**STATE AGENCY ON ENVIRONMENT PROTECTION AND FORESTRY UNDER THE GOVERNMENT OF THE KYRGYZ REPUBLIC**

# CLIMATE CHANGE ADAPTATION PROGRAMME AND ACTION PLAN FOR 2015-2017 FOR THE FOREST AND BIODIVERSITY SECTOR

**Bishkek, 2015**

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# FOREWORD

Dear reader,

Over the past decades, climate change and its effects on the environment, economy and society have become among the most pressing global challenges for the international community. According to the findings of the Intergovernmental Panel on Climate Change, the vulnerability of the Central Asian countries, including the Kyrgyz Republic, to climate change will increase, adding to the pressure on natural resources and the environment caused by rapid urbanization, industrialization and economic development. Aggravated by the arid climate and mountainous terrain of the country, climate change leads to weakening of food security, threatens the uninterrupted water supply, and adversely affects the health of the population. Many countries have already started preparing for the effects of climate change through the development of special strategic documents and the implementation of adaptation measures.

Expert analysis describes the situation in the Kyrgyz Republic as critical in terms of the transition to irreversible climate change. The calculations made by experts show that annual economic losses for the country in the worst-case scenarios of climate change may reach about 1,350 million US dollars. Climate change may eventually cancel all the efforts to improve the quality of life and sustainable development; in this regard, the development and implementation of the national climate policy, especially in terms of adaptation to climate change, is imperative.

In 2013, the State Agency on Environment Protection and Forestry under the Government of the Kyrgyz Republic, as the national authority responsible for the United Nations Framework Convention on Climate Change, developed a national strategic document, and the Government of the Kyrgyz Republic identified Priorities for Adaptation to Climate Change in the Kyrgyz Republic for 2013-2017 covering all sectors which are most vulnerable to the effects of climate change: agriculture, water resources, energy, emergencies, health, and forest and biodiversity.

The Climate Change Adaptation Programme and Action Plan for 2015-2017 for the Forest and Biodiversity Sector, which you will find in this document, were developed in line with Paragraph 7 of the Package of Measures to Ensure the Environmental Safety of the Kyrgyz Republic for 2011-2015, promising directions concerning the field of the environment, included in the National Security Concept of the Kyrgyz Republic, in the main objectives of the state policy on environmental protection and ecological safety as defined in the National Strategy for Sustainable Development of the Kyrgyz Republic for 2013-2017, and in the measures outlined in the Programme of Transition to Sustainable Development of the Kyrgyz Republic for 2013-2017, all in the framework of the implementation of Priority Directions for Adaptation to Climate Change in the Kyrgyz Republic until 2017.

This Programme is a sectoral policy document aimed at strengthening the resilience of the sector to the adverse effects of climate change on natural ecosystems and communities. The Programme was developed by specialists of the State Agency on Environment Protection and Forestry under the Government of the Kyrgyz Republic (SAEPF), as well as the expert community and stakeholders who participated in technical consultations.

I should note that the Programme took account of the sectoral strategic documents being implemented by State Agency, which define the process and direction of the Forestry and Biodiversity sector in the Kyrgyz Republic: Concept of Forestry Development of the Kyrgyz Republic until 2025, the National Forest Programme for 2005-2015, the Priorities for Biodiversity Conservation in the Kyrgyz Republic until 2024, and the Action Plan for 2014-2020.





Thus, this Programme complements the process and direction of the sector development with policy adaptation measures in response to the new challenges to sustainable development, brought by climate change.

The Programme was developed by SAEPF experts within the framework of the European Union FLERMONECA (Forest and biodiversity governance, including environmental monitoring) Project, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (German federal enterprise for international cooperation).

I am confident that the implementation of the Programme for the Forest and Biodiversity sector, supported by financial resources, will allow fulfilling the obligations of the Kyrgyz Republic in the framework of the UNFCCC.

However, we must also be aware that addressing the problem of climate change requires cross-sectoral cooperation and a sound exchange of experiences. For this, we need to use and develop existing effective institutional mechanisms for a flexible response to the challenges and opportunities arising in our country and at the global level, such as international climate negotiations. The key to the use and further development of such mechanisms is to strengthen the capacity at all levels in the Kyrgyz Republic. This process should be supported by a comprehensive, coordinated approach by our international development partners.

I would like to thank the European Union and the GIZ for the timely financial support to the development of this Programme, and I look forward to their continued participation and support in the fulfillment of the tasks facing us. I also express my gratitude to all national experts and professionals involved in the development of this document.

**Sabirdjan Atadjanov**

Director, State Agency on Environment Protection
and Forestry under the Government of the Kyrgyz Republic

# 1. INTRODUCTION

The purpose of this Programme is to enhance and preserve the biological diversity of the Kyrgyz Republic and to increase the area covered by forests under a changing climate.

## 1.1. Justification

The Climate Change Adaptation Programme and Action Plan for 2015-2017 for the Forest and Biodiversity sector were developed pursuant to Paragraph 7 of the Package of Measures to Ensure the Environmental Safety of the Kyrgyz Republic for 2011-2015"[1] promising directions concerning the field of the environment, reflected in the Concept of National Security of the Kyrgyz Republic[2], and the main objectives of the state policy on environmental protection and ecological safety as defined in the National Strategy for Sustainable Development of the Kyrgyz Republic for 2013-2017[3], and in the activities within the Programme of Transition to Sustainable Development of the Kyrgyz Republic for 2013-2017[4], a in the framework of the "Priority Directions for Adaptation to Climate Change in the Kyrgyz Republic until 2017" (hereinafter referred to as the Priorities) approved by the Decree of the Government of October 2, 2013 № 549.

When developing the National Priorities, the group of domestic experts assessed the vulnerability and the potential damage and prepared a list of activities and economic calculations as the basis for project proposals to donors. In general, the Priorities cover sectors which are most vulnerable to climate change: agriculture, emergencies, water resources, forests and biodiversity, and human health. It is planned that the Priorities will be implemented in stages - the creation of legal, production and processing conditions in each sector, the achievement and consolidation of the interim results, and the development of investment projects, negotiations and the search for international donors.

The basis of the development of the Climate Change Adaptation Programme and Action Plan for 2015-2017 for the Forest and Biodiversity Sector (hereinafter referred to as the Programme) is the decision made at the meeting of the Coordination Committee on Climate Change on February 15, 2013 (Minutes No. 19-8), imposing the obligation to develop the Climate Change Adaptation Programme by November 1, 2014, on the Ministry of Energy and Industry, the Ministry of Agriculture and Melioration, the Ministry of Emergency Situations of the Kyrgyz Republic, the State Agency on Environment Protection and Forestry under the Government (SAEPF), and the State Agency on Local Self-Governance and Inter-Ethnic Relations under the Government of the Kyrgyz Republic. In 2009-2010, the Ministry of Health with the support of the World Health Organization developed the Climate Change Programme for 2011-2015 for the Healthcare sector and is currently implementing it.

The Programme took account of the current sectoral strategic documents that define the process and direction of the development of the Forestry and Biodiversity sector in the Kyrgyz Republic: the Concept of Forestry Development of the Kyrgyz Republic until 2025[5], the National Forest Programme for 2005-2015[6], and the Priorities for Biodiversity Conservation in the Kyrgyz Republic until 2024 and the relevant Action Plan for 2014-2020[7].

1 Resolution of the Government of the Kyrgyz Republic of September 23, 2011 No.599.
2 Decree of the President of the Kyrgyz Republic of June 09, 2012 No.120.
3 Decree of the President of the Kyrgyz Republic of January 21, 2013, No.11.
4 Resolution of the Government of the Kyrgyz Republic of April 30, 2013 No.218.
5 Resolution of the Government of the Kyrgyz Republic of April 14, 2004 No.256.
6 Resolution of the Government of the Kyrgyz Republic of November 25, 2004 No.858.
7 Resolution of the Government of the Kyrgyz Republic of March 17, 2014 No.131.





The Programme complements the process and direction of sector development with adaptation measures in response to the new sustainable development challenges caused by climate change.

The Programme was developed by SAEPF specialists and a group of national experts involved in the development of the national "Priority Directions for Adaptation to Climate Change in the Kyrgyz Republic until 2017", with the partial financial support of GIZ (German federal enterprise for international cooperation) in the framework of a European Union project.

This Programme does not in every respect reflect the professional point of view of GIZ experts. However, GIZ clearly respects the process behind the elaboration of the program, which guarantees ownership among the national responsible and reflects the current status of the discussion about climate change adaptation in the sectors of forestry and biodiversity in Kyrgyzstan.

## 1.2. Adaptation Approach

Adaptation to climate change is a dynamic process extended over time. Similar to the development process, it should be focused on continuous improvement, and its goal is to reduce vulnerability to climate change over time. The adaptation process incorporates three main steps: 1) vulnerability assessment; 2) capacity building; and 3) implementation of adaptation measures. Some developing countries have already been active and efficient in implementing adaptation measures in the framework of cooperation for development.

The vulnerability assessment helps to identify possible impact, characteristics of the affected systems (for example, biophysical status of the region or the forest in a country), and priority areas for action. Capacity building helps enable the social system for taking actions and measures to adapt to climate change. And adaptation measures are aimed directly at improving the adaptive capacity of the (natural or social) system.

In recent years, the global development agenda has been increasingly featuring a new adaptive approach entitled "ecosystem-based adaptation" (EBA), which aims at strengthening the management of ecosystems that provide a wide range of social benefits - from the regulation of local climate conditions to the provision of safe drinking water. These benefits derived from natural ecosystems are collectively called ecosystem services. Being a source of livelihood, food, water and energy, ecosystem services are also fundamental tools for climate change adaptation.

EBA is "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people adapt to the adverse effects of climate change"[8]. This definition implies a variety of opportunities for sustainable management, conservation and restoration of ecosystems to provide services that enable people to adapt to climate change. At the same time, EBA is aimed at maintaining and strengthening the stability and reducing the vulnerability of ecosystems and people by supporting the ecosystem services. EBA can generate a number of social, economic and cultural benefits, including disaster risk reduction, sustainable livelihoods and food security, carbon sequestration and sustainable water resources management[9].

8 See Secretariat of the Convention on Biological Diversity. 2009. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. Montreal, Technical Series No. 41, 126 pages, The World Bank, 2009, Convenient Solutions to an Inconvenient Truth: Ecosystem-based Approaches to Climate Change; IUCN.
9 Secretariat of the CBD 2009. Op cit. and A. Colls, N. Ash and N. Ikkala. 2009. Ecosystem -based Adaptation: a natural response to climate change. Gland, Switzerland: IUCN. 16pp.

By protecting and enhancing the services of natural and managed ecosystems that provide livelihoods, vulnerable communities can maintain their natural "safety nets". Local foundations and traditions reflect access rights to the resources and the capacity of communities to support ecosystem products and services. These public rights and their recognition by decision-makers at national and local levels are extremely important for proper adaptation.

In fact, EBA is focused on the key linkages between climate change, biodiversity, ecosystem services and sustainable management of natural resources. In this respect, the concept of ecosystems as the basis for adaptation to the impacts of climate change developed in recent years is today the most important technology among adaptive tools.

It is important that decision-makers realize that "natural infrastructure" can effectively help to achieve the adaptation objectives. Analysis of the opportunities and risks related to the application of EBA compared to traditional infrastructure alternatives should utilize a systematic approach.

This is the key approach of the Programme to the adaptation of the sector, as it is determined by the management object itself, i.e., forests and biodiversity.

### 1.3. National Adaptation Priorities of the Forest and Biodiversity Sector

As noted in the Priorities for Adaptation to Climate Change in the Kyrgyz Republic until 2017, ***the overall objective of the adaptation projects and programs is to support specific measures aimed at mitigating the adverse effects of climate change on the population of the country and sectors of the economy.***

The main adaptation activities include the following:

- Improving the regulatory legal framework for climate change adaptation;
- Improving the institutional framework and ensuring cross-sectoral integration in adapting to climate change;
- Improving financial and economic mechanisms, including the mobilization of external funding for priority adaptation measures;
- Improving information tools to provide process monitoring of climate change and climate risk assessment;
- Involvement of civil society in the process of adaptation to climate change;
- Building scientific capacity to adapt to climate change;
- Organization and promotion of cross-border cooperation on adaptation to climate change.

The section Main Priorities for Adaptation to Climate Change, which covers the main vulnerable sectors and threats and risks to forest ecosystems and biodiversity, identified the following major tasks and policy measures in this sphere:

**Task 1. Conservation of Diversity of Flora and Fauna Species.**

Key measures:

- Continuous monitoring of flora and fauna populations under climate change;
- Increasing the efficiency of the protected areas system management;
- Conserving and restoring wetlands as habitats of natural biodiversity of species and an essential component of the natural environment, which plays a crucial role in adapting to climate change;
- Taking account of the recreational capacity of territories when planning tourism activities, etc.





**Task 2. Increasing forest area.**

Key measures:

- Promoting the principles of social afforestation and joint forest management;
- Implementing forest management and reforestation measures, etc.

Since these tasks were approved by the Government as priorities for the sector, they have become the industry adaptation priorities for the forest and biodiversity conservation system. The above measures are included in the Adaptation Action Plan of the Programme aimed at increasing the resilience of the sector to the impacts of climate change. Accordingly, this framework determines the existing barriers, programme goals, objectives and measures of the Adaptation Programme of the Forest and Biodiversity Sector.

## 2. SITUATION ANALYSIS

### 2.1. Biodiversity Conservation

Despite the fact that the Kyrgyz Republic is a small country in terms of area (0.13% of the world's land area), it is one of the 200 priority ecoregions of the planet. This is due to the high concentration of species diversity - about 2% of the world's flora species, and 3% of the world's fauna species.

Currently, about 3,676 fungi and other inferior species, 3,869 higher plants, 101 protozoa species, 14,600 insects and other arthropods, more than 1,500 thousand of other invertebrates, 75 fish species, 4 amphibian, 33 reptile, 390 bird, and 84 mammal species are registered in the Kyrgyz Republic.

Genetic resources of the Kyrgyz Republic (medicinal plants, wild relatives of cultivated plants, etc.) are extremely rich and varied, but insufficiently studied. The Kyrgyz Republic has 1,600 wild flora species used by people; the highest number of useful species is represented by such multi-species families as Poaceae (cereals) - 224 species, Fabaceae (legumes) - 222, species Asteraceae (sunflower) – 80 species, Brassicaceae (cabbage) – 73 species, Rosaceae (rose) – 50 species, Alliaceae (onion) - 49 species, etc. Besides this, more than 200 species of medicinal plants have been discovered in Kyrgyzstan.

However, the use of genetic plant resources in the country is haphazard, lacking mechanisms for cooperation of stakeholders at all stages - from obtaining access to genetic resources to the development of the final product; there is no system of reproductive material exchanges between countries in the region; no studies are conducted on genetic testing; and there are no seed nurseries, no plant breeding information systems, etc.

The Kyrgyz Republic has a unique agro-biodiversity, comprised of 93 local plant varieties and several domestic animal species. The Tien Shan mountain ecosystems have 132 ancestral species of relatives of cultivated plants. At the same time, no adequate studies, protection, reproduction measures are undertaken, and no rational use of agricultural biodiversity is in place, especially of traditional breeds and ancestral forms of relatives of cultivated plants.

Mountain ecosystems of the Kyrgyz Republic support the unique plant and animal communities and are the center of origin, a repository of biodiversity and a genetic fund of flora and fauna. The status of biodiversity in the Kyrgyz Republic is largely dependent on the sustainability of ecosystems. At the same time, each biological species is part of a specific natural ecosystem and

is unable to survive without this supporting ecosystem. Biodiversity conservation problems are in most cases connected with the negative anthropogenic impact on natural ecosystems.

The Kyrgyz Republic has 20 ecosystem classes[10], ranging from alpine tundra analogues (alpine deserts and the nival zone), medium-altitude forest analogues, to the medium- and low-altitude steppe and desert analogues, as well as aquatic ecosystems (marsh, lake, river). At the same time, all the natural ecosystems, to some extent, are subject to anthropogenic influence, which disrupts their normal functions and the ability to maintain the natural diversity of species. Table 10 provides an expert evaluation of disturbance levels..

*Table 1: Ecosystems in Kyrgyzstan and their disturbance levels*

| Ecosystem classes | Area, *km²* | Disturbance level | | |
|---|---|---|---|---|
| | | High | Medium | Low |
| Fir and spruce-fir forests | 3,017.00 | | X | X |
| Juniper forests and sparse forests | 2,548.32 | | X | |
| Small-leaved forests | 1,040.64 | X | X | |
| Walnut forests | 928.75 | | X | |
| Broad-leaved forests | 83.67 | | X | X |
| Pistachio and almond woodlands | 458.47 | X | | |
| Medium-altitude deciduous shrubs | 3,871.96 | | | X |
| Cryophytic (high-altitude) deserts | 1,953.44 | X | | |
| Cryophytic (alpine) meadows | 17,263.49 | | X | |
| Cryophytic (high-altitude) steppes | 22,474.57 | | X | |
| Subalpine meadows | 13,207.99 | | X | |
| Medium-altitude deserts | 1,384.34 | X | | |
| Medium-altitude steppes | 24,803.53 | | X | |
| Medium-altitude meadows | 8,898.19 | | X | |
| Medium-altitude savannoids | 2,361.89 | | X | |
| Medium-altitude open stands | 231.51 | X | | |
| Lowland and foothill steppes | 192.70 | X | | |
| Lowland deserts | 5,571.61 | X | | |
| Wetlands* | 8,086.02 | X | X | |
| Anthropogenic lands | 32,111.71 | | | |
| Other lands | | | | |
| Glaciers and snowfields | 5,773.74 | | | |
| Nival and subnival lands | 13,909.04 | | | |
| Rocks, slides and placers | 9,150.67 | | | |
| Total: | 178,313.38 | | | |

Source: Fourth National Report of the Kyrgyz Republic to the UN Convention on Biodiversity, 2008.
* Various comparable sites have varying integrity levels

[10] Fourth National Report of the Kyrgyz Republic to the UN Convention on Biodiversity, 2008.





**Institutional Organization of Biodiversity**

To preserve the biodiversity, the Kyrgyz Republic has created a network of protected areas represented by 90 sites with a total area of 1,200,872.0 ha (6,006% of the total area of the country)[11]. The map of protected areas is attached as Annex 1.

Depending on their functional role, protected areas managed by SAEPF are divided into the following categories:

State reserves with total area of 509,476 ha[12]

1. Sary-Chelek Biosphere Reserve
2. Padysh-Ata Reserve
3. Kulun-Ata Reserve
4. Issyk-Kul Reserve
5. Besh-Aral Reserve
6. Naryn Reserve
7. Karatal-Japyryk Reserve
8. Sarychat-Eertach Reserve
9. Dashman Reserve
10. Surma-Tash Reserve

State nature parks with total area 361,406.8 ha[13]

1. Ala-Archa State Nature Park
2. Besh-Tash State Nature Park
3. Chon-Kemin State Nature Park
4. Karakol State Nature Park
5. Kara-Shoro State Nature Park
6. Kyrgyz-Ata State National Nature Park
7. Saimaluu-Tash State Nature Park
8. Salkyntor State National Nature Park
9. Kara-Buura State Nature Park
10. Sarkent State Nature Park

Biotope and species protection sites. These are 68 wildlife sanctuaries (botanical, zoological, geological, forest and integrated), a botanical garden in Bishkek and a zoo in Karakol. Wildlife sanctuaries occupy 301,426.7 ha.[14]

At the national level, public policies on biodiversity conservation are implemented by the Department of Forest Ecosystems and Protected Areas of SAEPF. Another division of SAEPF – Department of Forest and Hunting Management – is responsible for the inventory of protected areas' resources and planning of biodiversity management. Department of Sustainable Management of Natural Resources of SAEPF, in turn, regulates the conservation and use of hunting resources.

Despite the conservation efforts, human activities in Kyrgyzstan have contributed to the loss of biodiversity - some species have disappeared altogether, while others are endangered. Thus, 3 species have become extinct, and 15 species are endangered in large and medium-sized mammal's fauna; 4 birds species died off, 26 species are under threat; losses in plants are smaller - only one

[11] National Report on the State of the Environment in the Kyrgyz Republic for 2006-2011 approved by the Government of the Kyrgyz Republic on August 7, 2012 No.553.
[12] Data of the Forest Registration Fund approved by the Order of SAEPF of December 23, 2014 No.01-9/389.
[13] Ibid.
[14] Data of the Department of Protected Areas of SAEPF.

species has disappeared, and 56 species are endangered. Based on this, the main focus of the sector's environmental activities is the conservation of rare, endemic and endangered plant and animal species.

Currently, the Red Book of the Kyrgyz Republic (2007) incorporates 57 bird species, 23 mammal species, 2 amphibian species, 8 reptile species, 7 fish species, 18 arthropod species, 83 higher plant species, and 4 fungi species – all threatened with extinction.

## 2.2. Forestry

The Kyrgyz Republic is a sparsely wooded area. Forests are mainly represented by mountain plantations, and about 90% of the forests are located at an altitude of 700 to 3,500 meters above sea level.

As of January 1, 2012, the State Forest Fund (SFF) had 2,619,675.5 ha of land, including protected areas (PAs) - 870,882.8 ha, and forested areas – 1,135,526.8 ha, or 5.68% of the total area of the country.[15]

About 65% of the population lives in rural areas, the well-being of many of them is dependent on forest resources.[16] Thus, the effectiveness of sustainable forest management has a significant effect on poverty levels and sustainable development of rural areas.

According to the Forest Code, all forests of the Republic are to be conserved as performing environmental, sanitation, health and other protective functions. In this connection, due to their great ecological value, unique forests of the Kyrgyz Republic play an important role in the global processes of environmental control and the prevention of the negative effects of climate change.

Forests in the Kyrgyz Republic are divided into the following protection categories:

- Water protection (restricted forest belts along rivers, lakes, reservoirs and other bodies of water);
- Protective (anti-erosion forests, protective forest belts along highways, forests in arid and sparsely wooded mountainous areas of importance for environmental protection);
- Sanitary and health (urban forests, forest parks, green zones around settlements, first and second belt forests in sanitary protection water source zones, forests in sanitary protection resorts);
- Forests in protected areas (nature reserves and preserved areas, national parks, wildlife sanctuaries, valuable forest areas, forests of scientific value, including genetic reserves and natural monuments, walnut forests), juniper forests, pistachio forests.

According to studies conducted in the framework of the Kyrgyz-Swiss Forestry Sector Support Programme KIRFOR in 2006-2008, there are eight forest areas in the Kyrgyz Republic[17] listed below in Table 2 (see the map in Appendix 2).

[15] Inventory data of the Forest Fund, 2013.

[16] National report on the state of the environment in the Kyrgyz Republic for 2006-2011 approved by the Decree of the Government of the Kyrgyz Republic of August 7, 2012 No.553

[17] Ennio Grisa, Bronislav Venglovsky, Zakir Sarymsakov, Gabriele Carraro. The typology of forests of the Kyrgyz Republic. SAEPF, Representation of the Swiss Foundation Intercooperation in Kyrgyzstan. Bishkek, 2008.





*Table 2: Forest areas in Kyrgyzstan*

| # | Forest areas | Climate | Forest type |
|---|---|---|---|
| I | **Turkestan-Alai** | Arid climate in the valleys, very cold in the highlands; the middle range is characterized by the spring and autumn precipitation. In general, the climate is stringent. | Mostly juniper and shrubs; some broad-leaved species along floodplains; conifers. |
| II | **Fergana-Alai** | Better climatic conditions than in forest area I; this explains the diversity of types. | Mostly shrubs and juniper forests; conifers and broad-leaved species. |
| III | **Fergana-Chatkal** | This area is characterized by best climatic conditions; pistachio trees and bushes grow even in valleys and foothills. In summer – dry climate with clearly marked altitudinal gradient. | All types are present in this area; most part of walnut trees; pistachios; broadleaved forests. |
| IV | **Chatkal** | Drier conditions than in area III; dry summers. | Mostly shrubs and juniper forests. |
| V | **Talas** | The central part of this area is very arid; improved climatic at higher altitudes. | Mostly shrubs and juniper forests; coniferous (spruce / fir); broad-leaved (floodplain) species. |
| VI | **Chui-Kemin** | Dry in the lowlands; precipitation gradient increases with altitude, dry summers | Mostly shrubs, juniper and conifer forests (eastern part); broad-leaved species along floodplains |
| VII | **Issyk-Kul** | Very dry to the west of the lake; partly arid climate; better climatic conditions in the eastern part; precipitation occurs primarily in summers; best conditions in the southeast | Dominated by conifers and shrubs; some juniper; broad-leaved along floodplains |
| VIII | **Inner Tien-Shan** | Because of highlands, this forest area has cold climate and very dry summers | Mostly conifers and shrubs, some juniper and broad-leaved (floodplains) |

Source: Forest typology in the Kyrgyz Republic, 2008.

This study also identified development trends of different forest types, depending on the environmental conditions of growth, human pressure and climatic conditions (see Appendix 9).

At the same time, recommendations have been provided to achieve sustainability of different types of forest ecosystems.

According to the National Forest Inventory (2008-2010), the total amount of tree and shrub vegetation timber in the forests of Kyrgyzstan was 55,000 thousand m³, including: 48,000 thousand m³ on forest lands, 1,000 thousand m³ on non-forest lands, and 6,000 thousand m³ on other lands.[18]

Data on the stock of woody vegetation on forest lands from the National Forest Inventory (2008-2010) are shown in Table 3.

*Table 3: The stock of woody vegetation on forest lands*

| | Total stock of forest lands | Natural forests | | | | Artificial forests | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total stock | Conifers | Leaved | Mixed | Total stock | Conifers | Leaved | Mixed |
| Stock of woody vegetation, ths. m³ | 48,000 | 44,800 | 37,600 | 4,800 | 2,400 | 3,200 | 800 | 1,300 | 100 |

Source: National Forest Inventory, 2008-2010.

One of the services provided by forest ecosystems is climate regulation. Forest ecosystems affect climate both locally and globally. Forests are the natural repositories of carbon and, therefore, play a crucial role in maintaining the balance of greenhouse gases in the atmosphere of the entire planet.

Forests are the most reliable system to prevent natural greenhouse effect in terms of carbon sequestration and the accumulation period. This important ecosystem service will be preserved through retaining the extent of forest and increasing the forested area.

The National Forest Inventory (2008-2010) provides data on the biomass and carbon stocks of all types of lands, which were inventoried. According to these data, the total biomass of all categories of land is around 46.2 million tonnes, and the total deposited carbon stock is 22.9 million tonnes. [19]

In general, experts' estimates show that the economic value of the environmental services of forest ecosystems in Kyrgyzstan today is around 9.32 billion US dollars each year. However, due to lack of evidence-based methodologies and calculation tools in our country, this figure is used as indicative and is not taken into account in development planning.

**Institutional Organization of State Forest Management in Kyrgyzstan**

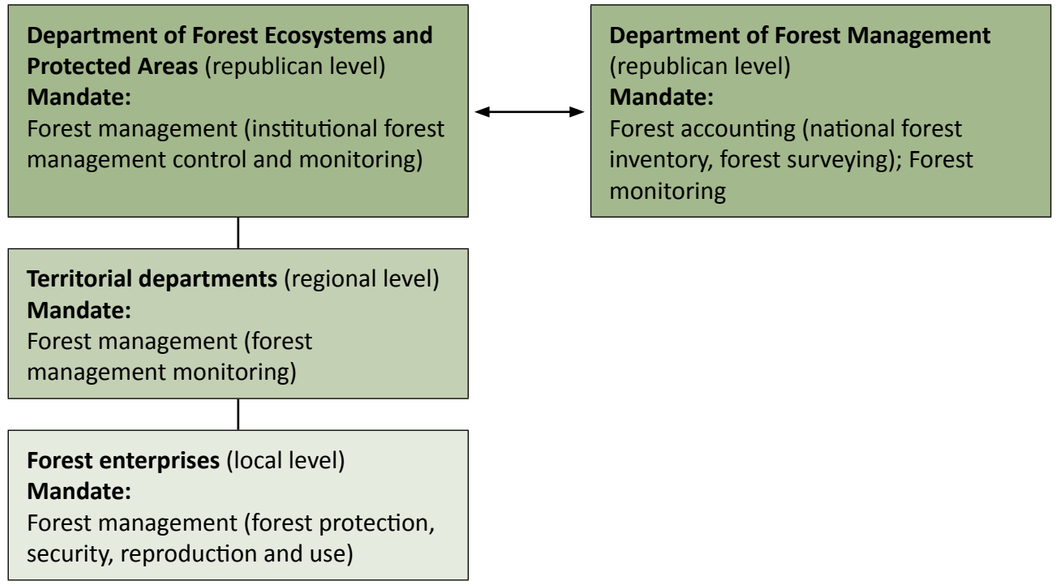
The forestry system has a vertical subordination and covers the republican level: Department of Forest Ecosystems, Department of Forest Management; the regional level: territorial departments of SAEPF; and local level: forest enterprises or forest districts on a separate balance sheet. The forest management scheme is shown in Figure 1.

[18] Integrated Assessment of Natural Resources of Kyrgyzstan, 2008-2010. SAEPF, FAO, Bishkek 2010
[19] Integrated Assessment of Natural Resources of Kyrgyzstan, 2008-2010. SAEPF, FAO, Bishkek 2010.





*Figure 1: Forest management scheme*




The State Forest Fund supervises 50 forest enterprises. The information about their number and distribution across the territory is shown in Table 4.

*Table 4: Number and distribution of forest enterprises and forest districts on separate balance sheet by territory*

| № | Oblast | Forest enterprises and forest districts on a separate balance sheet |
|---|---|---|
| 1 | Batken | 4 |
| 2 | Jalal-Abad | 19 |
| 3 | Issyk-Kul | 7 |
| 4 | Naryn | 5 |
| 5 | Osh | 8 |
| 6 | Talas | 3 |
| 7 | Chui | 4 |
| **Total in the country** | | 50 |

**2.2.1. Impact of climate change and ecosystem vulnerability**

Analysis of classification of climate regions (Appendix 3) and forest areas (Appendix 2) shows an almost complete match between the climate and forest distribution. For example, forest ecosystems in forest zones I-IV coincide with the borders of the Southwestern climatic area, forests in areas V and VI - with the boundaries of the Northwestern climatic region, forests in zones VII - with the boundaries of the Northeastern region, and forests in zone VIII – with the borders of the Inner Tien-Shan climatic region.

Kyrgyz forests mainly grow under the boreal climate with adequate moisture. However, it should be noted that because of biological features, pistachios and some bushes can grow in more arid conditions, and juniper elfins can grow at high altitudes at low temperatures (tundra climate). Spruce forests grow in relatively cold climates, sometimes occupying areas with a fairly cold tundra climate, and walnut forests - in a moderately warm climate with plenty of moisture.

Climate change will impact all forest landscapes and biodiversity in Kyrgyzstan. Projected changes in climate variables will seriously affect the ability of forests and biodiversity to adapt and maintain. It is expected that temperature rise, changes in water availability and the projected increase in carbon dioxide will entail changes in forests and biodiversity at two levels: the structural level (physiology and metabolism of trees and wildlife) and at the level of ecosystem functioning.

A further increase in temperature will lead to the displacement of vertical zones of plant communities. The desert and semi-desert plant species will move to mountain steppes and meadow steppes, plant species turnover and loss of biodiversity and forest cover will intensify. Together with this, the vegetation season will likely last longer.

Thus, according to forecasts of scientists, the accumulated positive temperatures could increase by 255 °C by 2100, and the length of the growing period – by 37 days. At the same time, the lower boundary of forest zones at 600-1,400 m will shift upward by 150-200 m, and at 1,600-2,600 m will remain the same.

In the Northeastern region, the boundary of thermal zones will be shift upwards by 200 m at an altitude of 1600 m and will not change at altitudes of 1,600-2,600 m. The growing season will increase by 23-63 days.

In the Inner Tien-Shan, zone borders will move upwards by 200 at an altitude of 1,600 m and will remain the same at altitudes of 1,800-2,400. The growing season will increase by 18-56 days.

In the Southwestern climatic region, zone borders located at altitudes of 1,600-2,400 m will shift upward by 150-200 m, and at altitudes of 2,400-2,800 m they will not change. The growing season will increase by 18-38 days.[20]

Forest movement to higher altitudes can increase the vulnerability of many plant species because of genetic and environmental influences. Many tree species will not be able to adapt and will disappear as a result of climate change. FAO studies show that the rate of climate change in the next century will exceed the rate, which would allow forest ecosystems to adapt to the new, warmer climate. This will lead to the disappearance of a number of plants and forests, and respectively, to the loss of the ecological services they provide. To preserve the economic benefits of ecosystem services, silvicultural work and other forest management activities must be intensified.

Expert estimates suggest that given a 1.5°C rise in temperature and a 10% reduction in precipitation, maintaining the annual economic benefits of ecosystem services will require holding annual forest management activities worth 4,550.4 million soms (94.8 million US dollars). At the same time, in the worst scenario, that is an up to 6 °C increase in temperature, and the economic damage from the loss of forest resources will amount to 10,272 million soms (214 million US dollars).[21]

[20] O.V. Kolov. Climate change and its impact on the forest ecosystems of the Kyrgyz Republic, KRSU Bulletin No.6, 2003.
[21] Priorities for Adaptation to Climate Change in the Kyrgyz Republic until 2017





According to the Forest Fund Inventory (2013), forest area in the Kyrgyz Republic occupies 1,135,526.8 ha, or 5.6% of the total area of the country. It is represented by four species: walnut, pine and spruce, juniper, and floodplain forests. The main tree species are juniper (Juneperus), spruce (Picea Shrenkiana), walnut (Juglans Regia), etc.

When designing the National Priorities for Adaptation to Climate Change in 2011, V.A. Kuzmichenok developed models to determine the optimal conditions and assess the possible evolution of the climatic optimum for the main tree species under given climate change scenarios.

Climate models show the displacement of climatic optimum for forest forming tree species on the map (see Appendices 4-8).

The results of this modelling confirm the opinion of FAO experts that climate change leading to an increase in the annual average of air temperature and precipitation increases the likelihood of redistribution of tree growth zones.

Tables 5, 6, 7 and 8 show data on possible changes in the growth areas of dominant juniper, spruce and walnut species.

*Table 5: Change in juniper, spruce and walnut growth areas*

| Temperature, (°C) | Species | Area, % | Including: | |
|---|---|---|---|---|
| | | | Areas occupied by species unlikely to remain, % | Areas occupied by species likely to remain, % |
| 1.5 | Juniper | 100 | 43 | 57 |
| | Spruce | 100 | 38 | 62 |
| | Walnut | 100 | 50 | 50 |
| 4 | Juniper | 100 | 100 | 0 |
| | Spruce | 100 | 100 | 0 |
| | Walnut | 100 | 100 | 0 |
| 6.4 | Juniper | 100 | 100 | 0 |
| | Spruce | 100 | 100 | 0 |
| | Walnut | 100 | 100 | 0 |

Source: Technical Report by V.Surappaeva, UNDP National Consultant, 2012.

Table 5 shows that growth areas of juniper, spruce and walnut are redistributed with increasing temperature.

The areas proportional to growth areas were estimated based on the space occupied by forestforming species planted in the 1970s using the materials of the State Forest Fund Inventory.

*Table 6: Change in growth area of juniper*

| Temperature, (°C) | Precipitation, m* | Area of growth, ths km²** | Total area, ths ha*** | Including: | |
|---|---|---|---|---|---|
| | | | | Areas occupied by species unlikely to remain, ths ha | Areas occupied by species likely to remain, ths ha |
| 1.5 | 0.9 | 13.5 | 171.6 | 73.8 | 97.8 |
| | 1 | 12.7 | 161.8 | 69.6 | 92.2 |
| | 1.1 | 10.8 | 136.8 | 58.8 | 78.0 |
| 4 | 0.9 | 15.4 | 195.9 | 195.9 | 0.0 |
| | 1 | 13.1 | 166.2 | 166.2 | 0.0 |
| | 1.1 | 11.3 | 143.3 | 143.3 | 0.0 |
| 6.4 | 0.9 | 14.2 | 180.2 | 180.2 | 0.0 |
| | 1 | 11.6 | 148.0 | 148.0 | 0.0 |
| | 1.1 | 9.7 | 124.1 | 124.1 | 0.0 |

Source: Technical Report by V. Surappaeva, UNDP National Consultant, 2012.
* Parameters of the Explanatory Note by V.A. Kuzmichenok, UNDP National Consultant, 2011.
** Area of growth - climatic optimum projected area in km². Explanatory Note by V.A. Kuzmichenok, UNDP National Consultant, 2011.
*** Total area – area occupied in thousand ha, estimates of the total area proportional to the area of growth.

*Table 7: Change in growth area of spruce*

| Temperature, (°C) | Precipitation, m* | Area of growth, ths km²** | Total area, ths ha*** | Including: | |
|---|---|---|---|---|---|
| | | | | Areas occupied by species unlikely to remain, ths ha | Areas occupied by species likely to remain, ths ha |
| 1.5 | 0.9 | 5.2 | 118.4 | 44.9 | 73.5 |
| | 1 | 4.3 | 96.3 | 36.6 | 59.7 |
| | 1.1 | 3.8 | 86.3 | 32.8 | 53.5 |
| 4 | 0.9 | 5.3 | 120.5 | 120.5 | 0 |
| | 1 | 4.6 | 104.3 | 104.3 | 0 |
| | 1.1 | 4.2 | 96.2 | 96.2 | 0 |
| 6.4 | 0.9 | 4.8 | 108.2 | 108.2 | 0 |
| | 1 | 3.9 | 89.8 | 89.8 | 0 |
| | 1.1 | 3.2 | 71.7 | 71.7 | 0 |

Source: Technical Report by V. Surappaeva, UNDP National Consultant, 2012.
* Parameters of the Explanatory Note by V.A. Kuzmichenok, UNDP National Consultant, 2011.
** Area of growth - climatic optimum projected area in km². Explanatory Note by V.A. Kuzmichenok, UNDP National Consultant, 2011.
*** Total area – area occupied in thousand ha, estimates of the total area proportional to the area of growth.





*Table 8: Change in growth area of walnut*

| Temperature, (°C) | Precipitation, m* | Area of growth, ths km²** | Total area, ths ha*** | Including: | |
|---|---|---|---|---|---|
| | | | | Areas occupied by species unlikely to remain, ths ha | Areas occupied by species likely to remain, ths ha |
| 1.5 | 0.9 | 0.7 | 22.7 | 11.3 | 11.4 |
| | 1 | 0.8 | 25.2 | 12.6 | 12.6 |
| | 1.1 | 0.9 | 20.6 | 10.2 | 10.4 |
| 4 | 0.9 | 0.9 | 26.4 | 26.4 | 0 |
| | 1 | 0.9 | 28.0 | 28.0 | 0 |
| | 1.1 | 0.8 | 25.0 | 25.0 | 0 |
| 6.4 | 0.9 | 1.1 | 34.0 | 34.0 | 0 |
| | 1 | 1.3 | 39.2 | 39.2 | 0 |
| | 1.1 | 1.9 | 59.7 | 59.7 | 0 |

Source: Technical Report by V. Surappaeva, UNDP National Consultant, 2012.
* Parameters of the Explanatory Note by V.A. Kuzmichenok, UNDP National Consultant, 2011.
** Area of growth - climatic optimum projected area in km². Explanatory Note by V.A. Kuzmichenok, UNDP National Consultant, 2011.
*** Total area – area occupied in thousand ha, estimates of the total area proportional to the area of growth.

Thus, the above presented tables show that changes in growth areas of juniper, spruce and walnut may occur under all climate change models. A 1.5°C change in temperature will lead to a partial change, and a 4°C change will result in a complete displacement, meaning the loss of ecosystem service environmental functions.

Further mathematical modeling taking account of the geographical coordinates of the forest stands' boundaries for each species, and their conversion into existing and perspective areas with due regard to growth conditions in the new territories, allows identifying specific changes in the forest area for the given parameters of climate change. This information will serve as an information basis for planning of future silvicultural activities in the climate change context.

One of the negative impacts of climate change is increased fire danger in Kyrgyz forests evidenced by the practice of recent years. In 2011 fires destroyed 13 ha of forest area, in 2012 - 37 ha, in 2013 - 22.9 ha, and in 2014 - 54 ha[22]. Fires have contributed to increased damage to forests, loss of forest plantations, and, consequently, reduced volume of the ecosystem services provided.

Another negative climatic impact making forests vulnerable is the increased spread of pests and diseases. According to entomologists, annual damage from loss of walnut forests is already very high. Their studies suggest that climate change will cause more frequent outbreaks of pests and diseases in forest ecosystems.

For example, pests annually damage over 20 ths ha of fruit and nut forests. Among the most dangerous pests, the occurrence of which is linked to climate change, are the gypsy moth (*Lymantria dispar L.*) and globose scale (*Sphaerolecanititn prunastri Fonsc.*).

[22] Data of the Department of Forest Ecosystems and Protected Areas.

The increase in the number of pest foci occurs in accordance with the observed patterns of outbreak permanence. Outbreaks in the upper zone of walnut forests are due to the northwest direction of air flow and the gradual transition from the lower to the upper sub-zone owing to a temperature change, that is in warm and dry years, which repeat every 3-4 years in this region. These data characterize the dynamics of pest foci and outbreaks under the the Fergana Range conditions.

Another group of measures aimed at adaptation of forests to climate change includes strengthening the practical fire prevention, monitoring forest pathology and controlling the spread of pests in forest ecosystems.

### 2.2.2. Risks for Sustainable Forest Management and Biodiversity Conservation; Balance of Interests

Sectoral consultations and analysis of questionnaire data, distributed among the expert community in the development of this Programme, the vulnerability of ecosystems to climate change described above, given the current forest management practices, help determine the following interrelated and interdependent risks for sustainable forest management:

Environmental:
- Changes in species growth areas at the ecosystem level;
- Loss of biodiversity due to adverse climatic conditions;
- Qualitative (species) change in forest ecosystems;
- Accessibility and quality of services provided by ecosystems.

Economical:
- Changes in land use practices caused by the increasing demand for agricultural land due to population growth in forest areas;
- Reduced production of forest products;
- Changes in the quality of wood and non-wood forest products (NWFPs);
- Indirect impact on the value chain of wood due to changes in the quantity and quality of wood;
- Impact on the ability of some species intended for plantation cultivation to maintain the rate of growth and wood quality in the next 30-50 years;
- Impact on other sectors, especially agriculture, energy and water resources.

Social:
- Impact on the livelihoods of people who depend on forest resources;
- Increased danger of natural disasters due to the weakening of forest functions (for example, landslides, mudflows, etc.).

In these circumstances, balancing of all stakeholders' interests becomes necessary for the preservation of ecosystem services in a changing climate. At the same time, the stability of forest ecosystems and biodiversity in the context of negative impacts of climate change may be achieved through compromise at the following three levels: (1) balancing the interests in the conservation of ecosystems and the sustainability of natural resources, and (2) balancing the interests in ecosystem management, and (3) balancing interests between natural resource users. In all cases, balancing of interests will be based on the legal framework and consensus. However, the strengthening of cooperation and partnership between all interest groups in decision-making on the conservation and sustainable use of ecosystem goods and services under climate stress is particularly relevant.





This implies another adaptation measure that will contribute to the search for compromises and reduction of the aforesaid risks. Such a measure is the development and implementation of mechanisms of inter-agency cooperation and joint management of natural resources and ecosystems on the basis of partnership and equitable distribution of rights, responsibilities and benefits between all participants in the adaptation partnership.

## 2.3. Climate Change and Barriers to Sectoral Development

### 2.3.1. Actual Problems of Biodiversity and Forest Conservation

The analysis revealed the absence of an effective partnership between the forest and protected areas management bodies and local state administrations, local authorities, and local communities, as well as the lack of clear delineation of authority and responsibility at the local level.

Many government agencies at the national level are one way or another involved in environmental protection and biodiversity conservation, but they act at their own discretion and often on paper only. The sectoral policy documents of ministries, departments, local state administrations and local self-governance authorities of the Kyrgyz Republic do not cover issues of biodiversity conservation and sustainable forest management.

The exchange of information between public authorities and stakeholders takes place in the form of official inquiries and, if necessary, through the establishment of inter-agency working groups. At the same time, environmental impact assessment of economic projects does not incorporate an economic valuation of ecosystem services, as no appropriate techniques are in place.

Since the opinion of the community is taken into account "along the way", this often leads to conflicts between businesses and local communities, where environmental issues are often the main argument of local communities to express their discontent, which is in fact caused by economic and social interests. Therefore, it is important to integrate biodiversity conservation and sustainable forest management issues into the broader productive landscapes and adjacent areas.

Economic activity has the greatest influence on biodiversity. The following man-made factors pose the greatest threat[23]:
- Illegal forest felling;
- Barriers to natural forest restoration;
- Degradation of natural pastures;
- Destruction of natural ecosystem sites;
- Reduction of the forest area;
- Over-harvesting of medicinal plants;
- Overfishing;
- Poaching.

Mining activities carried out normally in mountainous ecosystems, which are especially fragile and vulnerable, is another factor contributing to the disturbance, destruction and pollution of natural ecosystems, fauna habitat, and flora growth areas.

In recent years, climate change has been a global factor of external impacts on biodiversity, ecosystems and their services.

[23] Priorities for Biodiversity Conservation in the Kyrgyz Republic until 2024 and the Action Plan for 2014-2020.

Studies show that the most relevant sectoral **problems threatening forestries, nature reserves and natural parks** of the Kyrgyz Republic are the following:

- Location of the settlements in the territory or within the boundaries of protected areas, SFF, and their economic activity, which leads to conflict situations;
- Poor material and technical base;
- Outdated methodology and approaches to nature conservation, poor scientific monitoring and biodiversity assessment;
- Outdated methodology and approaches to forest management, monitoring and forest management economic assessment;
- Lack of effective mechanisms for the development of eco-tourism;
- Weak human resource potential in the sector, the shortage of climate change experts;
- Poor information and database management within the sector.

The existing legal framework does not cover all the forests in the country; implementation mechanisms of control, regulatory, permitting and economic functions are not clearly defined; relations caused by the use of the forests fund lands, for example, for subsoil use and for recreational purposes, are not regulated.

The sector's institutional organization is inherited from the Soviet period and does not fully meet the modern requirements of sustainable forest management. Therefore, the foundation of forestry reform should be a gradual transformation of the existing forestry institutions which define the framework of the sector's development.

Institutional reform should include the decentralization of functions, namely the division of control and economic functions using public-private partnership mechanisms and by organizing public committees for joint forest management at the level of forestry enterprises.

Currently, there is virtually no forestry economy, and the development of modern forestry proceeds without proper economic justification. In addition, no economic assessment of forest resources and state natural capital has been conducted.

No major changes have been introduced into the forestry funding system over the past 20 years. It's basic principle still remains the government funding of only payroll and insurance contributions to the Social Fund, while major forest silvicultural and management activities are implemented using special funds earned by forest enterprises as a result of economic activity. As a result, forest management is chronically underfunded. Some funds are also coming under the technical assistance of international organizations and the National Fund for Nature Conservation and Forestry Development.

Forests monitoring shows that natural regeneration is low, and the increase in forest area due to the reproduction of forests (reforestation, afforestation) is too slow. Measures for the protection of forests from disturbances are inadequate.

Currently, the technical capacity of institutions in charge of forest management is underdeveloped, the material and technical base is obsolete, knowledge about modern approaches for sustainable forest management is insufficient, forest management methods and technologies (protection, afforestation, reforestation) are outdated.

### 2.3.2. Information Gaps and Uncertainty Management

The impacts of climate change on biodiversity and forest ecosystems in our country are not adequately studied, so there are information gaps on certain aspects necessary for the proper planning of adaptation measures, which causes uncertainties.





The following information gaps related to sectoral climate change adaptation have been identified:

- Lack of methods and models for forecasting and scenario analysis of the impact of climate change on biodiversity and forest resources;
- Lack of methods for assessing the vulnerability of biodiversity and forest ecosystems to climate change and for studying their adaptive capacity;
- Lack of a methodology for economic valuation of ecosystem services;
- Lack of economic evaluation data on productivity of forest ecosystems and the current forest management;
- Underdeveloped ground and remote methods of forest inventory and monitoring, hampering the improvement of information and an analytical database of protected areas and forestry enterprise under the climate change;
- Lack of scientific advice on methodology of planning of climate-resilient forest and ecosystem management;
- Lack of scientific basis of forestry and silvicultural adaptation measures to reduce the negative impacts of climate change and enhance the resilience of ecosystems.

Collection of data to fill information gaps will be an important adaptation measure along with the strengthening of cooperation with country research institutes and the expert community.

### 2.3.3. Sector Adaptation Measures

Analysis of the situation and problems in the Forest and Biodiversity sector, and its vulnerability to the multifactor impact of climate change, has identified the following general adaptation barriers to sustainable development of the sector in the climate change context:

1. No due regard to climate aspects in the current forest and protected areas management practices;
2. Continuing loss of biodiversity and degradation of forest ecosystems, which increase the vulnerability of the sector as a result of anthropogenic impacts and negative impacts of climate change.
3. Lack of awareness and knowledge on climate change in the sector.

The Programme will seek to overcome these barriers to increasing the resilience of the sector to climate change. Adaptation measures will reflect the real needs and capacity of the sector and be focused on attracting foreign expertise and climatic resources.

The first barrier is due to the lack of appropriate parameters and procedures for the collection and analysis of relevant information in the sector on the impact of climate change on forests and biodiversity for future management of protected areas and forests adapted to the impacts of climate change. Management planning in the sector is based on the materials of the national forest inventory and forest management, which should take into account the necessary climate parameters for planning of climate-resilient management.

Current forest management materials do not contain climate information to support adaptation measures. Therefore, it is important to develop a system of climatic parameters in cooperation with stakeholders, which must be integrated into forest and biodiversity management plans.

The use of modern information and communication technologies and geographic information systems in the sector has not yet been sufficient, especially at the local level. The exchange of information does not yet meet the requirements of operational problem solving for effective sector management.

It is therefore necessary to develop a scientific basis, improve the legal framework, and develop and implement climate monitoring at the level of protected areas and forest enterprises.

Current forest and protected areas management plans do not support a purposeful enhancement of the ecosystem and the resilience of nature to the negative impacts of climate change. Therefore, adaptation measures, as envisaged by the Programme, will be integrated into forests and protected areas management plans and practices through strengthening of the relevant capacity.

At the same time, there is a need to integrate biodiversity conservation issues into development strategies for key sectors of the economy: mining, energy, transport; and in the local community development plans. Participation of sector representatives in the planning of socio-economic development of relevant territories for the promotion of conservation and reproduction of ecosystems is an important adaptation measure for joint regulation of pressure on natural resources in the context of climate change.

The second barrier to adaptation associated with the loss of biodiversity and degradation of forests, is the general trend and the result of the growing economic pressure, and low efficiency of forest enterprises and protected areas management.

Trends in regional economic development, population growth, increased energy consumption, the development of transport infrastructure and mining, have led to the loss of biodiversity, change in some species' habitats and the degradation of forest ecosystems. Expanding the network of protected areas is an effective adaptation measure for conservation of natural ecosystems. Development of the programme for the development of the network of protected areas can ensure the representativeness of the protected species and ecosystems. It is also necessary to ensure the wide participation of the public and due regards to interests of all stakeholders.

International evaluation of the efficiency of biodiversity conservation will be integrated into the national protected areas system.

In the context of climate change, special attention should be paid to the system of state wildlife sanctuaries, many of which are supervised by local communities. Conducting an inventory of this system and increasing its status may contribute to the conservation of species in productive landscapes.

This requires the involvement of local communities in the management of protected areas. The participation of local authorities in inventory, planning and management, and making decisions based on democratic principles such as openness, transparency and accountability, will not only ensure the preservation of biodiversity, but also improve the efficiency of protected areas management plans, raise community awareness, and reduce the likelihood of conflicts.

The main problems in the conservation and sustainable management of forest resources coincide with those of protected areas. At the same time, there are many more problems and solution options in the system of forest enterprises. Sustainable forest management is an integrated system of activities aimed at conservation, protection, reproduction and efficient use of forests.

Conservation of forests and increasing their area can be achieved through the practice of the annual creation of forest cultures and the promotion of natural regeneration. The creation of artificial plantations is one of the forest adaptation priorities, which is already supported by the





existing infrastructure: seed plots, warehouses, seed laboratories, nurseries, and the necessary silvicultural fund.

Silvicultural activities under climate change require a review and adaptation of technologies, approaches and methods of planting forest species on rainfed land and the transfer of focus on the creation of plantations with artificial irrigation from small natural or artificial ponds and streams.

Expanding the range of trees and shrubs, improvement of irrigation systems in nurseries, and implementation of advanced drip irrigation systems, will enhance the resilience of established plantations.

The growing number and expansion of forest foci and diseases already observed in many forests requires improved protection measures. Extended dry periods will significantly increase fire danger in the forests, which require strict compliance with fire safety rules, fire prevention measures, and the organization of volunteer fire brigades in forest enterprises.

Creating socially oriented plantations for timber and fruit on lands managed by local communities, and supporting local afforestation initiatives on private land, will reduce the pressure on natural forest ecosystems.

Cooperation with local communities in most densely populated forest areas is based on the rent relationships and the community management, which in some cases does not exist in practice. Relations between forest enterprises and local communities are still regulated by bilateral agreements with individual forest users, who are quite difficult to manage, both in terms of overall and forest management. Therefore, further improvement of mechanisms for joint forest management is an effective adaptation tool, which will enhance the efficiency of management of forest ecosystems.

The low level of use of modern information technologies in forestry exacerbates problems associated with forest management and complicates the exchange of information between the national and local levels. Therefore, the widespread introduction of modern information and communication technologies in forestry is an important adaptation measure improving the management of the forestry sector.

The third barrier is associated with underdeveloped capacity and low level of awareness of stakeholders on climate change and adaptation of the sector to its negative consequences.

The process of developing this Programme has shown that there are many information gaps that need to be addressed. It is therefore necessary to convert climate information into communication products and distribute them among stakeholders. Implementation of this Programme should be accompanied by an appropriate SAEPF communication strategy on climate change.

At the same time, strengthening the capacity of the State Agency employees, both at the national and local levels, on issues of climate change and adaptation to its adverse effects, is an important adaptation challenge facing the State Agency.

Measures to raise awareness and knowledge of sector partners and stakeholders on the impact of climate change and the vulnerability of natural ecosystems and their services, are also inadequate and are characterized by information gaps and a lack of a communication strategy on climate issues. Therefore, the work in this direction at the national and local levels will also be an important adaptation measure to increase the resilience of the sector to climate change.

## 3. PROGRAMME GOALS, TASKS AND ACTIVITIES

The above review of barriers to adaptation defines the following goals of the adaptation Programme:

*Goal 1. To incorporate the climate change impacts into protected areas and forest enterprises management plans and practices and involve forest communities into activities to strengthen the resilience of ecosystems and communities.*

*Goal 2. To promote the conservation and restoration of damaged natural ecosystems to strengthen their resilience to climate change.*

*Goal 3. To increase the capacity and awareness of stakeholders of the Forest and Biodiversity sector on adaptation to climate change.*

To achieve the first goal, the following tasks will be will be performed: (1) to reduce information gaps on the impact of climate change on forests and biodiversity through strengthened monitoring and inter-agency cooperation; (2) to incorporate climatic aspects in the planning and management of protected areas and forest enterprises field units; and (3) to integrate climate-resilient biodiversity and forest ecosystems in the sustainable development of priority sectors of the economy and the socio-economic development of local communities.

The second goal of the Programme, to promote the conservation of biodiversity and ecosystem services and the restoration of damaged natural ecosystems and strengthen their resilience to climate change, will be achieved through the following two tasks: (1) to increase the ecosystem area covered by the protected areas system and promote a more efficient protected areas management (2) to expand the forest area and improve the efficiency of forest enterprise management.

The third goal, to increase the capacity and the awareness of stakeholders of the Forest and Biodiversity sector on adaptation to climate change, will be achieved through the following tasks: (1) to build the capacity among SAEPF staff and its structural divisions on climate change and (2) to raise awareness of stakeholders of the sector adaptation to climate change.

To implement these tasks and achieve the programme goals, an Adaptation Action Plan was developed in the course of sectoral consultations with all stakeholders.





## 4. ADAPTATION ACTION PLAN OF THE FOREST AND BIODIVERSITY SECTOR

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| **Goal 1: To incorporate the climate change impacts into protected areas and forest enterprises management plans and practices and involve forest communities into activities to strengthen the resilience of ecosystems and communities** | **Task 1.1: To reduce information gaps on the impact of climate change on forests and biodiversity through strengthened monitoring at both national and local levels;** | 1.1.1. To conduct studies and develop models of forecasting and scenario analysis of the impact of climate change on biodiversity and forest resources | 2016-2017 | SAEPF, DFM, DFEPA, NAS, NGOs, FAO, UNDP (subject to agreement) | SAEPF, NAS funding limits for the year, international grants | Establishment of joint interdisciplinary groups | The methodology and models of forecasting and scenario analysis of the impact of climate change |
| | | 1.1.2. To develop methods for assessing the vulnerability of biodiversity and forest ecosystems to climate change and to study their adaptive capabilities | 2016-2017 | SAEPF, DFM, DFEPA, NAS, NGOs, FAO, UNDP (subject to agreement) | SAEPF, NAS funding limits for the year, international grants | Establishment of joint interdisciplinary groups | Methods for assessing the vulnerability of biodiversity and forest ecosystems |
| | | 1.1.3. To study international experience and select possible indicators for the national system of monitoring the impact of climate change on forests and biodiversity | 2015-2016 | SAEPF, DFM, DFEPA, NAS, FAO, UNDP (subject to agreement) | SAEPF, NAS funding limits for the year, international grants | Establishment of joint interdisciplinary groups | The list of nationally appropriate indicators for monitoring the impact of climate change |
| | | 1.1.4. To develop a national system for monitoring the effects of climate change on forests and biodiversity. | 2016-2017 | DFM, DFEPA, NAS, FAO, UNDP (subject to agreement) | SAEPF, NAS funding limits for the year, international grants | Establishment of joint interdisciplinary groups | Instructions on how to conduct monitoring |

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 1.1.5. To introduce systems for monitoring the impact of climate change on forests and biodiversity at the level of forest enterprises, reserves, and national parks | 2017 | DFM, DFEPA, forest enterprises, reserves and national parks, NAS, NGOs, FAO, WB (subject to agreement) | SAEPF, NAS, forest enterprises, protected areas funding limits for the year, international grants | Establishment of working groups and involvement of experts | Software to create databases at the level of forest enterprises and protected areas and process data at the national level |
| | | 1.1.6. To strengthen inter-agency cooperation and information exchange on climate change via the SAEPF coordinating and advisory council | 2015-2017 | SAEPF, ESPO, DFM, DFEPA | SAEPF funding limits for the period, international grants | Preparation of presentations and enquiries of recommendations | Minutes of discussion of problems and recommendations of scientists |
| | | 1.1.7. To expand sector participation in the national consultation process on climate change and the development of national communications to the UNFCCC | 2015-2017 | SAEPF, ESPO, DFM, DFEPA | SAEPF funding limits for the year, international grants | Information gathering, verification and preparation of presentations on best practices | Presentation of climatic experience and best practices on protected areas and forest enterprises at the Steering Committee on Climate Change |



| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 1.1.8. To strengthen international cooperation in the exchange of information of monitoring of biodiversity and forest resources in a changing climate | 2015-2017 | SAEPF, DFM, DFEPA | SAEPF, MALR, NAS funding limits for the period, international grants | Contribution to the national communications, project proposals, participation in international forums | Contacts and partnership with international organizations, new international projects |
| | | 1.1.9. To develop and implement a GEF project to strengthen the monitoring and management of information on the implementation of the obligations of the Kyrgyz Republic before UNFCCC and CBD | 2015-2017 | SAEPF, DFM, DFEPA<br><br>UNDP (subject to agreement) | SAEPF funding limits for the period, grants of international organizations | Project implementation, involvement of experts and consultants | Project proposals submitted to GEF |
| | | 1.1.10. To develop national biomass growth coefficients for forest resources | 2017 | DFM, DFEPA,<br><br>NAS, NGOs, FAO, WB (subject to agreement) | SAEPF, NAS funding limits for the year, international grants | Meetings, consultations and discussions of interdisciplinary working groups | Instructions on national coefficients |

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 1.1.11. To develop a methodology for assessing ecosystem services | 2017 | SAEPF, DFM, DFEPA<br><br>NAS, NGOs (subject to agreement) | SAEPF, NAS funding limits for the year, international grants | Meetings, consultations and discussions of interdisciplinary working groups | Methodical substantiation of the valuation of ecosystem services |
| | **Task 1.2: To incorporate climatic aspects in the planning and management of protected areas and forest enterprises field units** | 1.2.1. To improve approaches, technologies and methods of inventory of forests and biodiversity, taking into account adaptation to climate change | 2016-2017 | DFM, DFEPA<br><br>FAO, WB (subject to agreement) | State funding limits for the year, international grants | Establishment of working groups and preparation of proposals | Suggestions for amendments and approval of the inventory process |
| | | 1.2.2. To integrate climate change issues into management plans for forest enterprises, nature reserves and national parks | 2016-2017 | DFM, DFEPA<br><br>FAO, WB (subject to agreement) | State funding limits for the year, international grants | Consultations with stakeholders | Management plans incorporating climate change sections |
| | | 1.2.3. To expand the use of remote sensing in forest management and biodiversity conservation | 2016-2017 | DFM, NAS, DFEPA, forest enterprises, nature reserves and national parks,<br>NGOs, FAO, WB (subject to agreement) | State funding limits for the year | Consultations with stakeholders | Field level recommendations for completing the development of new management plans |



| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 1.2.4. To create a unified forestry and biodiversity conservation information and analysis center | 2016-2017 | DFM, DFEPA<br><br>NGOs, GIZ, FAO, UNDP, WB (subject to agreement) | SAEPF funding limits for the year, grants of international donor organizations | Project implementation, involvement of experts and consultants | Maps using GIS, data base management systems, GPS navigators, satellite image databases on protected areas and forest enterprises, software |
| | **Task 1.3: To integrate climate-resilient biodiversity and forest ecosystems in the sustainable development of priority sectors of the economy and the socio-economic development of local communities** | 1.3.1. To strengthen participation of the sector in designing of development strategies for mining, fuel and energy and transport sectors of the country, as well as regional development strategies to promote climate-resilient forest and protected areas management | 2015-2017 | SAEPF, DFEPA, DFM, ESPO | SAEPF funding limits for the year, grants of international donor organizations | Participation in interdepartmental working group on development of sectoral strategies | The relevant sections of sectoral strategies |

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 1.3.2. To develop and implement a mechanism to involve the public and communities in decision-making and planning for conservation and sustainable use of biodiversity and forest resources | 2015-2017 | SAEPF DFEPA, forest enterprises, nature reserves, national parks (local state administrations, local governments, communities, FAO, UNDP, GIZ (subject to agreement) | SAEPF funding limits for the year, grants of international donor organizations | Establishment of cross-sectoral joint management boards in forest enterprises and protected areas | Co-management boards in forest enterprises and protected areas |
| | | 1.3.3. To support civil initiatives on protection of biodiversity and combating desertification | Ongoing | SAEPF, DFEPA, DFM, Republican Fund for Nature Conservation and Forestry Development, GEF Small Grants Programme, communities, NGOs (subject to agreement) | SAEPF funding limits for the year, grants of international donor organizations | Providing technical advice on biodiversity and planting material | Man-made plantations and non-state protected ayil aimak (AA) areas (rural municipality areas) |



| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 1.3.4. To introduce the practice of joint action with the local communities to conserve and restore ecosystems and biodiversity, develop ecological tourism, urban parks and green spaces in towns | 2016-2017 | SAEPF, DFEPA, DFM, nature reserves and national parks, Republican Fund for Nature Conservation and Forestry Development, GEF Small Grants Programme, communities, NGOs (subject to agreement) | SAEPF funding limits for the year, grants of international donor organizations | Providing advice and planting material to LSGs, provision of forest areas for ecotourism | Completed campaigns on planting, sites of SFF allocated for ecotourism |
| | | 1.3.5. To include biodiversity and forest ecosystem conservation and sustainable use and climate adaptation in development plans of local communities and regional development strategies of administrative territories | 2016-2017 | SALSGIER, SAEPF, DFEPA, DFM, forest enterprises, nature reserves and national parks<br>Local state administratons, LSGs, communities, NGOs, UNDP, GIZ, FAO (subject to agreement) | SAEPF funding limits for the year, grants of international donor organizations | Participation of working groups in devising of strategies for the development of regions, districts and ayil aimak (AA) areas (rural municipality areas) | Area strategies include sections on climate-resilient biodiversity conservation and sustainable forest management |

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| **Goal 2: To promote the conservation and restoration of damaged natural ecosystems to strengthen their resilience to climate change.** | **Task 2.1: To increase the ecosystem area covered by the protected areas system and promote a more efficient protected areas management.** | 2.1. To develop a program of protected areas development of the Kyrgyz Republic taking into account the vulnerability of ecosystems to external effects of climate change | 2016-2018 | DFEPA, DFM, NAS, SALSGIER, SAGMR, UNDP, WWF (subject to agreement) | SAEPF, NAS funding limits for the year, grants of international donor organizations | Establishment of an interdepartmental interdisciplinary working group | Protected areas development plan |
| | | 2.1.2. To develop and implement a practice of conducting feasibility studies for the establishment of new protected areas with the involvement of all interest groups | 2015-2017 | DFM, DFE, nature reserves and national parks, other stakeholders, UNDP (subject to agreement) | SAEPF funding limits for the year, grants of international donor organizations | Establishment of a working group and the involvement of the expert community | Model feasibility study approved for future use |
| | | 2.1.3. To organize new and expand the area of existing protected areas with a view to preserving ecosystems most vulnerable to climate change | 2015-2017 | DFEPA, DFM<br>NAS, UNDP (subject to agreement) | SAEPF funding limits for the year, grants of international donor organizations | Implementation of GEF projects | The new protected areas covering vulnerable ecosystems |
| | | 2.1.4. To review the status of state wildlife sanctuaries (with increased environmental role of local communities), and to inventory them, taking into account the negative impacts of climate change | 2015-2017 | DFEPA, DFM, nature reserves and national parks<br>SALSGIER, LSGs, NAS, UNDP ( subject to agreement) | SAEPF, SALSGIER, LSGs, NAS funding limits for the year, grants of international donor organizations | Establishment of an interdisciplinary working group | Document on the inventory of state wildlife sanctuaries and proposals to strengthen their status |
| | | 2.1.5. To identify the most important wetlands and their vulnerability to climate change for inclusion in the Ramsar List | 2015-2017 | DFEPA, DFM<br>NAS (subject to agreement) | SAEPF, NAS funding limits for the period | Establishment of an interdisciplinary working group | List of wetlands and a package of documents for the Convention on Wetlands (Ramsar) |
| | | 2.1.6. To introduce an international system for assessing the efficiency of management of protected areas taking into account the climatic aspects of management | 2015-2017 | DFEPA, DFM, protected areas<br>UNDP (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of working groups on piloting | METT system introduced in all protected areas |
| | | 2.1.7. To proceed to the implementation of the new climate-resilient management plans in forest enterprises, nature reserves and national parks | 2017 | DFEPA, DFM, forest enterprises, protected areas, UNDP (subject to agreement) | SAEPF funding limits for the period, international donor funds | Implementation of management plans | Protected areas management plans with sections on climate change |
| | | 2.1.8 To improve approaches, technologies and methods for joint management of protected areas at the local level | 2016-2017 | DFEPA, DFM, forest enterprises, pro<br>tected areas UNDP (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of working groups on piloting | Public supervisory boards of protected areas |

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | **Task 2.2: To expand the forest area and improve the efficiency of forest management** | 2.2.1. To revise approaches, technologies and methods of forest reproduction | 2016-2017 | DFEPA, DFM, NAS, forest enterprises<br>FAO, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of working groups and the development of proposals at the level of forestry enterprises, project implementation | Centralized database on seed material in DFEPA |
| | | 2.2.2. Create forest seed plots and seed storage centers in forest enterprises of the Kyrgyz Republic | 2016 | DFEPA, DFM, forest enterprises<br>FAO, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Project implementation at the level of forest enterprise | Local databases of seed materials and seed infrastructure |
| | | 2.2.3. To improve growing techniques of planting stock in nurseries through the modernization of irrigation systems and growing seedlings with closed root system | 2015-2017 | DFEPA, DFM, forest enterprises<br>FAO, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Project implementation and creation of demonstration nurseries using innovative methods | Expanded range and higher quality of planting material |
| | | 2.2.4. To adapt and implement forest species planting and growing techniques under climate change | 2015-2017 | DEFPA, DFM, forest enterprises<br>NAS, FAO, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Guidelines on adaptation of silvicultural measures |



| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 2.2.5. To develop action plans for natural regeneration of forests for all forest zones (spruce, juniper, floodplain, walnut). | 2015-2017 | DEFPA, DFM, forest enterprises<br>NAS, FAO, GIZ, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Plans to promote natural forest enterprise regeneration |
| | | 2.2.6. To develop and implement projects to establish forest plantations on SFF lands. | Ongoing | DEFPA, DFM, forest enterprises<br>FAO, WB, GIZ (subject to agreement) | SAEPF funding limits for the period, international donor funds | Project implementation | Plans to establish forest plantations in territories of forest enterprises |
| | | 2.2.7. To develop and implement projects to establish socially-oriented plantations of fast-growing climate-resilient species | Ongoing | SAEPF, DFEPA, DFM, forest enterprises, Republican Fund for Nature Conservation and Forestry Development, GEF Small Grants Programme, communities, NGOs (subject to agreement) | SAEPF funding limits for the period, international donor funds | Project implementation | New forest stands on LSGs' lands |

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 2.2.8. To demonstrate the practice of climate-resilient agroforestry at the community level (FAO, DFM, forest enterprises) | 2015-2017 | DFEPA, DFM, forest enterprises<br>FAO, GIZ (subject to agreement) | SAEPF funding limits for the period, international donor funds | Project implementation | Agroforestry demonstration sites |
| | | 2.2.9. To support LSGs' initiatives to plant outside the SFF | Ongoing | DFEPA , DFM, forest enterprises<br>NGOs, FAO, WB, GIZ (subject to agreement) | SAEPF funding limits for the period, international donor funds | Project implementation, contracts for supply of planting material | Increased planting outside the SFF |
| | | 2.2.10. To review methods, standards and mechanisms for conversion into forest area | 2015-2017 | DFM, DFEPA, forest enterprises | SAEPF funding limits for the period, international donor funds | Establishment of an interdisciplinary working group | Guidelines for conversion into forest area |
| | | 2.2.11. To improve measures for preservation and protection of forests and enhancement of forest pathology monitoring | 2015-2017 | DFEPA, NAS, forest enterprises<br>FAO, WB, GIZ (subject to agreement) | SAEPF, NAS funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Plans for forest protection and forest protection measures |



| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 2.2.12. To improve the work of forest enterprises in fire safety and to integrate these measures in civil protection of territories | 2015-2017 Ongoing | DFEPA, forest enterprises<br>FAO, GIZ, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Forest enterprises' operational plans for fire prevention measures |
| | | 2.2.13. To revise the rules for multiple use of forests | 2015-2017 | DFEPA, forest enterprises<br>NAS, FAO, GIZ, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Guidelines on forest use standards |
| | | 2.2.14. To revise the current practice of joint forest management and forest use system and to develop recommendations based on climate change | 2015-2017 | DFEPA, forest enterprises<br>NAS, FAO, GIZ, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Analytical document containing recommendations |
| | | 2.2.15. Finalize and implement the Concept of Joint Forest Resource Management in a changing climate (SAEPF, SALSGIER, NAS, NGOs) | 2016-2017 | DFEPA, NAS, forest enterprises<br>FAO, GIZ, WB (subject to agreement) | SAEPF funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Concept of development of joint forest management in a changing climate |

| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| **Goal 3: To increase the capacity and awareness of stakeholders of the Forest and Biodiversity sector on adaptation to climate change.** | **Task 3.1: To build the capacity of SAEPF officials structural divisions in climate change and** | 3.1.1. To develop and approve at the Consulting and Advisory Committee a modular training program for professional development of employees in charge of protected areas and forest enterprises on climate change | 2015-2017 | DFE, DFM, NAS, forest enterprises, protected areas<br><br>NGOs, FAO, GIZ, WB (subject to agreement) | SAEPF, NAS funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Professional development program on climate change |
| | | 3.1.2. To develop regional professional development programs for employees in charge of protected areas and forest enterprises on climate change (DFE, DFM, forest enterprises, protected areas) | 2015-2017 | DFE, DFM, NAS, forest enterprises, protected areas<br><br>NGOs subject to agreement | SAEPF, NAS, SASL-GIER funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Regional professional development programs on climate change |
| | | 3.1.3. To conduct professional development training for employees in charge of protected areas and forest enterprises (DFE, DFM, forest enterprises, protected areas) | 2015-2017 | DFE, DFM, NAS, forest enterprises, protected areas<br><br>NGOs (subject to agreement) | SAEPF, NAS, SASL-GIER funding limits for the period, international donor funds | Establishment of an interdisciplinary working group, project implementation | Managers and engineers in charge of protected areas and forest enterprises have undergone professional training |



| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | **Task 3.2. To raise awareness of stakeholders on sector adaptation to climate change** | 3.1.1. To develop and implement communications strategy for biodiversity conservation and adaptation of forest ecosystems to climate change | 2015-2017 | DFM, DFEPA, forest enterprises<br>NGOs, media, FAO, WB, UNDP, GIZ (subject to agreement) | SAEPF, NAS funding limits for the period | Establishment of a working group | Awareness program |
| | | 3.2.2. To develop and approve at the Consulting and Advisory Committee a program to raise awareness of major sector stakeholders on climate change | 2015-2017 | SAEPF, DFM, DFEPA, forest enterprises<br>NGOs, media, FAO, WB, UNDP, GIZ (subject to agreement) | SAEPF, NAS funding limits for the period | Establishment of a working group | Sector awareness program |
| | | 3.2.3. To implement an awareness program for major sector stakeholders at the national level on adaptation to climate change | 2015-2017 | SAEPF, DFM, DFEPA, forest enterprises, nature reserves, national parks<br><br>NGOs, media, FAO, WB, UNDP, GIZ (subject to agreement) | SAEPF, NAS funding limits for the period, international donor funds | Seminars, trainings, round tables, publications of media and social networks | Representatives of ministries and departments, NGOs, businesses and other stakeholder groups have increased their awareness of the impact of climate change on forests and biodiversity |

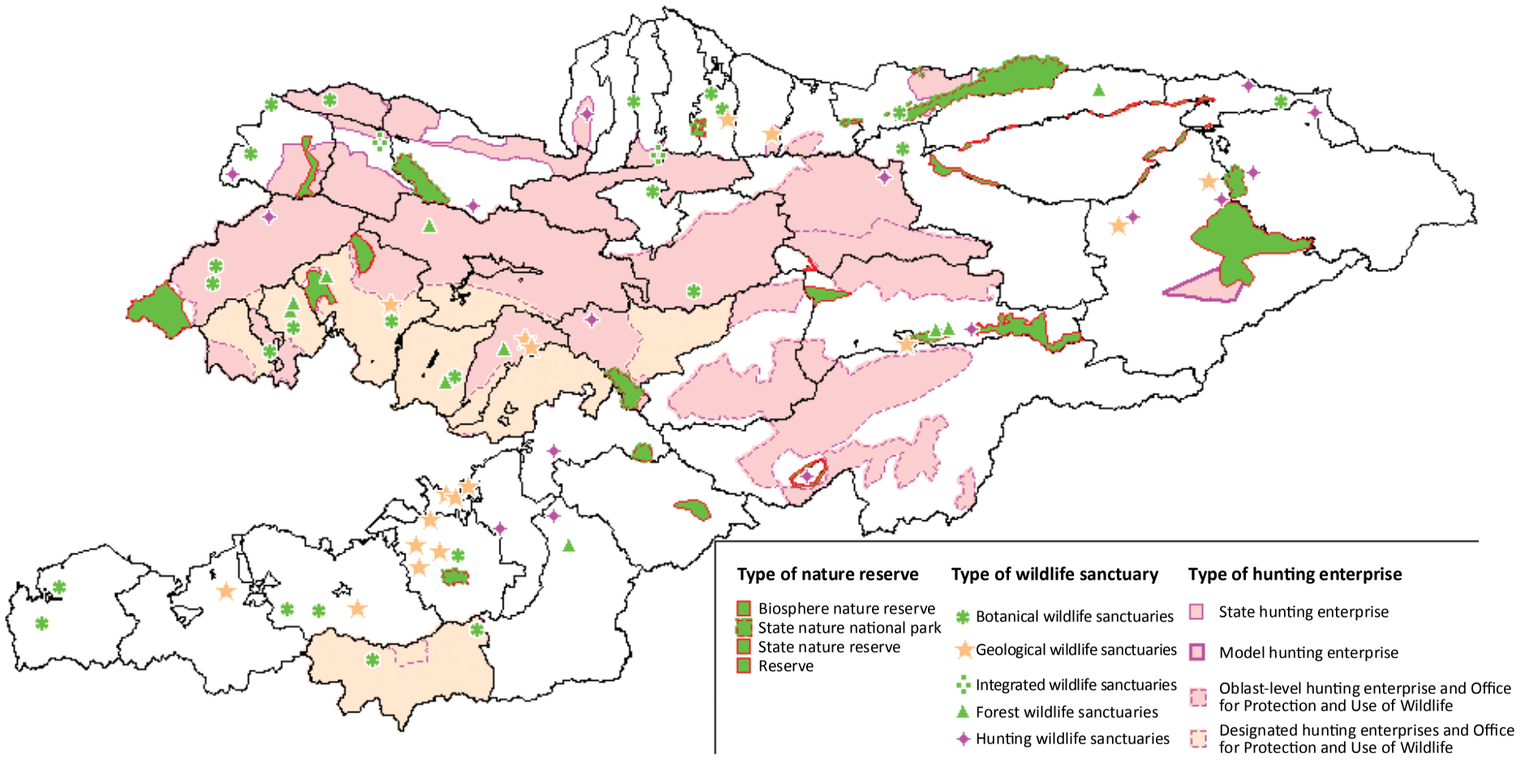
| Goals | Tasks | Activities | Timeline | Entities responsible | Sources of funding | Implementation form | Expected results |
|---|---|---|---|---|---|---|---|
| | | 3.2.4. To develop regional awareness plans for major stakeholder groups in the sector on climate change at regional and community levels (DFEPA, DFM, forest enterprises, protected areas) | 2015-2017 | SAEPF, DFM, DFEPA, forest enterprises, nature reserves, national parks<br><br>NGOs, media, FAO, WB, UNDP, GIZ ( subject to agreement) | SAEPF, LSGs, NAS funding limits for the year, international donor and private investor funds | Establishment of a working group | Regional awareness program |
| | | 3.2.5. To conduct regional awareness campaigns for key stakeholder groups in the sector on adaptation of the sector to climate change at the regional and community levels (DFE, DFM, forest enterprises, protected areas) | 2015-2017 | SAEPF, DFM, DFEPA, forest enterprises<br><br>NGOs, media, FAO, UNDP, GIZ (subject to agreement) | SAEPF, LSGs, NAS funding limits for the year, international donor and private investor funds | Seminars, trainings, roundtables, publications in the media and social networks | Representatives of state district administrations, LSGs and other stakeholder groups have increased their awareness on the effects of climate change on forest and biodiversity |



**Acronyms:**

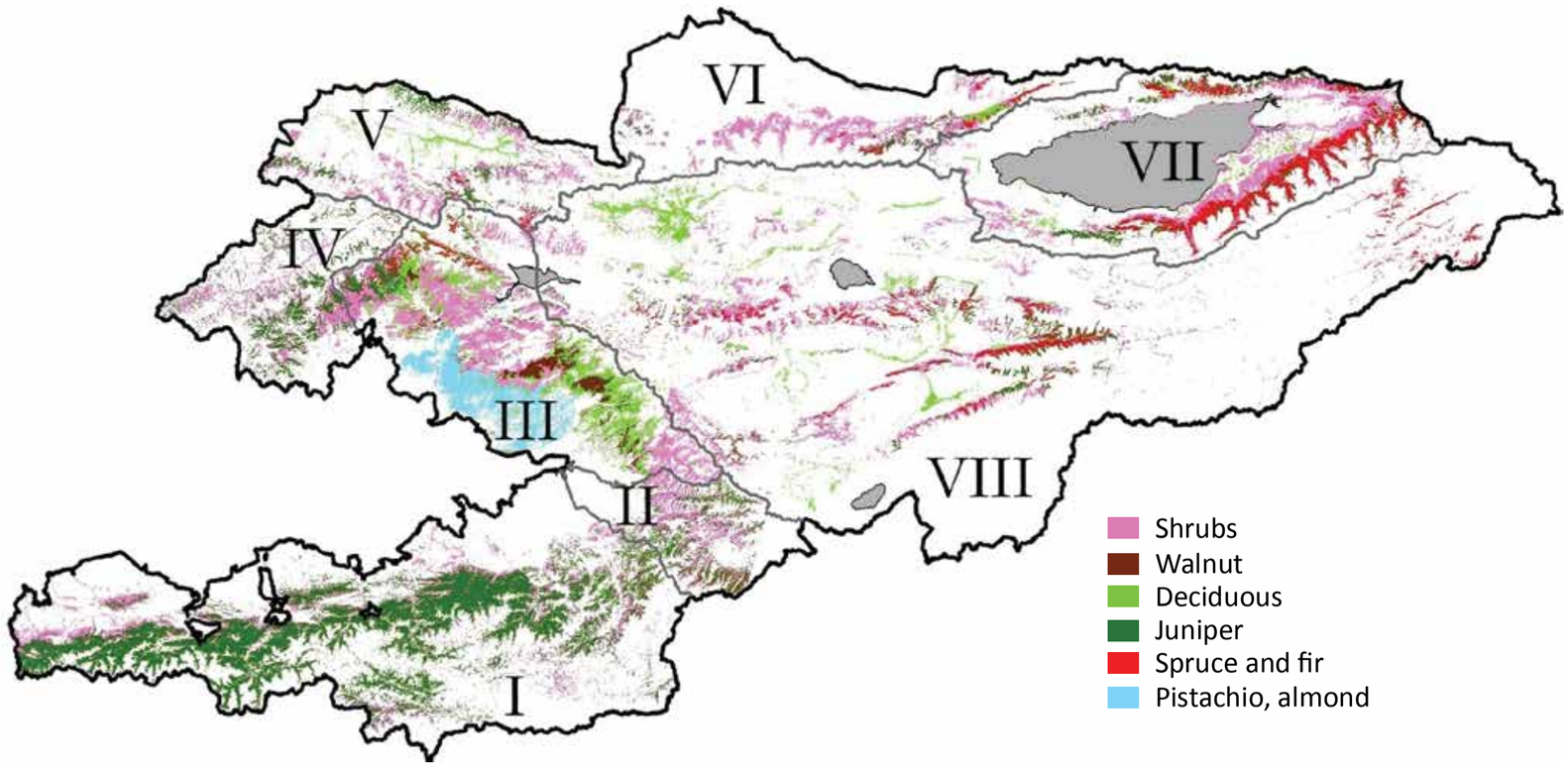
| | |
|---|---|
| DFM | Department of Forest Management of the State Agency on Environment Protection and Forestry |
| DFEPA | Department of Forest Enterprises and Protected areas of the State Agency on Environment Protection and Forestry |
| ESPO | Environmental Strategy and Policy Office and of the State Agency on Environment Protection and Forestry |
| SAEPF | State Agency on Environment Protection and Forestry of the Kyrgyz Republic |
| SAGMR | State Agency on Geology and Mineral Resources under the Government of the Kyrgyz Republic |
| SALSGIER | State Agency on Local Self-Governance and Inter-Ethnic Relations under the Government of the Kyrgyz Republic |
| NAS | National Academy of Sciences of the Kyrgyz Republic |
| LSG | Local self-government |
| GEF | Global Environmental Facility |
| CBD | Convention on Biological Diversity |
| UNDP | United Nations Development Programme |
| FAO | United Nations Food and Agriculture Organization |
| WWF | World Wildlife Fund |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (German federal enterprise for international cooperation) |

## APPENDIX 1: MAP OF PROTECTED AREAS OF KYRGYZSTAN

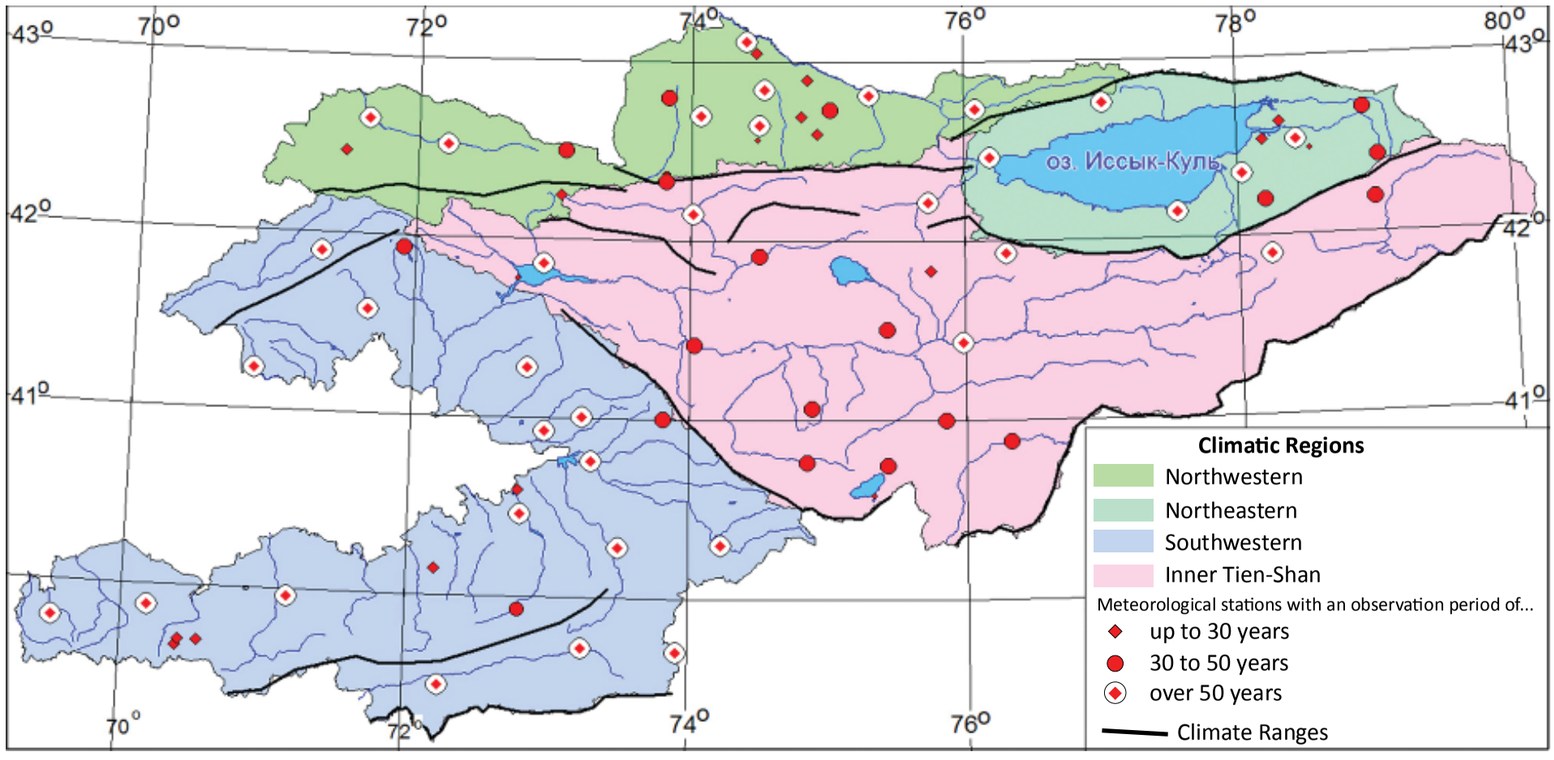





## APPENDIX 2: MAP OF FOREST RESOURCES OF KYRGYZSTAN

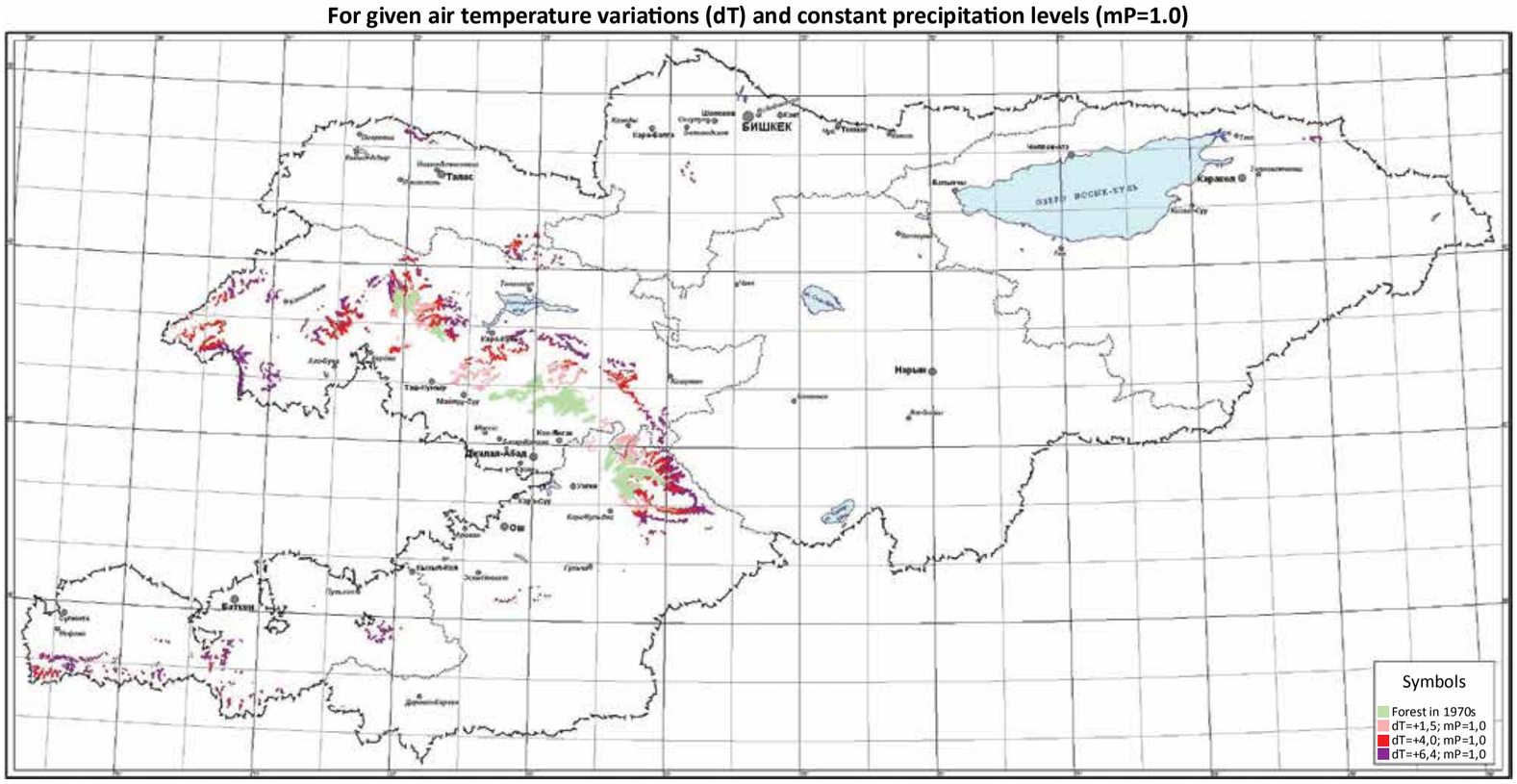


## APPENDIX 3: MAP OF CLIMATIC REGIONS OF KYRGYZSTAN



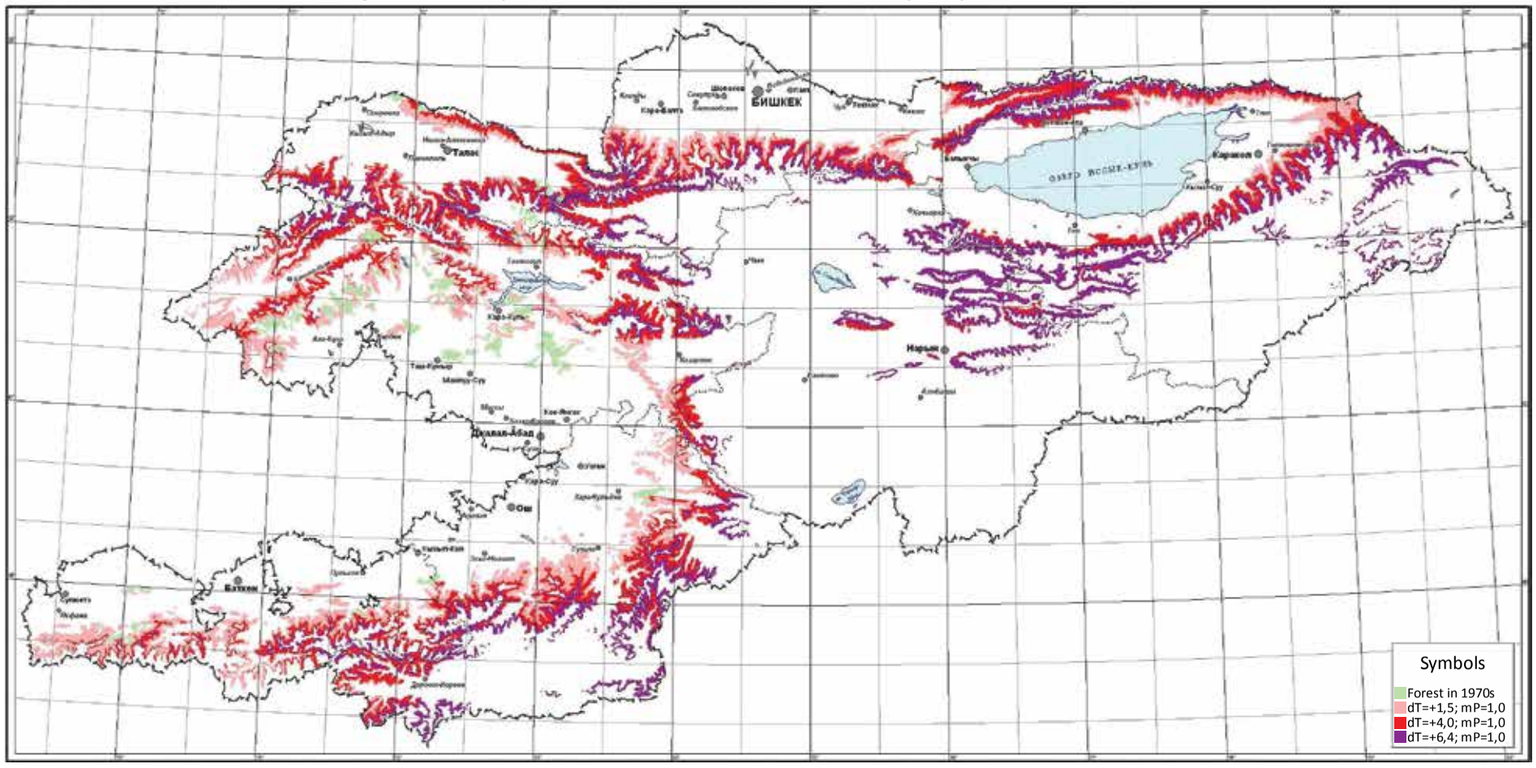

## APPENDIX 4: WALNUT GROWTH MODELLING MAP

### AREAS OF HIGH WALNUT GROWTH PROBABILITY (CLIMATIC OPTIMUM)
### For given air temperature variations (dT) and constant precipitation levels (mP=1.0)



## APPENDIX 5: ZERAVSHAN JUNIPER GROWTH MODELLING MAP

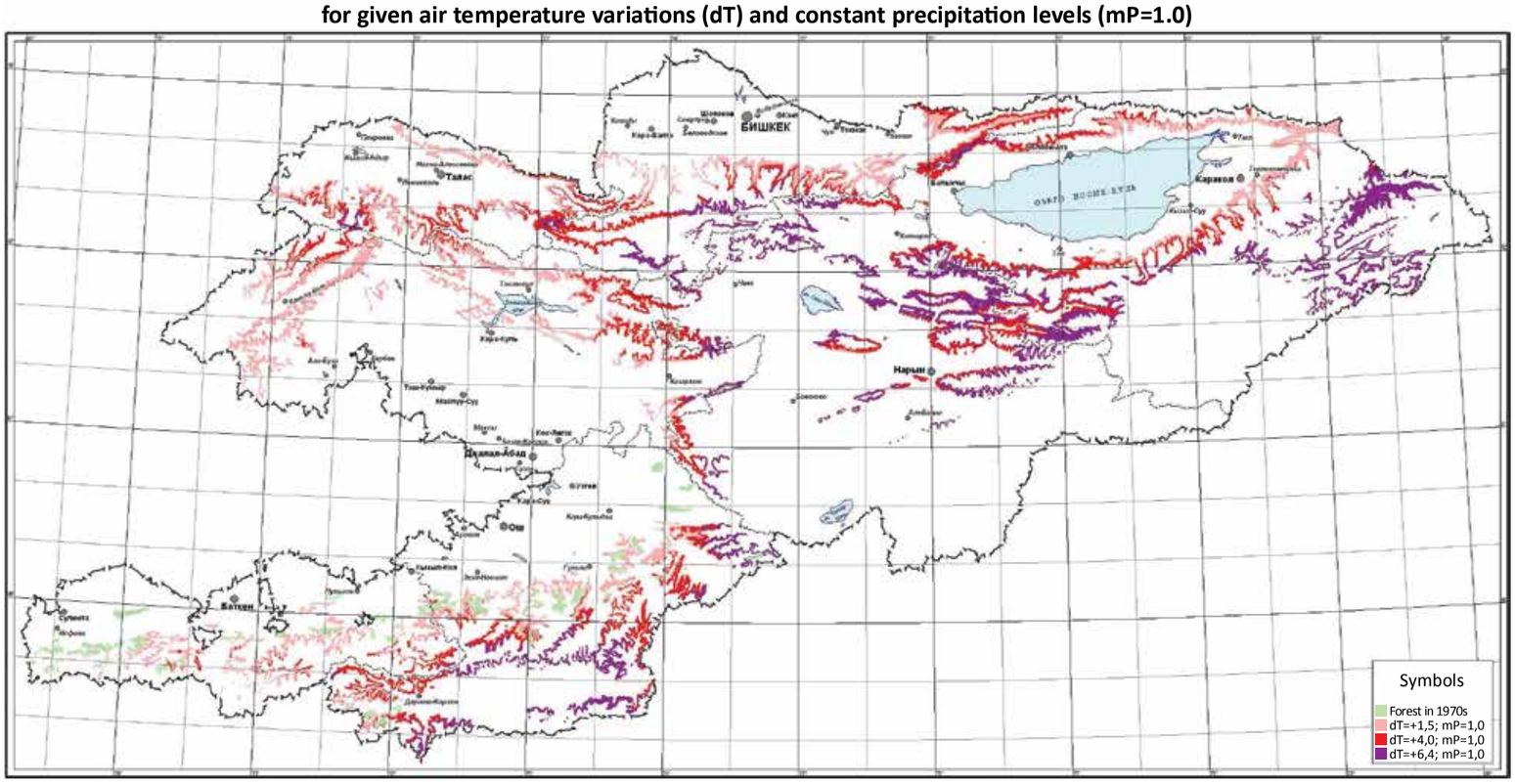
**AREAS OF HIGH ZERAVSHAN JUNIPER GROWTH PROBABILITY (CLIMATIC OPTIMUM)**
**for given air temperature variations (dT) and constant precipitation levels (mP=1.0)**





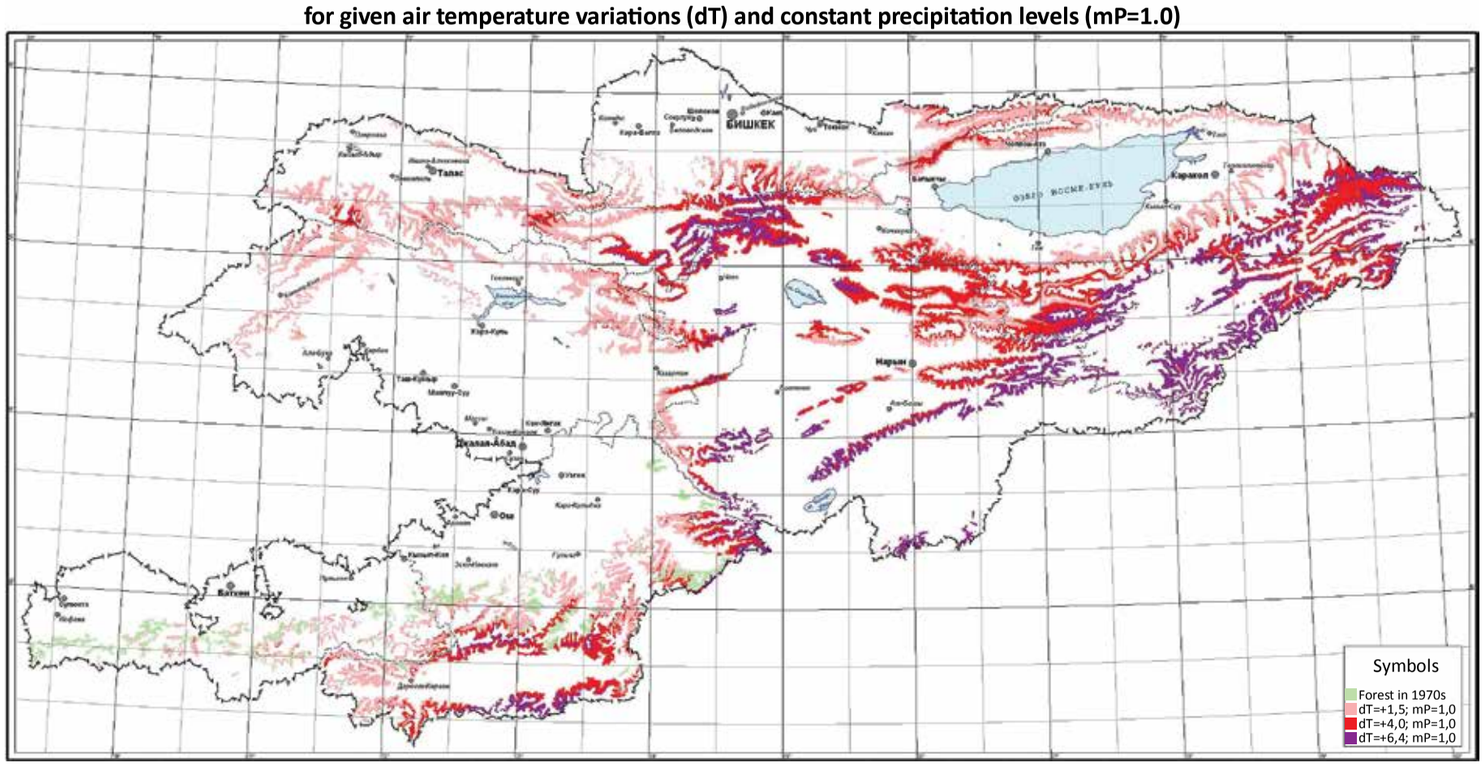

## APPENDIX 6: SEMIGLOBOSE JUNIPER GROWTH MODELLING MAP

**AREAS OF HIGH SEMIGLOBOSE JUNIPER GROWTH PROBABILITY (CLIMATIC OPTIMUM)**
**for given air temperature variations (dT) and constant precipitation levels (mP=1.0)**



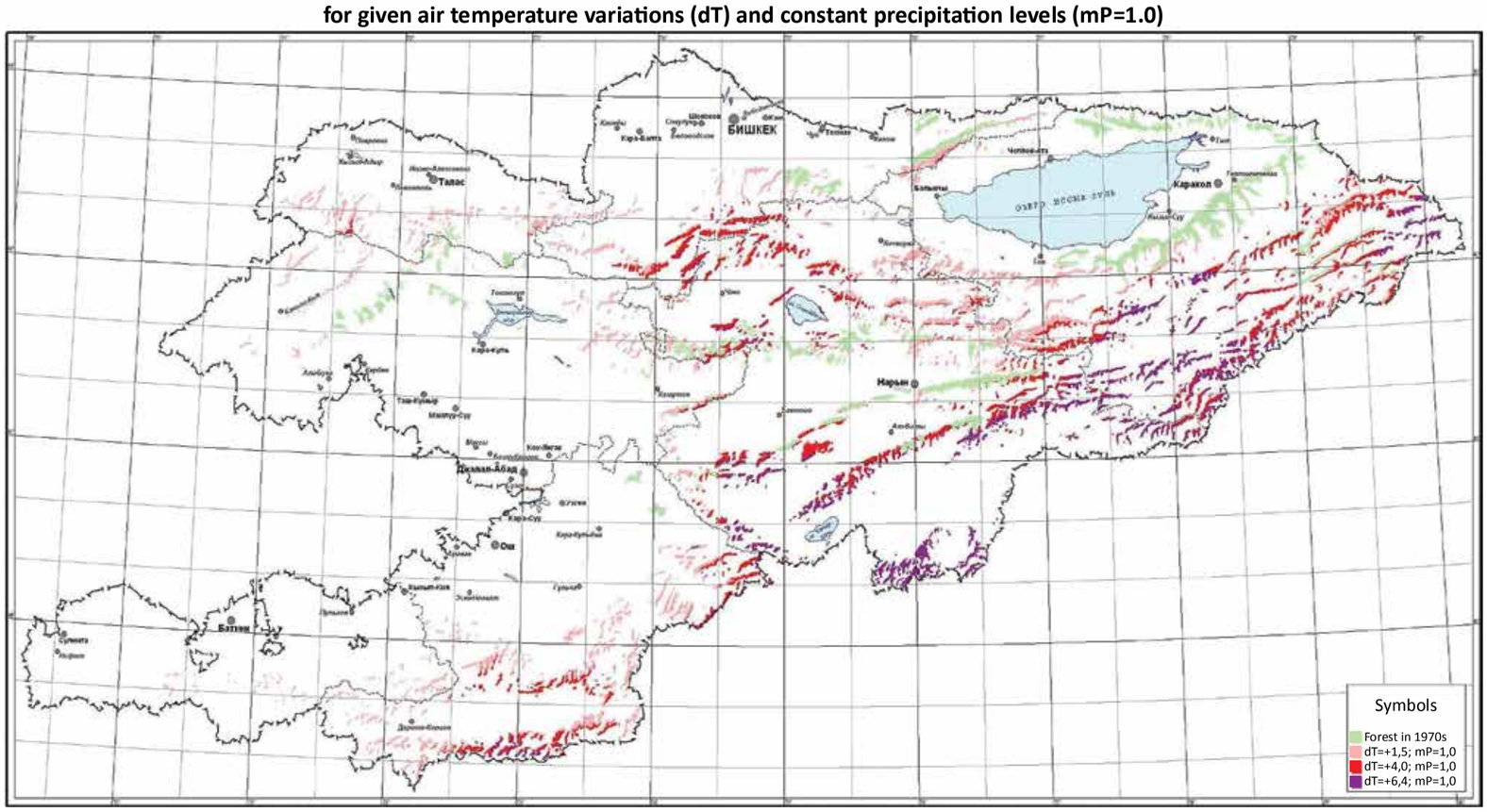
## APPENDIX 7: TURKESTAN JUNIPER GROWTH MODELLING MAP

**AREAS OF HIGH TURKESTAN JUNIPER GROWTH PROBABILITY (CLIMATIC OPTIMUM)**
**for given air temperature variations (dT) and constant precipitation levels (mP=1.0)**




## APPENDIX 8: SPRUCE AND FIR GROWTH MODELLING MAP

**AREAS OF HIGH SPRUCE AND FIR GROWTH PROBABILITY (CLIMATIC OPTIMUM)**
**for given air temperature variations (dT) and constant precipitation levels (mP=1.0)**



# APPENDIX 9: BRIEF TYPOLOGY OF KYRGYZ FORESTS

| № | Name | Forest growth area | | | | | | | | Slope exposure | | | | Altitude, m asl | Features and natural state | Development trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | N | E | S | W | | | |
| **Walnut stands** | | | | | | | | | | | | | | | | |
| 1.1 | Short-footed walnut stands | | | X | | | | | | X | | | | 1400-1800 | Thick, well-developed trees, high-density stands, presence of other tree and shrub species is insignificant | Decrease in area due to felling, possible transition to 1.6 on gentle slopes, stable on steep slopes |
| 1.2 | Walnut stands with additional moisture | | (x) | X | (x) | | | | | X | | | X | 1400-1800 | Pure forest stand, additional moisture (streams, close to surface groundwater…), walnut trees (poplar) are thick and well-developed | Decrease in area due to the vanishing of streams and man-made factors, possible transition to 1.1 and 1.6 |
| 1.3 | Walnut stands + spruce and fir | | | X | | | | | | X | | | X | 1300-1800 | Combination of walnut and conifer species; walnut trees grow in blocks (groups), are well-developed; tall grass; well-developed moss cover | Stable stand; spruce is under threat of extinction due to felling |
| 1.4 | Walnut +hawthorn | | | X | | | | | | X | X | (x) | X | 1200-2000 | Mixed stand; significant share of hawthorn; walnut is scattered here and here or grows in small groups, spreading crowns | Decrease in area; possible transition to 1.6 due to hawthorn felling, or 11.0 if walnut is felled |
| 1.5 | Walnut + apple and maple | | | X | | | | | | X | X | (x) | X | 1400-2100 | Mixed stand; walnut trees are thick with spreading crowns; shrub storey is well-developed; versatile grass, primarily tall grasses | Decrease in area; transition to 1.5b in case of maple felling, to 1.5 in case of maple and apple felling |
| 1.6 | Park walnut | | | X | | | | | | X | X | (x) | X | 1400-1800 | Pure walnut stand with glades, thick, well-developed trees; well-developed grass, not tall | Increase in the area due to the development of agricultural land; area can possibly be reduced in case of conversion to open stands |
| **Pistachio stands** | | | | | | | | | | | | | | | | |
| 2.1 | Pistachio + tall cereal grasses | | | X | | | | | | X | | | | 800-1400 | Pure stand, well developed trees; well developed and versatile grass cover | Decrease in area due to the use of land for pastures, transition to 2.2 is possible |
| 2.2 | Pistachio +sagebrush and cereal | | | X | | | | | | X | | | | 800-1200 | Pure stands, well developed trees | Decrease in area due to the use of land for pastures, transition to 2.3 is possible |
| 2.3 | Pistachio on eroded slopes | | | X | | | | | | X | X | X | X | 700-1200 | Mix stand, sparse forest, variegated openings and eroded slopes, high soil erosion | Area increase due to man-made pressure, transition to 11.0 or deforestation |
| **Almond stands** | | | | | | | | | | | | | | | | |
| 3.1 | Almond + tall cereal grasses | (x) | (x) | X | | | | | | | | X | | 700-1400 | Pure stands, sparse forest, grows in groups | Decrease in area due to the use of land for pastures, deforestation |
| 3.2 | Almond on rocky slopes | (x) | (x) | X | | | | | | | | X | | 1100-1600 | Pure stands, sparse forest, scrubby and multi-trunk | Decrease in area due to man-made factors, transition to 11.0 is possible |
| **Apple stands** | | | | | | | | | | | | | | | | |
| 4.1 | Apple + hawthorn | | | X | | | X | | | | | X | | 1200-1500 | Mixed stand, scrubby apple, grows in blocks; hawthorn makes up over 20%, well-defined shrub storey, steppe vegetation | Decrease in area; transition on gentle slopes to 4.3 due to hawthorn felling, to 6.5 due to apple felling |
| 4.2 | Apple + maple | | X | X | | | | | | X | X | X | X | 1700-1900 | Mixed stands, well developed plants, abundance of shrubs, motley grasses | Decrease in area due to maple felling, transition to 4.3 is possible |
| 4.3 | Park apple | | | X | | | | | | X | X | X | X | 1400-1900 | Pure singe-storey stand, well developed, short grass | Area reduction due to maple felling and use for agricultural plants |
| **Maple stands** | | | | | | | | | | | | | | | | |
| 5.1 | Maple +walnut | | | X | | | | | | X | | | | 1600-2100 | Mixed stand, well-developed, poor shrub storey, multi-storey grass cover, cereal dominations on open areas | Decrease in area, transition to 1.6, 1.1, 1.5 on gentle slopes due to maple felling |
| 5.2 | Maple + apple | | X | X | | | | | | X | X | X | X | 1800-2000 | Mixed stand, scrubby, well-developed shrub storey, multi-storey grass | Decrease in area due to maple felling, transition to 4.2 is possible |
| 5.3 | Maple a [or an] water paring and steep slopes | | X | | | | | | | X | X | X | X | 1900-2500 | Mixed stand, abundance of shrubs and developed grass vegetation | Decrease in area, transition to 11.0 (a), 6.5 (b) or 7.5 (b) is possible due to maple felling |
| 5.4 | Maple on rockslides | | X | X | | | X | | | X | X | X | X | 1400-2500 | Mixed stand, maple occupies over 80%; low, bushy, multi-trunk trees; well-defined shrub storey; motley grass | No changes are expected |
| **Hawthorn stand** | | | | | | | | | | | | | | | | |
| 6.1 | Hawthorn in fertile soil | | X | X | | | | | | X | X | X | X | 1200-1800 | Mixed stand, well developed; some apple trees, singular walnut trees, well-defined shrub storey, well-developed grass cover | Fast area reduction due to the use of land for agriculture, transition to 4.3 is possible |
| 6.2 | Hawthorn + apple | | | X | | | | | | X | X | X | X | 1400-1700 | Mixed stand, well-developed; versatile shrub storey, well-developed grass cover | Decrease in area due to man-made pressure, transition to 4.3 and sparse forest, use for pasture |
| 6.3 | Hawthorn + pistachio | | | X | | | | | | X | X | X | X | 1100-1400 | Mixed stand, well-developed shrub storey, grass vegetation – motley grass dominated by cereals | Decrease in area due to tree felling, transition to 11.0 |
| 6.4 | Hackberry hawthorn | | | X | X | | | | | X | X | X | X | 1750-2000 | Mixed stand, scrubby, grows in blocks, numerous shrubs, underdeveloped grass cover | No changes are expected |
| 6.5 | Hawthorn growing in dry areas | | X | X | X | | | | | | | X | | 1100-1400 | Pure stand, scrubby, underdeveloped bushy vegetation, versatile grass cover dominated by steppe grasses | Decrease in area due to strong man-made pressure, transition to bush sparse forests (11) and use of land for pastures |
| **Juniper stands** | | | | | | | | | | | | | | | | |
| 7.1 | Elfin juniper | X | X | X | X | X | X | X | X | X | X | X | X | 2200-3500 | Pure stand growing in blocks; shrub storey is underdeveloped, versatile grasses, well-developed | Area increase due to reduced man-made pressure – reduced grazing |
| 7.2 | Juniper – moistured, tall grass | X | X | X | X | | | | | X | | | | 2000-2900 | Pure stand, well-developed, shrub storey is pronounced, versatile grass vegetation | Area decrease due to the use of land for pasture and agriculture, transition to 7.5 |
| 7.3 | Juniper – dry, short grass | X | X | X | X | X | X | X | X | X | X | X | X | 1600-2600 | Pure stand or with spruce, well-developed, shrub storey is poor, short grasses dominated by steppe vegetation or cereals | Decrease in area due to the juniper and spruce felling, transition to 11.0 or 7.5 |





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| 7.4 | Levee juniper | X | X | X | X | X | X | X | X | X | X | X | X | 1600-2800 | Complex stand, birch, willow, fir, ash, shrub layer is well pronounced, multi-layered grass cover, well-developed | Decrease in area due to man-made pressure, transition to 10.7 or 11.0 is possible |
| 7.5 | Open shrubby juniper | X | X | X | X | X | X | X | X | X | X | X | X | 1700-2500 | Pure stand, sparse; a well-defined shrub layer, grass cover – motley grass | Decrease in area due to man-made effects, transition to 11.0, 7.3 is possible |
| 7.6 | Juniper on taluses and slides | X | X | X | X | X | X | X | X | X | X | X | X | 1700-2800 | Pure or mixed stand, grows in blocks; shrub layer is poor or well defined, steppe grass vegetation | Transition to 11.0 is possible due to strong man-made pressure |
| 7.7 | Rocky juniper | X | X | X | X | X | X | X | X | X | X | X | X | 1600-3200 | Pure sand, grows in blocks; shrub layer and grass cover are poor | No changes are expected |
| **Spruce stands** | | | | | | | | | | | | | | | | |
| 8.1 | Spruce + tall grass | | (x) | (x) | (x) | (x) | X | X | X | X | | | | 2000-2800 | Pure stand, grows in blocks; shrub layer is poor, abundant tall grass | Decrease in area due to high man-made presser, transition to 8.4 or sparse forests is possible |
| 8.2 | Upland spruce | | | | | | X | X | X | X | | | | 2700-3000 | Pure stand, grows in small and isolated groups; shrub layer is poor, alpine meadow grass vegetation | Decrease in area due to man-made pressure, transition to sparse forests is possible |
| 8.3 | Mossy spruce | | | | | | X | X | X | X | | | | 2100-2700 | Pure stand with a well-developed mossy cover, shrub layer is poor, sparse grass | Decrease in area due to logging, transition to 8.5 or 8.1 is possible |
| 8.4 | Spruce + mountain ash | | (x) | | | (x) | X | X | X | X | | | | 2100-2700 | Mixed stand, dense, tall trunks; mountain ash makes the second storey; shrub storey is well defined. In Inner Tien-Shan, trees are scrubby and sparse. Grass vegetation is well -defined. | Increase in area due to spruce felling, transition to 8.1 is possible. |
| 8.5 | Spruce + short grass | | | (x) | | | X | X | X | X | | | | 2200-2600 | Pure stand, well-developed trees, tall trunks, grows in blocks, shrub storey is poor, abundant motley grass | Decrease in area due to spruce felling, transition to 8.7 is possible |
| 8.6 | Levee spruce | | (x) | (x) | | | X | X | X | X | X | X | X | 1700-2800 | Mixed sand, well-developed; fir, ash, poplar, willow, birch; shrub storey is well-developed, versatile grass vegetation | Decrease in area due to man-made pressure, transition to 10.6 is possible |
| 8.7 | Open shrubby spruce | | (x) | (x) | | | X | X | X | | X | | X | 2200-2600 | Pure stand, grows in blocks, great number of openings occupied by well-developed shrubs; grass cover is abundant and versatile | Increase in area due to man-made pressure, transition to 11.0, sparse forests (pasture) is possible |
| 8,8 | Spruce + juniper | | (x) | (x) | | | X | X | X | X | | | | 1700-2900 | Mixed sand, thinned, a great number of glades; a well-defined shrub storey, versatile grass vegetation | Decrease in area due to spruce felling, transition to 7.5 is possible |
| 8.9 | Rocky spruce | | (x) | (x) | | | X | X | X | X | X | X | X | 2000-2800 | Pure stand, grows in small blocks, poorly-developed; shrub storey is poorly developed; versatile grass cover. | The stand is stable |
| **Fir stands** | | | | | | | | | | | | | | | | |
| 9.1 | Fir with additional moisture | | | X | | X | | | | X | | | | 1800-2500 | Pure and mixed stand with birch, well-developed, tall, thick trunks; shrub storey is poorly developed, versatile mesophilic grass | Prohibit grazing, limit logging and commercial wood harvesting |
| 9.2 | Fir + mossy motley grass | | | X | | X | | | | X | | | | 1800-2400 | Mixed stand, well-developed, motley cover up to 50%, versatile shrub storey, thinned grass | The stand is relatively stable, in case of man-made pressure, transition to 9.3, 9.4 |
| 9.3 | Fir + spruce and deciduous | | | X | | | | | | X | | | | 1400-2100 | Mixed stand, well-developed; shrub storey is poor, thinned grass | Decrease in area due to tree felling, transition to 9.4, 9.2 is possible |
| 9.4 | Fir + spruce and shrub | | | X | | | | | | X | | | | 1500-2200 | Mixed stand, short trees, grows in groups, open sites are occupied by developed shrubs, grass cover is poor | In case of man-made pressure, transition to 11,0, sparse forests (pasture) is possible |
| 9.5 | Fir + levee spruce | | | X | | | | | | X | X | X | X | 1700-2300 | Mixed stand, well-developed, birch, ash, grows evenly across the area; shrub storey is poor, thinned grass | Decrease in area due to man-made pressure, transition to 10.6 is possible |
| 9.6 | Rocky fir | | | X | | | | | | X | | | | 1600-2700 | Mixed stand, thinned, scrubby, spruce, maple, birch, grows in groups, open sites are occupied by shrubs, poor grass cover | The stand is stable; in case of man-made pressure, transition to 11.0 is possible |
| **Floodplain and levee forests** | | | | | | | | | | | | | | | | |
| 10.1 | Sea buckhorn + motley grass | X | X | X | X | X | X | X | X | X | X | X | X | 1200-2400 | Pure or mixed stand, grows in groups or evenly across the area, well-developed grass | The stand is stable, in case of man-made pressure, transition to sparse forests and pastures is possible |
| 10.2 | Willow + motley grass | X | X | X | X | X | X | X | X | X | X | X | X | 700-2500 | Pure or mixed stand, grows in groups or evenly across the area, shrub storey is well-developed, thinned grass | The stand is stable, in case of man-made pressure, transition to 10.1, 10.3 or 10.7 is possible |
| 10.3 | Poplar | | X | X | X | X | X | X | X | X | X | X | X | 1000-2700 | Pure or mixed stand (willow), grows in groups or evenly across the area; versatile grass | Decrease in area due to man-made effects, transition to 10.7 is possible |
| 10.4 | Oleaster + shrubs | | | X | X | X | X | X | X | X | X | X | X | 700-1400 | Pure or mixed stand, low-density, thinned, grows in groups, a well-developed shrub storey, thinned grass | Decrease in area due to man-made effects, transition to 10.7 is possible |
| 10.5 | Stream birch | | | X | | | X | | X | X | X | X | | 1800-2400 | Pure or mixed stand, well-developed, grows in separate groups, poorly-developed grass | Decrease in area due to man-made effects, transition to sparse forests is possible |
| 10.6 | Mixed tree levee forest | X | X | X | X | X | X | X | X | X | X | X | X | 1000-2400 | Mixed stand, well-developed, grows in groups or evenly across the area; shrub storey is poorly developed, grass is well-developed | Decrease in area due to the man-made effects, transition to 10.7 or sparse forests is possible |
| 10.7 | Mixed shrub and floodplain forest | X | X | X | X | X | X | X | X | X | X | X | X | 700-2700 | Mixed stand, grows in groups, well-developed grass | Decrease in area due to the use of land for agricultural crops (rice, etc.) and pastures |
| **Shrub forests** | | | | | | | | | | | | | | | | |
| 11 | Bush thickets on mountain sides | X | X | X | X | X | X | X | X | X | X | X | X | 700-3000 | Mixed stand, well-developed, highly thinned grass, lowlands are dominated by steppe flora, uplands – by subalpine flora | Increase in area due to higher man-made pressure in all forest ecosystems |

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