KYRGYZ REPUBLIC

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Review of the existing information, policies and proposed or implemented climate change measures in Kyrgyzstan

To date, there has been no targeted research on climate change impact on forests and wooded areas of Kyrgyzstan. There has been no study of climate change consequences for forest functions such as productivity, survival ability or loss of plantations, as there is hardly any scientifically-based information on this topic. The only work in this direction was performed within the framework of the National Communications on climate change.

The main problems related to climate change are clear in the country: decreased productivity in agriculture, decreased water supply, increased danger of extreme meteorological events, ecosystem destruction, and increased danger to the health of the population.

Realizing the extreme importance of the climate change issue, the Kyrgyz Republic ratified the UNFCCC in January 2000, and the Kyoto Protocol in January 2003. After the adoption in 2001 of the Law on the Ratification of the Framework Climate Change Convention of the UN, a decree of the Government of the Kyrgyz Republic was adopted "On the Execution Measures of the Framework Climate Change Convention of the UN".

In accordance with the Decree, the State Agency for the Protection of the Environment and Forestry of the Kyrgyz Republic is the responsible executive organ that implements the obligations of the Kyrgyz Republic under UNFCCC and the Kyoto Protocol. Being a Party to the Convention, Kyrgyzstan periodically submits reports to the Secretariat of the UNFCCC, providing a complete assessment of the modern state of the country in relation to climate change, supplying the following information:

- National condition.
- Inventory of the anthropogenic emissions from sources and GHG absorption by absorbers.
- Base scenarios.
- Vulnerability assessment to climate change, and adaptation measures.
- Measures aimed at climate change impact mitigation.
- Miscellaneous information on reaching the Convention's objectives.

Having ratified the UNFCCC and the Kyoto Protocol, the Kyrgyz Republic moved to practical actions in the sphere of climate change. Since then, in accordance with the requirements of the international agreements, a number of active measures have been taken in the Republic:

- A detailed survey of sources of GHG emissions for the period 1990–2005 has been completed, i.e. the assessment of the Republic's impact on climate change has been performed.
- The expected climate changes for all of the Republic's regions have been prepared for the period to 2100.
- Qualitative assessments of anticipated climate change impact have made in different spheres, such as the condition of surface water resources, the condition of glaciers, biodiversity, forest resources, agriculture, health of the population, and climatic emergencies.
- Measures have been taken to adapt to the expected climate changes and to mitigate climate change impact.

The Second National Climate Change Communication of the Kyrgyz Republic was prepared, and approved by Government Decree No. 274 of 6 May 2009. The vulnerability and adaptation issues of climate change in Kyrgyzstan were outlined. The analysis of the Second National Communication results was successfully presented to the UNFCCC at its session in Bonn in June 2009.

Kyrgyzstan has made an important step in the creation of the regulatory and legal basis for execution of obligations under the UNFCCC. Specialists of the State Agency for Environmental Protection and Forestry of the Kyrgyz Republic together with UNDP experts developed a Law "On State Regulation on the Greenhouse Gases Emission and Absorption Policy", which was adopted by the national parliament in 2007. This Law creates the necessary legal basis for the implementation of the state climate change policy.

By supporting global ecological efforts on climate change prevention, by Order No. 281 of the President of the Kyrgyz Republic, dated 18 June 2005, the National Committee on Climate Change Consequences (NCCC) was established, and officially registered at the CDM Executive Council at the Secretariat of UNFCCC. In accordance with the requirement of the Executive Council of the CDM, NCCC is led by the manager of the state executive body responsible for the execution of obligations under this convention. The main objective of the NCCC is the coordination of national activities for the execution of the Republic's obligations under UNFCCC and the Kyoto Protocol.

According to the SNC assessment on climate change, by 2100 there will be practically no glaciers and snowfields, the run-off from which are the main source of water for rivers. This forecast has implications for the condition of water resources in the entire Central Asia region. The results of the studies conducted during the preparation of the First and Second National Commitments showed that over the last century the air temperature on the territory of Kyrgyzstan increased by 0.8°C. This is higher than the average world change of 0.6°C.

Information on forestry-related projects

The study of climate change impact on the forestry of Kyrgyzstan within the framework of the National Communications to UNFCCC resulted in the information on Kyrgyzstan's forest sector considered below.

A short description of Kyrgyzstan's forest sector

The forests of the Kyrgyz Republic are the property of the Kyrgyz Republic, and, according to the Forest Code, have the status of protected natural areas. The forests form a unified State forest fund that includes both area actually covered by forest as well as the areas that are not covered by forest but designated for forestry needs.

According to the most recent official assessment (1 January 2008) the total acreage of the State forest fund's lands amounted to 3 533 100 ha, including 932 100 ha covered by forests. Forests cover 4.6% of the Republic's territory. The combination of vertical zonation and a variety of climatic zones have resulted in considerable diversity in forest-forming species in the forest reserves and have also led to rather low forest coverage of the territory.

Kyrgyzstan is a country with limited forest cover, and the forests are unevenly distributed over the country. They have primarily environmental functions and serve as natural reserves. The forests of the Kyrgyz Republic are dominated by four species: walnut (41 000 ha.), spruce (124 100 ha), juniper (archa tree) (303 500 ha) and inundatable (48 300 ha) forests.

Pistachio and almond plantations grow over the dry piedmonts of the Fergansky range and higher, at an altitude of 1300–1800 m, while over the slopes of Fergansky and Chatkal'sky ridges there spreads a solid mass of walnut forest, located in the Zhalalabad and Oshsky regions. The

Circassian walnut (*Juglans regia* L.) is the most valuable species among the great variety of tree species, and is the dominant species in the walnut forests.

In the northern part of the country, in the Priissykul'ye, Narynsk region over the slopes of the Kyrgyz ridge, the forests are formed predominantly by Tian-shan spruce (*Picea schrenkiana* Fisch. & Mey.). Its total acreage equals 128 200 ha, or 13.8% of the entire forest acreage of the Kyrgyz Republic. The spruce forests are located on the steep slopes of the mountain ranges, where they attenuate erosion processes, stabilize the soil against mud-and-stone landslides, regulate mountain river runoff and direct surface runoff into subsurface runoff.

The juniper (locally called *archa*) forests and the associated dwarf forms are of extreme importance. Archa forests are widespread in the dryer and harsher conditions of the Altai crest, and cover 303 500 ha, or 32.5% of the country's forests. The largest areas of archa forests are concentrated in Oshsky and Batkensky regions on the slopes of the Turkistan and Altai mountain ranges, but it is also found extensively in Zhalalabadsy oblast, in Chatkalsky, Ala-Bukinsky and Aksyjsky regions.

The archa forests are located on steep mountain slopes and they perform important water regulation and water conservation functions, preventing soil erosion and preventing mud- and landslides, which have been the cause of severe disasters and devastation.

The inundatable forests in the mountain regions are located along the bottomland and shores of large rivers: Naryn, Chu, Tyup, Talas, Susamyr, Dzergalan, Yassy and along many small rivers, occupying about 48 300 ha (5.5% of the Republic's forests). Such forests typically have water conservation functions. The natural content of the bottomland forests depends on species adaptiveness to the environmental conditions, and on competition between species. In the mountains, along river shores and on deltas, the vegetation grows in the form of narrow, broken forest strips, which frequently form riparian woods (*tugais*) consisting of black poplar (*Populus nigra*), Asiatic poplar (*Populus diversifolia*), European willow (*Salix alba*), grey poplar (*Salix cinerea*), oleaster (*Elaeagnus angustifolia*), tamarix (*Tamarix laxa*), sea buckthorn (*Hippophae rhamnoides*). Elm (*Ulmus* spp.) and poplar forests grow along the shores of the Talas river.

The combination of various species forms a wide variety of forest ecosystems: with archa and spruce in the highlands, walnut species in the mid-mountain range, and bottomland (*tugai*) species in the low-hill terrains. The archa and spruce forests are the most widespread (about half of the forest acreage). Walnut species occupy about 10% of the forest land. The most widespread tree and shrub vegetation types in the Kyrgyz Republic have a low biomass growth coefficient and this is why the Republic's carbon absorption potential through the expansion of its forest cover is relatively low.

The national forest cover expansion potential as evaluated by experts shows wide potential range. The most realistic assessment is that the Republic's forest cover could expand by up to 8%, which would mean that the additional yearly accumulation of carbon in the forest reserves would be about 784 Gg CO_2, basing the calculations on The IPCC guidelines for the LULUCF sector. The impact of climate factors on fruit-set in the walnut woods and other forests of Kyrgyzstan has not been sufficiently studied. The climate assessment, based on the connection between environmental factors and fruiting, in particular, allows identification of specific prerequisites for increased fruiting and seed set, and for the creation of artificial stands.

Vulnerability assessment of Kyrgyzstan's forests

In the age structure of the Kyrgyz Republic's forests, mature and declining stands prevail. This applies to all the forest areas. The gradual transition trend from one age group to an older group can clearly be observed. However, because of change to the forest acreage and natural forest

renewal, the acreage of young plantations remains stable. It should be noted that at the present time the age structure of the Kyrgyzstan's spruce forests is skewed; mature and declining stands amount to more than 40%. In the next 20 to 25 years, because of forest aging, mature and declining stands age group will occupy more than 50% of the acreage, and tree losses in the spruce forests will increase because of tree die-off.

Spruce forests

During the vulnerability assessment of the spruce forests that occupy the mountain range from 1600 up to 2900 m above the sea level, we have to take into consideration the changes of the temperature and precipitation patterns related to altitudinal change. When considering the spruce forest vertical range, there is significant vegetation distribution and lack of homogeneity. Considerable acreage is taken by steppe, valleys and scrublands. Sometimes this vegetation is secondary and it appeared as the result of forest harvesting, but in the majority of cases those are native vegetation types.

The spruce forests, growing in general on the slopes with northern exposure, are characterized by relatively high moisture content. Spruce is considered a moisture-loving species. Weak trunk cleaning from the spruce's branches creates a cover that lets through very little precipitation. Thus, at 2000–2200 m, as the lack of moisture and significant heat amounts are present, the spruce forests acreage amounts to 5.2% of the total plantation acreage. These altitudes exactly match the forest range with insufficient moisture content. It is quite probable that the spruce forests acreage could be much greater here, but because of forest accessibility it is decreasing because of wood harvesting, livestock grazing, etc.

Thus, if under present conditions the restricting factor for spruce forest growth at low altitudes is insufficient moisture content during the vegetative period, then at higher altitudes it is the winter conditions that affect its growth. As temperature increases, by 2100 this factor will level-off at high altitudes.

Spruce distribution largely depends on moisture levels and it shows that although the spruce is well adapted to aridness, it is still a moisture-loving species. When the temperature increases, the lower boundary of spruce forest will ascend by 150–200 m.

Archa (juniper) forests

The archa (juniper) forests, which were widespread on the plains of Central Asia, are now a narrow, thinned-out band, located on mountain slopes at altitudes from 1200 to 3200 m above sea level. Over the last 25 years, the archa (juniper) forests acreage has diminished by 18% and the rate of degradation has reached 0.8% per year. The acreage of only sparsely closed stands increased by 31% (11 500 ha), and soil erosion is increasing. There is no doubt that avalanches and mud slides in recent years have caused tremendous damage to the national economy, and the decrease in soil water content can be largely explained by the reduction in mountain forests and by their deterioration.

The degradation of the mountain vegetation is accompanied by the progressive aridization of the slopes and overall climate aridization. According to the existing data, over the last 25 years, the desertification border advanced vertically into the mountains by 500 m. A number of southern semi-desert and desert plants have appeared here that previously were unknown. In the opinion of the majority of the researchers, the main reasons for forest degradation are:

- industrial wood harvesting and wildfires in the past;
- intensive and increasing livestock grazing over the entire area;
- population and livestock growth in the mountain regions; and
- increased recreation.

One effect of the increased summer temperatures is that the archa forest ecosystem will gradually move higher, and by 2100 could be 150–200 m higher than present.

Walnut Forests

A forest restoration plan, covering forest restoration and forest development, was developed to take account of the probable global climate warming and the effect on forest growing conditions for each of the walnut forest subsystems. This plan takes into consideration the range from arid lowland up to moist slopes, and assesses cultivating walnut trees as well as other useful species, such as apple, pear, quince, jujube, plum and almond.

Analysis of the bioclimatic potential in the changing climate conditions for the forest ecosystems shows that the considerable increased evaporation in comparison with precipitation results in worsening of the natural humidity regime of the piedmont territory. We can assume that as CO_2 content increases in the atmosphere, the wetter zone borders will shift upwards, in general by 100–200 m, but in certain locations by 400 m.

Thus, if at altitudes of 1400–2300 m in the southwestern region in the well watered area (walnut forests) we see increased bioclimatic productivity, then in the dry steppe and in the semi-desert areas at 800–1400 m, typically with pistachio and almond plantations, this productivity will change little, or may even worsen under the influence of anthropogenic factor. Thus, climate change will contribute to changes in the biodiversity of the Republic; a considerable expansion of desert and steppe zones is anticipated.

Forestry adaptation strategy to the climate change

- Strategy No. 1. Improvement of the legislative basis of the Kyrgyz Republic (Forest Code, the development and the implementation of national adaptation measures to the climate change).
- Strategy No. 2. Implementation of institutional reform in the forest sector (separation of regulatory and management functions).
- Strategy No. 3. Improvement in the forest sector personnel potential (one of the consequences of the ambiguity in relation to the future climate change impacts is the fact that the specialists use past data to design future activities).
- Strategy No. 4. Development of sustainable forest management criteria and indicators.
- Strategy No. 5. Improvement of public awareness.

Review of future tasks and research topics, and lack of knowledge relevant to international activity threats

According to the information stated above, the following threats can be anticipated for the development of Kyrgyzstan's forest sector:

- Climate change will contribute to the altitudinal advance of the desert band's upper border by 400 m, the steppe band will advance by 250 m, the forest and glade band will advance by 150 m and the sub-alpine band will advance by 100 m. This will undoubtedly affect flora biodiversity. Some invertebrates adapted to certain specific soil types will be lost. The loss of some herbivorous animals is expected if certain plants disappear from the ecosystem.
- The range of many plant types and the main forest-forming species will change. Due to the increased soil moisture content requirements, the lower border of the European walnut will rise by 100–150 m, conditioned by the increase in the active temperature sum by 438°C and by the humidity increase and the extension of the growing period by 30 days. In this ecological niche typical of the lower sub-band of the walnut forest, the proportion of drought-resistant bushy types such as rosehip, hawthorn and honeysuckle will change.

Species that can adapt to the increased temperatures (pistachio, almond and jujube) will move up by 100–200 m.

- There will be increased degradation of lands in the vicinity of populated areas, with increased possibility of landslides, caused by excessive livestock grazing on the pastures near the villages.
- Worsening of the survival ability of forest cultures and plantations because of insufficient financing for use in reproduction, protection, prevention of illegal forest harvesting, and fighting pests and diseases.
- Lack of information on climate change impact on the condition of the forests will impede effective planning for forestry development. The current ambiguity in relation to future climate change impacts is the fact that the specialists have to rely on very limited past data to guide future activities.

Climate change projects implemented in Kyrgyzstan's forestry sector

In Kyrgyzstan there is only one climate change project currently being implemented that is directly related to forestry. In 2008, an agreement was signed between the International Development Association, represented by the World Bank, and the Government of the Kyrgyz Republic on a preparatory grant from the Japanese Government for the preparation and implementation of the forest restoration component and forest cultivation in the Kyrgyz Republic "*Tian-Shan Ecosystems Development*". This project is a continuation of the Central Asian Trans-border project on the preservation of the Western Tian-Shans biodiversity.

Main executor: State Agency on Environment Protection and Forestry under the KR Government

International executive agency: European Bank for Reconstruction and Development (EBRD

Donor: Global Environmental Facility (GEF), Government of Japan/PHRD

Objective: Contribute to the improvement of ecosystems management and sustainable forestry in project areas in the Kyrgyz Republic. The following are several of the global ecological objectives: preservation of biodiversity; and mitigation of the climate change through greenhouse gases deposits (accumulation and entrapment) in the forests of the Kyrgyz Republic

Expected results: *Within the framework of Component A*: Providing technical assistance and support to the selected specially protected territories, creating management plans for the specially protected territories, and providing technical assistance for the improved monitoring of biodiversity. *Within the framework of Component B*: Forest restoration and forest cultivation in all the regions of the Kyrgyz Republic on the acreage of 13 950 hectares of the State Forest Fund and on the agricultural lands, not used in agriculture (bogged, degraded, salinized, etc).

Activity Component A. The carbon deposition assessment at national level and project design development address project design development and carbon deposits project preparation—the Tian-Shan Ecosystem Development Project (TSEDP)—including the preparation of a feasibility study and the selection of tree planting sites; the preparation of the Project Design Documents according to the Clean Development Mechanism, the base investigation and monitoring plan, as well as assessment of the institutional and legal bases; implementation of pilot measures within the TSEDP framework by the selected communities and by the forest management entities; and carbon deposits assessment at the national level.

Activity Component B. The national potential increased by the creation of a State Agency for Environmental Protection and Forestry Potential for implementation of the land use projects, changes in land use character and in forest management, including increasing potential in relation to the rules and processes of the CDM in general, and of the rules and processes of the BioCarbon Fund in particular; and increasing the forest service potential and village administrations (*ayil oktmotu*) in events coordination dedicated to forest plantation and forest cultivation and carbon deposits with joint forest management and public forest management.

Activity Component C. *Project approval, initial verification, negotiations and monitoring*: Initial TSEDP verification by an independent Authorized Body; Providing legal assistance to the State Agency of the Environmental Protection and Forestry on conducting negotiations on the emissions reduction agreement and on the development of the plan for the village administrations and for forest management entities to receive income; Conducting pilot activities on afforestation.

Activity Component D. *Coordination and management*. Providing support for general management and coordination of measures within the framework of the grant agreement implementation, including preparation and consultations on the work plan, procurement schedule, financial reporting and accounting responsibilities.

Project's contact address: asatybekov@gmail.com

However, in the Kyrgyz Republic there is no single international project, targeted at the study and the assessment of the climate change on forests and plantations of Kyrgyzstan. The list below shows projects related to climate change currently being implemented in Kyrgyzstan, but that are not directly related to forestry.

The UNDP project "Increasing the potential for the implementation of sustainable waste management in the Kyrgyz Republic".
The main executor in the Kyrgyz Republic is the State Agency for Environment Protection and Forestry under the KR Government, and the objective is to assist the Kyrgyz Republic in the implementation of sustainable waste management. The project's objectives are the development of a National Waste Management Strategy, increasing the opportunities for private sector involvement in waste management, increasing public motivation levels in waste management. The implementation of this project will assist in implementation of the four ecological Conventions, ratified by Kyrgyzstan (Orkhuss, Basel, Stockholm Convention, Climate Change Convention). The project's contact address is: office@in.kg or project@in.kg

The project provides assistance to the Kyrgyz Republic in the implementation of separate international Conventions and Agreements, ratified by Kyrgyzstan, in the waste management sphere through their implementation in the legislation of the Kyrgyz Republic, namely

- the development of project proposals to attract resources for the implementation of the provisions of Conventions and Protocols; and
- increasing public awareness and motivation regarding the objectives and the implementation process of the Conventions and their possible contribution to this activity.

GEF/UNDP Project "*Demonstrating Sustainable Mountain Pasture Management in the Susamyr Valley, Kyrgyzstan*" for implementation under the Convention to Combat Desertification (UNCCD)
The objective is to develop in the Susamyr Valley a cost-effective and replicable pasture management mechanism that reduces the negative effects of livestock grazing on land and which improves rural livelihoods. The main executor in the Kyrgyz Republic is the Ministry of Agriculture, Water Resources and Processing Industry. The project can be contacted at: susamyr@elcat.kg

GEF/UNDP Project "*Energy Efficiency in Buildings*" for implementation under UNFCCC
The main executor in the Kyrgyz Republic is the State Agency for Architecture and Construction, and the objective is to reduce energy consumption and associated GHG emissions in the Kyrgyzstan building sector by 30–40% compared with the current level. The project can be contacted at e.rodina@up.elcat.kg or e.esykeeva@up.elcat.kg

Expected results are:

- The construction of new buildings, both private and public, to conform with the new energy efficient norms and rules.

- Two pilot schools constructed applying these energy efficiency norms.
- Energy efficiency assessment and GHG emission monitoring of the buildings performed by a certified and appropriately equipped laboratory.
- Introduction of construction education standards, include energy efficiency programmes.

Review of the status of national scientific (research) works on assessment of climate change impact on forest resources

Activities are implemented by the Institute of Forest and Walnut Cultivation of the National Academy of Sciences of the Kyrgyz Republic, which is the only establishment that studies the condition of the forests and conducts bio-ecological studies. However, cooperation between the State Agency for Protection of the Environment and Forestry and the Institute of Forest and Walnut Cultivation is not very pronounced. Various studies have been conducted with the support of various international projects. There has been no targeted research into climate change impact on forests and forest plantations.

Potential future activities

Below is a summary list of proposals for international cooperation with FAO.

- Improvement of the legislative basis of the Kyrgyz Republic.
- Adoption of a strategy for climate change adaptation measures.
- Development and implementation of a national climate change adaptation plan and other regulatory activities.
- Implementation of institutional reform.
- Separation of regulatory and management functions.
- Support to increased productivity of forest resources by improved management. Support to forest preservation measures and forest protection measures.
- Increasing public awareness. Public awareness levels regarding climate change issues are extremely low. No effective public information system has been developed.
- Development of sustainable forest management criteria and indicators.
- Increasing forest resources productivity. For example, at present very little attention is paid to the condition of walnut plantations. Systematic upgrading of the walnut species could deliver greater crop yields. This will provide the local population with more income, while reducing damage to forest plantations.
- Organization of assessment and of payment for the ecological services of the forest, primarily in performing protective functions.

References

Climate Change and the Required Technologies Assessment. 2004. Bishkek.

E. Shukurov. 2004. Ecological value of the Kyrgyzstan's forests and the state support for their preservation. Presented at the Regional Forest Congress, Bishkek, 2004.

Orlov, O.V., Dzhumadylova, C.K., Khudaibergenov, A.D. & Rodni Stuparik. 2003. Climate change and its impact on the forest ecosystems of the Kyrgyz Republic. Bishkek.

Podrezov, O.A. & Titova, L.I. 2002. The modern climate of Kyrgyzstan and its change scenario in the 21st century. Bishkek.

Second National Communication of the Kyrgyz Republic under the Framework Climate Change Convention of the UN. 2009. Bishkek.

Vengelovsky, B.I. 2006. Biological specifics of Kyrgyzstan's walnut forests restoration and development. Bishkek.