

**National Biodiversity Strategy and Action plan of  
The Democratic People's Republic of Korea**

DPR of Korea

1998

**CONTENT**

FOREWORD.....	5
INTRODUCTION.....	8
1.The status of Biodiversity in DPRK.....	11
1.1.Biological Resources.....	11
1.1.1.Ecosystem diversity.....	11
1.1.1.1.Forest ecosystem.....	11
1.1.1.2.Alpine ecosystem.....	12
1.1.1.3.Wetland ecosystem.....	13
1.1.1.4.River ecosystem.....	13
1.1.1.5.Marine and coast ecosystem.....	13
1.1.2.Species Diversity.....	14
1.1.2.1.Wild plants.....	14
1.1.2.2.Wild animals.....	14
1.1.2.3.Micro-organisms.....	15
1.1.3.Genetic Diversity.....	16
1.1.3.1.Domestic plants (crop germplasm).....	16
1.1.3.2.Domestic animals (livestock breeds).....	16
1.1.3.3.Acquatic animals and plants.....	16
1.2.Special Features of DPRK Biodiversity.....	17
1.2.1.Ecologica and Evolutionary Features of Biodiversity.....	17
1.2.2.Species of Endemism.....	17
1.2.3.Endangered and Rare Species.....	18
1.2.4.Economic Importance of Wild Species.....	20
1.3.Threats to DPRK Biodiversity.....	21
1.3.1.Threatened Status.....	21
1.3.1.1.Threatened status for ecosystem.....	21
1.3.1.2.Threatened status for species.....	22
1.3.1.3.Threatened status for genetic resource.....	22
1.3.2.The Factors of threats to Biodiversity.....	23
1.3.2.1.Population increase.....	23
1.3.2.2.Habitats destruction and over exploitation.....	23
1.3.2.3.Climate variability.....	24
1.3.2.4.Other causes.....	24
1.3.3.The Urgency of Biodiversity Conservation and Demand for its Sustainable Use.....	24
2.Current efforts and assessment of Biodiversity Conservation and its sustainable use in DPRK.....	26
2.1.In-situ conservation.....	26
2.1.1.Establishment of protected area.....	26
2.1.1.1.History of establishment.....	26
2.1.1.2.Categories and numbers.....	26
2.1.1.3.Geographical distribution and areas.....	31
2.1.2.Management for protected area.....	33
2.1.2.1.Policies, Legislation and enforcement.....	33
2.1.2.2. Institutional and Personnel status.....	33

## Biodiversity Strategy and Action Plan DPRK

2.1.2.3. Researches and monitoring.....	34
2.1.3. Assessment for establishment and management of protected areas .....	34
2.1.3.1. Main achievements .....	34
2.1.3.2. Main gaps .....	35
2.2. <i>Ex-Situ</i> Conservation .....	36
2.2.1. <i>Ex-Situ</i> conservation of wild plants .....	36
2.2.2. <i>Ex-Situ</i> conservation of wild Animals .....	36
2.2.3. Seed Bank .....	37
2.2.4. Assessment of <i>Ex-situ</i> conservation .....	37
2.3. Sustainable use .....	38
2.3.1. Agriculture .....	38
2.3.1.1. Actual state .....	38
2.3.1.2. Conducted work .....	38
2.3.1.3. Assessment .....	38
2.3.2. Forest .....	39
2.3.2.1. Actual state .....	39
2.3.2.2. Conducted work .....	39
2.3.2.3. Assessment .....	40
2.3.3. Fishery .....	40
2.3.3.1. Actual state .....	40
2.3.3.2. Conducted work .....	41
2.3.3.3. Assessment .....	41
2.3.4. Koryo medicine (Traditional medicine) .....	41
2.3.4.1. Actual state .....	41
2.3.4.2. Conducted work .....	42
2.3.4.3. Assessment .....	42
2.3.5. Sanatoria and Ecotourism .....	42
2.3.5.1. Actual State .....	42
2.3.5.2. Conducted work .....	42
2.3.5.3. Assessment .....	43
2.4. Capability strengthening conditions .....	43
2.4.1. Major state policies .....	43
2.4.2. Legal basis .....	44
2.4.2.1. Enactment and enforcement of Law .....	44
2.4.2.2. Success and Enforcement .....	44
2.4.3. Administrative and organisation Framework system machinery .....	45
2.4.3.1. Central Agency .....	45
2.4.3.2. Local Government Agencies .....	46
2.4.3.3. Non-government organization .....	46
2.4.4. Scientific and technical capability .....	47
2.4.4.2. Conducted work .....	47
2.4.4.3. Assessment .....	48
2.4.5. Education and Publicity .....	48
2.4.5.1. School education .....	48
2.4.5.2. Publicity .....	49
2.4.6. International cooperation .....	49
2.4.6.1. Multilateral cooperation and international conventions .....	49

## Biodiversity Strategy and Action Plan DPRK

---

2.4.6.2. Bilateral cooperation.....	50
3. Biodiversity Strategy for DPRK.....	51
3.1. Overall vision and goal.....	51
3.2. Strategic objective and direction .....	51
3.2.1. Conservation.....	51
3.2.2. Sustainable utilization .....	53
3.2.3. Profit sharing .....	55
3.2.4. Common measure related to conservation and sustainable use.....	56
4. Action Plan.....	60
4.1. Summary.....	60
4.2. Identified Priorities.....	60
4.2.1. Standard of deciding priority target.....	60
4.2.2. Priorities for conservation .....	60
4.2.2.1. Priority for ecosystems .....	60
4.2.2.2. Priority for species.....	61
4.2.2.3. Priorities for genetic resources .....	61
4.2.3. Priorities for sustainable use.....	61
4.2.4. Priorities for benefit sharing.....	62
4.2.5. Priorities for general measures .....	62
4.3. Action and priority projects.....	62
4.3.1. Action .....	62
4.3.1.1. Activity related to conservation.....	62
4.3.1.1.1. Conduct comprehensive investigation assessment on biodiversity of DPRK .....	62
4.3.1.1.2. Confirm protection management goals by protected areas by revision and recruitment of new established national natural protected area system.....	62
4.3.1.1.3. Equip conservation management facilities in natural protected area and improve conservation management work .....	63
4.3.1.1.4. Map out preservation plan on the species of significance in biodiversity and improve conservation management work .....	64
4.3.1.1.5. Establish preservation network system of national crops, livestock, germ and genetic resources.....	65
4.3.1.1.6. Restore destructed ecosystem, outside of natural protected area and establish the buffer zone and ecological corridor .....	65
4.3.1.1.7. Practice biodiversity monitoring plan by mapping out it .....	66
4.3.1.2. Action related to sustainable use .....	66
4.3.1.2.1. Develop forestry considering biodiversity.....	66
4.3.1.2.2. Protect agricultural biodiversity and accelerate development of nature cyclic type agriculture .....	66
4.3.1.2.3. Develop fish industry in the form of nature managements by intensifying aquaculture work of aquatic fauna and flora .....	67
4.3.1.2.4. Accelerate the protection and proliferation work of medicinal plant and provide sustainable use of Koryo medicine resources .....	67
4.3.1.2.5. Intensify rest work and develop ecotourism .....	67
4.3.1.2.6. Establish comprehensive measures to prevent influences by exotic species...	68
4.3.1.2.7. Map out and promote effective environment assessment on activities which will affect biodiversity.....	68
4.3.1.2.8. Take measures to prevent environment pollution which threatens biodiversity....	68

---

## Biodiversity Strategy and Action Plan DPRK

---

4.3.1.2.9. Take measures on biotic safety.....	69
4.3.1.2.10. Restore destructed ecosystem and improve basin management by mapping out comprehensive, national basin plan.....	69
4.3.1.3. Action on benefit sharing .....	69
4.3.1.3.1. Determine quantity of economic values of biodiversity in given regions in mapping out national land use plan and enable much amount by be profit of given regions .....	69
4.3.1.3.2. Appraise highly the super models in biodiversity conservation and sustainable use and generalize it.....	70
4.3.1.3.3. Establish national database and information network for biodiversity conservation and set up information exchange mechanism. ....	70
4.3.1.4 Common measure related to conservation and sustainable use.....	70
4.3.1.4.1. Include biodiversity conservation to the planning, unification work of national economy and proceed it.....	70
4.3.1.4.2. Include biodiversity conservation in national land development programme and make and generalize models of conservation and development.....	71
4.3.1.4.3. Strengthen scientific research work on biodiversity.....	71
4.3.1.4.4. Take proper measures to increase investment of biodiversity conservation.....	72
4.3.1.4.5. Strengthen local and international cooperation for biodiversity conservation.....	73
4.3.2. Priority projects .....	73
4.3.2.1. Priority projects on biodiversity conservation .....	73
4.3.2.2. Priority projects on sustainable use .....	79
4.3.2.3. Priority projects on benefit sharing.....	82
4.3.2.4. Priority projects on general measures.....	82

### **FOREWORD**

Biodiversity is closely related to the existence of human and their activity. Plants, animals and micro-organisms that make up biodiversity are components of natural ecosystem, which provide the basis for sustainable economic development.

Biodiversity refers to all the varieties of biology that consist of genes, species, communities, populations and ecosystems. And they are closely linked with each other making life support system of the earth. This is the off-spring of the long time earth evolutionary processes. The losses of biodiversity throughout the world force the basis of natural ecosystem and of economic development destroyed, while giving threats to the survival of human life.

Biodiversity conservation (biodiversity conservation) is one of the important tasks faced to the government of DPRK. The reason lays to that improving management of land and environment protection to reduce the damages of biodiversity is an important work to fulfil the responsibility of the present generation to develop economy and hand over the beautiful land and rich resources to the coming generation. It is generally understood that there are three main components of biodiversity: ecosystem; species; and genetic diversities.

An ecosystem diversity is a complex of living species and their non-living environment. All species are part of an ecosystem, playing an unique role in maintaining ecological processes, and at the same time, it requires sound ecosystem composed of cycling of chemical elements and flow of energy necessary for life support. These ecological processes are essential for evolution and development for all living things. Consequently, to maintain diversity of ecosystem is essential to maintain diversity of species and genes.

Species diversity is the richness or the number of animals, plants and micro-organisms. As this is the richness or the number of one area, this can be accessed as a criteria of taxanogical diversity which takes into account of relationship between species. Biological species takes a place of basic materials contributing to the industrial development for agriculture, stock breeding, forestry, fishery and also, medicaments for human health.

Genetic diversity refers to varieties of genes that are present within individual and single species and between species. Genetic variability of species determines the potentials for evolution of species. Genetic diversity has great practical importance in breeding of new varieties for developing agriculture and fishery. Thus, biodiversity has uncountable values including supply of food, medicine, energy, clear air and water for human-being.

Biodiversity conservation can, therefore, be of importance to the sustainable development of economy and environment protection of each country and play an important role in protection of environment of a given local or the globe from the concern of series of global ecosystem.

As a signatory to the Convention on Biological Diversity which adopted at the United Nations Conference on Environment and Development (UNCED), Rio, in 1992, the government of DPRK has reflected the programme for nature protection area for biodiversity conservation into the "General Plan for Land Management"(GPLM), and saw to it that the nature protection areas be

newly established.

The great leader Kim Jong Il, recently, put forth several times on improving and strengthening the work of land and environment protection for the richness of our country. The government of DPRK, recognizing the work to be driven in nationwide scale, established in 1996 the environment protection term for a month in spring and autumn every year, and pushed this work with great effort since the autumn of 1996

The DPRK has not large territory but has unique biodiversity for it occupies a peninsula in north East Asia. There are 3,943 species of higher plant so far surveyed, among which 315 species are endemism accounting for 12% of whole species. Although endemic fauna species takes a small number, its formation is diversified in species as a result of active migration of northern and southern type of animals during glacial and interglacial epoch. Particularly, it has great importance as migratory route, a transit site for internationally rare birds such as cranes and Black faced Spoonbill.

The biodiversity for DPRK has suffered severe damages during the half century of Japanese colonialist rule and 3 years of Fatherland liberation War between 1950~1953. And the rapid growth of population and irrational exploitation of resources and destruction of ecosystems through frequent natural damages have resulted great losses of biodiversity.

The biodiversity conservation in DPRK faces numerous blocks for the reason of special features of and historic consequences to the country's biodiversity. This requires better prospective programmes be developed for DPRK biodiversity conservation. The key issues that need attention in country's biodiversity conservation are:

- Scientific research for biodiversity conservation including investigation on bio-resources and main habitats to be expanded and improved;
- Management of existing protected areas to be improved by integrating reserve network system comprising areas significant to the biodiversity conservation;
- To restore the natural damaged ecosystems and to make close combination of the plan for biodiversity conservation and the plan for land use.
- To increase the bio-resources such as forestry, fishery and herbs, and establish sustainable use system.
- Biodiversity experts to be trained in short period.
- Laws and regulations for biodiversity need to be enforced.

The Biodiversity Strategy and Action Plan for DPRK (BSAP) has been drafted with the consideration of above mentioned. The action plan is prepared to be reflected to the framework of GPLM, as well as to the general economic development plan.

This paper has compiled all the available existing data and knowledge of DPRK biodiversity, so to be prepared in line with the principles and guidelines provided by Convention on Biological Diversity. The paper can generally take into 2 parts; giving description of present status of DPRK biodiversity and efforts for its conservation; giving description of plan of action, the steps to be taken for its conservation.

## **Biodiversity Strategy and Action Plan DPRK**

---

The BSAP consists of four chapters:

Chapter 1 provides an assessment of present status of biodiversity in DPRK; it summarizes biodiversity features and extent to which it is threatened and the urgency of biodiversity conservation and for its sustainable use.

Chapter 2 presents a description of the conservation in ex-situ and protected areas, the sustainable use of bio-resources in areas of agriculture, forestry, fishery, traditional medicine and tourism, and policies and legal basis, administrative and institutional systems, scientific and technological abilities for biodiversity conservation and its sustainable utilisation, and investment and international cooperations to this field.

Chapter 3 shows the description of strategy, conservation and sustainable utilisation, benefit sharing and general measures for biodiversity conservation in DPRK.

Chapter 4 addresses the action and priority projects for biodiversity conservation and its sustainable use:

The BSAP is of great importance for the DPRK itself. It is also an important component of the government's action for fulfilling its obligations to the Convention on Biological Diversity. And it will have a significant and positive impact to the contribution of north-east Asia and global biodiversity conservation.

## INTRODUCTION

### **Country Background**

DPRK is located in eastern part of Asia continent between 37°41"~41° 01 in northern latitude and 124°10"~130°41" in eastern longitude. The DPRK has two seas; the Korean East Sea (KES) and the Korean West Sea (KWS). And it borders with China and Russia by two rivers in north-west; Amnok river and Tuman River. It belongs to a typical temperate zone with distinct seasonal changes of climate. Its annual temperature is 8°C~12°C. The normal change of annual temperature is between 0°C~15°C. And it has regional and seasonal differences in climate, comparing to the size of its territory.

The average annual precipitation is 1,000~1,200mm. April~May is dry season, whereas June~August is rainy season which accounts 50% of total annual rainfall. 80% of territory is mountain and this mountainous topographical condition gives great impacts on climate. The average height above sea level is 583m. The topography of DPRK is characterized by developed and stiff valleys for covering many mountains and rivers. There are many mountains of over 2000m high including Mt. Paekdu and 1,000m high areas which account for 20% of the whole territory. The territory of DPRK can be clearly divided into 15 big basins and have large quantity of runoff compare to the size of rivers.

The DPRK covers an area of 122,762,338km<sup>2</sup>. It has diverse type of soil and distinct horizontal and vertical zonation. There are 12 types of soil. Plant cover zone can be divided into 4: subarctic coniferous forest; temperate northern broad leaved forest; temperate midland coniferous and broad leaved mixed forest, and temperate southern coniferous and broad leaved mixed forest.

The DPRK has more than 100 natural lakes and 1,700 artificial lakes and reservoirs. Such kinds of water areas occupy 5% of territory.

The coastline of DPRK stretches 2,891.5km long and there are 180 islands in KES and 560 islands in KWS. Most of sea areas are continental shelves, and the whole of the west sea is continental shelf. Seas around DPRK are strongly influenced by the Pacific Ocean. The KWS and KES have different oceanographic features. Especially, the KWS has ebb and flows that expose long tideland. Consequently, preserved some relic species, "living fossils" of tertiary period and mesoic era. And there were many moving of northern and southern type of fauna and flora during glacial and interglacial epoch. Since then, fauna and flora settled in the peninsula adapted to complex physio-geographical conditions and underwent an evolution into new varieties which diversified the biology of DPRK.

The peninsula has strong climate change and very intricate geography- mountain ranges, ramified river networks, numerous lakes, long coastline and vast seawater. This complicated physical condition provides various habitats for the existing fauna and flora. Therefore, the DPRK not only sustains the richness of fauna and flora, but also takes a place of high in number of species per unit of area in north east Asia.

*Relationship of BSAP with National Developing Plan and Other Planning Process*

## **Biodiversity Strategy and Action Plan DPRK**

---

The BSAP is developed through several consultations among planning staffs and scientists and between central bodies and local administrative bodies relevant to the biodiversity conservation and its sustainable use. BSAP has reflected issues of international communities.

The biodiversity conservation and its sustainable use has many problems that need integrated measures, and therefore, can have a successful promotion only when close link between development plans of several sectors of national economy is provided.

The relationship of BSAP with national developing plan is as follows;

▶ **Plan in Forestry**

Great part of BSAP is nearly considered with plan of afforestation and use of forest of the country. Especially, efforts to restore the damaged forest ecosystem due to the recent natural disasters and convert Bolded Mountains into thick forest so to promote afforestation throughout the country and sustainable forest development plan take great part of BSAP.

▶ **Plan in Agriculture**

The principle subject for agriculture is to protect agricultural eco-environment in order to improve the soil quality of farmland to provide safe agricultural production. From this point since most terrains are montane, to deduce the loss of soil and to conserve the biodiversity of agro-ecosystem that lead to the development of agriculture with environmental protection and agriculture with recycling of resources have close relationship with BSAP.

▶ **Plan in Fishery**

The major task for fishery is to provide the sustainable productivity of water area to ensure the full production of fish. From this point, the conservation of fish resource should be pushed in advance and strengthen the regulations for preventing the malpractice that lead to a immolation of development benefit for the sake of target benefit. Therefore, the BSAP reflects the programme to alternate the general fish industry into fishery with resource management while composing proliferation of fish resource with mariculture ahead.

▶ **Plan in Koryo medicine (traditional)**

The major task in Koryo medicine which has long historical traditions in DPRK is to provide full conservation and sustainable use of Koryo medicinal resource. The BSAP reflects the programme to promote the creation of Koryo medicinal resource, newly establish the protection areas; encourage the cultivation of domestic herbs and artificial propagation of animals for use of Koryo medicine.

▶ **Plan in Energy**

**General Plan for Land Management(GPLM)**

The GPLM is a integrated and prospective plan of land management to develop and use of land rationally in consideration of the development of national economy and welfare of our people and to improve the environmental protection. The BSAP is closely coordinated with all the plans related with natural environment rotection and sustainable use of land and bio-resources, and great part of BSAP is reflected in GPLM.

### ► **Plan in Scientific Research**

The scientific survey and review on status and changes of country's biodiversity is a primary process for the conservation of biodiversity and its sustainable use. This led to comprise the scientific research programme for biodiversity conservation and its sustainable use as a major component of BSAP.

### *Process of Biodiversity Strategy and Action Plan*

The BSAP of DPRK is developed with aid of GEF through UNDP in 1998. This project accepted the international consultants Mr. Manave Chacrabarti and Mr. Xue Dayuan since this project is under the Enabling Activity Project of GEF in 1997. For the preparation of BSAP, held there a training course by international consultants in Feb. 1998, and opened two times of national workshops for biodiversity conservation capacity building in April and November. Also, have had consultative meetings of local administrative bodies at major sites for biodiversity conservation.

The formulation of BSAP involved experts from Ministry of Land and Environment Protection, Academy of Sciences, Ministry of Agriculture, Ministry of Forestry, Ministry of City Management, Ministry of Fishery, Ministry of Public Health, Ministry of Education, Ministry of Finance and Korean Natural Conservation Union.

In November 1998, 2nd national workshop on biodiversity conservation capacity building had been held and there came on the carpet of BSAP draft. In February 1999, the DPRK Government endorsed the BSAP.

The BSAP shall take great significance to ensure the conservation and sustainable use of biodiversity in DPRK and to add lustre to the beautiful golden mountains and rivers of the country with full of animals and birds, and to overhand rich bio-resources to the coming generation. And also, it contributes to the global biodiversity conservation.

## Chapter 1. THE STATUS OF BIODIVERSITY IN DPRK

### 1.1 Biological Resources

#### 1.1.1. Ecosystem Diversity

The natural ecosystem of DPRK can, generally, be divided into 6 types: forest ecosystem; alpine ecosystem; wetland ecosystem; agricultural ecosystem; river ecosystem; and marine ecosystem.

##### 1.1.1.1 Forest ecosystem

The forest ecosystem can be said to be the habitats for various animals and plants and micro-organisms including trees as a major component. The forest ecosystem in DPRK can take division into 3 kinds; coniferous forest, broad leaved forest and coniferous-broad leaved mixed forest.

Coniferous forest accounts for 41.9% of whole forest area. The representative forest types are; forests of *Abies nephrolepis-Picea jezoensis*, larch/*Larix olgensis*, *Pinus densiflora* and pine/*Pinaceae*. The *Pinaceae* forest accounts for 45.1% of coniferous forests. *Abies nephrolepis - Picea jezoensis* forest is a typical of subarctic coniferous forest, and the main tree species are *Abies nephrolepis*, fir/*A. holophylla*, spruce/*Picea jezoensis* and *P. Koraiensis*. *Abies nephrolepis-Picea jezoensis* forest is mainly distributed in Paekdu Plateaus and Kaema Plateaus in the north of DPRK. *Abies nephrolepis-Picea jezoensis* forest takes 9.8% in coniferous forest. Larch/*Larix olgensis* is also a typical subarctic coniferous forest and distributed mainly in alpine area of Ryanggang Prov. and South and North Hamgyong Prov. This is distributed in areas of 1,000~1,900m high above sea level. The main tree species of this type are *Larix olgensis var, Koreana* and *Larix olgensis*.

The DPRK is a original place for *Pinus koreaiensis*. *Pinus koreaiensis* is distributed in broad areas except Paekdu Plateaus and Kaema Plateaus and in 1,200 m high area above sea level of Ryanggang Prov. and Jagang Prov. Especially, it is distributed, extensively, in the area of Mt. Oga.

The main tree species of the pine forest is *Pinus densiflora*, and this is distributed in every part of DPRK except northern alpine terrain. This is mainly distributed bellow 1,000m high above sea level and grow with *Larix olgensis* and oaks. It forms simple forest bellow 600m above sea level. The mean temperature of subarctic coniferous forest with *Abies nephrolepis-Picea jezoensis* and *Larix olgensis* forest is  $-5^{\circ}\text{C}$ . This area is covered with distribution of animals such as; *Ursus arctos*, *Cervus nippon*, *Cervus elaphus*, *Martes zibellina*, *Lyrurus tetrrix* and *Dryocopus Martius*.

The broad leaved forest covers an area of 35.6% of the whole forest area of the country which can be breakdowned into as subarctic deciduous broad leaved forest and temperate deciduous broad leaved forest. Subarctic deciduous broad leaved forest is consisted of *Populus koreana*, *Betula platyphylla*, *B. eramani*, *Acer Palmatum*, *Phellodendron amurense* and *Pinus koraiensis* and also, *Abies holophylla*. The oak tree is the main species in temperate deciduous broad leaved forest which includes *Tilia amurensis*, *Juglans mandshurica*, *Acer Palmatum*, and *Acer mandshuricum*. In southern terrain, *Carpinus laxiflora* and *Styrax japonica* are included. The oak forest is a typical forest community of temperate deciduous broad leaved forest in DPRK. The main tree species are *Quercus mongolica*, *Q. dentat* and *Q. acutissima*.

The annual average temperature in area of this community is 6°C~10°C and the precipitation varies around 700~1,400mm. The oak forest accounts for 52.4% of broad leaved forest and this is distributed even in the area of 1,400m high above sea level barring some alpine terrains. The broad leaved forest has about 90% of wild animals distributed. The representative species are *Sus scrofa*, *Hydropotes inermis*, *Vulpes vupes*, *Nyctereutes procyonoides* and *Lepus mandshuricus*. And also, many birds including *Dryocopus javensis richardsi*, the indigenous species of our country are inhabiting in the broad leaved forest. The coniferous and broad leaved mixed forest in DPRK can be classified into; subarctic evergreen coniferous forest-deciduous broad leaved forest, subarctic deciduous coniferous and broad leaved mixed forest, temperate evergreen and deciduous coniferous and broad leaved mixed forest according to the climate zone. The coniferous and broad leaved mixed forest takes 22.5% of the whole forest areas.

As for forest type, we can take *Pinus densiflora-Quercus serrata* forest, *Larix olgensis-Betula er, amii-Populus davidiana* forest, *Pinus koraiensis-Betula platyphylla-Populus davidiana* forest, *Abies nephrolepis-Pinus Koraiensis-Tilia amurensis* forest, *Pinus densiflora-Betula platyphylla* forest. In addition to this, we can take *Pinus densiflora* forest as for artificial forest. 56.4% of wild animals are distributed in coniferous and broad leaved mixed forest. The main species are *Capreolus capreolus*, *Felis linx*, *Pteromys volans*. Also inhabit here spring birds including woodpecker.

- \* The DPRK has no typical grassland ecosystem of large area, but only distributed in forest and agricultural ecosystem. All of the grasslands are originated from change of forests and since each grassland is surrounded by forests, they are easily alternated into forests if no attention for management is paid. Therefore, grassland in DPRK can be referred as forest type grassland ecosystem.

The main species of grassland ecosystem are *Miscanthus sinensis*, *Lespedeza crythoptria*, *Themeda japonica*, *Artemisia montana* and *Senecio nemorensis*. The DPRK has little experience of grassland ecosystem research. Recently, the efforts for creating grassfield of large area to breed grass animals such as goat is being deployed extensively. This lays weight to the improvement of formation and management of grassland ecosystem.

### 1.1.1.2. Alpine ecosystem

The alpine vegetation community in DPRK is distributed in areas along the peaks of above 2,000m high mountains. Mountains typically developed with alpine ecosystem are; Mt. Paekdu (2,750m), Mt. Pukpotae (2,288m), Mt. Nampotae (2,433m), Mt. Sobaek (2,171), Mt. Kanpaek (2,162m), Mt. Kwanmobong (2,540m), Mt. Duryu (2,309m), Mt. Chailbong (2,505m), Mt. Buksubaek (2,521m), Mt. Ryonhwa (2,355m) and Mt. Rangrim (2,186m). There distributed 250 species of alpine plants in alpine vegetation zone.

The representative community species are *Pinus pumila*, *Thuja koriensis*, *Rhododendron confertissimum*, *Rhododendron faurei*, *Oxytropis aentii* and *cladonica*. There are 30 species of endemic plant and 50 species of medical plant in alpine ecosystem. *Rheum coreana* is endemic species with high economic and medical values. Alpine ecosystem, also, have animals such as *Ochotona hyperborea*, the living fossils of glacial epoch and *Neomorpha goral* and *Cervus elaphes* and as for *Laves*, *Apus pcificus*, *Hirundoapus eaudacuta* and *Monticola gularis*. The

alpine ecosystem of the country has unique landscape and high value of tourism resource. However, the alpine ecosystem is under condition of easily destructible; is laid as an important object for its conservation.

### **1.1.1.3 Wetland ecosystem**

Wetland ecosystem in DPRK is generally distributed in tidelands, estuaries and large lakes and some are found in marsh land and peat land. The vegetation community in tideland is distributed in belt-shape of 50~200m width from Bidan island and Dasa island of Amnok river to the whole coast of west sea. And the mouth of bay is 300~500m width. In east coast, they are distributed at estuaries of Kumya river. The formation history of vegetation community of tideland in DPRK is not so long. Therefore, there is little differences in plant species component and distribution. The main plant species are *Salicornia europea*, *Suaeda japonica* and *Phragmites*.

The biological productivity in tideland plant community is every high, and comes 60t/ha in reed community. The number of invertebrate species and its density is high in tideland. Especially, various kinds of shells including *Metrix lamacki* are being inhabited in the coast of KWS.

The wetlands in east and west coast are the lead transit sites for intermediation habitat of migratory birds of north east Asia. The main tracts are: Dongrim ri, Mundok county of South Pyongan Prov. the mouth of Chongchon river; Haejung ri, Kumya county, South Hamgyong Prov. the mouth of Kumya river; Daedong bay between Ryongyon county, Taetan county and Onjin county, South Hwanghae Prov.; September, the 18th Reserve of Chongdan county, South Hwanghae Prov; and lake area of Razin-Sonbong, North Hamgyong Prov.

### **1.1.1.4 River ecosystem.**

The DPRK has densed river network. The density of river network is 0.4-0.6km/km<sup>2</sup> and river basins account for 3.0% of whole territory. The rivers to flow into Korean West Sea(KWS) have their length very long as well as developed river branches, and the width of basins are wide compared to their length. The rivers to flow into Korean East Sea(KES) have their flow steep slope and short length.

The main plant species living in river basins are *Populus maximowiczii*, *Poncircus koreana* Rend, *Populus davidiana* and *Salix koreensis*. The vegetation community in river basin is playing a function of water catchment and land protection. Therefore, to provide the linkage between the basic study on plant community and river basin reforestation and management so to ensure the safe of ecosystem is regarded very important subject for river ecosystem management. Especially, to restore the recent flood damaged forests and river ecosystem to improve the biodiversity conservation is being raised as an urgent issue.

There are 30 species of endemic fish in rivers of the country such as; *Gonoproktopterus mylodou*, *Coreolueciscus splendidus* and *Thymallus articus*. The management of river ecosystem, therefore, has great significance in fresh water fish production. This lays necessity to the improvement of river ecosystem management which is being affected of human activities such as pollution.

### **1.1.1.5. Marine and coast ecosystem**

The Korean West and East Seas are influenced by Pacific Ocean through several channels. Rivers of Amnok, Chongchon and Taedong from DPRK and rivers of Hwanghwa and Janggang from China are flowing in to the Korean West Sea carrying enormous amount of residue and deposits. The KWS has high ebb and flow.(maximum 11.02m high)

According to preliminary statistic, 250 species of fish are in offshore of KWS. The average water depth is 39m and the deepest one is 118m in west sea. It is, therefore, important task to protect water environment of KWS. Whereas, the average depth of KES is 1,668m, the deepest is 3,699m and the length (from north to south) is longer than the width (from the coast of DPRK to the coast of Japan). There are 600 species of fish in waters of KES. Deep and high transparency and salty water it has, not so affected by waters flowing down from inland.

The KES has very favourable conditions for mariculture. The coast is estimated to have 546 species of seaweed (*rhodophyte* 329, *phaeophyte* 130, and *chlorophyte* 87). The seaweed is being mixed with northern and southern species (factors). The KWS has its topography with tideland and many islets. And its inland has major farmland area. Whereas, KES has deep water and low ebb and flow, and most of tracts are rock areas except some big river estuaries. From these topographical differences of east west, they have distinct biological features. Since it is predicted the sea level rise following the global warming, survey study on marine ecosystem variability of the country is suggested absolutely necessary task.

### ***1.1.2 Species Diversity***

The species is the basic unit in the sense of biological evolution, and the species diversity takes the central position in the role of biological diversity. The DPRK is characterised with rich species of fauna and flora in light of its territory size.

#### ***1.1.2.1 Wild plants***

The plant species recorded so far in DPRK are 8,758; among which 3,167 species, 690 genera, 204 families are vascular plants. The moss has 767 species, 243 genera, 80 families, and the lichen has 436 species, 59 genera, 28 families. And there are also lower plants of 4,406 species, 959 genera, and 269 families. The lower plant becomes the first step of producible biology among component of ecosystem and so takes basic place in biodiversity conservation of land, freshwater and sea water. It is predicted that the number of species in the country will be increased for there is on-going investigation of lower plant.

#### ***1.1.2.2 Wild animals***

The vertebrates recorded up to 1997 in DPRK are 1,431 species of 472 genera of 151 families.

##### **◆ Mammals**

Among vertebrate, mammalian has 107 species of 69 genera of 28 families, among which terrestrial mammalian has 7 species, 48 genera, 20 families which composes 11 species of insectivores, 24 species of chiropter, 2 species of lagomorph, 18 species of rodents, 15 species of carnivores and 7 species of perissodactyls etc. Representative mammals are tiger, leopard, jackal, grey wolf, brown bear, bear, sable, common otter, deer, musk deer, water deer, roe deer and goral, and so on.

## Biodiversity Strategy and Action Plan DPRK

◆ Aves

Bird has 64 species of 190 genera of 61 families, among which, migratory birds are 64 species, summer birds 92 species, winter birds 104 species, passers 83 species and lost birds 73 species and most rate of birds are dominated by migratory birds. The representative birds are *Grus*, *Egrett*, *Cyconidae*, *Platalea*, *Limicolae*, swallow, cygnus including duck,goose, limicolae.

◆ Herpeto fauna

Amphibian has 26 species of 17 genera of 11 families and the representative species are *Eumeces coreensis*, *Ancistrodon blomhoffi*, totoise and so on. Reptilia has 17 species of 8 genera of 6 families, and *Rana nigromachlata*, *Rana temporalia*, *Rana coreana*, *Hynobius onychodactylus* are the representative species.

◆ Fish

According to the preliminary survey, the country has 865 species of fish including sea fish, among which, pure freshwater fish are 111 species, fish living in mixed of salt and fresh water 59 species and anadromous fishes 15 species. The endemism present most in freshwater fish.

◆ Invertebrates

The invertebrate animals so far recorded are 8,360 species, among which 5,965 species are insects. Presently, the study on this field is undergoing and predicts to be increased 4~5 times.

**Table 1. Number of Species of Major Groups of Animals and Plants in DPRK**

Taxa	Species	Genera	Families
Vascular Plant	3,176	690	204
Bryophyta	767	243	80
Lichennophyta	436	59	28
Eumycophyta	1,685	384	80
Myomycophyta	169	35	12
Chlorophyta	444	115	36
Rhaeophyta	129	60	21
Bacillariophyta	615	70	21
Mammal	107	69	28
Aves	416	190	61
Reptile	26	17	11
Amphibian	17	8	6
Pisces	865	188	45
Mollusk	518	227	123
Insect	5,965	2,157	327

### 1.1.2.3 Micro-organisms

There are 1,005 species of 140 genera of micro-organisms known in DPRK upto 1997 that isolated from variable ecosystems. Considering data on Mt. Paekdu, those micro-organisms isolated in this tract are 306 species of 43 genera. The order of rate is seen as; fungi (113 species of 15 genera), yeast (81 species of 18 genera), Actinomycetes (71 species of 2 genera), bacteria (41 species of 8 genera). It is

foreseen to discover more species and to elucidate more clearly of regional features following the intensified taxonomical research on micro-organisms.

### **1.1.3 Genetic Diversity**

Genetic diversity is the main factor of biodiversity and becomes the basis of ecosystem diversity through species to species. Most of wild fauna and flora known in DPRK are the species with high economic and scientific values. And these species play a significant role in maintaining sound ecosystem of the country. Therefore, there must be new progress in protection of genetic resource diversity of wild fauna and flora by establishing protection areas considering the distributional features of wild fauna and flora.

#### **1.1.3.1 Domestic plants (crop germplasm)**

The DPRK has rich genetic resources of crops and livestock as it has 5,000 years of history. *Oryza sativa*, *Glycine max*, *Panicum miliaceum* and *Sorghum sp.* have been cultivated for about 6,000 years and this is identified by excavation of old historical relics. The domestic plants of the country have special features of high rate for medicinal plant. This is related with the long history of Koryo medicine, the traditional medicine of DPRK.

The representative herb species is *Panax schinseng*(Insam). Today, Kaesong Koryo Insam cultivated in Kaesong, is recognized for its higher medical value than other countries in the world. The representative taxa are those genera of; *Prunus Allium*, *Pyrus*, and *Ribes*.

The main crops cultivated in DPRK are; maize, potato, wheat, barley, millet, sorghum and beans for vegetables are; Korean cabbage, radish, cabbage, spinach, cucumber, pumpkin, egg-plant, pepper, red beet, carrot, lettuce, garland chrysanthemum, garlic, leek, stone-leek, and onions. The total national registered indigenous species are about 1,110. There are about 250 indigenous species of fruit and they are apple, pear, peach, plum, cherry, jujube, persimmon, chest-nut, apricot, strawberry, grapes and so on.

#### **1.1.3.2 Domestic animals (livestock breeds)**

The representative domestic animals that are bred in DPRK are 16 species which are; cow, pig, goat, sheep, rabbit, horse and donkey, and the races are 80. The representative husbandary are 8 species which are; hen, goose, duck, turkey and quail, and the races are 30. Many indigenous breeds are of high production to adapt to the relevant climate and soil.

#### **1.1.3.3 Aquatic animals and plants**

The DPRK puts great efforts to the mariculture to improve dietary life of people. As for sea weed in mariculture, we have 6 main domestic species which are; kelp, seaweed, sea lettuce, *Chorda filum*, *ahnfeltia*, *Gelidium amansii*. For sea invertebrate, 8 main species which include *Meretrix lamarki*, short neck clam, *Mactridae*, surf clam, oyster, abalone, sea urchin, sea cucumber, are being cultured.

Recently, expansion is found in breeding, hatching and artificial propagation of fish such as flatfish,

sole carp, silver carp, *kinyom* fish, grass fish, rainbow trout, *Osmerus spp.*, char, *Brachymystax lenok*.

The main fish breeding targets are carp, silver carp, *kinyom* fish, grass fish, rainbow trout, *Osmerus spp.*, char, *Brachymystax lenok*. The fishes for breed are being produced by intensive breeding in hatchery, which are provided with artificial hatching techniques. And carp, silver carp, sweetfish, *Osmerus spp.* are artificially hatched and released into the rivers and streams so to bring up the productivity of the water area. Therefore, conservation of gene resource to prevent degeneration of breeding fishes and species of mariculture.

### 1.2 Special Features of DPRK Biodiversity

#### 1.2.1 Ecological and Evolutionary Features of Biodiversity

The DPRK is rich of fauna and flora species compare to the territorial size and even more than other neighbouring countries in the rate per area. As far as higher plant is concerned, the DPRK has 3,9943 species which accounts 0.03 species/km<sup>2</sup> and as for bird, has 420 species which accounts 0.003 species/km<sup>2</sup>. Also, the DPRK is characterized to have diversity in the formation of bio-species.

The reason falls to that DPRK is a peninsula situated in the east of Asian continent that has not directly influenced much by tertiary glacial epoch. And also, northern type of species from north-east China and Mongolia and southern type of species of temperate and subtropical origin and Kwangpo species from north east Asia and Eurasian continent had migrated and distributed actively during the glacial and interglacial epoch. And another reason is put to that the fauna and flora survived upto now have developed to endemic species through dynamics to the diverse natural and geographical conditions of the country after the glacial epoch.

The main relic species, "living fossils" for plant in the country are *Magnolia sieboldii*, *Nelumbo nucifera*, *Ginko biloba*, *Myrica rubra* and *Diapensia japonica*. *Mergus squamatus*, *Tadorna cristata* and *Emberiza jankowskii* are the typical avian living fossils of tertiary period. And *hydronotes inermis* is the typical mammalian living fossils of the same above period. Among fresh water fish, *Gonoprokopterus mylodon*, *Microphysogobia koreensis* are endemic fishes that evolved in the time of paleo Amnok River system and those distributed in northern alpine terrsin such as *Gonoprokopterus mylodron* and *Microphysogobio koreensis* are the endemic species related with paleo Amur river system. To this end, the DPRK fauna and flora has special important position in view of the evolution history of bio-species in north east Asia.

#### 1.2.2 Species of Endemism

The DPRK has high rate of endemic species in total plant species. According to the analysis of data informed todate, 14 species in fernbrake plant (variety 7species), 3species in *Gymnosperniniphyta* (variety 5species, modification 1species), 298 species in *Angiospermophy*(variety 197 species, modification 17 species coming total of 315 species which account 8% of total higher plants.(Annex 1-1)

There are 6 endemic genera (that of 1genus of 1species in the world): *Abeliophyllum Nak* of *Abeliophyllum Nak* genus; *Eeshinosophora Koreensis* of *Eeshinosophora Koreensis* genus;

*Pentactina rupicola* of *Pentactina rupicola* genus; *Megaleranthis saniculifolice* of *Megaleranthis saniculifolice* genus; *Caelopleurum Nakaianum* of *Caelopleurum Nakaianum* genus; and *Coreanomecon hylomeconoides* of *Coreanomecon hylomeconoides* genus. And there are also, 2 species of one genus which is *Keumkangsania asiatica* (*Keumkangsania asiatica* and *Keumkangsania latisejala*). Economic species of medical value such as *Rheum coreanum*, and *Astroagalus setsureianus* are also in place of endemism. As for endemic animals, the vertebrate is known to have 33 species/sub species of fish, 3 species of amphibian, 2 species of reptile, 2 sub species of avez, 1 species of mammalia which account for 2.7% of total vertebrate(Annex 1-2).

The representative endemic species are:

**Pisces;** *Thymallus jaluensis*, *Hucho ishikawai*, *Gonoprokopterus mylodon*, *Microphysogobio koreensis*

**Amphibia;** *Rana coreana*, *Rana chosenika*,

**Reptilia;** *Eumeces coreensis*

**Avez;** white-billied black woodpecker:

The reason of having many endemic species in DPRK is that the complex geophysical conditions forced biological isolation and accelerated the formation of endemic species. That is, the DPRK has 10 mountains of more than 2000m high and high density of mountain ranges and valleys. And the difference at the subtle climate conditions and ecological environmental condition at the topography where high mountain ranges and deep valleys are in complex restrained the exchange of seed distribution and pollen exchange.

It is expected that many endemic species in DPRK will be discovered when the research on the genus of flower plant and invertebrate animals is deepened.

### **1.2.3 Endangered and Rare Species**

Endangered and rare species are very sensitive to the change of ecosystem. The fact that the good survival of well protected endangered species is the evidence that the habitats are well managed, and endangered and rare species themselves play a function of index biology towards the ecological environment changes.

Thus, the protection of endangered and rare species needs the protection of species itself as well as habitat protection. We can divide the species of animals and plants in DPRK in line with the criteria of the World Conservation Union (WCU) as follows;

- a) extinct species
- b) endangered species
- c) vulnerable species
- d) rare species
- e) local populations.

In case of higher plant, endangered species 10 (1 variety), vulnerable species 42, rare species 76 (variety 3), local population 26, comes to the total of 158 species. And this accounts for 4.0% of total number of higher plant. (Table 2)

## Biodiversity Strategy and Action Plan DPRK

**Table 2. Number of Endangered and Rare Species for Plants in DPRK**

Taxum	Endangered species			Vulnerable species			Rare species			Local populations			Total
	Species	Variety	Morpha	Species	Variety	Morpha	Species	Variety	Morpha	Species	Variety	Morpha	
Gymnosperniophyt	1			1						5			7
Angiospermophytina	9		1	41			75		4	21			151
Total	10		1	42			75		4	26			158

As far as vertebrate is concerned, extinct species 2, species threatened with extinction 9, vulnerable species 29, rare species 117, in total 1,431 species, and this accounts for 11.1% of total 1,495 species of vertebrates. (Table 3) (Annex 3)

**Table 3. Number of Endangered and Rare Species for Taxa of Vertebrate in DPRK**

	Species with extinction	Species threatened with extinction	Endangered species	Rare species	Total
Pisces		3	4	26	33
Amphibian			3	6	9
Reptile		1	4	8	13
Aves	2	2	9	63	76
Mammal		3	9	16	28
<b>Total</b>	<b>2</b>	<b>9</b>	<b>29</b>	<b>119</b>	<b>159</b>

The order of priorities for endangered and rare plant protection is as follows:

Species threatened with extinction and of endemic value such as *Rheum coreanum*, *Diola westerii*, *Ajuga Apectabilis*, *Juniperus coreana*, *Sapium japonicum*, *Panax schinseng*, *Pinguicula vulgaris*, *Pacedria scandens*, *Gastrodia elata* and etc.

The endemic plants of DPRK such as *Echino sophora koreensis*, *Pentactina rupicola*, *Keumkangsania asiatica*. Species of endangered, rare and of endemism such as *Forsythia densiflora*, *F.ovata*, *Ligustrina faurei*, *Saussurea rectinervis*, *S.calicola*, *Abelia mosauensis*, *Iris minitorea* and *Goodyera repeus*.

As for the priority of animal protection: in *Disces*; *Gonoproktopterus mylodou*, *Coreoleuciscus splendidus*, *Thymallus* and in *Amphibia*; *Rana coreana*, in *Reptilia*; *Eumeccs coreensis*, in *Avez*; *Dryocopus javensis richardsi*, *Platalea minor*, *Egretta eulophotes*, *Grus japonensis*, *G. vipio*, *G. monacha*, *Dendrocopus martius*, *Ciconia byciana*, *Aythya baeri*, *Larus sasundersi* and birds of prey, and in mammal; *Pantera tigris*, *Cervus nippon*, *ursua arctos*, *Martes zibelline*, *Lutra lutra*, *Moscshsu moschiferus*, *Nemorhaedus goral*.

According to the criteria of IUCN and CITES, vulnerable and rare species of vertebrate can be

divided as follows;

**Table 4. Relationship between DPRK and CITES for Endangered and Rare Animals**

Taxa	Endangered & rare species in DPRK	Species in CITES	
		Annex1	Annex2
Amphibian	9		
Reptile	13		
Aves	74	15	21
Mammal	28	4	7
Total	124	19	28

**1.2.4. Economic Importance of Wild Species.**

Most animals and plants distributed in DPRK have high economic values. The number of plant species of economic value for usage shows in table 5.

**Table 5. Number of Species by Use of Plants in DPRK**

Usage	Species
Medicinal plant	900
Wild edible greens	300
Nuts	30
Forage plant	160
Timber plant	100
Fibre plant	100
Oil plant	50
Spice plant	60
Honey source	170
Horticulture	300
Sugar source	10
Total	2,180

Among forest resources of DPRK, we can take following species as representative ones;

- *Abies nephrolepis*, *Picea jezoensis*, *Larix olgensis* var. *koreana*, *Ulmus macrocapa*, *Tilia amureasis* with high timber value;
- *Juglans regia*, *J.cordiformis*, *J.mandshurica*, *Pinus koraiensis*, *Evodia danielli* as oil plant;
- *Panax schinseng*, *Schizandra chinensis*, *Rheum coreanum*, *Codonopsis pilsula*, *Atractylodes*