

The population density in the Kyrgyz Republic (24 persons per km²) is relatively low, compared to that of other countries. However, only 19% of the total area of the Republic can be described as a habitable area (comparatively comfortable), 35% as habitable, but not prime living area, and the remaining 45% as inhospitable terrain, unsuitable for human habitation.

The Kyrgyz Republic is a unique region of Central Asia in term of biodiversity. There are more than 500 species of invertebrates, including 83 species of mammals, 368 species of birds, 28 species of reptiles, 3 species of amphibians, 75 species of fish, 3,000 species of insects, and more than 4,500 species of higher plants. A relatively small area of the Republic is represented by a significant diversity of biocenosis. 0.4 species of mammals, 1.8 species of birds, 0.14 species of reptiles, 0.23 species of fish account for 1,000 square km in Kyrgyzstan, while these figures are notably smaller in neighbouring countries.

The territory of the Kyrgyz Republic as a high mountain ecological system is especially susceptible to natural and anthropogenic influence. Nine out of twenty most dangerous natural processes are widespread in Kyrgyzstan. These are earthquakes, landslides, mudflows, floods, lakes in danger of bursting, stone falls, land-slips, under-flooding, and avalanches.

The Kyrgyz Republic is a typical high mountain country with an arid continental climate and a large temperature range. Along with this, separate parts of its territory differ dramatically from one another. Four climatic zones are clearly distinguished: North and Northwest Kyrgyzstan, Southwest Kyrgyzstan, Issyk-Kul basin, and Inner Tien-Shan. A significant climate-forming factor is high mountain ranges, predominantly of sub-latitude location, separated by deep valleys and basins.

Table S.1. General information on the Kyrgyz Republic

Indicator	Units of measurement	1990	1992	1994	1996	1998	2000
Population as of the end of year	mln people	4.42	4.53	4.52	4.66	4.81	4.91
Urban population	%	37.5	36.9	35.6	35.1	34.8	34.8
Population density	people per sq.km	22.1	22.6	22.6	23.3	24.0	24.6
Gross National Product	USD per capita	-	820	610	550	350	-
Gross Domestic Product, total	USD per capita	-	810	610	-	-	279
including:							
industry	%	26.4	32.1	20.5	11.1	16.3	-
agriculture	%	32.7	37.3	38.3	46.2	35.9	-
construction	%	7.7	3.9	3.4	6.0	4.5	-
transport and communications	%	4.8	2.6	4.1	4.1	4.1	-
trade and food production	%	4.0	3.5	9.7	10.4	12.6	-
Officially registered unemployed	%	-	0.5	1.6	3.1	2.2	3.0
Population literacy level	%	97.3	97.3	97.3	97.3	97.3	98.7
Life expectancy at birth	years	68.5	68.27	65.42	66.65	67.15	68.5
Infant mortality rate	per 1,000 life births	30.0	31.62	29.62	26.58	25.99	22.6
Population having access to safe drinking water, including:	%	-	-	-	81.3	86.5	81.5
Urban	%	-	-	-	98.4	95.0	99.1
Rural	%	-	-	-	73.7	74.2	72.1
Water consumption, total	mln m ³	8,993	8,953	8,257	6,871	6,420	4,976
including:							
industrial needs	mln m ³	623	526	277	153	138	48
irrigation and agricultural needs	mln m ³	8,076	8,143	7,671	6,359	5,963	4,749
household-drinking water needs	mln m ³	294	253	293	357	309	182

For the past 10 years, the economy of Kyrgyzstan has been in a deep recession. Since 1996 economic conditions have somewhat stabilised. The recession has affected the processing industry most significantly. In addition to the overall recession, the economy has undergone considerable structural changes. Instead of industrial-agricultural it has become extraction-agricultural. The main exporting industries are the mineral resources industry and power engineering.

There are abundant forecasted coal resources in the Kyrgyz Republic (approximately 5 billion tonnes) and the potential for hydro-energy from large and medium size rivers (18.5 million kW power and 140-160 billion kWh output). Industrially extracted reserves of oil and gas are located only in the Fergana valley.

There are great resources of practically unused alternative energy: solar energy (4.64 billion kWh, or 23.4 kWh per km²), wind energy – 2 billion kWh, geothermal energy – 613 GJ annually (of which 27% is feasible for development), resources of bio-mass processing (livestock waste) could provide 1.6 billion m³ of methane, the potential of small water currents is 1.6 million kW power, or 5-6 million kWh of output.

The fuel and energy sector of the Kyrgyz Republic cannot meet the demand for energy resources, which leads to dependence on import. The lack of mineral oils is determined by the lack of necessary volume of recoverable reserves. The insufficient coal extraction is caused by high transportation costs from the mines (in the south of the Republic) to the consumers (mainly in the north), reaching up to 300% of extraction costs, and also by the economic and functional depreciation of mining equipment etc. Rising energy demand dictates the necessity of developing the coal-mining industry, and the exploitation of new deposits, for example at Kara-Keche.

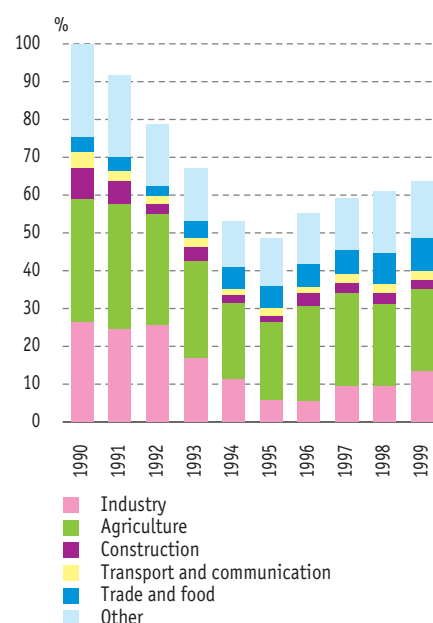
In spite of reduction of energy and water usage and also a considerable reduction in the use of fertilisers and other chemicals, it is possible to point out an increase in the harvest of basic crops.

Table S.2. Production and consumption of energy resources

Energy resources	Units	Years			
		1990	1995	1999	2000
Production	mln t.c.f.	6.60	2.80	2.40	2.81
Coal	mln tons	3.7	0.5	0.4	0.4
Oil	mln tons	0.15	0.09	0.08	0.08
Natural gas	bln m ³	0.1	0.04	0.02	0.03
Energy produced at including:	bln kWh	13.15	12.26	13.40	14.80
- HPS	bln kWh	8.95	11.1	12.4	13.6
- TPS	bln kWh	4.20	1.16	1.0	1.2
Consumption	mln t.c.f.	11.8	4.35	5.7	5.02
Coal	mln tons	4.8	1.2	1.0	1.2
Mineral oil	mln tons	0.003	0.039	0.14	0.15
Natural gas	bln m ³	2.1	0.9	0.6	0.7
Electric energy	bln kWh	7.6	7.12	8.70	8.70

t.c.f. – tons of conventional fuel

Figure S.1. Volume of GDP by sectors compared with 1990 (in percent)



Irrigated land farming is the most significant branch of agriculture in Kyrgyzstan: up to 70-75% of the total area under arable lands. Soils on the territory of Kyrgyzstan are prone to wind, water and pasture erosion, salinization, swamping, overgrowing by shrubs and other processes of degradation. Territories with strongly eroded soils account for 31% of the total agricultural area, medium eroded – 27.1%, and weakly eroded – 17%.

The total area of the state forests in the Kyrgyz Republic constitutes 2,601 thousand hectares (based on registration as of 1998), including forest covered areas – 849.5 thousand hectares, shrubs covered areas – 342.6 thousand hectares. Forests account for 4.25% of the Republic's territory. As a result of intensive forest use in the period of 1930-1988, forest cover decreased, including major forest-forming species – spruce, walnut, archa-tree.

At the present time despite some increase in the forest covered area, the process of forest senescence outstrips the process of forest recovery, and nowadays ripe and overripe forests account for 50% of the total reserve. Unique natural reserves of relic nut-fruit trees are under threat. Major forest-forming species are: coniferous – 36.4%; hard-leave – 4.5%; soft-leave – 1.9%; others – 57.2%.

Water resources are vitally important and strategic not only for the Kyrgyz Republic, but also for the whole of the Central Asia. Possessing significant water reserves – more than 50 km³/year of a surface river flow, 13 km³/year of sub-surface water resources, approximately 1745 km³ in lakes and 500-650 km³ of fresh water in glaciers – Kyrgyzstan uses only 12 to 17% of surface runoff on its own needs. The main types of water use in Kyrgyzstan are for irrigation and agricultural needs. Sub-surface water use accounts for a relatively small part of the total water consumption and is primarily used for providing water to large settlements, for the needs of industrial production, and for economic and drinking purposes.

Greenhouse gas inventory by sources and removals by sinks

To achieve international comparability of inventory results, calculation methodologies approved and agreed upon by the Conference of the Parties were applied. Those included: IPCC Guidelines (Revised 1996 IPCC Guidelines, IPCC/UNEP/OECD/IEA, 1997), IPCC Good Practice and Uncertainty Management in National Greenhouse Gas Inventories, 2000, and IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual. Revised 1996. In the absence of default approaches, national methodologies of calculation and coefficients were applied. This is true for the following processes: production of stibium and mercury; core-mould casting, re-melting of cast iron and non-ferrous metals; glass production; blasting operations, usage of solvents, and mountain fires.

According to the Guidelines, the inventory was conducted by sectors: energy; industries; solvents; agriculture; land-use changes and forestry; waste. Emission of the following GHGs was taken into consideration: carbon dioxide, methane, nitrous oxide, nitric oxides, carbon oxide, NMVOCs, sulphur dioxide, and halogens. The greenhouse gas inventory was carried out for the period of 1990-2000 in Kyrgyzstan as a whole and, where appropriate, in the context of 7 oblasts (areas) and Bishkek city. In concordance with the IPCC Guidelines, the year 1990 was taken as a base year.

Inventory results, according to Guidelines statements, are expressed both in units of mass for certain GHGs and in relative units of CO₂ equivalent. The latter are applied to compare the contribution of various gases to total emissions and depend on the value of the global warming potentials.

The basic information for GHG emission assessment comes from statistics on fuel and energy resources consumption, the existence of GHG sources, volumes of production giving GHG emissions. The following information sources were used:

- official publications by the National Statistics Committee;
- internal information of ministries, state institutions and organisations;
- opinions, calculations, and information provided by national experts;
- information in mass media.

Total emissions of all greenhouse gases in Kyrgyzstan in the a base 1990 year amounted to 36,647 Gg of CO₂ equivalent, including 29,105.5 Gg of CO₂ emissions. Net emissions, taking CO₂ uptake into account, were 35,817 Gg. In 1990, specific GHG emissions were 8.28 tonnes per capita, of which CO₂ was 6.58 tonnes. The largest contribution to the Kyrgyzstan's GHG emissions comes from energy use, which makes up some 80% of emissions of all main GHGs in CO₂ equivalent, and 74% in 2000. The structure of main GHG emissions in CO₂ equivalent by sectors for 1990 and 2000 is shown in Figures S.3 and S.4. In the context of the overall reduction in fuel and energy use, the decrease in coal consumption was more significant than that of other kinds of fuel. This has led to a reduction in the share of coal in the consumption balance, and an increase of the liquid fuel share. The proportion of CO₂ emissions from burning local and imported coal remains rather stable and is about one half.

Greenhouse gas emissions and sinks forecast has been prepared on the basis of macroeconomic indicators forecast. The sectors of industrial processes and solvents were not taken into consideration in forecasting, since emission from sectors of industrial processes and solvents lies within the range of overall uncertainty of calculations.

Figure S.2. Total emission dynamics of the main GHGs (in Gg of CO₂ equivalent)

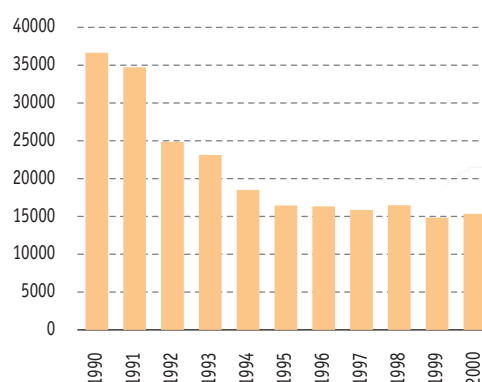
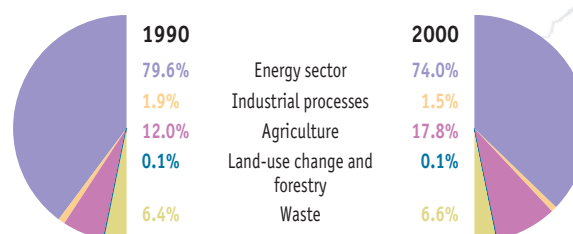


Figure S.3. Distribution of the total greenhouse gas emissions by sectors



The solvent sector is not mentioned here and further, as it makes an insignificant contribution to total GHG emissions.

Figure S.4. Share of the main GHGs in total emissions in 1990 and 2000

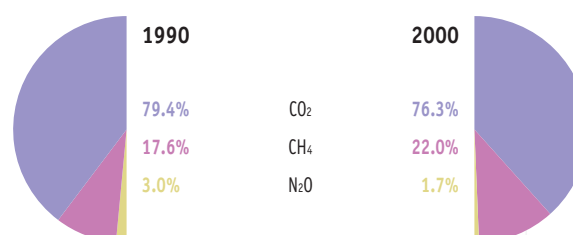


Table S.3 GHG emission forecast (in Gg)

Sector	Emissions (in Gg of CO ₂ equivalent)			
	2000	2010	2020	2100
Energy sector	11,351	21,539	34,850	55,000
Agriculture	2,207	2,832	3,118	5,000
Land-use change and forestry	-983	-1,014	-1,045	-1,336
Waste	1,007	2,350	3,390	7,150
Total	13,582*	25,707	40,313	65,814

* Total emissions in 2000 do not coincide with actual emissions (see Appendix) due to non-consideration of relatively small (by emission volume) sectors and sources

Climate change research

The earliest meteorological stations on the territory of Kyrgyzstan were established in the late 19th century. By 1985, the network had reached the peak of its development and comprised 79 stations. Today, the Kyrgyzhydromet network includes 30 meteorological stations. Eight stations report to the WMO.

The following different climatic areas are clearly distinguished on the territory of Kyrgyzstan:

1. Northern, North-western Kyrgyzstan (NNWK);
2. South-western Kyrgyzstan (SWK);
3. Issyk-Kul basin (IKB);
4. Inner Tien-Shan (ITS).

The average annual temperature in Kyrgyzstan in the 20th century, taken over a 100 year period, has risen by 1.6°C, which is much higher than the global average one. At the same time warming considerably varied either by separate climatic zones and stations within zones, i.e. high-altitude zones. In the 20th century precipitation in Kyrgyzstan increased insignificantly – by 23 mm, or 6%.

Table S.4. Scenarios of warming for the territory of Kyrgyzstan by seasons and in average per year for 2050 and 2100 according to three models of MAGICC/SCENGEN for IS92a and IS92c emission scenarios

Emission scenario	Seasons of 2050					Seasons of 2100				
	W	Spr	S	F	Year	W	Spr	S	F	Year
HadCM-2 model										
IS92a	1.5	1.3	1.4	1.5	1.4	3.2	2.6	3.1	3.2	3.0
IS92c	1.5	1.2	1.5	1.5	1.4	2.3	1.7	2.5	2.4	2.2
UKTR model										
IS92a	2.2	2.5	1.9	2.0	2.2	4.5	4.8	4.2	4.1	4.4
IS92c	2.0	2.0	1.9	1.9	2.0	2.7	2.7	2.6	2.5	2.7
CSIRO2-EQ model										
IS92a	1.6	1.8	0.6	1.2	1.3	3.5	3.6	1.8	2.7	2.9
IS92c	1.6	1.6	0.9	1.3	1.3	2.1	2.1	1.3	1.7	1.8

Table S.5. Scenarios of precipitation trends for the territory of Kyrgyzstan by seasons and in average per year for 2050 and 2100 according to three models of MAGICC/SCENGEN for IS92a and IS92c emission scenarios

Emission scenario	Seasons of 2050					Seasons of 2100				
	W	Spr	S	F	Year	W	Spr	S	F	Year
HadCM-2 model										
IS92a	1.26	1.17	1.64	1.41	1.37	1.46	1.22	1.84	1.64	1.54
IS92c	1.15	1.09	1.25	1.23	1.18	1.26	1.09	1.06	1.24	1.16
UKTR model										
IS92a	1.11	1.04	1.43	1.16	1.19	1.24	1.05	1.46	1.17	1.23
IS92c	1.08	1.02	1.11	1.04	1.06	1.11	1.02	0.89	0.99	1.00
CSIRO2-EQ model										
IS92a	1.10	1.06	1.36	1.11	1.16	1.12	1.10	1.36	1.10	1.17
IS92c	1.02	1.05	1.07	1.0	1.03	1.02	1.03	0.80	0.93	0.94

In order to assess the future climate the scenarios designed on the basis of global climatic models (GCM) were applied. The MAGICC/SCENGEN software recommended by IPCC, was used for estimating climate scenarios in Kyrgyzstan for the period up to 2050 and 2100. This software helped estimate 12 scenarios relevant to 3 GCMs with various sensitivity levels and two options of GHG emission scenarios (IS92a – moderately high emissions with doubled CO₂ concentration by 2100, and IS92c – moderately low emissions with 35% concentration increase). They were also able to take into account (or not to take into account) the heat-alleviating impact of anthropogenic sulphate aerosols. Besides, two additional scenarios were forecast on the basis of the GRADS software.

According to the HadCM-2 model of average sensitivity in the case of moderately high IS92a emission scenario, a warming of 3°C is possible by 2100, taking the aerosol impact into consideration. Without such, warming would be 0.5°C greater. For the moderately low IS92c emission scenario, warming will be even less (2.4°C) and it will hardly depend on aerosol emissions. Rises in temperature are almost equally spread over the seasons, though according to both scenarios they are a little less in spring. However, one should not expect greater warming in winter than during other seasons.

By 2100 the overall range of warming scenarios equals a 1.8-4.4°C rise in average annual temperature and a 1.3-4.8°C rise in temperature in different seasons. The overall range of moistening scenarios will vary from an annual precipitation reduction of 6% to an increase of 54%. Seasonal scenarios vary from 20% reduction to 84% increase.

Vulnerability assessment and adaptation

Three major scenarios of expected development have been used for vulnerability assessment – climatic, demographic and economic. For assessment of macroeconomic indicators for the short term, Kyrgyzstan's national development programmes (National Development Strategy of Kyrgyzstan till 2010, National Poverty Reduction Strategy in Kyrgyzstan, etc.) were used. For the assessment of macroeconomic indicators for a longer period of time (until 2100) an analogy method was used. The results have been adjusted for economic activity structures, existence of natural resources and orientation at the global development tendencies considering national peculiarities, for instance, a further preferred development of hydro-power and renunciation of nuclear power.

The forecast of the total flow of Kyrgyzstan's major rivers (Naryn, Chu, Talas) was performed on the basis of modelling the balance of precipitation and evaporation taking into account the relief and types of water catchment area (forests, lakes, etc.). Vulnerability assessment of water resources independently implemented for the Kyrgyz Republic leads to the following conclusion: the expected change in water resources as a result of climate change is going to be favourable. The forecasted water supply is assessed as sufficient in the framework of basic development scenarios. However, it is a fact that the water resources of the Kyrgyz Republic are life supporting for the neighbouring states and that water supply problems already exist in a regional perspective. The acuteness of these problems will increase as time goes on, unless mitigation measures are taken. In other words, given the systemic vulnerability assessment of water resources, adaptation measures should be worked out, taking into account the interests of the neighbouring states.

The total energy potential of the Kyrgyz Republic is fairly high, which does not exclude certain problems. The existing oil and gas reserves do not satisfy Kyrgyzstan's needs for oil products. Coal deposits are located far from the major consumers, which significantly increases the cost of using local coal. Use of unconventional and renewable power sources is virtually absent.

Table S.6. Forecast of some economic indicators for the Kyrgyz Republic

Indicator	Unit	2000	2010	2020	2100
Population	million people	4.91	5.44	6.34	14.87
GDP with PPP	billion \$	12.38	19.15	34.28	327.1
GDP with PPP, per capita	\$/capita	2,521	3,520	5,407	22,000
Energy consumption, total	million t.o.e.*	2.99	5.7	9.18	32.71
per capita	t.o.e./capita	0.61	1.05	1.45	2.2
per \$1000 of GDP	t.o.e./\$1000 GDP	0.24	0.3	0.27	0.1
including:					
- coal;	million t.o.e.	0.74	1.46	2.96	
- natural gas;	million t.o.e.	0.58	1.02	1.44	
- CLM (combustive-lubricating materials);	million t.o.e.	1.57	3.09	4.60	
- energy of TPS (thermal power station)	million t.o.e.	0.1	0.13	0.18	
- energy of NTRES	billion kWh	0	0.025	0.035	
- energy of small HPS	billion kWh	0.08	0.175	0.365	
Electricity generation, total	billion kWh	14.8	18.53	27.32	74.36
per capita	kWh/capita	3,014	3,373	4,309	5,000
per \$1000 of GDP	kWh/\$1000 GDP	1.20	0.97	0.80	0.20
Forest area	thousand ha	858.5	888.5	918.5	1,194

* t.o.e. – tons of oil equivalent

A programme for developing the energy sector of Kyrgyzstan should comprise the following measures:

- harmonising conditions of usage of rivers that are important for irrigation and hydro-power, taking into account the interests of all states of the region;
- creating prerequisites for a fuller use of hydro-power potential;
- reducing electric and thermal energy losses and introducing energy-saving technologies;
- increasing the share of renewable energy sources in the energy balance. Given world practice, it is hard to expect a substantial increase in the use of geothermal, solar and wind energy, etc. These constitute approximately 0.5% of world-wide capacity nowadays. Taking into consideration that waste processing accounts for 10% of energy in the entire world, it is necessary to expedite the development of this very trend;
- increasing the share of ecologically cleaner fuels;
- working out a development strategy for motorised transport, in particular public transport

A substantial relationship between sickness rates and climate change has been determined. Taking into consideration the forecasted climate change, a significant increase in the urolithiasis rate in Kyrgyzstan may be expected. A linear dependence has been found between common sickness appeals to the ambulance centres during the hot period of the year (May-August) and the level of oxygen partial pressure and temperature. Given the expected climate change (an increase of approximately 3°C) an increase in the ambulance call-out rate in the whole Kyrgyzstan could be more than 1%. The research of embryo development pathology has shown a sharp slow-down in their development with the temperature changes. The most serious damage occurs in the period when major embryo organs and systems are formed. Review of the research has shown that the expected climate change may cause an increase in common sicknesses, cardiovascular and broncho-pulmonary pathology, skin diseases and trauma rates. The mortality rate from ischemic heart disease may increase (particularly for elderly people). The expected climate change (increase in temperature and precipitation) will lead to an extension of the geographical distribution and incidence of infectious diseases: transmissible infections (malaria); tropical fevers; enteric infections (salmonellosis, escherichiosis, cholera, etc); parasitic diseases. In brief, measures aimed at adaptation to climate change could be grouped in two major directions: increase in the population's socio-economic living standards and improvement of the health care system.

Based on the scenarios of climate change the following changes in Kyrgyzstan's biodiversity may occur. Desert and steppe belts will significantly expand. However, it is not expected that belt shifts will lead to substantial loss in flora and fauna. This refers particularly to invertebrates and vertebrates, because they possess a natural adaptation to temperature increase, or will migrate. Their ecological niches will be replaced by species from other belts. There will be a loss of invertebrate species only for conservative geobionts (common gryllotalpa, acridae, ant-lion), which are adapted to inhabit only very specific types of soil. Herbivorous monophagus may possibly perish (bloody mite, shield bug), provided that some plants will fall out of the ecosystem because of the belt shift. The number of insect species is also expected to increase owing to xerophiles moving up from lower zones: Lepidoptera, Coleoptera, and Hymenoptera.

Climate change will also affect the forests. By 2100 the spruce forest density will have been increased to 0.5-0.6. At an altitude of 2,200-2,600 m spruce forests will occupy not only northern but also western and eastern slopes. About 37.2% of the total area under forests will be concentrated here. At an altitude of 2,600 m and higher forest density will go up sharply, which is connected with the significant temperature increase at this altitude.

Along with ample availability of water this will promote a further growth of areas under forests and emergence of spruce even on south-western slopes. At an altitude of 2,600 m and higher toward the tree line forests will occupy 57.7% of the total area. At these high places the spread of spruce coincides with the sub-belt of sufficient moisture. In case of a significant area under forest cover (27.2%) they could grow on shaded northern and north-eastern slopes at the top section of the belt at altitudes between 2,800 and 3,000 m. As a result of an increase in the sum of above-zero temperatures, by 2,100, there may be a boundary shift of the habitat zones for every type of archa-tree. Each of these (Zaravshan, semi-spherical and Turkestan) occupies a high-altitude zone. At an altitude of 1,400-2,300 m in the south-western region they may be an increase in bio-climatic productivity in an area with sufficient availability of water. Generally walnuts could move up by 100-150 m in response to climate change. However, given the influence of age structure (ripe and overripe forests account for 60%) and human-induced factors are barriers to such movement. Forest adaptation measures should include:

- sustainable preservation of forest ecosystems begins with an inventory of species and intra-species diversity on the basis of a single methodological approach and a well-developed method of forest genetic resources assessment,
- poverty alleviation among the population,
- participation of local communities in decision-making as far as their access to forest resources is concerned, based on community forest use.

For the plant-growing sector an increase in areas under crops is not expected. Output is likely to grow through an increase in crop yield per hectare. The forecasted increase is considered realistic, since it has already been achieved on individual farms.

Table S.7. Production forecast of major agricultural crops

Name of crops	2000			2100		
	Area (in 1,000 ha)	Crop yield (in centners/ ha)	Total yield (in 1,000 tons)	Area (in 1,000 ha)	Crop yield (in centners/ ha)	Total yield (in 1,000 tons)
Cereals, total	589.8	26.4	1,557.0	400-500	50-100	2,500-4,000
Sugar beet	23.5	191.4	449.8	30	400-600	1,200-1,800
Cotton	33.8	26.0	87.9	40	40	160
Tobacco	14.5	23.9	34.6	25	60	150
Oil-crops	57.1	9.4	53.45	70	N.A.	N.A.
Potato	68.9	151.8	1,046	70	300-500	2,100-3,500
Vegetables, total	46.9	159.3	747	50	300-500	1,500-2,500
Fruit and berries	42.6	37.8	161.0	60	90	540

N.A. = data not available

Table S.8. Changes in livestock and poultry (in thousands)

Name	1990	2000	2100
Cattle	1,205	947	2,000
Sheep and goats	9,972	3,799	10,000
Horses	313	354	600
Pigs	393	101	300
Poultry	13,900	3,100	12,000

Research suggests that pasture fodder is likely to be sufficient for required growth in heads of cattle. However, the majority of experts assume that there was an excessive pasture overload in 1990.

Strategy and measures of climate impact mitigation

As a developing country the Kyrgyz Republic does not have any obligation to reduce GHG emissions. However, in the framework of relevant mechanisms for implementing the goals of the UNFCCC and the Kyoto Protocol, the Kyrgyz Republic could – in collaboration with other countries and to the extent the economic situation allows – voluntarily undertake the commitment to prevent future GHG emissions.

Implementation of the main GHG emission reduction measures requires significant financial resources. Nevertheless, despite the current economic hardships, the country has the opportunity to carry out a number of GHG emission reduction measures that cost little or nothing. These are related to the emission reduction of such combustion products as sulphur dioxide, nitric oxide, carbon oxide, and other chemical substances and aerosols.

The Kyrgyz Republic is still to overcome such serious problems as:

- lack of effective regulatory bodies in the sphere of climate change;
- lack of stimulation mechanisms for the introduction of “clean technologies”;
- reduction of current market and institutional barriers that prevent the implementation of economically worthwhile measures for GHG emission reduction.

The comprehensive implementation of such policies and measures in the form of an interrelated set of instruments for GHG emission reduction could make these actions more effective. This set of national instruments should include:

- organisation of effective government monitoring and control of GHG emissions as well as emission of other dangerous air pollutants;
- practical support of measures for GHG emission reduction by the government and society as a whole;
- periodic preparation and submission of National Communications and Inventories of GHG emissions and sinks to the Convention’s Secretariat;
- improvement of the relevant legislation;
- introduction of such economic tools as differentiated taxes and tendered sale of emission permits, as well as reduction of subsidies that contribute to the emission of GHGs;
- co-ordination of efforts with different countries in the sphere of GHG emission reduction, including trade in emissions quota;
- access to the information, advanced technologies, and financial resources;
- public information campaigns about the problems of climate change and involvement of the public in solving these problems;
- support of scientific and applied research and human resource development.

The development of a fuel and energy sector, which provides for maximum energy independence of Kyrgyzstan, as well as sufficient and stable energy supply to consumers, represents the major goal of the Kyrgyz Republic’s energy policy.

This policy envisages:

- further development of hydro-energy potential of the Naryn river by constructing Kambarata hydroelectric power stations with a total power of 2,260 MW;

- implementation of the Development Programmes for small and micro HPS and non-traditional energy sources (installation of photoelectric cells with a power of 2-3 MW; wind energy parks with a power of 1.0-1.2 million kWh);
- by the year 2005, increase of coal mining activities by up to 80% due to the expansion of open coal mining at the lignite deposit of Kara-Keche and increase of up to 30% of the mining rate of existing coal enterprises;
- by the year 2005, increase of oil extraction to 190,000 tons and natural gas to 30 million m³ whereas the need for gas is 800 million m³;
- transition to the use of renewable energy sources, reduction of low-grade coal import, increase of fuel efficiency by modernising fuel combustion systems; reduction of fuel expenditures in the heat and energy production;
- implementation of the strict energy saving policy; strengthening of accounting and control systems; reduction of commercial losses and non-production energy expenses;
- elaboration of legal mechanisms that stimulate consumers to save energy and increase the use of non-traditional energy sources;
- scientific and applied research into the development and implementation of new energy and resource saving technologies; GHG absorption technologies, modern means of GHG emission capture and instruments of GHG recording;
- improvement of public awareness about the ecological and social consequences of climate change, and about measures that are being undertaken, as well as involvement of the public in the implementation of these measures.

The potential for reduction of GHG emissions from heating lies in energy saving, which would allow energy consumption to be reduced by 15-20%. The recommended technologies of reducing GHG emissions are:

- built-in autonomous systems of solar energy supply;
- integrated building solutions aimed at energy efficiency increase;
- improvement of construction standards and control systems that monitor the observance of these standards by the buildings that are under construction.

Motor vehicles take up to 90% of all internal freight forwarding and passenger traffic in the Kyrgyz Republic. They are expected to become the preferred mode of transport for all kinds of freight. The exploitation conditions of vehicle fleet (mountain landscape, bad quality of roads, deterioration of vehicles, etc.) account for the increased GHG emission from traffic. Low cost measures, such as the improvement of state governance and control over the transport sector could be very effective in this sector.

The main GHG emission reduction measure in industry is reduction of energy use due to the introduction of energy saving technologies.

Carbon dioxide emission reduction in agriculture can be achieved through the discontinuance of agricultural waste combustion. Methane emission reduction is possible through the enhancement of manure collection and storage systems.

Methane capture from wastes and manure storage systems with biochemical methods will not only allow reducing GHG emission, but at the same time will provide farms with fuel and secure organic fertiliser.

In the national mitigation strategy the enhancement of sinks is of great importance. Planting new trees and creating new forests significantly contributes to carbon accumulation. Rehabilitating forestland, planting new trees, increasing forest productivity and reducing illegal tree logging will lead to a 50% increase of CO₂ sinks.



Education and public awareness on climate change issues

The experts of the project on climate change in Kyrgyzstan took active part in the development of the Concept of Continuous Environmental Education and standard programmes on ecology and safety of human activities. These courses are mandatory within education standards for all professions in higher educational institutions. They include teaching materials on the global climate change issues and its impact on population health.

To enhance public awareness on climate change issues and to provide experts, schools, academic institutions with expertized materials in the relevant areas the following publications were prepared by the project teams:

- “Climate and Environment” (book);
- Three issues of the Information Bulletin “Enabling the Kyrgyz Republic to Prepare its First National Communication in Response to its Commitments under the UNFCCC”, both in electronic and hard copy versions;
- “Sustainable Development of Environmental and Economic Systems under the Climate Change Conditions” (manual on sustainable development issues);
- A thematic collection of articles covering climate change issues;
- “Kyrgyzstan and UNFCCC” web-site developed and published in the Internet.

Six video clips have been prepared and broadcasted by the main television channels in Kyrgyzstan. Moreover, several debates and four round-table discussions have been arranged for ecological TV programmes. Finally, information on the main climate change issues was regularly highlighted in many popular newspapers in Kyrgyzstan.

Civil sector experts were actively involved in activities under this climate change project – those were experts from schools, academic and research institutions, NGOs (about 100 people).

Climate change issues, objectives and outcomes of the project were discussed at more than 40 round-tables, seminars, and conferences on environmental problems and sustainable development organised by different organizations and NGOs.

Within the framework of the project five workshops with wide community and NGOs participation were conducted with the purpose of informing them about the goals and tasks of the project, preliminary results, and the project in general.

Prospects and further activities

- Improvement of climate models, regional circumstances taken into consideration
- Development and implementation of adaptation measures with respect to the ecosystems and economic sectors that are most susceptible to climate change
- Development and implementation of GHG emission reduction measures and enhancement of sinks
- Institutional capacity building in order to carry out the commitments of the Kyrgyz Republic under the UNFCCC
- Improvement of education and public awareness on climate change issues in order to involve the general public in the decision-making process
- Stimulation of climate change research.