UZBEKISTAN

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Summary of climate change dimensions

There is no scientifically based information in recent decades on observations of the effects of climatic change experienced in forest stands, such as yield and vitality decline, or increased mortality. This reflects features of scientific grant distribution as well as the current situation forest science. The only activity in this direction was made within the framework of National Communication reports on climate change.

Acknowledging the importance of the climate change problem and the need to take rapid measures on mitigation of its consequences, Uzbekistan signed the UNFCCC in 1993 and ratified the Kyoto Protocol in 1999.

Government of the Republic of Uzbekistan entrusted the Centre of Hydrometeorological Service (Uzhydromet) at the Cabinet of the Ministers with functions of realizing obligations under UNFCCC. In accordance with its obligations, Uzbekistan presents to UNFCCC data on:

- National conditions and peculiarities of the country.
- National GHG Inventory.
- Forecasts of GHG emissions.
- Emission reduction potential assessment and necessary measures.
- Climate observation systems and climate research information.
- Climate change consequences assessment and possible means of adaptation.
- Public awareness on climate change problems.
- Possible strengthening for UNFCCC obligations fulfilment in Uzbekistan.

As do other country signatories to UNFCCC, Uzbekistan realizes projects directed to fulfilling its obligations under the Convention. The first step towards fulfilment of the obligations was the project "Uzbekistan – country study on climate change" with GEF and UNDP support. The First National Communication of the Republic of Uzbekistan under UNFCCC was prepared and presented in 1999. The Second National Communication was presented in 2008.

All activities related to the influence of global warming on forestry have been started and continue to be implemented in the framework of preparation of the national communications of Uzbekistan on climate change. Uzbekistan submits regularly its national reports on forestry to UNFCCC (see: unfccc.int/resource/docs/natc/uzbnc1.pdf) and FAO (see www.fao.org/forestry/webview/media?mediaId=8859&geoId=170). To date, two such Communications have been developed: in 1999 and 2008. These communications contain information about the country's forestry.

Brief description of forestry in Uzbekistan

The total land area of the State forest fund of the Republic of Uzbekistan at the beginning of 2009 included 8 661 200 ha, or about 19.5% of the national territory, within which the forest-covered area was 7.3%. The forestry fund comprises forest lands, i.e. lands intended for afforestation, and non-forest lands, where afforestation requires additional reclamation. Forest lands include categories such as forest-covered areas, open artificial plantings, sparse forests, fire sites, perished stands, cut sites, groves and abandoned sites. Non-forest lands include arable lands, hayfields, pastures, marshes, sands and other lands.

Correspondingly, based on topography, soil and climatic conditions, the country's forests (forest-covered areas) are divided into mountain forests, floodplain valley forests, and desert forests. The greatest distribution (78%) is of aridity-tolerant species, such as saxaul (*Haloxylon persicum* Bge. and *H. aphyllum* Hjin.), salwort (*Salsola richleri* (Moq.) Kar. ex Litv., *S. paletzkiana* Litv.), *Calligonum* spp., and other desert-type forest vegetation.

In mountains coniferous species (juniper) occupy 11% of all the forest area of Uzbekistan, whereas nuciferous and wild fruit trees ones occupy 2.8%. Juniper forests of Uzbekistan are formed three species (Sabina section): *Juniperus seravshanica* Komar, *J. semiglobosa* Rgl. and J. *turkestanica* Komar. *Tugays* (flood-plain forests) occupy floodplains and river deltas periodically flooded. These are typically oleaster (*Elaeagnus angustifolia* L.), *turanga* (*Populus euphratica*) and tamarisk (*Tamarix* spp.). They occupy about 5% of the forest area.

The forest-covered area is distributed unevenly across Uzbekistan, with 80% of forests in Karakalpakstan, Navoi and Bukhara regions, and less than 1% of forests in Sirdarya, Samarkand and regions of the Fergana valley altogether.

The forest productivity of Uzbekistan is very low. The forest stocking density per hectare of mature and over-mature forests on average is ca 6 m^3, with coniferous forests at 29 m^3, hardwoods only 6 m^3, and saxaul forests at about 3 m^3. It is quite obvious that this is associated with the general aridity. Nevertheless, all forests of Uzbekistan have huge protective importance. In addition, these are sustainable ecosystems (in the absence of anthropogenic impacts), highly adapted to specific soil-climatic conditions, including to natural climatic fluctuations.

In the mountains they prevent erosion and mudflow processes, convert surface water flow into interflow and expand the debit of the rivers. In deserts, forest stands mitigate conditions of habitat, fix mobile sands, and protect economic objects from sand covering, serve as local sources of fuelwood, and increase productivity of desert pastures. In floodplains, the tugai forests perform a bank and water protection role, and provide casewood. In irrigated plain lands, the forest stands serve as protection from injurious action of water and wind erosion, and hot dry winds.

The forests are the source of non-wood forest products, including nuts (walnut, pistachio, almond), fruits (apple, pear, cherry-plum, apricot, hawthorn, barberry), mushrooms and berries, herbal medicines, tanning and dyeing agents. Forests are the basis for maintaining biological diversity of the fauna and flora.

Inventory of GHG emissions and sinks

Emissions and sinks of CO_2 were calculated by applying the LULUCF module to the lands of the State Forest Fund. The State inventory of the forest fund is undertaken every five years, based on forest regulation materials for forestry farms, which is undertake in nature once every ten years. It is obvious that updating of the GHG inventory is also undertaken once in five years with this module. The values of sinks and emissions in the following four years are taken as equivalent by default. The whole further calculation is carried out for forest-covered areas of the State Forest Fund. Inventory of emission and absorption of GHGs in the forestry sector has been undertaken based on the IPCC Guidelines for effective practice for the LULUCF sector. The table below shows the calculated annual change in carbon reserves, based on methodologies for 1996 and 2006.

Table 1. Calculation of annual change of carbon reserves in living biomass of the forestry sector.

Inventory year	Method-ology	Forest area	Annual increase in carbon reserves (t C/year)	Annual decrease in carbon reserves (t C/year)	Annual change in carbon reserves (Gg CO_2/year)
1998	1996	3 033.5	—	—	758.0
2003	1996	2 327.3	171.7	18.3	562.5
2003	2006	2 327.3	387.5	30.2	1310.0

Assessment of climate change impact on forests of Uzbekistan

In order to assess the climate change impact on forest ecosystems, an empirical biophysical model was applied, assessing conditions of natural habitats of tree or shrub species based on the totals of positive average monthly temperatures and precipitations during the warm period of the year with existing and changing climate. The climate change impact on basic forest forming species of mountain (juniper), flood-plain-valley and desert (saxaul) forests of the country was assessed.

Vulnerability assessment

Desert forests

The desert forests of Uzbekistan account for about 78% of all forest-covered area of the country. Saxaul forests, as the main forest forming species of desert forests, account for 67% of all these forests. Expected climate conditions in the deserts of Uzbekistan will be hotter and dryer, but new agricultural meteorological indices in saxaul natural habitat do not go beyond the limits of accepted climatic habitat limits of these species. The habitat conditions become more arid (especially in 2080), i.e. the general climate of area within the country's limits becomes warmer, dryer and characterized by smaller fluctuation of climatic indices, but these climatic changes will not have a significant impact on condition of saxaul stands. However, it is obvious that such conditions may result in a decrease in productivity and deterioration of saxaul stands. Similar conclusions apply for other shrub species growing in the deserts of Uzbekistan, as they are distributed on the common territory.

Flood-plain and valley forests

These include forest plantations on irrigated and conditionally irrigated lands, protective forest plantings on agricultural lands and tugai forests (flood-plain forests). Forest plantations are often protective forest plantings on agricultural lands and are artificially created stands. In the conditions of Uzbekistan, these stands can grow only on irrigated or conditionally irrigated lands. The main factor limiting the growth of forest stands here is access to moisture, which is assured or not assured by human intervention. Therefore, their state depends mainly not on possible climate warming but on maintenance activities and irrigation. Tugais occupy periodically inundated flood-plains. Remains of tugai vegetation can be also observed along modern riverbeds on surface terraces, if they are flooded from time to time. In the depth of the desert in old river zones there are remains of degraded tugai vegetation, where moistening of soil currently depends only on precipitation. Vulnerability of tugais is not so much due to changing air temperature and precipitation, but rather uncontrolled felling due to easy access to these plantations, uprooting with the purpose of agricultural reclamation of flood lands, lack of high waters in natural terms due to overregulation of river run-off (regulated flow), lowered groundwater levels, etc.

Mountain forests

Based on the example of the well studied mountain juniper formations, the situation with other forest formation species in this zone during climate change can also be estimated. In general, the

climatic factor combinations for areas favourable for juniper growing will be shifted toward dryer and colder climates. The boundary of cold dry climate will be shifted much less than the boundary of warm humid climate. The more unfavourable becomes the combination of increasing temperature and changing precipitation due to possible climate change, the more constricted becomes the area of preferred habitat of juniper, especially by 2080 (Figure 1). The hypsometric level of juniper formation boundaries will rise. The hypsometric level of the lower boundary of zeravshan junipers (*Juniperus seravshanica* Komar.) will rise by more, 1000 to 1050 m, e.g. in 2080 under the A2 scenario. The hypsometric marks of the upper boundary of zeravshan junipers will rise by smaller values, 800 to 900 m, semi-globular junipers (*J. semiglobosa* Rgl.) by 650–750 m, and the upper boundary of turkestan juniper (*J. turkestanica* Komar.) by 500–650 m.

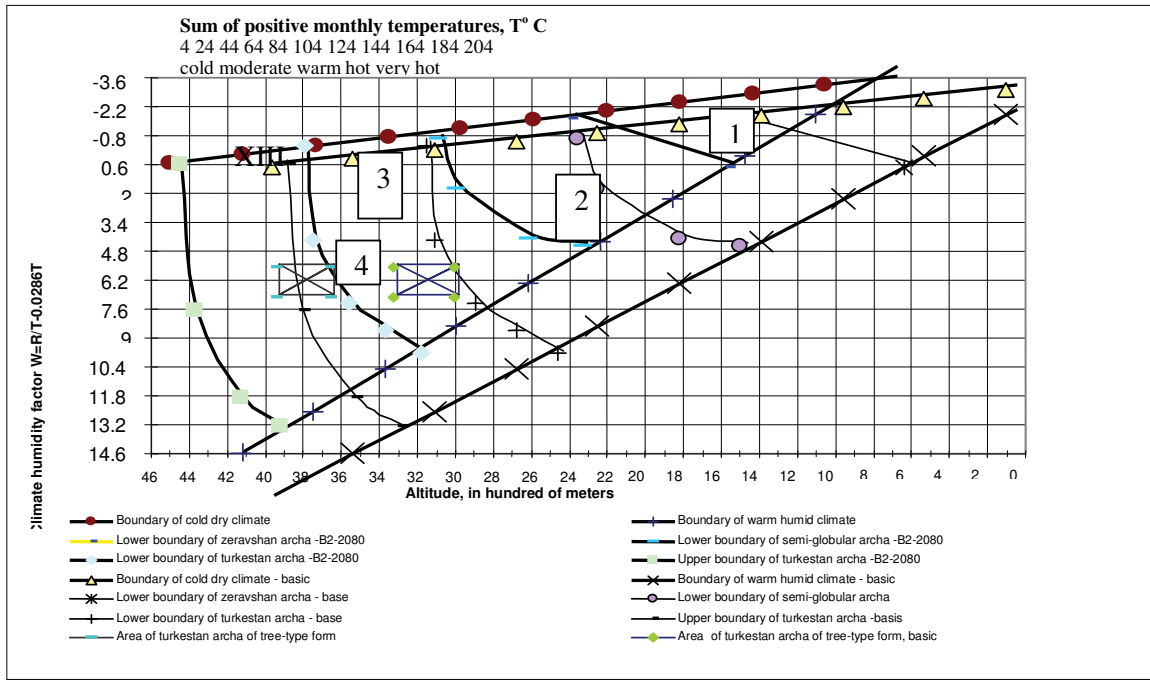
The term boundaries implies changes in the boundaries of possible favourable zones for the entire juniper forests in Uzbekistan. Certain forest planting districts may have greater amplitudes. The outcome of such a shift in juniper growing zone boundaries will be reduction in the breadth of the juniper belt. Moreover, the elevation belt of lowland formations will reduce by more in comparison with highland stands. In general, according to true altitude, the juniper belt extent will decrease by 350 m (2080, A2 scenario). This, naturally, will also reduce the whole area with conditions favourable for juniper stands. It can also be assumed that this area will contract because the higher the hypsometrical level of the soil surface, the smaller its area. In addition, increasing altitude above sea level results in substantial worsening of soil conditions as there is more coarse material, stone screes, shallow soils, etc. This, in turn, will substantially reduce productivity of woodlands in new habitats and complicate work for their establishment.

Assuming that currently juniper occupies the full extent of its potential habitat in the different forest planting districts (except for small area in Gissar-Darvaz for turkestan juniper), then possible climate change will change this. The semi-globular juniper and all the turkestan juniper in Gissar-Darvaz forest planting district may be lost. Unfavourable conditions for turkestan juniper may also occur in Chatkal-Ugam forest planting district. The most vulnerable to climatic changes may be tree-type turkestan juniper formations. Increase in climate change results in vertical shifting upwards from the present location, by up to 600 m by 2080. In addition, by 2030 and 2050, the area of favourable climatic factors coincides only marginally with Gissar-Darvaz forest planting district.

Thus unfavourable climatic conditions will develop in the current locations of tree-type Turkestan juniper, and at the same time favourable conditions will either develop elsewhere in new areas of Gissar-Darvaz district, or no such climatic factor combination will be found, as forecast according to scenario A2 for 2030 and 2050.

Existing tree-type turkestan juniper stands will be in conditions where they become unable to be regenerate at the same place due to climatic factors. Unfavourably changing climate conditions may result in weakening, illness, and even in early loss of these stands. At the same time, the natural flexibility of this type of juniper, at least younger age classes, should be able to transform to tree-type form in the future, if, of course, the situation will not be a permanent change. Thus, the most vulnerable to climate change are mountain forest stands.

Figure 1. Chart of juniper formation layout in the climate grid in 2080 under scenario B2.



Key: 1 = zeravshan juniper; 2 = semi-globular juniper; 3 = tree-type form of turkestan juniper; 4 = crooked and bush-like stands of turkestan juniper.

Strategies for adaptation of forestry to climate change

- Strategy 1 – Legislative initiatives and institutional changes (Forest code, National forest programme).
- Strategy 2 – Improvement of the forestry management system (forest inventory, prospective plans for development of forest farms, including climate change taken into account; monitoring; database).
- Strategy 3 – Enhancement of effectiveness of forestry works (realistic work planning, grazing regulation, and mitigation of anthropogenic pressure).
- Strategy 4 – Improvement of professional skills in the forestry sector (manuals that take into account national forestry characteristics; professional development).
- Strategy 5 – Development of applied scientific research based on production needs (targeted scientific programmes, using knowledge gained for interrelation of science with production).

Status of assessment and research on climate change

Threats

In case of development of a situation on base scenario "as is", the following threats for development of country's forestry can be expected in the near future:

- lack of objective and comprehensive information on forest condition in the country will prevent planning of scientifically grounded forestry development;
- worsening of survival rate in regeneration and condition of existing forest stands due to traditional causes (lack of material and financial resources, application of truncated technologies,

uncontrolled grazing, illegal tree felling, fires, pests, diseases, etc.), as well as new and increasing negative climate change impact;

- change of forest planting district conditions in mountain territories under the influence of changing climate may lead to spatial shift in existing forest areas, i.e. there will be a shift upwards of growing boundaries for all tree and shrub species, with all the ensuing consequences, including biodiversity loss;
- reduction in the area of forest-covered lands, impoverishment of species composition, reduction of forest density and productivity of forests, worsening of age structure of forests, due both to traditional reasons and to global warming;
- tugai forests will become endangered, especially for euphratica poplar, as climate warming will inevitably result in increased water consumption for household and agricultural needs. Therefore further reduction of water yield and river sink regulation. which these unique forests depend on, can be expected; and
- field-protective forest stands may vanish, except for coppice linear plantings of mulberry and willow, which not may effectively perform a field-protective function.

Projects implemented in the field of forestry and climate change

Project I. "Training Programme on GHG emission reduction in Caspian Region" with the support of the Canadian International Development Agency (CIDA). The main purpose of the Programme is training of specialists from different economic sectors in elaboration and realization of projects on GHG emission reduction and CDM projects, preparation of project documentation according to the rules and standards of international donor agencies and investment funds; participation in carbon project tenders.

The CO_2 sequestration project provided experience in reduction of GHG emissions in the Caspian Sea basin (2003–2005), which included a sub-component of demonstrative CDM projects on forestry. Under the framework of this project it was planned to create forest plantations on the lands of one of the farmers of Djizzak region of Uzbekistan. Programme contact address: www.ctp-ghg.com

Project II. In 2007–2008, a project proposal on “Reconstruction and creation of forest plantations in Djambai and Zamin forest farms” was prepared as a CDM project.
The project's task was to test and demonstrate potential and benefits of joint management of forest farms in a CDM context. This project laid the foundation for replication of experience gained in forestry in Uzbekistan. The project had as its objectives:

- Creation of forest plantations on 206 ha of two forest farms by 2009 in accordance with CDM requirements. These include:
    - Reconstruction of young forest plantations with the purpose of increasing their density in accordance with CDM requirements on an area of 126.2 ha in the valley zone of Djambai forestry farm of Samarkand region;
    - Creation of new forest stands on an area of 20 ha in the valley zone of Djambai forestry farm; and
    - Creation of new forest stands on 60 ha in the mountain zone of Zamin forestry farm of Djizzak region in collaboration with local population (i.e. joint forestry management).
- A high level of CO2 sequestration and mitigating climate change.
- Improving the methods of reforestation and managing the current forests.
- Creation of the necessary foundation for future initiatives in the CDM framework (departmental normative forest definition; improving existing models of tree growth calculation, and expanding them up to assessment models of CO2 sequestration volume; compliance with the new National Forestry Development Plan; etc.).

A project proposal was approved by the National body on CDM and submitted to various carbon funds. One such fund (Ecosecurities, Ireland) expressed its interest in the project, but they were not ready to work with projects intended for afforestation/reforestation on areas of less than 2000 ha.

Project III. The project "Demonstration of conducting economic activity in arid conditions as an alternative for existing practices of economic activity and adaptation to changing climatic conditions on the example of farm "SBM Mukhammadamin" of Farish district of Djizzak region" was developed in 2008 under the GEF Small Grants Programme.

The proposed project plans to demonstrate an opportunity for sustainable land use under arid conditions in the foothill zone of Uzbekistan as an alternative to existing practices of economic activity and as adaptation to changing climatic conditions. The proposed approach enables simultaneous stabilization of the landscape and generation of sustainable income for the local population. In addition, the project assumes conducting on-site training on the example of practical lessons for farmers living in similar arid conditions. The project will be implemented using the example SBM Mukhammadamin farm, thus serving as an obvious case of how to re-orient people from animal husbandry to other systems of management, which restores vegetation, and holds back the processes of desertification and soil degradation.

Land in the foothill and upland zones in Uzbekistan are used mainly for dry sowing of grain crops and as pasture. The crops harvested in these territories mainly depend on annual precipitation, but harvests rarely exceed 8-10 t/ha and such harvests occur only once in 3 to 5 years. In other years, the harvest only compensates for expenses for seed, or there is no harvest at all. Pastures are degraded, low-productive lands due to overgrazing.

Climate change in Uzbekistan is progressing and may only worsen in the future: moisture availability may decline and consequently the probability of receiving reasonable crop harvests in non-irrigated lands (*boghara*) will decrease, as well as fodder biomass in pastures. In combination with increasing anthropogenic load, it will result in increasing the pressure on natural pastures, their further degradation and withdrawal of non-irrigated (dry) lands from economic turnover. In this context it becomes a necessity to find alternative methods of business, which could generate income for the people under conditions of current climatic change, and restore normal condition and functions of ecosystems of drying zones for further sustainable use.

This project proposes obtaining benefits for nature through creation of forest plantations possessing multifunctional reclamation features for the environment, and material benefits for local societies. The project aims to demonstrate that there are alternative methods of land use and income generation, unlike current unsustainable practices, even taking into account increasing aridity related to climate change. The project is in the stage of implementation.

Projects related to climate change in Uzbekistan without direct connection to forestry

- UNDP/UNOPS Regional Project "Capacity building for improvement National GHG inventories of countries (CIS/Europe region)" Project contact address: ghgii@sarkor.uz
- UNEP/Uzbekistan Project: "Implementation of Article 6 of UNFCCC on education, training and public awareness on climate change problem" Project contact address: ososkova@meteo.uz; info@climate.uz
- UNEP/Uzbekistan Project "Preparation of Second National Communication on Climate Change of the Republic of Uzbekistan under UNFCCC". Project contact address: ososkova@meteo.uz
- Uzbekistan/GEF/UNDP Project "National Capacity Self-Assessment on Global Ecological Conventions (NCSA)" Project contact address: raisa.taryanikova@ncsa.uzsci.net

- TACIS Project "Technical Assistance to Central Asian countries in implementation of their commitments on global climate change". Contact address of the project: zavlilya@mail.ru

One more project could be considered as having an indirect connection to an aspect of climate change, but possessing sequestration potential due to the great planned afforestation volumes. This is "*Achieving Ecosystem Stability on degraded land in Karakalpakstan and the Kyzylkum Desert*", a project launched in February 2008 by UNDP-GEF and the government of the Republic of Uzbekistan. Prerequisites for beginning the activity of the project became occurrence of degradation and desertification of the lands on the territory of Karakalpakstan and the Kyzylkum desert. This project complies with the provisions of the National action programme of Uzbekistan on fighting desertification, especially through promoting physical anti-desertification measures such as improving the system of land use and afforestation, which are included in the programme. The project implementation period is 5 years, starting in February 2008. More information is available at www.undp.uz.

The main objective of the project is to test, evaluate and promote innovative solutions to the problems of land degradation at a pilot scale in Kyzyl Rovat and Kazakhdarya communities (a total area of 500 ha) and replicate best practices in order to achieve ecosystem stability on degraded land in Karakalpakstan and the Kyzylkum Desert. Upon completion of the works, the issue of spreading the positive experience to other regions, which require implementation of measures for fighting desertification and degradation of lands (a total area of 100 000 ha), will be considered. The objectives of the project are to be achieved through the following project outcomes:

- Plant species, having both strong ecological and economic benefits for succession in desert and semi-desert ecosystems identified and sustainable land management methods tested.
- Mobile sands stabilized and degraded land rehabilitated in partnership with local communities.
- Institutional and policy framework for integrated land use planning and management, strengthened.
- Monitoring and evaluation, learning and adaptive management, implemented.

Review of status and work by national research institutions on research for assessment of climate change effects on the forest sector

There is only one research institution dealing with forestry in Uzbekistan. This is the Republican Scientific-production Centre of Decorative Gardening and Forestry (former Scientific - Research Institute of Forestry). Until recently, the Centre had no research related to climate change impact on forestry. However employees of RSPC DG&F, being national consultants of GEF-supported projects on climate change or through private initiatives, were involved in projects directly connected with forestry.

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Proposed areas for cooperation

FAO's assistance would be appreciated in gaining access to world experience in:

- assessment of forest ecosystem vulnerability. A special method, which includes its strengths and weaknesses, was applied in order to assess vulnerability of Uzbekistan's forest ecosystems. Getting acquainted with other methodologies of vulnerability assessment will allow adoption of best experience and improve the quality of assessment of forest ecosystem vulnerability;
- practical measures of forestry's adaptation to climate change in similar conditions, taking into account climate change in prospective plans for forestry development. Learning the world experience of planning and implementation of complex of practical measures on adaptation to climate change in general, and in countries with similar edapho-climatic conditions in particular, will allow application of such experience in Uzbekistan taking into account local specific characteristics;
- preparing a successful CDM project in the field of forestry. At present, there are no CDM projects on forestry in the country, though there is great potential for such implementation. Detailed knowledge on preparation of project documentation, practical implementation of projects, distribution of benefits from its implementation, rights and obligations of participating parties would help in promoting such projects in the country;
- small catchment management. The fast reduction in glaciated areas, growing economic activity in the basin of the Syrdarya and Amudarya rivers, including in north Afghanistan, complete regulation of run-off of these rivers aggravates the water deficit in the region. Only 20% of Syrdarya and Amudarya runoff originates in the territory of Uzbekistan. Therefore creation of highly possible river runoffs on the country's territory becomes an essential issue. One of the basic means of solving this problem is scientifically based afforestation of mountain slopes in upper basin areas;
- preparation of courses of lectures for educational institutions and organizations on professional development in the field of climate change impact on the forest sector and methods of adaptation. Learning from the experience of countries where such training already exists would support preparation of equivalent courses for Uzbekistan.

Opportunities in related areas

- Reorganization of forest regulation and forest statistics. At present, due to the unsatisfactory condition of the forest regulation service, forest statistics are not trustworthy. Any decisions or estimates for the forestry sector must be based on reliable and real statistical data. This, in particular, also refers to statistical data required for undertaking GHG inventory in forestry.
- Implementation of small demonstration CDM project in forestry.
- Training in modelling of forest stand productivity in changing climatic conditions (e.g. the APSIM model). This model might help in assessment of the impact of climate change on growth and productivity of stands. Unfortunately, the forestry sector of Uzbekistan has no working experience in such modelling.
- Implementation of demonstration pilot project on catchment management.
- Implementation of demonstration pilot projects on pasture rotation in mountain and desert zones. In the territory of the State forest fund, including forest covered areas, overgrazing can be observed. This factor can be considered as a basic one due its impact on forest ecosystem degradation. Therefore creation of sustainable models for utilization of the forest fund in mountain and desert zones as pastures remains a priority task.
- Distribution of knowledge of climate change impact in forestry among specialists and the general population.