MINISTRY OF NATURE PROTECTION OF TURKMENISTAN

Biodiversity Strategy and Action Plan for Turkmenistan

ASHGABAT 2002

There are mountains and valleys, the desert and the sea; well-watered rivers flow across the land. This is the land of the Turkmens - the nation that was gifted a favour from Allah – which is without equal anywhere in the world. For thousands of years the Turkmen people have loved and looked after this land and the land has repaid them. There is no doubt that the Turkmen people and this land are inseparable from each other - they form an organic whole.

Saparmurat TURKMENBASHI

CONTENT

State flag of Turkmenistan

National emblem

President's flag

Turkmenistan is a neutral state in Central Asia
Area – 491,200 km²
Political division – 5 velayats
Capital – Ashgabat
The highest representative body – Halk Maslahaty (People's Council)
The highest legislative body – Mejlis (Parliament)
The President is the Head of State
Population – 5,640,000 (as of 01.01.2002)
State language – Turkmen
National currency – manat

FOREWORD

In the new millennium, Turkmenistan, like all humanity, has entered a difficult era of searching for an optimal strategy of interaction between society and nature. The act of signing the Convention on Biological Diversity marked a key moment in the history of Turkmenistan's development. This is reflected in the Programme on "Strategy for Social and Economic Reform in Turkmenistan for the period till 2010" [2]. The idea of supporting ecological security has been put forward as one of the priority goals of State policy. The key to solving global problems and overcoming challenges and threats lies in making use of each nation's potential. Ruhnama, a treasury of national wisdom, contains the following principal on the relation between man and Nature: "When a man amalgamates Nature he becomes as pure and beautiful as Nature itself" [1].

Our purpose is to make Turkmenistan a prosperous country and turn it into a safe home for each person. All the state programmes of neutral Turkmenistan are based on the need to steadily improve the level of human well-being. Without the maintenance of environmental equilibrium it is impossible to reach this goal.

All of us understand that the normal functioning of natural ecosystems is an essential condition for the sustainable development of people themselves. The loss of any components of biodiversity decreases its sustainability and finally results in the destruction and extinction of species and some ecosystems. Therefore issues of biodiversity conservation and sustainable use of biological resources and equitable sharing of benefits from them have been examined for the first time in this Biodiversity Strategy and Action Plan (BSAP) for Turkmenistan. Biodiversity survey at a national level carried out in accordance with international standards is closely connected with various aspects of species conservation as well as habitat and landscape protection. This is an element of the process of implementation of the Convention on Biological Diversity.

Our country's movement to sustainable development requires co-ordinated actions in all areas of society as well as adequate reorientation of state social, economic and ecological institutes. Successful implementation of a biodiversity conservation strategy for Turkmenistan is closely connected with the development strategies for all other sectors of the country, namely: economy, national security, healthcare, law, education, science, culture, etc. Today the country has all the prerequisites for success in this sphere.

We should understand that biodiversity is an integral and natural part of life for the whole society, part of our heritage, given to us over thousands of years, which we should conserve for future generations. We hope that the principles of nature conservation will be incorporated into the system of behaviour norms accepted by all sections of the population. The rich spiritual heritage of the Turkmen people will help to preserve the beauty of the native land that so delights our eyes and nourishes our souls.

EXECUTIVE SUMMARY

The overall aim of this Biodiversity Strategy and Action Plan is "To conserve, restore and sustainably use the biological diversity of Turkmenistan for present and future generations".

Country Context

- Turkmenistan is a newly-independent neutral state situated in the western part of Central Asia. It borders Kazakhstan, Uzbekistan, the Islamic Republic of Iran, and Afghanistan. Its area is 491,200 km^2 (excluding the Caspian Sea). Ashgabat is the capital of Turkmenistan and has a population of 730,000 [7, 56].
- Though desert ecosystems occupy the majority of the country, Turkmenistan possesses a rich and unique biological diversity that includes the characteristics of three large floristic provinces. Some ecosystems remain relatively uninfluenced by Man's activities, representing great potential for sustainable use.
- Despite a difficult transitional economic period, recognising the importance of biodiversity conservation, the State is making efforts to improve the situation.

Geography Up to 80% of Turkmenistan is desert and less than one fifth is mountainous – the Kopetdag range, the Kugitangtau and Paropamiz Mountains. Elevations range from 81m below sea level (Akjakai depression in Zaunguz Karakums) to 3,139m above sea level (Airybaba peak in the Kugitangtau Mountains). Parts of the Aral and Caspian Sea basins are located in Turkmenistan. The river network is limited. The biggest rivers are the Amudarya, Murgab, Tedjen, Chandyr, Sumbar and Atrek. The combined water resources of all rivers totals approximately 32.9 km^3 [54, 55].

Climate Turkmenistan has a typical desert climate, which is however milder along the Caspian Sea and in the mountains. The average temperature in January in the northeast is less than -5°C, while in

Geopolitical map of Turkmenistan

the southeast and southwest it is +4°C. The average July temperature is +30°C. The highest recorded air temperature is +45°C while the lowest is -22°C.

Turkmenistan is located in an arid zone. In the plains, annual precipitation does not exceed 150 mm. In the pre-Aral and Karabogazgol areas it is less than 100mm, while in the mountains it may attain 350mm [28]. Because of the arid conditions, artificial irrigation is almost universally needed for farming.

Population On 1st January, 2002 the total population was approximately 5,640,000[56]. There are over 100 ethnic groups but 90% of the population is Turkmen. More than half of the population lives in rural areas and nearly 40% of the labour force are involved in agricultural production.

Economic, Social and Political Situation The economy of the country is of an industrial and agricultural character. The total area of Turkmenistan is 49,121,000 ha of which 40,227,000 ha (81.8%) are used for some kind of agricultural activity. The total area of pastureland is 38,500,000 ha, of which 94% consist of desert plains and the rest of montane pasture [56].

The agricultural sector includes a large number of agricultural and processing enterprises accounting for a third of the Gross National Product.

The strategically important crops are cotton and wheat. There are one and a half million head of livestock. The rearing of livestock accounts for 16-24% of agricultural production.

Industrial enterprises under various forms of ownership operating today in Turkmenistan, contribute 80% of the GDP. Extractive enterprises (mainly the oil-and-gas sector) account for 67% of industrial output [14, 56, 62].

In 2001 the volume of GDP was 31 trillion manats (approximately 6 billion US$), its annual rate of growth was 20.5%, while the private sector produced 42% of GDP. The value of gross agriculture production was 7.4 trillion manats (approximately 1.4 billion US$) an increase of 18% from 2000 [56].

Turkmenistan is a Presidential Republic. Internal and foreign policy, as well as its neutral status have made for rapid implementation of market reforms. They are characterised by phased and consecutive implementation in combination with large-scale measures for the social support of the population.

Turkmenistan's Biodiversity

Turkmenistan possesses high biodiversity. More than 20,000 species have been identified, of which 7,064 are higher and lower plants and about 13,000 are vertebrates and invertebrates;

There is a general tendency of decline in certain species of flora and fauna in the world, including Turkmenistan;

Human influence on the natural habitats of some species is pushing a number of rare and important ecosystems to the verge of disappearance.

Importance of Biodiversity for Turkmenistan

The biological diversity of Turkmenistan plays an important role in the country's economy, its culture and traditions;

Representatives of Turkmenistan's flora and fauna are of great significance for the development of such branches of the economy as local medicinal, perfume and food industries, as well as hunting, fishing, agriculture, etc. The number of flora and fauna species involved in the system of economic consumption is increasing;

Wild relatives of the cultivated plants of the Central Asian Genetic Centre have been preserved in Turkmenistan, one of their countries of origin;

The culture and traditions of Turkmenistan are closely related to its landscape and wild nature [27, 30].

Reduction of biodiversity can negatively influence the well being and living standards of the human population.

Current Situation of Biodiversity Conservation

The huge resources of intellectual and industrial potential create the prerequisites for the conservation and rational consumption of the nation's natural wealth, i.e. the biological diversity of the country;

The most general reasons for biodiversity reduction are habitat loss and excessive exploitation.

The Biodiversity Strategy and Action Plan (BSAP)

The Turkmenistan Parliament (Mejlis) ratified the Convention on Biological Diversity (CBD) on 18th June 1996. Preparation of a "Country Study on the status of Biological Diversity in Turkmenistan" and a "Biodiversity Strategy and Action Plan (BSAP)" is one of a signatory's responsibilities under the Convention on Biological Diversity.

The present Project has been developed by the Ministry of Nature Protection is financially supported by the Global Environment Facility.

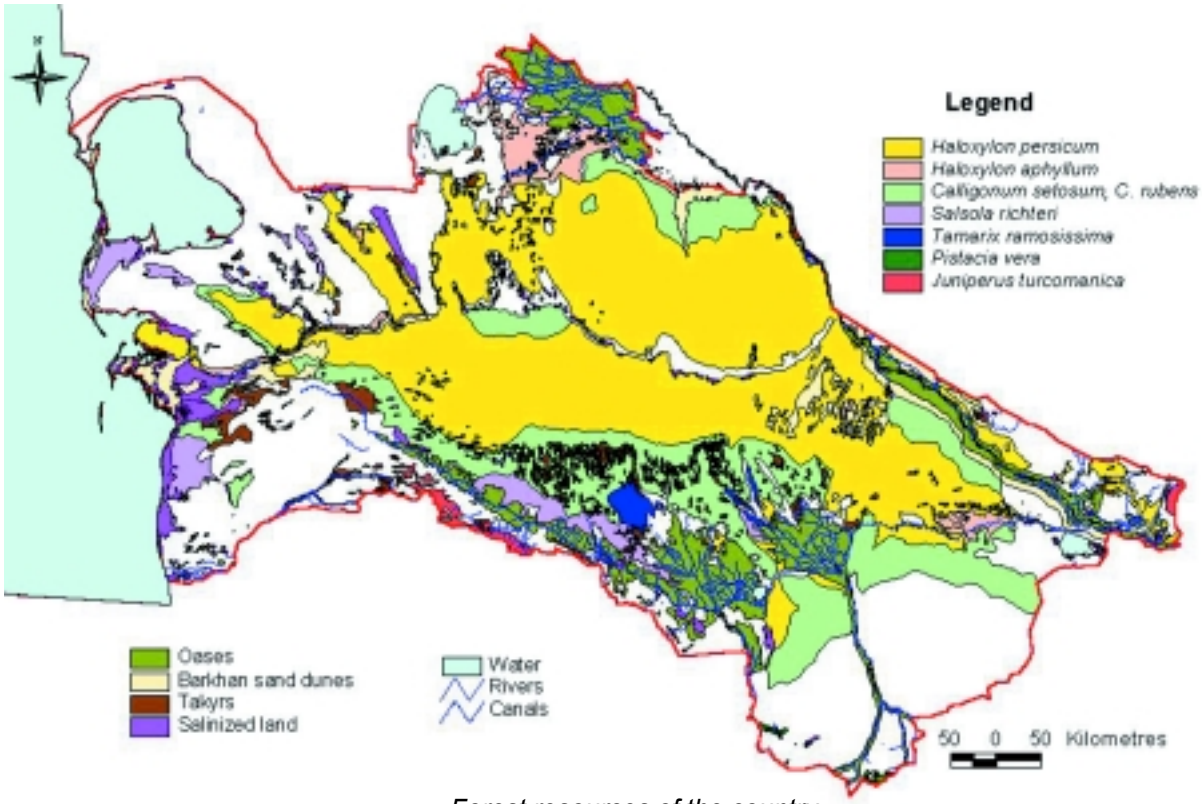
The document has been prepared as an integrated Action Plan in which a timescale of implementation, sources of financing and targets are defined. The Action Plan is a system of definite measures and actions aimed at biodiversity conservation.

Management, implementation, monitoring, financing and approximate costs are also covered in the Action Plan.

Expected Outcome of the Plan

The Action Plan provides a mechanism to solve the problems of biodiversity conservation in Turkmenistan;

The Action Plan inspires confidence that biological resources will be restored and will be a foundation of the well being of the human population of Turkmenistan.



Forest resources of the country

ACKNOWLEDGEMENTS

This Biodiversity Strategy and Action Plan was prepared by the Ministry of Nature Protection of the government of Turkmenistan, under the guidance of the "State Commission of the Ministry of Nature Protection for ensuring implementation of the commitments of Turkmenistan under the UN Environment Conventions and Programmes" which acted as a Steering Committee. The State Commission included senior members of key state institutions (Ministry of Nature Protection, State Forestry Agency, Ministry of Economy and Finance), representatives of academic institutions and NGOs, and was headed by the Deputy-Chairman of the Cabinet of Ministers of Turkmenistan R.S. Saparov. The State Commission ensured general management, approval and support at the key stages of the BSAP preparation process.

The BSAP project's national co-ordinator was the Minister of Nature Protection, M. Rajapov. The core project team consisted of A. Shamuradov (Project Manager), D. Saparmuradov (Fauna expert), G.L. Kamakhina (Protected areas expert), and S.B. Karryeva (Biogenetic resources expert). Translation and administrative support were provided by O.B. Ishanova (Finance assistant), E.A. Goncharuk (Administration assistant), and S. Akmedov (Information technology assistant).

Funding for the BSAP preparation process was provided by the Global Environmental Facility through the UNDP office in Turkmenistan. International technical assistance was provided by a team of consultants from Fauna & Flora International, co-ordinated by C. Magin.

We would like to take this opportunity to extend our heartfelt thanks to all the wide range of specialists, interested individuals and organisations who participated in and contributed to, the development of the BSAP during a national series of workshops and via an extended system of expert working groups.

1. OVERALL INTRODUCTION

1.1 Global Importance of Biological Diversity

The biological resources of the Earth are necessary for the economic and social development of humanity. The precise numbers of existing flora and fauna species are not known. Preliminary evaluation of data puts the figure at between 10 and 50 million species. Scientists have described more than 1.5 million separate living forms. Many of these forms have not only common origins and genetic relationships but also are continuously inter-linked in a mutually supporting network preserving life. Every species fulfils its own function, which other species are not able to fully substitute, and so each can be regarded as irreplaceable.

Natural ecosystems support conditions necessary for the existence of human beings. They purify air and water, stabilise and mediate the climate, restore soil fertility, and eliminate wastes. The organic world is an indissoluble complex network. The loss of any element of this network, which at first sight may seem insignificant, runs the risk of causing the destruction of the whole system.

The combination of all species is what makes the Earth's surface suitable for the maintenance of life. Biodiversity components provide a source of genetic material. Therefore, it can be safely said that sustainable development of any society is impossible without the sustainable condition of the biodiversity components on which it depends.

Despite the fact that biodiversity has high value not enough attention is paid to the problems of its conservation. One of the reasons for this is the long-held belief that the resources of the organic world are limitless.

Unfortunately the sustainable state of ecosystems has been disturbed during recent years and this has caused irreplaceable loss of biodiversity components. Biodiversity reduction on the planet still continues mainly through the destruction of natural habitats (forests, steppes, deserts, etc.), excessive exploitation of natural resources, environmental pollution and introduction of alien species.

At present there is no ecosystem on the planet that does not suffer to some extent from the vigorous economic activities of humans. Today on the global level nearly 45% of forests and nearly 10% of coral reefs have been lost; steppes as a type of a landscape have practically vanished, while 34,000 flora species and 5,200 fauna species are extinct or threatened with extinction (according to UNEP / IUCN data).

The current loss of biodiversity is unprecedented in the history of mankind. Eminent scientists of the world consider that if current extinction rates continue, by 2020 the Earth will have lost nearly 20% of all living species. Moreover the loss of species and ecosystems is accompanied by huge losses of genetic diversity within species.

Extinction of any species, either a plant or animal or bacteria means a reduction in the number of occupied habitats and threatens other existing species.

Therefore conservation of not only individual species, but also their natural communities

is very important. A great number of species in such natural communities fulfil evolutionary co-ordinated functions ensuring the maintenance of life in an unstable changing environment.

We can state that the practical, esthetical, ethical, scientific, and educational values of biodiversity are immense and irreplaceable. However its most important function is a biospheric one: i.e. the support of the stable parameters of the environment. Impoverished, destroyed and anthropogenically-modified ecosystems are not able to fulfil this function.

Meanwhile natural ecosystems have not been preserved in the majority of countries of the world. In many other countries the dramatically human-altered environment surrounds small natural flora and fauna communities and they are exposed to destructive influences. Areas of environmental degradation are increasing and now already cover one third of all land.

In these circumstances territories and countries that have conserved natural wild ecosystems become particularly important. They become centres of biodiversity conservation and stabilisation for the whole planet's biosphere. Their support will give hope for the restoration of the lost biosphere balance.

Many scientists and philosophers emphasise the idea of the inter-dependence of all living things on the Earth. It is appropriate to mention here the words of a well-known German researcher, Bernhard Grzimek, whose life's work was the conservation of nature: "We should share our place under the sun with animals" - and of course plants. That is why the main aim of this project is to make people in Turkmenistan aware of the dependence of human well-being on the conservation of biodiversity (above all national biodiversity) which is a measure of the quality of life.

1.2 Convention on Biological Diversity

Awareness of the serious threat to the well -being and indeed existence of humanity caused by the loss of biodiversity induced the governments of many countries to adopt the Convention on Biological Diversity. The Provisions of the Convention form a unified legal basis for all international agreements on the conservation of species, communities and ecosystems. The CBD serves as a powerful spur to the establishment of mechanisms that could potentially create large-scale models for reconciling biodiversity conservation and sustainable development.

The Convention was opened for signing on 5th June 1992 at the UN Conference on Environment and Development in Rio de Janeiro, at a meeting of the World's leaders dubbed the "Earth Summit". By 4th June 1993, 168 countries had signed it. The Convention entered into force on 29th December 1993 [32].

The Convention on Biological Diversity pursues three main goals:

- conservation of biological diversity;
- sustainable use of its components;
- fair and equitable sharing of the benefits related to the use of genetic resources, including permitting necessary access to genetic resources and transfer of appropriate technologies as well as providing necessary financing.

The Provisions of the Convention stipulate specific commitments to reach these goals. They are stated in the 42 Articles of the Convention.

Having signed the CBD, Parties preserve full sovereignty over the use of their biological resources: however they are bound to certain commitments, namely conservation and sustainable use of natural resources, research activities and training of specialists, monitoring, public informing and participation, ensuring access to genetic resources, financing, etc. In short, these are commitments to implement national actions that promote biodiversity conservation, and develop and implement biodiversity conservation projects.

The CBD confirms the unique and priceless value of biological diversity for the maintenance of life and ensuring the sustainable well-being of present and future generations.

1.3. Biodiversity Strategy and Action Plans

One of the particular conditions of the CBD (stipulated in Article 6) is that all Parties (i.e. those countries that have adhered to the Convention) should conduct a national Country Study of biological diversity, and then develop and implement a Biodiversity Strategy and Action Plan (BSAP) for its conservation [32].

Such a Country Study should be based on an analysis of the national status of biodiversity, scientific, institutional, legal, economic, educational, information management measures, and other peculiarities of the country as well as ways of engaging traditional experience and the involvement of the local population in this process. The analysis should include data on the number of species in various systematic groups, number of endemics and species included in the Red Data Book and information on governmental and non-governmental organisations operating in the sphere of nature protection as well as threats connected to human activities, etc.

The overall aim and objectives of the Strategy are identified on the basis of this analysis. They should accord with the Provisions of the CBD as well as with the general approach to conservation in the region where the given country is located.

The objectives of the Strategy include the identification of existing problems and development of measures aimed at their solution. The actual status of biodiversity and expected results of the activities for its conservation are analysed. The present state of the country's human, institutional and financial resources are evaluated and needs for international co-operation are defined. The Strategy should suggest necessary actions and investments aimed at each identified priority area.

Specific steps, dates and means of implementing the Strategy are defined in the Action Plan. It also includes actions on other projects in the sphere of biodiversity conservation, which are currently being realised or are planned to be implemented.

The Biodiversity Strategy and Action Plan are focused on the mobilisation and co-ordination of governmental and non-governmental organisations' efforts as well as identification and attraction of donors interested in supporting particular areas of biodiversity conservation.

1.4. Short Review of the Status of Turkmenistan's Biological Diversity

Biodiversity plays an important role in the creation and maintenance of an environment fit for humans. Natural ecosystems maintain biological processes important for human life such as soil formation, surface water purification, control of run-off and precipitation, maintenance of the gaseous composition of the atmosphere and many others.

The fisheries, tourism, forestry and agricultural industries depend directly on the sustainable use of ecological resources. Wild relatives of cultivated plants and numerous medicinal and economically important species are currently used or will be used in the future for the benefit of society and the country. An economic assessment of biodiversity has yet to be conducted, but the Turkmenistan Government recognises that its protection and support is an investment for the future.

The economy of Turkmenistan developed slowly before independence. The monocultural character of agriculture, centralisation of industry and failure to take into account local conditions led to serious threats to the country's biodiversity. Correspondingly the nature protection system was based on the command economy/central administration format that quite often led to conflicts between SPAs and the local population and damaged the development interests of the regions.

Despite the relatively low population density, some areas have suffered from overpopulation. Today the internal and foreign policy of Turkmenistan promotes biodiversity conservation and sus-

tainable use of resources. With the growth of industry and infrastructure, effects on components of biodiversity are expected to increase: however, current socio-economic conditions provide the foundations for the successful solution of the problems connected with biodiversity conservation.

The main threats to biodiversity are habitat loss, invasive (alien) species, pollution and over-exploitation of biological resources.

1.5. Biodiversity Strategy and Action Plan for Turkmenistan

1.5.1.Ratification of the Convention on Biological Diversity (CBD)

The Turkmenistan Parliament (Mejlis) ratified the Convention on Biological Diversity (CBD) on 18th June 1996. In line with their responsibilities under Article 6 of the CBD the Government of Turkmenistan has undertaken the development of a Country Study on the Status of Biodiversity, the first step towards implementation of Turkmenistan's commitments. The Country Study contains a detailed review of the country's biodiversity status as well as the factors that influence it. On the basis of this information a comprehensive plan (the BSAP) has been developed. This plan aims at co-ordinating biodiversity conservation activities in Turkmenistan over the next nine years. The draft documents were approved by the State Commission's decree No.2 of March 3, 2002.

1.5.2. Development of the BSAP

The Ministry of Nature Protection, with technical assistance and consultation from the international non-governmental organisation Fauna & Flora International (FFI), developed the BSAP, which was funded by a grant from the Global Environment Facility through UNDP. Work on the project started in August 2000.

In order to strengthen the BSAP and ensure its successful implementation a great number of existing guidelines have been taken into account in the process of its development. Thus many interested parties have taken part in the development of the BSAP; and different opinions on biodiversity and its conservation have been taken into consideration. Information on the current status of biodiversity in Turkmenistan has also been collected from various sources including 15 national consultants and a large number of inter-sectoral specialists.

1.5.3. Preparation Process

The BSAP document itself was developed between October 2001 and March 2002. The management process included the following:

The main link in the preparation process was the BSAP Co-ordination Group;

The preparation process was carried out under the guidance and control of the State Commission which included representatives of management from the major state institutions, academic and research institutes as well as a working group for the implementation of the CBD;

An international group of consultants from FFI worked together with the BSAP Co-ordination Group. It provided technical support;

Thirty contracted specialists/consultants shared their knowledge and experience;

Hundreds of people from various organisations were involved in the process of project preparation, while the development process further extended the number of interested parties;

Mass media publicity also helped to extend full participation and ensured public awareness of this project.

The development of the BSAP was implemented in several stages: preparation; collection and assessment of the information; action planning; strategy development and implementation. During each stage of the development of the report and plan, seminars, public forums, reviews, working group meetings, and inter-sectoral meetings were held. The project was widely covered in the mass media.

A more detailed description of the project preparation process is given in Appendix 3.

1.5.4. Document Structure

The Document consists of three main parts:

Section One gives general information, introduction to the BSAP, the purpose of the process and the final document.

Section Two presents a summary of the Country Study on the Status of Turkmenistan's Biological Diversity. It gives a review and analysis of the current status of, and threats to, biodiversity, programmes for biodiversity conservation and factors which directly or indirectly influence biodiversity. The Review serves as a foundation for consideration of the biodiversity conservation activities in the country taking into account biological, social, infrastructure and economic factors. Generalisation and detailed information analysis is the basis for the planning of future activities related to biodiversity in the framework of the identified constraints and opportunities.

Section Three of the document outlines an integrated mechanism for tackling the problems facing biodiversity conservation. This Section contains the overall aim of the Biodiversity Strategy, the principal objectives and a number of strategic components. These components are described in more detail as a set of actions and activities; with approximate costs and time-scales of implementation. The Action Plan is supported by additional information on methods for evaluating and reporting on progress, together with a schedule for its implementation.

1.5.5. Intended Audience for the BSAP

The BSAP document is a description of the national policy on biodiversity and is addressed to politicians, public servants, businessmen, scientists and donors, including national, international, governmental and non-governmental donors, and representatives of NGOs. This information will also be useful to a wider range of society, such as journalists, teachers and those people who directly or indirectly use biodiversity.

Landscape in the Kopetdag foothills

2. COUNTRY STUDY OF TURKMENISTAN'S BIODIVERSITY

2.1. Review of the Country Study on the Status of Biodiversity

All available information on the current biodiversity situation in Turkmenistan and factors that affect it has been collected in a separately published document. This "Country Study on the Status of Biodiversity of Turkmenistan" is not merely a source of information for public consideration, but gives a full assessment of biodiversity threats and a description of the priority actions for biodiversity conservation. Analysis of the problems, caused mainly by anthropogenic influences, provides a foundation and a framework for the future planning of actions for biodiversity conservation.

The Country Study document is the first complete study on Turkmenistan's biodiversity and forms a basis for the concept of sustainable development and strategy for biodiversity conservation. A number of direct and indirect factors affecting biodiversity and its conservation are analysed. A large volume of information is included in nine chapters, and seven Appendices. The material is illustrated by 19 figures, five tables and 55 photos. At the same time we do not exclude the possibility that there is further new and more detailed information that could be added to and correct future editions of the BSAP.

The status of Turkmenistan's biodiversity and its global importance is given in the first chapter of the Country Study. Current activities and existing programmes on biodiversity conservation are reviewed in further chapters. A rather detailed analysis is given of the country's institutional and administrative basis as well as of research on and the legal framework concerning biodiversity. A brief summary of financial resources, and analysis of economic and social problems allowed all factors to be combined in the problem analysis. This helped to reveal the main constraints and opportunities for future development of activities on biodiversity conservation in Turkmenistan.

2.2. Biodiversity Status

2.2.1. General Characteristics

Three large floristic provinces meet in Turkmenistan: the Kopetdago-Horasan (Kopetdag, Greater and Lesser Balhans), the Montane Central Asian (Kugitang) and Turan (Karakum) with the transitional region of Badkhyz and Karabil [26]. This accounts for the unique characteristics of biological and landscape diversity, which simultaneously exhibit features of both the Central Asian, Mediterranean and Turan desert flora. Almost all the territory of Turkmenistan (80%) is desert or semi-desert. The majority of the territory (9,351,100 ha) is occupied by sand-and-desert sparse forests (forests of arid type) stretching from the Caspian Sea to the Amudarya River. Small areas of riverine tugai and montane juniper forests as well as the montane steppes

of the Kopetdag and Kugitang attached to them have a unique national and regional character. For instance, the montane steppes of the Kopetdag have much in common with the southern steppes of Russia, Iran and Armenia [26] forming a single centre of steppe flora development.

Saxaul *(Haloxilon sp.)*

A specific character of the Kopetdag biodiversity is the fact that its range serves as a peculiar montane bridge: many representatives of flora from the Iranian Plateau and eastern Caucasus migrated to Turkmenistan. Therefore, the Kopetdag, a part of the Horasan mountains of eastern Iran, reflects the flora of Iran, with close genetic relations with the Caucasus and montane Central Asia flora. Besides this, there is a large number of rare species and relict habitats with a high degree of endemism that are characteristic of ancient arid ecosystems (for instance, the level of endemism in the Kopetdag is 16% [26], whereas in the Karakums it is only 1.3%) [12]. Wild relatives of the cultivated flora species of the Central Asian Genetic Centre are preserved *in situ*. A high level of floral taxonomic studies made Turkmenistan the first state in Central Asia to possess a full description of the existing flora.

During more than a hundred years of study 3,140 higher plant species (3,000 vascular plants, 17 horsetails and ferns, 12 gymnosperms, 140 mosses, 2,969 angiosperms) and 3,924 lower plant species (470 lichens, 827 algae, 2,585 fungi, and 42 bacteria) were discovered. There are 7,064 species of flora [8,31,34,43, 53, 63, 66, 67].

Many of the faunal groups, such as the vertebrates and ichthyofauna of the inland water systems have been studied more completely. The most studied faunal groups are amphibians and reptiles (Turkmenistan contains 53.5% of all species of these groups living on the territory of the CIS). There are 683 vertebrate species recorded in Turkmenistan: 1 Cyclostomata, 115 fishes, 5 amphibians, 82 reptiles, 376 birds and 104 mammals. There are 12,000 invertebrate species including 500 Protozoa, 1,100 Platyhelminthes, Nematodes and Annelida, over 20 Crustacea, 600 Arachnida and 8,000 species of insects [4, 39, 45, 50, 57, 59, 64, 67]

2.2.2. Species of Key Importance

Amongst the dominant plant species, 130 are considered to be of key importance. In the desert communities of the Karakums, the key species are black and white saxaul (*Haloxylon persicum, H. aphyllum*). In the semi-savannah, key species are *Poa bulbosa,* and *Carex pachystylis.* In the mountains Turkmen juniper (*Juniperus turcomanica*), Zaravshan juniper (*J. seravschanica*), *Ephedra intermedia* and *E. equisetina* are key species while in the mountain steppes it is species of *Festuca* and *Elytrigia*, *Artemisia ciniformis, A. gypsaceae*, and *A. badhysi* and saltworts such as *Salsola dendroides, S. orientalis* and *S. gemmescens*.

Of the 393 rare plant species, 370 are found in the mountains including 255 that are endemic. There are 100 endemic or rare species in the lichen flora of Turkmenistan.

There are 92 endemic and near-endemic vertebrate taxa which are of great importance to national biodiversity (25 of which are reptiles). Three geckos (*Eublepharis turcmenicus, Alsophylax laevis* and *Alsophylax loricatus* ssp. *szczerbaki*) and a lizard (*Lacerta defilippii*) are endemic to the Turkmen-Horasan Mountains. Some lizard species, for example the Baluch stone gecko (*Bunopus tuberculatus*), rock gecko *(Cyrtopodion longipes)* and the steppe racerunner (*Eremias arguta*) are at the edge of their natural range in Turkmenistan. A local population of the spotted toad-headed agama (*Phrynocephalus maculatus*) is found in a 10 km^2 area of saltmarsh in Ulyshor and in the foothills of the western Kopetdag.

Crocus michelsonii

Although there are no national endemics, the bird fauna of Turkmenistan is important in terms of the conservation of rare and threatened birds (19 taxa), most of them breeding in the central or south-western Kopetdag.

There are many endemic and regionally-endemic mammal species in Turkmenistan (19 taxa) including the mouse-like or Asiatic dormouse (*Myomimus personatus*), the rare jerboa *(Allactodipus bobrinskii)*, the mouse-like hamster (*Calomyscus mystax*), the comb-toed jerboa (*Paradipus ctenodactylus*), Blanford's or greater three-toed jerboa (*Jaculus blanfordi*), and the long-clawed ground squirrel (*Spermophilopsis leptodactylus*). Zarudny's jird or gerbil (*Meriones zarudnyi*) is at the northernmost end of its range in southern Turkmenistan.

Spermophilopsis leptodactylus

Among ungulates, three subspecies of mountain sheep or urial, the Afghan urial (*Ovis orientalis (= vignei) cycloceros*), the Bukhara urial (*O. o. bochariensis*) and the Transcaspian urial (*O. o. arkal*) as well as the Bukhara deer (*Cervus elaphus* ssp. *bactrianus*) are regional endemics. The red deer subspecies *Cervus elaphus maral* formerly inhabited the western Kopetdag, but is now extinct in Turkmenistan. In desert ecosystems, kulan (*Equus hemionus* ssp. *onager*) and sand gazelle (*Gazella subgutturosa*) are of key importance [54, 55] (Appendix 1).

On a regional level there are 28 species and subspecies of fish that are restricted to aquatic ecosystems of adjacent countries, and one lamprey (*Caspiomyzon wagneri*). For example, the Aral Sea basin contains the following endemics: the striped bystranka (*Alburnoides taeniatus*); the pike asp (*Aspiolucius esocinus*); the asp (*Aspius aspius*); Aral barbel (*Barbus brachycephalus* ssp. *brachycephalus*); Bulatmai barbel (*Barbus capito* ssp. *conocephalus*) and subspecies of the Danube bleak (*Chalcalburnus chalcoides aralensis*); the ide; and the roach (*Rutilus rutilus aralensis*).

Bukhara deer *(Cervus elaphus bactrianus)*

Sand gazelle *(Gazella subgutturosa)*

The following fish species are found in the rivers of the Kopetdag and Paropamiz in Turkmenistan as well as in Iran and Afghanistan: the Transcaspian marinka (*Schizothorax pelzami*), the Turkmenian loach (*Nemacheilus sargadensis*) and Turkmenian crested loach (*N. cristata*). A blind cave loach (*Nemacheilus starostini*) is the only endemic fish species in Turkmenistan. Two species of sturgeon in the river basins of Turkmenistan are regional endemics: the small Amu-Dar shovelnose sturgeon (*Pseudoscaphirhynchus hermanni*) and the large Amu-Dar or false shovelnose sturgeon (*P. kaufmanni*), as is a subspecies of the roach (*Rutilus rutilus uzboicus*). The only population of the dwarf form of carp bream (*Abramis brama* ssp. *orientalis)* is found in Lake Yazkhan in western Uzboy.

2.2.3. Threatened Species

The Red Data Book of Turkmenistan was published to provide information about the conservation of threatened plant and animal species. The increase in the number of species listed from 1985 (152 species) to 1999 (261 species) was due to the inclusion of invertebrates, fungi, lichens, mosses, ferns, and gymnosperms [35, 36]. Ninety-eight taxa in Turkmenistan are included in the IUCN Red Lists (1996, 1998, 2000) - see Appendix 2. The most threatened category in the Red Data Book of Turkmenistan (1999), species endangered or threatened with extinction, included 17 animals and 28 plants.

According to these publications the population status of the following taxa is causing concern: North Persian leopard (*Panthera pardus* ssp. *saxicolor = P. p*. ssp. *ciscaucasica*), kulan, Bukhara deer, sand gazelle, Turkmen wild goat or bezoar (*Capra aegagrus* ssp. *turcmenica*), Afghan urial, Caspian snowcock (*Tetraogallus caspius*), saker falcon (*Falco cherrug*), lammergeier (*Gypaetus barbatus*), houbara bustard (*Chlamydotis undulata*), great bustard (*Otis tarda tarda*), the agamid lizard *(Phrynocephalus maculatus)*, and the small and large Amu-Dar shovelnose sturgeons. Among plants the following should be noted: *Calligonum triste*, *Sibera nana*, *Atrops komarovii*, Turkmen mandrake (*Mandragora turcomanica*), and *Epipactis turcomanica*.

2.2.4. Plant Species of Economic Importance

Saker falkon *(Falco cherrug)*

Plants of economic importance are those that are used in the drug, food, perfume and dyeing industries. Plants used in the production of drugs and medicines are critical for maintaining the health of the nation. Around 40% of the drugs used in Turkmenistan today contain ingredients derived from plants. Liquorice is a particularly important plant for export. The demand for liquorice increases every year. Methods for producing liquorice on an industrial scale are being developed and used. Liquorice and its by-products are one of the main preparations produced by the Turkmen pharmaceutical industry and exported world-wide. Turkmenistan exports only two drugs, liquorice and the introduced *Cassia senna*, which is used as a laxative. In the year 2000, export sales of liquorice totalled 4,800 billion manats (approximately 923 million US$). In the past few years about 50 species of local flora have been cultivated. It has been proved that nearly 40 of the most valuable drug plants can produce high yields in irrigated areas. This will allow Turkmenistan to reduce the level of drug imports and also export some of its own production.

Food and non-food plants (700 species) as well as plant dyes (over 100) are widely used in many industries. The Government of Turkmenistan has taken measures to restore and to reintroduce natural dyes into the carpet industry, as they are more stable and colourful than artificial dyes. In addition to the carpet industry natural dyes may be used for dyeing more expensive and refined fabrics such as silk. It is possible to get many different colours and tints (60 tints) for dyeing yarn, fabrics and leather.

Today 53 species of wild and cultivated plants are used by the food industry. Some of the most economically valuable plants are the saponin-producing species such as the Turkestan soap root (*Allochrusa gypsophilioides*). Rubber-producing plants such as *Astragalus pulvinatus* as well as plants such as *Anabasis aphylla,* from which both soda and poisons for the extermination of pests and production of toxins can be produced are also of certain economic value.

a *b* *c*

Medicinal plants*: a – Rheum turkestanicum; b – Hypericum scabrum; c – Ephedra intermedia*

Ziege *(Pelecus cultratus)* is an economically important fish of inland waters

Wild boar (hunting permitted with a licence), tolai hare, pigeon and waterfowl (coots, ducks and geese) are game species of economic importance.

Sturgeons are of particular importance in the Caspian Sea. Though there are no spawning grounds in the Turkmen part of the Caspian Sea, and therefore there are no locally-hatched sturgeon, the coast from Esenguly to Ogurchinsky Island is a major fattening and wintering place for sturgeon spawned in the area from the Volga river in the north to Sefridruda in the south. The other important habitat for the fish of the Caspian Sea is the Ajiyab spawning ground at the mouth of the Atrek River. Other valuable fish species in the Caspian Sea include sprats (*Clupeonella* spp.), grey mullet, common carp, and roach. Since 1996, fishing of the brine shrimp (*Artemia salina*) on an industrial scale has begun in Karabogazgol Bay.

Until recently, two species of venomous snake, the Oxus cobra (*Naja naja* ssp. *oxiana*) and the blunt-nosed viper (*Vipera lebetina*), were captured in order to extract their venom. In the last few years cobras have not been used in this way. The Kopetdag mountains, particularly the eastern areas, are a major habitat for the blunt-nosed viper.

The nutria and musk-rat are two fur-bearing animals of economic importance that have been artificially introduced into Turkmenistan. In the inland waters of Turkmenistan, introduced Far Eastern herbivorous fishes such as white-eye bream and white Amur bream are the species that are mainly caught [41, 52, 57].

2.2.5. Invasive / Alien Species

Invasive species found in Turkmenistan can be divided into two groups. The first contains species, for instance, freshwater fishes, which were intentionally introduced to increase productivity in aquatic ecosystems and combat the excessive growth of aquatic plants. Many ornamental plants have also been deliberately imported, and have then escaped into the wild. The second group is represented by those species such as the three-spined stickleback (*Gasterosteus aculeatus*) and jellyfish *(Mnemiopsis leidyi)* accidentally introduced to the country through the emptying of ship's ballast water in the Caspian Sea. The natural flora is being affected by alien trees such as the osage-orange or bowwood (*Maclura pomifera*), *Gleditsia triacanthos* and the tree of heaven (*Ailantus altissima*) from China, which is establishing itself in mountain valleys.

The threat from non-native species in agriculture is well understood, but the threat to biodiversity remains underestimated. In particular, in the Caspian Sea alone there are up to 50 non-native exotics, including species which in the past have devastated the Black and Azov Seas. The problem of non-native species has not previously been considered one of the more serious threats to the Caspian biota; however analysis of the actual indirect data puts this problem at the top of the list of threats.

2.2.6. Agrobiodiversity

In Turkmenistan, especially in the mountain regions, wild ancestors of Central Asian cultivated species have been preserved *in situ*; their cultivation began several thousand years ago. Wild species (including weeds) are important reservoirs of genetic material for the development of new cultivated varieties.

Among the wild relatives of domestic animals, populations of markhor (*Caprus falconeri*) and wild goat are rather diverse and unique. The kulan is the only representative of the

A total of 249 species of wild relatives of cultivated plants [33, 42] have been found in Central Asia, of which 172 are plants found in Turkmenistan (89 genera, 28 families). In addition there are 100 ornamental species that are of direct importance in the development of cultivated varieties and that provide a rich source of genetic material. There are more than 40 wild ancestors of tree species, such as walnut, iron tree, pomegranate, and mulberry (*Morus alba, M. nigra*). Wild grapes (*Vitis sylvestris*) and the relict rootstocks of the grapes cultivated during the long history of selective breeding constitute a great number of varieties [21].

genus *Equus* that was conserved in Turkmenistan [38]. Some local breeds such as the Akhalteke horse [51], karakule and sarja sheep breeds [17], one-humped camel (dromedary), borzoi tazy dog, and Central Asian sheep dog (alabai) [19, 23, 37] are used not only in neighbouring and distant countries, but have also influenced the creation of new breeds.

In spite of severe arid conditions and the limited water resources in Turkmenistan, different plants have been adapted and cultivated for centuries. Today, over 100 ancient forms of 19 main species of cultivated plants selected and grown in Turkmenistan for many years, have been preserved [46, 58, 60, 61 65].

A local sort of white wheat - Ak bugdai - which was first cultivated 5,000 years ago, has been preserved. Local types selected on the basis of wild growing forms of cotton, wheat, corn, pumpkin, grapes, and watermelon provide excellent source material for the production of further varieties [46].

2.2.7. Biodiversity of Ecosystems

Up to 80% of Turkmenistan is desert. Mountain ecosystems cover small areas: above 600-650 m lie areas sparsely wooded with deciduous trees; above 1,000 m juniper (archa) woods are found; and above 2,700-3,000 m are mountain steppes. The riverine ecosystem includes areas of tugai, wormwood, saltwort and water-meadow vegetation. The territory of Turkmenistan includes the underwater shelf area of the eastern half of the southern Caspian Sea down to a depth of 200 m.

Deserts. A major part of the biodiversity in deserts is in areas such as the barkhan dune fields which cover 350,000 km^2. Vascular plants are found in the barkhan sands, some of these are typical sand dune species such as *Stipagrostis karelinii*, *Ammodendron conollyni*, and *Acanthophyllum elatius*, *Calligonum bobyri*, *C. muravljanskyi*, *Artemisia leucodes* are found on kyr (= mixed clay and sand desert) ridges [11] of strata in Zaunguz. *Salsola gemmascens*, *Anabasis salsa* and other species are typical of takyrs (= clay desert), which cover 5 million ha or 10 % of the territory, where blue-green algae and lichens are predominant, with occasional annual saltwort (*Salsola* spp.). In saline areas, typical salt-tolerant species, mainly bushes (for example common glasswort (*Salicornia europaea*) and *Halostachys belangeriana*) are found. Clay badlands are vegetated by scattered annual saltwort plants (*Salsola* spp.) [12].

Barkhan sands in the Central Karakum

Desert monitor lizard or varan *(Varanus griseus)*

Almost 90 species of lichens are found in the loamy deserts of Turkmenistan: 20 species in gypsiferous deserts, and 68 species in sand deserts. The desert moss *Tortula caninervis* is a typical species of desert ecosystems [53].

The national symbols of the desert are the kulan and sand gazelle. Deserts are also home to amphibians such as the Eurasian green toad (*Bufo viridis*) as well as more than 40 species of reptiles including the steppe agama (*Trapelus sanguinolentus*), race-runners or fringe-toed geckos (*Eremias* spp.), agamid lizards (*Phrynocephalus* spp.), rock geckos (*Cyrtopodion* spp.), snakes, desert monitor lizard (*Varanus griseus*) and steppe tortoise (*Agrionemus horsfieldi*) [64]. Two hundred and twenty species of birds [50] live in the Karakum desert, 60 of which are breeding species. These include species such as long-legged buzzard (*Buteo rufinus*), little owl (*Athene noctua*), eagle owl (*Bubo bubo*), saxaul sparrow (*Passer ammodendri*), and Pander's ground jay (*Podoces panderi*). More than 40 species of mammals are recorded from the deserts of Turkmenistan. These include *Diplomesodon pulchellum,* long-eared desert hedgehog (*Hemiechinus auritus*), Tolai hare (*Lepus tolai*), and goitred or sand gazelle. Predators include red fox (*Vulpes vulpes*), Corsac fox (*Vulpes corsac*), golden jackal (*Canis aureus*), wolf *(Canis lupus)*, European weasel (*Mustela nivalis*), marbled polecat (*Vormela peregusna*), caracal (*Felis* (*Lynx) caracal*), sand cat (*Felis margarita*), and wild cat (*Felis lybica*). The characteristic species of the sand desert is the piebald or sand shrew (*Diplomesodon pulchellum*). More than 1,500 species of insects are recorded including many species of locust, ants, termites and beetles (especially family *Tenebrionidae*).

Mountains. The importance of *mountain ecosystems* cannot be over-exaggerated in terms of the conservation of arid ecosystems as a whole (species diversity of montane fauna and flora, montane rivers and springs, prevention of soil erosion). The conservation of mountain rivers and springs helps prevent soil erosion and thus increases the sustainability of the ecosystems in the plains. The conservation of juniper forests *(Juniperus* spp.*)* and montane steppes, which are exposed to noticeable degradation [24] is an important indicator of the sustainability of mountain ecosystems.

The sparsely wooded deciduous areas are characterised by species such as *Certis griffithii, Acer turcomanicum, Acer pubescens*, iron tree (*Celtis caucasica*), pistachio (*Pistacia badghysi*), *Colutea buhsei,* and *Paliurus spina-christi*, which typically grow on dry stony and scree slopes. These areas are heavily influenced by human activities such as tree-cutting and game hunting that reduces their species diversity. Habitats dominated by *Celtis* are more stable. Habitats dominated by maples, members of the Zygophyllaceae and, in the southwestern Kopetdag *Paliurus spina-christi,* are widespread. There are also scattered areas of pistachio savannah, but these do not form any large continuous tracts.

The juniper woods (42,020 ha) adjoin the mountain steppes. Again, these are fragmented without any large continuous tracts, and are mostly found in the border area from the Arvaza-Messinev region up to the Tekechengasy range near Kuruhaudan.

Caracal *(Felis (Lynx) caracal)*

The mountain steppes are found at higher altitudes than the juniper woods. They are often found in small inter-montane valleys or the bases of canyons. The best-preserved examples are in the Kopetdag. In the Kopetdag steppes, xerophytic plants are encroaching on feather-grass habitat.

Mountain scenery

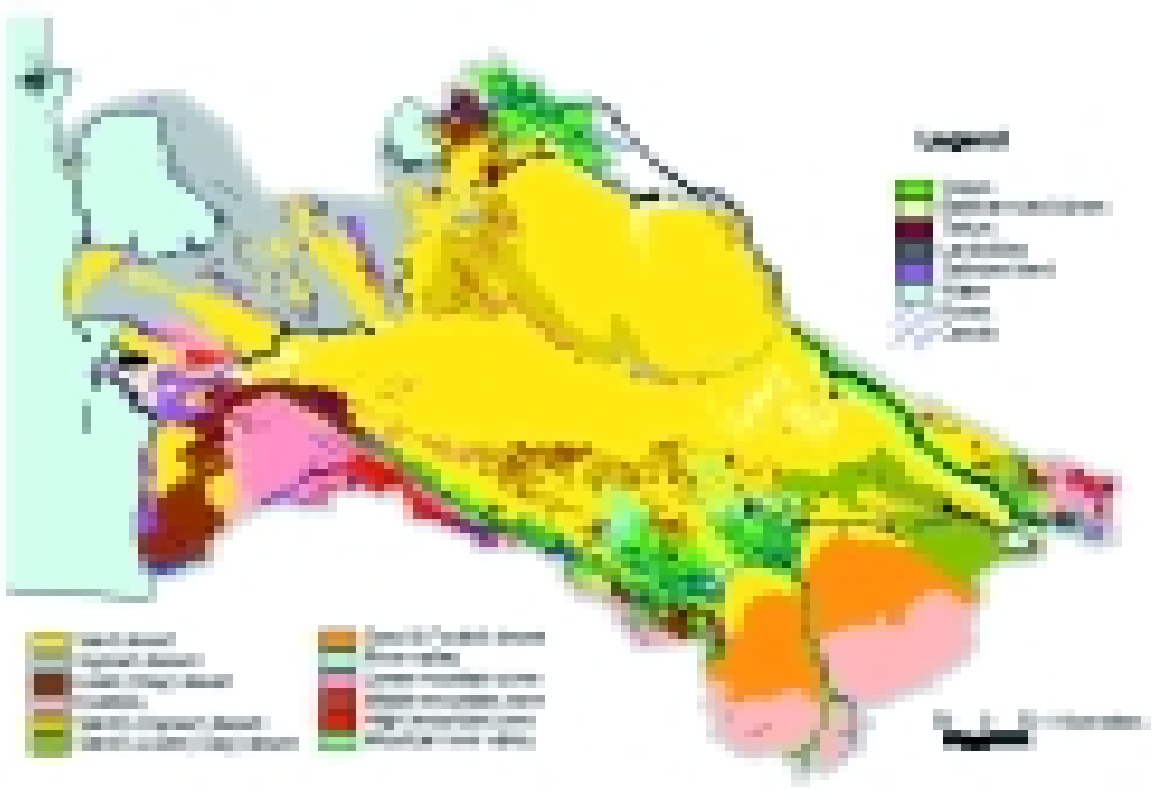
Two thirds of Turkmenistan's terrestrial vertebrate species are found in mountain ecosystems, including almost all amphibian species (four species). Nearly 50 species of reptiles are found in the mountains, including agama (*Agama caucasica*), armoured glass-lizard (*Pseudopus apodus*), skinks (*Mabuya* aurata.), Schneider's skink (*Eumeces schneideri* ssp. *princeps*), mountain racer (*Coluber ravergieri*), Forskal's sand snake (*Psammophis schokari*), the blunt-nosed or Levantine viper (*Vipera lebetina*), and the Oxus cobra (*Naja naja* ssp. *oxiana*) [4]. Species such as the gecko *Eublepharis turcmenicus*, cat snake (*Telescopus rhynopoma*), Grozny lizard (*Lacerta defilippii*) and ocellated skink (*Chalcides ocellatus*) are endemic to the Kopetdag. There are 290 bird species recorded from the mountains, 150 of which are breeding species. Typical mountain birds include choughs (*Pyrrhocorax* spp.), white-winged grosbeak (*Mycerobas carnipes*), rock sparrow (*Petronia petronia*), Eastern rock-nuthatch (*Sitta tephronota*), Chukar partridge (*Alectoris chukar*), lammergeier or bearded vulture (*Gypaetus barbatus*), Caspian snowcock (*Tetraogallus caspius*) etc.

Nearly 75 mammal species are found in the mountains including North Persian leopard, Pallas' or steppe cat (*Otocolobus* (= *Felis*) *manul*), urial, Turkmen wild goat or bezoar, Tadjik markhor (*Capra falconeri heptneri*), Blanford's fox (*Vulpes cana*), Afghan pika (*Ochotona rufescens*) and other rodents. Among widespread species, *Canis lupus, C. aureus, Vulpes vulpes*, and *Vormela peregusna* are common [39]. More than 1,500 invertebrate species have been recorded including many species of Frenata, Hymenoptera, Hemiptera and Diptera.

River and Lake (Freshwater) Ecosystems The riverine ecosystems of the Amudarya, Murgab, Tejen, Sumbar, Chandyr and Atrek Rivers include areas of tugai vegetation: *Populus pruinosa*, *P. euphratica*, *S. acmophylla*, *S. songrica*, a number of tamarisk (*Tamarix*) species, *Halimodendron halodendron* and, rarely, *Ulmus carpinifolia*. Grasses such as *Erianthus ravennae*, *Saccharum spontaneum* (*Juncus* sp.) and a number of rush species constitute the understorey. Salt-tolerant plants such as *Aeluropus littoralis*, *Limonium otolepis*, and *Karelinia caspica* grow beneath trees and bushes in the saltmarsh areas. Rare species such as *Astragalus kelifi, Eulophia turkestanica* and *Zeuxine strateumatica* are also found there.

The developed root systems of the plants strengthens riverbanks, preventing their erosion and landslips. Tugai forests are traditional habitats for wild cat, hare (*Lepus europaeus*), foxes, jackal and Bukhara deer. *Elaeagnus angustifolia* and liquorice are useful medicinal plants and grow in the gallery forests. In the water meadows they constitute industrial raw material resources.

The forests of the montane river valleys have unique features. Red blackberry bushes (*Rubus caesius*) are common and giant reed (*Arundo donax*) and horsemint or long-leafed mint (*Men-*



Ecosystems of Turkmenistan

tha longifolia) are found along the edges of the rivers. Water meadows include species such as reed mace *Typha* spp., *Erianthus ravennae*, *Saccharum spontaneum*, *Imperata cylindrica* other sedges and grasses (*Cyperaceae, Poaceae, Juncaceae*) and *Salsola* and *Artemisia* species.

At higher levels, species such as iron wood, walnut *(Juglans regia)*, willows (*Salix aegyptia, Salix babilionica*), poplars (*Populus* spp.), and elms (*Ulmus* spp.) are found.

Fauna of the riverine ecosystems includes all representatives of inland waters excluding several lake fishes such as the blind cave loach (*Nemacheilus starostini*), roach (*Rutilus rutilus uzboicus*), goby sp. (*Neogobius iljini*) and carp bream (*Abramis brama orientalis*). Over 10 fish species inhabit the mountain rivers of Kugitang and Kopetdag. Species that use the Atrek River for spawning include roach (*Rutilus rutilus caspius*) and common carp (*Cyprinus carpio*) [52]. Amphibians found in Turkmenistan's rivers include the Eurasian green toad, the Middle Asiatic toad (*Bufo danatensis*), marsh frog (*Rana ridibunda*), black-spotted pond frog (*R. nigromaculata*) and Caucasian frog (*R. macrocnemis*). The Caspian turtle (*Mauremys caspica*) and European pond turtle (*Emys orbicularis*) are found in the Sumbar, Chandyr and Atrek Rivers. Many lizard and snake species are also recorded such as the European legless lizard (*Pseudopus apodus*), grass snake (*Natrix natrix*), dice snake (*N. tesselata*), Oxus cobra and the blunt-nosed viper. More than 200 bird species have been recorded from the floodplains.

Mammals recorded from the river systems include wild boar (*Sus scrofa)* and Eurasian otter (*Lutra lutra*) as well as species that have become established in the second half of the 20th Century (musk-rats *Ondatra zibethicus* and the nutria or coypu, *Myocastor coypus*) [44, 45]. Bukhara deer are now only found on the floodplains of the Amudarya River. Invertebrate species recorded include Rotatoria, Hirudinea, Cladocera, Copepoda, Ephemeroptera and Trichoptera. There are also many mosquito species (Culicidae, *Phlebothomus*). The exact number of invertebrate species in the river systems is unknown [59].

Species of grasses (Poaceae), reed mace (*Typha* spp.) and goosefoot (Chenopodiaceae) dominate the coastal flora of lake ecosystems. In Lake Karategelek the dominant species of the

freshwater plankton are *Pediastrum, Scinodesmus* and *Nitschatia* mixed with some saltwater species, as well as *Ceratophyllum demersum*.

Greater bladderwort (*Urticularia vulgaris*) is a rare insectivorous plant found in Lake Karategelek. It is listed in the 1999 Red Data Book of Turkmenistan [35, 36]. Bacillariophyta and green alga dominate Lake Topiyatan. Ninety-six species of algae are found in the lake ecosystems of Turkmenistan (the dominant ones are diatoms and Chlorophyta) including species of *Sinedra*, *Nitschatia*, *Lingbia* and *Oscillatoria* [31].

Ten fish species are recorded from the lakes of the western Uzboy, two of which, roach and the goby (*Neogobius iljini*) are not found in other inland waters. Lake Yashkan contains the only population of carp bream *(Abramis brama* ssp. *orientalis)*. Seventeen fish species are present in Lake Minor Delili and in the estuary of the Atrek River. These include Bulatmai barbel (*Barbus capito capito*), Kura barbel (*Barbus lacerta cyri*), Transcaucasian barb (*Capoeta capoeta gracilis*), European chub (*Leuciscus cephalus orientalis*), kutum (*Rhodeus frisii kutum*), and crested loach (*Nemacheilus malapterurus* ssp. *malapterurus*)[52]. Amphibians recorded include the Eurasian green toad and marsh frog. The European pond turtle is also common. The Caspian turtle is found in the Atrek estuary and in Lake Minor Delili. There are also many bird species including coots (*Fulica atra*), ducks (Anatidae), gulls and terns, and grebes. Insects flying over water serve as food for swallows (Hirundinidae), martins (Apodidae) and bee-eaters (Meropidae). Starlings *(Sturnus vulgaris*), sparrows (*Passer* spp.) and desert finches (*Rhodospiza obsoleta*) spend their nights in thickets of *Phragmites australis*, which grow along the banks of the lakes. Some species of reed warbler (*Acrocephalus* sp.) also nest here. A small population of the rare black francolin (*Francolinus francolinus*) is found in the vicinity of Lake Minor Delili. Mammal species commonly recorded include wild boar, Eurasian badger (*Meles meles*), Eurasian otter, and striped hyaena (*Hyaena hyaena*). The Corsac fox and marbled polecat are found along the western Uzboy. Mammals commonly recorded here include golden jackal, red fox , sand cat and wild cat.

Marine and Coastal Ecosystems. A total of 854 species of animals and plants are found in the Turkmen part of the Caspian Sea. Of these, 610 are animal species, including 60 species of

Small mountain river

Common pheasant *(Phasianus colchicus)* – found in tugai forests

bacterial plankton, 120 species of zooplankton, 59 species of zoobenthos, 80 fishes, 289 birds, two reptiles and one mammal (the Caspian seal *Phoca caspica*) [41].

Four species of flowering plants as well as Chara algae are found.

The zoobenthos includes 29 worm species, crustaceans, molluscs and insect larvae. Large numbers of birds are recorded. The coastal wetlands of the Caspian Sea play an important role in the conservation of biodiversity and populations of game species not only for Turkmenistan but also for other Caspian countries. The areas provide rich habitats for over 30 bird species and a number of mammals, reptiles, fishes and plants listed in the Red Data Books of Turkmenistan and Red List of IUCN (see Appendix 2). In summer, the dense reedbeds are breeding areas for ducks, coots, moorhens and bitterns. Thousands of gulls and terns nest on the numerous islands and bays. The fry of herring and grey mullet feed in estuaries. Five species of pigfish and other small non-trade fish species breed in the estuaries and provide food for sturgeons, other economically valuable species and Caspian seals. In winter, about 80 fish species, including sturgeon, herring, common carp, and grey mullet gather in the southeastern part of the Caspian Sea (south of Ogurchinsky Island to the Iranian border) [41, 48].

Man-made Ecosystems. The man-made ecosystems of Turkmenistan include oases, water-storage reservoirs and discharge basins (Khovuzkhan, Zeyd, Tashkeprinsky, Iolotansky, Saryayzinsky, Gindikushsky, Sarykamysh and Kelifsky Lakes, and others) in the floodplains of the Amudarya and Murgab Rivers and Karakum Canal.

The biodiversity of the water-storage reservoirs includes 886 algae and higher plant species. Plants growing around the edges of these reservoirs include *Calligonum eriopodum, C. arborescens, C. caput-medusae, Salsola richteri, Phragmites australis, Typha australis,* various members of the Juncaceae, tamarisks, and white and black saxaul.

Fish species recorded include Aral barbel, Bulatmai barbel (*B. capito conocephalus)*, carp bream, white-eye bream (*A. sapa aralensis*), ziege (*Pelecus cultratus*), roach, ide (*Leuciscus idus oxianus*), gudgeon (*Gobio gobio lepidolaemus),* and silver carp. Almost all the reservoirs are important for fisheries and as habitats for migrating birds.

The oases (Lower and Middle Amudarya, Murgab-Tedjen, the Kopetdag–Murgab region, and Atrek-Sumbar) with their rich natural vegetation are important for the interaction between wild and cultivated species. From the perspective of biodiversity conservation, the natural vegetation of disturbed ground in areas that have been clear-felled, and meadows and steppes which have been ploughed and heavily used for agriculture, is particularly important.

The Caspian Sea

2.2.8. Threatened Ecosystems

All ecosystems are affected by humans in one way or another. In mountain ecosystems a total of 122 rare habitats are considered threatened and have been defined as in need

of protection. In the relict walnut forests in the southwestern Kopetdag nut harvesting is hampering natural regeneration. One of the biggest natural pistachio forests is located in Badkhyz, covering 76,000 ha and combining desert and montane elements. Major pistachio forests are found from Pulikhatum to the Gyazgyadik ridge and adjacent high plateaux (Akarcheshme, Pynkhancheshme and Kepele), as well as near Kushka and a small area near Marchak at the junction of Badkhyz and Karabil. Small pistachio forests are found in some areas of the Kopetdag and Kugitang. Parts of these mountain pistachio forests are in the protected areas of Syunt-Hasardag, Kopetdag and Kugitang zapovedniks and their zakazniks. The lower courses of the Atrek River include breeding areas for anadromous and semi-anadromous fishes, as well as breeding and migratory stopovers for estuarine birds and resident species such as purple gallinule (*Porphyrio porphyrio*) and black francolin. These areas have become less important as they have silted up following the extraction of water for irrigation purposes in Iran.

Striped hyaena *(Hyaena hyaena)*

Wild pomegranate (*Punica granatum*) forms dense impenetrable forests in the southwestern Kopetdag. Relict vineyards with both cultivated (*Vitis vinfera*) and wild (*V. sylvestris*) grapes are occasionally found in the valleys of the central and southwestern Kopetdag. Wild apple-tree (*Malus sp*.) and pear-tree (*Pyrus sp.*) forests are found in the canyons of the southwestern Kopetdag and Kugitang. Eight species of hawthorn grow on limestone outcrops.

Relict communities of *Ziziphus jujuba* occupy the lower belt of the southwestern Kopetdag and are occasionally found in the eastern Kopetdag and Kugitang. Communities of oriental plane *(Platanus orientalis)* occupy the riverbeds of the Kopetdag mountain valleys or areas near the population points.

Juniper (archa) forests include the Turkmen juniper and Zaravshan juniper. They cover the lower and middle montane elevations, sometimes forming a more or less closed canopy. The Kopetdag-Horasan endemic juniper species is spread from the Greater Balhans in the west to Badkhyz in the east. Juniper habitats have been lost through human activities but in some inaccessible areas natural communities with many dominant juniper trees have been preserved. Turkmen juniper and other deciduous trees are rarely recorded. The highest Zaravshan juniper trees are at almost 2,650 m. Small areas of Zaravshan juniper are found in Turkmenistan at various densities along the crest of the Kugitang. The main habitats are semi-savannah and semi-savannah wormwood-juniper woodland in which the dominant species are *Ferula kuhistanica, Ferula nevskii, Acer pubescens, Amygdalus bucharica, Pyrus regelii*, etc.

Turkmen maple *(Acer turcomanicum)*

2.2.9. Threats to Biodiversity

Loss of flora and fauna habitats as a result of industrial and agricultural development is the main cause of declining biodiversity. This happens both as a result of human activities (such as ploughing up soils, changing the hydrological regime, overgrazing, tree felling, the construction of roads and mining activities) or natural events (such as fluctuations in the level of the Caspian Sea and natural climate change).

Loss of habitat, non-native species, and over-consumption (overgrazing, tree felling and poaching) are among the threats. The expansion of cultivation is always accompanied by the loss of natural landscapes.

In montane areas wild and domestic animals compete for pastures and water. In conditions of continuous drought the lack of tough regulation of livestock numbers causes degradation of some specific pastures and results in a number of unfavourable consequences (land erosion, salinization, decrease of water availability, etc.). Among thenon-native species, Baluchistan melon fly (*Myiopordalis pardalina*) and whitefly (*Remisia* sp.) are considered a serious threat to indigenous biodiversity, as well as the jellyfish *(Mnemiopsis leidyi)*, which was officially registered in the Caspian Sea in autumn 1999 and by July 2000 was already a massive problem species.

The main sources of pollution are the extraction and processing of hydrocarbons, the chemical industry, agriculture, electricity generation and household waste. Climate change, fluctuations of sea level, and natural disasters are other factors that present some threat to biodiversity. The problem of climate change is closely associated with desertification, the most serious threat to biodiversity. The existing models of climate change forecast that a 100% increase in CO_2 in the atmosphere will cause a warming of 4 - 8°C with a simultaneous decrease in rainfall over practically the whole of Turkmenistan, especially in spring.

Among natural factors drought is a threat, which accompanies the transition to more extensive methods of agriculture production, as well as natural pathogens such as diseases of wild plants and animals. In combination with other factors (loss of habitat and forage resources, pollution, etc.) these may cause specific threats to some species and populations as well as the sustainability of their habitats.

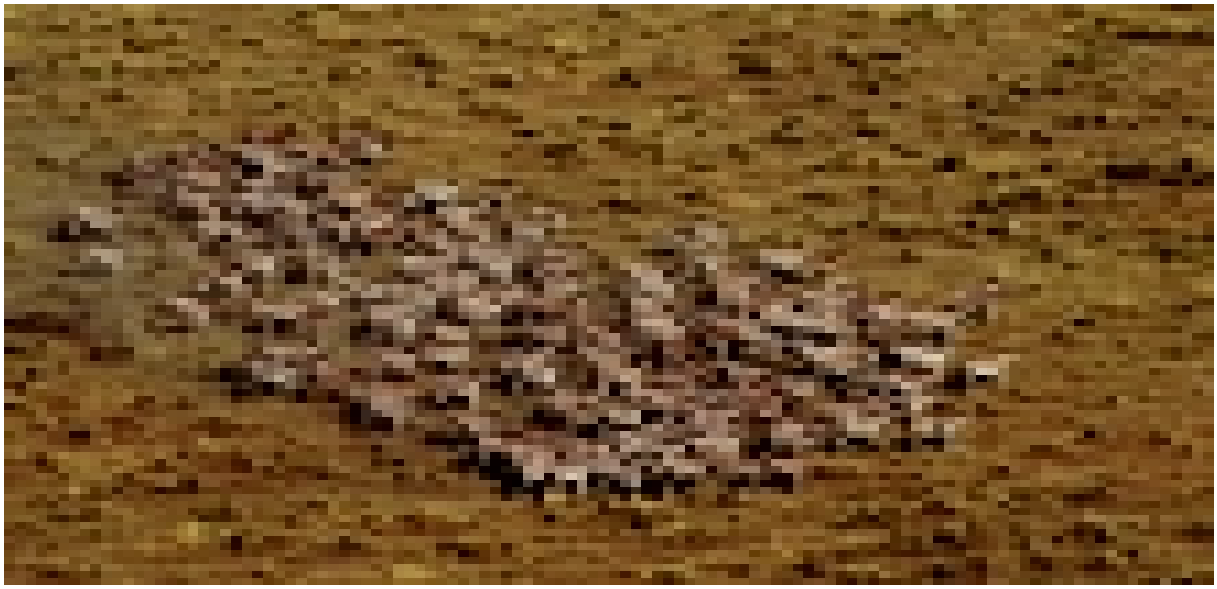
2.3. Existing Programmes on Biodiversity Conservation

One of the priority areas of State policy is environmental protection, efficient use of natural resources, and the ecological security of the population.

The existing state programme on biodiversity conservation includes the following measures: scientific research, measures to conserve species and their habitats *in situ*, measures for *ex situ* conservation, prevention of introduction of invasive species, a system for biodiversity information, education and public awareness, development of monitoring systems, and personnel training.

2.3.1. In Situ Conservation

One of the priority tasks in biodiversity conservation is the creation of a system of specially protected areas (SPAs), as a positive measure for the restoration of degraded ecosystems, and the protection of rare and endangered species [5]. In accordance with the Law "On Nature Protection" (Article 21), SPAs in Turkmenistan are defined as *state zapovedniks, zakazniks (sanctuaries) national, historico-natural and memorial parks, natural monuments, botanical and zoological gardens and arboreta, natural sanatoria (spas etc.) as well as fauna and flora listed in the Red Data Books* [35, 36]. All zakazniks and cultural monuments are under the supervision of zapovedniks and the latter in their turn are accountable to the Ministry of Nature Protection.



Kulans *(Equus hemionus kulan)* in Badkhyz zapovednik

Measures required for *in situ* conservation of species include regenerative activities (where biodiversity is heavily damaged) and protective measures such as:

- conservation of the population structure of a species
- protection of populations in specially protected areas
- conservation of populations of domestic animals and cultivated plants
- conservation of habitats and the environment
- regulation of utilisation of exploited species
- prevention of hybridisation with Genetically Modified Organisms
- prevention of animal mortality on man-made structures
- control of agricultural and other anthropogenic activities.

Zapovedniks and zakazniks are the main forms of specially protected areas ensuring the safety of nature and its protection [5, 20].

The total area of SPAs of all categories is 1,978,300 ha or 4.02% of the whole territory of the country. Zapovedniks constitute 39.7% (784,600 ha) or 1.6% of the whole area of Turkmenistan; zakazniks 58.4% (1,155,900 ha) or 2.35% of the country's area; protected zones 1.8% (35,400 ha) or 0.07% of Turkmenistan's area; natural monuments 0.1% (2,300 ha).

Data from the Flora and Fauna Protection Department at the Ministry of Nature Protection show that of 250 registered natural monuments only 17 have official legal status, designated on the basis of their protective, scientific and educational values. The Botanical and Zoological Gardens play an important though modest role as repositories of biological diversity. Ashgabat Botanical Garden is a member of the International Association of Botanical Gardens. Among the protected sites are the National Nature Park of Turkmenistan's Independence (3,000 ha) and the Park and Forest Zone [14, 49] of the closed Green Belt (Geok Gushak) around Ashgabat in the foothills of the Kopetdag (10,000 ha).

Zapovedniks and Zakazniks of Turkmenistan

Repetek zapovednik (established in 1928), Turkmenistan's only biosphere reserve, is located at the junction of the Central and Southeastern Karakum sand deserts, covering 34,600 hectares. About 2,000 ha of natural black saxaul are present. The protected ecosystems, which are predominantly desert, suffer noticeable grazing pressure [29].

Hazar zapovednik (until 1994 called Krasnovodskiy) was established in 1932 on the southeastern coast of the Caspian Sea at the juncture of typically dry Transcaspian desert and the saltwater area of the Caspian and Astrabad subtropical province of Iran. The total area is 262,037 ha, including 192,047 ha of the Caspian Sea itself.

Badkhyz zapovednik (established in 1941, covering 87,680 ha) is located between the Kushkinsko and Tedjensky rivers in the foothills of the Eastern Kopetdag (mountain range Gezgyadyk) and Paropamiz (the saline Eroylanduz lake basin) in the southeast of Turkmenistan. The zapovednik contains 76,000 ha of pistachio woodland; populations of kulan etc. It is recommended for inclusion as a UNESCO World Heritage site.

Kopetdag zapovednik (established in 1976, 49,793 ha) is located in the Central Kopetdag. Mountain forest (mainly of Turkmen juniper) covers 21,814 ha (1982 data). Kalininskiy (established in 1976 covering 15,000 ha) and Meana-Chaachinskiy zakazniks (created in 1976 covering 60,000 ha) were established to protect common cranes (*Grus grus*) and to restore the population of kulan.

Syunt-Hasardag zapovednik (established in 1978 covering 26,461 ha) fully represents the main landscape and ecological types of the middle elevations of the Southwestern Kopetdag dry subtropics. Relict plants such as Turkmen mandrake, wild pomegranate and wild grapes occur. In 1990 Syunt-Hasardagskiy zakaznik (38,000 ha) was established.

Kaplankyr zapovednik (created in 1979 covering 282,800 ha) is located in the northeast of Turkmenistan at the juncture between the southeastern flanks of the Ustyurt hills (Kaplankyr plateau), the Zaunguzsky Karakum and the Sarykamyshsky basin. The zapovednik is located at the junction of the borders of Turkmenistan, Kazakhstan and Karakalpakiya, in the transition zone between the northern and southern deserts. To protect the lake ecosystems, migrating waterfowl and the calving grounds of sand gazelles, Sarykamyshsky zakaznik was established in 1980. From 18/01/91, its borders were re-defined, and it now covers 551,066 ha. In order to breed and to introduce kulans, Shahsenemsky zakaznik was created in 1984, covering 270,000 ha).

Zapovedniks of Turkmenistan

Kopetdag zapovednik

Amudarya zapovednik (established in 1982 covering 49,514 ha) consists of three areas in the middle course of the Amudarya River in which the valley flood plain tugais, ridge-hillocks and barkhan sands, and salt pans of the Turan lowland are well represented. The territory of the zapovednik includes part of the Amudarya River.

Kugitang zapovednik (established in 1986, 27,139 ha) is located on the territory of the western (Turkmen) scarp slope of the Kugitang ridge of the Pamiro-Altai mountain range. Karlyuksky zakaznik (1986, 40,000 ha), Hodjaburdjibelendsky zakaznik (1986, covering 17,532 ha) and Hodjapilsky zakaznik (1986 covering 31,635 ha) were created to protect unique caves and archa forest and species of rare plants.

The degree of protection of biodiversity in the zapovedniks mainly depends on the state of the ranger service. The infringements recorded include the following: hunting and trapping of animals, tree-cutting, hay-mowing, grazing and collection of fruit and berries.

The difficult conditions of Turkmenistan's transitional economic period reflect in the work of the zapovedniks. Forest surveys to assess logging practices have not been conducted for many years and professional censuses of animals have been carried out only on a part of the territory.

In 2001, the total staff of all eight zapovedniks was 385 people (wages and salaries comprised US $746,900). The ratio of guards to researchers was 9:1 (159 guards comprising 52.3% of the workforce, 22 researchers comprising 5.9%). The guards had technical secondary and secondary education.

Examination of statistics for the period 1995-2000 reveals that some populations of animals in protected areas have declined. Changes in populations of threatened and economically valuable species in zapovedniks are one indicator of changes in ecological variables and the degree of threat to an area.

In 2000 the Ministry of Nature Protection made a decision to form captive-breeding centres in zapovedniks for rare species of fauna and flora. Among regenerative activities on *in situ* conservation of species and their habitats the successful work on the reintroduction of kulan into

the protected Meana-Chaachinskiy and Kalininskiy zakazniks of the Kopetdag zapovednik must be considered. Two captive-breeding centres were created at Gyaurs (in Kopetdag zapovednik) and Garrygala (in Syunt-Hasardag zapovednik). An independent population of sand gazelle was created in the 1980s on Ogurchinsky Island in the Caspian Sea. Besides this pistachio trees were planted in Meana-Chaachinskiy zakaznik and the protected zone of Kopetdag zapovednik. Some experimental initiatives were implemented on the captive breeding of Caspian snowcock, black francolin, common pheasant (*Phasianus colchicus*), houbara bustard, Chukar partridge and wild quail (*Coturnix coturnix*). Attempts in 1981 to translocate the isolated relict Turkmen population of the spotted toad-headed agama lizard (*Phrynocephalus maculatus*) to new habitat failed [3, 5, 13, 15].

2.3.2. Ex Situ Conservation

Ex situ conservation (breeding centres and nurseries, gardens and other special places) is as important as *in situ* conservation.

In *Garrygala Scientific and Experimental Centre of Plant Genetic Resources* a unique gene pool (4,040 samples) of wild fruit trees has been collected. These are wild relatives of Central Asian cultivated plant species. The high number of endemic species emphasises the global significance of the region.

The *Gyzyletrek Scientific-Production Experimental Centre of Subtropical Cultures* conducts industrial tests on subtropical cultivars (olives, jujube, persimmon, date palms and various citrus species).

The *Ashgabat Botanical Garden* (established in 1929) covers 18.5 ha, of which 12 ha are occupied by the arboretum which contains 1,200 species, sorts and varieties of trees and bushes. The Garden's collection comprises 5,000 species, sorts and varieties, of which there are 157 species and 67 sorts of highly ornamental exotic gymnosperms (pine trees, juniper, cypress etc.) and 1,196 species, sorts and varieties of tropical and subtropical plants (including 15 species and sorts of water plants). The ornamental plant collection consists of 352 species and 1,109 sorts and more than 600 local floral species. Among them the collection of relict and threatened "Red Data Book" species of local flora is of particular interest. A genetic seed bank of nearly 3,000 species has been created, mainly of Turkmenistan's flora but including plants from other parts of world obtained on an exchange basis.

Forest Nurseries. There are seven permanent and nearly 20 temporary nurseries in the forests of Turkmenistan. In the permanent tree nurseries, covering a total area of 1,250 ha, up to 20 million saplings of various species are grown.

The National Herbarium of Turkmenistan consists of the unique herbarium of the National Institute of Deserts, Flora and Fauna (since the year 1815 more than 250,000 samples of higher plants including 36 holotypes and isotypes have been collected), as well as the herbaria of higher educational establishments and zapovedniks. Besides these, mycological, lichen and bryophyte herbaria are held in the Institute. The collections of insects and vertebrates, several zoological museums are an important source of information for scientific research; educating students.

Captive Breeding of Rare Animals. The breeding of rare faunal species in Turkmenistan (sand gazelle, Caspian snowcock, black francolin, common pheasant, houbara bustard) has not progressed beyond certain experimental trials, which were conducted by the Turkmen Society of Nature Protection, higher educational establishments and some zapovedniks. Since 2000 the Ministry of Nature Protection has decided to conduct planned research in this field in the zapovedniks.

2.3.3 Prevention of the introduction of alien species

The responsibility for preventing the introduction of alien species into Turkmenistan is divided between various authorities: Customs, Plant Quarantine Inspectorate, "Caspecocontrol"

and others. Since invasive species may pose a threat to agriculture, the majority of these organisations are under the supervision of the Ministry of Agriculture. "Caspecocontrol" is the most important organisation acting in this sphere within the Ministry of Nature Protection and is responsible for the conservation of the Turkmen sector of the Caspian Sea. Moreover, the Ministry gives decisions on suggestions for introducing new varieties of flora and fauna to Turkmenistan.

2.3.4. Research

Scientific research on biological diversity was mainly conducted in the academic institutes of biology. After the reorganisation of the National Academy of Sciences in 1997 the National Institute of Deserts, Flora and Fauna, which had unified three earlier independent institutes (the Institute of Deserts, the Institute of Zoology and the Institute of Botany) was incorporated into the structure of the Ministry of Nature Protection. Scientific research in this area is conducted by the individual departments of the higher institutions and universities. The Botanical and Zoological Gardens, the Institute of Cattle Breeding and the Institute of Agriculture within the Ministry of Agriculture carry out research into genetic resources. The zapovedniks, and Garrygala Scientific and Experimental Centre of Plant Genetic Resources are engaged in the issues of biodiversity conservation.

During decades of activity the Academy of Sciences of Turkmenistan, higher education institutions and public organisations have published a great number of monographs and thousands of articles. Scientific observations and data, and generalisations on the issues of biodiversity conservation in the country are given in these [3, 4, 10, 12, 16, 18, 31, 34, 39, 43, 50, 57, 67, and others]. The Collection of the National Herbarium of Turkmenistan consists of an herbarium of more than 250,000 samples of higher plants, as well as mycological, lichen and bryophyte herbaria. In addition the Institute of Zoology holds a collection of the animals of Turkmenistan.

Scientific research in Repetek Biosphere zapovednik

2.3.5. Information Systems

In principle access to any published information on the biodiversity of Turkmenistan is not restricted, however in reality it is difficult to access because of technical reasons (lack of photocopiers, computer facilities, and etc.).

The situation is much worse in regard to Internet access to information on biodiversity in Turkmenistan. Biodiversity data are spread out on the websites of several international organisations (for instance, Grid-Arendal, Turkmenistan UNDP office, WWF and others). This information was mainly created by public organisations, for instance the MAB Fauna of Turkmenistan database was designed by the TSNP. Most recently within the framework of CEP a website on biodiversity has been developed.

2.3.5. Education and Public Awareness

There are some special courses on botany and zoology in the higher educational establishments of Turkmenistan. This specialist knowledge is applied by experts in practice in the zapovedniks, forestry, or in carrying out impact assessments on the exploitation of natural resources. At school level, environmental education programmes are either being developed or are already given as optional subjects. Environmental education of children is also carried out within the framework of school groups, summer ecological camps etc.

The country has several higher education institutions under the Ministry of Education. These include the Mahtumkuli Turkmen State University, the State Medical Institute, the Niyazov Agricultural University, the Polytechnic Institute, and the Seidi State Teachers' Institute, all of which train ecological specialists.

There is a special Department for Information and International Relations at the Ministry of Nature Protection, which is concerned with the dissemination of information in local and international news, seminars, and also handles environmental disasters. It publishes a monthly bulletin called "Tebigat habarlary" or "Nature news". TV and radio pay attention to ecological problems on a regular basis, in addition to which many articles are published on ecological issues.

2.3.7. Monitoring System

The annals or "Nature Chronicles" of the zapovedniks are the primary source of information on the state of biodiversity.

Monitoring in the field of biodiversity in Turkmenistan has been represented by taxonomic research on various groups of living organisms, conducted by several generations of Turkmen scientists. Species catalogues and identification keys, regional reports on soils, flora and fauna, and especially monographs on flora and fauna prove this. Fundamental research on biodiversity, supplemented with the series of observations from the protected areas and research stations of the institutes of the former Academy of Sciences, provide the scientific groundwork and methods for the monitoring of certain groups of organisms and types of ecosystems. One of the elements of the existing environmental monitoring system is The Red Data Book of Turkmenistan (1985; 1999), as well as the archives and reports of the Ministry of

Workshop in the Seidi Turkmen State Teachers' Institute

Nature Protection and the institutes of the former Academy of Sciences and a number of other institutions. A primary source of information on the biodiversity status of Turkmenistan is the "Nature Chronicles", which are the annual reports of the zapovedniks.

2.3.8. Incentive Systems

Incentive economic systems have not yet been developed and have therefore never been applied in Turkmenistan. To some extent the WWF efforts to create a compensation scheme for livestock damage caused by leopard in the Sumbar valley of Garrygala etrap can be regarded as an incentive measure. In this case the initial capital provided by WWF enabled the creation of a self-recompensing mechanism of compensation.

Work supported by the ISAR Fund serves as another pilot example of reducing anthropogenic impact on mountain pastures. This was achieved through providing local people with the seeds and technology for growing new highly productive legume forage crops such as soyabean and Indian bean (*Dolichos lablab*). Such an approach will encourage the population to switch from pasturing to stabling livestock.

Thus existing programmes for the conservation of national biodiversity both *in situ* and *ex situ* (scientific research, monitoring, the network of SPAs, incentive systems, Botanical Garden, Gene Pool Centres) are able to ensure protection both of its major components and the environment in general. Many of Turkmenistan's natural ecosystems are practically in pristine condition and can serve as models of natural ecosystems and processes. Public awareness activities and the creation of databases, combined with a broad partnership interaction with educational institutions, will help find positive solutions to the problems of biodiversity conservation.

2.3.8. International Co-operation

International co-operation in the sphere of biodiversity conservation within Turkmenistan is mainly implemented via UNDP. There are also some proposals from UNEP, TACIS, and the World Bank, which have only recently become more specific and turned into the form of real projects. The most significant projects are the National Environmental Action Plan for Turkmenistan (NEAPT) and Capacity-21. Regional co-operation is mainly of a data-sharing character, though biodiversity problems were touched upon in the Nukus and Almaty Declarations at the level of the Ministers of Environment. Several existing regional projects should be mentioned: the Aral Sea Project (World Bank, UNDP) and the "Biodiversity" part of the Caspian Ecological Program (CEP). Various Central Asian projects are at the stage of development and approval. At present several projects have obtained finance and are being implemented. Among them are the following: "Conservation of the Leopard in Turkmenistan" and "Conservation and Restoration of the Bukhara Deer in Turkmenistan, Uzbekistan, Tajikistan and Kazakhstan"; from 2001 "Conservation and Management of the Kulan". Projects on the Biology and Conservation of Sturgeon (*Pseudoscaphirhynchus* spp.) in Central Asia, and the Flora of the Southwestern Kopetdag ("Correlation of Extinction Risks for Biodiversity of Central Asia") are being carried out.

2.4. Institutional and Administrative Basis

In accordance with the legislation of Turkmenistan, the Ministry of Nature Protection is a specialised independent department that oversees the efficient consumption of natural resources and environmental protection as well as the development of the national forest estate. The State Fishery Committee is authorised to regulate fisheries and is responsible for the effective management and rational use of fish resources.

The main executing bodies of the Ministry of Nature Protection responsible for biodiversity conservation are the velayat departments of nature protection, and two specialised depart-

ments: the Department for Protection of Fauna and Flora of Zapovedniks, and the Information and International Relations Department. The State Fishery Committee has velayat and sea inspectorates that directly carry out the protection, control and evaluation of fishery resources.

The Ministry of Nature Protection in co-operation with the State Fishery Committee and their regional sub-departments, the Department of Public Security of the Ministry of Internal Affairs (MIA), the National Security Committee (NSC) and the Frontier Troops Administration, have worked out an Action Plan for joint activities to enforce the law on protection of fauna and flora, including fish stocks, for the years 2001-2005.

The Botanical and Zoological Gardens, the Institute of Cattle Breeding and the Institute of Agriculture within the Ministry of Agriculture carry out research into genetic resources.

Public organisations in Turkmenistan (NGOs) focus on the problems of biodiversity conservation to different extents. The oldest NGOs concerned with biodiversity are the Turkmen Society for Nature Protection (TSNP) and the Turkmen Society of Hunters and Fishermen (TSHF). For several decades TSNP has been conducting public awareness initiatives, publishing articles and undertaking scientific research and other activities in the field of biodiversity conservation. The Society made considerable contributions to the first and second editions of the Red Data Book of Turkmenistan. Its activities achieved worldwide recognition and it was incorporated into IUCN. Besides this the TSNP has a system of public inspectors who assist the Ministry of Nature Protection in its day-to-day work. Professional scientists' associations such as the Geographic, Hydrobiological and Ornithological Associations, continue their activities today.

Since Turkmenistan's independence many new public organisations have been founded such as the Falconers' Club, the environmental education group at the State University, and the youth groups "Young ecologist" and "Ecology and tourism" at the Palace of Youth and Children. Environmental educational activity is conducted in close co-operation with the state authorities and international NGOs such as WWF (the Worldwide Fund for Nature), IUCN, and the Law and Environment Eurasia Partnership (LEEP).

Numerous unincorporated initiative groups, aimed at environmental education and increasing awareness in the field of biodiversity conservation, carry out activities in all the velayats in the country.

2.5. Research Programmes and Potentials

The existing research infrastructure in Turkmenistan is able to work efficiently to carry out specific research programmes. The availability of a wealth of basic research materials (including collections of fauna and flora) maintained as part of the country's national heritage, enables successful progress in the implementation of ecological projects.

The problems of biodiversity conservation *in situ* fall under the remit of the scientific departments of the zapovedniks and zakazniks which for many years have been research centres implementing all-year-round research on the natural ecosystems of Turkmenistan. Scientific work in all protected areas is focused on a single problem, the "Scientific basis of conservation and restoration of the major ecosystems of Turkmenistan" based on one general manual of scientific methods encapsulated in the programme of compiling the "Nature Chronicles".

The paramount role of the research activities in Turkmenistan's protected areas is to ensure the preservation of their genetic resources and to gather data on changes in ecological variables as a basis for making informed management decisions. The initial stage entails conducting floral and faunal assessments at each zapovednik, where up to 70-85% of the flora species and more than half of the species listed in the 1999 Red Data Book of Turkmenistan are preserved. Annotated lists (summaries) of the flora of Repetek [22, 29] and Badkhyz zapoved-

niks [16] and breeding birds [10] have been published. However, to date even this data-gathering stage has not been completed: either lists have not been published or the key elements of fauna and flora in all zapovedniks and zakazniks have not been fully assessed.

In a number of cases the science departments' activities have shifted from all-year-round observation of nature to environmental education of the population. This change is only to be expected, because scientific monitoring is currently accorded a low priority and only partially fulfils its tasks. In addition, the wildlife itself in combination with the qualifications of the specialists creates a unique educational environment for public awareness activities. This improves the status of SPAs in the estimation of the population, deepens their ecological awareness and raises public awareness of conservation.

The second (1999) edition of the Red Data Book of Turkmenistan [6, 36] reflects the extent of current study of the biota and the state of its protection. A total of 261 taxa have been listed: 152 animal and 109 plant taxa. More than half (64 species or 59%) of the listed plant species are endemic to Turkmenistan. The publication of the Red Data Book is an incentive to strengthen the protection of rare species and is the basis for the allocation of the nature protection budget to prevent damage to biodiversity. At the same time rather than concentrating on the enlargement of the network of protected areas, measures recommended for species conservation and rehabilitation should accentuate the need to conduct ecological impact assessments on any economic activity which might cause damage to wild populations.

Leading scientists of the National Institute of Deserts, Flora and Fauna take part in the implementation of UNDP, ESCAPO, FAO, and CEP international projects on biodiversity conservation. At present, the Institute, State zapovedniks, Gosrybokhrana (State Fishery Protection) and Garrygala Scientific and Experimental Centre of Plant Genetic Resources possess highly qualified scientific potential in the field of biodiversity conservation.

2.6. Legislation and Policy

Legal measures are of key significance in biodiversity conservation [40, 47, 54]. In Turkmenistan they consist of particular provisions of the general legislation, together with specific legislation on nature protection covering all aspects of the interaction between society and nature.

In the Criminal Code (Ecological Crimes) of Turkmenistan the responsibility for ecological crimes of organisations and individuals is defined. Since independence in 1991 the nature protection laws have been improved in accordance with the new sovereign status of the country. The 1992 Constitution defines the legal system. The relevant articles are contained in the Administrative Offence Code (1984).

National Legislation contains the Law "Concerning State Specially Protected Natural Areas" (1992) and the following associated standard provisions, which fix the status and regime of zapovedniks and other protected areas: "Standard Provision for State Reserves / Zapovedniks of Turkmenistan" (15/12/1995); "Standard Provision for the State Sanctuaries / Zakazniks of Turkmenistan" (15/12/1995); "Standard Provision for the Conservation Zones of the State Zapovedniks of Turkmenistan" (15/12/1995); "Standard Provision for the State Natural Monuments of Turkmenistan" (15/12/1995); "Standard Provision for State Nurseries of Rare and Threatened Floral and Faunal Species of Turkmenistan" (15/12/1995); "Provision on Hunting and Hunting Regulations" (15/12/1995); "Provision on the State Fund for Nature Protection of Turkmenistan" (1996); "Provision on the Red Data Book of Turkmenistan" (25/03/1997); and "Provision on the Protection of Fish Stocks and Regulation of Fisheries in Territorial and Inland Waters of Turkmenistan" (20/03/1998).

A package of in-house documents and taxes for calculation of penalties for damages, etc. is also a part of the national legislative system.

The Law of Turkmenistan "On Property" grants the State exclusive ownership of "forest and water resources, protected or specially used nature areas, and sites of historic and cultural heritage of Turkmenistan". The Law of Turkmenistan "On De-nationalisation and Privatisation of Property in Turkmenistan" (1992) imposes limitations on the list of sites subject to de-nationalisation and privatisation.

International conventions relating to biodiversity conservation are part of the national legal system. Existing laws in the field of biodiversity conservation and sustainable use can be considered relatively well developed, and in accordance with the legislation of Turkmenistan the State bears the full and exclusive responsibility for environmental protection and thus, biodiversity conservation [40, 47, 54].

The protected areas legislation of Turkmenistan provides thorough legal protection of biological diversity, but laws are not always well implemented and enforced. There are some gaps and contradictions that require targeted work and reform to bring national legislation into line with the CBD.

Unlike in many other CIS countries, the zapovedniks of Turkmenistan are exempt from land tax. However it should be noted that in the nature protection legislation of Turkmenistan the notion of a "national park", which has been widely adopted in international conservation, is not represented. However in 1979 in accordance with the MAB UNESCO programme, Repetek zapovednik was inscribed as a "Biosphere Reserve".

Since Turkmenistan's independence it has been legally enshrined that natural resources of the country are national property. Their protection and sustainable use is part of government policy.

National standards on Environmental Impact Assessment (EIA) have been developed and adopted by the Decree of Turkmenstandardlary (2000), within the framework of the President's Programme "National Environmental Programme of Turkmenistan".

The legal framework for environmental protection consists of the following laws "On Nature Protection in Turkmenistan" (1991); "On the Interior of the Earth" (1992); "On Foreign Investments" (1992); "Sanitary Code" (1992); "On Foreign Concessions" (1993); "On State Ecological Expertise" (1995); "On Atmospheric Air Protection" (1996); "On Hydrocarbon Resources" (1996); "On Hyakimliks (Local Authority Bodies)" (1997).

Existing laws are in general adequate for the modern situation, however it is necessary to strengthen certain existing laws and reform weak ones. What is important is that the laws should be brought into line with international commitments to biodiversity conservation undertaken by Turkmenistan after the signing and ratification of various international Conventions. This is confirmed by the Law "To introduce changes and additions to some legal texts of Turkmenistan" (1999).

In order to co-ordinate the activity of Ministers and departments in the implementation of Turkmenistan's commitments arising from Conventions and UN Programmes on the Environment, a State inter-ministerial committee was established in 1999 according to Presidential Decree. This "State Commission of the Ministry of Nature Protection for ensuring implementation of the commitments of Turkmenistan under the UN Environment Conventions and Programmes" co-ordinates the activity of all work groups, and controls the development of the National Environmental Action Plan (NEAP). The NEAP is a permanent planning document covering environmental protection and envisages concrete activities in the improvement of environmental management and sustainable use of natural resources. The NEAP plays an essential role in determining priorities for "ecological security" in the Presidential Programme "Strategy of socio-economic reforms in Turkmenistan for the period till the year 2010". A special work group on the problem of biodiversity loss was created under the framework of the NEAP.

Turkmenistan's actions under the CBD will strengthen its existing commitments under other international conventions, including the "World Heritage Convention" (26/09/1994), Basle Convention "On the control of transboundary transportation of hazardous wastes and their elimination" (18/06/1996); "Convention to combat desertification" (18/06/1996); Aarhus Convention "On access to information and public involvement in the process of decision making and access to justice on environmental issues" (30/04/1999).

Turkmenistan always sets great store by participation in international conventions, implementation of universally recognised norms and principles of international law in the field of environment protection. The Parliament of Turkmenistan was one of the first to ratify the international Convention on Biological Diversity on June 18, 1996.

Turkmenistan has joined various international conservation agreements and become a part of the Framework Convention on Climate Change, Vienna Convention and Montreal Protocol on ozone-depleting substances. In 1979, in accordance with the MAB programme of UNESCO, Repetek zapovednik was awarded the status of a Biosphere Reserve. In 2000, Ministry of Nature Protection officers submitted nominations for three sites (Syunt-Hasardag, Badkhyz and Kugitang zapovedniks) to the Secretariat of the World Heritage Committee for possible inclusion into the World Heritage List of UNESCO.

The central part of Hazar zapovednik on the southeastern coast of the Caspian (north Cheleken, Turkmenbashy, Balhan and Mihailovski bays) was designated as a Ramsar site (a wetland of international significance as waterfowl habitat) under the Ramsar Convention. The basic prerequisites for the harmonisation of national legislation and international conservation conventions in Turkmenistan are in place.

2.7. Financial Sources for Biodiversity Conservation

The financial means allocated by the Government of Turkmenistan to the Ministry of Nature Protection form the essential basis for tackling regional and inter-state ecological problems. The Ministry of Nature Protection's budget in 2000 was 95.7 billion manats (nearly US $ 18.4 million).

In Turkmenistan there is a special Nature Protection Fund, which is compiled from various payments for waste and disposal, fines, fees for expertise and other services. The fund is allocated for environment protection purposes by agreement of the Cabinet of Ministers and the Ministry of Economy and Finance.

The Nature Protection Fund of Turkmenistan was founded by the Presidential Decree of 15/04/1996 for financing measures on nature protection, renewal of nature resources, rehabilitation of the environment, mitigation of ecological consequences of accidents and disasters, and compensation of damage caused. The main shareholders of the Fund are the Ministry of Nature Protection and the State Fishery Committee; both have their sub-accounts.

The major factor influencing investments in nature protection is the existence of legislation, regulations and rules. The "polluter pays" principle is implemented by means of charging for standard levels of waste and disposal, and penalty sanctions for exceeding these. In spite of the money the state spends on biodiversity conservation, there is a need to attract additional resources. During recent years extra finance has come from international organisations (UNDP, UNEP, World Bank and others) within the framework of joint ecological projects, which to different extents concern the problems of biodiversity.

2.8. Socio-Economic Context

A number of favourable natural and socio-economic features are unique to Turkmenistan: a large geographical area, warm climate that means low power consumption, rich natural resources, relatively high level of education of the population, and an absence of social unrest and frontier conflicts.

The declaration of Turkmenistan's independence, and the country's integration into the world economy, provided a true incentive for the improvement of the people's well being and for solving ecological problems. Environmental protection is now considered an integral part of economic reform. The social and economic policy of the state is based on the principles of harmonisation of industry and the environment and awareness of the severity of the ecological problems the country faces.

According to the Constitution, land, water, wild animals, plants and other natural resources are a part of the national heritage and come under the protection of the state. Existing laws are in general in accord with the modern situation, however some of them require additional development. Organisational changes and reforms in all spheres of the economy have not only promoted stability but the gradual development of economic activity and have also ensured the stable social and economic state of the country.

The State Budget is the main source for financing the social sector, providing, for instance, 92% of the education sector and 87% of the healthcare sector [7]. The literacy level of the population of Turkmenistan is high. Data from the World Bank Survey in Turkmenistan show that the level of literacy for the 9-49 year age group is 99.3%. This is characteristic not only of the urban but of the rural population as well. Almost one third of the able-bodied people have higher or secondary special education.

Technological activities in Turkmenistan are of an irregular nature: agriculture is concentrated in oases and industry is mainly located in urban areas. Industrial enterprises of different ownership forms operate in Turkmenistan. Turkmenistan is an exporter of energy (natural gas, oil products, and electricity).

This peculiarity has both positive and negative aspects. On the one hand, the concentration of industries in a restricted area makes it possible to preserve vast areas for wildlife. On the other hand, fragile arid ecosystems can be destroyed if they fail to withstand the accumulating anthropogenic pressures.

More than half of the population lives in rural areas and nearly 40% of the labour force works in agriculture. The agriculture sector consists of agriculture enterprises and processing enterprises that produce almost one third of GDP.

Fisheries play an important role in Turkmenistan. The Caspian Sea is the most significant fishery. The main harvested species include marine species such as sprats, grey mullet, some species of herring, sturgeons and Caspian sea trout. At present, those branches of the economy that are directly connected with the consumption of biological resources (fisheries, hunting, the fur industry, collection of medicinal plants) do not greatly affect biodiversity. The illegal consumption of biological resources (poaching etc.) is a much more serious threat.

Recently the production of the country's main crops and cattle breeding have significantly increased. However, water consumption for irrigation has reduced by nearly 10% and this is a positive factor. It should be mentioned that the use of chemicals (fertilisers, herbicides, pesticides) has significantly decreased due to economic problems. The problem of the utilisation of irrigation waters is gradually being solved, while pollution from Caspian oil-and-gas companies is decreasing. However the problem of waste water accompanying oil extraction is still one of the main reasons for environmental pollution and causes the deaths of

birds near oil-and-gas installations. More attention is paid now to ecological factors in reconstructing existing chemical enterprises or the construction of new ones [2, 14, 56].

2.9. Problem Analysis

The SPAs of Turkmenistan include 8 state zapovedniks, 13 state zakazniks, 17 state natural monuments, and 261 taxa listed in the Red Data Book of Turkmenistan [5, 35, 36]. Despite some concrete successes in the field of nature protection, the problem of biodiversity conservation faces essential constraints.

There is insufficient understanding in the field of conservation management of the role of biodiversity as a basis for sustainable development. In particular, nature conservation issues are not fully incorporated into prospective plans for industrial development. Methods of evaluating the economic significance of natural resources have still not been developed. This leads to their underestimation. Management methods in the second half of the 20th Century caused sufficient imbalances in ecosystems in some regions that many species were brought to the edge of extinction and were registered in the Red Data Book of Turkmenistan (1999).

Among the major threats to species diversity there are: destruction of habitats, overexploitation of natural populations of animals and plants and, in some cases, the introduction of non-native species. As a result of man's impacts therefore, a direct reduction in the populations of key species has been observed, leading to an unacceptably high probability of the occasional extinction of a species or population.

Reduction / loss of habitat is the most common cause of biodiversity loss. The large area of sparsely developed land in Turkmenistan creates an illusion of "inexhaustible resources". Wild animals and plants have occupied the whole country since time immemorial and every developed hectare inevitably decreases the availability of habitat for them. When an area is degraded to an unacceptable level the extinction of a species or population may take place. In addition, sometimes when the area of a species has been reduced to a critical level extinction may occur as a result of a natural event such as a fire or flood. The main "consumers" of land in Turkmenistan are the agricultural and mining sectors, and companies within these industries currently have no economic incentives to reduce their land consumption.

Overexploitation of biological resources is also one of the most serious problems for biodiversity conservation. The legal system of Turkmenistan prohibits, in principle, the consumption of biological resources above sustainable limits. These limits are exceeded as a result of illegal activities such as poaching and wood-cutting, which proves the need to strengthen nature protection enforcement. The problem of overexploitation is also of a transboundary character; in particular, the biodiversity of the Turkmen sector of the Caspian Sea suffers from the poaching of sturgeons in the northern Caspian and in the estuaries of the Volga and Ural Rivers.

Besides this, there are some instances where the reduction of the population of a wildlife species (particularly localised or endemic species) has taken place on a comparatively small scale as a result of anthropogenic activities (for example, the grass *Aethionema kopetdaghi* during reconstruction of the Goudan highway, and the spotted toad-headed agama lizard as a result of the discharge of drainage waters into the Ulyshor saltmarsh). In all these instances the key problem was that planners and project executors were unaware of these species. Lessons like these highlight the necessity for more detailed analysis of planned projects at the EIA stage, development of geographic information systems (GIS), wide dissemination of information on the value of biodiversity conservation, and an improvement in environmental education.

In the field of the conservation of natural resources the role of invasive species is underestimated. Until now the problem of their introduction has been studied only from the point of view of their impact on agriculture, i.e. ignoring their effect on biodiversity.

In the field of nature protection there are also a number of factors that reduce the efficiency of current activities. The SPA system in Turkmenistan is primarily aimed at conserving objects and areas; at present there is a lack of a number of criteria accepted in foreign practice that allow for the combining of protective, culture-educational and recreational functions. An adequate nature protection system could be established at comparatively low cost by means of connecting existing SPAs through a system of *green corridors*. At the moment this function is partly performed by river valleys, coastline, tracts of native forest and bush and other elements of the natural landscape that are not specially protected.

The legal basis for *interaction* between SPAs and adjoining areas, and limitations on some kinds of activities during wildlife breeding and migrating seasons is incomplete.

The specialist training system for biodiversity conservation has not been effective. A reduction in the staffing of scientific departments has led to a decrease in the quality of monitoring, and weakened their role as scientific research organisations. The poor *research-and-development facilities* of zapovedniks (a shortage of transport, lack of computers and modern communication facilities) hinders the compilation of data sets and efficient data exchange. It should be noted that the lack of scientifically-based, cheap and reliable *indicators* of biodiversity influences the quality of monitoring. In addition, emergency measures should be taken to improve public awareness of environmental issues.

2.10. Summary

On the whole, the general status of biodiversity can be considered relatively satisfactory: the major elements of the flora and fauna of all terrestrial landscape zones of the country and freshwater and marine ecosystems have been preserved. The biodiversity of Turkmenistan includes more than 20,000 species: 7,064 higher and lower plants and nearly 13,000 vertebrates and invertebrates. Besides rich species resources the biodiversity of Turkmenistan is characterised by a great number of restricted range endemics, wild relatives of cultivated plants and domestic animals and medicinal plants. The IUCN Red Lists of 1996, 1998 and 2000 include 98 flora and fauna species from Turkmenistan. The Red Data Book of Turkmenistan (1999) includes 17 fauna and 28 flora species considered endangered or threatened with extinction.

At the moment the ecological security of all citizens (right to clean air and water etc.) is guaranteed by the Constitution of Turkmenistan. Legislation on nature protection is based on the generally accepted principle of rational use of natural resources. According to the Constitution, land, water, wild animals, plants and other natural resources are a part of the national heritage and come under the protection of the state. Turkmenistan has joined most of the main international nature protection conventions and meets its commitments under them.

There is a developed environmental legislation and nature protection infrastructure that includes, *inter alia*, a network of SPAs. Although the existing network of SPAs is not totally representative from the point of view of the coverage of all biogeographic areas, this problem is not so significant. A more important development in the next few years would be the establishment of an integrated multifunctional system consisting of a territorial combination of SPAs that complement each other with various types of economic activities.

The total area of SPAs of Turkmenistan comprises 4.2% of the country's total area, which considerably exceeds that of other countries in the region. Through the coverage of biogeographic regions, the SPA network of Turkmenistan is one of the most representative in the CIS. This is also supported by the high intellectual potential of conservation science in the country. In order to increase the effectiveness of conservation in the zapovedniks it is necessary given the new socio-economic conditions, firstly to set priorities, and secondly to introduce new regulations guiding scientific research activity. In order to organise a rational interaction between man

and nature based on a precise knowledge of natural processes and human society, it is necessary to gradually convert the zapovedniks from species monitoring programmes to ecosystem-defined ecological monitoring, which will permit an improvement in the level of research into species and ecosystem biodiversity, and the monitoring of natural processes and changes of an anthropogenic character. Ecosystem-defined ecological monitoring can be a concrete instrument contributing to the economic stability of the country.

The Turkmenistan Government devotes considerable resources to nature protection. Funds directed for social programmes also contribute positively to biodiversity conservation. In particular, the connection of remote villages to the national gas pipeline system promotes the conservation and restoration of forests. Interaction between the government and international organisations and financial institutions (UNDP, UNEP, World Bank and others) means that the State's efforts in this sphere will be supported by foreign investment. A considerable part of the population of Turkmenistan is well aware of the importance of nature protection and takes an active role in the realisation of ecological initiatives and activities. The traditional outlook of the people living in the country plays a significant role as well. Public organisations (NGOs) provide the link between government authorities, the population and the international conservation community.

Turkmenistan's considerable efforts so far in the field of biodiversity conservation have been based almost entirely on the requirements of the Convention on Biological Diversity (identification and monitoring; *in situ* and *ex situ* conservation; sustainable use of components of biological diversity; incentive measures; research and training of specialists; public education and awareness; data exchange; technical-scientific co-operation and others). There is a sound basis in Turkmenistan for the creation of a common information network. Some legal reforms and policy changes are nonetheless required to bring Turkmenistan into closer harmonisation with the CBD.

3. BIODIVERSITY STRATEGY AND ACTION PLAN FOR TURKMENISTAN

3.1. Introduction to the BSAP

3.1.1. The need for a BSAP

The global threats that are causing reductions in natural resources and disturbance of ecosystem functions demonstrate the need for urgent measures to conserve biodiversity. When Turkmenistan joined the Convention on Biological Diversity on 18th June 1996, it demonstrated its desire to tackle problems concerning national and global biodiversity. This Biodiversity Strategy and Action Plan (BSAP) provides the mechanism for Turkmenistan to fulfil its obligations under the Convention. It aims to provide a detailed breakdown of the country's biodiversity conservation strategy.

The first stage of the process was the compilation of a Country Study (CS) that reviewed the status of biodiversity in Turkmenistan. This addressed the different social, economic and natural conditions in various parts of the country and the document's compilers included information on threats to natural ecosystems and outlined the first necessary steps in the process of their long-term conservation, restoration and use. Solutions to the problems associated with biodiversity conservation are examined in the Problem Analysis (CS Chapter 9). The development of the BSAP provides an opportunity to co-ordinate activities to help prevent negative impacts on biodiversity in Turkmenistan.

3.1.2 BSAP Structure

The Turkmenistan BSAP has three main elements. The first is the Biodiversity Strategy for Turkmenistan. It contains aims and objectives for tackling biodiversity conservation issues within Turkmenistan. An integrated approach based on strategic components has been developed. The second element, the Action Plan, contains details of how the strategic components outlined in the Strategy will be realised. It lists specific activities, with indicative costings, timescales and expected outputs. The integrated nature of the Action Plan is demonstrated through interrelations between different activities. The final element of the BSAP includes a description of the evaluation and monitoring procedures, as well how implementation will be assessed. In particular, administrative and organisational issues are considered. These include potential implementing organisations, financial mechanisms, as well as recommendations concerning the administration and management of Action Plan implementation.

3.1.3. Timescale for Action Plan Implementation

The Action Plan is designed to be implemented over a nine-year period from 2002-2010. Nine years are enough for impacts of the BSAP to become apparent, but not so long that changes in the socio-economic and political situation will render the Plan unrealistic. The Action Plan

contains a purely indicative timetable to give some general guidelines on priority actions and activities, upon which other further actions and activities may be dependent.

Underlying Principles of the Turkmenistan BSAP

Importance of Biodiversity. Biodiversity and other natural processes connected with it have ecological, economic, social, cultural, spiritual, educational and other values. All citizens of Turkmenistan should understand the importance of biodiversity and bear responsibility for their contribution to biodiversity conservation and sustainable use of natural resources.

Integrated Decision Making. An ecological approach to resource management is necessary for conservation and the sustainable use of natural resources. Decision making should reflect ecological, economic, social and cultural values.

Prevention of Negative Impacts. Environmental Impact Assessments (EIAs) should be conducted in areas where activities may have a negative impact on biodiversity, in order to avoid adverse effects.

Precautionary Principle. Where an activity may result in the reduction or loss of biodiversity but the exact impact is unknown, then the precautionary principle should be applied. That is, in case of doubt, the conclusion should be to cancel such an activity.

Protective Measures. The lack of complete scientific information should not be used as a reason for delaying protective measures.

Displacement. If it is impossible to eliminate activities that are harmful to biodiversity then they should be transferred to areas where the negative impact is minimised.

Ecological Compensation. If it is impossible to avoid negative impacts in areas that are important for biodiversity, the responsible party should undertake compensatory or conservation measures in mitigation.

Ecological Integrity. The maintenance of key ecosystems and support of natural processes are the prerequisites for the conservation of natural habitats (*in situ*) and sustainable use of biological resources.

Restoration and Reintroduction. Where it is feasible, habitats and biodiversity should be restored. *Ex situ* measures may be necessary to support the conservation of endangered species and are essential to ensure sustainable use.

Research. Decision-making on biodiversity conservation should generally be based on sound scientific principles and in particular the monitoring of species with limited natural habitats.

Use of the Best Technologies and Knowledge. Biodiversity conservation activities should be based on existing processes, programmes, technologies, institutions and projects. Their planning should allow them to develop on the basis of assessment and new information. However, existing knowledge and national traditions should be taken into account.

Polluter Pays. Measures should be taken to ensure that the costs of prevention, control and mitigation of environmental impacts are borne by the party responsible.

Co-operation, Share of Costs and Benefits. The conservation and sustainable use of Turkmenistan's biodiversity and natural resources require national, regional and international co-operation as well as the sharing of information and experience, and the equitable sharing of costs and benefits. External investments and internal support are both necessary for conserving Turkmenistan's biodiversity.

Economic Compensation. The development of a system of economic incentives will help fund compensation packages for the damage caused by wild animals.

Public Participation and Access to Ecological Information. It is necessary to be more proactive in attracting public interest in biodiversity conservation through encouraging the par-

ticipation of all interested groups, stakeholders and the development of public awareness campaigns. Continuing ecological education programmes at all levels should be developed as necessary.

3.2. Biodiversity Strategy for Turkmenistan

The strategy for conserving Turkmenistan's biodiversity includes the following:

- An *overall aim* for biodiversity conservation within the country;
- A number of *objectives* that reflect likely changes in the key element of biodiversity and other sectors in support of the overall aim;
- A number of *strategic components* or approaches, that show how these changes will be implemented. A more detailed description of these actions within the framework of each strategic component was developed during the preparation of the BSAP. The outline of these actions is presented in the Biodiversity Action Plan.

3.2.1 Overall Aim

The overall aim of the Strategy is to conserve, restore and sustainably use the biological diversity of Turkmenistan for present and future generations.

3.2.2 Objectives

To reach the overall aim it will be necessary to attain the following 12 objectives:

1. To integrate biodiversity conservation activities into all levels of governmental programmes by 2005.
2. To revise and develop nature protection laws in accordance with the Convention on Biological Diversity, eliminating gaps in the legislation by the end of 2006.
3. To reduce the relative level of environmental pollution by 20% by the end of 2007, through the revision and improvement of nature protection laws.
4. To halt the process of degradation of natural landscapes in 30% of Turkmenistan's territory by the end of 2010.
5. To preserve the existing state of the forests and restore 5% of their area by the end of 2010.
6. To increase the level of public awareness on the importance of biodiversity to 50% and increase level of ecological education by 10%.
7. To increase protected areas by 6% by the end of 2008 and ensure their effective management.
8. To improve the conservation of agricultural biodiversity and *ex situ* conservation of genetic resources by 30% by the end of 2008.
9. To develop and introduce economic incentives to increase local people's interest in biodiversity conservation by 2010.
10. To support internal and external funding of BSAP projects for the whole period of their implementation.
11. To increase investments for supporting the scientific potential of existing institutions relating to biodiversity conservation by 30% by the end of 2010.
12. To develop a plan for biological resource management that aims to reduce overexploitation and ensure its implementation by 2006.

3.2.3 Strategic Components

The Strategy for the Conservation of Turkmenistan's Biodiversity consists of a number of inter-related components, or conservation approaches, that when implemented jointly will allow the attainment of the overall aim and objectives. These approaches have been developed on the basis that the implementation of one strategic component will not bring success without the implementation of inter-related activities. The strategic components are as follows:

***In situ* conservation**. This approach recognises the importance of undertaking conservation within the natural environment. It highlights the importance of maintaining communities and ecosystems, both within and outside protected areas.

***Ex situ* conservation.** Conservation away from the natural environment is seen as a back-up to *in situ* conservation. This provides a safety net to ensure protection of a wide range of genetic resources, with the aim of eventual reintroduction, wherever possible.

Sustainable use of biological and landscape diversity. This approach recognises the importance of biodiversity as a resource, and the dependence of local communities, and others, on this resource. Sustainable use is a mechanism by which conservation can be put alongside these needs, thus reinforcing the immediate value of these resources, and the need for conservation, while also meeting the needs of local people. The concept is a particularly important tool for *in situ* conservation outside protected areas, and is closely associated with the development of incentive measures.

Development of institutional potential and training. The implementation of any institutional changes will rely on parallel capacity building of individuals and organisations to support increased or novel activities.

Ecological education and public participation. Any conservation activity requires the understanding and support of the wider populace if it is to be successful and sustainable. Informing the public underlies any activities taking place outside protected areas, and ecological education promotes a wide involvement in conservation activities.

Identification and monitoring. For any plan it is important to be able to assess the impacts of new or changed activities. Since biodiversity conservation is the target of this plan, long-term monitoring of species and ecosystems is necessary to enable its impact to be evaluated. This will ensure that future threats are identified as early as possible.

Research. In order to manage biodiversity conservation effectively, management decisions (such as those for *in situ* conservation and for monitoring) must be based upon the most appropriate and detailed information. A complex biological system requires ongoing research to better understand its conservation needs, and to adjust management practices if necessary.

Information exchange and accessibility. For effective conservation, information on biodiversity, and on activities affecting biodiversity, needs to be available to a wide

range of people. This ensures that activities are not duplicated and that decisions are made on the best information available, while promoting transparency within conservation. Information may be exchanged at a range of levels – locally, nationally, regionally or internationally.

Co-operation (technical, scientific, inter-state technology transfer). Biodiversity does not observe boundaries – be they between parts of society, communities or states. Effective biodiversity conservation must, therefore, rely upon communication and co-operation to ensure fairness and equity with respect to biological resources. Furthermore, co-operation between neighbouring, and distant states is important to ensure effective co-ordination of activities towards the common goal of conserving the world's biological resources.

Impact assessment. This provides an important technique to monitor the effects of a range of activities on biodiversity. Through effective advance planning, it is possible to ensure appropriate responses to mitigate negative impacts on biodiversity. Impact assessment also provides a clear basis for assessing appropriate incentive and disincentive measures.

Legislation. Any changes in approaches, or activities, in this plan will need to be supported by appropriate regulations. Legal measures will underpin the other strategic components in this plan (including incentive measures). In many cases existing legislation will need to be reviewed or up-dated, in order to enable effective support of the planned activities.

Incentive measures. One of the most important factors contributing to biodiversity loss is the lack of true economic value associated with natural resources. The use of economic (and other) incentives and disincentives, allows this to be re-balanced, by linking some of the true value to such resources, and thus promoting favourable conservation behaviour.

Financial resources. Implementation of this plan, and its strategic components, will require financial support. The sources of these finances need to be considered within the plan – be it a review of existing mechanisms, or the development of novel funding avenues for conservation.

Co-ordination of the Biodiversity Strategy and Action Plan (BSAP). In order to support its successful implementation, the structures for administrating and managing planned actions need to be considered within the plan itself. By identifying the mechanisms for co-ordination of the plan at this stage, an integrated approach can be taken to implementation of all other strategic components. These include clarification of responsibilities for promoting the plan, and mobilising co-ordinated action.

These strategic components, included in the Biodiversity Strategy, were developed during discussions at the inter-sectoral workshops and are linked to the Articles of the Convention on Biological Diversity.

The issues addressed by Articles (6-20) of the CBD are clearly represented within the strategic components:

Article 6	General measures on conservation and sustainable use
Article 7	Identification and monitoring
Article 8	*In situ* conservation
Article 9	*Ex situ* conservation
Article 10	Sustainable use of components of biodiversity
Article 11	Incentive measures
Article 12	Research and training
Article 13	Public education and awareness
Article 14	Impact assessment and minimising adverse effects
Article 15	Access to genetic resources
Article 16	Access to and transfer of technology
Article 17	Exchange of information
Article 18	Technical and scientific co-operation
Article 19	Handling of biotechnology and distribution of its benefits
Article 20	Financial resources

The clear links between the BSAP's components and the Convention's Articles may be considered an advantage, allowing for easy reporting on the implementation of the Convention in Turkmenistan. Additionally, such a structure will allow for simple comparison between this document and the BSAPs of other countries and provides an internationally agreed framework for biodiversity conservation.

3.3. Biodiversity Action Plan

Actions / Activities. The Action Plan includes practical actions that should be undertaken within the framework of each strategic component in order to attain the overall aim and objectives. These actions are subdivided into a number of constituent and inter-related, activities. Some of these activities will be implemented in accordance with existing plans and projects, whereas others will be developed for the first time. The description of each activity is intended to provide clear outlines for implementation, with indicative costing and time-scale and defined outputs.

Cost. Approximate budgets are given in US dollars. This is done exclusively for illustrative purposes and for the purpose of international compatibility and attracting donors. These budgets are estimates of the expected expenses (from $US 100 to 1 million) and serve as an indication of the funding required for the implementation of each action. In some cases this budget may relate to several inter-related activities. The specific value will be outlined during the projects' development.

Duration. The duration or timescales are also relative. They cover a nine-year period (2002-2010) during which each activity should be implemented, taking into account its relative priority and dependence on other activities' completion and therefore the likely allocation of financial means for this priority activity.

Outputs. These are the actual results of each activity, which serve as a basis for evaluating success and the degree of completion. These outputs are proximal achievements but it is understood that the completion of any activity will affect a wider range of success indicators, including the objectives of the BSAP.

Related Objectives. These show how the overall aim may be reached. They demonstrate what activities will lead to the attainment of particular objectives. Numbering in this column corresponds to the numbering of objectives in Section 3.2.2.

Related Activities. These identify other closely related activities within the framework of the BSAP. Generally speaking, activities within the framework of one action will be probably be similar. However, this information (based on the numbering of activities for reference purposes) make it possible to refer to inter-related or similar actions within the framework of the BSAP.

Large differences in the natural, social and economic conditions between the regions of the country, the degree of transformation of natural ecosystems and the intensity of anthropogenic impacts allow for the definition of 55 actions and 253 activities within the scope of the 14 strategic components of the national Action Plan.

The precise inter-relations between BSAP components and CBD articles can be considered a positive attribute facilitating reporting on Turkmenistan's commitments under the CBD. These inter-relations facilitate the comparison of Turkmenistan's BSAP with similar documents prepared by other countries and provide an internationally agreed action scheme for biodiversity conservation.

INTEGRATED PLAN

Since the Action Plan is based on the principle of integration, most activities are linked with others, either within the framework of the same component or within other strategic components. They are shown in the column "Related Activities".

In some cases the activities may be inter-dependent and the successful implementation of one activity may depend on prior or subsequent implementation of other(s). Thus, integration is a key facet of this BSAP and it is recommended that the information on related activities should be consulted before any activity is implemented.

Biodiversity Action Plan

3.3 Biodiversity Action Plan

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
3.3.1 Strategic Component A: **In situ *conservation***								
A.1	**Improve management of existing protected areas**							
A.1.1	Review effectiveness of current protected area management and develop integrated government policy and co-ordinated management	A.3.2 A.8 D.2.1 F.4.4	1-12	2002-2004	1-10	Ministry of Nature Protection (MNP)	Review; improved management	A
A.1.2	Training of nature conservationists in the development of management plans for sustainable functioning of Specially Protected Areas (SPAs)	A.1.1 C.5.1 D.3.2	1,3,6, 7,11	2003-2004	1-10	MNP	Training of specialists in management of SPAs	A
A.1.3	Provide technical assistance and equipment to Repetek Biosphere zapovednik	A.5.2 C.5.4 B.5.4 L.3.1	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A
A.1.4	Provide technical assistance and equipment to Hazar zapovednik	A.6.5 A.7.1 C.1.3 F.1.5 F.2.5	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A
A.1.5	Provide technical assistance and equipment to Badkhyz zapovednik	A.2.2 B.5.2 G.1.4 L.3.1	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A
A.1.6	Provide technical assistance and equipment to Kopetdag zapovednik	A.5.5 A.6.6 A.7.4	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A
A.1.7	Provide technical assistance and equipment to Syunt-Hasardag zapovednik	A.4.2 A.5.5 B.1.2	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A

* - the specific value will be defined during the projects' development

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
A.1.8	Provide technical assistance and equipment to Kaplankyr zapovednik	A.5.1 A.7.3 B.5.3	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A
A.1.9	Provide technical assistance and equipment to Amudarya zapovednik	A.5.7 A.6.2 C.5.4	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A
A.1.10	Provide technical assistance and equipment to Kugitang zapovednik	C.2.1 A.6.4	6,7, 11,12	2003-2005	10-100	MNP	Technical and logistical support	A
A.1.11	Create multi-purpose GIS of flora and fauna of protected areas to improve integrated management	A.2.1 D.3.4 F.4.4 H.1.1	2,7, 8,11	2003-2006	10-100	MNP	National protected area GIS	A
A.2	**Improve network of protected areas**							
A.2.1	Review scientific principles and criteria for increasing / amending the network of specially protected areas	A.1.1 A.1.11 L.2.2	1,7, 11,12	2003-2005	1-10	MNP	Scientific basis for a network of multi-functional protected areas	A
A.2.2	Prepare nominations for sites to be included into the World Heritage List of UNESCO	A.1.3 A.1.5 L.2.1	1,7, 11,12	2003-2004	1-10	MNP	Nominations	A
A.2.3	Prepare recommendations to improve the functioning of the protected area system in Central Kopetdag	A.1.1 F.1.6 L.2.1	1,7, 11,12	2003-2007	1-10	MNP	Recommendation note	A
A.2.4	Develop model provisions / regulations in minor protected areas: different forms of zakazniks and buffer zones	A.1.1 A.2.5 L.2.2 L.2.5	1,7,8, 11,12	2004-2005	1-10	MNP	Model provisions / /regulations	A
A.2.5	Prepare inventory of breeding sites of rare animal species as the basis for creation of minor protected areas	A.2.4 L.2.2	1,7,8, 11,12	2003-2004	1-10	MNP	Inventory	B

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
A.3	**Creation and management of Balhan zapovednik**							
A.3.1	Prepare background materials necessary to create Balhan zapovednik	A.1.1 A.2.1 L.2.2	1,2, 7,11	2003- 2004	1-10	MNP	Package of documents	A
A.3.2.	Prepare zapovednik management plan for protection and sustainable management of natural resources	A.1.1 A.1.2,L.2.5	1,6, 7,11	2004- 2007	1-10	MNP	Management plan	A
A.4	**Creation of new National Parks**							
A.4.1	Develop package of supporting documentation on the establishment of National Parks	E.6.12 L.2.3	2,6, 7,11	2003- 2004	1-10	MNP, State Tourism and Sports Committee	Package of documents	A
A.4.2	Develop the schematic plan of organisation and development of Sumbar National Park (south-western Kopetdag)	A.1.7 A.4.1 E.6.12	1,2, 7,11	2004- 2005	1-10	MNP	Schematic plan	A
A.4.3	Develop a schematic plan of organisation and development of Kugitang National Park (Pamir-Alay system)	A.4.1 E.6.12	1,2, 7,11	2004- 2005	1-10	MNP	Schematic plan	A
A.5	**Conservation, restoration and sustainable use of key ecosystems**							
A.5.1	Conservation of north-western desert ecosystems	A.1.8 A.6.3	1,6, 7,11	2003- 2006	>100	MNP	Nature-conservation activities	A
A.5.2	Conservation of black saxaul ecosystems of the Karakums	A.1.3 A.6.3	1,7, 11,12	2003- 2005	10-100	MNP	Package of activities	A
A.5.3	Develop sustainable forestry as a basis for conservation of globally important plant and animal species	A.5.4 B.4.2 C.2.1 G.3.7	1,7, 11,12	2003- 2010	10-100	MNP, “Geok Gushak” PLC	Package of activities	A
A.5.4	Identify priority areas for restoration of archa *Juniperus* forest	A.5.5 E.4.2 I.1.3	1,7, 11,12	2003- 2005	10-100	MNP	Area maps	A
A.5.5	Conservation and restoration of biodiversity of forest-steppe mountain communities	A.5.4 C.2.1 E.4.2	1,7, 11,12	2003- 2010	>100	MNP	Package of activities	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
A.5.6	Develop activities to increase the area of natural pistachio forest	A.5.6 C.2.2 G.1.5	1,7, 11,12	2003-2010	10-100	MNP "Geok Gushak" PLC	Increase in area of pistachio forest	A
A.5.7	Conservation and restoration of tugai relict forests along the Amudarya river as a habitat for Bukhara deer	A.1.9 A.6.2	1,7, 11,12	2003-2010	10-100	MNP	Package of activities	A
A.5.8	Develop an ecological network as a basis for long-term conservation of ecosystems in Central Asia	A.7.2 L.2.2	1,7, 11,12	2002-2005	10-100	MNP	Trans-border project with Uzbekistan	A
A.5.9	Conservation of Caspian Sea ecosystems and biodiversity	C.1.3 I.1.2 F.1.5	1,7, 11,12	2002-2005	10-100	MNP	Package of activities	A
A.5.10	Conservation of biodiversity of the Kugitang Mountains in Turkmenistan	A.1.1, A.1.10, A.6.2, C.5.7	1, 7, 11, 12	2002-2005	10-100	MNP	Trans-border project	A
A.6	**Conservation of rare and threatened species**							
A.6.1.	Develop conservation activities for one of the «key» species as a form of conservation of major ecosystems	A.6.2 B.4.1	7,11, 12	2003-2005	10-100	MNP	Package of activities	A
A.6.2	Develop and implement action plans to conserve priority threatened species (such as leopard, striped hyaena, Bukhara deer etc.)	E.6.10 F.3.2 I.1.4 G.1.4	7,11,12	2003-2005	10-100	MNP	Implemented action plans	A
A.6.3	Undertake background studies, and where practical continue existing and develop new reintroduction projects for rare and locally extinct species (for example kulan, Asiatic cheetah)	E.6.10 G.1.1 M.1.1 M.2.4	1,7, 9,11	2003-2006	>100	MNP	Expeditions, reports, reintroduction projects	A
A.6.4	Provide technical support to nature protection services	A.6.1 A.7 F.4	7,8, 11,12	2003-2006	10-100	MNP	Technical support	A
A.6.5	Continue active management of existing introduced animal populations through translocation, reinforcement etc. (e.g. sand gazelle on Ogurchinsky Island)	A.1.4 B.4.1 M.1.1	7,8,11,12	2006-2007	10-100	MNP	Managed populations	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
A.6.6	Improve logistical support to bio-technical activities to maintain snake populations on the edges of the protected snake refuge (Kopetdag zapovednik)	A.1.6 M.2.2	6,7,11,12	2003-2007	10-100	MNP	Logistical and technical support for bio-technical activities	A
A.7. Conservation of migration corridors								
A.7.1	Provide protection for areas where migrating species of birds concentrate (for example in the wetlands of Hazar zapovednik, related to the Ramsar Convention)	A.1.4 L.2.2 L.2.4	1,6, 7,11	2003-2005	10-100	MNP	Improved territorial ranger service	A
A.7.2	Prepare recommendations for a regional network of protected areas to conserve migratory and wide-ranging species (e.g. Asiatic cheetah, cranes)	A.5.8 L.1.2 L.2.2 L.2.4	2,7, 8,11	2006-2007	10-100	MNP	Recommendations for network of protected areas	B
A.7.3	Conservation of saiga and saiga habitat on migration routes, and wintering and summer grounds (Kazakhstan, Uzbekistan, Turkmenistan)	A.1.8 I.1.6 L.1.2 L.2.4	1,6, 7,11	2003-2006	10-100	MNP	Trans-border project	A
A.7.4	Create a crane refuge at Meana-Chaachinskiy, and incorporate into the international network of crane refugia	A.1.6 A.2.1 I.2.3 L.1.2 L.2.1	1,7, 11,12	2003-2005	1-10	MNP	Conservation of flyway crane population	A
A.8. Increase the role of the local population in management of protected areas								
A.8.1	Develop mechanisms that incorporate stakeholder opinions more effectively into the decision-making process relating to protected areas	E.4.3 I.1.1 L.2.5	1, 4, 6, 7, 11,12	2002-2004	1-10	MNP	Wider range of expertise contributing to decision-making	A
A.8.2	Integrate PA management with other government management structures and programmes to involve local government	A.1.1 D.1.1 L.2.1	1, 2, 3, 6, 7, 12	2002-2005	1-10	MNP	Integrated and co-ordinated management	A
A.8.3	Create an NGO to promote interest in protected areas conservation and nature protection	D.1.1 H.1.1 H.1.2 H.1.3	1,6, 7,11	2003-2006	1-10	MNP	NGO “Society of zapovednik friends”	C

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
		K.3.2 M.2.5						
3.3.2 Strategic Component B: **Ex situ** *Conservation*								
B.1. Support the *ex situ* conservation of wild relatives of cultivated plants and traditional crop varieties								
B.1.1	Provide logistical support to the live collections of the Garrygala Scientific-Production Experimental Centre for Genetic Resources	C.2.1 D.1.1 E.1.4 G.2.2 M.1.1	7, 8, 11	2003-2007	>100	Ministry of Agriculture (MA), MWR (MWR)	Modernisation of auto tractor park and its infrastructure	A
B.1.2	Construct an artificial reservoir to provide irrigation water for the collection of Garrygala Scientific-Production Experimental Centre for Genetic Resources	G.1.5 G.3.3 M.1.3	7, 8, 11	2004-2008	>100	-“”-	Water reservoir	A
B.1.3	Increase the level of professional qualification of staff at the Garrygala Scientific-Production Experimental Centre for Genetic Resources	B.3 D.3 E.3.2 F.2.3 M.2.4	7, 8, 11	2004-2008	10-100	- “” -	Retraining of specialists	A
B.1.4	Establish cultivated collection of locally selected and rare varieties and forms of apples, pears and grapes	E.5.1 E.5.2 G.2.1	6,8,9	2003-2006	10-100	- “” -	Cultivated collection	A
B.1.5	Support breeding centres for conservation of wild plant species, important for agrobiodiversity	B.2.2 B.4.1 G.2.2	5,7,8	2003-2007	1-10	- “” -	Modern technical equipment	B
B.2 Promote conservation of genetic diversity of fruit plants and their wild relatives								
B.2.1	Train farmers in techniques of breeding and cultivating local varieties and forms of wild fruit plants	C.4.2 D.2.4 G.2.2 K.1.3	7,8,9	2004-2008	1-10	- “” -	Seminars	A
B.2.2	Conduct public awareness campaign on the values of the conservation of wild-growing species and local types of fruit trees	E.2.2 H.1.2 K.1.2	6,7, 8,9	2003-2007	1-10	- “” -	Exhibition of farmers’ achievements, publications	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
B. 3	**Creation of plant seed banks and germplasm banks**							
B.3.1	Prepare logistical basis for creating a plant genetic seed bank at Garrygala Scientific-Production Experimental Centre for Plant Genetic Resources	B.1.3 F.2.3 G.2.3	5,7,8	2003-2005	1-10	Ministry of Agricuture	Logistical support	A
B.3.2	Develop legislation on management and regulation of seed collection	C.1.6 L.3.5	5,7,8	2003	1-10	MNP	Legislation	A
B.3.3	Provide logistical support for creation of a forest plant germplasm bank	A.4.2 E.4.1 F.2.3 M.1.1	3,4, 6,8	2003-2006	1-10	MNP, MA, MWR	Germplasm bank	A
B.4. Creation of new and improvement of existing breeding centres for rare and threatened plant species								
B.4.1	Establish infrastructure and technical basis for a breeding centre for rare and threatened plant species	D.1.2 G.3.2 H.3.4 M.3.4	5,7,8	2003-2007	10-100	MNP	Rare plant breeding centre	B
B.4.2	Provide logistical support to existing tree nurseries	A.5.3 B.4.1 C.2.2 C.2.3	5,7,8	2003-2007	1-10	MNP	Modern technical equipment	B
B.5. Create captive centres for conservation								
B.5.1	Develop rules and regulations covering capture of wild animals in line with international practice	B.5.2 C.1.6 C.3.1	7,8	2003-2004	1-10	MNP	Model rules and regulations	B
B.5.2	Create a centre for rehabilitation and breeding of threatened animals and support existing breeding centres at the zapovedniks	B.5.1 C.1.6 G.1.4 L.1.1	7,8	2004-2007	>100	MNP	Captive breeding and rehabilitation centre	A
B.5.3	Create a houbara bustard breeding centre in Kaplankyr zapovednik	A.5.1 B.5.1 D.3.1	6, 7, 8, 9	2002-2006	>100	MNP	Increased houbara population	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
B.5.4	Establish semi-wild herd of sand gazelle in Repetek zapovednik	A.5.2 B.5.1 D.3.1	7,8, 11,12	2003-2006	10-100	MNP	Demonstration breeding centre (5 ha; up to 40 head of sand gazelle)	B
B.6. Conservation of urban biodiversity								
B.6.1	Create park zones as a form of urban environment biodiversity protection in Turkmenistan's rapidly-expanding towns	B.6.2 F.2.2	6,7, 8,9	2003-2007	10-100	"Geok Gushak" PLC	Park zones	A
B.6.2	Set up a database of plants introduced from the local flora into urban landscapes	F.1.4 F.2.1	6,7, 8,9	2003-2004	1-10	"Geok Gushak" PLC	Database	B
3.3.3 Strategic Component C: Sustainable use								
C.1 Promote sustainable use of biological resources								
C.1.1	Identify types and extent of biological resources and prepare recommendations for their sustainable use	B.3.2 B.5.1 C.1.6 F.3.7	3,4, 6,8	2003-2005	10-100	MNP	Field survey and recommendations	A
C.1.2	Develop special activities related to conservation of breeding and feeding grounds of freshwater resource fishes (e.g. roach and carp in the Atrek River)	C.3.2 I.1.2 K.3.1	3,4, 6,8	2003-2010	10-100	MNP, State Fishery Committee	Package of activities	B
C.1.3	Promote sustainable utilisation of Caspian Sea fisheries resources including sturgeon	A.5.9 C.1.6 I.1.2 J.1.3	1,7, 11,12	2002-2010	10-100	MNP, State Fishery Committee	Develop regulations and enforce quotas	A
C.1.4	Review the acceptable limits of human impact on vulnerable and rare ecosystems and landscapes	B.3.2 B.5.1 J.1.2	3,4, 6,8	2003		MNP	Limits	B
C.1.5	Encourage sustainable use of natural liquorice bushes (undertake economic evaluation, train farmers in liquorice cultivation, establish a processing plant for natural liquorice)	C.1.1 F.3.7 L.1.6	3,4, 6,8	2003-2009	10-100	MNP, Ministry of Health and Medical Industry	Sustainable use and conservation of liquorice	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
C.1.6	Review quotas for production and sale of natural resources (including hunting) in accordance with changes in their status	B.5.1 B.5.2	3,4, 6,8	2003- 2005		MNP	Quotas for production and sale	B
C.2 Promote sustainable utilisation of montane forests								
C.2.1	Develop and implement a package of activities in forestry and sustainable use of forest resources	A.5.4 A.5.5 A.5.6 E.4.2 I.1.3	3,4, 6,8	2003- 2009	10-100	MNP, "Geok Gushak" PLC	Package of activities and its implementation	A
C.2.2	Provide logistical support for creation of a pistachio tree nursery (basis for matrix planting of pistachio trees)	A.1.5	3,4, 6,8	2003- 2007	10-100	MNP	Pistachio tree nursery	A
C.2.3	Disseminate international experience on forest restoration in degraded lands	E.4 H.2.1 I.2.7	3,4, 6,8	2003- 2007	1-10	MNP	Demonstration planting of trees	B
C.3	**Establish new model self-sustaining centres for harvesting wildlife**							
C.3.1	Prepare groundwork to create a new model of hunting / sport fishing farm	B.5.1 C.1.1 C.3.4	3,4, 6,8	2003- 2004	1-10	TSHF	Background report	A
C.3.2	Prepare groundwork to create new model fish farms	B.5.1 C.1.2 C.3.5	3,4, 6,8	2003- 2004	1-10	State Fishery Committee	Background report	B
C.3.3	Prepare groundwork to create a new model of wild animal breeding farm	B.5.1 C.1.1 C.3.4	3,4, 6,8	2003- 2004	1-10	MA, MWR	Background report	C
C.3.4	Prepare project documentation for new models of resource centres run on a sustainable basis	B.5.1 C.3.3 C.3.5	3,4, 6,8	2003- 2004	1-10	TSHF	Project documentation	A
C.3.5	Provide logistical support to new model resource centres run on a sustainable basis	C.3.4 M.3.3	3,4, 6,8	2005- 2010	>100	TSHF	Functioning resource centre	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
C.4	**Development of economic incentives for involving local stakeholders in conservation of biodiversity**							
C.4.1	Develop alternative methods of sustainable water use, pasture and agricultural land use, oriented towards biodiversity conservation	J.1.2 J.2.1 J.2.3	3,4, 6,8	2003- 2006	10-100	MA, MWR	Package of activities	A
C.4.2	Encourage farmers to grow local medicinal plants by providing logistical support	C.5.2 K.1.3	3,4, 6,8	2003- 2007	10-100	Turkmenderman, MA, MWR	Logistical support	A
C.5	**Development of sustainable ecotourism**							
C.5.1	Work out a management plan for the development of scientific and ecological tourism	A.1.2 D.3.2 K.3.3	1,2,6, 7,11	2003- 2004	1-5	MNP, State Tourism and Sports Committee	Management plan	A
C.5.2	Identify new recreational or aesthetic resources (natural monuments, spiritual places etc.)	K.1.3 K.2.1	1,6, 7,11	2003- 2006	1-10	MNP, State Tourism and Sports Committee	Registration of new areas	A
C.5.3	Prepare a guidebook on game animals to attract tourists and develop photographic safaris in Turkmenistan	C.5.1 K.3.3	1,7, 9,11	2004- 2007	10-100	MNP	Reference-data book about game animals	A
C.5.4	Establish two new open-air "museums": on black saxaul in Repetek zapovednik and Bukhara deer in Amudarya zapovednik	E.6.13 C.5.1 K.3.3	1,7, 9,11	2003- 2007	10-100	MNP	Open-air museums	A
C.5.5.	Provide nature conservation staff with training in ecotourism at Repetek zapovednik	C.5.4 D.3.1 E.1.5	1,6,7, 9,12	2003- 2006	10-100	MNP	4-5 trained specialists per year	B
C.5.6.	Develop nature trails and interpretative materials at key sites	D.3.2 E.1.5	1, 6, 7	2002- 2004	10-100	MNP, State Tourism and Sports Committee	Nature trails, panels	B
3.3.4 Strategic Component D: Institutional strengthening and capacity building								
D.1	**Institutional support**							
D.1.1	Enhance state and public institutional management mechanisms for the conservation and sustainable use of biodiversity	A.1.1 A.8.2 H.1.2 M.2.5	1,3,7, 8,11	2003- 2007		MNP, MA, MWR, Ministry of Education	Review of management mechanisms	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
D.1.2	Provide infrastructure for management and sustainable use of biological resources at MNP and review and clarify specific functions and responsibilities within departments and develop mechanisms for increased co-ordination	A.1.1 B.4.1 C.3.4	1,3,7, 8,11	2003- 2004		MNP	Infrastructure improved; functions and responsibilities clarified	C
D.1.3	Provide logistical support for existing educational-scientific ecological centres at Higher Educational Institutions (HEIs)	A.1.1 E.1.2 E.2	4,7, 8,11	2003- 2005	10-100	Ministry of Education	Computer technology	A
D.2.	**Improve inter-sectoral co-operation on natural resource use at the national level**							
D.2.1	Establish an inter-Ministerial working group to determine recommendations for an integrated policy on natural resource use	A.1.1 D.2.2 I.1.1 I.1.5	1, 3, 7, 11, 12	2002- 2003	1-10	MNP	Working group established	A
D.2.2	Adopt an integrated policy on natural resource use (as a government resolution)	A.1.1 D.2.1 D.3.1 I.1.4	1, 3, 7, 11, 12	2002- 2010		MNP	Government resolution	A
D.2.3	Increase the level of awareness and competence of staff and decision makers about biodiversity conservation in MNP and other relevant organisations	D.2.1 D.2.4 E.2.2 I.2.2	6,11,12	2003- 2010	10-100	MNP	Training and package of informative-educational material	A
D.2.4	Arrange permanent training to improve inter-sectoral co-operation and exchange of experience and information on biodiversity conservation	B.2.1 D.2.3 E.6.14 I.2.2	1,2,3, 7,11	2003- 2010	10-100	MNP	Training	C
D.3	**Capacity building through professional and scientific training**							
D.3.1	Train professional staff at international centres in natural resource management, conservation and sustainable use of biodiversity	A.1.2 B.1.3 B.4.1 C.5.5	1,2,3, 7,11	2003- 2010	10-100	MNP	Trained professional staff	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
D.3.2	Develop and publish a manual / guidelines for preparation of management plans for protected areas	A.1.2 C.5.1	1,2,3, 7,11	2003-2004	1-10	MNP	Manual	B
D.3.3	Provide re-training courses for protected areas staff (including computer and internet training)	A.1.2 D.3.1 F.4.4 H.1.1	1,2,3, 7,11	2003-2010	10-100	MNP	Refresher courses and participation	C
D.3.4	Provide logistical support for training and use of GIS by professional staff as a data evaluation instrument in biodiversity conservation	A.1.11 B.1.3 F.4.4 H.1.1	3,4,5, 7,8	2003-2005	10-100	MNP	Trained staff and GIS equipment	A
D.3.5	Promote the participation of specialists from ministries in national, regional and international conferences concerning biodiversity	B.1.3 D.3.1 H.3.3	1,2,3, 7,11	2003-2010	1-10	MNP	Representation at conferences	B
3.3.5 Strategic Component E: Ecological education and public awareness								
E.1	**Improve the level of ecological education**							
E.1.1	Reform ecological-educational programmes and biodiversity conservation curricula at HEIs and schools	E.2 E.3	1,6, 11,12	2003-2007	10-100	Ministry of Education	Reformed programme	B
E.1.2	Develop and publish a package of different ecological activities in biodiversity conservation for infant, primary and secondary schools	E.2 E.3 D.1.3	6,11,12	2003-2005	10-100	Ministry of Education, MNP	Activities and materials	A
E.1.3	Develop and publish modern methods of ecological education in infant schools	E.2 E.3	6,7, 11,12	2003-2005	10-100	Ministry of Education	New teaching methods	A
E.1.4	Develop courses in nature protection education, including the issues of biodiversity conservation and management of protected areas	E.2 E.3	1,2,3, 7,11	2003-2004	10-100	Ministry of Education, MNP	Courses for schools and HEIs	B
E.1.5	Organise summer ecological camps for schoolchildren	E.2 E.3 C.5.6	1,2,3, 7,11	2003-2004	10-100	Ministry of Education, MNP	Ecological camps	A
E.2	**Logistical support to special programmes in ecological education at all levels**							
E.2.1	Prepare computerised school ecological-education	E.1	6,7,	2003-	10-100	Ministry of	Computerised	B

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
	programmes	E.3 E.6	11,12	2005		Education, MNP	programmes available in schools	
E.2.2	Establish centres for ecological education in velayat nature protection divisions	E.1 E.3 E.6 C.5.5 D.1.3	1,6, 11,12	2003-2005	10-100	MNP	Ecological education centres	B
E.2.3	Publish books and teaching aids based on local materials for kindergartens, schools and HEIs in the Turkmen language	E.1, E.3, E.5, E.6	6,11,12	2003-2007	>100	MNP, Ministry of Education	Books and teaching aids	A
E.2.4	Develop a scenario for a “round-table” on TV:dialogue between children and representatives of different Ministries	E.1 E.3 E.6	6,11,12	2003-2004	1-10	MNP	Scenario “Dialogue on nature”	B
E.3	**Increase capacity of nature protection specialists and educational staff to deliver ecological education**							
E.3.1	Provide training for teachers and lecturers to improve their capacity for delivering environmental education	E.1 E.2 E.6	6, 7, 11, 12	2002-2010	10-100	MNP, Ministry of Education	Trained teachers	A
E.3.2	Improve the qualification level of nature protection specialists (ecologists, taxidermists and others) for delivering ecological education	E.1 E.2 E.6	6,7, 11,12	2003-2010	10-100	MNP, Ministry of Education	Trained specialists	A
E.3.3	Set up a library of ecological methods, and a photo and film library of the landscape component of biodiversity	E.1 E.2 E.6	6,11,12	2003-2006	1-10	MNP, Ministry of Education	Library, photo and film library	C
E.4	**Increase public participation in conservation and sustainable use of forest resources**							
E.4.1	Direct ecological education activities in secondary schools to promote rules on forest utilisation	A.5.5 C.2 E.6 G.1.3 I.1.3	4,5, 6,7	2003-2006	1-100	MNP, Ministry of Education, “Geok Gushak” PLC	School forest farms	B

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
E.4.2	Establish an experimental site in the mountains for strengthening the interaction between people and forest resources	A.5.4 C.2.1 E.6 G.1.3	4,5, 6,7	2004- 2007	10-100	MNP	Pilot project	A
E.4.3	Encourage involvement of the population in developing a forest resource use strategy	A.8.3 B.3.3 F.2.3 G.1.3	4,5,6,7	2003- 2006	1-10	TSNP, "Geok Gushak" PLC	Seminars, training	A
E.5	**Support and assistance to biodiversity conservation activities related to culture and traditions**							
E.5.1	Support to biodiversity conservation in line with traditional cultural practice	B.1.4 E.5.2	6,7, 8,11	2003- 2010	10-100	MNP	Thematic seminars; competitions for publication in mass media	A
E.5.2	Encourage rebirth of national traditions and culture connected with biodiversity conservation	B.1.4 C.5.2 E.5.1	6,7,8	2003- 2007	10-100	MNP	Grant programme	B
E.5.3	Adopt measures to encourage conservation of traditional dog breeds (alabai and tazy), for example national centres, amateur dog-owners' clubs, database of pedigree dogs, training in stud book maintenance and support to shepherd breeding farm	B.1.4 E.5.2 K.1.3	6,7, 8,9	2003- 2004	10-100	MA, MWR	Package of activities	A
E.6	**Increase public awareness of the importance of biodiversity conservation**							
E.6.1	Review current activities promoting public awareness of biodiversity and establish baseline level of awareness	D.1.1 E.6.6 H.1.2	6, 7, 11, 12	2002- 2003		MNP	Review	A
E.6.2	Create and support a national centre for ecological education and public awareness	D.1.1 E.2 E.6.3 H.1.2	1,6,12	2002- 2003	10-100	MNP	Ecological education centre	A
E.6.3	Develop a public awareness programme promoting biodiversity and the need for its conservation through	E.6.4 H.1.1	6,7, 11,12	2003- 2010	10-100	MNP	Awareness programme	B

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
	the mass media (TV and radio programmes, national newspaper articles etc.)							
E.6.4	Prepare and disseminate teaching aids for biodiversity	C.5.3 E.1.3 E.6.3	6, 7, 11,12	2002- 2007	10-100	Ministry of Education, MNP	Booklets, post-cards, newsletter	B
E.6.5	Publish an educational journal covering the problems of biodiversity	E.2.3 E.6.3	6,7, 11,12	2003- 2010	10-100	Ministry of Education, MNP	Journal “Nature” “Tebigat”	A
E.6.6	Increase public awareness of existing laws related to biodiversity	E.6.1 H.1.2 K.3.2	2,6, 11,12	2002- 2010	10-100	MNP, TSNP	Publication of booklet on nature protection laws	C
E.6.7	Publish postcards depicting the medicinal plants of Turkmenistan	E.6.3 E.6.4	2, 7, 8, 11, 12	2003- 2005	1-10	TSNP	Set of postcards	A
E.6.8	Conduct public awareness campaign, illustrating traditional methods of biodiversity conservation (e.g. borzoi-tazy)	B.1.4 E.5.2 E.6.3	6,8, 11,12	2003- 2006	10-100	MNP	Programme	A
E.6.9	Promote public participation in international environmental days	A.8.3 C.5.3 H.1.2	6,7, 11,12	2002- 2010	10-100	TSNP	Programme	C
E.6.10	Conduct public awareness campaign on the importance of conservation of threatened and endemic species as part of national and world heritage (e.g. kulan)	A.6.2 A.6.3 F.1.11 H.1.2	6,8, 11,12	2003- 2006	1-10	MNP	Programme	A
E.6.11	Publish a list of invasive species and publicise their negative impacts on biodiversity	F.1.4	1,2,4, 6,9	2003- 2006	1-10	MNP	Published list	B
E.6.12	Increase level of ecological awareness among the population about the importance of protected areas (e.g. creation of a film “Island in the desert” about Balhan; publication of a booklet in order to publicise the role and objectives of National Parks)	A.1.1 A.4 E.6.3 E.6.4	6,7,12	2003- 2005	10-100	MNP, State TV and Radio Company	TV campaign, booklets, demonstration materials, TV documentaries and films	B
E.6.13	Provide logistical support for nature museums	C.5.4	6,7, 11,12	2003- 2010	10-100	MNP	Renovation and modernisation of nature museums	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
E.6.14	Organise short workshops with local communities and authorities to discuss biodiversity conservation issues	D.2.4	1, 6	2002-2010	10-100	MNP, MA, MWR	Workshops	B
3.3.6 Strategic Component F: Identification and monitoring								
F.1	**Develop and implement a national biodiversity monitoring system**							
F.1.1	Create information-resource centre at the Ministry of Nature Protection with an analytical department for biodiversity monitoring	F.1.2 F.4.3 G.4.2	2,7, 8,11	2003-2005	10-100	MNP	Biodiversity monitoring unit	A
F.1.2	Develop and implement national system of monitoring and inventory surveys in key ecosystems and landscapes (including natural pastures and agro-ecosystems)	A.5.2 A.5.5. A.5.7. A.5.9 F.1.5	1,3, 4,7	2003-2010	10-100	MNP	National monitoring system	A
F.1.3	Conduct ecological monitoring of invasive species, which can negatively impact biodiversity	B.6.2 E.6.11 G.4.1	1,3,4, 7,8	2003-2010	>100	MNP, Customs	Recommendations	A
F.1.4	Prepare recommendations for transboundary structures to monitor the biological resources of the Caspian Sea ecosystem	A.5.9 C.1.2 I.1.2 I.2.3	1,3, 4,7	2003-2004	1-10	MNP, CEP	Recommendations	A
F.1.5	Create an experimental area in Dushakerekdag mountains for carrying out monitoring of central Kopetdag ecosystems	F.1.3 F.2.2	3,4,5, 6,11	2003-2005	10-100	MNP	Experimental monitoring area in Dushakerekdag	B
F.1.6	Identify suitable biological indicators to monitor and evaluate sustainability of natural ecosystems (e.g. lichens, insectivorous insects)	F.1.2	1,3,4, 7,8	2003-2007	10-100	MNP	Identified biological indicators	B
F.1.7	Develop a system of ornithological monitoring	B.6.1 F.1.2 F.2.2	1,3, 4,7	2003-2005	1-10	MNP	Programme	A
F.1.8	Develop a national monitoring system for desertification processes	A.5.2 F.1.2	1, 4, 5	2006-2010	1-10	National Institute of Deserts, Flora and Fauna	Monitoring system of desertification	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
F.1.9	Introduce a complete satellite-monitoring programme for monitoring the ecological status of Turkmenistan	J.1.2 G.3.3	1, 4, 5	2006-2010	1-10	MNP	Make rapid decisions for biodiversity conservation	A
F.1.10	Monitor and inventory threatened Aral basin fauna and flora	G.3.4 I.1.2	1, 3, 4, 7, 8	2002-2010	10-100	MNP	Inventory	A
F.2	**Co-ordination and maintenance of biodiversity data**							
F.2.1	Create computer database of flora and fauna of Turkmenistan	F.2.2 F.2.4 H.3.4	3,4,5, 7,8	2003-2006	10-100	MNP	Database	A
F.2.2	Create database for wild predatory birds of Kopetdag - ecological indicators of environmental status	F.1.9 F.2.1 F.3.3 G.3.3 J.1.2	3, 4, 5, 6, 11	2003-2006	1-10	MNP	Database	A
F.2.3	Develop information system on genetic resources	B.1 B.3 F.2.1 G.1.5	1,3,4, 7,8	2003-2005	10-100	MA	Inventory of national genetic resources	A
F.2.4	Inventory and catalogue data in the Herbarium collection and create a floristic database	F.2.1 H.1.1 H.3.1 H.3.4	4,5, 6,11	2003-2007	10-100	MNP	Floristic database, hardware, software	A
F.2.5	Prepare database on biodiversity of wetlands under the Ramsar Convention	A.1.4 A.7.1 L.1.1	4,5, 6,11	2002-2006	10-100	MNP	Wetlands database	A
F.3	**Identify the status of priority populations, species and communities and develop measures for their conservation**							
F.3.1	Identify and restore habitats of rare plant species currently threatened	B.4.1 F.3.2 G.1.4	3,4, 7,12	2003-2005	1-10	MNP	Inventory	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
F.3.2	Implement special programmes to monitor species included in the Red Data Book of Turkmenistan	A.6.2 F.3.1 G.1.4 I.1.4	3,4, 7,12	2003- 2010	10-100	MNP	Expeditions	A
F.3.3	Identify species-to act as indicators of anthropogenic changes to the environment	F.2.2 F.3.5	3,4, 7,12	2003- 2005	1-10	MNP	Lists of indicator species	B
F.3.4	Identify ecologically vulnerable and priority habitats that need protection	A.6.2 A.7.1 F.3.5	3,4, 7,12	2003- 2005	1-10	MNP	List of priority habitats	B
F.3.5	Develop rapid assessment methods of rare species status	F.2.2 F.3.3	3,4, 7,12	2003- 2006	1-10	MNP	Rapid assessment methods	B
F.3.6	Provide population estimates of flagship species (sand-gazelle, kulan, cranes and others) in key ecosystems including use of aerial surveys	F.1.9 G.1.4	3,4, 7,12	2003- 2007	10-100	MNP	Statistical records	A
F.3.7	Undertake monitoring of populations and elements of flora and fauna in order to produce guidelines for their sustainable use	C.1.1 C.1.5 C.1.6	3,4, 7,12	2003- 2006	10-100	MNP	Sustainable use guidelines	B
F.4	**Provide systematic ecological monitoring in zapovedniks**							
F.4.1	Increase the level of arrangement and structuring of information files in zapovedniks for biodiversity monitoring	F.1.1 F.4.2 H.3.2	3,4, 6,12	2003- 2005	10-100	MNP	Logistical support	A
F.4.2	Develop provisions / regulations for providing systematic ecological monitoring of natural processes and changes of anthropogenic character	F.4.1	3,5,6, 8,11	2003- 2004	1-10	MNP	Provisions / Regulations	B
F.4.3	Publish the Nature Chronicles of the zapovedniks from previous years	F.1.1 F.4.1 H.3.2	3,5,6, 8,11	2003- 2005	10-100	MNP	Data book	A
F.4.4	Undertake training and supply equipment to support the ecological monitoring system in protected areas and their surrounding zones	A.1.1 A.1.11 D.3.3	3,5,6, 8,11	2003- 2004	10-100	MNP	Training and equipment	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
3.3.7 Strategic Component G: Scientific research								
G.1	**Study and conservation of key components of biodiversity**							
G.1.1	Support taxonomic and inventory surveys of key resource species	B.4.1 G.1.2	2,7,8, 11,12	2003-2006	10-100	MNP	Database	B
G.1.2	Identify unprotected biodiversity "hot-spots" in key ecosystems	G.1.1 G.2.1	5,6,7, 8,9	2003-2005	10-100	MNP	Landscape-ecological zoning of territories	A
G.1.3	Assess ecological status of forests of mountain, desert and tugai ecosystems	A.5.2 C.2.1 E.4.2	6,7, 8,12	2003-2007	10-100	MNP	Ecological assessment	A
G.1.4	Undertake detailed ecological and population studies of threatened plant and animal species (e.g. tulips, crane, goat, argali, otter, Amudarya sturgeon, mandragora, berry and wild onion relatives) included into the IUCN Red List and Red Data Book of Turkmenistan	A.6.2 E.6.10 F.3.2 I.1.4	5,6, 7,12	2003-2007	>100	MNP	Population dynamics and biological data	B
G.1.5	Conduct studies of population structure and intra-specific diversity of wild pomegranate and valuable forms of wild pistachio	B.1.1 C.2.2 F.2.3	5,6, 8,12	2003-2005	1-10	MA	Detailed *in situ* and *ex situ* study	A
G.1.6	Establish national centre for ringing and marking wild animals and birds	F.1.7	1,6, 7,11	2004-2006	10-100	MNP	Ringing / marking centre	A
G.2	**Evaluation of local status of agro-biodiversity**							
G.2.1	Conduct field study of status of wild fruit plants in Southwestern Kopetdag and Turkmen part of Kugitang	B.1.3 B.2.2 B.3.	7, 8,11	2003-2007	10-100	MNP, MA	Recommendations	A
G.2.2	Undertake complete evaluation of local varieties and forms of fruit plants, old locally selected varieties of melons, grains and vegetable crops	B.1.4 B.1.5 B.3	7, 8, 11	2003-2007	1-10	MA	Reference book	B
G.2.3	Develop database for varieties and forms of fruit plants, old locally selected varieties of melons, grains and vegetables	B.1.4 B.1.5 B.3.3	7, 8, 11	2003-2006	1-10	MA	Database	A
G.2.4	*In situ* on-farm conservation of agrobiodiversity in Central Asia	B.1.4	7, 8, 11	2002-2006	>100	MA	Transborder project	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
G.3	**Applied research in biodiversity conservation**							
G.3.1	Set up inter-disciplinary research group on applied problems of biodiversity conservation	B.5.2 G.3.2 H.3.1	6,7, 8,12	2003		MNP	Group	B
G.3.2	Broaden the circle of applied research in biodiversity conservation to include the improvement of the socio-economic situation of the population	B.6.2 C.5.5	6,7, 8,12	2003- 2005	1-10	MNP	Recommendations	A
G.3.3	Study abiotic, biotic and anthropogenic factors, affecting mountain and tugai (riverine) biodiversity and develop recommendations for their improvement	F.1.9 J.1.2	6,7, 8,12	2003- 2005	10-100	MNP	Recommendations	B
G.3.4	Develop a national strategy on Aral basin biodiversity conservation and restoration	F.1.10 I.1.2	1, 2, 4, 6	2002- 2005	10-100	MNP	Strategy	A
G.3.5	Inventory and map natural ecosystems modified by human influence	C.1.4 J.1.1	5,6, 8,12	2003- 2007	10-100	MNP	Inventory and maps of degraded lands	A
G.3.6	Conduct studies of fungal disease and insect pests on dominant species of plants in tugai and desert forests; and of pests of fruit and forestry plants	C.1.4 G.4.1	5,6, 8,12	2003- 2007	1-10	MNP, MA	Database	B
G.3.7	Conduct a review of forest propagation technologies in arid conditions	C.2.1 D.3.1 H.3.1	6,7, 8,12	2003- 2004	1-10	MNP, “Geok Gushak” PLC	Data book	B
G.4	**Studies of invasive (alien) species**							
G.4.1	Study methods of combating invasive alien species (e.g. brown rats, *Mnemiopsis*, and melon fly), threatening indigenous ecosystems, species and varieties	B.6.2 . E.6.11	1,4,6, 8,11	2003- 2005	1-10	MNP	Activities	A
G.4.2	Conduct research on the use of biological control agents on alien species	E.6.11 L.1.4	1,4,6, 8,11	2003- 2006	1-10	MNP	Recommendations	A
3.3.8 Strategic Component H: Information accessibility and exchange								
H.1	**Improve public access to information on biodiversity**							
H.1.1	Create a Turkmenistan biodiversity website on the	A.1.11	2,7,	2004-	1-10	MNP	Website	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
	internet with regularly updated data (e.g. main data of the zapovednik Nature Chronicles)	E.6.10 D.3.3 D.3.4	8,11	2006				
H.1.2	Publicise the adoption of the Aarhus Convention on Information Access so the wider population understand their rights to ecological information	D.1.1 H.1.3 M.2.5	1, 6	2002-2004	1-10	MNP, Ministry of education	Increased awareness	A
H.1.3	Ensure regular exchanges of information between NGOs and relevant government agencies, in order to increase the role of NGOs in decision making and implementation of biodiversity conservation activities	A.8.3 H.1.2 M.2.5	1, 6	2002-2010	1-10	MNP	Increased NGO involvement	A
H.2	**Increase efficiency of inter-sectoral information exchange**							
H.2.1	Develop a mechanism to provide integration and regional and inter-sectoral exchange of biodiversity information	D.3.5 H.2.2 H.3	3,5,6, 8,11	2003-2005	10-100	MNP	Inter-sectoral information-sharing mechanism	B
H.2.2	Develop rules for access to inter-sectoral information exchange on biodiversity	E.6.10 H.2.1 H.3	2,7, 8,11	2003	1-10	MNP	Rules of access	C
H.3	**Promote international exchange of information**							
H.3.1	Develop and handle forms of international information exchange about scientific research on biodiversity	G.3.2 H.2.1 H.2.2	2,7, 8,11	2003-2005	10-100	MNP	Legal provision	B
H.3.2	Prepare and publish materials and scientific articles on biodiversity conservation and sustainable use in foreign languages	F.4.3	1, 6	2002-2010	10-100	MNP	International dissemination	A
H.3.3	Ensure representation of Turkmenistan at the most relevant international conferences and meetings	D.3.5	1, 6	2002-2010	10-100	MNP	Representation	A
H.3.4	Participate in implementation of scientific programmes of data exchange in biodiversity (international database on diseases of wild plants)	F.2.1 F.2.4	2,7, 8,11	2003-2006	10-100	MNP	Database	A
H.3.5	Develop regulations for data sharing and joint use of biological and genetic materials previously taken out of the country	L.1.3 L.1.4 L.1.6	1, 2, 6, 7	2003	1-10	MNP	Regulations	B

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
3.3.9 Strategic Component I: Co-operation (technical, scientific, international, transfer of technologies)								
I.1.	**Assistance to regional co-operation and information exchange**							
I.1.1	Continue necessary support for Turkmenistan's participation in existing regional programmes and strategies (e.g. PEBLDS)	L.2.4 L.2.5	1, 6	2002-2010		MNP	Participation	A
I.1.2	Provide assistance to the development of programmes for trans-frontier co-operation in biodiversity conservation and sustainable use of natural resources of global importance in the Aral and Caspian basins	A.5.9 G.3.4 I.1.5 I.1.6 I.2.3	1,5,7, 8,11	2003-2010		MNP	Conservation programme of valuable and rare species	A
I.1.3	Prepare an integrated management plan for the montane ecosystems of the Kopetdag at a regional level	A.5.4 A.5.6 G.3.7 I.1.3	1,5,7, 8,11	2004-2005	10-100	MNP	Trans-border management plan (Turkmenistan and Iran)	B
I.1.4	Develop agreement on preparation and publication of a Red Data Book of threatened species for Central Asian countries	D.2.2 G.1.4	1,5,7, 8,11	2003-2004	>100	MNP	Agreement; published Red Data Book	A
I.1.5	Prepare draft international agreement for regulation of trans-frontier issues on biodiversity conservation, including migratory birds	I.1.6 I.2.3 L.1.2	1,5,7, 8,11	2003-2004		MNP	Draft agreement	C
I.1.6.	Establish international co-operation to set up integrated management system and exchange of regional information on biological resources and their sustainable use	D.2.1 H.1.1 H.3.1	1,5,7, 8,11	2003-2006	1-10	MNP	Information network	A
I.2	**Assistance to international co-operation and exchange of information, resources and technologies**							
I.2.1	Prepare regulations on the safe use of genetically modified organisms	L.1.3 L.1.4	1,5,7, 8,11	2003-2005	1-10	MNP, MA	Regulations	A
I.2.2	Develop and implement protocols for regulating import, export and transit shipping of threatened species	D.2.2 L.1.1 L.1.3	1,5,7, 8,11	2003	1-10	MNP	Control over trading	B

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
I.2.3	Increase scientific and technical co-operation by development and participation in joint projects with other countries to solve national biodiversity conservation problems	C.4.1 D.3.5	2,9,11	2002-2010	1-10	MNP	Joint projects	B
I.2.4	Develop and implement the regulations on information access to biodiversity and herbarium data by representatives of foreign countries	F.1.9 F.2.4 G.3.5	2,7, 8,11	2003	1-10	MNP	Implemented regulations	B
I.2.5	Assist bilateral co-operation and exchange of technologies with Russia in the use of prospective medicinal materials (*Helianthus tuberosus*)	C.4.2	1,5,6	2003-2006	1-10	MNP, Ministry of Health and Medical Industry	Technological exchange	C
I.2.6	Develop a strategy for fair and equitable sharing of benefits of biological and genetic resources	L.1.5 L.1.6	1,2, 6,7	2003-2005	1-10	MNP	Strategy	A
I.2.7	Develop international programmes for scientific exchange for experts in biodiversity conservation	C.2.3 D.3.5	1,5,7, 8,11	2003-2005	1-10	MNP	Experience exchange and participation in international seminars	B
3.3.10 Strategic Component J: Impact assessment								
J.1	**Review of environmental impact assessment methods**							
J.1.1	Develop improved environmental impact assessment (EIA) methods for different pollution sources or emissions and their effect on biodiversity (oil-gas sector, agriculture, mining industry, etc.)	C.1.4 L.3.2 J.1.2	1,2,3, 6,7	2003-2005	1-10	MNP, MA, Ministry of Oil and Gas Industry and Mineral Resoures	Improved EIA methods	A
J.1.2	Introduce amendments incorporating specific impacts on biodiversity into national standards of EIA	C.4.1 F.1.9 L.3.3 J.1.1	1,2,3, 6,7	2003-2004	1-10	MNP	Amendments to EIA standards	B
J.1.3	Conduct research to identify indicator organisms for monitoring pollution in sea water	A.5.9 C.1.3 F.1.4	1,6,7, 9,12	2003-2006	1-10	MNP	Recommendations	A
J.2	**Develop mechanisms to control the impact from all economic sectors on biodiversity**							
J.2.1	Produce and disseminate materials on biodiversity	C.4.1	1,2,3,4	2003-	1-10	MNP	Explanatory	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
	impact assessment and disseminate them to enterprises that affect biodiversity	H.1.2		2007			materials	
J.2.2	Develop a system of inter-sectoral control over biodiversity conservation in linear objects (oil-gas pipelines, main roads, power lines, irrigation canals, etc.)	H.1.2 J.1.2	1,2,3,4	2003-2007	10-100	MNP, Ministry of Oil and Gas Industry and Mineral Resources, MWR, Ministry of Automobile Transport, Railway Administration	Control system	A
J.2.3	Develop guidelines for responses to ecological disasters to mitigate threats to biodiversity	C.4.1 H.1.2	1,2,3,4	2003-2004	1-10	MNP	Guidelines	B
J.2.4	Conduct EIAs on existing industries suspected of negatively affecting biodiversity, and create a database on polluters of the environment, and their impacts on biodiversity	G.3.1 H.1.2 J.1.2	1,2,3,4	2003-2007	1-10	MNP	Conduct EIAs; establish database	A
J.2.5	Publish a list of businesses with evaluation of their positive and negative impacts on biodiversity	C.1.4 G.3.5	1,2,4, 6,9	2003-2010	1-10	MNP	Published list	A
3.3 11 Strategic Component K: Incentives								
K.1	**Develop incentives for biodiversity conservation within sustainable agricultural production**							
K.1.1	Develop methods for economic evaluation of biodiversity	C.5.1	1,6,7, 9,12	2005-2008	10-100	MNP	Economic evaluation methods	A
K.1.2	Develop a public awareness programme on the measures and possibilities for reducing grazing pressure on natural pastures	C.4.1	1,2,4, 6,9	2003-2004	1-10	MNP	Mass media campaign; workshops with shepherds	B
K.1.3	Provide and publicise grants, and provide training, to stimulate introduction of new agricultural techniques favourable to biodiversity (e.g. grants to local villagers to grow olives as an alternative to reduce anthropogenic pressures on natural pastures)	C.4.2 G.3.2	1,2,4, 6,9	2003-2006	>100	MNP, MA	Grant programmes, information leaflets, training	A
K.2	**Economic assistance to farming communities living next to protected areas**							
K.2.1	Create additional new jobs assisting	B.1.4	1,2,4,	2003-	10-100	MNP, MA	Employment	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
	environmental protection	C.5.2 E.5.2 K.1.3	6,9	2010			programme	
K.2.2	Develop and implement annual competition for best etrap farmer, sustainably using local natural resources	C.4.2 C.5.2 K.1.3	1,2,4, 6,9	2003- 2010	1-10	MNP, MA	Competition	B
K.3	**Promote population activities in biodiversity conservation**							
K.3.1	Establish a fund for supporting habitats of rare threatened species and ecosystems	C.1.2 F.2.1	1,2,4, 6,9	2003- 2006	>100	MNP	Fund	A
K.3.2	Facilitate co-operation mechanisms between the state and NGOs in biodiversity conservation projects	A.8.3 D.1.1 H.1.2 M.2.5	1,2,4, 6,9	2003- 2006		MNP	Joint NGO / government projects	A
K.3.3	Restore local artisanal industries and traditions sustainably utilising biodiversity as an integral element of ecotourism development	C.5.2 E.5.2 K.1.3	1,2,4, 6,9	2003- 2006	10-100	MNP, Ministry of Culture	Programme	A
K.3.4	Ensure application of disincentive measures for activities which negatively impact biodiversity	L.1.2 L.3.2 M.1.3	1, 3	2002- 2010	10-100	MNP	Enforcement	A
3.3.12 Strategic Component L: Legislation								
L.1	**Harmonise national legislation with international biodiversity conventions**							
L.1.1	Prepare supporting documents to join international biodiversity conventions (e.g. Ramsar,and others)	I.1.4 F.2.5 L.2.1	1,2,3,7	2003- 2004	1-10	MNP	Supporting documents	A
L.1.2	Develop regulations on restricting certain activities during the migration period of animals in accordance with the Convention on Migratory Species	A.7.2 I.1.5 K.3.4 L.2.1	1,2,3,7	2003- 2004	1-10	MNP	Regulations	A
L.1.3	Develop a Law on “Biological safety and use of genetically-modified organisms”	I.2.1 L.2.1	1,2,3,7	2003- 2005	1-10	MNP	Draft law	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
L.1.4	Develop mechanisms for ensuring application of existing procedural and institutional rules and legislation regarding biosafety	I.2.1 L.2.1	1,2,3,7	2003-2004	1-10	MNP	Mechanisms of law-enforcement	B
L.1.5	Develop a Law on "Fair and equitable sharing of benefits in regard to biological and genetic resources"	I.2.6 L.2.1	1,2,3,7	2004-2005	1-10	MNP	Draft law	A
L.1.6	Develop mechanisms for enforcing procedural and institutional rules concerning fair and equitable sharing of benefits of biodiversity	C.1.5 L.2.1	1,2,3,7	2005-2006	1-10	MNP	Mechanisms of law-enforcement	B
L.2	**Strengthen legal basis of protected areas**							
L.2.1	Strengthen legislative basis of protected areas to bring them into line with international standards	L.1. L.2.3	1,2,3, 7,11	2003-2005	1-10	MNP	Development of legal mechanisms of PA	B
L.2.2	Upgrade legal basis for the further development of the PA network	A.2.1 A.5.8 A.7.4	1,2,3,7	2003-2005	1-10	MNP	Upgrading of Provisions on PA	B
L.2.3	Develop new regulations on national parks	A.4.2 L.2.1	1,2,3,7	2003-2004	1-10	MNP	Draft national park regulations	A
L.2.4	Develop bilateral provisions on international co-operation to demarcate powers in the field of trans-frontier protected areas	A.7.1 A.7.2 A.7.3 I.1.6,I.2.3	1,2,3,7	2003-2004	1-10	MNP	Provisions	A
L.2.5	Improve legal basis to cover the interaction of protected areas, buffer zones and adjoining territories in accordance with international legislation	A.2.4 A.2.5 B.3.2 L.2.1	1,2,3,7	2003-2004	1-10	MNP	Project	A
L.3	**Review legislation on environmental protection**							
L.3.1	Review regulations in inspection services in the context of other institutional changes	A.6.4 J.1.2	1,2,3,7	2003	1-10	MNP	Regulation renewal	B
L.3.2	Develop and adopt regulatory mechanisms to ensure that fines are collected from businesses violating environmental statutes	K.3.4 J.1.1 J.1.2	1, 2, 3	2002-2010		MNP	Collection of fines	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
L.3.3	Amend legislation on protection of aquatic fauna of open surface waters (small mountain rivers, temporary watercourses and other reservoirs)	C.4.1 J.1.2	1,2,3,7	2003	1-10	MNP	Amendment on aquatic fauna protection	B
3.3.13 Strategic Component M: Financing								
M.1	**State budget financing of nature protection**							
M.1.1	Review state budget for environment protection in the context of other institutional changes	A.1.2 A.2.1 A.3.2 D.1.1	1,2, 10,11	2003- 2004	1-10	MNP, Ministry of Economy and Finance	Review of state budget	B
M.1.2	Provide citizens and other institutions with access to information on budget planning for environmental protection	A.2.1 H.1.2	1,2, 10,11	2003- 2004	1-10	MNP	Increase in public awareness	A
M.1.3	Develop mechanisms for including into the state budget the actual costs of biodiversity support and compensation of all activities causing damage to it	C.4.1 J.2.3 L.3.2	1,2, 10,11	2002- 2005	1-10	MNP	Identification of actual costs	B
M.2	**Sources from international donors**							
M.2.1	Develop a system of small grants for biodiversity projects	C.5.3 K.1.1 K.2.1	1,2, 10,11	2003- 2010	>100	MNP	Grant programme	A
M.2.2	Provide financial support for carrying out assessment of sustainable use of biodiversity	C.1.1 K.1.3	1,2, 10,11	2003- 2010	10-100	MNP	Grant programme	B
M.2.3	Implement a fund-raising strategy directed to the fulfilment of the BSAP	N.1 N.2 N.3 N.4	1,2, 10,11	2003- 2010	>100	MNP	New projects	A
M.2.4	Provide training in project design and developing grant proposals acceptable by international donors	E.3.2 N.3.1	1,2, 10,11	2002- 2004	1-10	MNP	Training	A
M.2.5	Prepare and develop biodiversity projects to be submitted to international donors by the staff of ministries, PAs and NGOs	A.8.3 D.1.1 H.1.2	1,2, 10,11	2002- 2004	10-100	MNP	New projects	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
M.3	**Alternative financing sources**							
M.3.1	Provide permanent consideration to new mechanisms for biodiversity financing, including inter-sectoral relations and possibilities of international financing	M.3.3 N.1.2	1,2, 10,11	2002-2010		MNP, Ministry of Finance and Economy	New financing mechanisms	B
M.3.2	Attract the resources of the state livestock company "Turkmenmallary" to create new artificial pastures to relieve the pressure on natural ecosystems	J.2.3	1,2, 10,11	2003-2006		MNP, "Turkmenmallary"	Financing	C
M.3.3	Establish hunting farms as a way of attracting the commercial sector to biodiversity conservation	C.3.1 K.2.1 M.3.3	4,7, 8,11	2005-2010	>100	TSHF	Hunting farms	A
M.3.4	Encourage the involvement of the private sector in biodiversity conservation through developing provisions on preferential taxation and investments for enterprises with ecologically pure and non-wasteful production	L.3.2	1,2,3,4	2003-2004	>100	MNP	Provisions on preferential taxation	B
M.3.5	Develop procedures for inclusion of nature protection expenses into the ministerial and governmental budgets	L.3.2	1,2,3,4	2003-2004	1-10	Ministry of Finance and Economy	Procedures	C
3.3.14 Strategic Component N: Co-ordination, implementation and monitoring of the BSAP								
N.1	**Establishment of Co-ordination Unit for integrated biodiversity planning**							
N.1.1	Provide logistics for the establishment of a Co-ordination Unit	A-N	All	2002-2003	10-100	MNP	Logistics	A
N.1.2	Identify roles and responsibilities of staff members of newly approved Co-ordination Unit	A-N	All	2002	-	MNP	Roles and responsibilities	A
N.1.3	Prepare and disseminate information about the BSAP to interested parties, potential donors and decision makers	A-N	All	2002-2010	1-10	MNP	Information material	A
N.1.4	Create a database of potential project implementing organisations, to set up co-ordination and provide assistance in targeting donors	A-N	All	2002-2010	1-10	MNP	Contact database, training	A
N.1.5	Develop regulations for an information database for the implementation of the BSAP	A-N	All	2002-2006	1-10	MNP	Database	A

№	Actions / Activities	Related activities	Related objectives	Dates	Cost ($ x 1000)*	Implementing organisation	Outputs	Priority
N.2	**Develop action plan for integrated biodiversity planning**							
N.2.1	Develop inter-sectoral integrated action plan for biodiversity conservation and introduce into the working plans of all relevant Ministries	A-N	All	2003	1-10	MNP	Integrated Action plan	A
N.2.2	Identify priority actions in biodiversity conservation in inter-departmental structures	A-N	All	2003	1-10	MNP	Package of activities	A
N.2.3	Assist regional and international co-operation in exchange of information, resources and technologies	A-N	All	2003-2010	1-10	MNP	Action plan	A
N.3	**Evaluation and monitoring of BSAP implementation**							
N.3.1	Undertake regular reviews and monitor the progress of task fulfilment	A-N	All	2003-2010	1-10	MNP	Report	A
N.3.2	Compile and disseminate annual national reports on the fulfilment of the BSAP to the CBD Secretariat	A-N	All	2002-2010	1-10	MNP	National reports	A
N.3.3	Provide regular reviews of the BSAP, and make amendments if necessary	A-N	All	2002-2010	1-10	MNP	Reviewed BSAP	A
N.3.4	Publish a full report on the implementation of the BSAP on completion of its 9 year period	A-N	All	2010	10-100	MNP	BSAP implementation report	A

3.4. Monitoring and Evaluation

Monitoring and evaluation form a necessary link between the implementation of activities, the assessment of their success and the subsequent evolution of the BSAP. Monitoring and evaluation are integral parts of the implementation process, which should run in parallel with it, and are not something that is carried out once the activities have finished.

Monitoring and evaluation:
- Identify the extent of BSAP implementation.
- Evaluate the effectiveness of the planned activities.
- Help to avoid duplication of activities.
- Allow for revision of the BSAP in accordance with changing situations.

Monitoring and evaluation permit the avoidance of duplication by using accumulated expertise that helps to avoid repeating mistakes as well as to adjust the plan to changing situations.

Monitoring and evaluation provide answers to the fundamental questions:
- To what extent have the planned activities achieved their expected outputs?
- To what extent have the overall objectives been achieved through implementing these activities?
- What lessons have been learned about the factors which affected the success or failure of these activities?
- What additional information would help promote the development of the BSAP?
- What was missing in the BSAP, taking into account existing information and experience?
- In what way might these omissions be reconsidered in the future development of existing activities or by adding new ones to the plan to fill the gaps?

To define the success of the BSAP's implementation it is very important to have indicators for the evaluation of progress. Such evaluation methods are indicated in two places within the Plan:

OBJECTIVES. The twelve objectives are general indicators for assessing if the overall aim is reached. Obviously they are not able to identify the majority of ways in which the BSAP may affect biodiversity conservation. However, the degree of achievement of each objective is a good indicator of the general success or failure of the BSAP. The objectives may be used for assessing long-term success.

OUPUTS. Each activity is evaluated by its output. This is a tangible assessment of whether the activity has been successfully implemented and if it works towards attaining the overall aim. Inevitably in many cases the output is a simplification of the activity's complexity. However, the output is a way of defining if a particular activity has been completed as well as a general assessment of the degree of implementation at each stage.

3.4.1. BSAP monitoring and evaluation process

In this process existing structures and available information should be used as much as possible, and the establishment of new structures and collection of new types of information should be avoided. The BSAP monitoring and assessment process involves a number of different stages:

- An implementing organisation for an activity will bear responsibility for the monitoring and evaluation of that activity's progress. This process will be carried out within the framework of the existing structure of the implementing organisation, but the evaluation will be undertaken based on the outputs and objectives outlined in the BSAP.
- The BSAP Co-ordination Unit will be responsible for collecting information from various implementing organisations on the implementation of activities within the framework of the BSAP. This information will be collected from these institutions through regular communications (including reports and interviews).
- The BSAP Co-ordination Unit will be responsible for collecting this information and presenting a general review of the BSAP's implementation. A technical advisory group collaborating with the State Commission will provide an independent source of monitoring and evaluation.
- The results of monitoring and evaluation will be widely disseminated through public information campaigns.
- These results will be used as a basis for improving and updating the BSAP through the inclusion of completed activities, identification of gaps, and incorporation of lessons learned.

3.5 Reporting Requirements

Reports on the implementation of the BSAP will need to be produced for a number of reasons and for a number of different target audiences. The main types of reporting are as follows:

Annual National Report. This is a progress report prepared for initial consideration by the Steering Committee, as well as by higher-level institutions. This report should include detailed descriptions of all the activities undertaken, indicating success and outputs, an analysis of the goals reached, a description of shortcomings, any lessons learnt as well as any changes required due to changing circumstances at national or local levels. The assessment of the impact of the BSAP on core indicators should also be included, taking into account economic and political changes within the country. This type of report is intended for decision-makers such as donors, NGOs, scientists and businessmen and all those directly involved in the BSAP and its implementation.

Public Report on Progress. This report should contain the information which is of most interest to the public as well as to individuals and groups of people who are interested in biodiversity issues or whose activities impact on biodiversity conservation. It should be in the form of a summary of the Annual National Report, containing key information on progress, and should be easily understood by various sections of population and be suitable for use by the mass media.

International Report on Implementation of the Convention on Biological Diversity. This is presented during the BSAP development process and serves as proof of the BSAP's degree of implementation. The International Report will be based on the National Report, and in some cases may even be the same document but in English.
.

Final Report on Progress. The Final Report of the BSAP's implementation is written at the end of the reported period. This Report should include not only achievements but the reasons for the successes or failures in the implementation of various elements of the initial BSAP, lessons learnt and recommendations on planning for the next period. This document should be in the form of a detailed review of the BSAP itself as a working document and contain recommendations for planning other activities on biodiversity conservation, based on accumulated experience.

3.6 Project Implementation

Basic Principles

General structures for project implementation should, as far as possible:

- be based on existing structures
- be efficient in terms of resources and personnel
- be based on the principle of self-sustaining or on long-term internally-developed funding

3.6.1 Management and Administration of BSAP Implementation

The management and administration of project implementation will be carried out by the BSAP Co-ordination Unit, which will be required to undertake the following:

- Support implementing organisations in finding funding for the implementation of the BSAP;
- Co-ordinate funding mechanisms for the BSAP;
- Promote contacts between the implementing organisations and appropriate funding mechanisms;
- Identify the needs for, and help provide, support in training and technical inputs for BSAP implementation;
- Collect and organise all information relevant to the BSAP;
- Co-ordinate all levels of BSAP planning;
- Monitor and evaluate the whole process of BSAP implementation, in collaboration with the Technical Advisory Working Group;
- Prepare the National Annual Review on BSAP implementation jointly with the Technical Advisory Working Group and if necessary revise the BSAP;
- Report on the progress of the BSAP;
- Disseminate information on the BSAP;
- Development and promotion of co-operation and information exchange between all groups involved in the BSAP.

Suggested Composition:

Individual(s) with a range of skills in project management, information management and networking. They should be closely linked to the main implementing organisation (the Ministry of Nature Protection) but maintain independence in order to conduct an independent monitoring and objective assessment. Within the framework of the Co-ordination Unit a *Technical Advisory Working Group* will be defined. Moreover *technical specialists* (short-term consultants) will be involved on a contractual basis to collect information and independently monitor and assess the progress of BSAP implementation.

The BSAP will be implemented with the direct participation of a number of organisations and agencies (see implementing organisations) including the Ministry of Nature Protection as the lead agency. The BSAP implementation will be financed by existing as well as new financial mechanisms.

The existing State Commission will support the BSAP at the highest levels and will provide assistance in all sectors of the national economy.

Activities:

- Regular review of progress of BSAP implementation;
- Provide feedback to the BSAP Co-ordination Unit;

• Increase awareness of the importance of the BSAP in various governmental sectors;
• Co-ordinate inter-sectoral activities.

Suggested Composition:

High-level authorities such as Ministers and Directors, respected and interested people from important sectors, especially the Government, businessmen, NGOs, and scientific and research institutes, who will express their desire to support the BSAP through:

a) consultations and provision of expertise;
b) promoting the BSAP within the sector they represent.

They would not take part in the daily management or co-ordination of the project.

3.6.2 Implementing Organisations

For effective implementation of the BSAP the BSAP Co-ordination Unit should communicate with the main implementing organisations and groups, including the governmental agencies, local authorities, NGOs, academic institutes, and various societies.

A list of organisations and groups that will most probably be involved in the BSAP implementation process is given below:

Implementing Organisations

Governmental Agencies, including:
Cabinet of Ministers Administration
Ministry of Nature Protection
Public Limited Company "Geok Gushak"
Ministry of Agriculture;
Ministry of Water Resources;
Ministry of Economy and Finance;
Ministry of Oil and Gas Industry and Mineral Resources;
Ministry of Education;
Ministry of Health and Medical Industry;
State Fishery Committee;
State Tourism and Sports Committee;

Local authorities, including:
Velayat Hyakimliks (Provincial Executive Authorities)
Etrap Hyakimliks (Regional Executive Authorities)
City Hyakimliks (City Executive Authorities)

Non-governmental organisations (NGOs) operating in the following sectors:
Ecology
Environment
Education
International

Institutions, including:
National Institute of Deserts, Flora and Fauna;
State Zapovedniks;
Sylvicultural and Nature Parks Protection Service;

Garrygala Scientific Research Centre of Plant Genetic Resources;
Gyzyletrek Scientific Centre of Sub-tropical Cultures;
Flora Quarantine State Service;
Caspecocontrol (Caspian Ecological Control);
Botanical Garden;
Zoological Garden;
National Institute of Raw Drug Materials;
Turkmendermansenagat Association;
Turkmenmallary Association;
Anti-plague Station;
Scientific Research Institute of Agriculture and Water Resources ;
Scientific Research Institute of Cattle Breeding and Veterinary Science;
University and Educational Institutes;
Technical Colleges;
Schools.

Mass media, including:
National and local newspapers;
National and local TV;
National and local radio.

Existing national and international projects, including:
Aral Sea Basin Project of the World Bank / UNDP
Biodiversity component of the Caspian Ecological Programme
Conservation of the Leopard in Turkmenistan
Conservation and Restoration of the Bukhara Deer in Turkmenistan, Uzbekistan, Tajikistan and Kazakhstan
Conservation and Management of the Kulan
Conservation of the sturgeon *Pseudo scaphirhynchus* in Central Asia
Correlation of extinction risk for biodiversity in Central Asia

Central-Asian projects under development, including:
Conservation of biodiversity in the Kugitang Mountains of Turkmenistan
Conservation of north-western desert ecosystems in Turkmenistan
Development of ecotourism in Kugitang
Conservation of saiga and its habitats on migration routes and wintering and summer grounds
In situ on-farm conservation of biodiversity in Central Asia
Development of an ecological network as a basis for long-term conservation of ecosystems in Central Asia

BSAP project proposals

- Conservation and restoration of biodiversity in montane steppe / forest communities
- Preparation of background materials for creation of new model sport-hunting game ranches
- Nomination of natural objects to be included into the list of World Heritage Sites
- Enabling Activities Phase II – the first step towards implementation of the Biodiversity Action Plan for 2002-2010.

A key function of the BSAP Co-ordination Unit will be to ensure a co-ordinated implementation of activities by the different organisations involved, avoiding duplication of effort. Such co-ordination and integration of activities will be based on an efficient dissemination of information using low-cost techniques. In cases where a single implementing organisation bears responsibility for a particular activity, or where implementation has already begun or is planned to begin within the framework of existing projects, thorough dissemination of information will ensure co-ordination with other isolated activities. If several implementing organisations undertake a number of similar activities within the framework of an integrated project, the co-ordination of activities becomes more problematic. In this case great importance should be attached to good relations between partners and co-operation between the different implementing organisations. The ability to create such partnerships and relationships and an atmosphere of co-operation at all levels will ensure closer collaboration between different sectors and agencies. This will require investment in infrastructure and information systems. Any model developed to improve the integrated approach to biodiversity management could then be applied to many areas and to many issues. It is envisaged that the State Commission, responsible for overseeing BSAP implementation, will be the first step towards such an integrated approach to management.

3.6.3 Financial Mechanisms

BSAP implementation will be partly financed from existing resources. However to implement the wide range of activities, it is necessary to review current funding mechanisms and ensure new sources of funding. The BSAP Co-ordination Unit will be central to the development of new funding mechanisms and bear responsibility for the co-ordination of donors' activities and development of the relations between donors and implementing organisations. The establishment of financial mechanisms and the BSAP Co-ordination Unit will require external assistance during the first year. The implementing organisations will have to ensure that governmental organisations, NGOs, local authorities and communities, can access and use funds effectively.

A number of financial mechanisms to implement the BSAP are given below:

State Budget

The suggested activities within the framework of the BSAP, together with other structural changes, will require a review of State budget allocations and moreover an increase to adequately reflect the significance of biodiversity and sustainable development. The fundamental importance of natural resources in economic and social development should be reflected in revenue distribution for the purposes of biodiversity conservation.

Velayat (Provincial) Budgets. The implementation of activities at the local level will make funds available at the velayat level for the purpose of biodiversity conservation and will encourage ongoing investment into the sustainable use of natural resources.

Nature Protection Fund

A review and strengthening of this Fund will help to make its management more efficient and responsible. In future this Fund may become an important internally-funded means for supporting biodiversity management and related issues.

Micro-credit

The development of micro-credit programmes will provide funds for small-scale operations both in the sphere of biodiversity conservation and local economic activity.

Small Grants

Small grants will be required in the initial stages of many activities and in some cases they will be necessary to maintain initiatives in the provinces. They will be an important means for the development of local capacity relating to environmental protection in the provinces both within communities and organisations.

Donor-funded Projects

Taking into account the broad scope of the BSAP, which includes activities to address social issues, sustainable economic activity, rural development and biodiversity conservation, there are many possibilities for close co-operation with various national and international donors during the development of projects. A very important initial stage of BSAP implementation will require capacity building within government agencies and NGOs to assist them in the development of project concepts, proposals, grant applications and project management systems in accordance with the requirements of international donors.

Potential National and International Donor Organisations:

GEF
UNDP
UNEP
World Bank
USAID
TACIS
WWF
Counterpart Consortium
FFI
Foreign embassies' small grants programmes
GTZ

Global Environment Facility

One of the main objectives of the GEF is the management of areas of globally-important biodiversity. This provides an opportunity to implement projects of global as well as national importance. A range of funding mechanisms are available within the GEF (including small and medium-sized grants programmes).

Loans

While preparing an application for international loans it is important that clear links between biodiversity conservation and the sustainable development of Turkmenistan are considered in the design of the loan, and that these are reflected in proper legal agreements.

Private Sector

The development of the private sector and corporate interests in Turkmenistan has created an increased potential for the development of partnerships, and sponsorship, for the support of the improved management of biodiversity.

REFERENCES

Nb. The references below are numbered according to the Russian version of the Country Study. Due to differences in the English and Russian alphabet, they are therefore not arranged in strict alphabetical order by author.

1. Ruhnama by the President of Turkmenistan Saparmurat Turkmenbashi. Ashgabat,2001.

2. Presidential Programme "Strategy of socio-economic reforms in Turkmenistan for the period till 2010". Ashgabat, 1999.

3. Anon. (1998). Key issues of environmental protection and sustainable development of Turkmenistan. Ashgabat.

4. Ataev Ch.A. (1985). *Reptiles of Turkmenistan Mountains*. Ashgabat: Ylym.

5. Atamuradov H.I. (2000). Current status of the SPA network of Turkmenistan. In: *SPAs of Northern Eurasia. Development through participation*. M.

6. Atamuradov H.I., Shammakov S., Yazkulyev A. (2000). The Red Data Book second edition. *Problems of desert development*, No.2.

7. Ashgabat (1996). *Professional business reference book*. Ashgabat: Turkmenpress.

8. Batyrova G.Z. (1977). Mushrooms of Kopetdag, Candidate Dissertation, Ashgabat.

9. Bishop K., Green M., Phillips A. (2000). National park models. WWF Publishing Centre.10. Bukreyev S. (1997). Ornithogeography and conservation business of Turkmenistan. M.

11. Bykov B.A. (1988). *Dictionary of ecology*. Alma-Ata: Nauka.

12. Geldihanov A.M. (1995). Analysis of the flora of the Karakums. Abstract of thesis for a Doctoral degree. Ashgabat.

13. German V.B., Blyaher M.A. (undated). Scientific-applied program for 1986-1990 on the problem "Conservation and restoration of ecosystems of nature regions of Turkmenistan" (manuscript).

14. Anon. (1999). Main trends of socio-economic development of Turkmenistan for the period till the year 2010 (agro-industrial sector). Ministry of Agriculture of Turkmenistan.

15. Gorelov U.K. (1998). Man's Activities Influencing Biodiversity of Badkhyz. *Actual Issues of Environment Protection and Sustainable Development of Turkmenistan*. Ashgabat.

16. Gorelova T.G. (1990). Vascular plants of Badkhyz zapovednik. In: *Flora and Fauna of zapovedniks of the USSR*. M.

17. Gubanov S.M. (1934). On the problem of origin of Asian and pure European sheep breeds. Publication of the Interdepartmental Committee on nature protection and natural resources development, No.1.

18. Gubanov O., Tokgaev T., Shammakov S., Eminov A. (1997). *Three-Language Dictionary of the names of the animals in Turkmenistan*. Ashgabat: Ylym.

19. Gusev V.G. (1987). *Your gun dog*. M.

20. Dezhkin V.V., Puzachenko Yu.G. (1999). Concept of the system of protected areas of Russia. WWF Publishing Centre. M.
21. Zhukovskii P.M. (1971). Cultivated plants and their wild relatives. L.:Kolos.
22. Ishankuliev M. (1983). *Flora of Repetek biosphere zapovednik*. Ashgabat: Ylym.
23. Kalinin V.A., Ivanova T.M., Morozova L.V. (1992). Domestic breeds of war-dog of Asian origin. M.; Patriot.
24. Kamahina G.L. (1999). Degradation of mountain steppes of Kopetdag. *Steppe bulletin*, No.5.
25. Kamahina G.L., Kapkov B.B. (1990). Problems of rare floral species protection of the Central Kopetdag. *Nature protection of Turkmenistan*. Edition VII, Ashgabat.
26. Kamelin R.V. (1973). Florogenetic analysis of natural flora of Central Asia. L.: Nauka.
27. Karryev B.A. (1980). Turkmen sayings and proverbs. Ashgabat: Ylym.
28. Kuvshinova K.V. (1972). Climatic regions of south-western Turkmenistan. *Problems of desert development*, No.4.
29. Kuzmenko V.D. (1998). Role of Repetek Zapovednik in Biodiversity Conservation in the Eastern Karakums. *Actual issues of environment conservation and sustainable development of Turkmenistan*. Ashgabat.
30. Anon. (2000). Cultural heritage (deep sources and current perspectives). Materials to the international scientific conference. Ashgabat – Saint-Petersburg: Europe house.
31. Kogan Sh.I. (1973). Algae of the water ponds of the Turkmen SSR. Ashgabat, Book 2.
32. Anon. (1994). Convention on Biological Diversity (Russian version).
33. Korovina O.N. (1982). Wild relatives of cultivated plants of the Central Asian genetic centre. L.
34. Koshkelova E.N. (1977). *Micromycetes of Southern Turkmenistan*. Ashgabat: Ylym.
35. Anon. (1985). *Red Data Book of the Turkmen SSR*. Ashgabat: Turkmenistan.
36. Anon (1999). *Red Data Book of Turkmenistan (Second edition)*. Ashgabat.
37. Mazover A.P. (1935). About the Turkmen sheep dog. M.
38. Mednikov B.M. Gorelov U.K. (1982). On the Use of Biochemical Methods in Solving Controversial cases in Systematics (Place of Kulans among Modern Horses). Modern Problems and Methods in Animal Classification. M.
39. Anon. (1995). *Mammals in Turkmenistan*. Ashgabat: Ylym.
40. Anon. (1999). Guarding ecological security. Compilation of laws and regulations of Turkmenistan. M.
41. Anon. (1998). Scientific grounds of sustainable fishery and regional distribution of fishing objects of the Caspian Sea. M.: All-Union scientific-research institute of fishery(VNIRO).
42. Nikitin V.V., Bondarenko O.N. (1975). Wild relatives of cultivated plants and their spread on the territory of the USSR (summary). L.
43. Nikitin V.V., Geldykhanov A.M. (1988). *Turkmenistan Flora Key*. L., Nauka.
44. Nurgeldiev O.N., Sekunova S.A., Ovechkina Z.I. (1956). Nutria – a new fur animal of Turkmenistan. Works of the Institute of Biology of the Academy of Sciences of the Turkmen SSR, section zoology. v.IV. Ashgabat.
45. Nurgeldiev O.N., Scherbina E.I., Marinina L.S., Babaev H.B. (1986). *Mammals of the Karakum Canal zone*. Ashgabat: Ylym.
46. Orazov G. (1996). Melon science development in the country. *Agriculture of Turkmenistan*, No.3.
47. Anon. (1996). Protection of environment and health of people of Turkmenistan. Compilation of laws. Dashoguz Ecological Club: 21st Century Fund.
48. Anon. (2001). Action Plan on conservation of habitats of the Caspian Sea (Turkmenistan). Manuscript.
49. Anon. (1993). Program: Forestry Development of Turkmenistan. Ashgabat.

50. Rustamov A.K. (1954). *Birds of the Karakum Desert*. Publication house of the Academy of Sciences of TSSR. Ashgabat
51. Salikhov B.S. (1985). Akhalteke Horses. Ashgabat.
52. Salnikov V.B., Shakirova F.M. (1998). Ecological and nature protective aspects of fishery use of inland waters of Turkmenistan. In: *Actual issues of environment protection and sustainable development of Turkmenistan*. Ashgabat.
53. Sirotina I.V. (1988). Kopetdag Mosses. Candidate Dissertation. L.
54. Anon. (1999). *The state of environment of Turkmenistan*. "XXI Century" Fund.Ashgabat.
55. Anon. Conservation of biodiversity of Central Asia: Turkmenistan. Ashgabat, 1997.
56. Anon. (2000). *Statistics year-book of Turkmenistan*. Ashgabat.
57. Tashliev A.O., Myarzceva S.N., Berdiev A.B. et al. (1988). Fauna resources of Turkmenistan and problems of rational use. Ashgabat: Ylym.
58. Toydjanov H.T. (1996). Characteristics of fruit and harvested plant sorts of Turkmenistan by etraps. Ashgabat.
59. Tokgaev T.B. (1998). Biological diversity of insects of Turkmenistan. In: *Actual issues of environment protection and sustainable use of Turkmenistan*. Ashgabat.
60. Hodjaev I. et al. (1995). Ak Bugday: prospect and reality. *Agriculture of Turkmenistan*, No.3.
61. Chapau A. et al. (2000). Deciduous sorts of cotton. *Agriculture of Turkmenistan*, No.4.
62. Anon. (2000). Human measurement in the Strategy of socio-economic development of Turkmenistan in XXI Century. Material of the International scientific-practical conference. Ashgabat.
63. Cherepanov S.K. (1995). *Vascular Plants of Russia and Neighbouring Countries*. Saint-Petesburg.
64. Shammakov S. (1981). *Reptiles of the plains of Turkmenistan*. Ashgabat: Ylym.
65. Esenov A., Karov D. (1999). Turkmen melons. Ashgabat: Ruh.
66. Atamuradov H.I. et al. (1999/2000). Biodiversity, Genetic Diversity and Protected Areas in Turkmenistan. Co-published simultaneously in *Journal of Sustainable Forestry* (Food Products Press, an imprint of the Haworth Press, Inc.), No.1.9, No. 1/2, 1999 pp. 73-88 and *Problems of desert development*, No.2, 2000;
67. Fet V., Atamuradov H. (1994). *Biogeography and ecology of Turkmenistan*. Kluwer Academic Publishers, Dordrecht, The Netherlands. 650 pp.

GLOSSARY

Anadromous – (of fishes and other aquatic organisms) living part of the life cycle in freshwater and part in saltwater;

Anthropogenic – produced or dependent on man's activity;

Archa – juniper tree species belonging to the genus *Juniperus*;

Avifauna – population of birds of a given area;

Barkhan – crescent-shaped sand dune [11]

Benthos – organisms living on the bed of a water body (e.g. lake, river etc.);

Biological diversity - the variability of living organisms from all sources including terrestrial, marine and other water ecosystems and ecological complexes which they are a part of; this notion includes the diversity within a species, between species and the diversity of ecosystems [32];

Biological resources - the genetic resources, organisms or their parts, populations or any other biotic components of ecosystems, which have actual or potential utility and value for man;

Biosphere reserve - a protected area that meets the requirements of the MAB UNESCO Programme and has an appropriate international certificate;

Biotechnology - any kind of technology related to the use of biological systems, living organisms or their derivatives;

BSAP / NBSAP - (National) Biodiversity Strategy and Action Plan;

CBD - Convention on Biological Diversity;

Caspecocontrol – Caspian Ecological Control Administration;

CIS – Commonwealth of Independent States i.e. the countries that comprised the former Soviet Union without the Baltic countries;

Dominant - a species quantitatively prevailing in the community;

Ecosystem – a dynamic complex of flora, fauna and micro-organisms, together with their physical environment;

EIA – environmental impact assessment;

Endemic – restricted to a particular localised distribution;

Entomofauna – population of insects;

ESCAPO - Economic and Social Commission for Asia and the Pacific Ocean;

Etrap – administrative territorial / political division corresponding to a district**;**

Exotic – alien, not native to a given area;

***Ex situ* conservation -** the conservation of biodiversity outside its natural habitat;

Fauna – animals;

FAO - Food and Agricultural Organisation of the United Nations;

Flora – plants;

GEF – Global Environment Facility**;**

Gene pool – an assemblage of genetic material of different species, types, varieties, breeds etc.;

Habitat – the area or place in which an organism lives;

Herpetofauna – amphibians and reptiles**;**

Ichthyofauna – fish;

***In situ* conservation -** the conservation of ecosystems and natural habitats as well as the maintenance and restoration of viable species populations in their natural environment;

Introduction – deliberate or accidental transfer of individuals of a species to a new area;

ISAR - Initiative for Social Action and Renewal;

IUCN – World Conservation Union (still known by the acronym of its former name, the International Union for the Conservation of Nature and Natural Resources);

"Geok Gushak" – a public limited company (Geok Gushak = Green Belt) which plants trees around Ashgabat;

Kyr ridges – alternating ridges in stone, clay, and sand deserts with one steep slope and one shallow slope;

LEEP - Law and Environment Eurasia Partnership;

MAB – "Man and the Biosphere" Programme of UNESCO;

Manat - unit of currency of Turkmenistan;

Mejlis – Council of Deputies (= parliament of Turkmenistan);

Monoculture – cultivation of a single species;

National park – a protected area that combines protective and recreational functions and takes into consideration the interests of the population living in the vicinity [9, 20];

Natural monuments – natural objects or sites of aesthetic, educational, and historical value, which are designated without expropriation of land, the responsibility for their conservation being fixed on their owner / user [20];

NEAP – National Environmental Action Plan;

NGO – Non-Governmental ("public") Organisation;

Plankton – aquatic micro-organisms;

Population – an aggregate of living organisms of the same species inhabiting a certain area.

Protected area – geographically delimited zone, which is allotted, regulated and used for nature conservation;

Relict – a species that was formerly widespread and has now been preserved in a restricted area;

Ruhnama – a book on the spiritual-cultural values of the Turkmen people written by the President Sparmurat Turkmenbashi, (2000);

Saxaul – woody plants of the genus *Haloxylon*: White saxaul = *Haloxylon persicum*; Black saxaul = *Haloxylon aphyllum*;

Specially Protected Area (SPA) - a territorial form of nature protection that excludes, or strictly regulates all forms of direct use of natural resources, and provides opportunities for conservation and restoration of different forms of biodiversity [20];

Sustainable use – exploitation of components of biological diversity in a way that maintains them in the long-term, thus preserving their capacity to cover the needs of present and future generations and to meet their expectations;

TACIS - Technical Assistance to the CIS;

Takyr – a clay desert**;**

Taxon – a group of evolutionarily-related organisms, for example a genus, a species or a sub-species;

Tugai – densely vegetated thickets and woodlands along river valleys in arid regions, consisting of various poplars, thorny shrubs and reeds[11];

"Turkmendermansenagat" – an association that produces medical drugs;

"Turkmenmallary" – an association for livestock breeding;

UNDP – United Nations Development Programme;

UNEP - United Nations Environment Programme;

UNESCO - United Nations Educational, Scientific and Cultural Organisation;

Velayat – a political structure corresponding to a region / province;

WWF- Worldwide Fund for Nature (still known by the acronym of its former name, World Wildlife Fund);

Zakaznik - a type of protected area permitting certain forms of direct use of natural resources under strict regulation, providing they do not conflict with the main purpose of nature conservation (= a sanctuary);

Zapovednik – a strictly protected area in which no human activities are allowed, created to preserve biological processes and ecosystems

Appendix 1.

VERTEBRATES OF KEY IMPORTANCE
(National and Regional Endemics)

English common name	Scientific name	Distribution
Class Cyclostomata (Lampreys)		
Caspian lamprey	*Caspiomyzon wagneri*	Caspian Sea basin
Class Pisces (Fish)		
Small Amu-Dar shovelnose sturgeon	*Pseudoscaphirhynchus hermanni*	Amudarya basin
Large Amu-Dar (or false) shovelnose sturgeon	*Pseudoscaphirhynchus kaufmanni*	Amudarya basin
Anchovy sprat	*Clupeonella engrauliformis*	Caspian Sea basin
Southern Caspian sprat	*Clupeonella grimmi*	Caspian Sea basin
Caspian sea trout	*Salmo trutta caspicus*	Caspian Sea basin
Beloribitsa	*Stenodus leucichthys leucichthys*	Caspian Sea basin
Striped bystranka	*Alburnoides taeniatus*	Aral Sea basin
Pike asp	*Aspiolucius esocinus*	Aral Sea basin
Asp ssp.	*Aspius aspius iblioides*	Aral Sea basin
Aral barbel	*Barbus brachycephalus brachycephalus*	Aral Sea basin
Bulatmai barbel ssp.	*Barbus capito conocephalus*	Aral Sea basin
Transcaucasian barb ssp.	*Capoeta capoeta gracilis*	Caspian Sea basin
Sharpray ssp.	*Capoetobrama kuschakewitschi kuschakewitschi*	Aral Sea basin
Danube bleak ssp.	*Chalcalburnus chalcoides aralensis*	Aral Sea basin
Ide	*Leuciscus idus oxianus*	Aral Sea basin
Roach ssp.	*Rutilus rutilus aralensis*	Aral Sea basin
* Roach ssp.	*Rutilus rutilus uzboicus*	Turkmenistan
Transcaspian marinka	*Schizothorax pelzami*	Turkmenistan, Afghanistan, Iran
Golden-spined loach ssp.	*Sabanejewia aurata aralensis*	Aral Sea basin
Bukhara stone loach	*Nemacheilus amudarjensis amudarjensis*	Aral Sea basin
Khorezm loach	*Nemacheilus amudarjensis choresmi*	Aral Sea basin
Turkmenian crested loach	*Nemacheilus cristata*	Turkmenistan, Iran, Afghanistan
Gray loach	*Nemacheilus dorsalis*	Aral Sea basin
Amudarya stone loach	*Nemacheilus oxianus*	Aral Sea basin
Turkmenian loach	*Nemacheilus sargadensis turcmenicus*	Turkmenistan, Iran, Afghanistan
* Blind cave loach sp.	*Nemacheilus starostini*	Turkmenistan
Southern ninespine stickleback ssp.	*Pungitius platygaster aralensis*	Aral Sea basin
Tadpole-goby sp.	*Anatirostrum profundorum*	Caspian Sea basin
Class Reptilia (Reptiles)		
Steppe tortoise	*Agrionemys horsfieldi*	Turkmenistan, Iran, Kazakhstan, Uzbekistan, Tadjikistan, Kyrgyzstan
*European pond turtle ssp.	*Emys orbicularis orientalis*	Turkmenistan
Gecko sp.	*Eublepharis turcmenicus*	Turkmenistan, northen Iran
Straight-fingered gecko sp.	*Alsophylax laevis*	Turkmenistan, Uzbekistan
* Straight-fingered gecko sp.	*Alsophylax loricatus szczerbaki*	Turkmenistan
Rock gecko sp.	*Cyrtopodion turcmenicus*	Turkmenistan, Afghanistan
Rock gecko sp.	*Cyrtopodion spinicauda*	Turkmenistan, Iran
*Yellow-bellied skink ssp.	*Eumeces taeniolatus parthianicus*	Turkmenistan
*Skink ssp.	*Mabuya aurata affinis*	Turkmenistan

English common name	Scientific name	Distribution
*Caucasian agama ssp.	*Laudakia* (*Agama*) *caucasica triannulatus*	Turkmenistan
*Agama lizard ssp.	*Laudakia* (*Agama*) *erythrogastra nurgeldievi*	Turkmenistan
*Agama lizard ssp.	*Phrynocephalus rossikowi shammakowi*	Turkmenistan
* Agama lizard ssp.	*Phrynocephalus guttatus salsatus*	Turkmenistan
* Agama lizard ssp.	*Phrynocephalus reticulatus bannikovi*	Turkmenistan
Agama lizard sp.	*Phrynocephalus raddei*	Turkmenistan, Uzbekistan Tadjikistan
Legless skink (sand swimmer sp.)	*Ophiomorus chernovi*	Turkmenistan, Iran
Race-runner or fringe-toed gecko sp.	*Eremias persica*	Turkmenistan, Iran
Race-runner or fringe-toed gecko sp.	*Eremias regeli*	Tadjikistan, Turkmenistan, Uzbekistan, Afghanistan
Race-runner or fringe-toed gecko sp.	*Eremias lineolata*	Turkmenistan, Uzbekistan, Kazakhstan, Tadjikistan, Iran
Lizard sp.	*Lacerta defilippii*	Turkmenistan, Northen Iran
Elegant sand boa	*Eryx elegans*	Turkmenistan, Iran
Russian sand boa ssp.	*Eryx miliaris speciosus*	Turkmenistan, Kazakhstan, Uzbekistan, Tadjikistan, Iran, Afghanistan
* Oriental rat snake ssp.	*Ptyas mucosus nigricens*	Turkmenistan
Cat snake	*Telescopus rhynopoma*	Turkmenistan, Iran
Oxus cobra	*Naja naja oxiana* (= *Naja oxiana*)	Turkmenistan, Uzbekistan, Iran, Tadjikistan, Afghanistan
Class Aves (Birds)		
Caspian snowcock ssp.	*Tetraogallus caspius caspius*	Turkmenistan, Iran
Chukar partridge ssp.	*Alectoris chukar shestoperovi*	Turkmenistan, Iran
Common pheasant ssp.	*Phasianus colchicus persicus*	Turkmenistan, Iran
Murgab River pheasant	*Phasianus colchicus principalis*	Turkmenistan, Afghanistan
Common pheasant ssp.	*Phasianus colchicus zarudnyi*	Turkmenistan, Uzbekistan
Common pheasant ssp.	*Phasianus colchicus chrysomelas*	Turkmenistan, Uzbekistan
Wood pigeon ssp.	*Columba palumbus iranica*	Turkmenistan, Iran
Northern eagle-owl ssp.	*Bubo bubo omissus*	Turkmenistan. Uzbekistan
Desert lark ssp.	*Ammomanes deserti parvirostris*	Turkmenistan, Kazakhstan
Pander's ground jay ssp.	*Podoces panderi panderi*	Turkmenistan, Uzbekistan, Kazakhstan
Northern wren ssp.	*Troglodytes troglodytes subpallidus*	Turkmenistan, Iran
Chifchaff ssp.	*Phylloscopus collybita menzbieri*	Turkmenistan, Iran
Coal tit ssp.	*Parus ater chorassanicus*	Turkmenistan, Iran
Turkestan tit ssp.	*Parus bokharensis* (*cinereus*) *intermedius*	Turkmenistan, Iran
Greater rock nuthatch ssp.	*Sitta tephronota iranica*	Turkmenistan, Iran
House sparrow ssp.	*Passer domesticus hyrcanus*	Turkmenistan, Iran
Desert sparrow ssp.	*Passer simplex* ssp.*zarudnyi*	Turkmenistan, Uzbekistan
Chaffinch ssp.	*Fringilla coelebs* ssp. *transcaspius*	Turkmenistan, Iran
White-winged grosbeak ssp.	*Mycerobas carnipes speculigerus*	Turkmenistan, Iran
Class Mammalia (Mammals)		
Horseshoe bat sp.	*Rhinolophus bocharicus*	Turkmenistan, Uzbekistan, Afghanistan
* Natterer's bat ssp.	*Myotis nattereri tschuliensis*	Turkmenistan
Geoffroy's bat ssp.	*Myotis emarginatus desertorum*	Turkmenistan, Iran, Afghanistan
Long-clawed ground squirrel	*Spermophilopsis leptodactylus*	Turkmenistan, Kazakhstan, Uzbekistan, Iran, Afghanistan

English common name	Scientific name	Distribution
Mouse-like or Asiatic dormouse	*Myomimus personatus*	Turkmenistan, northen Iran
Severtzov's jerboa	*Allactaga severtzovi*	Turkmenistan,Kazakhstan, Uzbekistan, Tadjikistan
Jerboa sp.	*Allactodipus bobrinskii*	Turkmenistan, Kazakhstan, Uzbekistan
Comb-toed jerboa	*Paradipus ctenodactylus*	Turkmenistan, Uzbekistan
*Jerboa ssp.	*Jaculus blanfordi margianus*	Turkmenistan
Jerboa sp.	*Eremodipus lichtensteini*	Turkmenistan, Kazakhstan, Uzbekistan
Mouse-like hamster	*Calomyscus mystax*	Turkmenistan, Iran
Zarudny's jird or gerbil	*Meriones zarudnyi*	Turkmenistan, Iran, Afghanistan
Caspian seal	*Phoca* (= *Pusa*) *caspica*	Caspian Sea basin
Bukhara deer	*Cervus elaphus bactrianus*	Turkmenistan, Uzbekistan, Tadjikistan
Turkmen wild goat	*Capra aegagrus turcmenicus*	Turkmenistan, Iran
Afghan urial	*Ovis orientalis* (=*vignei*) ssp. *cycloceros*	Turkmenistan, Uzbekistan
Bukhara urial	*O. o. bochariensis*	Turkmenistan, Uzbekistan, Tadjikistan
Transcaspian urial	*O. o. arcal*	Turkmenistan, Kazakhstan, Uzbekistan
Piebald or sand shrew	*Diplomesodon pulchellum*	Turkmenistan, Uzbekistan, Kazakhstan, pre-Caspian part of Russia

NOTE: Taxa marked with * are found only in Turkmenistan

Appendix 2.

THREATENED FLORA AND FAUNA

Plants and animals listed in the Red Data Books of Turkmenistan and the IUCN Red Lists

№ п/п	Taxon	English common name	Red Data Book category	
			Turkmen	IUCN
		Flora (IUCN, 1998)		
**	*Ophioglossum vulgatum*	Adder's-tongue	I*	-
**	*Anogramma leptophylla*	Jersey fern	I*	-
**	*Asplenium adianthum- nigrum*	Black spleenwort	I*	-
1	*Eremurus kopetdaghensis*	-	I*	I
2	*Fritillaria raddeana*	Crown imperial sp.	II	I
3	*Tulipa hoogiana*	Tulip sp.	II	EN
4	*Tulipa kuschkensis*	Tulip sp.	II	EN
5	*Tulipa ingens*	Tulip sp.	II	I
6	*Tulipa wilsoniana*	Tulip sp.	II	VU
**	*Tulipa botschantzevae*	Tulip sp.	I*	-
7	*Hyacinthus transcaspicus*	Hyacinth sp.	I*	I
8	*Allium transvestiens*	Leek sp.	I*	LR
9	*Allium eugenii*	Leek sp.	II	I
10	*Ungernia spiralis*	-	I*	I
11	*Ungernia victoris*	-	II	I
12	**Iris ewbankiana*	Iris sp.	-	I
**	*Eulophia turkestanica*	Orchid sp.	I*	-
13	**Orchis fedtschenkoi*	Orchid sp.	-	I
**	*Epipactis turcomanica*	Helleborine sp.	I*	-
**	*Listera ovata*	Twayblade sp.	I*	-
**	*Juglans regia*	Walnut	I*	-
**	*Calligonum triste*	-	I*	-
14	**Polygonum arianum*	Knotgrass sp.	-	I
**	*Salsola iljinii*	Saltwort sp.	I*	-
15	*Salsola chiwensis*	Saltwort sp.	III	EN
16	**Allochrusa gypsophiloides*	Soap root	-	I
**	*Corydalis kamelinii*	-	I*	-
17	*Prionotrichon gaudanense*	-	III	I
**	*Homalodiscus ochradeni*	-	I*	-
**	*Ribes melananthum*	Currant sp.	I*	-
**	*Sorbus graeca*	Greek ash	I*	-
**	*Sorbus turkestanica*	Ash / rowan sp.	I*	-
**	*Pyrus turcomanica*	Pear sp.	I*	-
**	*Malus sieversii* ssp. *turkmenorum*	Apple sp.	I*	-
18	**Cerasus blinovskii*	Wild cherry sp.	-	I
19	*Colutea atabaevii*	Bladder senna sp.	II	I
20	**Astragalus arianus*	-	-	Ex
21	**Euphorbia sclerocyathium*	-	-	LR
**	*Pistacia badghysi*	Pistachio sp.	I*	-
**	*Alcea karakalensis*	Kara-Kala Rod Rose	I*	-
**	*Reaumuria botschantzevii*	-	I*	-
22	**Reaumuria badhysi*	-	-	LR
23	**Frankenia pulverulenta*	-	-	VU

№ п/п	Taxon	English common name	Red Data Book category	
			Turkmen	IUCN
24	**Ferula turcomanica*	Giant fennel sp.	-	I
**	*Mandragora turcomanica*	Turkmen mandrake	I*	-
25	*Atropa komarovii*	Nightshade sp.	I*	I
26	*Lepidolopha fedtschenkoana*	-	III	I
**	*Cousinia tscherneviae*	Thistle sp.	I*	-
27	*Cousinia badhysi*	Thistle sp.	-	I
28	*Centaurea androssovii*	Knapweed sp.	I*	LR
	Fauna (IUCN, 2000)			
Insecta - Insects				
**	*Catocola lesbia*	Moth sp.	I*	-
**	*Taragama faina*	Moth sp.	I*	-
29	*Chalepoxenus zabelini*	Ant sp.	-	VU
30	*Saga pedo*	Grasshopper sp.	II	VU
Pisces - Fish				
31	** Acipenser gueldenstaedtii*	Russian sturgeon	-	EN
32	*Acipenser nudiventris*	Spiny sturgeon	I*	EN
33	** Acipenser persicus*	Persian sturgeon	-	VU
34	** Acipenser stellatus*	Stellate or star sturgeon	-	VU
35	** Huso huso*	Beluga	-	EN
36	** Sabanejewia* (*Cobitis*) *aurata*	Golden-spined loach	-	DD
37	*Pseudoscaphirhynchus kaufmanni*	Large Amu-Dar (or false) shovelnose sturgeon	II	EN
38	*Pseudoscaphirhynchus hermanni*	Small Amu-Dar shovelnose sturgeon	I*	CR
39	** Stenodus leucichthys*	Beloribitsa	III	EN
40	** Aspiolucius esocinus*	Pike asp	II	VU
41	** Aspius aspius*	Asp	-	DD
42	** Cyprinus carpio*	Common carp	-	DD
43	*Nemacheilus starostini*	Blind cave loach sp.	III	VU
Reptilia – Reptiles				
44	** Testudo* (*Agrionemys*) *horsfieldi*	Steppe tortoise	-	VU
45	** Emys orbicularis*	European pond turtle	-	LR
**	*Phrynocephalus maculatus*	Spotted toad-headed agama	I*	-
**	*Alsophylax laevis*	Straight-fingered gecko sp.	I*	-
46	*Naja naja oxiana*	Oxus cobra	II	DD
Aves – Birds				
47	*Pelecanus crispus*	Dalmatian pelican	III	LR
48	** Phalacrocorax pygmeus*	Pygmy cormorant	-	LR
49	*Anser erythropus*	Lesser white-fronted goose	IV	VU
50	** Branta ruficollis*	Red-breasted goose	-	VU
51	** Aythya nyroca*	Ferruginous duck	-	LR
52	*Oxyura leucocephala*	White-headed duck	II	EN
53	*Marmaronetta* (= *Anas*) *angustirostris*	Marbled teal	I*	VU
54	** Gallinago media*	Great snipe	-	LR
55	** Crex crex*	Corncrake	-	VU
56	*Vanellus gregarius*	Sociable plover	III	VU
57	** Columba eversmanni*	Eastern stock dove	-	VU
58	*Grus leucogeranus*	Siberian white crane	I*	CR
59	*Chlamydotis undulata*	Houbara bustard	I*	LR

№ п/п	Taxon	English common name	Red Data Book category	
			Turkmen	IUCN
60	*Otis tarda*	Great bustard	I*	VU
61	*Tetrax tetrax*	Little bustard	II	LR
62	*Picus squamatus*	Scaly-bellied green woodpecker	I*	EX
63	*Aegypius monachus*	Black or cinereous vulture	III	LR
64	* *Circus macrourus*	Pallid harrier	-	LR
65	* *Aquila clanga*	Greater spotted eagle	-	VU
66	*Aquila heliaca*	Imperial eagle	II	VU
67	*Falco naumanni*	Lesser kestrel	III	VU
68	*Haliaeetus leucoryphus*	Pallas' sea eagle	II	VU
69	* *Haliaeetus albicilla*	Grey or white-tailed sea eagle	-	LR
Mammalia - Mammals				
70	*Rhinolophus blasii*	Blasius' horseshoe bat	II	LR
71	*Rhinolophus euryale*	Mediterranean horseshoe bat	III	VU
72	* *Rhinolophus ferrumequinum*	Greater horseshoe bat	-	LR
73	*Rhinolophus hipposideros*	Lesser horseshoe bat	III	VU
74	*Myotis emarginatus*	Geoffroy's bat	III	VU
75	* *Dryomys nitedula*	Forest or tree dormouse	-	LR
76	* *Glis glis*	Edible dormouse	-	LR
77	*Myomimus personatus*	Mouse-like or Asiatic dormouse	III	VU
78	*Calomyscus mystax*	Mouse-like hamster	III	LR
79	*Meriones zarudnyi*	Zarudny's jird or gerbil	III	EN
80	*Capra falconeri heptneri*	Tadjik markhor	I*	CR
81	*Capra aegagrus turcmenicus*	Turkmen wild goat	II	VU
82	*Equus hemionus kulan* (*E. h. onager*)	Kulan	II	EN
83	*Ursus arctos*	Brown bear	I*	VU
84	*Hyaena hyaena*	Striped hyaena	I*	LR
**	*Lynx lynx*	European lynx	I*	-
85	*Panthera pardus saxicolor (P. p. ciscaucasica*)	North Persian leopard	I*	EN
86	* *P. tigris*	Tiger	-	EN
87	*Cervus elaphus bactrianus*	Bukhara deer	I*	VU
88	*Gazella subgutturosa*	Sand gazelle	II	LR
89	*Lutra lutra*	Eursian otter	II	VU
90	*Ovis orientalis arcal*	Transcaspian urial	II	VU
91	*O. o. bocharensis*	Bukhara urial	II	EN
92	*O. o. cycloceros*	Afghan urial	II	VU
93	* *Phoca caspica*	Caspian seal	-.	VU
94	*Saiga tatarica tatarica*	Saiga	II	LR
95	*Vulpes cana*	Blanford's fox	IV	DD
96	* *V. corsac*	Corsac fox	-	DD
97	*Otocolobus* (*Felis*) *manul ferrugineus*	Pallas' or steppe cat	III	LR
98	* *Acinonyx jubatus venaticus*	Asiatic cheetah	-	VU

Key: numbered taxa are listed by IUCN (1998; 2000) for Turkmenistan; taxa marked by "**" are plants listed in the Red Data Book of Turkmenistan (1999), but not by IUCN. Taxa marked by "*" are taxa listed by IUCN, but not included in the Red Data Book of Turkmenistan (1999).

Turkmenistan Red Data Book categories: I – extinct or endangered species (marked by "*"), II - declining, III – rare, and IV – data deficient.

IUCN Red List Categories (2000): EX - extinct, CR – critically endangered, EN – endangered, VU - vulnerable, LR – taxon of lower risk, DD – data deficient, NE – not evaluated; I (Indeterminate) – not defined.

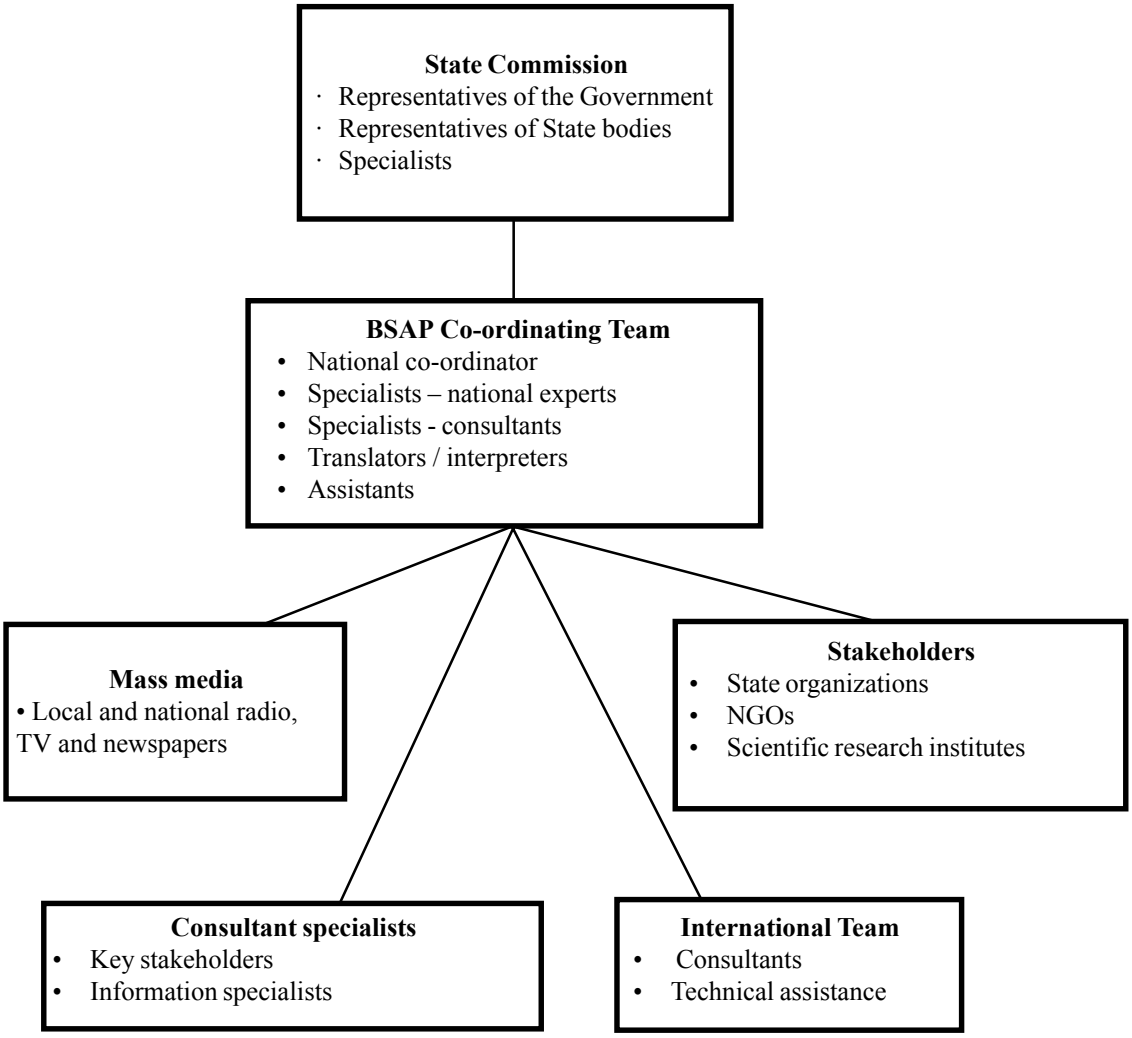
Appendix 3.

Process of BSAP Preparation

How the Biodiversity Strategy and Action Plan was prepared is very important for understanding the structure of the Plan itself. The process was developed to fit in with procedures accepted in Turkmenistan and on the basis of national and international experience in planning activities related to biodiversity. The experience gained during BSAP development was reflected in the Plan's structure. It is important that BSAP implementation builds upon the information, participation and experience that was developed during its preparation.

Process Management

The development process of the BSAP included the management and co-ordination of the following groups:



BSAP Co-ordinating Team

The BSAP Co-ordinating Team constituted the core element of the BSAP preparation process. The Unit consisted of the following members:

National co-ordinator: Rajapov M.

Specialists – national experts: A. Shamuradov (Project Manager), Saparmuradov D (Fauna expert), Kamakhina G.L. (Protected areas expert), Karryeva Sh.B (Biogenetic resources expert).

Translators and assistants: Ishanova O.B (Finance assistant), Goncharuk E.A (Administration assistant), Akmedov Sh. (Information technology assistant), who supported the work of the other members of the group.

State Commission

The State Commission (SC) supervised the process of BSAP compilation. It included senior members of key state institutions (Ministry of Nature Protection, Ministry of Foreign Affairs, Ministry of Agriculture, Ministry of Water Resources, Ministry of Economy and Finance), representatives of academic institutions and other. The SC was headed by the Deputy-Chairman of the Cabinet of Ministers of Turkmenistan Saparov R.S., the Deputy-Head of the SC was Rajapov M., Minister of Nature Protection. The SC ensured general management, approval and support at the key stages of the BSAP preparation process.

International Team

The UK-based NGO Fauna & Flora International was invited by the Ministry of Nature Protection to provide general management and technical support during the BSAP preparation process. FFI's input was co-ordinated by Dr Chris Magin, and FFI's international experts (Nigel Coulson, Martin Hollands, Dr Tim Reed and Dr Zbig Karpowicz) worked jointly with the BSAP Co-ordinating Team at all stages of the process.

Specialists / Consultants

Thirty specialists / consultants took part in the BSAP compilation. Many of them worked over short periods of time and contributed their knowledge and experience to the project. At different stages of the compilation process these consultants worked in small working groups to discuss various issues. However, due to the fact that the project was of an inter-disciplinary nature, particular attention was paid to maximising co-operation with a variety of interested stakeholders. To this end a number of regional inter-sectoral workshops were held in velayats. More than 250 specialists from ministries, educational institutions, scientific research institutes, NGOs and other organisations took part in these.

Stakeholders

Hundreds of people and organisations were involved in the process of BSAP preparation. As the preparation process advanced, the range of stakeholders and the depth of their participation widened - starting from obtaining simple information on progress and finishing with taking the initiative in planning and development of BSAP activities. The national and far-reaching importance of the BSAP means that many stakeholders at all public levels have had an input into its development and preparation.

Mass Media

Widespread public awareness about the BSAP was one of the important parts of the process. This in particular helped all participating stakeholders to take part in the process from a well-informed position, and significantly increased the population's awareness of biodiversity conservation issues in Turkmenistan. Mass media representatives (TV, radio, and newspapers) attended many of the workshops / seminars and their active participation was encouraged. A national programme of public awareness on environmental issues was implemented in parallel with BSAP preparation.

Process of BSAP Development

The process of BSAP development involved several stages:

Stage 1: Preparation ***(4-5 months)***

- Main Outputs
- Working procedures developed.
- The BSAP co-ordination team formed.

Stage 2: Information collection and assessment ***(6 months)***

- Main Outputs
- The Country Study on the Status of Biodiversity was prepared.
- Increased awareness and participation of stakeholders.

Stage 3: Strategy development (2 months)

Main Outputs

- Development of Biodiversity Strategy
- Wide participation of stakeholders

Stage 4: **Action planning (5—6 months)**

- Main Outputs
- Final version of the Action Plan was prepared.
- Wide participation of stakeholders.

Stage 5: Implementation (4 months)

Main Outputs

- Start of implementation of BSAP activities.
- Co-ordination of implementation.

Basic Principles

The main underlying principles used in the national planning of the activities on biodiversity are reflected in other documents, mainly *National Biodiversity Planning: Guidelines based on early experience around the world (WRI/UNEP/1UCN)* and other documents of the Convention on Biological Diversity. The basic principles given below were key ones in the preparation process in Turkmenistan.

Stakeholder Participation

Participation of stakeholders in the BSAP preparation process plays an important role because:

BSAP implementation will affect and be affected by many institutions, policies and plans;

Many groups will take part in the BSAP's implementation. Their knowledge, support and contribution are essential;

Despite the fact that many people are stakeholders in biodiversity conservation, this activity is not a priority for them. Successful implementation of the BSAP is based on their goodwill, support and approval;

Although the document will obtain the status of an *official state document*, there will be few mechanisms for enforcing the implementation of the BSAP.

The process of BSAP compilation was planned in such a way that it not only aimed to satisfy people's different levels of interest in participation but encouraged them to get information and be involved in planning and implementation.

Planning as a Process

The main output of the preparation process was undoubtedly the production of the *Biodiversity Strategy and Action Plan*. However, the main purpose of the process was to improve and ultimately conserve biodiversity in Turkmenistan.

Therefore, there was a constant need to balance the quality of the *content* of the final version of the plan and the quality of the *process* of its development.

Building the Capacity of Existing Institutions

The principle of building the capacity of existing institutions was critical in beginning to address a number of problems, including the following:

- Many of the institutions that formerly received adequate funding now face problems relating to the transitional social economic situation;
- These institutions possess high capacity in some spheres, but were lacking in project cycle management);
- The limited financial resources allocated to biodiversity conservation mean that the BSAP would be more effective if it was focused on more effective use of the existing resources, rather than on the establishment of new institutions;

Therefore the *institutional stability* of the BSAP is dependent on the country's potential to support the capacity of existing institutions.

This principle was applied to a number of activities, including:

- *The development of skills*, such as project cycle management;
- *Establishment of networks*;
- *Participation of stakeholders*;
- *Foreign assistance* - an international team of foreign experts from FFI was involved in the BSAP preparation. It acted as a consultant but was not dominant in the process and did not dictate its direction.

Flexibility

Given the transitional character of the social and economic situation in Turkmenistan, the principle of *flexibility* was used in the BSAP preparation process:

The schedule and structure of the process was adapted to changing situations as the project developed, especially as the needs of different stakeholders were identified more clearly;

Feedback from stakeholders was received continuously and played an important role in this overall flexibility;

The transitional character of the social, economic and political situation in Turkmenistan means that the BSAP should develop in such a way that it can easily react to unpredictable changes in the forthcoming years;

Flexibility between stakeholders was encouraged, as the preparation of the BSAP required negotiation to deal with differing perspectives.

BIODIVERSITY STRATEGY AND ACTION PLAN
OF TURKMENISTAN

M.Rajapov – editor-in-chief

English editors: Chris Magin, Simon Mickelburgh
Translators: Kasparova G.M., Ishanova O.B., Meredkulieva A.

Photos by: Belov A., Garipov T., Yefimenko N., Krupko V., Mechailyuk V.,
Rahmanov J., Salnikov V., Gertrud and Helmut Denzau.