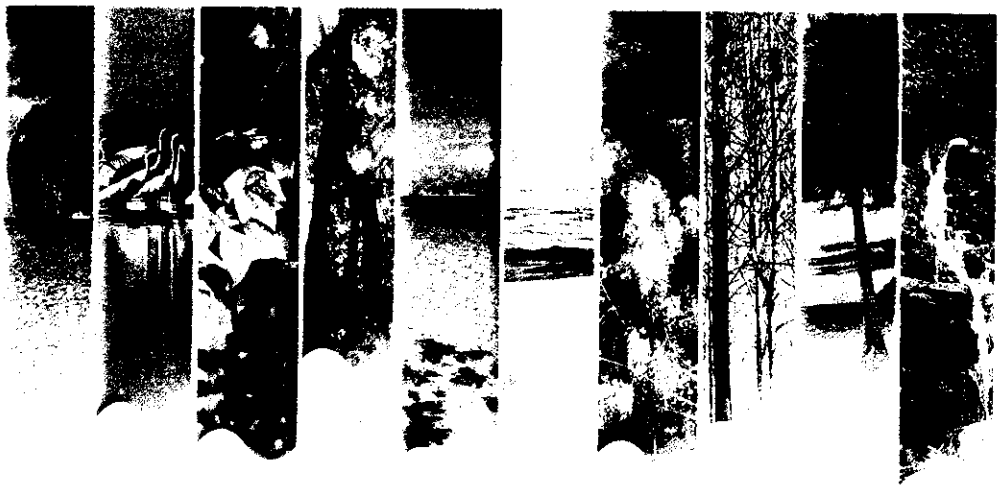

THAILAND

Biodiversity Conservation in Thailand

National Report

Implementation of Article 6 of the Convention on Biological Diversity

OFFICE OF ENVIRONMENTAL POLICY AND PLANNING
MINISTRY OF SCIENCE TECHNOLOGY AND ENVIRONMENT

Contents

Preface

Regular review of state of biodiversity and its conservation has been recognized by the Convention on Biological Diversity (CBD) as a crucial element in combatting loss of biodiversity. Under Article 6, the Convention's Contracting Parties are obligated to report on implementation of provisions of the Convention including measures formulated and enforced. These reports serve as valuable basic information for operation of the Convention as well as for enhancing cooperation and assistance of the Contracting Parties in achieving conservation and sustainable use of biodiversity.

Although Thailand has not yet ratified the Convention, the country has effectively used its provisions as guiding principles for biodiversity conservation and management since the signing of the Convention in 1992. Thailand has accumulated considerable amount of information and experience on its implementation which can be of significant contribution to international efforts under the Convention. Compilation of this national report was thus a clear evidence of how far the country undertook toward realization of the Convention as well as an instrumental endeavour to ensure that the country's experience is beneficial to biodiversity conservation at the global level.

The Office of Environmental Policy and Planning (OEPP) sincerely believes that the national report is not merely a presentation of Thailand's implementation of the Convention, but also an instrument in reflecting effectiveness of activities undertaken to preserve the nation's biological wealth. The publication is entrusted to provide those involved in biodiversity management with indications on best possible approaches and means to overcome problems associated with the conservation. OEEP is convinced that the report's most valuable asset can be realized when lessons documented are applied in actual conservation works, either in the field or in planning process.

On behalf of the OEPP, I wish to express sincere gratitude to the Working Group on the National Report on Implementation of the Convention on Biological Diversity for providing input and reviewing manuscript of this publication. I would like to also thank Dr. Banpot Napompeth for sacrifying his dispensable time to edit this report. Finally, I would like to extend OEPP's appreciation to all who contributed to drafting and producing this document.

Saksit Tridech
Secretary General

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CHAPTER 1
BIODIVERSITY AND STATUS

SPECIES DIVERSITY

Thailand is situated within two major biogeographical regions, the Indochinese region in the North and the Sundaic region in the South. Apart from the effect of these two regions within the Indomalayan Realm, some elements of Thailand's flora and fauna are also influenced by biogeographical characteristics of the Indian and Palaearctic regions.

The six biogeographical units namely the Northern Highland, the Korat Plateau, the Central Plain of the Chao Phraya River, the Southeast Upland, the Tenasserim Hills and the South Peninsular have distinct floral and faunal associations. For example, many bird and mammal species of the Northern Highland have Chinese affinities, which can not be found in other biogeographical units. Similarly, a number of mammal and bird species found in the Southern Peninsula have characteristics related to those of the Sundaic regions.

Flora

Thailand does not have unique floristic elements. Because of its geographical location the majority of plant species in the country are closely related to the species in neighbouring countries. Thus, Thailand could be considered as a collective center of botanical diversity from 3 major regional elements : Indo-Burmese, Indo-Chinese and Malesian.

Thailand's flora appears rich in comparison with other countries in the world, even though many native species have become extinct in many habitats. During the past century depletion of forest area, degradation of terrestrial, fresh-water and marine habitats as

well as conversion of natural ecosystems into agricultural and urban areas, all have led to reduction of species richness. Unfortunately, the number of plant species originally occurred in the country before human disturbance remains unknown.

Non-vascular plants in Thailand comprise about 2,154 species including algae and bryophytes. The knowledge of the lower groups especially macrofungi and lichens is still limited in comparison with the higher ones. Vascular plants include 1,869 genera and 9,441 species recorded from Thailand. It is estimated that these numbers constitute about 80% of those existing within the country. Among all families, Orchidaceae is most diverse in species. The family comprises about 160 genera and 1,116 species of which 177 species are endemic to Thailand. Number of known Thai species of plants is shown in Table 1.

Table 1 Number of known Thai plant species

Taxon	Common name	Number of species
Plantae	**plant**	**12,253**
Cyanophyta	blue green algae	272
Chlorophyta	green algae	497
Chromophyta	colour algae	385
Phaeophyta	brown algae	48
Rhodophyta	red algae	132
Bryophyta	mosses & allies	820
Anthocerotopsida	hornworts	2
Bryopsida	mosses	630
Hepaticopsida	liverworts	188
Psilophyta	whisk-ferns	2
Lycophyta	clubmosses	39
Sphenophyta	horsetails	1
Pterophyta	ferns	591
Pinophyta	gymnosperms	25
Magnoliophyta	flowering plants	9,441
Magnoliopsida	dicotyledons	7,750
Liliopsida	monocotyledons	1,690

Sources : Biological Diversity in Thailand: A Country Study

Fauna

Thailand is the geographical center of a distinct biogeographic realm extending from eastern India to Vietnam and south China. The greater part of the country lies properly in the continental South-East Asia. Thus, terrestrial fauna of Thailand has a distinctly continental aspect in distribution. Marine fauna are quite different in species composition between those of the Gulf of Thailand and Andaman Sea. It is estimated that 87,500 species of animals do exist in Thailand but the described species are 18,073. The number of known Thai animal species is shown in Table 2. By far the majority of invertebrates are insects. Only 8,705 species have so far been described which account for 10% of estimated number of species exist in Thailand.

Table 2 Number of known Thai animal species in Thailand

Taxon	Common name	Number of species
ANIMALIA	**ANIMALS**	**18,073**
Protozoa		**181**
Porifera	**sponges**	**59**
Mesozoa		**4**
Cnidaria	**cnidarians**	**492**
Scyphozoa	jellyfish	8
Cubozoa		41
Hydrozoa	hydrozoans	19
Anthozoa	sea anemones and corals	424
Ctenophora	**comb-jellies**	**1**
Plathelminthes	**flatworms**	**66**
Turbellaria	free-living flatworms	3
Trematoda	flukes	41
Cestoda	tapeworms	4
Nemertea	**ribbon worms**	**116**
Rotatoria	**rotifers**	**288**
Acanthocephala	**spiny-head worms**	**2**
Nematoda	**roundworms**	**347**
Sipunculida	**peanut worms**	**22**

Table 2 (continued)

Taxon	Common name	Number of species
Annelida	**annelids or bristle-worms**	**279**
Polychaeta	marine annelids	264
Oligochaeta	freshwater annelids, earthworms	7
Hirudinea	leeches	8
Bryozoa	**sea-mats**	**1**
Brachiopoda	**lamp-shells**	**3**
Arthropoda	**arthropods**	**10,519**
Myriapoda	centipedes, millipedes etc.	12
Hexapoda	insects	8,705
Zygentoma	silverfish	3
Ephemeroptera	mayflies	8
Odonata	dragonflies	318
Blattodea	cockroaches	9
Mantodea	mantids	11
Isoptera	termites	92
Orthoptera	grasshoppers, crickets	200
Plasmida	stick insects	7
Dermaptera	earwings	13
Plecoptera	stoneflies	2
Psocoptera	book-lice	2
Phthiraptera	biting/sucking lice	6
Thysanoptera	thrips	99
Hemiptera	bugs	327
Homoptera	planthoppers and aphids	320
Neuroptera	lacewings and ant-lions	18
Coleoptera	beetles	2,297
Strepsiptera	stylops	2
Mecoptera	scorpion flies	9
Siphonaptera	fleas	16
Diptera	two-winged flies	1,077
Trichoptera	caddis-flies	17
Lepidoptera	butterflies and moths	3,329
Hymenoptera	wasps and their allies	523
Merostomata	horseshoe crabs	2

Table 2 (continued)

Taxon	Common name	Number of species
Crustacea	crustaceans	1,242
Cladocera	water fleas	28
Ostracoda	seed shrimps	32
Copepoda	copepods	171
Cirripedia	barnacles	3
Lepadomorpha	parasitic barnacles	2
Mysidacea	mysid shrimps	2
Cumacea	cumaceans	35
Stomatopoda	mantis shrimps	62
Isopoda	isopods	33
Amphipoda	amphipods	49
Decapoda	decapods	825
Chelicerata	spiders & scorpions	558
Araneae	spiders	140
Opiliones	harvestmen	8
Pseudoscorpiones	false scorpions	1
Acari	mites and ticks	393
Scorpionida	true scorpions	7
Uropygida	whip scorpions	6
Palpigradida	micro-whip scorpions	1
Schizomida	schizomid	1
Amblygygida	tailles whip scorpions	1
Mollusca	**molluscs**	**1,340**
Polyplacophora	chitons	2
Gastropoda	snails, whelks etc.	844
Bivalvia	bivalve molluscs	445
Scaphopoda	tusk shells	2
Cephalopoda	squids, octopods etc.	47
Hemichordata		**5**
Enteropneusta	acorn worms	4
Pterobranchia	pterobranchs	1
Chaetognatha	**arrow worms**	**10**
Echinodermata	**echinoderms**	**244**
Crinoidea	sea-lilies and feather stars	36
Asteroidea	starfish	57

Table 2 (continued)

Taxon	Common name	Number of species
Ophiuroidea	brittle-stars	69
Echinoidea	sea urchins	55
Holothuroidea	sea cucumbers	27
Chordata	**chordates**	**4,094**
Tunicata	tunicates	9
Appendicularia	appendicularians	4
Thaliacea	salps	4
Ascidacea	sea squirts	1
Cephalochordata	lancelets	4
Craniata	vertebrates	4,072
Pteraspidomorphi	hagfishes	1
Chondrichthyes	cartilaginous fishes	145
Osteichthyes	bony fishes	2,255
Amphibia	amphibians	123
Reptilia	reptiles	318
Aves	birds	962
Mammalia	mammals	292

Sources : Biological Diversity in Thailand: A Country Study

Vertebrate comprises approximately 4,072 species of land, freshwater and marine vertebrates. It has been known that the species of northern Thailand are largely Palaearctic while those of the southern part are more likely Sundaic. The Indochinese species join the fauna of the East and the Indo-Burmese species share composition of the western fauna.

- Cartilaginous fishes comprise 145 species of sharks, rays and chimaeras. Almost all cartilaginous fishes live in deep sea. Most species that occur in the South China Sea and Indian Ocean can possibly been found in Thai waters. Bony fishes are numerous and diverse in species composition. According to current knowledge, 570 freshwater bony species and 1,531 marine bony species have been recorded to occur in Thailand. The marine bony fishes are of the Indo-Pacific faunal element which distributing widely from the eastern coast of Africa to northern Australia. Most freshwater bony fishes are of Indo-Chinese and Sundaic origins.

- Amphibians comprise at least 123 species known in Thailand including numerous species of frogs and toads and few species of salamanders and limbless amphibians. There are 91 species of frogs and 26 species of toads. Many species inhabit a

wide range of wetlands and forest habitats. The true frogs form the largest family numbering 47 species. The next largest family, the Old World tree frogs, comprises 28 species of tree frogs and flying frogs. Horned toads numbering 17 species have been found in forests throughout the country. There are 15 species of burrowing frogs and 9 species true toads.

- Reptiles contain at least 318 species of turtles and tortoises, crocodiles, lizards, and snakes known in Thailand. Reptiles form a remarkable group occupying every type of habitat, from mountain tops to the depths of the sea. Turtles and tortoises contain 24 species known to occur in the country. Among all 5 species of sea turtles are very important on the conservation point of views. Total 3 species of land tortoises are exclusively terrestrial and exist throughout the country with the exception of the marshy central plains. Snakes contain at least 178 species found in Thailand. The species which are arboreal, aquatic or fossorial, live in various types of habitats from paddy fields, montane forests, lowland forests to urban areas and the sea. About one-third of the species are very venomous, another one-third mildly venomous and the remaining one-third non venomous. The species appear in all sizes and colours, from the huge reticulated python *Python reticulatus* attaining as much as 10 metres in length to the tiny blind fossorial snakes of a few centimetres.

- Birds comprise 962 species recorded in Thailand. Among these the resident species which actually breed or supposed to breed in the country numbering 549 species such as little grebe, yellow bittern, black-shouldered kite, siamese fireback and around 284 species are migratory birds which move into the country during the short wintering period such as northern pintail, eastern marsh-harrier, Eurasian coot, brown-headed gull, and white wagtail. Some of them spend the whole winter breeding in Thailand.

- Mammals recorded in Thailand include 292 species of bats, rodents, carnivores, ungulates, primates, flying lemurs, pangolins, whales and dolphins, dugongs and insect eaters like moles and shrews.
  - Bats are the highest species numbers, i.e. 108 species found in Thailand or approximately 37% of the known Thai species comprise 11% of the world species. The dominant groups are insectivores numbering together 90 species. Rodents are Thailand's second most numerous mammalian order in terms of included species. The group includes diurnal squirrels with 17 species, murid rats, mice and bamboo rats with 42 species and porcupines with 2 species.
  - Elephants, the largest land mammals are represented by the Asiatic elephant *Elephas maximus* which was once widespread in Thailand but is now found only in a few remote forests, or in captivity. Odd-toed ungulates comprise 3 species including tapirs with 1 species, the Malayan tapir *Tapirus indicus*; and rhinoceroses with 2 species of highly endangered animals, the lesser one-horned rhinoceros *Rhinoceros sondaicus* and the Asian two-horned rhinoceros *Dicerorhinus sumatrensis*. The former may already be extirpated from Thailand. Even-toed ungulates include small to large-sized herbivores which are represented in Thailand by 15 species such as wild boar *Sus scrofa*; mouse deer *Tragulus*

javanicus and *T. napu*; Schomburgk's deer *Cervus schomburgki*; hog deer *Axis porcinus*; gaur *Bos gaurus* and wild water buffalo *Bubalus bubalis*. Many species in this group are becoming extremely rare.

Endemic Species

Due to Thailand's position at the center of the Southeast-Asian mainland and surrounded by many neighbouring countries which share our flora and fauna. The country's endemic plant species are fewer in number than those in island countries. Most endemic species occur in montane habitat of limestone hill areas. It is estimated that around 1,000 species are endemic to Thailand.

According to the recent research under the Flora of Thailand Project, 120 species have been found as endemic to Thailand.

Among these, 24 species of pteridophytes have been recorded as endemic species. Some occur on mossy rocks near streams in dense evergreen forests while some live on calcareous rocks on cliffy mountain at various altitudes. Botanists believe that many more species of pteridophytes could exist if forest habitats had not been seriously destroyed during the past decades.

Endemic faunal species are few due to Thailand's continental status. According to current knowledge there are 141 endemic species and subspecies of vertebrates. These include 6 species of mammals, 67 subspecies of birds, 29 species of fishes, 31 species of reptiles, and 8 species of amphibians.

Endemic invertebrates are not much well known. However, as recorded there are 11 endemic species of mantis shrimps, 1 endemic species of freshwater shrimps, 14 endemic species of freshwater crabs, 43 species of insects have been identified as endemic species, including 5 species of butterflies and moths and 29 species of dragonflies and damselfies.

Threatened Species

Too little is still known about threatened floral species. The number of threatened plant species will be probably very large, particularly if all species, which have been found once or a few times, are to be included. So far 457 species are recorded as nationally threatened taxa according to WCMC status report as of October 1995; while 40 species of pteridophytes have been identified as threatened species. It has been recorded that 310 species of vascular plants are threatened.

As high as 554 vertebrate species are considered threatened according to the brainstormed meeting on status of vertebrate species during May 1996. These includes mammal

with 114 species, birds with 194 species, reptiles with 41 species, amphibians with 26 species and fishes with 179 species. Thailand has already lost 1 species of mammal, 2 species of birds, and 3 species of fishes. List of extinct vertebrate species is shown in Table 3. Besides, 7 more species are extinct in the wild. List of vertebrate species extinct in the wild is shown in Table 4.

Table 3 Extinct vertebrate species of Thailand

Scientific Names	Common Name
Cervus schomburgki	Schomburgk's deer
Pseudibis gigantea	giant ibis
Graminicola bengalensis	large grass-warbler
Balantiocheilus melanopterus	silver shark
Platytropius siamensis	Siamese flat-barbelled catfish
Coius microlepis	Siamese tiger fish

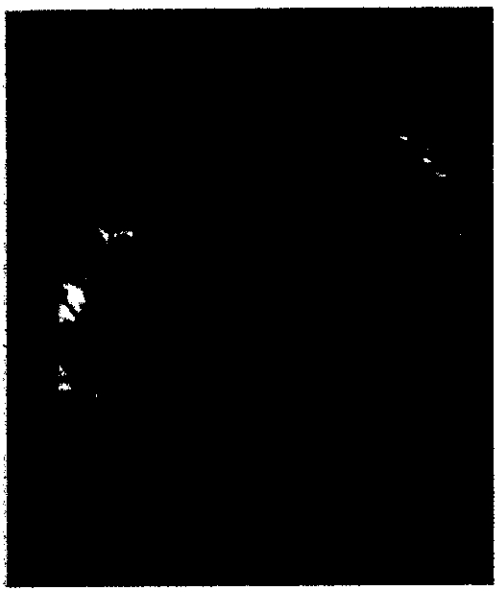
Sources : OEPP 1997

Table 4 Species extinct in the wild of Thailand (vertebrate)

Scientific Names	Common Name
Rhinoceros sondaicus	lesser one-horned rhinoceros
Cervus eldii	Eld's brow-antlered deer
Bos sauveli	kouprey
Tormistoma schlegelii	false gavial
Mycteria cinerea	milky stork
Pseudibis davisoni	white-shouldered ibis
Grus antigone	sarus crane

Sources : OEPP 1997

Most threatened bird species are large water birds, such as storks, ibises, and pelicans that depending upon extensive lowland marshes for foraging and nesting purposes. Some are mature forest-dependent species such as hornbills and ground cuckoos. The important reptilian threatened species include at least 4 species of sea turtles and 3 species of crocodiles.



Most threatened fish species are freshwater. Some are those gigantic species that need large suitable rivers in order to flourish successfully. Among the listed species are Mae Khong catfish *Pangsius gigis*, the Siamese giant carp *Catlocarpio siamensis* and Jullien's golden carp *Probarbus jullieni*. Marine threatened fishes includes 5 species of guitarfishes of *Rhinobatus*, *Rhynchobates*, and *Rhina*; 2 species of sawfishes of *Pristis*; and 4 species of manta rays of *Manta* and *Mobula*, which are fishes of the open seas that rarely venture into shallower Gulf of Thailand.

Very important threatened invertebrates are anemone corals *Gonipora burgosi*, trumpet shells *Charonia tritonis*, and coconut crabs *Birgus latro*. All are naturally scarce and appeared to occur in low population in few suitable localities. Also 13 species of butterflies and 1 species of beetle are seriously threatened. The butterfly trade in the country has ever caused deleterious effects to the continual existence of Bhutan glory butterfly *Bhutanitis lidderdalei* and Kaiser's butterfly *Teinopalpus imperialis* found only on a few mountain tops in Chiang Mai. Three molluscs have been identified as vulnerable species. These are great green turban *Turbo marmoratus* and top shells *Tectus niloticus* which are marine inhabitants and freshwater giant clam *Chamberlainia hainesiana* of the western Mae Khlong river. Fourteen species of crustaceans have been identified as threatened species. These includes 1 species of primitive frog crabs, 3 species of land crabs, 4 species of freshwater crabs, 1 species of shovel lobster, 2 species of mole crabs and 3 species of mantis shrimps.

GENETIC DIVERSITY

It is generally accepted that despite significant development of genetic identification techniques during the last 20 years, most information on genetic diversity is restricted to domestic species of commercial or agricultural importance. Much less has been learnt about such diversity of wild populations. In Thailand, knowledge of genetic diversity of cultivated crops and domestic animals is somewhat limited. For example, rice is the only crop with extensive information on genetic diversity. Due to less diverse breeds found, diversity of domestic animals has been more comprehensively studied and documented than those of plants. However, the present knowledge of genetic diversity of domestic animals is mostly on native species. Introduced species have never been properly documented nor assessed for their diverse genetic distinction.

Plant Genetic Resources

There are five species of wild rice found in Thailand. *Oryza rufipogon* and *O. nivara* commonly occur throughout Thailand and are, thus, closely associated with presently grown cultivars. *O. officinalis*, *O. ridleyi*, and *O. granulata* (*O. meyeriana*), on the other hand, are not usually found near rice fields. *O. ridleyi*, in particular, is regarded by several botanists as one of endangered species due to its limited distribution. As for cultivated rice, present varieties have evolved from these wild species, mostly *O. rufipogon* and *O. nivara*, for more than 7,000 years ago. At least, 3,500 cultivated varieties is believed to exist in Thailand.

Several land races (farmers' varieties) are known to scientists and breeders due largely to their high adaptivity to conditions of primitive agricultural practices and thus, are good sources of genetic materials for crop improvement. Land races are usually genetically diverse, variable, in equilbrium and known to differ in adaptation to soil type, time of seeding, date of maturity, etc. Examples of land races in Thailand include Nahng Mon, Leuang Pratew and Jek Chuey for rice; Kao Pode Tien for maize; Oi Gai and Oi Dum for sugar cane; and Kam Pan and Sam Pao Thong for durian. In addition to the land races, old cultivars have also been collected and studied by scientists since they too possess useful genetic materials. These cultivars are now mostly collected and maintained by governmental institutes in either seeds or living specimens. Example of these cultivars are Phra Phutthabat 5, Thai DMR 6, Pak Chong 1602 for maize; IS 8719 and E173 for sorghum; Keaw Yai for kenaf; Bo Van, Thong Daeng and E Thui for durian; Nam Tan Gruad for rambutan; E Paen and E Chan for mangosteen and Lueng Udom for rice.

Some wild species with commercial value are documented for their economic potential. These species include ornamental palms such as *Maxburrettia* and *Kerriodoxa* and some orchids such as *Vanda* and *Paphiopedilum*. Several plants have been known to yield beneficial active ingredients including *Dioscorea* and *Costus* which can be used to produce contraceptive drugs. Large scale cultivation of some wild species, e.g. *Amorphophallas* and *Dioscorea* as source of carbohydrate and chemical drug, has been attempted. Other species such as *Quercus*, *Lithocarpus*, *Castanopsis*, *Dialium*, *Diospros* and *Tarenna* are documented for their medicinal value.

Animal Genetic Resources

Lists of Thai animal genetic resources reported by FAO's Global Databank for Farm Animal Genetic Resources (FAO 1995) was used as a basis for compilation of native domestic animals in the country study. Additional breeds were included in the FAO's lists to ensure most comprehensive listing of native species as possible. List of domestic animals native to Thailand is shown in Table 5.

Table 5 Native domestic animals found in Thailand.

Groups	Breed Name	Status
Cattle	White Lamphun cattles	
	Thai native cattles	
	Gayals	
	Bali cattles	
	Kouprey	Extinct
Buffalo	Swamp buffaloes	Rare
Goat	Southern goat (Katjung Kambing)	
Pig	Hailum	Endangered
	Kwai	Endangered
	Paung	Endangered
	Raad	Critically endangered
Domestic duck	Pak-Nam native duck	Critically endangered
	Nakhon Pathom native ducks	Extinct (present stock derived from introduction)
Domestic goose	Ped Thed Puen Muang	
Chicken	Tha Phra I	
	Fighting chicken (Gai Chon)	
	Thai native chicken (Gai Puen Muang)	
	(6 breeds)	

In addition to these native breeds, there have also been records of newly developed breeds which are important for local consumption and export. These breeds include:

- Beef cattles: 5 breeds (White Bhraman, Mixed Bhraman, Red Bhraman and Shabra)
- Dairy cattles: 5 breeds (White Black pure breed, TMZ, Sahiwal and Red Sindhi)
- Goats and sheeps: 2 breeds (Mixed indigenous goat and Katekeen sheep)
- Pigs: 5 breeds (Large White, Duroc Jersey, Land Race, Mieo San, Mitsumpan)

- Foreign ducks: 2 breeds (Tha Pha II and Bang Pakong)
- Geese: breed (Tha Phra I)
- Ducks: 3 breeds (Khaki Campbell, Pak Nam, Peking)
- Chickens: 7 breeds (Red Rhode-Island, Black Barplemutlock, White Barplemutlock, Chiang Mai 1, Chiang Mai 2, Meat variety, Mixed indigenous).
- Birds: 3 species (Ostrich, Emu and Partridge)

ECOSYSTEM DIVERSITY

Natural ecosytems in Thailand can be generally divided into forest ecosystems, freshwater ecosystems, coastal ecosystems and marine ecosystems.

Forest Ecosystems

Forests of Thailand are usually classified into either evergreen or deciduous forests. With different geographical features, soil structures, precipitation rate and general climatic conditions. Approximately 65 percents of Thailand's forests can be classified as deciduous. The remaining 35 percents are evergreen forests where seasonal changes are minimal. These forests could be further sub-divided into 7 major types as the followings.

- Rainforests or moist evergreen forests occur mostly in southern and eastern coastal regions of Thailand with dipterocarps as dominant species. The forest are situated in areas with everage annual percipitation of about 2000 mm. and at an elevation less than 900 m. Palms and rattans are the characteristic of this forest along with ferns, orchids and strangler figs. This forest shelters a grater diversity of wildlife than deciduous ones. There are great numbers of insects, fruits and flowers available all year around. However the ground of the rainforest is not suitable for larger mammals. Smaller mammals are plenty and there is very high diversity of birdlife.

- The dry evergreen forests occur in area with at least 3 months of continuous drought. Found at an elevation below 400 m., the forests comprise of less number of dipterocarp species than the moist evergreen forests. There are fewer palms and rattans than in the rainforests. The forests, although less humid, are hosting higher number of birds and mammals than do the deciduous types, including bats, monkeys, gibbons, squirrels, civets and boars, as well as large species such as gaurs, bantengs, elephants, sambar deers, and tigers.

- Situated at an elevation over 1200 m., these relatively cool and humid hill evergreen forests are found scattered on the mountain ranges of northern and northeastern regions of Thailand. The forests shelter temperate zone trees like laurels, oaks and chestnuts. Moss, ferns, rhododendrons and podocarps are also common. In the north, the forest is the only place in Thailand where mammals from the Peleartic habitat are found. These include shrews, moles, and rodents. There is a great diversity of birds, including Sino-Himalayan species.

- Comprised of *Pinus kesiya* and *P. merkusii* as dominant species, the coniferous forest are found at an elevation between 200-1,800 m., mostly in northern and northeastern Thailand. The forests are not very important habitats for wildlife.

- Mixed deciduous forests are situated in areas with three distinct seasonal patterns (summer, rainy season and winter), over three months of continuous drought and average annual rainfall below 1,600 mm.. Scattered throughout the central plain, northern and northeastern regions, the forest is dominated by dipterocarps. Teak was once a prominent member of this forest community but now bamboo stands take its place. Forest floor is dense with vegetation including shrubs, herbs and grasses. This forest type is quite rich in wildlife such as gibbons, macaques, squirrels, and bears.

- Found at an elevation between 100-1000 m., mostly in the northeastern plateau, the dry dipterocarp forests comprise of deciduous dipterocarps as index species. The forests are habitats of large mammals including banteng and kouprey before the later disappeared from Thailand. The forest is lower in stature and more open than the mixed deciduous forests. It contains a ground storey composed mainly of grasses while bamboo is scarce.

Other Types of forest habitats include limestone forest, scrub forest and grassland.

- Limestone forests are found on the limestone ridges and outcrops which dominate the western Thailand, from north to south. Many are islands surrounded either by sea or by lowerlying plain. The forests are dry and stunted because their substrate is porous. The plants are sparse and deciduous. Fig trees are common. Some endemic mammal and bird species are found.

- Scrub forests are found in areas of poor quality, shallow or highly acidic soil, with average annual percipitation below 800 mm.. The forests are subjected to frequent forest fire, limiting reproductivity of large trees and hence enabling various scrub species to become dominant vegetation. The forests are common in northeastern Thailand.

- Although sharing similar ecological features to scrub forests, grasslands cover greater areas than the scrub forests including several parts of important protected areas.

Freshwater Ecosystem

Regarding to hydrological characteristics, freshwater ecosystems in Thailand can be classified as riverine system including river flood plain, lacustrine lake and pond, and patustrine swamp, and marsh. Moreover, there are two special types of swamp forests. Freshwater swamp forests occur along the banks of the rivers and other sites which are subject to occasional inundation. Peat swamp forests are wetlands that dominated by species rich community growing on water logged peat.

- The river systems classified by geographical characteristics are Salween, Mae Klong and Petchaburi, southern region, eastern region, Chao Phraya and Kong river systems. Most of the rivers in the southern and eastern systems are short and cover lesser areas than other systems. Chao Phraya river system is the most important where its origin is from Ping, Wang, Yom, and Nan rivers in the northern region. One of the tributaries of the river Chao Phraya is Ta Chin river. The river Kong is the eleventh longest river of the world, and support many important river systems of the northeastern region such as Pong, Chi, and Mun rivers. Salween river is important to areas of the northern and western regions. The river contains the largest number of perennial rapid and abyss of the world. Most of the river bottom is rock.

- Not many large natural lakes are found in Thailand. The important and well known ones are Thale Noi in Phattalung province and Nong Han Kumpawapi in Udon Thani province. Others are Bung Boraphet in Nakhon Sawan province, Kwan Payao in Payao province and Nong Han in Sakon Nakhon province. In addition, many reservoirs are originated from dam construction such as Sri Nakarin and Khao Laem dams. Those water resources are important to migrated birds.

- Freshwater swamp forest or flooded forest is an area where plant communities are found on seasonal river floodplain. During each year, flood exists for a couple of months. There is no dead plant accumulation at the forest floor because of flooding influence. This type of forest is found in most regions of Thailand, however, most of them occur in small areas. The forests was used to be found in Chao Phraya river floodplain. At present, some large forests can be found at Tapi river floodplain such as Tung Thong freshwater swamp forest in Surat Thani province, Thale Noi freshwater swamp forest in Phattalung province and Tung Kam within Mun and Chi floodplain.

- Peat swamp forest is found in permanent of seasonal floodplains. Most of the soil is organic in compositions since their origin is from dead plants. Completely and non-completely deteriorated parts are called muck and peat, respectively. Soil in the peat swamp forest usually is the combination of those muck and peat. Water in the peat forest is mostly rainwater. Since there is no natural canal therefore plants

found differ from those in the freshwater swamp forest. Large peat forests are found in Narathiwat province such as Ba Jor and Toe Daeng peat swamps. Small ones are in Surat Thani province and other provinces in the southern region of Thailand. This kind of ecosystem with organic soil accumulation can also be found in permanent or seasonal bogs on mountains where there are fern accumulation, such as sphragnum bogs on Indhanon peak in Chiang Mai province and Phu Kradueng peat bog in Loey province.

Coastal Ecosystems

The eastern and southern coastline, including 128 islands on the Andaman sea and the Gulf of Thailand, is more than 2,614 kilometers. The coastal ecosystem can be classified as follow.

- Beach forest is found on sand bottom, old sandy beach and rocky beach. Virgin forests are seen in Tarutao, Ang Thong, Phi Phi, Chang Islands Marine National Parks. Most plants in the forest resist to dryness since drought period is long. Plants on sandy soil are mostly *Casuarina equisetifolia* in Songkhla, Phang Nga and Phuket provinces.

- Mangrove forest is evergreen forest on mud or soil coastal zone, especially at the river or canal mouth. Along the national coastline, 36 percent are mangrove forest. Plant species in the forest differ from those in other types of forest. Aerial roots and salinity resistance is their characteristics. With these unique features, reforestation is difficult. Deteriorated forest eventually turns to *Melaleuca* forest. Relatively adundant mangrove forests in the western coastline of the southern region of Thailand are at Ranong, Phang Nga, Krabi, Trang and Satun provinces.

- Mud flat is found at low slope coastal areas with minimal current, at the river or canal mouths and close bay or lake. The origin of mud flat is from sedimentation therefore it is high in nutrients and is feeding ground of molluscs and invertebrates. It is also the habitat of more than 40 marine bird species. Important sites of bird habitat are Sam Roi Yod and Tarutao islands national parks, Pak Phanang bay, Mae Klong river mouth and Ranong province coastline.

- Sandy beach in each area differs in slope, beach width and size and composition of sand. The sand size determines its fertility and type of living species. Beach near the river mouth or riverine usually mixed with mud. Coarse sandy beach is found at coastline with rough wind and wave, while small sandy beach is the opposite. Animals on and near the beach are crabs, molluscs, polychaete, shrimp, fish, etc. which are preys to water and mangrove birds.

- Rocky shore consists of rock knoll and large rock. Rock beach is also found at the coastal area or island. Water pool is found in some rocky shores. It is the feeding ground of water and shore birds since plants and animals such as rock barnacle, oyster, sea sponge and algae are found.

- Seagrass bed mostly grows on sandy substrates. It is an important ecosystem for marine species since it is the feeding and juvenile hiding grounds. It is also the habitat of critically endangered *Dugong dugon*. The beds of the eastern part of the southern region are mostly found in Songkhla province, while ones of the west coast are in Trang and Krabi provinces, such as Chao Mai beach in Krabi province.

- Coral reef is the habitats of various kinds of marine species. When compared to forest ecosystem (such as tropical virgin forest), its species in terms of diversity and quantity is more. More than 300 coral reefs are found in the Gulf of Thailand and the Andaman sea. The healthy ones are at Chang and Tao islands in the Gulf of Thailand and Surin and Similan islands in the Andaman sea. More than 645 marine vertebrate and invertebrate species are found in the Andaman coral reefs.

Marine Ecosystems

Thailand's marine ecosystems include the areas of the Gulf of Thailand in the Pacific Ocean and the Andaman Sea in the Indian Ocean separated by the Southern Peninsular of Thailand. The Gulf is a part of Sunda Shelf and is semi-closed in nature. Circulation of currents in the Gulf are influenced by two seasonal monsoons and water is exchanged between the Gulf and the South China Sea. The Andaman Sea is deeper and with higher salinity and lower turbidity levels than the Gulf. Andaman species composition are influenced by physical and biological environment of the Indian Ocean.

Marine fish fauna is relatively rich in Thai waters. Many species are commercially exploited. Among the pelagic fish resources, Indo-Pacific mackerel (*Rastrelliger brachysoma*), Indian mackerel (*R. kanagurta* and *R. faughni*) are caught in the Gulf. King mackerel (*Scomberomorus commersoni, S. guttatus* and *S. lineolatus*) are also caught in substantial quantities. The anchovy (*Stolephorus* spp.) comprise 10 species commonly found in the catches. Sardine (*Sardinella* spp.) including 8 species are economic fish caught in the Gulf as well as tunas (*Thunnus tonggol, Euthynnus affinis* and *Auxis thazard*), Scads (*Decapterus* spp.) are found in the Gulf and the Andaman Sea including 4 species namely *D. macrosoma, D. russeli, D. maruadsi* and *D. pinnulatus*. A large quantity of demersal

fish resources is caught by bottom trawl nets. Several species inhabiting coral reefs are usually caught by trap and bottom long line. More than 300 species of demersal fish are of economic value including treadfin breams (*Nemipterus* spp.), snappers (*Lutjanes* spp.), bigeyes (*Priacanthus* spp.), monocle breams (*Scolopsis* spp.), croakers (*Otolithes* spp.), lizard fish (*Saurida* spp.), barracudas (*Sphyraena* spp.), and many others. Other commercially utilized marine organisms in Thai waters include shrimps, prawns, crabs, squids, cuttlefishes, jelly fishes and molluscs of at least 100 species.

Threats to Biodiversity in Thailand

The Thailand's Biodiversity Country Study has identified and described threats to biodiversity components in accordance with each type of ecosystems. Although certain activities are of particularly serious threats to the existence of viable populations of species in specific ecosystems, it is possible to summarize the threats to overall biodiversity of Thailand as follow.

- **Destruction of Natural Habitats**

  The most serious and obvious threats to biodiversity in Thailand is undoubtedly the destruction of natural habitats. Such threat has been clearly demonstrated by rapid destruction of forest lands during the past 50 years. In 1960, 54% of the total area was natural forests. Unfortunatelly, forest coverage rapidly declined to 34.15% in 1978 and eventually to 25.28% or 129,722 km^2 in 1998.

  The uncontrollable destruction of natural habitats is a direct consequence of the country's quest for prosperity that have been enjoyed by western countries. For the poors, every piece of lands, including natural lands, are wealth that they are entitled to, and thus, available for them to be used for elevating their well-being, by any means possible. This attitude leads to continuous and intensive destruction of natural lands in order to enable various kinds of income generating practices, ranging from agriculture, pasture to aquaculture. The public sector is reluctant to mitigate or redress this destructive practice. It was not until the last 30 years or so that conservation and preservation of natural habitats had been viewed as activities which ran counter to the national agenda of achieving economic development.

- **Excessive and Illegal Use of Biological Resources**

  Excessive use of biological resources is sometimes considered as one of the causes of habitat destruction. Similar to the destruction of the natural habitats, over

exploitation of biological resources is largely due to efforts to obtain greater economic prosperity, especially the shift from harvest for domestic consumption to exploitation for export demand. Biological resources had been viewed as pools of infinite wealth and have been acquired without recognizing existence of their carrying capacity. The most evident example of these excessive uses is perhaps the increase of fishing vessels in Thai waters from 4,000 vessels in 1972 to 13,000 in 1980 and 18,146 in 1993. This increase was believed to be the main cause of drastic reduction of weight per catch in both the Andaman Sea and the Gulf of Thailand. It was estimated that harvest of both demersal and pelagic fishes has long reached the carrying capacity since 1970 and the present stocks of the fishes are, thus, no longer able to support any more vessels.

Equally to, and in certain cases, more detrimental than the excessive use of biological resources, is illegal exploitaition. In effort to conserve little of what remain of the natural forests, the Royal Forest Department banned forest concession in 1989. However, considerable forest lands are still lost every year due largely to illegal logging. Several protected wildlife and plants have also been hunted and collected to satisfy local and international markets. Many of these wildlife and plants are increasingly pouched from protected areas. For example, full trucks load of orchids have been reported to be collected from Phu Luang Wildlife Sanctuary on regular basis and become easily accessible to buyers at several weekend markets as well as oversea markets. Inadequate manpower to control illegal trade of protected wildlife and plants, even those listed under CITES, has indicated that control of the illegal trade remains virtually uneffective.

- **Land Ownership**

Land ownership is not only one of the most serious threats to biodiversity but also one of the most controversial. Pursuing for greater wealth for the poors is a national agenda of the high priority. Allowing an increase in ownership of the land has been seen as one of the paths for economic prosperity for the poors, although several lands are of enormous ecological and biodiversity importance. Accompanied by poorly structured system of public lands, efforts to provide lands to the poors have now exceeding any common sense even the national conscience to conserve biological resources for future generations. With the declaration of natural lands which are no longer "ecologically viable" (deteriorated forests), or the recognition of human as an integral part of natural habitats, more and more forest lands are being occupied illegally.

In several cases, recognition of local community roles in conserving natural habitats, is a sustainable mean in maintaining local biodiversity. Unfortunately, such recognition in Thailand has been applied indiscriminately, resulting in destruction of natural habitat by those who have taken advantage of the official recognition. Community rights over natural lands, especially protected areas, has also become a political issue where ownership of natural resources are debated and negotiated at the expense of the conservation.

- **Inappropriate Use of Biological Resources**

  In addition to excessive and illegal harvest of biological resources, serveral kinds of legitimate utilization have proven to be detrimental to biodiversity. The most obvious example is perhaps the abandon of diverse land races by farmers to make way for newly developed varieties with higher productivity. Although without detail documentation, 80% of farmers in Thailand and other Southeastern Asian countries are believed to replace their local varieties with few introduced ones. This has significantly increased genetic vulnerability of various economic crops as witnessed by a number of regional epidemics of certain plant diseases in recent years.

  Some destructive practices have been declared illegitimate to protect viable stock of biological resources. For example, trawling which has been detrimental to aquatic life in coastal areas, is now restricted to 3 km away from shoreline. In practice, however, owners of larger vessels were often able to negotiate exemptions with the authorities resulting in restriction of only one kilometer off the shoreline. This again demonstrates that conservation of biological resources is still with little or no bargaining power when negotiated with economic interests.

  Occasionally, misinterpretation of biological resources utilization can lead to destruction of biodiversity. Ecotourism, for instance, has been viewed by many as an appropriate mean for utilization of natural habitats while increasing public appreciation of biological resources and their diversity. However, ecotourism in Thailand is mostly anything but environmentally sound. Ecotourism has been viewed by many tour operators as mere touring activities in natural habitats instead of cultural and historical sites, and thus are not awared that special care is needed to avoid damage caused by such activities. A recognizable example of destruction of natural habitats by ecotourism, is visits to coral reefs in the Andaman Sea. Without any regards to the corals, anchoring of tourist vessels has seriously damaged the coral reefs of Patong bay, Kata beach, Hei island, Dorkmai island, and a number of areas of Similan island groups. Poorly supervised and instucted tourists have also been allowed to romp free on the reefs, stepping over and trompling, littering all kind of wastes or even illegal collecting of corals for souvenirs. It was believed that considerable proportion of 2,357,100 kg of corals collected from the area off coastline of Phuket province was obtained via tour operations.

- **Introduction of Non-indigenous Species**

  Various alien species in Thailand have long been unaccounted for and several are even misunderstood as being native to the country. It was estimated that approximately 80% of 1,000 known plant species, including fruits, flowering plants and vegetables, have been introduced from overseas. The remaining 20% are believed to be indigenous or at least native. While considerable number of alien species have contributed greatly to agricultural and economic development, some became ecologically harmful and threats to the existence of native species. The most recognizable non-indigenous plant species which are detrimental to the ecosystems

include *Mimosa pigra*, *Eichhornia crassipes*, *Chromolaena odorata* and *Pennisetum polystachyon*, as a few examples. Unless there is a significant increase in the recognition of effects of these alien species, the destruction of local biological resources is likely to continue aggravate in the country.

- **Development Projects**

Various development projects have directly and indirectly reduced and destroyed significant number of natural habitats. Road construction, in particular, has been a serious threat to natural habitats. Roads and other motorways have not only destroyed natural lands and disturbed wildlife, they have also allowed greater access to biological resources, enabling excessive and illegitimate use of the resources. More importantly, networks of roads connecting in "spider-web" fashion throughout the country have, in many cases, divided natrual lands into small pockets and made existing populations of wildlife and vegetation to become even more vulnerable.

Industrial and urban development has also proven to be important cause of biodiversity destruction. Such development permanently converts natural lands beyond any possible natural recovery as well as pollutes what remain of natural habitats nearby or even those further away through air, soil and water pollution.

- **Public Perception of Importance of Biodiversity**

Efforts to control, mitigate and prevent destruction and deterioration of biodiversity in Thailand have been initiated by various agencies, however there is an indication suggesting that the rate of loss of biodiversity will not slow down. Such loss in Thailand will continue over a certain period of time in the future.

The continuous loss of biodiversity in Thailand is mainly caused by the lack of social awareness and consciousness in preserving natural resources for the coming generations. The lack of awareness may largely due to the fact that Thai society does not have enough information on the loss of biodiversity and, hence, is unaware of the problem or does not fully provide obvious signs of the problem to the youth.

CHAPTER 2
ACTIVITIES PRIOR TO THE ENACTMENT OF THE NATIONAL STRATEGY ON BIODIVERSITY

Before the enactment of the National Policies, Measures and Plans on Conservation and Sustainable Utilization of Biodiversity, the first administering framework focused directly on biodiversity and the Convention on Biological Diversity (CBD), the Royal Thai Government (RTG) has implemented a certain number of activities related to the conservation of biodiversity. These activities can be considered as significant contributions to the implementation of Article 6: General Measures for Conservation and Sustainable Use of the Convention as well as other relevant provisions. The activities can be summarized in accordance with related articles in Table 6.

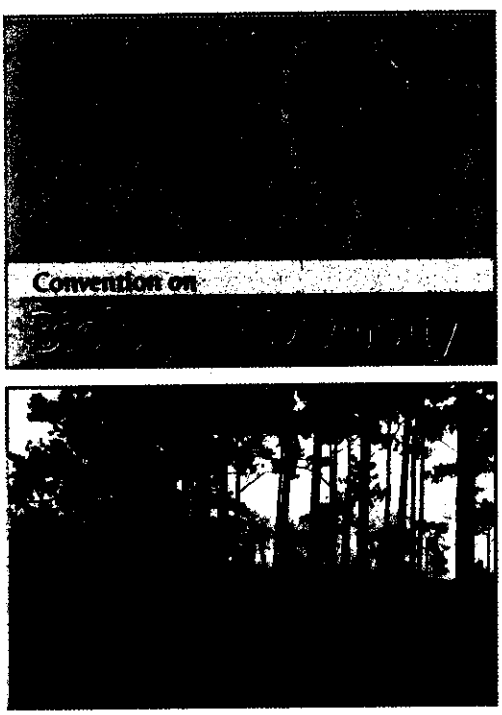


Table 6: List of activities being implemented in accordance with the CBD articles

Related CBD Articles	Activities	Funding Sources	Implementing Agencies	Duration and/or Commencement
Article 6: General Measures for Conservation and Sustainable use	• Establishment of the National Committee on the Convention on Biological Diversity.	RTG	OEPP	1994
	• Compilation of Thailand Biodiversity Country Study.	UNEP	OEPP	1995
	• Formulation of the National Policies, Measures and Plans on Conservation and Sustainable Utilization of Biodiversity.	RTG	NEB	1995
	• Formulation of the Strategy on the Conservation and Sustainable Use of Natural Resources.	RTG	MOAC	1996
Article 8: *In-Situ* Conservation	• Declaration of Dun Lampan Environmentally Protected Area to protect the endemic crab, *Thaipotamon chulabhon*.	RTG	OEPP	1996
	• Formulation of policies on the promotion of local participation in rehabilitation of forests.	RTG	RFD	1984
	• Drafting Community Forest Act.	RTG	RFD	–
	• Preservation of the wild species in their natural habitat.	RTG	DOA	–
Article 9: *Ex-Situ* Conservation	• Formulation and enactment of the regulation on collection and conservation of plant species *in-situ*, *ex-situ* and in gene bank.	RTG	DOA	1992
	• Establishment of the National Rice Seed Storage Laboratory.	RTG	DOA	1980
	• Establishment of the National Gene Bank.	RTG	TISTR	1985
	• Collection and maintaining plant tissues in special plant gene banks.	RTG	Royal Chitladda Project	1994

Table 6: (continued)

Related CBD Articles	Activities	Funding Sources	Implementing Agencies	Duration and/or Commencement
Article 10: Sustainable Use of Components of Biological Diversity	• Coastal Fishery Development Project. • Development and distribution of plant varieties which require low inputs.	RTG RTG	DOF DOA	1992 –
Article 11: Incentive Measures	• Alternative farming for local communities, especially hilltribe populations. • Economic and conservation evalution of natural resources project.	RTG RTG	His Majesty the Royal Project OEPP	– –
Article 12: Research and Training	• Biodiversity Research and Training (BRT) program.	RTG	TRF	1996
Article 14: Impact Assessment and Minimizing Adverse Impact	• Declaration of Environmental Impact Assessment (EIA) as a mandatory requirement for all development projects, under the 1992 Enhancement and Conservation of National Environmental Quality Act.	–	OEPP	1992
Article 15: Access to Genetic Resources	• Drafting the regulation on access to biological resources.	RTG	OEPP	1993-1994
Article 16: Access to and Transfer of Technology	• Revision of Patent Act.	RTG	DIP	1992
Article 17: Exchange of Information	• Thailand Biodiversity Data Management.	UNEP	OEPP	1995-1998

Table 6: (continued)

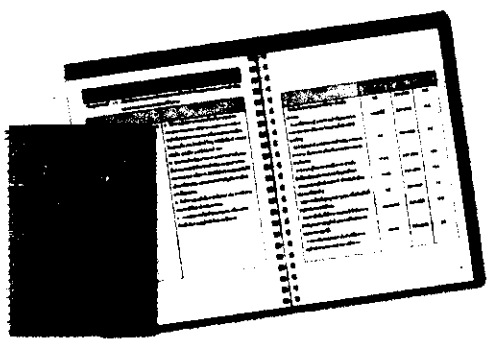
Related CBD Articles	Activities	Funding Sources	Implementing Agencies	Duration and/or commencement
Article 18: Technical and Scientific Cooperation	• Participate in ASEAN activities including AWGNCB, ASEAN Heritage Parks and ASEAN Marine Turtle Conservation Program, etc.	RTG	MOSTE, MOAC, MOFA	–
Article 19: Handling of Biotechnology and Distribution of its Benefit	• Establishment of the National Biosafety Committee (NBC). • Formulation of Biosafety Guidelines in Genetic Engineering and Biotechnology.	RTG RTG	BIOTEC, NSTDA NBC, BIOTEC	1990 1992

ASEAN = Association of the South East Asian Nations
AWGNCB = ASEAN Working Group on Nature Conservation and Biodiversity
BIOTEC = National Center for Genetic Engineering and Biotechnology, NSTDA
DIP = Department of Intellectual Properties, MOC
DOF = Department of Fisheries, MOAC
DOA = Department of Agriculture, MOAC
MOAC = Ministy of Agriculture and Cooperatives
MOFA = Ministry of Foreign Affairs
MOC = Ministry of Commerce
MOSTE = Ministry of Science, Technology and Environment
NEB = National Environment Board
NSTDA = National Science and Technology Development Agency, MOSTE
OEPP = Office of Environmental Policy and Planning, MOSTE
RFD = Royal Forest Department, MOAC
RTG = Royal Thai Government
TISTR = Thailand Institute of Scientific and Technological Research, MOSTE
TRF = Thailand Research Fund
UNEP = United Nations Environment Programme

With these activities, Thailand has been substantially prepared to implement the Convention on Biological Diversity. The National Policies, Measures and Plans thus aim to build synergy and strengthen coordination among those agencies who initiated and implemented these activities. When effectively implemented, it also allow all competant individuals and institutions to direct their initiatives toward immediate interests and priorities of biodiversity conservation and utilization in Thailand, and hence strengthen effort in the implementation of the Convention even further.

CHAPTER 3
NATIONAL STRATEGY FOR IMPLEMENTING THE CONVENTION ON BIOLOGICAL DIVERSITY

Thailand's national strategy on biodiversity, the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity, were formulated not merely with a recognition of provisions under Article 6 of the Convention, but also through the concern and need for a common framework for implementing biodiversity conservation and management. Thailand has long been implementing a number of activities relating to biodiversity conservation, however, many of them have been loosely coordinated without common objectives that appropriately respond to national need for biodiversity conservation. The National Policies, Measures and Plans were thus created as a national administrative framework to ensure that biodiversity activities do meet national interests as well as to prioritize actions required for achieving the objectives of the Convention. Formulated for a period of 5 years (1998-2002), the National Policies, Measures and Plans have been approved by the Cabinet on July 15, 1997 and become a principle framework for biodiversity conservation and management in Thailand.



Background

As a master strategy on biodiversity, the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity were created under participatory framework. Following the signatory of the Convention on Biological Diversity in 1992, the National Environmental Board (NEB) appointed the National Committee on the Convention on Biological Diversity in June 1993, comprising of representatives from various relevant governmental agencies, selected NGOs and distinguished local experts. One of the first few tasks of the National Committee, which is chaired by the Permanent Secretary of the Ministry of Agriculture and Cooperatives (MOAC) and with the Office of

Environmental Policy and Planning (OEPP) as secretariat, was to establish a working group to draft a national strategy on biodiversity. To ensure full disclosure and participation, the early draft of the National Policies, Measures and Plans was submitted to a panel of over 100 experts from both governmental agencies and private organizations at a meeting organized by OEPP in July 1995. The recommendations from the meeting were then integrated into the National Policies, Measures and Plans before submitting to the National Committee, the National Environment Board and the Cabinet for approval.

Priority for Implementation

Priorities are given to seven strategies formulated under the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. Measures and activities under each strategy are of equal importance as indicated by similar timeframe for implementation. Certain activities that are marked for implementation at later stage are those required after the completion of other pre-requisite activities.

The strategies of the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity are ranked in accordance with their priorities as the followings:

- Building capacity of institutions and their staff on the conservation of biodiversity.
- Enhance efficiency in management of protected areas to ensure sustainable protection of overall biodiversity at local level.
- Improve incentives for conservation of species, population and ecosystems.
- Conservation of species, population ecosystems.
- Control and monitor processes and activities that threaten existence and richness of biodiversity.
- Encourage the management of biodiversity in the environment and traditional culture.
- Promote cooperation between international and national agencies/institutions in conservation and sustainable utilization of biodiversity.

Among the priorities, strengthening institutional capacity was identified as the most important action. At present, there are currently fourteen Acts including drafted Act on Community Forests, two Cabinet Decisions, five national plans and policies including the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity and two departmental regulations related to the conservation of biological diversity. Thus, limited achievement in the conservation is not due to inadequate legislation, but rather to a lack of efficient and proper capacity to enforce and implement provisions of the existing laws and regulations. Without the improvement of the capacity, it would be difficult, if not impossible, to achieve the goals set out by the remaining strategies.

With larger proportion of natural lands now being protected by certain of legislations, ensuring preservation of biodiversity in protected areas was identified as a priority required in the conservation of biodiversity, especially with regards to the *in-situ* conservation. Under the second strategy, focus has been directed toward harmonizing management of protected areas in order to better reflect need for biodiversity preservation.

Other priorities emphasize the increasing role and participation of local population, enhancing knowledge of biological resources, and monitoring and controlling impacts from human activities. Although lower priorities are given to the social aspects of biodiversity management and cooperation with international entities, by no mean it indicates less effort would be directed toward these aspects. Such priorities show that these issues are not emergent need in the early stage of implementation, but are, nevertheless, important components in achieving effective conservation and sustainable utilization of biodiversity of the country once the strategies of higher priority have been achieved.

Approaches Undertaken by the National Strategies

The National Policies, Measures and Plans proposed several new and additional initiatives to existing relevant institutions in order to support the protection of biodiversity in the country. The main focus of the national strategy was directed toward emphasizing and enhancing present responsibilities of the institutions implementing and enforcing biodiversity conservation. The National Policies, Measures and Plans are created to serve as a guideline for institutions to re-focus their responsibilities in order to better serve principles and goals of biodiversity conservation and sustainable use.

Biodiversity Conservation

Suggested actions for biodiversity conservation under the National Policies, Measures and Plans can be elaborated as the followings:

- ***In-situ* Conservation of Biodiversity**

Conservation of biodiversity components in natural habitats is most visible in measures under Objective 4.1 (improve capacity in the conservation of species, population and genetic diversity in natural habitats) of Strategy 4 which are:

- Measure 4.1.1: Integrate conservation of species, population and genetic diversity in protected area management.
- Measure 4.1.2: Use keystone species or well known species as targets to support *in-situ* conservation.
- Measure 4.1.3: Improve and extend legislative mechanisms to protect species.

These measures are strongly species oriented with an emphasis on studies of the status of flora and fauna diversity in natural habitats. The suggested studies are accompanied by legislative amendments and formulation of appropriate measures for protecting species underthreated.

On the other hand, measures of Strategy 2 (enhance efficiency in management of protected areas to ensure sustainable protection of biodiversity) placed a conservation focus toward viable natural habitats especially those which are protected areas. Although, measures under Objective 2.1 (To ensure that the protected areas are capable to conserve rare and endangered species and ecosystems) do share emphasis on conserving threatened species with those in Strategy 4 (Objective 4.1), they have been directed to management oriented activities rather than researches. In addition, measures under Objective 2.3 (to build capacity in protected areas management) and Objective 2.4 (to improve preservation of protected areas) also contribute to strengthening *in-situ* conservation, especially in natural habitats known to be of significant biodiversity importance.

Apart from the mentioned strategies, selected measures of the remaining strategies are also supportive to the *in-situ* conservation. These measures can be categorized in accordance with their specific emphasis as the followings:

- Capacity building
  - Measure 1.4.1: Support training and continuous education in occupations related to biodiversity (Strategy 1); especially in providing training and short courses on biodiversity conservation.
  - Measure 6.3.2: Promote activities that conserve biodiversity in society (Strategy 6); providing support to strengthen role of women and monks in biodiversity conservation.
- Incentives and public participation
  - Measure 3.1.2: Increase incentive for communities to conserve public lands that are biologically diverse (Strategy 3).
  - Measure 3.1.3: Support maintenance of traditional cultures in biodiversity conservation (Strategy 3).
  - Measure 3.3.1: Promote awareness on value of local knowledge and biological resources (Strategy 3); especially the implementation of programs promoting use of local knowledge to conserve biodiversity.
  - Measure 6.1.1: Provide incentives for conservation to private firms or organizations implementing biodiversity conservation programs (Strategy 6).
  - Measure 6.1.2: Support cooperation of private sectors in providing supports to biodiversity conservation (Strategy 6).

- Information and technological availability for conservation
  - Measure 1.2.1: Build or strengthen national institutions capable of providing information on biodiversity conservation and potential value of genetic resources (Strategy 1).
  - Measure 7.4.1: Promote access to and transfer of technologies on the conservation and sustainable use of biodiversity (Strategy 7).

Details of these measures and several others relating to the *in-situ* conservation are stated in Annex I.

- ***Ex-situ* Conservation of Biodiversity**

In contrast to the *in-situ* conservation, measures on the *ex-situ* conservation under the National Policies, Measures and Plans are restricted mostly in Objective 4.2 (improve capacity of the *ex-situ* conservation to enable biodiversity conservation, promote public education and support sustainable development) of Strategy 4. Although, the measures are comparatively less than those for *in-situ* conservation, they have comprehensively covered full range of activities on preserving and maintaining biological resources held in collection facilities. More importantly, the *ex-situ* conservation has been considered by the national strategy as an activity which could be enhanced to accommodate relevant and selected *in-situ* conservation such as species re-introduction, ecological rehabilitation, and habitat restoration.

Several measures mentioned in the *in-situ* conservation are also harmoniously supportive of the *ex-situ* conservation. This is a testament that both *in-situ* and *ex-situ* conservations should not be implemented separately, but rather together in a complementary manner.

Integration of Biodiversity Conservation and Sustainable Use into Sectoral Areas

With an implementing timeframe of five years, the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity could be considered as a short to medium term administrative framework. Thus, focus of this national strategy on integration of biodiversity conservation and sustainable use has been guided toward sectors where components or values of biodiversity are directly exploited. Such focus is aimed to urgently ensure proper protection of the components, biological resources, in sectors where exploitations have been known to be destructive to biodiversity or threaten existence of its components. The sectors mentioned for the

integration of conservation and sustainable use principal include tourism, agriculture, forestry and fishery sectors.

Recognizing of Article 6 (b) (integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs and policies), the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity have included in the five objectives (sectors) of Strategy 6 (encourage management of biodiversity in the surroundings and in traditional cultural practices), measures on the integration of biodiversity conservation and sustainable use in each sector. Relevant measures and projects of Strategy 6 are as the followings:

Strategy 6: Encourage management of biodiversity in the surroundings and in traditional cultural practices.

Objective 6.5: To integrate biodiversity conservation with other activities that utilize biological resources.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 6.5.1 Promote the country's tourism in manner that assist biodiversity conservation.	• Integrate biodiversity conservation in national and provincial tourism master plans. • Require cooperation in allocating financial benefits from tourism as funding to maintain biodiversity. • Develop policy emphasizing cultural and biodiversity of Thailand in tourism promotion and public relations. • Campaign for awareness of biodiversity loss as loss of tourist spots and economic revenue. • Provide knowledge to administrators and local operators on benefits from ecotourism.	- Formulate ecotourism master plan in priority provinces. - Plan education programs on ecotourism. - Establish biodiversity conservation fund in tourist sites by tourist operators. - Promote ecotourism. - Campaign to increase understanding of tour leaders, operators and tourists on biodiversity conservation.	TAT SU (Prasarnmit) TAT TAT SU (Prasarnmit)	1998-2002 1999 1998-2002 1998-1999 2000-2002	50.2 2.0 15.0 15.0 15.0

Strategy 6 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 6.5.2 Integrate biodiversity conservation in agricultural policies.	• Encourage maintaining indigenous domesticated plant and animal varieties used in agriculture. • Support maintaining biodiversity in cultivated fields and pasture through integrated farming systems, nature-based cultivation etc. • Promote opportunity for farmers to study successful nature-based cultivation in order to generate interest in such cultivation.	- Establish and include biodiversity conservation policies into agricultural policies. - Improve farmer's knowledge on importance of indigenous varieties and maintaining agricultural biodiversity. - Financially support farmers in maintaining indigenous varieties. - Conduct study tours on nature-based agriculture for farmers.	DOA DOLD DOA DOLD DOA DOLD DOA	1999 1999 1999-2001 1999-2002 2001-2002	2.0 2.0 7.0 7.0 15.0 15.0 9.0
Measure 6.5.3 Integrate biodiversity conservation in forestry policies.	• Enact additional measures in national forestry master plan requiring rehabilitation programs for deteriorated forests in most provinces to maintain natural biodiversity. • Enact operational directions for maintaining species, ecosystems and genetic pools in national protected areas master plan.	- Enact additional measures in the National Forestry Master Plan requiring rehabilitation programs for deteriorate forests in most provinces to maintain natural biodiversity. - Require reforestation programs and forest park plantation to maintain species diversity especially indigenous species.	RFD RFD	1998-2002 1998-2002	- -

Strategy 6 (continued)

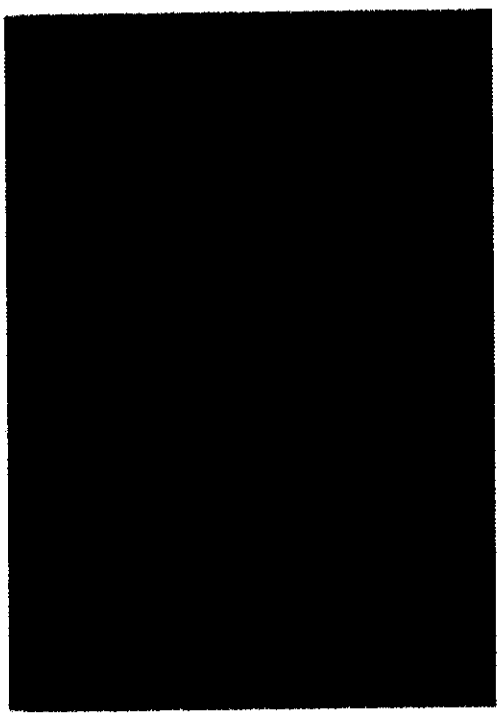
Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 6.5.3 (continued)	• Require reforestation programs and forest park plantation to maintain species diversity especially indigenous ones. • Require clearing in development project areas to avoid destruction of biodiversity.	- Require clearing in development project areas to avoid biodiversity destruction.	RFD Trang/Ranong province	1998-2002	30.0 5.0/5.0
		- Rehabilitate deteriorated terrestial forests to maintain biodiversity.	RFD	1998-2002	50.0
		- Establish national park, wildlife sanctuary and wildlife non-hunting area master plans with emphasis on maintaining biodiversity.	RFD	1998-2002	50.0
		- Establish master plan for Biosphere Reserves to maintain biodiversity	RFD	1998-1999	7.0
Measure 6.5.4 Integrate biodiversity conservation in fishery policies.	• Include rehabilitation and restoration of marine species and ecosystem diversity in the Thai Sea Rehabilitation plan. • Emphasize monitoring species diversity and maintaining habitats of endangered aquatic species in fishery policies. • Require annual reporting of biodiversity status of fishery resources.	- Include rehabilitation and restoration of marine species and ecosystem diversity in the Thai Sea Rehabilitation plan.			
		- Emphasize monitoring of species diversity and maintaining habitats of endangered aquatic species in fishery policies.			
		- Rehabilitate deteriorated coral reefs to ensure habitats for marine species.			
		- Monitor biodiversity in freshwater ecosystems.			

Strategy 6 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 6.5.4 (continued)		- Monitor biodiversity in marine ecosystems. - Report status of biodiversity of fishery resources on annual basic.			

Note:

DOA : Department of Agriculture
DOF : Department of Fisheries
DOLD : Department of Livestock Development
RFD : Royal Forest Department
SU : Srinakharinwirot University
TAT : Tourism Authority of Thailand



Under the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity, the institutions responsible for management of biological resources are assigned further tasks to ensure that their responsibilities are carried out with greater emphasis on biodiversity conservation and sustainable use. The institutions would be supported for their efforts in revising respective administrative frameworks as well as in implementing conservation activities. In several cases, an integration of biodiversity conservation and sustainable use into policies and programs do not require budget for implementation. For example, an initiative on maintaining species diversity especially indigenous species in reforestation and plantation activities only require shifts in operation strategy, without any need for additional fund.

Sustainable Utilization of Biological Diversity

Under the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity, the principle of sustainability has been focused upon the use of biological resources by local populations as well as the use of the resources in protected areas (Strategy 3: improve incentives for conservation of biodiversity at local level). The focus includes several measures on enhancing sustainability in utilizing biological resources of local population under Objective 3.1 (to support biodiversity conservation at local level) and Objective 3.2 (to promote and extend sustainable use of biodiversity). Sustainable use is also the main focus of Objective 2.2 (to support sustainable use in protected areas) and Objective 2.3 (to increase capacity in protected areas management) of the national strategy. In all, selected measures and projects on the sustainable use of biodiversity indicated in the National Policies, Measures and Plans can be shown as the followings:

Strategy 2: Enhance efficiency in management of protected areas to ensure sustainable protection of overall biodiversity.

Objective 2.2: To support sustainable use in protected areas.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 2.2.1 Promote appropriate management of benefits from protected areas.	• Collect research results on benefits from protected areas that can be financially estimated as well as intrinsic benefits.	- Collect results of researches related to benefits derived from protected areas, in both financial term and intrinsic value.	OAE	1999	3.0
	• Identify and evaluate benefits from products and services of protected areas and those benefits from such products and services.	- Conduct studies to classify and evaluate benefits from goods and services of protected areas and classify the users.	OAE	1999	2.0
	• Survey resources in each protected areas, including their geography, cultural and historical sites, ecosystems, species and genetic resources, to estimate investing capital.	- Conduct studies to evaluated biological resources asset in protected areas.	OAE	2000	3.0
		- Encourage collection of economic information and dissemination of information on utilization of protected area.	OAE	2001	10.0

Strategy 2 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 2.2.1 (continued)	• Disseminate information on benefits from protected areas and provide appropriate means to coordinate usage of different groups	- Formulate guideline on proper management of benefits from protected area.	OAE	2002	2.5
Measure 2.2.2 Recognize the vital roles of local communities nearby the protected areas (in buffer zones and the vicinity area) as partners in conserving protected areas.	• continue work with local communities to ensure that the protected areas management is coincided with daily requirements of the communities. • Build awareness on sustainable development of protected areas of authorities and communities nearby the areas with community participation. • Seek supports from communities nearby protected areas in conserving protected areas through establishment of committees or volunteers for protected area management.	- Conduct studies on importance of biodiversity and its economic value to local communities. - Organize meetings between officers and local communities to promote awareness in biodiversity conservation. - Establish protected areas management committees/volunteers to facilitate biodiversity conservation.	OEPP RFD RFD	1998-2000 1998-2002 1998-2002	6.0 2.5 10.0

Strategy 2 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 2.2.2 (continued)	• Disseminate documents honoring successful cooperative efforts on protected area management as examples for other groups • Develop research methods that can be carried out by communities themselves as basis for appropriate use and dissemination of information to other communities.				

Objective 2.3: To increase capacity in protected areas management.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 2.3.1 Improve management of protected areas to better suit sustainable use.	• Require authorities of protected area to report status of conservation of and threats to biodiversity on annual basis.	- Annually report on status of biodiversity conservation and theats.	RFD	1998-2002	20.0
		- Conduct consultation meetings to improve management of protected areas.	RFD	1998-2002 (once a year)	5.0
	• Formulate management plans for groups of protected areas and each protected areas with well-defined objectives and coverage of needed and required implementation.	- Develop protected area management plans.	RFD	1998-2002	70.0
		- Develop management plans for aquatic organism preservation areas.	DOF	1998-2002	15.0
		- Develop management plans for environmentally protected areas.	OEPP	1998-2002	12.0

Objective 2.3 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 2.3.1 (continued)	• Organize groups of researchers and experts to improve and monitor implementation in each protected areas and to provide scientific and technical consultation.	- Train volunteers, youths and military personnel to assist in monitoring protected areas.	RFD	1998-2002	7.0
		- Organize conservation networks of communities and produce newsletter to disseminate news and information.	RFD	1998-2002	2.5
	• Support community participation in protected area management such as volunteers, youth groups as well as surveillance of illegal activities (ie. logging) by the military.	- Compile results from community's researches for dissemination.	RFD	1998, 2002	2.0

Strategy 3: Improve incentives for conservation of biodiversity at local level.
Objective 3.1: To support biodiversity conservation at local level.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 3.1.1 Support and promote efficent use of agricultural lands to reduce pressure from encroachment of forests and other important natural ecosystems.	• Survey, identify, and evaluate agricultural lands that are valuable for biodiversity conservation.	- Survey, identify and evaluate areas with significant value of genetic diversity in order to preserve the areas as genetic sources.	DOA DOLD	1999-2000	5.0 5.0
	• Promote and support sustainable agriculture, nature-based agriculture and agro-forestry especially in areas adjacent to natural ecosystems.	- Encourage and promote sustainable agriculture and agricultural forestry especially in buffer zones of protected areas.	DOA	1998-2002	10.0
	• Legally collect land ownership tax in manners that facilitate conservation.	- Conduct studies to, formulate policies and measures on collection of land tax that facilitate conservation.	OAE	1999	1.2
Measure 3.1.2 Increase incentives for communities to conserve public lands that are biologically diversed.	• Support local organizations, such as district councils, in organizing committees in villages or districts to responsible for maintaining and managing biological resources outside protected areas.	- Encourage NGOs and communities in conserving biodiversity.	DEQP	1998-2001	50.0
		- Conserve and sustainable use biodiversity through use of indigenous knowledge.	OEPP	1999-2001	5.0
		- Conduct study tours on biodiversity conservation for community leaders.	DEQP	1999-2000	10.0
	• Financially and technically support communities that implement conservation activities.	- Increase incentives for communities in conserving public lands that are biologically diverse.	Office of Permanent Secretary, MOAC	1998-2002	10.0

Strategy 3 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 3.1.2 (continued)	• Urgently enact Community Forest Act in order to facilitate implementation of forest conservation by communities. • Accept knowledges of local communities on sustainable, and legitimize local management of natural resources. • Support communities in maintaining their own biological resources with scientific and technical advices from responsible public agencies.	- Conducts trainings on involvement of communities in biodiversity conservation. - Support inclusion of provisions on biodiversity conservation in the (drafted) Community Forest Act	Office of Permanent Secretary, MOAC RFD	2002 1998	5.0 not yet specified
Measure 3.1.3 Support maintenance of traditional culture in biodiversity conservation.	• Study and survey traditional and cultural practices related to local biodiversity conservation. • Promote and publicize conservation of natural ecosystems with traditional and cultural practices of local communities.	- Conduct studies on culture of indigenous communities that are related to biodiversity conservation. - Support communities in maintaining local tradition on ecosystem rehabilitation. - Release indigenous aquatic species on cultural occasions.	OEPP OEPP DOF	1999 2000-2002 1998-2002	3.0 8.0 8.0

Strategy 3 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 3.1.3 (continued)	• Provide financial assistances and organize trainings for communities in maintaining traditional and cultural practices that recognize values of biodiversity conservation and appropriate practices which do not destroy biodiversity.	- Conduct training to provide knowledge on preservation of indigenous culture that recognize value of biodiversity conservation and appropriate occupations that are not destructive to biodiversity.	MOUA DNE Rajabhat Institutes	1998-2002	15.0 15.0 15.0

Objective 3.2: To promote and extend sustainable use of biodiversity.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 3.2.1 Increase benefits to communities from implementing ecotourism.	• Promote ecotourism in national parks and wildlife sanctuaries with tourism potential.	- Provide education on importance of biodiversity conservation and ecotourism to communities.	SU (Prasarnmit) Rajabhat Institutes DNE	1999-2000	8.0 8.0 8.0
	• Provide opportunities for communities to participate in administering and managing ecotourism on equitable term.	- Support communities and NGOs on administering and managing benefit from ecotourism.	TAT	1998-2002	15.0
	• Organize committee to supervise equitable sharing of benefits from tourism between operators and communities.	- Establish a committee to supervise fair benefit sharing of ecotourism between operators and communities.	TAT	1998-2002	5.0

Objective 3.2 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 3.2.1 (continued)	• Organize training for communities in operating appropriate ecotourism that is beneficial for conservation and management. • Provide knowledge and publicize correct information that is beneficial for conservation and management.	- Train bird watching and natural study leaders in national parks and wildlife sanctuaries.	MOUA	1999-2000	10.0
		- Provide bird watching and natural study lessons for school children.	RFD	1998-2002	15.0
		- Train local tourist operators especially those operate ecotourism in national parks.			
		- Review possibility of conducting ecotourism in wildlife sanctuary.			
		- Train local tourist operators on ecotourism at sea.			
Measure 3.2.2 Build capacity of communities in maintaining and utilizing agricultural biodiversity.	• Train and demonstrate integrated agricultural systems, agro-forestry and nature-based agriculture. • Provide information on production of organic fertilizers and biological control.	- Study integrated farming system.	DOA	1998-1999	2.0
		- Promote, disseminate and educate integrated farming system.	DOA	2000-2002	10.0
		- Prevent and eradicate pests by biological and integrated means.	NRCT (NBCRC)	1998-2002	30.0
		- Urge maintaining of soil by organic and biological fertilizers.	DOA	1998-1999	15.0
		- Promote chemical free vegetable and indigenous vegetable species and locate markets for the products.	DOA	1998-2002	15.0
		- Use agricultural waste.	KU	1998-1999	5.0

Objective 3.2 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 3.2.3 Develop and publicize roles of traditional herbs and ensure appropriate and sustainable use of the herbs	• Study, research, and analyze active ingredients of herbs to enable use of their ingredients for health benefit. • Promote and disseminate use of the active ingredients.	- Study, conduct research and analyze active ingredients of herbs with potential health benefits. - Promote and disseminate knowledge on utilization of herbal active ingredients.	DMS DMS	1998-2000 1998-2002	10.0 10.0
	• Develop use of the active ingredients for manufacturing of health and medical products.	- Develop active ingredients from studies/ researches into health and treatment products (medicines)	DMS	1998-2000	5.0
	• Conduct studies and researches to certify properties and qualities of herbs referenced by local knowledge, and use information from researches for health benefit. • Promote and publicize use of traditional herbs and medicinal value of animal extract and provide knowledge on harvesting and breeding herbal plants in order to generate income for communities.	- Conduct studies and researches to certify properties and qualities of herbs that have been referred by traditional knowledge in order to educate the public. - Promote and disseminate knowledge on use of traditional herbs and medicine from animal parts and provide information on harvesting and breeding of herbs in order to generate income for communities.	DMS DMS	1998-2000 2000-2002	5.0 10.0

Note:

DEQP : Department of Environmental Quality Promotion
DMS : Department of Medical Sciences
DNE : Department of Non-formal Education
DOA : Department of Agriculture
DOF : Department of Fisheries
DOLD : Department of Livestock Development
KU : Kasetsart University
MOAC : Ministry of Agriculture and Cooperatives
MOUA : Ministry of University Affairs
NBCRC : National Biological Control Research Center
NRCT : National Research Council of Thailand
OAE : Office of Agricultural Economic
OEPP : Office of Environmental Policy and Planning
RFD : Royal Forest Department
SU : Srinakharinwirot University
TAT : Tourism Authority of Thailand

As indicated in the tables, the initiatives on sustainable use are often accompanied by those on conservation. This is perhaps due to the fact that proper use of biological resources can not be practically achieved without associated conservation efforts and *vice versa*. Above all, sustainable utilization and conservation will be effective in maintaining biodiversity, if both are practiced by local populations with proper knowledge. Thus providing education and training to the population involved are crucial components in ensuring sustainable use of biodiversity.

Apart from the measures and projects mentioned, there are also a number of projects related to sustainable use of biodiversity in the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. These projects include: collection of indigenous knowledge on conservation and sustainable use of biodiversity (Measure 1.3.2: support social, religious and cultural researches related to conservation and utilization of biodiversity) and providing correct information on community and farmer's rights (Measure 3.3.2: support community rights to local biological resources and farmer's rights as owner of varieties). Although these projects are more closely related to other issues concerning protection of biodiversity than the issue of sustainable use, they are, nevertheless, contributing elements to the success of sustainable utilization of biodiversity in the country.

It is important to note that the measures and projects indicated are by no means new and innovative. They have been, at certain extent, incorporated into several legislations and administrative frameworks by various public institutions and sectors. For example, the promotion of integrated farming systems has been practiced and included in the

workplans of the Department of Agricultural Extension and Department of Agriculture for sometime, especially with emphasis on maintaining soil fertility through multiple cropping and crop rotation. Inclusion of these initiatives in the National Policies, Measures and Plans are, thus, selections of environmentally-sound practices that are beneficial to sustainable use of biodiversity and worth focused in the national framework.

Equitable Sharing of Benefits from Biodiversity

Equitable benefit sharing under the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity include those benefits derived from bio-prospecting, utilizing information on biological resources, and other fields and laboratory research activities as well as direct exploitation of the resources in the country.

As one of the countries identified as sources of biological wealth, an issue on equitable sharing of benefits in Thailand is closely linked to an issue on access to and transfer of technology as indicated in the context of the Convention on Biological Diversity (Articles 15 and 16). Recognizing the need to comply with the provisions of the Convention, these two issues have been integrated into the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. Measures under Objective 7.3 (to ensure appropriate benefits from use of biological resources to Thailand) and Objective 7.4 (to ensure that Thailand receives appropriate technologies on the conservation and sustainable use of biodiversity from overseas and is able to transfer existing technologies to other countries) of Strategy 7 (promote cooperation between international and national agencies/institutions in the conservation and sustainable utilization of biodiversity) have elaborated certain actions to be taken to ensure equitable sharing and appropriate technology transfer as the followings.

Strategy 7: Promote cooperation between international and national agencies/institutions in conservation and sustainable utilization of biodiversity.

Objective 7.3: To ensure appropriate benefits from use of biological resources to Thailand.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 7.3.1 Equitable and fair sharing of benefits derived from use of biological resources on basis of sustainable use.	• Enact regulations and criteria on appropriate access to biological resources.	- Develop regulations and criteria on appropriate access to biological resources.	NBC	1999	2.0
	• Establish the National Biodiversity Center as central agency responsible for coordinating access to biological resources.	- Establish the National Biodiversity Center as central agency responsible for coordinating access to biological resources.	NBC	1998-2002	32.5
	• Develop research guidelines for international cooperation on researches and developments of biological resources.	- Develop research guidelines for international cooperation on researches and developments of biological resources.	NBC	1999	3.0
	• Develop guidelines on sharing of benefits related to researches, developments and technology transfers.	- Develop guidelines on sharing of benefits related to researches, developments and technology transfers.	NBC	1999	2.5
Measure 7.3.2 Legitimate regulation on access to biological resources and benefit sharing criteria.	• Submit a regulation on access to biological resources to the Cabinet and acquire its approval for enactment as regulation under the Office of Prime Minister.	- Prepare and submit a regulation on access to biological resources to the Cabinet and acquire approval for its enactment as regulation of Office of Prime Ministers.	OEPP	1998	-
	• Organize meetings of involved agencies and institutions to improve understanding on the regulation.	- Organize meetings of involved agencies and and institutions to formulate implementing guideline for the regulation.	NBC	1998-1999	1.5

Strategy 7 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 7.3.2 (continued)	• Strengthen awareness in implementation in accordance to the regulation.	- Enhance awareness in implementation in accordance to the guideline.	NBC	1999-2002	3.0

Objective 7.4: To ensure that Thailand receives appropriate technologies on conservation and sustainable use of biodiversity from overseas, and is able to transfer existing technologies to other countries.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 7.4.1 Promote access and transfer of technologies on conservation and sustainable use of biodiversity.	• Compile lists of technologies required from overseas and those that are able to be transfered to other countries.	- Compile lists of technologies required from overseas and those that are able to be transferred to other countries.	NBC	1999	2.5
	• Develop guidelines on technology transfer under fair and mutually agreed term.	- Develop guidelines on access and transfer of technologies.	NBC	1999	2.0
	• Develop cooperative guidelines with other countries on access and transfer of technologies protected under intellectual property systems.	- Develop cooperative guidelines with other countries on access and transfer of technologies protected under intellectual property systems.	Department of Intellectual Property	1999	2.0

Objective 7.4 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 7.4.2 Strengthen capacity of the National Biodiversity Center in operating Thailand Clearing House Mechanism (CHM).	• Establish a networking system to coordinate access and transfer of technologies related to biological diversity. • Improve capacity of personnel and acquire equipments that enable more effective operation.	- Establish a networking system to coordinate access and transfer of technologies related to biological diversity.	NBC	1998-1999	5.0
		- Improve capacity of personnel and acquire equipments that enable more effective operation.	NBC	2000-2002	5.0
		- Establish research and development networks on transfer of technologies on animal and plant genetic resources.	DOLD	1999-2000	5.0

Note:

DOLD : Department of Livestock Development
NBC : National Biodiversity Center
OEPP : Office of Environmental Policy and Planning

In addition to these measures and projects, the National Policies, Measures and Plans also include the principle of equitable sharing of benefit in initiatives to protect community's right over local biological resources. Measure 3.3.2 (support community's right over local biological resources) suggests formulation of an implementing guideline on sharing of benefits from harvest of biological resources to communities and farmers who own the resources. The Royal Forest Department, Department of Fisheries and Department of Livestock Development have been identified as responsible agencies to formulate such guideline.

Unlike sustainable use, the equitable sharing of benefits derived from the use of biodiversity is a relatively new issue in Thailand. This is largely due to the absence of systematic administration and monitoring of such access in the country. With limited information on the access, it is not possible to determine whether benefits from the access are shared on equitable and fair term nor to regulate sharing of the benefits. The initiatives on benefit sharing and technology transfers in the National

Policies, Measures and Plans are thus, an innovative and important step in managing biodiversity as well as crucial components in achieving the objectives of the Convention on Biological Diversity.

Public Awareness on the Importance and Benefits of Biodiversity

Biodiversity has long been considered by general public as a scientific concept of considerable complexity. Those interested in biodiversity issues are often found to comprehend the term "biodiversity" and relevant issues on its preservation and management. Without such understanding, it is unlikely that the public can effectively participate in negotiating required management of biodiversity nor be sufficiently competent to be involved in relevant conflict resolution processes regarding utilization of biological resources. Limited understanding may also be detrimental to any effort to implement the Convention on Biological Diversity and other conservation initiatives as public can be easily misled by politically motivated groups who usually do not adequately understand these circumstance.

To enhance public awareness of involved communities, an understanding of biodiversity values and conservation needs are placed as first priority for actions under the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. The actions are in the top priority strategy on building capacity for biodiversity conservation (Strategy 1) as stated under measures under Objective 1.1 (to increase awareness and appreciation of value and importance of biodiversity). Such measures and accompanying projects are as the followings.

Strategy 1: Building capacity of institutions and their staff on the conservation of biodiversity.
Objective 1.1: To increase awareness and appreciation of value and importance of biodiversity.

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 1.1.1 Building awareness in importance and value of biodiversity to culture and society.	• Continuously provide knowledge on threats to biodiversity and status of biodiversity conservation to general public via various media such as televisions, radios, newspapers, magazines, books, brochures and posters etc.	- Publish natural science magazines for youths.	DEQP	1998-2002	10.0
		- Compaign to provide knowledge and create awareness of value of biodiversity via radio and television.	RFD	1998-2002	10.0
		- Produce posters and organize slogan, painting, photograph and essay competitions on issues related to biodiversity.	DEQP	1998-2002	8.0
	• Organize slogan, painting and photograph competitions demonstrating awareness of importance and value of biodiversity. General public at all levels would be participated in the competition. Winning slogans would be used in promotional programs via different kinds of media.	- Organize nature conservation camps for youths (primary & secondary students)	DCID	1998-2002	12.0
		- Honor selected individuals, communities or locals for their outstanding conservation efforts	DEQP	1998-2002	15.0
		- Conduct public relation programs to improve public understanding on importance of conservation and proper use of fishery resources	DOF	1998-2002	2.0
	• Organize additional activities on selected occasions including nature education camps for youths during summer break.	- Promote biodiversity conservation	Office of Permanent Secretary, MOAC	1998-2002	2.5

Strategy 1 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 1.1.1 (continued)	• Honor selected communities or local organizations for their outstanding efforts in conserving biological resources.				
Measure 1.1.2 Use existing education system to improve awareness on biodiversity and need in conserving biodiversity.	• Develop an additional subject on basic knowledge of biodiversity in existing experience building program for elementary students.	- Publish additional reading text books on "biodiversity" for primary and secondary students.	DCID	1999-2000	10.0
		- Develop environmental study curriculum on biodiversity for primary and secondary schools.	DGE	1999-2000	10.0
	• Develop additional subjects on importance of biodiversity to human survival in secondary and high school curriculum.	- Include courses on biodiversity conservation as non-elective courses in university.	MOUA	1998-2002	10.0
		- Produce education tools, including videoes, slides, tape cassetes on biodiversity.	DCID	1999-2000	20.0
	• Develop and publish self-learning text books on biodiversity for teaching of biology in elementary and secondary schools.	- Produce and distribute teacher handbooks on biodiversity.	DCID	1998-1999	20.0
		- Train teachers on teaching subjects related to biodiversity	DCID	1999-2000	12.0
	• Develop teaching tools on biodiversity including videoes, tape cassettes, posters, cards, games for distributing to elementary schools nationwide.	- Train staff at operational level on biodiversity management.	Office of Permanent Secretary, MOAC	1998-2002	10.0

Strategy 1 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 1.1.2 (continued)	• Develop additional short training courses identifying importance of biodiversity for institutions that offer special training courses for administrators and high ranking decision makers. • Encourage development of information sources on biodiversity for local communities using existing infrastructure such as library, village's news hall, center for tradition knowledge education etc.	- Train administrative officers on biodiversity management. - Support NGOs in establishing conservation new centers in communities with apropriate potential.	Office of Permanent Secretary, MOAC DEQP RFD DOF	1998-2002 1998-2002	10.0 5.0 5.0 5.0
Measure 1.1.3 Integrate concerns for biodiversity loss in external (outside classroom) education.	• Organize external education programs on biological characteristics of plants, animals and ecosystems in national parks and wildlife sanctuaries. • Encourage expansion of youth trainings for conservation of forest resources nationwide. • Establish or improve existing tourist service centers in	- Promote forest plantation program for young farmers - Establish Songkhla Lake Nature Study Center - Establish nature study centers in Huey Kha Kaeng, Chiang Dao and Kao Arng Ru Nai - Improve tourist service centers in national parks and ensure that biodiveristy information is distributed by the centers.	DOA DOF RFD RFD	1998-2002 1998-2002 1998-2002 1998-2002	7.0 30.0 20.0 30.0

Strategy 1 (continued)

Measures	Implementation	Projects	Responsible Agencies	Duration	Budget (million Baht)
Measure 1.1.3 (continued)	national parks to act as sources of biodiversity information for visitors.	- Develop the mangrove research station in Ranong Province into international mangrove research center.	RFD	1998-2002	30.0
	• Establish natural history museums or nature research centers in areas that contain unique ecosystems such as Songkhla lake, Huai Kha Kaeng Wildlife Sanctuary etc.	- Organize forest conservation camps for youths in most province and conduct youth trainings.	RFD	1998-2002	30.0
Measure 1.1.4 Strengthen knowledge and basic understanding of biodiversity to those who are "core" in dissemination information and providing education.	• Organize field education programs for members of media to disseminate knowledge on biodiversity conservation.	- Conduct trainings and study tours on biodiversity conservation for media.	DEQP	1998, 2000, 2002	3.0
	• Organize continuous training courses on biodiversity conservation for teachers nationwide.	- Conduct trainings and study tours on biodiversity conservation for teachers thoughout the country.	DGE	1998-2002	5.0
		- Conduct trainings on conservation of nature and diversity of aquatic organisms for teachers	DOF	1998-2002	5.0
		- Publish documents and disseminate knowledge on biodiversity	OEPP	1998-2002	10.0

Note:

DCID : Department of Curriculum and Instruction Development
DEQP : Department of Environmental Quality Promotion
DGE : Department of General Education
DOF : Department of Fisheries
MOAC : Ministry of Agriculture and Cooperatives
MOUA : Ministry of University Affairs
RFD : Royal Forest Department

As demonstrated in the above-mentioned measures and projects, improving understanding on biodiversity issues of students at all levels is the prime focus of awareness building strategy. Providing education on the issues to children has been considered an important investment for the future. With proper and scientifically-sound knowledge on biodiversity, the future generations will be better equipped and more competent in approaching challenges in the preservation and conservation of biodiversity.

Conclusions

The National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity, as elaborated in this chapter, have comprehensively undertaken almost every possible activities for the conservation, sustainable use and equitable sharing of benefits from the utilization of biodiversity. Being a rather short term administrative framework, this national strategy will be thoroughly evaluated after the year 2002. Although, focus will be placed on an assessment to determine whether measures and activities under the National Polices, Measures and Plans have proven to be respondent to national needs in the implementation of the Convention and maintaining viable components of biodiversity. It will also be important to find out how extensive are these measures and activities have been effectively implemented. Such an assessment is likely to, systematically and officially demonstrate capacity available for the implementation of the Convention in Thailand.

CHAPTER 4
COORDINATING MECHANISMS FOR THE IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY

During the five years period between the signing of the Convention on Biological Diversity and the approval of the ratification of the Convention, the national coordination mechanism on the implementation of the Convention is the National Committee on the Convention on Biological Diversity. The National Committee was involved in expediting the ratification while engaging in supervising the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. In addition, the National Committee has been responsible in drawing the government's attention toward several concerned issues of the Convention and in establishing sectoral coordinating bodies with aims to effectively integrate provisions of the Convention into strategies of respective sectors.

The National Committee on the Convention on Biological Diversity

It was immediately recognized, after the signing of the Convention on Biological Diversity, that its implementation would indeed require cross-sectional efforts. The establishment of a mechanism to initiate cooperation of relevant agencies and to coordinate their implementation tasks was an institutional action of high priority. Such a need was realized with the formation of the National Committee on the Convention on Biological Diversity, under the National Environment Board (NEB), in June 1993. Direct linkage between the National Committee and NEB is crucially important to expedite biodiversity and other CBD-related activities in Thailand.

Despite being without any real political power, the National Committee on the Convention on Biological Diversity has remained a firm and supportive mechanism in facilitations of the implementation of the Convention. The earlier focus of the National Committee

on expediting the ratification of the Convention was later shifted to the formulation of the National Policies, Measures and Plans on the Conservation and Sustainable Use of Biodiversity. The Committee members are comprised of representatives from nine departments under the Ministry of Agriculture and Cooperatives (MOAC), Ministry of Science, Technology and Environment, (MOSTE), Ministry of Public Health (MOPH), and Ministry of Foreign Affairs (MOFA). An NGO and three research institutes are also represented together with six distinguished experts from the universities and relevant institutions. The Office of Environmental Policy and Planning (OEPP) serves as a secretariat of the National Committee.

Roles and Responsibilities of the National Committee

Initially, the National Committee on the Convention on Biological Diversity was assigned to serve as a consultative body to the NEB on the ratification of the Convention. Thus, the main tasks of the National Committee were then focused to consider the most appropriate means for the ratification of the Convention as well as to determine immediate actions required under the Convention. After the ratification was approved by NEB in March 1994, however, these tasks were then formally completed. The successive task of the National Committee was to formulate a national strategy to implement the Convention. Such a task was realized with formulation of the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity, later approved by the Cabinet as an administrative framework for 1998-2002.

The current responsibilities of the National Committee assigned by the NEB's Order of August 15, 1996 are as follows:

- To provide consultation on the national policies and measures on the conservation and sustainable use of biodiversity to the National Environment Board (NEB).
- To prepare for national policy, administrative and legistative implementation of the conservation and sustainable use of biodiversity in accordance to the Convention on Biological Diversity.
- To coordinate with national and international institutions in implementing the Convention on Biological Diversity.
- To formulate the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity.
- To coordinate the implementation of the National Policies, Measures and Plans on the Conservation on Sustainable Utilization of Biodiversity.
- To supervise and monitor the implementation of the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity.
- To support scientific and technological developments related to the conservation and use of biodiversity resources.
- To establish appropriate working groups for specific tasks.
- To carry out other tasks assigned by the NEB.

Apart from the responsibilities stated in the National Policies, Measures and Plans, the National Committee has been assigned to assume the role of the national focal point for implementation of the Convention on Biological Diversity. The responsibility is also to enable the National Committee to prepare policies, guidelines or relevant laws and legislation to better respond to certain specific provisions of the Convention such as a regulation on an access to genetic resources.

Achievements

Responsibility to formulate policies, guidelines and laws in accordance with the Convention, stated under the NEB's Order, had led the National Committee to establish a Working Group on the National Policies, Measures and Plans on Conservation and Sustainable Utilization of Biodiversity. The National Committee also established several other working groups to carry out other assigned tasks including to supervise reporting of issues on biodiversity components and conservation.

Another significant achievement of the National Committee is the preparation of a drafted regulation on access to biological resources by the Working Group on Genetic Resources. The drafted regulation appears in Annex II.

Current and Future Developments

The tasks undertaken by the National Committee on the Convention on Biological Diversity are diverse. The National Committee has been supervising activities on specific issues related to the Convention including identification of threatened components of biodiversity, alien species, biodiversity data management and cooperation with relevant international initiatives. A list of threatened vertebrates in Thailand has been compiled by the OEPP in consultation with distinguished experts and is currently available for interested researchers, policy makers as well as the general public.

The Working Group on Alien Species was established under the National Committee. The working group has been conducting an inventory on alien plant and animal species found in Thailand. Another working group was established to identify and facilitate the implementation of clearing house mechanism (CHM) of the Convention. The Working Group on Biodiversity Data Management has reviewed and endorsed the Guideline and Action Plan on Biodiversity Data Management, formulated by 1995-1997 OEPP/OWEP/WCMC Project on Thailand's Biodiversity Data Management. The Guideline and Action Plan have been incorporated in the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity, as facilitating mechanisms for handling information relevant to biodiversity research and decision making process.

As the Convention on Biological Diversity is increasingly becoming a key principle for managing biological resources at an international level, the existing global initiatives, especially those under responsibilities of relevant organizations and/or agencies of the United Nations, have restructured themselves to better serve and meet the provisions of the Convention. The most visible example is the UNESCO's Man and Biosphere (MAB) Programme where a new operational strategy, the Seville Strategy, was adopted to enable the Programme's biosphere reserves to better serve as experimental sites for implementation of the Convention. The restructuring of the MAB Programme was immediately responded by a direct coordination between the Secretariat of the National Committee on the Convention on Biological Diversity and the Secretariat of the National Committee on UNESCO's MAB Programme. Under this coordination, meetings were organized to inform relevant agencies about the MAB Programme and relationship between the Programme and the Convention. In addition, the objectives of the MAB Programme as well as the Seville Strategy were incorporated as one of the measures under the National Policies, Measures and Plans on the Conservation and Sustainble Utilization of Biodiversity, to further solidify cooperative effort in implementing the MAB Programme and the Convention.

Other Biodiversity Committees

Four agencies under the Ministry of Agriculture and Cooperatives had established their own departmental committees on biodiversity, in response to the ministry's interest on biodiversity issues. These agencies are the Royal Forest Department, Department of Fisheries, Department of Agriculture, and Department of Livestock Development. The responsibilities of these committees focus on sectors of their direct concerns. The main features and responsibilities of such committees can be briefly described as follows:

- *Royal Forest Department (RFD): Departmental Committee on the Implementation of Activities Related to Forest Biodiversity*

  Chaired by the Director General of the Royal Forest Department, the Committee was assigned to recommend implementations which are in compliance with the provisions and commitments stated under the Convention on Biological Diversity. Recommendations made by the Committee would be used to formulate common guiding procedures for RFD. These procedures may include measures on *in-situ* and *ex-situ* conservation and sustainable use of biodiversity components as well as plans for the conservation and protection of forest biodiversity. The Committee is also responsible for monitoring the implementation of biodiversity issues at the national level and communicating with other relevant national and international agencies on the implementation of the Convention with emphasis on forest biodiversity.

- *Department of Fisheries (DOF): Departmental Committee on the Implementation of Activities on Biodiversity of Department of Fisheries*

  The Committee, chaired by Director General of the Department of Fisheries, was assigned with the responsibilities similar to the RFD's committee. These responsibilities include the formulation of plans and management programs on the conservation and sustainable use of aquatic biodiversity, creating conservation measures for the protection of biodiversity components with fishery potential, monitoring the implementation of biodiversity issues at the national level, and coordinating with other relevant national and international agencies.

- *Department of Agriculture (DOA): Departmental Committee on Biodiversity*

  The Deputy Director General of the Department of Agriculture is a chairperson of the Committee. Unlike other departmental committees, tasks of the DOA's Committee are focused on the implementation at operational level including the formulation of DOA's policy on operational guideline on biodiversity as well as monitoring and evaluating results from the implementation of biodiversity activities of the department. The most important aspect of the Committee is its responsibility on drafting new laws or amending existing ones under the department responsibilities to ensure better compliance with the Convention on Biological Diversity.

- *Department of Livestock Development: Departmental Committee on Biodiversity of Livestock*

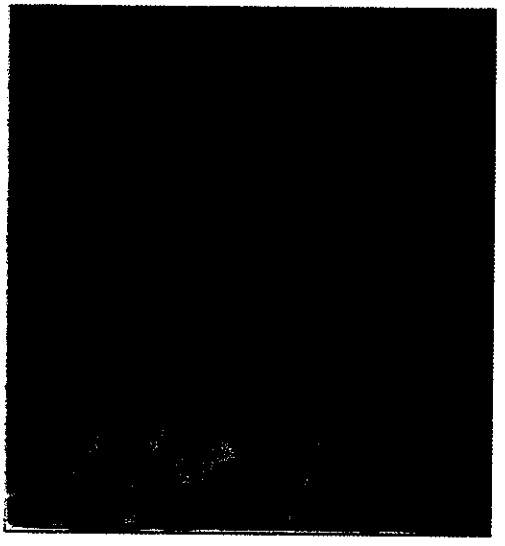
The Director General of the Department of Livestock Development is a chairperson of the Committee with the Deputy Director General as vice-chairperson. The responsibilities of the Committee are to implement activities in accordance with the provisions of the Convention on Biological Diversity as far as the domesticated animals and livestock are concerned. The Committee's tasks include several issues such as development of measures for *ex-situ* and *in-situ* conservation as well as the sustainable use of biodiversity components, the formulation of plans and management procedures for the protection of livestocks, monitoring the implementation of activities on biodiversity of livestock, and coordinating with national and international agencies in implementing the action plans and measures related to the Convention.

Conclusions

The National Committee on the Convention on Biological Diversity has been an institutional and coordinating mechanism vital to the implementation of the Convention in the country. The achievements accomplished by the National Committee are not restricted to the success in advocating an approval for the ratification of the Convention nor the formulation of the national strategies on biodiversity, but also in stimulating recognition on the importance and role on the implementation of the Convention by the concerned institutions. With driven efforts of the National Committee, relevant institutions are convinced of their obligation to the Convention and the national strategies, and are able to translate such initiatives and principles into fruitful and practical actions. This was evidenced by the establishment of various coordinating bodies in the concerned agencies, enabling considerable incorporation of the Convention initiatives into respective sectors, private and public, as well as national, regional and international.

CHAPTER 5
INTERNATIONAL COOPERATION AND COLLABORATION

Collaboration, technical support and assistance from international and foreign organizations have long been instrumental in the preparation for the implementation of the Convention on Biological Diversity. Since the signing of the Convention in 1992, institutional and financial supports committed by the public sector have not been sufficient in the execution of various of activities suggested by the Convention. In most cases, foreign and international assistance, collaboration and cooperation have been the only available and reliable supporting instruments to undertake urgently initiatives.



Notable among international sources of assistance for the implementation of the Convention have been the United Nations Environment Programme (UNEP) and the Danish Government. Their contributions to biodiversity initiatives in Thailand have been of a particular importance, as they were directed toward the activities associated with capacity building of a basic framework for the implementation of the Convention. Other international and foreign bodies, such as United Nations Development Programme (UNDP), Food and Agriculture Organization of the United Nations (FAO), International Development Research Center (IDRC), United States Agency for International Development (USAID), Canadian International Development Agency (CIDA), Japanese International Cooperation Agency (JICA) and Australian Agency on International Development (AUSID), although were supportive to specific aspects of the conservation and sustainable use of biodiversity, should also be highly commended for their interest, attention and support to biodiversity conservation in Thailand.

United Nations Environment Programme (UNEP)

The United Nations Environment Programme (UNEP) was the first international organization to provide support for the preparation for actual implementation of the Convention in Thailand. As a host country of the UNEP Regional Office for Asia and the Pacific, UNEP was particularly interested in assisting the country in strengthening understanding of biodiversity and its components. This interest was realized with financial support for some important projects shown in Table 5.

Table 5: UNEP supported projects on the implementation of the Convention on Biological Diversity in Thailand.

Project's Title	Responsible Agencies	Duration
• Implementation of UNEP Guideline for Preparation of Country Study on Biological Diversity	OEPP	1991-1992
• Thailand Biodiversity Country Study	OEPP	1994-1997
• Thailand's Biodiversity Data Management Project	OEPP	1995-1998

OEPP: Office of Environmental Policy and Planning

With regard to the Biodiversity Country Study Programme (1994-1997), assistance from UNEP was not only a research funding for the compilation of information on biodiversity, but also for the national focal point of the Convention, Office of Environmental Policy and Planning (OEPP), to informally create a network of competent experts on biological resources in Thailand. These experts have later become viable contributors to various biodiversity initiatives including the preparation of a Red List of vertebrate species, compilation of records and an inventory on non-indigenous animal and plant species, the drafting of a regulation on an access to genetic resources and the formulation of the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. Without the Country Study Project, many of these scientists and experts may have never been identified and, could not contribute to the implementation of the Convention in the country, at least not at the level they have been professionally capable.

Although the financial support from UNEP has ceased at the conclusion of the Country Study Project in March 1997, OEPP has kept on improving and updating the Country Study with its own resources.

Danish Cooperation on Environment and Development (DANCED)

With a long history biological research by Danish experts in Thailand, accommulated Danish expertise fit the profiles of cooperation the Danish Government was looking for during the 1990s. The Danish Cooperation on Environment and Development (DANCED) Program was introduced not only as a funding source for environment and development activities, but also as a collaborative regime in which both financial and scientific assistance can be extended to joint initiatives including those on biodiversity. In 1994, DANCED provided support for preparation for implementing the Convention on Biological Diversity under a project entitled "Support for Thailand's Implementation of the Convention on Biological Diversity" with several activities including:

- Support IUCN experts to participate in drafting the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity.
- Co-sponsor, with the Royal Thai Government, the Conference on Prospects of Cooperation on Biodiversity Activities held in Chiang Rai in January 1996.
- Support compilation on lists of selected groups of species including a Checklist of Forest Insects in Thailand, Bryophytes in Thailand, and Algae in Thailand.

In addition to the project, the Danish Goverment also supported several biodiversity initiatives of public institutions. DANIDA, another Danish cooperation program has also contributed to implementation of selected projects related to specific aspects biodiversity. These projects are listed in Table 6.

Table 6: Danish collaborative and assistance projects in Thailand.

Project's Title	Responsible Agencies	Donors	Duration
• National Inventory of Natural Wetlands	OEPP	DANCED	1995-1998
• Forest Genetic Resources Conservation Management	Royal Forest Department (RFD)	DANCED	1997-2000
• Tropical Marine Mollusk Research	Department of Fisheries (DOF)	DANIDA	1990-
• Scientific Cooperation on Aquatic Bio-resources	Department of Fisheries (DOF)	DANIDA	1996-

Other International Organizations and Agencies

Assistance and cooperation from other international organizations and agencies, although are often short-term and not directly related to biodiversity, were usually innovative and and contributing, at some extent, to the implementation of the Convention.

• International Development Research Center (IDRC)

In Thailand, the International Development Research Center (IDRC) has long been known to support various kinds of research programs and activities. Direct assistance from IDRC can be demonstrated by funding provided for the implementation of "Electronic Atlas of Agenda 21 : Biodiversity Volume" (ELADA 21), a cooperative project between OEPP and the Canadian Centre for Remote Sensing (CCRS). Under this project, a software was introduced to OEPP for presenting characteristics and status of Thailand's biodiversity via digital hypermedia scenarios. The information compiled by Thailand's Biodiversity Country Study Project has been utilized for the scenarios, enabling the users to directly interact with the information from basic desktop computer facilities. The ELADA 21 and accompanying scenarios have been well received by the general public with substantial national exposure. Although the technology of the ELADA 21 has now been viewed to be somewhat obsolete by several data management experts due to its limited applications, the Project has successfully drawn attention toward the importance of proper and appropriate presentation of biodiversity information in the country.

In addition to the ELADA 21 Project, many research initiatives supported by IDRC have been known to contribute to better understanding of components of biodiversity, such as a project on bamboo in Thailand executed by the Royal Forest Department during 1983-1989.

• Canadian International Development Agency (CIDA)

In comparison to IDRC, the Canadian International Development Agency (CIDA) has placed emphasis on providing assistance to active conservation works rather than research activities. Thus, majority of biodiversity-related activities of CIDA is usually on the rehabilitation of natural habitats or conservation of specific components of biodiversity. Examples of such activities were the restoration of forest with cultural importance in Maha Sarakam province, initiated by OEEP in 1996 and, ASEAN Forest Tree Seed Center Project executed by Royal Forest Department during 1981-1997.

• United States Agency for International Development (USAID)

The United States Agency for International Development (USAID) has long been an institution which fosters bilateral cooperation on agricultural and forestry development between Thailand and U.S.A. It is obvious that many USAID initiatives related to

biodiversity strongly emphasized sustainable use of biological resources, where experiences of agricultural development can be fully utilized. Biodiversity-related activities implemented with USAID assistance are listed in Table 7.

Table 7: Biodiversity-related initiatives supported by USAID at the Royal Forest Department.

Project's Title	Duration
• Biomass Cooking Store Improvement Household Use	1982-1984
• Reforestation and Development of Nursery Technique for Forest Plant	1993-1995
• Northeast Rainfed Agricultural Development Project	1983-1986
• ASEAN-US Watershed Project	1984-1989

United Nations Development Programme (UNDP)

Similar to the USAID, the United Nations Development Programme (UNDP) concentrates its funding on biodiversity-related activities and initiatives with an emphasis on the sustainable use of natural resources. Several of these initiatives were joint-sponsored by the Food and Agriculture Organization of the United Nations (FAO) and Global Environment Facility (GEF). Projects supported by UNDP which are related to conservation and sustainable use of biodiversity can be seen in Table 8.

Table 8: Biodiversity-related initiatives supported by UNDP at the Royal Forest Department.

Project's Title	Duration
• Land Use and Land Cover Change	1994-1996
• Reforestation and Denuded Forest Land in Khao Kho*	1990-1995
• Integrated Development of Phu Wiang Watershed*	1982-1989
• Impact from Change of Land Use and Land Cover**	1995-1996

* UNDP/FAO initiatives

** UNDP/GEF initiatives

• Food and Agricultural Organization of the United Nations (FAO)

FAO participation in biodiversity-related activities in Thailand has been directed toward those on agriculture and forestry sectors. Although concentrated on specific sectors, FAO has been providing financial support for diverse kinds of relevant activities including research, conservation, management and technical training programs such as the Project on Eco-development of Buffer Zone Management Planing executed by the Royal Forest Department during 1994-1996.

• International Plant Genetic Resources Institute (IPGRI)

Formerly, a part of the Food and Agriculture Organization of the United Nations (FAO), the International Plant Genetic Resources Institute (IPGRI) is now well established as an independent institute with several cooperative projects on genetic diversity in Thailand. In fact, the cooperation between the IPGRI and Thailand dated back since the IPGRI was still a branch of the FAO Regional Office for Asia and the Pacific (RAPA) in Bangkok in 1977. In 1992, IPGRI set up a Regional Office for Asia, the Pacific and Oceania (APO) to foster cooperation in the region and hence enable IPGRI to associate with Thai institutes on plant genetic resources at greater extend. Collaboration between IPGRI and Thailand in recent years can be summarized by a list of projects shown in Table 9.

Table 9: Collaborative projects between IPGRI and Thailand since 1994.

Project's Title	Responsible Agencies	Year
• *In-situ* Conservation of *Cotylelobium melanoxylon*	Chumphon Hort. Research Center	1995
• Research on Bamboo Seed Technology, Preparation of Guidelines	ASEAN Forest Tree Seed Center	1995
• Genetic Analysis of *Calamus palustris*	Royal Forest Department	1995
• Status Report on Genetic Resources of Mangos, Rambutans and Durians	Kasetsart University	1995
• Research on Distribution and Conservation of Bamboo and Rattan Species in Northern Thailand	Chiang Mai University	1995
• Coconut Germplasm Collecting and Establishment in Field Genebank	Department of Agriculture	1995
• Study of Impacts of Forest Disturbance on Genetic Diversity of Key Species	ASEAN Forest Tree Seed Center	1996
• Locating & Assessing Diversity in Tropical Forest	ASEAN Forest Tree Seed Center	1996

- **Japanese International Cooperation Agency (JICA)**

The Japanese Government has been extending support for biodiversity-related activities through her selected international research and development organizations. The Japanese International Cooperation Agency (JICA) has been providing financial assistance for various agricultural, fishery and forestry projects for a number of years. The assistance from the Japanese Government for initiatives which are supportive to the implementation of the Convention, is shown in Table 10.

Table 10: Research projects supported by JICA at the Royal Forest Department.

Project's Title	Duration
• Research and Training in Re-Afforestion Project	1981-1992
• Reforestation and Extension Project in the Northeastern of Thailand	1991-1996
• Aerial Photography and Forest Management Plan in the Encroached National Forest Reserves	-

- **Australian Agency for International Development (AUSAID)**

Although the Australian Government has participated and extended support to conservation initiatives through regional programs such as ASEAN-AUS, AUSAID has also been active in assisting some biodiversity-related initiatives including Tropical Marine Ecosystem Management Project at the Royal Forest Department.

- **Others**

Other public and private organizations from overseas as well as other international institutes have provided support of various kinds of biodiversity related initiatives with a focus on specific aspects of their interest. Such projects are listed in Table 11.

Table 11: Biodiversity-related activities supported by other overseas and international organizations at the Royal Forest Department.

Project's Title	Donors	Duration
• Development of Reforesting for Lac Producing Tree by Agro-forestry	RETROF	1993-1996
• Management of Natural Resources and Environment Project	Oregon Wood Inc.	1993-1995
• Community Woodlot Extension Project	Green Earth	1985-1995
• Thailand Upland Social Forestry Pilot Project (Phases I-III)	Ford Foundation	1987-1996
• Agricultural Diversification and People Irrigation Project	International Fund for Agricultural Development	1989-1994
• Seminar.and Training on Sea Turtle Conservation	ASEAN Association	1995
• Wetland Value : Management and Environmental Education	ASEAN Association	1993
• Forest Information System Development Project for the Management of Tropical Forests	JAFTA	1990-1993
• Geographic Information System for Tropical Forest Management	JAFTA	1990-1993

Note: ASEAN : Association of South-East Asian Nations
JAFTA : Japanese Forest Technical Assistance
RETROF : Research Association for Reforestation in Tropical Forests

Some cooperative initiatives were jointly implemented and sponsored by certain institutes and governments. For example, a project between SEAFDEC (South-East Asia Fisheries Development Center) in Thailand and the Marine Fisheries Resources Development and Management of Malaysia was supported by the Japanese government and SEAFDEC. The Project concentrated on the identification of fisheries resources with spatial analysis for management in the South China Sea.

Conclusion

International cooperation and collaboration have played an important role in implementing the Convention on Biological Diversity in Thailand. However, such cooperations and collaboration needs careful management to better replenish the lack of sufficient public funding for biodiversity activities. Funding from the UNEP was not used only for the preparation of the Biodiversity Country Study, but was also allocated for organizing several meetings to formulate the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. In many cases, support from international and foreign sources was instrumental to the success of implementing biodiversity activities, not as major funding but rather as an additional small grants for completing the activities. Such international cooperation and collaboration will continue to be vital, not on how large the sources of funding would be, but more on how they could lead to the ultimate goals of the projects and future development on conservation and sustainable use of biodiversity in the country.

CHAPTER 6
CAPACITY FOR AN IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY

It has been relatively difficult to determine the capacity available for effective implementation of provisions stated under the Convention on Biological Diversity. This is largely due to a wide range of activities related to the Convention and, at considerable extends, limited recognition of their contributions assumably utilized in line with the implementation of the Convention. The actual realization of the capacity was first assessed by the national focal point, the Office of Environmental Policy and Planning (OEPP), during the preparation of a revised Thailand's Biodiversity Country Study in 1994. The Country Study did not only reveal the lack of direct supporting capacity institutional framework and human resources for the identification and the management of biodiversity components. Systematic evaluation of capacity and resources available for biodiversity activities was later conducted under the UNEP/OEPP/WCMC Biodiversity Data Management Project (1995-1998), which further confirmed the situation identified in the Country Study. The capacity for an implementation of the Convention in Thailand can be elaborated for the institutional, human resources, financial and information technology points of view as the followings.

Institutional Capacity

At present there are a number of public agencies responsible for the conservation and utilization of almost every component of biological diversity. Limited institutional involvement in the realization of the Convention is due mainly to the lack of timely polarization on the Convention-oriented conservation and sustainable utilization of biodiversity resources. This is evidenced by limited views and recommendations of

relevant institutions on certain issues such as invasive alien species, access to genetic resources, status of threatened species, and information management. There exists an urgent need for the government to declare and pave ways, through policy-making and planning as well as directives and goals, to orient conventional tasks and responsibilities of the concerned and relevant institutions, toward the implementation of the Convention on Biological Diversity.

Administratively, the ministries involved with the Convention in Thailand are the Ministry of Science, Technology and Environment (MOSTE), Ministry of Agriculture and Cooperatives (MOAC), Ministry of Foreign Affairs (MOF), Ministry of Commerce (MOC), Ministry of Public Heath (MOPH), Ministry of University Affairs (MOUA), Ministry of Education (MOE), and Ministry of Industry (MOI). They are responsible for certain issues related to the implementation of the Convention. With the exception of the Ministry of Commerce (MOC), Ministry of Education (MOE), Ministry of Industry (MOI), and Ministry of University Affairs, they are represented in the National Committee on the Convention on Biological Diversity, thus ensuring relatively comprehensive participation of relevant institutions. Nevertheless the Ministry of Commerce and Ministry of University Affairs are represented by a legal advisor of the Ministry of Commerce and researchers and scientists from selected universities. The National Committee has contributed significantly to better understanding, recognition, realization and commitment of concerned government agencies on their respective roles and responsibility in implementing the Convention.

Human Resources Capacity

Human resources development (HRD) is the main theme and objective of the 8th National Economic and Social Development Plan (1997-2001). There is no doubt that the most serious problem associated with human resource capacity is limited availability of the human resources itself. The lack of qualified workforce for biodiversity activities is characteristic to those experienced by other biological researches and studies where the insufficiency is particularly severe in highly specialized groups such as animal and plant taxonomists. The recent institutional survey under UNEP/OEPP/WCMC Thailand's Biodiversity Data Management (BDM) Project (1995-1998) on human resources available for biodiversity activities, estimated the number of biological-oriented personnel in relevant institutions at less than one-sixth of the total staffs.

It was cleared from the survey and other data compilation works, such as the Biodiversity Country Study, that available workforce is nowhere sufficient to contemplate even basic tasks suggested by the Convention. Identifying biodiversity components, for instance, is carried out by a handful of taxonomists from the universities and governmental agencies. Acquiring additional skilled personnel for these institutions has been increasingly difficult during the last two decades.

Effectuated by the workforce trimming policy of the government has forced many institutions to employ some graduates on temporary basis at least to sustain the on-going routine researches. High salary and attractive incentives provided by private firms have also drawn a large number of temporary employees, graduates and even the public servants to work for the firms causing the so called "brain-drain" from the government institutions.

The problems of workforce shortage has been identified and tackled in the National Policies, Measures and Plans on Conservation and Sustainable Utilization of Biodiversity. Commitments to biodiversity conservation and management, especially researches on biological resources, have been visualized as a crucial basis for improving human resources capacity. Thus, the priority under the Measure 1.4.2 (strengthen incentives for occupations on biodiversity at the local and field level) was directed toward the formulation and enactment of the policy for conservation and sustainable use of biodiversity in each institution. The Measure also suggests an increase of positions for biodiversity researchers and declares specific biodiversity expertises, such as taxonomy, conservation ecology and population genetic as deficient in the public sector.

The Biodiversity Data Management (BDM) institutional survey revealed that of 67% of workforce in the public institutions which are university graduates, 40% are with master degree or higher. Percentage of university staff with a master or higher degree is much higher than those in other public agencies. This is due to the fact that the majority of universities required positions with at least a master degree, while other government agencies are comfortable to employ a workforce with an undergraduate or bachelor degree, or equivalents, or even vocational ones.

Although the present educational system has sufficiently produced gruduates to supply human resources need of public institutions, it remains uncertain whether newly recruited graduates have necessary skills or expertise to meet the challenge introduced by the Convention. From various researches and identification activities, such as Biodiversity Country Study, it appears that new employees with adequate expertise, are almost non-exist, especially in the public agencies. Most experts on specific fields of biodiversity in the government agencies, did not acquire their expertise from the university education but rather from their own interest and effort accumulated in such fields.

The academic qualification for those responsible for the administration and management of the conservation and sustainable use of biodiversity is also an area of concern. With a progressive discussion of the Convention's Conference of the Parties (COP) and its advisory bodies, the implementation of the Convention has become increasingly multidiscipline oriented. The compliance with the Convention would thus require relevant and competent institutions to incorporate various skills for highly specific concerned issues. Presently, the universities in Thailand do offer graduate programs on integrated management of natural resources. However, most programs fall short of adequately addressing biodiversity issues.

The problems associated with human resource capacity have been addressed by the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. Under Strategy 1 (building capacity of institutions and their staff on the conservation of biodiversity), Measure 1.4.1 (support training and continuous education in occupations related to biodiversity) encourages universities to produce specialized personnel, particularly taxonomists, through provision of scholarship for undergraduate and graduate students in different fields of biodiversity. The Measure also demonstrates the national intention to improve university capacity in producing graduates in the existing and on-going biodiversity-related programs. This Measure is a crucial step in improving capacity of human resources for biodiversity activities. In addition to an emphasis on the production of graduates, the universities and other educational institutions are also viewed as competent bodies for conducting capacity building programs for public servants and employees from relevant governmental agencies, as well as staff of private organizations. Short courses and trainings are suggested by the Measure as activities that the universities could organize to serve and improve workforce knowledge and skill required in implementing the Convention.

It is not possible to address human resources capacity for implementing the Convention on Biological Diversity without taking into account financial and institutional capacity available. The lack of institutional commitment and policies on biodiversity issues would result in limited funding which, in turn, restrict the recruitment of new personnel or provision of training for the existing ones. Thus the institutional willingness is of a vital importance to the improvement of human resources than the financial resources itself. In several cases, funding from private and overseas donors has enabled the institutions to acquire additional skilled workers and experts, to conduct training programs or even to improve necessary infrastructure and facilities. However, without firm commitments and policies, the capacity-building of human resources would not be fulfilled.

Financial Capacity

Since the authorities for the implementation of the Convention on Biological Diversity are mostly governmental agencies and organizations, an annual budget appropriation of sufficient financial resources for the implementing agencies is undoubtedly necessary. However, since the signing of the Convention on Biological Diversity in 1992, there has been no any significant appropriation nor an increase in budget allocated to relevant agencies responsible for either the identification of biodiversity components, the conservation of the components, or the coordination of conservation efforts. The RFD Herbarium responsible for the classification of over 15,000 herbarium specimens, is still being funded with a budget of merely 1 millions Baht (approx US$27,000) annually with 10 working staff members.

Limited funding for biodiversity activities, in several cases, was a direct result of the lack of recognition and appreciation of the institutional roles and responsibilities in conserving and managing biodiversity. Although the institutional recognition has been significantly improved through the efforts of the National Committee on the Convention on Biological Diversity, additional funding for existing and new biodiversity-related tasks has not been increased or forthcoming at significant amounts. The Ministry of Science, Technology and Environment (MOSTE), an administrative authority on the environment issues, has remained one of the least-funded ministries of the Royal Thai Government. During the annual House Budget Appropriation Session and the prevailing economic crisis, funding for environmental issues, management and conservation, including those on biodiversity, is the first to suffer from budget trimming.

Although, it could be argued that the governmental agencies responsible for carrying out biodiversity activities at the ground level, such as the Ministry of Agriculture and Cooperatives (MOAC), are adequately funded, the tasks of such agencies are extremely diversified and do not guarantee that such funding will be complimentary to the national agenda on biodiversity.

Under the 1992 Enhancement and Conservation of National Environmental Quality Act, the "Environmental Fund" was established to provide necessary financial support for environmental activities of urgent and immediate need. However, the contributions from the Environmental Fund for the implementation of the Convention and other biodiversity activities are still limited. Section 23 of the Act clearly states that the environmental activities eligible for the disbursement from the Environmental Fund are pollution control oriented. These include grants for an investment in waste treatment facilities, loan for public pollution control system, or loans for private firms to install the waste treatment systems. For other environmental activities, the Section simply mentions, under Heading 4, that aids or grants may be provided "to support any activities concerning the promotion and conservation of environmental quality as the Environmental Fund Committee sees fit and with the approval of the National Environment Board". This, however, can be implied that any biodiversity-related activities, including taxonomic research, field study, habitat management, capacity building, institutional restructure or legislation review, are low priorities to receive any support from the Environmental Fund, despite of their urgent need in the country.

However, thus the Office of Environmental Policy and Planning (OEPP) formulated a management plan to obtain a few amount of financial support from the Fund for managing the biodiversity in the 0.5 km^2 "Dun Lampan" Environmentally Protected Area in Maha Sarakham province where is the habitat of *Thaipotamon chulabhorn*, a crab species endemic to very few localities in Thailand. The Environmental Fund could support and contribute to biodiversity conservation and the implementation of the Convention if being declared Environmental Protected Area management.

Sources of financial assistance from bilateral cooperation and collaboration projects with foreign and international organizations have been vital in the preparation for implementing the Convention. Upon becoming a state party to the Convention, the

financial support from the Global Environment Fund (GEF) would be made available to Thailand and thus furthering options for oversea sources of funding. With the country being categorized as the nations with the economic in transition, Thailand is not likely to gain a priority for financial support from the GEF over other developing nations or state parties. Furthermore, as of the end of 1999, the ratification process of the Convention is still in process.

Optimistically, increasing institutional recognition on the importance in implementing the Convention should direct greater flow of financial resources to biodiversity activities. Thus, more efforts are needed to ensure increasing involvements of all concerned institutions in the national implementation of the Convention through initiatives suggested in the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity. The urgency of the initiatives should be properly addressed and adequately accommodated with all possible financial support.

Information Technology Capacity

It has been widely recognized that identification of all components of biodiversity would not be complete within a short period of time. Although about 1.75 millions species of organisms have been described and identified, they are believed to account for less than 8% of the total number of species, roughly estimated at 13-14 millions. While a significant proportion of higher vertebrates and angiosperms is known to the scientific community, the taxonomic knowledge of invertebrates, lower plants and microorganisms remain severely limited. For instance, the scientist have described roughly 750,000 species of insects, such number is less than 10% of the total estimated number. Groups of species which have been comprehensively identified, after a few hundred years of taxonomic works, are least numerous number such as mammals, reptiles, birds and amphibians.

Knowledge and information on components of biodiversity in Thailand are similar to the global pattern. Recent literature surveys revealed that 95% of mammals and birds have been identified while only 70% of other higher vertebrates (reptiles, amphibians and fishes) are known. However, only 10-15% of the invertebrate species have been identified. Although sharing similar pattern of taxonomic information deficiency with the rest of the world, the problem is comparatively more serious in tropical countries such as Thailand. One percent of the total number of selected groups of species in tropical countries is often several times more numerous than that in countries in temperate zone. For example, 4,072 species of terrestrial vertebrates (mammals, birds, reptiles and amphibians) found in Thailand are at least five times greater than those in Norway (299 species) or Sweden (328 species). Thus, a lack of knowledge of even a 1% of

a group of species in Thailand could lead to a large amount of information on the existence of such a group.

Insufficient taxonomic literature and information could be considered serious obstructions to effective conservation of biodiversity components. What urgently needed is, thus, the information which acknowledges threatened components of biodiversity as well as the threats themselves. Conservation status has been recognized as one of effective means to identify threatened species. The criteria used by IUCN's Red List of Species, in particular, has been instrumental in providing common classification regime, to determine existing situations of species. By assigning the IUCN and other conservation status, those responsible for the conservation and management would be capable to focus on certain biodiversity components whose existence are uncertain and better place emphasis on the most serious threats to the components themselves.

Prior to 1996, classification of species in accordance with their conservation status had been limited. A revised 1992 Wild Animal Reservation and Protection Act has provided protection for over 200 wildlife species. These protected species are classified into four categories which are: preserved species, protected species (with 2 sub-categories), multipliable protected species, and species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973. However, the classification, with an exception of species listed under CITES, does not explicitly address nor indicate specific conservation status of the species. Listings of "preserved" and "protected" species, for instance, were carried out by panels of experts who pooled and discussed all available information for the listing. The preserved species under the Act range from those species which are under serious threat to those reported to be rare in the wild, while the protected species could include any species from relatively rare to common ones.

For several years, there had been attempts to classify wildlife species in accordance with their conservation status. However, these classifications were usually without common criteria and often become incomparable and, in some cases, were conflicting with each other. Recognizing these problems, the Office of Environmental Policy and Planning (OEPP), embarked upon compiling lists of threatened vertebrates, classified according to IUCN criteria. A meeting was organized by the OEPP in May, 1996 for vertebrate experts from universities and research institutions to participate in the listing of mammal, bird, reptile, amphibian and fish species into selected IUCN threatened categories. The species documented by the 1994 IUCN Red List of Threatened Animals were used as basis in assigning conservation status to the species in doubt. At the conclusion, the participants produced list of threatened vertebrates of Thailand which are acceptable and agreeable by all experts in respective fields.

The determination of the conservation status of plant species is also being planned by the OEPP. Unlike vertebrates, the local expertise alone is not substantial enough to carry out listing of threatened plants. It has been recognized for many years that significant proportion of Thai plants has been collected and studied by western scientists and researchers, especially those from Denmark, for at least a hundred years. Thus, to

properly classify the species into selected threatened groups, foreign experts must be involved. Realizing this need, the Danish Cooperation on Environment and Development (DANCED) Program has provided support for OEPP in compiling "Red List of Plant Species of Thailand" under Biodiversity Monitoring and Management (BIOMOMA) Project. Under the project, distinguished Danish experts would collaborate with local experts in attempting to prepare a list of threatened plant species from approximately 15,000 herbarium specimen collected at the RFD Herbarium within 18 months. The Red List is expected to be available at the later part of 2001.

In addition to making available of reference lists of threatened biodiversity components, the efforts in assigning the conservation status to selected species also gave raise to other problems associated with biodiversity information. The most apparent one, was perhaps an absence of proper coordination between researchers in respected fields as well as limited opportunity for them to discuss their views, opinions and findings. Thus, when a panel of researchers and experts is convened to discuss or determine issues related to their interest or studies, it is often difficult to reach a consensus or agreement. This problem also underlines the overlapping redundancy of research activities which have yet to be properly addressed by relevant institutions and authorities.

These above mentioned problems were further explored by the UNEP/OEPP/WCMC project entitled "Thailand's Biodiversity Data Management (BDM)". Initiated in 1995, the BDM Project was a part of a collective group of initiatives on biodiversity data management carried out under the Global Environment Facility (GEF) grant in 10 developing countries. Lacks of coordination, overlapping, redundancy and other information associated problems have been identified, by the BDM project to be a consequence of a single cause, limited availability of information itself. This would imply that while significantly small amount of information on biodiversity components does exist, much less can be accessed and/or used. With limited available information, scientists and researchers could find difficulty building up a knowledge base from the existing information while avoiding overlapping of works among themselves.

In pratice, it is a rather common phenomenon that several researchers, although equipped with considerable amount of information, often have little interest in exchanging and making their information available. This problem, in many cases, is capacity-related as researchers do not have properly trained and skilled professionals to help compile the information nor sufficient funding for publishing. Researchers are generally not awared of importance in enabling an access to their information. Some also hesitate to publish their finding, and information on the basis that the present academic system in Thailand has not yet been able to guarantee proper protection and suitable penalty for plagiarism.

This limited willingness to make information available was clearly demonstrated by the finding of institutional surveys of the BDM Project. Less than 20% of information was found to be kept in a digitized format while only half of this information is 100% complete. Most of the remaining information, however, is either published documents or raw data. With average computer of over 3 sets per institutional unit (section, division, faculty, station, office etc.), there is little doubt that limited attention was given to the utilization of the computer facility to keep the institution information. Presently, almost all publicly available information of the insititutions is in the printing format and the latest ones are usually uncomplied raw data. This is also evident in the lack of up-to-date reports on the status of specific components of biodiversity (i.e. forests), on an annual basis. Those who need to acquire the latest information on biological resources, thus, could not rely on the institutional annual reports, which are usually not updated, and have to directly contact the institutions and end up making their own data analysis and interpretation.

Other problems associated with limited availability of biodiversity information is the poor selection of information technology. This problem is almost strictly institutional where the technologies acquired can not meet the real need of information management. Another problem is the failure to recognize and address demand for information of the institutions. For example, the acquisition of Geographical Information Systems (GIS) in the early 1990s was carried out on the basis that the technology (system) and services provided as well as sufficient fund for purchasing were available, and not whether the information needed can be satisfied by the technology. Thus, when the GIS was eventually acquired, very few decision-makers realized what contribution the system could provide and what tasks should the systems be assigned to. At present, the GIS systems in several public institutions have been used in analyzing the environmental and ecological conditions on a case by case basis and in specific areas such as head-watershed zones of important watershed areas in the Northern Thailand.

Limited availability of biodiversity information and other related problems have been taken into account by the Convention's national focal point, the OEPP. In addition to the institutional surveys, the formulation of national guideline and action plan on biodiversity information management was the main activity under the BDM Project. Since the national guideline and action plan were based on the findings of the institutional surveys, these inherent problems have been comprehensively addressed and measures are being sought to relieve such problem and syndrome.

To resolve the problems on limited available information, the guideline has formulated measures and activities to ensure greater institutional commitment toward documentation of their information and assessment of their data management capacity. An informal network has been suggested to provide a systematic cataloging of biodiversity information available in respective institutions. The voluntary members of the network will be coordinated by an independent agency (hub) who is responsible for compiling names, types, characteristics and access conditions of the information, and provide technical and institutional support to participating members as well as information services to interested users.

The guideline has also give priorities to institutions with limited workforce and facility for data management work. It has been recognized, however, that the acquisition of additional personnel and equipments is the responsibility of individual institution. Thus, the guideline confines itself only as a "guide" for the best possible means to maximize data management capacity with minimum additional personnel and equipments possible. The cost-effective means to acquire technologies and (data management) specialist were also included in the guideline.

Essentially, the guideline on biodiversity data management alone may not be sufficient to ensure progressive development of the biodiversity data management as required. The guideline is merely a technical guideline or a set of suggestions for enhancing data management capacity and does not assign specific responsibilities for particular institutions. Thus, it is deemed necessary to formulate concrete measures capable of effectively translating the initiatives of the guideline into practical acivities with responsible institutions and time frame for implementation. Such measures were also realized as the Biodiversity Data Management Action Plan, consisting of 4 policies, 15 measures and 51 specific activities.

The guideline and action plan have been approved by the Working Group on Biodiversity Data Management under the current National Committee on the Convention on Biological Diversity. The details of the guideline and action plan are included in Annex III and IV respectively.

Conclusion

Institutional recognition and financial commitment in Thailand are the key to successful implementation of the Convention on Biological Diversity. Such commitment should not merely to increase support to biodiversity activities, but should also be obligatory to perform certain specific tasks of immediate need related to biodiversity as well. There is little doubt that, for many years, a vast amount of financial resources and workforce have been allocated to the conservation and management of biological resource. However, only a very small proportion of these resources has been directed toward the tasks prioritized by the Convention, notably, the identification of biodiversity components. Thus, concerned institutions should re-focus their resource management to be better supportive to the Convention, particularly through paying greater attention to the provisions of the Convention themselves. Private sector should also be encouraged to participate in strengthening capacity for the implemention, securing not only additional resources but also a supervisory use in the management of public supports to conservation and sustainable use of biological diversity.

ANNEX I

National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity 1998-2002

Approved by the Cabinet on July 15, 1997

Target

To maintain and conserve ecological process and ecosystems for the conservation and sustainable utilization of biodiversity

Principles

- Conservation of biodiversity in the most suitable manner possible which include the *in-situ* conservation along side with the need for *ex-situ* conservation.
- Prevent and redress causes of biodiversity loss.
- The conservation of biodiversity essentially requires cooperation between various responsible agencies, conservation groups, communities as well as the resources users themselves.
- Recognize the importance of the preservation of indigenous knowledge, creativities and tradition as the first priority element for the conservation and sustainable utilization of biodiversity.
- Thailand urgently needs greater public education, capacity building for existing staff involved in the conservation as well as the production of efficient staff for research and education on biodiversity.
- The consideration and decision on the utilization and sharing of biological resources must be conducted in a fair and transparency manner and lead to effective practice.
- The conservation of biodiversity can be implemented along side a collection and inventory of information and knowledge on biological resources.
- The implementation of activities on the conservation and sustainable utilization of biodiversity must be in compliance with related national and international laws.

Strategies

- Building capacity of institutions and their staff on the conservation of biodiversity.
- Enhance management efficiency of protected areas to ensure sustainable biodiversity protection.
- Improve incentives for conservation of biodiversity at the local level.
- Conservation of species, populations, genetics, and habitat ecosystems.
- Control and monitor processes and activities that threaten the biodiversity.
- Promote biodiversity management in the environment, traditional lifestyle, and culture.
- Promote cooperation between international and national agencies/institutions in conservation and sustainable utilization of biodiversity.

Strategy 1
Building Capacity of Institutions and Their Staff on the Conservation of Biodiversity

Objective 1.1 *To increase awareness and appreciation of the value and importance of biodiversity.*

Measure 1.1.1 Building awareness in importance and value of biodiversity to culture and society.

Implementation

- Continuously provide knowledge on threats to biodiversity and status of biodiversity conservation to general public via various media such as televisions, radios, newspapers, magazines, books, brochures and posters etc.
- Organize slogan, painting and photograph competitions demonstrating awareness of importance and value of biodiversity. General public at all levels would be participated in the competition. Winning slogans would be used in promotional programs via different kinds of media.
- Organize additional activities on selected occasions including nature education camps for youths during summer vacation.
- Honor selected communities or local organizations for their outstanding efforts in conserving biological resources.

Measure 1.1.2 Use existing education system to improve awareness on biodiversity and need in conserving biodiversity.

Implementation

- Develop an additional subject on basic knowledge of biodiversity in existing experience building program for elementary students.
- Develop additional subjects on importance of biodiversity to human survival in secondary and high school curriculum.
- Develop and publish self-learning textbooks on biodiversity for teaching of biology in elementary and secondary schools.
- Develop teaching tools on biodiversity including videoes, tape cassettes, posters, cards, games for distributing to elementary schools nationwide.
- Develop additional short training courses identifying importance of biodiversity for institutions that offer special training courses for administrators and highranking decision makers.
- Encourage development of information sources on biodiversity for local communities using existing infrastructure such as library, village's news hall, education center for traditional knowledge etc.

Measure 1.1.3 Integrate concerns for biodiversity loss in external (outside classroom) education.

Implementation

- Organize external education programs on biological characteristics of plants, animals and ecosystems in national parks and wildlife sanctuaries.
- Encourage expansion of youth trainings for conservation of forest resources nationwide.
- Establish or improve existing tourist service centers in national parks to act as sources for biodiversity information for visitors.
- Establish natural history museums or nature research centers in areas that contain unique ecosystems such as Songkhla Lake, Huai Kha Kaeng Wildlife Sanctuary etc.

Measure 1.1.4 Strengthen knowledge and basic understanding of biodiversity to those who are "core" in disseminating information and providing education.

Implementation

- Organize field education programs for members of media to disseminate knowledge on biodiversity conservation.
- Organize continuous training courses on biodiversity conservation for teachers nationwide.

Objective 1.2 *To support institutions in disseminating information necessary for biodiversity conservation.*

Measure 1.2.1 Build or strengthen national institutions capable of providing information on biodiversity conservation and the potential value of genetic resources.

Implementation

- Support relevant institutions in collecting and disseminating basic information necessary for biodiversity conservation.
- Promote reporting of results from biodiversity researches to general public.
- Encourage academic institutions to develop information system to maintain data on biodiversity, its usages and threats.
- Financially support institutions in acquiring tools and equipments for collecting and exchanging biodiversity information through networking system with other institutions.

Measure 1.2.2 Establish national biodiversity monitoring program and report on the program's progress on a regular basis.

Implementation

- Establish national biodiversity monitoring program with a nationwide network.
- Establish long-term biodiversity monitoring programs in selected areas.
- Conduct training on data collection for field staff emphasizing species that are examples of ecosystems and easy to survey.
- Disseminate documents and information on the changes in biodiversity through newsletters and magazines on a regular basis.
- Support biodiversity research by providing financial resources, equipments and documents.
- Support printing and dissemination of information obtained from biodiversity researches.

Measure 1.2.3 Create national news and information networks to accelerate the transfer of information at local, national and international level.

Implementation

- Provide financial resources, equipments and experts to support the establishment of news and information networks in public and private academic institutions.
- Improve efficiency of universities in Bangkok and upcountry to better serve as regional information centers capable for dissemination of information at a rural level/within Bangkok also.

- Establish National Biodiversity Center to transfer and exchange biodiversity information at the national level.

Objective 1.3 *To promote basic research and applied research emphasizing the study of species and status of biodiversity.*

Measure 1.3.1 Promote basic and applied research on biological science emphasizing biodiversity conservation.

Implementation

- Support basic survey and reporting of biodiversity status in protected areas on an annual basis.
- Prioritize supports provide to taxonomic researches and establish network for Flora of Thailand and Fauna of Thailand project to ensure participation of the relevant institutions and agencies.
- Prioritize and provide support to research activities that satisfying biodiversity conservation policy and required for the sustainable use of biological resources.
- Establish research fund to support public and private organizations on basic and applied researches on biodiversity as well as comprehensive long-termed research projects.

Measure 1.3.2 Support social, religion and cultural researches related to the conservation and utilization of biodiversity.

Implementation

- Financially support researches by establishing the research fund for communities and private organizations conduct researches on indigenous plants varieties, community forest, maintenance of local biodiversity and community welfare .
- Financially and administratively support research on Buddhism and biodiversity conservation.
- Encourage public and private academic institutions and agencies to conduct ethnobiological research.

Objective 1.4 *To build capacity of personnel in biodiversity conservation.*

Measure 1.4.1 Support training and continuous education in occupations related to biodiversity.

Implementation

- Create biodiversity personnel especially taxonomists, by providing scholarship for undergraduate and graduate degree students in different fields.

- Provide educational tool and financial support to public and private agencies to enable them to occupational training related to conservation of biodiversity.
- Support universities and other educational institutions in organizing short courses on biodiversity conservation for personnel from public and private sectors.
- Improve capacity of universities and other educational institutions, that offer biodiversity related programs, in producing undergraduate and graduate degree personnel.
- Organize national program to train officials and staff responsible for biodiversity conservation and to produce biodiversity personnel.
- Urgently establish national center for training on biodiversity conservation.

Measure 1.4.2 Strengthen incentive for occupations related biodiversity at local and field levels.

Implementation

- Formulate a policy in public agencies involved in conservation and sustainable use of biodiversity to give first priority to biodiversity research.
- Allocate additional budget for travel, per-diem and other expenses for personnel attending educational courses, training programs and research activities related to biodiversity conservation, domestically and internationally.
- Increase number of positions for biodiversity researchers especially research stations at the national parks, wildlife sanctuaries and wildlife non-hunting areas.
- Declare biological diversity works with expertise on taxonomy, conservation ecology, and population genetic as being deficient expertise in the public sector.
- Acquire suitable equipments for field staff and encourage central agencies and biodiversity related agencies such as the national park and wildlife sanctuary authorities to cooperate with personnel conducting field surveys and researches.

Measure 1.4.3 Support exchange of knowledge, opinions and experiences between personnel and biodiversity experts.

Implementation

- Provide opportunity and funding for personnel to attend workshops, seminars, conferences and meetings overseas.

- Support biodiversity related agencies to organize seminars on biodiversity in/or between the agencies, at least once a years, to allow researchers and experts to exchange information and opinions.
- Support organization of seminars on biodiversity of Thailand.

Measure 1.4.4 Strengthen capacity for business, private institutions, NGOs in biodiversity conservation.

Implementation

- Organize certificated training courses on biodiversity and related legislations for personnel in NGOs and different private sectors.
- Encourage private educational institutions to give first priority to education on biodiversity conservation.
- Support NGOs in researching and surveying biodiversity and implementing activities on biological resources conservation.
- Provide academic support for business sector in order to allow the sector to continuously receive information on biodiversity conservation.
- Support expansion of trainings for forest protection volunteers nationwide.

Measure 1.4.5 Strengthen and develop capacity for public agencies responsible for biodiversity conservation.

Implementation

- Organize oversea visiting trips on biodiversity conservation for administrators.
- Increase number of positions responsible for biodiversity.
- Establish committees in agencies responsible for the conservation and utilization of biodiversity to supervise and cooordinate works and activities on biodiversity conservation.
- Request agencies responsible for the conservation and utilization of biodiversity to report on the capacity in implementing biodiversity tasks an annual basis.

Strategy 2
Enhance the efficiency in management of the protected areas to ensure sustainable protection of biodiversity.

Objective 2.1 *To ensure that the protected areas are capable to conserve rare and endangered species and ecosystems.*

Measure 2.1.1 Review existing protected areas system and plan for a national protected areas system.

Implementation

- Urgently develop a national plan on protected areas system to investigate adequateness and need in the future for developing protected areas into models of various kinds of ecosystems.
- Categorize protected areas to better suit biodiversity conservation and enact suitable legislative measures for the protection and management of each types of protected areas.
- Prioritize protected area management and formulate of short and long-termed measures.

Measure 2.1.2 Establish additional protected areas when and where appropriate and required.

Implementation

- Establish additional protected areas in accordance with the protected areas system national plan.
- Establish environmentally protected areas in the unique and threatened ecosystems.

Measure 2.1.3 Support the establishment of transboundary reserves.

Implementation

- Investigate suitable sites and criteria to establish transboundary reserves with adjoining and neighboring countries.
- Coordinate with neighboring countries and ask for academic supports for international organizations such as IUCN, WWF and UNEP in preparing an operational plan for transboundary reserves.

Measure 2.1.4 Recognize the "overall" geography of each regions and integrate protected areas as part of regional geography to conserve biodiversity.

Implementation

- Identify and establish buffer zone surrounding the protected areas and expand reserve forests to connect boundaries of the forests.

- Integrate planning of protected area development into a regional planning.

Objective 2.2 *To support sustainable use in protected areas.*

Measure 2.21 **Promote appropriate management of benefits from protected areas.**

Implementation

- Collect research results on benefits from protected areas that can be financially estimated as well as intrinsic benefits.
- Identify and evaluate benefits from products and services of protected areas and those benefits from such products and services.
- Survey resources in each protected areas including their geography, cultural and historical sites, ecosystems, species and genetic resources, to estimate investing capital.
- Disseminate information on benefits from protected areas and provide appropriate means to coordinate usage of different groups.

Measure 2.2.2 **Recognize the vital roles of local communities nearby the protected areas (in buffer zones and the vicinity area) as partners in conserving protected areas.**

Implementation

- Continue work with local communities to ensure that the protected areas management is coincided with daily requirements of the communities.
- Build awareness on sustainable development of protected areas of authorities and communities nearby the areas with community participation.
- Seek supports from communities nearby protected areas in conserving protected areas through establishment of committees or volunteers for protected area management.
- Disseminate documents honoring successful cooperative efforts on protected area management as examples for other groups.
- Develop research methods that can be carried out by communities themselves as basis for appropriate use and dissemination of information to other communities.

Measure 2.2.3 **Encourage and create supporting base for conserving the protected areas from NGOs and general public**

Implementation

- Organize local protected area supporting groups and campaign for support and funding at the national level.

- Promote and publicize activities of the groups by organizing occasions to present awards and personnel coordination.
- Encourage public agencies, NGOs and general public to formulate information dissemination and education programs as well as continuous distribution of news on the protected areas.

Objective 2.3 *To increase capacity in protected areas management.*

Measure 2.3.1 Improve management of protected areas to better suit sustainable use.

Implementation

- Require authorities of every protected area to report status of conservation of and threats to biodiversity on annual basis.
- Formulate management plans for groups of protected areas and each protected areas with transparence objectives and coverage of needed and required implementation.
- Establish groups of researchers and experts to improve and monitor implementation in each protected areas and to provide scientific and technical consultation.
- Support community participation in protected area management such as volunteers, youth groups as well as surveillance of illegal activities (i.e. logging) by the military.

Measure 2.3.2 Seek for fund to support for managing the protected areas.

Implementation

- Seek for fund to support protected area i.e. fund from NGOs campaigns, the Environmental Fund and tourism fee.
- Set appropriate fee for the use of products and services from the protected areas to pay for the expense in managing the areas.

Measure 2.3.3 Support researches to benefit management of protected areas.

Implementation

- Acquire equipments and facilities for scientific researches in protected areas including staff assigned to responsible for coordinating researches in every protected areas.
- Ensure that management of protected areas is scientifically sound and based on research findings in the areas.
- Support researches that emphasize redressing urgent problems including pollution, management of alien species, and management of species with low population in the wild.

- Find appropriate means for collecting and managing information on the protected areas, possibly, through the establishment of protected areas information centers in each region with coordinating linkages.

Objective 2.4 *To improve the conservation of protected areas.*

Measure 2.4.1 Establish protected areas demarcation.

Implementation

- Establish committee to demarcate boundaries of respective protected areas with a participation of local communities (including land holders) and officials from relevant public agencies.
- Utilize the Global Positional System(GPS) and Global Information System(GIS) in demarcating boundaries of protected areas.
- Appropriately adjust boundaries of protected areas and create permanent landmark indicating the boundaries.

Measure 2.4.2 Increase the efficiency of agencies responsible for conserving the protected areas.

Implementation

- Improve communication system in protected areas and transboundary protected areas.
- Acquire fire prevention equipments and provide adequate and effective front fire surveillance.
- Organize trainings for staff on the protection of biological resources as well as other promotional activities.

Measure 2.4.3 Improve legislations to well cover all aspects of biodiversity conservation and to be effectively enforced legislations to conserve and protect biodiversity.

Implementation

- Amend, improve and revise existing Acts related to protected areas to enable effective protection of rare, endemic, and endangered species.
- Train staff in protected areas to improve their expertise in protected area legislations.
- Train communities nearby protected areas to better understand protected areas legislations.

Strategy 3
Improve incentives for the conservation of biodiversity at the local level.

Objective 3.1 *To support biodiversity conservation at local level.*

Measure 3.1.1 Support and promote efficient use of agricultural lands to reduce pressure from encroachment of forests and other important natural ecosystems.

Implementation

- Survey, identify, and evaluate agricultural lands that are valuable for biodiversity conservation.
- Promote and support sustainable agriculture, nature-based agriculture and agro-forestry especially in areas adjacent to natural ecosystems.
- Legally collect land ownership tax in manners that facilitate conservation.

Measure 3.1.2 Increase incentives for communities to conserve public lands that are biologically diversed.

Implementation

- Support local organizations, such as district councils, in organizing committees in villages or districts to responsible for maintaining and managing biological resources outside protected areas.
- Financially and technically support communities that implement conservation activities.
- Urgently enact Community Forest Act in order to facilitate implementation of forest conservation by communities.
- Accept knowledges of local communites on sustainable, and legitimize local management of natural resources.
- Support communities in maintaining their own biological resources with scientific and technical advices from responsible public agencies.

Measure 3.1.3 Support maintenance of traditional culture in biodiversity conservation.

Implementation

- Study and survey traditional and cultural practices related to local biodiversity conservation.
- Promote and publicize conservation of natural ecosystems with traditional and cultural practices of local communities.
- Provide financial assistance and organize trainings for communities in maintaining traditional and cultural practices that recognize

values of biodiversity conservation and appropriate practices which do not destroy biodiversity.

Measure 3.1.4 Compensate communities or individuals who give their lands for biodiversity protection.

Implementation

- Appropriately and fairly compensate, with financial resources or lands, those who lost land rights or titles to use their lands.
- Relocation of communities, in areas important to ecosystem and security, must be carried out with careful consideration on the basis of reliable information and with an appropriate implementation on a case by case basis.
- Provide adequate infrastructure for relocated communities, give advice on occupations and monitor the implementation of the relocation.

Objective 3.2 *To promote and extend sustainable use of biodiversity.*

Measure 3.2.1 Increase benefits to communities from implementing ecotourism.

Implementation

- Promote ecotourism in national parks and wildlife sanctuaries with tourism potential.
- Provide opportunities for communities to participate in administering and managing ecotourism on equitable term.
- Organize committee to supervise equitable sharing of benefits from tourism between operators and communities.
- Organize training for communities in operating appropriate ecotourism that is beneficial for conservation and management.
- Provide knowledge and publicize correct information that is beneficial for conservation and management.

Measure 3.2.2 Build capacity of communities in maintaining and utilizing agricultural biodiversity.

Implementation

- Train and demonstrate integrated agricultural systems, agro-forestry and nature-based agriculture.
- Provide information on production of organic fertilizers and biological control.

Measure 3.2.3 Develop and publicize roles of traditional herbs and ensure appropriate and sustainable use of the herbs.

Implementation

- Study, research, and analyze active ingredients of herbs to enable use of their ingredients for health benefit.
- Promote and disseminate use of the active ingredients.
- Develop use of the active ingredients for manufacturing of health and medical products.
- Conduct studies and researches to certify properties and qualities of herbs referenced by local knowledge, and use information from researches for health benefit.
- Promote and publicize use of traditional herbs and medicinal value of animal extract, and provide knowledge on harvesting and breeding herbal plants in order to generate income for communities.

Objective 3.3 *To ensure that communities and individuals who own knowledge on biological resources conservation, receive proper benefits from the use of such resources.*

Measure 3.3.1 Promote awareness on value of indigenous knowledge and biological resources.

Implementation

- Study, survey and document the indigenous knowledge related to biodiversity.
- Honor the owners of indigenous knowledge on sustainable use of biological resources.
- Encourage registrations of local inventions or indigenous knowledge.
- Implement programs promotion the use of indigenous knowledge in conserving biodiversity in the model areas.

Measure 3.3.2 Support community rights to local biological resources and farmer's rights as ownership of varieties.

Implementation

- Enact appropriate legislations and promote supports to the community rights to biological resources and farmer's rights as the owner of varieties.
- Implement equitable sharing of benefits for harvesting biological resources to communities or farmers who own such resources.
- Provide proper information on the community and farmer's rights over crop varieties as well as information on the conservation and sustainable use of biological resources.

Strategy 4
Conservation of species, population and ecosystems

Objective 4.1 *Improve capacity in the conservation of species, population and genetic diversity in natural habitats.*

Measure 4.1.1 Integrate the conservation of species, population and genetic diversity into the protected areas management.

Implementation

- Urgently survey the status of endemic, rare and endangered species or genetic pools in the protected areas and wild lands outside the protected areas.
- Revise the size of protected areas in the local and nearby forests for possible expansion of the areas to appropriate size for maintaining existing population and genetic resources.
- Enact measures prohibiting the release of wild animals into the protected areas without verifying existing records of the animals and an appropriate release method.

Measure 4.1.2 Use keystone species as targets to support *in-situ* conservation.

Implementation

- Survey the status of every protected areas emphasizing the important animal and plant species.
- Campaign to educate and improve understanding of nearby communities or general public on the important animal and plant species.
- Rehabilitate and maintain important animal and plant species especially the indigenous species.

Measure 4.1.3 Improve and extend legislative mechanisms to protect species.

Implementation

- Urgently ratify the Convention on Biological Diversity which is a mechanism supporting the protection of habitats of important species.
- Urgently ratify Ramsar Convention which is a mechanism supporting the protection of important wetland habitats.
- Include additional species in lists of reserved and protected wild animals and plants to ensure that the lists do comprehensively cover all endemic, rare and endangered species to Thailand.
- Enact legislative measures to protect endemic, rare and endangered species and natural habitats of the species.

- Enact and strictly enforce legislative measures prohibiting trading and ownership of endemic, rare and endangered species.
- Enact appropriate measures for maintaining and managing migratory species and species with transboundary range.

Objective 4.2 *Improve the capacity of ex-situ conservation to enable biodiversity conservation, promote public education, and support sustainable development.*

Measure 4.2.1 Extend capacity in conserving genetic resources of crops, fruits, wild plants, and traditional varieties of vegetables and livestocks.

Implementation

- Improve and strengthen capacity of the facilities, equipments, and other tools in genebanks, culture collection centers, and aquatic animal breeding stations.
- Strengthen cooperation and financially support acquisition of equipments and tools for maintaining culture collection of crops, fruits, and livestocks.
- Establish an information center for genebanks to exchange information domestically and internationally.

Measure 4.2.2 Improve capacity in conserving and breeding varieties of herbal plants.

Implementation

- Organize programs to maintain important herbal plants and to propagate them for culture in the collection centers.
- Develop the capacity of research in identifying and introducing herbal plants (including wild plants) with commercial potential.
- Promote the expansion of production and commercial use of herbal plants for farmers and interested public.

Measure 4.2.3 Develop microbial culture collection centers to be more efficiently operated.

Implementation

- Provide financial support in acquisition of necessary tools and equipments to microbial culture collection centers.
- Improve microbial serotype information system on to enable linkage with information overseas.
- Study and collect local microbial species in different ecosystems and permanently maintain specimens in microbial culture collection centers.

- Improve capacity of research in identifying and introducing microbial species with commercial potential.
- Study safe use of microbial germplasm.

Measure 4.2.4 Promote and support seed banks to improve the protection and exchange of plant genetic resources.

Implementation

- Identify and develop commercial plant varieties.
- Establish plant varieties information systems to exchange the information nationally and enable linkage with networks of seed banks overseas.

Measure 4.2.5 Develop botanical gardens into network for conservation of wild plants.

Implementation

- Organize projects to conserve rare and endangered plants through propagation and breeding in botanical gardens and parks.
- Acquire sufficient botanists and tools for propagation and breeding of wild plants especially the indigenous species that are threatened or inhabited in destroyed habitats.
- Investigate possibility of re-introducing plant species and carry out re-introduction for appropriate plant species.
- Encourage and support the establishment of botanical gardens for schools.
- Improve the operation of botanical gardens to meet international standard and support the establishment of regional botanical gardens.

Measure 4.2.6 Strengthen the roles of zoos, wildlife breeding centers, aquariums, and aquatic animal breeding stations in conserving biodiversity.

Implementation

- Organize programs and plans and acquire tools for breeding stations of endangered and threatened animals or animals that inhabited in destroyed habitats.
- Support the roles of zoos and museums in educating general public and maintaining genetic resources.
- Investigate possibility of re-introducing species back to their original habitats using proper and appropriate steps.
- Formulate control measures in managing wild animals in private zoos on a scientifically sound basis.

Measure 4.2.7 Strengthen the cooperation between agencies/institutions responsible for *in-situ* and *ex-situ* conservation in order to extend roles of *ex-situ* conservation to include reintroduction into the wild, ecological restoration, and ecosystems rehabilitation.

Implementation

- Organize an exchange of genetic materials of endangered animal, plant and microbial species between natural habitats and areas outside natural habitats (i.e,. *ex-situ* collections) to preserve genetic diversity.
- Support the study and research on reintroduction of rare and endangered species into natural habitats.
- Organize an exchange of information and experiences between researchers of different groups of species.

Measure 4.2.8 Extend the capacity of species, population and genetic resources information system especially those in the *ex-situ* conservation.

Implementation

- Compile information on species, population and genetic resources and develop harmonized databases with network and linkages.
- Establish a national information center on species, population and genetic resources.

Strategy 5
Control and monitor the processes and activities that threaten the existence and richness of biodiversity

Objective 5.1 *To develop environmental impact monitoring and assessment systems to enable effective protection of biodiversity.*

Measure 5.1.1 Provide specific protection for endangered, rare and endemic species.

Implementation

- Enact legally appropriate measures forcing the development projects to avoid land usages that could destroy natural habitat of endangered, rare and endemic species.
- Officially declare lists of endangered, rare and endemic species to prohibit the destruction of natural habitats of these species.

Measure 5.1.2 Conduct biodiversity impact assessment especially for projects in the protected areas and wild lands.

Implementation

- Formulate and develop policies by giving first priority to the impact on biodiversity.
- Enact legislative measures requiring all projects developing in the protected areas to submit an environmental impact assessment (EIA) report.
- Formulate guideline for biodiversity impact assessment (BIA) covering possible impacts to the structure, components, and roles of the ecosystems.

Measure 5.1.3 Improve the capacity and expertise in assessing impacts on biodiversity to relevant personnel.

Implementation

- Study biodiversity impacts of the development projects that have been carried out as examples in evaluating the impacts.
- Produce a guidebook for reviewing biodiversity impact assessment reports.
- Produce lists of endangered, rare and endemic species with information of the ecosystem where the species inhibit.
- Organize trainings for public and private sectors on preparation of and reviewing biodiversity impact assessment reports.

Measure 5.1.4 Exchange biodiversity information between relevant public and private sectors to enable the use of information to study and plan for mitigating environmental impacts.

Implementation

- Collect and publicize biodiversity information important and relevant to planning and assessing the impacts.
- Organize biodiversity information network connecting information of public and private sectors use in assessing impacts on biodiversity.

Objective 5.2 *Improve the capacity to monitor the impacts on biodiversity and undertaken immediate action in response to the emergency situations.*

Measure 5.2.1 Provide NGOs and local organizations with their role in surveillance and monitoring biodiversity impacts.

Implementation

- Continuously educate and train NGOs and local organizations on the methods for monitoring biodiversity impacts from the development projects.

- Financially support an organizing of local environmental volunteers to report news on biodiversity impacts.
- Authorize district council or NGOs to act as authorities responsible for the surveillance and monitoring of biodiversity impacts in their areas.

Measure 5.2.2 Improve reporting process in case where accidents severely affect biodiversity.

Implementation

- Acquire modern equipments for transmitting news and information to agencies responsible for monitoring the impacts.
- Plan for accidents that could severely affect biodiversity, for example, immediate reporting of water pollution directly to the responsible agencies and dissemination of information on the pollution to the general public.
- Provide information to population in area adjacent to the project areas on the process and their rights to report accidents.

Measure 5.2.3 Organize an immediate response in case where biodiversity is seriously affected.

Implementation

- Decentralize authorities to regional and local agencies directly responsible for solving the urgent problems of serious biodiversity destruction.

Measure 5.2.4 Support international cooperation in solving problems and formulating cooperative implementation plans.

Implementation

- Organize international coordination and cooperation for planning and preparing for emergency situations that severely affect biodiversity such as forest fire and oil spill.
- Formulate plan for preparing readiness for emergency situations with the identification of responsible agencies and their roles.

Objective 5.3 *Prevent spreading of invasive alien species and genetically modified organisms (GMOs) that may result in alteration of biodiversity.*

Measure 5.3.1 Strengthen the knowledge and understanding on the impacts of invasive alien species to biodiversity.

Implementation

- Study, survey and compile the lists of the invasive aliens species, and document their distributions and their impacts to the indigenous species and the ecosystems.

- Organize seminars and trainings for officials and general public on the impacts of invasive alien species.

Measure 5.3.2 Formulate additional regulations on the import and controlled use of alien species.

Implementation

- Set up additional animal and plant quarantines and strictly enforce the associated importing laws.
- Formulate a regulation for agencies involved in importing alien species for improving crop varieties and animal breeds.
- Strengthen knowledge of officials and organize trainings on import, export, or transfer species outside the country.
- Produce illustrated guidebooks on alien species for the authorities and public.
- Control and monitor the releases of alien species and genetically modified organisms (GMOs).

Measure 5.3.3 Provide additional legislative mechanisms to control transport of genetically modified organisms.

Implementation

- Seek for the Cabinet's approval on biosafety regulations and decree the regulations in order to legitimize the regulations which is yet to be mandatory.
- Provide additional evaluation measures on risk assessment in the existing biosafety regulations and strict monitoring in the regulations.

Strategy 6
Encourage the management of biodiversity in the surroundings and in traditional cultural practices.

Objective 6.1 *To support initiatives of the private sector in biodiversity conservation programs.*

Measure 6.1.1 Provide incentives for conservation to the private firms or organizations implementing biodiversity conservation programs.

Implementation

- Award and honor private firms or organizations implementing biodiversity conservation programs for youths such as bird watching programs and youth camps for nature conservation.

- Enact tax break measures for the private firms or organization investing in researches that are supportive to biodiversity conservation.
- Campaign for the use of biodiversity conservation as a cause in public relations of the private sectors.
- Support research and development of both public and private sectors through prioritizing and supporting biodiversity conservation with the Environmental Fund.

Measure 6.1.2 Enhance cooperation of the private sectors in providing supports to biodiversity conservation.

Implementation

- Establish a committee of private sectors to support biodiversity conservation.
- Formulate working conservation programs and invite private sectors to continuously implement the programs
- Create competitive atmosphere in conserving biological resources in order to attract private investments.

Objective 6.2 *To promote biodiversity conservation in the urban and rural communities.*

Measure 6.2.1 Support the use of public lands to establish natural forest parks to demonstrate the local natural ecosystems.

Implementation

- Allocate the public lands in major cities to propagate additional indigenous plant species and modify the landscape to resemble natural conditions.
- Establish nature education centers in natural forest parks to set up exhibitions and disseminate information on biodiversity conservation.
- Organize cooperative programs to ensure the participation of private sector communities and youths in establishing and maintaining natural forest parks.

Measure 6.2.2 Promote the maintenance of indigenous and local plant and animal varieties in public and private lands.

Implementation

- Disseminate knowledge and information related to indigenous and local plant animal varieties.
- Distribute indigenous plant seedlings on traditional occasions and invite the citizens to plant them in private and public lands such as along the motorways.

- Support conservation and maintenance of privately owned natural lands to ensure their long-termed existence.
- Provide low interest loans to the private sector in implementing biodiversity conservation such as bird sanctuaries, public parks, natural forest parks, etc.
- Establish fund to support the private firms or organizations requiring financial assistance in maintaining wild land.

Measure 6.2.3 Promote the maintenance of natural conditions in work places and residential areas.

Implementation

- Declare governmental policy requiring academic institutions, temples and public agencies to preserve the natural condition in their responsible area especially the preservation of old trees maintaining swamps and ponds that are habitats of bird species.
- Request cooperation from the private sector in preserving natural conditions in responsible areas especially the preservation of old trees and maintaining bird habitats, etc.

Measure 6.2.4 Develop land-planning measures to facilitate strengthening of biodiversity in urban communities.

Implementation

- Create conditions requiring the housing schemes, residential buildings and shopping centers to include natural parks as part of the buildings and strictly monitor compliance to the conditions. If there is any change in the allocated parks, communities will have to be informed.
- Create conditions requiring the protection of some areas as "green areas" or "buffer zones" for large transportation projects, such as the expressways, railways and transport stations, which utilize large area of land and create pollution to the communities.

Objective 6.3 *To conserve biodiversity in accordance with the maintenance of Thai traditional cultural practices.*

Measure 6.3.1 Study and survey Thai traditional and cultural use and conservation of biodiversity.

Implementation

- Survey Thai traditional and cultural practices and identify favorable and adverse impacts of the traditions and cultures to biodiversity conservation.
- Promote Thai traditional practices that conserve and sustainably use of biodiversity.

- Maintain traditional and cultural custom and ceremony that use biological resources as important components.
- Provide and disseminate knowledge to the general public in order to increase public awareness of value of biodiversity in Thai tradition and culture.

Measure 6.3.2 Encourage activities that conserve biodiversity in society such as activities of Buddhist monks and women.

Implementation

- Honor and encourage roles of women as those who recognize the values of biodiversity and actively conserve and sustainably use biodiversity at home and in the daily occupations.
- Study and encourage the role of monks in teaching youths to conserve biodiversity and in conserving of natural areas in and nearby the monasteries.

Objective 6.4 *To conserve biodiversity in cultural forests.*

Measure 6.4.1 Promote rehabilitation and re-plantation cultural forests and give right to the communities in participating in the management of cultural forests through the conservation and sustainable use

Implementation

- Survey coverage of biodiversity in the use of cultural forests nationwide.
- Formulate long-term programs to rehabilitate the ecosystems in cultural forests through a joint implementation between the communities and local universities.

Measure 6.4.2 Provide knowledge to the general public and promote awareness on the importance and necessity in conserving cultural forests.

Implementation

- Produce media, equipments and technical methods for promoting knowledge and awareness of value of biodiversity in cultural forests to the general public.
- Organize training for youth and general public and establish volunteer agencies to look after the cultural forests with continuous promotional activities.

Objective 6.5 *To integrate biodiversity conservation with other activities that utilize biological resources.*

Measure 6.5.1 Promote the country's tourism in a manner that assists biodiversity conservation.

Implementation

- Integrate biodiversity conservation in national and provincial tourism master plans.
- Require cooperation in allocating financial benefits from tourism as funding to maintain biodiversity.
- Develop a policy emphasizing cultural and biodiversity of Thailand in tourism promotion and public relations.
- Campaign for awareness of biodiversity loss as loss of tourist spots and economic revenue.
- Provide knowledge to administrators and local operators on benefits from ecotourism.

Measure 6.5.2 Integrate biodiversity conservation in agricultural policies.

Implementation

- Encourage maintaining indigenous domesticated plant and animal varieties used in agriculture.
- Support maintaining biodiversity in cultivated fields and pasture through integrated farming systems, nature-based cultivation etc.
- Promote opportunity for farmers to study successful nature-based cultivation in order to generate interest in such cultivation.

Measure 6.5.3 Integrate biodiversity conservation in forestry policies.

Implementation

- Enact additional measures in national forestry master plan requiring rehabilitation programs for deteriorated forests in most provinces to maintain natural biodiversity.
- Enact operational directions for maintaining species, ecosystems and genetic pools in national protected areas master plan.
- Require reforestation programs and forest park plantation to maintain species diversity especially indigenous ones.
- Require clearing in development project areas to avoid destruction of biodiversity.

Measure 6.5.4 Integrate biodiversity conservation in fishery policies.

Implementation

- Include rehabilitation and restoration of marine species and ecosystem diversity in the Thai Sea Rehabilitation plan.
- Emphasize monitoring species diversity and maintaining habitats of endangered aquatic species in fishery policies.
- Require annual reporting of biodiversity status of the fishery resources.

Strategy 7
Promote cooperation between international and national agencies/institutions in the conservation and sustainable utilization of biodiversity

Objective 7.1 *To create cooperation between government, private organizations and local communities in the conservation and sustainable utilization of biodiversity.*

Measure 7.1.1 Promote a cooperation between public agencies involved in the conservation and sustainable use of biodiversity.

Implementation

- Improve the components and structure of the National Committee on the Convention on Biological Diversity to ensure a more effective operation.
- Develop a coordination guideline to enhance future cooperative operation between the involved agencies.

Measure 7.1.2 Coordinate cooperation between public sector, NGOs and local communities in formulating the provincial environmental plans that include the conservation and sustainable use of biodiversity.

Implementation

- Establish coordinating committees between public and private sectors to formulate provincial environmental plans on the conservation and sustainable use of biodiversity.
- Establish local coordinating committees to formulate guidelines on conservation and sustainable use of biodiversity in accordance with the provincial environmental plans.

Objective 7.2 *To promote cooperation in research and development on biotechnology between public and private agencies.*

Measure 7.2.1 Allocate fund to systematically and comprehensively support researches to emphasize benefits derived from the development of biotechnology.

Implementation

- Prioritize biotechnology researches and development projects for further support.
- Allocate funding sources for prioritized projects.

Measure 7.2.2 Support a cooperation between the public and private sectors in research and development on biotechnology.

Implementation

- Provide incentives for private sector for the joint research and development, i.e. tax break measures for industries, etc.

Objective 7.3 *To ensure appropriate benefits from the use of biological resources to Thailand.*

Measure 7.3.1 Equitable and fair sharing of benefits derived from use of biological resources on basis of sustainable use.

Implementation

- Enact regulations and criteria on appropriate access to biological resources.
- Establish the National Biodiversity Center as central agency responsible for coordinating access to biological resources.
- Develop research guidelines for international cooperation on researches and development of biological resources.
- Develop guidelines on sharing of benefits related to researches, developments, and technology transfers.

Measure 7.3.2 Legitimize regulation on access to biological resources and benefit sharing criteria.

Implementation

- Submit a regulation on access to biological resources to the Cabinet and acquire its approval for enactment as regulation under the Office of Prime Minister.
- Organize meetings of involved agencies and institutions to improve understanding on the regulation.
- Strengthen awareness in implementation in accordance to the regulation.

Objective 7.4 *To ensure that Thailand receives appropriate technologies on the conservation and sustainable use of biodiversity from overseas and is able to transfer existing technologies to other countries.*

Measure 7.4.1 Promote access and transfer of technologies on conservation and sustainable use of biodiversity.

Implementation

- Compile lists of technologies required from overseas and those that are able to be transfered to other countries.
- Develop guidelines on technology transfer under fair and mutually agreed term.
- Develop cooperative guidelines with other countries on access and transfer of technologies protected under intellectual property systems.

Measure 7.4.2 Strengthen capacity of the National Biodiversity Center in operating Thailand's Clearing House Mechanism (CHM).

Implementation

- Establish a networking system to coordinate access and transfer of technologies related to biological diversity.
- Improve capacity of personnel and acquire equipments that enable more effective operation.

Objective 7.5 *To promote appropriate access to and transfer of biodiversity information.*

Measure 7.5.1 Establish the national biodiversity information networks and systems.

Implementation

- Revise the existing information exchange mechanisms for information related to the conservation and sustainable use of biodiversity.
- Require the National Biodiversity Center to be responsible for coordinating data collections, establishing biodiversity information networking system and disseminating information.

Measure 7.5.2 Improve the capacity in collecting and utilizing information for the agencies and personnel.

Implementation

- Organize trainings on the collection and use of biodiversity information in the networking system for relevant agencies and institutions.

Measure 7.5.3 Promote cooperation on the information exchange between the domestic and oversea agencies.

Implementation

- Develop and domestically and internationally publicize a guideline on access to and transfer of biodiversity information.

ANNEX II
Drafted Regulation on the Access and Transfer of Biological Resources

Access to biological resources for either commercial or research purposes is probably the most critical and controversial issue related to the ratification and implementation of the Convention on Biological Diversity. In the actual event, the concern over this issue has propelled ratification of the Convention to the national stage with extensive criticism from various NGOs and, threatened the ratification process of the Convention itself. Whether such concerns arose from insufficient understanding or other interest, Office of Environmental Policy and Planning (OEPP) has recognized that a regulation on the access to biological resources must be formulated to ensure control on the issue as well as strengthen the country's readiness in implementing the Convention. In this regard, OEPP, under cooperation with and supervision of the Working Committee on Genetic Resources chaired by Dr. Ampon Seinanarong, Privy Councillor, drafted the Regulation on the Access and Transfer of Biological Resources. The regulation, which include principles, conditions, and directions for drafting of contracts to ensure suitable share of benefit from genetic resources, has been submitted to a panel of over 70 experts from various governmental agencies and private organizations at the meeting on April 19, 1995. After corporating recommendations provided by the experts, the regulation was submitted to the National Committee on the Convention Biological Diversity on June 26, 1995.

Under the regulation, the proposed National Biodiversity Centre and the National Committee on Conservation and Utilization of Biodiversity are empowered to review and grant permission to access and transfer biological resources. The permission process itself was designed with emphasis on preservation of the existing biological diversity including the collected species and their habitats, as well as sensible time limits for efficient operations. Conditions for individuals to gain permission to access biological resources stated in the regulation are as follows.

ANNEX II

Principles and Conditions

- *Those granted legal permission to access and transfer biological resources...*
  - must represent a company, foundation, cooperative, institution, organization or agency of state that is the Party to the Convention on Biodiversity and must be legally empowered to sign a contract.
  - If such company, foundation, cooperative, institution, organization and agency is not yet legally or officially established, the person seeking permission must accept the principle, conditions, process and format imposed by the National Biodiversity Centre.
- *Biological resources allowed for utilization*
  - Biological resources transferred across boundaries must not include those protected by other laws and regulations.
  - The National Committee is empowered to declare what types of biological resources do not require permission to transfer and to set conditions under which kind of transfers do not require permission. These conditions can be modified or cancelled by the Committee at any time.
  - In the case of biological resources which were previously permission-exempted, the Committee is empowered to temporarily or permanently cease the exemption.
- *Requests for permission to access and transfer biological resources must be submitted to the National Biodiversity Center.*

  The request must follow the conditions and present in a format indicated by the National Biodiversity Center which include a project proposal and terms of reference for gaining access to or importing or exporting biological resources. The request must also indicate the status of the legally responsible person, and be accompanied by any other relevant legal documents.
- *Principles for the consideration of project proposals submitted for permission to access and transfer biological resources.*

  Proposals related to the access and transfer of biological resources approved by the National Committee must be technologically suitable, economically enhanced, and include mean to equally share benefits derived from the resources. The following proposal components will be considered:
  - Type and quantity of required biological resources.
  - Location of the required biological resources.
  - Process or technology used for access to the required biological resources.
  - Thai researchers or representatives involved in the access of the biological resources.

- Funding for the access.
- Objectives of the utilization of the biological resources at present and in the future.
- The implementation of conditions once permission is gained.
- Limitations in the utilization.
- Proposal for sharing the benefits from the utilization.
- Violation of community rights.
- Violation of animal rights and moral codes for the use of living organisms in research.
- Other conditions the National Committee considers essential.

- *Period of time for consideration of the proposal.*

  - The Center must finalize consideration process for each request within 60 official days. The Center is empowered to ask for further elaboration of the request and proposal and/or request for additional documents. Approval of the request must be informed within seven official days.

- *The draft of contract between the Center and permission applicant must be finalized within seven official days.*

- *The Center would collect an insurance payment against any possible loss and degradation of the requested biological resources with the Center's regular fee before issue the permission document.*

- *Permission can not be granted for a period greater than one year. Renewal, suspension and cancellation of permission is conducted according to principles, conditions and process set by the Center.*

Coordination and Request for Permission

- Applicant for permission must coordinate with individual and institutions/agencies involved in the research in Thailand before requesting permission.

- Applicant for permission must submit the request form to the National Biodiversity Center before enterring Thailand. Detailed information about the project that requests the used of biological resources must also be submitted.

- Applicant for permission must enter the country with researcher or sample collector visa, and not a tourists one. Accommodation in Thailand must be indicated during entire duration for the project. If there is change in the accommodation, the location of new accommodation must be informed to the director of the Center within 5 days.

- Once permission is grant. The contract must be written in according to direction designated by the Center.

- Once permit to survey and collect samples in protected areas, the collectors/researches must strictly obey the regulations of such areas.

- In collecting sample, there must be Thai researchers or representatives presented at collected sites at every occasions. The researchers/representatives must include at least one biologist and expense must be provided for the researchers/representatives participating in the collection.

- Must collect the sample of species, varieties, genus and families that are permitted and only parts of organism permitted. The collectors must not collect too many samples. The collection must not threaten existing of the species, their habitats or create impacts upon the nearly species and their habitats. The collectors are liable to damage or loss of natural resources caused by the collection.

- In case that the research/study resulted in the finding of rare or endangered species/varieties, the collectors must inform the Center as well Thai institutions/ organizations involved in the research/study of such finding and the location where the species in found.

Analysis and Research

- Once the survey and sample collection are completed, the collectors must deposit samples of duplicate specimens used in the research with all relevant detailed information including the locations where sample are collected, at the Center in order to ensure the convenience in repeating the collection. The collector must also provide copies of pictures or slides to the Center or Thai institutions involved in the research or museums or natural science institutes in Thailand.

- In case where new species are found, the researcher must deposit the type specimens of the newly found species at museums, natural science institutes and herbariums in Thailand.

- Preliminary researches must be conducted in involved Thai institution/organizations. Such preliminary researches could include extraction and study of biological activities of extracted compounds. The researches are aimed to develop expertise of the local staff in the researches.

- Methods used in the research must not conflict the moral code for the utilization of living organisms for research.

Transfer

- When request permission to transfer biological resources, the permission request form for the transfer must be submitted with that for access to biological resources.
- The individuals who transfer the resources must strictly obey the regulations, conditions and processes for the export and import of biological samples. Such regulations include relevant quarantine regulations, CITES Convention, International Air Transportation Association's Life Animal Regulation (IATA).
- The transfer of threatened or ecologically reliable biological resources must be conducted in accordance to relevant laws and regulations.
- Location of the transferred samples must be informed to the Center and Thai institution/organizations with continuous reporting of information on the exported biological resources.

It should be noted that the process was also designed to encourage the partnership for researches and other sample collecting activities. The aim of such partnership is not only to improve the ability of local staff in sample collection technique but also enhance their capabilities and consequently, efficiency in providing assistance for sample collectors in future activities.

ANNEX III
Guideline on Biodiversity Data Management (BDM)

The early phase of the Biodiversity Data Management (BDM) project was devoted to surveys of institutional capacity in handling and managing biodiversity information. Finding from these surveys, the Guideline Testing and subsequent BDM Institutional Survey, indicated certain difficulties and problems associated with information management in biodiversity-related institutions. It is deemed necessary that these difficulties and problems receive attention from those concerned and be appropriately resolved by specific administrative measures. The BDM project assumed that respective institutions have exclusive rights and responsibilities over the use and management of their own information as accepted by the Conference of the Parties to the Convention on Biological Diversity (CBD/COP) meeting. Thus, administrative means, such as guidelines and action plans, seem to be more appropriate in solving problems related to the management of biodiversity information. Under these considerations, the BDM project drafted a Guideline on Biodiversity Data Management as a suggested measure for improving the management of information in biodiversity-related institutions. The guideline was presented to concerned institutions in a meeting on "Guideline and Action Plan for Biodiversity Data Management" held in Bangkok in December, 1996. Comments and opinions expressed by the participants in the meeting were incorporated into the guideline as well as the following action plan in the last chapter.

Principles

Since its early development, the Guideline on Biodiversity Data Management has aimed to achieve two major goals; to improve information availability and to better identify needs for new and additional data management technologies. Such goals are direct results of finding from the institutional surveys which identified the lack of information availability and poor selection of data management tool as the two most serious problems. In resolving these problems, the guideline has set out to establish and ensure institution's commitments toward documenting their information and assessing their data management capacity through the formation of informal network. Initially, the

network would be operated with voluntary participation by interested institutions and individuals who have been identified as information custodians. An independent agency (hub) would be created to provide service to the network members (participants) as well as to maintain overall operation of the network.

The guideline has also aimed to tackle other problems identified in the institutional survey including the lack of sufficient workforce for data management tasks and limited availability of hardware and software. Measures formulated under the guideline for these problems would, however, be implemented at a lesser extent than those dealing with the establishment and maintenance of the network. BDM project has realized from the initial drafting of the guideline that acquiring additional staff and equipments is the responsibility of participating institutions. Thus, the guideline would confine its role merely as a guide on the best possible means to maximize the improvement in data management with a minimum number of additional personnel and equipments, it required. In addition, the technical assistance for cost-effective acquirement of technologies and (data management) specialists is also included in the guideline.

Finally, the guideline would be used to raise a profile of the data management tasks in the institutions that maintain information concerning various aspects of biodiversity. The guideline, through the provision of informal network, would attempt to improve awareness on the importance of data management and ensure better information service from the institutions. The guideline also acts as a reference for the institution in determining their data management status as well as in making appropriate adjustment to improve such status.

Components

Guideline on Biodiversity Data Management consists of three major components which are:

- **Biodiversity Information Network (BINET)**

  BINET is an informal network comprising initially of institutions and individuals identified as the custodians of biodiversity related information. The network is maintained by a data transferring coordinator or "hub" which is operated as an independent agency under the existing National Committee on the Convention on Biological Diversity.

- **Guideline on the Development of Efficiency in Biodiversity Data Management**

  This guideline provides a direction for both the participants of the BINET and other institutions, in building efficiency in the data management. Under the guideline, administrative measures for data management and a practical guide in selecting additional personnel are suggested.

- **Biodiversity Data Management Standards (BDMS)**

  BDMS is a criteria used mainly for determining status of data management of institutions participating in the BINET. The BDMS indicates minimal requirements for the institution in making information available or providing an access to the information. The standards could be seen as a set of conditions for measuring the institution commitment to data management.

In order to ensure maximum benefit from the guideline, these three components should be integratedly and simultaneously operated as a complete system.

The BINET could act as an operation component where information on the status of (biodiversity) data management is consistently collected and new measures for improving management capacity are tested and implemented.

At the same time, the Guideline on the Development of Efficiency in Biodiversity Data Management could be used to assist the operation of the BINET through an administrative adjustment and cost-effective acquiring of personnel and equipments. In return, the guideline would benefit from the information gathered from the BINET in refining its own measures.

The last component, the BDMS, could undertake its role as a criteria in assessing the effectiveness of the Guideline on Development of Efficiency in Biodiversity Data Management as well as the benefit from the BINET.

If implemented effectively, Thailand BDM project believes that these three components could provide basic platforms for standardized data exchange and transfer system.

Biodiversity Information Network (BINET)

Until recently, most of biodiversity related information in the major sources, the governmental agencies, was often "classified" and not accessible by the general public. Although these information are research-related and do not possess any threats to the national security nor the authority of the government, an access to these information was virtually impossible. Thus, when the government endorsed greater disclosure of their information to interested public, the agencies were relatively unprepared to provide effective information service or facilitate an access to such information. Decades of the minimal information transfer between the agencies and interested users and among the agencies have created unawareness on the necessity of effective information management. It is often found that several government institutions do not have the full knowledge of the information they have and know even less about their data management capability. If this knowledge is not improved, the institutions will not likely be able to participate effectively in the global networking community in the prevailing information technology era.

The Biodiversity Information Network (BINET) is aimed to ensure greater interest toward the basic information management. By participating in the BINET, institutions are obligate to commit their resources for documentation of their information as well as available personnel and equipments assigned for data management tasks. Contributions made by participating institutions (information on available data and resources for data management) to the BINET are compiled, published and returned to the institutions as referenced documents. Apart from the documents, the institutions would benefit from other networking service provided by a designated coordinator.

BINET is not a computer network and would not rely exclusively on electronic communications, i.e. the Internet, in maintaining contact between participating institutions. Instead, the BINET operates on the basis similar to that of the Clearing House Mechanism (CHM) of the Convention on Biological Diversity, where participants are welcome to transfer and exchange information in format best suited to their present data management capacity. Since the published document was identified by the BDM Institutional Survey as the most common format, the BINET places higher priority for the exchange of publications and lower priority for the electronic transfer in the network until the digitized information is proven to be the dominant form of data storage. Such priority settings clearly reflect the principal objective of the BINET in ensuring greater availability of information in all possible forms. Although information availability is the utmost important goal of the BINET, the network would provide certain means to enable participating institutions to transfer their information via electronic (computer) network in order to encourage interest in the conversion of data into a digital format as well as to develop electronic networks in the country.

- **Components of BINET**

  In all, BINET is comprised of three components as follows :

  - **Participating institutions/individuals**

    Initially, participants of the BINET would consist of institutions or individuals that can identify themselves as the custodians of biodiversity related information. To obtain membership in the BINET, the institutions and individuals must be able to verify their ownership over their information. The participants must also have authority to provide permission for accessing and making use of their information as well.

  - **Data transferring coordinator (hub)**

    A data transferring coordinator or a hub is responsible for coordinating information exchange in the BINET. The hub would act as a center in collecting information from participating institutions in the BINET as well as assisting the institutions in searching and modifying their desired information. In addition, the hub would also be responsible for monitoring the status of data management and providing support for the improvement of data management capacity in participating institutions.

The hub is operated under the Working Group on Biodiversity Data Management formulated by the National Committee on the Convention on Biological Diversity. The Working Group would supervise the operation of the BINET and approves the activities to be undertaken by the hub.

▼ **External users**

Interested institutions or individuals that do not participate in the BINET are regarded as external users. The users may be those who are not sufficiently capable and are not willing to commit themselves in the BINET. The external users can request for certain information services (i.e., information search) from the hub but are not entitled to receive any support for building up their data management capacity that BINET members are eligible.

Apart from reports from participating institutions (BINET members), any information transfer that does not acquire services from the hub, would not be regarded as activities under the BINET. The BINET members are free to distribute, exchange or supply their information to any individuals or institutions as well as to retain all rights to prohibit access to and use of their information. The hub is authorized to ensure that reporting commitments are met by the members but are not empowered to administrate any change in data management of the members. The members can withdraw their membership from the BINET at any time. The withdrawal is in effect once acknowledged by the Working Group on Biodiversity Data Management.

● **Roles and responsibilities of BINET components**

▼ **Data transferring coordinator (hub)**

The hub is responsible to fulfill the following major tasks :

- Collect, catalog and publish information available from the BINET members.
- Provide information searching service and, upon request, reproduce information from information available with the members.
- Monitor and provide support to the development of data management capacity of the members in order to ensure better compliance with Biodiversity Data Management Standards (BDMS).
- Survey and compile the lists of resources used for data management by the members.
- Assist in providing linkage between the members and international organizations, i.e. WCMC, IUCN etc.
- Regularly rank the members on their need for strengthening data management capacity.
- Locate and obtain funding for the development of data management capacity for the members.

In order to ensure effective implementation of these tasks, the hub would be administrated and operated by the two enabling units which are :

The Working Group on Biodiversity Data Management

The operation of the BINET is governed and supervised by the Working Group on Biodiversity Data Management established by the National Committee on the Convention on Biological Diversity. The Working Group is currently comprised of selected experts and representatives from major governmental institutions (i.e., Royal Forest Department, Department of Fisheries, etc.). Representatives of BINET members are included in the Working Group once the BINET is fully operational. These representatives are selected in an assembly of the BINET members held annually to review the performance of the BINET.

The Working Group on Biodiversity Data Management is entrusted with the responsibility to review and consider the following issues ;

- Applications, admission and withdrawal of new BINET members.
- Provision of supports for the development of data management capacity of the BINET members.
- Ranking of the BINET members on the need for the development of data management capacity.
- Allocation of BINET budget for various tasks including a funding provision for the development of data management capacity.
- Conducting specific negotiations between applicants and the information custodians when an access dispute occurs.

The Working Group is not responsible for considering regular information service provided by the BINET. It would, however, review reports of the service prepared by other mechanism and the operation team, on a regular basis and provide suggestions on how to improve such services.

Operation team

The operation team is responsible for information service and performing other BINET tasks. These service and tasks include information search, collecting compulsory reports from the BINET members, compilation and publishing of information/resource metadata as well as preparing documents for the meeting of the Working Group on Biodiversity Data Management. The operation team would also perform specific tasks assigned directly by the Working Group such as making an appointment for those involved in access negotiations.

The operation team is made up of individuals with either biodiversity, data management, administration or financial expertises. The Working Group on Biodiversity Data Management would appoint a chief to lead the team. The chief is entrusted with an authority to make decisions on regular service and tasks of the BINET that do not require the Working Group's approval.

The operation team is also responsible for arranging an annual meeting of BINET members. Apart from selection of the member representatives to the Working Group on Biodiversity Data Management, the meeting would act as an open forum for the members to express and discuss the performance of the BINET. In addition, the representatives from international organizations such as IUCN, WCMC and Species 2000 would be invited to participate. Interested individuals and institutions are also welcome to actively participate in this annual BINET event.

▼ **Participating institutions/individuals (BINET members)**

Initially, institutions/individual participating in BINET must be the information custodians who can clearly demonstrate official or legal-binding ownership of their information to the administrator of the BINET, the Working Group on Biodiversity Data Management. The institutions/individuals or BINET members may not need to be those carrying out data collection themselves as long as they are able to be responsible for the following tasks ;

- Maintain information in accordance with the Biodiversity Data Management Standards (BDMS).
- Regularly update information, preferrably, in accordance with the BDMS.
- Ensure consistent accuracy of information.
- Provide appropriate access to information, where the information is not classified.
- Provide advice on appropriate use of information.

As far as the membership is concerned, the responsibility of BINET participants is confined to reporting of their information and data management status. BINET members have to regularly submit their reports to the Data Transferring Coordinator (hub) within a designated timeframe set by the Working Group on Biodiversity Data Management. With preliminary evaluations from the operation team, the Working Group would grant an approval of the reports. If the reports are found to be incomplete by the Working Group, BINET service to submitted members will be temporary suspended until resubmitted reports are approved by the Working Group. Failure to submit the reports may, however, result in the termination of the membership.

BINET members are required to prepare and submit two types of reports. They are:

Data management report

The Data management report is a documentation of all available resources allocated for data management of BINET members. Using a form of the Data Transferring Coordinator (hub), the members must list the numbers of personnel assigned for data management tasks as well as the quantity and specification of equipments, such as the hardware and software in possession. Information obtained from

the report is to be used by the hub to determine the needs for development of data management capacity of each member and in the ranking of the members according to such need.

Dataset reports

BINET members have to list names of their sets of information, or datasets, specifying characteristic of the datasets as well as describe how the datasets are maintained in two separated reports as follows :

- *Dataset statement*

Initially, BINET members must prepare and submit a dataset statement enlisting all of their available datasets and describing how each dataset is managed and what conditions users need to comply to gain an access to the datasets. The members only need to submit one dataset statement per each dataset at the beginning of their participation in the BINET to validate their memberships. The members have to prepare the statements for every new datasets compiled/established.

If the members fail to report their new and additional datasets, the service provided to the member would be suspended until the dataset statements for such datasets are submitted. In some cases, where failure to compile the statement suggests the serious lack of commitment by the members (i.e. fail to report new datasets for over one year), BINET membership may be terminated.

- *Updating report*

Updating report consist of three main components;

- addition (with dataset statements)/cancellation/transfer of datasets,
- addition/cancellation/transfer of components of datasets, and
- alteration of access conditions.

Although, these three components have to be submitted to the hub together on a regular basis, it is desirable that BINET members report changes in any components, either datasets, components of the datasets or access conditions, as soon as they occur.

Failure to report any such on a regular basis is considered as a serious lack of commitment and may result in the immediate termination of membership.

Entitled services

As member of the BINET, participating institutions /individuals are eligible to the following service:

- Entitle to obtain copies of analyzed/refined/modified datasets or any information products produced by the hub.

- Receive BINET datasets catalog from the hub with regular updates.
- Entitle for information searching service. The service is free of charge. However, for datasets that required certain access fee, those using the service would have to pay for the fee.
- Entitle for dataset modification from the hub. The service is usually free. If the modification is, however, proven to be costly, those using this service will have to pay for such expense.
- Entitle for advice and consultation on the data management issues.
- Entitle to receive institutional and financial supports from the hub for the development of data management capacity.

Criteria for selecting BINET members

In order to obtain BINET membership, institutions/individuals must be able to demonstrate the following qualifications:

- **Possess official or legally-binding ownership of their proclaimed datasets (information)** : The members may have copyrights over their datasets or receive institutional recognition of the ownership. Most importantly, the members must be able to legitimately authorize an access and use of their datasets.
- **Responsible for the maintenance of datasets** : The members may not need to collect information first hand, but are required to be entrusted with a responsibility to ensure integrity of the datasets.
- **Be the first person or institution to document changes in the datasets** : The member must be able to be the first who records and reports addition, cancellation, transfers and other alterations of the datasets and their components to the hub.
- **Be the most suitable and competent to maintain the dataset** : In the case that similar datasets are maintained by more than one institutions/individuals, the one with best data management commitment and capacity, is granted the membership in the BINET. However, the less qualified custodians are welcome to join the BINET as the owners of other different datasets, if present, or as partners of the one already receiving the membership.
- **Institutionally and financially secured** : The members must be able to secure consistent funding and supports and be able to allocate sufficient resources for the data management tasks regularly.

▼ **External users**

Those institutions or individuals who intend to use the BINET services but are not interested nor qualified to obtain the BINET membership, are classified as the external users. Similar to BINET members, the participation of the external users is confined to the activities that required services from the hub such as information search or an access negotiation. An access and transfer of information directly from the members to the external users is considered as bilateral activities under the

jurisdiction of the members and not of the BINET. Unlike the members, however, the external users usually have to pay for services offered by the hub with an exception of certain promotional documents (i.e., brochures, posters, etc.)

- **Access negotiation**

As far as BINET is concerned, an access to unclassified datasets for non-commercial purpose can be carried out with a simple registration with the hub. The registration will enable the hub to obtain required datasets from BINET members and inform the acquirers of conditions they need to comply, in order to access and/or use such datasets. The registration also allows the hub to learn what purposes the acquirers intend to use the datasets for and whether the purposes are acceptable to dataset providers (members). If the purposes are found to be conflicting with the objectives of the dataset (i.e. use for commercial purposes) or unacceptable to the providers (i.e., benefits from the datasets are not substantially returned to the providers), the hub would arrange for a negotiation between the acquirers and the providers (concerned members). The Working Group on Biodiversity Data Management would act as a negotiation panel and mediator for resolving an access dispute between the two parties, the acquirers and the providers.

The operation team is responsible for coordinating an access negotiation process. the team would inform and advice the acquirers on the preparation and presentation of their access proposals, and assist the dataset providers (concerned members) in preparing necessary information for the negotiation, i.e. objectives and access conditions of their datasets. The team is also responsible for arranging venue and date for the negotiations.

Since the providers have an absolute authority over their dataset, the results from an access negotiations, whatever the outcome, are final. There will not be any appeals after the negotiations nor any new panels to renegotiate the case.

For every access inquiry and request via the BINET, the hub is entrusted with a duty to inform the access conditions and possible disputes to the acquirers within five working days. If the disputes occur and the acquirers are willing to negotiate the access with the concerned information providers, the hub would further provide necessary documents for and advice the acquirers on the negotiation process. However, for minor disputes, the hub would attempt to convene informal meetings between the acquirers and the providers to find possible resolutions and avert time-consuming formal negotiation process in the Working Group.

ANNEX III

Guideline on the Development of Efficiency in Biodiversity Data Management

- **Guideline on the development of data management for BINET members**

This guideline is an operational framework for allocating available support to the BINET members. Under the guideline, the hub is considered as a representative of all BINET members in requesting and obtaining new and additional resources to replenish support to the members. Such representation is expected to enhance the possibility in securing funding and other supports from non-government sources, especially the international organizations.

With information from submitted reports, BINET members are ranked according to the need for development of data management. Higher the ranking indicates the greater the need. The ranking is carried out almost entirely by comparing the data management status of the members with Biodiversity Data Management Standards (BDMS).

BINET members are entitled to request for supports for specific development of data management. If the requesting members are higher ranked and the requests themselves are for the interest of the whole BINET (i.e., increasing information availability), the Working Group on Biodiversity Data Management will grant an approval for supports to the members. The operation team is then responsible for arranging and releasing institutional/financial supports as well as monitoring the use of the supports by the members. Inappropriate utilization of the supports may result in disqualification future the supports.

In all, the guideline has indicated four areas of development that could be supported by the BINET as follows:

- **Compilation and publishing of information**

Due to the abundance of raw data in the majority of biodiversity institutions, compiling and publishing the data are undisputedly the most important element in improving information availability in and outside the BINET. Initially, support provided for these activities would be directed to the members that house information most valuable for better understanding of the country's biodiversity. These information include the lists of species found in the wild, taxonomic description of species, and composition and distribution of species at all levels.

- **Building data management capacity**

Strengthening data management capacity of personnel through training is one of the best means to improve the capacity of institutions. The training is also a cost-effective activity where a relatively large number of personnel can obtain additional data management skill in a single event (training course). Topics or subjects of the training should respond to the data management need of most

institutions. The topics and subjects could be selected from an assessment of reports from the BINET members.

▼ **Acquiring specific hardwares and additional equipments**

Acquisition of hardware and additional equipments, i.e. scanners or modem, is usually regarded as the responsibility of BINET members. Thus, the Working Group on Biodiversity Data Management would only grant hardware supports on certain occasions where the provision of the support significantly improves the availability of information valuable for better understanding of Thailand's biodiversity. Such cases include members who collect and maintain a large amount of basic taxonomic information at the national and regional levels.

BINET members should request for supports in either ones of the above mentioned areas. Other types of supports including those for database and local network development, may be requested from the BINET. However, such supports are not likely to be approved by the Working Group unless they are proven to be beneficial for the overall improvement of either the data availability or the management.

- **Guideline on the development of biodiversity data management for general institutions**

Due to the lack of information on data management in most institutions, this guideline is consisted of only general recommendations for improving information availability and data maintenance capacity in the institutions. Implementation of the guideline is relied solely on the commitment and allocated resources of the institutions. Thus, the successful development of data management capacity can not be achieved by just following the guideline but rather by the institution's willingness to improve their data management potential. The recommendations in the guideline are as the followings.

- Allocate sufficient fund for the compilation of all available datasets. The institutions may use BINET dataset catalogues as an example for this activity.
- Improve the data management capacity as a preparation for obtaining membership in the BINET. Benefits expected from the BINET (information services) may be used as a justification for the improvement.
- Organize training workshops or training courses on data management, especially with topics on the widely-used software, in order to improve the data maintenance skill of the personnel. An institution may cooperate with others in organizing the workshops/training courses to increase participation and minimize cost.
- Establish a section or unit responsible for providing information service. The section/unit should be entrusted with a duty to maintain dataset catalogue as well as to facilitate appropriate access to unclassified information available.

- **Guideline on the development of personnel for biodiversity data management**

Apart from occasional provision of the general training for BINET members, the development of personnel for data management, including acquisition of additional staff, are the responsibility of both the members and non-member institutions themselves. Thus, this guideline would confine itself merely as a recommended strategy that the institutions can adopt to enable such development. Similar to the guideline on the development of biodiversity data management for general institutions, the successful development of personnel under this guideline is depended entirely on the commitment and available resources. It is important, however, to note that unlike the development of the overall data management structure described by earlier guidelines (2.1 and 2.2), a greater number of available personnel with better skill do not always ensure better data management capacity nor efficiency. The institutions should be consistently reminded that without well developed data management structures and procedures, a contribution from the development of concerned personnel to development of the capacity is likely to be limited.

▼ **Types of personnel involved in biodiversity data management**

Before specifying the strategy for the development of personnel, it is useful to first classify personnel involved in biodiversity data management. In general, the personnel can be categorized into ones of the following groups.

Biodiversity specialists

The biodiversity specialists are scientists and researchers who have good understanding and knowledge on certain aspects of biodiversity. The specialist are viable human resources in the management of biodiversity information, especially where most of the information remains as raw data. Their knowledge is valuable asset in classifying, compiling and cataloging the raw data and thus enable them to be the only group of personnel capable to access information at the lowest level.

Information processors

The information processors are those responsible for storing collected information into institution's chosen media, usually a computer. When the information is properly compiled and collected, the processors are entrusted with a duty to select tools and/or software that are best accessible as well as most suitable to the objectives of the collection.

Data analysts

The data analysts are personnel with a specialized data analysis skill. They are usually considered as those who bridge information transfer between the information custodians and the users. Due to the highly specialized skill and a great demand in the market, the number of the analysts is usually scarce and allows the analysts to demand an above-average to an extremely high salary from the institutions. Thus, a large to medium scale employment of the analysts would certainly be costly for the institutions.

▼ Strategy for the development of personnel

Institutions may carry out personnel development activities by adopting the following strategies:

Acquisition of additional personnel

To ensure an effective development of personnel for biodiversity data management, the institutions should consider their own data management need before acquiring additional staff. If the majority of information is kept as raw data, the institutions should concentrate on employing biodiversity specialists to improve the availability of the information rather than acquiring the information processors or analysts. Once most information is properly collected and compiled, the processors may be employed to further the availability in digital format. The institutions should, however, acquire the analysts when specialized analysis of their information is needed (i.e., existing staff are not capable to carry out the analysis) and sufficient fund is available for their employment.

Overall, however, an acquisition of additional personnel is appropriate only when the institutions have sufficient financial resources available and are able to find personnel suitable for their data management need. The acquisition is usually a suitable mean for the institutions with minimal data compilation and thus, are the custodians of largely raw data. In general, acquiring biodiversity specialists is often more appropriate than acquisition of other types of personnel since they are playing a greater role in making information, especially the raw data, available. Employment of the specialists may be considered also as a cost-effective and long termed investment due to the long term commitments by the specialists who often devote to the biodiversity tasks by their own interests. In certain cases, the data analysts may be required to fulfill specific data management tasks. The institutions should, however, remind themselves that the analysts usually have short-termed commitment and demand a relatively high pay.

Building up data management capacity

Development of the personnel data management capacity is best carried out by training workshops/courses due to their cost-effectiveness. The institutions should embark upon arranging the training workshops or courses when they are sufficiently equipped with data management staff. In short term, training is usually more appropriate for information processors due to a shorter period of learning and acceptable cost. Training for biodiversity specialist, although a good long-termed investment, is usually lengthy, while training for data analyst is often expensive. Training the analysts received, cannot also always guarantee a significant improvement in the data management capacity, especially when the management structure is not adequately developed.

Exchange of personnel

For institutions with limited resources available for the development of data management, an exchange of personnel seems to be the best option. To exchange

the personnel, the institutions need to locate needed staff in other institutions and seek cooperation for the transfer. The institutions also need to be ready to provide their own staff as well as other resources, if requested, in return for the released personnel from other institutions. It is rather unfortunate that due to human resource scarcity, limited budget, and complex bureaucratic process, most institutions would be reluctant to allow any personnel exchange and transfer.

Biodiversity Data Management Standards (BDMS)

The Biodiversity Data Management Standards (BDMS) is a criteria for assessing the performance of biodiversity data management of BINET members. The institutions that are not BINET members are, however, welcome to use the BDMS as a guide for the evaluation of their data management. If the institutions are proven to be qualified under the BDMS, they are likely to be granted membership to the BINET provided that they are committed to the required reporting.

The BDMS is not a tool for comparing the amount of resources available for data management but rather for assessing how such resources are used. Under the BDMS, the data maintenance practices are evaluated in accordance with the available resources of the BINET members. Required tasks under the BDMS are within the capability and resources of most institutions. Thus, failure to comply to the BDMS can be considered as lack of proper attention and commitment to data management. In certain cases where resource insufficiency is the main cause for the failure, necessary supports from BINET should be provided as soon as possible.

The BDMS consists of three components as the followings.

- **Data compilation standards**

  Institutions (including BINET's members) are qualified under the data compilation standards when they have completed the following tasks:

  - Compile and update datasets at least every 6 months.
  - Compile and publish available datasets at least every year. Institutions may choose to disseminate their datasets via electronic network as long as the dissemination is carried out at least annually.
  - If the computer facility is available, over 50% of the datasets must be collected and maintained in a digitized format.
  - If more than five datasets are available, the institutions must compile and update metadata (catalog) of the datasets at least once every two years. For the institutions that did not compile such metadata prior to being accepted as BINET members, they must do so and submit the metadata, as a part of the required report, within three months after membership is granted.

- **Data analysis standards**

  Institutions must complete the following tasks to be qualified under the data analyst standards:

  - Analyze the collected data within three months after the collection is completed.
  - Publish or disseminate, via electronic network, information obtained from the analysis within six months after the analysis is completed.

- **Access standards**

  Institutions must be able to implement the following tasks to ensure compliance with the access standards:

  - Compile and publish metadata of the dataset collectors or those responsible for maintaining the datasets at least every six months.
  - Compile and publish access conditions of all unclassified datasets, at least every year, unless there is no addition or cancellation of the conditions (existing conditions are still valid).
  - If the datasets are contained in a digitized format, the users must be able to duplicate the dataset into diskettes unless such duplication is prohibited.
  - If the datasets are updated at least every three months, the institutions must prepare documents informing the users of the updates.
  - If institutions have network facilities (i.e., modem), they should at least acquire an E-mail to ensure better information access. Institutions may acquire facility for Internet and create their own Homepage to further the access, but they must enable access via other mediums, especially publication also.

ANNEX IV
Biodiversity Data Management Action Plan

Introduction

Following formulation of the Guideline on Biodiversity Data Management, there is a common recognition that the guideline alone may not be sufficient to ensure progressive development of biodiversity data management as required. After all, the guideline is merely a technical guidance, a set of useful suggestions, for concerned institutions to undertake enhancement of their (biodiversity) data management efficiency and capacity and does not assign specific responsibilities for particular institutions in doing so. Thus, it is deem necessary for Thailand, and possibly other countries, to formulate a concrete measure that can effectively translate initiatives stated in the guideline into practical activities with responsible institutions and timeline for implementation. Such measure was realized, after the drafting of the guideline, as Biodiversity Data Management Action Plan. The plan has identified tasks for concerned institutions for improvement of national biodiversity data management through utilization of the guideline as reference. Present body overseeing biodiversity information management, the Working Group on Data Management under the National Committee on the Convention on Biological Diversity had reviewed and approved the plan.

To allow the implementation of the Biodiversity Data Management Action Plan to have immediate impact on availability of biodiversity information, participation of institutions identified as custodians of information on important components of biodiversity, is need. Thus, the plan is aimed to firstly bring together the institutions and create an operational network, Biodiversity Information Network (BINET) to enable greater access and better management of their information, in accordance to the Guideline on Biodiversity Data Management. Early years in implementing the plan are expected to be directed toward improving management of research-based biodiversity information, particularly notable components of biodiversity. This emphasis on basic biodiversity information is the direct result of decisions of the National Committee on The Convention on Biological Diversity which indicated that all national biodiversity initiatives, for the time being, must be directed toward increasing knowledge of components of biodiversity. It is possible

that once some experience is gained from operating the BINET and implementing the plan, the plan may be revised to better serve management of information on other aspects of biodiversity.

Background

In 1994, the United Nations Environment Programme (UNEP) had provided financial assistance to the Office of Environmental Policy and Planning for preparation of Thailand's Biodiversity Country Study. In addition to compilation of information on various aspects of biodiversity and its conservation, the Country Study confirmed concern over limited availability of biodiversity information. Such concern was properly acknowledged and documented later by the institutional surveys conducted under the Thailand's BDM project. It was found by the project that the limited availability is not merely a problem resulted from insufficient support for research activities, but also outcome of the lack of interest and resources to disseminate biodiversity information as well as the lack of capacity to manage such information.

In order to solve these problems, the Thailand's BDM project has drafted the Guideline on Biodiversity Data Management as suggested means for improving accessibility and availability of biodiversity information. To ensure commitment of public agencies in implementing the guideline, an accompanied action plan, the Biodiversity Data Management Action Plan, was also formulated (as described in introduction). Certain parts of the plan were integrated into the National Policies Measures and Plans on Conservation and Sustainable Utilization of Biodiversity, the national strategy on biodiversity, which was approved by the cabinet on July, 15, 1997. This integration is proven to be a crucial for realization of objectives of the plan since the government has, in principle, committed approximately 40 billions baht for the national strategy and thus securing financial resources for implementation of at least some parts of the plan.

Objectives

Since the Biodiversity Data Management Action Plan was derived from the need to ensure realization of the Guideline on Biodiversity Data Management, The Action Plan does share objectives with the Guideline which are:

- To increase availability of biodiversity information.
- To enable greater access and transfer of biodiversity information.
- To improve capacity in managing biodiversity information, and
- To better coordinate exchange of biodiversity information between institution, domestically and internationally.

These objectives are ranked in accordance to priority for implementation where availability of information is ranks as the utmost importance issues.

Components

In Total, the Biodiversity Data Management Action Plan consists of 4 policies, 15 measures and 51 specific activities. Majority of the activities has been assigned as responsibilities of Data Transferring Coordinator (hub), a body established to operate Biodiversity Information Network (BINET). This is largely a result from the fact that the BINET is indeed a core mechanism of the plan and thus commands a large proportion of the activities. A considerable number of the activities is fell under responsibility of custodian institutions. Such institutions are referred to agencies that are known to collect and maintain biodiversity information. Initially, to ensure effective implementation of the activities, the custodian institutions would be those that gain BINET's membership which, in effect, certifies the competency in (biodiversity) data management of the institutions. If the implementation of the activities under the action plan are proven successful, members of the BINET should increase and consequently, expand the implementation of the activities to greater number of institutions.

Generally, Thailand's Biodiversity Data Management Action Plan was formulated with structure as followed :

Policy 1: Promote biodiversity data management at national level

Measures :

- Establish Biodiversity Information Network (BINET).
- Formulate criteria for participation in BINET, service of data transferring coordinator (hub) and agreement between the hub and information custodians (BINET members).
- Encourage information custodians to appropriately manage their own biodiversity information.
- Encourage publishing of information\news related to surveys and monitoring of biodiversity information in newsletters or magazines on regular basis.
- Encourage communication and information exchange between institutions as well as appropriate use of information.

Policy 2: Promote development of efficiency in biodiversity data management at national level

Measures :

- Continuously survey status of biodiversity data management (including equipment and personnel).
- Strengthen data management capacity of BINET's members.
- Strengthen data management capacity of non-BINET's member institutions.

- Encourage implementation of joint projects, with other countries or international organizations, that are related to transfer of technology for biodiversity data management.

Policy 3: Promote development of biodiversity data management personnel

Measures :

- Provide supports for training and education program on biodiversity data management.
- Increase number of data management personnel in institutions.
- Encourage exchange of knowledge, opinions and experiences between personnel and experts on biodiversity data management.

Policy 4: Promote regional and international cooperation

Measures :

- Prepare linkage with regional international and foreign institutions to enable exchange of biodiversity information.
- Provide linkage with ASEAN-EU's ASEAN regional center on biodiversity conservation (ARCBC).
- Provide linkage with clearing house mechanism of the Convention on Biological Diversity (CBD) details of the action plan are stated in the following pages.

ANNEX IV

Policy 1
Promote Biodiversity Data Management at National Level

Measures	Activities	Responsible institutions
• Establish Biodiversity Information Network (BINET)	– Establish data transferring coordinator (hub) as a mechanism for coordinate and exchange information between institutions. – Establish Working Group on Biodiversity Data Management to supervise the BINET and Operation team to operate the hub – Encourage participation in BINET.	Office of Environmental Policy and Planning (OEPP), National Biodiversity Center National Committee on the Convention on Biological Diversity data transferring coordinator (hub)
• Formulate criteria for participating in BINET, services of data transferring coordinator (hub) and agreement between the hub and information custodians (BINET members).	Compile biodiversity data management handbook for Thailand.	data transferring coordinator (hub)
• Encourage information custodians to appropriately manage their own biodiversity information	– Establish a sector/division in institutions, with biodiversity information, responsible for collecting and managing the information as well as co-ordinating with BINET's hub.	information custodians
	– Identify information necessary for management of biodiversity and systematically compile such information for specific areas of interest ie. marine ecosystem, agriculture etc.	information custodians
	– Investigate all available biodiversity information and establish databases for the information with linkage to databases of other institutions.	information custodians
	– Acquire and develop tools and equipments necessary for compilation of information, and establishment of databases.	information custodians (BINET's members may be supported by the hub)
	– Send selected staff to short-training courses on data management.	information custodians

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Measures	Activities	Responsible institutions
• Encourage publishing of information/news related to surveys and monitoring of biodiversity information in newsletters or magazines on regular basis	– Investigate various types of information requested by users in order to determine types of information demanded by general public.	information custodians
	– Publish newsletters or report enlisting available information using Biodiversity Data Management Standard (BDMS) as guide.	information custodians
• Encourage communication and information exchange between institutions as well as appropriate use of information.	– Formulate regulation/guideline on access to information including process for submitting request for information.	data transferring coordinator, information custodians
	– Organize consultation meeting on types of biodiversity information by required users.	data transferring coordinator
	– Provide financial assistance for compiling reports on information required by users. The reports should be submitted to hub on regular basis.	data transferring coordinator
	– Organize annual meetings to present information from reports of BINET members and other collected information in order to formulate appropriate means and systems for information exchange (i.e. E-mail).	data transferring coordinators
	– Compile reports on all available databases of INET members and distribute to users.	data transferring coordinators
	– Compile resource inventory of Thailand from collected information and data from BINET's members.	
	– Create internet homepage to present the national resource inventory.	data transferring coordinator
	– Develop online networking system between the hub and BINET members as well as interested users.	data transferring coordinator
	– produce various information products including published lists, CD-ROMs, maps, videos to meet the need of users.	data transferring coordinator
	– Updating information and improve data quality.	data transferring coordinator

Policy 2

Promote Development of Efficiency in Biodiversity Data Management at National Level

Measures	Activities	Responsible institutions
• Continuously survey status of biodiversity data management (including equipments and personnel).	– Draft and distribute forms for reporting of status of biodiversity data management to BINET's members as well as non-member institutions.	Office of Environmental Policy and Planning, data transferring coordinator
	– Evaluate results of the survey from returned forms in order to select institutions, both BINET member and non-member institutions, with sufficient capacity for appropriate data management.	data transferring coordinator
	– Organize annual meetings to report on status of national biodiversity data management.	data transferring coordinator
• Strengthen data management capacity of BINET's members.	– Ranking BINET's member institutions in accordance to the institution's need for financial and equipment support. Importance of information in the institutions and cooperation in exchanging information are the main criteria for the ranking.	data transferring coordinator
	– Ranking of equipments, and software need by the institutions.	data transferring coordinator
	– Present the ranking of institutions and equipments/ software to the Working Group on Biodiversity Data Management for consideration and proposing budget for possible financial assistance.	data transferring coordinator
	– Introduce equipments with useful application for biodiversity data management to BINET's member institutions.	data transferring coordinator
	– Provide/introduce software with useful applications for biodiversity data management to BINET's member institutions.	data transferring coordinator
	– Introduce reference systems developed by international organizations such as Species 2000 to institutions, both BINET's members and non-members, to promote harmonization of database.	data transferring coordinator

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Measures	Activities	Responsible institutions
	– Arrange training courses for management biodiversity data personnel from institutions to ensure management of information with common standard and introduce new technology.	data transferring coordinator
	– Introduce funding sources, both domestic and international, that BINET's members can request for possible assistance to strengthen their data management and coordinate, assist and advice the members in doing so.	data transferring coordinator
• Strengthening data management capacity of non-BINET's member institutions .	1. Organize short training courses on biodiversity data management for personnel of concerned institutions.	data transferring coordinator
	2. Provide biodiversity data management experts to institutions that are without sufficient data management capacity.	data transferring coordinator
	3. Provide equipments and software where possible.	data transferring coordinator
• Encourage implementation of joint projects, with other countries or international organizations, that are related to transfer of technology for biodiversity.	Coordinate with international organizations and/or foreign agencies in implementing joint projects or in transferring data management technologies that are available.	data transferring coordinator and information custodians

ANNEX IV

Policy 3

Promote Development of Biodiversity Data Management Personnel

Measures	Activities	Responsible institutions
• Provide supports for training and education program on biodiversity data management.	– Conduct surveys on the need for development of data management capacity of personnel in BINET's member institutions.	data transferring coordinator
	– Set priority for training topics for personnel of BINET's member institutions and present to the Working Group on Biodiversity Data Management for consideration.	data transferring coordinator
	– Organize trainings on data management topics selected by the Working Group on Biodiversity Data Management. 2 - 3 trainings workshops may be organized annually.	data transferring coordinator
	– Produce undergraduates and post graduates on biodiversity data management through provision of scholarship for undergraduate and master degree students.	Ministry of University Affairs, Office of the Civil Service Commission
	– Request university and educational institutions to provide additional basic computer courses in faculty/school of biology related subjects.	Ministry of University Affairs
	– Organize training courses at national level through cooperation with foreign/ international organization related to biodiversity data management.	
• Increase number of data management personnel in institutions.	– Enlisting biodiversity data management as required expertise in all concerned institutions.	Office of the Civil Service Commission, information custodians
	– Encourage hiring of data management and information analysis personnel in sections/ divisions responsible for collecting and managing information.	data transferring coordinator
• Encourage exchange of knowledge, opinions and experiences between personnels and experts on biodiversity data management.	– Collect and disseminate data exchange records in BINET to find appropriate approachs to improve data exchange.	data transferring coordinator
	– Provide opportunity and funding for personnel to participate in meetings/seminars oversea.	data transferring coordinator
	– Encourage involved institutions to organize seminars on biodiversity data management within or between institutions at least once a year.	data transferring coordinator

ANNEX IV

Policy 4

Promote Regional and International Cooperation

Measures	Activities	Responsible institutions
• Prepare linkage with regional international and foreign institutions to enable exchange of biodiversity information	– Organize national consultation meeting to classify information with access conditions and information in public domain. – Monitor progress of biodiversity data transfer mechanisms at regional and international level.	Working Group on Biodiversity Data Management Office of Environmental Policy and Planning
• Provide linkage with ASEAN-EU's ASEAN Regional Center on Biodiversity Conservation (ARCBC)	Coordinate, through ASEAN Working Group on Nature Conservation and Biodiversity, with ARCBC network.	Office of Environmental Policy and Planning
• Provide linkage with clearing house mechanism of Convention on Biological Diversity (CBD)	Coordinate with Subsidiary Body on Scientific, Technology and Technical Advice, Conference of the Parties as well as CBD Secretariat on transfer and exchange of biodiversity information and related technology, possibly through the clearing house mechanism.	National Committee on the Convention on Biological Diversity, Office of Environmental Policy and Planning

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