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Sectoral and Cross-Sectoral Integration of Biodiversity in Armenia

Contents

1. Introduction

Armenia reported[1] on agriculture; forestry; industry; fishing and fisheries; education; tourism and recreation; integration of biodiversity issues in other national strategies and projects, including Millennium Development Goals and Poverty Reduction Strategic Programs.

Description of the extent to which biodiversity has been integrated into sectoral and cross-sectoral strategies and plans (agriculture, forestry, industry, fishing, education, tourism)

The modern approaches to environmental protection presuppose the inclusion of biodiversity issues in the development plans and strategies of other spheres and fields of the economy of the country.

Agriculture, forestry, industry, power engineering and urban development are the main sectors influencing biodiversity, Furthermore, the first two have the most influence on the natural ecosystems and the flora and fauna.

For the last few years, the policies and strategies in the field of agriculture and forestry have improved significantly. Laws and political and strategic documents regulating those fields have been adopted, according to which a number of various projects are being implemented both by state finances and with the assistance of international donor organizations. Although the importance of environmental protection is mentioned in agriculture and forestry policies and other strategic documents, plans and laws, the lack of opportunities, means and commitment hinder the implementation of actions aimed at protection.

Furthermore, the absence of substantial progress in the application of environmental approaches in the practice of agriculture and forestry management has a negative impact both on the development of economy and on the health of the population. For example, the losses from soil erosion amount to tens of millions of dollars, and the contamination of drinking water with agricultural fertilizers and pesticides has a negative impact on the health of the population.

It is known that a lot of effort is needed to prevent the negative impact of agriculture and unsustainable forest use on the environment. The state of soil erosion conditioned by economic activity is aggravating year by year, and the efforts towards preserving soil fertility and combatting pests are limited to pilot projects and small-scale activities. Despite the positive trends of rising water use efficiency and decreasing salinization owing to the rehabilitation of irrigation and drainage systems, it is still difficult to assess their impact on the environment, including biodiversity. The results of the fight against illegal forest loggings aren't obvious either, although significant steps are being taken towards improving the situation.

[1] Armenia (2009). Fourth National Report to the Convention on Biological Diversity, Ministry of Nature Protection, Yerevan 2009, 78 pp.

2. Agriculture

For the last few decades, in the context of reducing state assistance to and subsidization of the field of agricultural, change of agriculture structure and management, as well as rising frequency of occurence of extraordinary climatic events, the negative impact of agriculture on the environment (including biodiversity) is more striking.

Land is the main resource of agricultural production, and it is obvious that land protection and rational and sustainable use of land resources have not only agricultural and environmental, but also general significance. Soil degradation has a direct impact on growth rates of agricultural production and the fertility of crops, hayfields and grasslands. In this connection, land protection and soil improvement is beneficial not only for raising agricultural productivity, but also for the environment in general.

The 2974.3 thousand hectares of total available land of the Republic is divided into the following land zones:

- semidesert - 236 thousand hectares,
- dry steppes - 242 thousand hectares,
- steppes - 797 thousand hectares,
- forests - 712 thousand hectares,
- mountainous meadows - 629 thousand hectares,
- outcrops of bed rocks, sands, waters and other areas - 358.3 thousand hectares.

The adverse influence of agricultural activity on the natural environment is especially reflected in the following phenomena: degradation of farmlands, soil erosion, salinization, overwetting, disturbance of the plant cover of natural grasslands, disappearance of many vascular plants, larger scales of pest infestation and diseases, wrong implementation of agricultural melioration, farming and cattle breeding, as well as contamination of soil, water and atmosphere as a result of land irrigation with industrial and domestic wastewaters.

Around 40% of the farmlands of the Republic is eroded. About 75% of total lands and more than 50-60% the arable land in mountainous areas is subject to the destructive influence of water streams.

Furthermore, water, wind and irrigation erosion inflict heavy losses on agriculture each year: eroded land gives 3-4 times less harvest as compared to uneroded land.

For the last few decades around 44.0% of the total land area and 20.3% of arable lands has faced different degrees of erosion. It usually includes Aragatsotn, Kotayq, Lori, Syuniq, and Vayots Dzor marzes of Armenia. The overgrazing of grasslands also contributes to erosion, as a result of which the area of natural grasslands is steadily declining.

The natural grasslands of Armenia have degraded substantially during the last two decades, since during the whole pasture period the livestock in the Republic is fed with natural fodder.

Because of low productivity and small quantity of livestock in today's farms, as well as due to the lack of finance, livestock grazing takes place mainly in near-village pastures, hence remote summer and alpine grasslands remain undeveloped.

The majority of community near-village pastures is currently overexploited and subjected to different types of degradation, from change of the plant cover to creation of erosion centres which are also a result of landslides and torrents. As a result of continuous inefficient use of natural grasslands and lack of attendance, a part of them (about 150 thousand hectares) has become useless. There is currently acceleration of water erosion and enlargement of marshes in the natural grasslands.

The difficulties of plant diversity conservation in grasslands are connected with the imperfection of the mechanisms of their management by local authorities and village dwellers, and the lack of means for carrying out monitoring and restoration activities.

The conservation of grasslands of particular importance to biodiversity must be focused on their regulated efficient use, development of new technologies, assessment and improvement of the ecological state of the grasslands, and wide use of local flora in the process of practical selection for getting new perennial fodder crops.

In Soviet times thousands of tons of mineral fertilizers and pesticides and about 1.8 tons of organic fertilizers were used in the fields of the country every year. As a result, agriculture created an ecologic pressure on the environment.

For the last 15 years the agriculture in the Republic is in the phase of extensive ploughing; there are almost no scientifically developed agroactivities. For the last decade, the use of mineral fertilizers has been reduced more than 10 times, and that of organic fertilizers - about 18 times. At the same time, according to the data from the National Statistical Service of the Republic of Armenia, the import of pesticides rises year by year, which results in additional soil and water contamination.

Table 1. Quantity of pesticides imported into the Armenia in 1999-2005

Import year	1999	2000	2001	2002	2003	2004	2005
Quantity of pesticides (tons)	144.12	216.9	247.5	160.91	273.7	364.1	540.1

Source: National Statistical Service of the Republic of Armenia

Protection of the Armenian lands is carried out in accordance with republic and regional programs. The owners/users of land have certain responsibilities in terms of land protection. Natural grasslands and pastures usually belong to the state; they are not subject to privatization and are managed by relevant state authorities.

The Land Code of Armenia (1991) clearly separates the responsibilities of the land users in the field of land protection. Land protection and its efficient use is carried out on the basis of state and regional land construction and environmental programs. The necessary actions for the protection of privatized lands are carried out by land users and owners at their own expense; state land conservation is carried out at the expense of the state (community) budget.

The inclusion of biodiversity issues in the field of agriculture is reflected in a number of founding documents and international and national projects. Thus, one of the goals of the "Agricultural Sustainable Development Strategy" of Armenia (2006) is the protection of the gene pool of agricultural plants (particularly crop wild relatives) and animals and the efficient use in selection, particularly:

- conservation of natural resources, restoration, sustainable use and improvement of management mechanisms of degraded grasslands,
- control of the quality and import of chemicals used in the field of agriculture, with a view to maintaining the ecological balance.

At the same time, the Agricultural Sustainable Development Strategy states that until the year 2015, the cultivated areas will reach 446.1 thousand hectares which will exceed the 2003-2005 index by 37.7%, and the cultivated areas, productivity and gross production of fruit, potato, grapes, vegetables and fodder and industrial plants will grow. Naturally, all this will be possible to realize with the help of modern agrotechnology which supposes a growth in the use of fertilizers and chemical means of plant protection. As a result, until 2015 the volumes of pesticide and chemical fertilizer use can reach the Soviet index, which can bring about serious and radical changes in natural ecosystems and in the structure of biodiversity.

The following are among the tasks of the "Food security programme in Armenia" (2005):

- to ensure the efficient management and use of agricultural genetic diversity and of fodder plants and domestic animals in particular, □ to ensure a lower reduction and degradation rate of natural habitats,
- to ensure the assessment, monitoring and restoration of agrobiodiversity, particularly fodder plants and domestic animals.

Similar issues are stipulated in the "Food safety programme in Armenia", that is, efficient management and use, as well as assessment, monitoring and restoration of crop diversity and in particular fodder plants, crop wild relatives, and domestic animals.

In order to promote the protection of natural habitats of valuable fodder plants, the implementation of the following activities has been stipulated by Resolution N880 of the Government of Armenia (2005):

- assessment of the state of grasslands and registration of species,

- improvement measures, rehabilitation of irrigation systems,
- improvement of legislation, development of local management plans,
- development of criteria for assessment of values and efficiency of biodiversity.

Agrobiodiversity management issues. As may be seen from the above mentioned founding documents, the issues of the conservation and rational use of agrobiodiversity as an important component of genetic resources is given high importance in agricultural strategies. The efficient management of agrobiodiversity is in the focus of two fields, agriculture and nature protection, and is a vivid example for the development of inter-sector joint policy and cooperation.

Since agrobiodiversity management includes the tasks of the conservation, study and use of resources, the components of agrobiodiversity management are under the supervision of different departments. Agrobiodiversity conservation in natural habitats is regulated by the Ministry of Nature Protection, which is at the same time the coordinator of the Convention on Biological Diversity.

The conservation of agrobiodiversity in gene banks and separate seed and animal collections, its use with the aims of selection, as well as the issues of the conservation and restoration of biodiversity of natural grasslands and pastures are coordinated by the Ministry of Agriculture, which is also the coordinator of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

The scientific-research work on agrobiodiversity issues in Armenia is financed by the Ministry of Education and Science, in accordance with the assessment of independent experts and taking into account the development priorities of each field.

On the principles of base financing, Armenian National Academy of Sciences contributes to the comprehensive research and conservation work on agrobiodiversity, which is implemented in scientific institutions under the control of the NAS.

In order to prevent the potential threats to agrobiodiversity, a number of activities are being developed and implemented in the country, which aim at improving environmental protection and the sustainable use of natural resources. In particular, during the last 5-10 years the legal framework of the sphere has been improved: a number of laws have been amended and adopted, including the Law “On specially protected nature areas” (2006), the Forest Code (2005), the Law “On plant protection and plant quarantine” (2006) and a number of by-laws. The main objective of the development and improvement of legislative documents is their harmonization with the criteria of international legislation and their approximation with international legislation.

The issues of agrobiodiversity conservation and its sustainable use are currently in the focus of the attention of a number of multi-party and two-party projects and initiatives. For the last few years Armenia has participated in a number of initiatives of international organizations and donor countries, expanding international cooperation in the field of nature protection and particularly in biodiversity conservation.

The issues of international agreement ratification and membership in international or regional conventions pass an obligatory phase of discussion and agreement with relevant departments. In terms of the conservation of plant genetic resources the recent participation of Armenia in several international conventions and treaties is worth mentioning: in particular, the "International Plant Protection Convention" (2006), within the framework of which the Law "On plant protection and plant quarantine" is being approximated to international standards for phytosanitary measures and CoE regulations, and elimination of discrepancies between international and national criteria is being carried out, as well as the "International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)" (2007), which is aimed at the creation of a comprehensive system of availability of genetic resources of plants used for food production and agriculture management and ensuring the protection of the rights of farmers.

Armenia has been member of the "European Cooperative Programme for Plant Genetic Resources" (ECPGR) since 2007. Within the framework of the programme, inventorization, assessment and database creation is being carried out for collections of plant genetic resources, which contributes to conservation of agrobiodiversity, information sharing on existing resources, and raising efficiency of selection activity.

At the moment the "2008-2012 National programme of self-sufficiency with agriculture development main crops" is being developed. The issues of efficient conservation and sustainable use of food and plant genetic resources (in seeds gene banks and field collections) are supposed to be included into the programme.

- With the support of the Food and Agriculture Organization, the Ministry of Agriculture implemented the "Creation of national information sharing mechanism on Plant Genetic Resources for Food and Agriculture (PGRFA) and preparation of a national report on the state of PGRFA" program in 2008. The aim of the program is to create a national information sharing mechanism, ensuring the availability of information on PGRFA management, the participation of all the interest parties by data collection, granting and analysis, and to prepare the second national report on the state of plant genetic resources. The Armenian and English versions of the report have been uploaded to the website www.pgrfa.org/gpa/arm. A database has also been created (in Armenian and English) which contains data on:

  - Organizations engaged in PGRFA conservation and use and people involved in the field,
  - projects, publications, laws, Government resolutions, scientific and educational articles, books, as well as international, regional and national treaties in the field of PGRFA conservation and use,
  - variaties of crops cultivated in the Republic, existing ex situ colletions, preserved samples,
  - information systems applied in the country, etc.

Measures for the solution of problems. In countries with transition economy like Armenia, substantial improvements of agriculture management are needed in order to ensure a stable resource base. In this connection, from the environmental point of view, the primary issues in the field of agriculture are:

- sustainable management of lands and conservation of their fertility,
- decrease and prevention of soil degradation, implementation of anti-erosion ameliorative actions to that end, definition of principles of privatized farmland consolidation,
- introduction of a land monitoring system, creation of Geographic Information Systems (GIS) based on modern technologies and with the application of monitoring criteria,
- passing of authorizations in the field of remote grassland management on to intercommunity unions, with a view to preventing their degradation, biodiversity conservation and ensuring the use of remote pastures by all the communities,
- development of a national strategy and national program on genetic resources for agrobiodiversity and particularly for food and agriculture,
- efficient coordination of activities in the field of agrobiodiversity conservation, use and information sharing: an interdepartmental committee for plant genetic resources for agriculture and food safety was created in 2005; its aim is to coordinate the development of national programs and strategies in the field of plant genetic resources conservation. At the moment the Committee needs functional enhancement and expanding of the scope of activities,
- clear separation of functions and responsibilities of structures in the field of protection on different state levels,
- creation of comprehensive national databases,
- close cooperation between institutions involved in the field on national, regional and international levels,
- creation of information sharing mechanisms between institutions involved in the field,
- development of a strategy regulating the delivery of agrobiodiversity samples and genetic plasma and profit sharing.

Sustainable management of grasslands and water stream formation zones, development of organic agriculture and reduction in greenhouse gas emissions are also included in this list.

3. Forestry

Forests have their own place and role among the rich vegetation communities in Armenia. Armenia is a mountainous country for which the soil-protecting, water-protecting and climate-regulating properties of forests are invaluable.

According to official data, the average yield class of the forests of Armenia is 3.6 bonitets, the average integrity is 0.55, and average timber stock is ~ 125m3/hectare, average annual growth is ~1.3 m3/hectare. By volume, there is about 12 m3 live timber per person in the Republic.

The forested areas of Armenia have been reduced almost by half for the last century due to anthropogenic factors. The vertical borders of forests have also been changed. As a result of grazing, haying and irregular logging the upper forest zone has gone down from its natural borders by 100-500 meters and been replaced by subalpine and sometimes mountainous meadows. The same phenomenon is observed in the lower forest zone; the main reason is the enlargement of arable land and spring pastures at the expense of forests. The pressure of the impact of anthropogenic factors is higher especially in thickly populated areas. As a result, losing the natural borders of vertical distribution, the forests border mountain slopes in thin belts.

A large area of forests was overlogged in 1930-1950 for industrial needs and annihilated in 1990s as a result of the economic and energy crisis, disturbing the ecological balance of the environment.

At present around 70% of the natural forests of Armenia is old and disintegrated. 36% (13.5 million m3) of the overall timber stock is located in mature and old forests. The latters are located in areas which are relatively difficult to access. Here there is a need to combine forest exploitation with increase in economic efficiency of forests and implementation of ecological activities. According to the latest data of forest survey (1993), the total stock of timber of forest resources is 41.74 million m3, and annual growth is 354 thousand m3.

In the farms of the state system carrying out forestry management there are 300 hectares of nursery forests (out of which 192 is irrigable) which are in a very unfavorable state. A considerable part of its does not operate; as for the rest, only 15-20% of their capacity is used. The variety of the seedlings has also been reduced (not more than 10-12 varieties).

Irregular forest use harms the forests of Armenia greatly, having at the same time a negative impact on the other fields of forestry management. Due of different social reasons as well as high demand for timber, there are still illegal loggings going on which sometimes exceed the volumes of legal loggings.

On the other hand, during trade loggings economically more valuable trees are usually stored as timber, threatening the quality of the forests. Forest biodiversity has reduced greatly, natural habitats have been damaged, and a number of rare, endemic and relict species have become threatened.

Deep structural changes have taken place in the forests: they have lost their ability to reproduce naturally, productivity has dropped, erosion is more active and the hydrological regime has been disturbed which in its turn has brought about a rise in the probability of landslides and torrents.

Consequently, the solution to the problem of conservation, protection, reproduction and sustainable use of the forests of Armenia is an important priority for the socio-economic development of the

Republic and demands improvement of the legislation regulating the field and scientifically sound forestry management.

Policy in the field of forestry, national and international projects. With the aim of sustainable management, conservation and protection of the forests of Armenia, as well as for the solution of the economic, social and ecological problems of the forests, serious steps have been taken towards the development of strategic documents. Not only the relevant department, but also all the interested organizations related to the field participate in the development of policies and national programs in the field of forestry, which ensures the involvement of issues of sectoral character.

- In the "Biodiversity Strategy and Action Plan of the Republic of Armenia" (BSAP) the "Conservation and restoration of landscapes and ecosystems" action has been accepted as a national target. It includes the following activities:

- to conserve and restore the main forest ecosystems, especially the forests destroyed in the period 1990-1995,

- to rehabilitate the forests rich in rare and economically valuable species, ensuring the process of their natural reproduction,

- to promote the sustainable use of forest resources,

- to restore the degraded landscapes and the biodiversity of the areas damaged by economic activity,

- to create mechanisms of restoration of forest resources and reduction of impact on forests.

- The "National Forest Policy and Strategy of the Republic of Armenia" (2003) was developed in 2003, with the support of the grant program of the Swedish International Development Cooperation Agency (SIDA) and within the framework of the forest management component "Natural resource management and poverty reduction program".

The aim of the National Forest Policy and Strategy of the Republic of Armenia is to ensure the restoration and sustainable use of degraded forest ecosystems and the development of useful qualities of forests.

The main tasks of the National Forest Policy are:

- legislation and institutional issues,

- economic and financial issues and illegal activities,

- environment and biodiversity,

- forest management,

- education, science, training, information and international contacts,

- social issues.

- The main aim of the “Action Plan for Mitigating Actions to help address the Problems associated with Illegal logging” (protocol decision N38 of the Government of Armenia session of September 30, 2004) is to reduce the volume of illegal loggings while keeping economic and social aspect in focus.

Since the majority of illegal loggings is conditioned by the poverty of rural population, the program of illegal logging prevention will be based on actions aimed at reducing poverty. In case of successful implementation of all the components of the program, the pressure on forests will reduce greatly, contributing to the conservation and sustainable use of forest ecosystems and biodiversity.

- The “National Forest Program of the Republic of Armenia” (Resolution N 1232-N of July 21 2005 of the Government of Armenia) contributes to the sustainable management of forests, as well as to raising the economic, social and environmental role of forests. The main tasks of the National program are:

– conservation and protection of forest ecosystems,

– rehabilitation of degraded forests,

– sustainable and continuous use of forest resources,

– ensuring the sustainable management strategy of forests.

The biodiversity conservation component of the National Forest Program envisages activities both implemented by separate departments and coordinated by several departments. For example, the necessity of forest science development is mentioned in the list of activities; without it, sustainable forest management and rational use is hard to imagine; the latters are indirectly related to conservation of forest biodiversity.

A National Coordinating Council has been created aimed at the successful implementation of the National Forest Program. The Council includes the following main beneficiaries: Ministries of Agriculture, Nature Protection, Finance, Economy, Territorial Administration of Armenia, as well as scientific and non-governmental organizations functioning in the field, international donor organizations, etc.

- Within the framework of the “Natural Resource Management and Poverty Reduction project” the development of participatory management plans of “Sevan” and “Dilijan” national parks, mapping of national parks, inventorization of components of biodiversity and introduction of a system of biodiversity monitoring has been carried out.

Within the framework of the “Sustainable forest management” component, different activities aimed at forest management and use have been carried out.

As a result of inter-sector cooperation, several steps have been taken in the fields of organization of training courses, capacity development and raising of public awareness. Thus, a number of training

courses have been organized in the Ijevan forest enterprise, mainly aimed at forest inventorization, taxation, application of new information technologies and management issued.

With the financing of the partnership fund formed within the framework of the project "Food production growth" of the Japanese Government, "Hayantar" SNCO carried out afforestation and fencing work in different marzes of the Republic (Lori, Tavoush, Syunik, Kotayk, and Shirak) and in Yerevan in 2006.

The "Community-based Forest Management in Armenia" project is being implemented with the grants from the Government of Norway and with the support of the "Norwegian Forestry Group" (NFG). Three pilot communities have been chosen in Lori and Tavoush marzes (Lernapat, Margahovit and Koghb) where work is being carried out aimed at community capacity development in forest management, afforestation and other activities.

The activities implemented and envisaged within the framework of the above mentioned projects contribute to the rehabilitation of degraded forests, growth of forested areas, raise of the productivity of forest lands, improvement of the state of biodiversity, improvement of environmental qualities and sustainable forest management.

Table 2. The Goals, Expected Results and Assessment Criteria of Forestry Projects Implemented by State Budget

#	GOALS	ACTIVITIES	RESULTS	ASSESSMENT CRITERIA
1	Ensure efficient conservation of Armenia's state forest resources (360 thousand hectares).	Protection of forests from illegal loggings, grazing, pollution and land takeover; Anti-fire capacity development.	Reduction in the number of violations of forest use rules and fire prevention on an area of 360 000 hectares of forests.	Increased efficiency of discovery of forest use violations. Increased efficiency of anti-fire measures.
2	Ensure the efficient protection of the Armenia's state forest resources from disease and pests.	Study of forest pests and diseases. Development of integrated approaches to forest protection. Pest infestation and disease outbreak prevention.	Forests free of pests and diseases	Increased efficiency of forest protection. Data on pest and disease occurrence on Armenia's forest resources and the damage caused by them. Reduction in the occurrence of pests and diseases.
3	Ensure the rehabilitation of overlogged and degraded forests of the Armenia's state forest resources.	Organization of forest rehabilitation, biodiversity conservation in forest ecosystems. Development of seed and seedplot economies. Promotion of the natural rehabilitation of forests.	Rehabilitated forest areas	Enlargement of forested areas. Increased productivity of forests. Ensuring establishment of seedlings and saplings. Prevention of erosions, landslides and desertification.
4	Ensure sustainable management of the Armenia's state forest resources.	Monitoring of the forest resources. Inventorization of forest resources. Development of afforestation projects.	Sustainable management of the forests in Armenia.	Inventorization of forest resources. Development of afforestation projects for forest resources.
5	Improvement of forest legislation.	Development of legal acts regulating the field of forests.	Laws, by-laws, normative documents regulating the field of forests.	Developed and adopted legal acts. Developed and adopted normative documents.
6	Improvement of the structure of state forest institutions.	Restructuring of state forest institutions, clear role distribution.	Restructured state institutions realizing sustainable forest	Founded and restructured forest enterprises.

			management.	

Barriers to the development of the field. During the last few years serious steps have been taken by the Ministry of Agriculture in the field of forest rehabilitation. The volumes of support to sprout regrowth, natural regrowth of forests, as well as founding of forest cultures have risen dramatically. “Hayantar” SNCO and international donor organizations are carrying out treeplanting and forest protection activities. Combat against illegal tree logging has been enhanced considerably.

Nevertheless, despite certain progress there are still problems in the forest management sphere in the Republic which requires immediate solution. Among those are:

- frequent structural changes in the field,
- unclear separation of management system functions between beneficiary structures, necessity to broaden the scope of authorizations of local authorities and to clarify their obligations,
- insufficient participation of the communities in the forestry management process,
- low public awareness about the functions of the forestry management field,
- small number of activities in the forest sector development projects directly aimed at forest biodiversity conservation,
- insufficient quantity of scientific-research work about forest conservation and protection,
- lack of specialists, especially in the fields of management, afforestation, forest rehabilitation and reproduction (the majority of the specialists are elderly people; there is a lack of young specialists due to the absence of adequate specializations in higher educational institutions, except for the preparation of forest specialists by the silvics chair of the Armenian Agricultural Academy for the last few years. The infrequency of training and qualification courses due to the lack of finance),
- lack of scientific and technical means and equipment, as well as a laboratory facilities necessary for afforestation and forestry management,
- There are violations of the forest legislation not only in the forests of general use, but also in the forests which are included into the list of specially protected areas.

There is still no mechanism of data granting and sharing about the violations of forest legislation and the current situation.

4. Industry

The current decline in the industry production volumes is an important factor for the improvement of the environmental situation in Armenia, although the direct negative impact of man on ecosystems and biodiversity has obviously increased.

At present mine exploitation and mining industry are the sectors of industry having the most negative impact on biodiversity.

Having a relatively small area, the Republic of Armenia is rich in minerals. By 2007, 579 mines of solid minerals have been registered, including 26 metals, out of which 13 are being exploited, and 553 non-metals, out of which 238 are being exploited.

The lands degraded as a result of extraction of metals and non-metals are located in 281 communities of the Republic. According to the data of the 1978-1998 inventorization, there are 640 sites of degraded lands with a total area of 7530.0 hectares, out of which 3780 hectares used to be farmlands before degradation. Mining has been concluded on 3037 hectares of degraded lands, and they are being recultivated for further use, and 4493.0 hectares are still being exploited.

The possibility of diverse impact on the environment and especially on forest ecosystems by open mining is expected, for example, during the exploitation of the Lori region Teghout copper-molybdenum mine, where, according to the confirmed project, forests containing valuable, rare and endemic plant and animal species will be logged. The construction and exploitation of the Teghout copper-molybdenum concentration plant and the industrial waste accumulated in tailing pits will result in environmental pollution, with typical consequences thereof.

In mountainous areas mining companies are a source of soil pollution; they pollute the soil with heavy metals and chemical compounds. Mining activities occupies about 9700 hectares in Armenia, out of which 8300 are degraded lands, and 1400 hectares are under tailing pits. The volume of accumulated industrial wastes is several hundred million m3. During 1996 only, about 300 thousand m3 industrial wastes have been left from non-metallurgic mines.

The territory of the Alaverdi copper-molybdenum factory in a radius of 3 kilometers is contaminated with heavy metals,the concentration of which exceeds the maximum permissible level 20-40 times.

The areas near the Ararat Gold Recovery factory are also contaminated with heavy metals.

There are similar companies is Kajaran, Kapan, Meghri, Agarak, where the nearby territory is also contaminated with heavy metals (there are no statistic data). Chemical industry pollutes the soil with persistent organic pollutants – polychlorobiphenyl, and cement factories – with dioxine, oil products and other harmful substances.

Since 2003 about 300 million m3 wastewaters are produced in Armenia yearly, out of which 60% flows into open reservoirs without any cleaning whatsoever, and the remained 40% is cleaned mechanically.

The wastewaters from the Lake Sevan basin flow into the Sevan without any cleaning. The main sectors of industry in the Lake Sevan basin used to be mechanical engineering, food industry, light industry and timber industry. At present these sectors are either idle, or work with low capacity.

Nevertheless, corrosive elements such as chlorine, sulphates, nitrogen, oil products, phosphates, iron and copper, go right into the lake through channels which are never cleaned.

On the basis of the assessment of accumulation, disposal and cleaning of industrial and solid wastes, the Gegharkunik region development project has included proposals about the construction of economic-domestic and industrial wastewater purification stations, as well as solid waste recycling stations.

In the absence of purification stations, there has been no reduction in the level or volumes of external impact on biodiversity.

"Environmental impact monitoring centre" SNCO of the Ministry of Nature Protection carries out periodical monitoring of water quality from more than 40 rivers in Armenia each year.

Environmental impact assessment in Armenia is carried out by "State Environmental Expertise" SNCO functioning in the Ministry of Nature Protection, in accordance with the Law "On Environmental impact assessment". An instance of environmental impact assessment in the specially protected nature areas is the ban on the construction of a gold mining factory in Sotk. The Ararat Gold Recovery Company started the process of construction of the Sotk gold mining factory in 2004; it was to replace the factory in Ararat marz. The suggestion was presented to the Ministry of Nature Protection in order to assess the environmental impact of the project. The project was turned down as a result of independent expert examination.

"Environmental Survival" NGO has implemented the "Reduction of negative impact of tanning industry on the ecosystem of the river Hrazdan" sub-project, within the framework of which they studied the waterworld of the river Hrazdan, assessed the impact of the industrial enterprises on the biodiversity of the river and reconstructed a purification station for "Kashi" CJSC.

On the whole, the impact of industry on biodiversity is as follows:

- open mining causes loss of habitats of plant and animal species, disintegration of populations, degradation of lands and landscapes,
- soil, water and atmosphere pollution through emissions and leakage disturbs the species composition of biodiversity, the natural course of development of species and populations and the ecosystem balance,
- the creation of piles or tailing pits of industrial wastes, including wastes generated by minerals extraction and exploitation, concentration, metallurgical and other recycling industry, expands the area of degraded land, aggravates the degradation of landscapes and biodiversity, the exogenic processes, etc.

5. Fishing and Fisheries

Lake Sevan has been, and remains, the main center of Armenian fishery. Fish industry was on a high level in Armenia until the 90s. The fish reserves were managed in Lake Sevan on the basis of scientific

research, while in separate fish-breeding farms in Gegharkunik Marz the fish gene pool was preserved by incubation and other valuable fish species were bred as fish products (rainbow trout, silver carp, crucian carp, etc). The quantities of fish products satisfied the demand not only in Armenia but also in neighboring countries.

Since the 90s, as a result of the economic crisis, the stable functioning of the fish-breeding farms and the regular functioning of fish industry has been interrupted. Nowadays there is a rupture of trade fish reserves in Lake Sevan due to non-effective management of fish reserves.

Although fish-breeding farms have been developing rapidly in Armenia for the last few years, the fish product produced this way is considerably more expensive and is not reasonable for every walk of life. Since the price of fish produced in these farms depends on imported food, as well as the prices of used water and electricity, the gradual rise of fish price is inevitable.

There are currently 6 fish-breeding farms in Armenia: Jermuk, Angeghakot, Sevan, Lichk, Karchaghbyur and Kamo, which engage in artificial reproduction of salmonids in order to replenish their stock. All the farms except for the first two are in the Lake Sevan basin.

Thus, the efficiency of fish-breeding in the Sevan basin reduces year by year and requires efficient measures and radical reconstruction not only to improve the biotechnology of breeding, but also in terms of fish stock conservation and regulation of fish catch in the lake.

Trade trout-breeding was not developed enough in Armenia for a long time. The reason was mainly the absence of high-quality and valuable fish food, as well as the uncertainty of competitiveness of the trout with the Sevan trout and the whitefish.

Until recently, there were several rainbow trout breeding farms – Aknalich farm in Armavir, Angeghakot farm in Syunik region, and the farms in Jermuk, Masis and Hrazdan.

The largest of them was the Aknalich farm which was founded in 1966. Its capacity was 300-350 tons of trout per year. Today, a lot of farms have been divided into smaller ones after privatization, and the calculation of their capacity and production has become very difficult.

As for the crucian carp farms, the largest ones are those in Armash and Yeghegnadzor. The designed capacity of the Armash farm used to be several thousands of tons per year. However, nowadays the yearly output of these farms is only 400-500 tons of carp and silver carp.

Although the Armenian legislation prohibits the voluntary introduction of alien species, a number of introduced species are being bred in farms today, the influence of which on the fish world of the country needs to be studied.

6. Education

Armenia is one of the countries of the UN EEC area which has expressed his readiness to be integrated into the European educational processes, and is the only country in South Caucasus where the Law “On

Environmental Education" has been functioning since 2001; in accordance with the main principles of the law, the system of continuous environmental education has been formed in the Republic of Armenia. The Law regulates the principles and the legal, organizational and financial and economic grounds of the state policy in the field of environmental education of the population. Nevertheless, a number of by-laws regulating the field which are necessary for the implementation of the law and by which the mechanisms of environmental education in educational institutions have to be defined, have not been developed and adopted yet. Taking into account the fact that the practical efficiency of the law is still low, it is necessary to study and analyze the reasons for it, reviewing the issue in the context of improvement of the whole educational system and at the same time taking into account the peculiarities of the field of environment. The point is that environmental education has to serve not only for education and awareness, but also, which is extremely important nowadays, for preparation of specialists.

The system of environmental education in Armenia includes the following levels: pre-school, secondary, specialized secondary, higher vocational, post-graduate and public.

The environmental education and training system is managed by the competent authorities of the Government of Armenia such as Ministries of Nature Protection and Education and Science. The main tasks of the above mentioned authorities in the field is the development of a unified educational policy, creation of scientific-educational and methodological grounds for its application, staffing, information supply and financial security, environmental education and training on all the levels of secondary education and regulations of the legal framework. Nevertheless, there is still a lack of harmonized application of the principles of the law, which is conditioned by the non-efficient cooperation of state competent authorities of the environmental education system.

Regardless of certain positive trends, environmental education is still a secondary issue on the secondary education level. There are no subjects about nature in elementary school. As for middle and high schools, there are only a few subjects with the help of which pupils get acquainted with environmental issues, which are however allotted very little time by the syllabus; this hinders the implementation of adequate environmental education and training. The subjects "Nature", "Natural science", "Geography" and "Biology" are particularly of environmental significance; with the help of those pupils get some knowledge about the environment.

Higher vocational environmental education can be received in almost all the state and several private higher educational institutions in Armenia. The educational process is based on modern environmental subject selection and software, staffing and methodology. This situation is typical of mainly state higher educational institutions, where for the last few years there is modernisation of syllabi of environmental education, harmonization of the specialization process with international requirements, creation of new chairs of ecology and assistance to student scientific-research activity.

The environmental education and training of different walks of life is one of the strategic priorities of the environmental policy of the 21st century. It is aimed at raising environmental knowledge and

awareness, as well as environmental culture and aesthetics of different walks of life (both with vocational training and without it), organization of activities in congruence with the nature, and raising social activeness. It is implemented mainly by environmental NGOs. Their educational-training activity aimed at the formation of environmental ideology of the young generation, and the recognition and protection of the nature and its cultural/spiritual heritage is more praiseworthy.

The activity of the Aarhus Center in Armenia, as well as its regional infrastructures contribute to the organization of public environmental education. However, there is still no clear mechanism of environmental information granting, and the ways of granting are limited. The society is often not aware of the principle of information availability. The opportunities provided by modern information technologies are not fully used.

7. Tourism and Recreation

Tourism has real potential for getting substantial benefit from biodiversity conservation and sustainable use of natural resources, but at the same time its quick and sometimes uncontrollable growth can cause serious environmental degradation. On the one hand, the rich bioresources and the favorable natural and climatic factors attract tourists, but on the other, success in this field can bring about quick degradation of the environment, reducing the main precondition of its very success - the attractiveness of the site.

The positive impact of sustainable tourism on biodiversity conservation can be manifested only if the local communities have immediate benefit from the development of tourism, which in its turn will raise the responsibility of the communities in environmental protection. Besides, sustainable tourism can contribute to raising the educational level of the population, raising awareness about the benefits of natural ecosystems and natural resources.

The reasons for the negative impact of unregulated tourism and recreation on the biodiversity of Armenia are:

- direct use of land resources: construction of houses, buildings and infrastructures, which causes soil erosion and loss of biodiversity,
- forest logging, disturbance of water balance of forests, change of quality and quantity of products and services delivered by forest ecosystems,
- increase of consumption of ground waters, contamination of water shores and water objects, eutrophication, presence of malignant bacteria in waters,
- pollution of areas with domestic waste,
- recreational trampling of the plant cover, unregulated gathering of plants, their parts and their fruit, fishing, hunting, troubles to animals, and abandonment of habitats by animals, as well as invasion of alien species.

This impact is mainly conditioned by wrong planning of activity, irresponsible conduct of tourists and tourism operators, and lack of knowledge and awareness about the negative impact.

Nowadays, there is a rising demand in the world tourism market for those tourism products which are maximally close to natural conditions and are in close contact with wild nature. These include ecotourism, including tourism in protected areas, agrarian (or rural) tourism, scientific tourism, all the types of adventure tourism, etc. In Armenia, where on a relatively small area one can find a number of natural and tens of thousands of historic-cultural monuments (ancient petroglyphs, pagan and medieval temples, rich flora and fauna), as well as highly qualified specialists, there are undoubtedly real perspectives for the development of ecotourism. However, the Law "On Tourism and Touristic Activities" (2004) does not define the tourism priorities for Armenia, and the peculiarities of different types of tourism and their modes of development are not separated.

In this connection it is important to carry out an assessment of the perspectives and needs of development of tourism and the field of recreation, and the natural resources having economic and environmental value. In particular, it is necessary to carry out:

- analysis of legislation in the field of environment and improvement of the legal framework related to tourism and recreation,
- development of mechanisms of fair and equitable sharing of the benefits arising out of tourism and recreation activity, stressing the role of local population,
- development of mechanisms to enhance the participation of local population in different aspects of tourism and recreation activity (decision making, project development, implementation and monitoring),
- analysis of the present state of tourism and recreation infrastructures, assessment of advantages and needs,
- development of infrastructures (visitor centers, marked paths, mountain huts, separate sites for garbage, tent stations, etc), taking into account their harmony with the natural landscapes and ecosystems,
- assessment of human resources and specialized staff in the field of tourism and recreation and creation of preconditions for development,
- study of modern methodology of tourism advertisement and marketing, selection of localized methods for the country,
- cooperation and exchange of experience between specialists in natural heritage and tourist businesses,

- preparation of methodological guides: regulations, codes of ethics, booklets about natural heritage, etc.

8. Integration of biodiversity issues in other national strategies and projects

The majority of the processes in the country more or less include the principles of the Convention on Biological Diversity.

Thus, the "Concept on Sustainable Development" gives the following definition of development: "Sustainable development is a development which guarantees maximum starting adequate conditions for present and future generations in order to make use of their capabilities and support livelihood.

Sustainable development is based on economy which in a society protecting human rights is combined with the principles of environmental security and social justice". One of the objectives of sustainable development is "transition to sustainable and balanced use of nature, where all the components of the impact of man on the nature are agreed with the ability of natural systems to bear anthropogenic pressure". One of the main global principles of this aspect of the Concept comes to the necessity to conserve biological and landscape diversity. Furthermore, for that purpose, there are proposals to take measures aimed at the sustainable use and in-situ and ex-situ conservation.

The Concept also discusses issues about the legislation in the country in the context of sustainable development, improvement of the system of ecological monitoring, eco-audit and eco-certification, and formation of national and local environmental funds. It mentions that the proposed sustainable environmental development strategic goals are based on international principles.

"Ensuring environmental sustainability" is one of the goals of the "Millennium Development Goals" (Goal N7). It gives the analysis of the situation and the adopted policy, and mentions the peculiarities of the environmental situation in Armenia and the reasons for deterioration. Biodiversity conservation is reviewed in the context of the improvement of management mechanisms of the specially protected nature areas, creation of new specially protected areas, as well as conservation and restoration of the forest gene pool. However, the goals in the above mentioned document are very general; nonetheless, it is important that the issue of biodiversity conservation be considered a priority for the country.

By joint effort of the Government and the civil society, the Poverty Reduction Strategic Program (PRSP) was adopted in 2003, where the overexploitation of natural resources and the problems of the Lake Sevan are mentioned as serious environment problems. The problems of forest resources degradation and forest rehabilitation are given a lot of attention. The PRSP puts forward a number of suggestions directed at the improvement of the field of environment. The second PRSP for 2008-2015 has been renamed "2008-2021 Sustainable Development Program of Armenia" (SDP), proceeding from the current situation of the country . The main goal of this paper is to ensure high speed of economic growth and to distribute the benefits to poor and vulnerable groups by social projects. It is noteworthy that the PRSP-2 also refers to the role of forests in biodiversity conservation. Realizing the requirements of the PRSP, the Government hopes that it will be able to eradicate mass poverty and improve living

standards by 2015. In this context, Armenia has made a Millennium Development Goals report, the 7th goal of which, among other targets, refers to sustainable use of water supply, forest rehabilitation and prevention of desertification.

The “Environment for Europe” process made decisions in 1998 in Aarhus about satisfying the requirements of newly independent states. The need for a strategy adopted to the sustainable development requirements for Eastern Europe, Caucasus and Central Asia (EECCA) was mentioned on the initiative of Ministers of Environmental Protection (Hague, 2002) and was supported in the World Summit on Sustainable Development (Johannesburg, 2002) by the declaration of East-West cooperation on Environmental Issues. An environmental strategy for the EECCA countries was developed and adopted in Kiev; one of its central goals is the sustainable management of natural resources. It includes the issue of “Biodiversity conservation and ecosystems protection”; the activities targeted at the solution of this issue are very up-to-date for Armenia.

However, it should be noted that the awareness of the main principles and provisions of the above mentioned global process and their importance and the possibilities of their implementation for our country are not yet included in the scope of interests of structures functioning on different levels, which does not contribute to the creation of integrated links and partnership initiatives between the representatives of the Government, businesses, local communities and NGOs, in order to slow down the speed of biodiversity loss and anthropogenic influence.