

REPUBLIC OF TAJIKISTAN

**NATIONAL STRATEGY AND ACTION PLAN
ON CONSERVATION AND SUSTAINABLE
USE OF BIODIVERSITY**



DUSHANBE – 2003



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ҚАРОР

GOVERNMENT OF REPUBLIC OF TAJIKISTAN
DECREE

from September 1, 2003 № 392
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**Concerning National Strategy and Action plan
on conservation and sustainable use of biodiversity
in Republic of Tajikistan**

to fulfill the commitments of Republic of Tajikistan according to the requirements of the UN Convention on biological diversity, Government of Republic of Tajikistan **e n a c t s:**

1. Approve Strategy and Action Plan on conservation and sustainable use of biodiversity of Republic of Tajikistan.
2. Provide the implementation of National Strategy and Action Plan on conservation and sustainable use of biodiversity of Republic of Tajikistan by ministries and institutions, chairmen of Gorno-Badakhshan autonomous region, other regions and cities.
3. To implement National Strategy and Action Plan on conservation and sustainable use of biodiversity organize National Biodiversity and Biosafety Center on the basis of working group on the development of National Strategy and Action Plan and approve its Statute.
4. Entrust to National Focal Point the preparation of documentation concerning action of National Biodiversity and Biosafety Center.
5. Entrust to National Biodiversity and Biosafety Center and National Focal Point monitoring for the implementation of National Strategy and Action Plan on conservation and sustainable use of biodiversity of Republic of Tajikistan and Cartagena Protocol on Biosafety to the Convention on biodiversity, and order to National Focal Point submit annual report concerning the implementation of Strategy and Action Plan on biological diversity to Government of Republic of Tajikistan.

**Chairman
of Government
of Republic of Tajikistan**



E. Rakhmonov

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With the participation of:

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FOREWORD



The area of Tajikistan is one of the global centers for speciation of living organisms and it plays the vital role in global biodiversity conservation. The geographical location of the country in the middle of Eurasia, at the junction of many floristic and faunal provinces of the northern hemisphere, among the huge mountain systems of Central Eurasia, vast deserts, and complex landscapes, favored concentration of the richest biological diversity, with numerous endemic species, relict communities, ecosystems, and genetic resources.

The ancient agricultural activity of the population of Tajikistan promoted a creation of numerous varieties of cultivated crops and domestic animals, based on the genetic resources of local wild species.

The present period of transition to the market economy promotes increasing involvement of the unique and fragile biodiversity components in the economy of the country, which can disturb its balance.

Biodiversity Conservation Problem and the Strategy should be the priorities among other plans of the country.

The National Biodiversity Strategy and Action Plan, elaborated according to the state environmental policy, foster the sustainable environmental development of the country. They are aimed at taking coordinated decisions on using biological resources and promote harmonization and integration of scientific ideas, research, and state instructions, and their implementation in situ.

While elaborating the Strategy and Action Plan, the international organizations (UNDP, GEF), the Government of Tajikistan, and non-governmental organizations made efforts to include the issues of conserving the unique biodiversity of Tajikistan in the global priorities. These efforts make us hope for a conservation and sustainable management of the biodiversity in mountainous Tajikistan.

Number of political, legislative, and economic initiatives on improving the environment, taken by the Government of the country at the national and international levels, created favorable conditions for developing and implementing the Strategy and Action Plan. Particularly important is the development of protected area network and implementation of measures on biodiversity restoration and conservation. The UNDP country-office in Tajikistan, with the financial support of GEF, is making a considerable contribution in this work.

While developing the Strategy and Action Plan, financial sources and possible economic and ecological benefits were determined for each direction of activities. Measures on improving the institutional, legislative, educational, and scientific base in the state ecological structure of the country, as well as the re-orientation of nature use for mountain tourism and recreation, can promote to a significant degree the poverty alleviation and conserving the unique biodiversity of Tajikistan.

The National Focal Point and NBBC thank those who took part in the development of the National Strategy and Action Plan and promoted this process, primarily the Global Environmental Facility, UNDP, Secretariat of the Convention on Biodiversity and the Ministry for Nature Protection of Republic of Tajikistan.

**Neimatullo Safarov,
CBD National Focal Point**

WELCOME ADDRESS



Projects aimed at conservation and environmental protection are among the core priorities of UNDP in Tajikistan. The “National Strategy and Action Plan on Conservation of Biodiversity and the Sustainable Use of Resources” is dedicated to the conservation of biological resources in Tajikistan, a country which is rich in genetic resources and valuable mountain ecosystems, which are of special interest to the whole mankind.

This National Strategy and Action Plan is the result of the joint efforts of leading scientists, experts, and representatives of environmental NGOs, which has greatly enhanced the value and scientific depth of the document. It is first document of its kind in Tajikistan, presenting a comprehensive programme of biodiversity conservation.

The document presents a scientific baseline and comprehensive analysis of the current state of the flora and fauna (especially in terms of populations and species listed in the “Red Data Book”), as well as practical recommendations on improving the mechanisms of biodiversity conservation in the country.

Owing to its geography and climate, Tajikistan is a unique country with rich, both in composition and number, biological resources. With over 25,000 species of plants, insects, reptiles, birds, and mammals, Tajikistan is endowed with a diversity which among other things can serve as a starting ground for the cultivation of new high-yield and hardy agricultural crops, and an incentive for enhanced livestock breeding. Sustainable management of biodiversity is a national issue as, if successful, it provides a balanced progress of nature and society, especially in countries where natural resource conservation is directly linked to poverty alleviation issues.

On the other hand, the balance of ecosystems in Tajikistan is constantly and progressively being disturbed, many plants and animals species have become rare and endangered. Here, along with natural factors there is a great impact of human activity, as agriculture is still the dominant sector of the country economy. For this reason the main objective of the Strategy is to promote conservation, the rational use of biological resources and the protection of ecosystems to safeguard sustainable development.

The National Strategy and Action Plan on Conservation of Biodiversity and the Sustainable Use of Resources, as well the First National Report on Climate Change, published in 2002, is real evidence of the effective partnership between the Government of Tajikistan and the UN Development Programme. Both documents are designed to promote conservation and help Tajikistan comply with its commitments under the UN Environmental Conventions it has ratified over the last decade.

Matthew Kahane
UNDP Resident Representative

A handwritten signature in blue ink, appearing to read 'Matthew Kahane', written in a cursive style.

ABBREVIATIONS

AS	Academy of Science
BD	Biological Diversity
C	Cattle
CBD	Convention on Biological Diversity
CDGC	Central Department of Geodesy and Cartography
CGD	Central Geology Department
CIS	Commonwealth of Independent States
CSR	Center for Strategic Research
CWB	Convention Working Body
DRS	Districts of Republican Subordination
EF	Ecological Foundation
EFK	Ecological Foundation of Khukumats
EFKR	Ecological Foundation of Khatlon Region
FPE RT	Forest Production Enterprise of the Republic of Tajikistan
GBAR	Gorno-Badakhshan Autonomous Region
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GMO	Genetically Modified Organism
GRT	Government of the Republic of Tajikistan
GWG	Governmental Working Group
HPS	Hydroelectric Power Station
IF	International Foundation
IHE	Institute of Higher Education
IUCN	International Union for Conservation of Nature
LA	Local Authorities
LKh	Local Khukumats
LM	Local Means
LR	Leninabad Region (renamed to Sogd Region in 2000)
LTU	Long-term Use
MA	Ministry of Agriculture
MC	Ministry of Culture
ME	Ministry of Emergency
ME	Ministry of Education
MET	Ministry of Economy and Trade
MF	Ministry of Finance
MFA	Ministry of Foreign Affairs
MJ	Ministry of Justice
MM	Mass media
MM	Ministry of Melioration
MNP	Ministry for Nature Protection

NBBC	National Biodiversity and Biosafety Center
NBF	National Biosafety Framework
NBSAP	National Strategy and Action Plan on Conservation and Sustainable Management of Biological Diversity of the Republic of Tajikistan
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
NPA	Nature Protected Areas
PIZP	E.N.Pavlovsky Institute of Zoology and Parasitology
PO	Private owner
RI	Research Institute
RIF	Research Institute of Forestry
RLNP	Research Laboratory on Nature Protection
RT	Republic of Tajikistan
SB	State Budget
SBC	State Broadcasting Committee
SFR	State Forest Resources
SLUC	State Land Use Committee
SGCA	Space Geodesy and Cartography Agency RT
SPE «Bogparvar»	Scientific Productive Enterprise «Bogparvar»
SPE «Ziroat»	Scientific Productive Enterprise «Ziroat»
SSA	State Statistic Agency
TAAS	Tajik Academy of Agricultural Sciences
TAP	Tajik Aluminum Plant
TRICB	The Tajik Research Institute of Cattle-Breeding
TSNU	Tajik State National University
UNDP	UN Development Programme
UNO	United Nations Organization
UNO	United Nations Organization
WB	World Bank
WB CW	Working Body of the Convention on wetlands
WHO	World Health Organization
WR	Wildlife Resources

c	area	mln.	million
c/ha	centners from hectare	mm	millimeter
dol.	dollar	r.	river
gr	gram	R.	Range
ha	hectare	reg.	region
kg	kilogram	rr.	rivers
km	kilometer	settl.	settlement
km ²	square kilometer	som.	somoni
km ³	cubic kilometer	t	tonnes
l.	lake	t/ha	tonnes from hectare
m	meter	th.	thousand
m ²	square meter	un.	unit
m ³	cubic meter		
masl	meters above sea level		

GLOSSARY

- Agroecosystem** – area under ploughing lands, farmlands, gardens and settlements located within cultivated lands zone.
- Alien species** –the term is used under the commitments of the Convention on biodiversity and refers to a species occurring outside its normal distribution; and "alien invasive species" refers to those alien species which threaten ecosystems, habitats or species.
- Biocoenosis** (*bio*– and gr. *koinos* - common) – totality of plant, animal and microorganism populations that have common relations with each other and suitable to environment factors. The term “biocoenosis” was suggested by K.Mebius (1877). Biocoenosis is a component part of biogeocoenosis.
- Biogeocoenosis** – (*bio*, gr. *geo* – earth and *coenosis*) – a homogeneous territory with a certain diversity of living (biocoenosis) and inert (ground atmosphere layer, solar energy, soil, etc.) components comprised by the substance and energy interchange into common natural complex. The term “biogeocoenosis” suggested by V.N.Sukachov (1940) has been used as the synonym to the term “ecosystem”.
- Biomass** – the summary mass of species individuals, a group of species or community usually calculated in mass units of dry or moist substance related to the unit of square or volume of ecotope.
- Biosphere** – the Earth shell which structure and power are characterized by common activity of living organisms.
- Biotope** (*bio*– and gr. *topos* – plot) – the homogeneous plot corresponding to separate parts of biocoenosis.
- Community** – a group of populations of different species in a certain space and time.
- Dynamics of ecosystem** – seasonal (annual), the form of cyclic change in biota community related to seasonal transition. Cyclic (periodical) - reversible change of ecosystems caused by occasional environment factors with gradual return to initial state.
- Ecological niche** – the term comprises not just physical space occupied by an organism but its function within the community and its position to gradients of environment factors – temperature, moisture, pH, soil, etc.
- Ecology** – a science studying the organization and functioning of under-organism systems of various levels: populations, biocoenosis (communities), biogeocoenosis (ecosystems) and biosphere.
- Ecosystem** (gr. *oikos* - dwelling and *systema* - combination) – ecological system - complex of communities of plants, animals and microorganisms and their abiotic surroundings, which function as a unit.
- Ecotype** (gr. *oikos* - dwelling and type) – totality of individuals of species coexisting in one habitat, hold heritable features.
- Environment** - habitat of human; natural and material surrounding world. Environment includes natural and artificial surroundings, i.e. totality of nature components created from natural substances by humans and having no analogues in virgin nature (buildings, constructions, etc.)
- Genetic pool** – totality of genes hold by individuals of the population. Emphasizing the need of conservation all living organisms there is a concept of G.p. of the Earth (biosphere).
- Land reclamation** – complete or partial land restoration destructed by prior economic activity. Includes land leveling, reforestation, establishment of parks and ponds in the mountain areas, etc.
- Melioration** (lat. *melioratio* – improvement) – the system of organizational economic and technical measures on the core improvement of unfavorable hydrological soil and other conditions with the purpose of their effective use.
- Monitoring** – system of supervision, evaluation and prognosis for population dynamics.

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Pest killers – chemicals used to combat the organisms unfavorable in medicinal and economic meaning (e.g. pesticides).

Pesticides (lat. *pestis* – infection/pest and *caedo* – kill) – (pest-killers), chemicals used to combat the weeds (herbicides), vermins (insecticides, acaricides), diseases (bactericides) of cultural plants.

Population (Mid latin *populatio*, lat. *populus* - people, population) – a group of individuals of one species with common genetic pool, occupying one territory.

Reproduction of natural resources - natural (regulated/non-regulated) and artificial accretion of natural resources, reproduction of their qualitative characteristics. It comprises land reclamation and melioration, agrotechnical activity on soil improvement, reforestation, biotechnical measures on conservation and reproduction of wildlife and water resources protection as well.

Reserve (Zapovednik) – specific territories of economic, scientific and cultural value.

S.d. is sequent to natural process of one stage transfer of soil formation to the next stage or caused by destructive cultivation methods and forest cutting.

Selection (lat. *selectio* – assortment) – the science applying the methods of creation the varieties and hybrids of agricultural plants and animals.

Soil degradation – gradual soil distortion, loss of fertility.

Soils salinity – soils with increased content (over 0.25%) of water-soluble mineral salts mainly chloride and sulfuric natrium, calcium, magnesium salts, sodium, sometimes natrium and potassium nitrates.

Species (biological) – basic structural and classification (taxonomic) unity in the system of living organisms; totality of populations that cross-breed and produce fertile descendants, hold common morphological and physiological features, occupy a limited region and have common relations with biotic and abiotic environment factors.

Succession (lat. *successio* - inheritance) – consequent change in time period of one biocoenosis by others on the definite territory.

Zakaznik – species management area.

INTRODUCTION

Biological diversity is the main source of all life varieties formation and development, keeping a stable ecological balance and providing community with material welfare.

75% of people living in mountain areas of Tajikistan are engaged in cultivation and use of biological resources and their living standards depend on the state of these resources; that is why the awareness of importance and need to conserve the biological diversity are quite essential.

At present the anthropogenic impact at all life levels is becoming more intensive. In this view the threatened and unpredictable changes of biological diversity are increasing. The state of environment in mountain, arid, and subarid geosystems is worsening. Thus, the need of taking adequate measures to provide conservation and sustainable development of biological resources of national, regional, and global value is urgent.

Considering the priority of biodiversity conservation, despite all the difficulties, Tajikistan was among the first countries that ratified the Convention on Biological Diversity and it is pursuing the policy of biodiversity conservation and sustainable management.

Recognizing the need of biodiversity conservation, according to the Convention requirements, our country is to develop the basic mutually acceptable documents, as well as to take a number of important decisions, providing sustainable management and equitable benefit sharing of biological diversity use. The development of the National Strategy and Action Plan on biological diversity conservation and sustainable management (NBSAP) is a priority.

In this aspect the National Strategy and Action Plan are highly important and include: evaluation of the biodiversity current state, change tendencies, main strategic trends of biodiversity development, schedules of measures on the Action Plan implementation, and identification of economic, political, and financial mechanisms of biodiversity conservation and sustainable management.

Current State. In Tajikistan, where considerable world specific diversity of flora and fauna is accumulated, the state of biodiversity in forest, meadow, desert, steppe, and other ecosystems is worsening. Many species became rare and endangered.

The socio-economic problems of Tajikistan are resulted on the biological diversity of the country. The consequences of the past historical periods and human activity led to the worsening of the environment: land resources are exhausted; the state of pastures, forests and other ecosystems is disturbed. The uncontrolled urbanization threatens the conservation of natural monuments, irretrievably transforms unique forests, alpine and sub-alpine meadows, and wildlife communities.

The negative consequences of the human impact on the state of biological diversity are observed in all regions of the country, being dangerous in densely populated areas, though in general the situation is still under the control, creating an impression of sustainable development.

The threat of losing the richness of biological diversity of Tajikistan is great, since recently the population has been involving more and more biological resources in the economic activity.

Strategy. To solve the problems of biological diversity, the strategic trends of the Convention implementation should be determined; they will provide evaluation of priorities in conserving flora and fauna, and its associations, which have national, regional, and global importance.

The National Strategy provides base for the biodiversity sustainable development at all levels, from genotypes of plants and animals, communities and ecosystems, to soils, wild and cultivated plants and domestic animals. Considering the national priorities, a mechanism of diminishing the biodiversity vulnerability at the present stage of the country development is to be worked out. The Strategy provides conservation of all biodiversity components (species, populations, communities, and ecosystems) and sets the main trends of policy in this field.

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The environmental activity is based on conservation of plant and animal varieties (among the main biodiversity components). At the initial stage of the Strategy realization, issues of determining priorities and working with local population on education in the sphere of biodiversity conservation are discussed.

The National Strategy and Action Plan envisage:

- Determining strategic trends of biodiversity conservation and sustainable management;
- Determining the country needs in biological diversity use;
- Developing mechanisms and principles of biodiversity sustainable development and methods of its conservation;
- Collecting, systematizing information and analyzing the present state of biological diversity;
- Determining the place and role of biological diversity in the global ecosystem;
- Determining the role of the public in developing careful attitude to biological diversity;
- Determining new priorities in funding environmental activities concerning biodiversity conservation.

Action Plan. The Action Plan is a long-term program providing a base for sustainable development of nature and society. It determines the main trends in the activities of state and non-governmental organizations on solving the problems of biodiversity conservation, and includes a system of measures on funding, providing equipment, training specialists, and other measures promoting successful socio-economic and ecological development.

The Action Plan is aimed at providing conservation of biodiversity components out-

side their natural habitats (*ex-situ*) and conservation of ecosystems, maintaining and restoring viable species, populations, and communities within their natural habitats (*in-situ*).

The Action Plan is to be implemented in a short-term (5 years), medium-term (10 years), and long-term (over 10 years) periods, with the total funds being up to 27 million US\$ from various financial sources.

The Action Plan structure involves all interested ministries and institutions. It includes the improvement of political, legislative, research, and educational activities.

The Action Plan promotes solution of some important problems of the socio-economic life in Tajikistan, such as poverty alleviation, providing economically stable growth of industrial and agricultural production and other branches of economy, through sustainable management and conservation of biological diversity.

The main objectives of the Action Plan implementation are: developing all-national measures on the main issues of biological diversity and realizing relevant measures in particular regions of the Republic.

The process of monitoring and evaluating the Action Plan implementation is based on the accessibility of information provided by executing agencies and informational reports of the Governmental Working Group on the plan implementation. The results of the monitoring and evaluation will be highlighted, particularly among the executing agencies, through variable reporting systems. These results will be the base for improving the National Strategy and Action Plan on conservation and sustainable management of biodiversity in the country.

I

CURRENT STATE AND MAIN TRENDS OF BIODIVERSITY DEVELOPMENT

1.1. Natural and Historical Conditions of Biodiversity Development

1.1.1. Natural Conditions

Tajikistan is an intra-continental country located at the boundary of the subtropical and temperate climatic zones. It occupies the south-eastern part of Central Asia, between 36°40' and 41°05' of northern latitude and 67°31' and 75°14' of eastern longitude. It borders with Afghanistan, Uzbekistan, Kyrgyzstan, and China, and is close to India, Pakistan, Turkmenistan, and Iran (fig. 1.1). The country area is 143.1 thousand km². The Republic is located in one of the links of the Eurasian highland belt, stretching from the Atlantic to the Pacific Ocean.

The formation of the peculiar local soil and climatic conditions is based on the physical and geographical characteristics of the territory.

The soil composition is variable, with a clear division into belts (according to types): plains and low mountains (300-1600 masl) with gray desert soils, medium-high mountains (1600-2800 masl) with mountain brown soils, high mountains (2800-4500 masl) with high-mountain meadow-steppe, steppe, zang, and desert soils, and nival belt (4500 masl) with skeletal soils (fig. 1.2)

Changeable mountain climatic conditions and hard natural historical processes (fig. 1.3) promoted formation of a unique biological diversity in Tajikistan. The annual average sunshine level varies from 2090 to 3160 hours, the average air temperature varying from +17°C and higher in the south of the country to -7°C and lower in the Pamirs. The highest temperature is in July, the lowest temperature is in January. The most se-



vere climate is observed in the Eastern Pamirs, where the annual average temperature is from -1 to -6°C. The absolute minimum is at the Bulunkul Lake – -63°C. In hot deserts of southern Tajikistan and in cold high-mountain deserts of the Eastern Pamirs, the annual average precipitation level varies from 70 to 160 mm, the maximum being in Central Tajikistan, sometimes exceeding 2000 mm a year.

The contrast combination of arid, sub-arid, and humid conditions, with the precipitation fluctuation from 70 to 2000 mm a year, promoted formation of complex, particularly rich flora (nearly 10 thousand species) and vegetation, from broad-leaf forests and boreal meadows to subtropical and tropical deserts.

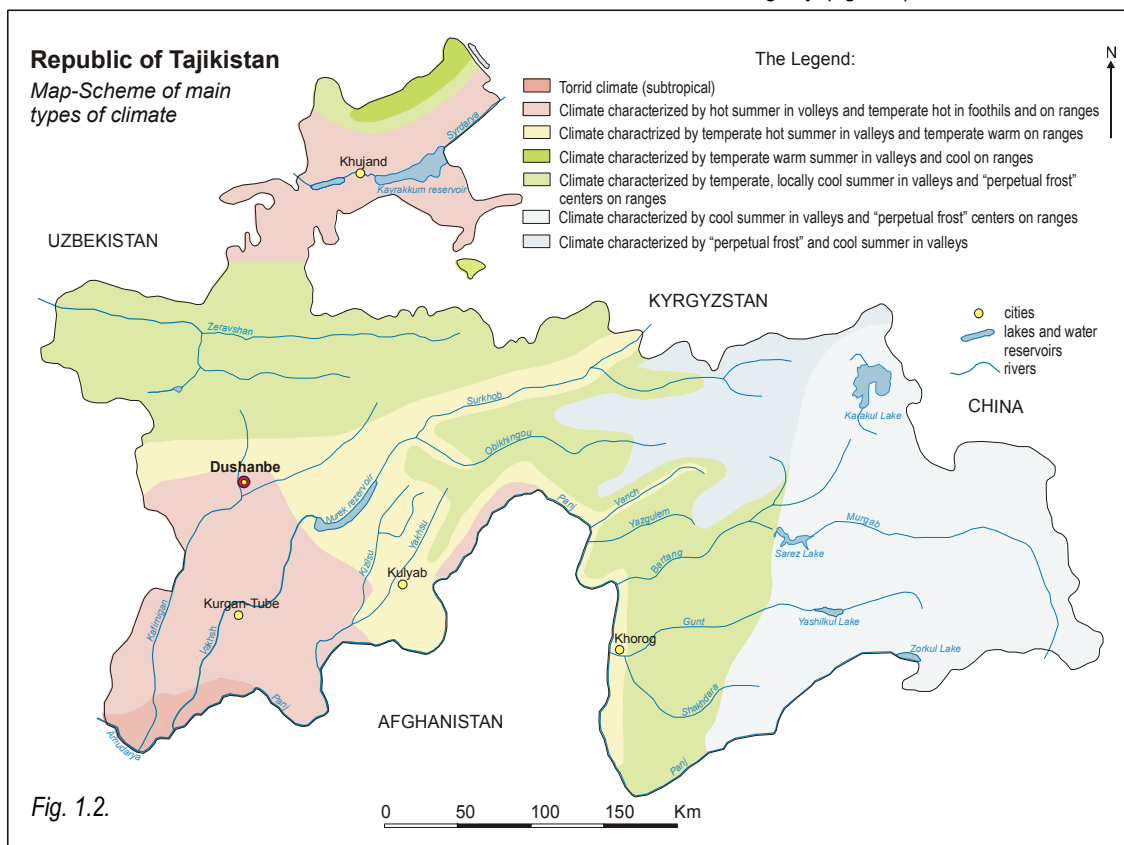
The fauna of Tajikistan is diverse in its genetic composition. The mountain fauna is richer than that of the plains; it contains a considerable number of European-Siberian and Eastern Asian elements. The fauna of lowland hot deserts has a lot of Indo-Himalayan, Ethiopian, and Mediterranean species.

The genetic relations of the fauna and flora with other faunal and floristic provinces (Mediterranean, Central Asia, Turan desert complexes, and Arctic-Alpine elements) enrich the biodiversity genetic resources of the Republic.



High Mountains

The Tertiary flora elements have preserved due to the fact that continental glaciers did not reach Central Asia, and the local glaciation did not reach the mesophyllic forest zones. During the fall of temperature, the Tertiary flora was much impoverished: a great number of species disappeared, which is proved by Pliocene micro- and macrofossils of paleoflora (spruce, cedar, pine, fir-tree, hemlock, sequoia, chestnut, oak, beech, alder, walnut, lime, liquidambar, ginkgo, tulip-tree, etc.). Representatives of the latest Pleistocene-Holocene formations (ephemeretum) coexist with the relic Tertiary forest flora, which has persisted from the time of the Oligocene-Pleistocene orogeny (fig. 1.4).



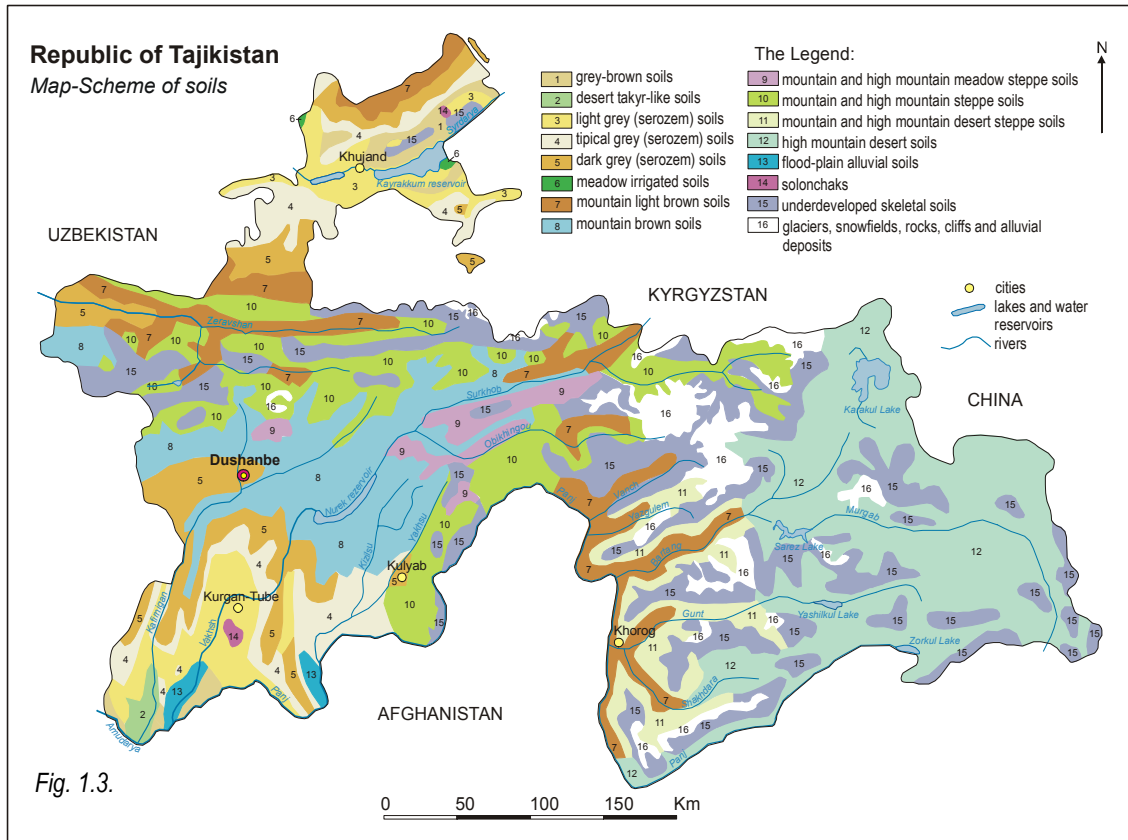


Fig. 1.3.

The regular succession of natural and climatic conditions formed specific complexes of live nature: Upper Cretaceous – age of mesophyllic broad-leaf forests; Eocene-Oligocene – age of paleomaquist and paleosavannas; Miocene-Pliocene – age of Turgai forests, representatives of Poltava flora, paleoprairies, and paleoshyblyak; Pleistocene-Holocene – age of cryophilization, paleoprairie and Turgaian forest degradation, and Pleistocene floristic complex formation; the present time – period of semisavannas and steppes.

In the last glacier period, many “migrants” from the Palearctic ecological systems – Tibet, Himalayas, mountains of Iran, Afghanistan, and Caucasus – produced a considerable impact on the composition of floristic complexes. The presence of species common with Tibet, Kunlun, and other Central Asian mountain regions, clearly distinguishes the Pamirs fauna from that of other mountain areas of Central Asia. These conditions created numerous ecological niches for the sustainable development of plant and animal varieties.

The present flora of Tajikistan began to form since the late Mesozoic-early Cainozoe. The most important factor of the fauna transformation

was the gradual climate aridization that began as early as late Cretaceous and caused the formation of semi-savannas, savannas, steppe, semi-deserts, and deserts. Having increased in Palaeogene and occurring for the entire Cainozoe, the aridization promoted the autochthonous processes of faunogenesis.

The Alpine orogenesis promoted formation of new fauna and flora types. On its completion, a lot of endemic species appeared in Pleistocene.

Fig. 1.4. Scheme of main stages and processes of biodiversity formation of Tajikistan

Quaternary	Holocene	1,8 mln. years
	Pleistocene	
Tertiary	Pliocene	25 mln. years
	Miocene	
	Oligocene	
	Palaeogene	66 mln. years
	Eocene	
	Palaeocene	

■ Fall of temperature ■ Orogenesis
■ Aridization ■ Departure of Thethis

Tajikistan is located in the southern part of Central Asia, in the mountain desert zone of the Eurasian continent, where the main geosystems (fig. 1.5) of the Northern hemisphere – desert, steppe, savannoids, conifer forest, mountain mixed forest, high-mountain desert, glacier – are widely represented.

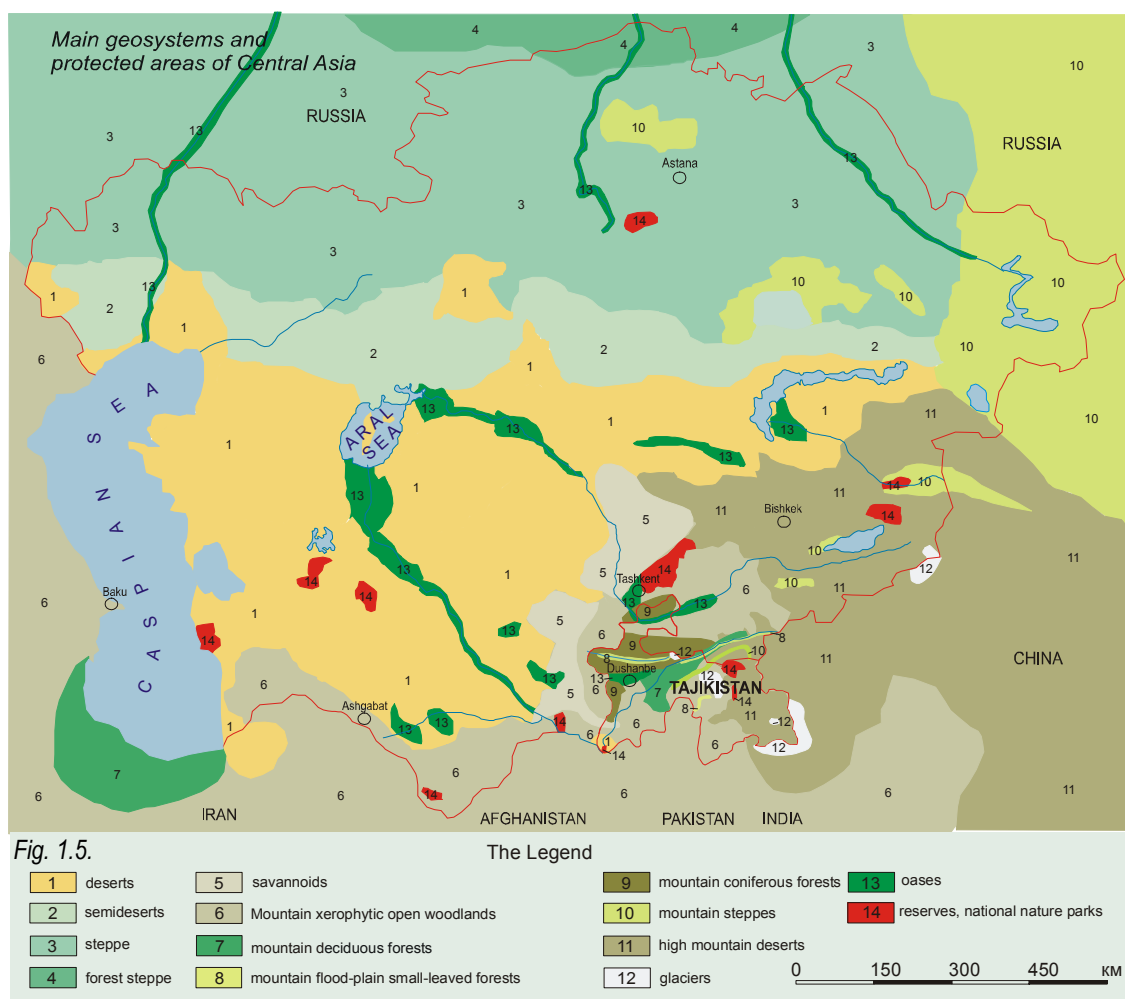
The area of Tajikistan falls within the Pamir-Alay mountainous system, occupying the South-Western Tien Shan.

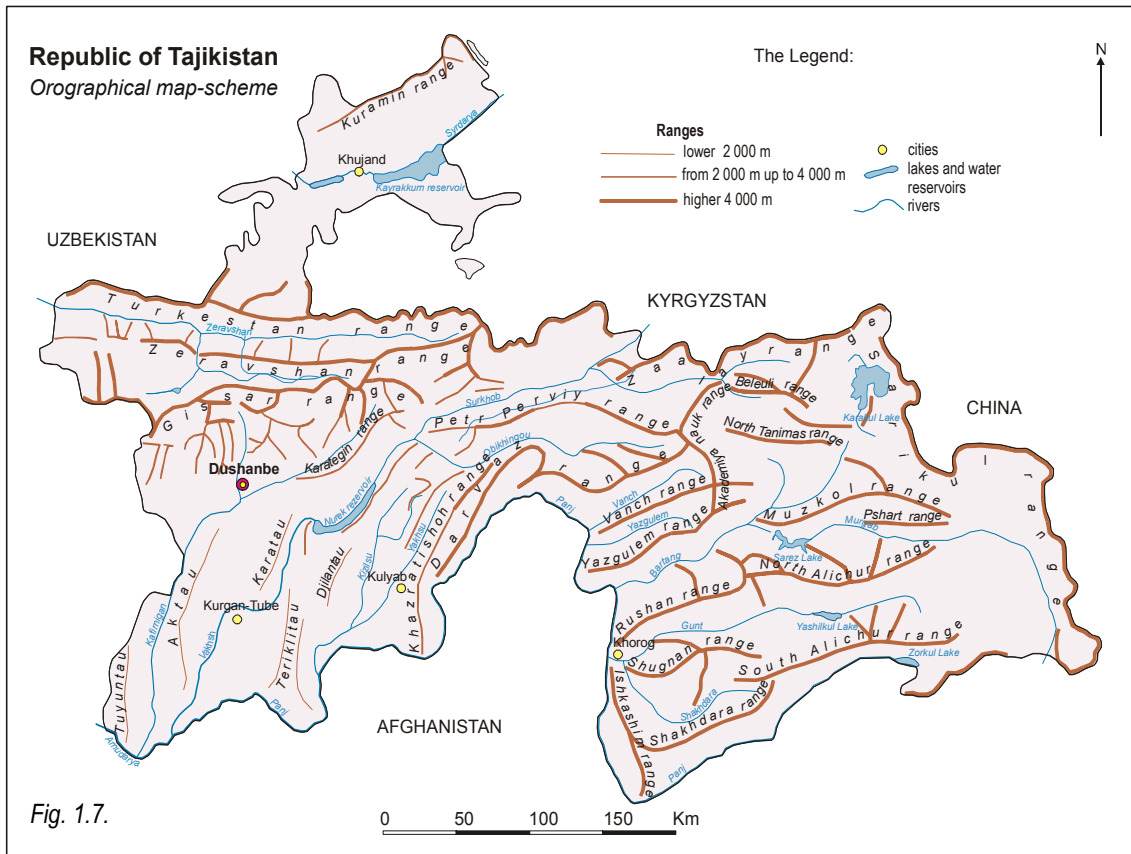
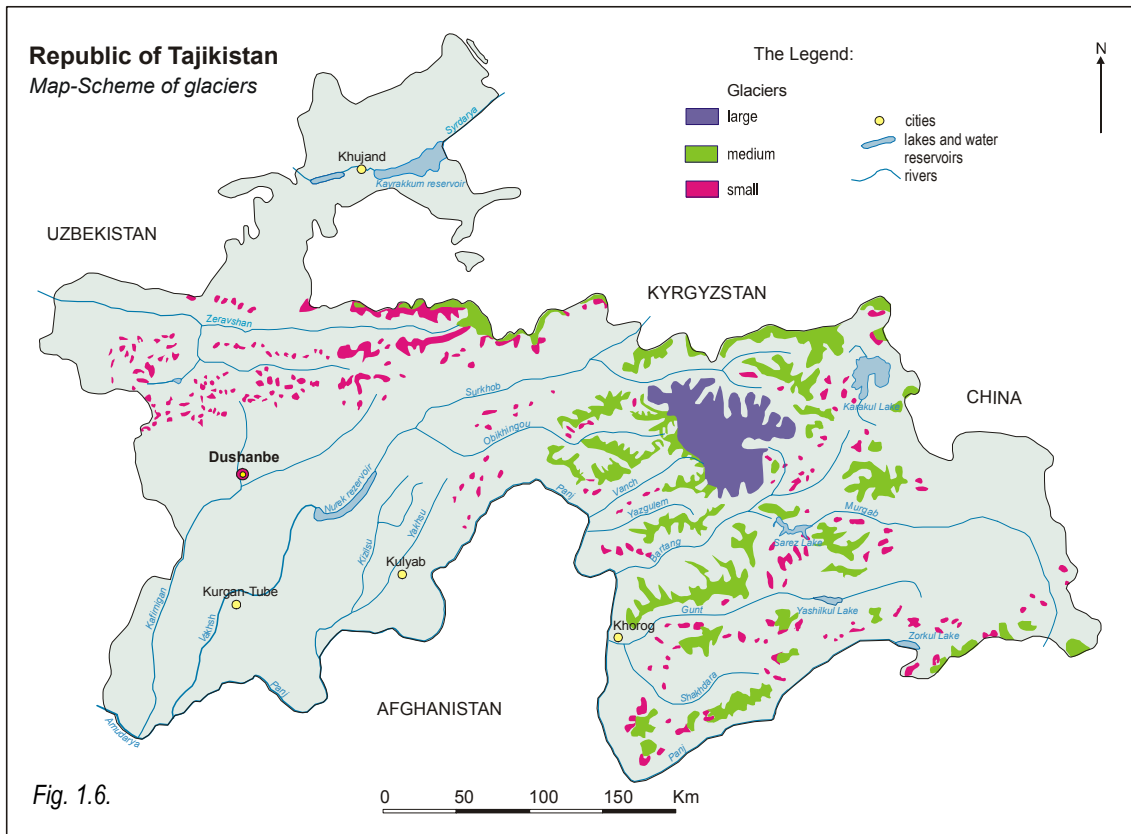
The relief is characterized by alternation of mountain ranges (Kuramin, Turkestan, Zeravshan, Hissar, Karateghin, Darvaz, Yazgulem, Shakhdara, Vakhsh, Peter the Great, Khazratishokh, and a number of small ranges of southern Tajikistan and Eastern Pamirs) (fig. 1.6), with intermountain depressions and oases (Khudjand-Fergana, Hissar, Vakhsh, Kulyab, Zeravshan, Karateghin, Badakhshan, etc.). The highest mountain peaks (Ismoil Somoni Peak – 7495 masl, Lenin Peak – 7134 masl, etc.) are located here.



Chimtarga Peak

The geological structure of Tajikistan is fairly complex. The deposits developed here are dated from Precambrian to the present age. The southwestern and northern parts contain mainly Quaternary, Neogene, and Palaeogene deposits; magmatic rocks also occur. Mesocainozoic sedimentary deposits are common in Central and Southern Tajikistan. Phanerozoic deposits, in addition to Precambrian magmatic formations, occur in the Pamirs.







Karakul Lake

Tajikistan is one of the major centers of the modern mountainous glaciation (fig. 1.7). 70% of Central Asian glaciers are accumulated here. The Tajik glaciers occupy 8.5 thousand km², or 6% of the country area. The main glaciation areas are located in the high mountains of Zeravshan, Pamirs, and Hissar-Darvaz.

There are 947 rivers in Tajikistan; their total length is 28.5 thousand km. The major water streams are the rivers Pandj, Vakhsh, Syrdarya, Zeravshan, Kafirnigan, Bartang, Gunt, etc.

The country has 1.5 thousand lakes, 80% of which are located at the elevation of over 3000 m. The total area of the lakes exceeds 705 km². The largest lake — Karakul (380 km²), is located in a crater depression formed by the fallen asteroid 10 m. y. ago.

1.1.2. Natural Zones or Geosystems

The total area of Tajikistan is subdivided into natural zones according to relief and anthropogenic impact.

Foothill-Plain Zone is the most intensively used zone, with a strongly degraded vegetation. The huge areas of southwestern and northern Tajikistan, within the Syrdarya, Kafirnigan, Vakhsh, and Kulyab oases, and the Hissar Valley, are marked by geosystem and ecosystem fragmentation, and an impoverishment of the composition and structure of vegetation communities. Many unique plant and animal species and natural communities are being extinct or dropping in numbers.

Low Mountain and Savanniod Hilly Zone is actively used for rain-fed and partially irrigable agriculture on the Mogoltau and Kuramin ranges, low mountains of the Turkestan and Ze-

ravshan ranges (northern Tajikistan); river valleys of the southern slopes of the Hissar, Karateghin, and Vakhsh ranges, and Khazratishokh Ridge (Central Tajikistan). A considerable transformation of the geosystem, a destruction of ecosystem composition, and a reduction of valuable community and species areas occur here.

The zone still preserves natural ecosystems, though their functions are strongly disturbed.

Mid-High Mountain, Light Forest, and Forest Zone is used for cattle breeding and rain-fed agriculture (Central Tajikistan). The forested areas have considerably reduced; the composition of valuable communities is worsening, partially invaded by alien and weed plants.

The mid-high, light forest, and forest zone, where natural ecosystems are numerous, their functions are still preserved.

The protected areas preserve limited number of rare animal and plant habitats. Most of them are located beyond the State Forest Resource areas. They are assigned to economic agencies. At present, the flora and fauna in Romit, Tigrovaya Balka, Dashti-Jum zapovedniks, the Varzob and Yakhsu river valleys, lakes of the Nurek, Kairakkum, and other reservoirs are endangered.

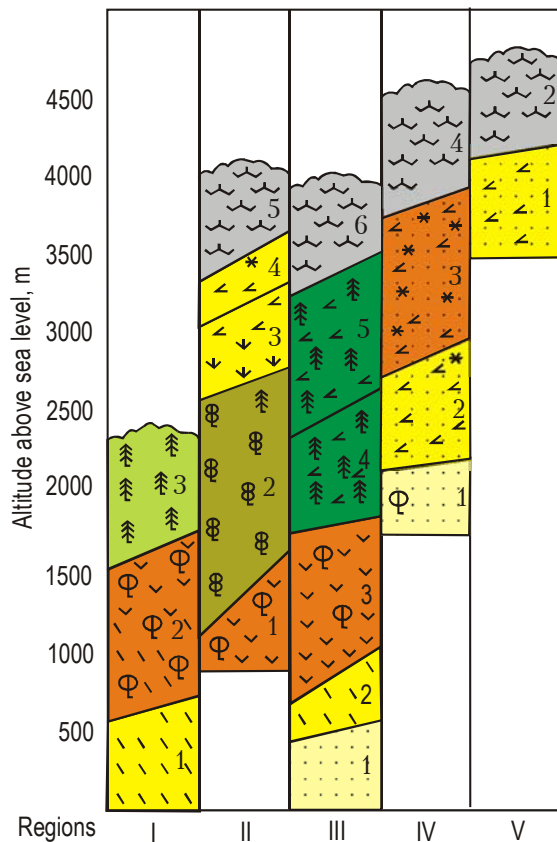
High Mountain and Desert Zone, with desert and steppe vegetation, combined with alpine meadows and actively used by people, is partially choked with weeds, requires controlled pasturing and biotechnical measures on pastures.

High Mountain Snow and Glacier Zone, with rare and highly vulnerable vegetation, requires regulation of all kinds of tourist activity (fig. 1.8).



High Mountain desert zone

Fig. 1.8. The scheme of vegetation belts in botanic-geographical zones



The Legend

- 1. Southern Tajikistan region:
 - 1 - zone of semi-savannas with domination of low herbs;
 - 2 - zone of shiblyak and semi-savannas
 - 3 - zone of thermophyllic juniper forest;
- II. Gissar-Darvaz region:
 - 1 - zone of shiblyak and semi-savannas with domination of tall grasses
 - 2 - zone of deciduous forests with domination hemophylle juniper forests;
 - 3 - zone of sub alpine meadows and various herb steppes, tall herb semi-savannas;
 - 4 - zone of steppes with domination of tragakan;
 - 5 - zone of cryophytone;
- III. Zeravshan-Turkestan region:
 - 1 - zone of sage and saltwort deserts;
 - 2 - zone of deserted and low herb semi-savannas;
 - 3 - zone of tall grasses and shiblyak;
 - 4 - zone of thermophyllic juniper forests and steppes;
 - 5 - zone of microtherme juniper forests and steppes;
 - 6 - zone of cryophytone;
- IV. West Pamir region:
 - 1 - zone of prickle herb and steppe deserts with domination of shyblyak;
 - 2 - zone of deserted tragakan steppes;
 - 3 - zone of tragakan and deserted taragakan steppes;
 - 4 - zone of cryophitone;
- V. East Pamir region:
 - 1 - zone of high mountain deserts and deserted cryophillic steppes;
 - 2 - zone of cryophytone.

The orographic features of the Republic account for the belt distribution and geographic isolation of a number of vegetation communities and groups, including biological components.

Semisavannas, combined with xerophytic light forests (consisting mainly of pistachios and almonds), are the dominant types of vegetation in southern Tajikistan. Fragments of thermophyllic juniper forests and saltwort-saxaul communities are also observed here.

The Hissar-Darvaz Region is characterized by the domination of relict broad-leaf forests, combined with xerophytic light forests, high-grass semisavannas, and fragments of thermophyllic juniper forests.

The Zeravshan-Turkestan Region is characterized by the presence of desert and semidesert vegetation, combined with low-grass semisavannas, with fragments of xerophytic light forests.

Most common in the mountain part of the Region are mixed thermophyllic and microthermal forests, combined with cryophytic steppes on the mountain peaks.

The Western Pamirs Region and a small part of the high-mountain area of the Hissar-Darvaz Region are occupied with dwarf steppes, combined with high-mountain deserts at the border of the Eastern Pamirs Region. In the lower part of the Western Pamirs, xerophytic light forests with desert vegetation elements occur.

The Eastern Pamirs Region is a prevalence zone of high-mountain wormwood-teresken deserts, combined with steppes and cryophytic meadows.



Juniper forests top border

1.1.3. Area Subdivision

According to the botanical and geographical conditions, relief, geological structure, composition of the vegetation and animal worlds, and ecological load, the area of Tajikistan is subdivided into the Sogd-Zeravshan, Central Tajikistan, South Tajikistan, and Gorno-Badakhshan ecological provinces, which in turn are subdivided into regions (fig. 1.9).

Sogd-Zeravshan Province occupies a considerable part of Southern Tien Shan, the northwestern part of the Pamir-Alai mountainous system, and the mountain landscapes of the Zeravshan River Valley, composed of Palaeogene and Neogene deposits and magmatic formations. The main orographic elements are the Kuramin and Turkestan ranges, the Mogoltau Mountains, and Fergana Depression, formed as a result of the Hercynian and Alpine tectonogenesis. Flora is presented by steppes, semisavannas, and semi-deserts.

Quaternary, Neogene, and Palaeogene deposits and intrusive rocks are most common here. The soil cover consists of gray desert (sierozem), brown-carbonate, and mountain-steppe soils.



Landscape Central Tajikistan Province

The climate in the Syrdarya and Is-travshan-Isfara regions is continental, relatively dry, the annual average temperature is from -2°C to $+7^{\circ}\text{C}$, the annual average precipitation varying from 300 to 350 mm. The main water resources are the Syrdarya River and the Kairakkum Reservoir.

The vegetation is represented by mountain forests and light forests, mountain-steppes, tugais, and semideserts. The animal world is rich in birds, reptiles, and mammals.

The climate of the Zeravshan region is relatively cool. The annual average air temperature is from $+10$ to -11°C , precipitation – 400-700 mm annually. The Zeravshan glaciation knot is

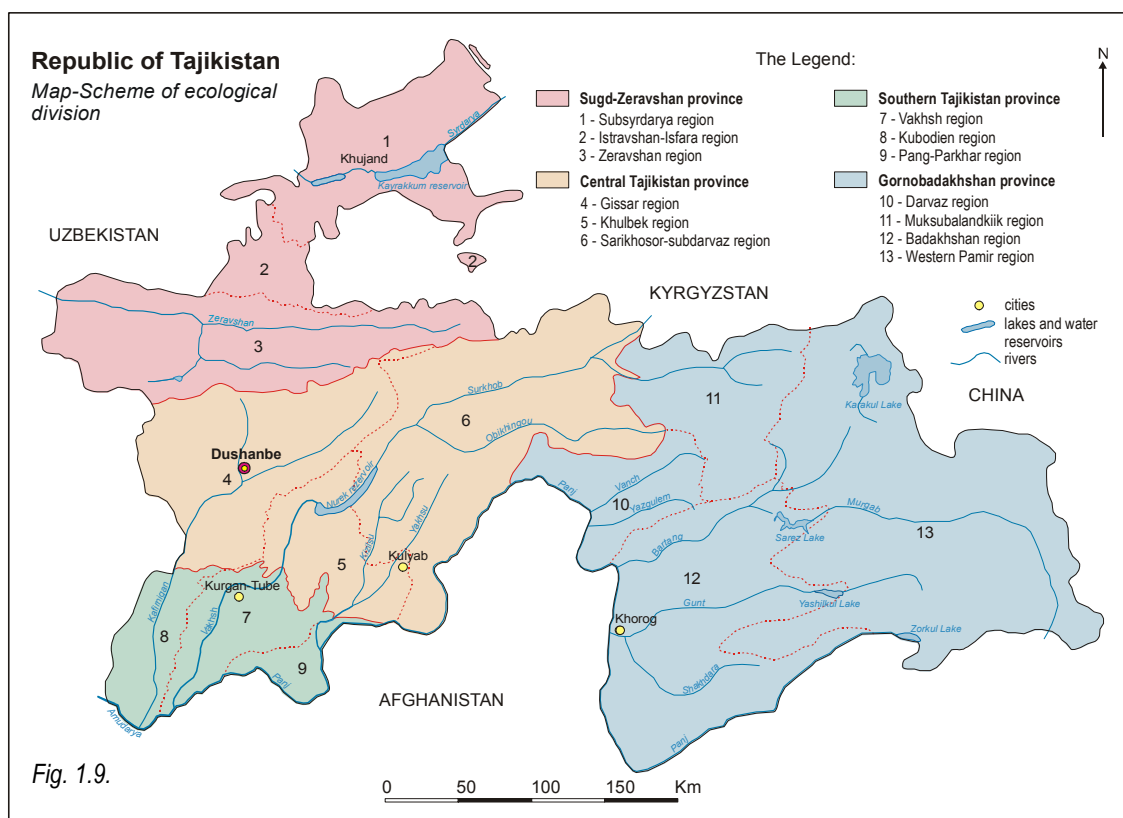


Fig. 1.9.



Iskanderkul Lake

located in the high-mountain area of the region. There are numerous dam lakes, the largest of which are Iskanderkul and Kulikalon.

The vegetation is dominated by juniper forests and light forests, high-grass semisavannas, and mountain steppes. The animal world mainly consists of high-mountain steppe species – snow leopard (*Uncia uncia*), Siberian ibex (*Capra sibirica*), wild boar (*Sus scrofa*), marmot (*Marmota*), and birds.

Central Tajikistan Province occupies the central part of Tajikistan, including the Karategin, Vakhsh, Darvaz, Alai, Peter the Great, and Khazratishokh ranges, the Surkhob and Obikhingou intermountain depression, as well as the western Pamir-Alai mountainous system and Hissar intermountain depression.

In addition to Palaeogene, Neogene and Quaternary deposits, the province contains Precambrian formations and intrusive rocks.

The annual average air temperature in the Hissar region is from +14 to -16°C, precipitation – 800-1500 mm a year. There are numerous snowfields. The main water flows are the Kafirnigan, Karatag, and Varzob rivers.

In vegetation, the region is considered the richest one, represented by juniper, broad-leaf, xerophytic, and light forests, alpine and sub-alpine meadows, semisavanna and mountain steppes. The flora contains at least 3.5 thousand species of flowering and spore-bearing plants.

The climate of the Khulbek and Sarikhsor-Darvaz regions is variable, mild continental, and cool. The annual average temperature is +11°C, precipitation – 500-1500 mm a year. Here, the largest rivers of Tajikistan – Vakhsh, Surkhob, Yakhsu, and Obikhingou – and major glaciers, including the Pamir glaciation knot with 40% of Central Asian glaciers, are formed. Moraine lakes occur.

The flora and the vegetation cover are diverse, with mesophyllic forests, high-grass semisavannas, xerophytic light forests, mountain steppes, and alpine meadows prevailing. The floristic composition is estimated at 4000 higher flowering and spore-bearing plants.

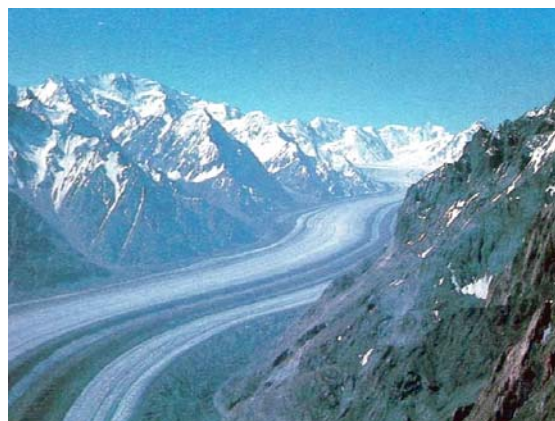
The region area contains almost all mammal and bird species of Tajikistan, nearly 50% of rare endemic plant and animal species. The most valuable plant communities and endemic species are assigned to this region area.

South Tajikistan Province occupies the southern Pamir-Alai, consisting of small ranges: Babatag, Aktau, Touyuntau, Teraklitau, Choltau, Jilantau. They are gradually turning into the Parkhar-Pyandj, Vakhsh, and Beshkent-Shartuz oases, called the South Tajik Depression, which is represented by Cretaceous, Quaternary, and Neogene deposits.

Here, in the lower reaches of the Pyandj, Vakhsh, and Kafirnigan rivers, the highest-water and largest river in Central Asia – Amudarya is formed. The soils are composed of dark and light sierozems.

The climate is dry and hot. The annual average air temperature is from +15 to -17°C, precipitation – 150-250 mm a year. A considerable part of the lands is used for agriculture. Anthropogenic ecosystems prevail.

The vegetable cover is diverse; it is represented by juniper forests, semisavannas, xerophytic light forests, and fragments of deserts and and tugai vegetation. The animal world is rich in reptiles, mammals, and birds, among which there are many rare and endemic species.



Fedchenko Glacier

Gorno-Badakhshan Province occupies solely high-mountain areas of the Darvaz, Vanch, Yazgulem, Shakh dara, Shugnan, Vakh an, Ishka-shim, Rushan, Zaalai, North- and South-Alichur, and Muzkol ranges, where Precambrian rocks, Jurassic, Carboniferous, and Triassic rock intrusions prevail.

The climate of the western part of the province is cool, sometimes severe. The annual average air temperature is from -2 to +7°C, precipitation – 300 mm a year. The area includes the Pamir glaciation knot and the largest Fedchenko Glacier – 130 km³. The earliest glaciation is assigned to the Early Quaternary age.

The large dam and moraine lakes – Sarez, Yashilkul, and Zorkul – are situated here.

Vegetation of the Western Pamirs is relatively rare, with mountain steppes, small-leaf forests, and cryophytic meadows prevailing. The floristic composition includes 1500 species. The tree and shrub communities are fragmentary, occurring at river flood-plains and ground-water outlets. Of large mammals, there are: snow leopard (*Uncia uncia*), Siberian ibex (*Capra sibirica*), Pamir wild ram (argali) (*Ovis ammon polii*).

The Eastern Pamirs region is characterized by a severe climate, the annual average temperature is from -6 to +1°C. Many rivers originate here; the largest lake of Tajikistan – Karakul – is located in this region.

The vegetation is rare, represented mostly by high-mountain desert, cryophytic meadow and wetland species. The floristic composition does not exceed 250-300 species. The animal world consists of no more than 600-800 species, including invertebrates. The most typical animals are argali (*Ovis ammon polii*), Siberian ibex (*Capra sibirica*), marmot (*Marmota caudata*), snow leopard (*Uncia uncia*), tolai hare (*Lepus tolai*).



Yashikul Lake

1.1.4. History and Socio-Economic State of Tajikistan

Tajikistan is a sovereign, democratic, legal, secular, and unitary state.

The area of Tajikistan has been occupied since the 5th-4th millennium B.C. The name of the country comes from the word “Tajik” – the name of the people inhabiting the entire Central Asian area from the Caspian Sea to India and western borders of China since ancient times. Tajiks are mentioned in ancient manuscripts as early as the V-VI centuries A.D.

For over 2000 years, the Tajik people were included in the Achaemenid State. The main state religion was Zoroastrianism. The sacred book of the religion, “Avesta”, was written in a language close to Tajik-Persian. Some of its chapters (gats) contain appeals to careful treatment for living beings (biodiversity).

The formation of a unitary Tajik state started at the era of Samanids (IX-X centuries A. D.). The founder of the Samanid state (fig. 1.10) was Ismoil Somoni. The country celebrated the 1100th anniversary of the state foundation in September of 1999.

In XIII-XIV centuries, after the Gaznevids invasion, the Samanid state disintegrated and, since then up to XIX century, was successively under the power of Mongols, the Temurid, Sheibanid, and Ashtarkhanid dynasties, who caused a great damage to both the cultural heritage and biological resources.

After having been repeatedly conquered by foreigners (Alexander the Great, Arabs, Mongols, etc.), Tajiks abandoned their historical motherland, their cultural and historical heritage in the areas of Afghanistan, India, Iran, Turkmenistan, Uzbekistan, and other countries of the Near and Central Asia, and revived their state at the foothills of Pamir-Alai, Hindukush, Tien Shan, and Tibet.

At the end of XIX century, the small mountainous area of Tajikistan, that remained unconquered by miracle and with greatly reduced borders, joined the Russian Empire. Within the mountain system of Pamir-Alai and Tien Shan, in 1924, the Tajik Autonomous Soviet Socialist Republic was established, which was proclaimed an independent Tajik SSR in 1929.

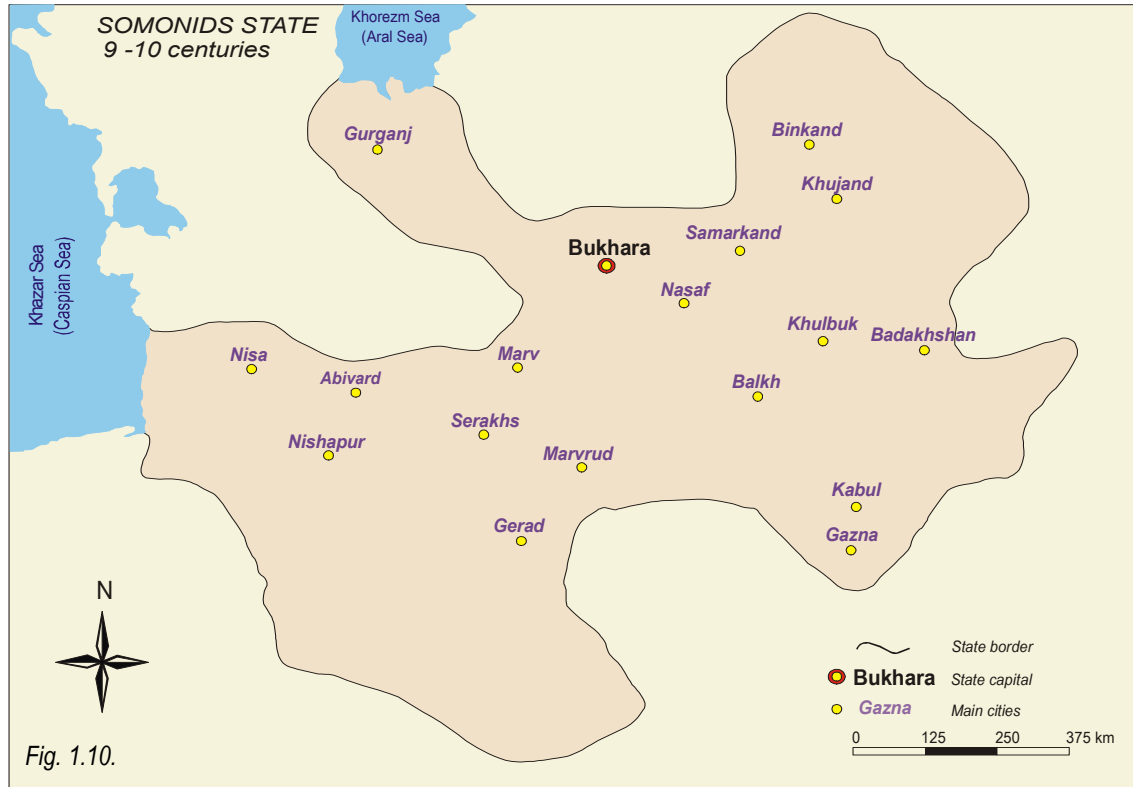


Fig. 1.10.

The Republic of Tajikistan declared its independence in September 9, 1991.

Tajikistan, like all other republics of the USSR, underwent the stages of accelerated industrialization and collectivization, which considerably changed its socio-economic conditions.

The country inherited a developed infrastructure, well-organized and comprehensive industrial and agricultural base from the time of socialist construction. Large industrial enterprises appeared due to inexpensive electric power of the giant Nurek and Vakhsh Cascade hydroelectric power plants, and abundant resources of mining raw materials.

Mining, ore-concentration, chemical, energetic, building, light, and food industries were developed in Tajikistan. The non-ferrous metallurgy is still the main source of export and income of the country.

Despite the developed mining industry, the economy of Tajikistan is based mainly on the agrarian sector (41% of gross domestic value), the industrial sector being developed to a lesser degree. The agriculture of the Republic is specialized mainly on cotton growing. Cotton is the main exported agricultural product and the main raw material of the internal market of light and textile industry.

The transition to the market economy caused serious changes in the economic system and relations between economic institutions. Many industrial enterprises are privatized and transformed into joint-stock companies and commercial firms.

70% of the population lives in rural areas. Despite the sharp decline in the living standards, the rate of the increase in population is still high – annual average 2.5% in last years, and 1.25% in 2001. In XX century, the population of the country increased more than six times. The high rate of the population increase and the extension of agricultural areas caused damage to the biodiversity composition and structure, as well as a loss of many local varieties and breeds of domestic animals, raised as a result of selection.

Since ancient times, Tajikistan raises cotton, leguminous crops, and cereals, including the specific populations of hexaploid wheat, small-seeded forms of cultivated leguminous plants (pea, chick pea, lentil, alfalfa), oil flax, carrot, and onion. Fruits are grown on a large scale, particularly: apricot and grapes, walnut and pistachio, elaeagnus, almond, pomegranate, fig, etc. Mulberry, peach, quince, sweet cherry, plum, etc. were introduced from Eastern Asian countries. Many new fruit varieties originated in Tajikistan.

The consequences of the socio-political crisis had a drastic impact on the living standards of the population. By 2000, the GDP per capita was US\$179. The consumer's basket being US\$24 per month and a month ration – US\$35, an average wage is about US\$9.9 (2001), and a minimum pension US\$0.84 per month.

In 1995, the volume of industrial output was reduced by 63%, compared to 1990. The cotton yield (the main item of hard currency entry) in 1995 dropped to the level of 1953.

The economic decline had affected mainly the investment conditions of economy. Before 1990, the annual increase of capital investments was 8%, or 0.5, which corresponded to the 105th place among 174 world countries, according to the human development index. In 2002, Tajikistan occupied the 112th place (UNDP, 2002).

The successful realization of the first economic concepts of transition to the market economy in 1992-1995 allowed restoration of the credit-monetary system. The short-term economic policy (October 1997 – June 1998) reduced the inflation from 20% a month before the program implementation to less than 5% at the present time. The real GDP increased roughly by 2% in 1997, when the war ended and the cotton yield increased by nearly 15%. Within the Program, foreign trade was liberalized, small ventures privatized, and the external debts restructured.



Agroecosystem

The government is currently realizing the medium-term economic strategy developed within the implementation of the Program of Economic Transformations (approved by the Parliament in July 1998) and the Poverty Alleviation Strategy (approved by the Parliament in 2002).

The programs are aimed mainly at creating favorable conditions for the economic growth through export by way of developing the private sector and foreign investments. They outline the decline in the annual inflation rate to 8% and economic increase by 3.5-4.5% a year. This increase is supposed to be provided by processing agricultural products, further development of hydropower and mining industries, privatizing of medium-sized and large enterprises.