Biodiversity Strategy and Action Plan for the Republic of Armenia

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Biodiversity Strategy and Action Plan for the Republic of Armenia

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Foreword

The Republic of Armenia ratified the Convention on Biological Diversity in 1993, at a time when the country was undergoing dramatic economic transition, and was suffering a drastic decline in the standard of living. However, even at that time, the relationship between Armenia's economic wealth and its biological resources was recognised. Despite social and economic difficulties, the Government of Armenia considered nature protection, and particularly biodiversity conservation, to be a priority for the country. This commitment is also demonstrated through the improvement of environmental legislation over the last five years. A number of regulations including "The Forest Statute" (1994), "Law on Expertise to Assess the Impact on Environment" (1995), and "Law on Payments for Bioresources Use" (1998) have been adopted. In addition, draft laws "On Fauna" and "On Flora" have been developed, and once adopted by the National Assembly these will promote biodiversity conservation and sustainable use. In addition, the development of two documents "The National Environmental Action Plan" and the "The Lake Sevan Action Plan" has provided an essential first step to support successful conservation, management and regeneration of biodiversity.

At the same time, as a result of the recent changes in the country, new problems face biodiversity, and a new governmental document is needed to ensure the conservation of the biological, genetic and landscape diversity of the country. Much of the information necessary to the development of such a policy document in contained in the recently published First National Report on Biodiversity in Armenia. This document highlighted the richness and diversity of the biological resources of the country, and emphasised their connection to the future development and prosperity of the nation. Further development of biodiversity conservation needs to be within the framework of a State policy, such as a national Biodiversity Strategy and Action Plan. Such a policy would require the implementation of a series of activities for biodiversity conservation, taking into account the socio-economic situation, legislative and institutional bases, and many other factors.

A Biodiversity Strategy and Action Plan for the Republic of Armenia has been developed to meet the country's obligations to the Convention on Biological Diversity, with the financial assistance of UNDP and financial support from GEF. This document contains contributions from a wide range of specialists, national experts and international consultants. It provides an extensive and comprehensive overview of the steps needed to improve biodiversity conservation over the next four years. The implementation of this strategy will ensure the sustainable development of the Republic of Armenia, for the benefit of future generations.

Gevorg Vardanyan

The Minister of Nature Protection for the Republic of Armenia

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Executive Summary

Context

The Republic of Armenia is a relatively small, mountainous and landlocked country located in the Caucasus region of Eurasia, and borders Georgia, Azerbaijan, Iran and Turkey. Armenia became independent of the Soviet Union in 1990, and has since undergone a dramatic economic transition.

During the Soviet era, Armenia underwent substantial industrial and agricultural development. However, political transition coupled with conflict in the region, as well as economic and energetic blockades, have since undermined the infrastructure and economy of the country. Most industries are no longer operating, and agriculture has declined as a result of land privatization and unsustainable farming practices. Economic collapse has resulted in large-scale inflation, high levels of poverty and mass emigration. Declines in socio-economic conditions have in turn resulted in substantial over-use of biological resources, and declines in the effectiveness of environmental protection.

Biodiversity in Armenia

The country of Armenia shows clear altitudinal and climatic zonality, reflected in a diversity of landscapes and species. The location and topography of the country have resulted in biological richness – with high levels of endemism, and rich agrobiodiversity.

Armenia is an important centre of origin for many plants and animals of economic importance. Much of the biodiversity of the country has been used traditionally by local communities, and has a strong cultural importance. Many of the ecosystems have provided the basis for economic development (natural pastures, meadows and forests). The botanical resources of Armenia have been used by humans for up to 6000 years, as a source of food, animal fodder and medicine. Forests have been used to provide timber and fuel wood. The Armenian Plateau is considered to be one of the places where agriculture first developed, and still supports many wild relatives of crop plants and domestic livestock, as well as a diversity of cultivars and breeds.

The biodiversity of Armenia also has an important functional ecosystem role. The maintenance of natural systems helps to regulate the country's climate, water resources (rivers, lakes) and water quality. It has therefore been recognised that a

loss of biodiversity in Armenia will directly or indirectly impact the living conditions of the human population.

During recent years the use of biological resources in Armenia has become unsustainable, as a result of increasing human pressures linked to economic collapse. As a result, certain habitat types have been significantly degraded (including forests, mountain pastures and wetlands), and a number of species face extinction. Around 470 species are considered to be at particular risk, including 66 bird and 18 mammal species. At present, the economic situation constrains the effectiveness of conservation measures to limit use and recover threatened species.

Status of conservation

There is a long history of environmental protection in Armenia, both through in-situ and ex-situ approaches to conservation. A network of protected areas (including State Reserves, State Conservation Areas, National Parks and Natural Monuments) covers 10% of the land in Armenia. However, many important habitat types are not represented in this network, and protected area management has been undermined by a lack of finances. Outside protected areas, conservation is approached through a series of laws and regulations to limit the use of biological resources. Few species are maintained in ex-situ conditions, and captive breeding for reintroduction does not currently take place.

Environmental issues are gradually becoming integrated within the policy frameworks for socio-economic development, as the link between the biodiversity conservation and human sustainable development is recognised. Within Armenia, there is a growing recognition of the need to maintain biological resources and use them in a sustainable manner.

The Biodiversity Strategy and Action Plan

In 1993 the Republic of Armenia was among the first countries to ratify the Convention on Biological Diversity. Under its obligations to this convention the Government of Armenia has undertaken the production of a First National Report on Biodiversity in Armenia, and the development of a Biodiversity Strategy and Action Plan (BSAP). These were financed by GEF via UNDP, and undertaken by the Ministry of Nature Protection with the collaboration of a range of leading national specialists.

The Biodiversity Strategy and Action Plan outlines a national strategy for biodiversity conservation, defines the priorities for implementation of this strategy,

and integrates these priorities with plans for sustainable development and other relevant projects and programs. The BSAP provides the basis for effective and integrated conservation, taking into account the current socio-economic conditions, and incorporates a range of short-, medium- and long-term actions to promote biodiversity conservation, sustainable use and regeneration.

Expected outputs as a result of the BSAP include:

- Adoption of the BSAP as an official government document, which can be related to policy development in other spheres, and will actively be implemented.
- Implementation of the BSAP which will provide a guarantee for the conservation of biodiversity and genetic resources in Armenia, and thus will contribute to human development.
- The BSAP will enable an agency will co-ordinate biodiversity conservation and sustainable use throughout the country, within a regional structure.

The Armenian Biodiversity Strategy and Action Plan aims: *To ensure the conservation, sustainable use and regeneration of the landscape and biological diversity of the Republic of Armenia, for sustainable human development*

Acknowledgments

The national Biodiversity Strategy and Action Plan has been prepared by the Ministry of Nature Protection of the Republic of Armenia. The BSAP represents the second component of the UNDP/GEF/ARM/97/G31/A/1G/99 project "First National Report to CBD and Biodiversity Strategy and Action Plan". This document is the result of extensive inputs from, and effective collaboration between, the project team and leading specialists in the field of biodiversity, including state management agencies, NGOs and other relevant institutions. The project administration wish to extend their thanks to all who participated in the development of this document.

The project was financed by Global Environmental Facility (GEF) through the Armenian office of UNDP. In addition, to financial support, UNDP has also provided assistance in offering guidance, consultation, and both methodological and practical advice, all of which was of great use to the project team. The project team greatly appreciates this approach to the work. Within the UNDP Armenian Office, we would particularly like to thank the Resident Representative Mrs. K. Cekaloviç and Program Officer Ms. Anahit Simonian for their continuous support, consultation and assistance during the development of the project.

The BSAP was developed under the direction of a steering committee, chaired by the Minister of Nature Protection, Mr. G. Vardanyan. Mr. S. Baloyan, Deputy Minister of Nature Protection, and National Director of the BSAP project made an important contribution throughout the project. Invaluable assistance was provided by the international consultants to the project, and we would like to thank Mr. Nigel Coulson and Dr. Abigail Entwistle of the NGO 'Fauna & Flora International'. As well as providing general guidance, they facilitated the development of strategic components and activities for the BSAP, and edited the final English version of the document.

The project was co-ordinated by Mr. S. Shashikyan, head of the Department of Bioresources Conservation, in the Ministry of Nature Protection. This role was supported by professional and organisational assistance from Mrs. T. Danielyan and Mrs. S. Mouradyan, staff within the same department. Office support and logistics, along with English translation, were provided by the project assistants, Mr. V. Tonoyan and A. Gevorgyan. Mr. T. Yeghyan also had a significant role in the translation of the documents. Part of the BSAP Country Study was prepared separately by Mr. A. Bayandouryan. We would like to thank them for their work.

Mr. A. Nersisyan made an important contribution in the production of color photos and maps, as well as editing and design. Publication of the document was conducted by the publishing company 'HayEdit', and we would like to thank this company and its Director, Mr. M. Karapetyan.

The Project administration would lie to thank all organizations, specialists and participants who together have made an invaluable contribution to the preparation of the BSAP and have ensured its successful completion.

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Section 1

Overall Introduction

1.1 The Importance of Biodiversity

Biological diversity[1] is essential in supporting human life, and is central to the relationship between man and nature. An appreciation of the importance of biodiversity world-wide is crucial; the well-being and prosperity of human society, along with the earth's ecological balance, directly depend on the extent and status of biological diversity. Throughout the world, the vital role of biodiversity, and the need for its protection, has now been recognised.

In parallel with human development and economic expansion has come a greater reliance on products and resources originating from the world's biodiversity. However, this increase in the extent and range of use of biodiversity has generally not taken into account natural regeneration rates of biodiversity, and thus over-use has resulted in the degradation of natural systems and loss of components of biodiversity. Over the last century this process has been accelerated due to rapid industrial and agricultural development, resulting in greater use of natural ecosystems including forests and grasslands.

As in other countries of the world, the situation regarding biodiversity degradation and loss are critical in parts of Armenia. Thus, issues relating to biodiversity and sustainable use are recognised as being of crucial importance as we enter the new century.

1.2 Convention on Biological Diversity

The Convention on Biological Diversity (CBD) was opened for signing in Rio de Janeiro in 1992, and more than 180 parties have since ratified the Convention. The Convention and provides a comprehensive document underlining the principles of biodiversity conservation and sustainable use at the global scale. The objective of the CBD is to ensure sustainable use and conservation of biological resources, as well as fair distribution of benefits related to biodiversity and genetic resources. The Convention also highlights the relationships between conservation, sustainable use of natural resources and sustainable human development. In ratifying the CBD, the Parties to the Convention undertake a commitment to implement the Convention at a national level in contribution to achievement of its goals and objectives at a global level.

[1] Biological diversity or 'biodiversity' has been defined as 'the variability among living organisms from all sources… [and] includes diversity within species, between species and of ecosystems' (Convention on Biological Diversity, 1992). In effect biodiversity is used as a short hand for all the species of animals, plants and micro-organisms in the world, their inter-relationships and functions.

The Republic of Armenia ratified the Convention on the 14th of March 1993, and was thus one of the first countries to join the CBD. Ratification of the Convention has resulted in a number of obligations regarding biodiversity conservation in Armenia, but has also created opportunities to effectively tackle some of the most important problems related to use of biological resources in the country.

1.2.1 Biodiversity Strategies and Action Plans

Once countries have ratified the Convention on Biological Diversity, one of the first obligations is the production of a National Biodiversity Strategy and Action Plan (BSAP). BSAPs set out the government's aims for biodiversity conservation, with clear targets and approaches. A BSAP provides a mechanism by which governments can show how they will meet their obligations under the CBD, and how their progress towards this can be assessed.

Biodiversity Strategy and Action Plans are developed on the basis of the information presented in a country study. This country study is the First National Report to the CBD. The country study provides an overview of the current status of biodiversity in the country, the extent of current protection and related contextual factors (such as economic, institutional, legal, educational, scientific and informational frameworks, and the traditional experience and participation of local communities available in the country). Such reviews include analyses of species richness, and status (particularly of threatened species), and of the anthropogenic threats to biodiversity, along with their underlying causes.

On the basis of these analyses an overall aim and specific objectives for undertaking the conservation of biodiversity at a national level are developed, as part of the BSAP. Principles and approaches for biodiversity conservation are then developed, in line with those outlined within the provisions of the CBD, but with reference to the national framework which will implement the plan. Where possible, links should be made to other existing structures (such as the Pan-European Biological and Landscape Diversity Strategy).

Within the BSAP a specific action plan is developed. This outlines the measures required to meet the overall aim and objectives of the BSAP. The action plan needs to be supported by clarification of budgets and time-scales, and should link to other projects currently being implemented or which are planned in the sphere of biodiversity conservation. This action plan provides a basis for identifying clear priorities, for undertaking specific projects which all contribute to an overall goal, and provides a mechanism by which success can be assessed, in relation to

obligations under the CBD. Implementation of BSAPs is led by government agencies, but often relies on mobilisation of public support, activities of NGOs, and attraction of external funding.

1.3 Introduction to Armenia

1.3.1 Geographical Location and Borders

The Republic of Armenia is a landlocked country with a total area of 29,740 km^2, which is located at the north-eastern part of the Armenian plateau. The territory of Armenia lies within the co-ordinates 38°50-41°18 latitude and 43°27-46°37 longitude. At its longest the country measures 400 km (north-west to south-east), and at its widest is 200 km (west to east). A narrow projection of land (Zangezour province) extends to the south-east, and in places this strip of land is as narrow as 26km wide. In total, the borders with neighbouring countries total 1,479 km. Armenia borders Georgia in the north, Azerbaijan in the north-east, east and south-west, Iran in the south, and Turkey in the west (Map 1). Armenia is land-locked and is located about 145 km from the Black Sea, 175 km from the Caspian Sea, 750 km from the Mediterranean Sea and 960 km from the Persian Gulf.

1.3.2 Physical Geography

Armenia is a generally mountainous country, with an average altitude of 1,850m above sea level and varying as much as 2001m in a short distance. The highest point in the country reaches 4,095m above sea level (the northern peak of the mount Aragats), while the lowest point is at 375m above sea level (near the banks of the river Debed in the north). Such altitudinal variation results in a great diversity in climates and landscapes, relative to the size of the country.

Four main geological regions can be identified in Armenia:

- Mountainous ridges and valleys in the north-east of the country (highest altitude 3101m), which occur mainly in the basin of the River Kur (including the ranges of Virahajots, Bazumi, Pambak, Gougarats, Aregouni, and Sevan) and which are subject to extensive erosion.
- Regions of volcanic origin within Asia Minor, including the mountain ranges of Ashotsk, Aragats, Geghama, Vardenis, Sunik and Mount Aragats (4095m). These areas are covered by lava of relatively recent origin (upper Pliocene). Such regions are characterised by gentle slopes, and little evidence of erosion, although larger rivers have carved out deep gorges and canyons.

- A series of ridged mountains adjacent to the River Arax (ridges on the left bank along with the Urts-Eranossian, Teksar, Vaik, and Zangezour mountain ranges, including the peak of Kapoutdjugh at 3094m) constitute the Minor Caucasian system. This area is prone to intense erosion.
- The Ararat Valley represents the lowest part of the Ararat depression (which is still undergoing tectonic movement). This area is covered with sediments of different geological origins.

Within these regions, a range of landscapes are found, reflecting the different geological substrates and histories. Furthermore, there is clear zoning of landscapes with altitude. Seven key physio-geographical zones are recognised in Armenia: Shirak, Lori-Pambak, Agstev-Tavush, Sevan watershed, Ararat valley, Vaik and Zangezour.

1.3.3 Climate

A wide range of climatic zones have been recorded within Armenia. The country is located centrally in the sub-tropical zone, and thus is prone to arid (desert and semi-desert) conditions. However, the altitudinal variation within the country results in further variation in climatic zones, in addition to existing latitudinal clines.

In general, the country receives high levels of sunshine; ranging from 2600 hours per year (Yerevan) to 2800 hours per year (shore of Lake Sevan). The average temperature throughout the year varies geographically from 2.7°C (Mount Aragats) to 14°C (Meghri, in the north-east). The highest average monthly temperature is recorded in July-August; in low lying areas, such as the Ararat valley, average summer temperatures reach 24-26°C, while cooler temperatures are recorded at higher altitudes (averaging 15-20°C at mid-altitude, and 10-15°C at high altitude). Significant temperature variations are also recorded in winter, average January temperatures range from 0.3°C (Meghri) to -13°C (Mount Aragats). Average minimum temperatures in winter range from -18.9°C (Berdashen) to -3.1°C (Meghri), with an absolute minimum of -45°C recorded near Berdashen. Relative humidity averages around 60% (Yerevan), but varies with season and altitude. Highest levels of humidity are observed in winter (80% and above), while in summer recorded humidity is as low as 44% in some places.

Average annual precipitation is between 600mm and 1000mm, but varies in different altitudinal zones (from 250mm in semi-arid zones to 1100mm in alpine zones). Most rainfall occurs in the spring, while the second half of the summer is dry. Long-lasting snows exist on mountains over 1300m. In these places snow over

may reach up to 2m in depth (for example on Mount Araragts), while snowfall is much sparser on the steppes (30-50cm deep).

1.3.4 People and Culture in Armenia

The Armenian Plateau has been inhabited by man for many thousands of years, and archaeological and anthropological investigations have identified an Armenoid anthropological type which originated in this area, and later dispersed to Asia and southern Europe. One of the earliest recorded cultures in the region was the Urartu State (9^{th}-6^{th} centuries BC), under which many of the Armenian tribes unified, and from which later Armenian royal dynasties developed. Armenia was the first country to adopt Christianity as the national religion (in 301 AD) and the Armenian alphabet was established in 405 AC. However, in later centuries this state weakened and much of its land was eventually invaded and conquered.

Since the 11th century, considerable changes have occurred to the population and the national boundaries on the Armenian Plateau. Invasions by foreign powers and increased ethnic diversity have been mirrored by emigration of Armenians to other nations. Despite these changes, Armenians have maintained their own spiritual and cultural individuality. Armenia has a strong history of architecture, urban construction and constructive art, medieval miniature painting, carpet making, poetry, music, painting, farming and livestock breeding. This culture has significantly contributed to cultural diversity in other states and to overall world culture.

Today around 3.8 million people live in Armenia, with an average population density of 232 people per km^2. Most of the population is found in urban centres (67%), the greatest proportion of which (70%) live in the three major cities (Yerevan, Guimri and Vanadzor). Of the total population, around 97% are ethnically Armenians, other ethnic groups include Kurds (1.6%) and Russians (0.8%). Other ethnic Armenians are dispersed in communities elsewhere in the world (totalling around 4.2 million), and further migrations from Armenia have occurred in response to recent economic hardships.

1.4 The Importance of Biodiversity in Armenia

Armenia boasts an extremely rich variety of both biodiversity and landscapes, reflecting the variety in geology and altitudes found within the country. A number of factors have contributed to the relatively high levels of biological diversity found in this country

- Armenia, and the Armenian Plateau, is located at the junction of major biogeographic zones.
- Armenia provides an important passage and resting sites for migratory animals and birds.
- Seven main landscape types are represented across the different altitudinal zones of Armenia within a relatively small territory.
- Armenia is an important centre of endemism for wild relatives of domestic crops and has long been a centre for breeding and selection of cultivated plants and livestock.

As elsewhere in the world, biodiversity in Armenia has an important environmental role; ecosystems act to regulate thermal and water regimes, and influence climate. Biodiversity has an important role in maintaining atmospheric air quality and in ensuring a healthy ecological environment for humans. Elements of biodiversity also act to protect the soil from erosion. Humans have hunted, fished and gathered the plants and animals of Armenia since ancient times. Intensive use of natural resources continues today.

Most components of social and economic development in Armenia can be related, directly or indirectly, to biodiversity.

- In agriculture, biodiversity has provided sources of food, fodder and grazing for livestock, genetic variation for selection, etc.
- Biodiversity has provided important natural raw materials like leaves, fruits, and berries for the food industry.
- In medicine, some plants are extremely important sources of natural and commercial remedies.
- Forest resources are widely used in industry and construction.
- Landscapes have important aesthetic and recreational value and provide the basis for tourism.

Threats to biodiversity, from both natural factors and human impacts, is of concern not just locally, but at a global level. Human activities are the greatest factor currently affecting biodiversity, through the use of natural resources by industry, agriculture, hunting, and energy generation.

- As a result of extensive agricultural development over the last 50 years, many natural landscapes in Armenia have been severely degraded – to an extent even greater than in neighbouring countries. Today, around 43% of agricultural lands (0.6 million ha) are under cultivation, while a further 0.8 million ha are covered

by pasture and grazing lands. The use and conversion of land for agriculture has resulted in degradation, and even loss, of certain natural habitats, as well as causing large-scale pollution.

- Declines in forest cover have been reported in Armenia since ancient times, although this process has accelerated significantly over recent years. As well as declines in total cover, the quality and composition of forests have also changed, with a replacement of valuable timber species with less valuable types of tree.
- Industry, transport and construction works have had increasing direct and indirect impacts on biodiversity. The gross industrial product of the nation increased 1000 times between 1921 and 1990; this expansion resulted in overuse of natural resources and serious ecological problems. In particular, pollution from the mineral industry, heavy industry, household waste, air emissions and noise has had a significant impact biodiversity.
- Continued emissions of greenhouse gases across the world increase the threat of global warming. Climate change specialists predict that in 50-100 years, the mean annual temperature in Armenia may increase by 2-3°C, while total rainfall may drop by 10-15%. A more arid climate would be likely to result in further desertification, with increases in the area of semi-deserts and deserts being predicted, along with significant declines in wetland areas. Such changes are likely to have important consequences for plants and animals with specific or restricted distributions, and such species may face increased risks of extinction.

1.5 The Biodiversity Strategy and Action Plan for Armenia

Armenia is undergoing economic transition from a centralised economy to free market conditions, and at this time it is important to recognise the inter-relations between human society and the natural environment. The wealth of biodiversity in Armenia is widely used in different spheres, and provides an important contribution to the social and economic development of the country. In this context the development of a Biodiversity Strategy and Action Plan, to meet the obligations of the country to the CBD, is of vital importance.

1.5.1 Ratification of the Convention on Biological Diversity

The Republic of Armenia signed to the Convention on Biological Diversity at the Rio Summit, in 1992, and the Convention was ratified by the National Assembly on the 14th of May 1993. In becoming a Party to the Convention, Armenia accepted its commitment to biodiversity conservation and sustainable use within the country, as well as to active co-operation in tackling the biodiversity issues of regional and global relevance, including the sharing of genetic resources and biodiversity

information. In accordance with its obligations under the CBD, the Government of Armenia started to develop its Biodiversity Strategy and Action Plan (BSAP) and first National Report in 1997.

The BSAP has been developed using information collated in a comprehensive review of the existing situation for biodiversity and its conservation, and social and economic factors affecting the biodiversity in the country (see the First National Report to the CBD). All issues relating to biodiversity, including research, education, conservation, management, staff and legislation have been assessed and analysed, and an integrated plan for the improved future management of biodiversity in the country has been developed.

1.5.2 Development of the BSAP

The BSAP was developed by a Project Implementation Unit within the Ministry of Nature Protection. The development of the BSAP was initiated in 1997, with financial support from GEF via UNDP. The general approach to the BSAP was in accordance with strategies for economic and social development in Armenia and the principles of the CBD. Guidance in the development of the BSAP was provided from a range of sources, and relevant international expertise was used to ensure that the experience from other countries could be incorporated. International collaboration was provided through the NGO Fauna & Flora International.

A wide range of organisations and individuals have been involved in BSAP development, including representatives of governmental and non-governmental organisations, industry, agriculture and the public sectors. This participatory approach, applied over the duration of project, has allowed viewpoints and feedback from various stakeholders to be represented in the final BSAP, and has been important for its successful completion.

1.5.3 The Planning Process

The BSAP was developed between May 1998 and March 1999, with guidance and management from a national Steering Committee and the National Project Director. There are four key stages within the process of BSAP development: (1) analysis of existing situation; (2) identification of strategic objectives and priorities; (3) development of action plan; and (4) implementation of actions. Within each of these stages working groups undertook a number of activities (outlined below). The outputs from different stages of BSAP development were widely discussed at various national and regional meetings and seminars, and were widely broadcast in the media. The following activities were important during BSAP development:

- Identification of major problems, priorities, and criteria for the Biodiversity Strategy, conducted by a number of national consultants and a stakeholder panel.
- Discussion of outputs and further details at regional stakeholder meetings.
- Discussion of the draft list of priorities by the Steering Committee.
- Collection of relevant data by 40 leading specialists, in accordance with the identified priorities.
- Discussion and further planning for strategic aims, objectives and priorities for biodiversity at a national seminar, involving local and international consultants.

1.5.4 Structure of the BSAP Document

The Biodiversity Strategy and Action Plan for Armenia includes three sections:

- **Section 1** provides an introduction to the Convention on Biological Diversity, the country of Armenia, and the context and process of the BSAP.
- **Section 2** describes the current status of biodiversity, priorities for conservation, and direct and indirect impacts on biodiversity in Armenia. In addition, contextual factors relating to biodiversity conservation, including social, economic, institutional and legal issues, are explored.
- **Section 3** incorporates the outcome of the BSAP planning process, with the Strategy and Action Plan outlined in detail. The plan integrates activities across different sectors relevant to biodiversity conservation, including legislation, management, research, education and science, biodiversity use, and its regeneration. Practical guidelines are provided for implementation structures.

1.5.5 Intended Audience for the BSAP

The BSAP provides a comprehensive background and details of state policy and strategy for biodiversity conservation in the country, including identification of short- and long-term activities. The BSAP document is intended to be of interest to governmental and non-governmental organisations, education and science entities, and international organisations dealing with biodiversity use and conservation, including the donor community.

Section 2

Country Study of Biodiversity in The Republic of Armenia

2.1 Introduction to the Country Study

In any country, the development of plans for biodiversity conservation must be based on a thorough review of available information on the current status of biodiversity and its conservation. Such information is essential for the planning of strategies for biodiversity conservation, sustainable use and restoration of natural resources. As well as a description of biodiversity and its most important components, it is important to assess the threats to biodiversity, and opportunities for its conservation, prior to developing plans to improve the situation for biodiversity.

Within this document, the Country Study of Biodiversity provides a thorough review of the current status of biodiversity in the Republic of Armenia, and of factors affecting its conservation. Much of the information contained here was derived from the First National Report to the CBD, where more detailed data is presented. However, the information contained within the Country Study is sufficient to provide a brief outline of biodiversity conservation in the country, and to demonstrate the context and constraints within which the BSAP has been developed. Information included within the Country Study includes reviews of: the current status of biodiversity; existing programmes to protect biodiversity; institutional base; research potential legislation and policy; financial resources for biodiversity; economic and social issues; and, an analysis of the key constraints and opportunities for biodiversity conservation in Armenia. The information from this Country Study has been vital in guiding the realistic and appropriate development of strategies and actions within the BSAP, with the goal of promoting biodiversity conservation and sustainable use of natural resources in the Republic of Armenia.

2.2 Status of Biodiversity

2.2.1 Description of the Biodiversity of Armenia

Due to the diversity of altitudes, climates and landscapes found in the country, Armenia supports a surprisingly high diversity of plants and animals, including many endemic, relict and rare species. Armenia is botanically diverse; some 3,500 species of vascular plants have been recorded, giving a density of higher plants (100 spp./km^2) that is one of the highest in the world. In addition, tens of thousands of lower plants and bacteria species have been recorded from Armenia. More than 17,500 species of animals have been recorded from Armenia, including 500 vertebrate species.

Agricultural species are of particular importance in Armenia. Armenia is considered one of the most important centres for agrobiodiversity in the world, and represents a relatively large area supporting wild relatives of crops and agricultural varieties. The people of Armenia have used these natural resources for over 5000 years, and have built important relationships between human society and agrobiodiversity, both through breeding and through use of agricultural lands. Indeed, natural pastures and meadows represent a crucial natural resource for Armenia, occupying a third of the area of the country.

In general, the biological resources of Armenia are recognised as being the basis for effective economic and social development, and are seen to have a role in creating a healthy environment. Forest habitats, in particular, have important ecological roles, although they cover less than 11% of the country. As well as being an important source for industrial, agricultural and food resources, forests are responsible for regulation of climate, water balance, and heat circulation.

2.2.2 Diversity of Ecosystems in Armenia

The mountainous nature of Armenia results in a series of highly diverse landscapes, with variations in geological substrate, terrain, climate, soils, and water resources. These landscapes support a great variety of habitats, which support distinctive flora and fauna, and different human use. Seven distinct altitude landscape zones have been described in Armenia: deserts, semi-deserts, dry steppes, steppes, woodlands, sub-alpine and alpine lands. The areas covered by the seven main landscape types are shown below (Table 2.1), along with a more detailed description of each landscape zone.

Table 2.1. The area of Armenia covered by different landscape types, along with their altitudinal distributions

Landscape type	**Altitude (metres above sea level)**	**Percentage cover across the country**
Deserts and semi-deserts	700-1300	10%
Mountain steppes	1300-2400	37%
Forests, thin forests, shrubs	600-2500	20%
Alpine and sub-alpine meadows	> 2100	28%

- **Deserts and Semi-deserts** occur in the Ararat Valley and adjacent mountain slopes at altitudes of 1200-1300m, in the Vaik lowlands, and the Meghri gorge. Sand accumulations in the Arax area result in a desert landscape, which are also found in saline lowlands. In these landscapes, the climate is dry and continental, with hot summers and moderately cold winters. The soils are generally of the semi-desert grey type, and have been managed for cultivation over the last millennia. Cultivation has required intensive irrigation, and these areas now support fruit, vegetable, flower, and wine production, but have suffered major impacts from human activities.
- **Dry mountainous steppes** are found at higher altitudes than semi-deserts (above 1500m) in the Ararat Valley, and some other areas, but are also found at lower altitudes (above 800m) in the lowlands to the north-east of the country, which were originally forested. The climate in the dry steppes is characterised by warm, dry summers and mild winters. A range of soils are found, but in the Ararat Valley these lands are typically stony. Irrigation of dry steppes allows cultivation of crops, vegetables and fruit, and these landscapes have also suffered severe human impact.
- **Mountain steppes** are the dominant landscape for most of the country, particularly at altitudes above 1500m (and at altitudes up to 2000m in the north, 2400-2500m in the south). Meadow steppes occur in the highlands, while patches of forest also occur on ridge tops among steppes in the north-east and Sjunik regions. The climate is generally moderate, with warm, cool summers, and moderate or cold winters. Soils generally have a humus content of between 6-7%. Steppes are used for agriculture (including cultivation of crops, vegetables, frost-tolerant fruit trees (in lower altitudes) and fodder plants (in highland areas).
- **Forests** generally cover the mid-zone of mountains, occurring at altitudes between 500m and 2100m in the north (up to 2500m in the south). In central Armenia, forests occur in small areas rather than as a continuous zone, and forests can be found on steep slopes and other areas with limited human access. Soil types include red soil in the lowlands and forest grey soils in the highlands.
- **Sub-alpine meadows** occur at higher altitudes than steppes and forests, including highland mountain ranges. The climate is moderate with short, cool summers and long, cold winters. Much of the land here is meadow, with soils of high humus content.
- **Alpine meadows** occupy the highest altitudes above sub-alpine meadows (up to 3000m in the north and 3800m in the south). These meadows represent the principal pasturelands for the country, with meadow and alpine vegetation. Climatic conditions are severe, with long, cold winters, and annual temperatures average less than -40°C. Snow cover lasts up to 9 months, and permanent snows may occur in some areas.

- **Azonal landscapes** cover over 10% of the territory of the country, and occur independently of altitude (unlike the previously described landscapes). These include wetlands, as well as saline and alkaline lands, which cover about 25,000ha, including areas in the Ararat Valley where the underground waters are close to the earth surface, resulting in water vaporisation and salt precipitation. Upland wetlands are dominated by fresh (non-brackish) water, while lowland wetlands (particularly those around the River Arax) are usually drained in summer, resulting in high salinity.

2.2.3 Key Ecosystems in Armenia

Human impacts on natural ecosystems have been evident in Armenia since ancient times. The early development of agriculture and livestock breeding in Armenia resulted in significant changes to the use of the land. Over several thousand years human activity has led to the disappearance of forests, increased the area of land under irrigation, cultivation of desert and semi-desert habitats and the expansion of pastures and meadows. The current status and relative importance of different types of ecosystem reflects their economic significance, including factors such the level and type of use, their broader ecological functions, the value of the species and genetic diversity they support, and their resilience to both natural changes and human impacts.

In the context of these factors mountain steppe, semi-desert and forest ecosystems are considered to be of key economic importance, given patterns of human settlement, suitable climatic conditions and opportunities for agriculture. Most arable land and human settlements in Armenia occur at altitudes below 2,200m. Of a total of 1,229,700ha of arable land, 20% occurs at altitudes below 1,000m, 33% between 1,000m and 1,500m, and 47% above 1,500m – in regions dominated by mountain steppe ecosystems. Semi-deserts and mountain steppes are also important in supporting various forms of cultivation, while meadows in semi-deserts are used as a source of horticultural material. Forest ecosystems are of particular importance, given their roles in soil protection, climate regulation and in supporting a range of biodiversity. Forest ecosystems support a wide range of plant species of economic importance. These include over 200 species of edible plants, 2,000 species of plants used as animal fodder, 120 species of wild berries, 350 species of plants visited by bees, 120 aromatic plant species, and 130 species important as a source of vitamins.

In addition, to the general importance of these ecosystems, a number of specific sites have been identified which support ecosystems of global or regional significance, and are rich in endemic, relict or rare species. These include:

- A unique assemblage of species of wild relatives of crops occurring near Yerevan
- Stands of plane trees (*Platanus orientalis*) near the Tzav river valley.
- Psamophpil desert on the bank of the Vedi river.
- The habitats supporting the endemic species of insect 'vordan karmir' (*Porphyrophora hamelii*) in the Ararat valley.
- The open woodland and semi-desert ecosystems of Central Armenia, with its unique and rich associated fauna and flora.
- Relict wetland meadows in the Lori area.
- Stands of yew (*Taxus baccata*) and hazel (*Corylus colurna*) in the Agstev river basin and Zangezour.
- Rhododendron habitats in sub-alpine regions of the Pambak and Tsaghkunyats ranges.
- Habitats of the sub-Arax mountain ridges where populations of Armenian mouflon (*Ovis orientalis gmelinii*) occur.

2.2.4 Threatened Ecosystems

Forests

Forests are one of the most seriously threatened ecosystems in Armenia. Archaeological data indicates that around 40% of the land was originally forested. Since then forest cover has declined significantly as a result of both changes in climate and human impacts. The expansion of the human population has led to increased pressure on land for grazing and agriculture, resulting in forest clearance. In addition, two intensive periods of deforestation have occurred. Between the 1930s and 1950s, around 450,000m^3 of wood was extracted annually from Armenian forests for industrial use. Extensive deforestation also took place between 1992-1995, during the period of economic blockade and energy crisis. A combination of poor forest management and illegal felling resulted in damage to around 27,000 ha of forest (more than 8% of the total forest area), including the total clearance of around 7000 ha. During this period, the forests around Yerevan, Gegharkunik, Lori, Kotayk, and Armavir were the most severely damaged.

Today, forests cover less than 10% of the land surface of Armenia. Forests are now concentrated in the north-east of the country, and in some areas, such as the Ararat valley, Vayk and Sevan regions, only small scattered patches of forest remain. These isolated patches are prevented from regenerating due to the pressure of uncontrolled felling and their use as pasture land. Further forest declines in some areas (such as Vaik and Sevan) have resulted from increases in forest pests and changes in the hydrological regime of forests.

Wetlands

The threats to wetlands in Armenia are clearly illustrated by the changes in Lake Sevan. This large, alpine lake is extremely important to Armenia, in terms of its water resources, ecological role, and unique fauna and flora. Lake Sevan effectively represents an important reservoir of water for Armenia and the wider Southern Caucasus region.

Since the 1930s the development of the industrial, agricultural and energy sectors have relied on the water resources of Lake Sevan. Off-take of its waters supplied irrigation systems for agriculture and hydroelectric power stations downstream. Water from the lake irrigated around 100,000 ha and generated more than 2.5 million kW of electricity, thus providing an important contribution to the socio-economic development of the country. However, such extensive off-take of water also resulted in a serious ecological disaster, with significant falls in the level of the lake. Since 1933 the level of the lake fell by 19m, and its overall volume decreased by 42%. As a result the average temperature of the lake increased, oxygenation levels fell, resulting in eutrophication and algal blooms. The first signs of the lake's eutrophication were recorded in 1964, when green and blue algae blossomed in the lake.

The decline in water levels also affected the whole of the Sevan watershed. Around 10,000ha of surrounding wetland and semi-wetland areas dried out, as did the neighbouring Lake Gilly.

The drainage of the lake also had significant effects on the biodiversity of the lake and surrounding areas. Populations of around 60 species of plant are considered to have declined as a result of the draining of Lake Sevan. Within the lake, the principal breeding sites for Sevan trout were lost, and populations of this and other endemic fish species, have declined. The Sevan wetlands were previously used by up to 160 species of migratory birds, only 50 of which are now recorded. Today the numbers of birds using the whole Sevan watershed are lower than those recorded on Lake Gilly alone in 1939, and waterbird populations continue to decline. The populations and diversity of mammal and reptile species in the area have also declined significantly, and a number of spaces are considered to be threatened.

Semi-deserts

Cultivated lands represent 80-90% of the area of the semi-desert zone, and natural ecosystems have been extensively damaged as a result of uncontrolled irrigation

and agricultural intensification, which has resulted in increased soil erosion, salinity and pollution.

Steppes and meadows

Uncontrolled grazing by livestock threatens many of the natural pastures of the mountain steppes and alpine and sub-alpine meadows. Serious degradation of pastures and meadows has occurred over the last 100 years, with the most significant impacts recorded in the grasslands of Vaik, Zangezur, Mount Aragats and Pambal.

2.2.5 Species Diversity

In Armenia, some taxonomic groups are much better studied than others. The most extensive research has been done on bacteria and other micro-organisms, as a result of their role in the food industry, and other sectors of the economy. In addition, mushrooms and flowering plants are relatively well studied. The best studied animals include amphibians, reptiles and waterfowl. A number of endemic[2] species and sub-species are recorded in Armenia (Table 2.2).

Endemic species and sub-species represent 3% of vascular plants in Armenia (as compared to 1.5% more widely across the Caucasus). Furthermore, of the animal species represented in Armenia, 30% of fish, 12% of reptiles and 7% of mammals are endemic. The overall species richness in Armenia is relatively high, given the size of the country, particularly with respect to lower plants and some animal groups (Table 2.3).

Quality of Information

Although groups such as the higher plants (about 3500 species) and vertebrates (about 500 species) have been intensively studied in Armenia, little work has been done on other taxa (including invertebrates and some lower plants). The information on species richness in these groups may therefore be significantly underestimated. Further assessments are therefore needed of biological resources and of conservation status of key group. At present financial constraints severely limit scientific research in Armenia, and no funds are available to support inventories or long-term monitoring of fauna and flora.

[2] Endemic species are those found only in the location in question and nowhere else in the world, in this case those species or sub-species unique to Armenia.

Table 2.2 The number of species, and endemic forms, from different taxonomic groups, represented in Armenia

Group	Number of species	Number of endemic species or sub-species
PLANTS		
Algae	388	-
Fungi	4166	2
Lichens	300	-
Moss	395	-
Vascular plants	3555	106
Total	**8,804**	**108**
ANIMALS		
Invertebrates	17,000	316
Fish	30	9
Amphibians	8	1
Reptiles	53	6
Birds	349	1
Mammals	83	6
Total	**17,523**	**339**

Table 2.3 The relative species density (species per 1000km^2) in Armenia, compared with global estimates.

Group	Number of species in Armenia	Relative density of species (number of species per 1,000km^2)	
		Armenia	World-wide
PLANTS			
Lower plants	4854	161.8	0.15
Higher plants	3960	131.66	1.67
ANIMALS			
Molluscs	155	5.16	0.10
Arthropods	5830	194.33	5.86
Fish	30	1.00	0.05
Amphibians	8	0.26	0.02
Reptiles	53	1.76	0.05
Birds	349	11.60	0.06
Mammals	83	2.76	0.03

2.2.6 Species of Economic Importance

Collection of wild plants

A wide range of plant species are collected in Armenia:

- Over 200 species of **edible plants** are collected in Armenia, and are used fresh, cooked, pickled or dried. Commonly used plants include longleaf (*Falcaria*), asparagus *(Asparagus),* and chervil (*Chaerophyllum*).
- Around 120 species of **wild berries and nuts** are collected, including walnut (*Juglans*), hazelnut (*Corylus*), pear (*Pyrus*), apple (*Malus*), dogwood (*Cornus*), blackberry and raspberry (*Rubus*), and currant (*Ribes*).
- A great variety of plants are used for **animal fodder** (around 2,000 species), including clover (*Trifolium*), sainfoin (*Onobrychis*), and alfalfa (*Medicago sativa*).
- Around 10% of plants found in Armenia have some **medicinal use,** and species of hawthorn (*Crataegus*), buckthorn (*Rhamnus*), juniper (*Juniperus*), barberry (*Berberis*), rose (*Rosa*), and St John's wort (*Hypericum*) are collected for traditional remedies.
- Around 150 species of plants are known to produce **essential oils**, mainly species of thyme (*Thymus*), helichrysum (*Helichrysum*), and wormwood (*Artemisia*).
- Plants used in **producing dyes** (120 species) include spurge (*Euphorbia*), buckthorn (*Rhamnus*), elder (*Sambucus*), and madder (*Rubia*).
- A number of plants (c. 350 species) have an important role in **attracting bees**, including representatives of aster (*Acer*), sainfoin (*Onobrychis*), alfalfa (*Medicago*), lime (*Tilia*) and clover (*Trifolium*).
- A number of species are also used for their vitamin, tannin or resin contents.

Fisheries

Commercial fishing of Lake Sevan is extensive, with annual catches of around 2000 tons (90% of national catch) in some years. However, changes in the ecology of the lake have resulted in declines in the species of previous commercial importance (Sevan trout, *Salmo ischchan* and kura kogak, *Varicorhinus capoeta sevangi*), and an increase in the catches of whitefish or Sevan sig (*Coregonus lavaretus sevanicus*) and carp, (*Carassius auratus*). Amateur fishing is open in all water bodies, expect those in protected areas.

Hunting

A number of birds and animals were traditionally hunted in Armenia, including quail (*Coturnix couturnix*), partridge (*Alectoris graeca*), mallard (*Anas platyrhynchos*), rock dove (*Columba livia*), fox (*Vulpes vulpes*), wolf (*Canis lupus*), deer (*Cervus* spp.), wild pig (*Sus scrofa*), wild sheep (*Ovis musimon*). The populations of many game animals declined dramatically, and hunting of many of the mammals mentioned is now prohibited. In addition, snakes including the Russian and bluntnose vipers (*Vipera raddei* and *V. lebetina*) are collected for use in traditional medicines.

2.2.7 Agrobiodiversity

Armenia is an important centre for agrobiodiversity. Agriculture and horticulture have been conducted in Armenia for many thousands of years, and some of the earliest farming developed in this region. The rich agrobiodiversity of the country includes wild relatives of crop plants, wild-growing edible plants, and a wide range of plant varieties and animal breeds.

The diversity of wild relatives of crop plants found in Armenia (22 species, and 218 sub-species) has been used to develop new varieties through selection. A wide range of species are currently grown in Armenia – including six species of cereals, 366 fodder plants, 62 berry species, and 65 types of vegetable. In total these 521 plant species represent 16% of those found in Armenia. Sites such as Erebuni have particular significance for agrobiodiversity – this reserve was set up to protect the genetic diversity present in wild relatives of crops, and supports three species, and 100 sub-species of wheat.

Armenia is an ancient centre for the breeding of livestock, and also supports wild relatives of domestic breeds. Endemic breeds of sheep were recognised as early as the 9th Century BC, which had been selected from their wild ancestors, the Armenian mouflon. Today, mouflon are still found in the southern parts of the country, particularly in Khosrov reserve, although their numbers are declining due to habitat loss and illegal hunting. As well as sheep, endemic races of goats and horses also originated from the Armenian Plateau, and the genetic variety in livestock in Armenia has resulted in successful breeding of valuable varieties of cows, sheep, pigs, hens, and rabbits over the last 50-60 years.

2.2.8 Threatened Species in Armenia

Because of natural and human impacts, almost half the plant species present in Armenia may face some threat of extinction. To date, 35 plant species of economic importance are known to have become extinct in Armenia. A further, 386 species (12% of the flora) are listed in the Armenian Red Data Book[3] (produced in 1988). At a regional level, 61 plant species are listed in the Red Data Book of the former Soviet Union (produced in 1984). Of critical concern are species such as sweet flag bulrush (*Acorus calamus*), a valuable medicinal herb, and the beautiful Judas tree (*Cercis griffithii*), which is endangered because of agricultural use of the land. Other examples of endangered plants include a newly discovered endemic species of saltwort *Salsola tamamschjanae,* threatened as a result of sand processing, and the regionally endemic iris, *Iris grossheimii.* In addition, the status of lower plants has not been fully assessed, but at least 15 species of mushroom are considered to be under threat.

Of around 17,500 species of invertebrate and vertebrates recorded in Armenia, approximately 300 are considered to be rare or declining. A total of 99 vertebrates are currently listed in the Armenian Red Data Book, of which 39 are also listed in the Red Data Book of the Former Soviet Union, and a number are considered internationally threatened (according to the IUCN Red List of Threatened Animals; Table 2.4). However, updating the Armenian Red Data Book would be likely to lead to the inclusion of many more species (perhaps doubling the existing list). The Armenian Red Data Book for Invertebrates is not yet available, but initial assessments indicate that over a hundred species will be listed. The Red Data Book of the Former Soviet Union already lists 48 invertebrate species which are found in Armenia.

Among the vertebrate species listed in the Armenian Red Data Book are 12 amphibians and reptiles, and 18 mammal species – many of these species are critically endangered. The threats facing these species have increased recently as a result of the effects of natural disasters and economic crisis, coupled with the lack of effective environmental legislation. Among the mammals listed, six species are at particular risk of extinction: Armenian mouflon *(Ovis orientalis gmelinii),* wild goat (*Capra aegagrus)*, marbled polecat (*Vormela peregusna),* European otter (*Lutra lutra),* brown bear *(Ursus arctos),* and manul (*Felis manul).* In addition, the striped

[3] Red Data Books list species which are considered to face some risk of extinction, and include an assessment of the degree of threat to such species. Such lists are compiled at national level (e.g. the Republic of Armenia), regional levels (e.g. the Red Data Book of the Former Soviet Union), and internationally (the Red Lists of Threatened Species compiled by IUCN – The World Conservation Union).

hyaena *(Hyaena hyaena),* and the Caucasian birch mouse *(Sicista caucasica)* are probably extinct in Armenia.

Table 2. 4 Number of vascular plants and vertebrate species listed in the Red Book of Armenia, and regional and international Red Lists. Threat categories are given for species listed in the Armenian Red Data Book (Ex = Extinct, Th = Threatened, Ra = Rare, De = declining, Dd = Data deficient).

Group	No. in Armenian Red Book	No. of species					No. in USSR Red Book	No. in International Red List
		Ex	Th	Ra	De	Dd		
Fish	2	-	2	-	-	-	1	-
Amphibians	1	-	-	-	1	-	1	-
Reptiles	11	-	6	4	1	-	7	2
Birds	67	-	20	34	13	-	19	3
Mammals	18	-	3	6	6	3	11	1
Vascular Plants	386	35	129	155	59	8	61	-
Total	**485**	**35**	**160**	**199**	**80**	**11**	**100**	**6**

2.2.9 Threats to Biodiversity in Armenia

The greatest threats to biodiversity result directly and indirectly from human activities. The key threatening processes include: (1) habitat loss and modification; (2) over-use of biological resources; (3) pollution; (4) effects of introduced and non-native species; and (5) climate change. All these threats can result in declines in populations of animals and plants, loss of species and degradation of ecosystems.

In Armenia, the growth of the agricultural, industrial, construction and energy sectors have led to extensive habitat change across all landscape types. Urban and industrial areas have grown, while forests have been logged and over 20,000ha of marshes and wetlands have been drained. This has led to the destruction of natural habitats, and has brought a number of species close to the brink of extinction. Habitat degradation is likely to be exacerbated in future as a result of land privatisation.

Direct use of biological resources is common in Armenia, including the use of pastures and meadows for grazing, collection of wild plants, fisheries and hunting. The current levels of use for a number of species appear to be unsustainable, and

population declines have been recorded in some species. Continued overuse is likely to result in species extinctions, and changes in ecosystems.

Outputs from the industrial, energy and transport sectors have resulted in substantial levels of air, soil and water pollution in Armenia. The legacy of Soviet industry is clear in heavy metal levels still recorded in soils today. Such levels of pollution have direct impacts on the health of species and integrity of ecosystems.

A number of species of foreign origin have been introduced to the natural ecosystems of Armenia. The effects of introduced species through competition with native species, is not clear and their broader effects on biodiversity are unknown.

The impact of climate change on biodiversity remains unclear but a temperature rise of 2-3°C is predicted, which would result in increased desertification, and possibly to species extinction.

Human impacts on biodiversity in Armenia

All types of natural resource use affect biodiversity in some way. The most important sectors affecting natural systems in Armenia, and their impacts, are listed below:

- **Agriculture** has resulted in soil erosion and salination, and degradation of vegetation and ecosystems.
- **Livestock breeding** has resulted in the overgrazing in sub-alpine and alpine meadows, and decline in wild fodder species.
- In the **forestry sector**, over-use has resulted in the loss of forested areas, reduced regeneration and changes in the forest ecosystem.
- **Industry** has had severe impacts on biodiversity through pollution and over-use, causing long-term pollution of key ecosystems, species extinction, and ecosystem degradation.
- The **hydroenergy sector** has affected biodiversity through pollution and changes in water use, resulting in loss of unique ecosystems associated with water basins.
- **Tourism and recreation** have led to pollution of the natural environment, and declines of rare and endangered species.
- **Over-collection** of natural resources, including illegal hunting, collection of medicinal herbs, fungi, berries and other plants, has led to the decline of several species, which are now threatened with extinction.

2.2.10 Conclusion

Armenia supports a rich diversity of both species and ecosystems as a result of its position at the junction of several bio-geographic regions, coupled with the complex geological structure and altitudinal variation in the country,. Within its small area, seven distinct landscape zones have been identified, each supporting a different mix of habitats and species. Many of these ecosystems have provided an important contribution to the socio-economic development of the country. Armenia boasts an impressive species richness and diversity for its size, and a number of endemic species have been recorded. Over 2000 plant species found in the country are of economic value (for food, medicine, fodder etc.), and Armenia is considered to be an important centre of origin for wild relatives of crop species. As well as plant varieties, Armenia has produced many breeds of livestock, and is considered to be an ancient centre of agriculture and horticulture.

Many of the ecosystems of Armenia have been adversely affected by human activity. Forest cover has been substantially reduced, and agriculture has degraded steppe and semi-desert systems. Of particular concern have been the changes in Lake Sevan and the surrounding areas, following over-use in water resources, and a 19m decline in the level of the lake. The impacts linked to agriculture, industry and poverty, including habitat loss, pollution and over-collection of biological resources, have resulted in declines in the populations of hundreds of plant and animal species, many of which are now on the verge of extinction in Armenia. The conservation of the country's biodiversity and natural ecosystems, and the development of sustainable use of biological resources, is a matter of not just local or national concern, but is also an issue of international importance.

2.3 Biodiversity Conservation Programmes in Armenia

2.3.1 Introduction

Most biodiversity conservation activities in Armenia are managed by the government. In-situ conservation of biodiversity occurs both in protected areas and in the wider landscape, mainly on lands under State ownership. The Law on Privatisation makes biodiversity conservation on private lands the responsibility of the owner, however economic factors and lack of information mean that the level of protection for biodiversity on private land is poor.

2.3.2 Information Review

Protected areas

The existing system for protected areas in Armenia was established in 1958, and the network currently covers around 311,000ha, or 10% of the total area of the country. At least 60% of the species of fauna and flora found in Armenia are represented within the protected areas system. Four types of protected areas are recognised under existing laws: state reserves, state conservation areas, national parks and natural monuments.

- **State Reserves** have a protection status equivalent to IUCN category 1a protected areas (i.e. strict nature reserves, with activities limited to conservation and scientific research). Five State Reserves have been established in Armenia, covering a total of 68,000ha.
- **State Conservation Areas** were established in Armenia between 1950 and 1970. Of 22 State Conservation Areas, 15 are managed by the Ministry for Nature Protection, six are controlled by the Ministry of Agriculture, and one by the Institute of Physics.
- A **National Park** was established in 1978 at Lake Sevan. Sevan National Park covers 150,000ha, including the lake surface (125,200ha) and 24,800ha of surrounding land. The national park is managed by the Ministry for Nature Protection.
- **Natural Monuments** are selected according to international criteria, and include both living and geological sites of academic, historic or cultural importance. However, the natural monuments of Armenia have not been officially surveyed and registered, so their precise number is unknown.

Despite the size and history of the protected areas network, there are a number of problems with the design and management of protected areas which reduces their effectiveness for biodiversity conservation.

- Many important and characteristic ecosystems are not represented within the protected areas network.
- The borders of the protected areas have not been designed appropriately to take into account factors such as topography, altitudinal variation, and distribution patterns.
- The protection status of State Reserves and Conservation Areas is not generally enforced, and human activities such as farming and recreation occur in Reserves.
- Protected areas lack effective administration and conservation management regimes, and have insufficient staff and resources.
- The legal framework for protected areas management is poor or totally lacking, and regulations or limits on use of natural resources do not exist.
- Natural monuments have not yet been officially registered and an inventory of sites has not been completed.

Conservation outside protected areas

Prior to the collapse of the former Soviet Union a number of laws regulated biodiversity conservation outside protected areas, including human activities around rivers, water catchments and resorts, use of pastures, and collection of species. However, many of these regulations are now out of date, and do not take account of the new economic situation. Three regulations are implemented by the Ministry of Nature Protection: (1) licensing of hunting and fisheries; (2) licensing for the collection and storage of wild medicinal plants; and (3) ecological assessment of any new business activity.

By law, hunting and fisheries can only be conducted under licence and with a special contract. Each season a range of expert bodies are consulted for guidance on populations, hunting methods and likely impacts. On the basis of this information the Ministry of Nature Protection issues the appropriate number and size of permits for hunting or fisheries. Similar assessments are made of populations of wild medicinal plants before permits are issued.

Ex-situ conservation

Live collections of plants and animals are supported by the Institute of Botany (of the National Academy of Sciences), Yerevan Zoological Garden, and a number of recently developed private zoos and collections. An extensive plant collection has been established at the Institute of Botany for over 60 years, and now includes about 1,650 species of plants from 75 families. These are maintained in botanic gardens in Yerevan, Vanadzor and Sevan, and in a number of dendroparks. Although no captive breeding facilities are currently operating, the collection of animals at Yerevan Zoo includes 164 species (14 fish, 9 amphibians, 40 reptiles, 57 birds and 47 mammals) among which are a number of endemic and threatened species from Armenia. A collection of micro-organisms has been established at the National Bacteriological Research Centre, and currently maintains some 6,000 species of bacteria and fungi.

In general the conditions of ex-situ collections are relatively poor, and these have been undermined by the economic crisis and energy shortages. Museum research collections have been similarly affected. Furthermore, ex-situ institutions have developed in isolation without co-ordination between the existing collections.

Educational programmes and ecological awareness

A range of educational and training programmes in Armenia include issues relating to biodiversity conservation. In secondary schools, pupils learn about biodiversity from the 4th grade through courses on natural sciences and zoology. In most schools, field trips are also organised to botanic gardens and zoos. Biodiversity conservation is also covered in a number of advanced courses run by higher education institutions, including both State and private universities. A variety of courses relate to biological and social aspects of conservation, along with environmental protection, ecological policy development and environmental economics.

Public awareness of biodiversity is relatively low in Armenia. Little information on this issue is broadcast on State radio or television, although articles about the environment appear regularly in the press. The only television programme about nature is broadcast twice a month, but generally presents foreign documentary films, rather than describing the problems facing biodiversity and its protection in Armenia. A popular science magazine (*Armenian Nature*) which discussed many issues relating to biodiversity conservation was produced until 1995, but then folded due to financial difficulties. The Ministry of Nature Protection has published a newsletter (Nature) since 1998, which includes many articles on environmental protection. However the print run and distribution of this publication is very limited.

International recognition of the importance of public awareness has resulted in the development of the UN Convention on Access to Information, Public Participation Decision-Making, and Access to Justice in Environmental Matters. Armenia signed to this convention at Aarhus in 1998, and once the government ratifies the document the dissemination of environmental information and mechanisms for public participation will be clarified.

International biodiversity conservation projects

Various projects, funded through international sources, have been undertaken in Armenia, and underline the global significance of biodiversity conservation. Such projects include:

- A review of *Forest Sector Development*, financed by FAO (1993-1995).
- The *Country Study on Climate Change*, financed by GEF (1997-1999).
- A *Forest Resources Assessment*, funded by the Swedish International Development Agency (1998).
- The *Lake Sevan Action Plan*, funded by the World Bank.
- The *National Environmental Action Plan* includes a review of issues relating to biodiversity conservation and sustainable use of biodiversity, and a number of priority areas for action were identified. The data and priorities identified by the NEAP have been incorporated wherever possible into the BSAP to ensure the plans are compatible and mutually reinforcing.

2.3.3 Conclusion

A number of programmes in support of biodiversity conservation do exist in Armenia, but these need to be improved and strengthened within the framework of an integrated State policy on this issue. This review has some key issues which need to be addressed to improve biodiversity conservation programmes in Armenia:

- Limitations in the efficiency of the management of protected areas.
- Problems in the positioning and boundaries of existing protected areas.
- Non-representation of key landscape types within the protected area network.
- Lack of specific action plans for the conservation and regeneration of important endangered species.
- Ineffective legislation to support biodiversity conservation.
- Lack of resources for ex-situ facilities and genetic collections.
- Poor levels of public awareness about biodiversity issues.
- Low external investment in biodiversity conservation.

2.4 Institutional and Administrative Base

2.4.1 Introduction

A range of different ministries and institutions are involved in managing activities relating to biodiversity conservation in Armenia. In addition, many other bodies, including businesses and NGOs are affected by, or have important impacts on, biodiversity conservation.

2.4.2 Information Review

Government agencies

The **Ministry for Nature Protection** (MNP) has overall responsibility for the management of biodiversity conservation and sustainable use in the Republic of Armenia. The Ministry implements State policy relating to biodiversity conservation, sustainable use and species regeneration, and oversees environmental regulations, the development of principles for and monitoring of natural resource use. The central department of the MNP is responsible for biodiversity conservation, inter-ministerial co-ordination and international collaboration on this issue. Other departments of the MNP have more specific responsibilities.

- **Hayantar State Enterprise** is responsible for management of some forestry concessions (23 Forest Areas) and a number of protected areas (14 Conservation Areas)
- The **Department of Protected Areas** is responsible for management and conservation within protected areas, and manages five Reserves, one Conservation Area, and Lake Sevan National Park.
- The **State Inspectorate** is responsible for monitoring of legal limits on use, in relation to conservation of biodiversity, through six regional inspectorates.
- At a regional level, marz-level authorities also undertake the responsibilities of the Ministry of Nature Protection, and at a local level, local authorities undertake Ministry of Nature Protection responsibilities.

The **Ministry of Agriculture** is responsible for the management of agrobiodiversity in Armenia, and this is implemented through a number of structures within the ministry:

- The State Land Cultivation Inspectorate
- The State Soil Inspectorate

- The Department for Protection of Agrobiodiversity
- The State Inspectorate for Livestock Breeding and Husbandry
- The Veterinary and Animal-breeding Department
- Livestock Breeding and Valuable Livestock Species Treatment Department
- The Department for Plant Cultivation, Selection and Nurseries
- Regional Agrarian Inspectorates are responsible for monitoring of agrobiodiversity

Non-Governmental organisations

Several NGOs are actively involved in biodiversity conservation activities, and over 50 NGOs undertake ecological education, disseminate information, provide expert assessments or participate in specific conservation projects. However, the activities and impacts of the NGO movement are considered to be fairly limited at present. The effectiveness of NGOs is limited by financial constraints; membership fees provide only limited resources and such NGOs generally rely on the initiatives of a few individuals and on financial assistance from international donors. Furthermore, NGO activities are undermined by a lack of co-ordination between their activities and the work carried out by the Ministry of Environment.

One of the most active NGOs is the Environmental Protection Advocacy Centre (EPAC), which aims to promote environmental legislation and public participation in the development of such laws. EPAC has contributed to the development of two new draft laws for the protection of fauna and flora. However, as stated above (section 2.3.2), most NGOs are still constrained financially, and do not generally co-ordinate their activities with the MNP.

Other institutions

Several other ministries and institutions are involved in biodiversity conservation and use, and are listed below. In addition, several companies, organisations and entrepreneurs are involved in plant collection, hunting and reintroduction, but their impacts are difficult to assess.

- The **Armenian Hunting and Fisheries Union** (HayVorsMiutyun) is responsible for issuing hunting and fishing permits, in co-ordination with the MNP. The union was previously financed by the State and was active in all the main hunting regions, over an area of 84,000ha. The union currently has a membership of 2,000 hunters, but receives no State support and struggles to conduct its anti-poaching and supplementary activities at a much smaller scale. Permits from the MNP are also issued by the union for commercial fisheries in Lake Sevan.

- The **Ministry of Education and Science** develops educational and scientific programmes relating to biodiversity conservation.
- The **Tax Inspectorate** is responsible for the monitoring of import and export of fauna and flora species, and has a role in implementing relevant health and phytosanitary regulations.

- The **Consumers Union** (Haykop) organises the collection, storage and export of medicinal herbs in different regions of Armenia.

2.4.3 Conclusion

An adequate institutional and administrative base for management of biodiversity conservation exists in Armenia. However this system is not as effective as it should be in the context of modern approaches to biodiversity and the country's obligations to the *Convention on Biological Diversity*. The main issues to be tackled include:

- The lack of an integrated national and governmental strategy for biodiversity management.
- A lack of clarification of the various roles of State, regional and local management agencies.
- The management system and implementation regimes are not in line with current economic conditions, especially in regard to land privatisation
- There are no guidelines or regulations for agencies involved in the conservation and monitoring of biodiversity.
- The work of the Ministry of Nature Protection is limited by financial constraints and a lack of appropriate technical equipment.
- The agencies responsible for protected areas are limited by financial constraints, lack of equipment and the absence of a clear system or management plan.
- There is a lack of participation by local communities in the State management of biodiversity conservation
- There is a lack of co-ordination between the activities undertaken by NGOs and the state management system for biodiversity conservation.

2.5 Research Base

2.5.1 Introduction

Research into biodiversity has contributed strongly to the development of conservation policy around the world. Research acts to identify impacts of human activities and priorities for conservation, to guide appropriate methods for conservation and to monitor the success of conservation programmes. A key first stage for developing conservation policy is an accurate assessment of the species and ecosystems present and their status. Armenia has a strong history of scientific research on biodiversity and other disciplines. Information gathered through research into the fauna and flora of Armenia provides the basis for the data on the biodiversity of the country, and underpins the planning process for the BSAP.

2.5.2 Information Review

The history of research into biodiversity in Armenia

Biological research in Armenia effectively dates to the earliest civilisations, where experimentation with micro-organisms and fermentation processes led to the development of beer, wine, cheese and other dairy products, traces of which have been found in excavations dating back to the 7th century BC. Since that period, many records exist about the biodiversity of Armenia. The first descriptions of the animals of the country date from the 4th century (Kesaetsi), while even earlier historical references were made to animal intelligence in Armenian texts (Metrodoros). Early descriptions exist of the uses of animals for agriculture, including horses, cows, sheep, dogs, chickens, and bees (the Girk Vastakots text). The diversity and use of plants has also been well documented in Armenia, with some references dating back to the 15th century (A. Amasiatzi). Further documentation of the fauna and flora of the country continued between the 17th and 19th centuries (by Kostandnapolisetsi, Tournefor, Eichvald, G. Alishan, Koch, Wagner, Bush, and Lipski, among others). Of key importance are the studies of medicinal use of plants in Armenia ('Botany in Armenia', S. Shamiramyan). In addition, research into the aquatic ecosystems of the country was initiated towards the end of the 19th century. Since then scientific research on biodiversity thrived in Armenia in the 1920-1930s during the Soviet era, with extensive studies of the fauna and flora of the country. However, recent economic crises have led to decline in the sector, as a result of lack of funding for research.

Research centres

At present several institutes have the capacity to undertake biodiversity research and training, including:

- The research institutes of the Armenian National Academy of Sciences (the institutes of Botany, Zoology, Aquatic Ecology and Fisheries, Agro-chemistry and Hydroponics, and Microbiology).
- The associated institutes of the Ministry of Agriculture and the Ministry of Industry (Institutes of Land Cultivation, Soil-science, Plant Protection, Wine and Berry Production, and Applied Biotechnologies).
- Higher education institutions, including the Yerevan State University, Agricultural Academy, Medical Institute, and Teaching Institute (where students are trained in zoology, botany, microbiology, ecology, geography, and soil science).
- The Department of Protected Areas in the Ministry of Nature Protection has scientific centres for Zoology and Botany.

Focal areas of research

The biodiversity of Armenia has been documented and studied for a number of centuries (see box above). Much of the research relates to studies on classification and taxonomy, population dynamics, and conservation of the genebank. Such research has been based on material stored in scientific collections (herbariums, museums, botanic and zoological gardens, genebanks, and seedbanks), as well as on data collected on field expeditions, and a wealth of information on biodiversity has been published in scientific monographs and articles. In addition, specific applied research has focused on human threats to biodiversity, the development of a sound scientific basis for ex-situ and in-situ conservation and reintroduction, and issues relating to invasive species. Key focus areas for biological research and inventory are explained in more detail below, along with assessments of the extent of knowledge about particular groups of organisms and systems.

Micro-organisms

The development of the science of microbiology in the late 19th century led to extensive research in Armenia, particularly in relation to yoghurt production (matsoon). During this century, micro-organisms from soil, foodstuffs, fermentation, and other sources have been extensively studied in Armenia, by national and foreign scientists, resulting in the documentation of many new species and types, some of which have important commercial uses.

Flora

At present not all groups of Armenian plants are equally well known - the best studied are the fungi and flowering plants. A seven volume publication documents fungi and related groups (The Micoflora of Armenia) with a further three volumes in preparation. Work since the 1950s has culminated in the production of nine volumes documenting vascular plants (The Flora of Armenia). A further two volumes on monocotyledons will soon be published. However, in comparison to these two taxa, other plant groups are less well studied.

Information of the distribution on vegetation types, and geo-botanical relationships, has been recorded since the 1920s, when an inventory was compiled of pastures and grasslands. Further botanical studies have described key floristic regions and habitat types of the country. Other research has focused on plants of industrial and commercial value, including information on their distributions and chemical composition.

Fauna

Extensive surveys and inventory of animal species began in the 1930s, with the publication of a number of monographs devoted to various insects and birds. Further zoological studies followed, including the publication of 'The Fauna of Armenia' in 1954 (S. Dal), and work on herpetology (in particular, parthogenesis in lizards). Since the 1950s zoological research has continued on various groups (including molluscs, arachnids, beetles, ticks, amphibians, reptiles, birds and bats), with studies focusing on their taxonomy, zoogeography, ecology and behaviour, as well as issues relating to their conservation.

Agrobiodiversity

While knowledge of plant and animal breeding dates back many centuries, systematic research into the diversity of cultivars and of native breeds of livestock started in the 19th and early 20th centuries. Extensive research has been conducted into crop diversity, studying issues such as genetic diversity within and between varieties, identification of varieties, wild relatives, and their natural habitats. These studies have aided the development of new varieties, and a series of high-yield crops have been produced. Such research and breeding still continues today.

Aquatic systems

A large body of information has been collected on the biodiversity associated with aquatic systems in Armenia. Phytoplankton surveys have been conducted in more than 60 sites, and regular assessments of phytoplankton are made in key lakes (including surveys dating back to the 1930s in Lake Sevan). Other studies include surveys of wetland plant species, research into the fish associated with various

water bodies, and surveys of aquatic invertebrates. By far the most extensive research has been conducted in Lake Sevan, where the populations, lifecycles, development and productivity of invertebrates (including bottom living species) have been studied. In addition, the fish species of Lake Sevan have been intensively studied with regard to their populations and productivity, particularly in relation to fisheries.

Survey and monitoring

Although no comprehensive State survey of biodiversity has been conducted, scientists have conducted surveys of forests, grasslands and pastures, and of rare species, including mammals and game species. Species lists for plants and key vertebrate groups have been compiled for four State Reserves and the National Park. Some of the biological research conducted in Armenia also incorporated a monitoring component, particularly studies of species/genetic diversity, rare and endangered species, populations of fish and game animals, use of wild plants and distributions of introduced/invasive species. However, such monitoring was conducted on an *ad hoc* basis and was rarely systematic. Similarly, monitoring conducted in protected areas was incomplete, and often involved short-term assessments, without clear targets. Since the economic difficulties, no monitoring of biodiversity is currently undertaken in Armenia, resulting in a lack of up-to-date information on the populations and distributions of valuable and threatened species.

2.5.3 Conclusion

Much of the research described was conducted during the Soviet era, when financial support for science was high. During this period Armenia supported many high-calibre scientists working in the field of biodiversity research. However, the recent economic hardships have resulted in a lack of money for research or for scientists' salaries. Therefore, limited research is currently conducted on biodiversity in Armenia. Despite these difficulties the intellectual and technical capacities for research within Armenia remain high. The challenge is to apply this resource to key questions relating to biodiversity conservation

2.6 Legislation and Policy

2.6.1 Introduction

Traditions regulating impacts on biodiversity date from ancient times in Armenia. For example, as early as the 4th Century decrees were in place to prevent illegal tree felling. During the Soviet era, a number of laws relating to biodiversity conservation were adopted across all the States. Following independence in 1991, environmental legislation was reviewed in Armenia, with the aim of developing a more comprehensive State policy towards ecological protection and sustainable use.

2.6.2 Information Review

National legislation relating to biodiversity

In the past decade, a series of new laws have been developed, including regulations relating to protected areas (1991), a land code (1991) and a forest statute (1994). A law relating to the protection of flora and fauna is currently being prepared by the initiative of the Ministry of Nature Protection, and this will be reviewed by NGOs and scientific institutions. Key laws relating to biodiversity are explained in more detail below.

Key laws and regulations relating to biodiversity conservation and natural resource use in Armenia

- Law on Principles of Environmental Protection (1991)
- Law on Protected Areas (1991)
- The Land Statute (1991)
- The Water Statute (1992)
- Law on Protection of the Atmosphere and Air Quality (1994)
- The Forest Statute (1994)
- Law on Environmental Impact Assessment (1995)
- Government decree on Fishing activities in Lake Sevan (1996)
- Law on Nature Protection and Payments for Use of Natural Resources (1998)
- Law on Flora (draft)
- Law on Fauna (draft)

The Forest Statute regulates the protection and use of forest, including the conservation of biodiversity within such areas. The statute stipulates that all the forests are State property, and the government is responsible for their use. However, the economic situation, including private land ownership, is not addressed by these regulations, and thus the development of forest-based enterprises by the private sector or local communities are prohibited. The Forest Statute is currently under revision by the Ministry of Nature Protection. This document is aimed at regulating relations with respect to biodiversity conservation, protection and regeneration.

The **Law on Protected Areas** outlines procedures for the establishment and management of protected areas and their relationships with other sectors. Under this law, State Reserves, State Conservation Areas, National Parks and Natural Monuments are considered as protected areas. The Law on Protected Areas is based on those developed elsewhere in the former Soviet Union, and does not account for the changing socio-economic and political situation, particularly with regard to land privatisation and the establishment of the private sector. A number of issues need to be clarified under the existing law, particularly the rights and responsibilities of public and private sectors, and the role and participation of local communities and NGOs in protected areas. In addition, clear plans for conservation regimes and opportunities for sustainable use are not included in this law, and the status of different protected areas is not considered. The current system is restrictive and might benefit from a broader range of types of protected areas being recognised.

The **Draft Laws on Flora and Fauna** are being developed to provide scientifically determined regulations on the conservation, management and regeneration of natural populations of plants and animals. These laws will regulate both the conservation and use of many wild species.

The **Law on Nature Protection and Payments for Use of Natural Resources** defines payments made for use of biological and natural resources, including who needs to pay, types of payments, levels and methods of payment, and mechanisms to deal with violation of this law. This law was only adopted at the end of 1998, and specific regulatory acts have not yet been developed.

International conventions

During the 1990s Armenia has joined a number of international conventions which relate to biodiversity conservation:

- *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (Ramsar Convention, 1971). Armenia ratified the Ramsar Convention in 1993, however despite the international importance of Lake Sevan and Lake Arpa, little has been done to implement this convention.
- *Convention on Biological Diversity* (UNCBD, Rio de Janeiro, 1992). This convention was ratified by Armenia in 1993, and the first stage of implementation is currently being undertaken including the production of the first National Report earlier in 1999, along with the development of this *National Biodiversity Strategy and Action Plan* to meet reporting requirements to the convention.
- *Convention concerning the Protection of the World Cultural and Natural Heritage* (World Heritage Convention, Paris, 1972). This convention was ratified in 1993, however there is little available information on its implementation.
- *Convention to Combat Desertification* (UNCCD, Paris, 1994). The UNCCD was ratified by Armenia in 1997. A project is currently being developed to meet obligations under this convention.
- *Framework Convention on Climate Change* (UNFCCC, Rio de Janeiro, 1992). The UNFCCC was ratified by Armenia in 1993, and production of a *Country Study on Climate Change* is underway.

In addition, Armenia has signed the *Convention on Access to Information, Public Participation Decision-Making, and Access to Justice in Environmental Matters* in 1998, but has yet to ratify it. Three further international conventions relate to biodiversity conservation, and Armenia has not yet acceded to these.

- *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES, Washington 1973).
- *Convention on the Conservation of Migratory species of Wild Animals* (Bonn Convention, 1979).
- *Convention on the Conservation of European Wildlife and Natural Habitats* (Bern Convention, 1979).

2.6.3 Conclusion

A range of laws and regulations exist in Armenia which relate to the conservation and sustainable use of biodiversity. However, many of these laws are not effective, and cannot be enforced at present. Several of the laws are now out-dated, and would need revision to be brought into line with current economic and social changes in Armenia, including land privatisation. A number of key laws relating to use of biological resources have still not been adopted (such as the laws on fauna and flora), and there is currently no legislation regulating biosafety or ecotourism. Many of the laws do not correspond to international standards, and there are still a number of international biodiversity-related conventions to which Armenia doe not yet belong.

2.7 Finances for Biodiversity Conservation

2.7.1 Introduction

The Republic of Armenia suffered severe economic hardships at the beginning of the 1990s. Economic recovery has now started, aided by a reasonably low level of international debt. The financing of biodiversity conservation programmes is supported by a number of mechanisms, including the State budget and foreign contributions to projects. While environmental problems are recognised, the environment is not considered as a national priority for public expenditure. According to the Ministry for Finance and Economics, the priorities for investment include: (1) the provision of a secure energy supply; (2) maintenance of basic social services (health, education and poverty alleviation); (3) maintenance of existing infrastructure (energy, transport, communications etc.); and (4) capital investments likely to generate economic growth.

2.7.2 Information Review

State budget

Limited State resources, and the low priority placed on environmental issues, have meant that public expenditure in this sector has been minimal to date. At present, State expenditure on the environment is effectively restricted to covering the operating costs of the Ministry of Nature Protection and its affiliated agencies. In 1998 expenditure was approximately US$980,000 or 0.3% of total public expenditure (0.06% of GDP). The current State budget meets less than 35% of the basic needs for biodiversity conservation funding, and the existing expenditure is primarily for payment of staff salaries. Almost no investment is made into equipment or other capital costs, and there is inadequate support for scientific research on biodiversity.

Environmental spending is focused on three principal areas: (1) Fisheries; (2) Forestry; and (3) Protected areas. Additional activities covered include the funding of the Environmental Inspectorate which is responsible for the enforcement of relevant legislation and regulations, and for the collection of payments for natural resource use.

Fisheries

Direct expenditure for protection and regeneration of fish stocks represents around US$34,000 annually, financed via the Ministries for Nature Protection and

Agriculture. The level of expenditure is currently insufficient to make effective assessments of fish stocks, and to set sustainable levels of fishing to ensure recovery of stocks.

Forestry

Forest protection activities are financed both from the State budget (c. US$200,000 in 1998) and from the profit from selective (sanitary) felling (c. US$664,400 in 1998). Of a total income of around US$864,000 in 1998, expenditure equalled US$804,000. However, the costs of sustainable forest protection are estimated to be 4-5 times greater than current expenditures, and are likely to grow substantially.

At present the average salary for forestry personnel is equivalent to US$16 per month, which undermines effective protection activities. Levels of illegal felling have been estimated to be 4-5 times higher than legal felling. Appropriate enforcement could help protect these valuable forest assets, and potentially increase income from legal felling by a factor of three or four. However, this argument is balanced by concerns about whether such extensive felling can be sustainable, without reducing forest cover further.

Protected areas

The State budgets for the various protected areas operated under the Ministry for Nature Protection are shown in Table 2.5.

Table 2.5 State budget to protected areas in 1998

Protected area	**Expenditure in 1998 (in US$)**
Lake Sevan National Park	130,000
Reserve-park complex (including Sevlich State Reserve)	34,800
Dilijan State Reserve	24,800
Khosrov State Reserve	39,600
Shikahogh State Reserve	4,600
National Research Centre	16,000
Department of Protected Areas	76,200
TOTAL	**US$ 326,000**

The protected areas expenditure can be broken down into 56% for salaries, 43% for other operational costs and less than 1% (c. US$3,260) for capital expenditure, including equipment. Despite the proportion of the budget spent on personnel, average salaries in 1998 were equivalent to US$20. Such low wages inevitably affect

the capacity for effective conservation of protected areas. The amount available for capital expenditure is minimal, and underlies the current lack of technical material and equipment.

Public expenditure

Public investments in environmental protection and mitigation (including pollution control and restoration, water and energy efficiency measures) declined from US$4 million (0.25% GDP) in 1996 to US$1.6 million (0.11% GDP) in 1997. Within these figures, funding for biodiversity conservation activities is not specifically indicated.

Internationally funded programmes

At a government level, international projects requiring co-financing and loans are focused on national priorities, and have not previously included environment programmes. At present, only grant-based environmental projects have been adopted, and donors have generally dealt directly with the Ministry of Nature Protection (rather than going through the co-ordination of the Ministry of Finance and Economy). A number of internationally funded projects have been conducted through the Ministry of Nature Protection (Table 2.6), most of which were initiated by donor organisations, although the MNP has produced its own project proposals aimed and multi- and bi-lateral donors. External funding of environmental projects is relatively recent (the first project was agreed in 1995). Since then these projects (mainly focusing on capacity building and policy development) have provided environment-related funding equivalent to approximately US$ 600,000 per annum between 1996 and 1997, roughly equivalent to the total State budget for those years (US$584,000 and US$656,000).

Table 2.6 Donor-financed environmental projects managed by the Ministry of Nature Protection

Project	Donor	Date	Grant (US$)
Forest Development Project	FAO	1996-97	442,000
Lake Sevan Action Plan	World Bank	1996-97	350,000
National Environmental Action Plan	World Bank	1996-97	200,000
Country Study on Climate Change	GEF/UNDP	1996-98	350,000
Strengthening MNP Management Structure	UNDP	1997-98	130,000
Ozone Layer Protection Project	UNEP	1997-98	50,000
Biodiversity Strategy and Action Plan	GEF/UNDP	1997-99	174,000

Donor assistance tends to support immediate national priorities, and as a result environmental projects are not currently a high priority for donor agencies (excepting UNDP and related organisations), and few other international donors are interested in environmental projects. Relative to overall donor assistance in Armenia, relatively little funding has been provided for environmental issues (less than 0.2% of a total of US$354 million in 1996).

Direct economic value of biodiversity

Biodiversity provides direct and indirect economic benefits to Armenia. At present such values are not recognised or included in economic forecasts and decision making. Information on the direct use value of biodiversity (Table 2.7) suggests that the revenue from biological resources is in the region of US$ 3 million per year. This does not include indirect costs, such as revenue from tourism and recreation linked to protected areas.

Table 2.7 Assessments of potential revenue per annum from direct use of various biological resources.

Biological resource	**Potential revenue (US$)**
Forest resources	84 million
Pastures and hay-lands	1.7 million
Revenues from livestock grazing	500,000
Medical herbs	50,000
Edible plants	180,000
Berries and fruits	180,000
Fisheries	122,000

The revenue generated from sustainable use of biological resources could be greatly enhanced through adoption of market pricing strategies. At present, pricing policy is generally driven by the need to raise revenue rather than by market forces. For example, timber prices are currently determined by the costs of extraction and the need to generate specific revenues, and as a result timber products are undervalued, and are sold well below international prices. It has been suggested that the introduction of modern technologies, along with revised pricing and effective marketing of timber, could increase income from forestry by 650% (to around US$7,900,000). In general, there is a need for an integrated economic policy and pricing mechanism with regard to forest and biodiversity management, which relates market values to revenue generation.

2.7.3 Conclusion

Current State budgets are insufficient to support the needs of biodiversity conservation in Armenia. At present government budgets are supplemented by funds from international donors. The biological diversity of Armenia represents an important economic asset, although the true values of biological resources are rarely considered in economic policy and pricing structures. Armenia is clearly on the way to developing a market economy and, sooner or later, the pricing of biological resources is likely to be determined by market forces.

2.8 Socio-economic Issues

2.8.1 Introduction

The relationship between the Armenian people and the natural environment dates back many thousands of years, and in that time nature has influenced Armenian culture, while man has in turn shaped the landscape of modern Armenia. A large sector of the economy is based upon agriculture, and this has developed using the natural resources of the country. The use of wild genetic resources of plants and animals for agriculture has been complemented by preparation of the land for cultivation through widespread irrigation. Further changes to the natural landscapes of Armenia have resulted from the development of mountain terraces to increase the land available for farming. Today the socio-economic situation of the country reflects the availability of biological resources, and also determines the context for biodiversity conservation.

2.8.2 Information Review

Economic situation and reforms

Until the late 1980s Armenia experienced rapid growth, and showed high levels of development with regard to industry, power generation, and production, as well as high levels of social support. The industrial base in Armenia during the Soviet era relied heavily on the use of natural resources, and caused lasting environmental impacts.

However, as a result of the effects of the disastrous Spitak eathquake in 1988, followed by substantial social and economic changes after the break up of the Soviet Union, the war with Azerbaijan and associated energy and economic blockades, the current situation is very different. This has been further exacerbated by the influx of refugees from Azerbaijan, with around 219,000 now living in Armenia.

Over the past decade almost all key economic and social indicators have constantly declined, as the country entered a deep economic crisis. For example, between 1989 and 1994 GNP fell by over 60% to 652 million USD. By the beginning of the 1990s the economy of Armenia faced total collapse, with the closure of many factories and businesses, drastic declines in production and loss of electricity to many regions. Over 50% of the population is considered to be living below the poverty line, and the unemployment rate is one of the highest in CIS countries.

At present, the economy in Armenia is undergoing a slow recovery. Over the past years there have been significant socio-economic reforms in Armenia, including a shift to democracy, a market-based economy and privatisation of land and industry. Armenia has successfully undergone the transition to a free market economy, and following decentralisation, the private sector now accounts for over half of production in the country. The legal system now encourages business development and foreign investment. In 1998, the GNP increased for the first time over its figures in the previous years, indicating a reversal in the economic slow down.

Social situation

The economic crisis of the early 1990s resulted in extreme social problems, resulting from sudden declines in incomes and the standard of living. This has resulted in significant declines in development indicators such as life expectancy, education and GDP, to levels nearer those expected in the developing world. In response to this situation emigration from the country has increased, with nearly a third of the earning population now seeking work abroad.

Armenian society is becoming increasingly polarised, with a growing gap between the richest and poorest in the population. Sources of economic production (except land) are owned by less than 10% of the population, while the remaining 90% is on the verge of poverty. The income of the richest 10% of the population was over 110 times that of the poorest 10%. The average monthly income in Armenia is currently between US$20-26, well below the estimated subsistence costs of $50 per month ($1.7 per day). Poverty is becoming a way of life for much of the population, and this has significant effects for society as a whole. Unemployment is high (around 25%), and land reforms have resulted in increased immigration to urban centres from rural areas. New social problems are becoming apparent, along with changes in moral behaviour patterns, with increases in begging and petty theft.

The population has also been affected by reforms in the payment system for healthcare. This has reduced access to medical assistance amongst the poorest in the population. Significant increases in death rates from heart disease, cancer, tuberculosis and AIDS have been recorded since the mid-1980s. There are also significant problems supplying clean water for much of the population, given the degradation of the infrastructure and over-use of water resources for irrigation.

Relationships between socio-economic issues and biodiversity

The links between biodiversity and socio-economic issues are clear in Armenia. Natural habitats and biodiversity have been a key factor supporting various branches of the economy – particularly agriculture and tourism, as well as providing raw materials for many industries, including food production. Recent economic change has in turn had significant impacts on biodiversity. While levels of air, soil and water pollution have been reduced following economic collapse, other impacts have led to increased degradation of natural habitats and loss of species.

The combination of economic crisis, unemployment and poverty have severely affected biodiversity and natural resources. This was clearly visible as a result of the energy crisis between 1992 and 1995 where fuel requirements led to damage to over 27,000 ha of forest. Illegal felling still continues in many areas, as a result of high energy prices. At a local level, the need for survival has changed attitudes towards natural resources, as wild plants and animals become an important source of food and other materials. As a result, there have been significant recent increases in the levels of hunting, illegal felling, and collection of wild plants, particularly among economically vulnerable sectors of society. Unlicensed collection of food – including hunting and fisheries – is an important source of sustenance, and limits in the availability of health care have increased the reliance on traditional remedies based upon medicinal herbs and snake venom.

2.8.3 Conclusion

Over the last decade the economic transition of Armenia, as in other CIS countries, has resulted in a unique series of economic and social difficulties, which differ from traditional patterns of human development. Changes in the economy and society have led to the development of changed relationships between society and nature, many of which have resulted in increased pressures on biodiversity. Biodiversity conservation needs to be considered in the context of the impacts and opportunities of the new economic situation in Armenia (including factors such as land privatisation and tax reform).

2.9 Problem Analysis

2.9.1 Introduction

People rely on natural resources to provide for their basic needs, including food, shelter, and clothes, but also compete for the space occupied by natural habitats. Population growth and human development therefore affect biodiversity both directly and indirectly. The effects of humans on the environment, including use of land and other natural resources, are the greatest factors underlying the current declines in biodiversity. In Armenia, with its rich and unique biological resources, the impacts of human on the environment has become increasingly marked.

2.9.2 Human Pressure on the Environment

Historically, low human population densities and regulated use of natural resources protected the balance of ecosystems in Armenia. However, over the last 1,000 years human impacts on the land have increased, mainly through deforestation and increased use of pastures. Such problems have intensified over recent years with unprecedented population growth and urbanisation since 1920 (Table 2.8), resulting in increased human impacts not only on individual species, but also on whole ecosystems.

Table 2.8 Increases in population and human impacts between 1920 and 1990

Parameter	**Factor of increase**
Population	5-fold
Urban population	26-fold
Urban spread	14-fold
Industrial districts and centres	30-fold
Irrigated land area	3-fold
Cultivated land area	1.5-fold
Areas under construction (buildings, roads, streets, etc)	20-fold

The population density (Table 2.9) directly influences the impacts of humans on biodiversity. To ensure that human development is sustainable, society develops mechanisms to regulate impacts on biodiversity and natural resources, including

laws, protected areas for threatened species and ecosystems, and regulations for use.

Table 2.9 Some parameters of current population and human pressures in Armenia

Parameter	Total	Density (average)
Population	3.8 million	232 persons/km^2
Populated areas	980 settlements	6 settlements/100km^2
Road and railway network	14,000 km	0.85km/km^2

2.9.3 Threats to Biodiversity in Armenia

Habitat modification and loss

Anthropogenic impacts have affected a large proportion of Armenia, and have led to damage and destruction to natural habitats. Over the last 50 years agricultural intensification has resulted in the loss of natural grasslands and wetland ecosystems, while felling of forest areas has resulted in substantial losses in biodiversity. Habitat loss has affected food resources and nesting opportunities for a range of species, and restricted range species have been particularly affected, including a number of threatened species. For example, the partial drainage of Lake Sevan affected the spawning areas for Sevan trout, leading to severe declines in this species.

Over-use of biological resources

In Armenia, both habitats and species have suffered from unregulated use. Although few figures are available, concern is expressed about the impacts of over-collection of wild plants and poaching of animals. Among species most at risk are plants of edible, medicinal or decorative use, and over-collection of such species has affected the semi-deserts, steppes and meadows in which they occur. Among animals, snakes have suffered over-collection for their venom, while the fish resources of Lake Sevan and other water bodies are declining as a result of over-fishing. Habitats, particularly pasturelands, have also suffered degradation through over-use. Over 50% of pasture lands are now degraded, and these show reduction in species diversity, succession with poisonous and inedible species, soil compaction, loss of vegetation cover and erosion.

Pollution

Pollution is a major issue in Armenia, involving not just current emissions, but the legacy from pollution during the Soviet era. Sources of pollution include industrial centres, mining enterprises, chemical and power plants, and vehicle emissions. Much pollution remains as a legacy from Soviet industry. While air pollution has declined substantially, heavy metal and chemical pollution of soil and water remains an important threat to biodiversity.

Invasive species

A range of species have been introduced to Armenia. Some species have expanded their ranges to the detriment of native species, and have resulted in population declines and disruptions of ecological relationships, affecting both biodiversity and agricultural systems. At present, most concern is expressed about the introduction of agricultural pests (including insects such as the Colorado bug and the Asian grasshopper). Among the most aggressive invasive plant species are *Xanthium, Cirsium,* and *Galinsoga parviflora*, while wormwood ambrosia (*Ambrosia artemisiefolia*) has expanded its distribution by over 200km^2 within the last decade. The increasing levels of trade regionally and internationally, may result in increased introductions to Armenia, as a result on inadequate customs checks and quarantine regulations. The major dangers among invasive species include aggressive weed plants, insect pests, pathogens, fungi and raptors.

Climate change

An indirect impact of pollution on the natural environment comes from the predictions of global warming. Increases of 2-3°C are predicted for Armenia's climate, along with declines in rainfall, resulting in increased risks of desertification. This is likely to severely affect wetland habitats and associated species, while changes in the distribution of habitats may affect the range and viability of a number of species.

2.9.4 Key Sectors Affecting Biodiversity

As well as its rich biodiversity, Armenia is characterised by intensive human impacts affecting ecosystems and species. Threats to natural systems include: 1) habitat loss and modification; (2) over-use of biological resources; (3) pollution; (4) effects of introduced, non-native species; and (5) climate change. A wide number of sectors use or affect natural resources, either directly or indirectly, and therefore

also threaten Armenian biodiversity. The impact of each of these sectors on biodiversity is discussed below.

Agriculture

Agriculture remains the largest sector in Armenia, and almost half of the total land area is devoted to agricultural use. As such agriculture is a key sector for natural resource use and has caused much damage to biodiversity. Key impacts from agriculture include:

- Habitat change and destruction of natural ecosystems.
- Over-grazing (affecting vegetation composition of pastures).
- Land degradation (including compaction of soils and increased salinity) and reduction in productivity.
- Pesticide use and soil pollution.
- Soil erosion (and increased risks of landslides).
- Pollution of water sources.
- Increased spread of disease through livestock populations.

Pastures represent around half the agricultural land, and have been severely degraded by over-grazing. As a result, productivity of pasture has declined, vegetation has changed (including loss of valuable fodder species), soil has been compacted and erosion is prevalent on many hillsides.

Around 600,000ha of land is cultivated in Armenia, although reduced productivity and erosion have led to the abandonment of some areas on hillsides. Over the last 70 years, there has been increased conversion of semi-desert, steppe and wetland habitats for cultivation, resulting in the loss of some important sites, and increased threats to species. For example the amphibians and reptiles of the Arax valley are now threatened as a result of habitat loss, while the diversity and populations of breeding birds has reduced as their food sources have been cleared. Unregulated irrigation of land has further consequences. For example, salinity has increased dramatically in 24,000ha of land in the Ararat valley. Factors such as salinity, soil compaction and overuse of fertilisers and pesticides has had a negative effect on the soil organisms, which ensure soil fertility.

Prior to 1992 over 75% of agricultural land was owned by State or collective farms. However, the land has since been privatised and divided between 130,000 farms, as well as a number of non-agricultural organisations. Privatisation and land ownership has resulted in new legal and social conditions relating to land use. It is not clear how this will affect biodiversity – difficult economic conditions and lack of

resources for farming have acted to reduce the intensity of agriculture. However, the absence of effective regulations for the use of private lands could result in even greater environmental impacts in the future.

Forestry

Forest cover in Armenia is around 10%, and forests are mainly found on steep mountain slopes where they have an important role in soil protection. Loss of forests has a number of effects on biodiversity and natural ecosystems:

- Loss and change of forest habitats.
- Increased erosion with loss of tree cover.
- Increased silting and eutrophication of water bodies.
- Collapse of natural hydrological systems associated with forests.
- Gradual forest succession as a result of changed water balance (from primary forest, to secondary growth, to scrubland and eventually to desert).

The extensive deforestation during the energy crisis of the early 1990s (see section 2.2.4) resulted in the loss of most forests close to towns and cities. Since then, in recognition of the important ecological and functional roles of forests, commercial clearance of forests has been banned. Selective logging is conducted for forest health and to encourage regeneration. However, illegal logging of forests is extensive, and grazing and hay production in forest areas is common. As a result, productivity and regeneration of forests are declining, species composition has changed and erosion has increased. In these conditions, populations of pest species have increased, while many bird and mammal species associated with forests have become threatened. The knock-on effects of forest loss have become apparent through increased erosion leading to flooding and landslides. Extensive flood damage has affected a number of regions including Tavush, Sunik and Lori.

Industry

Extensive industrial growth took place in Armenia between the 1920s and the 1980s, with the development of more than 200 industrial sites, including a number of gigantic industrial plants. Over this time, industrial development increased GDP by a factor of 1,000. However, industrial development therefore had significant effects on the ecosystems and biodiversity of the country, including:

- Habitat loss as a result of construction.
- Degradation of natural habitats.
- Pollution of soils, water and air.

Prior to the economic crisis, substantial levels of pollution were recorded from the country's industrial centres, totalling around 245,000 tonnes annually (54,400 tonnes of solid particles and 190,900 tonnes of liquid or gaseous emissions). This included around 50 different pollutants, including sulphate anhydride (58%), nitric oxides (15%) and oxides of carbon (14%). At present only a small proportion of industries remain operational (10-30%) and emissions of pollutants have dropped dramatically to 15,000-20,000 tonnes per year. However, pollution continues to have negative impacts on both natural ecosystems and agricultural lands in the country. Of great concern is the continued release of chemical waste, gaseous emissions and heavy metals from key industrial sites. Examples include:

- The Allaverdi metal factory, where the heavy metal content of cultivated plants is 20-40 times greater than standard limits.
- Degradation of 703ha of forests around the Vanadzor chemical plant as a result of emissions of nitrogen-containing compounds (such as ammonia and nitric oxides).
- Crop damage and plant mutations as a result of the release of chlorides and flourides from the Narit factory.
- Natural and agricultural ecosystems affected by dust emitted by the Ararat and Hrazdan cement factories.

Mining

Armenia is rich in mineral resources, and supports an extensive mining industry. Over 130 mining enterprises operate in Armenia, of which all but four involve open-cast mining. Mining operations affect an area of 9,700ha, including 8,275ha which have undergone direct disturbance, and 1,400ha covered by tailings or slag. Many mines are situated at relatively high altitudes (including copper and gold mines at between 2,000 and 2,500m), and thus represent a direct threat to fragile mountain ecosystems, and also affect lowland habitats downstream from such mines.

Mining affects the biodiversity of the country as a result of:

- Large scale habitat destruction through open-cast mining.
- Impacts of tailings and other deposits on ecosystems.
- Pollution of rivers and groundwater.

Of particular concern are a number of tailings from extractive and processing operations, totalling around 220 million m^3, which remain in Armenia. There is a high risk that pollutants from these tailings may leach into water systems.

Energy

All forms of power generation (hydro-electric, thermal and nuclear) affect biodiversity in some way, as does the electrical transmission network across the whole country. Impacts include:

- Thermal pollution (including of water used as a coolant) and air pollution (particulate and gaseous).
- Effects of construction of power plants on the site.
- Local changes in vegetation in the vicinity of power plants.
- Local habitat disruption through the erection of high voltage power lines (particularly on mountain steppes where vast areas of forest have been felled to erect such lines).
- The electromagnetic field from power lines may lead to changes in the plant and animal communities in the direct vicinity.

The impacts of the energy sector on biodiversity have become clear since the 1950s. At that time the development of hydroelectric power plants on the River Hrazdan using increasing outflow from Lake Sevan, which resulted in a 19m decrease in the water level of the lake. This decline had extensive impacts on the lake and its biodiversity, including changes in chemical balance, loss of species and eutrophication (see section 2.2.4).

Hydro-electric plants also affect biodiversity locally, within the rivers on which they were built. Effects include changes in biodiversity in both feeder channels and areas downstream of outlets, and in artificial reservoirs designed to regulate flow. Changes in water flow have also resulted in the aridisation of some areas where water has been channelled off for use by power plants.

Construction

Construction work has increased dramatically in Armenia over the last half century, in line with industrial development and human population growth. Around 90,000 ha, or 3% of the total land is now covered by urban or industrial construction. Such areas support few species and construction affects biodiversity directly through the complete destruction of natural habitats. In addition, areas in the vicinity of construction work are affected by habitat degradation and by long-term damage with construction wastes that are not properly removed.

Transport

The transport system in Armenia is extensive, covering 800km of rail track and 13,000km of roads. Transport systems affect biodiversity in a number of ways:

- Destruction of natural habitats during construction.
- Degradation of surrounding habitats.
- Pollution (local and air pollution).
- Barrier to dispersal resulting in fragmentation of populations.
- Direct mortality of wildlife.

One of the major issues is the effect of pollutants, including nictric and carbon oxides, on wildlife. Vehicle emissions are a major contributor to pollution in Armenia, representing 94% of total emissions (an increase from 67% of emissions in 1987). In particular, exhaust fumes contain oxides of nitrogen and carbon (Table 2.10), which contribute both to local pollution of natural ecosystems, and to global warming. At present laws regulate several pollutants in vehicle emissions, however overall assessments of pollution from road transport are difficult to quantify accurately from the data available.

Table 2.10 Annual estimates for vehicle emissions (based on data from the State Registry)

Pollutant	**Emission levels (thousand tonnes)**				
	1987	**1989**	**1991**	**1993**	**1995**
Nitrogen oxides	23.3	24.9	20.9	8.8	9.5
Carbon oxides	389.3	381.3	349.4	142.2	171.9
Hydrocarbons	76.6	74.0	62.4	19.4	23.1
Total	**486.2**	**480.2**	**432.7**	**170.5**	**204.5**

Tourism and recreation

The landscapes and biodiversity of Armenia have been a focus for tourism and recreation use over a number of decades, but this has intensified significantly over the last few years. By the end of the 1980s over 110 sanatoria and guest houses were operating, supporting more than 600,000 customers. In addition 200 summer camps for children existed, and 30 tourist centres, with 6000 places, were operational, along with approximately 10 tour routes. In the last few years recreational activities have increased dramatically, however many are improperly

managed and result in damage to biodiversity and to natural sites. Damage includes:

- Direct destruction of vegetation.
- Trampling.
- Over-use of water and other resources.
- Littering and increased waste production.

Unsustainable harvesting of wild species

Unsustainable collection of wild plants and hunting of animals by the local population has affected a number of species and habitats in Armenia. Although few figures are available, concern is expressed about over-collection of plants of edible, medicinal or decorative use, capture of snakes for their venom, and poaching of Armenian mouflon, and other big mammals. As a result of such harvesting, declines have been noted in a number of species, and semi-desert, forest and meadow ecosystems have been degraded.

2.9.5 Underlying Causes of Biodiversity Loss

Many of the proximate threats to biodiversity in Armenia are due to wider underlying causes. These factors affect Armenia as a whole, not only its biodiversity, and it is beyond the scope of this plan to address them fully here. These underlying factors increase the pressures on biodiversity, while also reducing the ability to react to biodiversity loss. Some of the key underlying causes of biodiversity loss in Armenia include:

- The current economic problems.
- Legacy of the Soviet period.
- Population changes.
- Social deprivation.
- Over-reliance on natural resources.
- Lack of alternative environmentally-sustainable sources of income.

2.9.6 Current Constraints and Opportunities for Biodiversity Conservation

An understanding of the context in which biodiversity conservation will take place is essential if realistic goals and activities are to be identified during the planning process. The information presented in the Country Study provides the basis from which the constraints on, and opportunities for, biodiversity conservation in the Republic of Armenia can be identified. These have been taken into account in the development of strategies and actions for the BSAP.

Constraints

A number of constraints currently restrict the extent and efficiency of biodiversity conservation activities in Armenia. Some of the main constraints include:

- Legacy of over 70 years of environmental problems.
- Low priority of the environment on the national agenda, given other social and economic priorities.
- Lack of finances as a result of the economic crisis.
- Lack of equipment and technical materials.
- Gaps in the legislative base, and a lack of ability to enforce existing regulations.
- Recent declines in vocational training.
- Lack of salaries and declining motivation of staff.
- Lack of co-ordination within and between institutions.
- Low public awareness of biodiversity issues.
- Increasing power of the private sector without increasing their environmental responsibilities.

The limited financial contribution to nature protection is currently a major hurdle in achieving effective biodiversity conservation. The finances provided are insufficient to address all the tasks required (including protected area management, monitoring, rehabilitation of Lake Sevan, forest protection, development of new technologies and biosafety). Effective conservation will require a much more substantial investment to solve the current problems. Furthermore the absence of funds for contemporary research into biodiversity, is undermining the ability to identify, and react to, threats to biodiversity. Lack of investment has resulted in the loss of technical expertise and capacity for training, particularly among protected area staff.

The lack of integrated information and management systems undermines biodiversity conservation activities, particularly for protected areas. The absence of effective information systems leads to difficulties in identifying rational and achievable aims. In general, the fragmentation of responsibilities, and lack of clear, in the roles of different management agencies, while the absence of integrated policies with regard to protected areas management result in ineffective management approaches.

The current level of ecological awareness in the general population is very low, and even decision-makers and relevant agencies are unaware of ecological limits and requirements. Although legislative reform has been initiated, more work is needed to ensure public awareness and participation in the planning and implementation

of nature protection projects. If such projects are to be successful, they will require the involvement of the general public, NGOs and other institutions.

Opportunities

A number of factors support biodiversity conservation, and provide important opportunities that can be built upon in the future. Such positive factors include:

- A large number of well-trained and committed personnel.
- Considerable academic potential.
- A good basis of existing structures (e.g. protected areas).
- A strong and detailed legislative base.
- Government's commitment to biodiversity and meeting the obligations of the CBD.
- Positive appreciation of the environment by the Armenian people.
- History and culture of conservation over many centuries.
- Strong recognition of the importance of natural resources to the national economy.
- Extensive scientific research base.
- Large number of institutions involved in biodiversity conservation activities (both government and NGOs).
- Extent of existing environmental programmes and plans (e.g. National Environmental Action Plan, Biodiversity Strategy and Action Plan, Lake Sevan Action Plan, Country Study on Climate Change etc.)

The genetic resources of the country themselves represent an important opportunity to promote biodiversity conservation, given their importance for economic, social and cultural development. Furthermore, the existing protected area system is extensive (representing almost 10% of the total area of the country), and over 60% of all species occur within protected areas. The effective in-situ conservation of species (both within and outside protected areas) is supported by recently revised legislation, which accord to international standards, and by the presence of a range of agencies with a remit for conservation within the state structure, as well as a range of supporting non-governmental organisations.

At a broader level, although public support for ecological activities is currently low, the literacy rate is very high, and interest in biodiversity conservation is increasing in the younger generation. Specialist training is promoted through higher education courses in ecology available in Armenia. General awareness of biodiversity issues is increasing, and NGOs are likely to have an increasing role in disseminating such information. Over 50 NGOs are now recognised in Armenia, and through collaboration with governmental management structures, they have the opportunity

to make important contributions to biodiversity conservation in the country. Over recent years, collaboration with international institutions and donors has increased, and a number of governmental and non-governmental organisations have received grants to undertake important biodiversity conservation projects. This provides a good basis to promote further international collaboration in future.

A more detailed analysis of existing opportunities and constraints for biodiversity conservation in a number of general sectors is presented in Table 2.11.

Table 2.11 Specific existing opportunities and constraints for biodiversity conservation activities

Factor	Opportunities	Constraints
Political and socio-economic reforms	• Extension of nature protection programs as a result of conservation being incorporated within new policy frameworks • Increased ecological education and awareness through publicity campaigns • Government support for meeting commitments to the CBD • Increased investment in conservation from land privatization • Reduction in pollution and its impacts following declines in industrial and agricultural sectors	• Reduction of conservation activities as a result of limited budget • Unsustainable use of natural resources as a result of land privatization • Expansion of human pressures on the environment and unsustainable use due to high levels of poverty • Over-exploitation of forests as a result of the energy crisis
Legislative basis	• Promotion of in-situ conservation and sustainable use as a result of the ratification of international conventions • Inclusion of clauses relating to biodiversity conservation and use in environmental laws • Inclusion of article on biodiversity conservation in civil, administrative and criminal laws • Development of draft laws on fauna and flora taking account of new political and socio-economic contexts • Development of strong legislative basis for biodiversity conservation over the last decade	• Limits to enforcement of regulations • Lack of legislation to regulate use of resources, in the absence of legislation on the use and sharing of genetic resources • Lack of legislation on biosafety, genetically-modified organisms and invasive species • Lack of correspondence between existing regulations for use of biological resources and private ownership of land
Institutional basis	• Recognised need to integrate and co-ordinate activities for biodiversity conservation within the state management systems	• Unclear roles of different management agencies • Limits to effective implementation as a result of

	• Increased responsibility for regulation of natural resource use at regional and local levels • Enforcement of environmental legislation through state monitoring network • Effective co-ordination and implementation of environmental activities through regional environmental management units • Increased training to develop staff for management agencies, through lectures of the Higher School of Management of Armenia • Increasing activities of a wide network of NGOs	budget cutbacks • Decline in quality of personnel and applicants as a result of low salaries and lack of technical support • Duplication of monitoring activities between different agencies • Duplication of permissions granted by different agencies • Lack of information database and monitoring systems • Incompatibility between conservation needs and current protected areas system • Weak relationships between management agencies and NGOs • Insufficient stakeholder participation
Infrastructure	• Reduction in extent of tree felling for fuel as a result of the growth in the energy sector • Existing mechanisms and networks to prevent the spread of pathogens and pests	• Increased road building leading to environmental degradation and off-road activities • Increasing urban development threatening natural habitats • Increased water and air pollution • Intensification of biological resource use as a legacy of economic blockade • Decreased levels of international information exchange due to weak information systems and poor communications
Research and personnel base	• Promotion of scientific studies on biodiversity at a number of institutions • Strong basis for biodiversity research and analysis from long term studies and publications • Intellectual resources available to identify biodiversity conservation approaches • Availability of newly qualified specialists in biodiversity management from new ecological courses at higher education institutions	• Reduction in opportunities to undertake biodiversity research and lack of experience of new technologies and approaches as a result of lack of finance and equipment • Lack of implementation of biodiversity research as a result of emigration of scientific personnel • Lack of up-to-date educational materials limits the ability to develop new approaches and to train staff • Absence of information for state Register and for Red and Green Data Books constrains biodiversity conservation planning • Absence of an ongoing staff training system within a range of management structures

Public awareness	• Dissemination of information on state and institutional decisions relating to biodiversity • Involvement of greater proportions of the population in the state management system as a result of the public awareness activities of NGOs	• Insufficient ecological education and lack of information dissemination to the general public as a result of financial and technical limitations • Lack of public awareness at regional and local levels • Few public awareness opportunities, as no public forums exist to discuss issues relating to biodiversity conservation
International collaboration	• Increased information exchange as a result of participation in meetings linked to international conventions and other agreements • Enhanced experience-sharing as a result of implementation of joint projects undertaken with international support • Increased activities and wider participation as a result of projects funded by the international donor community • Promotion of ecological education as a result of seminars undertaken as part of internationally-funded projects	• Lack of funds for attendance of international conferences • Limits to effectiveness of biodiversity conservation given that a number of international conventions have not been ratified • Ineffective protection of migratory species as a result of the lack of mechanisms for collaboration with neighbouring countries • Lack of opportunity for overseas training due to financial restrictions and limits to international assistance

2.9.7 Conclusion

Extensive changes in the landscapes and biodiversity of Armenia have been clear over the last 500 years, particularly in the decline of forest cover and increase in the area of agricultural land. The loss of natural systems has increased dramatically over the last century in response to a growing human population and industrial development. A number of sectors of the economy have important impacts on biodiversity, including agriculture, forestry, industry, mining, energy, construction, transport, tourism and recreation, and harvesting of wild species. These sectors negatively affect biodiversity in a number of ways, including loss of habitats, over-use, pollution, impacts of introduced species and climate change. As a result, many plants and animals are facing extinction, and a number of ecosystems are suffering from erosion and increased desertification. These impacts ultimately occur as a result of the present economic and social climate of the country, which also provides the context for biodiversity conservation. In this context a range of constraints and opportunities have been identified, which need to be incorporated into the planning procedure for biodiversity conservation.

2.10 Summary of the Country Study

The Country Study presents a brief, but comprehensive, review of biodiversity in Armenia, along with analysis of threats, current activities affecting conservation and constraints and opportunities for future activities.

As a result of its geographical location, and altitudinal and climatic variation, Armenia contains a wide diversity of ecosystems and species. As a result of its position, Armenia has an important regional role, and affects climate and water supply throughout the Caucasus region.

Armenia supports biodiversity of global significance, and represents an important centre of origin for agrobiodiversity. Many of the species which occur in the country are of economic value, and are an important resources within the traditional economies of Armenian people.

Substantial changes to biodiversity in Armenia have been recorded over the last century, as a result of increased human impacts. Degradation of natural areas and resources has been particularly extreme over the last 20 years, resulting in the loss of both habitats and species. Of key concern has been the impact on deserts and semi-arid areas, declines in forests and degradation of mountain steppes. In addition, over 500 species of plants and animals are considered to be endangered.

Intensive industrial development over the last 70 years has also had a negative impact on biodiversity. Sectors such as mining, agriculture, energy and chemical industries have affected biodiversity both directly and indirectly, through habitat loss, over-use of resources and pollution.

The current state management system for biodiversity conservation includes legislation, a network of protected areas, forest conservation practices and to some extent an ex-situ conservation system of botanical and zoological gardens.

Armenia has a strong potential with regard to scientific and intellectual resources for conservation, including experience in staff training. The developing NGO movement provides a potential basis for increasing the effectiveness of conservation actions in future.

At present the under-financing of nature protection agencies, as well as an incomplete legislative base with low levels of enforcement, represent important constraints to the effectiveness of biodiversity conservation and sustainable use

activities in Armenia. These problems are further reinforced by low public awareness of, or involvement in, nature conservation issues.

Biodiversity conservation needs to be integrated within approaches to socio-economic development in Armenia. Increasing investments in nature protection are likely to result in important development benefits linked to sustainable use and regeneration of natural resources. Such an approach would recognise that biodiversity conservation and sustainable use are key tools to ensure the improvement of living standards and sustainable development of the Armenian people.

Section 3

Biodiversity Strategy and Action Plan

3.1 Introduction to the Plan

3.1.1 Purpose of the Plan

The Biodiversity Strategy and Action Plan (BSAP) for the Republic of Armenia has been developed to provide an integrated framework within which biodiversity conservation in Armenia can be organised and co-ordinated over the coming years. The BSAP has been developed in line with the Convention on Biodiversity, and provides guidance on how the plan will be implemented, monitored and evaluated. The plan relates directly to the preceding information review contained in the Country Study (section 2), and incorporates the constraints and opportunities for biodiversity conservation identified within the problem analysis (section 2.9).

3.1.2 Design of the Plan

The Biodiversity Strategy and Action plan is divided into three main sections. The Strategy (section 3.2), the Action Plan (section 3.3) and some guidelines for implementation procedures, including monitoring and reporting (sections 3.4, 3.5 and 3.6). The Strategy and Action Plan provide an integrated outline for biodiversity conservation in Armenia, and should be used together. The Strategy and Action Plan are inter-related through the Strategic Approaches (which provide a framework for the Action Plan), and by relating specific activities back to the various objectives which they contribute to. All activities listed in the Action Plan will contribute to the overall aim of the Biodiversity Strategy.

3.1.3 Time Schedule of the Plan

The Strategy and Action Plan has been planned for a four year period, 2000-2004. This period was considered sufficient to be able to realistically monitor the impacts of the BSAP, and the plan will be revised at the end of this period.

3.2 Biodiversity Strategy for Armenia

The Biodiversity Strategy outlines:

- What this process aims to achieve (the Aim).
- What will change (the Objectives).
- What mechanisms or techniques will be used to bring about these changes (the Strategic Approaches).

3.2.1 Overall Aim

The overall aim of the Biodiversity Strategy is:

To ensure the conservation, sustainable use and regeneration of the landscape and biological diversity of the Republic of Armenia, for sustainable human development

3.2.2 Objectives

The 13 objectives listed below provide a more detailed expression of the overall aim, providing quantifiable targets to be attained through the implementation of the plan. The order in which they are presented does not indicate their importance.

1. *To develop mechanisms which mitigate economic activities that negatively affect biodiversity, while ensuring that a more realistic market value is placed on biological resources by 2001.*

2. *To increase internal and external investments in order to conserve and regenerate landscapes and biodiversity by 30% by 2004.*

3. *To conserve, regenerate and sustainably use forest resources, with a resulting increase in healthy forested areas of 3000 ha by 2004.*

4. *To support and extend the capacity to use science as a vital tool in guiding conservation management (including both research and monitoring), through increased investment of 15% in both relevant scientific programmes and professional training by 2004.*

5. *To improve management systems relating to biodiversity conservation (including protected areas management) with the result of increased effectiveness by 2001.*

6. *To improve legislation and economic mechanisms for the conservation and sustainable use of biological and landscape diversity, in line with the other objectives.*

7. *To improve and strengthen the ecological education and training system, along with increasing public awareness of biodiversity, so that knowledge improves by 30% by 2004.*

8. *To ensure the use of appropriate ecologically-friendly technologies in support of biodiversity conservation, through increased investment in this field of 10% by 2004.*

9. *To ensure the participation of NGOs and other relevant stakeholders in all stages of project development and implementation, and improve their opportunities to take a direct role in conservation management, with an increased involvement of 20% by 2004.*

10. *To conserve and regenerate species, ecosystems and landscapes, so that a further 3% is in a natural condition by 2004.*

11. *To extend the network of specially protected areas, and to improve the effectiveness of the system by 5% by 2004, in an appropriate manner, which takes into account the size and terrain of the country.*

12. *To ensure the sustainable use and further regeneration of biological resources, including agrobiodiversity, to maintain 90% of genetic resources by 2004.*

13. *To support and contribute to sustainable development, including the further integration of biological resource management into the development of rural communities, to help to reduce the levels of poverty by 30% by 2004.*

3.2.3 Strategic approaches

The strategy is a series of strategic approaches or techniques for conservation, which can applied to meet the objectives and aims of the BSAP. These explain what approaches will be applied to resolve the issues linked to biodiversity loss in Armenia. These strategic components are also used to provide a framework for the action plan. In addition, the strategic approaches provide a direct reflection of the articles of the Convention on Biological Diversity, and thus provide a clear way to

monitor the progress of the country in meeting its obligations to the convention. Fourteen strategic approaches have been identified:

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 resources. 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. A wide range of changes are proposed in this action plan. The implementation of these 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. It is important for any plan 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 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 activities affecting biodiversity, needs to be available to a wide range of people. This ensures that activities are not duplicated, decisions are made on the best information available, and promote transparency within conservation. Information may be exchanged at a range of levels – locally, nationally, regionally or internationally.

Co-operation (technical, scientific, inter-state, and technology transfer). Biodiversity does not observe boundaries – be they between parts of society, communities or states. Effective biodiversity conservation must, therefore, rely upon 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 monitoring, 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 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.

3.3 Biodiversity Action Plan for Armenia

The Action Plan documents the specific activities which need to be completed to achieve the overall aim and objectives of the Biodiversity Strategy for Armenia. The actions are organised around the framework of the 14 Strategic Approaches outlined in the biodiversity strategy (section 3.2.3). Within each action, a series of more specific activities are listed. The actions and activities have been developed within an integrated, holistic structure, and therefore may link to activities listed under separate Strategic Approaches.

Each of the columns in the table of the Action Plan are explained below:

Number of the action or activity: each action and activity has a unique code to allow it to be identified and cross-referenced within the plan.

Name of the action or activity: a brief heading or description of each action and activity.

Related activities: other closely associated activities elsewhere in the plan are indicated here. This information (using the individual reference numbers for activities) also allows cross-referencing to other related or similar activities throughout the whole plan.

Related objectives: this column indicates which of the objectives each activity is expected to contribute towards and hence how each activity will help to meet the overall aim of the plan. The numbers in this column relate to the numbering of objectives in section 3.2.2.

Duration (time-scale): this indicates when during the four years of the plan (2000-2004) each activity should take place.

Estimated budgets: The likely cost of each activity is indicated using rough budget categories. These categories are roughly indicative of relative cost as follows:

- I indicates a budget in the range US$1,000-US$100,000
- II indicates a budget in the range US$100,000-US$500,000
- III indicates a budget over US$500,000

Outputs: The verifiable achievements for each activity are listed, and these provide a basis for evaluation of success or completion. These outputs are proximal achievements, but completion of any activity is also expected to have impacts on wider indicators of success (see section 3.4), including the general objectives of the plan.

Priority: The relative priority of each activity is provided, where I indicates the highest priority, and III the lowest. Priority may not necessarily indicate importance, it may rather indicate that other activities may need to be completed first before it can be initiated.

No.	Action/activity	Related activities	Related objectives	Duration	Estimated budget	Outputs	Priority
Strategic component A: In situ conservation							
A.1	**IMPROVEMENT OF PROTECTED AREAS SYSTEM MANAGEMENT**						
A.1.1	Review current protected areas management, and from this develop and implement an integrated government policy on protected areas management.	D.1.1, C.7.2, C.7.3, A.4.1	5, 11	2000-2001	I	Review; improved management	I
A.1.2	Develop and strengthen co-ordinating management mechanisms to improve integrated management of the protected areas system	D.1.2, C.7.3, C.7.2, D.3.1	5, 11	2000-2001	I	Co-ordinated management systems	II
A.1.3	Establish an integrated database for biological and management information from protected areas	F.3.3, G.1.7, F.3.2, F.3.5	5, 11	2000-2002	III	Information database	II
A.1.4	Review and develop appropriate management structures and mechanisms for different types of protected areas	A.5.1, D.1.3, C.7.2, C.7.3	5, 11	2000-2004	III	Revised management structures	II
A.1.5	Develop and implement an inter-sectoral management plan for buffer zones	C.6.1, B.2.1, C.6.2, C.9.3, C.2.7, C.6.5, C.7.1	5, 11	2001-2002	II	Management plan	III
A.2	**CLARIFICATION OF THE PROTECTED AREAS NETWORK**						
A.2.1	Inventory of natural monuments and registration by the Government	A.5.1, A.4.10	5, 11	2001-2003	II	Inventory	II
A.2.2	Review the delineation of protected areas	A.5.1, A.5.7, G.1.7	11	2000-2001	I	Review	II
A.3	**BUILD CAPACITY OF PROTECTED AREAS STAFF**						
A.3.1	Conduct skills assessment and deliver vocational training courses for protected areas staff	A.1.1, A.1.2, D.3.1, F.3.4	5, 11	2000-2001	I	Training course	II

A.3.2	Conduct joint workshops involving protected areas staff, local authorities and enforcement agencies	E.2.11, C.6.4	7	2001	I	Workshops	II
A.4	**DIRECTLY SUPPORT CONSERVATION ACTIVITIES IN PROTECTED AREAS**						
A.4.1	Review existing financial mechanisms to support protected areas management and conservation	A.1.1, M.1.1, M.1.2	2	2001	I	Finance review	II
A.4.2	Provide technical assistance and equipment for Erebuni reserve and to support a monitoring and research station	F.3.2-F.3.9	2, 5, 11	2001	I	Technical assistance	I
A.4.3	Provide technical assistance and equipment for Dilijan reserve	F.2.1, F.3.2-F.3.9	2, 5, 11	2001	II	Technical assistance	I
A.4.4	Provide technical assistance and equipment for Shikahogh reserve	F.3.2-F.3.9	2, 5, 11	2001	I	Technical assistance	II
A.4.5	Provide technical assistance and equipment for Khosrov reserve	F.3.2-F.3.9	2, 5, 11	2001	II	Technical assistance	I
A.4.6	Provide technical assistance and equipment for Sevan National Park	F.3.2-F.3.9	2, 5, 11	2001	II	Technical assistance	I
A.4.7	Provide transport, communications and other equipment to strengthen enforcement in protected areas	C.1.7, D.3.3, K.2.2, J.2.1	2, 5, 11	2001-2002	I	Equipment	I
A.4.8	Provide resource material for libraries in reserves and the National Parks	E.1.6	2, 4, 7	2000-2003	I	Resource materials	II
A.4.9	Redevelop museums in Dilijan and Khosrov reserves as ecological education and awareness centres	E.1.6	2, 4, 7	2001-2002	II	Interpretative centres	III
A.4.10	Promote targeted research in protected areas aimed at improving conservation management practices	F.2.1, F.3.9, G.2.2, G.1.3, G.1.7, G.1.8	7, 5	2000-2004	II	Research programme	I
A.5	**EXTEND THE PROTECTED AREAS NETWORK**						
A.5.1	Develop and use criteria for the selection and expansion of protected areas	A.1.4, D.3.4, C.9.5, F.2.1, F.3.8, F.3.9	11, 4	2001	I	Criteria	II

A.5.2	Establish a series of new protected areas incorporating representative areas of all landscape classes, including alpine meadows, steppes, semi-deserts, wetlands habitats and saline swamps	A.5.4-A.5.6, G.1.3, G.1.2	10, 11	2001-2004	II	New protected areas	II
A.5.3	Develop corridors to facilitate migration of animals between protected areas	J.1.1, L.1.8	10, 11	2001	II	Ecological corridors	II
A.5.4	Establish a network of micro-reserves for endangered species of fauna and flora	G.1.1, G.1.7, G.1.8	10, 11	2001-2002	II	Micro-reservations network	II
A.5.5	Establish a new National Park in Jermuk, incorporating two existing reservations	G.1.1, G.1.7, G.1.8	10, 11	2001-2002	II	New national park	I
A.5.6	Establish a new National Park at Arpi to protect gorge and cave systems	G.1.1, G.1.7, G.1.8	10, 11	2000-2001	II	New national park	I
A.5.7	Extend the boundaries of Vordan Karmir reservation, in line with the distribution of this species	A.2.2, G.1.7	11	2000-2001	I	Extended reservation	II
A.6	**CONSERVATION AND REHABILITATION OF LANDSCAPES AND ECOSYSTEMS**						
A.6.1	Conserve and rehabilitate key wetland ecosystems (including Lake Sevan, Lake Gilly, and Lake Arpi)	G.1.2, G.1.3, C.9.5	10	2000-2003	III	Wetland rehabilitation	I
A.6.2	Conserve and rehabilitate key forest ecosystems, particularly forest areas damaged between 1990 and 1995	C.3.1-C.3.8, C.5.4, C.8.3, C.8.4, C.8.5	3, 10	2000-2004	III	Forest rehabilitation	I
A.6.3	Restore natural regeneration of forests dominated by rare and economically valuable species	B.1.2, C.8.2, C.8.4, C.5.4	3, 10	2000-2003	II	Forest regeneration	II
A.6.4	Establish a series of sparse growth trees sites where natural regeneration of trees and shrubs can be enhanced within arid zone	C.8.2, F.2.2, F.3.8, G.1.1	3, 10	2001-2003	I	Dendroparks	II
A.7	**CONSERVATION AND REHABILITATION OF SPECIES AND ASSEMBLAGES**						
A.7.1	Develop and implement individual action plans for conservation of key endangered species (including Armenian mouflon, leopard, Vordon Karmir, Sevan trout, etc.)	B.1.1, B.1.2, B.3.1, B.3.2, B.3.4, C.1.4	10	2000-2004	II	Action plans	I

A.7.2	Develop and implement an action plan for the protection of wild relatives of crop plants, in line with the agrobiodiversity project	B.2.1, C.2.4, C.6.2	10, 12	2000-2003	II	Action plan	II
A.7.3	Build measures for the control of invasive species into institutional plans and species conservation action plans	D.2.3, D.3.6, G.1.9, K.1.1, C.4.2	12	2001-2003	I	Invasive species control incorporated	II
A.7.4	Rehabilitate degraded landscapes and biodiversity of areas damaged by industrial activities	F.3.7, G.1.3, C.1.4, C.2.3, C.2.6, G.1.6.1, C.6.6, F.1.2, F.2.2, J.1.7	2, 10, 3	2000-2004	III	Rehabilitation	I

Strategic component B: Ex situ conservation							
B.1	**IMPROVEMENT OF MECHANISMS FOR EX-SITU CONSERVATION**						
B.1.1	Develop guidelines for collection, maintenance and reintroduction of plants and animal species in ex-situ programmes	A.7.1	6	2000-2001	I	Guidelines	III
B.1.2	Strengthen the existing capacities for the use of new technologies in the regeneration of endemic and threatened species	A.7.1, D.3.5, C.5.4, G.2.1, G.2.2	8, 10	2001-2003	I	Strengthened capacity	II
B.2	**DEVELOP AND MAINTAIN NURSERIES AND PLANT COLLECTIONS**						
B.2.1	Establish nurseries for wild relatives of cultivated crops close to protected areas (such as Erebuni) for the purposes of reintroduction and conservation.	A.7.2, A.1.5	11, 12	2001-2003	II	Nurseries	II
B.2.2	Provide financial support and resources to maintain the collection of endemic and endangered Armenian plants within Yerevan Botanic Garden, and provide support for their eventual reintroduction	A.7.2, B.4.2, C.5.4, F.1.1, B.4.2, F.3.8, G.1.8, E.1.6	2	2001-2003	II	Improved support for collections	II

B.3	**DEVELOP AND MAINTAIN CAPTIVE BREEDING CENTRES**						
B.3.1	Re-establish centre for captive breeding and reintroduction of endemic and endangered species at the Institute of Zoology of the National Academy of Sciences	A.7.1	10, 12	2000-2002	II	Breeding centres re-established	II
B.3.2	Establish new centres for rehabilitation and reintroduction of key threatened species (Armenian mouflon, wild boar)	A.7.1	10, 12	2001-2003	III	Reintroduction centres established	I
B.3.3	Re-establish breeding centres for agricultural livestock, to maintain important native breeds of animals	D.2.1, D.3.2, D.3.5, C.2.4, K.1.1, K.1.4, C.2.2	12	2001-2003	II	Breeding centres re-established	II
B.3.4	Provide resources and equipment to fish hatcheries for the purpose of development and reintroduction of endemic species	A.7.1, C.4.1, C.4.3, C.6.1, C.6.2, C.6.4, C.6.5	2, 12, 13	2000-2002	II	Equipment and resources provided	I
B.4	**MAINTENANCE AND DEVELOPMENT OF SEED BANKS AND GENETIC BANKS**						
B.4.1	Develop and publish guidelines for the collection, maintenance and use of specimens in genetic collections	A.7.1, A.7.2, B.1.1	4, 6	2001	I	Guidelines	III
B.4.2	Re-establish seed bank based at the Institute of Botany and Agricultural Academy to maintain the genetic resources and provide measures for reintroduction	B.2.3, A.7.2, B.1.2, E.1.6	2, 12	2001	I	Seed bank re-established	II
B.4.3	Maintain, strengthen and extend existing collections of genetic resources (including bacteria, plasma and sperm banks) within the National Academy of Sciences	F.3.10, B.1.1, B.1.2	2, 12	2001-2003	II	Gene bank collections improved	I

Strategic component C: Sustainable use							
C.1	**IMPROVE THE ASSESSMENT AND ENFORCEMENT OF LIMITS ON USE OF BIOLOGICAL RESOURCES**						
C.1.1	Develop standardised methods and guidelines for conducting assessments of biological resources for the State Registry	F.2.1, J.1.7, D.3.4	1, 4, 12	2000-2001	I	Methodical instructions and guidelines	II
C.1.2	Improve support and resources for assessment of populations of economically valuable species for inclusion in the State Cadastre System and for the setting of limits of use	G.1.1, G.1.8, D.3.4, J.1.2, J.1.7	1, 4, 12	2000-2002	I	Criteria	II
C.1.3	Develop and adopt limits for use of different biological resources (including medicinal and edible plants), or where relevant revise existing limits in the light of improved information	G.1.1, G.1.8, J.1.2, J.1.7, L.1.6, C.5.3, D.3.4	1, 4, 12	2000-2001	I	Limits adopted	II
C.1.4	Develop regulations for the use of particularly fragile or vulnerable habitats	A.7.1, A.7.4, F.3.8, D.3.4, F.1.2, F.3.7, C.9.1	1, 10	2001	I	Regulations	II
C.1.5	Develop a mechanism to increase local stakeholder consultation in development of norms or limits of use for biological resources	C.6.4, D.2.1, D.2.2	7, 13	2001	I	Consultative body	III
C.1.6	Establish an inter-ministerial Commission to manage licensed use of biological resources	D.1.1, D.2.1, D.2.2, D.2.3	5	2000	I	Inter-ministerial commission	II
C.1.7	Provide technical assistance and equipment to the State Inspectorate for the Environment, to improve enforcement of norms and limits of use of biological resources	D.3.3, J.2.1, J.2.2, K.2.5	6, 2	2000-2001	I	Technical assistance	II

C.1.8	Review and rationalise the responsibilities of regional, marz and local authorities for the enforcement of limits on biological resource use	C.3.3, D.1.3, D.2.1, D.2.2, G.1.4	5, 13	2000-2001	I	Re-distribution of responsibilities	II
C.1.9	Develop and disseminate guidelines (instructions, rules) for local and regional authorities regarding their responsibilities in regulating biological resource use	C.3.3, D.1.3, D.2.1, D.2.2	6, 5, 13	2000-2001	I	Guidelines	II
C.2	**PROMOTE METHODS OF SUSTAINABLE USE OF BIODIVERSITY IN THE FIELD OF AGRICULTURE**						
C.2.1	Develop guidelines for farmers on sustainable limits of grazing (including livestock density and duration of pasture use) in relation to different landscape types	C.3.1, C.3.2, C.6.4, J.1.2, J.1.3, L.1.1	6, 13	2000-2001	I	Guidelines	II
C.2.2	Develop a grants scheme to provide farmers access to supplementary food for livestock to reduce pressure on natural pastures	B.3.3, K.1.1, M.2.2	2, 12, 13	2001	I	Grants scheme	II
C.2.3	Define optimal proportions of areas of non-grazed hay fields to pasture lands for different landscape types, to best balance both productivity and diversity	A.7.4, F.3.7, L.1.11	4, 1, 10	2000-2001	I	Proportions defined	II
C.2.4	Develop and implement pilot projects on novel agricultural methods and sustainable use of agrobiodiversity	A.7.2, B.3.3, C.4.3, C.5.4, F.3.7, G.1.1, G.2.2	12	2001-2003	II	Pilot projects	I
C.2.5	Develop regulations on use of roads network in fragile ecosystems, particularly natural pastures	C.3.1, C.3.5	12, 10	2001	I	Regulations	III
C.2.6	Develop and implement projects for the regeneration of natural pasture lands, particularly sub-alpine meadows	A.7.4, C.6.5, F.1.2, F.3.7	10, 12	2000-2003	III	Projects implemented	I
C.2.7	Develop mechanisms, including grants schemes, to encourage cultivation of traditional crop varieties	C.6.2-C.6.6	12, 6	2001-2002	I	Mechanisms established	II
C.2.8	Review and enforce regulations regarding pesticide use in agriculture	G.1.6, K.1.4	8	2001-2002	I	Monitoring enforcement	II

C.3	**PROMOTE SUSTAINABLE USE OF FOREST RESOURCES**						
C.3.1	Develop regulations for local communities for reducing impacts on forested areas both from grazing and movements of livestock to pastures	C.2.1, C.2.2, C.2.5	1, 10	2001	I	Regulation	III
C.3.2	Develop mechanisms for regulating grazing in key forest areas, including forests within protected areas	C.2.1, C.2.2	3, 1	2001-2002	I	Monitoring and enforcement	III
C.3.3	Conduct an independent review of the roles and responsibilities of different government agencies in protection of forest resources, and revise roles accordingly	C.1.8, A.1.4, D.2.1, D.1.2, J.2.3	3, 5	2001	I	Revision of roles	II
C.3.4	Increase financial resources and technical assistance to agencies enforcing forest protection, in line with recommendations of the external review	D.3.1, D.3.3, C.1.7	2, 3	2001-2002	II	Technical assistance	II
C.3.5	Restore and extend forest roads network, to mitigate unnecessary damage to lands and biodiversity	C.2.5	3, 10	2001-2003	II	Forest road network	II
C.3.6	Develop and adopt regulation on timber extraction, to reduce the negative impact on biodiversity	A.6.2	3, 10	2001	I	Regulation adopted	II
C.4	**PROMOTE SUSTAINABLE FISHERIES**						
C.4.1	Review and revise, if necessary, existing regulations regarding commercial fisheries in Lake Sevan	G.1.2, L.1.4, L.1.3, L.1.6	6	2001	I	Regulations	II
C.4.2	Develop regulations on the introduction and management of non-native fish species in watersheds	A.7.3, G.1.9	6	2001-2002	I	Regulations	II
C.4.3	Develop regulations for privatised enterprises on fisheries management appropriate to biodiversity conservation	C.2.4, A.7.1, B.1.2	6	2001	I	Regulations	III
C.5	**PROMOTE SUSTAINABLE APPROACHES TO BIORESOURCES USE**						

C.5.1	Build on and redevelop the existing structure of hunting enterprises to promote the role of hunting unions in regeneration of stocks of animals and sustainable hunting	C.1.6, K.2.2, K.2.5, L.1.4	5, 13	2000-2001	I	Strengthened role of hunting unions	II
C.5.2	Review and revise regulations on hunting, taking into account the new economic situation	L.1.6, L.1.4, E.3.1	6	2000-2001	I	Regulations	III
C.5.3	Produce and disseminate guidelines for local people and enterprises on sustainable collection and storage methods of medicinal plants and other plants in common use, based on traditional approaches	C.1.3, C.6.2, C.6.3, C.6.5	12, 13	2000-2001	I	Guidelines	II
C.5.4	Establish and support plantation breeding for economically valuable plants species in different regions of country	C.2.4, B.1.2, B.2.3, C.2.4	2, 12, 13	2001-2003	II	Plantations established	I
C.6	**PROMOTION TO SUSTAINABLE USE BY LOCAL COMMUNITIES**						
C.6.1	Conduct assessments of opportunities for local traditional use, and identify potential mechanisms to apply such approaches	C.1.8, K.1.1	13	2001-2002	I	Promotion to national traditions	II
C.6.2	Develop a series of pilot projects to demonstrate traditional approaches to biodiversity use	A.7.2, B.3.4, C.2.7, C.5.3	7	2001-2003	I	Pilot projects	II
C.6.3	Develop mechanisms for adoption of biodiversity conservation and sustainable use principles to local experience	C.2.7, C.5.3	13	2000-2001	I	Mechanisms developed	III
C.6.4	Conduct ongoing training and education programmes aimed at local communities, and entrepreneurs on methods for sustainable use of biodiversity	B.3.4, C.1.5, C.2.1, C.2.7	7	2000-2003	I	Educational programs	III
C.6.5	Develop a grants scheme to stimulate traditional experience and sustainable use of biodiversity at a local level	B.3.4, C.2.7, C.5.3	2, 13	2001-2002	I	Grants scheme	II
C.6.6	Develop a grants scheme to stimulate habitat regeneration by local communities in their own localities	A.7.4, C.2.6, C.2.7	2, 13	2001-2002	I	Grants scheme	II

C.7	**DEVELOP MECHANISMS FOR SUSTAINABLE USE OF RESOURCES BY LOCAL COMMUNITIES IN THE VICINITY OF PROTECTED AREAS**						
C.7.1	Develop incentive schemes to use traditional varieties in the buffer zones of protected areas	A.1.5, J.2.4	6	2001	I	Incentives	III
C.7.2	Develop and invest in novel methods of income-generation in the vicinity of protected areas	J.2.4, M.1.4, M.2.5, M.1.2	2	2001-2002	I	Income-generation	II
C.7.3	Develop regulations to ensure some degree of profit-sharing with local communities of income from protected areas	M.1.4, M.2.5, M.1.2	2, 13	2001	I	Regulations	III
C.8	**DEVELOP MECHANISMS TO REGENERATE FOREST RESOURCES AND TO REDUCE PRESSURE ON FORESTS**						
C.8.1	Conduct studies to assess the feasibility of extending alternative sources of energy (hydro-power, biotechnology, wind) while taking into account their potential impacts on biodiversity	D.3.2, K.1.4, K.1.6	8	2000-2001	I	Report	II
C.8.2	Establish woodlots primarily for local communities, using native species wherever possible	A.6.2, C.6.3, C.6.5, C.6.6, A.6.3	3	2001-2004	II	Woodlots	I
C.8.3	Develop and implement a programme of large-scale replanting of deforested areas	A.6.2, A.6.3, E.2.10, K.1.2	3	2001-2004	III	Replanting	I
C.8.4	Provide technical assistance and direct support to tree nurseries to ensure sufficient planting material is available	A.6.2, A.6.3	3	2000-2002	I	Technical assistance	II
C.8.5	Develop and implement a specific project on replanting of woodland in Yerevan's green belt using native species	A.6.2, A.6.3	3	2001-2004	II	Replanting	I
C.8.6	Develop a grants scheme to encourage tree planting projects by NGOs and local communities	A.6.2, K.1.1, K.1.2, M.2.1, M.2.3, E.2.10	9, 3	2001-2002	I	Grants scheme	III

C.9	**DEVELOP AND IMPLEMENT PROJECTS ON PROMOTION OF SUSTAINABLE ECOTOURISM**						
C.9.1	Conduct surveys of areas suitable for ecotourism, taking into account habitat vulnerability	K.1.3, L.1.9, C.1.4	10, 4	2001-2002	I	Report	II
C.9.2	Develop criteria and regulations for ecotourism use in different landscape types	K.1.3, L.1.9	4, 6	2001-2002	I	Regulations	II
C.9.3	Develop criteria and regulations for development of ecotourism in protected areas and buffer zones	A.1.5, L.1.9	11, 6	2001	I	Criteria and regulations	III
C.9.4	Assess impacts of recreational activities in the Lake Sevan watershed on biodiversity	K.1.3, L.1.9, J.1.2	1, 4	2001-2002	I	Impact assessments	I
C.9.5	Based on an assessment of impacts, develop criteria and regulations for recreational use in the Lake Sevan watershed	A.5.1, K.1.3, L.1.9, J.1.3	1, 4	2000-2001	I	Criteria and regulations	I
C.9.6	Develop and disseminate regulations for environmentally responsible development of ecotourism and appropriate behaviour with respect to natural habitats	H.3.3, K.1.3, L.1.9	6	2000-2001	I	Regulations	II
C.9.7	Produce informative and demonstrative materials about biodiversity for visitors and outline appropriate behaviour at ecotourism sites (including protected areas)	H.3.3, L.1.9, E.2.2	7	2001-2002	I	Information materials	III

Strategic component D: Institutional strengthening and capacity building							
D.1	**IMPROVEMENT OF BIODIVERSITY MANAGEMENT WITHIN THE STATE SYSTEM**						
D.1.1	Review and strengthen mechanisms for biodiversity management within the State system, taking into account existing structures and available resources	A.1.1, C.1.6, J.1.5	5	2001	I	Management mechanisms revised	I

D.1.2	Review and clarify specific functions and responsibilities of departments within the Ministry of Nature Protection with respect to biodiversity conservation, and develop mechanisms for increased co-ordination	A.1.2, C.3.3	5	2000-2001	I	Functions and responsibilities specified	II
D.1.3	Rationalise local management system and improve collaboration with State management system	C.3.3, C.1.8	5, 13	2001-2002	I	Management system rationalised	III
D.2	**IMPROVE INTEGRATION OF NATURAL RESOURCE MANAGEMENT ACROSS DIFFERENT SECTORS**						
D.2.1	Establish an inter-ministerial working group to determine recommendations for an integrated policy on natural resource use	B.3.3, C.1.5, C.1.6, C.3.3, C.1.8	5	2000	I	Working group established	II
D.2.2	Adopt an integrated policy on natural resource use (as a government resolution)	C.1.5, C.1.6, C.3.3, C.1.8	5, 6	2001	I	Government resolution	I
D.2.3	Establish an inter-ministerial Commission for permissions for import and export of biological resources	A.7.3, C.1.6, E.2.6, E.3.1, E.3.2, G.1.9	6	2001	I	Commission established	I
D.2.4	Set up a representative council to co-ordinate biodiversity-related activities of NGOs and to liase with the Ministry of Nature Protection	H.1.1-H.1.3	9	2000	I	Representative council	III
D.3	**CAPACITY BUILDING FOR BIODIVERSITY CONSERVATION**						
D.3.1	Provide ongoing training for staff of the Ministry of Nature Protection and other relevant organisations to improve capacity for biodiversity management	A.3.1, A.1.2, F.3.5, F.3.4	7	2000-2003	I	Training	II
D.3.2	Provide training for staff of other ministries to increase their awareness of environmental issues	B.3.3, C.8.1, L.1.12	7	2000-2002	I	Training	II
D.3.3	Provide specialist training to the State Inspectorate for assessment of biological resources and for impact assessment methods	C.1.7, J.2.1, A.4.7	7	2000-2001	I	Training	II
D.3.4	Provide training to the expert consultants on population assessments and	C.1.1-C.1.4	7, 4	2001-2002	I	Capacity building	II

	determinations of appropriate limits of use for biological resources						
D.3.5	Organise discussions on the issue of biosafety, and provide training, for personnel working with biotechnology and genetically-modified organisms	A.7.1, D.3.3, F.3.10, G.2.1, G.2.2, J.1.6	7, 8	2001-2002	I	Courses	II
D.3.6	Provide training to customs inspectors on identification of important and endangered species requiring licences for export and import	A.7.3, D.2.3	7	2001-2002	I	Training	III

Strategic component E: Environmental education and public awareness							
E.1	**IMPROVE THE LEVEL OF ENVIRONMENTAL EDUCATION**						
E.1.1	Develop an overall programme with the Ministry for Education and Science on improving environmental studies delivered within the school curriculum	H.3.1-H.3.3	7	2001	I	Educational programme	II
E.1.2	Provide schools with updated manuals, textbooks, and practical materials relating to biodiversity conservation	H.3.1-H.3.3, E.2.6, E.2.2, E.2.10	7	2000-2002	I	Materials	I
E.1.3	Produce and distribute up-dated support materials on biodiversity conservation for higher education institutions (textbooks, manuals etc.)	H.3.1-H.3.3, E.2.4, E.2.5	7	2000-2003	I	Materials	I
E.1.4	Develop a course on Biodiversity Conservation at Yerevan State University and provide necessary support materials	H.3.1-H.3.3, F.3.1, F.3.2, E.2.3, E.2.4, E.2.5	7	2000-2004	I	Course	II
E.1.5	Provide training for teachers and lecturers to improve their capacity for delivering environmental education	H.3.1-H.3.3, E.2.3, E.2.4	7	2001-2002	I	Training	II

E.1.6	Provide support and resources for the development of interpretative and educational centres (at sites including Yerevan Botanic and Zoological Gardens and the State Natural Museum)	H.2.5, M.2.1, B.2.3, B.4.2	2, 7	2001-2002	I	Interpretative centres	II
E.2	**INCREASE PUBLIC AWARENESS RELATING TO BIODIVERSITY CONSERVATION**						
E.2.1	Review current activities for public awareness of biodiversity and assess level of awareness as a baseline	H.2.1, H.2.2, H.1.2	7				
E.2.2	Develop a public awareness programme promoting biodiversity involving the mass media, including a series of radio and television programmes, and national press releases	H.1.2, H.2.1, H.2.2	7	2000-2001	I	Awareness program	I
E.2.3	Produce a television programme specifically about the biodiversity of Armenia	E.2.2, H.3.1	7	2000-2001	I	TV programme	II
E.2.4	Produce and disseminate materials about rare and threatened species of Armenia	A.7.1, A.7.2, F.1.1, F.1.2	7	2001-2002	I	Publications	II
E.2.5	Produce and distribute regional listings of endangered species targeted particularly at those using biodiversity	F.1.1, F.3.8, C.1.5	4, 7	2001	I	Listings	II
E.2.6	Increase the circulation and distribution of the newspaper “Nature”, and include articles relating to BSAP implementation	N.3.5, J.1.2	7	2000-2001	I	Publications	III
E.2.7	Use flagship species (such as Armenian mouflon, and Armenian gull) to promote conservation through the wide use of these symbols in other materials	E.1.2, E.1.3	7	2000-2001	I	Use of flagships	III
E.2.8	Develop a series of postage stamps depicting important and threatened species of Armenia	F.1.1	7	2000-2002	I	Stamps	III

E.2.9	Develop a public awareness programme (mass-media programs, publications, etc.) emphasising the links between biodiversity and sustainable development in mountain ecosystems, for the International Year of the Mountain	K.1.5	7	2000	I	Awareness program	II
E.2.10	Organise public events on international environment days	C.8.3, K.1.2	7	2000-2002	I	Events	III
E.2.11	Organise brief workshops for local communities and authorities to discuss issues of biodiversity conservation	A.3.2, D.1.3	13	2000-2001	I	Workshops	II
E.3	**INCREASE PUBLIC AWARENESS ABOUT LEGISLATION RELATING TO BIODIVERSITY CONSERVATION**						
E.3.1	Develop a public awareness programme to disseminate information on laws relating to biodiversity, using mass media (TV, radio and newspapers)	C.5.2, E.2.9, E.2.2	7, 6	2000-2002	I	Awareness campaign	III
E.3.2	Organise a series of briefings on environmental laws, involving government agencies, NGOs and mass media	E.2.2	6, 7, 9	2000-2001	I	Briefings	III

Strategic component F: Identification and monitoring							
F.1	**IDENTIFY PRIOIRTY SPECIES AND HABITATS FOR CONSERVATION**						
F.1.1	Revise and produce a new Red Data Books of Armenia (including Red Book for Invertebrates), taking into account up-to-date information and new criteria	A.7.1, A.7.2, G.1.1, G.1.8	4, 10	2001-2003	II	Publication	II
F.1.2	Develop and produce Green Book of Armenia defining status of vulnerable and threatened ecosystems	A.7.4, C1.4, C.2.6, G.1.9	4, 10	2003-2004	II	Publication	II

F.2	**DEFINE APPROPRIATE INDICATORS FOR MONITORING**						
F.2.1	Identify appropriate indicator taxa for assessing habitat quality and levels of pollution, and use in monitoring systems	A.4.10, A.5.1, C.1.1, J.1.2	4	2000-2001	I	Indicators identified	I
F.2.2	Identify key sites which can be used as permanent plots for monitoring, including sites within protected areas	A.7.4, A.5.2	4, 11	2000-2001	I	List of sites	I
F.3	**DEVELOP AND IMPLEMENT BIODIVERSITY MONITORING SYSTEM**						
F.3.1	Set up a biodiversity monitoring centre within the Ministry of Nature Protection to collect information and conduct monitoring	A.1.3	4	2001	I	Monitoring centre	I
F.3.2	Establish a database, with appropriate technical support and equipment, to store data from the monitoring programme	A.1.3	4	2000-2003	I	Database	II
F.3.3	Develop a GIS system to aid analysis of biodiversity data collected in the monitoring programme	F.2.1, F.2.2	4	2001-2003	II	GIS system	II
F.3.4	Provide training in computer support skills and GIS analysis to key staff of the biodiversity monitoring centre	D.3.1, D.3.4, A.3.1	4, 7	2001-2002	I	Training courses	II
F.3.5	Provide localised access to the biodiversity database, supported by equipment and training, for mobile monitoring units and protected areas staff	A.1.3, F.3.1, F.3.2	4	2001-2002	I	Database network	II
F.3.6	Establish regional mobile monitoring units co-ordinated by the Ministry of Nature Protection, and provide with necessary equipment and training	A.1.3, F.3.1, F.3.2	4	2001-2002	II	Mobile monitoring units	I
F.3.7	Develop and implement a programme to directly monitor anthropogenic impacts on natural ecosystems, including lands in private ownership	A.7.4, C.1.4, C.2.3, C.2.4, F.3.7	1, 12	2001	I	Monitoring programme	II
F.3.8	Establish a programme to monitor populations of key endangered species	A.5.1, C.1.4	10, 12	2001-2002	I	Monitoring programme	II

F.3.9	Use data from the monitoring programmes to develop and revise conservation activities accordingly	A.5.1	1, 10, 12	2001-2004	I	Revised activities	II
F.3.10	Develop a system of monitoring to assess biosafety of organisations dealing with biotechnology, and ensure open access to this information	G.2.1, G.2.2, B.1.2, C.2.4	4, 7, 8	2001-2002	I	Monitoring system	III
F.3.11	Conduct regular monitoring of stored chemical and industrial wastes and carry out risk assessments for their impact on biodiversity	J.1.1, J.1.4, J.1.7	1, 4	2001-2003	I	Monitoring	II

Strategic component G: Research							
G.1	**CONDUCT APPLIED RESEARCH TO INFORM CONSERVATION MANAGEMENT**						
G.1.1	Conduct research projects to assess the distributions and populations of economically important species	C.1.1, C.1.2, F.1.1, C.2.4, D.3.4	4, 12	2001-2003	II	Reports	I
G.1.2	Record and monitor changes in biodiversity corresponding to revised water resource management regimes for Lake Sevan, and other relevant water bodies	A.6.1, C.9.4, C.9.5	13	2001-2002	I	Monitoring network	II
G.1.3	Record and monitor changes in biodiversity at Lake Gilly and other wetlands, following rehabilitation	A.7.4, A.6.1, A.7.4	10	2001-2002	II	Monitoring network	II
G.1.4	Conduct research to assess the impact of different forest management practices on biodiversity	C.1.8, C.3.3	3	2001	I	Proposals	III
G.1.5	Conduct research to identify inter-relationships between economic conditions (including rural population poverty and privatisation) and changes in biodiversity	C.6.6	10, 13	2001-2002	I	Reports	II

G.1.6	Conduct research on fertilisers and pesticides currently in use, and on their effects on biodiversity (including agrobiodiversity)	A.7.4, C.2.8, J.1.3	4, 12	2001-2002	I	Report	II
G.1.7	Collect data for development of maps and demarcation of protected area boundaries	A.2.2, A.1.3, A.4.10	4	2001-2002	I	Maps and new demarcations	II
G.1.8	Conduct targeted research programmes to assess status and distribution of understudied taxa	B.2.3, C.1.2, C.2.4, D.3.4	4, 10	2001-2003	II	Reports	I
G.1.9	Conduct research to identify and monitor distributions of invasive species and their impact on biodiversity	A.7.3, C.4.2, D.2.3	4	2001-2002	I	Reports	II
G.2	**RESEARCH ON BIOTECHNOLOGY AND BIOSAFETY**						
G.2.1	Conduct research on new biotechnological approaches that could be applied to biodiversity conservation	B.1.2, C.2.4, F.3.10, J.1.6	8	2001-2003	I	Reports	II
G.2.2	Conduct research to assess potential risks of biotechnologies and genetically modified organisms on biodiversity, including agrobiodiversity	B.1.2, C.2.4, L.1.2, F.3.10, J.1.6	8, 12	2001-2003	II	Reports and norms outlined	II

Strategic Component H: Information accessibility and exchange							
H.1	**STRENGTHEN THE ROLE OF NGOS IN BIODIVERSITY CONSERVATION AND SUSTAINABLE USE**						
H.1.1	Disseminate information from the biodiversity database of the Ministry of Nature Protection to the widest possible group of NGOs, using existing mechanisms wherever possible	A.1.3, D.2.4	9	2001-2003	I	Information dissemination	III

H.1.2	Organise regular meetings and workshops between NGOs and relevant government agencies, to share information and to promote the involvement of NGOs in the implementation of the BSAP	D.2.4, E.2.1, E.2.2, M.3.2	9	2001-2002	I	Meetings, workshops	II
H.1.3	Review and increase the role of NGOs in decision-making and in environmental project assessment and implementation	D.2.4, E.2.1, E.2.2	9	2001-2002	I	Resolutions for NGO involvement	II
H.2	**DEVELOP MECHANISMS FOR EXCHANGE OF INFORMATION ON BIODIVERSITY CONSERVATION**						
H.2.1	Review and regulate public access to ecological information from environmental management agencies	E.2.1, E.2.2	7	2001-2002	I	Information accessibility reviewed	II
H.2.2	Publicise the adoption of the Convention on Information Access so the wider population understand their rights to ecological information	E.2.1, E.2.2	7	2001	I	Awareness campaign	II
H.3	**DEVELOP MECHANISMS FOR INTERNATIONAL EXCHANGE OF INFORMATION**						
H.3.1	Create a homepage on the internet on Armenian biodiversity	E.1.1, E.1.2, E.1.3	7	2001-2002	I	Homepage	I
H.3.2	Subscribe to relevant international data exchange systems, and disseminate information from the biodiversity database	E.1.1, E.1.2, E.1.3	7	2001-2002	I	Involvement in data exchange mechanisms	I
H.3.3	Develop and publish materials on biodiversity, conservation and sustainable use in Armenia, in foreign languages	E.1.1, E.1.2, E.1.3	7	2001-2003	II	Publications	II
H.3.4	Ensure representation of Armenia at the most relevant international conferences and meetings	J.2.2	7	2001-2004	II	Representation	II
H.3.5	Develop an ongoing programme of information exchange with other countries on the subject of agrobiodiversity	C.2.4, A.7.2	12	2001-2002	I	Information exchange	II

Strategic Component I: Co-operation							
I.1	**SUPPORT INTERNATIONAL CO-OPERATION ON BIODIVERSITY CONSERVATION**						
I.1.1	Develop transboundary project with Georgia to help establish natural migration routes between protected areas	A.5.3, L.1.8	5	2001-2003	I	Transboundary project	II
I.1.2	Provide necessary support to enable Armenia's full participation in the Pan-European Strategy	C.1.2, C.1.3, E.2.9, J.2.5	2	2001-2004	I	Participation	I
I.1.3	Develop and implement international scientific exchange programmes for researchers and conservation managers	J.2.1-J.2.3, H.3.4	4	2001-2002	II	Exchange programme	II
I.1.4	Organise discussions with foreign countries to identify areas of possible collaboration	H.3.4, H.3.5, H.3.2	5, 7	2001-2002	I	Discussions	II
I.1.5	Develop a plan for ratification and implementation of CITES	J.2.4	8	2000-2001	I	Ratification	II
I.1.6	Develop necessary conditions to join the international protocols on safe transfer, use and input of genetically modified organisms and biotechnologies	G.2.1, G.2.2, F.3.10	8	2000-2001	I	Protocols signed	II
I.1. 7	Develop a collaborative programme on biodiversity research and conservation with the Republic of Nagorno Karabakh	J.2.1, J.2.2	4	2000-2002	I	Collaborative programme	II
I.2	**DEVELOP MECHANISMS FOR REGIONAL CO-OPERATION AND INFORMATION EXCHANGE**						
I.2.1	Develop mechanisms to promote inter-regional collaboration between national environmental agencies	J.1.3, J.1.4	10, 12	2001-2002	I	Mechanism developed	I
I.2.2	Organise and host a regional conference to promote exchange of information on mutual biodiversity issues	H.3.4	7	2001-2002	I	Regional conference	II

I.2.3	Encourage involvement of international specialists in national and regional conservation issues by promoting information about the region to an international audience	C.3.3, H.3.1, H.3.2	7	2001-2002	I	Information exchange	III
I.2.4	Develop mechanisms to promote exchange of genetic resources and fair sharing of their benefits	C.7.2, C.7.3, J.1.4	12, 13	2001-2002	I	Mechanisms	II
I.2.5	Develop regional co-ordinating body to co-ordinate the global taxonomic initiative in Caucasus	J.1.2	7	2000-2001	I	Coordinating body	II

Strategic Component J: Impact Assessment							
J.1	**DEVELOP MECHANISMS TO IMPROVE ENVIRONMENTAL IMPACT ASSESMENT**						
J.1.1	Review and revise the existing methods of impact assessment used for different sources of pollution	F.3.11, C.9.4, A.7.4, F.2.1, C.9.5, C.1.7	1	2001	I	Revised methods	II
J.1.2	Review and revise criteria for assessing effects on biodiversity, and outline these to relevant businesses	C.2.1, C.1.7, F.2.1, A.7.4, C.9.5, F.3.11	1, 4	2000-2001	I	Criteria	II
J.1.3	Produce simple materials on biodiversity impact assessment and disseminate to businesses and the private sector	C.2.1, A.7.3, F.2.1, F.3.7	4, 7	2001-2002	I	Explanatory materials	I
J.1.4	Produce a register of businesses and enterprises which affect biodiversity, and their activities	F.3.11, F.3.10, F.3.7	1	2001	I	Register	II
J.1.5	Improve the institutional basis and management system for monitoring impacts of businesses on biodiversity	D.1.2, D.1.1, D.3.3	1, 5, 13	2001-2002	II	Improved system	I
J.1.6	Develop guidelines for responses to ecological disasters, based on international experience, and provide technical assistance if necessary		2	2001-2002	I	Guidelines	II

J.1.7	Identify sites of current mining activities in mountainous areas, and conduct assessments of their environmental impacts	A.7.4, F.3.11, J.2.1	1	2000-2001	I	Register and assessment	II
J.1.8	Conduct environmental impact assessments in the vicinity of the national nuclear power plant	F.2.1, J.2.1	2	2001-2002	I	Impact assessments	I
J.2	**ENSURE ENFORCEMENT OF ENVIRONMENTAL IMPACT REGULATIONS**						
J.2.1	Establish and equip central laboratory for use by State Inspectorate in assessing environmental contamination	C.1.7, D.3.3	10	2001-2002	II	Central laboratory	I
J.2.2	Develop and publicise a regulated mechanism for reporting environmental violations	C.1.7, D.3.3	7	2001-2002	I	Mechanism publicised	III

Strategic component K: Incentive measures							
K.1	**DEVELOP DIRECT MEASURES TO PROMOTE ENVIRONMENTAL PROTECTION**						
K.1.1	Develop and manage a grants fund for different types of small-scale environmental projects (including local communities and work on privatised land)	A.7.3, B.3.3, C.2.2, C.6.1, C.8.6	13	2000-2004	I	Grants fund	I
K.1.2	Develop grant scheme targeted at volunteers who are directly involved in nature protection	C.8.3, C.8.6, E.2.10	2	2000-2004	I	Grants scheme	II
K.1.3	Develop a grant scheme to stimulate environmentally-responsible ecotourism activities	C.9.1-C.9.7	2	2000-2004	I	Grants scheme	I
K.1.4	Provide grants for the development and application of environmentally-friendly technologies	B.3.3, G.1.6, C.2.8, C.8.1	8	2001-2004	I	Grants scheme	II
K.1.5	Widely publicise information on	E.2.1, E.2.2,	7	2001-2004	I	Awareness	III

	environmental grants schemes using mass media	E.2.6, E.2.9				campaign	
K.1.6	Develop and implement tax incentives for businesses using environmentally friendly technologies	C.8.1	8	2002-2004	I	Tax relief	II
K.2	**APPLY DISINCENTIVE MECHANISMS TO ENSURE BIODIVERSITY CONSERVATION**						
K.2.1	Review and revise fines system for environmental pollution	J.1.1-J.1.5, J.1.7	6	2001-2002	I	Fines system reviewed	II
K.2.2	Review and revise the size of fines for illegal use of natural resources (hunting, fishing and logging)	C.5.1, C.5.2, A.4.7	6	2001-2002	I	Revised penalties	I
K.2.3	Widely publicise the fines system for illegal activities causing environmental damage, using mass media	H.1.1, E.2.2, J.2	6	2001-2002	I	Awareness campaign	II
K.2.4	Establish a system of penalties for illegal export of prohibited species	D.2.3, D.3.6	6	2001-2002	I	Penalties system	II
K.2.5	Encourage state inspectors to publicise cases of illegal hunting and logging	D.3.3, J.2.1, J.2.2, C.1.9	10	2000-2004	I	Publicity	II

Strategic component L: Legislation							
L.1	**DEVELOP AND REVISE LAWS AND REGULATIONS RELATING TO BIODIVERSITY**						
L.1.1	Adopt the drafted Laws on Fauna and Flora		6	2000	I	Laws	I
L.1.2	Develop and adopt a law on biosafety	G.2.2	6	2001-2003	II	Law	I
L.1.3	Adopt drafted regulation on biological resource use	C.4.1, C.1.1-C.1.4, C.1.6, C.1.9	6	2001	I	Regulation	I
L.1.4	Review and, if necessary, revise regulatory acts on hunting and fisheries	C.4.1, C.5.1, C.5.2	6	2001	I	Revised legislative basis	II

L.1.5	Review and, if necessary, revise the Forest Statute, accounting for the needs of biodiversity conservation	C.3.1-C.3.5	6	2001	I	Revised legislative basis	II
L.1.6	Review and revise regulatory acts in the field of biodiversity to bring them into line with Law on Payments for Nature Protection and Natural Resource Use	C.4.1-C.4.3, C.5.2	6	2001-2002	I	Revised legislative basis	II
L.1.7	Revise the Law on Principles of Privatisation and Civil Law taking into account the international norms of biodiversity conservation	C.4.1-C.4.3	6	2001-2002	I	Revised legislative basis	I
L.1.8	Review and, if necessary, revise existing legislation on protected areas, taking into account the implications of land privatisation	A.1.1-C.1.5, C.2.1, C.2.2	6	2001-2002	I	Revised legislative basis	I
L.1.9	Develop and adopt a law to regulate ecotourism	C.9.1-C.9.6	6	2001-2003	II	Law	II
L.1.10	Develop and adopt regulatory acts to ensure that fines are collected from businesses violating environmental regulations	K.2.1-K.2.5	6	2001-2002	I	Revised legislative basis	II
L.1.11	Develop and apply regulations on the limits of use for grasslands and pasture lands	C.2.3, C.2.6	6	2001-2003	I	Revised legislative basis	II
L.1.12	Develop a government resolution to ensure that account is taken of biodiversity conservation and sustainable use principles within all new laws and existing activities of other government ministries	C.1.8	6	2001-2002	I	Resolution	II

Strategic component M: Financial resources for implementing the BSAP							
M.1	**REVIEW FINANCING FROM STATE BUDGET FOR BIODIVERSITY**						
M.1.1	Review and revise the state budget for biodiversity conservation, in line with other institutional changes within management agencies	A.4.1	1, 2, 6	2000-2001	I	Revision of financial contributions	II
M.1.2	Review and revise self-financing mechanisms for supporting biodiversity conservation	A.4.1	1, 2, 6	2001-2002	I	Self-financing mechanisms	II
M.1.3	Investigate mechanisms by which realistic economic values can be placed on biodiversity within relevant State budgets		1, 2, 6	2001-2002	I	Mechanisms identified	II
M.1.4	Develop and implement system for using a proportion of income from payments and fines for natural resources use for biodiversity conservation	C.7.1-C.7.3	1, 2, 6	2001-2002	I	Financial revisions	I
M.2	**SOURCE FINANCING FOR BIODIVERSITY PROJECTS THROUGH GRANTS AND LOANS**						
M.2.1	Develop and run a small grants scheme for biodiversity projects	C.8.6	1, 2, 6	2001-2004	I	Grants scheme	II
M.2.2	Develop a scheme of micro-credits and interest-free loans to promote sustainable use	C.2.2	1, 2, 6	2001-2004	I	Loan scheme	II
M.2.3	Establish a special grants and credits commission to disburse and monitor funds for biodiversity projects	C.8.6	1, 2, 6	2001-2002	I	Commission	II
M.2.4	Organise a co-ordinating unit to administer grant and credit programmes		1, 2, 6	2001-2002	I	Coordinating unit	II
M.2.5	Establish and manage an Environment Fund to finance biodiversity conservation projects, including applied research	C.7.2, C.7.3, A.6.1-A.6.4, A.7.4	1, 2, 6	2001-2004	I	Fund established	I

M.3	**DEVELOP MECHANISMS TO STIMULATE EXTERNAL INVESTMENT IN BIODIVERSITY CONSERVATION**						
M.3.1	Conduct a review of potential external donors and investors for biodiversity conservation, and identify appropriate projects	J.2.3, J.1.4	2	2001-2002	I	Review	II
M.3.2	Provide inputs to build capacity within Ministries, NGOs and other organisations to design and submit funding proposals for donors	M.2.3, M.2.4, M.2.5	2	2001-2004	I	Capacity building	II
M.3.3	Provide inputs to build capacity within Ministries, NGOs and other organisations to collaborate with the private sector in funding biodiversity projects	H.1.2, H.1.1, H.1.3	6, 9, 2	2001-2003	I	Capacity building	II
M.3.4	Develop a fundraising plan focusing on Armenian diaspora, particularly in Europe and the Americas	J.1.4	2	2001-2002	I	Fundraising plan	II

Strategic component N: BSAP Implementation							
N.1	**ESTABLISH STEERING COMMITTEE**						
N.1.1	Outline responsibilities of steering committee and determine membership and representation of the committee	All	All	2000	I	Committee plan	I
N.1.2	Appoint steering committee and ensure government approval	All	All	2000	I	Government resolution	I
N.1.3	Organise regular meetings of the steering committee	All	All	2000-2004	I	Workplan	I
N.2	**ESTABLISH TECHNICAL WORKING GROUP**						
N.2.1	Define role and responsibilities for technical working groups	All	All	2000	I	Roles and responsibilities	I

N.2.2	Identify focal topics for technical working groups, determine membership and appoint leaders for each group	All	All	2000-2004	I	Plan	I
N.2.3	Determine protocols, meetings schedule and reporting mechanisms for technical working group	All	All	2000-2001	I	Workplan	I
N.3	**ESTABLISH CO-ORDINATING (FOCAL) UNIT WITHIN THE MINISTRY OF NATURE PROTECTION**						
N.3.1	Determine role and responsibilities of co-ordinating unit and human resource requirements	All	All	2000	I	Roles and responsibilities	I
N.3.2	Create new office base for co-ordinating unit, with necessary equipment and support	All	All	2000-2001	I	Office base	I
N.3.3	Agree and appoint staff for the unit, including national co-ordinator	All	All	2000	I	Staff	I
N.3.4	Produce and disseminate information materials on BSAP for stakeholder groups and decision makers	All	All	2001-2004	I	Materials	II
N.3.5	Create and maintain database for information pertaining to BSAP implementation	All	All	2001-2004	I	Database	II
N.4	**DEVELOP MECHANISMS FOR TECHNICAL ASSISTANCE**						
N.4.1	Identify sources for external technical and financial assistance	All	All	2001	I	Sources identified	II
N.4.2	Develop mechanisms for technical and financial assistance	All	All	2001	I	Plan for external assistance	II
N.5	**CONDUCT MONITORING OF BSAP IMPLEMENTATION**						
N.5.1	Prepare annual reports and submit to Steering Committee	All	All	2001-2004	I	Report	II
N.5.2	Produce and disseminate information on progress of projects conducted by different implementers	All	All	2001-2004	I	Awareness campaign	II

N.5.3	Review and adapt plan of activities and relative priorities in response to changing situations	All	All	2001-2004	I	Revised plan	II
N.5.4	Prepare and disseminate annual national report on BSAP implementation, and submit translation to CBD to meet international reporting requirements	All	All	2001-2004	I	National report	I
N.5.5	Conduct annual review of implementation, and revise BSAP document accordingly	All	All	2001-2004	I	Revised BSAP	II
N.5.6	Produce a full report reviewing BSAP implementation at the end of the 5-year period	All	All	2004	II	Implementation report	I

3.4 Monitoring and Evaluation

Monitoring and evaluation is essential to follow progress in implementing the BSAP and to ensure that any changes are fed back to revise the plan. In order to be effective, monitoring and evaluation procedures need to be incorporated at every stage of implementation.

What is the purpose of monitoring and evaluation?

- To identify how successfully the plan is being implemented.
- To assess the impact of the planned activities.
- To avoid duplication of efforts.
- To incorporate growing experience.
- To use experience to avoid making the same mistakes again.
- To allow the plan to evolve with changing situations.

In designing monitoring and evaluation mechanisms, it is worth considering a series of questions, which provide a framework for assessment. Such questions might include:

- To what extent have the planned activities achieved their outputs?
- To what extent have the overall objectives of the plan been achieved through these activities?
- What lessons have been learnt about the factors have made these activities a success or failure?
- What other information has become available that may help the development of the plan?
- What gaps exist in the plan, based on the information and experience that is available?
- How can developing existing activities or adding new ones in the plan fill these gaps?

Monitoring and evaluation will be built into every project generated under the BSAP. Overall responsibility for the monitoring of BSAP implementation will lie with the BSAP co-ordinating council, with support from a series of technical advisory groups. A number of criteria might be used which the success of the BSAP can be assessed against. Suggested criteria include:

- Number and quality of ecosystems (as demonstrated by their distribution and populations of chosen indicator species and taxa).
- Extent of agricultural land and loss or change of natural environments.
- Number of threatened species or sub-species.
- Number of endemic species in key taxa.
- Levels of pollution, including key chemical groups of particular threat to biodiversity.
- Socio-economic factors which reflect wider changes in the country, and are likely to predict impacts on biodiversity (including demographic factors (population size, mortality rate), economic factors (inflation, trade performance) and social factors (access to health care, causes of death).

3.5 Reporting Requirements

Reports on the implementation of the BSAP will need to be produced in order that representatives of state management bodies, international organisations (including for donors and the CBD) and the general public are kept informed about project implementation progress, objectives, challenges and changes. Key reporting requirements are outlines below, more detailed reporting requirements are described in table 3.1:

- **Annual national report.** This report should include details of all activities undertaken within each year, with details of their success and outputs. The report should include a review of progress against the set targets, an identification of gaps, lessons learnt and any changes required in the light of changing circumstances, at a national or local level. The impact of the plan on a number of core indicators should be assessed, along with changes in the national economic or political context in which the plan is operating. Once approved by the Steering Committee, the audience for this report will include decision-makers, donors, government and ministry officials, implementing organisations, NGOs, scientists, businesses, and all others directly involved in the BSAP and its implementation.

- **Interim public report on progress.** The public report should contain the information from the national report that is most relevant to the general public, and a wider range of groups or individuals interested in or affected by biodiversity conservation. This should represent a digest of the national report with the key information on progress in a form readily accessible to the wider public, and appropriate to use by mass media.

- **International reports on implementation of the Convention on Biological Diversity**. The CBD Secretariat requires regular reporting on the progress of individual countries with regard to their commitments to the CBD. The first stage of action under the CBD is the production of a BSAP; national reporting will then be required to document the extent of implementation of the plan. International reports will be based on information contained in the national report, and in some cases may represent the same document. However, these reports should ideally be more concise, aimed at a broader international audience, and may be produced in Armenian and English. The report will be supervised by the national focal point for the CBD and co-ordinated with the CBD Secretariat. Guidelines for national reporting are available from the CBD Secretariat.

- **Final report on progress.** At the end of the five year period a final implementation review will be produced. This will not only review achievements over this time, but will also outline reasons for success or failures in implementation of various elements in the initial plan, lessons learnt, and recommendations for the next planning period. This document should provide a thorough review of the plan itself as a working document, as well as implementation structures and recommendations for other biodiversity planning processes. This should be based on the experience gained.

Table 3.1 Reporting requirements during the implementation of the BSAP

Report	Contents	Produced by	Audience	Frequency
Annual Report	A detailed technical review of progress during the year and updated plans for the following year, including: Update and analysis of any new information. Extent of progress against outputs, objectives, and other indicators. Other feedback from monitoring and evaluation. Review of BSAP financing. Updated annual plan.	Co-ordinating unit	Steering committee Major implementing organisations. Major financing organisations. Other organisations closely associated with BSAP	Annually
Steering committee briefing papers	Summary reports on: Progress of activities, planning, financing, overall situation, etc from co-ordinating unit. Progress of activities within sectors represented by each steering committee member. Recommendations for updating the plan.	Co-ordinating unit & steering committee members	Steering committee members Co-ordinating unit	Every steering committee meeting

Annual Public Report	A summarised and accessible version of the full annual report.	Co-ordinating unit	All implementing organisations. All stakeholders. General public. International interest groups. Media.	Annually
Sector/ issue reports (as required)	Detailed expert reviews of key sectors or issues, as required by the co-ordinating unit, to include: Update and analysis of available information. Review of progress within the sector. Evaluation of progress/lessons learnt, etc. Recommendations for further action and updating the plan.	Technical advisors	Co-ordinating unit. Steering committee.	Annually (before production of annual reports)
Activity reports	Regular reports on progress of individual activities in the BSAP, based on annual reporting requirements and indicators of progress with the BSAP.	Implementing organisations	Co-ordinating unit. Steering committee. Financing organisations.	At least annually
CBD National Report	A modified version of the annual report, outlining progress in the national implementation of the articles of the CBD.	Co-ordinating unit & MNP	CBD Secretariat. Parties of the CBD.	Annually
International BSAP reports	There may be a need to produce reports specifically relating to the process of the BSAP implementation, for BSAP co-ordinating/ networking organisations. These will generally be based on the annual report.	Co-ordinating unit & relevant government agency	Other countries/ organisations planning and implementing BSAPs.	As required
Other international reports	It may be necessary to produce reports to other international conventions, agreements, organisations, etc relating to biodiversity conservation (e.g. Climate Change Convention, Ramsar, CITES, etc). These will be based on the annual report.	Co-ordinating unit & relevant national organisations	Relevant international organisation.	As required
Financing organisation reports	Each organisation financing any BSAP activity will require reports on progress, possibly in addition to annual and activity reports.	Recipient organisations &/or co-ordinating unit	Financing organisation.	As required
Final Report	A detailed review of the implementation of the BSAP, integrating the information from all previous reports. This should form the basis for the production of the new BSAP.	Co-ordinating unit with all stakeholders	All organisations involved in the BSAP.	Before five year period is completed

3.6 Implementation

Basic principles

As far as possible, general implementation structures should be:

- Based on existing structures
- As simple as possible.
- Efficient, in terms of resources required and personnel.
- Self-sustaining - using the above principles
- Reliant on internally generated long-term financial sources

3.6.1 Project Development and Management

The process of implementing the Biodiversity Strategy and Action Plan (BSAP) will involve the participation of numerous local, national and international organisations and agencies. However, the major responsible agency implementing the BSAP is the Ministry of Nature Protection.

Ministry of Nature Protection

The responsibilities of Ministry of Nature Protection in implementing the BSAP are:

- Co-ordination of BSAP development.
- Promotion of involvement of new organisations and institutions in the development process.
- Presentation of BSAP outcomes to the highest level state management entities (Ministries, Government, etc) and promoting their support.
- Establishment of appropriate links with potential implementing and funding organisations.
- Annual monitoring, evaluation and revision of the BSAP.
- Dissemination of information related to BSAP inside the country and abroad.

In order to properly organise the management of the BSAP implementation, it is suggested to the following units operate:

Steering Committee

The role of the Steering Committee is to oversee and co-ordinate the implementation and development of the BSAP. The Steering Committee will be composed of leading,

high-level officials from the Government, stakeholder organisations, businesses and scientific circles.

The objectives of BSAP Steering Committee are:

- To represent BSAP and its interest in high levels, within all sector of country's development.
-

The Steering Committee's activities will include:

- Monitoring of BSAP implementation through regular meetings.
- Co-ordination of BSAP implementation financial mechanisms.
- Promotion of BSAP implementation and planning at all levels.
- Determination and provision of BSAP implementation technical and human resources.

BSAP Co-ordinating Unit

This unit will be the agency responsible for BSAP implementation within the Ministry of Nature Protection.

The objective of the BSAP Co-ordination unit is:

- To organise, co-ordinate and monitor BSAP implementation.
-

The activities of the BSAP Co-ordinating unit will include:

- Finding resources for BSAP implementation, and encouragement of implementing agencies.
- Collection and dissemination of information on the BSAP.
- Planning of BSAP activities.
- Summarising and compiling reports, preparation of annual reports, and presentation to the Steering Committee on BSAP implementation progress.
- Regular preparation of national reports and their presentation to CBD Secretariat, with the approval of the Steering Committee.
- Revision of the BSAP Action Plan according to the current situation.

Technical Working Group

The Technical Working Group will be established within the Ministry of Nature Protection to support the BSAP Steering Committee the technical and practical development of the BSAP.

The main activities of the Technical Working Group will be focus on:

- Co-ordination with the Steering Committee in areas of information dissemination, report development and drafting the planning activities.
- Annual checking of project progress, identifying the completion of various phases, identifying the challenges, and make appropriate recommendations.
- Revision of the strategy, based on the existing situation.
- Identifying the priorities for different phases of project development.
- Organising and implementing the project monitoring, staff training, and if needed, designing the project reports and financing requests.