Unofficial translation

Ministry of Natural Resources and Environmental Protection
of the Republic of Belarus

Information and views on the means to achieve climate change mitigation objectives, including information on the potential environmental, economic and social consequences and spillover effects

in accordance with the documents
FCCC/KP/AWG/2007/2, paragraph 24
FCCC/KP/AWG/2007/4, paragraph 24
by the Ad Hoc Working Group on further commitments
for Annex I Parties under the UN Framework Convention
on Climate Change

February 2008

TABLE OF CONTENTS

pg.

Annotation

According to the Decision adopted by the Ad Hoc Working Group on further commitments for Annex I Parties under the UN Framework Convention on Climate Change, held in Bali 3-11 December, 2007 relating to the revision of the Program and mode of operation as well as the plan of consecutive sessions, in this Report the Republic of Belarus presents information and views on the means to achieve mitigation objectives, including information about the potential environmental, economic and social consequences taking into consideration national circumstances and spillover effects on other countries.

Introduction

The Republic of Belarus is a country of regional importance. Due to its geographical position the country has influence on building up the environmental situation in Europe through a system of redistributing transboundary air and water flows. The forests and wetland ecosystems in Belarus make a significant contribution to absorbing traditional pollutants as well as GHG emissions in Europe. In the economic sector, the Republic of Belarus also brings influence on the transit of freight traffics and energy carriers between western European countries, Russia and Central Asian countries and, therefore, is a country dependent on these flows.

Belarus belongs to the transition economy countries, which main distinctive feature is a considerable decline in gross domestic product production (GDP) in the 90-es of the last century linked with the beginning of reforms in planned command economy. Market mechanisms switching on the principles of economic and energy efficiency and the deliberate resource saving policy of the Governments have accounted for the fact that most of these countries, while getting out of recession and increasing GDP up to the pre-crisis level, stabilized its GHG emissions at a level of 40-60% of what used to be before reforms.

Earlier than any other former Soviet Union country, in November 2003, the Republic of Belarus recovered and exceeded the GDP level (by purchasing-power parity) of the pre-crisis 1990. At the same time, in order to reach the level of social and economic development planned by the main national program documents, it is vital to bridge a gap between the country and most industrialized countries in a number of economic parameters such as GDP per capita and energy consumption per capita, GDP energy intensity, etc. Ex ante development goals require high growth rates. The country's total GDP increased half as much again within the 2000-2005 period. In 2005 the Republic of Belarus ranked the world seventh for GDP growth rate by purchasing-power parity (the country was the fifth in 2004). Such rate led to an increase in GHG emissions in spite of continued trends towards reducing energy intensity of economy (Fig. 1).

On retention of the present GDP growth rate and without further measures to reduce energy intensity the consumption of fuel and energy resources is expected to increase more than 20% by 2012 compared to 2005 that will result in an increase in GHG emissions approximately by a quarter taking into account the necessity of fuel diversification. Thus, when determining the measures of reaching objectives and the actions for preventing climate change, it is necessary to take into account economy growth factors, which increase GHG emissions and decrease GHG sinks, as well as to provide for strategic actions stabilizing emissions and increasing GHG absorption.

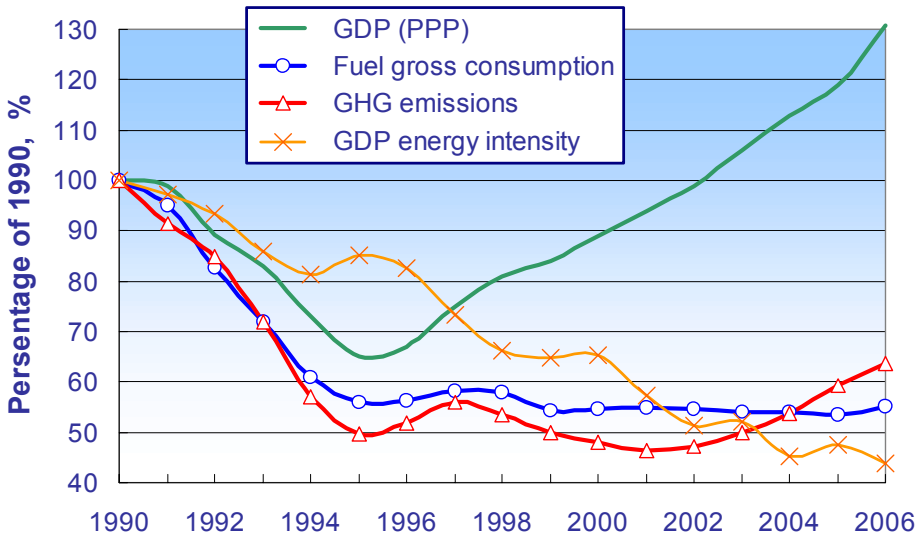

Figure 1: GDP trends, fuel gross consumption, energy intensity of GDP, and GHG emissions

Belarus pays due attention to the climate change problem as demonstrated by its accession to all major international environmental agreements. The Republic of Belarus signed the UN Framework Convention on Climate Change (UNFCCC) on July 11, 1992, ratifying it on May 11, 2000 and becoming a full Party to UNFCCC on August 9, 2000.

On August 26, 2005 the country signed the document on accession to the Kyoto Protocol to UNFCCC, becoming a full Party to the Protocol on November 24, 2005. The Parties by decision 10/CMP.2 adopted the first Amendment to the Kyoto Protocol that laid down quantitative obligations for the Republic of Belarus to limit its GHG emissions with 92% of the 1990 emission level. The inclusion of Belarus in Annex B is a key condition that gives the country an opportunity to use extra instruments in its national policy to reach the climate change mitigation objectives.

Delay in the ratification of the mentioned decision by the Parties does not allow the Republic of Belarus to boost the policy for modernization of the energy sector, where the consumption of fixed capital runs to 60%, and to attract renewable energy resources; restrains the introduction of best available technologies into industry and agriculture, and contributes to further implanting the existing practice with its low power supply capacity and high energy costs. Energy intensity of GDP (by purchasing-power parity) in the country remains 2 times higher than in a number of developed countries with the similar climatic conditions that gives evidence of considerable reserves for GHG emission reduction.

Since its accession to the Kyoto Protocol, the country has been making much effort to build conditions for meeting the commitments. For Belarus' full and effective participation in Kyoto flexible mechanisms, a legislative, institutional and

technical framework has been established, the National Action Plan for Climate Change and the Strategy of Reducing Emissions and Enhancing Removals by Sinks of Greenhouse Gases in the Republic of Belarus for 2007-2012 have been approved. The Republic of Belarus meets its commitments also with regard to submission of necessary information. The First and Fourth National Communications, Reports on the GHG cadastre, Report on Progress, Initial Report on assigned amount calculation, and First Annual Report under Article 7.1 of the Kyoto Protocol were timely submitted to UNFCCC.

The present Report is submitted according to the Decision adopted by the Ad Hoc Working Group on further commitments for the Parties included in Annex I to UNFCCC at its closing 4th session held in Bali on December 3-11, 2007 relating to the revision of the program and modalities as well as the plan of consecutive sessions, and it tends to inform the Ad Hoc Working Group about available tools to reach climate change mitigation objectives including information concerning environmental, economic and social consequences and spillover effects with due account for national circumstances.

Chapter 1. National circumstances and their impact on GHG emissions

1.1. Demographic and social indices

As of January 1, 2007 total population of Belarus came to 9.7 millions, the average population density makes up 46.7 persons per square kilometer, and urban population is 70.2%. Demographic trends and other accompanying social indices are shown in Table 1, from which it is seen that the main social benefits per capita have been growing since 2000.

Table 1. Demographic and social indices

	1990	1995	2000	2001	2002	2003	2004	2005	2006
Total population (to the end of the year), 1000 people	10190	10177	9990	9951	9899	9849	9800	9751	9714
Average annual population engaged in economy, 1000 people	5151	4410	4441	4417	4381	4339	4316	4350	4402
Real incomes of population, in % to the previous year	112,4	66,4	114,1	128,1	104,1	103,9	109,8	118,4	117,8
Total housing space put into service, 1000 m^2	5282	1949	3528	3009	2811	3019	3501	3786	4101
Consumer Price Index (December to the December of the previous year; in %)	…	344,0	207,5	146,1	134,8	125,4	114,4	108,0	106,6
Number of students in the trade secondary educational institutions, per 10000 people	141	144	150	156	163	165	162	158	157
Number of students in the higher educational institutions, per 10000 people	185	262	282	303	324	343	370	393	409
Number of medical professionals per 10000 people	38,9	42,7	45,8	44,9	44,8	45,0	45,3	45,6	46,4
Number of hospital beds per 10000 people	132,6	125,1	126,3	126,0	119,7	113,7	107,4	111,6	112,0

Source: http://belstat.gov.by/homep/ru/indicators/

Population has both a direct and indirect impact on GHG emission into atmosphere. Rural population remains the main consumer of firewood, peat brick and other stove fuel, which use in households is characterized by minor efficiency compared to that of heat power plants in cities. In addition production of domestic fuel for rural population involves a negative impact on the state of GHG sinks (forests

and peat bogs). Urban dwellers use transport in a more intensive way, have higher income, their demand fosters intensely the consumption of fuel resources and agricultural products, accumulation of decomposing and organic waste and as a result rise in GHG emissions.

1.2. Economic development

GDP growth is an underlying tool to provide and indicate sustainable development of national economy and to resolve social and environmental problems. In 2005, the Republic of Belarus was ranked the world 65th by GDP per capita (by purchasing-power parity) (8541 dollar/capita; source: World Bank www.worldbank.org/data/icp). At the same time, Belarus ranked the world 7th by GDP growth rate (in 2004 - the 5th). The major national economic indices and their trends are shown in Table 2.

Table 2. Major aggregated economic indices

	1990	1995	2000	2001	2002	2003	2004	2005	2006
Gross Domestic Product, bln. Rb.	43	121403	9134	17173	26138	36565	49992	65067	79231
Major indices in % to the previous year									
Gross Domestic Product	…	89,6	105,8	104,7	105,0	107,0	111,4	109,4	109,9
industrial product	102,1	88,3	107,8	105,9	104,5	107,1	115,9	110,5	111,4
consumer goods production	107,6	75,8	104,1	106,8	104,7	107,8	113,2	111,2	111,5
agricultural product	91,3	95,3	109,3	101,8	100,7	106,6	112,6	101,7	106,0
investment into the capital funds	108,5	69,3	102,1	96,5	106,0	120,8	120,9	120,0	132,2
retail turnover	114,7	77,2	111,8	128,2	111,5	110,3	111,5	120,0	117,4
Consumer Price Index (December to the December of the previous year; in %)	…	344,0	207,5	146,1	134,8	125,4	114,4	108,0	106,6
Profitability of sold goods, work, services, %	22,3	17,1	15,8	10,9	10,5	12,0	15,3	15,4	15,5

Source: http://belstat.gov.by/homep/ru/indicators/. Data in value terms are presented in real established prices, for 1995 subject to the denomination in 1994 (a tenfold decrease), for 2000 subject to the denomination in 2000 (a thousandfold decrease). The indices are given in comparable prices

1.2.1. Fuel and Energy Consumption

Combustion of hydrocarbon fuels is the main source of greenhouse gases. Gross fuel and energy consumption had tendency towards reduction until 1995, after that it stabilized, and by 2005 it was in the range of 35-37million tons of coal

equivalent (t.c.e.) per year, then the steady trend of growth begins since 2006. Great dependence on import of energy resources is the main problem for the development of the national energy sector. Increase of import prices for raw materials leads to increasing energy tariffs which in turn aggravates the problem of non-payments. As a result there is an acute shortage of intra-sector investment into the capital funds of the fuel energy complex. Production of national oil and associated gas steadily reduced from 1990 to 2006; the said tendency has been growing and at present is linked with country's oil reserves depletion.

The country's economy is characterized by a high level of GDP energy intensity. The 1990s accounted for the fall of the given indicator. By 1995 energy intensity of GDP dropped by 14% in comparison with 1990 that caused a reduction in fuel consumption as a consequence of economic crisis. In the late 1990s energy intensity reduced by another 28% compared to the 1995 level which involves the re-equipment of a number of sectors as well as implementation of energy saving policy. It precisely explains reduction of GHG emissions from the energy sector within 1990-2005 (Fig. 2).

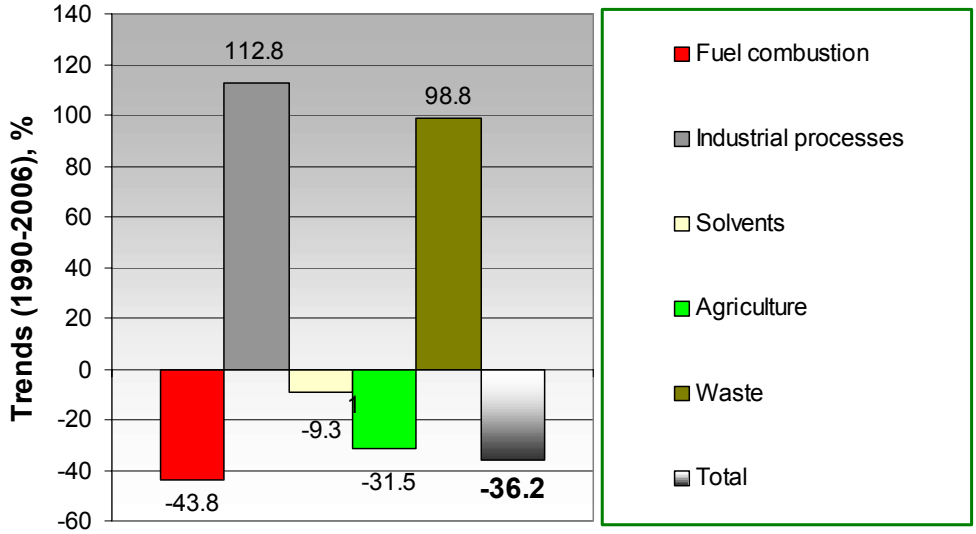

Figure 2: GHG emission trends by source type, 2006 in % to 1990

The structural change of fuel resources oriented at the energy needs is another sound cause of emission reduction. Having displaced, in the first place, mazut, natural gas became a dominant source. A share of coal used to produce heat energy has been reduced. At the same time the overall consumption of peat and peat bricks is a specific feature of the country. Low renewable resource supply is another national distinctive feature (except biomass).

The structure of fuel consumption by main consumption vectors has not changed dramatically. Fuel resources are mainly used to produce heat and electric energy where the state policy aimed at the increase in energy efficiency led to GHG

emission reductions (Fig. 3). Hydrocarbon raw materials are used as a technological fuel in industry where emissions have a tendency towards a considerable growth (Fig. 3) in the conditions of underinvestment for technical re-equipment as well as a rapid growth of construction industry and extension of housing stock.

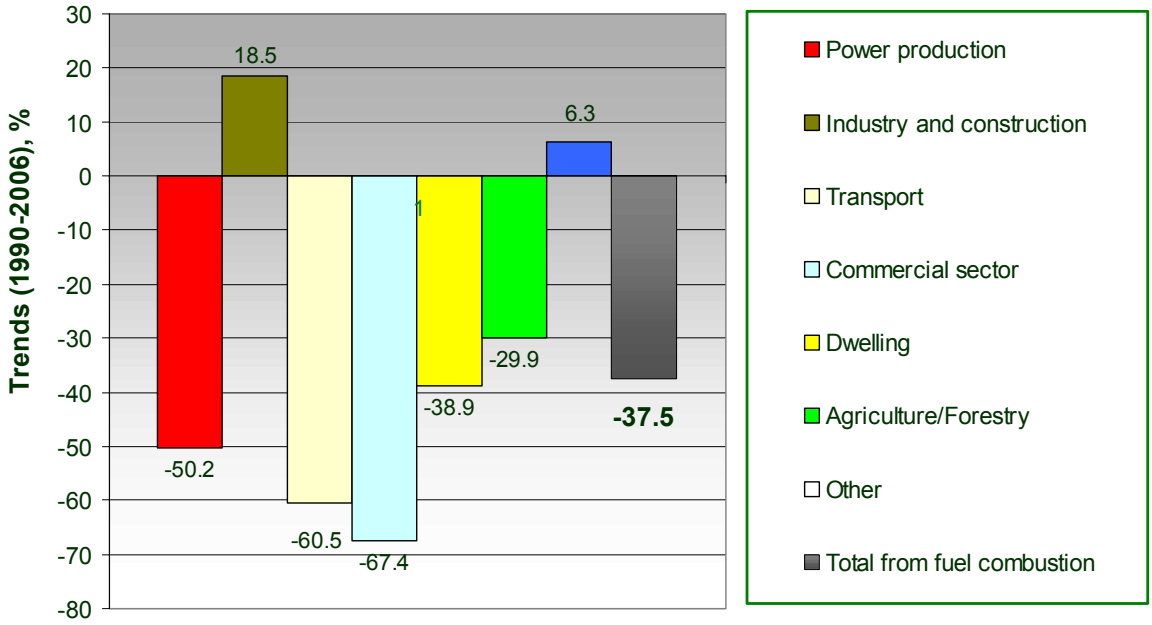

Figure 3: Trends of emissions from fuel combustion by sectors, 2006 in % to 1990

Leakages and emissions of methane and volatile non-methane organic compounds (VNOCs) in the course of transportation and storage of gas and liquid fuels and during oil refining are another source of greenhouse gases in the fuel-and-power sector. Transportation is mainly provided through gas pipelines (to the total extent of 6.4 thousand km) and oil pipelines (3 thousand km) as well as oil-products pipelines. Its primary pipeline sections have been in operation for 30 years, and some of them have defects. Oil-products are produced by two oil-refinery plants. Transitory allocation of oil-products is chiefly handled by rail transport to oil storage depots and terminal distribution is handled by motor transport to fuel filling stations. Measures for reducing fugacious emissions by modernization of gas pressure and distribution valves, re-equipment of oil- and gas-transport product pipelines are the most effective way to avoid methane leakages into the atmosphere.

1.2.2. Industry

In Belarus, the industries generating greenhouse gases are: metallurgy, engineering and metal-working (electro-smelting, rolling and pipe production, foundry, and production and repair of refrigerating engineering), petrochemical sector (production of ammonia, nitric acid, caprolactam, ethylene), construction sector

(production of cement, lime), wood-working plants, pulp and paper mills and glass industries.

The key industries in 1990 were engineering (34.2% of industrial production value), light industry (17.2%), food processing (14.9%) as well as chemical and petrochemical industries (9%). By 2005 there was marked the ratio of power production (approximately 3% to 8%), chemical and petrochemical industry (9% to 18%) and siderurgy (1% to 3%) as well as building material industry (6% to 8%) in the industrial product structure.

The primary problems of the industrial complex as a whole are deterioration of the basic physical assets, lack in technology in some directions, underinvestment, and competitiveness reduction under the conditions of price rise for energy carriers. These factors together with a marked production growth are responsible for GHG emission increase in industry (Fig. 2 and 3).

1.2.3. Agriculture and forestry

Agricultural production was cut down within 1990-2005. The structure of crop areas changed slightly during that period. Grains (41.2 %) and forage crops (42.3%) dominate in this sector. As a whole, there is a trend towards reducing GHG emissions from main sources (Fig. 2), involving mainly reductions in fertilizer consumption and livestock. There is also a tendency to cut down emissions in agriculture and forestry caused by the reduced consumption of fossil fuels (Fig. 3).

1.2.4. Transport

The national transport sector consists of rail, motor, inland water and air transport. In 1990-2005, the network of motor ways was mainly developed with its length increased half as much, the length of railways being almost unchanged. By transport type the structure of passenger traffic changed noticeably. The structure of freight turnover changed slightly by transport types. The railway (about 78%) and motor transport (about 22%) play a dominant role.

It is worth noting that despite the rapid growth of car stock, aggregate fuel consumption reduced which stems from the growing share of economical transport vehicles, optimization of passenger traffic and routing due to which GHG emissions from fuel combustion in the transport sector have a tendency towards reduction (Fig. 3).

1.2.5. Waste

In Belarus, solid municipal wastes are disposed of at landfill sites under the conditions leading to methane generation. Waste have not been burnt since 1990, and all municipal waste landfills are characterized by lack of «blowing» - ventilation. For the last decades, total waste especially decomposing one have increased by several

times which accounts for retaining the tendency to increase GHG emissions in this sector (Fig. 2).

Waste water is handled at treatment facilities by the biological method under aerobic conditions. This method practically excludes GHG generation.

1.2.6. GHG Sinks

The main sinks of carbon dioxide on the territory of Belarus are forests. Volumes and efficiency of carbon absorption are dependent on forest management, the species composition of stands, and forest age. As of January 1, 2006 the forest area totaled 9247.5 thousand ha, of which 8892.3 thousand ha (37.8% of the entire territory) are covered with forest.

Between 1990 and 2005 forest management underwent positive changes. The areas of clear felling reduced by 27.9%. For all that, the felling volume practically remains the same at the 1990 level by all types of felling. The structure of felling has been changed as follows: in 1990 the main felling predominated, at present most of commercial wood comes from selective felling (cleaning and sanitary felling) and others. Afforestation and transplanting increased by 663.1 thousand hectares in comparison with 1990. Nevertheless, that circumstance has not led to positive growth of net GHG emissions in the land and forest use sectors yet (Fig. 4).

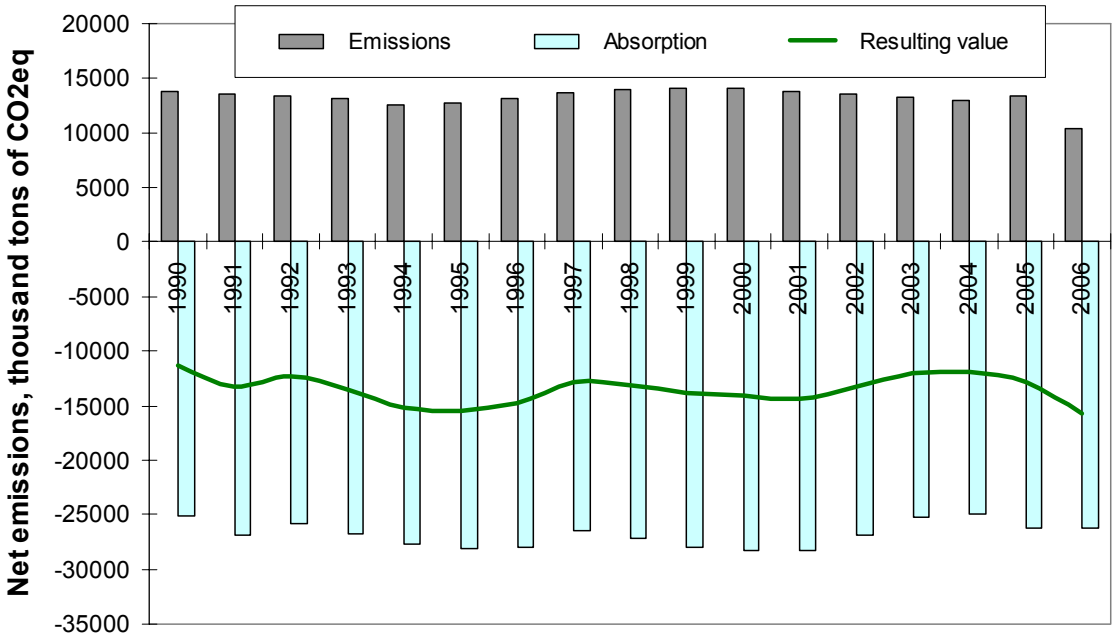

Figure 4: Net emission trends in the land use sector and forestry, 2006 in % to 1990

Chapter 2. Existing potential of policy, measures and technologies to achieve the climate change mitigation objectives and its evaluation

2.1. Political measures

Belarus adopted a number of basic documents defining the long-term socio-economic development of the country:

- National Strategy on Sustainable Socio-economic Development of the Republic of Belarus until 2020, approved by the National Commission for Sustainable Development of the Republic Belarus on May 6, 2004;
- Socio-economic Development Programme of the Republic of Belarus for 2006-2010, adopted by the President's Decree №384 of June 12, 2006;
- National Action Plan for Rational Use of Natural Resources and Environmental Protection in the Republic of Belarus for 2006-2010, adopted by the President' Decree of May 5, 2006. № 302.

According to the given documents, the country's medium-term development strategy stipulates the GDP growth, which is to be in line with outstripping growth rate of production and services in all sectors of national economy (Fig. 5).

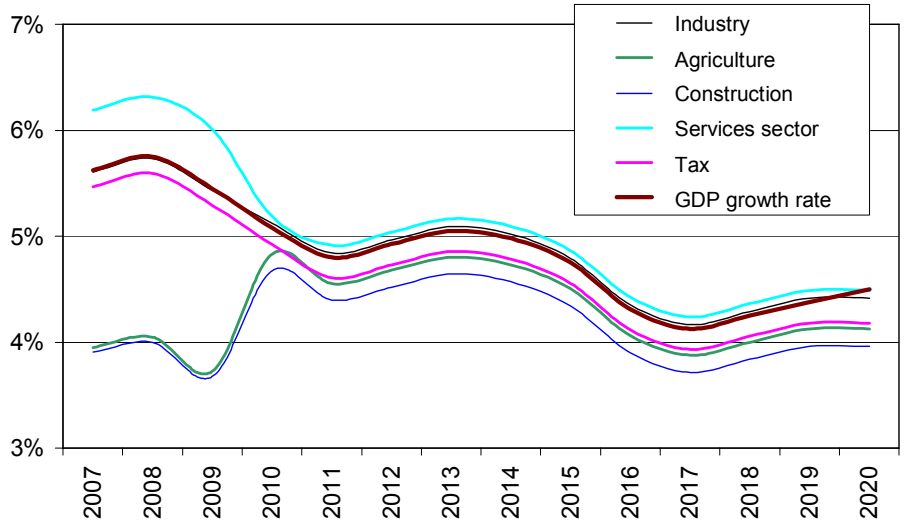

Figure 5: GDP growth rate in different economy sectors

Based on the general policy formulated in the program documents, the medium-term economic development is oriented at resource-saving, high-end reproduction and further reduction of GDP energy intensity through both building up energy-saving capacity and changing the GDP structure towards least resource-intensive industries, fuel supply diversification, increased efficiency of fuel conversion, and extended use of renewable energy sources.

The country has developed a draft of the National Program for Climate Change Mitigation Measures in 2008-2012. According to the Program, the net GHG emission reduction by 12 million tons of CO_2 equivalent within above period in comparison with the projected emission under an intensive economic development scenario is a target index, which is to be reached through implementation of national measures, while the GHG emission assigned amount being not exceeded 92% of the 1990 GHG emission level. The Program comprises a package of measures of legal, financial, economic and organizational character aimed at GHG emission reduction and incorporating:

- strengthening the role of the State in building and implementing climate change policy,
- establishing a system of State control over climatic impact,
- establishing a legal framework for climate change mitigation, developing and adopting the National Law «On Climate Protection»,
- developing new and updating existing regulatory acts on various climate change directions,
- establishing a procedure framework and developing regulations,
- creating conditions for building up and improving the institutional capacity in the field of climate change,
- creating conditions for the involvement of business community into activities relating to the mitigation of and adaptation to climate change,
- creating conditions to attract foreign investments including those within the Kyoto mechanisms.

1.5 million US dollars is required to implement all program measures. About 70-80% of this financing is foreseen to attract resources from the state budget, other programs and borrowed funds. According to the Program developers, the mentioned target index could be achieved only under the condition of external carbon financing at the rate of about 300 million US dollars.

The analysis of feasibility of application of the Kyoto flexible mechanisms is presented in the draft of the National Strategy for Participation of the Republic of Belarus in the Flexible Mechanisms under the Kyoto Protocol to UN FCCC for 2008-2012, which is being developed pursuant to the Action Plan for the Implementation of the Provisions of the Kyoto Protocol to UN FCCC for 2005-2012 approved by the Belarusian Council of Ministers' Resolution №1582 of December 30, 2005. It is shown that the country's participation in the Kyoto mechanisms as well as size of financing to be obtained from such participation is subject to a number of circumstances, among which are:

- entry of the amendment to the Kyoto Protocol into force, which sets quantified GHG emission limitation and reduction commitments for the Republic of Belarus over the 2008-2012 period;
- meeting of other eligibility requirements to use the Kyoto mechanisms and carbon units transactions;
- surplus of assigned GHG emission allowances with due account of commitment reserve and additional reserve established according to the relevant decisions of the Parties;
- possibility for participating in the voluntary GHG emission reduction mechanism;
- GHG emission reduction potential accounting for joint implementation projects assessed on the basis of the National Strategy of Reducing Emissions and Enhancing Removals by Sinks of Greenhouse Gases in the Republic of Belarus for 2007 2012;
- the country's economic development forecast.

Most of national and international experts as well as the Parties to the Kyoto Protocol admit (document FCCC/KP/CMP/2007/L.5) that the Republic of Belarus meets all provisions and demonstrates high readiness to be eligible for use of the Kyoto mechanisms, but delay in the ratification of decision 10/CMP.2 will not allow the country, during a rather significant part of the Kyoto Protocol first commitment period, to apply these complementary instruments in order to achieve the climate change mitigation objectives in view.

2.2. Organizational and economic measures

The main organizational and economic measures are:

- developing new market mechanisms for financing energy-saving subsectors in energy, industry, construction, housing, transport and trade;
- strengthening capacity for developing and implementing national, sectoral and regional energy-saving programs;
- upgrading state expertise in sectoral energy efficiency development and project proposals;
- providing control over timely implementation of measures as planned on the basis of energy audits;
- product certification by energy intensity and consumption;
- increasing a share of financing energy-saving measures from innovation funds on the return basis;

- creating conditions for diversification of bank credits to implement energy-efficient innovation projects;
- creating economic and institutional conditions for cutting the payback period of non-traditional and renewable energy sources based on, e.g., mechanisms of carbon financing aiming at further scaling-up introduction of these energy sources.

2.3. Measures for introduction of available technologies

The main technological trends of climate change mitigation are reflected in the Strategy of Reducing Emissions and Enhancing Removals by Sinks of Greenhouse Gases in the Republic of Belarus in 2007-2012 adopted by the Council of Ministers' Resolution №1155 of September 7, 2006. The most significant of them are associated with enhancement of efficiency of utilization of fuel and energy in all sectors of economy.

With due account of securing the stipulated GDP growth and national energy safety until 2020, consumption of boiler and furnace fuels in the country is expected to increase by 25-28% in 2015 in comparison with 2005, and by 30-35% until 2020. Along with this, the structure of fuel consumption will change towards reduction of natural gas share, while share of coal and other solid fuels in the fuel balance being increased. Figure 6 shows changes in fuel balance structure in 1990-2005 and forecast of structure of fuel consumption pursuant to the adopted program documents.

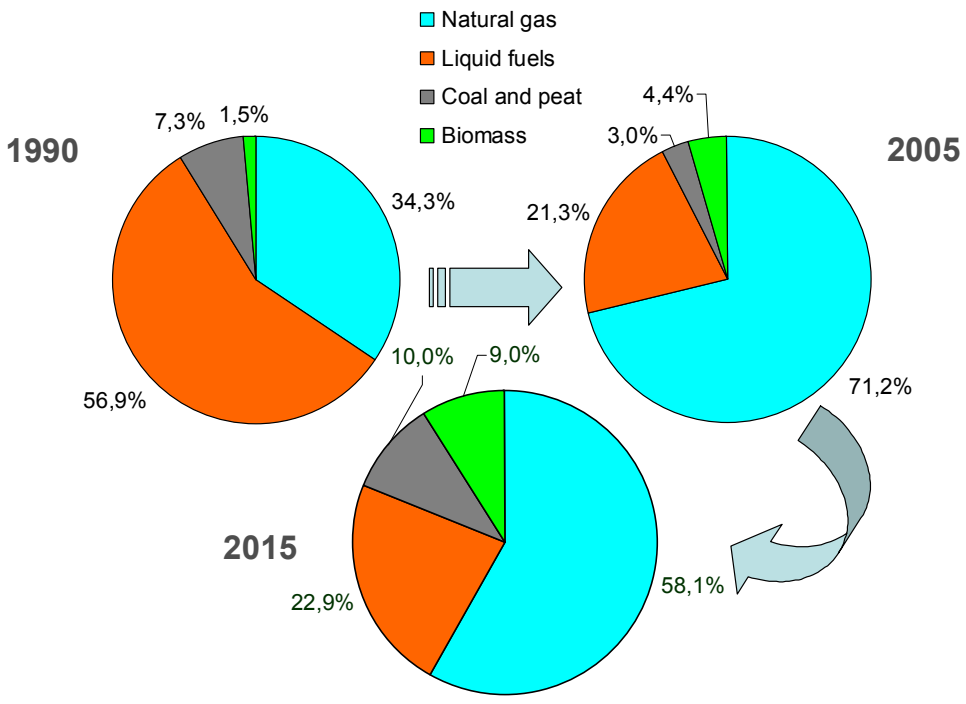

Figure 6: Changes in structure of fuel consumption

The growth of consumption of boiler and furnace fuels and projected trends in its structure will lead to noticeable increase of GHG emissions from energy and industrial facilities. Among the priority directions of anthropogenic climate impact mitigation technologies, the aforementioned emission mitigation strategy for forthcoming period envisages the following measures:

- increase of using non-traditional and renewable energy resources;
- introduction of new energy effective technological processes of production in all sectors of economy;
- modernization of energy-generating installation; putting in operation energy-generating equipment in boiler units; building of mini-CHPs operated with renewable fuel;
- utilization of high- and medium-potential secondary energy resources with their use in heat supply schemes;
- enhancement of heating system efficiency and heat supply optimization;
- energy valorization of methane from solid municipal waste landfills; introduction of biogas technologies to handle organic waste including liquid ones;
- efficiency enhancement and development of forestry including artificial and natural forest restoration, forest fire control, organizational measures of forestry activities (artificial forest renewal, rational use of forest biomass);
- secondary swamping of peatland and wetland restoration on unused drained territories.

2.4. Measures and target indices by sectors

Most of the above measures are not the common practice in Belarus yet, and their implementation demands financial and technological resources that can provide establishing the required infrastructure. At that, it is vital to take into consideration other acute problems of the growing economy and difference in the development priorities for specific sectors. The proposed approach to defining the range of target emission indices and relevant measures to achieve them in specific economic sectors of Belarus is based on the approved and underway sectoral programs.

2.4.1. Energy

In this sector new economic conditions resulting from growth in prices for energy carriers, increasingly growing energy consumption compared to the planned one required the adoption of a package of long-term measures, the main of which are set out in the following program documents:

- The Target Program for providing no less than 25% volume of electric and

heat production at the cost of using local fuels and alternative energy sources until 2012 approved by the Council of Ministers' Resolution №1680 of December 30, 2004;

- Concept for Energy Safety and Enhancement of Energy Independence of the Republic of Belarus approved by the President's Decree № 433 of September 17сентября, 2007;
- State Integrated Program for Modernization of Capital Industrial Assets of National Energy System, Energy Saving and Increase of Share of Domestic Fuel and Energy Resources in 2006-2010, approved by the President's Decree № 575 of November 15, 2007.
- National Energy Saving Program for 2006-2010 approved by the Council of Ministers' Resolution № 137 of February 2, 2006.
- Action Plan for Implementation of the President's Directive №3 of June 14, 2007 «Economy and Economic Use are the Main Energy Safety Factors of the State», approved by the Council of Ministers' resolution № 1122 of August 31, 2007.

In line with these documents, the follow-up development of the fuel and energy complex will be oriented at tackling the following objectives:

- optimization of the structure of fuel and energy balance (growth of secondary energy resources, local fuels, non-traditional and renewable energy resources: wind-, helio- and bioenergy, small-scale hydroenergy);
- nationwide introduction of new efficient production technologies, implementation of energy-saving measures in all sectors, including the social sector; development of oil treatment technologies increasing the level of oil extraction and use as well as the quality of products of its treatment;
- improvement of interaction of fuel and energy sector with the environment to reduce negative environmental impact.

Optimization of the structure of generating sources in the energy sector is envisaged through introducing combined gas-vapor and steam-turbine cycles, increasing energy generation by cogeneration cycle, converting municipal boiler-houses into mini-CHPs operated with local fuel, gas-piston and gas-turbine technologies. This makes it possible to the greatest extent satisfy a growing demand in energy and to increase heat supply efficiency in residential areas and settlements, provide energy safety for the country, enhance its energy independence and reduce GHG emissions by about 2.5 million tons CO2eq for 2008-2012. More comprehensive study is necessary in order to determine to what extent the existing barriers, connected mainly with limited investment resources, will influence the building of this capacity.

2.4.2. Industry

A possible growth in mazut consumption, forming at the Belarusian refinery enterprises, will allow forcing out a share of gas fuel and increasing a variety of energy balance by types. Though most energy sources can use both gas and mazut, in the nearest future an increase in consumption of the latter as well as that of coal and peat will result in a visible increase in GHG emissions in addition to emissions caused by the planned growth rates of the sector development (not less than 11% of annual growth).

In order to compensate emission growth it is necessary to envisage measures to decrease anthropogenic effects on climate, of which energy saving and introduction of renewable energy sources are most efficient.

The implementation of measures set out by the National Energy Safety Program for 2006-2010 will allow implementing emission reductions in a more effective way at the expense of enhancing the efficiency of fuel use in all the sectors and introducing energy saving measures to achieve the value of GDP energy intensity stipulated in the above documents (31% reduction in 2010 compared to the 2005 value). The expected environmental effect from its implementation within the national context without counting the entities of Ministry of Energy is GHG emission reductions for 2008-2010 in the scale of not less than 6.5 million tons of CO2eq. In industry this figure, estimated on the basis of departmental energy-saving program, will amount to about 1,1 million tons of CO2eq within the period 2008-2012.

At present in the construction sector, new materials and energy saving and resource efficient constructive schemes for dwelling houses are being introduced that reduce both resource and energy consumptions in the course of building and maintenance of dwellings. It is expected that emission reduction in this industry will be not less than 1 million tons of CO2eq during the period of 2008-2012.

2.4.3. Housing and municipal sector, agriculture

In the housing and municipal sector and agriculture in addition to GHG emission reductions from implementing energy saving measures, enhancing efficiency of heating systems and optimizing heat supply schemes, the large potential is built in methane emission reductions at municipal waste landfills and livestock waste lagoons.

The technologies available for capturing and utilization of landfill gas allow already now to build up effective application of gas-piston-based energy generating installations at the polygons being sealed, thus providing GHG emission reduction by 1.4 million tons of CO2eq in 2008-2012 owing to replacement of fossil fuels by resulting biogas.

In Belarus, the construction of methane tanks to generate the biogas with its following utilization in gas-piston energy installations at the municipal and livestock wastes treatment facilities can provide GHG emission reduction of not less than 2.5 million tons of CO2eq in 2008-2012 due to switching from fossil fuels to the biogas.

In the same sectors, especially in the areas with a great number of small and medium size settlements, it is reasonable to use wind turbine power installations, solar collectors for helio-heating units, production and utilization of bio-diesel fuel and bio-ethanol.

2.4.4. Land use, land use change and forestry

As long as at present time sinks predominate in this sector and no significant changes is expected in its balance, it is recommended to set the target indices at the level of long-term annually average value, which is 13.5 million tons of CO2eq. From now forth, when developing the climate change mitigation long-term strategy it is vital to foresee such a component of land use as restoration of degraded peatlands that can significantly contribute to an increase of GHG absorption.

Chapter 3. Consequences of building up mitigation capacity

In order to determine the climate change mitigation potential in each sector the sum of two forecasting components shall be assessed:

- probable GHG emission reduction at the cost of application of available political and economic decisions with due account for all existing barriers (legal framework in the field of environmental protection, degree of access to investment and credit resources, general economic situation and other national circumstances);
- probable level of GHG emission reduction due to ex ante new additional measures that takes into account, e.g., Kyoto mechanisms to remove the existing barriers.

The analysis of measures and tools for GHG reduction by sectors of economy allows implementing several climate change mitigation scenarios. The realization of mitigation potential can have a positive (stimulating) effect as well as a negative (limiting) effect, therefore, in spite of availability of apparent reserves for emission reduction, it is vital to properly estimate possible negative consequences of the proposed measures for the environment, economy and social sphere, which may prove to be major bars on the road to building up mitigation capacity.

3.1. Environmental consequences

Most unfavorable environmental consequences stemming from the implementation of the proposed GHG emission reduction measures are in the energy sector, which constitute the following barriers:

- increased emissions of solid particles as a result of switching from gas or mazut to wood fuel, particularly because of lack of filtering in the flue gas treatment scheme (exceeding the standard limits for gas-fired facility by ten times);
- increased amount of ash waste due to switching from fuels with low ash content (mazut and gas) to wood fuel with high ash content, and lack of technologies for ash waste utilization in the country;
- lack of approved sanitary and hygienic standards for treating ash waste generated from combustion of wood waste after forestry and woodworking, particularly in likely circumstances when wood is supplied from regions contaminated by radioactive isotopes as a consequence of Chernobyl Accident.

3.2. Social and economic consequences

In the energy sector, we can consider as a negative consequence the costs, which any entity incurs when switching from fossil fuel to wood chips due to the necessity of establishing infrastructure for utilization, supply, storage, conditioning (drying, chipping) and delivery of fuel. An increase of land acquisition for ash disposal sites and fuel stores as well as other components of infrastructure must be taken into account. In the event of launching renewable resources, such as wind turbine installations connected to the grid, reservation of power generation capacity shall be envisaged that leads to reduction of efficiency of energy production and fuel consumption. The similar problem is raised when converting municipal boilers and small heating sources into grid-connected mini-CHPs as well as incorporating biogas installations into the grid.

In general, for other sectors, the evaluation of negative consequences, which are mainly represented by additional lump-sum costs for setting up a relevant infrastructure, does not constitute any complexity. Moreover, in most cases these costs can be ignored.

The assessment of social consequences in the process of implementing most of the climate change mitigation technologies and measures suggests that all these effects are mainly of positive character giving an opportunity to enhance a number of jobs, create more comfortable and safe labour conditions (except measures related to energy valorization of radioactive wood waste and switch of gas and mazut fuel to wood chips) and professional training.

3.3. Spillover effects

According to preliminary analysis of proposed measures and technologies, both national ones and those under the Kyoto mechanisms, possible adverse effects on other countries, Parties to the Kyoto Protocol, have not been revealed for building up their climate change mitigation potential. The right of the Republic of Belarus to participation in the Kyoto mechanisms shall not be considered to any extent as infringement of the other Parties' right to the implementation their policy of application of these mechanisms, taking into account their market character.

Conclusion

The net GHG emission reductions in the Republic of Belarus for the period from 1996 to 2006, aggregating 130 million tons of CO2eq, were achieved owing to the implementation of the country's task-oriented climate change mitigation policy through the use of available instruments and measures of reduction of GDP energy intensity, efficiency improvement at energy generating installations, increase of share of natural gas and wood fuel in fuel balance, introduction of energy-saving technologies nationwide, lowering of emission reduction marginal cost, which practically did not exceed $50 US dollars.

For the time being, one can observe a certain GHG emission growth rate of approx. 3-4 million tons of CO2eq per year, which is caused by outrun economic growth against lagging of needed structural and technological changes in the innovative policy, increased fuel and energy consumption, reduced share of gas fuel at the cost of more extensive peat use, and by growth of unreclaimable organic waste.

The analysis of available measures, instruments and technologies make it possible to determine the minimal target value of net GHG emission reduction in the Republic of Belarus in 2008-2012, which is set in the draft of the National Program for Climate Change Mitigation Measures in 2008-2012 equal to 12 million tons of CO2eq. The probability exists that the set target index of net emission reduction can not be met due to delay in ratification by Parties of the amendment to Annex B to the Kyoto Protocol. The preliminary analysis shows that additional financial resources and transfer of best available technologies in the framework of the Kyoto mechanisms would give an opportunity to enlarge the range of the mentioned target index to 40 million tons of CO2eq.

Under the conditions of growth achieved in Belarus economy, the lagging in structural and technological changes and barriers in the process of implementation of innovative policy based on the involvement of the Kyoto mechanisms on one hand, and lack of direct foreign investments into modernization of key sectors on the other hand under significant escalation of gas fuel prices as well as at increased marginal costs per unit 1 ton of reduced emissions (more than $200 US dollars), can lead the country to the situation when there will be no opportunity for the Republic of Belarus to take adequate further commitments for the post-Kyoto period, and to threat for its sustainable development.

The results of the assessment based on sectoral approach showed that the main part of the target index could be achieved at the expense of implementation of emission reduction potential in the field of energy production and industry – about 50% and 12% of total GHG emission reduction value respectively. With regard to emission source categories, the highest climate change mitigation potential is associated with the hydrocarbon fuel fired facilities (over 65% of total emissions);

then the agricultural enterprises and municipal waste landfills follow (over 20% and 8% respectively). Almost the same picture can be revealed from analysis of the portfolio of GHG emission reduction projects and measures listed in a draft the National Program for Climate Change Mitigation Measures in 2008-2012.

The preliminary least-cost analysis of implementation of the climate change mitigation policy shows that most of the GHG emission reduction measures will not be paid off in the nearest future, since their internal rate of return would be not more than 10%. The use of the carbon financing principles in the climate policy both within the Kyoto and non-Kyoto mechanisms makes it possible to minimize risk of cost ineffectiveness.

The preliminary results of analysis of possible environmental consequences from the implementation of climate change mitigation measures testify that in most cases there will be no essential negative effect. A probability of environmental impact nevertheless exists in the case if wood wastes from the regions contaminated by radioactive isotopes because of Chernobyl Accident are used as a fuel. Such effect can be minimized by a number of organizational and technical measures that in turn require extra financing, for example, within the «green investment» scheme.