



Forestry Development and Best Practices  
of Forest Management in Greater Central Asia

## **Forestry Development and Best Practices of Forest Management in Turkmenistan**



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Editors: LONG Chao KONG Zhe PENG Peng XIAO Jun SUN Weina

Editors-in-charge: LIU Kaiyun ZHANG Jian

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# Forestry Development and Best Practices of Forest Management in Greater Central Asia

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# Map of the World







## Map of the Asia





# Foreword

Strong social, economic and cultural connections exist among economies across Central and Northern Europe, Central Asia, the Middle East, North Africa and Greater Central Asia (GCA). The GCA region, in the widest sense, encompasses Kazakhstan, Tajikistan, Uzbekistan, Turkmenistan, Kyrgyzstan, Mongolia and western China and harbors unique biodiversity. Various species of fauna and flora mingle with endemic species not found elsewhere.

Forests in this region are vital natural resources that provide important environmental services including climate regulation, soil protection, clean water supply and many more. They also play a leading role in socio-economic development, supplying people with food, fuel, medicinal plants and recreational areas. Meanwhile, forests are suffering the effects of increasingly severe land degradation and desertification due to a host of natural and human factors. The most significant of these factors include overgrazing, land clearing for agricultural use, illegal logging and poaching, firewood collection, excessive water consumption, and insufficient financial and technical support.

Economies in GCA are actively involved in international and regional commitments focused on climate change adaptation, biodiversity conservation and desertification control. However, a comprehensive overview of the history, status and outlook of forestry development in GCA has been lacking.

Given this, the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet) identified the GCA region as one of its seven geographical priority areas for strategic interventions. Desk research and field surveys have been conducted since 2014 with the financial support of the Department of Science and Technology (DST) of the State Forest Administration of China (SFA), the active involvement of officials from different forest authorities, as well as consultants from international organizations, which has culminated in a series of six books being published.

This book, one of the six, gives a holistic overview of the current state of forests and forestry, the contribution of forests to economic development, forestry policies and legislation, and forestry education and research, in Turkmenistan. In particular, sustainable forest management best practices in relation to soil and water conservation, desertification control, forest fire and disease prevention, biodiversity conservation and rehabilitation of degraded forests etc., are covered in-depth.

We hope that this book will be of value to foresters, from policy makers to grass root practitioners and those working in forest authorities, academia, international organizations and civil society organizations who have an interest in forestry development in Turkmenistan.



**APFNet Executive Director**

# Contents

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Foreword

List of figures

List of tables

Abbreviations

|                  |  |           |
|------------------|--|-----------|
| <b>Chapter 1</b> | <b>Current state of forest and forestry</b>                                  | <b>01</b> |
| 1.1              | General information of the economy   | 03        |
| 1.2              | Land use status  | 04        |
| 1.3              | Extent of forests and woodlands  | 06        |
| 1.4              | Afforestation and reforestation  | 09        |
| 1.5              | Urban forestry   | 10        |
| 1.6              | Community-based forestry   | 10        |
| 1.7              | Internal and external factors affecting forests and forestry                 | 10        |
| <b>Chapter 2</b> | <b>Contribution of forests to economic development</b>                       | <b>11</b> |
| 2.1              | Economic and environmental significance of forests and woodlands             | 13        |
| 2.2              | Financing and investment in forests and forestry                             | 13        |
| 2.3              | Forests, livelihoods and poverty   | 14        |
| <b>Chapter 3</b> | <b>Forestry policy and legislation</b>                                       | <b>15</b> |
| 3.1              | Policy, legal and institutional framework                                    | 17        |
| 3.2              | Short-term and long-term planning for forest development                     | 20        |
| 3.3              | The history and future of forestry development                               | 21        |
| <b>Chapter 4</b> | <b>Best practices for sustainable forest management</b>                      | <b>23</b> |
| 4.1              | Soil and water conservation  | 25        |
| 4.2              | Desertification control  | 27        |
| 4.3              | Rangeland degradation control  | 28        |
| 4.4              | Salinization control (Aral Sea zone)   | 28        |
| 4.5              | Forest fire and disease prevention   | 29        |
| 4.6              | Comprehensive utilization of forest resources and non-timber forest products | 29        |

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## Forestry Development and Best Practices of Forest Management in Turkmenistan

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|                         |  |           |
|-------------------------|--|-----------|
| <b>Chapter 5</b>        | <b>Forestry education and research</b>                       | <b>31</b> |
| 5.1                     | Forestry education   | 33        |
| 5.2                     | Technical capacity of forestry authorities                   | 34        |
| <b>Chapter 6</b>        | <b>Forestry projects and initiatives</b>                     | <b>35</b> |
| <b>Chapter 7</b>        | <b>International forestry cooperation mechanisms</b>         | <b>39</b> |
| <b>Chapter 8</b>        | <b>Challenges and opportunities for forestry development</b> | <b>45</b> |
| <b>Annex</b>            |  | <b>49</b> |
| <b>References</b>       |  | <b>51</b> |
| <b>Acknowledgements</b> |  | <b>53</b> |

## List of figures

|            |                                  |    |
|------------|----------------------------------|----|
| Figure 1-1 | Land degradation forms           | 05 |
| Figure 1-2 | Forest cover map of Turkmenistan | 08 |

## List of tables

|           |   |    |
|-----------|---|----|
| Table 4-1 | Species planted in afforestation of Aktokay | 26 |
| Table 5-1 | Forest research action plan                 | 33 |

## Abbreviations

|             |  |
|-------------|--|
| APFNet      | Asia-Pacific Network for Sustainable Forest Management and Rehabilitation            |
| BSAP        | Biodiversity Strategy and Action Plan  |
| CBD         | Convention on Biological Diversity   |
| FAO         | Food and Agriculture Organization  |
| GEF         | Global Environment Facility  |
| GTZ         | German Technical Cooperation   |
| GTZ/GEOPLAN | Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation) |
| JSC         | Joint Stock Company  |
| NIDFF       | National Institute of Deserts, Flora and Fauna                                       |
| NTFP        | Non Timber Forest Product  |
| SFF         | State Forest Fund  |
| SFM         | Sustainable Forest Management  |
| TACIS       | Technical Assistance to the Commonwealth of Independent States and Georgia           |
| UNDP        | United Nations Development Programme   |
| UNEP        | United Nations Environment Program   |
| WWF         | World Wildlife Fund  |





## Chapter 1 Current state of forests and forestry

- 1.1 General information of the economy
- 1.2 Land use status
- 1.3 Extent of forests and woodlands
- 1.4 Afforestation and reforestation
- 1.5 Urban forestry
- 1.6 Community-based forestry
- 1.7 Internal and external factors affecting forests and forestry



### 1.1 General information of the economy

Turkmenistan is the second largest economy among the five Central Asian economies. Turkmenistan lies in the southwestern part of the region in the desert zone, northward from the Kopetdag ridge of the Turkmen-Khorasan mountain system, between the Caspian Sea in the west and the Amudarya River in the east, and borders on the Republic of Kazakhstan in the north, the Republic of Uzbekistan in the northeast and the east, Afghanistan in the south-east, and the Islamic Republic of Iran in the south. The Caspian Sea is the western natural border of the economy.

The sandy deserts of Turan lowland occupy northern and central parts of the territory of Turkmenistan, including Central Karakums, Zaunguz Karakums and South-Eastern Karakums (about 80% of the whole territory).

Mountains occupy about 20% of the surface of the economy in the south. The sandy deserts change for the hills and foothills of the Kopetdag Mountains that are the medium altitude mountains reaching to 2,942 m above the sea level. Moreover, there are the separated mountain ridges of Small and Grand Balkhany. The Kojtendag Mountains are located in the east, as well as the highest peaks of the economy (up to 3,140 m above the sea level) available in the economy.

Sharp continental, extremely dry climate is typical for Turkmenistan. It is characterized by frequent considerable fluctuations of temperature both within one day and within a year. The dryness of climate is resulted from very scarce precipitation, low air humidity and low cloudiness. The annual amplitude of average temperature varies within 21-34°C.

Turkmenistan forests grow in severe climatic conditions on the territory, which is a part of the geographical zone of extended deserts in the northern hemisphere of the globe.

Forests are essential solutions to adaptation and mitigation of climate change through the sustainable forest management that would increase the resilience of ecosystems and societies and optimize the role of forests and trees in absorbing and storing the carbon while also providing other environmental services.

Climate change poses a serious threat to the planet and to forests and forest-dependent people, and there is a risk that actions will fall short of what is required. Climate change may also lead to increase threat to tree health and to ecosystem resilience.

Climate change will have severe consequences for the Central Asian countries and negatively add to already suboptimal conditions for sustainability of agroforestry and natural

## Forestry Development and Best Practices of Forest Management in Turkmenistan

ecosystems. IPCC report estimates further desiccation due to longer and stronger drought periods. Today, approximate 50% of the population depends on various forms of vegetation cover on the dry lands before the background of a still rapidly growing population. As the dry-forests of today are expected to segue into less productive mixed forest-grassland and grassland formations. Farmers, smallholders and pastoralist communities will face difficulties to maintain productivity, thereby causing further degradation of ecosystems. A dominant land use in Turkmenistan is formed by the so-called pasturelands, where a number of tree species are selectively retained from the natural vegetation. Thus they provide products (e.g. meat, milk, wool) as well as protective services to crops and animals through the microclimate, as well as through hydraulic equilibration in the soil (hydraulic lift), thereby increasing the effective soil volume participating in the annual water balance. The functions of old trees, however, cannot be readily replaced by young ones, thereby adding to the vulnerability of land use under climate shifts.

Climate plays a crucial role for forestry and agriculture, so detailed climate scenarios for the coming decades on a local scale could decisively help to alleviate these problems: 1. by helping the single farmers in adapting their cultivars to maintain productivity and income; 2. by upholding the functionality of the regional agroforestry; and 3. by giving the right directions of the overall planning in the socio-economic development.

Dry lands of Turkmenistan are fragile ecosystems. The rehabilitation of degraded lands in dry zones and submountain areas of Turkmenistan is a long-term process. Deforestation and degradation of tree and shrub formations in the past (mainly for conversion to agricultural use) and overexploitation of forests and woodlands (through fuelwood collection and overgrazing) are among the major causes of soil degradation in dry areas of Turkmenistan.

The exceptionally dry and harsh continental climate, with the high deficit of humidity and intensive evaporation, accompanied by periodic dusty winds, is the main feature of the Turkmenistan climatic condition. The evaporation exceeds the precipitation more than 20 times. Because of the droughts and high air temperatures, the agricultural work as well as planting and growing of trees, bushes and woody vegetation, relies only on the artificial irrigation.

Wildlife (animals and birds) in the forest zone has increased over the past years, since the food supply is improved because of the regular watering. As the consequence of this development, the potential for preservation of the biodiversity is further enhanced within the forest ecosystems.

### 1.2 Land use status

The total land area of Turkmenistan is 49.1 million ha. In 2006, the area of agricultural lands was 42.9 million ha, of which 38.5 million ha or 95.7% were the pastures, over 1.9 million ha

or 4.3 % were the irrigated lands, and 2.5 million ha or 0.24% were perennial plantations.

The arable lands are expanded mainly at the expense of pastures. The land reclamation reserve, consisting of the area suitable for further development, contains mainly pasture lands. This land reclamation reserve comprises 17.7 million ha. These lands are located in ancient delta and foothill plains. Depending on its natural fertility, the soils may be characterized as follows (in declining order of quality): light sierozems (gray earth), meadow sierozems irrigated over the long time and meadow-takyr-like soils that all are used mainly in irrigated agriculture; takyrs (gray-brown) soils are used as pastures.

Brown soils and dark colour sierozems are widely spread in mountainous regions of Turkmenistan and occupy about 5% of the economy territory. These soils are used as pastures and for dry land farming of grain crops in some places. The irrational use of land resources may conduce to degradation of soil and reduction of its fertility.

Land degradation processes have various local and zonal signs. Secondary salinisation of irrigated lands, waterlogging, wind and water erosion, and technogenic desertification are the most frequent signs.

Natural and anthropogenic factors of land degradation are closely connected with the agricultural development of territories in the arid climate. Therefore, the environmental problems resulting from agricultural activities are very concrete. According to the data of the National Institute of Deserts, Flora and Fauna of the Committee on Environment Protection and Land Resources of Turkmenistan, 446,000 km<sup>2</sup> of land (91.4% of the territory of Turkmenistan) is exposed to the different forms of degradation. As shown in Figure 1-1, about 75% land degradation directly relates to the loss of ground vegetation mainly due to anthropogenic factors (agriculture, overgrazing and fire). It also depends on climatic conditions, especially in drylands, where, consecutive dry years cause the reduction of ground cover vegetation biomass.

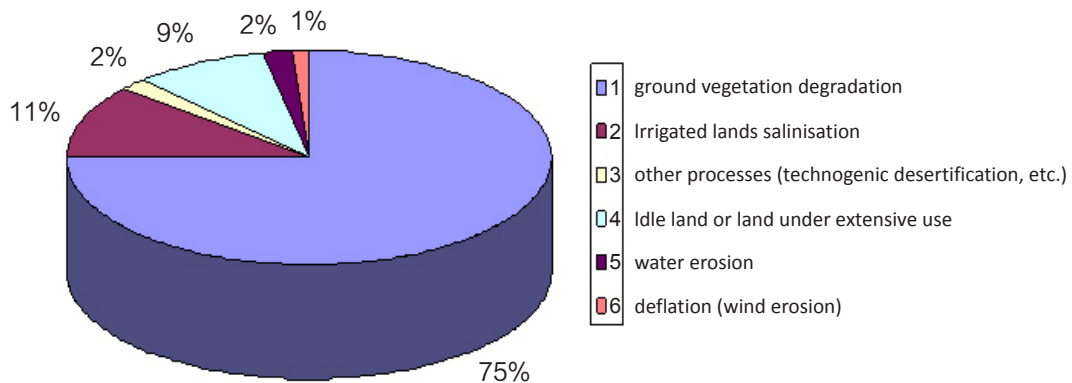


Figure 1-1 Land degradation forms

### 1.3 Extent of forests and woodlands

Turkmenistan is a lower forests cover economy (economies with less than 10 percent of their lands covered by forest, FAO). According to forest inventory data conducted in 1988-1989, the total area of State Forest Funds (SFF) of Turkmenistan was 9.9 million ha that correspond to approximate 20.3% of total area of the economy. Forest-covering area occupies 4,127,000 ha or 41% of total area of the SFF or 8% of total area of the economy.

The forests in Turkmenistan execute protective functions, so they are referred in I group. From the total area of the forest fund, 6,458,100 ha are sent to stockbreeding in the long-term use. Forest-covering area in the category of protection is distributed as:

- Water protection (on coast of the rivers) 26,200 ha;
- Soil protection 3,081,600 ha;
- Sanitary-hygienic and recreational 3,800 ha;
- Specifically-protected natural territory 789,200 ha;
- Other 226,000 ha.

In Turkmenistan, there are three main types of forests: mountain forest, desert forest and tugai (riparian) forest.

#### 1.3.1 Mountain forest

The basic species is Juniper Turkmenian (*Juniperus turcomanica*), which is the main component of biocenosis and ecosystem of Kopetdag. The overall area of forest stand in Kopetdag is 66,200 ha, including 400 ha of young growth, 6,900 ha of half-mature forest, 15,100 ha of near-mature forest and 43,800 ha of mature and over mature forest. Timber reserves are 1.32 million m<sup>3</sup>, of which 1.01 million m<sup>3</sup> are near-mature and mature forest.

Walnut (*Juglans regia*) grows mainly in mountain forests in western Kopetdag and in the valleys of the rivers Sumbar and Arvaz, and occupies a small area of only 100 ha.

The mountain forests of Turkmenistan are characterized by the rich spectral variety and are a potential source of valuable raw materials for timber products (juniper, maple, hawthorn, almond, barberry, celtis, wild rose, jujuba, etc.).

The South Kopetdag region has pistachio stands at the southwestern Turkmenistan. They are the continuation of *Pistacia vera* population of the Parapamiz mountain system entering into Turkmenistan through two patterns of distribution: one is located in the East of Kooshka ("the Kooshka grove") and the second in the west of Kooshka (the Pool grove, Khatoom grove and the Badhiz forest reserve all known as "Badhiz"). In this region, *Pistacia vera* populations (almost 75,000 ha) are represented by isolated and, sometimes, rare stands growing at an altitudinal range of 600-1000 m above the sea level. Pistachio (*Pistacia vera*) is a typical subtropical plant well adapted to harsh conditions of the semi-desert foothills of

Turkmenistan. It is known that there is no tree species, with exception of almond, which can withstand such a low moisture content. High temperatures during the hot dry season are bearable for *Pistacia vera*. The main bearing fruit plantings of pistachio are located on the south-west and the south of the economy, in Kooshka forest and Badhiz reserve.

*Pistacia vera* plays a great soil and water conserving role, positively influencing the microclimate of the foothills. In addition, this amazing plant is the source of the high oil-bearing pistachio nuts. Pistachio is the solely valuable horticulture of the dry nuciferous trees in Turkmenistan. Organizations of pistachio grow in quotient, and farmers of pistachio earn significant incomes.

### ***1.3.2 Desert forest***

Vegetation of desert territories of Turkmenistan is typically xerophilous (tolerant to dry conditions) with enormous amount of diverse endemic species. The main wood and shrubby species are saxaul (*Haloxylon persicum*), saxaul black (*Haloxylon aphyllum*), *Salsola richteri*, *Kalligonum*, *Ephedra*, *Ammodendron* and *Astragalus*, and saxaul white (*Haloxylon persicum*), and occupy higher relief forms with fine-grained soil. The density of the stands of saxaul white is usually less than that of saxaul black. They reach 400-500 trees per hectare on average. Saxaul black prefers dense sandy soils and tends to occupy positive relief forms. Some samples of old black saxaul can reach the height of 6-7 m and the weight of up to 1 ton. The maximum overall of biomass reaches 40 tons per hectare.

A significant part of the desert vegetation is represented by perennial herbs. They preserve a large stock of nutrition supply and are highly potential reserves for livestock breeding. The general area of saxaul stands is 688,100 ha, including 15,000 ha of young growth, 284,100 ha of half-mature forest, 320,700 ha of near-mature forest, and 67,900 ha of mature and overmature forest. The reserves of wood products reach 2,050,000 m<sup>3</sup>, 1,720,000 m<sup>3</sup> of which are of half-mature and mature forest.

Turkmenistan has a vast experience in afforesting desert areas, which is done to prevent desertification and to put these areas into economic cycles (pastures). Forest amelioration is widely used in the construction of railway in desert areas. Desert forests are of great significance to the inhabitants of sandy regions as they supply them with pastures, firewood, and building materials.

### ***1.3.3 Tugai forest (riparian forest)***

Desert floodplain forests are typical for river valleys and deltas in arid regions. Tugai mainly describes the forests in the floodplains and deltas of river in the Central Asian countries (e.g. the rivers Amudarya, Zeravshan, Tedjen, Murgap, Sumbar, and Syrdarya). Typical Tugais in Turkmenistan occur at narrow belts, with a width range from a few hundred meters to several kilometres, along rivers or canals. Nowadays, the overall area of tugai forests in Turkmenistan is 38,800 ha.



## Forestry Development and Best Practices of Forest Management in Turkmenistan

Tugai vegetation in Turkmenistan is characterized by a high capacity to tolerate very wet soils and very dry air, resistance to droughts and salts, high transpiration intensity and the disposition to grow adventitious roots (typical for vegetative propagation).

Tugai vegetation can be divided into three groups: tree tugai, bush tugai and grass tugai. With more than 230 plant species, the tugai vegetation can be considered as one of the most diverse vegetation types of the arid regions of the Central Asia. The main tree species of woody tugai are poplar (*Populus euphratica*, *P. pruinosa*), oleaster (*Eleagnus turcomanica*, *E. angustifolia*) and willow (*Salix songarica*, *S. wilhelmsiana*). They are accompanied by bushes and tall grasses, such as tamarix (*Tamarix ramosissima*), Halomodendron (*H. halodendron*), reed (*Phragmites australis*), reed grass (*Calamagrostis dubia*, *C. epigeios*, *C. pseudophragmites*), and herbs, like liquorice (*Glycyrrhiza glabra*), Apocymum scabrum, as imperator cylindrical (*Imperata cylindrical*), Arunda donax. Under favorable conditions, tugai forests are characterized by a great species diversity and a complex vertical and horizontal structure providing diverse microhabitats for animal life (Figure 1-2).

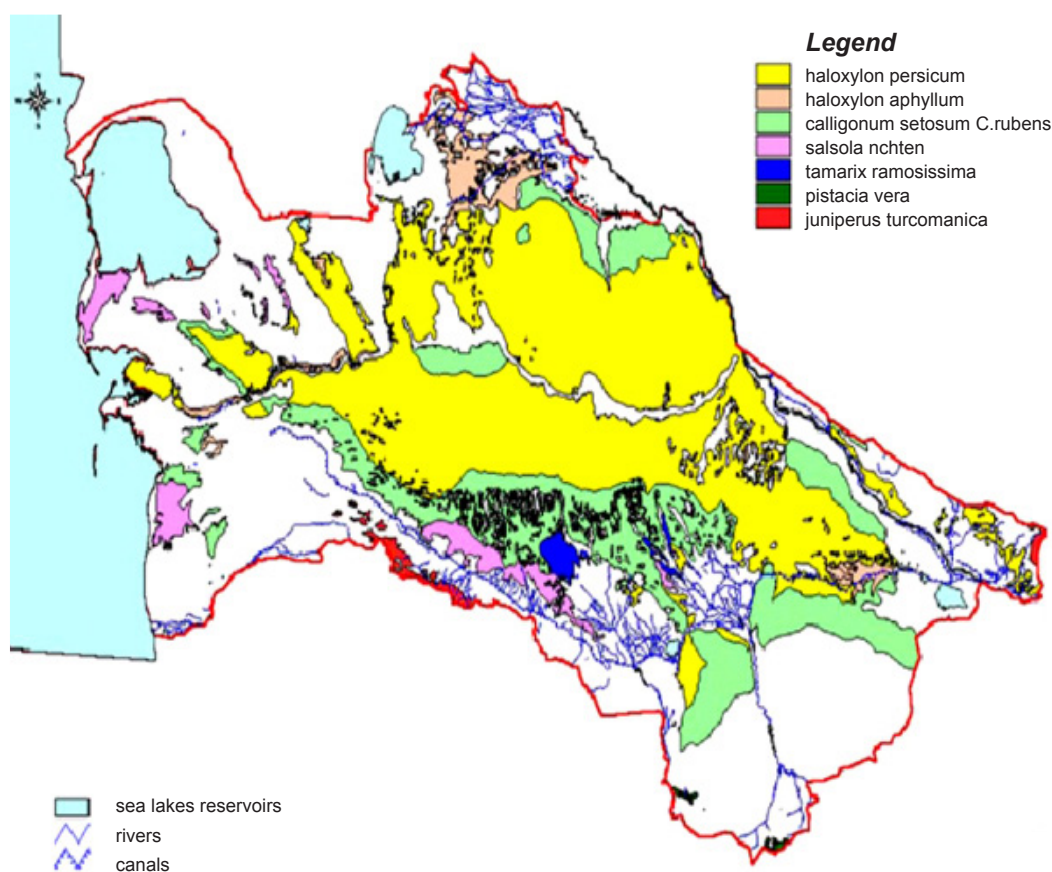


Figure 1-2 Forest cover map of Turkmenistan



## 1.4 Afforestation and reforestation

In 1998, the afforestation program launched in Turkmenistan was foreseen establishing of forests in deforested areas of the economy. This afforestation mainly is aimed at mitigating drought, improving microclimate conditions, and preventing land degradation. In severe climatic conditions, such as hot and dry summer and cool winter, planting trees and growing forests require more efforts due to its continental climate with insufficient rainfalls, and frequent considerable fluctuations of temperature both within day and within a year. Thus, sustainable forest management in arid climate of Turkmenistan is affected by a number of factors, of which the primary ones include climatological conditions at a level of both stand microclimate and mesoclimate of the region.

To create Turkmenistan into blossoming gardens and plant forest zones in the suburban areas around the capital Ashgabat, and regional and district centers, every year in spring and fall seasons, the ministries, various organizations and branches, the mayor's offices of Ashgabat city and regional ones planted millions of seedlings and took care of them to grow. Along with planting trees, the construction and maintenance of railways and highways, other building projects which is important for living have been implemented in the economy that stabilized sands.

In Turkmenistan, it has become a tradition to plant deciduous, coniferous and fruit bearing trees. The implementation of the tasks on turning into green zone and enriching its beautiful nature around Ashgabat and in the regions will be continued. Turkmenistan planned to plant about 3 million of trees every year, including deciduous, coniferous and fruit bearing trees and grapes. Among them:

- The Ministries and branch departments, and Ashgabat municipality have been tasked to plant 1.5 million trees in the area between Anew and Baharly towns;
- Regional municipality within the area of their regions was instructed to plant 1.5 million saplings. 20% of the total plants would include fruit bearing trees and grapes.

In order to meet this goal, the CEPLR allocated land plots for Ashgabat and regional municipality to plant, jointly with the ministries and organizations of Turkmenistan, deciduous, coniferous and fruit bearing trees and grapes.

The ministries, branch departments, Ashgabat and regional municipality were given a task of improving the cultural surroundings of the places for planting trees, purchasing seedlings, taking care of them and setting up the system for drip irrigation.

In the afforestation activities planted many species of trees and bushes including coniferous trees (*juniperus turcomanica*, *juniperus arizonica*, *juniperus virginia*, pine tree, biota, thuja), deciduous trees (mulberry tree, plane tree, Syrian ash wood, poplar, elm tree, yellowwood, willow, acacia, ailanthus), fruit bearing trees (apricot, apple, pear, cherry plum, Turkestan

## Forestry Development and Best Practices of Forest Management in Turkmenistan

soap root, plum, oleaster) and other trees. These trees are recommended for planting in Turkmenistan following the guidelines and standards on the specifics of weather and soil in each region.

### 1.5 Urban forestry

Greenbelts around Ashgabat, the capital city of Turkmenistan and other provinces, have also been increasing since the late 1990s. More than 70 million seedlings were planted during the 1998-2015 period under the Greenbelt Programme, including 40 million seedlings planted in and around Ashgabat. Committee on Environment Protection and Land Resources (CEPLR) in collaboration with Forestry Administration establishes an annual forestry plan, produces and sells seedlings and monitors the implementation of afforestation activities in and around cities and settlements.

### 1.6 Community-based forestry

In Turkmenistan, community-based forestry is developed on the level of growing fruit trees or gardens in small-sized plots. People are growing fruits and nuts for their own needs and realizing them in markets. According to the *Forest Code of Turkmenistan*, it is planned to give forestlands for lease: short-term lease for 5 years and long-term one for 50 years. Since the *Forest Code of Turkmenistan* was accepted, recently there was no enough experience to lease forestlands. Mainly in desert areas, farmers are practicing and using the method of pastureland rotation for livestock grazing.

### 1.7 Internal and external factors affecting forests and forestry

The internal factors affecting forests and forestry include lack of experiences in growing high quality seedlings with containers (closed root system) that can be used for afforestation and tall seedlings for planting in cities and towns or around buildings. Construction of modern greenhouses and nurseries with high production capacities of planting stock with closed and bare roots is required. The external factors are dry climate, lack of precipitation, poor soils and difficulties related to growing of endemic species such as *juniperus turcomanica*. Insects in nature damage mainly the seeds of this species, and technology of their artificial growing is not yet developed well. Therefore, it requires further research and experience exchange with other institutes.



## Chapter 2 Contribution of forests to economic development

- 2.1 Economic and environmental significance of forests and woodlands
- 2.2 Financing and investment in forests and forestry
- 2.3 Forests, livelihoods and poverty



### 2.1 Economic and environmental significance of forests and woodlands

All afforestation activities in Turkmenistan are carried out in accordance with the National Forestry Program (NFP) that includes all activities, participants, and responsible organizations. The Forestry Administration is a self-financed organization, meaning that the Forestry Administration is not financed from state budget. In afforestation, activities within the economy involve most of the ministries, organizations, enterprises and many other state organizations. They plant trees with their own funds. Every year government issues a decree on planting trees, and according to such decree, all the organizations establish plantings in the plots belonging to them. Due to the fact that organizations plant trees with their own funds, it is difficult to estimate the expenses in the economy.

All forests in Turkmenistan perform the protection functions such as soil and water erosion, combating of desertification, conservation of biodiversity, etc. Commercial wood production is not developed, as enough stands are not available in the economy. Commercial wood is imported from abroad. Wood is mainly imported by private companies; therefore, insignificant Non-Timber Forest Products (NTFPs) such as pistachio, walnut, berries, firewood, and medicinal herbs are available only.

### 2.2 Financing and investment in forests and forestry

Financing in forest management and forestry in Turkmenistan is provided by ministries and organizations from their funds. Most of the ministries and organizations have their own plots where they plant trees and establish forest tree nurseries. Only special afforestation programme is financed from state budget. Afforestation area in Northern Province close to the Aral Sea zone in the territory of Turkmenistan is financed from budget by decree of Government. Financing this area for afforestation only within few years includes purchasing seedlings, digging planting holes, using techniques and initial watering. Other afforestation activities are financed with own funds of organizations.

Cost of afforestation of 1 ha area is within the range of 15,000-20,000 manats (Turkmen currency) or in equivalent 4,286-5,714 US\$ depending on the current exchange rate. The cost covers all planting activities, including the initial watering of seedlings.

The Forestry Administration of Turkmenistan is a self-financed department, as well as a main body responsible for growing and providing forest tree seedlings, and realizing them to other organizations. Funding of salaries/wages of the department staff and workers is done through production and sale of forest by-products such as growing agricultural crops (cotton, wheat, vegetables, fruits, and husbandry) to generate additional incomes besides the seedlings.

### 2.3 Forests, livelihoods and poverty

In the past, it was vital to collect firewood and berries for livelihood in Turkmenistan. Commencing from 1991, the forest felling is prohibited. Only sanitary felling is allowed as a care of forest plantations. Measures taken in this respect, as well as provision of the population with natural gas helped to save arbor-shrubbery seminal plants and created favorable conditions for natural rehabilitation of forests. Local people mainly depend on pasturelands that they are using for grazing cattle.

The most concrete potential for increasing forest-related benefits for local communities is to create leaseholds in forests where a big amount and low investments are required for harvesting the NTFPs. In Turkmenistan, the most important of these NTFPs are pistachio, walnuts, and medicinal herbs. However, there is a growing awareness amongst the forest-dependent villagers about the importance of group formation for gaining access to these leaseholds. As the leaseholds over NTFPs represent one of the main options for the forest-dependent people, it will be important to ensure that they are accountable to the local forestry administration.



## Chapter 3 Forestry policy and legislation

- 3.1 Policy, legal and institutional framework
- 3.2 Short-term and long-term planning for forest development
- 3.3 The history and future of forestry development





### 3.1 Policy, legal and institutional framework

The creation of conditions for the rational use of forest resources, their regeneration, protection and preservation, raising the ecological and economic potential of forests and wooded lands had been defined as the main responsibility of governmental bodies and organizations. The forestry policy is determined by the Committee on Environment Protection and Land Resources and the Cabinet Ministries of Turkmenistan, which holds its regular sessions. The Government pays a special attention to the protection of lands covered by trees in the view of establishing new protected areas and planting new trees.

Out of the Cabinet of Ministers, which is the supreme body on forestry and forest management, the main governmental institutions responsible for forestry-related activities and forestry and forest management are the Committee on Environment Protection and Land Resources (CEPLR) and its subordinated bodies, the Forestry Department (Forestry Administration of the CEPLR), the National Institute of Deserts, Flora and Fauna (NIDFF), and the Inspection of Natural Parks Protection and Forestry Seeds Growing.

Other bodies are involved in particular in planting trees and tending seedlings and young plantations.

The National Programme determines the areas allocated for planting the forestry belts and the quantity of saplings that need to be planted until 2020 in each region.

The implementation of the activities related to planting protection forestry belts is be monitored by the CEPLR of Turkmenistan.

#### ***3.1.1 Functions of the Committee on Environment Protection and Land Resources of Turkmenistan***

The CEPLR of Turkmenistan is the specially authorized state body conducting state policy and controlling over protection and rational use of natural resources. The Committee provides realization of the state ecological policy and state programs on nature protection, and carries out the state control over observance of the nature protection legislation, over protection of ecological systems, surface and underground waters, atmospheric air, flora and fauna, marine environment and natural resources.

The Committee carries out the state ecological expertise of design materials on construction projects, enterprises reconstruction and other economic objects, develops specifications of natural resources payment and emissions of polluting substances to the environment, and licensing of all types of ecological activities and defines quotas for using objects of flora and fauna.

## Forestry Development and Best Practices of Forest Management in Turkmenistan

Before 1999, the forestry and forest growing activities had been executed by the Forestry Department of the former Ministry of Environmental Protection, and the forestry work and related activities were financed from the state budget. In 1999, in the process of restructuring, its functions were passed to the self-financed Joint Stock Company (JSC) "Gok Gushak" (Green Belt), which was established for the implementation of those specific functions. Up to the year 2008, "Gok Gushak" had been running 20 forestry enterprises, which were restructured into the system comprising 14 forestry organizations with some 1,400 employees. Among engineering and technical personnel, there were specialists specifically qualified in forestry, as well as agronomists, geographers, biologists and others. As for province level, there are also forest nurseries and 14 foresters: 1 in Balkhan Province, 2 in Akhal Province, 1 in Mary Province, 2 in Lebap Province, and 1 in Doshoguz Province. It had established and extended the park zone in the foothills of Kopetdag; planted drought-resistant plants along roads and highways and on the banks of the Karakum Canal and in Circum-Aral area; provided seedlings of forest and horticultural crops; and provided control over sanitary felling and rehabilitation of mountain forests.

At the present, the Forestry Administration is a self-financed organization under the State Committee on Environment Protection and Land Resources. Self-financing is based on establishing nurseries and growing seedlings, on cotton, cattle growing, and other activities, which are not directly linked with forest management. During the previous period, activities of the forestry sector were centrally planned and financed by the Government.

The other key institutions under the CEPLR contributing to the forest and other wooded land management are:

- National Institute of Deserts, Flora and Fauna (NIDFF) conducting scientific and research activities linked to forestry (three laboratories);
- Inspection of Natural Parks Protection and Forestry Seeds Growing, implementing and controlling trees planting and seedlings growing (nursery).

### ***3.1.2 The policy in the field of forestry***

Forests of Turkmenistan are in exclusive state property. The existing *Forest Code of Turkmenistan*, accepted on March 25, 2011, is an adjusting document in the field of forests and forestry, and defines the principles and actions on rational use of forests, their protection and increase of ecological, economic and social potential of Turkmenistan. However, with provision for economic change and ripeness of modern situation, there is a need in elaborating and reforming the *Forest Code of Turkmenistan* so the project of new edition is prepared.

The *Forest Code of Turkmenistan* complements the following laws which form background legislation on guard, control and use of natural resources, including forest and vegetation of the economy:

- *Forest Code of Turkmenistan* (2011);

- *National Forestry Program* (2013);
- Law about *State Specifically-protected Natural Territory* (2014);
- Law about *Protection of the Atmospheric Air* (2015).

The main trends of politicians are in the field of development of forestry facilities of Turkmenistan which can be briefly stated as follows:

- Efficient protection of existing forest resources and vegetation cover and their biological aspectual variety;
- Reconstruction of degraded forests and vegetative resource by means of acceptable methods;
- Bookmark of the multi-objective forests plantings in the 21<sup>st</sup> century countrywide to enlarge the forest-covering area about 10 million ha. Annex shows the legislation regulatory documentation which has to be developed in accordance with the *Forest Code*. Some of these documents have already been prepared and must be approved by Ministry of Justice.
- Ensuring the participation of different state organizations and local representatives, as well as their associations into the organization of making the forestations and complex action on technical maintenance;
- Undertaking action on forestations to add special importance and priority to organization of the timber belt around greater city and populated points, protection of the main engineering buildings (freeway, railroad tracks, channel), agricultural areas and settling protection from desertification, fight with destruction of river coast, high level of underground water and salty ground;
- Improving the methods growing in forestry nursery and increasing production seedling for the reason increasing quality and necessary amount required for organization and realization of the above-mentioned plan on bookmark of the timber plantings;
- Fortifying the public consciousness, state formation and practical education in the field of timber and the other resource environments;
- A constant participation of the institutions of Turkmenistan, concerning with questions on forestry, in international cooperation and program and procedures cooperation;
- Improving the possibility for structured development and skills of the personnel of the Forestry Administration.

The *National Forestry Programme (NFP) of Turkmenistan* is an integrated part of the *National Strategy of Turkmenistan on Climate Change*. As noted in such *National Strategy*, the forestry was the raw material source for various products including foods, public health, natural dyes and decoration plants. Therefore, the forestry has a particular value and is of a particular importance.

The *NFP* developed in Turkmenistan is also an essential part of the national environment strategy developed to protect environment, increasing and responsibly managing the economy natural resources and opportunities as well as resolving the issues of preserving

## Forestry Development and Best Practices of Forest Management in Turkmenistan

ecology and providing for the food security within the economy. The far-reaching complex measures on forestry that were in the process of implementation in the economy were aimed at safeguarding state benefits and maintaining the economy ecologic health.

The main objective of the *NFP* was to assist in turning the economy into blossoming gardens, to create favorable living conditions for people by means of the implementation of the far-reaching ecological policy, and to improve the protection of forests, their use and restoration to establish a sustainable system for efficient forestry management.

The main tasks stipulated in the *NFP of Turkmenistan* are as follows:

- Introduce new innovational technologies into production to implement the large-scale activities aimed at transforming the economy into blossoming gardens;
- Establish a forest zone on the coastal area of the Aral Sea in Turkmenistan to mitigate the damage caused by salt coming from the dried bed of the Aral Sea;
- Continue planting trees at the “Awaza” National Tourism Zone and transform it into a forest covered area;
- Stabilize moving sands and plant forests in the deserts to enrich the flora of the Garagum desert and prevent desertification process;
- Plant protected forest belts in agricultural land fields to safeguard the agricultural production in the face of climate change and improve the quality and quantity of harvests;
- Plant and grow enough amount of flowering and decorative trees and plants for beautification of towns, settlements and villages;
- Improve the forestry registration system to ensure sustainable management of forestry in Turkmenistan.

### 3.2 Short-term and long-term planning for forest development

#### 3.2.1 Short-term planning for forest development

In Turkmenistan, the short-term planning is stipulated in the *NFP*, in which all planned activities are distributed and scheduled for the period of 2013-2020. According to the *NFP*, the following activities are to be implemented:

- Establishing new forest areas through growing 3 million trees annually;
- Establishing protective forest belts around the agricultural fields;
- Producing local and introduced forest species in the amount of about 6 million seedlings by 2020;
- Developing legislation and regulatory documentation (Annex);
- Undertaking scientific researches required for forestry development;
- Preparing forest tree seeds depending on species;
- Undertaking afforestation activities in the Aral Sea region in Turkmenistan;
- Undertaking afforestation activities in the tourist zone “Avaza” (Caspian Sea);
- Conducting forest inventory by 2020.

### *3.2.2 Long-term planning for forest development*

- Continuously implement the measures aimed at combating desertification through afforestation, improving pastureland and biodiversity conservation;
- Developing and introducing the best forestry practices, and advanced forestry techniques;
- Growing the high quality planting stock.

## **3.3 The history and future of forestry development**

In Turkmenistan, the study and description of forests was initiated at the end of the 18<sup>st</sup> century and was accomplished by the end of 1960s. After disintegration of the USSR, the studies on all the forests of the enterprises in Turkmenistan have not been conducted since 1990. The last forest inventory was held in 1988 by the Pribaykalskiy (Russia) forest enterprise. The status on Turkmenistan's forest resources was given based on these materials.

All the forests in Turkmenistan by resolution of government are referred to the I group, so the main use is not to lead and is not planned. The forests in Turkmenistan in arid climatic conditions have enormous ecological importance. So in new economic condition, importance of forest constantly increases, as requires defining the concrete tasks for this branch and describing forest activities accurately. For the purpose of sustainable forest development, sanitary chopping in annual volume of not more than 10,000 m in the population of the economy is conducted free of charge, and so in recent years decreased the illegal cutting. In 2004, the production power of paper was 50 tons per annum, where raw materials were the straws of the cotton and corn.

The limited pasturage of the livestock within certain area can be negatively reflected on growing and development of forest, particularly on timber forest seeding cultivation.

From all the Central Asian economies, the region is garbed by generality of the many conditions, but Turkmenistan differs in the originality of the forest cover. Original natural-climatic conditions predetermine favorable possibilities for conservation of the row of the plants, particularly in forest-shrubby Caucasus and Mediterranean regions, as well as west Tan-Shan; herewith, sharp expression of continental climate has conditioned the difference of forest mountains and foothills from sandy-deserts under their total xerophily.

In its history of development, forests of Turkmenistan were subjected to the different negative actions, as from early development of human society. The work on conservation and propagation of forests has been conducted for the last 100 years only. The conservation of forest in natural area promoted the limited possibility of human society corresponding to its development and some national traditions, but the most tolerant plants are adapted to survive in these heavy forest-growing conditions.

## Forestry Development and Best Practices of Forest Management in Turkmenistan

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Being one of the main and the most important components of the nature, development of forest cannot be considered both in history and in future plans separately. Only in the aggregate with the other component of the nature must separate events of the landscape be conducted analysis, estimation and forecasts for the future forest. The forest development, today and tomorrow, will dare the questions of the development of the branches of the economy directly connected with forest facilities. Together with that scientific production, functioning is proved that in turn the forest development is closely bound and its degree of development even depends on the degree of the anthropogenic influences such as pasture of livestock, mastering natural resource and others. So only on the grounds of clear scientific developments and deep analysis of the forestry, plan is possibly developed in combination with the economic development of Turkmenistan.



## Chapter 4 Best practices for sustainable forest management

- 4.1 Soil and water conservation
- 4.2 Desertification control
- 4.3 Rangeland degradation control
- 4.4 Salinization control (Aral Sea zone)
- 4.5 Forest fire and disease prevention
- 4.6 Comprehensive utilization of forest resources and non-timber forest products





### 4.1 Soil and water conservation

Desert conditions are prevailing in most part of the economy, so priority is given to establishment of new forest zones and sustainable management of existing forests. All forests of Turkmenistan are related to I group forests and primarily perform the protection functions. Afforestation program was initiated within the economy in 1998, and was aimed at preventing land degradation, thereby preventing expansion of desertification process, protecting agricultural lands and habitations from moving sand dunes and stabilizing riverbanks.

In desert areas are planted native shrub and tree species *Haloxylon persicum*, *Haloxylon aphyllum*, *Calligonum amodendron*, *Salsola richteri*. In mountains are planted such trees as Juniper (*Juniperus turcomanica*), Turkmen maple (*Acer*), Pistachio (*Pistacia vera*), Almond (*Amigdalus communis*), Celtis, etc. In riverside areas for protections are planted Populus (*populous euphratica*), Tamarix (*tamarix risossoma*), and Salix (*salix songarica S. acmophylla*), etc.

Turkmenistan is one of the driest economies in the Central Asia where it is lack of precipitation for growing trees in natural conditions which require artificial irrigation for practicing better forestry. The tree species for afforestation of degraded lands in Aktokay forest (site near the Ashgabat city) and surrounding areas should be selected according to site conditions and characteristics, decomposition matter production, and leaf and stand transpiration and with suitability for planting on low fertility soil.

For sustainable management and for reducing water stress in forest zones, using water saving technologies like drip irrigation is more effective in drylands of Turkmenistan. Drip irrigation has more advantages in drylands, for example, it can use water resources economically, plants grow faster, and it is possible to supply fertilizers by pipes.

Afforestation has proved to be effective in revegetating marginal and degraded lands, improving ecological conditions and mitigating further land degradation and climate change. However, to ensure effective and sustainable management, afforestation of marginal and degraded lands should be preceded by a comprehensive evaluation of appropriate tree species. The species to be planted should be more effective, more drought tolerant and salt and high pH tolerant species.

In low fertility, soils of Aktokay forest tree plantations in the end have potential to increase soil organic matters due to leaf and needles decomposition and replenishment of soil N stock and other nutrients elements. Eighteen years after afforestation, in comparison with bare land, the soils of Aktokay forest slightly increased in humus and nutrient content. Pine (*Pinus eldarica*) is a dominating coniferous species which is planted in Aktokay plots and

## Forestry Development and Best Practices of Forest Management in Turkmenistan

surrounding areas. Pure pine forests are established in this area as evergreen due to their fast-growing abilities. Dominance of pine affects the character of herbs layer vegetation and composition of the litter layer, which concomitantly affect the microclimate conditions.

Pure pine plantation has a shade dark condition which results in absence of young regeneration of pine seedlings, absence of herbs, decrease of light intensity and low amount of precipitation. Root system characterized as shallow is about 80 cm deep; after irrigation, trees are not stable to wind and may incline.

Mixed forests in Aktokay are diverse in broad-leaved species and a majority of them were introduced to Turkmenistan. Mainly representative species are (*Ailanthus altissimo*, *Morus alba and nigra*, *Catalpa*, *Junipers arizonica*, *Gleditsia triacanthous*, *Acer*, *Fraxinus*, *Platanus orientalis*) etc. and some fruits tree species. The list of planted species is presented in Table 4-1. Broad-Leaved species with relatively high life expectancy showed a high potential for rapid rood-system development.

**Table 4-1 Species planted in afforestation of Aktokay**

| #  | Common name     | Latin name                     |
|----|-----------------|--------------------------------|
| 1  | Ailanthus       | <i>Ailanthus altissima</i>     |
| 2  | White mulberry  | <i>Morus alba</i>              |
| 3  | Black mulberry  | <i>Morus nigra</i>             |
| 4  | Gleditschine    | <i>Gleditschia triacanthos</i> |
| 5  | Mondell pine    | <i>Pinus eldarica</i>          |
| 6  | Arizona cypress | <i>Cupressus arizonica</i>     |
| 7  | Populus         | <i>Populus euphratica</i>      |
| 8  | Catalpa         | <i>Catalpa bignonioides</i>    |
| 9  | Thuja           | <i>Thuja orientalis</i>        |
| 10 | Maclura         | <i>Maclura pomifera</i>        |
| 11 | Sycamore        | <i>Platanus orientalis</i>     |
| 12 | Ash             | <i>Fraxinus syrica</i>         |

Productions of leafy and woody biomass by these species are moderate, and stems are relatively high, at least in loamy soils. Species are mainly planted in drought and relatively saline-tolerant soils and can survive in soils with pH values of up to 8-9. In addition, it tolerates to low soil moisture and low ambient humidity and presents a number of characteristics that are suitable for the afforestation of degraded soils.

Trees are planted close to each other in spacing: 50 cm to 1 m. In Aktokay region, vegetative

period starts in the beginning of April when average daily temperature reaches 12°C and deciduous trees begin to cast a shade, and the intensity of light reaching the floor decreases in the end of April.

In addition, the plantations on barren land show amenity and aesthetic values, such as providing shadow and shelter and offering possibilities for habitats and wildlife. This study has provided such information about different stands of Aktokay forest.

Further research in broader scales will contribute to the study of microclimate/mesoclimate conditions in drylands of Turkmenistan, which will respectively contribute to further sustainable afforestation.

### 4.2 Desertification control

To combat desertification, it is important to preserve and restore forests. For the period by 2020, forested area in Turkmenistan was reduced by 994,000 ha. Desertification resulted in destruction of the vegetative cover, loss of productivity of forests and provoked erosion.

Establishment of protective forests and shelterbelts will eliminate the further development of destructive processes, in particular loss of upper productive soil layer and formation of barkhan sands. Protective forests in the desert will provide the increase of biological productivity and conservation of biodiversity.

As a result of the realization of the Programme, main tracts of desert woodlands destroyed by excessive cutting will be restored. Therefore, stabilization of moving sand dunes is the problem of great importance. The main types of work are as follows: protection against sand drifts of engineering structures, settlements, cattle-breeding farms, highways, railways, etc.; afforestation of sand tracts inside and around oases aimed at regeneration of the vegetative cover; protection and management of forest plantations with the objective of utilization of wood; amelioration of microclimate near settlements and farms by planting *Haloxylon*, *Calligonum* and other species.

Conservation of biodiversity is very significant for sustainable development and plays an important role in desertification control. Loss from natural ecosystems of several plant and animal species results as a rule in reduction of biological productivity.

The quantity and quality of forage at desert rangelands is falling. Many plant and animal species should be conserved as a gene pool for future selection of new varieties to the benefit of people. At least, riches of biological life have an aesthetic value by contacts of people with nature.

### 4.3 Rangeland degradation control

Rangelands of Turkmenistan are effected by degradation due to shortage of water resources, overloading and overgrazing. The existing policy in rangeland exploration is a result of anti-scientific and anti-ecological approaches in this branch or economy. Awareness of this situation dictates the need of conservation of grazing lands and protection of the biodiversity of forage plants. Desert rangeland is a valuable national property as well as a biological resource which should be used with care for the benefit of people living in the desert. From vast areas of degraded rangelands, 1.7 million ha need improvement in the first place. Moderately degraded lands on the area of 17.3 million ha would be improved in a distant future. The rest needs conservation and proper management. Several research institutions of the Central Asian countries have elaborated a technique, which includes reseeding and rangeland improvement.

For protection of engineering structures from deflation, complex method is used. At first, semi-latent or cover mechanical protections of vegetative material are installed. The height is 4-5 mm. Sprouts of rush or reed mace are used. Cover mechanical protections are installed by rows 2-3 mm wide, they are fixed by sand through 1.5-2.0 m. Moreover, camel's-thorn and *Stipogrostis Karelinii* are used. Between rows, seedlings of saxaul and *Calligonum* at a rate of 3,300 pieces per hectare are planted. For stabilization of sandy surface, chemical astringents (tar, mazut and others) are used. Chemicals are inserted by stripes 1.0-1.5 m wide. Their usage is especially perspective while protecting main roads from sand drifts.

### 4.4 Salinization control (Aral Sea zone)

The territory of the Turkmen Aral Sea Zone (Dashoguz and Lebap provinces) is located in the north of the economy and occupies the area of more than 90 thousand km<sup>2</sup>. It is a risky zone of agriculture, which is irrigated by waters of the Amudarya.

The increasing anthropogenic impact on environment, which has resulted in drying-up of the Aral Sea, and significant technogenic environmental pressure as a component of this impact (collector-drainage water discharges into the Amudarya from the territories of Uzbekistan and Turkmenistan; usage of pesticides and mineral fertilizers), all these have led to the formation of a zone of environmental disaster in the Turkmen Aral Sea Zone. All components of environment have been undergone negative changes.

By present time, up to 90%-95% of irrigation zone lands of the Turkmen Aral Sea Zone have become saline. Irrational use of land resources by different users could result in reduction of soil fertility and degradation. Land degradation processes tens of different local and zonal forms. The most widespread forms are secondary salinization on irrigated lands, waterlogging, wind and irrigational erosion, and technogenic desertification.

Natural and anthropogenic factors of land degradation are closely related to agricultural development of territories in arid conditions. Therefore, environmental problems arising from agricultural activities are so urgent. According to the data of the National Institute of Deserts, Flora and Fauna, 446,000 km<sup>2</sup> of lands (91.4% of the territory of Turkmenistan) are subject to different forms of degradation.

### 4.5 Forest fire and disease prevention

Agricultural practices such as slash and burn and shifting agriculture implemented by local communities had long been considered as one of the main root causes of wildfires. However, actually it is considered that local communities are also responsible for forest fires as often they make fires to manage the landscape. The community engagement in fire management can help balance the interventions in response to large, damaging or high profile fires, which were overwhelmingly focused on fire fighting.

In Turkmenistan, forest fires occur mainly due to anthropogenic factors in combination with extreme hot and dry weather. In case of forest fire, the CEPLR informs other structures, jointly with the firefighting service, to take emergency activities to prevent fire. Fire prevention activities include such as ploughing out strips around and inside the plantings and forest and patrolling especially during hot season. The length and width of fire ploughing strips depend on site conditions, type of plants and location.

The forest diseases are main cause of damaging plants. In Turkmenistan, the specialist of National Institute of Deserts, Flora and Fauna and Service of Plants Protection under Ministry of Agriculture and Water Economy identifies forests diseases are determined by local forestry administrations and enterprises and type of diseases. According to the type of forest diseases, the commission makes a decision on what further measures should be undertaken for prevention and conservation of forests or forest plantation.

### 4.6 Comprehensive utilization of forest resources and non-timber forest products

In Turkmenistan, forests have protective function. As for utilization of forest resources, only people in remote villages use forests for firewood. Firewood is used only by permission and special allowance of Forestry Administration, which gives the limits and indicates the place for collecting firewood. According to the *Forest Code*, only sanitary cutting is allowed in forestland, commercial production of wood is not practiced because of insufficient stands for it.

Non-timber forest products are used for own needs of farmers and supply to market. For market, they provide mainly medicinal herbs, and little amount of berries.

## Forestry Development and Best Practices of Forest Management in Turkmenistan

The forests of Turkmenistan are distinguished for vegetation diversity. Plants differ in their resources significance, range of useful features and possibilities for practical usage. The vegetation of Kopetdag Mountain is especially rich, as it is represented by 1,900 species of wild plants, 322 of which are endemic. Among all the diversities of useful plants, herbs are most valuable. Hilly regions of Turkmenistan (Kopetdag, Grand and Small Balkan, the Turkmenian part of Koitendag Mountains) are very promising for provision of wild herbs. They are abundant in the valuable herbs and technically used plants, such as Ephedra, Juniperus turkomanica, Pistacia vera, Almond, etc.

Numerous wild plants are valuable resources for the food and pharmaceutical industry and other local industries. Around 1,600 species contain biologically active elements (potential medicinal raw material), including 600 species used in the perfume industry, 55 species used in foodstuffs, 42 species being mountainous, 160 species used in the dyeing industry, nearly 50 species containing potash and more than 800 species used as foods. Resources significance of absinth species has increased dramatically. As they have been proved as the good volatile-oil-bearing plants, they are widely used as components for soft drinks, quality wines and balms.

The valleys and water meadows located along the rivers in Turkmenistan are sources of raw herbs. Tugai vegetation communities are an important source of valuable plants. In the valley of the river Amu-Darja, a huge amount of wild liquorice is available. Its roots and rhizomes are valued equally to ginseng. They are used in more than 20 subsectors of the national economy due to high content of glycerine (23%), and have the export value.

The Junipers turkomanica and Zaravshanian contain nutritive and medicine components as well. Almond trees grown in Kopetdag on the area of 23,000 ha are of the particular importance: 26 tons of almonds are harvested annually.

The amount of dog-rose is valued at 1.8-2 tons a year, ephedra at 30 tons a year, and lemon absinth at 20 tons a year.

A great amount of plants available at the plains and hills is the full-value nutrition fodder for livestock. In Karakums, 100 out of the 600 desert plant species are used for livestock pasture ration.





## Chapter 5 Forestry education and research

5.1 Forestry education

5.2 Technical capacity of forestry authorities





## 5.1 Forestry education

Training of specialists and their qualification improvement in the system of forestry management is set as a very important task. At present, the Turkmen Agricultural University recruits 20 students every year in the Department of Forestry and Parks Management Specialty. At the vocational specialized school of the above-mentioned university in Ashgabat city, 20 more students are entered every year to finish the school as specialists.

Studies of the subject on Forestry and Decoration Trees were introduced into the educational curricula of the Turkmen Agricultural University in the departments on agro-ecology, agronomy, agro-chemistry and soil studies. At the last semester, students prepare thesis or diploma work according to the chosen subjects.

The mentioned higher institution and vocational school offer training in forestry system management and technical engineering on a regular basis. Those are some short-term professional trainings and courses for the specialists working in the system of forestry.

Turkmenistan places a special importance on developing the future forestry management area, continues improving this branch by having the economy specialists trained at the educational institutions and scientific research centers abroad, and encourages experience sharing at different levels. The number of students entering postgraduate and doctorate courses in various professions of the forestry science increases every year. Table 5-1 shows action plan on development of forestry scientific research.

**Table 5-1 Forest research action plan**

| # | Names of scientific research work   | Implementing agencies  | Timeframes  |
|---|---|--|-------------|
| 1 | Elaboration of proposals on planting fruit bearing, umbrageous trees and desert plants along the drainage streams of the "AltynAsyr" Turkmen lake                     | The National Institute of Deserts, Flora and Fauna, the Turkmen Agricultural University                                | 2013 – 2015 |
| 2 | Study and elaboration of the scientific grounds for growing plants resistant to saline soils for the restoration of pasture areas and enhancing the feeding resources | The National Institute of Deserts, Flora and Fauna, Scientific Research Institute on Livestock Breeding and Veterinary | 2013 – 2015 |
| 3 | Elaboration of proposals on creating "green umbrellas" by collecting rain waters  | The National Institute of Deserts, Flora and Fauna   | 2015 – 2016 |
| 4 | Elaboration of proposals on combating pests and rodents that harm the forestry trees and desert plants  | The National Institute of Deserts, Flora and Fauna   | 2014 – 2016 |
| 5 | Development of technologies for the preparation of juniper seeding and growing saplings   | The National Institute of Deserts, Flora and Fauna   | 2014 - 2017 |

## Forestry Development and Best Practices of Forest Management in Turkmenistan

In order to raise the professional level of trainings of the Turkmen specialists and the working to protect forests and environment as well as to enhance the Turkmen scholars' skills and knowledge, it has been planned to continue the participation of the Turkmen professionals in international conferences, meetings and trainings to regularly exchange experience and learn from the world's best practices.

### 5.2 Technical capacity of forestry authorities

According to its regulations in Forestry Administration, it consists of four departments: forestry, agriculture, mechanization and financial departments. Under the current structure, the key role in the forest management is being played by the Forestry Department, and by its eight forest enterprises. The activities of enterprises on the ground are being implemented under the Forestry Department's supervision. The Forestry Department realizes and coordinates all actions in the sphere of rational forest management, organization of forest nurseries, forest growing and planting of greenery.

It should be mentioned that the specific trainings on forestry issues are required to introduce modern and developed techniques and provide machinery.

Personnel should be trained in managing and operating machinery and growing high quality planting stock. Technical capacity of Forestry Authorities is required specific trainings.



## Chapter 6 Forestry projects and initiatives



Now there are some projects related to climate, and in the framework of these projects are planted seedlings and established nurseries but they are in small pilot areas. From 2009 to 2011 was realized SFM joint project with GIZ; during this project, afforested area was up to 200 ha in desert and mountainous areas of Turkmenistan. During this project were planted local tree species with initial and regular watering and further tending of plants. In Turkmenistan, there were some joint projects with GIZ. Such projects are in the frameworks of Convention to Combat Desertification and Convention on Biological Diversity. All projects have demonstration pilot sites where they are planted trees and fixed moving sands by afforestation. It also could be mentioned some small projects like establishing forest tree nurseries and providing technical supports. At present, the Forestry Administration does not have any international or other bilateral projects.





## Chapter 7 International forestry cooperation mechanisms





The implementation of complex measures gives an impulse to realize the international initiatives and fulfill the economy commitments outlined in the *UN Framework Convention on Climate Change*, documents and conventions “On Combating Desertification”, “On Biological Diversity” to be realized by Turkmenistan as well as the objectives set in the *National Strategy of Turkmenistan on Climate Change*.

The implementation of the National Forestry Programme (NFP) of Turkmenistan would contribute to achieving the positive results. In order to mitigate the negative impact of the climate change on the socio-economic development of the state, and to adjust to the climate changes that were felt and expected, the importance of forestation among the measures assigned in the *National Strategy of Turkmenistan on Climate Change* was invaluable.

Forests play a very significant role in economic development of Turkmenistan and in particular given its soil status and climate conditions. It is of the importance for sustainability of agricultural production, safeguarding and enriching biological diversity, preventing land desertification process and mitigating climate change impacts on the ecosystem.

In Turkmenistan, the total forest covered area is 4,127,000 ha. Forests are spread in mountains, deserts, riversides and irrigated lands. To implement goals of the above-mentioned conventions, Turkmenistan closely cooperates with the German Agency for Technical Assistance (GTZ/GEOPLAN), Secretariat of the Convention to Combat Desertification, World Bank, Tacis and other international organizations. The National Institute of Deserts, Flora and Fauna under the Ministry for Nature Protection of Turkmenistan implements the project “Participation of Public in Natural Resources Management in three biogeographical Areas of Turkmenistan” in cooperation with GTZ/GEOPLAN. Since 1998, this initiative has been implementing in Central Karakums, Kopetdag Mountain and Irrigation area (oases). The residents of some rural settlements can participate in planning of environmental measures and implementation of actions to combat desertification. The local self-government bodies take an active part in those activities.

In general, the socio-economic situation in the economy provides enabling environment for meeting the requirements of CBD. The *Biodiversity Strategy and Action Plan (BSAP, 2002)* were approved by the State Commission on ensuring fulfilling national commitments undertaken within the UN environmental conventions and programmes. Some activities were implemented with support of the international donor organizations and using the government funding. Under the Article 6 of CBD, the Government of Turkmenistan has undertaken development of the economy study on the status of national biodiversity. This study includes a detailed review of national biodiversity status as well as the factors affecting it. Based on this information, the comprehensive Biodiversity Strategy Action Plan (BSAP) has been developed.

## Forestry Development and Best Practices of Forest Management in Turkmenistan

The overall goal of BSAP is to conserve and restore biological diversity, and use it in sustainable manner to save biodiversity for the generations to come. The twelve national target indicators were determined, and they allowed the economy to formulate and set up a global goal to be achieved by 2010, in accordance with the decisions adopted by the Conference of the Parties to the convention and the Secretariat. This plan was aimed at coordination of biodiversity conservation activities in Turkmenistan over the next nine years.

Development of strategy and action plan on conservation and efficient use of biodiversity is one of the key requirements of the Convention. The Action Plan was developed for the over nine-year period (2002-2010). It was implemented within the network of protected areas (9 nature reserves, and 13 game reserves) in cooperation with UNDP, UNEP, GEF, WWF, TACIS and World Bank, and included the following:

- Ecological trainings involved local people to protect the environment and combat desertification. However, environment education is not yet universal in the economy. Successful implementation of the National Action Programme requires that the majority of population is properly informed about the desertification progress and challenge;
- Stabilization of moving sands is the problem of the great importance. The key activities are as follows: prevention of sand drifts to engineering facilities, settlements, cattle-breeding farms, highways, railways etc.; afforestation of sand tracts located inside and around oases that is aimed at regeneration of the vegetative cover; protection and management of forest plantations to produce the timber; creation of microclimate nearby the settlements and farms by planting of Haloxylon, Calligonum and other species;
- Introducing the advanced irrigation technologies to prevent soil salinization and promote efficient use of available water resources.

Turkmenistan forestry has learned some experiences in afforestation, reforestation, and especially in improving desert areas. It is important to mention the lack in experience in modern methods on water saving technologies and scientific developments in this area. In recent decades, Turkmenistan has afforested several thousand ha of land, and now one of the plans is to carry out some investigations on impact of this planting to local soil and climate conditions. Other important issues are growing high-quality planting stock, afforestation of Aral Sea zone, and afforestation of desert and mountain areas. As we know, forestry is a long-term process, using best practices with less lost is an important aspect. It will be beneficial to fill this gap by strengthening regional cooperation that is still lacking.

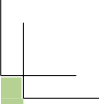
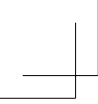
Since we have relatively similar geographical locations, it will be more productive and mutual beneficial to establish regional cooperation among Forestry Administrations, APFNet, and research institutes to exchange experiences and scholarships.

The forestry in Turkmenistan has learned some best practices related to afforestation and reforestation, and in particular to improve the desert areas. It is important to mention that the economy lacks the experience with application of the modern methodologies on

## International forestry cooperation mechanisms

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water saving and scientific developments in this area. In the recent decades, thousands of hectares of lands were afforested in Turkmenistan. Currently, the economy plans to conduct assessment of impacts of such afforestation on the soil and climate conditions. Other important activities included growing the high-quality planting stock, afforestation of the Aral Sea zone, desert and mountain areas. Forestation is the long-term process that requires application of the best practices. To cover the existing gaps in the knowledge and experience, strengthening of regional cooperation would be beneficial. Given the relatively similar geographical location, it would be mutual beneficial to establish a regional cooperation between the national Forestry Administrations, research institutes, and APFNet to exchange the experience, scholarship and best practices.





## Chapter 8 Challenges and opportunities for forestry development



## Challenges and opportunities for forestry development

The reduction of natural desert and tugai and mountainous forest cover has also contributed to the advancing of desertification process in the area. Another reason for such reduction in the forest cover is a continuous anthropogenic pressure such as overgrazing, felling for fuelwood, and secondary soil salinization. The droughts combined with high air temperature are the limiting factors for agriculture, forestry and water economy development.

Palaeontologists have demonstrated that the cutting of forests in the foothills of Kopetdag Mountains started as long as the VI to V millennia B.C. During the last 40 to 50 years, areas occupied by forests decreased by 30% to 40%; the total debit of water in Mountain Rivers fell by 50% and many mountain springs have dried up. As a result, the altitudinal boundary of forests has been elevated by 500 m to 700 m from its ecological optimum, which has transformed many other plant communities.

In 1997, Turkmenistan prepared its National Action Program to combat the land desertification in the economy. The Program measures included the land afforestation particularly in the mountain and foothill areas of the economy. Establishment of protective forests and shelterbelts is aimed at reducing and even eliminating the further development of destructive processes, in particular loss of upper productivity soil layer and formation of barkhan sands. Protective forests in the desert, foothill and mountain areas will provide the increase of biological productivity and conservation of biodiversity.

Afforestation and reforestation in drylands are proposed as possible tools to mitigate the desertification (FAO, 1989) and to reduce atmospheric concentrations of CO<sub>2</sub> by sequestering carbon in forest biomass (UNDP 2003). Drylands ecosystems are highly responsive to climatic variability. Plant biomass and ecosystem complexity depend on precipitation, temperature and cumulative solar radiation, as well as on the physical and chemical properties of soil. The establishment of tree plantations may affect the hydrological cycle.

Precipitation processes depend on local, regional, and large-scale atmospheric characteristics. Therefore, regional atmospheric modelling represents an important tool to study the impacts of realistic patterns of afforestation and reforestation on precipitation.

New forest plantations are presumably the sinks of CO<sub>2</sub> and are useful to stabilize the CO<sub>2</sub> cycle. Thus, planted forests of Turkmenistan are an important means for mitigating the climate change. They enhance the provision of a wide range of goods and services including production of wood in future and non-wood products, conservation, carbon sequestration, erosion control, reduction of pressure on native forests and rehabilitation of degraded lands. In remote areas, they supply the urgently needed firewood for fuel.

## Forestry Development and Best Practices of Forest Management in Turkmenistan

Where planted forests are established, all practicable steps should be taken to avoid replacing natural ecosystems of high ecological and cultural value.

For afforestation on marginal lands, species selection based on thorough screening must be addressed. Knowledge of the water use characteristics of drought and salinity-tolerant species would facilitate the selection of appropriate trees for planting.

The establishment of forest on marginal lands, even with drought and salt-tolerant species, requires irrigation during the initial stage of growth before sole reliance on available groundwater or soil moisture can become possible. However, the availability of irrigation water, particularly on marginal lands is limited. Hence, there is a need for assessment of water saving techniques, such as irrigation via drip, which has been adopted by for tree growing in the other arid regions of the world.

The main species for afforestation in Turkmenistan include coniferous (*Pinus eldarica*, *Thuja orientalis* and *Cupressus arizonica*.) and some broadleaf species (*Mulberry*, *Gleditschia*, *Sycamore*, *Poplar*, *Catalpa*), etc. The majority of them are the native species.

Pine (*Pinus eldarica*) was introduced to Turkmenistan from Caucasus and now is well adapted to local climate and soil conditions. And nowadays, Pine is one of the major plantation species in afforestation program of Turkmenistan. *P. eldarica* grows rapidly when young and reaches heights of 15-25 m. This shapely tree thrives in arid climate, drought and poor soils, and tolerates difficult arid climates.

This is one of the decorative and resistant conifer species in the climate conditions of Turkmenistan.

Potential advantages of afforestation have the greatest impact when appropriate species are planted. In the arid climate, early root extension in the deeper soil layers is a sign of a tree's adaptability to cope with water/salt stress in the upper horizons.

Turkmenistan has vast areas for afforestation and reforestation activities, and the only limiting factor is moisture for surviving trees. In future, priority should be given to drought/salt tolerant species, which are well adapted to local conditions. In this connection, it is necessary to establish the cooperation within the region and the Great Central Asian economies in exchanging experience and knowledge.



## Annex

### Preparation of legislation regulatory documentation in accordance with the forestry code of Turkmenistan

| #  | Regulatory legislation document  | Implementation period | Implementing agencies  |
|----|--|-----------------------|--|
| 1  | <i>Regulatory system for land areas to be registered and deregistered in the Forestry Fund</i>   | 2017 – 2018           | The Ministry of Agriculture of Turkmenistan, The Committee on Environment Protection and Land Resources of Turkmenistan  |
| 2  | <i>Regulatory system for the use and protection of forests created for specific purposes</i>   | 2018 - 2020           | Committee on Environment Protection and Land Resources of Turkmenistan   |
| 3  | <i>Regulatory system for the use and protection of production value</i>  | 2018 - 2020           | The Committee on Environment Protection and Land Resources of Turkmenistan   |
| 4  | <i>System on State Forestry Cadastre</i>   | 2013 - 2014           | The Ministry of Agriculture of Turkmenistan, Committee on Environment Protection and Land Resources of Turkmenistan  |
| 5  | <i>Regulatory system for collecting payments and fees for the use of forests</i>   | 2014 – 2015           | Committee on Environment Protection and Land Resources of Turkmenistan, Ministry of Finance of Turkmenistan, the Ministry of Economy and Development of Turkmenistan   |
| 6  | <i>Regulations on State Forestry Protection</i>  | 2013 - 2014           | The Ministry of Nature Protection of Turkmenistan  |
| 7  | <i>List of Management Personnel for the Turkmenistan State Forestry Protection Service</i>   | 2013 - 2014           | The Ministry of Nature Protection of Turkmenistan  |
| 8  | <i>Regulations on non-essential use of forests</i>   | 2013 - 2014           | The Ministry of Nature Protection of Turkmenistan  |
| 9  | <i>Regulations for the use of areas which are the property of the Forestry Fund for the needs of hunting households</i>                    | 2015 – 2016           | The Ministry of Nature Protection of Turkmenistan, the Association of Hunters and Fishermen of Turkmenistan  |
| 10 | <i>Regulations for the use of Forestry Fund areas for training experimental and scientific research purposes</i>                           | 2014 – 2015           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Education of Turkmenistan, the Academy of Sciences of Turkmenistan   |
| 11 | <i>Regulations for the use of Forestry Fund areas for raising cultural awareness, educational, tourism, recreation and sports purposes</i> | 2014 – 2015           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Public Health and Medical Industry of Turkmenistan, the Ministry of Education of Turkmenistan, the State Committee of Turkmenistan on Tourism, the State Committee of Turkmenistan on Sports |

## Forestry Development and Best Practices of Forest Management in Turkmenistan

(Continued)

| #  | Regulatory legislation document   | Implementation period | Implementing agencies  |
|----|---|-----------------------|--|
| 12 | <i>Regulation for cutting forests</i>   | 2013 – 2014           | The Committee on Environment Protection and Land Resources of Turkmenistan   |
| 13 | <i>Regulations on registration, filing, storing and issuing documentation on cutting woods</i>  | 2013 – 2014           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Finance of Turkmenistan  |
| 14 | <i>Format of the forest registration and forest cutting permit forms</i>  | 2013 – 2014           | The Committee on Environment Protection and Land Resources of Turkmenistan   |
| 15 | <i>Regulations on state monitoring</i>  | 2013 – 2014           | The Committee on Environment Protection and Land Resources of Turkmenistan   |
| 16 | <i>Schedule for organizational forestry activities</i>  | 2015 – 2016           | The Committee on Environment Protection and Land Resources of Turkmenistan   |
| 17 | <i>Terms, Conditions and Regulations for the Use of Forestry Fund Data</i>  | 2017 - 2018           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Agriculture of Turkmenistan  |
| 18 | <i>Schedule for the implementation of forest restoration (on an on-going basis) and new forest formation activities in the areas belonging to the Forestry Fund</i> | 2015 – 2016           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Agriculture of Turkmenistan  |
| 19 | <i>System for defining and compensating for the loss in forestry economy and agricultural production</i>  | 2014 – 2015           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Finance of Turkmenistan, the Ministry of Economy and Development of Turkmenistan |
| 20 | <i>System for defining fines for the damage caused by breaking legal forestry legislation and collection procedures</i>   | 2014 – 2015           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Finance of Turkmenistan, the Ministry of Economy and Development of Turkmenistan |
| 21 | <i>System for the state registration of Forestry Fund of Turkmenistan</i>   | 2014 - 2015           | The Committee on Environment Protection and Land Resources of Turkmenistan, the Ministry of Agriculture of Turkmenistan  |
| 22 | <i>Guidelines on forestry seeding bank</i>  | 2013 – 2014           | The Committee on Environment Protection and Land Resources of Turkmenistan   |

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