

*Status Review of the Biodiversity Conservation in the Caucasus:
Achieving C2010 Goals
(Georgia)*

1. Nature conditions

a. Climate and orographical conditions

Georgia covers an area of 69,500 square km, between 40' and 47' latitude east, and 42' and 44' longitude north. It is located on the southern slopes of Great Caucasus Mountain Range, on the isthmus between the Black and Caspian Seas. The land rises from sea level at the Black Sea, to approximately 5,184 meters above sea level (m.a.s.l.) at Mount Shkhara in the Caucasus. Two thirds of the country is mountainous - the average height is 1200 meters a.s.l.

The country has a diverse landscape. Mountains dominate the northern, central and southern parts of the country; the Great Caucasus in the north, the Likhi range in the central part and the lesser Caucasus in the south. To the west, the Kolkheti lowland plains extend to the Black Sea, and the Iberia Plains in the east open to the Caspian basin.

The climate of Georgia is similarly diverse; West Georgia is characterised by a relatively humid subtropical climate. East Georgia has a drier, moderately humid climate.

b. Biogeographic zones and main biomes

The climatic differences of east and west Georgia account for a major contrast in ecosystem diversity, and vertical zonation between the two areas. West Georgia has five major biome zones that can be identified, but is notably lacking in arid and semi-arid treeless areas. The biome zones are:

- 1 Forest (coastal plane – 1,900 m.a.s.l.)
- 2 Subalpine zone (1,900 – 2,500 m.a.s.l.)
- 3 Alpine zone (2,500 – 3,000 m.a.s.l.)
- 4 Subnival zone (3,000 – 3,600 m.a.s.l.)
- 5 Nival zone (> 3,600 m.a.s.l.)

The biome zones of eastern Georgia are more complex, however six major zones can be identified:

- 1 Semi-deserts, steppe and arid light woodlands (150– 600 m.a.s.l.)
- 2 Forest (600– 1,900 m.a.s.l.)
- 3 Subalpine zone (1,900– 2,500 m.a.s.l.)
- 4 Alpine (2,500– 3,000 m.a.s.l.)
- 5 Subnival (3,000 – 3,700 m.a.s.l.)
- 6 Nival zone (> 3,700).

Within these biomes, the diversity of habitat types is also remarkable. The ecologically and biogeographically distinct vegetation of the Kolkheti forest refugium is especially noteworthy in terms of species composition, as are the limestone and high mountain vegetation complexes. The following sections give a brief description of the biomes listed above, with their associated habitat types.

Flood plane forest biome

In eastern Georgia flood plane forests are only found along the rivers Mtkvari, Alazani, Iori and downstream Ktsia. These forests are dominated by oak (*Quercus pedunculiflora*) and poplar (*Populus canesaeus*, *Populus hybrida*), and are rich in creepers. The poplar forests along the river Iori are noteworthy in term of plant diversity. There is a clear distinction in species composition of forests along the river and in dry gullies.

Flood plane forests in West Georgia are dominated by the alder *Alnus barbata*, although there are other tree species present (wingnut *Pterocarpa pterocarpa*, oak *Quercus pedunculiflora*, and willow *Salix mican*, and *S. alba*). Away from the water sea buckthorn *Hippophae rhamnoides* and dewberry *Rubus anatolicus* create dense communities.

Semidesert biome

The plains of eastern Georgia support a semidesert biome, with patches of saline soils. This biome occurs between 150 and 600 meters a.s.l. The vegetation is characterised by halophytic and ephemeral species. *Nitraria schoeberi* communities are found in Shida Kartli, Kakheti and Meskheta. One form of eroded deserts is found on Iori Plateau. These communities also include the rare endemic *Tulipa eichleri*.

Steppe biome

Steppe vegetation in eastern Georgia occurs at the altitudes of 300-700 m.a.s.l. The soils in this biome are mostly cherozem and occasionally brown. The climate is subtropical with continental dry winters and hot summers. Snow is rare and snow-cover is unstable. The bearded grass (*Botriochloa ischaemum*) ecosystems are the most significant on the steppe. As a result of human activities, the steppe biome is invaded by forest and shrub.

It should be noted that real steppes occur in Georgia only in the form of small fragments mainly on deforested areas. Species rich *Stipa tirsia* communities are found on depressed chernozem areas in Gareji. *Stipa joanis* and *S. lessingiana* communities are found in dryer areas, where *S. tirsia* does not occur.

Montane steppe occurs only in southern Georgia at the altitudes of 1,800-2,500 meters a.s.l., mostly on southern slopes and flat areas. The plant community here is dominated by *Festuceto salcata* and *Stipa capillata*

Arid light woodland and hemi-xerophyte scrub biome

Arid light woodlands are found in the semi-desert and steppe belt of eastern Georgia. This biome consists of hemi-xerophyte tree and drought tolerant grass species. The best example of arid woodlands is represented in the Vashlovani Reserve that covers around 5,000 ha. Arid light woodlands are found on grey-yellow soils where the climate is dry

subtropical (Vashlovani) or temperate warm (Mtskheta). *Celtis caucasica* forests are less common.

Juniper woodlands are found on northern slopes of foothills at Mtskheta and Vashlovani, often occupying previously deforested areas. These woodlands are dominated by *Juniperus foudidissima* (an eastern Mediterranean species) and *J. polycarpus* (a Middle Eastern species). *Pistacia mutica* communities are found on chernozem and yellow-brown soils.

Semi-xeropyte scrub mainly occurs on southern foothills of east Georgia at the altitudes of 600-800 m in areas formerly occupied by Georgian oak (*Quercus iberica*). Xeromorphic shrubs and semi-shrubs, and ephemerals dominate this habitat type.

Forest biome

Forests are the most common habitat type in Georgia, covering 37% of the total area of the country. Forests are found throughout the country, with the exception of the Javakheti plateau. Khevi and mountainous Tusheti are relatively poor in forests. Oriental beech (*Fagus orientalis*) tends to be the dominant species, although there are many other tree species present in the forests. Notable forest types include:

- 1 Georgian oak forest (*Quercus iberica*): Occurs at 600-700 m.a.s.l. in eastern Georgia.
- 2 Xerophilic oak forests
- 3 Beech forests (*Fagus orientalis*): Found in middle and upper zones of the forest belt, these are highly productive ecosystems.
- 4 Pine forests: These often develop on the edges of mountain steppes or steppe-meadows (in southern Georgia), between 1,700-2,400 meters a.s.l. and are remarkably species rich.
- 5 Pine and oak woodland: This forest type is particularly noteworthy. It can be found in eastern Georgia at 800-1,100 m.a.s.l., but in Achara (western Georgia) from 300-1,200 m.a.s.l.
- 6 Yew (*Taxus baccata*) forests: Found in the east of Georgia, these are relic forests, a fragment of which is preserved in the Batsara Reserve.
- 7 Zelcova forest: These forests are found in east Georgia. The forest in Babaneuri is noteworthy due to its relict nature and distribution.
- 8 Maple (*Acer velutinum*) forests: These forests are found only in Alazani Valley. This species does not occur above 1,000 m. In east Georgia *Acer laetun* is usually found in mixed forests.
- 9 Colchic forests: These are forest in the Kolkheti (Colcheti) Lowlands (West Georgia), rich in creepers.
- 10 Endemic pine (*Pinus pitiunta*): These forests are found on the Abkhazian coastline.
- 11 Chestnut forests: These are found both in east and west Georgia. In west Georgia they occur at 100-1,000 m. In east Georgia are found as high as 1,400-1,450 meters but typically occur from 400-500 meters up to 1,300 - 1,350 meters a.s.l.

Subalpine biome

The high mountain flora of the subalpine zone is generally very diverse. This is believed to be due to the biome's geographical location, contrasting climatic conditions and its very disrupted and complex topography.

The flora of the upper tree line (2,400-2,750 m.a.s.l.) is especially complex and diverse in terms of species composition and community structure. It is rich in rare endemic and relic species. Major plant community types include light woodlands, crook-stem forests, lying shrubs, high grasslands, and broadleaf meadows. At about 1,800-1,900 m. sparse park-like forests replace closed canopy forests. Sparse forests are common on the Great Caucasus as well as on the Lesser Caucasus. Colcheti crook-stem forests* are remarkably rich in endemic and/or relic species.

Alpine zone biome

The alpine zone in Georgia has a lower range of 2,400-2,500, and an upper range of 2,900-3,000 meters a.s.l. It contains communities of: alpine meadows, 'alpine spots', shrubs, rock, and scree micro-communities. There are various grassland communities associated with this biome. They are listed in the appendix with a list of associated species. 'Alpine spots' are areas where snow cover stays for long periods. These communities are noteworthy, but are typically not rich in species composition and only include 20-25 spp. Northern and eastern slopes are covered with 'dekiani' shrubs. This community usually only includes 10-15 species. Species rich dwarf shrub communities are common on wet stony slopes throughout the Great Caucasus range.

Subnival biome

Subnival communities are well represented in central and eastern parts of the Great Caucasus. Only certain groups of plant species are adapted to the extreme conditions of the subnival zone (3,000-3,600 m). Nevertheless the proportion of endemic species* is remarkably high (60-70%).

Wetlands

Swamps and peat lands are common at various altitudes throughout the country but are especially well represented in the Colcheti lowlands and the volcanic plateau of southern Georgia. The majority are eutrophic wetlands, with many relic species. In western Georgia peat lands are found from the coast up to the alpine zone. In eastern Georgia due to dryer climate they are not present above 2,000 m.

Hydrophilic tall grasslands are found in the lowlands and Volcanic Plateau of South Georgia up to 2,000 m. Hydrophilic short grasslands develop at 2,300 m and above but only cover an insignificant area. Mezotrophic swamps are found in west Georgia from the coast up to the alpine zone. Some tree species are associated with wetlands, but shrubs are rare and mainly occur at 1700-2000 m.

c. Fauna and Flora Species that requires urgent conservation measures

According to the regulations from Georgian law on “Red List” and “Red Book” that was entered into force in 2003, before the final version of the Red List is elaborated, the Minister of Environment Protection and natural Resources of Georgia issued a decree to approve interim Red List. For now the Red List Commission of Georgian Academy of Sciences has prepared the draft of the New Red List of Georgia that will be approved soon. In this new draft version of the Red List the state of the species are assessed based on the IUCN categories and criteria.

In the interim Red List that is currently in force, there are entered 92 animal and 150 plant species while in the new draft Red List there are 135 species and 4 subspecies from animal kingdom. It should be mentioned that species from insects, crustaceans, arachnids, annelids and cephalopods have been added to the interim Red List. As for plants, in the new draft red list there are only entered wood plants (56 species). Grassy plants will be listed in the Red List after they are assessed according to the IUCN categories and criteria.

From mammals in the draft Red List there have been entered 33 species from which 4 are extinct on national level (*Castor fiber*, *Panthera tigris*, *Monachus monachus*, *Gazella subgutturosa*). Five species (*Lynx lynx*; *Panthera pardus*, *Hyaena hyaena*, *Cervus elaphus*, *Capra aegagrus*) are critically endangered and six species (*Clethrionomys glareolus*, *Vormela peregusna*, *Ursus arctos*, *Tursiops truncatus*, *Rupicapra rupicapra*, *Capra caucasica*) are endangered. From the chiropters that are listed in the IUCN Red List as a vulnerable, four species inhabit Georgia.

In Georgia there are bird species that are endangered on global level (*Pelecanus crispus*, *Anser erythropus*, *Oxiura leucocephala*, *Falco cherrug*, *falco naumanni*). In total, 35 bird species are entered in the draft Red List.

Among reptiles, 11 species are endangered. *Ablepharus pannonicus* is critically endangered and *Darevskia clarkorum* and *Vipera kaznakovi* are listed in the IUCN Red List under the category EN.

From amphibians two species are considered to be endangered. One of them *Mertensiella caucasica* is listed in the IUCN Red List under the category VU.

In the draft Red List there are listed all the species of sturgeons that can be found in Georgia. All of them are also entered in the IUCN Red List.

As for flora, three species (*Quercus imeretina*, *Sambucus tigrani* and *Pinus pitusa*) are entered in the IUCN Red List. From these species Tigran’s elder is critically endangered. On the national level *Populus euphratica* is also considered to be critically endangered.

In the draft Red List of Georgia the following species are listed under the category EN: *Anabasis aphylla*, *Amygdalus georgica*, *Arbutus andrachne*, *Astragalus sommierii*, *Astragalus tanae*, *Daphne albowiana*, *daphne pseudosericea*, *Erica arborea*, *Evesmannia*

subspinosa, *Halimodendron halodendron*, *Nitraria schoberi*, *Ostrya carpinifolia*, *Pyrus demetrii*, *Pyrus ketzkhoveli*, *Pyrus sachokiana*, *salix kikodseae*.

In the interim Red List many species are entered based on the Red Book issued in 1982. As it is mentioned above, currently assessing of grassy plants according to the IUCN criteria is executing. At present there have been identified some grass and fern species to be included in the Georgian Red List: *Galanthus krasnovii*, *Tulipa eichleri*, *Hymenophyllum tunbridgense*, *Pancreatium maritimum*, *Bongardia chrysogonum*, *Globularia trichosantha*.

2. State of the art of biodiversity

a. Species and Monitoring

Floral biodiversity

A total of 6,350 species of vascular plants have been recorded in the Caucasus region, and Georgia contains 4,100 of these. Among them: Pteridophyta - 74; Gymnospermae – 17; Angiospermae -4009 (Dicotyledoneae – 3254; Monocotyledoneae – 755).

In Georgia approximately 21% of flora is endemic and consists of about 900 endemic species. Among them about 600 species are Caucasian endemic species and about 300 are Georgian endemic species. Generic endemism of Georgian flora is high enough. In the Caucasus and Georgian flora 16-17 endemic genera are represented. The high level of endemism can be attributed to the physical characteristics of the central and eastern parts of the Great Caucasus, and to the ecological and geographical isolation of certain ecosystems.

In Georgian flora according to number of species 10 leading families are singled out: Compositae (538 species); Gramineae (332); Leguminosae (322); Rosaceae (238); Cruciferae (183); Scrophulariaceae (179); Umbelliferae (177); Labiatae (149); Caryophyllaceae (135); Liliaceae (129).

Faunal biodiversity

Over 11,100 species of invertebrates have been recorded in Georgia, including almost 9,150 arthropods (and of these over 8,230 insect species). Groups including many of the parasitic worm and flukes have been well studied, as have earthworms and some of the key insect groups – such as Lepidoptera (butterflies) and Coleoptera (beetles). The Coleoptera (with almost 5000 recorded species) along with Diptera (flies) and Hymenoptera (wasps and bees) show high species richness among the groups studied to date.

In total 84 species of freshwater fish have been recorded in Georgia. Nine of them, including *Barbus lacert*, *Barbus mursa* and *Barbus capito* are endemics in Mrkvari River

and its inflows. In the Black Sea basin there can be found five species of sturgeons. In addition to the native fish species, there are nine introduced species, of which the crucian carp (*Carasius carasius*) has become most common.

There are 12 species of amphibians in Georgia including four newts and salamanders (order Caudata), and eight frogs and toads (order Anura). Important amphibian habitats include the mountain forests of Colcheti as well as the Gardabani Valley, Borjomi Valley and western parts of the Meskhети range.

From reptiles there are 52 species in Georgia including: one species of tortoise, two turtle species, 27 lizard species (ten genera from six families), 23 snake species (ten genera of four families). Of these reptiles, three snake and 12 lizard species are endemic to the Caucasus.

There are more than 300 species of birds in Georgia. A significant number of these are migratory. The most important bird areas in the country are the Colcheti lowland (including lake Paliastomi and the coastal zone at the Black Sea) and the Javakheti Plateau, that is rich in freshwater lakes. More than 100 species of migratory birds visit these places in great numbers.

There are three Caucasian endemic bird species in Georgia, including: Caucasian black grouse (*Tetrao mlokosiewiczzi*), Caucasian snowcock (*Tetraogalus caspius*) and Caucasian warbler (*Phylloscopus lorenzi*).

A total of 79 species of small mammals are recorded from Georgia, from four different orders (insectivores, bats, rodents and lagomorphs). Georgia's fauna also includes 30 species of large and medium-sized mammals, including deer and gazelles, dolphins and carnivores. From large mammals there are two species *Capra cylindricornis* and *C. caucasica* which are Caucasian endemics.

Numbers of mammal species found in Georgia

Order	Family	Number of species
Small mammals		
Insectivora (<i>insectivores</i>)		10
Chiroptera (<i>bats</i>)		29
Rodentia (<i>rodents</i>)		39
Lagomorphs (<i>rabbits</i>)		1
Large and medium sized mammals		
Artiodactyla (<i>even toed ungulates</i>)		8
Cetacea (<i>whales dolphins, porpoises</i>)		3
	Mustelids (<i>weasels, otters, badgers</i>)	7

	Procyonids(racoons)	1
	Hyaenids (<i>hyenas</i>)	1
	Canids (<i>wolves and foxes</i>)	4
	Felids (<i>wild cats</i>)	5

Monitoring

Monitoring is considered as a priority issue in NBSAP and various national laws obligate the Government to establish a system of biodiversity monitoring, however, to date no system has been established. Currently data is collected and stored by various agencies, among which there is little or no systematic information exchange. Information is usually distributed to very narrow audiences or inaccessible altogether. At the same time, decision-makers and public interest groups often lack necessary information on the state of biodiversity. Responsible agencies have a limited knowledge of modern monitoring techniques, and different collection and analysis methods are used by each agency. Therefore there is no unified system of monitoring, there are discrepancies of interpretation and no accessible electronic system exists.

Current legislation on biodiversity monitoring is inadequate and general. The framework of the Law on Environmental Protection (1996) provides general provisions relating to biodiversity monitoring. Chapter VII of this law defines the Environmental Information System as a combination of (a) information collection and (b) monitoring systems (defined as data collection, storage and analyses). A Law on Environmental Monitoring is yet to be developed, but this would be the instrument to define the details of monitoring.

According to the current legislation protected areas and forestry departments of the Ministry of Environment Protection and Natural Resources are responsible for accomplishment of biodiversity monitoring.

In addition, current legislation obliges all users of biodiversity to conduct systematic monitoring and assessment of the resource(s) they exploit. All the data they collect must be submitted to one of the above agencies. According to the Georgian Forest Code, legal entities and individuals may conduct forest and wildlife monitoring within protected areas, hunting farms and in forests owned by the National Forest Fund. Funding for such monitoring may be provided either by the Government or private sector.

Although legislation defines the roles and responsibilities for biodiversity monitoring, these duties are often too general, the relative roles of different agencies are not clearly defined and the responsibilities of the above agencies to each other have not been stated.

Nowadays the Government made the first steps to lay foundation for biodiversity monitoring system. There has been created working group in order to elaborate biodiversity monitoring conception.

b. Use of Nature Resources

Forestry

Georgia's forests occupy 40% of the country's territory and constitute a crucial element of Georgian natural environment, rural livelihood, cultural tradition and national economy. They are also of critical international importance as a habitat to unique biological and landscape diversity, and as a factor of regional climatic and water regime.

In Georgia extensive logging was particularly noticeable in the first half the 20th century. In the 1970s-80s, mass woodcuts were limited due to import of comparatively cheaper timber from Russia. That's why mountain forests here remained more or less untouched. The collapse of the former Soviet Union has severed links to traditional markets for Georgia's veneer, sawn timber, and paper and paperboard in 1991. The energy crisis in 1990s and fuel shortage have caused an increase in woodcutting to obtain firewood for heating.

During the 1995-2000, the official annual cut varied from 310 thousands m³ to 370 thousands m³. Therefore, in addition to the official date, it was assumed that local people harvest nearly 700 thousand m³ of firewood. This harvest primarily takes place in forests of former collective farms (kolkhoz), which are gradually devastated. During that period, however, the lack of efficient control has led to illegal harvest of large timber volumes for commercial purposes. The Georgian Ministry of Environment unofficially estimated total amount of cut to be as high as 2.5 million m³ just in 1996.

As a timber, generally, there is being cut beech (20% of total cuts) and also spruce and fir-tree. Large amount of timber is being exported in Turkey. Beech timbers makes 92% of wood exported in Turkey. Illegal timber export is a serious problem, but official estimates of exports are not available.

After the Rose Revolution the Ministry of Environmental Protection and Natural Resources (MEPNR) has implemented some important reforms including setting up a new Environmental Inspection Service with stronger powers and more resources to detect and prosecute illegal logging. In accordance with the law on "Licences and Permits", forest usage in Georgia is conducted on the basis of licenses, which are sold by auction. The only exception is extraction of fuel wood to serve the needs of the local population. This type of forest usage is not subject to licensing.

Based on the official data amount of forest use during 2004-2005 was accordingly 618.6 thousands m³ (including 140.2 as a timber) and 684.2 thousands m³ (including 164.8 as a timber).

Georgia is a significant producer of high quality fir (*Abies Normaniana*) seeds that are exported to Western Europe for growing Christmas trees.

Wildlife

Hunting has always been very popular in Georgia. With the exception of certain mountainous areas, hunting in Georgia is for sport and is regarded as a form of recreation. In high mountains areas subsistence hunting still prevails, while tur hunting has great cultural significance. However, inappropriate game management practices over the last century have led to significant declines in many game species. Populations of species such as red deer (*Cervus elaphus*) and mountain goat (*Capra aegagrus*) have been severely reduced and remain only in protected areas, and the goitered gazelle (*Gazella subgutturosa*) has completely disappeared. Carnivore populations have been significantly affected by a bounty system, although this has recently been abolished.

With the exception of migratory birds, hunting only permitted on specially designated areas called hunting farms or hunting reserves. Hunting reserves may be owned by a legal entity (e.g. a registered company or organization, either governmental or non-governmental) or by a private individual. General licenses for hunting reserves are awarded by the Ministry of Environment through a competition for each potential site.

At present in Georgia there are 29 hunting farms with total area of 263 000 ha. Game species mainly are the following: *Capreolus capreolus*, *Rupicapra rupicapra*, *Vulpes vulpes*, *Canis lupus*, *Procyon lotor*, *Sus scrofa*, *Meles meles*, *Martes martes*, *Lepus europaeus*, *Felis silvestris*, different birds species.

Hunting on migratory birds is permitted for the following species: *Coturnix coturnix*, *Columba livia*, *Streptopelia turtur*, *Gallinago gallinago*, *Columba palumbus*, *Scolopax rusticola*, *Anser anser*, *Anas platyrhynchos* etc.

It should be noted that in 2005 hunting on migratory birds was temporarily stopped to prevent spreading of high pathogenic avian influenza.

Quotas for game species are set usually without carrying out appropriate research on game numbers and population dynamics. Poaching still remains to be one of the threats to biodiversity.

Tubers and bulbs of Snowdrops and Cyclamens are subject of international trade. Every year 18 millions of Snowdrop bulbs and 200 thousands of Cyclamen tubers are exported from Georgia. Rare species of falcons are captured and sold abroad.

Out of the 184 fish species and subspecies known to inhabit the Black Sea (Rass, 1987), 104 species could be found also in the Georgian coastal zone in the early 1980s (Meskhidze & Burchuladze, 1984). However, in the beginning of 21st century only 69 species and subspecies were recorded (Komakhidze *et al.* 2003).

High anthropogenic pressures on marine ecosystems have resulted in decreased amounts of commercial fish species. The volume of fish catch in the 1970s-80-s reached such a big size that this factor significantly affected the ecosystem of the Black sea.

Deterioration of water quality at the same time caused the reduction of overall volume of bioorganisms and the degradation of ecosystems. The number of commercial fish in the Black Sea for over past 30 –year period was reduced from 24 to 3-4 species by 1990.

At present there are five fish species of commercial value: Black Sea Anchovy (*Engraulis encrasicolus ponticus Alexandrov*), Black Sea Sprat (*Sprattus sprattus phalericus*), Black Sea whiting (*Merlangius merlangus euxinus*) and spiny dogfish (*Squalus acanthias*) and Black Sea surmullet (*Mullus barbatus ponticus*). Anchovy is the main target specie for the Georgian marine capture fisheries fleet.

From 1991, the difficult economic and social situation in the country, the lack of financial resources, the inflexible banking and credit policies as well as the loss of the former Soviet Union consumer market, all had a very negative impact on the fishery sector. The Ocean going fishing fleet was largely sold to other countries. It is generally estimated that the annual fisheries production between 1993 and 1998 was around 2 500 to 4 000 tonnes. Since 1997 Ukrainian and Turkish vessels started to fish again in Georgian territorial waters. The volume caught of Anchovy in Georgian waters increased from 1 400 tonnes (1995) to 12 200 tonnes (2003). In 2004-2005 season catch amount of anchovy in the Black Sea was 42 thousands tonnes (according to the issued licenses).

Both natural and artificial inland freshwater bodies have been traditionally used for commercial fishing. These include major rivers (such as Mtkvari and Alazani), lakes (including Jandari, Paravani, Tabatskuri, Sagamo, and Nadarbazevi) and artificial water bodies built for irrigation or hydropower schemes (such as Zhinvali, Algheti, Tbilisi, Sioni, Tsalka, Tkibuli reservoirs). The main commercial fish species caught in these lakes and reservoirs are the following: Lake trout (*Salmo trutta caspius lacustris*), Romanov lake trout (*Salmo trutta caspius romanovi*), Common carp (*Cyprinus carpio*), Vendace (*Coregonus albula*), Chub (*Leuciscus cephalus orientalis*), Crucian carp (*Carassius carassius*), Silver carp (*Hypophthalmichthys molitrix*), Bighead carp (*Aristichthys nobilis*) and various Barbels (a.o. *Barbus tauricus escherichi*, *Barbus capito*, *Barbus lacerta cyri*).

During 2004-2005 season catch licenses were issued for the following fish species: *Coregonus albula*, *Varicorhinus capseta*, *Barbus tauricus*, *Carassius carassius* more than 15 tonnes in total. (it should be mentioned that in FAO report the total inland capture fisheries production of Georgia was estimated at 388 tonnes). It is difficult to measure the average annual capture fisheries production in tonnes in the investigated lakes and reservoirs as poaching is a widespread practice.

Agriculture

Agriculture represents one of the main points of Georgian economics. In 2004 agriculture made 16% of total domestic production and provided 50% of employment. Production of agriculture products has generally small scale but commercial farming constantly becomes more important.

Agriculture land covers approximately 3 million hectares in Georgia including 802 thousands hectares of arable lands, 263 thousands hectares of lands with perennial plants and 1796.6 ha of pastures. 25% of agricultural land is private and 30% is leased. During 1992-2005 total area of agricultural lands slightly increased.

More than 1 million hectares, nearly 35% of this land has been degraded to some degree by water or wind erosion, the result of ill use as well as anthropogenic and natural processes. Erosion affects 380 000 hectares of arable land, 570 000 hectares of pasture and hayfields and 87 000 hectares in the Black Sea coastal zone.

Erosion is a serious problem particularly in mountain areas, along with natural processes significant contributions come from cultivation of steep slopes, impact from overgrazing and logging.

Desertification in the eastern part of Georgia has intensified because of the overgrazing and climate changes. About 3000 ha has been eroded including Shiraki, Eldari, Iori, Taribani, Natbeuri valleys, the ridges, plateau and the major part of the south slope of Kakheti ridge.

Mining and Extractive Industry

The most important mined products are gold, copper, lead, manganese, arsenic, marble, gravel, sands and other construction materials. Construction materials are virtually all used domestically. Up to 1990 manganese was an important export. It has been used by heavy industry as well. However, only small amounts are now mined.

Currently in Georgia the most important are Borjomi mineral water springs and Madneuli non-ferrous metals and gold mines. During last several years sand utilization almost doubled because of increased demand on it. The Ministry of Environment Protection and Natural Resources of Georgia has prepared database of Georgia's mineral resources that is available on the Ministry's web-site.

c. Protected Areas and Ecological Networks

The first nature reserve in Georgia was established in 1912, and another 14 strict nature reserves and five hunting reserves were subsequently established during the Soviet era. Strictly protected reserves covered 2.4%, and hunting reserves covered 0.8%, of the country's land area.

Since 1990, with the support of the international donor community, Georgia has begun to develop a more modern protected areas system. New approaches have been introduced concerning management, institutional capacity, financing, public relations, protection and prevention measures for protected areas.

The legal basis has been established that continues to upgrade day-by-day. The steps have been made to increase management efficiency in this sphere and to ensure financial

sustainability. Specifically during the last two years the state has substantially increased financing of protected areas; however, it still remains to be done a lot in this direction.

At present the system of protected areas includes 22 nature reserves, 4 national parks and 11 managed areas, that is around 6,7 %-s. of the Georgian territory, while the territory that is covered by forests is around 8.5%.

Information on current protected areas is given below:

Type of Protected Area	IUCN category	Number	Total area
Nature Reserve	I	22	171 726 ha
National Park	II	4	228 980 ha
Natural Monument	III	3	138 ha
Managed Reserve	IV	11	56 393 ha
Protected Landscape	V	1	27 903 ha
Total			485 140 ha

Most strict nature reserves are too small to guarantee long-term biodiversity conservation. Economic problems have resulted in an increase in poaching, illegal forest cutting and grazing in protected areas where the protection regime is not always enforced. Reserve employees are underpaid and equipment and transportation are lacking. Buffer zones are often non-existent, so consequences of resource use and human pressures outside reserves spill over the borders and impact protected ecosystems.

The Law on Protected Areas stipulates elaboration of management plans. For now management plans have been approved only for Kolkheti, Vashlovani and Lagodekhi National Parks. Draft management plans have already been prepared for Kobuleti Nature Reserve and Managed Reserve as well as for Tusheti National Park.

At present protection is concretely implemented only in those protected areas that have gained international support through particular projects. The other protected areas are neglected.

New protected areas need to be created in certain regions where there are none and corridors need to be created between existing protected areas. The protected status of sanctuaries with low levels of protection need to be increased in areas that are important for conservation of biodiversity and endangered species and ecosystems. Management and planning in nature reserves needs to be improved by increasing the qualifications of nature reserve staff and elaborating and implementing management plans.

Several new protected areas are in the process of establishment; these include protected areas in the Central Caucasus, Mount Mtirala National Park (15 806 ha) in Adjara's Autonomous Republic, Javakheti National Park in the Southern Georgia and Tbilisi National Park (24 024 ha) close to the capital of the country.

Along with better protection of virgin and insignificantly modified ecosystems and efficient network of protected areas the Government of Georgia works on the development of a new plan for country's protected areas system. One of the specific objectives (for 2010) is the protection of country's representative diversity that shall be culminated in setting up protected areas regime on 15% of country's forests.

Especially important is establishment of Caucasian Protected Areas Foundation on Ministerial Conference in Berlin. This trust foundation ensures long term support to prioritized protected areas.

It must be also mentioned that World Wildlife Foundation – International is preparing “Protected Areas Programme 2012”. The aim of this programme is to facilitate establishment of protected areas working programme of biodiversity convention in five model eco regions, including Caucasus. The programme will greatly contribute to further development of Georgian protected areas.

d. Public Participation and Awareness

In environment protection public participation in planning and decision-making processes is more active in comparison with other fields. This is caused by the following:

Request from those donor organizations that provided support for already implemented or ongoing projects and programmes aiming at the biodiversity protection.

Well-developed non-governmental sector. NGO's not only participated in elaboration of strategies and action plans but also played key role.

International conventions ratified by Georgia (e.g. Aarhus convention) and legislative acts which were adopted for implementation of these conventions and represent legal basis for public participation in decision-making processes.

In spite of above, public capacity to bring influence on decision-making processes is restricted because of insufficient level of public awareness regarding different issues and procedures of decision-making process.

In Georgia no special research has been carried out to assess the level of awareness among society and decision-makers regarding problems in conservation of biodiversity and its sustainable use. Based on the researches realized within the different projects it can be concluded that generally public is aware of worsening of biodiversity, especially in relation to forests and water resources, but it is much more difficult to understand importance of conservation of single species.

The role of the media in environmental education is currently extremely limited. Neither state nor private universities have courses in environmental journalism, and in general journalists show little interest in environmental issues and less in biodiversity. The low

priority given to ecological news reflects public lack of interest and its non-commercial nature, and as a result ecological stories appear only occasionally in the media.

High school programmes do not properly cover biodiversity conservation and sustainable use issues. Teachers lack training in environmental issues, and rarely use modern methods of teaching children about biodiversity conservation.

Institutes of higher education do not provide sufficient knowledge on conservation biology and sustainable development matters.

Public awareness raising has always been one of the objectives of already realized or currently running projects and programs in Georgia aiming at biodiversity protection. Hence, many awareness raising activities have been implemented within those projects, mainly by NGOs. However, there still is a need to continue working in this direction, especially with mass-media. It is essential also to participate in the ongoing reforms of educational system that is currently taking place in Georgia in order to ensure inclusion of biodiversity conservation issues in educational programmes.

3. Existing threats to Biodiversity from main economic activities

a. Industry (including extraction industry)

During the Soviet period Georgian industry developed under an energy and resource-intensive regime, resulting in high levels of environmental pollution. The economic crisis in 90th reduced environmental pressures from industry, which was not followed by major improvements on the state of the environment. Main environmental problems in industry and mining are related to the use of outdated technologies, low efficiency or lack of pollution controls, and the disposal and treatment of wastes accumulated around the facilities. Smaller factories generally do not have the means to install effective waste management mechanisms and equipment and runoff waters are highly polluted. Pollution of wetlands and rivers impacts breeding birds and fish populations. Pesticides and fertilizers kill large numbers of invertebrates and make their way up the food chain to birds and even humans.

An important factor influencing the environment is open-pit mining operations. In many places, open mines are located on household plots and agriculture lands, causing land degradation. Some of the mines are situated at relatively high altitudes, and impose a direct threat to fragile mountain ecosystems and also affect lowland habitats downstream from such mines. The mining of arsenic in Uravi pollutes the Lukhumi River, which flows into the Black Sea via Rioni River having adverse effect on the marine ecosystem.

An open cast copper mine at Madneuli can be considered as example of the most serious pollution of surface water from mining. Open pit waters of the deposit-based ore processing plant pollute the Kura river tributaries.

In Chiatura manganese quarries thousands hectares of agriculture lands have been excavated and become useless. As a result, erosion and landslides have become extensive. Wastewaters with high manganese concentration have been heavily polluting River Kvirila.

The level of oil exploration in Georgia has increased substantially in the past years, which leads to serious pollution of soil at mining areas.

According to the legislation that was in force until 2005 it was mandatory to carry out environmental impact assessment and ecological expertise for industrial projects, natural resource utilization, transport and infrastructure development and similar projects. However, because of absence of sufficient knowledge and experience, assessment of how an activity would influence biodiversity and setting of mitigating measures were mere formality. Monitoring of efficiency of those measures aimed at avoiding or mitigating the negative influence on biodiversity components were taking place very rarely.

As a result of the changes in environmental legislation that took place in 2005 the list of activities requiring environmental permit and environmental impact assessment has noticeably shortened. Technical regulations have been adopted instead.

b. Transport

Transport, including roads, rails, ports, aviation, and pipelines, is associated with actual and potential environmental impacts. Similar to other regions of the world, motor transport is an important source of air pollution and its impact continues to grow. Passenger cars are the major sources of air pollution. Increased pollution from traffic is more related to obsolete car fleet and low quality fuel.

Government strongly supports the development of Georgia's transit potential.

During last years in Georgia road rehabilitation projects were implemented and are still running with the support from international donor organizations. One of these projects is road rehabilitation in Javakheti plateau (South Georgia) near to those territory where it is planned to establish protected area.

Direct negative impacts from road maintenance and rehabilitation activities arise from: production and application of bituminous products; quarrying of stone and gravel; such short-term impacts as noise, dust and the disruption of traffic resulting from works execution; removal of waste materials and drainage and erosion. Emissions from asphalt plants represent a significant source of pollution to both the air and surrounding land areas.

Oil pipelines connect the Caspian and Black seas and gas pipelines run from Russia to Armenia via Georgia. The Baku-Ceyhan pipeline, now under construction, will connect the Caspian Sea with the Mediterranean, running through Azerbaijan, Georgia and Turkey. Environmental impacts of pipelines during both the construction and operation phases are significant. Pipelines cross the protected areas and water recharge regions. Pipelines and power lines fragment natural habitats and disrupt animal migrations.

Significant impacts can also come from cargo ships carrying crude and oil products from the Supsa Terminal and in future also from Kulevi Terminal.

c. Infrastructure

Infrastructure development, including roads, dams, channels and pipelines, fragments natural habitats and contributes to habitat loss. Draining wetlands and digging channels for agriculture and irrigation alters ecosystems irreversibly and leads to habitat loss. For instance: Large scale irrigation systems, that were constructed disregarding physical and chemical specifics of the Iori plateau, caused serious salinization of the soil that on the other hand has caused significant changes in steppe ecosystem. Because of the drainage works natural hydrological regime of Kolkheti peat bogs.

Several dams for hydroelectric stations and reservoirs have altered natural river systems and flooded forests. As they pose obstacles in the fish migration ways, hydro-technical buildings had negative influence on migratory fish species, including sturgeons.

Project to build a dam on the Chorokh River for irrigation or electricity will result in enormous damage to riparian ecosystems.

Implementation of project that includes building Kulevi Terminal at the Black Sea coast for crude and oil products makes a threat to the Kolkheti mires that are wetland of international importance. Besides, Kulevi Terminal creates danger also for the biodiversity of nearby marine area.

Since infrastructure and regional development is mostly concentrated near urban centers, many of the outlying regions of the countries are largely unscathed by large-scale infrastructure projects and development. As a result, much of the biodiversity in the Georgia has been preserved in these outlying regions and many of the corridor outcomes are situated in border regions.

d. Agriculture

Overgrazing and uncontrolled livestock grazing threatens steppe, subalpine and alpine ecosystems. Considerable part of pastures undergoes erosion. Sheep grazing in winter ranges and steppes and semi-deserts of the eastern Georgia has significantly increased in the past decade. Intensive grazing has resulted in reduced species diversity and habitat degradation. Grazing of cattle in forested areas disturbs undergrowth and creates competition for wild ungulates. Overgrazing is causing environmental damage in much of the hotspot, particularly in the Javakhet, Iori plateau, high mountain pastures.

One of the threats is also uncontrolled use of pesticides and fertilizers in agriculture, especially against birds of prey and bats. In 1990s use of pesticides and fertilizers decreased.

Although the use of chemicals has significantly declined, soil pollution has not significantly decreased as a result. Heavy metals used in agrochemicals are accumulated in soils in large amounts. Obsolete fertilizers and pesticides, stored in warehouses not meeting minimal environmental standards, have adverse impacts on land water quality. Still, some of chemicals are being used despite they are banned worldwide. Development of small-scale individual farming has also led to the incorrect use of chemicals.

e. Forestry

Illegal logging, fuel wood harvesting and the timber trade threaten biodiversity of the forests and lead to habitat degradation. Non-sustainable wood cutting methods do not support the regeneration of forests. Local ecological peculiarities are rarely taken into consideration. Forests are being destroyed and streambeds and banks damaged by the transports logs by trailing the brushwood.

In Georgia, as a result discriminate logging, forest density has been significantly reduced: 0,5 and lower density groves occupy 53%; groves of average (0,6-0,7) density occupy 43% and groves of high density (0,8 and more) occupy only 4%. It is quite clear that the area of high-density forests have been considerably reduced. The largest amount of cutting has taken place on former collective forests.

Intensive logging leads to decline in species composition, forest degradation and overall habitat loss, impacting a number of plant and animal species. As mentioned above, mainly valuable wood species, such as beech, are cut. This resulted in a drastic reduction in forest quality.

Uncontrolled grazing in forest areas is also common practice at present. Uncontrolled grazing represents one of the preventing factors for forest renewal. This causes the destruction of biodiversity of underbrush woods, endemic and relic species being the most vulnerable among them. As a result, underbrush fauna migrated from their habitats and less valuable brushes began to expand.

f. Fishery

The following main factors have negative influence on biodiversity: exaggerated catch, use of prohibited fishing equipments (bottom-trawling, electro-fishing gear) illegal catch of those fish species that are in Red List or banned for catch (Sturgeons, salmon, trout, sole). Exaggerated catch, together with pollution and introducing invasive species became one of the reasons of catch decrease in the Black Sea in 1990s. Number of fishing species has decreased from 26 to 6. Main fishing species is anchovy. Pollution and invasive species influence also resulted in decline of fish biodiversity and biomass.

Anthropogenic activities and inappropriate management practices have caused deterioration in the condition of many rivers and lakes. Populations of fish species including *Acipenser sturio* and *Salmo trutta* have been significantly reduced, and in many

cases the stocks of economically important fish species are significantly below estimated carrying capacity. Recovery of fish populations in such lakes as Jandari, Tabatskuri, Nadarbazevi, Faravani, and Tsalka, is unlikely to occur without active conservation intervention.

However, over recent years there have been a number of positive changes relating to protection of fish stocks, initiated by the Ministry of Environment. There was set fishing dates in the Black Sea as well as in internal waters. Fishing has been banned on Mtkvari and Alazani Rivers for the period of four months. Fishing is prohibited in those rivers that are vital for Sturgeons' migration.

4. Ways of halting the loss of biodiversity at the transition to sustainable nature resource use

a. Industry (including extraction industry)

When legislative regulations are being elaborated for an Environmental Impact Assessment, requirements by the Convention on Biological Diversity and Ramsar Convention guidelines have to be considered in this process.

It is necessary to raise the level of current expert experience and knowledge as well as to build capacity of proper Governmental bodies in order to set activities to mitigate/avoid negative impact.

Efficiency of the activities that are mitigating/avoiding negative impact on biodiversity has to be monitored.

Periodic environmental audits in mining and industrial companies must be conducted in order to evaluate and stimulate their performance and competitiveness;

Introducing a bank guarantee in future contracts for environmental rehabilitation of damage caused by mining operations.

Methodology for estimation of damage to different biodiversity components by an activity needs to be refined / elaborated. Compensation and fine payment systems need to be improved.

There must be established a scheme assuring that money from compensation and fine payments will be "put up" in environment rehabilitation and biodiversity conservation activities.

b. Transport

Assessing environmental impact of transport infrastructure rehabilitation or development projects, specific measures must be considered that will reduce influence on biodiversity. For the sections that are situated close to the vulnerable ecosystems (especially if they are protected sites) there have to be prepared emergency action programs in case of pollution causing accident happens.

c. Infrastructure

As an example of reducing negative influence of country's irregular spatial development on environment, human health and cultural heritage, there should be mentioned zoning,

that is considered in Georgian legislation, namely in “Georgian law on Tourism and Resorts”, “Georgian law on Water”, “Georgian law on Cultural Heritage”, “Georgian law on Social-Economic and Cultural Development of Mountain Regions”.

It must be discussed to use zoning for reducing a project impact on biodiversity beyond of the protected areas.

Monitoring of mitigation measures and their effectiveness has to take place.

Development companies must be required to provide funds for protected areas and other conservation measures in areas that will be disturbed by infrastructure projects.

d. Agriculture

In order to reduce negative influence that overgrazing exerts on pastures, it is necessary to encourage methods of their traditional use, namely method of pasture rotation. Pastures have to be inventoried and regulations for their use and management plans also need to be elaborated that must be preconditions for pasture renting. Besides, changes and amendments have to be done in legislation to ensure sustainable management of pastures. It is possible to implement a pilot project of sustainable pasture management that would demonstrate having of long-term economical effects together with maintaining of biodiversity.

It is important to encourage organic farming, to teach farmers and pasture tenants and to run awareness-raising campaigns for them, especially in the districts situated near to the protected areas.

Biodiversity impact issues must be considered when lands are privatized or rented, or land use is being planned.

Georgia recently joined to Stockholm convention. Close control is necessary for use of the chemicals that are fixed by the convention.

Georgia is considered as an important area for cultivated plant diversity. Due to the high risk of genetic contamination of native cultivars and their wild relatives, testing and use of genetically modified (GM) plants or seed materials may pose serious threats to Georgian agrobiodiversity. Georgia still has not ratified Biodiversity Convention Cartagena Protocol on Biosafety and national legislation do not regulates issues related to use of genetically modified organisms (GMOs) and their introduction in environment. The existing gaps in legislation may lead to risks of uncontrolled and unauthorised import and distribution of GM varieties and seed materials or GM products; it is essential to create proper legislation and to establish national biosafety framework as well as to increase scientific-technical capacity for effective control.

At present many endemic and native representatives of agrobiodiversity are in danger of extinction, and face severe problems of genetic erosion. National policies and comprehensive measures are urgently needed to address the problem.

e. Forestry

Georgia makes significant steps to reduce and eliminate one of the most important threats of the country’s and region’s biodiversity which is the illegal wood cutting and illegal

timber trade. As it was mentioned above in this connection state forests management and resource use reforms are taking place currently in Georgia.

For now, within the framework of the Forestry Development project, the following is planned to be done:

- Functional differentiation of Georgia's forests through landscape-ecological zoning method.
- Enhancement of Environmental Inspection capacity to prevent illegal cuts.
- Performing forest husbandry and forest protection and rehabilitation in the regions with high risk of avalanche.

Information exchange between importer and exporter countries, as well as transboundary cooperation in timber trade monitoring would help curb illegal logging. Local woodworking projects must be encouraged.

Measures must be taken to reduce unsustainable firewood harvesting include enforcing restrictions on firewood harvesting near villages and reducing dependence on firewood by providing energy alternatives such as natural gas.

f. Fishery

There is no national fishery sector policy or regulatory framework that would assist the sector in its sustainable development.

There is limited scientific knowledge of the state of the marine and inland water resources. It must be mentioned that human and financial resources are insufficient to undertake the necessary research that would allow the assessment of the fishery resources and support the development and monitoring of fishery management regimes.

There must be elaborated sustainable fishery concept and proper legislative base. Moreover, effective management system of the sector must be established.

Fishing quotas should be established based on independent scientific studies of reproductive capacity of fish populations.

Capacity Building of the Environmental Inspection is essential in order to prevent poaching and use of prohibited fishing equipments.

Alternative sources of income should be provided for fishermen.