

As can be seen in Table 5.4, the required livestock growth looks quite realistic and close to the growth in 1990. However, most of the experts assume that there was an excessive pasture overload in 1990, which requires certain measures to be taken. Table 5.5 demonstrates a potential enhancement of pastures.

**Table 5.5. Annual potential value of pasture resources in the Kyrgyz Republic with different yield based on the live sheep weight assessment**

Season	Pasture land (in 1,000 ha) *	Pastures with a low yield			Pastures with an enhanced yield		
		Dry Matter Yield (in kg/ha)	Number of sheep per hectare**	Resource value, in mln USD	Dry Matter Yield (in kg/ha)	Number of sheep per hectare	Resource value, in mln USD
Spring	1,200	400	2.6	27	550	3.4	37
Summer	3,800	800	3.3	228	1,200	5.0	380
Autumn	1,200	400	2.6	18	550	3.4	25
Winter	2,000	150	1.5	23	250	2.5	35
<b>Total</b>	<b>8,200</b>			<b>296</b>			<b>477</b>

\* 10% out of the total pasture are not productive;

\*\* taking into account the necessity of 80 kg/per head in the spring and autumn when raising young animals and 50 kg in the wintertime

At the present time the existing pastures may be considered low-yield pastures. Apparently, pastures with an enhanced capacity may completely provide the required amount of livestock.

Key measures of natural pasture improvement:

- using an optimal pasturing load; for this purpose monitoring and further training of pasture users are needed;
- introducing pasture rotation, which may increase pasture capacity by 20-30% due to productivity growth and improved top-soil. The area of hilly, lowland pastures and non-steep slopes should be divided into permanent plots by means of a fence or other types of hedges and stone barriers. Given a more complex relief, a barrier is not that essential in case there are natural boundaries, such as arroyos, rivers, divides, rocky formations, trees, etc. They can be used as boundary marks for the purpose of plots and pasture rotation. Areas susceptible to a significant erosion must be excluded from use;
- controlling deleterious (non-edible, perilous and noxious) weeds and bushes;
- improving pastures with seeds of appropriate types of grass.



## 6. ASSESSMENT OF STRATEGIES AND MEASURES OF MITIGATING THE IMPACT ON THE CLIMATE

### 6.1. Mitigation strategy for Kyrgyzstan's impacts on the climate

As a developing country, the Kyrgyz Republic does not have any obligations to reduce GHG emissions. However, in the framework of the relevant mechanisms for implementing the goals of the Convention and the Kyoto Protocol, the Kyrgyz Republic could – in collaboration with other countries and as the economic situation allows – voluntarily undertake a commitment to prevent future GHG emissions. In this regard, a strategy of climate change mitigation, centred on limiting GHG emissions, was developed. In order to increase its efficiency, the strategy of climatic effect mitigation was integrated with the national and sectoral development strategies, which provides for the reduction of both GHG emission and human poverty. This approach as much as possible promotes the sustainable development of the country and the fulfilment of its obligations under the UN Framework Convention on Climate Change.

Implementation of the main emission reduction measures requires substantial financial resources. Nevertheless, despite the current economic hardships, the country has the opportunity to carry out a number of GHG reduction measures that cost little or nothing. These are related to the reduction of such combustion products as sulphur dioxide, nitric oxide, carbon oxide, other chemical substances and aerosols. An additional benefit is the improvement of ambient air quality at both local and national levels, and consequently reduction of negative health impacts on people, animals, plants and ecosystems.

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 hinder the implementation of economically worthwhile measures for GHG emission reduction.

The Kyrgyz Government's recent decision to start the ratification process of the Kyoto Protocol (part of the UNFCCC) can serve to overcome the barriers that hamper the implementation of policies and measures for GHG emission reduction. The comprehensive implementation of such policies and measures in the form of a set of interrelated instruments for GHG emission reduction could make these actions more effective. This set should include the following:

- The organisation of effective government monitoring and control of GHG emissions as well as emission of other dangerous air pollutants;
- Practical support of GHG emission reduction measures by government and society as a whole;
- Periodic preparation of National Communications and Inventories of GHG Emissions and Sinks and their submission to the Convention's Secretariat;
- Improvement of the relevant legislation;
- Introduction of economic instruments, such as differentiated taxes and tendered sale of emission permits, 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 information, to advanced technologies, and to 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 of human resource development.

## 6.2. Specific mitigation measures

### 6.2.1. Energy production

GHG emissions from energy production constitute about 35% of the total GHG emissions. Considerable potential for GHG emission reduction is concentrated in this sector.

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

- In the electricity branch: further development of the river Naryn's hydro-energy potential by constructing the Kambaratinsk Hydro-electric Power Station (HPS) with a total capacity of 2260 MW; implementation of the Development Programmes for HPS and non-traditional energy sources (NTES) that provide for the reconstruction of the existing cascade of Alamedin and Kemin small HPS; rehabilitation and reconstruction of other small HPS with a total power of 10 MW and the output of 84.6 million kWh; construction of several new small HPS with a total power of 68 MW and output of 281 million kWh; installation of photo-electric cells with the power of 2-3 MW and output of 5.3-7.9 million kWh; micro HPS with a total power of 2-2.5 MW and output of 8.6-10.8 million kWh; wind energy parks with a power of 1.0-1.2 million kWh;
- In the coal industry: by the year 2005, increase of coal mining activities by up to 80% due to expansion of open coal mining at the lignite deposit of Kara-Keche, and increase by up to 30% of mining rate of existing coal enterprises;
- In the oil and gas industry: by the year 2005, increase of oil extraction to 190 thousand tonnes and natural gas to 30 million cubic meters, whereas the need for gas is 800 million cubic meters.

The development of Kyrgyzstan's hydro-energy and non-traditional energy sources is of considerable interest, both for energy sector development and simultaneous GHG emission reduction. The main reasons are their renewable nature coupled with their current low utilisation rate, their obvious ecological advantages in comparison with non-renewable fuels, and the high potential capacity of the country's main rivers.

A thoroughly planned policy of developing its energy sector would allow the Kyrgyz Republic to become the biggest electricity producer in the region. The industry would not only be able to fully meet the current electricity needs of the population, but also allow for switching to all-electric cooking and heating, thereby replacing the organic fuels which currently take up the greater part of energy consumption. Due to strict policy of energy saving and introduction of new technologies it should be possible to keep the growth in energy consumption below the growth of GDP.



In the future, considerable shifts in the structure of energy use are expected to take place due to the increase of the electricity share from 24% in 1990 to 55% in 2020. The share of natural gas will decrease from 22% to 12% by 2005 and to 10% in 2020. The share of residual oil will also drop sharply from 12% in 1990 to 1% in 2020.

Two basic scenarios of energy production are being elaborated within Kyrgyzstan's development programme. Scenario (A) gives priority to the development of the hydro energy sector and other renewable energy sources, while the other scenario (B) concentrates on the development of the (non-renewable) fuel-energy sector, aiming instead at the increase of coal mining activities and the expansion of the thermal-electric share in energy production.

Comparative evaluation of GHG emissions under both scenarios demonstrates the efficiency of energy sector development under the scenario A (see Table 6.1). The table shows that the proposed Scenario A allows a considerable reduction of GHG emissions from 11,214 Gg in 2000 to 9,284 Gg in 2020. Implementation of Scenario B, by contrast, would lead to an increase of GHG emissions to 28,752 Gg. Energy sector development according Scenario B would take GHG emissions back to the 1990 level by 2020.

The reduction of GHG emission requires the following actions to be undertaken:

- transition to the use of renewable energy sources, reduction of low-grade coal import, increase of energy efficiency by modernising fuel combustion systems; reduction of

**Table 6.1. Comparative evaluation of CO<sub>2</sub> emissions under different scenarios of the country's energy sector development for the period 2000-2020**

Indicator	2000		2005		2010		2015		2020	
	A	B	A	B	A	B	A	B	A	B
<b>Electric energy production (in bln kWh), including</b>	<b>14.767</b>	<b>13.609</b>	<b>15.192</b>	<b>14.408</b>	<b>18.61</b>	<b>15.93</b>	<b>21.002</b>	<b>17.185</b>	<b>23.033</b>	<b>24.89</b>
HPS	13.557	12.4	13.825	12.19	17.026	13.505	19.176	13.505	20.095	18.155
TPS	1.21	1.209	1.367	2.2	1.584	2.4	1.826	3.5	2.107	6.7
<b>Fuel consumption, including</b>										
Coal, mln. tons	0.93	1.1	0.95	1.83	1.25	2.38	1.527	3.1	1.55	4.8
Gas, bln. m <sup>3</sup>	0.570	0.71	0.8	0.93	0.8	1.24	0.8	1.52	0.8	1.75
Oil residue, mln. tons	0.13	0.2	0.155	0.7	0.16	1.1	0.165	1.6	0.17	1.8
Oil, mln. tons	0.188	0.3	0.69	0.7	0.79	0.8	0.8	1	0.93	1.1
Electric energy, bln. kWh	2.49	7.9	10.57	10	13.8	12.7	15.36	13.3	16.9	18.1
<b>CO<sub>2</sub> emission, Gg</b>	<b>11,214</b>	<b>8,580</b>	<b>10,410</b>	<b>14,274</b>	<b>9,750</b>	<b>18,584</b>	<b>10,536</b>	<b>21,390</b>	<b>9,284</b>	<b>28,752</b>

fuel use in the heat and energy production;

- introduction of a strict energy saving policy; strengthening of monitoring and control systems; reduction of non-technical losses in fuel and energy use;
- elaboration of legal mechanisms that stimulate consumers to save energy and increase the use of non-traditional and renewable energy sources;
- scientific and applied research on development and implementation of new energy and resource saving technologies; GHG abatement technologies, modern means of GHG emission capture and instruments of GHG measurement;
- communication to the public about ecological and social consequences of climate change, and about measures that are being undertaken against it, as well as involvement of the public into implementation of these measures.

### 6.2.2. Buildings and other structures

The heating of buildings accounts for 13-30% of the total GHG emissions in the Kyrgyz Republic. By the year 2000, the volume of construction went down by 90% compared to 1990. The buildings that are being constructed do not fully meet the construction requirements with respect to energy efficiency and energy conservation. Traditions, social barriers, lack of finance, and almost complete absence of the technologies recommended for the reduction of wastes and GHGs represent major barriers that hamper full-scale realisation of the potential for energy efficiency increase.

The following main measures are recommended:

- 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 application of these standards in the buildings that are under construction.

### 6.2.3. Transport

The transportation sector, especially its automobile part, accounts for about one third of the total GHG emissions. Motor vehicles take up to 90% of all internal freight forwarding and passenger traffic in the Republic, and they are expected to become the preferred mode of transport for all kinds of freight. The exploitation conditions of the vehicle fleet (mountain landscape, bad quality of the roads, deterioration of vehicles etc.) account for the increased GHG emissions. Therefore, the reduction of GHGs from the transportation sector represents one of the primary tasks in the overall GHG emission reduction policy. Low-cost measures could be very effective in this sector. For example, the introduction of a new, locally patented system of electronic ignition that will cost about \$20 to each consumer, and will ultimately save up to 15% on fuel and will reduce up to 30% of GHG emissions. This will require the start-up of production for this device at one of the currently inactive machine factories that have all the necessary equipment and some starting capital.

Other measures of GHG emission reduction include:

- enhancement of state governance and control over the automobile transport sector aimed at GHG emission reduction;
- development of public transport and the road network;
- fuel cell automobiles;
- hybrid electro-mobiles.

### 6.2.4. Industry

Kyrgyzstan's industry accounts for about 4% of GHG emissions. In recent years this figure dropped to 1.2%, and no significant increase of GHG emission from this sector is expected in the future. Nevertheless, the industrial sector has great potential for GHG emission reduction.

