ceiling for NH3 will be met.

Table 6: Evolution of the ammonia emissions over the period 2000-2010 for the various sectors in Lithuania

	2000		2005		2010		Increase 2000-2010 %
	Emission ton	Share %	Emission ton	Share %	Emission ton	Share %	
Power plants	22,918	0,05	18,885	0,03	87,634	0,16	282,4
Combustion in industry	14,214	0,03	14,08	0,03	14,937	0,03	5,1
Process emissions	5950	11,9	5500	10,0	5500	10,0	-7,6
Domestic	795,112	1,6	783,477	1,4	787,188	1,4	-1,0
Transport	154,591	0,3	238,441	0,4	228,516	0,4	47,8
Agriculture	43065,847	86,1	48184,718	88,0	48642,083	88,0	12,9
Others	-	-	-	-	-	-	-
Total	**50002,682**	**100,0**	**54739,601**	**100,0**	**55260,358**	**100,0**	**10,5**

Decoupling of emissions from energy consumption

The emission reduction measures, that Lithuania is implementing through the *acquis communautaire*, lead to a decoupling of the emissions of NO_x, SO_2 and NMVOC from the growth in energy consumption in the most important sectors, as is illustrated in Figure 1 to Figure 3.

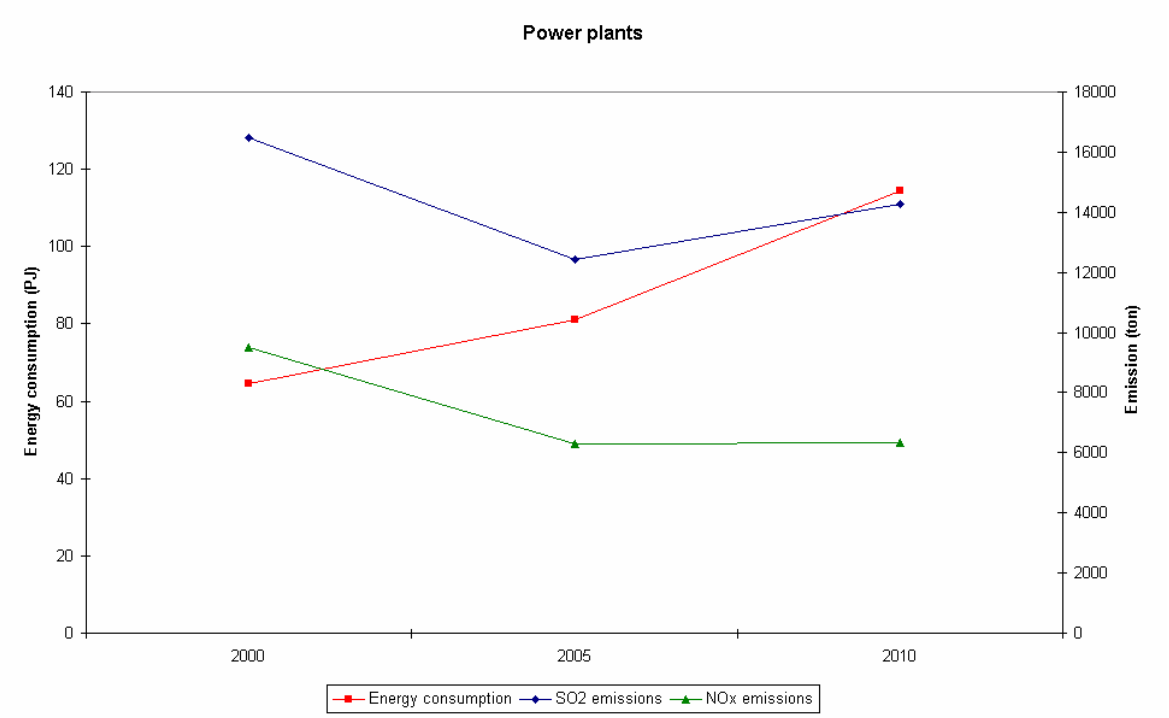


Figure 1: Decoupling of the SO_2 and NO_X emissions from the energy consumption in the power plants sector

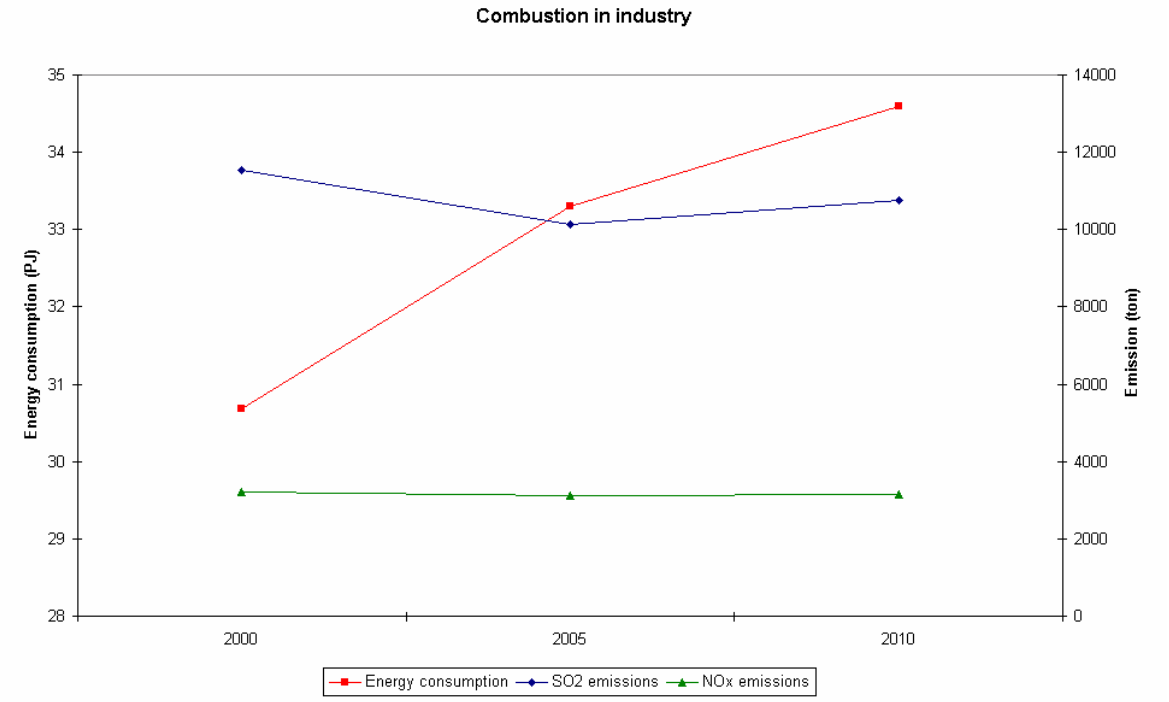


Figure 2: Decoupling of the SO_2 and NO_X emissions from the energy consumption in the sector of industrial combustion

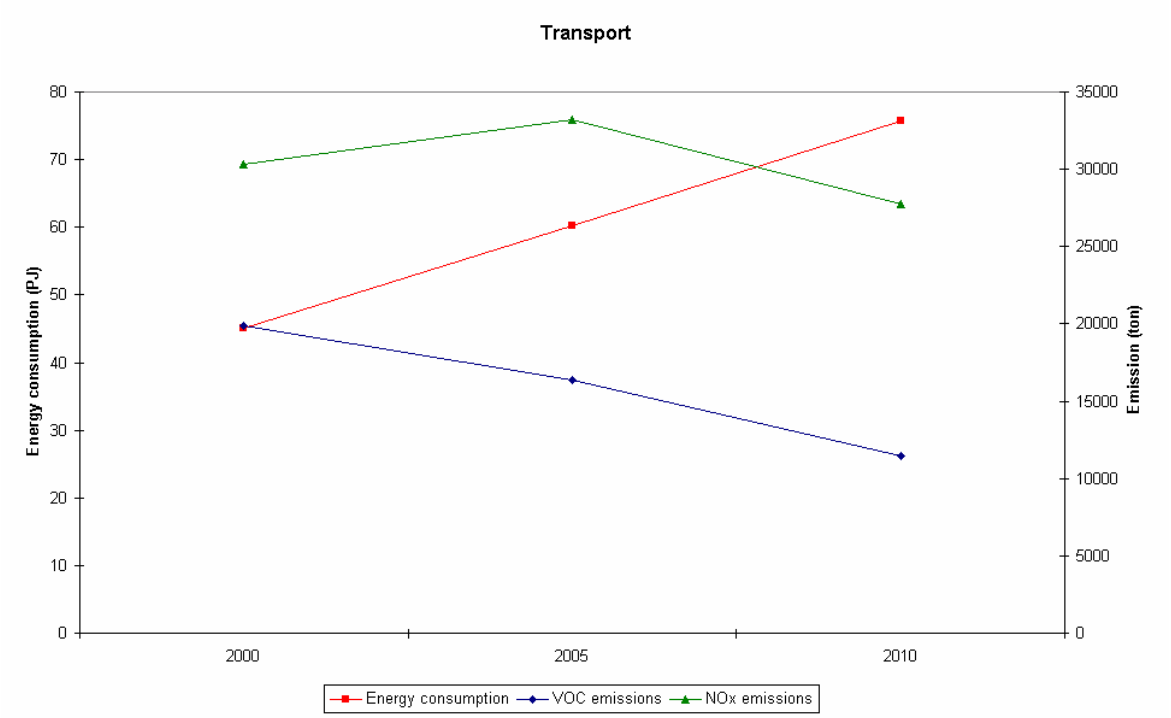


Figure 3: Decoupling of the NO_X and NMVOC (including evaporation losses) emissions from the energy consumption in the transport sector

Measures

The implementation of the large combustion plants Directive (2001/80/EC) will lead to a reduction of SO_2- and NO_x-emissions from power and district heating plants and larger combustion installations in industry. This reduction is achieved by (Table 7):

- switching to low sulphur solid and liquid fuels;
- lue gas desulphurisation;
- NO_x-control through combustion modification (low NO_x through staged air, staged fuel, steam injection, etc.)
- NO_x-control through selective catalytic reduction.

The latter measure leads to an increase of NH_3-emissions from those plants (NH_3-slip) but the contribution towards overall ammonia emissions of large combustion plants remains insignificant.
For transport, reduction of SO_2-emissions is the main result of the implementation of the Directive relating to the quality of petrol and diesel fuels (98/70/EC, amended by 2003/17/EC). The further limitation of the amount of light hydrocarbons in petrol and diesel fuels (higher Reid vapour pressure) will also have a beneficial effect on the evaporation emissions from cars. The reduction of NO_x-emissions resulting from transport, despite the increase of fuel consumption, is the main result of the implementation of the Directive on motor vehicle emissions (70/220/EEC + amendments, 88/77/EC + amendments), the so called Euro norms. Table 8 shows for the major categories (light duty vehicles on gasoline, diesel and LPG and heavy duty vehicles on diesel) the gradual introduction of vehicles meeting the different Euro norms as a result of implementation of the various EU Directives. For motorcycles, agricultural equipment, construction machinery and ships, similar measures as for light and heavy duty vehicle will also be introduced over the period 2000-2010. As the total emissions of these classes are, however, low compared to the light and heavy duty vehicles, the impact on total emissions of the measures introduced is low.

Table 7: Assumed implementation of measures for combustion plants in the RAINS model

		% of energy consumption applying measure		
		2000	2005	2010
Existing power plants	0,6% S HFO	12	50	70
New power plants	0,6% S HFO	-	70	70
	0,2% S FO	-	-	35
	0,045% S FO	-	-	65
	FGD solid fuel	-	100	100
Industrial combustion – all fuels	Combustion modification	8	16	24
Existing power plants – combustion modification	Gas	20	30	50
	FO	-	-	25
	HFO	-	-	55
	Coal	-	-	80
New power plants - SCR	Lignite	-	-	40
	Coal	-	-	60
	HFO	-	-	50
	Gas	-	-	10

Table 8: Assumed implementation of measures for the transport sector in the RAINS model

		% of energy consumption meeting specific norm		
		2000	2005	2010
Light duty vehicles - gasoline	Not suited	60	33	14
	Euro I	20	18	7
	Euro II	20	19	17
	Euro III		23	20
	Euro IV		7	42
Light duty vehicles - diesel	Not suited	80	42	17
	Euro I	10	9	7
	Euro II	10	9	8
	Euro III		33	30
	Euro IV		7	42
Light duty vehicles - LPG	Not suited	100	73	38
	Euro I			
	Euro II		10	10
	Euro III		10	10
	Euro IV		7	42
Heavy duty vehicles - diesel	Not suited	70	37	8
	Euro I	14	13	10
	Euro II	16	15	13
	Euro III		35	33
	Euro IV			24
	Euro V			12

Besides an effect on car evaporation losses as a result of the Directives relating to the quality of

petrol and diesel fuels (98/70/EC, amended by 2003/17/EC), VOC emissions are also reduced over the period 2000-2010 by implementation of the Directive on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations (94/63/EC) and the Directive on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations (1999/13/EC).
Next to the introduction of emission reduction techniques, there is also an tendency to switch to new equipment (with lower emissions) in the degreasing, dry cleaning, printing and vehicle refinishing sector, as is illustrated by the activity factors for those activities.

Table 9: Assumed implementation of measures for VOC emissions in the RAINS model

		% of activity applying measure		
		2000	2005	2010
Service stations	No control	70	30	-
	Stage I	30	70	100
Gasoline depots	No control	80	40	0
	Internal floating roof	20	50	50
	Internal floating roof + stage I	-	10	50
Decorative paint application	No control	90	20	-
	Changes in formulation and application patterns	10	50	20
	Changes in formulation and application patterns in order to comply with EC Products Directive	-	30	80
Degreasing – existing equipment	No control	100	81	54
	Basic emission management techniques	-	5	15
	Closed (sealed) degreaser – chlorinated solvents	-	3	10
	Cold cleaner	-	1	1
	Water based degreasing	-	10	20
Degreasing – new equipment	No control	80	60	40
	Closed (sealed) degreaser – chlorinated solvents	10	20	30
	Water based degreasing	10	20	30
Dry cleaning – existing equipment	No control	85	50	10
	Closed circuit	15	50	90
Dry cleaning – new equipment	No control	90	80	70
	Closed circuit	10	20	30
Industrial application of adhesives - traditional solvent based	No control	100	75	55
	Activated carbon	-	15	25
	Incineration	-	10	20
Industrial application of adhesives -	No control	100	89	77

		% of activity applying measure		
high performance solvent based	Emulsion	-	5	10
	Hotmelt	-	1	3
	Incineration	-	5	10
Industrial paint application	No control	69	43	15
	Current standard solvent based paints	15	30	35
	Improved solvent based paints	1	5	20
	Powder coating	10	15	20
	Water based paint	5	7	10
Fugitive emissions	No control	100	90	70
	LDAR	-	10	30
Offset printing – existing equipment	No control	100	75	10
	Primary measures + incineration	-	10	70
	Primary measures	-	15	20
Rotogravure – existing equipment	No control	95	55	10
	Enclosure + solvent recovery	5	15	30
	Enclosure + solvent recovery + low solvent ink	-	30	60
Shoe manufacture	No control	85	65	20
	Good housekeeping and substitution	15	35	80
Vehicle refinishing - existing equipment	No control	80	50	20
	Good housekeeping + primary measures	20	50	-
	Good housekeeping + primary measures + 25 % high solids or water based paint	-	-	80
Wood treatment	No control	74	51	10
	Vacuum impregnation system	1	5	5
	Water based preservatives	25	40	60
	Activated carbon	-	2	5
	Incineration	-	2	5

Table 10: Activity rates for existing and new equipment for VOC emitting activities in the RAINS model

		Activity factor		
		2000	2005	2010
Degreasing	Existing equipment	1,967	1,967	1,851
	New equipment	0,656	1,180	1,851
Dry cleaning	Existing equipment	1,889	1,802	1,619
	New equipment	0,633	1,081	1,619
Offset printing	Existing equipment	0,032	0,030	0,028
	New equipment	0,011	0,018	0,028
Rotogravure	Existing equipment	0,032	0,030	0,028
	New equipment	0,011	0,018	0,028
Vehicle refinishing	Existing equipment	0,218	0,204	0,219
	New equipment	0,073	0,122	0,219

Costs and Benefits of the implementation of the National Emission Ceiling

The costs of the implementation of the Directive 2001/81/EC on National Emission Ceilings for Certain Atmospheric Pollutants has been estimated in the study 'The Consequences of the Implementation in Lithuania of Directive 2001/80/EC On the Limitation of Emissions of Certain Pollutants into the Air from Large Combustion Plants (LCPs) and Directive 2001/81/EC On National Emission Ceilings for Certain Atmospheric Pollutants' , (European Committee, AAPC, 2002). According to the calculations the implementation of the Directive will require an additional 150,000 Litas in administrative expenses for various one-time tasks (review of the methodology of preparation of annual inventories of national emissions and of the methodology of determination of projections for SO_2, NO_x VOC and NH_3 emission quantities until 2010, evaluation of the exceedence of the 1990 critical loads by pollutants that cause acidification, determination of critical load projections for the year 2010, and assessment of critical levels of ground-level ozone as set forth in the Directive and determination of projections for the year 2010), and permanent expenses for two additional positions. However, there will be no need for investments.
Evaluating the benefit of the implementation only qualitative assessment was possible as the evaluation of an improvement of environmental protection is extremely complicated. The reduction of SO_2 and NO_X emissions will have a major impact on the health of the population. The implementation of the directive will be beneficial to the sectors of agriculture, forestry and fisheries. Economic benefit should also be gained by industries or enterprises, which manufacture, supply and sell cleaner technologies, fuel and equipment for the removal of pollutants. The benefit will also be enhanced by the reduced level of transboundary pollution.

Monitoring and revising of the programme of National Emission Ceilings

The Ministry of Environment draws up the national emission inventories for SO_2, NO_x, VOC and NH_3 on a yearly basis and provides these data to the Commission and the European Environment Agency.
As of February 2005, a Phare project has started on the 'Preparation of National Emission Reduction and Ambient Air Quality Assessment Programmes' (EuropeAid/114743/D/SV/LT). The goals of this program are, among others, to revise the current practises for emission inventory in the Republic of Lithuania, to improve it where necessary and to provide emission projections until 2020.
Based upon the outcome of this project, it may be necessary to review the current programme for progressive reduction of the emissions, which will be done before October 1, 2006 as required by the Directive. This project will also closely follow the activities under the CAFÉ program regarding the revision of the NEC Directive and the setting of potentially more stringent emission ceilings. If required, the revised version of the national programme for progressive reduction of the emissions will already take into account the future goals that might be set by the revised NEC Directive.

Air quality

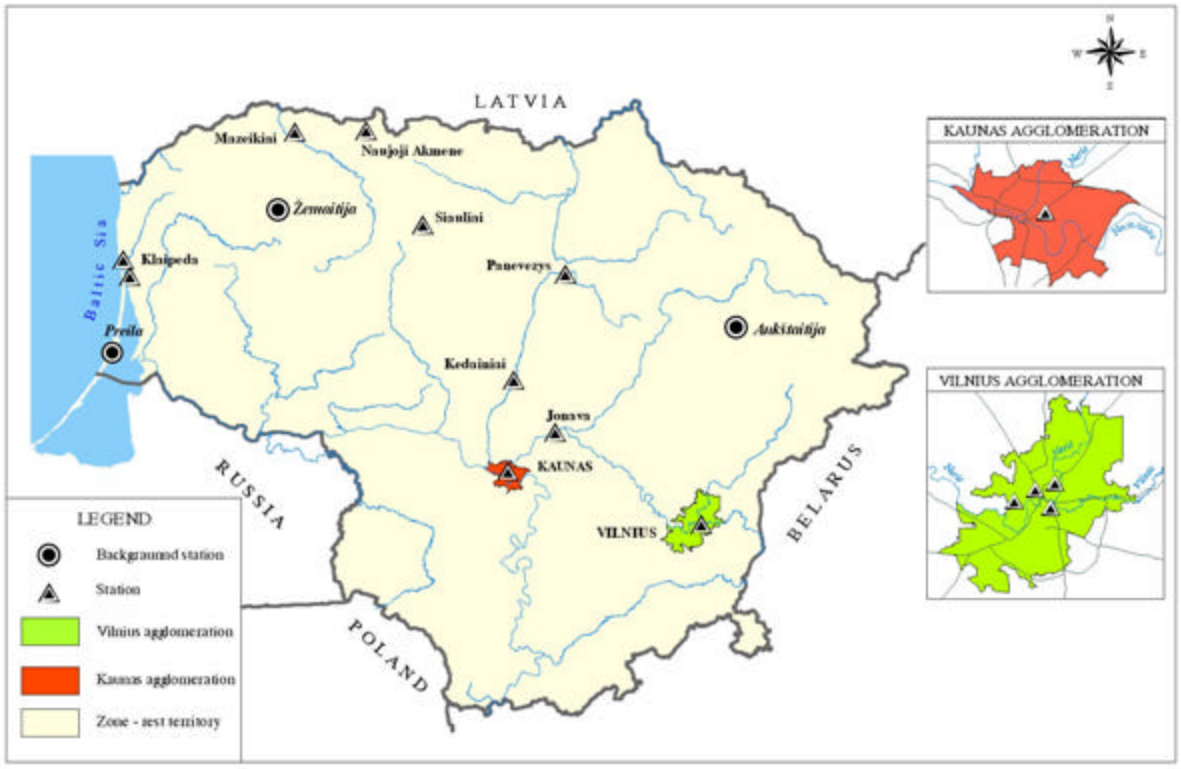
Air monitoring activity has been initiated in Lithuania since 1967 and basically was orientated to a local level. The system was expanded, optimized and in 1999 it consisted of 23 stationary air quality control stations located in major cities and industrial centres and based on wet chemistry methods (sampling of the pollutants conducted on a discrete basis, within 30 minutes three times a day: at 7 a.m., 1 p.m. and 7 p.m., thereafter samples were analysed in laboratories. New air monitoring network corresponding EU requirements was established at the end 2002. It consists of 16 stations located in two agglomerations and one zone. Three of them are rural stations and are carried out in remote sites from industrial enterprises and centers, where human activity is very low. These stations are considered for ecosystem's protection, all other stations represent the air quality

mainly in the cities and appointed for human health protection.
First ambient air quality for Lithuania report is prepared on the basis of measuring equipment only. There are 13 continuously measurement stations in current ambient air monitoring network. In five of them for SO_2, NO_2 and O_3 is used Differential Optical Absorption Spectrometry method (DOAS) and validated data for these components are able since October 2003. It should be mentioned, that there is no complete data coverage for DOAS measurements for 2003, also we expect that data coverage from air monitoring network next year will be better. In 3 rural stations measuring is carried out manually, only ozone here is measuring continuously as well as in other stations.
After the preliminary assessment Lithuania was divided into two agglomerations and one zone. It is approved by the order No 470/581 of the ministers of Environment and Health Protection on 30 October 2000.
With the aim to optimise air monitoring network, there is a plan to pursue passive samplers' campaign in Lithuania 2004-2005 and to make other needful supplementary measures. Probably the location of some monitoring sites may be changed as well as number of zones as a result of passive samplers' campaign.
Concentrations of pollutants, which are controlled in ambient air, usually are lower than limit values with exception of PM10. High concentrations of PM10 are established in the cities and mostly depend on winter sanding, emission of traffic and small scale stoves. The urban emissions and unfavourable meteorological conditions motivated the PM10 exceedences. According to Framework Directive requirements it should be draw up an action plans in order to reduce the risk for human health of high particulate matter concentrations. The action plans are on the preparation and concentrate on:
Improving the emissions from traffic;
Improving the emission regulations of small scale stoves;
Reducing the precursors of secondary aerosols (NO_x and SO_2).

Ambient air quality assessment by modelling is getting started and will be used in reporting next year.

Zones and agglomerations

Taking into account current air pollution level, administrative structure and density of population in the biggest cities, Lithuanian territory was divided into two agglomerations and one zone. One of the agglomerations is the capital of Lithuania – Vilnius city, which covers 400 km^2 and has about 553 thousand inhabitants.
Second agglomeration is a territory of Kaunas city, which occupies 157 km^2 with 369 thousand inhabitants. The remaining territory of Lithuania – 64743 km^2 and population around 2.5 mln - is nominated as one zone.
On the basis of the results of passive samplers' campaign, the number of zones and agglomerations may be optimised in the future. Growing centres in north of country, such as Šiauliai, with specific pollution sources and industrial area in the surroundings, may be detected as third agglomeration. Decision on this issue will be taken at the beginning of 2006.



The monitoring network

Lithuanian ambient air monitoring network consists of 13 automatic measurement stations located in urbanized territories and 3 background stations in the rural sites and allow assessment of ambient air quality according to EU directive's requirements.

There are 4 stations in Vilnius city: one urban-background, two traffic-orientated and a commercial-residential, which represent air quality in the agglomeration. One station is in Kaunas agglomeration and it is established near the most intensive traffic road.

In zone there are installed 8 continuous measuring stations in comparable big cities and industrial centers. The three background stations are in operation in separate regions of Lithuania. They are designed for the protection of ecosystems and are considered as a part of integrated monitoring. These stations are located in National Parks of Aukstaitija, Žemaitija and Neringa (Preila) and are in distance from motorways, industrial installations or urban areas.

Lithuanian air monitoring system was modernised and developed in line with the requirements of the relevant EU legislation at the end 2002. With PHARE Twining and others projects contribution there were installed new automatic equipment and put into operation including training in data processing.

At 8 stations in the network reference measuring methods are used for SO_2, NO_2, NO_x, NO, CO, benzene, lead, ozone and at 5 - Differential Optical Absorption Spectrometric method for NO_2, SO_2 and ozone. Sampling of the total suspended particles (TSP) with the aim to analyse lead is performed semi-automatic. In the background stations there are continuous measurements according to reference method for ozone, but for SO_2 and NO_2 concentrations allow only weekly data with exception of the Preila station, where daily data is obtained.

In all stations where are perform PM10 measurements, used β-Absorption method. For compliance with reference method, we use correction factor 1.3.

Methods used for measurement of concentrations in automatic stations:

NO_2, NO, NO_x	- Chemoliuminiscence
SO_2	- UV-Fluorescent
CO (mg/m^3)	- IR-Absorption
O_3	- UV-Absorption
Benzene	- Chromatography
PM_{10}	- β ray-Absorption
Pb	- Atomic Absorption Spectrometry

Maintenance, calibration and validation

The EPA is responsible for programming and co-ordinating environmental monitoring activities and is charged with advisory tasks on the accuracy of air measurement (systems) and air quality data and provides technical support and guidance to the whole of the ambient air monitoring network in the country.

Methods of quality control are used after starting the process of production when it is performed according to the demands of quality assurance. These methods are divided in control during the process and control on finalised products (data). The need for improving these quality assurance and quality control has been recognised by EPA. Therefore in the framework of the bilateral contacts between Lithuania and The Netherland's projects have been started to improve the monitoring system. Assistance of the Dutch project[1] will deliver technical support in order to improve the calibration laboratory and calibration procedures to make them more efficient and effective in air quality data processing.

The calibration will be expected to be in accordance to the requirements in the course of 2005.

Data capture

More than half of the monitoring sites produce data with a data capture more than 90 %. However, not all the stations' data coverage is in compliance with EU requirements. Especially the data capture for measurements made by DOAS method, have in the year 2003 ranging from 8 to 30 %. This is due to the fact that the equipment came in full operation for the first time in 2003, but quality controlled and assured data from DOAS stations is able only from September 2003.

City background station of Vilnius agglomeration didn't collect required amount of data, because at summer time due to technical reasons this station wasn't in operation. Data capture for different components range from 54 to 66 %.

Measuring Results

The main sources of pollutant emissions in Lithuania, as in many other countries, are mobile pollution sources, industry and energy sector.

SO_2

The concentrations of sulphur dioxide in ambient air, like in previous years, meet the limit values indicated in the DD1[2]. The results of measurement data on SO_2 did not exceed the lower and upper assessment threshold levels of the limit value for the daily mean and for the winter and yearly means. Only in Klaipeda (city in zone) at a very local scale maximum daily mean concentration

[1] Strengthening capabilities in implementing the requirements of Air Quality Directives for data assessment and exchange of information, Lithuania, PPA03/LT/7/4.

[2] Directive 1999/30/EC (the first Daughter Directive, DD1).

was 52 µg/m^3, e. a. exceeded lower assessment threshold (LAT) value. However in winter time SO_2 concentrations were a little bit higher, but no the exceedances of the limit values or the alert thresholds level are reported.

NO_2

An hourly mean nitrogen dioxide concentration - 200 µg/m^3 is given as one of the limit values for the protection for human health in the DD1 and this hourly value may not be exceeded more than 18 times a year. At no one monitoring site the 200 µg/m^3 limit value is exceeded more than 18 times per year. In 12 hours during 2003 this limit value was exceeded in Vilnius at the location near the road with heavy traffic and limit value plus margins of tolerance 278 µg/m^3 (LV+MOT) - only 2 hours. The maximum concentration here reached 338 µg/m^3. Also there were three hours, when NO_2 concentration was higher than LV, but below LV+MOT in industrial centre of zone, where a big fertilizer plant is located. The maximum value was 235 µg/m^3. The yearly mean concentration of nitrogen dioxide in Vilnius agglomeration varied from 15µg/m^3 at urban background station to 43 µg/m^3 at traffic station, in Kaunas agglomeration - 37 µg/m^3 and in zone it was lower than 40 µg/m^3 with exception of Šiauliai city with 41 µg/m^3. The reason of comparably high concentrations of NO_2 is intensive traffic in the cities.
The NO_2 alert threshold level – 400 µg/m^3 in Lithuania during 2003 was not detected.
Preliminary assessment of NO2 concentrations by dispersion modelling tools has started in Vilnius. Rough number of inhabitants that are living in the areas with exceedings of annual mean nitrogen dioxide concentration (40 µg/m^3) is 114.5 thousand.

PM_{10}

There is evidence of quite high concentrations of particulate matter (PM_{10}) over the whole monitoring network in Lithuania. The limit values combined with margin of tolerance for daily average were exceeded in 2003 only in Vilnius agglomeration. Annual mean concentration in traffic stations in Vilnius reached 41-47 µg/m^3 but in Kaunas agglomeration or in zone varied from 23 to 37 µg/m^3. Exceedence of the upper assessment thresholds level take place at all measurements stations.
The high PM_{10} concentrations depend on emission of mobile sources, winter sanding and house heating issues. The contribution of winter sanding is not clear at the moment. This will be analysed in the forthcoming period. If winter sanding is important for the higher PM_{10} concentrations, then Lithuania will consider practical measures to reduce the impact of winter sanding (better quality control of the sand and salts used; street sweeping programme after sanding etcetera). This is a long term process, compliance with the EU limits for 2010 is questionable, new limit (20 µg/m^3) is very likely not to be achieved in 2010.
There is no measuring results are available for $PM_{2.5}$, also in 2005 no monitoring equipment for measuring fine particulates will be able.

Lead

No exceedings of annual average lead concentrations were detected in Lithuania in 2003. The maximum value in agglomerations reached 0,007 µg/m^3 and in zone – from 0,002 to 0,010 µg/m^3. There are no local sources of lead that cause local higher concentrations. Since January 1998 lead is no longer a component of gasoline (not more than 0,013 g/liter) used in Lithuania. It is approved by order No 303 of the Minister of Economy on 22 October 1997.

Carbon monoxide

The concentrations of carbon monoxide are very low in all areas of the territory of Lithuania and meet the requirements of DD2 (the second Daughter Directive - 2000/69/EC). Maximum 8

hour moving average CO value was reported in Vilnius agglomeration and reached 5 mg/m^3. Usually CO concentrations are much lower in the cities of zone.

Benzene

No exceedings of benzene concentrations were measured. The maximum annual average value of benzene was detected in Vilnius – 1.7 μg/m^3 and in other areas it varied from 0.2 to 0.7 μg/m^3.

Ozone

The limit values of ozone are given in the DD3 (the third Daughter Directive - 2002/3/EC)for the protection for human health. These limit values were not exceeded in Lithuania in 2003. Only the 8 hour moving average target value (120 μg/m^3), which will be in force since 2010, was exceeded up to 5 days per year. Maximum ozone concentration (8 hour moving average) was established at urban background station in Vilnius and reached 138 μg/m^3. Target value for protection of vegetation (AOT), examined at rural stations not exceeded 18000 μg/m^3 h and varied from 4961 to 7148.

There were no alert and information thresholds for ozone in 2003, the maximum 1 hour average value reached 151 μg/m^3.

Summer exceedences were not detected in rural stations as well as in urbanized territories.

The ambient air quality in Lithuania for substances are assessed in compliance with the requirements. In the context of the limit values or alert thresholds there were no exceedences with exception of PM10. This problem is not only local, but observed in many other European countries. Forthcoming tasks are to develop and improve monitoring network as well as the quality of measurements. Modelling tools will be used in the future for assessing ambient air quality and hot spots for 2004 with probably support from PHARE project, which is underway.

Outlook for 2005

In 2005 the ambient air monitoring activities will be intensified: all stations are operational, data capture is sufficient. The quality control of the measurements will be improved due to support of the Dutch project, the monitoring maintenance and calibration practice will be improved that will allow to collect QA/QC data.

Report for 2004 will be done not only on the basis of measurements, but also with modelling tools. The effect of hot spots on ambient air quality will be assessed by modelling in addition to measurements. In the end of 2004 it will be decided what local scale models should be used best and introductions of the models will start in 2005. Probably the first results will be presented in the report over the year 2004.

In 2004 measurements for ozone precursors have been started. A set of precursors is measured at all the DOAS monitoring sites. These measurements are still in the research phase; quality control and quality assurance has not been completed until now. It is the aim of the ministry to set up this QC and QA system in the forthcoming years.

Institutional responsibility

The protection of environment is the primary responsibility of *the Ministry of Environment.* The MoE is the main environmental policy making authority of the Government of the Republic of Lithuania, which forms the country's state policy of the environmental protection, forestry, management of natural resources, geology and hydrometeorology, territorial planning, construction,

utilities and housing policy. The Ministry of Environment prepares the policy and legal basis for sustainable development and improvement of environmental quality, together with the subordinate institutions pursues the following goals: (1) to implement the principle of sustainable development; (2) to set preconditions for rational utilization, protection and restoration of natural resources; (3) to ensure provision of information about the state of environment and its forecasts to the public; (4) to create conditions for the development of construction business and the provision of residents with housing; (5) to ensure a proper environmental quality, taking into account the norms and standards of the European Union. For implementation of environmental policy as well as for monitoring the environmental quality, the Environmental Protection Agency was established in 2002. The Environmental Protection Agency collects and assesses the environmental data, organizes environmental quality monitoring, organizes IPPC requirements on a national level.

Other Ministries involved in the field of environmental protection include: Ministry of Agriculture responsible for land use, fisheries, land and water pollution issues; Ministry of Transport and Communications responsible for development of transport infrastructure in consideration decrease environmental impact, promotion of efficient, public transport development; Ministry of Economy for national economic planning and issues related to energy sector development; Ministry of Finance for financial planning.

The biggest obstacles to an effective long-term air protection policy in Lithuania are a lack of staff and training, a lack of funds.

The needs of capacity is:

- strengthening institutions at national level to co-ordinate and guide activities for air protection policy development and implementation (including national systems for data collection, data quality assurance and verification);
- education of local governments and industry stakeholders.