Funded by the European Union

WECOOP

EU – Central Asia Cooperation on Water – Environment – Climate Change

Analytical review of biodiversity and significant ecosystems conservation priorities in Central Asia

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ACKNOWLEDGEMENTS

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We would like to acknowledge the State Committee for Ecology and Environmental Protection of the Republic of Uzbekistan (now Ministry of Natural Resources of the Republic of Uzbekistan) and BirdLife International for valuable information provided.

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February 2023

List of abbreviations and acronyms

ADB	Asian Development Bank
CA	Central Asia
CAF	Central Asian Flyway
CAMI	Central Asian Mammals Initiative
CBD	Convention on Biological Diversity
CDP	Cassa depositi e prestiti Group
CICES	Common International Classification of Ecosystem Services
CIS	Commonwealth of Independent States
CITES	Convention on International Trade in Endangered Species
CMS	Convention on Migratory Species
COP	Conference of the Parties
CU	Customs union
EASIN	European Alien Species Information Network
EEA	European Environment Agency
EU	European Union
EFI	European Forest Institute
EUFORGEN	European Forest Genetic Resources Programme
EWS	Early warning system
FAO	Food and Agriculture Organisation of the UN
GBF	Kunming-Montreal Global Biodiversity Framework
GCU	Genetic Conservation Units
GEF	Global Environment Facility
IAS	Invasive alien species
IUCN	International Union for Conservation of Nature
KBA	Key biodiversity area
KLC	Key landscape for conservation
MAES	Mapping and Assessment of Ecosystems and their Services
NBSAP	National Biodiversity Strategy and Action Plan
NSC	National statistics committee
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PA	Protected area
RDB	Red Data Book
RRI-CA	Ramsar Regional Initiative for Central Asia
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SDG	Sustainable Development Goal
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCBD	United Nations Framework Convention on Biological Diversity

UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division
US EPA	United States Environmental Protection Agency
WECOOP	European Union – Central Asia Water, Environment and Climate Change Cooperation
WHO	World Health Organization
WWF	World Wide Fund for Nature

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Summary for Policy Makers

Conservation of all types of natural ecosystems, forests, genetic resources, and species diversity is of vital importance for the countries of Central Asia. The key condition for the conservation of biological diversity is the in-situ conservation of ecosystems and natural habitats, maintenance and recovery of viable populations of species in their natural conditions.

The countries of Central Asia have gained a unique biodiversity conservation experience and have come a long way since their independence building the administrative and legal system for biodiversity conservation management. But the traditional approach to the conservation of certain animal and plant species that was practiced for a long time has led to a reduction in their diversity. At the same time, it has demonstrated the need for an ecosystem approach to the preservation of the entire complex of living beings along with their habitat. Such an approach requires the development of new policies, strategies, programmes, and projects.

It is important for the development of those new policies to recognise the recent findings of regional scientists that biodiversity degradation affects not only the region's opportunities for sustainable economic development but also its chances to achieve climate-resilient development. Therefore, mainstreaming biodiversity goals in national and regional development programmes and climate change mitigation programmes is a key condition for their successful implementation.

The analysis has also revealed significant discrepancies in the classification of various Central Asian ecosystems, in the biodiversity terminology, sustainable or resilient development terminology, as well as in data on various CA ecosystems. This situation requires rethinking, further analysis and unification of concepts, methods and tools for quantitative and qualitative assessment of ecosystems, as well as adequate nationalisation of the global biodiversity SDGs.

Numerous institutional factors contribute to the poor management of natural resources throughout the region:

- Ecosystems have to be classified not only on the basis of their ecological and biological characteristics but also as an object of management.
- CA countries have the insufficient institutional capacity to properly manage biodiversity, and the relevant priorities have not yet been adequately integrated into economic development planning or private sector activities.
- There are structural inconsistencies, if not competing priorities, between central and local authorities. Agencies in charge of agriculture, oil and gas, minerals and water sometimes compete with each other and have more power than environmental agencies.
- The lack of targets and planning timeframes in the policy development documents makes it impossible to track progress towards either the biodiversity goals or the development goals.
- OECD principles of good governance are not recognised by the national systems of natural resources management.

The accession to and ratification of international legal instruments in the field of development and environmental protection is an important element of fulfilment by the CA countries of their commitments to the international community. But CA countries largely fail to fulfil the obligations they assumed under international environmental agreements, the countries' obligations assumed under certain agreements are often inadequately enacted and implemented at the national and regional levels.

Our analysis has shown that all countries of CA face similar challenges and have to solve the same problems.

Based on the analysis findings it is recommended that the following policy actions are taken:

- Due to increasing awareness of the role of climate change, it is necessary to update the terms “sustainable development”, “climate-resilient development”, “sustainable and efficient environmental management” at the national level;
- Align the national biodiversity targets with the UN SDG15 adopted by all CA countries and with recently adopted at UNFCBD Conference of Parties (COP27) the Kunming-Montreal Global Biodiversity Framework;
- Harmonise national biodiversity terminology in the region with the Multilateral Environmental Conventions glossaries;
- Set the targets and time frames for all national biodiversity goals;
- Develop a mechanism for the assessment of the economic value of biodiversity and ecosystem services;
- Widen engagement of local communities and the public concerned in environmental activities, empower social movements and groups;
- Complete the development of an efficient governance system based on the OECD principles of good governance, featuring the regulation of interdepartmental interaction and an effective monitoring system;
- Enhance the capacity of personnel of government bodies in charge of biodiversity management.

And, finally, the precondition for successful achievement of the Biodiversity Targets in Central Asia is statutory recognition of the OECD principles of good governance:

- Effectiveness – define clear common goals and meet commonly agreed targets and timetables.
- Efficiency – maximise the benefits of sustainable biodiversity management at the least cost to society.
- Trust and Engagement – build public confidence and ensure inclusiveness of stakeholders through democratic legitimacy and fairness for society at large.

Introduction

Diverse natural objects and ecosystems, including vast steppes and extensive deserts, high mountains, meadows, forests and a huge variety of landscapes, the natural habitat of flora and fauna preserved intact – all these features allow us to speak about the uniqueness of ecological systems and biological diversity of Central Asia (CA).

The current conservation trends are set out in the relevant Conventions, including the Convention on Biological Diversity, the CITES, the Bonn, Ramsar and Bern Conventions, and the Convention concerning the Protection of the World Cultural and Natural Heritage. Ideas embodied in these fundamental documents concerning important aspects of biodiversity conservation have been further developed in the UN Sustainable Development Goals (SDGs), the European Union Biodiversity Strategy for 2030 and the draft European Nature Restoration Law.

Central Asian countries[1] recognise the high importance of biodiversity and ecosystems for social and economic development and maintaining stability in the region. They adopted the Sustainable Development Goals, including SDG15 on the need to protect, restore and promote sustainable[2] use of ecosystems, halt and reverse land degradation and halt biodiversity loss. These countries are the parties to most of the relevant international treaties and take advantage of the opportunities provided by the international community in the field of biodiversity conservation, including addressing the root causes of biodiversity loss, reducing environmental loads, promoting sustainable use of biodiversity, protecting ecosystems, species, and genetic diversity, improving planning and implementation processes.

Central Asia is often underestimated in terms of biodiversity, even though some of the world's largest steppe and desert areas, as well as important wetlands and key mountain ecosystems vital to the region's natural water cycle can be found here. Located at the crossroads of three biogeographic realms (Palaearctic, Indomalayan and Afrotropical), Central Asia features unique biodiversity. At the same time, a substantial part of population in Central Asia still lives in rural areas relying heavily on natural resources as means of existence and putting natural areas under great pressure.

Since their independence, the European Union (EU) has supported Central Asian countries in strengthening their economies and improving their governance systems, including with a view to conserve biodiversity and ecosystems. In May 2020, the European Commission adopted the new EU Biodiversity Strategy for 2030, a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. One of the four key actions under the Strategy is to introduce measures to tackle the global ecosystem degradation challenge and thus demonstrate that the EU is ready to lead by example to address the global biodiversity crisis and to support other countries in their efforts to protect biodiversity.

In line with the above priorities, the study "Larger than Tigers: Inputs for a strategic approach to biodiversity conservation in Asia" was carried out in 2018 to ensure better coherence and coordination of EU actions in the area of biodiversity and ecosystems in Asia. As the title of the study suggests, biodiversity conservation extends far beyond the survival of iconic animals such as tigers. Endangered species are important components of complex natural ecosystems that are critical to functioning and sustainable development of local communities as they provide water and food, regulate climate, benefit human health and well-being, process waste, pollinate crops, and support a growing tourism industry.

[1]In this survey, the area under consideration is limited to five states – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.
[2]There is a footnote here in the Russian text explaining how we deal with the semantic differences between the Russian and English texts of UN documents. We follow the UN rule that in this case the English text is the one to refer to.

In June 2019, the Council of the EU adopted the joint communication "The European Union and Central Asia: New opportunities for a stronger partnership", which represents a new political framework for the EU's engagement with Central Asian states in the coming years. The new strategy focuses on building resilience, prosperity and regional cooperation in Central Asia, emphasising that sharing experience in the sustainable management of natural resources, biodiversity protection and ecological tourism can help achieve a wide range of the region's objectives such as rural development, conservation of ecosystems and enhancement of environmental sustainability.

The EU-CA Platform for Environment and Water Cooperation was specially established under the new strategy as the reference framework for the cooperation between EU and Central Asian countries in the field of water and environment. The EU-funded project "European Union – Central Asia Water, Environment and Climate Change Cooperation (WECOOP)" supports the Platform and aims to strengthen the policy dialogue on sustainable development among the Central Asian countries, and to facilitate their cooperation with the EU in the field of environment and climate change. The project efforts are focused on improving and streamlining policies and enhancing capacity of national ministries and government agencies working in the relevant fields, including protection of biodiversity.

Building on the understanding that the CA states are committed to biodiversity conservation, as evidenced by their accession to the Conventions, the analysis of current legislation, and based on previous experience and results achieved in the course of environmental strategies implementation, this review aims to determine the key areas and prospects for effective cooperation between the CA countries and the EU, developed with a view to the new concepts and responding to existing challenges, in order to combine fragmented actions into a system that would be in line with modern trends and best practices in international law and good governance and become a cooperation mechanism.

The Review Preparation Methodology

This analytical review was developed in several stages. At the stage when information was collected and the key relevant data sources were identified, a Questionnaire was developed and circulated to experts representing all countries in the region. The experts' answers were analysed and based on the analysis results interviews were selectively conducted with experts, representatives of government agencies and international organisations. As a result of these efforts a database of the most important documents was created and a list of priority topics to be analysed was made. In addition, the findings of scientific research carried out within the framework of various projects, including biodiversity, genetic resources, migratory species, vulnerable ecosystems, were studied.

During preparation of this review, analytical reviews, official reports developed by Central Asian states in order to fulfil their international obligations in the field of nature and biodiversity conservation, international treaties in this area, project reports and documents of the European Union and the EU member states published in open sources were used.

Publicly available cartographic information and satellite imagery data were analysed in order to evaluate the actual state of protected areas and ecosystems, including transboundary areas for conservation of ecosystems significant for the region.

To identify the strategic priorities of Central Asian states in the field of biodiversity conservation, effective cooperation strategies and practical actions they could take, the outcomes of successful transboundary environmental projects implemented both in Central Asia and in the EU were analysed. Projects and initiatives that could promote regional cooperation and cooperation between the Central Asian countries and the European Union in various areas related to biodiversity conservation were studied. At the same time, this is not intended to be an exhaustive review of all good practices, as a fairly large number of initiatives have been successfully implemented in these countries.

Chapter 1.

Central Asia – An Important Region for Biodiversity Conservation

Central Asia occupies a vast territory and stretches from the Asian part of Russia south of the taiga zone in the north to the north-western part of India and the northern lands of Pakistan and Iran in the south. From west to east Central Asia stretches from the Caspian Sea to Mongolia. This review is limited to the territories of five countries located in the middle of Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan).

The territory of Central Asia under consideration can be divided into two zones. One in the west and northwest is occupied by the Turan plain covered with deserts and steppes. The other is bounded by the Pamir-Alay and the Tien Shan mountain belt from east and southeast and by the Kopet Dag in the south.

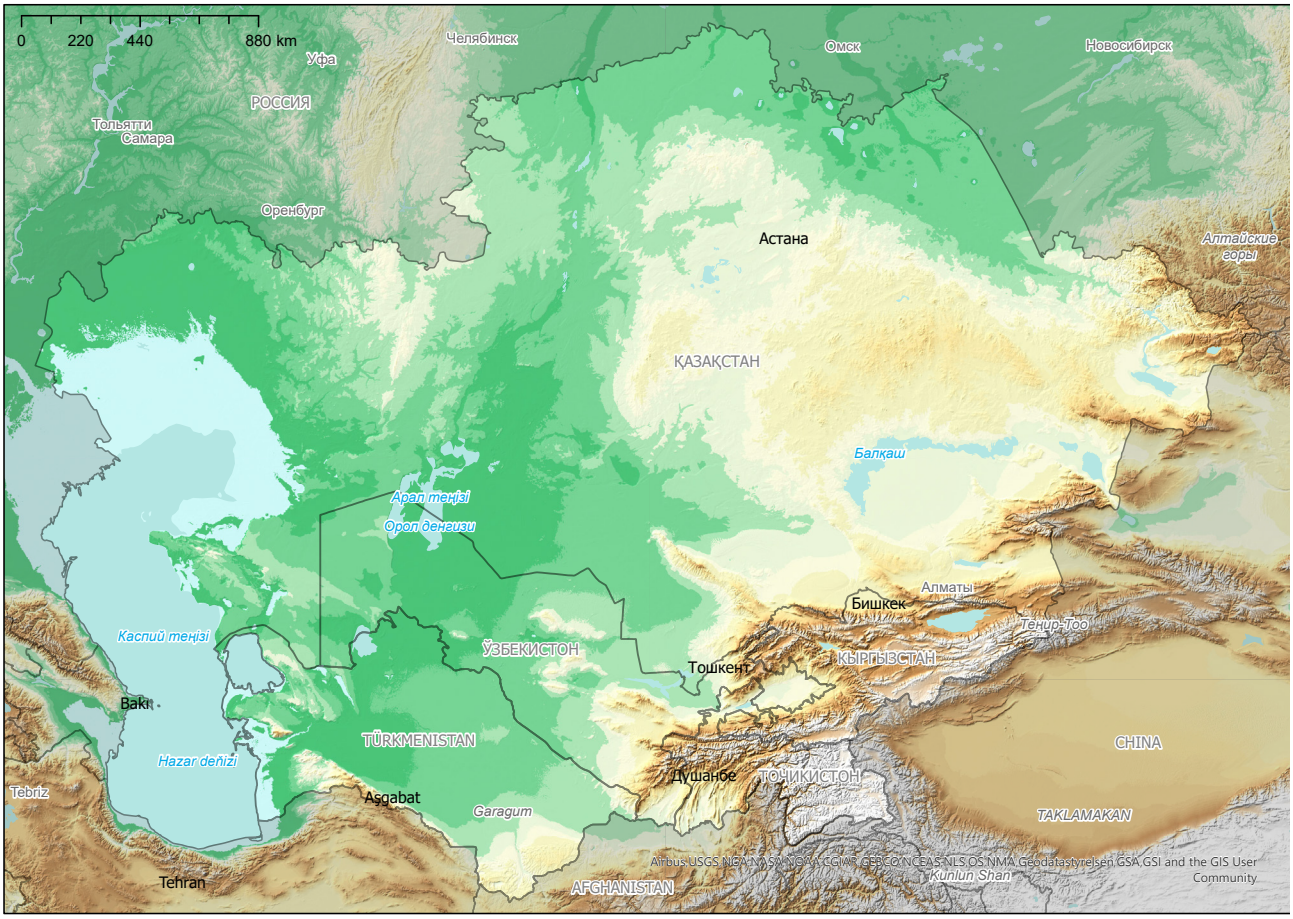


Fig. 1.1. *Central Asia.*

Source: https://www.arcgis.com/home/item.html?id=c753e5bfadb54d46b69c3e68922483bc

The geographical location and landscapes of Central Asia determine its climate. It is sharply continental with a relatively small amount of precipitation unevenly distributed over the area. Large amplitude of daily and seasonal temperature fluctuations is typical of Central Asia, as well as high solar radiation and relatively low humidity. Huge differences in geographical location and elevations account for microclimate diversity.

The average July temperature in valleys and deserts varies from 26°C in the north to 30°C in the south and can reach a maximum of 45-50°C. The average monthly temperature in January varies from 0°C in the south to -8°C in the north with an absolute minimum of -38°C. The amount of precipitation in the plains varies widely (80-200 mm per year). Most precipitation falls in winter and spring. 300-400 mm of precipitation falls in the foothills and 600-800 mm – on the southern and southwestern slopes of the mountain ranges (http://www.cawater-info.net/index_e.htm).
In general, natural and climatic zoning is well pronounced here. Arid ecosystems prevail in plains and foothills. At medium elevations, steppes, shrubs and forests are widespread. Grassland and tundra-like ecosystems are found in the highlands.

A distinctive feature of Central Asia is aridity that accounts for the vulnerable nature of its ecosystems located in a single ecological space of landlocked drainless basins of the Caspian and Aral Seas.

1.1. Ecosystems Diversity

Central Asia is without question a globally important region for biodiversity. In the conditions of diverse landforms and climatic zones Arctic, Mediterranean and Indo-European species meet and interact here (Lethier H., 2020).

1.1.1. Steppe Ecosystems

The forest-steppe is mostly located in the very northern part of the region, in Kazakhstan; these areas alternate forests – mostly deciduous – with steppe flora and host the highest species diversity of any steppe ecosystem in the world. They host many species of birds, from passerines to raptors, many of which are threatened, as well as several large ungulate, bat and rodent species.

Central Asia has the largest continuous steppe area in the world and the highest level of diversity of steppe-specific plant and animal species. Despite significant losses, the steppes continue to dominate the Central Asian landscape and form the largest area of temperate grazing lands left on earth. Nowhere else but here is the variety of steppe ecosystem types as great. Many of them can be deemed steppe ecosystem standards[3].

In addition to being indispensable for biodiversity conservation, the steppes of Central Asia are invaluable for climate regulation, water regulation and soil formation not only on a regional but also on a global scale. Thus, for example, large areas of Kazakhstan are occupied by forest-steppe and steppe ecosystems specific only to the Eurasian continent that are preserved here in the best condition. Natural ecosystems take up at least 30% of these areas[4].

Seven of the planet's 14 steppe ecoregions are in the countries of Central Asia[5]. The steppe landscapes of northern Kazakhstan have been designated a World Heritage Site and are known for outstanding wetlands turning into dry steppes to the south. The dry steppes of Central Kazakhstan are in turn replaced by semi-deserts. Most of the remaining natural, intact steppe areas are local fragments scattered throughout the region.

There are over 250 different types of steppe communities in the region, however, the dominant steppe species are grasses of genera ***Stipa***, ***Festuca***, ***Agropyron***, as well as various wormwood species (***Artemesia***). At high elevations, steppe communities are dominated by various species of grasses and herbs. A distinctive type of tall-grass steppe characterised by ***Elytrigia trichophora*** and ***Hordeum bulbosum*** occurs in the western Tien

[3] https://www.elibrary.ru/item.asp?id=32828726
[4] https://www.cbd.int/doc/nr/nr-06/kz-nr-06-en.pdf
[5] https://op.europa.eu/en/publication-detail/-/publication/ba5fe255-93cf-11e9-9369-01aa75ed71a1

Shan and the Pamir. Shrub communities are widespread in the lower steppe zone and may form dense thickets in gorges. Species present include hawthorns (***Crataegus pontica, C. turkestanica***), ***Cotoneaster melanocarpa, Euonymus semenovii***, ***Lonicera*** spp., ***Rosa*** spp. and ***Berberis*** spp.[6]

The steppe wildlife is characterised by the presence of numerous herbivorous mammals, including large ungulates such as the saiga antelope (***Saiga tatarica***) and migratory birds such as the sociable lapwing (***Vanellus gregarious***), demoiselle crane (***Anthropoides virgo***) and various species of raptors, eagles and osprey (***Pandion haliaetus***), white-headed duck (***Oxyura leucocephala***), two species of pelicans (***Pelecanus onocrotalus, Pelecanus crispus***), greater flamingo (***Phoenicopterus roseus***), and, although not common to steppe ecosystems, Eurasian curlew (***Numenius arquata***). Rare and endangered animals found in steppe ecosystems include the saiga antelope, gazelle, kulan, rare species of wild cats and birds such as the houbara bustard (***Chlamydotis macqueenii***).

1.1.2. Mountain Ecosystems

The mountains of Central Asia feature a vast variety of ecosystems. They host at least 20 distinct ecosystems and 4,500-5,500 species of vascular plants, a quarter of which are unique (endemic) to the region. In the foothills, dryland ecosystems prevail. At medium elevations, grasslands, shrubs and forests are widespread. Meadows and tundra-like ecosystems are found at the high mountain plateaus (Zoï, 2012).

The Mountains of Central Asia biodiversity hotspot consists of two of Asia's major mountain ranges, the Pamir and the Tien Shan[7]. The hotspot covers the area of 860,000 square kilometres in southeastern Kazakhstan, eastern Uzbekistan, western China, northeastern Afghanistan, and a small mountainous part of southeastern Turkmenistan, as well as most of Kyrgyzstan and Tajikistan. Due to a relatively large area of preserved natural habitat and a high level of endemism, and based on the knowledge of 200 terrestrial ecoregions (Olson, D. M. et al., 2012), Central Asia has been recognised as one of the most important biodiversity hotspots.

Flora of the region reflects the diverse biogeographical elements represented in mountain ecosystems. In total, there are 64 genera and many species of endemic flora, often with very narrow ranges, which include various species of birch, almond and juniper (Eastwood et al., 2009), as well as flowers and grasses, including 16 species of wild tulips threatened at the regional level. Around one-third of all plant species in the whole region are endemic[8]. The ecoregion is home to over 5,000 vascular plant species, 1,500 of which are endemic. Nearly 20 out of 140 mammal species found here are endemic to the region, such as Menzbier's marmot (***Marmota menzbieri***), the Tien Shan common treecreeper (***Certhia familiaris tianschanica***), ground squirrels (***Spermophilus***), the Pamir shrew (***Sorex buchariensis***) and the Alay mole vole (***Ellobius tancrei alaicus***). A wide variety of mountain ungulates includes several species of ibex, three endemic subspecies of argali, among them the Marco Polo sheep (***Ovis ammon polii***), Siberian ibex (***Capra sibirica***) and saiga antelope (***Saiga tatarica***). The biodiversity hotspot is also inhabited by several Felidae species, the best known of which is the snow leopard (***Panthera uncia***).

Mountainous nival ecosystems covering elevations from 4,000 up to 7,000 metres in the Pamir and the Inner Tien Shan, submontane plains and lower mountain belts constitute Central Asia's mountain ecosystems. The isolated nature of these high mountain areas accounts for emergence of original communities with many invertebrates. Local tree species include walnut (***Juglans*** sp.), juniper (***Juniperus*** sp.), spruce and wild fruit forests, many of which are thought to include the wild ancestors of widely cultivated fruits such as the apple. Mountainous steppes and meadows can be found in the higher mountain belt inhabited by various species and sub-species, such as mouflon, argali (***Ovis ammon***), Siberian ibex (***Capra sibirica***) and markhor (***Capra***

[6] https://www.cepf.net/sites/default/files/mountains-central-asia-ecosystem-profile-english.pdf
[7] Mountains of Central Asia. https://sites.google.com/a/lincoln.edu.gh/biodiversity-hotspots-lcs-ess/mountains-of-central-asia
[8] Floral endemism remains a controversial issue between Central Asia botanists. This issue will be clarified in due time.

falconeri), snow leopard (***Panthera uncia***), Menzbier's marmot (***Marmota menzbieri***), Tien Shan brown bear (***Ursus arctos isabellinus***), Himalayan snowcock (***Tetraogallus himalayensis***) and numerous rare raptor species.

1.1.3. Desert Ecosystems

In addition to the mountain ecosystems of Central Asia recognised as a biodiversity hotspot (CEPF, 2017) and already well represented on the UNESCO World Heritage List (https://whc.unesco.org/en/interactive-map/), the region also hosts important desert ecosystems. About 1,600 plant species have been identified here including 350 vascular plants found in the sand deserts, of which 56% are endemic (Schroeder, 1998).

The list of Central Asian deserts and semi-deserts includes several sand, stone and argillaceous deserts that stretch from the eastern coast of the Caspian Sea to Lake Balkhash and the foothills of the Kopet Dag, Tien Shan and Pamir.

The deserts of Central Asia are of global importance, among them the Karakum Desert located in Turkmenistan (12th largest in the world) and the Kyzylkum Desert (15th largest) shared by Kazakhstan, Turkmenistan, and Uzbekistan. The northern desert region lies in the south of Kazakhstan, in northern and western Uzbekistan, northern Turkmenistan and includes a small part of Kyrgyzstan in the Chu valley. The sparse vegetation of desert landscapes typically consists of xeric shrubs, including wormwood, saxaul (Haloxylon) and saltwort, while fauna is represented by wild ass, goitered gazelle, caracal, saiga antelope, and sand cat. Each region hosts distinct, often unique communities of flora and fauna, depending in part on the type of soil (salt, clay, sand, or stone).

Sand massifs producing large amounts of biomass, mainly various types of saxaul and other woody vegetation, are different from other desert communities and areas found in other parts of the region. However, the temperate deserts of Central Asia consist not only of sand massifs, but also of salt marshes, stony and gypsum deserts, and characteristic geological formations such as chink cliffs.

Central Asia's desert ecosystems are remarkable for plant communities typical for this region. They include relict species and other taxa such as ***Spireanthus***, endemic ***Ferula*** species, ***Astragalus*** sp., and psammophytic shrub species. The fauna is characterised by a rather high degree of endemism, especially among invertebrates, mammals, and reptiles.

Although fauna is relatively scarce because of the extreme environment, the deserts of Central Asia are home to several desert-adapted faunal species of particular interest, such as the honey badger (***Mellivora capensis***), caracal (***Caracal caracal***), sand cat (***Felis margarita***) and marbled polecat (***Vormela peregusna***). They are also inhabited by the world's sole natural population of kulan (***Equus hemionus***) and significant populations of goitered gazelle (***Gazella subgutturosa***) and urial (***Ovis orientalis***), the latter occurring mostly in mountain ecosystems. Local endemics such as the desert dormouse (***Selevinia betpakdalaensis***), saxaul sparrow (***Passer ammodendri***), Turkestan ground jay (***Podoces panderi***), Asian houbara bustard (***Chlamydotis macqueenii***), sandgrouse species (***Pteroptes*** sp. and ***Syrrhaptes paradoxus***), saker falcon (***Falco cherrug***) and Egyptian vulture (***Neophron percnopterus***) are also found here.

1.1.4. Forest Ecosystems

Central Asian states are sparsely forested. At the same time the region offers a wide variety of forest system types. Forest ecosystems currently occupy no more than 2% of its territory[9]. Most of the Central Asian forests can be divided into the following groups: spruce, spruce-fir, juniper, nuciferous, pistachio, maple, poplar-willow, and birch forests (Golovkova, 1927).

[9] Sayre et al, 2020 (https://www.sciencedirect.com/science/article/pii/S2351989419307231)

All mountain forests in Central Asia play an important soil-protecting and water-regulating role and are protected by the state. They hold back erosion, stabilise mountain slopes and soils, and make them resilient, thus reducing the risk of natural disasters, and regulate runoff. In the mountains of Kyrgyzstan, Tajikistan, Uzbekistan and southeastern Kazakhstan, natural walnut-fruit forests grow with wild apple (***Malus*** spp.), pear, almond, plum (***Amygdalus syn. Prunus*** spp.), pistachio (***Pistacia vera***) and walnut trees (***Juglans regia***). Valuable expanses of pistachio and other forests are found in the Kopet Dag Mountains in southern Turkmenistan.

Tugai (riparian) forests are among the most essential ecosystems of the region as they provide vital ecosystem services in arid regions, play an important role in soil protection and riverbank consolidation, and create valuable habitats for wild animals (FAO, UNECE, 2019)[10]. Found throughout the region in river valleys and on the shores of wetlands, tugai forests are characterised by communities of poplars (***Populus*** spp.), willows (***Salix*** spp.) and tamarix (***Tamarix*** spp.), alternating with wet meadows and marshes. These forests are particularly suitable for Bukhara deer (***Cervus elaphus yarkandensis***) and, until the 1950s it was the only remaining habitat for the now extinct Caspian tiger (***Panthera tigris virgata***).

These ecosystems are highly productive despite moderate species diversity (about 600 vascular plants). Tugai forests are dominated by willow, oleaster and poplar. However, they are an essential habitat for many endemic species and iconic mammal species such as the Bukhara deer. Tugai forests are indispensable for soil protection, grazing, as well as conservation of their unique biodiversity.

Within the framework of their national priorities, Central Asian countries have identified the most valuable forest areas that require specific approach to their protection and sustainable use.

Kazakhstan[11]. The category of especially valuable State Forest Fund areas includes especially valuable forest areas, wild fruit forests, tugai forests and forest areas in the subalpine mountain belt. They can be merged into protected areas (PA) or fall under one of the following categories of protected forest areas:
1) forest areas of scientific value, including forest genetic reserves
2) natural nuciferous forests
3) wild apple forests with *Malus sieversii*
4) forest areas in the subalpine mountain belt
5) tugai (riparian) forests within a desert zone

Kyrgyzstan[12]. The country's unique walnut and wild fruit forests are among the most vulnerable forest ecosystems. They form the world's largest natural expanse of nuciferous forests – a unique gene pool and landscape speciation in terms of its size, value, and beauty. At the moment, walnut and wild fruit forests under the State Forest Fund occupy over 644.0 thousand hectares. The vulnerable riparian ecosystems are very valuable, as they contribute to the water supply processes in the region, reduce the risk of natural disasters and form wildlife corridors for various species of animals and plants. All forests in Kyrgyzstan are protected; they occupy 5.6% of the country's land area and are of paramount conservation importance. Out of 20 types of forest ecosystems known in the country no more than 10 have survived, and they are unevenly distributed among the PAs.

Tajikistan. The most valuable forest communities in Tajikistan are relict broadleaf mesophytic forests of walnut (***Juglans regia***) and maple (***Acer turkestanicum***) (Central Tajikistan), small-leaved birch forests (***Betula tianschanica***) (along the Zeravshan River, in the Karategin Range and the Western Pamir), and mesophytic shrubs

[10] Forest Landscape Restoration in the Caucasus and Central Asia. Background study for the Ministerial Roundtable on Forest Landscape Restoration and the Bonn Challenge in the Caucasus and Central Asia
(June 21-22, 2018, Astana, Kazakhstan). FAO, UNECE. New York and Geneva, 2019 (https://unece.org/DAM/timber/publications/DP-72-flr-cca-en.pdf)
[11] The Sixth National Report on Biological Diversity in the Republic of Kazakhstan. Astana, 2018 (https://www.cbd.int/doc/nr/nr-06/kz-nr-06-en.pdf)
[12] the Sixth National Report on Biological Diversity in the Republic of Kyrgyzstan https://chm.cbd.int/database/record?documentID=243111

(Central Tajikistan). The most full-fledged walnut-maple forests are located in the Sarikhosor, Childukhtaron and Dashtijum reserves[13].

Pistachio groves are also notable as they regulate water and create a habitat for wild animals in arid zones. Their intensive use as pastures and hayfields barely allows for any natural regeneration. Significant areas (up to 80%) earlier occupied by pistachio communities are now overgrown with shrubs.

Turkmenistan. The dominant tree species in Turkmenistan are as follows: in the mountains – Turkmen juniper (***Juniperus turcomanica***) (in Kopet Dag) and Zeravshan juniper (***Juniperus seravschanica***) (in Koytendag), in the desert – white saxaul (***Haloxylon persicum***) and black saxaul (***H. aphyllum***), in tugais – oleaster (***Elaeagnus*** spp.), turanga (***Turanga*** spp.), elm (***Umus*** spp.), tamarix (***Tamarix*** spp.) and others, in artificial forest belts – various coniferous and deciduous species. The total area covered with forests is 4,309 thousand hectares, or 8.76% of the total country land area, of which mountain forests occupy 146.2 thousand hectares, desert forests – 3,958 thousand hectares, tugai or riparian forests – 26.2 thousand hectares, farmstead plantings (around crops) – 29 thousand hectares, and artificial forest belts – 150 thousand hectares[14].

Uzbekistan highlights the importance of tugai forests. The largest scattered areas of tugai ecosystems can be found in the Republic of Karakalpakstan, they cover around 30 thousand hectares or about 10% of the original tugai area in the delta of the Amu Darya River. The same areas make up 75% of all remaining tugai forests in Uzbekistan and 20% of all tugai forests found in Central Asia. The loss of tugai forests area has caused reduction of rare and endangered species associated with them. At present, tugai massifs are small narrow strips and isolated areas along river valleys and remain important wildlife corridors.

Table 1. *Forests in Central Asia*

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Forest area % of land area	1.2%- FAO (FAO, 2020)[15] 4.8%[16]- NSC 1.7%[17]- GFW (2010)	6.86 %- FAO 5.6%- NSC[18] 2.9%- GFW (2010)	2.9%- FAO 3%- NSC 0.22% GFW (2010)	8.78%- FAO 0.015% GFW (2010)	7.2%- FAO 7.3%[19]- NSC 0.17%[20] GFW (2010)
Forest fund area	30.0 million ha[21] - NSC	2.6197 million ha[22]- NSC	1.3 million ha[23] - NSC	9.995 million ha[24]	11.9752 million ha[25] 11.6 million ha- NSC[26]
Primary forest[27]	1.94%- FAO	37.02%- FAO	69.84%- FAO	2.52%- FAO	5.70%- FAO

[13] The National Strategy and Action Plan for Conservation of Biodiversity until 2031. Draft as of July 2021.
[14] Saparmuradov J. Head of Environmental Protection and Hydrometeorology Department of the Ministry of Agriculture and Environmental Protection. December 9, 2020. Ashgabat, Turkmenistan (https://unece.org/sites/default/files/2020-12/FR-Turkmenistan_Mr.%20Saparmuradov_workshop%209%20December%202020.pdf)
[15] FAO. Global Forest Resources Assessment, 2020 (https://fra-data.fao.org/KGZ/fra2020/home/)
[16] https://stat.gov.kz/official/industry/157/statistic/7 (Accessed in April, 2022)
[17] GlobalForestWatch, 2010 https://www.globalforestwatch.org/map/country/KAZ
[18] https://sustainabledevelopment-kyrgyzstan.github.io/15-1-1-1/
[19] The Concept for Forestry System Development in the Republic of Uzbekistan until 2030. Data as of 2019.
[20] GlobalForestWatch, 2010 https://www.globalforestwatch.org
[21] (https://stat.gov.kz/official/industry/157/statistic/7. Data as of 2019. (Accessed in April, 2022)
[22] http://www.stat.kg/media/publicationarchive/f55ce419-018b-4ad3-9384-ea1f4c5c4aee.pdf
[23] https://stat.ww.tj/publications/October2019/tphifzi_muhiti_zist_-_2019_nav.pdf
[24] https://unece.org/fileadmin/DAM/timber/docs/other_mtgs/2005krtiny/reports/tkm_r.pdf
[25] The Concept for Forestry System Development in the Republic of Uzbekistan until 2030. Data as of 2019.
[26] https://stat.uz/en/official-statistics/environment
[27] FAO. Global Forest Resources Assessment, 2020 (https://fra-data.fao.org/KGZ/fra2020/home/)

Forested area (land covered with forests)	3.3 million ha[28] - FAO 13.1 million ha[29] - NSC 4.53 million ha[30]- GFW (2010)	1.32 million ha - FAO 1.1166 million ha- NSC 578 thousand ha- GFW (2010)	0.42 million ha - FAO 0.4218 million ha- NSC 31.7 thousand ha- GFW (2010)	4.1 million ha - FAO 7.56 thousand ha- GFW (2010)	3.2 million ha- FAO 3.235 million ha[31] 74.3 thousand ha[32]- GFW (2010)
Priority forest types[33]:	Saxaul woodlands and forests, including on the dry bed of the Aral Sea, and tugai forests	Walnut and wild fruit forests in the Jalal-Abad (Chatkal district) and Talas provinces	Juniper, pistachio, riparian, mountain and saxaul forests	Saxaul woodlands and forests	Tugai forests, saxaul woodlands and forests on the dry bed of the Aral Sea
Note. Quantitative data on primary indicators, such as forest area (%) of land area, forest fund area, forested area (land covered with forests), etc. are interpreted differently in different sources of information. Data provided by the Global Forest Resources Assessment (FAO), national statistics committees (NSC) and Global Forest Watch differ dramatically. Data depend on approaches, including forest definition, measurement tools, methodology, and a great deal of data variation complicates decision-making and progress monitoring. For example, many differences are due to the fact that the sources use different definitions of the terms "forest" and "other wooded land". Therefore, some of the forests specified in the national data fall under the category of "other wooded land" in FAO classification (FAO, UNECE, 2019)[34].					

1.1.5. Grassland Ecosystems

Even though grasslands occupy no more than 3% of the territory of Central Asia, their role in biodiversity conservation cannot be overestimated. Grasslands are the most productive pastures, they regulate the state of the soil cover and house many endemic, rare and endangered species. Many Tien Shan vegetation researchers[35] believe tall-grass grasslands are secondary formations that appeared in places where forests were destroyed as a result of human economic activity, while others specify primary grassland ecosystems. Thus, N. Pavlov (Павлов, 1948) classified tall-grass grasslands with dominating ***Alopecurus pratensis***, ***Dactylis glomerata***, and ***Brachipodium pinnatum*** as indigenous and "primeval", and those with abundant tall coarse wild grasses like ***Anthriscus sylvestris***, ***Ligularia heterophylla*** – as secondary. N. Rubtsov (Рубцов, 1955) assumes that tall-grass grasslands confined to the plateau-like peaks of individual mountains are primary and appeared as a result of natural plant cover evolution in climatic conditions unfavourable for forest existence. At the same time, grasslands are often the result of man-induced deforestation.

So far, no unified classification system has been developed for grassland vegetation in desert areas of Kazakhstan and Central Asia. The following grassland types are distinguished depending on geographical location and dominant species: tall-grass, mid-grass cryophyte (subalpine) and short-grass cryophyte (alpine)[36]. Grassland ecosystems are divided into the following subtypes according to what ecological groups environment-forming

[28] FAO. Global Forest Resources Assessment, 2020 (https://fra-data.fao.org/KGZ/fra2020/home/)
[29] https://stat.gov.kz/official/industry/157/statistic/7 (Accessed in April, 2022)
[30] GlobalForestWatch, 2010 https://www.globalforestwatch.org/map/country/KAZ
[31] The Concept for Forestry System Development in the Republic of Uzbekistan until 2030. Data as of 2019.
[32] GlobalForestWatch, 2010 https://www.globalforestwatch.org
[33] Forest Landscape Restoration in the Caucasus and Central Asia. Background study for the Ministerial Roundtable on Forest Landscape Restoration and the Bonn Challenge in the Caucasus and Central Asia
(June 21-22, 2018, Astana, Kazakhstan). FAO, UNECE. New York and Geneva, 2019 (https://unece.org/DAM/timber/publications/DP-72-flr-cca-en.pdf)
[34] Forest Landscape Restoration in the Caucasus and Central Asia. Background study for the Ministerial Roundtable on Forest Landscape Restoration and the Bonn Challenge in the Caucasus and Central Asia (June 21-22, 2018, Astana, Kazakhstan). FAO, UNECE. New York and Geneva, 2019 (https://unece.org/DAM/timber/publications/DP-72-flr-cca-en.pdf)
[35] Ionov R. "Ecosystem approach" section. 31.10 2005 http://www.biom.kg/informatory/library/5856bc23bc854e81eca79250
[36] Ionov R. "Ecosystem approach" section. 31.10 2005 http://www.biom.kg/informatory/library/5856bc23bc854e81eca79250

plants belong to[37]: swampy grassland, true grassland, deserted grassland, halophytic grassland, shrubby grassland, tall-grass grassland, and sandy grassland. Grassland ecosystems are very dynamic, and in case environment or management conditions change, they transform into other types of ecosystems (more or less productive depending on external influences – into forest ecosystems, shrubs, or desert and semi-desert ecosystems).

Tall-grass grasslands are widespread in the forest-meadow mountain belt at elevations from 1,900 to 2,500 m in the Northern and Western Tien Shan ranges and can be spotted in the Inner Tien Shan. Projective cover degree is 80-95%, herbage height reaches 60-100 cm. The yield of aboveground mass is 25-30 c/ha. As a result of improper economic use of tall-grass grasslands (late haymaking, spring grazing), valuable top grasses fall out of the herbage: cocksfoot (***Dactylis glomerata***), heath false brome (***Brachypodium pinnatum***), awnless brome (***Bromus inermis***), meadow bluegrass (***Poa pratensis***), wood bluegrass (***Poa nemoralis***).

Subalpine (mid-grass cryophyte) grasslands. These can be found above the forest belt at elevations from 2,300 to 3,200 m. They are well represented in the mountains of the Northern and Inner Tien Shan and are less common in the Western and Central Tien Shan. Floristic richness is made up of 60-75 species of higher plants. Projective cover degree is 70-100%, herbage height is 20-40 cm. The yield of aboveground mass is 8-17 c/ha.

Alpine (short-grass cryophyte) grasslands. Features of the vegetation cover: lack of tree and shrub vegetation, predominance of low-growing (2-10 cm) species with "alpine" rosette-like growth habit. Alpine grasslands are common to all the Tien Shan ranges at elevations from 2,800 to 3,600 m. Floristic richness is 50 higher plant species, projective cover – up to 90%, aboveground mass yield – 1.5-8 c/ha[38].

1.1.6. Wetlands and River Deltas

There are about 12 thousand large and small rivers, as well as around 10 thousand lakes in Central Asia (Rustamov, 2018). All rivers flowing in the central and southern parts of the region including the major ones like the Amu Darya and Syr Darya, Ili and Irtysh represent internal drainage systems or endorheic river systems with catchment areas in mountainous parts of the region.

The region is distinguished not only by a large number of water bodies, but also by their exceptional diversity. The largest natural lakes are the Caspian Sea, Balkhash and Issyk-Kul, and the largest artificial lakes are Sarykamysh, the Aydar-Arnasay Lakes, Dengizkul, and Altyn Asyr. Several large lakes, in particular Issyk-Kul, are located in the mountainous regions of Central Asia.

A rather vast plain covering southern Kazakhstan, northern and western Uzbekistan, northern Turkmenistan and a small part of Kyrgyzstan is especially noteworthy. It houses several large lakes including the remaining parts of the Aral Sea and Lake Balkhash (half of which is salt, and the other half is freshwater). Several large rivers with vast deltas flow across the plain. These are the Syr Darya and Amu Darya, which used to flow into the Aral Sea, the Ili River, which flows into Lake Balkhash, and the Chu River, which disappears into the desert. Due to intensive irrigation, the flow of all rivers is constantly decreasing. After the loss of the Aral Sea the existence of Lake Balkhash is under threat too (IPBES, 2018).
The unique combination of the region's specifics – large-scale landscapes dominated by deserts and steppes along important bird migration corridors – makes Central Asia a globally significant region for wetland conservation. The river systems and associated wetlands of Central Asia contain the largest diversity of birds,

[37] Botanical geography of Kazakhstan and Central Asia (in the desert area). Rachkovskaya E. Chief editor. Composite work. Saint Petersburg, 1995. 130 p https://sng1lib.org/book/2438346/ae6630
[38] Ionov R. "Ecosystem approach" section. 31.10 2005 http://www.biom.kg/informatory/library/5856bc23bc854e81eca79250

reptiles, amphibians, fish and invertebrates in the region. Many of the local fish and invertebrate species represent common and widespread Palearctic communities, while others are endemic and on the verge of extinction[39]. Large lakes such as the Aral Sea, Balkhash, Issyk-Kul, Sasykkol, Alakol, Zaysan, Tengiz and Karakul are also known to be home to unique plant communities, including many endemics.

The region is invaluable in providing habitat for millions of migratory waterfowl and shorebirds, especially in Kazakhstan and Turkmenistan. One of the main areas for both migratory birds and local nesting bird populations is Lake Issyk-Kul (included in the Ramsar List) in eastern Kyrgyzstan, which if combined with numerous surrounding wetlands forms the largest ecosystem complex in Kyrgyzstan. The partly artificial Sarykamysh (Turkmenistan and Uzbekistan) (Ten et al., 2012) and Aydar-Arnasay (Uzbekistan and Kazakhstan) lakes are also of significant importance for wildlife, overlapping in many instances with many Important Bird Areas.

The vast complex of rivers and lakes surrounding the Caspian Sea is a breeding area for rare and endemic freshwater fish and is particularly important for migratory and wintering waterfowl.

1.1.7. Marine Ecosystems

The biological diversity of the Caspian Sea and its coastal zone makes the region one of the most valuable ecosystems in the world. Among the most important features of the Caspian Sea is the high rate of biological endemism. Diverse habitats ranging from vast river systems to extensive wetlands are home to a large variety of flora and fauna.

Although most of endemic species are found in the middle Caspian Sea, its northern part is distinguished by the greatest diversity of both habitat and species. This is due to the big rivers, such as the Volga and the Ural, which create a zone where marine and freshwater fauna are mixed (EEA, 2008).

The Caspian Sea lies at the crossing of migration routes of millions of migratory birds and offers refuge to a number of rare and endangered species. A total of 466 bird species can be found here including 120 nesting birds, 68 wintering species and 278 migratory birds or summer residents. The region is therefore a very important site for reproduction, moulting and rest during migrations.

Despite being the water body with a relatively low fish species diversity (about 76-126 species of 17 families), according to some sources the Caspian Sea holds up to 85%[40] of the world's population of sturgeon (*Acipenseridae*). The Caspian sturgeon is represented by six species: beluga (***Huso huso***), Russian sturgeon (***Acipenser gueldenstaedtii***), Persian sturgeon (***Acipenser percicus***), starry sturgeon (***Acipenser stellatus***), ship sturgeon (***Acipenser nudiventris***) and sterlet (***Acipenser ruthenus***). Other endangered local species include Caspian lamprey (***Caspiomyzon wagneri***), Volga shad (***Alosa kessleri volgensis***), Caspian trout (***Salmo trutta caspius***), ***Stenodus leucichthys***, ***Chalcalburnus chalcoides chalcoides***, ***Vimba vimba perca***, ***Barbus brachycephalus caspicus***, ***Barbus capbus***, ***Barbus citocasicus***. A notable mammal is the Caspian seal (***Pusa caspica***).

1.1.8. Anthropogenic Ecosystems

Anthropogenic ecosystems are artificial ecosystems created by humans in place of natural ones. Unlike natural ecosystems, they can't reproduce on their own in the absence of external support. From an environmental point of view, they are identifiable by broken and incomplete cycles where no complete turnover of nutrients is ensured.

[39] The Syr Darya sturgeon (***Pseudoscaphirhynchus fedtschenkoi***) is deemed extinct (WWF, 2014. Sturgeons: amazing fish on the verge of extinction or a source of gourmet products? VNIRO, 2014 (https://wwf.ru/upload/iblock/64a/osetr_web.pdf)), but according to some data (Amu Darya sturgeons, 2017. Amu Darya sturgeons. Conservation project (Uzbekistan) (http://life-on-earth.ru/amudarinskie-lopatonosy/amudarinskie-lopatonosy-proekt-sokhraneniya-uzbekistan) the Amu Darya sturgeon (***Pseudoscaphirhynchus kaufmanni***) can still be found in rivers.

[40] https://www.eea.europa.eu/publications/report_2002_0524_154909/regional-seas-around-europe/CaspianSea.pdf

Particularly large areas of anthropogenic ecosystems are associated with the middle and lower reaches of the Amu Darya, Syr Darya, Zeravshan, Talas, Naryn, Ili, and Chu and on the submontane plains. This is due to the peculiarities of economic development and traditional focus on irrigated agriculture.

Figure 1.2. demonstrates the diversity of natural and anthropogenic ecosystems in the region.

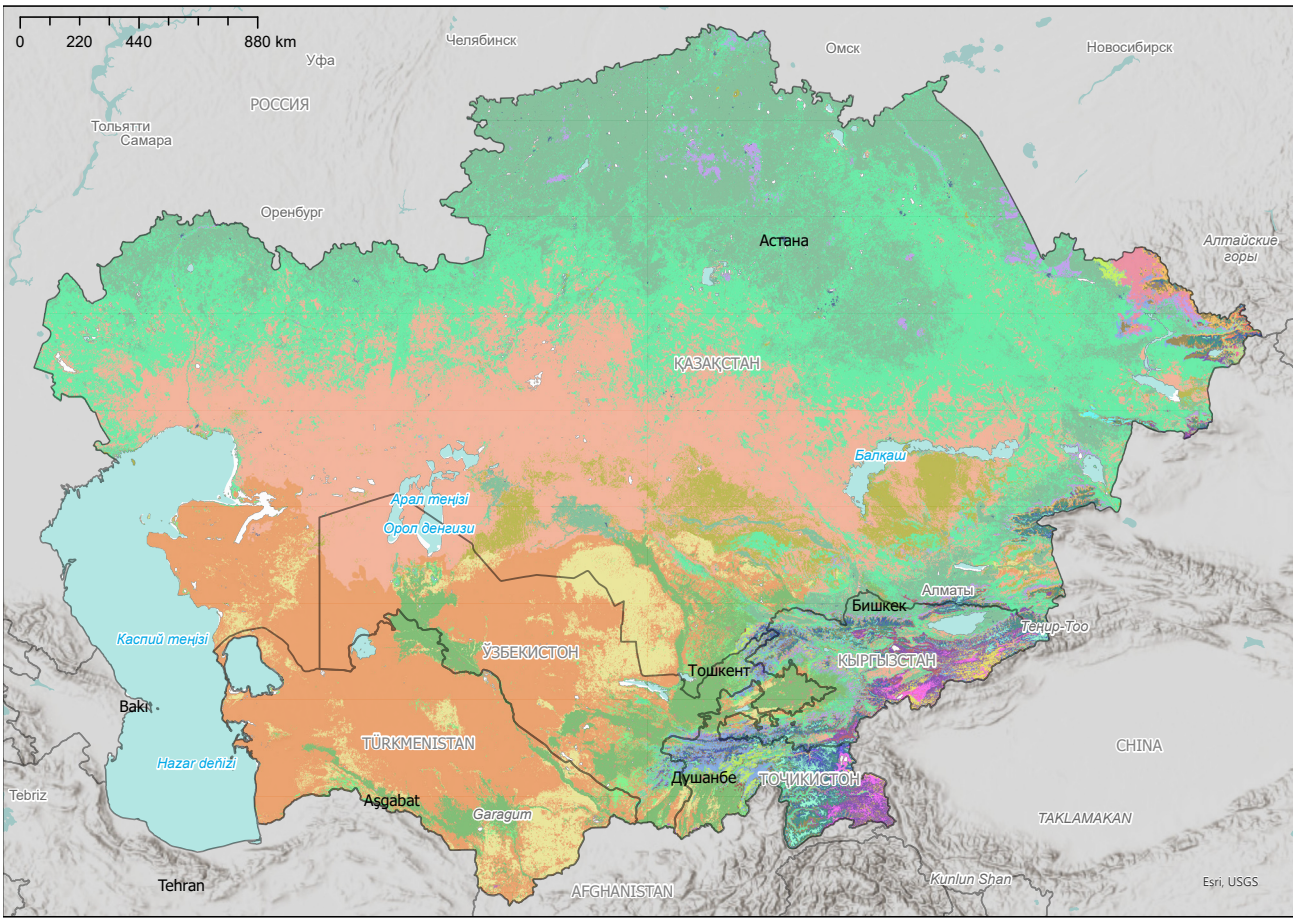


Figure 1.2. *The map of ecosystems in Central Asia (based on Sayre et al, 2020).* For the purposes of this Review, the map is merely illustrative, therefore no legend is included.

Box 1.1. *Examples of different approaches to identification of the most valuable ecosystems in Central Asia*

For practical purposes of biodiversity conservation, there are various approaches to identification of the most valuable areas featuring a high level of species and ecosystem diversity, the presence of rare species, a relatively high degree of conservation, or other similar criteria. In recent years, the following classification systems have been used in papers on biodiversity conservation in Central Asia:

- Key biodiversity areas (KBA, https://www.keybiodiversityareas.org/). KBAs are areas contributing significantly to the global persistence of biodiversity. They are significant because they host species and ecosystems that are globally endangered, have a limited geographic distribution, or are irreplaceable as they contain a significant proportion of the global population of a species. The International Union for Conservation of Nature (IUCN) has proposed several KBA qualification criteria. The criteria and thresholds are set out in the Standard (IUCN, 2016). The KBA criteria and delineation guidelines with quantitative thresholds ensure that KBA identification is objective and accurate and can be applied universally to identify sites in terrestrial, inland water and marine environments.

- Biodiversity hotspots. Biodiversity hotspots are identifiable by both exceptional biodiversity and significant habitat loss (Myers, 1988; Myers et al., 2000). Worldwide, 35 areas currently qualify as biodiversity hotspots; they cover only 17.3% of the Earth's land surface. These are the areas that contain at least 1,500 endemic plant and animal species and have lost at least 70% of their natural (primary) habitats. Biodiversity hotspots are home to 77% of all endemic plant species and 43% of vertebrates (including 60% of endangered mammals and birds). Central Asia is partially covered by two biodiversity hotspots, Irano-Anatolian hotspot, and the Mountains of Central Asia (see Figure 1.3).
- Key landscapes for conservation (KLC). This term is used in the synthesis report "Larger than Tigers: Inputs for a strategic approach to biodiversity conservation in Asia" published by the European Union in 2019[41]. KLCs should be viewed as priority targets for conservation funding and areas where potentially harmful projects (especially infrastructure and large-scale land use change) must be subjected to scrutiny in terms of biodiversity impact.

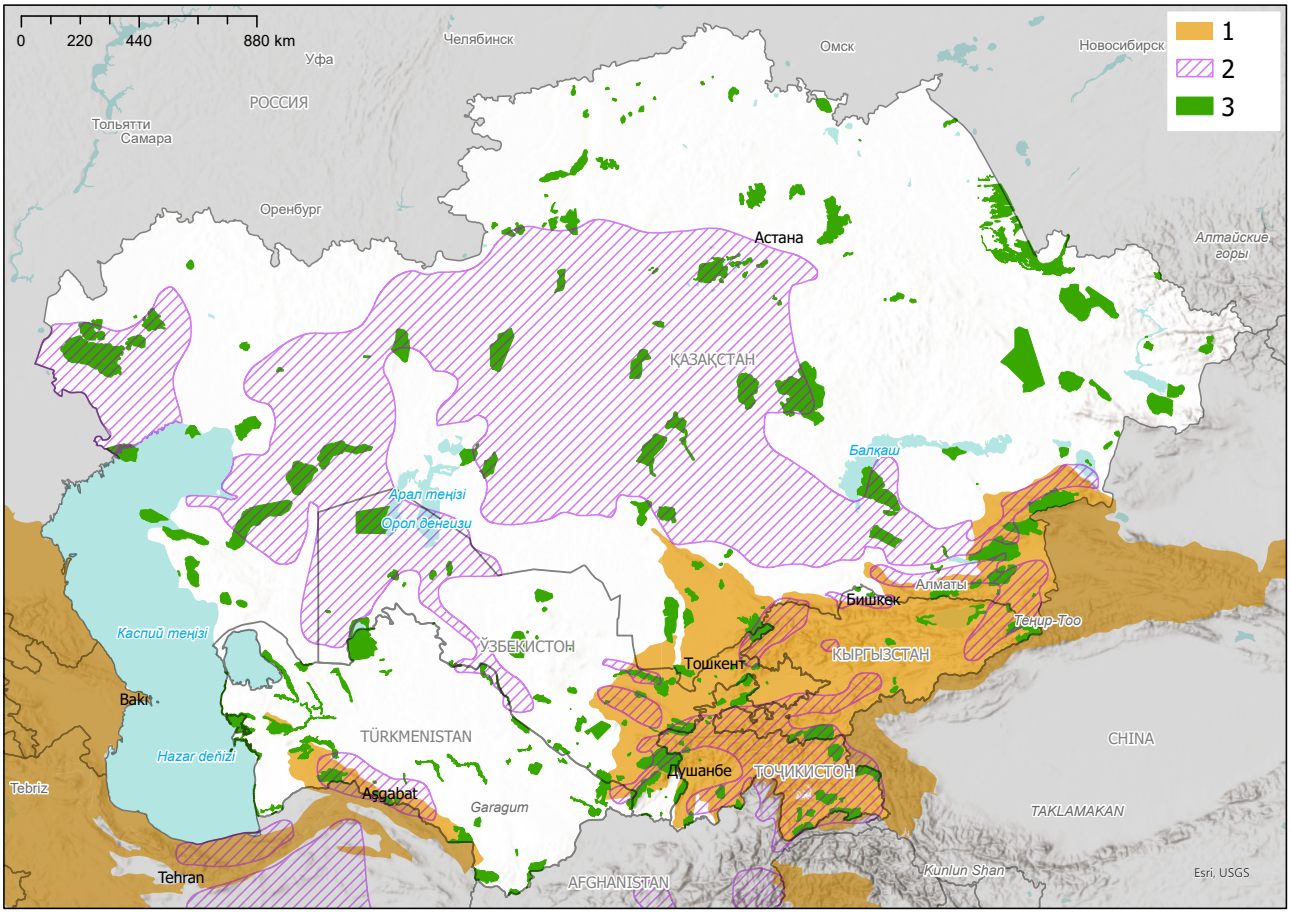


Figure 1.3. *Internationally recognised high-biodiversity areas in the region*

1. Terrestrial biodiversity hotspots (https://www.cepf.net/)
2. Key landscapes for conservation (https://ej.uz/851k)
3. Key Biodiversity Areas (https://www.keybiodiversityareas.org/)

[41] https://op.europa.eu/s/xbuQ

The major types of terrestrial ecosystems found in Central Asia are shown in Figure 1.4.

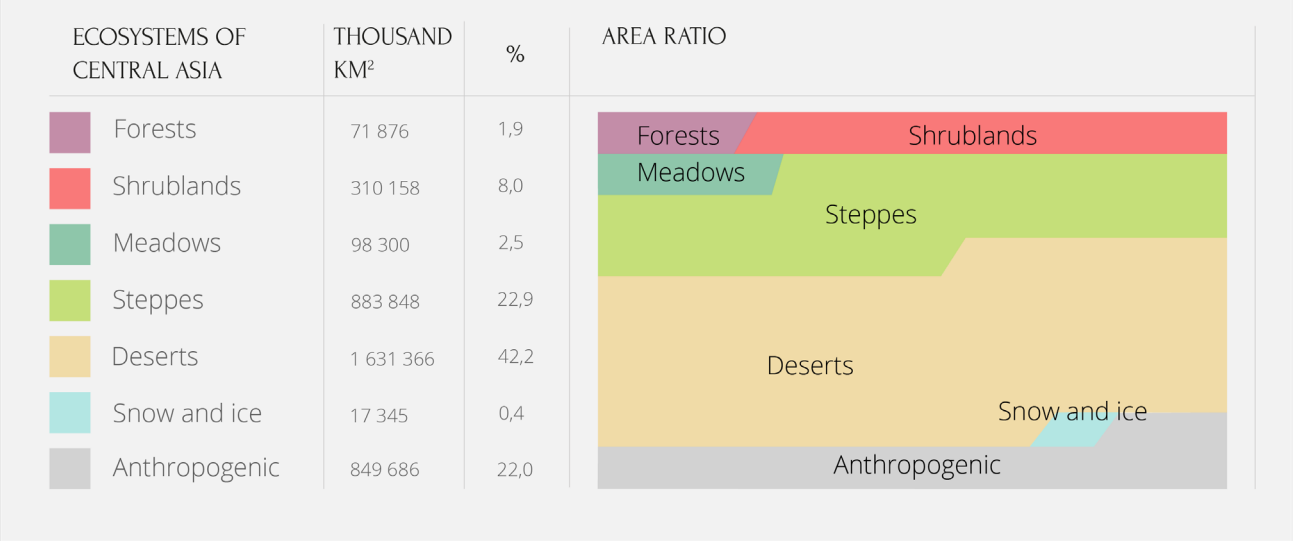


Figure 1.4. *Ecosystems area ratio in Central Asia (Sayre et al, 2020)*

1.2. Trends and Challenges

The region's natural ecosystems can produce biomass in such a volume that can be partly withdrawn for economic development and human life support. Replacement of natural ecosystems with anthropogenic ones is conditioned, to a certain extent, by the sufficient productivity of the latter. The exploitation of natural grass ecosystems for livestock grazing gives a 20-fold increase in yield per unit as compared to hunting. At the same time, such a human-modified ecosystem loses its ability to fulfil ecosystem functions of water regulation, microclimate, soil and pest balance maintenance and many others.

As long as natural ecosystems retain their original composition and structure, they remain flexible to respond to climate change and adapt to it. Thus, the vegetation cover conservation prevents topsoil loss and formation of destructive floods and mudflows. The preserved natural ecosystems are therefore powerful hotspots of transition to climate resilient development of adjacent territories.

Up to a certain point, anthropogenic transformation of ecosystems increases their productivity. However, when the sustainability threshold is exceeded the ecosystem structure, stability and functioning are disrupted resulting in transition to a lower productive level, at best (see Figure 1.5), all the way down to complete ecosystem destruction and loss of its economic value, whereas its restoration is an extremely complex and resource-intensive process (Shukurov, 2016).

A natural ecosystem is fully functional where there is a high level of species diversity in a certain area. In each specific case, indicators of the species composition of plants, animals and birds are used to determine the level of anthropogenic impact on an ecosystem or ecosystem load.

Thus, for example, the load on grassland ecosystems used as pastures is estimated based on their productivity. The state of a grassland community is measured by the biomass of grazed plants specific to the given grassland ecosystem.

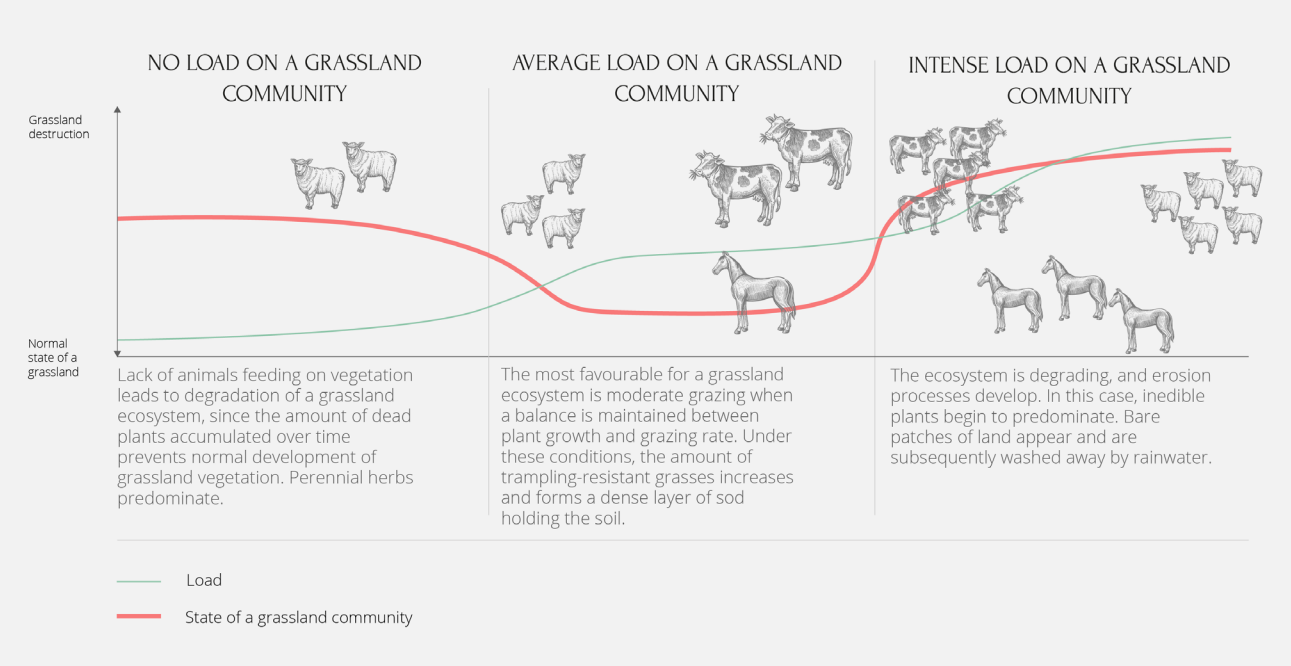


Figure 1.5. *Grassland ecosystems utilisation threshold. Shukurov, Domashov, 2017.*

The red line depicts the state of a grassland community: the lower part of the ordinate corresponds to a very good state of the grassland community (high species diversity and high bioproductivity), the upper part – grassland community degradation up to its complete destruction.

At the same time, the possibility of biomass withdrawal from ecosystems for the purposes of economic development is directly related to their productivity. The decline in ecosystem productivity affects the region's opportunities for sustainable economic development and sustainable development in general, in terms of both "intergenerational equity in access to natural resources" and "resilience to the impacts of climate change."

The same goes for landscapes. Under excessive anthropogenic impact, they are transformed into anthropogenic landscapes that can further degrade beyond recovery, thus becoming marginal lands (Badlands) – sharply and intricately dissected low-mountain landscapes, consisting of a tangled network of branchy narrow watersheds, that are impassable and unsuitable for agriculture.

Thus, as the level of exploitation of renewable natural resources constantly increases, production level grows too for a while, but later declines, sharply and steadily, all the way down to complete loss of practical significance. The very ability of a resource to reproduce is undermined in this manner.

The economic, political, social, cultural challenges the region faces are often at variance with the goals of ecosystem conservation, and therefore new, sustainable approaches to dealing with issues of the day are required, since biodiversity degradation will lead to an increase in poverty, inequality, conflict, migration flows and reduce the ability of local communities to resist the impact of climate change.

1.3. Ecosystems Degradation in the Region

For millennia, humans have converted much of the region's wilderness into farmland and pasture, and through predator control and trophy hunting have greatly reduced populations of some species. As elsewhere in the world, population growth and migration, as well as economic development effects, have greatly increased the threat to wildlife.

Global biodiversity assessments (CEPF, 2017, Millennium Ecosystem Assessment, 2005)[42] note that anthropogenic modification of habitats has become the most important driver of terrestrial ecosystem change over the past 50 years. In Central Asia, vast areas[43] of lowland semi-desert plains and foothills have been converted to agricultural use, mainly for cultivation of cotton, cereals, and other crops. Agricultural development has resulted in the loss of grasslands, pastures and semi-deserts, and deterioration of soil fertility and water availability.

Poor water management and irrigation practices, as well as pollution from overuse of fertilisers and pesticides, have degraded soil productivity even further. At present, habitats continue to change as a result of infrastructure expansion and land reclamation (CEPF, 2017).

Construction of large-scale irrigation and hydropower facilities has disrupted the natural hydrological regime of water bodies and, as a result, the aquatic ecosystems, and their biological diversity.

Due to the use of inadequate technologies large areas of arable lands and pastures are prone to degradation. Ever-expanding network of roads and railways causes universal fragmentation of wildlife habitats and subsequent degradation of the region's ecosystems.

Ecosystems vulnerability is also being exacerbated by climate change particularly noticeable in the region, making conservation efforts all the more significant.

Anthropogenic impact on ecosystems is unevenly distributed across Central Asia (Fig. 1.6). The greatest impact on ecosystems is registered in places featuring the most favourable conditions from the human point of view.

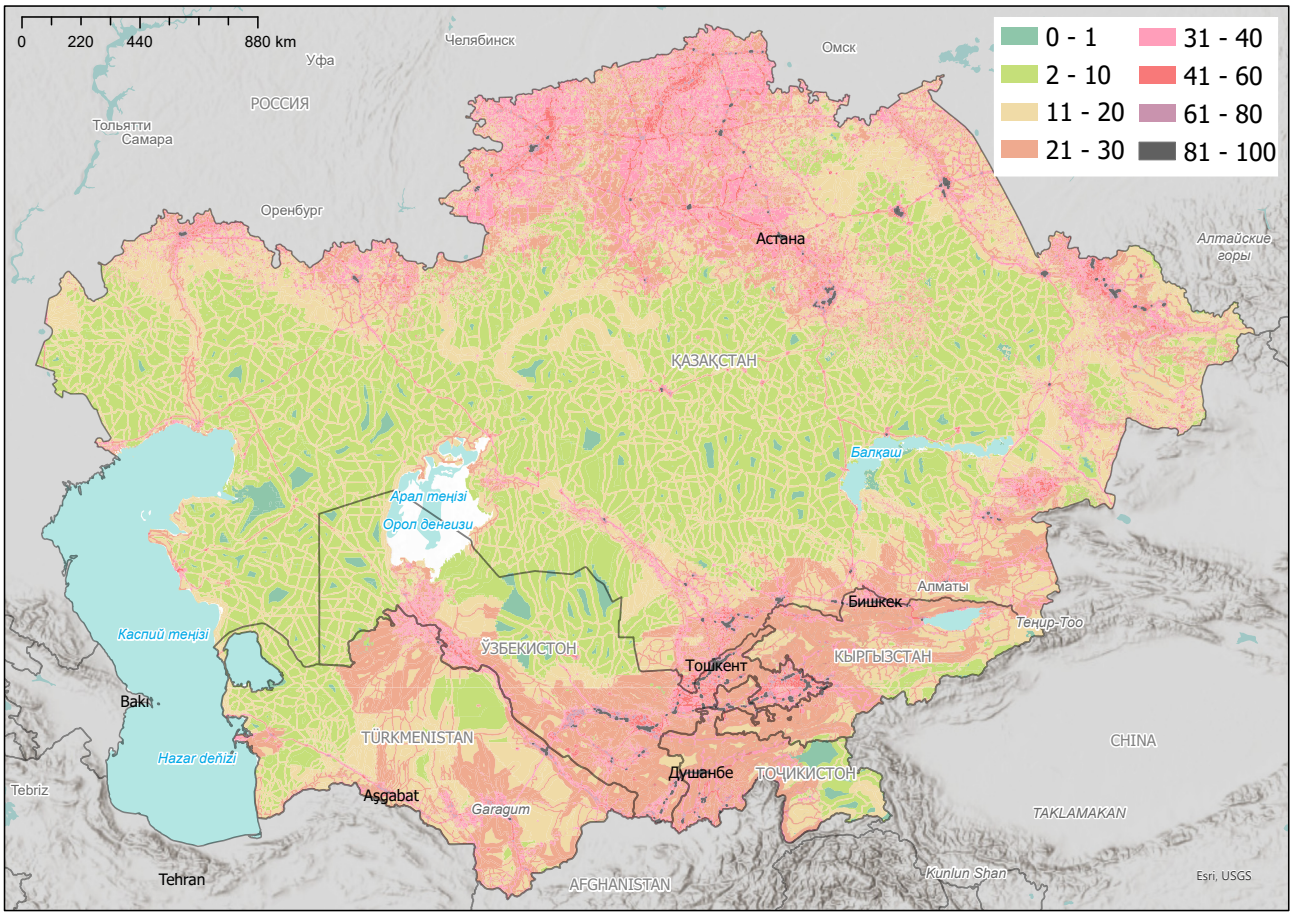


Figure 1.6. *Anthropogenic load in the region (Wildlife Conservation Society, 2005) , expressed as the Human Footprint Index (HF).*

[42] https://www.millenniumassessment.org/ru/index.html

[43] Until 1913, the irrigated land area in Central Asia amounted to 3.25 million hectares, by 1940 it was already 4.3 million hectares, in 1960 – 5 million hectares, as of January 1, 1999, it reached 7.95 million hectares (www.cawater-info.net).

HF expresses the relative human influence in each terrestrial biome in values from 0 (least influenced - more wild) to 100 (most influenced).

The forests near settlements, forest areas after opencast mining, tugai (riparian) forests and forests on steep slopes are most in need of attention. Despite their high importance for the life of local population, forests near settlements have been severely damaged as a result of uncontrolled logging and grazing. A striking example is the walnut-fruit forests of southern Kyrgyzstan. Wild forests with walnuts (***Juglans regia***) and fruits are a key genetic reservoir for the natural population of many globally important walnut species and a source of valuable non-timber forest products for local communities (UNECE and FAO, 2018).

Tugai forests are among the most degraded forest ecosystems in Central Asian states where they make up a substantial part of the state forest fund, namely Kazakhstan, Turkmenistan, and Uzbekistan. In the recent past, tugai forests were widespread, but their area has shrunk due to land conversion to agricultural use and decrease in water levels in river deltas after large amounts of water were diverted for irrigation. The remains of these forests can be found in the deltas of the Amu Darya and Ili rivers, as well as along the Syr Darya. The surviving tugai forests are under increased pressure from tree felling, fuelwood collection and livestock grazing.

Saxaul forests have suffered degradation largely from fuelwood removal and grazing. Black saxaul forests (***Haloxylon aphyllum***) have also suffered from reduced river flows, due to increased water abstraction, in the same way as tugai forests (Thevs et al., 2013). Saxaul degradation has resulted in widespread wind erosion in the deserts. Steep mountain slopes are also in need of forest restoration. Afforestation on mountain slopes will help prevent erosion and landslides and reduce the risk of natural disasters. Finally, a powerful argument in favour of forest restoration throughout the CA region is their important role in preserving the vital habitat for protected species and maintaining biological diversity in general.

Despite all efforts, forest cover in Central Asia has recently been declining for many reasons, including urbanisation, agricultural development, climate change, growing demand for timber, and expansion of plantations for species not typical for the region.

The steppe and grassland areas in Central Asia are among terrestrial ecosystems that are the most sensitive to climate change[44]. The structure of grasslands in mountainous areas is often a complex interaction of different types of vegetation that dominate under different climatic conditions. Due to their high climatic plasticity mountain grasslands can adapt to climate changes and produce the required amount of biomass under various climatic scenarios. In wet years, components that are more mesophytic in nature get better development in the herbage thus maintaining community structure. In drier years, the phytocenotic role of xeromorphic plant species in the vegetation cover significantly increases. Such plasticity may be lost due to decrease in biodiversity of grassland ecosystems.

At present, tall- and mid-grass grassland ecosystems of Central Asia are in a particularly vulnerable state. At the end of the 20th century, domestic livestock production initially declined, but as economies stabilised, the herding of sheep and goats increased sharply, especially in the foothills and lower slopes (800-2,000 metres), and to a lesser extent – above 2,500 metres. Degradation from overgrazing is apparent around settlements, however, its impact is much wider. Overgrazing results in soil erosion, reduces yields and species composition, leading to the dominance of less palatable or inedible grasses, and, as a result, further expansion of grazing areas. Overgrazing on the most productive pastures leads to less fodder for wild ungulates such as the argali and other subspecies of mountain sheep and complicates achievement of the Sustainable Development Goals[45]. The degradation of grassland ecosystems also causes loss of genetic resources and redistribution of ecological niches.

[44] http://climatechange.kg/uchenye-nanesli-na-kartu-samye-chuvstvitelnye-k-izmeneniyu-klimata-regiony-planety/
[45] https://www.cepf.net/sites/default/files/mountains-central-asia-ecosystem-profile-english.pdf

The steppe areas are currently partly cultivated, and the semi-deserts are used as pastures. It is estimated that after intensive agriculture was forgone in the second half of the 20th century, when about 90% of steppes had been converted into arable land, approximately 50% of the previously cultivated steppe territories in Kazakhstan have turned back into natural steppe landscapes[46].

In **Kazakhstan**, the largest areas of natural ecosystems are preserved in deserts, which occupy about 40% of the country's land area. In recent years, there has been an increase in land degradation and the loss of natural vegetation in these areas due to overgrazing. The most degraded pasture ecosystems are found in plains, where more than 95% of all degraded pastures are concentrated, including those in desert and semi-desert zones – 16.1 million hectares or 60% of their area.

In **Kyrgyzstan**, highly disturbed ecosystems include high-mountain, mid-mountain and low-mountain deserts, as well as low-mountain and submontane steppe ecosystems (the Sixth National Report on Biological Diversity in the Republic of Kyrgyzstan[47]). Over the past 50-100 years, submontane plain steppes, tugai and wetland complexes in the Chu valley and the Issyk-Kul basin, dry-steppe, semi-desert and desert ecosystems in the Fergana zone have virtually disappeared. The ecosystems in the lower reaches of the rivers were degraded due to heavy pollution and water withdrawal for irrigation, as a result of which water sources have dried out. Steppe, desert and semi-desert ecosystems of submontane plains and intermontane valleys, riverine tree and shrub vegetation are prone to severe destruction due to overgrazing, especially near settlements.

In **Tajikistan**, a particularly high anthropogenic load on the steppe ecosystems falls on the autumn-winter-spring ephemeral[48] and ephemeroid[49], and wormwood pastures in southern and northern Tajikistan and the summer steppe pastures in the Kuraminsky Range (north-eastern part of the country), leading to degradation of herbaceous and shrub vegetation, including steppe vegetation[50].

In **Turkmenistan**, most of the country's land area (about 80%) is covered by deserts. Due to a relatively low anthropogenic impact, many desert ecosystems of Turkmenistan are still virtually intact and can set a standard of natural complexes, and are therefore significant for conservation and preservation[51].

In **Uzbekistan**, out of 19 million hectares of pastures, desert pastures usually used for sheep grazing occupy over 80% of the country's land area. Other pastures intended for both cattle and small ruminants are either semi-deserts (12%), mountain steppes (5%) or highland pastures (2%). The greatest load in this instance falls on desert ecosystems and foothills[52].

Within the scope of their national documents (sixth national reports on biodiversity) all CA countries note the problems associated with degradation of grassland, desert, semi-desert, and steppe ecosystems.

- In **Kazakhstan**, overgrazing, wild plants collection, increase in unorganised tourism and agricultural land expansion are reported as major threats.
- The main threats in **Kyrgyzstan** are associated with poor pasture management leading to intensive degradation of submontane steppes and loss of endemic plant species.
- **Tajikistan** has faced expansion of agricultural production all the way up to the borders of protected areas and lack of clear land ownership rights.
- In **Turkmenistan**, the major problems are concentrated in the foothills and mountains of Koytendag. The

[46] The Sixth National Report on Biological Diversity in the Republic of Kazakhstan. Astana, 2018 (https://www.cbd.int/doc/nr/nr-06/kz-nr-06-en.pdf)
[47] https://chm.cbd.int/database/record?documentID=243111
[48] Ephemeral plants are annual plants with a very short life cycle.
[49] Ephemeroid plants are perennial herbaceous plants with a very short growing period.
[50] The Sixth National Report on Biological Diversity in the Republic of Tajikistan, 2019 (https://chm.cbd.int/pdf/documents/nationalReport6/247273/2)
[51] Turkmenistan: The Sixth National Report on Implementation of the UN Convention on Biological Diversity, 2019
[52] The Sixth National Report on Biological Diversity in the Republic of Uzbekistan, 2018

main threats are posed by agricultural expansion, overexploitation of certain species and unorganised recreational tourism.

- Expansion of agricultural land, unsustainable use of fertilisers and pest control and associated pollution, unregulated tourism and infrastructure development are major threats to ecosystems in **Uzbekistan**.

The traditional approach to conservation of certain animal and plant species that was practiced for a long time has led to reduction in their diversity in all CA countries. However, it has demonstrated the need for an ecosystem approach to preservation of the entire complex of living beings along with their habitat. Such approach requires development of new policies, strategies, programmes, and projects.

The key condition for conservation of biological diversity is the in-situ[53] conservation of ecosystems and natural habitats, maintenance and restoration of viable populations of species in their natural living conditions.

Ecosystems that have retained a rich diversity of species can adapt to changing climatic conditions and maintain their role as environmental regulators. However, only natural communities that have preserved their natural diversity are capable of such adaptation. To achieve this goal, first it is necessary to step up measures to support ecosystems that have been preserved in a state close to their original one and develop ways to restore ecosystems that have lost a significant part of their genetic basis and structure.

Box 1.2. **Common approach to habitat classification in the EU: a good practice example:**

The Habitats Directive is an EU legislative instrument that establishes a common framework for the conservation of wild animal and plant species and natural habitats of Community importance, and provides for the creation of a network of special areas of conservation, called “Natura 2000”. An integral part of this legislative instrument is the unified natural habitat classification system.

A common habitat classification was developed in course of preparation of the Directive by the European Union and agreed upon by all EU countries (Annex I to the Directive – Natural habitat types of Community interest whose conservation requires the designation of special areas of conservation).

Annex I currently lists 233 European natural habitat types, including 71 priority ones (i.e. habitat types in danger of disappearance and whose natural range mainly falls within the territory of the EU). The classification system given in Annex I assigns codes to habitat types and divides them into subtypes.

Since the difficulties of habitat types definition and general application of the habitat classification system were foreseen from the very outset, a scientific reference document “Interpretation Manual of European Union Habitats” was developed as a next step. The original EUR12 version of the Interpretation Manual has been amended several times when new biogeographical regions and habitat types found in the newly acceding EU member states were introduced. New habitat types can be accepted to be added to Annex I following negotiations with the European Commission and consultation with the Member States. Existing habitat types can also be amended to take into account variations in a particular region. The latest version of the Interpretation Manual is the EUR28 version, which was developed and approved to include descriptions of new habitats and amendments to existing habitats resulting from Croatia accession to the European Union in 2012.

[53] In place, within the natural habitat.

1.4. Conclusions and Recommendations

Conservation of all types of natural ecosystems, forests, genetic resources, species diversity is of vital importance for the countries of Central Asia. At the same time, political and economic challenges, spontaneous market development, aggravating regional challenges and climate change increase the impact on the region's vulnerable ecosystems.

The key condition for the conservation of biological diversity is the in-situ conservation of ecosystems and natural habitats, maintenance and recovery of viable populations of species in their natural conditions.

As the analysis has shown, there is a significant discrepancy in data on various Central Asian ecosystems found in different sources, particularly on forests. This is largely due to the concepts and categories (forest, forest types, forested area, intact forests, degraded forests, etc.) used by international organisations and national forest authorities. Further analysis and unification of concepts, methods and tools of quantitative and qualitative assessment of forests is required. A methodological framework must be developed to classify ecosystems, define their boundaries, and evaluate their state (the degree of anthropogenic disturbance).

The traditional approach to conservation of certain animal and plant species that was practiced for a long time has led to reduction in their diversity. At the same time, it has demonstrated the need for an ecosystem approach to preservation of the entire complex of living beings along with their habitat. Such approach requires development of new policies, strategies, programmes, and projects.

It is important for the development of those new policies to recognise the recent findings of regional scientists that biodiversity degradation affects not only the region's opportunities for sustainable economic development, but also their ability to ensure climate resilient development.

Therefore, mainstreaming biodiversity goals in national and regional development programmes and climate change consequences mitigation programmes is a key condition for their successful implementation.

Chapter 2.

International Instruments for Biodiversity Conservation in Central Asia

The countries of Central Asia are parties to most international agreements on the conservation of biological diversity and ecosystems. The time of accession and the degree of their involvement in the implementation of biodiversity conventions differ from country to country (Table 2.1).

Table 2.1. *Accession of Central Asian states to international agreements on biological diversity and ecosystems (years of accession).*

International agreement	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
The UN Convention on Biological Diversity	1994	1996	1998	1996	1995
The Cartagena Protocol	2008	2006	2004	2008	2020
The Nagoya Protocol	2015	2015	2014	2021	-
The Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress[54]	-	-	-	-	-
The Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES	2000	2007	2016	-	1997
The Ramsar Convention[55]	2007	2003	2001	2009	2002
The Convention on the Conservation of Migratory Species of Wild Animals, the Bonn Convention	2006	2014	2001	2021	1998
The UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage	1994	1995	1992	1994	1993

Accession to international conventions imposes certain obligations on countries that establish a minimum set of requirements, priorities, and targets. This means that when a country joins a convention, it is assumed that the provisions of the given convention will be reflected in one way or another in such country's national strategic documents. Thus, the provisions of the conventions are a kind of starting point, but not the final guideline for biodiversity conservation. Countries can expand them according to their own capabilities.

Accession to the conventions and their implementation (Table 2.2) procedure is reflected in varying degrees in the legislation of the CA countries. In some cases,[56] the countries recognise the priority of an international

[54] This binding international agreement creates obligations for States that need to be implemented domestically. The Protocol applies to damage resulting from living modified organism which find their origin in a transboundary movement.
[55] Country profiles. Source: https://www.ramsar.org/country-profiles
[56] The Law of the Republic of Uzbekistan. On international treaties of the Republic of Uzbekistan (https://lex.uz/docs/4193763)

agreement requirements, in others[57], requirements of a convention are incorporated in the national regulations.

Table 2.2. *The level of participation of Central Asian countries in implementation of biodiversity conventions.*

Country	Article	Regulation
Kazakhstan	Article 4. International agreements ratified by the Republic have primacy over its laws.	The Constitution of the Republic of Kazakhstan[58]
Kyrgyzstan	Article 6. International treaties to which the Kyrgyz Republic is a party that have entered into force under the established legal procedure and the universally recognised principles and norms of international law shall be the constituent part of the legal system of the Kyrgyz Republic.	The Constitution of the Kyrgyz Republic[59]
Tajikistan	Article 10. International legal acts recognised by Tajikistan are a constituent part of the legal system of the Republic. In case of disparity between the laws of the Republic and the recognised international legal acts, the norms of the international acts apply.	The Constitution of the Republic of Tajikistan[60]
Turkmenistan	Article 9. Turkmenistan shall recognise the priority of the universally accepted norms of international law.	The Constitution of Turkmenistan[61]
Uzbekistan	Article 3. International treaties of the Republic of Uzbekistan along with generally recognised principles and norms of international law are an integral part of the legal system of the Republic of Uzbekistan.	The Law of the Republic of Uzbekistan on international treaties of the Republic of Uzbekistan[62]

2.1. The Convention on Biological Diversity

The experience of the Convention instruments application in environmental practice and the degree of involvement in international processes vary from country to country. For instance, all CA countries regularly prepare their National Reports on Biological Diversity, specifically on the fulfilment of commitments assumed under the Convention on Biological Diversity and the implementation status of the Aichi Biodiversity Targets.

The participation of representatives of Central Asian states in the work of the intergovernmental scientific advisory body known as the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), which supports the Conference of the Parties (COP), provides them with an opportunity to better understand the ongoing processes and promote the interests of Central Asia. SBSTTA functions include providing assessments of the status of biological diversity, providing assessments of the types of measures taken in accordance with the provisions of the Convention, and responding to questions that the COP may put to the body[63]. Executive bodies of the Convention have developed platforms for information exchange and capacity building – the Biodiversity E-Learning Platform[64] and the Access and Benefit-Sharing Clearing-House[65].

[57] The Environmental Code of the Republic of Kazakhstan (https://adilet.zan.kz/rus/docs/K2100000400)
[58] The Constitution of the Republic of Kazakhstan (https://www.akorda.kz/ru/official_documents/constitution)
[59] The Constitution of the Kyrgyz Republic (http://cbd.minjust.gov.kg/act/view/ru-ru/112213?cl=ru-ru)
[60] The Constitution of the Republic of Tajikistan (https://www.mfa.tj/ru/bishkek/tadzhikistan/konstitutsiya)
[61] The Constitution of Turkmenistan (https://online.zakon.kz/Document/?doc_id=31337929)
[62] The Law of the Republic of Uzbekistan. On international treaties of the Republic of Uzbekistan (https://lex.uz/docs/4193763)
[63] https://www.cbd.int/conferences/sbstta24-sbi3
[64] https://scbd.unssc.org/course/index.php?categoryid=4
[65] https://absch.cbd.int/

2.2. CITES

All CA countries are sources of circulating animal and plant products, and some of them also act as transit points (for example, Kyrgyzstan). All countries except Turkmenistan are Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and have long been implementing the provisions of the Convention and carrying out relevant law enforcement activities. However, much remains to be done to improve performance in a number of areas, for example, with regard to addressing the gaps in national legislations, including those related to registration and control of organisations engaged in captive breeding of animals included in the CITES lists, as well as regularisation of information submission to CITES on both legal and illegal trade.

Creation of a customs union (CU)[66] within the Eurasian Economic Union had a negative impact on trade in items of flora and fauna. Even though formally the customs union establishment was not supposed to affect implementation of the Convention in its member states (i.e., according to the current CU legislation, the species listed in the CITES Appendices are not subject to other legal acts), the abolition of internal border control has resulted in the ability of CITES-listed species to move freely around the CU territory. This problem can be solved through clear coordination and continuous exchange of information among countries at all levels of CITES implementation and application throughout the CU territory.

Box 2.1. **About the EU-CITES Capacity-building project**

The project *"Strengthening CITES implementation capacity of developing countries to ensure sustainable wildlife management and non-detrimental trade"* was approved for funding by the European Union in 2009.

A major challenge for many countries is the difficulty in meeting the requirements to trade in CITES-listed species, ranging from legal sourcing and sustainability requirements to the effective control of legal trade and deterrence of illegal trade. Mechanisms exist in CITES and in both exporting and importing countries that promote and facilitate compliance – although Parties are often hampered by a lack of capacity or a lack of current biological or trade information with respect to certain species. This can result in levels of trade which are unsustainable, which in turn can impact economic growth and local livelihoods and reduce options and incentives for conserving and managing wild resources effectively.

The overall aim of EU's support is to strengthen capacities to implement the Convention and satisfy the CITES-related requirements of trading partners (such as the European Union), to prevent overexploitation and to ensure that legal international trade in wild fauna and flora does not exceed sustainable levels.

2.3. The Ramsar Convention

The mission of the Ramsar Convention is the conservation and wise use of wetlands, lakes, rivers, shallow marine areas, and other natural sites where water is the main factor that determines the living conditions of plants and animals. Being one of the key types of ecosystems on Earth, wetlands determine the cycle of water and a number of important elements, shape the climate, and ensure conservation of biological diversity.

So far 171 countries have joined the Ramsar Convention and 2,375 wetland sites with a total area of over 254 million hectares have been included in the List of Wetlands of International Importance (the Ramsar Sites) that are protected by the Convention (http://www.ramsar.org). The countries of Central Asia are active users of the

[66] The customs union established within the Eurasian Economic Union currently includes the Republic Armenia, the Republic of Belarus, the Republic of Kazakhstan, the Kyrgyz Republic, and the Russian Federation (http://www.eurasiancommission.org/en/Pages/ses.aspx)

Ramsar Convention instruments. To date, 22 sites in Central Asia have qualified as the sites of international importance.

Despite active participation of government bodies, including those only indirectly related to wetlands, as well as non-governmental and non-profit organisations in designation of natural objects for inclusion in the Ramsar List and their protection, it should be noted that the CA countries have no unified monitoring system, in particular, for migratory, wintering and nesting waterfowl, no well-established information exchange mechanism among countries, and no mechanisms of community participation in the monitoring and conservation of sites protected under the Convention.

Box 2.2. **The Ramsar Regional Initiative for Central Asia (RRI-CA)**

The Ramsar Regional Initiative for Central Asia (RRI-CA) was established in 2015 to implement the goals and objectives of the Ramsar Convention in Central Asia and operated under the auspices of the Regional Environmental Centre. The parties to the RRI-CA were Kazakhstan, Kyrgyzstan and Turkmenistan, the Republic of Tajikistan and Uzbekistan[67]. Implementation period of the initiative was November 2016 – August 2021. It aimed to effectively implement the Convention and its Strategic Plan (2016-2024) in Central Asia through stronger cooperation and synergies among the five Central Asian states.

On July 23, 2021, representatives of the RRI-CA participating nations held a meeting entitled "Wetlands: The Cradle of Biodiversity in Central Asia" to review the RRI-CA's overall performance in the countries over the five-year period[68].

2.4. The Bonn Convention[69]

All CA states have joined the Bonn Convention. In line with the Convention, participating countries are involved in implementation of regional initiatives aimed at conservation of migratory species of wild animals.

Thus, implementation of the Central Asian Flyway (CAF) programme has brought together development agencies including the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP), the World Bank and the Asian Development Bank (ADB), and international non-governmental organisations including BirdLife International, the World Conservation Union (IUCN), the World Wide Fund for Nature (WWF) and Wetlands International that all cooperate on regional and national wildlife conservation.

With a view to implement the Bonn Convention, over 140 countries signed the Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia[70] (Memorandum, 2008), developed and agreed on the Action Plan for the Conservation of Migratory Birds of Prey in Africa and Eurasia[71]. Both documents aim to ensure that all populations of African-Eurasian migratory birds of prey are maintained in, or returned to, favourable conservation status. The Action Plan provides for the key objectives to be achieved, categorises bird of prey species, and sets out priority actions.

The Central Asian Mammals Initiative (CAMI)[72] was created by the Convention on Migratory Species. CAMI aims to reverse the population decline of 15 migratory mammal species in 14 countries where these species

[67]The Ramsar Regional Initiative for Central Asia (RRI-CA) https://carececo.org/main/activity/projects/ramsarskaya-regionalnaya-initsiativa-tsentralnoy-azii-rri-tsa/, http://tajnature.tj/?p=2960&lang=ru
[68] https://e-cis.info/news/569/93739/
[69] The Convention on the Conservation of Migratory Species of Wild Animals
[70] The Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia. https://www.cms.int/en/document/final-text-memorandum-understanding-conservation-migratory-birds-prey-africa-and-eurasia-9
[71] Review of the CMS Raptors MOU Action Plan https://www.cms.int/raptors/sites/default/files/document/Review%20of%20the%20Raptors%20MOU%20Action%20Plan_April%202020.pdf
[72] Save Our Species. https://iucnsos.org/initiative/sos-central-asia/

live. A grant mechanism supports implementation of the Initiative in four Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. Running until 2022, the mechanism has supported conservation projects aimed at helping protect the populations of goitered gazelle (***Gazella subgutturosa***) and snow leopard (***Panthera uncia***), while supporting local communities through community engagement, the generation of alternative livelihood options, capacity building, public awareness raising, and similar supporting activities.

Table 2.3. *Participation of CA countries in the initiatives for the conservation of migratory species*

Initiative	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Central Asian Flyway (CAF)[73]	+	+	+	+	+
Birds of prey (Raptors)[74]	+	+	+	+	+
Bukhara deer (*Cervus elaphus bactrianus*)[75]	+	-	+	+	+
Saiga antelope (*Saiga tatarica*)[76]	+	-	-	+	+
Siberian crane (*Grus leucogeranus*)[77]	+	-	-	+	+
Slender-billed curlew (*Numenius tenuirostris*)[78]	+	-	-	+	+
Central Asian Mammals Initiative[79]	+	+	+	+	+
African-Eurasian Migratory Waterbirds (AEWA)[80]	+	-	-	+	+

2.5. The UNESCO Convention

All countries of Central Asia are parties to the UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage[81]. Their activities within the framework of the Convention are aimed at the conservation of biological diversity among other things. The Convention is one of the earliest international environmental instruments. It was adopted in 1972. The CA countries' performance efforts are focused on preservation of both cultural heritage and biological diversity. The World Heritage List has been made in line with the Convention and is updated on a regular basis.

The main purpose of the World Heritage List is to make known and protect sites that are unique in their kind. According to the Convention, the World Heritage includes, inter alia, natural objects whose preservation and promotion are top priority due to their special cultural, historical, or environmental significance. The status of a World Heritage Site confers certain advantages for a natural heritage site. Thus, the status:

- is an additional guarantee of safety and integrity of unique natural complexes,
- promotes publicity of the objects included in the List and development of alternative types of nature

[73] https://www.cms.int/sites/default/files/uploads/CAF3%20Final%20Declaration_En_signed.pdf
[74] Review of the CMS Raptors MOU Action Plan https://www.cms.int/raptors/sites/default/files/document/Review%20of%20the%20Raptors%20MOU%20Action%20Plan_April%202020.pdf
[75] The Action Plan concerning Conservation and Restoration of the Bukhara Deer (***Cervus elaphus bactrianus***) (https://www.cms.int/sites/default/files/document/Bukhara_Deer_Action_Plan_E_0.pdf)
[76] The Memorandum of Understanding concerning Conservation, Restoration and Sustainable Use of the Saiga Antelope (***Saiga tatarica tatarica***) (https://www.cms.int/saiga/sites/default/files/document/cms-cites_saiga-tw_inf.1_mou-amended-oct15_e.pdf)
[77] The Conservation Plan for the Central Population of Siberian Cranes (https://www.cms.int/siberian-crane/sites/default/files/document/Siberian_Crane_CP_c_pop_e_0.pdf)
[78] The Memorandum of Understanding concerning Conservation Measures for the Slender-billed Curlew (***Numenius tenuirostris***) (https://www.cms.int/sites/default/files/document/Slender-billed_Curlew_Action_Plan_E_0.pdf)
[79] The Central Asian Mammals Initiative (https://www.cms.int/cami/en)
[80]The Agreement on the Conservation of African-Eurasian Migratory Waterbirds https://www.unep-aewa.org/en
[81] https://www.unesco.org/en/legal-affairs/convention-concerning-protection-world-cultural-and-natural-heritage

management (primarily eco-tourism),
- ensures priority in attracting financial resources to support world cultural and natural heritage sites, primarily from the World Heritage Fund,
- contributes to monitoring and control over the safe state of natural objects

Table 2.4. *Natural objects in Central Asian states included in the World Heritage List*

Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Saryarka – Steppe and Lakes of Northern Kazakhstan Western Tien-Shan[82]	Western Tien-Shan: Sary-Chelek Reserve, Besh-Aral State Reserve, Padysha-Ata State Reserve[83]	Tajik National Park (Mountains of the Pamirs)[84]	Badhyz, Syunt Hasardag, Kugitang, Repetek, Amudarya reserves[85]	Ugam Chatkal National Park, Zaamin Mountainous Juniper Reserve, Shakhimardan, Gissar Mountains[86]

Inadequate application of the Convention provisions, an increase in tourist flows, lack of community participation mechanisms in site monitoring and conservation, insufficient awareness of local communities and international organisations, along with gaps in legal and law enforcement practice, lead to the gradual degradation of unique natural complexes.

2.6. The UN Sustainable Development Goals on Biodiversity

The CA countries adopted the UN Sustainable Development Goals (SDGs)[87] in 2015. One of these Goals, SDG15, is all about protecting and restoring terrestrial ecosystems[88]:

SDG15: *Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.*

Box 2.3 lists the 12 targets and 14 indicators approved by the UN for SDG15.

Box 2.3. **SDG15 targets and indicators[89]**	
Target 15.1 *By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements*	**Indicator 15.1.1** *is forest area as a proportion of total land area.* **Indicator 15.1.2** *is the proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type.*

[82] The following sites have been nominated to the List: Cold winter deserts of Turan (includes two nature reserves: Barsakelmes State Nature Reserve and Altyn-Emel National Park) https://whc.unesco.org/en/statesparties/kz
[83] Western Tien-Shan has been nominated to the List https://whc.unesco.org/en/statesparties/kg
[84] The following sites have been nominated to the List: Zorkul State Reserve, Dashti Djum State Reserve, Tigrovaya Balka, Fann Mountains, Tajik National Park in Gorno-Badakhshan Autonomous Region https://whc.unesco.org/en/statesparties/tj
[85] The sites nominated to the List https://whc.unesco.org/en/statesparties/tm
[86] The sites nominated to the List http://whc.unesco.org/en/statesparties/uz
[87] https://www.un.org/sustainabledevelopment/
[88] https://www.un.org/sustainabledevelopment/biodiversity/
[89] https://sdg-tracker.org/biodiversity

Target 15.2 *By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally*	**Indicator 15.2.1** *is progress towards sustainable forest management.*
Target 15.3 *By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world*	**Indicator 15.3.1** *is the proportion of land that is degraded over total land area.*
Target 15.4 *By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development*	**Indicator 15.4.1** *is coverage by protected areas of important sites for mountain biodiversity.* **Indicator 15.4.2** *is the Mountain Green Cover Index. The Mountain Green Cover Index measures the percentage of mountainous areas covered by some form of green vegetation.*
Target 15.5 *Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species*	**Indicator 15.5.1** *is the Red List Index. The Red List Index (RLI) defines the conservation status of major species groups, and measures trends in the proportion of species expected to remain extant in the near future without additional conservation action.*
Target 15.6 *Promote fair and equitable sharing of the benefits arising from the utilisation of genetic resources and promote appropriate access to such resources, as internationally agreed*	**Indicator 15.6.1** *Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits*
Target 15.7 *Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products*	**Indicator 15.7.1** *is the proportion of traded wildlife that was poached or illicitly trafficked.*
Target 15.8 *By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species*	**Indicator 15.8.1** *Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species.*
Target 15.9 *By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts*	**Indicator 15.9.1** *is progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020. Aichi Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting and reporting systems.*
Target 15.A *Mobilise and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems*	**Indicator 15.A.1** *is the official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems. This indicator is reported as the annual official development assistance (ODA) for biodiversity by recipient, and value of assistance by donor.*

Target 15.B *Mobilise significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation*	**Indicator 15.B.1** *is the official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems. This indicator is reported as the annual official development assistance (ODA) for biodiversity by recipient, and value of assistance by donor.*
Target 15.C *Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities*	**Indicator 15.C.1** *is the proportion of traded wildlife that was poached or illicitly trafficked.*

2.7. Conclusions and Recommendations

The foregoing shows that the Central Asian countries obviously seek to develop their national legislations. However, as the countries apply different concepts of ecosystems in their regulations, there is no clear understanding of ecosystem boundaries or indicators of their state, government agencies do not recognise them as objects of management, the result is spontaneous delineation of protected areas and low environmental efficiency of decisions made.

General classification on the basis of their ecological and biological characteristics is necessary not only for scientific purposes, but also as a management tool. For example, the most degraded, the least disturbed, climate-regulating and other types of ecosystems have to be identified, so that a package of more or less standardised solutions could be developed for each of them.

As a result, countries fail to fulfil the obligations they assumed under international environmental agreements. The accession to and ratification of international legal instruments in the field of development and environmental protection is another important element of fulfilment by the CA countries of their commitments to the international community. However, the countries' obligations assumed under certain agreements are often inadequately enacted and implemented at the national and regional levels undermining global efforts to address specific environmental problems and achieve sustainable development. In addition to that, insufficient involvement of countries in the international agreement processes results in limited awareness and country capacity and can lead to their isolation from ongoing global processes, reforms, and the possibility to obtain technical and financial assistance, data and knowledge (Жанель, 2018).

International agreements signed by the countries of Central Asia set out the main priorities of their biodiversity conservation strategies and policies. In some countries these agreements either have a higher status than the national legislation, or are an integral part of it, on a par with other regulations. The countries of the region have gained different experience of international agreements implementation. Therefore, it can be useful to exchange experience between the CA countries and utilise the EU experience to implement international agreements more effectively. This particularly applies to the development of regional effort coordination mechanisms based on the best practice examples of the European Union.

As the Central Asian countries seek cooperation with specialised international organisations such as BirdLife International and Wetlands International, and fulfil their obligations under the Ramsar Convention, the Convention on Biodiversity and other agreements, they need to expand the network of protected areas, strengthen and improve the quality of monitoring, including monitoring of migratory animals, migratory, wintering and nesting waterbirds, exchange experience on their conservation and sustainable reproduction.

Chapter 3.

Strategies and Regulatory Instruments for Biodiversity Conservation in Central Asia

According to the Convention on Biological Diversity[90] and the Aichi Biodiversity Targets[91] all Central Asian countries have to develop National Biodiversity Strategies and Action Plans (NBSAP). To fulfil its commitments each of the CA countries has made its own, unique to this country, list of priorities, which have been incorporated in its national strategy and action plan. The table below (Table 3.1) shows the goals for biodiversity conservation put forward in the main strategic documents of the countries.

Table 3.1. *Biodiversity conservation priorities of CA countries*

Republic of Kazakhstan	
The Concept of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030[92]	**Objectives/strategic priorities** **Objective 1.** Formation of a representative ecological network **Objective 2.** Rare and endangered species conservation **Objective 3**. Genetic resources conservation, access to them and a fair and equitable sharing of benefits **Objective 4.** Development of a biodiversity monitoring system based on ecosystem approach **Objective 5.** Improvement of the system and management of protected areas in accordance with the goals of biodiversity conservation **Objective 6.** Ensuring conservation and sustainable use of forest ecosystems and forest resources **Objective 7.** Ensuring protection, reproduction and sustainable use of wildlife resources **Objective 8.** Ensuring protection, reproduction and sustainable use of fish resources and sustainable development of fisheries **Objective 9.** Conservation and restoration of agrobiodiversity **Objective 10.** Stabilisation and improvement of environmental quality and protection of soil
The Concept of Transition of the Republic of Kazakhstan to Green Economy[93]	Conservation and effective management of ecosystems 1. Forest management 2. Fisheries management 3. Wildlife management 4. Ecological tourism
Kyrgyz Republic	

[90] https://www.cbd.int/intro/
[91] https://www.cbd.int/sp/targets/
[92] The Concept of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030
[93] The Concept of Transition of the Republic of Kazakhstan to Green Economy approved by Decree No. 577 of the President of the Republic of Kazakhstan dated May 30, 2013

Resolution No. 131 of the Government of the Kyrgyz Republic dated March 17, 2014 "On the priorities for the conservation of biological diversity of the Kyrgyz Republic until 2024 and the Action Plan for implementation of the Priorities for the conservation of biological diversity of the Kyrgyz Republic for 2014-2020"	**Strategic goal 1.** By 2020, mainstream biodiversity conservation as the basis for the existence of population and sustainable economic development of the Kyrgyz Republic in the activities of government bodies and public organisations. **Strategic goal 2.** Reduce the pressure on biodiversity, facilitate its sustainable use. **Strategic goal 3.** Improve protection and control of the state of ecosystems and species diversity. **Strategic goal 4.** Increase social significance of biodiversity and ecosystem services, the benefits of sustainable provision of ecosystem services and traditional technologies.
The Concept of Green Economy in the Kyrgyz Republic "Kyrgyzstan – the country of green economy"[94]	Adopt a unified ecosystem classification system in the Kyrgyz Republic, define standards for the relevant ecosystems for future monitoring of their state. Introduce ecosystem approach in sector-specific development plans, local management plans; account for the value of ecosystems and biodiversity in industrial and municipal planning, use of pastures and other agricultural lands; account for seasonal migration zones, quiet zones and wildlife corridors in pasture management plans and linear infrastructure projects. Develop programmes for restoration of ecosystems especially valuable for the conservation of globally significant biodiversity. Implement a system of biodiversity offsets by entities causing inevitable harm to biodiversity; support local initiatives promoting participation in biodiversity damage compensation schemes. Expand protected areas (PA) up to 10% of the country land area; involve local communities in promotion of local tourism products associated with protected areas (eco-, agro- and ethnic tourism, extreme tourism, mountaineering, agriculture certified with a PA label). Facilitate development of sustainable tourism (eco-, agro- and ethnic tourism) with due regard to the tourist capacity of natural areas. Introduce incentives for biodiversity-friendly economic activities; support biodiversity-focused PPPs.
Republic of Tajikistan	
The National Biodiversity Strategy and Action Plan until 2020[95]	**Strategic goals** (1) modernisation of the system of protected areas, (2) sustainable use of biodiversity of natural ecosystems and agroecosystems, (3) rational use of biotechnology, (4) development and strengthening of political, institutional, legislative frameworks, and capacity building of human resources, (5) equitable sharing of benefits from the use of biological resources, (6) NGO involvement in biodiversity conservation.

[94] The Concept of Green Economy in the Kyrgyz Republic "Kyrgyzstan – the country of green economy" approved by the Resolution No. 2532-VI of the Jogorku Kenesh of the Kyrgyz Republic dated June 28, 2018

[95] The National Biodiversity Strategy and Action Plan until 2020 approved at the national workshop on August 22, 2016 by the Chairman of the Environmental Protection Committee under the Government of the Republic of Tajikistan (https://www.cbd.int/doc/world/tj/tj-nbsap-v2-ru.pdf)

	The key priority areas of NBSAP implementation are: • Improvement of policy, legislation and institutional framework; • Spatial planning and biodiversity conservation programmes; • Biodiversity research and biodiversity monitoring; • Training and education of the population; • Strengthening of the financial support mechanisms for biodiversity conservation activities; • Information, coordination and cooperation; • Establishment of a clearing-house mechanism; • International cooperation; • Development of a special legislative act to regulate activities in the habitats of migratory species of animals within low-mountain semi-savanna (savanna-like) ecosystems.
Turkmenistan	
The National Biodiversity Strategy of Turkmenistan for 2018-2023[96]	The national priority is the conservation and restoration of ecological systems and their key components to ensure provision of ecosystem services. Effective functioning of the environmental sector and its structures, as well as sectors of the economy that affect nature or use natural products and services, must ensure the conservation and sustainability of Turkmenistan's biodiversity. **Strategic goals:** **Goal I.** Strengthen control over environmental legislation implementation, including biodiversity-related legislation. **Goal II.** Ensure sustainable use of human-influenced ecosystems (pastures, arable lands, water reservoirs, forests, hunting grounds). **Goal III.** Maintain a balance between the economy and biodiversity while developing extractive industries. **Goal IV.** Develop protected areas to improve nature conservation and social and economic benefits of biodiversity. **Goal V.** Improve understanding and awareness of the importance and benefits of biodiversity and ecosystem services.
Republic of Uzbekistan	
The Strategy for the Conservation of Biological Diversity in the Republic of Uzbekistan for 2019-2028[97]	**Strategic goals for 2028:** Mainstream biological diversity issues in the activities of government authorities, public administration and society as a whole. Reduce direct pressures on biological diversity, ensure sustainable use of its components in productive landscapes. Develop the system of protected areas, enhance the benefits of ecosystem services. Improve the efficiency of conservation and sustainable use of biological diversity through planning, capacity building and development of financing mechanisms.

[96] The National Biodiversity Strategy of Turkmenistan for 2018-2023 (https://www.cbd.int/doc/world/tm/tm-nbsap-v2-ru.pdf)
[97] Resolution No. 484 of the Cabinet of Ministers of the Republic of Uzbekistan dated June 11, 2019 (https://lex.uz/docs/4372841?query=%D1%82%D1%80%D0%B0%D0%BD%D1%81%D0%BF%D0%BE%D1%80%D1%82)

	Improve the efficiency of conservation and sustainable use of biological diversity through planning, capacity building and development of financing mechanisms. Increase ecosystem representativeness of protected areas. Increase the number of unique natural objects in the PA system. Increase the number of rare and endangered plant species under territorial protection (PA categories I-IV). Increase the number of rare and endangered species of animals under territorial protection (PA categories I-IV). Develop and regularly update the national database of biological diversity used for food production and agriculture. Determine the main habitats of wild relatives of cultivated plants. Develop and launch implementation of the State Programme of Conservation and Sustainable Use of Biological Diversity Components Used for Food Production and Agriculture.
The Decree of the President of the Republic of Uzbekistan on approval of the Concept of environmental protection of the Republic of Uzbekistan until 2030[98]	Increase the area and density of forest plantations and improve their quality. Expand and develop the PA network. Step up measures to bring the area of PA categories I-V to 7% of the country land area by December 1, 2021. Implement measures to ensure biological safety. Study international experience. Draft the Law of the Republic of Uzbekistan "On biological safety". Improve the legislative framework for the conservation of biological diversity. Adopt legislative instruments to: - step up protection of flora and fauna, as well as control over their use; - develop a system of taxes and duties stimulating the use of biodiversity objects grown in nurseries and reducing their withdrawal from nature. Take flora conservation and reproduction actions: develop an inventory of natural reserves of wild species of medicinal, food and industrial plants. Create plantations for cultivation of licorice, ferula, capers and other types of medicinal, food and industrial plants and ensure a 20% reduction in their withdrawal from nature relative to 2018 level. Take wildlife conservation and reproduction actions: establish new nurseries and expand the existing ones to breed endangered wildlife species (bustard, goitered gazelle).

Analysis of the strategies and action plans of Central Asian states has shown that, in addition to the scope of the Convention on Biological Diversity and the Aichi Biodiversity Targets, the countries' key priorities include significant improvement of ecosystem conservation and monitoring, as well as development, harmonisation and adoption of a unified ecosystem classification system.

In addition to that, the countries have also set strategic goals, achievement of which will contribute to the functioning of ecosystems and the fulfilment of their functions, such as:

- Regulating – improving political, institutional, legislative frameworks, spatial planning, strengthening

[98] The Decree of the President of the Republic of Uzbekistan "On approval of the Concept of environmental protection of the Republic of Uzbekistan until 2030" (https://lex.uz/ru/docs/4574010#4578836)

environmental compliance control in the development of extractive industries (Tajikistan[99], Turkmenistan[100]);

- Provisioning – increasing social significance of biodiversity and ecosystem services, the volume and benefits from sustainable provision of ecosystem services (Kyrgyzstan[101], Tajikistan[102]);
- Maintenance – reducing direct pressures on biological diversity, sustainable use of its components in productive landscapes, increasing ecosystem representativeness of protected areas, increasing the number of unique natural objects in protected areas, increasing the number of rare and endangered plant and animal species under territorial protection (Kazakhstan[103], Uzbekistan[104]);
- Genetic – conservation and use of genetic resources (Kazakhstan[105], Tajikistan[106]).

Only the Kyrgyz Republic mentioned the need to develop recreational functions of ecosystems as one of its priorities, while Tajikistan and Uzbekistan emphasised the need to create national databases and exchange information.

Upon comparison of the national priorities with the global SDGs, it becomes obvious that the former are not goals from an international standpoint, as, with rare exceptions, neither specific targets nor time frames for the goals achievement are specified. Thus, they do not provide an opportunity to track achievement progress and are not, in this sense, management instruments, but rather remain declarations of intent.

At the same time, comparison shows that individual national priorities are fully consistent with the spirit of individual SDGs 15.1, 15.2, 15.5, 15.6. and 15.9. The remaining SDGs – 15.3, 15.4, 15.7 and 15.8 have not yet been reflected in any national plans or programmes.

Table 3.2. *Correlation of the CA countries' national priorities with SDG targets*

SDG/Country	Republic of Kazakhstan	Kyrgyz Republic	Republic of Tajikistan	Turkmenistan	Republic of Uzbekistan
15.1	+	+	+	+	+
15.2	+	-	-	-	-
15.3	-	-	-	-	-
15.4	-	-	-	-	-
15.5	+	-	-	-	-
15.6	+	-	+	-	+
15.7	-	-	-	-	-
15.8	-	-	-	-	-
15.9	-	+	-	-	+

Table 3.2 makes it clear that the issue of harmonisation of national and international SDGs on biodiversity requires consideration by both national and international organisations.

[99] The National Biodiversity Strategy and Action Plan until 2020 (https://www.cbd.int/doc/world/tj/tj-nbsap-v2-ru.pdf)
[100] The National Biodiversity Strategy of Turkmenistan for 2018-2023 (https://www.cbd.int/doc/world/tm/tm-nbsap-v2-ru.pdf)
[101] The Concept of Green Economy in the Kyrgyz Republic "Kyrgyzstan – the country of green economy" approved by the Resolution No. 2532-VI of the Jogorku Kenesh of the Kyrgyz Republic dated June 28, 2018
[102] The National Biodiversity Strategy and Action Plan until 2020 (https://www.cbd.int/doc/world/tj/tj-nbsap-v2-ru.pdf)
[103] The Concept of Transition of the Republic of Kazakhstan to Green Economy approved by Decree No. 577 of the President of the Republic of Kazakhstan dated May 30, 2013. The Concept of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030.
[104] The Decree of the President of the Republic of Uzbekistan "On approval of the Concept of environmental protection of the Republic of Uzbekistan until 2030" (https://lex.uz/ru/docs/4574010#4578836)
[105] The Concept of Transition of the Republic of Kazakhstan to Green Economy approved by Decree No. 577 of the President of the Republic of Kazakhstan dated May 30, 2013. The Concept of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030.
[106] The National Biodiversity Strategy and Action Plan until 2020 (https://www.cbd.int/doc/world/tj/tj-nbsap-v2-ru.pdf)

3.1. Certain terms used by the CA countries

As part of this review, in addition to analysis of the strategic nature of the national biodiversity targets and time frames setting process, certain terms used in regulations concerning biodiversity were also analysed from the point of view of modern understanding of natural resources management and environmental policy. The analysis has led to the conclusion that although the countries are in line with global trends in improving their regulatory framework and use similar methods, there are different interpretations of the same terms and objectives, which is also due to different wordings of the same terms in English and Russian versions of the UN documents. Understanding the difference in approaches and interpretation of terms can make an important contribution to building mutual understanding in the negotiation processes, facilitate elaboration of support requests and exchange of positive experience.

The analysis was limited to certain terms that have different interpretations in the national legislations, such as ***sustainable development*** or ***resilient development***, ***sustainable management*** or ***efficient use*** (natural resources management), ***specially protected natural areas***, ***forest***, ***ecosystems***, ***Red Data Book***, ***biological diversity***, ***reforestation***, and ***afforestation***.

Table 3.3. *Some terms used by the CA countries*

Term	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan	Internationally accepted definition
Biological diversity	Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.		Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.	The entirety of plant, animal and other organisms characteristic of a particular area.		Variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
Ecosystem	Ecological system (ecosystem) means an objectively existing part of the natural environment, a dynamic complex of communities of plants, animals and other organisms, their non-living environment interacting as a functional unit and interconnected by the exchange of substance and energy, which has spatial and territorial boundaries.		Ecological system (ecosystem) is a single, stable, self-developing, self-regulating within a certain (local) area of the biosphere set of living and non-living components of the environment, interconnected by the exchange of substance, energy, and information.	An objectively existing and established part of the natural environment having spatial and territorial boundaries where its living and non-living elements interact as a functional unit.		A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
The Red List/ Red Data Book	It is described as a part of the State Wildlife Cadastre.	It is described as a part of the State Wildlife Cadastre.	The Red Data Book is an entirety of information about rare and endangered species of plants and animals, approved in accordance with the procedure established by the legislation of the Republic of Tajikistan, in order to make arrangements for their special protection and subsequent reproduction.	It is the main document containing an entirety of information on the status and measures for the protection of rare, declining and endangered species of wild animals, wild plants and fungi.	It is approved to ensure the conservation and restoration of rare and endangered species (subspecies) of wild animals, wild plants and fungi.	Annotated list of rare, endangered or extinct animal, plant and fungus species.

Sustainable development	Sustainable development is the socio-economic development of the Republic of Kazakhstan achieved without compromising environmental sustainability while ensuring environmental safety and ecologically balanced use of natural resources to meet the needs of present and future generations equitably.	Nature and its components are the national treasure of the Kyrgyz Republic, one of the key factors of its sustainable social and economic development.	One of the fundamental principles of environmental protection is a science-based combination of legal, environmental, economic and social interests of a person, society and the state, adoption of effective measures in order to achieve sustainable development.	Maintaining sustainability of biosphere and its ecological systems as a human habitat.	Maintaining sustainability of biosphere and its ecological systems as a human habitat and care for the environmental safety of human beings, the human gene pool and the future generations of human beings.	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Sustainable use [of natural complexes]	Sustainable use of natural complexes is the use of biological resources of natural complexes in a way and at a rate that does not lead to the long-term decline of biological diversity.		The following measures are taken by the state in order to safeguard the rights to a favourable environment: harmonisation of the state of the environment, protection and conservation of biological diversity, sustainable use and restoration of natural resources.	Sustainable use of specially protected natural areas means the use of biological resources of specially protected natural areas in a way and at a rate that does not lead to their long-term depletion.	In order to preserve, reproduce and restore natural objects and complexes in protected natural areas, a regime of their protection and use is established.	The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.[107]
Natural resources management		The entirety of all forms of exploitation of the natural resource potential and measures for its conservation.	Use of natural resources – economic and other (including military) activities carried out using certain types of natural resources, as well as the impact of these activities on the environment.	The entirety of processes of natural resources involvement in public consumption for creation of material goods and services.		
Protected area/Specially protected natural areas	Land plots, water objects and air space above them featuring natural complexes and objects of the state natural conservation fund for which the special protection regime is established.	Plots of land, water (water areas), including natural complexes or individual objects of nature, for which special protection and use arrangements are made. Specially protected natural areas may include natural or artificially created natural complexes and objects of nature that have a special ecological, environmental, scientific, historical, cultural, aesthetic, recreational value.	Specially protected natural areas are plots of land, water and water space above them, where natural complexes and objects of special environmental, scientific, cultural, aesthetic, recreational and health significance are located, and which, in accordance with the procedure established by law, are withdrawn in whole or in part from economic use and for which special protection arrangements are made.	Areas of natural environment (lands, forests, water, subsoil, air space), natural complexes and individual objects that have a special environmental, scientific, cultural, educational, recreational, therapeutic, aesthetic value, taken under special protection by the state for conservation and restoration of ecological balance, wealth and diversity of natural resources and beneficial properties of the natural environment.	Protected natural areas are plots of land and (or) water space (water area) that have priority ecological, scientific, cultural, aesthetic, recreational and therapeutic significance, completely or partially, permanently or temporarily withdrawn from economic exploitation.	Protected area means a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives.
System of specially protected natural areas	A set of specially protected natural areas of various categories and types ensuring representation of natural complexes of all geographic zones.			The system of specially protected natural areas is a set of ecologically interconnected specially protected natural areas of various categories, ensuring representation of natural complexes and objects of all geographic zones.	Protected natural areas make up a single ecological system designed to ensure biological and landscape diversity and maintain ecological balance.	

[107] SDG12.2 specifies “sustainable management” and “efficient use”.

Forest	A natural complex, formed in a certain area, based on the mixture of tree and shrub vegetation and other components of wildlife, interacting with the environment and having ecological, economic and social importance.	Forest is one of the main types of vegetation on Earth, comprising of trees, shrubs, herbs and other plants, including animals and microorganisms, which are biologically interrelated in their evolution and exert influence on one another and the environment.	Forest is a complex of natural vegetation that is formed naturally and artificially in a certain area, based on a combination of trees and shrubs (at least 10 percent of coverage by tree-forming plants, with an area of at least 0.5 hectares and at least 10 metres wide), interacting with other components of wildlife and having ecological, economic and social importance.	Forest is a set of interconnected and interacting components of biological diversity and natural environment, where tree and shrub vegetation prevails, the minimum area of which is 0.5 hectares, the minimum width is 3 metres, and the projective cover is at least 10 percent of its area.	Forests are a collection of trees, shrubs and other natural objects (land, subsoil, water, flora and fauna, atmospheric air) on the forest fund lands, interacting with the environment and influencing it, of ecological and socio-economic significance.	Land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use (FAO, 2018)[108]
Reforestation	The natural process of formation of a new generation of forest under the canopy, as well as in clearings, burned areas and other areas previously occupied by forest	Development of forest plantations on areas previously covered by forest.	Creating plantations or promoting their natural regeneration on lands of endangered forests.	Forests restoration (reproduction) measures on the forest fund lands previously occupied by forest.	Planting species of trees and shrubs fitting climatic conditions in places where trees and shrubs have been cut down, damaged by fires, pests, forest diseases and other negative impacts.	See Table 3.4
Afforestation	Creation and cultivation of artificial forest plantations in areas that were not forested before or artificial or natural forest overgrowth in non-forest lands.		Creation and cultivation of plantations on unforested lands intended for afforestation.	Creation and cultivation of artificial forest plantations in areas that were not previously covered by forest.	Planting and growing trees and shrubs on the forest fund lands not covered by forest.	See Table 3.4

[108] FAO (Food and Agriculture Organization of the United Nations). Global Forest Resources Assessment 2020. Terms and definitions. FRA-2020, 2018. (http://www.fao.org/3/I8661RU/i8661ru.pdf)

Note: This Table contains direct quotes from the following sources (all links accessed in April 2022):

The Environmental Code of the Republic of Kazakhstan No. 400-VI ZRK dated January 2, 2021. (https://adilet.zan.kz/rus/docs/K2100000400)

The Law of the Republic of Kazakhstan "On Specially Protected Natural Areas" as amended and supplemented on November 11, 2022. (https://online.zakon.kz/Document/?doc_id=30063141)

The Forest Code of the Republic of Kazakhstan No. 477-II dated July 8, 2003, as amended and supplemented on January 1, 2022. (http://adilet.zan.kz/rus/docs/K030000477)

The Law of the Kyrgyz Republic "On Environmental Protection" No. 53 dated June 16, 1999. (http://sbd.minjust.gov.kg/act/view/ru-ru/218)

The Law of the Kyrgyz Republic "On Specially Protected Natural Areas" No. 1561-XII BD dated May 28, 1994. (http://cbd.base.spinform.ru/show_doc.fwx?rgn=286)

The Forest Code of the Kyrgyz Republic No. 66 dated July 8, 1999, as amended and supplemented on January 20, 2022 No. 6/ (http://cbd.minjust.gov.kg/act/view/ru-ru/10?cl=ru-ru#:~:text=%)

The Regulation on the Red Data Book of the Kyrgyz Republic. Approved by the Government Resolution of the Kyrgyz Republic No. 189 dated April 11, 2016. (http://cbd.minjust.gov.kg/act/view/ru-ru/99137)

The Law of the Republic of Tajikistan "On Environmental Protection" No. 1449 dated July 18, 2017. (http://ncz.tj/content/)

The Law of the Republic of Tajikistan "On Specially Protected Natural Areas" No. 1159 dated November 27, 2014. (http://ncz.tj/cjntent/)

The Forest Code of the Republic of Tajikistan. Akhbori Majlisi Oli of the Republic of Tajikistan, 2011, No. 7-8, Art. 615. (http://extwprlegs1.fao.org/docs/pdf/taj181164.pdf)

The Law of Turkmenistan "On Nature Protection" No. 40-V dated March 1, 2014, as amended on March 20, 2017. (https://base.spinform.ru/show_doc.fwx/show_doc.fwx?rgn=66022)

The Law of Turkmenistan "On Specially Protected Natural Areas", as amended by the Laws of Turkmenistan dated March 1, 2014, August 16, 2014 No. 114-V, June 3, 2017. (https://base.spinform.ru/show_doc.fwx?rgn=51428)

The Decree of the President of Turkmenistan "On the Red Data Book of Turkmenistan" dated March 25, 1997. (http://www.untuk.org/publications/legislation/nat/nat055.htm)

The Forest Code of Turkmenistan No. 166-IV dated March 25, 2011, as amended by the Laws of Turkmenistan dated February 28, 2015, June 3, 2017 No. 578-V, June 9, 2018. (http://base.spinform.ru/show_doc.fwx?rgn=33053)

The Law of the Republic of Uzbekistan "On Protected Natural Areas" No. 710-II dated December 3, 2004. (https://lex.uz/ru/docs/415228)

The Law of the Republic of Uzbekistan "On Environmental Protection". The Decree of the President of the Republic of Uzbekistan No. UP-5024 dated April 21, 2017. (http://lex.uz/ru/docs/3174496)

The Law of the Republic of Uzbekistan "On Forests" No. ZRU-475 dated April 16, 2018. (https://lex.uz/ru/docs/3683532)

The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On measures taken to develop, publish and update the Red Data Book of the Republic of Uzbekistan". (http://base.spinform.ru/show_doc.fwx?rgn=112548)

The Convention on Biological Diversity, https://www.cbd.int/intro/

https://www.iucnredlist.org/

World Commission on Environment and Development's 1987 Brundtland report ´Our Common Future', https://www.un.org/ru/ga/pdf/brundtland.pdf

As shown by the analysis, there is a significant discrepancy in the data on various Central Asian ecosystems published in different sources, particularly on forests. This is largely due to the concepts and categories (forest, forest types, forested area, intact forests, degraded forests, etc.) used by international organisations and national authorities. Further analysis and unification of concepts, methods and tools of quantitative and qualitative assessment, of forests, inter alia, is required.

Since the concept of ecosystems has different interpretations in the national regulations, and due to lack of clearly defined ecosystem boundaries and indicators, government agencies often fail to qualify them as objects of management. This leads to spontaneous delineation of protected areas and low environmental efficiency of decisions made.

3.1.1. Sustainable Development – Sustainable Management and Efficient Use of Natural Complexes – Ecosystem

"Sustainable development" is one of the fundamental terms in environmental protection. In international documents, it is customary to use the definition given by UNESCO, ***sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs***[109], that goes back to the Brundtland Report "Our Common Future"[110].

However, the latest wordings of the UN SDGs (especially in English) provide more detailed definitions drawing a line between "development", "management" and "use" of natural resources. SDG15 mentions "sustainable management" and "use of biodiversity", while SDG12.2 also specifies "sustainable management" and "efficient use" of natural resources.

Due to increasing awareness of the role of climate change, the notions of sustainability as "intergenerational equity in resource consumption" and resilience as "the ability to resist the impact of catastrophic events or trends, while maintaining the most important functions, identity and structure" have already been distinguished in the latest report of the Intergovernmental Panel on Climate Change[111]. This difference is not mentioned at all in the legislative documents of the Central Asian countries, although the scientific community of these countries discuss it (see Shukurov, 2016).

The legislations of Central Asian countries contain no definitions of "climate resilient management" or "efficient use", and there is no understanding that in modern conditions an increase in management efficiency reduces resilience to the impacts of climate change, and vice versa. Therefore, it will not be possible to achieve both effectiveness in achieving individual SDGs and resilience to the impact of climate change. Consequently, there is a need for a discussion in the scientific community about the need for a compromise between efficiency and resilience, as well as updating the terminology in connection with the evolution of the environmental glossary as the consequences of climate change are realised at the international level.

The Environmental Code of Kazakhstan[112] alone provides the definition of sustainable development that links sustainable socio-economic development with environmental sustainability, environmental safety and ecologically balanced use of natural resources ***"to meet the needs of present and future generations equitably"***. In the laws and relevant codes of other CA countries, there are no wordings of the term, but there are only indirect references to the need for sustainable development. However, despite the lack of a clear definition of the term in the legislation of most Central Asian countries, this concept is widely used in the countries' strategic documents.

[109] UNESCO, 2015. Sustainable Development. (https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd)
[110] https://www.un.org/ru/ga/pdf/brundtland.pdf, 1987
[111] https://www.ipcc.ch/assessment-report/ar6/
[112] Environmental Code, 2021. The Environmental Code of the Republic of Kazakhstan № 400-VI ZRK dated January 2, 2021. (https://adilet.zan.kz/eng/docs/K2100000400)

Legislations of all CA countries contain definitions of the term ecosystem, which, however, differ from the definition given in the Convention. In the definition of this term, at the same time, all countries distinguish such properties of ecosystems as integrity, stability over time, and the relationship of organisms to each other and the environment. In some cases, the concept of ecosystems is detailed and overgrown with territorial details.

The Law of Turkmenistan "On Environmental Safety" introduces a very important concept from the point of view of biodiversity conservation- ***"natural ecosystem"***, which means an objectively existing part of the natural environment having spatial and territorial boundaries, where its living (plants, animals, and other organisms) and non-living elements interact with each other and are interconnected by the exchange of substance, energy and information[113].

Understanding of the term "ecosystem" is the backbone of activities carried out to create protected areas (PA).

3.1.2. PA/System of PAs

Despite the difference in naming, the term "[specially] protected [natural] areas" has very similar interpretations in the countries of Central Asia suggesting that these are the areas where a special protection regime is established. The main difference in PA definitions given by different countries is how detailed they are. For example, according to the Law of Turkmenistan "On Specially Protected Natural Areas", PAs are created ***"for conservation and restoration of ecological balance, wealth and diversity of natural resources and beneficial properties of the natural environment"***[114].

In the Law of the Republic of Kazakhstan "On Specially Protected Natural Areas", ***natural complexes***[115] are defined as ***a set of objects of biological diversity and inanimate nature subject to special protection***, assuming the need for an integrated approach to natural objects conservation.

Three Central Asian countries – Kazakhstan[116], Kyrgyzstan[117], and Turkmenistan[118] – have introduced the term ***network/system of specially protected natural areas*** into their legislation. In the laws of Kazakhstan, it is noted that the system of specially protected natural areas is meant to ensure representation of natural complexes of all geographic zones in them. The laws of Kyrgyzstan and Turkmenistan highlight the existence of ecological relationship between areas, including in the form of corridors.

The regulations of Tajikistan do not mention a network of specially protected natural areas, but there is a definition of ecological corridors, which "… are formed to provide spatial connection between specially protected natural areas and other protected natural areas of an ecological network for conservation of objects of the state natural reserve fund, biological diversity, protection of natural migration routes of animals living and distribution of plants growing in these protected natural areas".

The Law of the Republic of Uzbekistan "On Protected Natural Areas"[119] states that all protected natural areas make up a single ecological system designed to ensure biological and landscape diversity and maintain ecological balance. The State Cadastre of Protected Natural Areas systematises information about them: categories and types of such areas, their geographical location, quantitative and qualitative characteristics, environmental,

[113] The Law of Turkmenistan "On Environmental Safety" (https://www.parahat.info/law/parahat-info-law-01zd)
[114] The Law of Turkmenistan "On Specially Protected Natural Areas" (Records of the Mejlis of Turkmenistan, 2012, No. 1, part II, art. 37; 2014, No. 1, part II, art. 43; No. 3, art. 114; 2017, No. 2, art. 80)
[115] The Law of the Republic of Kazakhstan "On Specially Protected Natural Areas" as amended and supplemented on November 18, 2022 (https://online.zakon.kz/Document/?doc_id=30063141)
[116] The Law of the Republic of Kazakhstan "On Specially Protected Natural Areas" as amended and supplemented on November 18, 2022 (https://online.zakon.kz/Document/?doc_id=30063141)
[117] The Law of the Kyrgyz Republic "On Specially Protected Natural Areas" No. 1561-XII BD dated May 28, 1994 (https://cbd.base.spinform.ru/show_doc.fwx?rgn=286) (Accessed in April 2022)
[118] The Law of Turkmenistan "On Specially Protected Natural Areas", as amended by the Laws of Turkmenistan dated March 1, 2014, August 16, 2014 No. 114-V, June 3, 2017 (https://base.spinform.ru/show_doc.fwx?rgn=51428)
[119] The Law of the Republic of Uzbekistan "On Protected Natural Areas" No. 710-II dated December 3, 2004 (https://lex.uz/ru/docs/415228)

economic, scientific, educational and other value, data on landowners, land users, tenants and owners of land plots.

The term ***ecological network*** included in the Laws "On Specially Protected Natural Areas" of Kazakhstan[120] and Turkmenistan[121] has a similar meaning. In these documents, ***ecological network*** is defined as a complex of specially protected natural areas of various categories and types, interconnected with each other and with other types of protected natural areas by ecological corridors organised with due regard to the natural, historical, cultural and socio-economic features of the region.

Thus, an ecological network includes the concept of an ***ecological corridor***, introduced into the legislation of most Central Asian countries providing virtually the same interpretation. It is defined as follows:

An ecological corridor is a part of an ecological network represented by protected areas of land and water bodies that connect specially protected natural areas with each other and with other types of protected natural areas to ensure natural migration (distribution) of wildlife and the conservation of biological diversity. According to the Laws of Kyrgyzstan and Uzbekistan there is the term ***interstate specially protected natural areas***, that gives the opportunity to create transboundary protected areas, acting on the basis of multilateral and bilateral international treaties[122, 123].

In the Laws of Kyrgyzstan[124], Kazakhstan[125] and Uzbekistan[126] there are terms denoting specific biosphere units, such as ***biosphere reserve*** and ***biosphere areas,*** that refer to the Unesco Convention[127] as part of the World network of biosphere reserves. The definitions included in the documents are rather vague and thus create difficulties in law enforcement when organizing activities to preserve these objects.

[120] The Law of the Republic of Kazakhstan "On Specially Protected Natural Areas" as amended and supplemented on November 18, 2022 (https://online.zakon.kz/Document/?doc_id=30063141)
[121] The Law of Turkmenistan "On Specially Protected Natural Areas", as amended by the Laws of Turkmenistan dated March 1, 2014, August 16, 2014 No. 114-V, June 3, 2017
(https://base.spinform.ru/show_doc.fwx?rgn=51428)
[122] The Law of the Kyrgyz Republic "On Specially Protected Natural Areas" No. 18 dated May 3, 2011 http://cbd.minjust.gov.kg/act/view/ru-ru/203262
[123] The Law of the Republic of Uzbekistan "On Protecte d Natural Areas" No. 710-II dated December 3, 2004 (https://lex.uz/ru/docs/415228)
[124] The Law of the Kyrgyz Republic "On Specially Protected Natural Areas" No. 18 dated May 3, 2011 http://cbd.minjust.gov.kg/act/view/ru-ru/203262
[125] The Law of the Republic of Kazakhstan "On Specially Protected Natural Areas" as amended and supplemented on November 18, 2022 (https://online.zakon.kz/Document/?doc_id=30063141)
[126] The Law of the Republic of Uzbekistan "On Protected Natural Areas" No. 710-II dated December 3, 2004 (https://lex.uz/ru/docs/415228)
[127] https://www.unesco.org/en/legal-affairs/convention-concerning-protection-world-cultural-and-natural-heritage, https://unesdoc.unesco.org/ark:/48223/pf0000002091

3.1.3. Red Data Book

The CA countries have no unified approach to the place and role of the Red Data Book (RDB) in their regulatory frameworks. Thus, according to the Law of the Republic of Kazakhstan "On Specially Protected Natural Areas"[128], RDB is an integral part of the State Wildlife Cadastre, whereas the Law[129] of the Republic of Tajikistan "On environmental protection" No. 1449 dated July 18, 2017 and the Decree[130] of the President of Turkmenistan "On the Red Data Book of Turkmenistan" dated March 25, 1997 stipulate that RDB is approved in order to make arrangements for special protection and subsequent reproduction of rare, declining and endangered species of wild animals, wild plants and fungi, to raise awareness on their status and measures for their protection. The Resolution[131] of the Cabinet of Ministers of the Republic of Uzbekistan "On measures taken to develop, publish and update the Red Data Book of the Republic of Uzbekistan" also provides for its purpose to ensure the conservation and restoration of rare and endangered species (subspecies) of wild animals, wild plants and fungi.

3.1.4. Forest/Reforestation/Afforestation

It is noted in (FAO, 2020) that the countries of Central Asia have included the definition of ***degraded forest*** in their terminology, and the FAO Terms and Definitions[132] document requires that the countries include the definition or description of degraded forest in their legislation and provide the relevant data within the Global Forest Resources Assessment. Lack of the term clarification depresses the opportunities to monitor the state of forests and report the qualitative dynamics of forest change in the region.

(FAO, 2020) also uses a term not mentioned in the laws of the CA countries, i.e. ***primary forest (or intact forest)***, which means naturally regenerated forest of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.

Taking into account the climatic and landscape features of the Central Asia territories under consideration, some indicators, such as tree height and canopy cover, can probably be more specific. At the same time, it should be noted that the regulatory documents of the CA countries offer a wide range of interpretations and definitions of the term ***forest***. Some of them provide a comprehensive definition of the term (Law of the Republic of Uzbekistan, 2018), while others[133] describe ***forest*** as a natural complex that is formed in a certain area, focus[134] on the forest functions i.e. ***ensuring hydrological regime of rivers, preventing erosion and soil drifting***, or specify[135,136] the minimum area of a forest. However, none of the definitions provides for perception of a forest as an ecosystem or draws a line between natural (undisturbed, wild, intact) forests and plantations, despite this being the basic difference in terms of ecosystem functions of a forest. This presents a major hindrance to the improvement of legislation oriented toward ecosystem approach, and the present scientific knowledge implies that such a distinction is important in the context of climate change mitigation and adaptation (William et al., 2019).

[128] The Law of the Republic of Kazakhstan "On Specially Protected Natural Areas" as amended and supplemented on November 24, 2021 (https://online.zakon.kz/Document/?doc_id=30063141)

[129] The Law of the Republic of Tajikistan "On Environmental Protection" No. 1449 dated July 18, 2017 (http://ncz.tj/content/) (accessed in April 2022)

[130] The Decree of the President of Turkmenistan "On the Red Data Book of Turkmenistan" dated March 25, 1997 (http://www.untuk.org/publications/legislation/nat/nat055.htm)

[131] The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On measures taken to develop, publish and update the Red Data Book of the Republic of Uzbekistan" (https://lex.uz/docs/4113416)

[132] FAO (Food and Agriculture Organization of the United Nations). Global Forest Resources Assessment 2020, Terms and Definitions. FRA 2020, 2018 (https://www.fao.org/3/I8661EN/i8661en.pdf)

[133] The Forest Code of the Republic of Kazakhstan No. 477-II dated July 8, 2003, as amended and supplemented on January 1, 2022 (http://adilet.zan.kz/rus/docs/K030000477) (accessed in April 2022)

[134] The Forest Code of the Kyrgyz Republic No. 66 dated July 8, 1999, as amended and supplemented on January 20, 2022 No. 6/ (http://cbd.minjust.gov.kg/act/view/ru-ru/10?cl=ru-ru#:~:text=%) (accessed in April 2022)

[135] The Forest Code of the Republic of Tajikistan. Akhbori Majlisi Oli of the Republic of Tajikistan, 2011, No. 7-8, Art. 615 (http://extwprlegs1.fao.org/docs/pdf/taj181164.pdf)

[136] The Forest Code of Turkmenistan No. 166-IV dated March 25, 2011, as amended by the Laws of Turkmenistan dated February 28, 2015, June 3, 2017 No. 578-V, June 9, 2018 (http://base.spinform.ru/show_doc.fwx?rgn=33053)

3.1.5. International Experience

Table 3.4. *International experience in the use of terminology related to forest regeneration or expansion*

Country/ Organisation	Term	Meaning
USA (William et al., 2019)	Proforestation	Growing existing forests intact to their ecological potential, their exploitation is stopped.
	Afforestation	Growing a new forest from scratch.
	Reforestation	Replacing forests on deforested lands.
FAO[137]	Forest Expansion	Expansion of forest on land that, until then, was under a different land use. Can be achieved through natural succession[138] on land that, until then, was under a different land use – natural expansion of forest.
	Afforestation	Establishment of forest through planting and/or deliberate seeding on land that, until then, was under a different land use.
	Reforestation	Re-establishment of forest through planting and/or deliberate seeding on land classified as forest. Includes planting/seeding of temporarily unstocked forest areas and coppice from trees that were originally planted or seeded, but excludes natural regeneration of forest.
	Naturally Regenerating Forest	Forest predominantly composed of trees established through natural regeneration, including coppice from trees originally established through natural regeneration.

[137] FAO (Food and Agriculture Organization of the United Nations). Global Forest Resources Assessment 2020, Terms and Definitions. FRA 2020, 2018 (https://www.fao.org/3/I8661EN/i8661en.pdf)

[138] Succession is a progressive and consistent replacement of one biological community, for example, a phytocenosis, by another in a certain area of the environment over time under the influence of natural factors (including internal forces) or human activity.

Pan-European indicators for Sustainable Forest Management[139]	**Forest expansion:** Expansion of forest on land that, until then, was not defined as forest.	*Afforestation*. Establishment of forest through planting and/or deliberate seeding on land that, until then, was not classified as forest.
		Natural expansion of forest. Expansion of forest through natural succession on land that, until then, was under another land use.
	Reforestation: Re-establishment of forest through planting and/or deliberate seeding on land classified as forest.	1. Includes planting/seeding of temporarily unstocked forest areas as well as planting/ seeding of areas with forest cover. 2. Includes coppice from trees that were originally planted or seeded. 3. Excludes natural regeneration of forest.
	Regeneration: Re-establishment of a forest stand by natural or artificial means on land classified as forest, following the removal of the previous stand by felling or as a result of natural causes.	*Natural regeneration*. Re-establishment of a forest stand by natural means, i.e. by natural seeding or vegetative regeneration. It may be assisted by human intervention, e.g. by preparatory cutting, scarification[140] or fencing to protect against wildlife damage or domestic animal grazing.
		Regeneration by planting and/or seeding. The act of re-establishing a forest stand by artificial means, either by planting of seedlings or by scattering seed on land already in forest land use.
		Coppice sprouting. The re-growth from coppice stools after the previous stand has been cut.

The countries of Central Asia have much in common as they share the history of establishment of environmental institutions and elaboration of legal norms. However, over the past 30 years each of the countries has made earnest efforts to reform and improve its environmental institutions. Today, despite the use of a similar terminology, there are significant differences in the content of major terms.

Through reforms and updates of their environmental legislations, the countries have found effective ways to solve a number of environmental issues. The exchange of positive experiences has improved the regional dialogue and made environmental activities more efficient.

However, differences in definitions, including the concept of forest, given in the legislations of the CA countries, complicate the dialogue between countries, accounting and monitoring of ecosystems. Lack of clarity in definitions creates difficulties in law enforcement. A common interpretation of terms and definitions, including at the level of experts and decision-makers, is essential for a productive dialogue on biodiversity conservation between the Central Asian countries.

Development of a unified classification of ecosystems, including recommendations for determination of their boundaries and state, improvement and harmonisation of terminology will improve law enforcement and strengthen dialogue at the international and regional levels, and this, in turn, will create additional opportunities

[139] Forest Europe. Relevant terms and definitions used for the updated pan-European indicators for Sustainable Forest Management, 2015 (https://foresteurope.org/wp-content/uploads/2017/02/3AG_UPI_Updated_Terms_Definitions.pdf)

[140] Scarification means partial violation of integrity of the hard waterproof coat of seeds in order to encourage their swelling and germination and increase the germination percentage.

for improvement of legislation and management systems based on experience gained in the region. A unified classification of ecosystems developed on the basis of ecological and biological factors, among other things, will become a management tool used, for example, to develop and implement measures to restore disturbed or degraded ecosystems.

3.2. Governance Framework

The position of government bodies in charge of biodiversity management and conservation and the coordination systems within the institutional framework differ from country to country. In the CA countries, the bodies in charge of biodiversity management are either ministries or specialised committees.

Table 3.5. *Government bodies in charge of biodiversity management and conservation*

Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
The Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan[141] (Now, the Ministry of Ecology and Natural Resources) Includes the Fisheries **Committee** and the Forestry and Wildlife **Committee**	**The Ministry** of Natural Resources, Ecology and Technical Supervision[142] **The Ministry** of Agriculture, Water and Regional Development of the Kyrgyz Republic (forest management)	**The Committee** for Environmental Protection under the Government of the Republic of Tajikistan[143]	**The Ministry** of Agriculture and Environmental Protection of Turkmenistan[144]	**The State Committee** of the Republic of Uzbekistan for Ecology and Environmental Protection[145] (Now, the Ministry of Natural Resources)

[141] https://www.gov.kz/memleket/entities/ecogeo/about/structure/1/1?lang=en
[142] https://www.gov.kg/ru/gov/s/2
[143] http://www.tajnature.tj/en
[144] https://minagri.gov.tm/en
[145] https://www.uznature.uz/en

Table 3.6. *Brief description of the distribution of responsibility for the implementation of conservation tasks between government institutions.*

Country/Authority	Mandate
Kazakhstan	
The Ministry of Ecology, Geology and Natural Resources[146] (Now, the Ministry of Ecology and Natural Resources)	The Ministry plays the key role in both formation and implementation of the state policy, coordinates environmental management processes, including forestry, wildlife protection and protected areas.
The Forestry and Wildlife Committee	The Committee implements the state policy and exercises control and supervision over forestry, wildlife protection and specially protected natural areas.
The Committee for Environmental Regulation and Control	The Committee is responsible for environmental safety, improvement of government regulation in the field of environmental protection and government environmental control, conducts state environmental expert evaluation and issues environmental permits.
The Fisheries Committee	The Committee preforms strategic, regulatory and control functions in the field of protection, reproduction and use of fish resources and other aquatic animals.
The Information and Analytical Centre for Environmental Protection[147]	The Centre supports the biological diversity monitoring system covering all protected areas.
Kyrgyzstan	
The Ministry of Natural Resources, Ecology and Technical Supervision[148]	The Ministry is responsible for the development and implementation of state policy and coordination in the areas of environmental protection, ecology and climate, geology and subsoil use, the use and protection of natural resources, including bioresources, subsoil and water resources, and exercises government control and supervision over compliance with environmental requirements of industrial safety (including chemical, biological, radiation and nuclear), mining safety, subsoil protection, quality of coal and fuel.
The Department of Biodiversity Conservation and Specially Protected Natural Areas (Annex 3 to the Decree of the President of the Kyrgyz Republic, 2021)	The Department implements the state policy in the field of biodiversity conservation and sustainable functioning and development of the network of protected areas.

[146] The Resolution of the Government of the Republic of Kazakhstan "On implementation of the Decree of the President of the Republic of Kazakhstan "On further improvement of the government regulation system of the Republic of Kazakhstan" No. 17 dated June 17, 2019" as on January 18, 2022

[147] The Concept of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030 (https://docplayer.com/31773488-Koncepciya-po-sohraneniyu-i-ustoychivomu-ispolzovaniyu-biologicheskogo-raznoobraziya-respubliki-kazahstan-do-2030-goda.html) or (https://tehranconvention.org/system/files/kazakhstan/koncepciya.pdf)

[148] The Decree of the President of the Kyrgyz Republic "On the structure and composition of the Cabinet of Ministers of the Kyrgyz Republic and the structure of the President's Office of the Kyrgyz Republic" No. 425 dated October 12, 2021 (http://cbd.minjust.gov.kg/act/view/ru-ru/158727)

Tajikistan	
The Committee for Environmental Protection under the Government of the Republic of Tajikistan[149]	Exercises government control over the protection and rational use of flora and fauna, fish resources, specially protected natural areas, tourist routes, woodlands, water, land, compliance with environmental and biological safety requirements, environmental norms and standards, organises and conducts environmental monitoring.
The Department of Government Control over the Use and Protection of Flora and Fauna	Exercises government control over the use and protection of fauna and flora and fish resources. Issues permits for the use of objects of fauna and flora, including those listed in the Red Data Book. Reviews proposals for inclusion/exclusion of certain species of plants and animals in/from the Red Data Book of Tajikistan.
The Monitoring and Environmental Policy Department	Organises and conducts environmental monitoring, collects statistical data.
The Department of Government Control over Land Use and Protection and Waste Management	Ensures implementation of a unified policy of state environmental expert evaluation, performs environmental expert evaluation of projects.
Turkmenistan	
The Ministry of Agriculture[150]	Implements the state policy of the President of Turkmenistan in the field of agriculture and environmental protection, is the authorised body responsible for food security, environmental protection, land relations and hydrometeorology.
The Environmental Protection Service	Exercises government control over the work carried out in the country to protect, study, develop, enrich and use natural resources, forests, and biological diversity in a rational way.
The Land Resources Service	Exercises government control over the rational use and protection of land resources, maintains the State Land Cadastre and monitors the state of land.
Uzbekistan	
The State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection[151] (Now, the Ministry of Natural Resources)	Carries out public administration in the field of ecology, environmental protection, rational use and reproduction of natural resources. Responsible for regulation and implementation of environmental and ecological policy.
The State Environmental Expert Evaluation Centre	Conducts state environmental expert evaluation of draft government programmes, concepts, social development schemes, protected natural areas management plans.

[149] The Resolution of the Government of the Republic of Tajikistan "On the Committee for Environmental Protection under the Government of the Republic of Tajikistan" No. 357 dated September 2, 2021 (http://base.spinform.ru/show_doc.fwx?rgn=135275)
[150] The Ministry of Agriculture and Environmental Protection of Turkmenistan (https://minagri.gov.tm/en)
[151] Structure of the State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection http://www.uznature.uz/en/committee?numer=108

The Specialised Analytical Control Centre in the field of Environmental Protection	Monitors pollution sources, systematises and summarises the analytical control findings, information on the sources of pollution of atmospheric air, surface waters, soil, flora and fauna.

The governance structures of the ministries of Central Asian countries responsible for biodiversity conservation largely reflect the hierarchical structures of the respective governments. They are structured vertically, lack horizontal connections and, following the laws of composition and development of bureaucratic structures, each of their components – a department or a division – seeks to have the maximum possible amount of functions without taking performance efficiency into account.

Protected natural areas are an important element of biodiversity conservation. One of the most important steps taken by the governments in the region to preserve biodiversity was creation of protected areas. However, the effectiveness of biodiversity conservation within protected areas depends on their size, coverage of key habitats and ecosystems, and effective management.

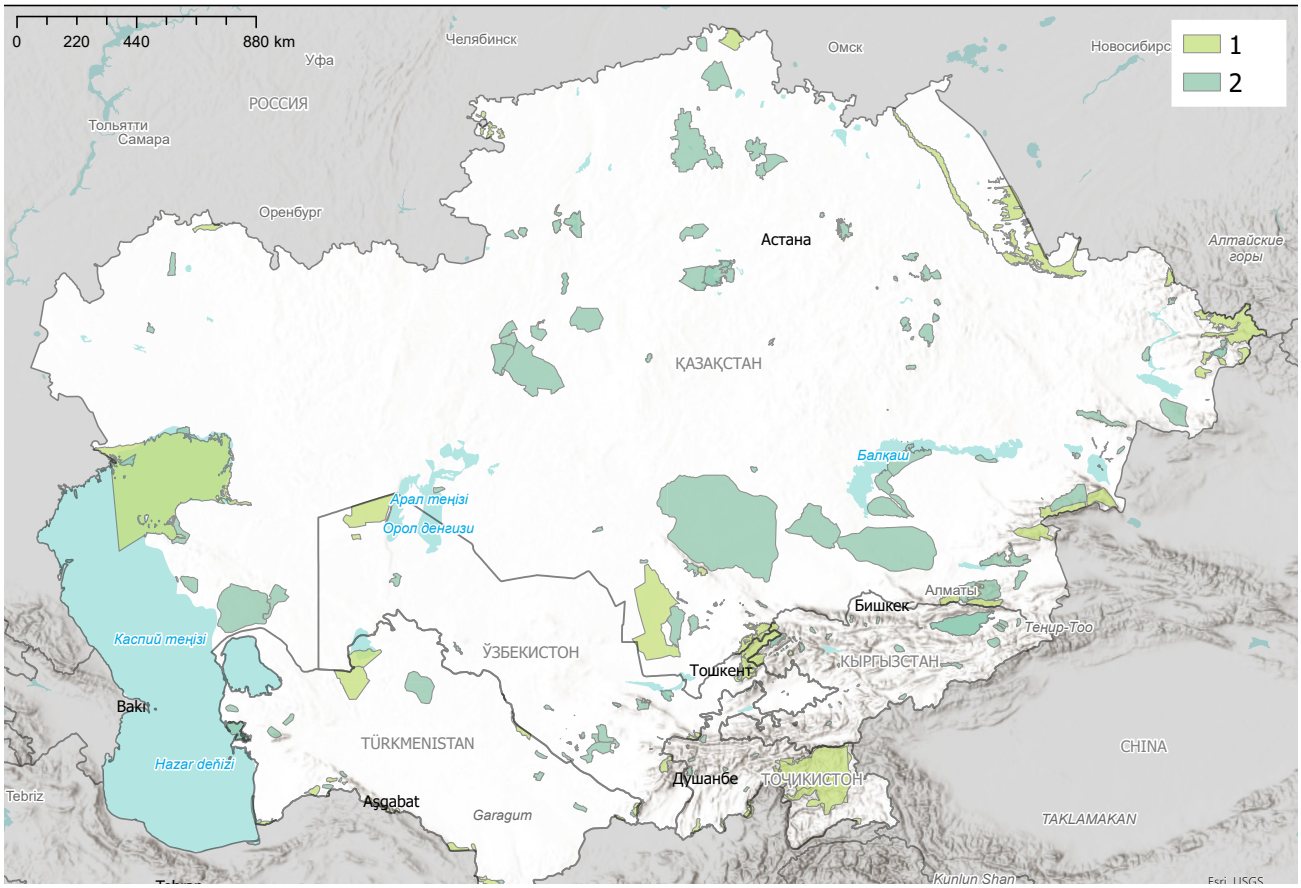


***Fig. 3.1**. Protected areas in the countries of Central Asia*

1. PAs along international borders

2. Other PAs

As shown by the above map, many initiatives designed to give a special conservation status to ecosystems end at the country borders, thus reducing the effectiveness of environmental activities. At the same time, it should be noted that transboundary protected areas require a more complex set of management tools, creation of coordination groups, expert platforms and councils for their effective monitoring and management. Such mechanisms have been partially created, but require further improvement and development.

In total, 5.6% of the CA countries land area is under protection, which is less than a half of the global average (14.8%) (EU, 2019). Moreover, the size of protected areas in the region varies from country to country. The total size of protected areas in Kazakhstan is 24.7 million hectares (9% of the country land area)[152], in Kyrgyzstan – 1.48 million hectares or 7.38% of the total land area[153], in Tajikistan – 3.1 million hectares or 22% of the total land area[154], in Uzbekistan – around 2.05 million hectares or 5% of the country land area, including nature reserves and monuments (EU, 2019).

A number of initiatives have been implemented in the region to establish transboundary protected areas, however, their short-term nature has limited their success in bringing together stakeholders and building sustainable transboundary mechanisms.
Threatened species can often be found outside protected areas where resources to enforce wildlife laws are minimal and very few specially trained personnel are present. As a result, illegal wildlife trade laws are poorly enforced outside protected areas, and endangered species are essentially left without protection in large areas of their habitat. The problem is particularly pressing in border areas, where border guards not only fail to act as a deterrent but can also pose a poaching threat. Some countries have made efforts to raise law enforcement awareness of wildlife crime.

The major issues in operation of protected areas in Central Asian countries are as follows: fragmentation of protected areas and interdepartmental interaction, systemic economic crisis and strong dependence of the population on the use of natural resources in everyday life, non-compliance with environmental legislation and the difficulty of control over the state of protected areas, insufficient funding of environmental protection activities, lack of monitoring of the state of protected areas and poor interaction with communities.

The challenges the modern society is facing and the commitments assumed under environmental conventions dictate the need to create new management tools, scale up the use of digital technologies and work with big data. To that end, the structures and methods of management and coordination, planning and management decisions evaluation processes have to be redesigned.

Development of new approaches and practices requires that all countries of the region unite their efforts at different levels of decision-making, from national to local.

By now, the region has gained some experience of implementing joint biodiversity conservation initiatives, which has shown that it is essential to join efforts and create joint expert platforms to discuss biodiversity conservation issues at the regional level. These platforms can provide a solid basis for elaboration of national and regional solutions. Such a mechanism would enable exchange of experience between countries and development of solutions with due regard to the coherence of the policies of Central Asian countries.

3.3. Strategic Areas of Biodiversity Conservation

The CA countries have a fairly well-developed system of laws, strategies and action plans for nature protection aimed at the habitats conservation and restoration. However, the implementation of strategies and plans, as well as the enforcement of legislation, is still insufficient, and restoration, if any, is achieved on a small scale (EU, 2019). Additional efforts have to be made to trigger biodiversity restoration, like improvement and expansion of the network of protected areas, recovery plans development and implementation.

[152] Data on protected areas. The Forestry and Wildlife Committee of the Ministry of Ecology, Geology and Natural Resources (https://www.gov.kz/memleket/entities/forest/activities/3811?lang=ru)
[153] Specially protected natural areas of the Kyrgyz Republic. The Department of Biodiversity Conservation and Specially Protected Natural Areas (https://fauna.kg/oopt/)
[154]The Wildlife Protection Centre. Protected natural areas of Tajikistan (https://www.biodiversity.ru/publications/zpnp/archive/n42/taj.html)

3.3.1. Protected areas

Biodiversity is better preserved in protected areas. However, the existing network of areas protected by the law, including those under strong protection, is not large enough to conserve biodiversity. The facts prove that the objectives set out in the Convention on Biological Diversity are insufficient for adequate nature protection and restoration[155]. Countries need to step up their efforts to do more and better for the nature and create a coherent regional natural network.

Box 3.1. **EU Biodiversity Strategy for 2030 and a new Nature Restoration Law**

Europe's nature is in alarming decline, with more than 80% of habitats in poor condition. The European Commission has proposed a new Nature Restoration Law to restore ecosystems for people, the climate and the planet. This Law is a key element of the EU Biodiversity Strategy, for 2030[156] , which calls for binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters. Restoring wetlands, rivers, forests, grasslands, marine ecosystems, and the species they host will help increase biodiversity, secure the things nature does for free, like cleaning our water and air, pollinating crops, and protecting us from floods, limit global warming to 1.5°C, build up Europe's resilience and strategic autonomy, preventing natural disasters and reducing risks to food security.

The EU proposal combines an overarching restoration objective for the long-term recovery of nature in the EU's land and sea areas with binding restoration targets for specific habitats and species. These measures should cover at least 20% of the EU's land and sea areas by 2030, and ultimately all ecosystems in need of restoration by 2050.

The proposal contains the following specific targets:

- **targets based on existing legislation (for wetlands, forests, grasslands, river and lakes, heath & scrub, rocky habitats and dunes)** - improving and re-establishing biodiverse habitats on a large scale, and bringing back species populations by improving and enlarging their habitats
- **pollinating insects** – reversing the decline of pollinator populations by 2030, and achieving an increasing trend for pollinator populations, with a methodology for regular monitoring of pollinators
- **forest ecosystems** – achieving an increasing trend for standing and lying deadwood, uneven aged forests, forest connectivity, abundance of common forest birds and stock of organic carbon
- **urban ecosystems** – no net loss of green urban space by 2030, and an increase in the total area covered by green urban space by 2040 and 2050
- **agricultural ecosystems** – increasing grassland butterflies and farmland birds, the stock of organic carbon in cropland mineral soils, and the share of agricultural land with high-diversity landscape features; restoring drained peatlands under agricultural use
- **marine ecosystems** – restoring marine habitats such as seagrass beds or sediment bottoms that deliver significant benefits, including for climate change mitigation, and restoring the habitats of iconic marine species such as dolphins and porpoises, sharks and seabirds
- **river connectivity** – identifying and removing barriers that prevent the connectivity of surface waters, so that at least 25 000 km of rivers are restored to a free-flowing state by 2030

EU countries are expected to submit National Restoration Plans to the Commission within two years of the Regulation coming into force, showing how they will deliver on the targets. They will also be required to monitor and report on their progress. The European Environment Agency will draw up regular technical reports on progress towards the targets. The Commission, in turn, will report to the European Parliament and to the Council on the implementation of the Nature Restoration Law.

[155] IPBES, 2019: Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

[156] European Commission, Directorate-General for Environment, EU biodiversity strategy for 2030: bringing nature back into our lives, Publications Office, 2021, (https://data.europa.eu/doi/10.2779/048)

3.3.2. Strengthening the legal framework and good governance for nature restoration

The current legislation of the CA countries already partly requires that actions are taken to conserve biodiversity. However, progress is hindered by significant gaps in implementation and statutory regulation. Drawing on the accumulated international experience, countries can start off by setting legally binding targets to be achieved within clearly defined time frames, for example, in terms of restoration of degraded ecosystems, those with the greatest potential for carbon capture and sequestration, or natural disasters prevention and mitigation.

3.3.3. Reviving nature on agricultural land

Farmers and dekhkans play a vital role in biodiversity conservation. They are among the first to feel the effects of biodiversity loss, but also among the first to reap the benefits of its restoration. Biodiversity enables them to provide us with safe, sustainable, nutritious and affordable food and gives them the income they need to thrive and develop. Farmers and dekhkans must continue to be the social and economic centre of many communities in Central Asia.

3.3.4. Solving the problem of land withdrawal and restoration of soil ecosystems

Soil is one of the most complex ecosystems. It is home to a wide variety of organisms that regulate and control key ecosystem services such as soil fertility, nutrient cycle and climate resilience. Soil is an essential non-renewable resource equally important for human health and economic performance. Therefore, it is necessary to redouble efforts to set restoration goals, protect soil fertility, restore degraded soils, reduce soil erosion and increase soil organic content through the implementation of sustainable soil management practices.

3.3.5. Increasing the amount of forests and improving their state and resilience

Forests are essential for biodiversity, climate and water regulation, food, medicine and material supplies, carbon sequestration, soil stabilisation, and air and water purification. They also offer a space to relax and explore nature. Foresters play a key role in the sustainable management of forests and biodiversity restoration and maintenance in forests.

In addition to strong protection of all available forests, it is necessary to increase the quantity, quality and resilience of forests, in particular to fires, droughts, pests, diseases and other threats that may rise with climate change. All forests must be kept in good condition to maintain their function for both biodiversity and climate.

3.3.6. Restoring freshwater ecosystems

The quality of water in many water bodies in Central Asia leaves much to be desired, especially in the lower reaches of the rivers. More efforts have to be made to achieve good ecological status of rivers[157], restore freshwater ecosystems and natural functions of rivers. This can be achieved both by preventing the discharge of polluted untreated effluents, reusing sewage water, and by increasing resilience to change – afforestation of the flow formation zones and floodplains, wetlands restoration.

3.3.7. Landscaping of urban and suburban areas

Green urban spaces provide a wide range of benefits for people. They reduce air, water and noise pollution, provide protection from floods, droughts and heatwaves, and keep people and nature connected. Healthy ecosystems based on sustainable environmental management principles have to be systematically incorporated

[157] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32000L0060

into urban planning, including public spaces, infrastructure, design of buildings and their surroundings. Urban planning has to provide for creation of biologically diverse and accessible urban forests, parks and gardens, urban farms, green roofs and walls, tree-lined streets, urban meadows and living fences. Planning must also improve the links between green spaces, eliminate the use of pesticides, limit excessive mowing of urban green spaces and other practices harmful to biodiversity. Such plans can mobilise political, regulatory and financial instruments.

3.3.8. Reducing pollution

Pollution is one of the main drivers of biodiversity loss and has a detrimental effect on our health and the environment. Biodiversity is affected by pollutant emissions, urban and industrial wastewater, and other waste, including garbage and plastic. All these loads must be reduced.

3.3.9. Addressing the issue of invasive alien species

Invasive alien species can significantly undermine efforts to protect and restore nature. In addition to causing serious damage to nature and the economy, many invasive alien species contribute to the emergence and spread of infectious diseases, posing a threat to people and wildlife. Effective measures must be in place to control the rate of invasion and the risks it poses to nature and health.

3.3.10. Governance system

Numerous institutional factors contribute to poor management of natural resources throughout the region.

There are structural inconsistencies, if not competing priorities, between central and local authorities. Agencies in charge of agriculture, oil and gas, minerals and water sometimes compete with each other and have more power than environmental agencies.

Another reason for insufficient integration of biodiversity into economic development planning and private sector activities is insufficient institutional development capacity in the CA countries. For example, the lack of targets and planning timeframes in most development plans makes it impossible to monitor progress towards either biodiversity goals or other development goals.

Biodiversity considerations must be better integrated into the government decision-making at all levels, and the decision-making process itself must be based on modern good governance principles. For example, the Organisation for Economic Co-operation and Development (OECD) formulates the following principles on water governance[158]:

Effectiveness relates to the contribution of governance to define clear sustainable water policy goals and targets at all levels of government, to implement those policy goals, and to meet expected targets.
Efficiency relates to the contribution of governance to maximise the benefits of sustainable water management and welfare at the least cost to society.
Trust and Engagement relate to the contribution of governance to building public confidence and ensuring inclusiveness of stakeholders through democratic legitimacy and fairness for society at large.

It is necessary to develop methods, criteria and standards to mainstream these governance principles across biodiversity management and sustainable development programmes.

[158] https://www.oecd.org/governance/oecd-principles-on-water-governance.htm

3.3.11. Improving knowledge, education and skills

Combat against the loss of biodiversity must be based on reliable scientific evidence. Investment in research, innovation and knowledge sharing has to become the key to obtaining the required information and developing the best solutions on the principles of sustainable nature management. Research and innovation will help develop new green solutions and generate investment.

Box 3.2. **Example of a transboundary PA management**

Pasvik-Inari Trilateral Park (Norway, Russia and Finland)

The Pasvik-Inari Trilateral Park, consisting of Vätsäri Wilderness Area in Finland, Øvre Pasvik National Park in Norway and Pasvik Zapovednik in Russia, is the transboundary protected area in the northern Fennoscandia. Pasvik Nature Reserve/Pasvik Zapovednik was formally founded through a resolution in the Russian government in 1992, whereas the Norwegian part of Pasvik Nature Reserve was formally founded through regal resolution in 1993. Starting from 1999 the municipalities of Pechenga (Russia), Inari (Finland) and Sør-Varanger (Norway) were involved in the trilateral cooperation on a permanent basis. During the trilateral meeting in 2002, it was decided to promote a common trilateral nature protection area in Pasvik-Inari.

Trilateral Cooperation Agreement signed in 2008 between Lapland Natural Heritage Services of Metsähallitus (Finland), Pasvik Zapovednik (Russia) and the County Governor of Finnmark (Norway) foresees main principles for cooperation as well as organisation of the cooperation of the signatories.

Protected area is recognised as Europarc Transboundary Protection Area[159] in 2008.

Implemented cooperation projects:

- Project: ***Promotion of nature protection and sustainable nature tourism in the Inari-Pasvik area*** (2006-2008)

Financed by Interreg IIIA North Kolarctic Neighbourhood Programme/Tacis programme

Total budget of the project: 605’116.00 EUR

Lead Partner: Metsähallitus, Lapland Nature Services (Finland)

Other partners: Finnmark County unicipality (Norway), Office of the Finnmark County governor (Norway), Pasvik Zapovednik (Russia), Sør-Varanger Municipality (Norway), Svanhovd Environmental Center (Norway), Statskog SF (Norway), Sør-Varanger travel forum (Norway), Municipality of Inari (Finland) and Lapland Environment Centre (Finland) During the project the nature tourism facilities and networks between the authorities and various interest groups were developed. In nature monitoring, the intensified cooperation led to testing harmonised monitoring methods. In addition, information materials about the area were developed.

The first joint management document was elaborated by the Project – ***Action Plan for Nature Protection and Sustainable Nature Tourism in Pasvik-Inari Area*** (2008).

- Project: ***Cross-border Dialogue and Multi-Use Planning in the Pasvik and Grense Jakobselv Catchments*** (2018-2021)

Financed by Kolarctic CBC Programme 2014-2020

Total budget of the project: 404’148.00 EUR

[159] https://www.europarc.org/nature/transboundary-cooperation/transboundary-parks-programme/

Lead Partner: The Office of the Finnmark County Governor (Norway)

Other partners: Centre for Economic Development, Transport and the Environment in Lapland (Finland), Pasvik Nature Reserve (Russia)

The overall objective of the project is to sustain and improve the state of the environment within Pasvik and Grense Jakobselv cross-border river basins, to the benefit of local people, and to increase the viability of the local economy. Revised Multi-Use Plan for the river basins of Pasvik and Grense Jakobselv were elaborated in the project.

- Project: ***Phenomena of Arctic Nature*** (2019-2022)

Financed by Kolarctic CBC Programme 2014-2020

Total budget of the project: 2'615'785.00 EUR

Lead partner: Metsähallitus, Parks & Wildlife Finland Finland)

Other partners: Youth Centre Vasatokka (Finland), Institute of Industrial Ecology Problems of the North (Russia), State Nature Reserve Pasvik (Russia), Biotope AS (Norway), Norwegian Institute of Bioeconomy Research (Norway), The Board for the Øvre Pasvik National Park (Norway), Lapland University of Applied Science (Finland) and Municipality of Salla (Finland)

Project's overall objective is that attraction and awareness of arctic nature and its unique phenomena in tourism market are growing and result in increasing number of tourists, higher income in the local economy and better employment rate in the tourism sector along the northern most part of Green Belt of Fennoscandia. The concrete outputs of the project include permanent exhibitions in nature centres, nature observation bases, and audio-visual shows. Target groups are tourism entrepreneurs, tourists, pupils, students and local people in the Barents area in Russia, Norway and Finland.

Project web page: https://www.metsa.fi/en/project/phenomena-of-arctic-nature-pan/

3.4. Conclusions and Recommendations

The countries of Central Asia have gained a unique biodiversity conservation experience and have come a long way since their independence building the administrative and legal system for biodiversity conservation management. At the same time, the analysis has shown that they all face similar challenges and have to solve the same problems:

- Complete the development of an efficient governance system based on the OECD principles of good governance, featuring the regulation of interdepartmental interaction and an effective monitoring system;
- Improve the legal framework on transboundary protected areas and biosphere reserves;
- Align the national biodiversity targets with the UN SDG15 adopted by all CA countries – sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss;
- Set the targets and time frames for all national biodiversity goals;
- Identify areas that have to be preserved and have a high conservation value, but have no conservation status or special regime of use;
- Strengthen financial support mechanisms for biodiversity conservation activities;
- Enhance the capacity of personnel of government bodies in charge of biodiversity conservation;
- Widen involvement of local communities and the public concerned in environmental activities, empower social movements and groups;
- Impose a moratorium on the development and use of pristine/primary forests in Central Asia, establish protection regimes for this type of ecosystems;
- Develop and maintain cross-border cooperation between the countries of Central Asia;
- Exchange genetic resources through international institutions and gene banks;
- Interact with international development agencies and financial organisations to attract international experience and resources for biodiversity conservation;
- Study regional and foreign experience in biodiversity conservation, including forest policy and forestry development strategies;
- Ensure regular participation in scientific conferences and workshops at international level;
- Develop the Red List of Ecosystems of Central Asia.

Due to increasing awareness of the role of climate change, it is necessary to update the terms “sustainable development”, “climate resilient development”, “sustainable and efficient environmental management” at the national level.

Successful incorporation of biodiversity goals into national development plans requires statutory recognition of the OECD principles of good governance – effectiveness, efficiency, trust and engagement.

Chapter 4.

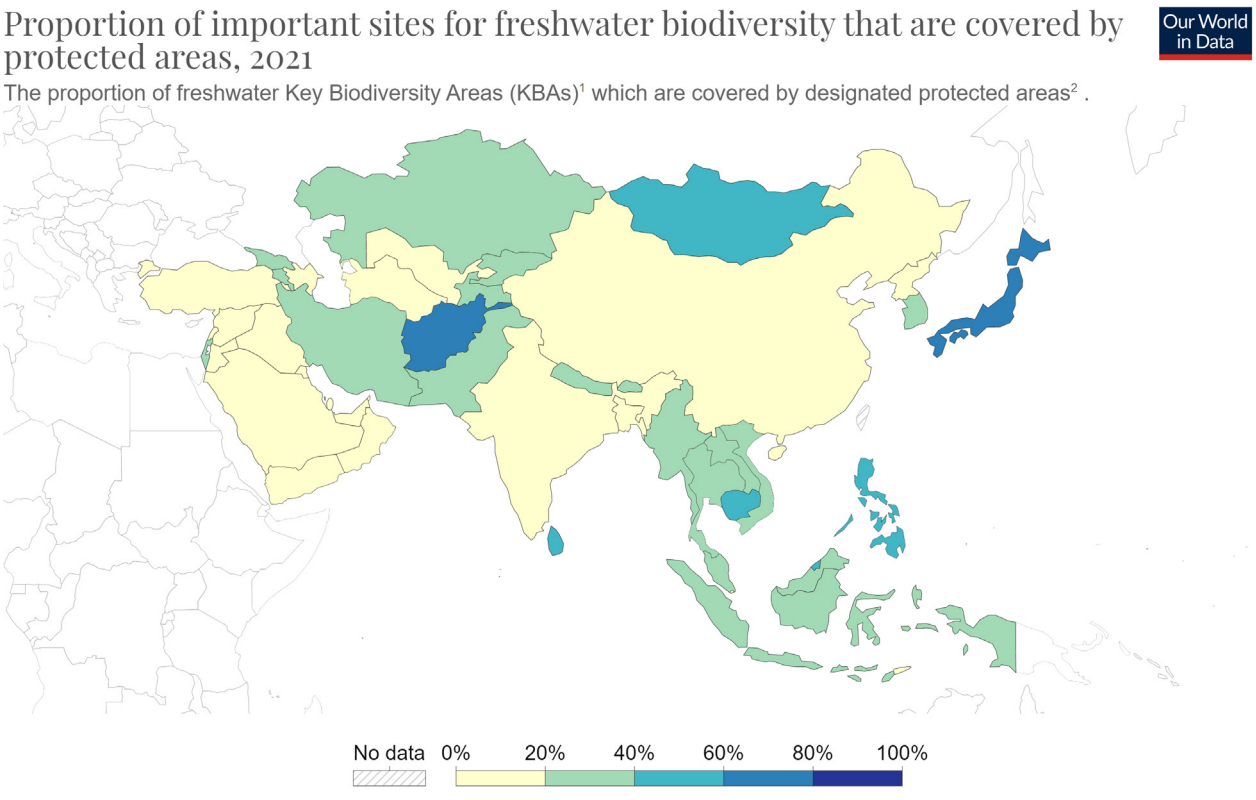
Policy for Achieving SDG15 on Biodiversity

Important aspects of governance that are directly relevant to the achievement of UN SDG15 on biodiversity and should be prioritised comprise the sustainable use and management of forests and ecosystems, combating desertification, halting and reversing land degradation and halting biodiversity loss including the conservation of migratory species, attitudes towards invasive species, the relationship between biodiversity and human health, the conservation of genetic resources and the provision of ecosystem services.

4.1. Protection of important biodiversity sites (SDG15.1)

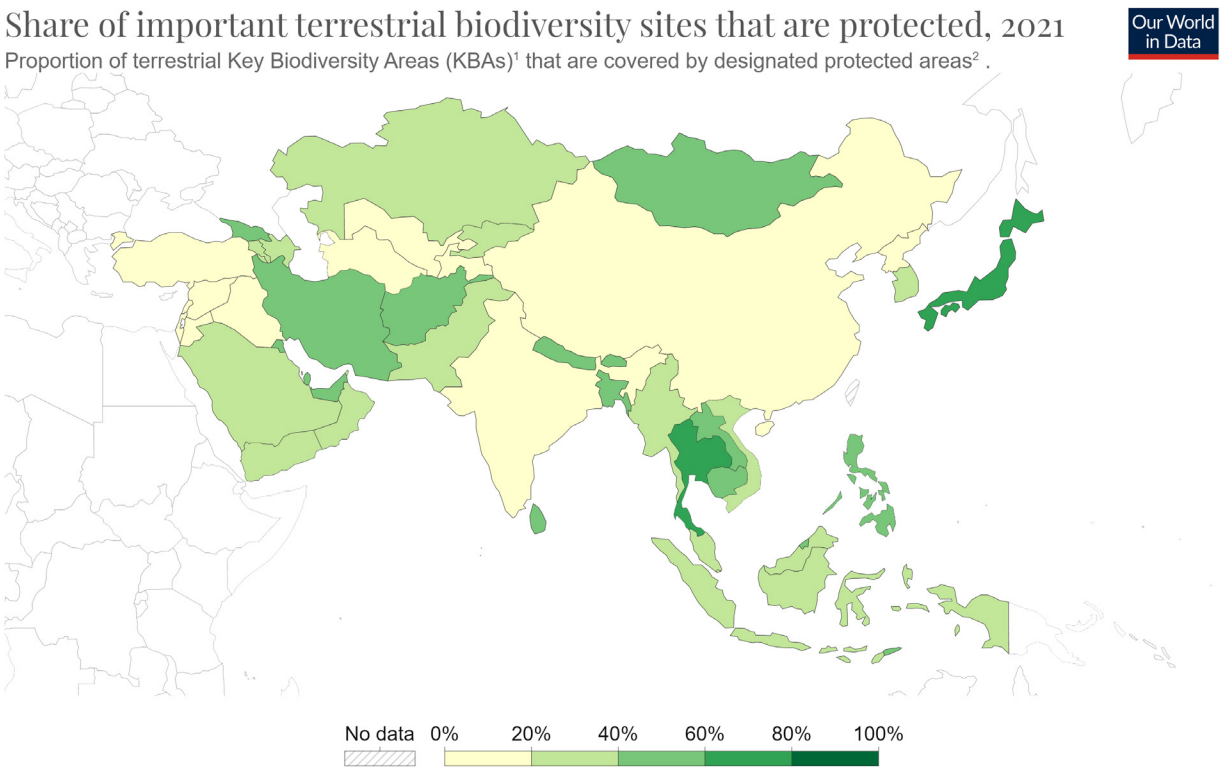
According to the UN, the coverage of important biodiversity sites by protected areas is rather limited in CA. The proportion of important sites for freshwater biodiversity covered by protected areas is 0-20% in Uzbekistan and Turkmenistan and 20-40% – in other countries of the region. The coverage of important terrestrial biodiversity sites by protected areas is hardly better, only in case of mountain diversity in the Republic of Kazakhstan the coverage exceeds 40%. There are no measurable national targets for 2020 against which progress towards SDG15.1 could be tracked.

Proportion of important sites for freshwater biodiversity that are covered by protected areas, 2021 (see https://sdg-tracker.org/biodiversity)

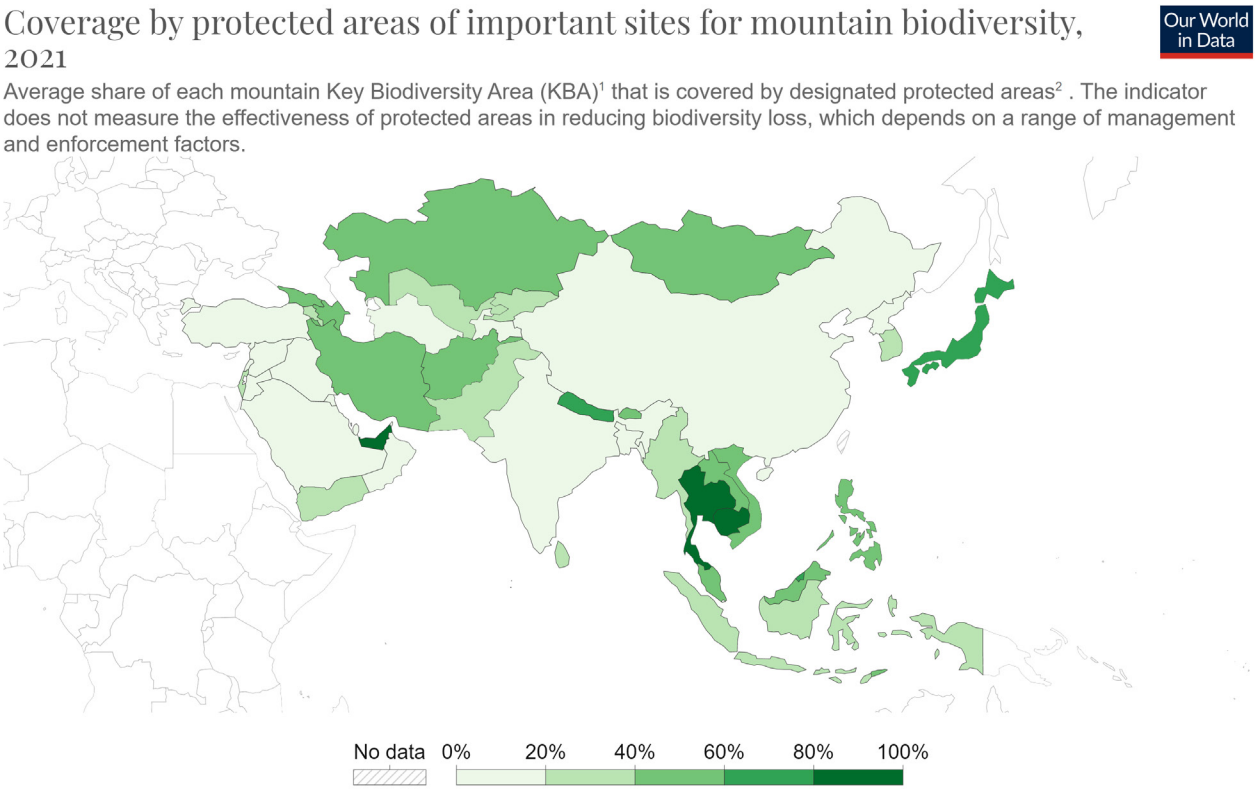


Source: BirdLife International, International Union for Conservation of Nature and United Nations Environment Programme
OurWorldInData.org/protected-areas-and-conservation • CC BY

Share of important terrestrial biodiversity sites that are protected, 2021
(see https://sdg-tracker.org/biodiversity)



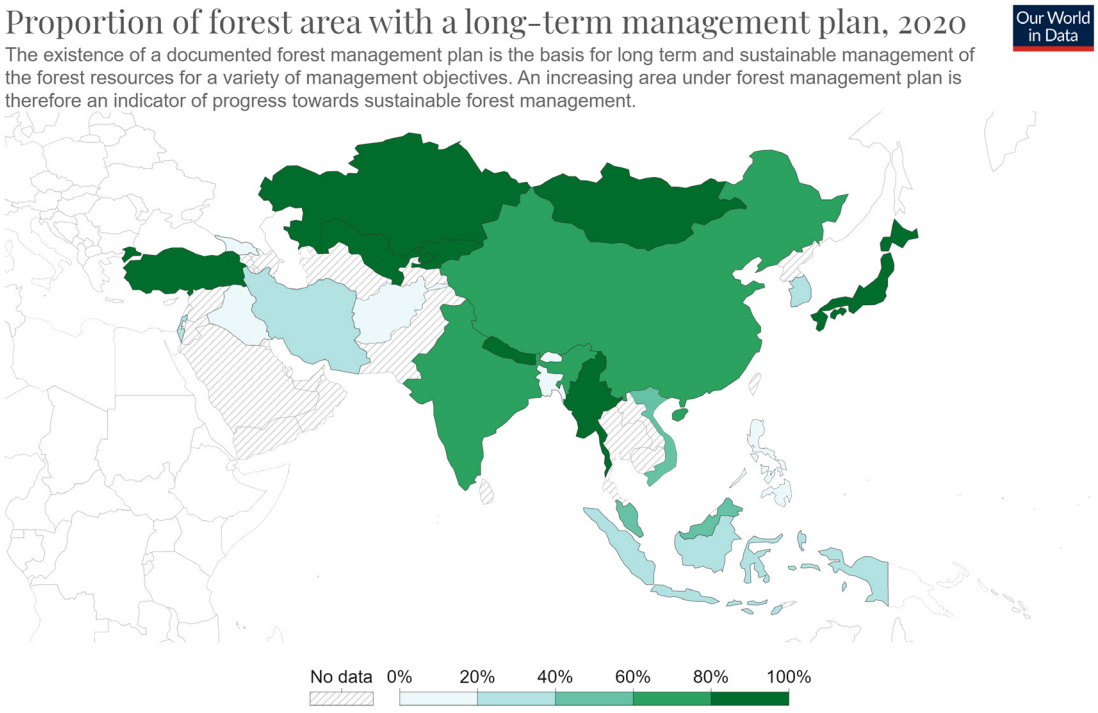
Coverage by protected areas of important sites for mountain biodiversity, 2021
(according to https://sdg-tracker.org/biodiversity).



4.2. Sustainable Management of Forests (SDG15.2)

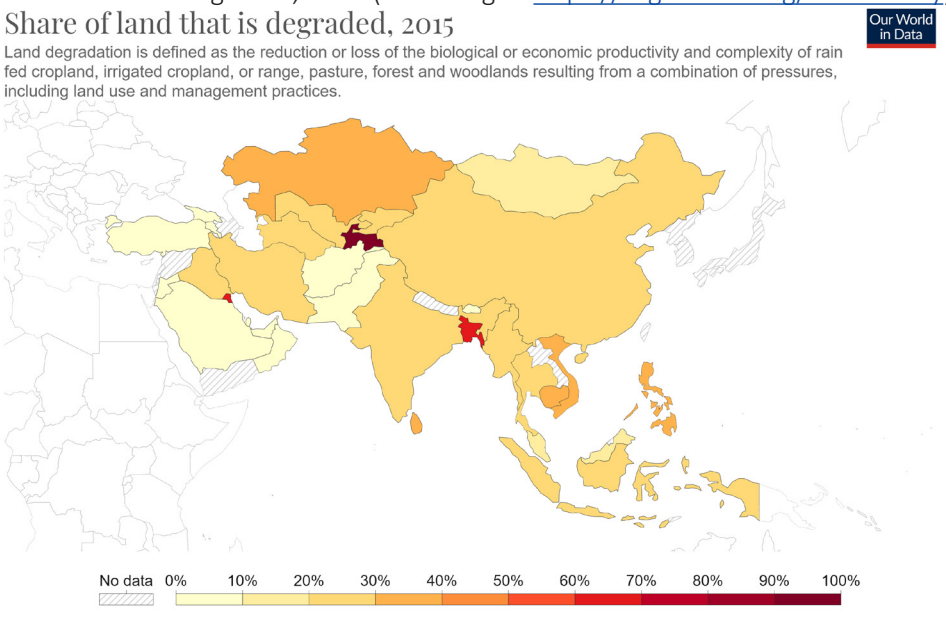
According to the UN, the proportion of forests with long-term management plans amounts to an impressive 80+% in Kazakhstan, Kyrgyzstan and Uzbekistan, which well reflects their progress towards sustainable forest management. Data on the other two CA countries are unfortunately not available, so the progress can't be assessed.

Proportion of forest area with a long-term management plan, 2020 (https://sdg-tracker.org/biodiversity)



A very high share of degraded lands in Tajikistan (90-100%) and Kazakhstan (40-50%) is of great concern. In other Central Asian countries, the situation is slightly better – 20-30%.

Share of land that is degraded, 2015 (according to https://sdg-tracker.org/biodiversity).



4.3. Conservation of Migratory Species (SDG15.6)

As noted above, the movement of wild animals occurs regardless of administrative or state boundaries. It is represented by an extensive network of migration routes that cross borders. Therefore, the conservation of migratory species requires international cooperation and implementation of the relevant transboundary programmes.

At present, transboundary projects for the conservation and protection of migratory species in Central Asia are implemented in the areas with high species diversity – in the Tien Shan mountains (Kazakhstan, Kyrgyzstan and Uzbekistan, China), in the Pamir-Alay mountain region (Kyrgyzstan and Tajikistan) and in the Altai-Sayan mountain ecoregion (Kazakhstan, Mongolia, Russia). Here, international cooperation is mainly aimed at the conservation of species that are objects of the Memoranda of Understanding under the Convention on Migratory Species (CMS), which include such species as the Bukhara deer (***C. elaphus bactrianus***), saiga antelope (***S. tatarica***), and Siberian crane (***G. leucogeranus***). An even broader programme is carried out by the Central Asian Mammals Initiative (CAMI)[160]. Examples of successful transboundary cooperation and creation of ecological corridors in the Central Asian biodiversity hotspot are provided by the Critical Ecosystem Partnership Fund[161].

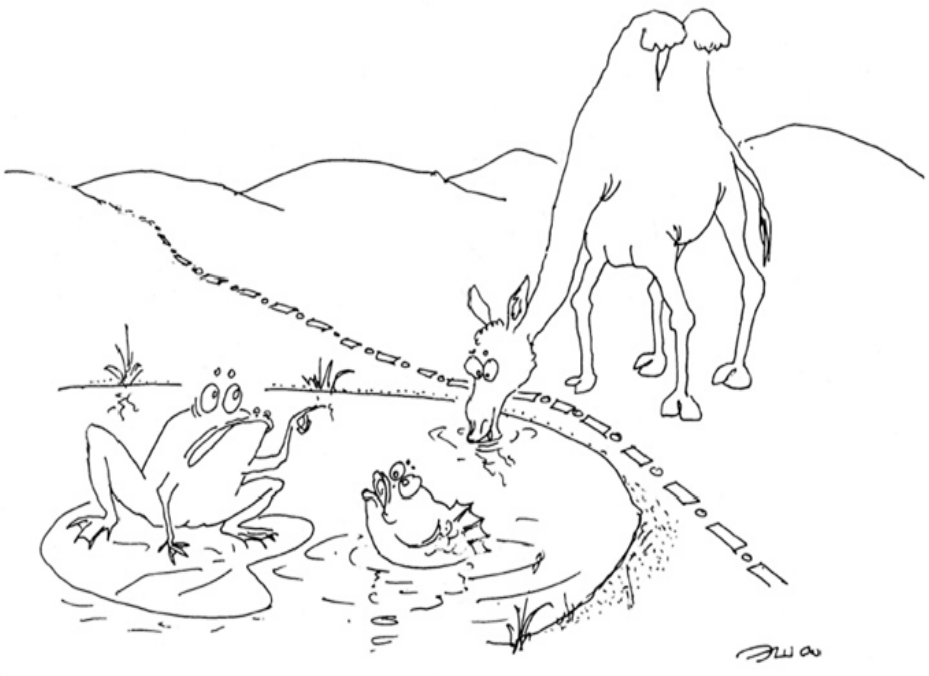


Figure 4.1. *On biodiversity in transboundary context. E. Shukurov (published with the author's permission)*

It should be noted that in the case of national borders, migratory species cross formal boundaries, and their conservation depends on an adequate and identical attitude towards them on both sides of the border, whereas in the case of mechanical barriers to the movement of migratory species, including those associated with infrastructure development in their habitats, more challenging problems arise.

For example, the Central Asian Mammals Migration and Linear Infrastructure Atlas[162] developed under the Convention on the Conservation of Migratory Species of Wild Animals contains a graph showing the barrier effect of different types of fences and explains that some of them, like metal panels and high fences, are a

[160] The European Commission, "Larger than Tigers: Inputs for a strategic approach to biodiversity conservation in Asia", 2019. (https://op.europa.eu/en/publication-detail/-/publication/ba5fe255-93cf-11e9-9369-01aa75ed71a1)

[161] Critical Ecosystem Partnership Fund, 2017, The Mountains of Central Asia Biodiversity Hotspot https://www.cepf.net/sites/default/files/mountains-central-asia-ecosystem-profile-ru.pdf

[162] UNEP/CMS, Eds. 2019. Central Asian Mammals Migration and Linear Infrastructure Atlas. CMS Technical Series No. 41. Bonn, Germany (https://www.cms.int/sites/default/files/publication/cami_atlas_3_complete.pdf)

complete barrier to migratory animal species as they can't overcome them.

Such infrastructure facilities as roads, railroads and pipelines have a negative impact on the movement of animals, change the habitual lifestyle patterns of populations and individual species. Double-track and high-speed railways and highways have the largest barrier effect. Low-speed and single-track railroads have the least impact on animal mobility, as do unpaved and low-traffic roads.

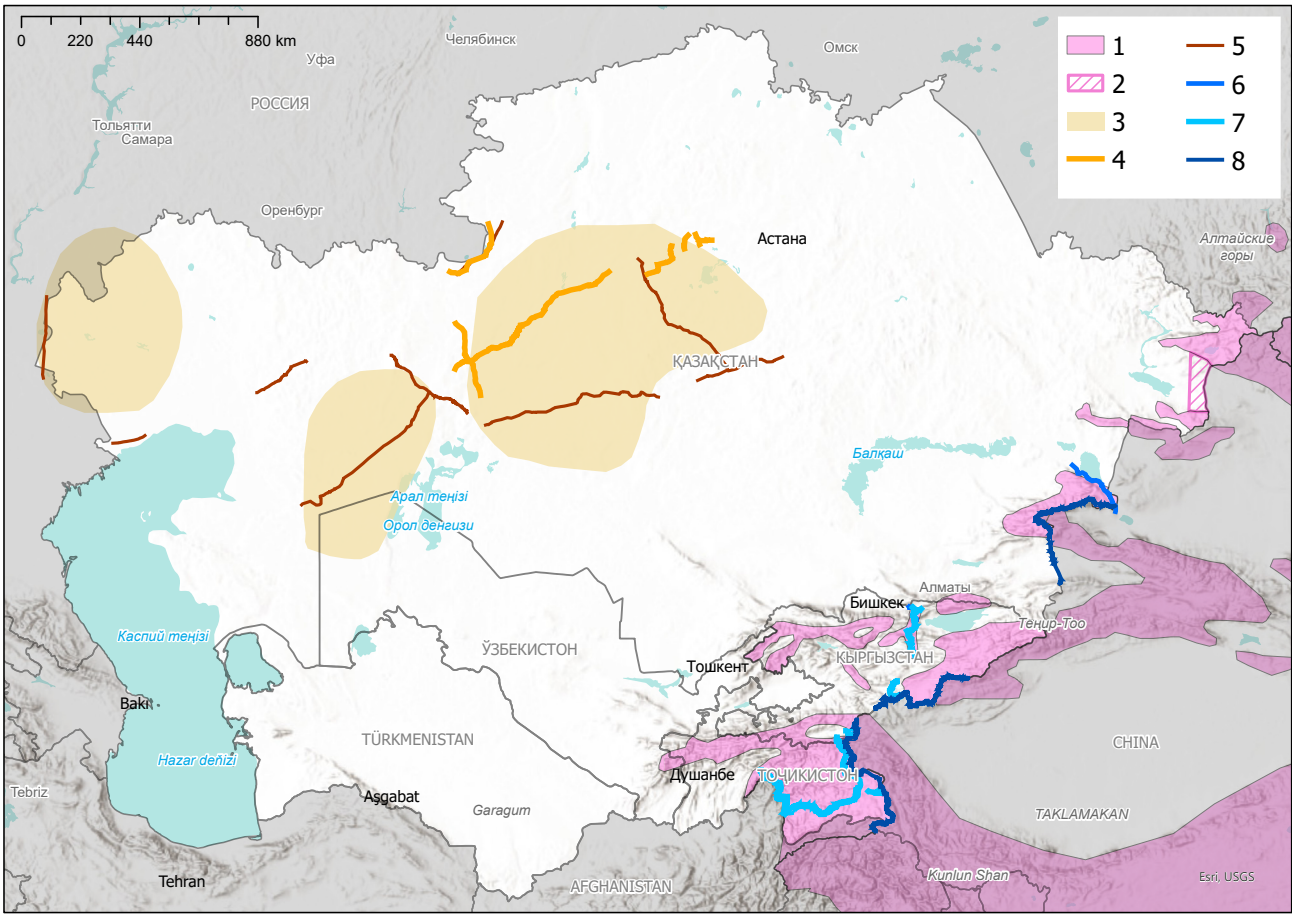


Figure 4.2. *Saiga antelope and snow leopard distribution ranges and linear infrastructure threats (https://www.cms.int/sites/default/files/publication/cami_atlas_3_complete.pdf)*

1. Snow leopard range
2. Snow leopard migration corridor
3. Saiga antelope range
4. Saiga antelope – identified conflict with roads
5. Saiga antelope – identified conflict with railroads
6. Snow leopard – identified conflict with railroads
7. Snow leopard – identified conflict with roads
8. Snow leopard – identified conflict with fences

4.4. Invasive Species (SDG15.8)

Invasive alien species (IAS)[163,164] change the processes in ecosystems, compete with native species, and thus reduce the natural diversity. Sometimes hybridisation and other side effects occur changing the structure

[163] Invasive alien species (IAS) are species whose introduction and/or spread outside their natural past or present distribution threatens biological diversity.
[164] https://www.cbd.int/invasive/WhatareIAS.shtml

of communities and genetic diversity. IAS often disrupt existing trophic links in ecosystems and drive native species out. This leads to disappearance of local fauna representatives, simplification of the structure of natural communities, and outbreaks of infectious diseases. Moreover, the impact of IAS goes beyond biodiversity seriously affecting economic activity, food security, human health and well-being too.

Although the size of the socio-economic costs associated with IAS is not properly estimated, according to the International Union for Conservation of Nature (IUCN, 2022 https://www.iucn.org), the direct impact of IAS and their management costs the global economy billions of US dollars annually. According to these estimates, IAS cost the EU at least €12.5 billion/year. Invasive alien insects alone cost at least US$70 billion per year worldwide due to their impact on agriculture and forestry. The global cost of controlling invasive freshwater biofouling species that accumulate on wet surfaces of power plants and wastewater treatment plants is estimated at over US$277 million per year.

IAS pose a threat to human health, directly or indirectly, by transmitting diseases through infectious pathogens or by providing suitable habitat for disease-spreading organisms. The impact of IAS may be exacerbated by climate change that may facilitate the spread and establishment of alien species. For example, climatic events such as floods can bring invasive species to new territories. Resilience of natural habitats can also be reduced by IAS that can make them more vulnerable to the effects of climate change. For example, introduced grasses and trees can change fire patterns, especially in areas getting warmer and drier due to climate change, putting habitat and human life at risk.

Overall, IAS can undermine progress towards 10 out of the 17 UN Sustainable Development Goals.

In their national reports on biodiversity conservation all countries of Central Asia noted the presence and negative impact of IAS on biodiversity and ecosystems. Another pressing problem is IAS imported into the countries without proper control and threatening the survival of local species. There are currently no IAS control mechanisms in the countries of CA. No risks associated with their introduction are assessed, no records are kept of the amount and species composition of IAS entering the countries.

For example, according to the Sixth National Report[165] of the Republic of Kazakhstan on Biological Diversity in Kazakhstan, there are more than 50 invasive and alien species of vertebrate animals, and nearly 30 out of 150 species of fish are invaders, accidentally or intentionally introduced into the country, making up over 17% of the entire ichthyofauna.

The action plan for the implementation of the Concept[166] of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030 provides for the development of a data collection and monitoring system for invasive alien species of animals and plants, and a list of identified species with the degree of threat they pose to biodiversity. However, no data collection system for invasive and alien species or any coherent programme for their control is operated in the country yet.

According to the Sixth National Report[167] of the Kyrgyz Republic on Biological Diversity, the majority of IAS in Kyrgyzstan are plants (81 species), insects (30 species), fish (9 species), birds (2 species), mammals and reptiles (1 species each).

2,950 species of alien plants have been identified in the composition of flora in Tajikistan[168]. The species are

[165] The Sixth National Report of the Republic of Kazakhstan on Biological Diversity, 2020 https://www.cbd.int/doc/nr/nr-06/kz-nr-06-en.pdf
[166]The Concept of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030, Kazakhstan, 2015 https://docplayer.com/31773488-Koncepciya-po-sohraneniyu-i-ustoychivomu-ispolzovaniyu-biologicheskogo-raznoobraziya-respubliki-kazahstan-do-2030-goda.html
[167] 2020 https://unece.org
[168] Biodiversity in Central Asia, Zoï Environment Network, 2012 https://zoinet.org

still conditionally divided into “useful” and “harmful” in the country and the current statistics reflect such classification. Invasive species spread over various vertical belts of the country actively move around under anthropogenic influence.

It is typical of Turkmenistan, like Tajikistan, to divide IAS into “useful” and “harmful” ones. At the same time, the introduction of alien species and biological pollution is recognised as a problem of great importance, since they cause certain damage to agriculture, forestry and fisheries, and affect the state of local species. According to the Report[169], the list of IAS in Turkmenistan includes 25 species of vertebrates, 24 species of invertebrates, 4 fish species, two bird species, one Ctenophora species and the barnacle. The appearance of 6 species of phytophagous insects was also noted in the Report.

In Uzbekistan[170], the majority of IAS are fish – up to 50% of the ichthyofauna. Among terrestrial vertebrates, alien species account for 2 species of birds (0.4% of the avifauna) and 5 species of mammals (4.7% of the theriofauna).

[169] Turkmenistan: The Fifth National Report on Implementation of the UN Convention on Biological Diversity at the National Level, 2014 https://www.cbd.int/doc/world/tm/tm-nr-05-ru.pdf

[170] The Sixth National Report of the Republic of Uzbekistan on Biological Diversity / edited by B. Kuchkarov / Tashkent, 2018 – 235 p, 2018

Box 4.1. **A good practice example: EU Regulation on Invasive Alien species**

Conditions and measures to prevent, minimise and mitigate the adverse impact of invasive alien species on biodiversity within the EU are set by the EU Regulation No. 1143/2014 on invasive alien species (the IAS Regulation). The Regulation entered into force on 1 January 2015, fulfilling target set by the EU 2020 Biodiversity Strategy, as well as target of the Strategic Plan for Biodiversity 2011-2020 under the Convention of Biological Diversity.

The core of the IAS Regulation is the list of Invasive Alien Species of Union concern (list IAS of Union Concern). Criteria for species to be included into the list IAS of Union Concern are determined by the Regulation No. 1143/2014. The revision of the list IAS of Union Concern is foreseen to be carried out every six years. All Member States are entitled to approve lists of invasive alien species that are specific for particular country, which are accordingly binding in those countries.

The IAS Regulation provides for a set of measures to be taken across the EU in relation to invasive alien species included on the list of Invasive Alien Species of Union concern. Three distinct types of measures are envisaged, which follow an internationally agreed hierarchical approach to combatting IAS:

- Prevention: a number of robust measures aimed at preventing the intentional or unintentional introduction of IAS of Union concern into the EU.
- Early detection and rapid eradication: Member States must put in place a surveillance system to detect the presence of IAS of Union concern as early as possible and take rapid eradication measures to prevent them from establishing.
- Management: some IAS of Union concern are already established in certain Member States. Concerted management action is needed to prevent them from spreading any further and to minimise the harm they cause.

As additional support tool the European Commission has developed an information exchange mechanism to facilitate the implementation of the EU policy on invasive alien species: the European Alien Species Information Network (EASIN)[171]. It's an online platform that aims to facilitate access to existing information on alien species from a range of sources.

EASIN includes a Species Search and Mapping tool, allowing for basic and advanced search of a database including over 14 000 alien species in Europe, and showing their distribution on a map. It includes the species currently on the list IAS of Union Concern.

EASIN includes the notification system, NOTSYS, for Member States to inform the Commission on new observations of IAS of Union concern, and on the rapid eradication measures taken.

Innovative tool to support data acquisition on invasive alien species is based on data obtained utilising citizen science approach. The App “Invasive Alien Species Europe” (developed by the European Commission’s Joint Research Centre) enables citizens to report IAS occurrences in Europe thus contributing to early detections of new invaders. The Invasive Alien Species in Europe app can be downloaded from Apple iTunes Store and Google Play Store and enables the general public (amateurs and professionals) to receive and share information about Invasive Alien Species (IAS) in Europe.

[171] https://easin.jrc.ec.europa.eu/easin

Box 4.2. **A good practice example: Management of the invasive Raccoon Dog (*Nyctereutes procyonoides*) in the north-European countries**	
Country:	Sweden, Finland and Denmark
Implementation period:	September 2010 – August 2013
Implementing organisation/partners:	Swedish Association for Hunting and Wildlife Management (Coordinator) Swedish Environmental Protection Agency (Participant) Finnish Wildlife Agency (Participant) Danish Nature Agency (Participant) Swedish University of Agricultural Sciences (Participant)
Focal point:	Jan SWARTSTRÖM, jan.swartstrom@telia.com
Web resource:	https://jagareforbundet.se/globalassets/global/mardhundsprojektet/dokument/mirdinec-final-report.pdf
Description:	The raccoon dog (***Nyctereutes procyonoides***) is an invasive species, native to eastern Asia, introduced as a fur game species to the western parts of the Soviet Union in the 1930s-1950s. It was listed in the top 100 most damaging invasive species by the DAISIE project (https://www.gbif.org/dataset/39f36f10-559b-427f-8c86-2d28afff68ca#description). The species has been found to cause substantial ecological damage to native fauna in the 1.4 million km^2 it has colonised by secondary expansion so far in Europe. The raccoon dog is also the single most important vector of rabies in Europe and an important vector of the fox tapeworm (***Echinococcuss multilocularis***), sarcoptic mange, and trichinellosis. Urgent action is considered necessary to prevent a population explosion of raccoon dogs in Scandinavia.
Goals and objectives:	The objectives of this LIFE+ Biodiversity project focused on halting the loss of EU biodiversity, particularly in wetland areas, from raccoon dogs. The project aimed to establish an early warning system (EWS) to track immigration of raccoon dogs and to apply innovative culling/management methods to control the species. Project findings were expected to be transferable to many other invasive species.
Coverage/geography (map, if any):	Sweden, Finland and Denmark
Impacted species:	Raccoon dog (***Nyctereutes procyonoides***)

Key outcomes:	The Project has instigated international cooperation to manage a highly mobile invasive alien species (IAS). By means of modelling, it was demonstrated that dispersal of raccoon dogs from Finland to Sweden and Norway was slowed down as the result of the Project. A reduction in the existing population of IAS in Sweden and Norway was demonstrated. The Project has slowed down dispersal of the population of IAS in Denmark and prevented a rapid population increase. The Project contributed to the objectives of the Rio Convention on Biological Diversity, the Bern and Ramsar conventions and the Commission Communication: "Halting the loss of Biodiversity by 2010 and beyond". An early warning system (EWS) in Sweden, Denmark and Finland was developed and implemented within the Project. This has provided early warnings of the presence of raccoon dogs along the major immigration routes into Sweden and Denmark. The Project's awareness-raising initiatives amongst the hunting community and the general public contributed greatly to the success of the EWS. The project improved methods of raccoon dog capture and demonstrated the potential transfer of innovative methods to other invasive species with similar behaviour, such as raccoons (*Procyon lotor*). As a result of the Project, authorities in Sweden, Norway and Denmark have allocated short-term financing for the joint continued management of IAS – the raccoon dog (*Nyctereutes procyonoides*).

4.5. Biodiversity and Human Health

Forecasting and prevention of animal transmitted diseases associated with the functioning of ecosystems is of great importance for the countries of Central Asia, since the natural foci of especially dangerous infections, such as plague, cholera, and anthrax, are located in the region.

An international study ["Rodents as Reservoirs of Future Zoonoses"][172] identified the wildlife species that are most likely to be the source of future zoonotic diseases, and in which regions new outbreaks are most likely to occur. Central Asia is one such potential hotspots of future zoonotic disease emergence. Figure 4.2 shows the areas of natural plague foci on the territory of Central Asian countries.

[172] Preventing the Next Pandemic: Zoonotic diseases and how to break the chain of transmission. A special volume of UNEP's ***Frontiers*** Report Series (https://www.unep.org/resources/report/preventing-future-zoonotic-disease-outbreaks-protecting-environment-animals-and?_ga=2.37671904.1516667467.1629300886-27741798.1629190593)

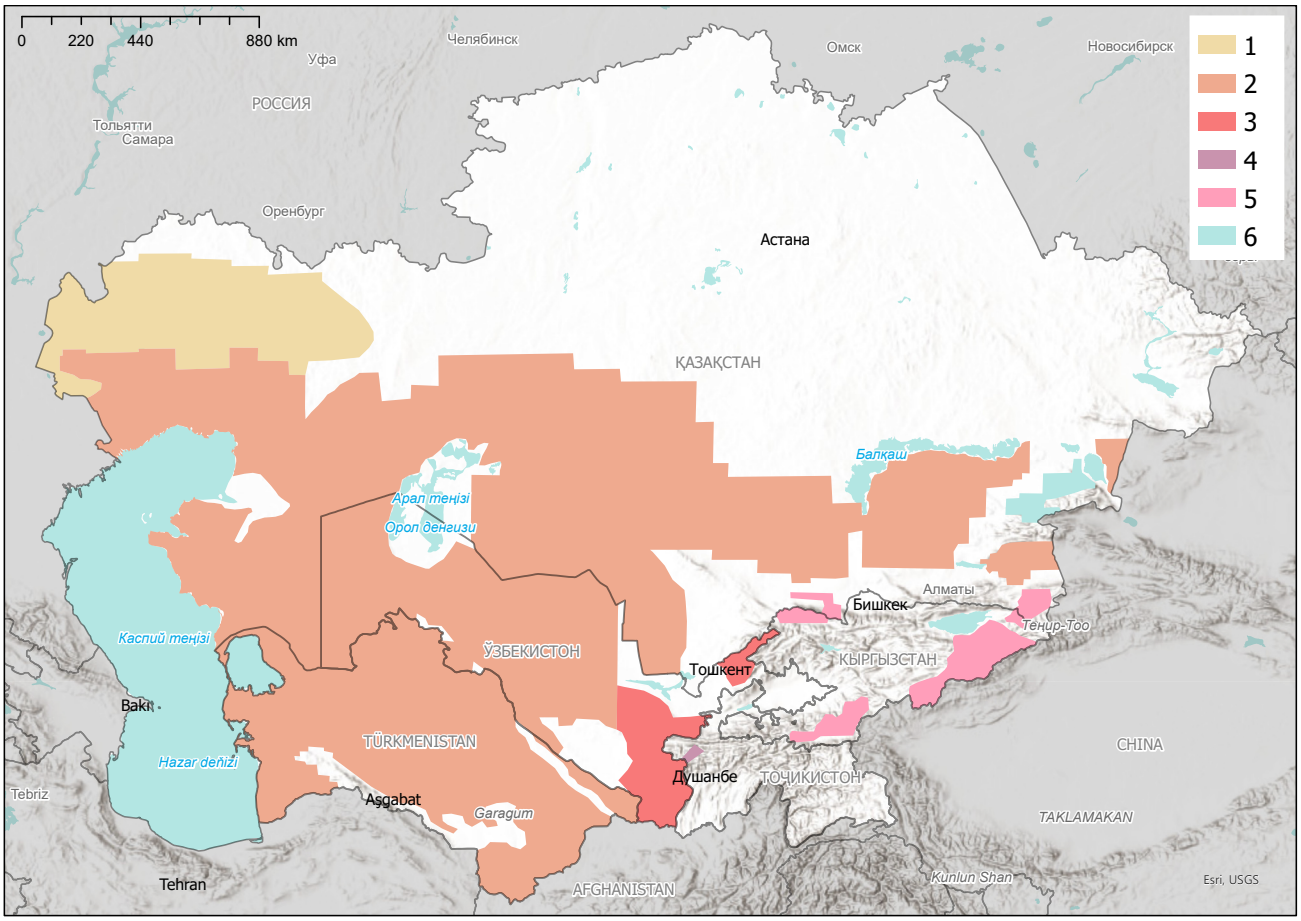


Figure 4.2. *The areas of natural plague foci on the territory of Central Asian countries (based on Popov et al, 2013)*

1 – The ground squirrel foci in flat dry steppes and semi-deserts;
2 – The Mariones jird foci in deserts and semi-deserts;
3 – A group of mountain plague foci;
4 – The vole foci in the highlands;
5 – The marmot foci in the highlands;
6 – Mixed (vole-ground squirrel-marmot) foci in the highlands.

Central Asia is particularly vulnerable to especially dangerous zoonotic infections due to its location at the crossroads of global value chains and economy heavily relying on labour migration. Illegal trade in wild animals and plants further facilitates the spread of zoonotic diseases in the region. At the same time, Central Asia is well placed to prevent and tackle future disease outbreaks (Burunciuc L., 2020).

With their shared epidemiological past and the remaining elaborate network of antiplague centres, research institutes, and laboratories with trained personnel, the countries of Central Asia have a good foundation for interaction and threat prevention.

One of approaches to zoonotic disease risk reduction in the region is the One Health approach based on the findings of the FAO-OIE-WHO Tripartite and many expert groups. The approach integrates medical, veterinary and environmental knowledge, and is designed to help governments, organisations and civil society to adequately withstand any threats and maintain human, animal and environmental health at an acceptable level.
To that end, it is necessary to start out by taking the following actions at the regional level: coordinate efforts and exchange experience in preventing especially dangerous infections, develop a special practice of using the dangerous disease focus areas to prevent potential infection of humans and animals, study the potential risks

and threats, raise public awareness, improve regulatory instruments, and implement joint projects.

Besides that, it is important to:

- develop and implement interstate, interdepartmental action plans to reduce the risks of especially dangerous infections;
- strengthen multisectoral collaboration and information exchange between health, veterinary, food safety and other relevant sectors;
- expand scientific inquiry into the environmental dimensions of zoonotic diseases;
- develop a publicly accessible disease control information system in the veterinary sector; ensure full functioning of a similar system in the public health sector at all levels and functional compatibility of both system;
- phase out unsustainable agricultural practices;
- develop and implement stronger biosecurity measures for humans and animals;
- build capacity among stakeholders[173].

4.6. Genetic Resources (SDG15.6)

Central Asia is the centre of origin of many globally important crops, in particular temperate fruit tree species. Despite some loss of natural resources, more than 8,000 plant species still grow in this region, of which 890 species are endemic. About 400 of them are endangered and listed in the National Red Data Books.

The CA countries are distinguished by a rich variety of agricultural crops, including many landraces with unique characteristics. The high diversity of cultivated plant species in the region is a world-class resource, an essential component of improved crop production in the region, and a key element of agricultural production strategies in various countries. Conservation of the richest plant biodiversity in the region guarantees existence of a pool of valuable genetic resources for breeders and researchers. These species will not only be conserved in this manner but will also provide a solid basis for sustainable agricultural production in the region.

The Convention on Biological Diversity defines genetic resources as genetic material of actual or potential value[174]. The Nagoya Protocol enacted within the framework of the Convention is aimed at conservation and sustainable use of genetic resources and fair and equitable sharing of benefits arising from their utilisation. According to the Nagoya Protocol, utilisation of genetic resources means conducting research and development on the genetic and/or biochemical composition of genetic resources, including through the application of biotechnology. Four Central Asian countries are parties to the Nagoya Protocol. In addition to the Nagoya Protocol, there are regional agreements on utilisation of genetic resources at the CIS level. Most of the countries of Central Asia are parties to these agreements.

[173] Preventing the Next Pandemic: Zoonotic diseases and how to break the chain of transmission. A special volume of UNEP's ***Frontiers*** Report Series (https://www.unep.org/resources/report/preventing-future-zoonotic-disease-outbreaks-protecting-environment-animals-and?_ga=2.37671904.1516667467.1629300886-27741798.1629190593)

[174] Horticultural Crops and Wild Fruits Species in Central Asia (http://centralasia.bioversityinternational.org/en/)

Table 4.1. *Parties to Nagoya Protocol and regional agreements on utilisation of genetic resources...*

Agreement	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
The Nagoya Protocol to the Convention on Biological Diversity	**2015**	**2015**	**2014**	**2021**	**-**
The Cooperation Agreement on the conservation and utilisation of plant genetic resources of the CIS countries (in force since October 16, 2000)	**+**	**+**	**+**	**-**	**+**
Agreement of the CIS Council of Heads of Government on Legal Protection of Plant Varieties (in force since November 29, 2004)	**+**	**+**	**+**	**-**	**-**

The conservation and utilisation of genetic resources is an important aspect of biodiversity conservation. The countries have made different progress in this area. The flora of Kazakhstan is represented by 5,754 species of higher plants, including a special group of over 210 species of wild plants that determine the genetic potential of 24 crops, some of which are the progenitors of apple and apricot crops. The Concept[175] of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030 sets out the objective to develop an infrastructure ensuring the conservation of genetic resources, access to them and their utilisation in a fair and equitable way. However, the short-term biodiversity conservation plans fail to mention the need to solve this problem[176]. Utilisation of genetic resources in the country is fragmented and uncoordinated, there are no uniform storage requirements for genetic resource collections and, consequently, over 70% of available samples are stored in uncontrolled temperature and humidity conditions, taxa representation in the collections is incomplete, geographical coverage is limited, and the known local and historical varieties are either missing or lost. Organisation of conservation of natural flora and fauna resources does not guarantee the conservation of genetic resources of flora and fauna. They are not protected from unauthorised outflow from the country contributing to uncontrolled utilisation of these resources and the loss of the country's sovereign rights to the benefits of such utilisation.

[175]The Concept of Conservation and Sustainable Use of Biological Diversity in the Republic of Kazakhstan until 2030. Kazakhstan, 2015 https://docplayer.com/31773488-Koncepciya-po-sohraneniyu-i-ustoychivomu-ispolzovaniyu-biologicheskogo-raznoobraziya-respubliki-kazahstan-do-2030-goda.html

[176] The Sixth National Report on Biological Diversity in the Republic of Kazakhstan, 2018 (https://www.cbd.int/doc/nr/nr-06/kz-nr-06-en.pdf)

Box 4.3. **To ensure implementation of the Nagoya Protocol on its territory, Kazakhstan took part in the UNDP-GEF Global ABS Project "Strengthening Human Resources, Legal Frameworks and Institutional Capacities to Implement the Nagoya Protocol" (2017-2019).**

The project aimed to:

- facilitate mutually beneficial exchange of genetic resources of cultivated plants and their wild relatives;

- ensure mutually beneficial access to samples of the gene pool of plants collected together in the gene pools of the former Soviet republics;

- assist in creation of national banks of plant genetic resources based on the exchange of gene pools, methods and technologies;

- develop joint automated databases of the national gene pool for accelerated use of plant genetic resources in breeding programmes;

- support free and duty-free movement of the gene pool samples across borders with due regard to the phytosanitary control requirements.

The mountain terrain of Kyrgyzstan featuring a variety of soil and climatic conditions is home to a unique rich diversity of plants species. Thus, in the Gareyev Botanical Garden of the Kyrgyz National Academy of Sciences alone, in operation since 1938, the hybrid gene pool amounts to over 3,000 hybrid forms of apple trees[177].

The country's genetic diversity conservation measures are set out in the Biodiversity Conservation Plan[178]. In 2009, Kyrgyzstan signed the UN FAO International Treaty[179] on Plant Genetic Resources for Food and Agriculture, however, no information on the progress of the Treaty implementation has been found in open sources.

The nature of Tajikistan offers a significant biological diversity and the presence of genetic material of global importance. The main genetic resources are stored in the laboratories and departments of a number of research institutes of the Tajik Academy of Agricultural Sciences (collections of wild and cultivated plant varieties, wild animal gene bank). The living collection of genetic resources is stored in the Botanical Gardens, individual nurseries, and on the territory of reserves and sanctuaries (nature reserves). Tajikistan owns a significant genetic stock of local agricultural crops. The gene pool of cereals, legumes, oilseeds amounts to around 3,000 samples.

However, lack of legal instruments stands in the way of the wild plant pool conservation, regulation of relations in the field of biotechnology and access to genetic resources, and use of genetically modified organisms.

In Turkmenistan, 172 species of wild relatives of plant crops have been preserved, including 40 species of fruit crops and a group of legumes and vegetables making up the core of modern agriculture. They account for 69% of the total number of species in the Central Asian genetic centre. Large numbers of endemic species among wild relatives of cultivated plants characteristic only of Kopet Dag with adjoining Khorasan and Koytendag determine the high global significance of this centre of genetic diversity in the origin of domesticated crops.

The National Genetic Seed Bank of the Ak Bugday Museum has collected 270 wheat varieties, including 42

[177] The Sixth National Report on Biological Diversity in the Republic of Kyrgyzstan, 2020 https://unece.org

[178] On the Biological Diversity Conservation Priorities of the Kyrgyz Republic for the period up to 2024 and the Action Plan for the Implementation of the Biological Diversity Conservation Priorities of the Kyrgyz Republic for 2014-2020, the Kyrgyz Republic, 2014 http://cbd.minjust.gov.kg/act/view/ru-ru/96264

[179] The International Treaty on Plant Genetic Resources for Food and Agriculture. IT, 2009 https://www.un.org/ru/documents/decl_conv/conventions/pdf/genetic_resources.pdf

ancient indigenous species of local selections and 144 barley varieties (***Hordeum*** spp.). The gene pool of the Magtymguly Research and Production Experimental Centre for Plant Genetic Resources of the Botany Institute of the Academy of Sciences of Turkmenistan is represented by 409 samples (including 186 indigenous varieties and 223 wild forms of Turkmen origin).

The rather extensive list of wild relatives of cultivated plants in Uzbekistan contains species that play a significant role in human nutrition. Some of these priority species have been selected for study and development of conservation proposals within the framework of the UNEP-GEF project[180] "In-situ Conservation of Crop Wild Relatives through Enhanced Information Management and Field Application".

Wild-growing relatives of cultivated plants majorly contributing to the creation of new and improvement of existing economically valuable plant varieties are of particular interest.

Uzbekistan has set the objective to develop a state programme[181] for the conservation and sustainable use of biological diversity components for food and agriculture. However, the issue of conservation of crop wild relatives is not outlined in any legislative or regulatory document, despite the fact that their importance for humans goes far beyond biodiversity conservation and is directly related to sustainable development in the context of a food crisis.

Central Asia is very rich in genetic resources, ancestral forms of cultivated plants and farm animals. The effort to preserve genetic diversity in the region has taken the form of collecting seeds and valuable plant samples, creating germplasm banks and botanical collections. In their National Reports under the Convention on Biological Diversity, all countries have mentioned difficulties in conservation and sustainable use of genetic resources associated with the lack of regulatory and legal instruments. In this regard, it is strategically important for the countries of Central Asia to enter into an interstate agreement on conservation of local varieties of fruit crops and their wild relatives. The legal framework concerning plant and animal genetic resources has to be improved to ensure development of agriculture, including the system of state registration of collections, seed stocks, and germplasm banks, and national strategies for the conservation and sustainable use of genetic resources have to be developed.

Box 4.4. **Good practice example: Conservation of genetic diversity in the EU**

To safeguard conservation of genetic diversity as foreseen by ***Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets*** (Aichi target 13) as well as to address biodiversity conservation issues defined within EU Biodiversity Strategy to 2020, a focused initiatives has been applied to raise the profile of genetic diversity in line with the two other components of living diversity — species and ecosystems.

Significant projects and networks dealing with conservation of genetic resources in EU are:

1. EUFORGEN (European Forest Genetic Resources Programme), www.euforgen.org

An international cooperation programme that promotes the conservation and sustainable use of forest genetic resources in Europe as an integral part of sustainable forest management.

The Programme contributes to the implementation of Forest Europe commitments on FGR and to relevant decisions of the Convention on Biological Diversity (CBD). EUFORGEN also contributes to the implementation of regional strategic priorities of the Global Plan of Action for the Conservation, Sustainable Use and Development of Forest Genetic Resources (GPA-FGR) and provides inputs to European and global assessments.

[180] FAO, 2020 https://www.fao.org/3/ca8252ru/ca8252ru.pdf

[181]The Resolution of the Cabinet of Ministers "On approval of the Strategy for the Conservation of Biological Diversity in the Republic of Uzbekistan for 2019-2028", Tashkent, 2019 https://lex.uz/docs/4372841

Projects and activities on research issues of pan-European forest genetic resources implemented within EUFORGEN framework:

- FORGENIUS project (www.forgenius.eu)

  Project duration: January 2021 – December 2025

  Founded under EU Horizon 2020 programme, overall budget: € 7'537'292,50

  Coordinator of the project: National Research Institute for Agriculture, Food and Environment (FR)

Project aims to upgrade the current European Information System on Forest Genetic Resources (EUFGIS) platform, by adding new types of data and information on the Genetic Conservation Units (GCU), allowing predictions of the fate of European forests in the short, medium, and long term.

- EVOLTREE network (http://www.evoltree.eu)

European Research Group of 30 partners in 20 European countries, under the umbrella of the European Forest Institute (EFI), which maintains and provides the scientific community with research facilities, resources and training, aiming to:

- improve understanding of forest ecosystem structure, dynamics and processes by linking genomics, genetics, ecology and evolutionary studies
- promote the application of genetics and genomics in breeding and conservation activities, and in forestry operations
- continuously develop initiatives and projects for long-term research
- provide foresight documents and motivate scientific discussion.

- GenResBridge (http://www.genresbridge.eu)

  Project duration: January 2019 – December 2021

  Founded under EU Horizon 2020 programme, overall budget: € 2'999231,25

  Coordinator of the project: European Forest Institute (EFI)

The project is aiming at acceleration of collaborative efforts and widened capacities in plant, forest and animal genetic resource domains by sharing perspectives, exchanging best practices, harmonising standards, trainings and sharing resources under the auspices of the pan-European genetic resources networks.

2. PGR Secure (Plant Genetic Resources Secure), www.pgrsecure.org
Project duration: March 2011 – August 2014

Funded under FP7-ENVIRONMENT, overall budget: € 3'652'921,60

Coordinator of the project: The University of Birmingham (UK)

The aim of the project was defined as research on novel characterisation techniques and conservation strategies for European crop wild relative and landrace (cultivated, genetically heterogeneous variety that has evolved in a certain ecogeographical area) diversity, and further, to enhance crop improvement by breeders, as a means of underpinning European food security in the face of climate change.

ConGRESS (Conservation Genetic Resources for Effective Species Survival) www.congressgenetics.eu
Project duration: May 2010 – April 2013

Funded under FP7-ENVIRONMENT, overall budget: € 1'140'421.00

Coordinator of the project: Cardiff University (UK)

Main goal: the establishment of the comprehensive web portal with an attractive and user-friendly interface.

The output website is foreseen to includes a database of the genetics of threatened European wild species and a sample planning tool to assess the power of experimental design. A decision-making tool helps formulate genetic approaches to a management problem. Educational downloads include a series of 'How to' leaflets and a 'Knowledge pack' to answer management problems.

4.7. Ecosystem Services

Ecosystems perform functions and provide services that are of key importance for ensuring environmental sustainability and sustainable economic development, maintaining human health and improving their standard of living.

It is obvious that ecosystems accounting and comparison requires a certain universally recognised system of their description. For example, the EU has adopted and widely used the CICES system (https://cices.eu/)[182] co-developed by the European Environment Agency (EEA) and the United Nations Statistics Division (UNSD) and improved with assistance from the US Environmental Protection Agency (US EPA). These systems specifies certain types of services, including regulating, provisioning, maintenance, genetic and recreational, and sorts them into certain divisions, groups, and classes.

The climate regulating services of ecosystems are of global significance, and biodiversity hotspots are sources of many ecosystem services indispensable for sustainable development of the entire region. Climate and water regulating services lay the foundation for agriculture. Services that reduce the probability and magnitude of natural emergencies minimise threats to human life and health and any potential damage to the economy. Provisioning services ensure operation of important sectors of the economy – forestry, fishery and hunting sector. Ecosystem services providing for the production of natural pastures, fishing and hunting are key to maintaining a traditional way of life.

The most important ecosystem services are maintenance services. They maintain stable environmental conditions that determine the opportunities for economic development of regions, as well as health and quality of life of local population.

Genetic services provide opportunities for the development of biotechnological and environmentally sustainable industries in the future.

Recreational services provide people with an opportunity to have a good rest.

Despite the extremely high importance of ecosystem services, the countries of Central Asia have not yet set an independent task to assess and maintain the most important ecosystem services. As of today, they have only partially set up accounting for the main provisioning services – production of commercial fish and game animals. According to strategic documents and action plans for biodiversity conservation, services are mainly considered as a result of functioning of commercial populations rather than ecosystems. Ecosystem properties are partially taken into account, primarily in the context of “sustainable nature management” projects, but in general, the ecosystem approach to the use of bioresources is poorly developed.

[182] There are other classification systems based on the EU system, for example (https://www.nottingham.ac.uk/cem/pdf/JNCC_Review_Final_051109.pdf or https://www.biodiversity.ru/programs/ecoservices/first-steps/Status_Quo_Report_2013_sm.pdf)

Maintenance, information and recreational services have not yet been systematically assessed. Only the maintenance role of forests is partially taken into account, as proved by the existence of protected forests.
The outcomes of ecosystem services assessment projects implemented in the EU countries show that the value and importance of maintenance services for humans can far exceed the value of biological products they withdraw from nature. For example, available assessments indicate that the total value of forest ecosystem services can be 2-4 times higher than the market value of wood produced from them. The value of information services is comparable to the value of provisioning services. Thus, the annual global turnover of medicines and cosmetic products derived from natural genetic resources accounts for around 100 billion US dollars, which is equal to the volume of timber and seafood markets, and according to the TEEB[183] project, the volume of the global genetic resources market exceeds that of timber and seafood markets. The annual turnover of ecological tourism is measured in tens of billions of US dollars. Thus, the value of maintenance, information and recreational services is several times higher than the economic value of bioresources extraction.

Central Asia is currently at an early stage of research of ecosystem services, and no nationwide assessment has yet been carried out. In general, few assessments have been carried out and most of them aimed to promote economic activity. For example, papers on the situation in Kazakhstan have examined the opportunities for cropland expansion (Kraemer et al., 2015) and farmers' behaviour in terms of their willingness to conserve the ecosystems that provide the services they use (Dessalegn et al., 2018). The link between ecosystem services and biological diversity in Kazakhstan was studied as part of research concerning the delta of the Ili River (Thevs et al., 2017). In Kyrgyzstan, where agriculture and livestock production also play an important role, studies have assessed ecosystem services related to agriculture (Hong et al., 2015), plant diversity (Imanberdieva et al., 2018) and river ecosystems (Betz et al., 2016). In Tajikistan, the need for forest restoration was analysed as part of a study on the value of forest ecosystem services for the general public (Mislishoeva et al., 2013) and indigenous mountain communities (Rahmonov et al., 2021). As for Uzbekistan, the studies here also focus mainly on agriculture, the potential for its development (Ashurmetova, 2021) and the problem of land degradation (Nurmetov et al., 2015). In addition to that, the potential for ecosystem services provision in specific protected areas (Reimov et al., 2016; Beckhanova, 2017) and in urban areas (Sharipjonova et al., 2020) has been studied. Thus, in the countries of Central Asia, research has mainly focused on those types of ecosystem services that are relevant to agriculture forming the economic basis of the region or can be provided by protected areas, more often in river basins.

Lack of assessments or undervaluation of ecosystem services leads to erroneous underestimation of the benefits of biodiversity conservation. To resolve this problem, a mechanism of assessment of economic value of biological diversity and ecosystem services has to be created and national approaches and guidelines have to be developed in accordance with recommendations and drawing on the example of pilot areas[184].

It is necessary to develop incentive mechanisms for the protection, sustainable use and reproduction of biological resources for conservation and sustainable use of ecosystems, for example, in the form of tax, credit and other incentives to support activities aimed at biodiversity conservation and having an environmental effect.

To promote the development of a mechanism for the assessment of the economic value of biodiversity and ecosystem services, SDGs on biodiversity have to be integrated into national development strategies, planning, accounting and enforcement processes.

Public awareness raising and wide dissemination of information on the values of biodiversity and ecosystem services remains an important task that would promote recognition of importance of biodiversity in decision-making across all sectors of the economy.

[183] The Economics of Ecosystems and Biodiversity (TEEB), 2010 https://teeb.biodiversity.ru/en/

[184] The Sixth National Report of the Republic of Uzbekistan on Biological Diversity / edited by B. Kuchkarov / Tashkent, 2018 – 235 p, 2018

Box 4.5. **Mapping and assessment of ecosystem services in the EU**

The concept of ecosystem services has gained a strong political profile in the European Union (EU) during the last 20 years starting with Millennium Ecosystem Assessment.

A uniform definition and a standardised typology for ecosystem services - the Common International Classification of Ecosystem Services (CICES), has been developed in EU already in 2009 (revised and updated in 2011). In 2011 the European Union has adopted a ***Biodiversity Strategy to 2020***[185] with the aim to halt the loss of biodiversity and ***ecosystem services*** in the EU and help to stop global biodiversity loss by 2020. Action 5 of the Strategy, better known as *Mapping and Assessment of Ecosystems and their Services* (MAES), sets specific targets dedicated to ecosystem services and requires member states to "map and assess the state of ecosystems and their services in their national territory" and to integrate "these values into accounting and reporting systems at EU and national level by 2020".

Mapping and Assessment of Ecosystems and their Services (MAES[186]) is an initiative of the European Commission and the EU Member States to increase our knowledge on ecosystems and their services in Europe. MAES provided a coherent analytical framework for the EU Ecosystem Assessment.

Within the framework of MAES the EU-wide ecosystem assessment - The EU Ecosystem Assessment, was carried out and results were published in 2020[187]. The ***EU Ecosystem Assessment*** is an analysis of the pressures and the condition of terrestrial, freshwater and marine ecosystems and their services using a single, comparable methodology based on European data relative to the baseline year 2010. The EU-wide ecosystem assessment evaluates the state of Europe's ecosystems and their services based on an analysis of available data. The assessment covers the whole EU-28 territory, including the EU marine regions. The ecosystems analysed within the assessment are: urban ecosystems, agroecosystems (croplands and grasslands), forests, wetlands, heathlands and shrub, sparsely vegetated lands, rivers and lakes, and marine ecosystems. The assessment is based on the best available European data (e.g., the CORINE Land Cover data). In addition, this report contains crosscutting assessments on climate change, invasive alien species, landscape mosaic, soil and ecosystem services.

ESMERALDA, a Horizon 2020 project, and INCA (The EU INCA project), an EU initiative on ecosystem accounting, have contributed to the analytical framework for ecosystems. All EU Member States have engaged in the mapping and assessment of ecosystems and their services on their territories.

ESMERALDA (Enhancing ecosystem services mapping for policy and Decision making) project (financed by EU Horizon 2020 programme) was implemented starting from 2015 untill 2018, the project involved 37 project partners (universities as well as governmental institution partners) from all 28 EU Member States. Project has provided scientific support as well as collection and analysis of best practice cases.

Main outcomes of the ESMERALDA project are:

- an overview of the state of ES mapping and assessment in EU member states;
- a flexible methodology and tiered approach for ES mapping, valuation, accounting and assessment;
- methods for developing high quality and consistent information on the condition of ecosystems and their services;

[185] European Commission (2011) EU Biodiversity Strategy to 2020 COM (2011)
[186] https://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm
[187] https://publications.jrc.ec.europa.eu/repository/handle/JRC120383

- exemplar applications from selected representative case studies (agriculture, forestry, marine areas, others);
- an online data sharing system for maps;
- a set of practical policy recommendations;
- a set of recommendations for the future development and implementation of related policies;
- practical guidance, data and tools for using BD and ecosystem-related data in other policies.

Detailed information on ESMERALDA project is available from project's web site http://www.esmeralda-project.eu/

The EU ***INCA project*** was launched in 2015 to produce a pilot for an integrated system of ecosystem accounting for the EU (project has ended in 2021). INCA project was implemented as a joint project of Eurostat, DG Environment, DG Research and Innovation and the Joint Research Centre of the European Commission and the European Environment Agency. One of the most important outcomes of the INCA project was development of an integrated system of ecosystem accounts for the EU. Detailed information on an introduction to ecosystem accounting and presents ecosystem extent accounts, initial ecosystem condition accounts and ecosystem services accounts for EU28 is available from final report- ***Accounting for ecosystems and their services in the European Union (INCA) — 2021 edition***[188] summarising key results of the project.

In 2020, the European Commission adopted the EU Biodiversity Strategy for 2030[189]. The Strategy for 2030 has the ambition to further strengthen the EU legal framework for nature restoration. Despite the fact that there are not always clear or binding targets and timelines and no definition or criteria on restoration or on the sustainable use of ecosystems, as well as there is no binding requirement to comprehensively map, monitor or assess ecosystem services, health or restoration efforts, results achieved under the Biodiversity Strategy to 2020 are considered as important basis for the implementation of future tasks.

Box 4.6. **Mapping and assessment of ecosystem services – Uzbekistan**

The first attempt to developing national approaches to valuation of ecosystem services in Uzbekistan was made within the framework of the FLERMONICA Project "Forest and biodiversity management, including environmental monitoring". Methodological approaches to economic assessment of ecosystem services in the tourism sector were tested on the example of the Beldersay pilot area (Ugam-Chatkal National Natural Park) – a tourist destination popular all year round (FLERMONICA, 2015). According to the assessment results, the total economic value of ecosystem services in the field of tourism in the Beldersay tract amounted to 1.3 million US dollars. At the same time, the total economic value of ecosystem services in this area was estimated at over 6.3 million US dollars, taking into account the regulating and maintaining ecosystem services. Beldersay is the only pilot area in the Ugam-Chatkal National Park where an economic assessment of ecosystem services has been carried out. According to the developers, approaches to economic assessment were chosen arbitrarily. The effort mainly aimed to demonstrate that ecosystem services have a certain value, and that the ways of their valuation are diverse and depend on the conditions, as well as the type of ecosystem services and the interests of those who make decisions to change the conditions of environmental management (FLERMONICA, 2015).

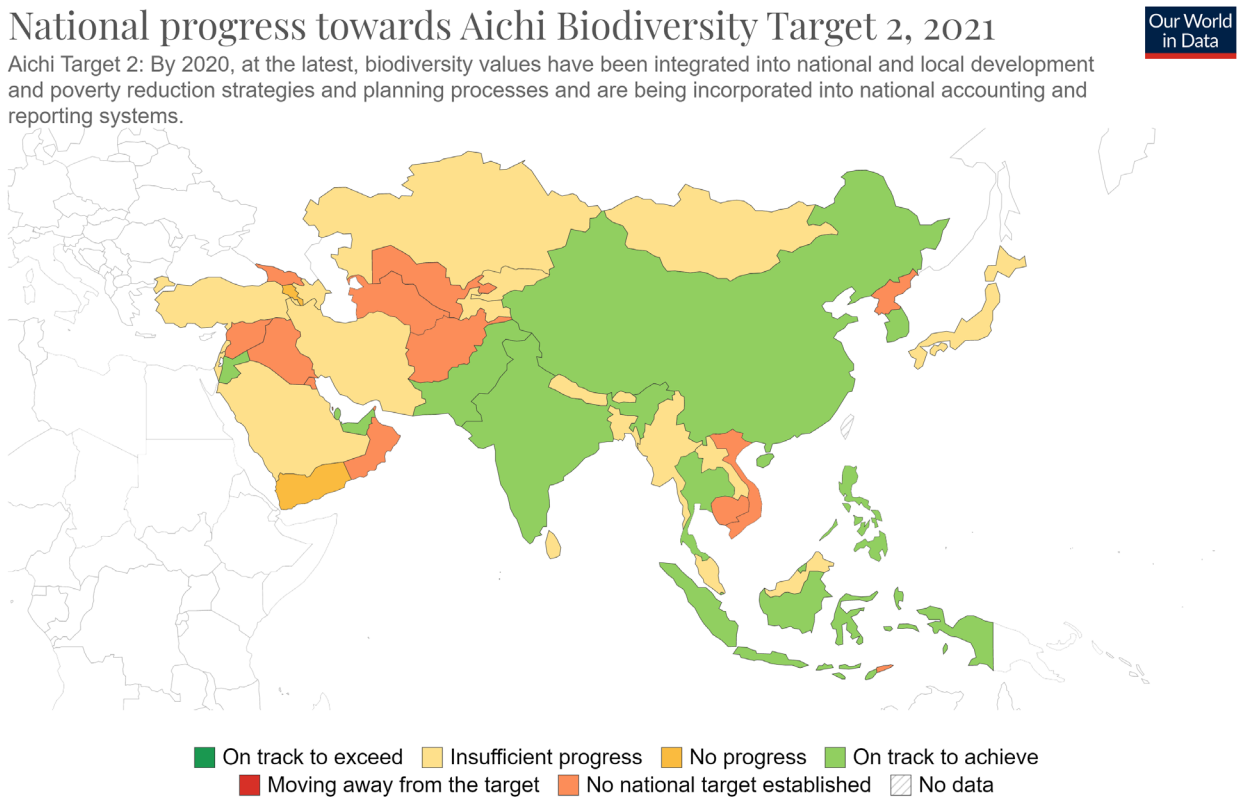
[188] https://ec.europa.eu/eurostat/web/products-statistical-reports/-/ks-ft-20-002
[189] https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en

Box 4.7. **Mapping and assessment of ecosystem services – Kyrgyzstan**
In Kyrgyzstan, the ecosystem services of the Karakol and Chon-Kemin National Parks have been studied and their economic value has been estimated (Sabyrbekov, 2017). For example, the value of ecosystem services per 1 ha in Chon-Kemin Natural Park was estimated at 1,100 US dollars. At the same time, the value of biodiversity and carbon sequestration was estimated at 140 million US dollars per year, while the government expenses on the park maintenance amounted to 84,000 US dollars per year.

4.8. Ecosystem and Biodiversity Management Integration in National Planning (SDG15.9)

It has already been noted above that the most important indicator of progress towards SDG on biodiversity is Aichi Biodiversity Target 2 – integration of biodiversity values into national planning. According to the UN, progress in this area is insufficient in three of the CA countries, while in Turkmenistan and Uzbekistan, Aichi Target 2 has not been set at all.

National progress towards Aichi Biodiversity Target 2, 2021 (https://sdg-tracker.org/biodiversity)



Source: Convention on Biological Diversity and World Environment Situation Room CC BY

4.9. Kunming-Montreal Global Biodiversity Framework

On 20 December 2022 the 15th Conference of Parties to the UN Convention on Biological Diversity (COP15) adopted the "Kunming-Montreal Global Biodiversity Framework" (GBF), including its four goals and 23 targets for achievement by 2030. The COP further decided that the GBF will be used as the strategic plan for the implementation of the Convention and its Protocols, its bodies and its Secretariat for 2022-2030.

The Background (Section A) describes the current state of the planet and the fundamental role of biodiversity for human wellbeing and a healthy planet. The Purpose (Section B) outlines the aim of the GBF, to halt and reverse biodiversity loss. Considerations for implementation (Section C) consists of a set of elements for how the framework is to be understood, acted upon, implemented, reported, and evaluated. Relationship with the 2030 Agenda for Sustainable Development (Section D) describes the GBF contributions to achieving the SDGs. The Theory of Change (Section E) recognizes that urgent policy action is required globally, regionally, and nationally to achieve sustainable development in order to reduce and/or reverse drivers of biodiversity loss.

The 2050 Vision of the framework (Section F) is a world of living in harmony with nature where: "by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people." The supporting 2030 mission is about taking urgent action to halt and reverse biodiversity loss to put nature on a path to recovery.

The Kunming-Montreal goals for 2050 (Section G) consist of four overarching long-term goals for 2050: Goal A on ecosystems, species and genetic diversity; Goal B on sustainable use and management of biodiversity; Goal C on benefits from the utilization of genetic resources; and Goal D on means of implementation of the GBF.

The Kunming-Montreal 2030 Targets (Section H) consist of 23 targets in the following categories: reducing threats to biodiversity (targets 1-8), meeting people's needs through sustainable use and benefit-sharing (targets 9-13), and tools and solutions for implementation and mainstreaming (targets 14-23).

4.10. Conclusions and Recommendations

Conservation of all types of natural ecosystems, forests, genetic resources, species diversity is of vital importance for the countries of Central Asia. At the same time, political and economic challenges, spontaneous market development, aggravating regional challenges and climate change increase the pressure on the region's vulnerable ecosystems.

Central Asian countries have gained a unique biodiversity conservation experience and have come a long way since their independence building the administrative and legal system for biodiversity conservation management. At the same time, the analysis has shown that they still face serious challenges and have to solve similar institutional and governance problems.

Numerous institutional factors contribute to poor management of natural resources and biodiversity throughout the region. There are structural inconsistencies, if not competing priorities, between central and local authorities. Agencies in charge of agriculture, oil and gas, minerals and water sometimes compete and have more power than environmental agencies.

In general, many countries have insufficient institutional capacity to properly manage biodiversity, and the relevant priorities have not yet been adequately integrated into economic development planning or private sector activities.

Regarding the governance principles, there is no understanding that biodiversity degradation affects not only the opportunities for sustainable economic development of the region, but also transition to the climate resilient development. The analysis has also revealed significant discrepancies in the biodiversity terminology, sustainable or resilient development terminology, as well as in data on various CA ecosystems published in different sources, in particular on forests. In many ways, this is explained by the fact that concepts and categories

still used by individual international organisations and national biodiversity and forest management bodies rapidly become obsolete due to increasing awareness of the role of climate change. This situation requires rethinking, further analysis and unification of concepts, methods and tools for quantitative and qualitative assessment of ecosystems, as well as adequate nationalisation of the global biodiversity SDGs.

The CA countries also have different perception and definitions of the concepts of "ecosystem" and of "SDGs on biodiversity", there is no clear understanding of ecosystem boundaries or indicators of their state, and neither state of ecosystems nor ecosystem services are recognised as objects of governance. Based on the analysis findings it is recommended that the following policy actions are taken towards reaching SDGs on biodiversity in all CA countries:

- Due to increasing awareness of the role of climate change, it is necessary to update the terms "sustainable development", "climate resilient development", "sustainable and efficient environmental management" at the national level;
- Align the national biodiversity targets with the UN SDG15 adopted by all CA countries;
- Harmonize national biodiversity terminology in the region with the Multilateral Environmental Conventions glossaries;
- Set the targets and time frames for all national biodiversity goals;
- Improve the legal framework on transboundary protected areas and biosphere reserves;
- Develop a mechanism for the assessment of the economic value of biodiversity and ecosystem services;
- Identify areas that have to be preserved and have a high conservation value, but have no conservation status or special regime of use;
- Strengthen financial support mechanisms for biodiversity conservation activities;
- Build the capacity of personnel of government bodies in charge of biodiversity management;
- Widen engagement of local communities and the public concerned in environmental activities, empower social movements and groups;
- Impose a moratorium on the development and use of pristine/primary forests in Central Asia, establish protection regimes for this type of ecosystems;
- Develop and maintain cross-border cooperation between the countries of Central Asia;
- Exchange genetic resources through international institutions and gene banks;
- Interact with international development agencies and financial organisations to attract international experience and resources for biodiversity conservation;
- Study regional and foreign experience in biodiversity conservation, including forest policy and forestry development strategies;
- Ensure regular participation in scientific conferences and workshops at international level;
- Develop the Red List of Ecosystems of Central Asia.

To conclude it is worth reiterating that successful achievement of Biodiversity Targets in Central Asia requires adherence to OECD principles of good governance: Effectiveness, Efficiency, Trust and Engagement.

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