

MALAYSIA

FIRST NATIONAL REPORT

TO THE

CONFERENCE OF THE PARTIES

OF THE

CONVENTION ON BIOLOGICAL DIVERSITY

MINISTRY OF SCIENCE, TECHNOLOGY AND THE ENVIRONMENT

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SUMMARY

The First National Report to the Conference of the Parties to the Convention on Biological Diversity has been prepared in accordance with Decision 11/17 of the Second Conference of the Parties (Jakarta, Indonesia, November 1995), and focuses on the measures taken for the implementation of Article 6 of the Convention, “General Measures for Conservation and Sustainable Use”, as well as on the information available in national country studies on biological diversity. The National Policy on Biological Diversity and the Assessment of Biological Diversity in Malaysia, two documents that are appended to the First National Report, provide further and more detailed information to that contained in the National Report.

Tin mining activities in the middle of the nineteenth century, beginning of plantation cultivation of rubber at the start of the twentieth century and subsequently of oil palm cultivation, led to decline in forested areas in the lowlands. Poverty eradication programmes led to the expansion of land development schemes that saw forest conversion in the 1970s and 1980s to vast oil palm plantations. These activities have now abated. Presently the land under natural forest stands at 57.5 percent of the total land area of 32.86 million hectares.

Malaysia is one of the 12 ‘megadiversity’ countries of the world, and the nation's biological diversity has important economic, technological and social implications. Agriculture, forestry and fisheries have been major contributors to national wealth creation, and together they contributed 13.6 percent of the national gross domestic product in 1995, and accounted for 16 percent of total employment and 12.1 percent of total export earnings.

The flora of Malaysia is exceedingly rich and is conservatively estimated to contain about 12,500 species of flowering plants, and more than 1,100 species of ferns and fern allies. Much remains to be known of the flora of the country, especially of lower plants such as the bryophytes, algae, lichens and fungi. The diversity of fauna in the country is also great. In the invertebrates there are about 300 species of wild mammals, 700-750 species of birds, 350 species of reptiles, 165 species of amphibians and more than 300 species of freshwater fish. While there are about 1200 species of butterflies and 12,000 species of moths, a conservative estimate is that there are more than 100,000 species of invertebrates. Endemism in the flora and fauna is high.

A total of 3.43 million hectares of natural forest have been designated as protection forest. In addition, 2.12 million hectares of forest have been designated as national parks and

wildlife sanctuaries. In total, therefore, just over 29 percent of the natural forest is protected. In the marine environment, the surrounding marine waters of 38 offshore islands of the country are gazetted as marine parks.

Despite all these efforts, however, it is deemed that conservation efforts need strengthening to cover several important habitats that are under represented, as well as individual species of plants, insects and fish, and landraces of indigenous plant species such as fruits and rice. Further strengthening of present *ex-situ* conservation efforts is also deemed necessary.

Malaysia's awareness and commitment towards the environment can be traced at least as far back as the introduction of the Waters Enactment in 1920, followed by the Mining Enactment in 1929, and a large number of other environment related legislation enacted from time to time. Much of the existing legislation relating to biological diversity conservation and management is sector-based: for instance the Fisheries Act 1985 deals mainly with the conservation and management of fisheries resources, the Protection of Wild Life Act 1972 deals with the protection of wildlife, and the National Forestry Act 1984 deals with the management and utilization of forests alone.

A National Policy on Biological Diversity was developed after the Earth Summit in June 1992 and was endorsed by the Government on 22 October 1997. The Policy addresses biological diversity issues across sectors and contains strategies and action plan of programmes for the conservation of biological diversity and sustainable use of its components. The 15 strategies cover areas such as improving the scientific knowledge base, enhancing sustainable utilization of the components of biological diversity, strengthening and integrating conservation programmes to areas such as integrating biological diversity considerations into sectoral planning strategies, enhancing skill, capabilities and competence and enhancing institutional and public awareness. Each of the strategies outlines an action plan of programme to be implemented to achieve the goals of the Policy. The action plan of programmes, is expected to be implemented by government institutions and universities that are already in place, as well as by non-governmental organizations and the private sector, including the general public.

GEOGRAPHICAL BACKGROUND

Area

Malaysia covers an area of about 32.86 million hectares, consisting of Peninsular Malaysia (with 12 states) and the states of Sabah and Sarawak and the Federal Territory of Labuan in the north-western coastal area of Borneo Island. The two regions are separated by about 540 kilometres of the South China Sea. Peninsular Malaysia covers 13.16 million hectares, has its frontiers with Thailand in the north and Singapore in the south, while Sabah, with an area of 7.37 million hectares and Sarawak with about 12.33 million hectares, border the territory of Indonesia's Kalimantan.

Climate

Malaysia lies near the Equator between latitudes 1° and 7° North and longitudes 100° and 119° East. Malaysia is subject to maritime influence and the interplay of wind systems which originate in the Indian Ocean and the South China Sea. The year is generally divided into the South-West and the North-East Monsoon seasons. The average daily temperature throughout Malaysia varies from 21° C to 32° C. Humidity is high.

Geology

Almost half of the total surface area of the Peninsular is granite of the Triassic Age. The central core is dominated by a series of parallel mountain ranges which run northwest to southeast along the length of the Peninsular. The highest and most prominent of these ranges is the Main Range. The Peninsular's highest peak is Gunung Tahan (2,187 m). Over half of the land area is 150 metres above sea level.

Sabah is criss-crossed by a series of mountain ranges with the Crocker Range dominating its topography. Mount Kinabalu (4,101 m), the highest mountain in Malaysia, is found on the northern reaches of the range. The Crocker and other adjoining ranges are of the Tertiary Fold. Underlying more than nine tenths of Sabah are sedimentary rocks. Sarawak's topography shows a flat coastal plain followed by a narrow belt of hills with a sharp rise of mountainous mass extending the full length of the state. Gunung Murud (2,425 m) is the state's highest peak and Gunung Mulu (2,371 m), the second highest, has limestone hills with some of the largest natural caves in the world. The oldest formations go back some 300 million years.

THE NATION'S BIOLOGICAL DIVERSITY

Flora

The flora of Malaysia is exceedingly rich and is conservatively estimated to contain about 12,500 species of flowering plants, and more than 1,100 species of ferns and fern allies. Many of these are unique and are found nowhere else in the world.

Much remains to be known of the flora of the country, especially of lower plants such as the bryophytes, algae, lichens and fungi. The fungi constitute the major plant diversity of the country but the total number of species is not known.

The terrestrial flora as well fauna, are found in a range of habitats and ecosystems from the lowlands to the top of the highest mountains, and in a wide range of forest types. These forest types form the cradle of the country's biological diversity. The lowland dipterocarp forest is extremely rich in species diversity. For example, 814 species of woody plants of 1 cm diameter and larger were found in a 50-hectare area in such a forest type. Now not much remains of this type of forest due mainly to agricultural expansion.

The main economic product of Malaysia's forest is timber. The most important timber producing family is the Dipterocarpaceae, from which is obtained the well-known timber called Meranti, Chengal, Keruing, Kapur and Balau. The next most important family is Leguminosae from which comes Kempas and Merbau. Nyatoh is from Sapotaceae, Ramin from Gonystylus.

Tropical rain forest occupies about 57% of Malaysia's land area mainly on the hills and mountains. The lowlands have been largely converted to agricultural use, mainly of the cash crops, oil palm and rubber. Apart from other crops such as coconut, rice and sugar cane, the agricultural lowlands consist of pineapple, cocoa, topioca, maize and coffee areas.

Endemism in plant species is high in freshwater habitats. In Peninsular Malaysia, for example, 80 species in freshwater swamps and 27 species in river systems are known to be endemic. Another 70 and 41 species in these respective habitats are known to be rare.

Fauna

The majority of the unique Malaysian animals are found in the lowlands of the tropical rain forest. There is a great diversity of fauna in the country. In the vertebrates, there are about 300 species of wild mammals, 700-750 species of birds, 350 species of reptiles, 165 species of amphibians and more than 300 species of freshwater fish. Endemism in the states of Sabah and Sarawak is higher than in Peninsular Malaysia. While there are about

1,200 species of butterflies and 12,000 species of moths in Malaysia, little is known of other groups. A conservative estimate is that there are more than 100,000 species of invertebrates.

Freshwater habitats such as the lowland slow-flowing streams and upland rivers with water torrents support a diverse aquatic invertebrate fauna and a variety of fish. Marine fauna include fish, cuttlefish, squids, sea urchins, giant clams, sea cucumbers, copepods, segestid shrimps, arrow worms and many other large and small organisms.

Microorganisms

The microorganisms are very poorly known. This lack of information is a global phenomenon.

Genetic resources

Malaysia is rich in plant genetic resources. As an example, fruit resources are very diverse in the country. There are 28 species of durian (*Durio*) and its relatives in Malaysia. All with the exception of *D. zibethinus* are wild. The mangoes are equally rich, with 22 species, and only three or four of these are being utilised. There are 49 species of mangosteen and its wild relatives in Peninsular Malaysia but only *Garcinia magostana* is popularly eaten. Other examples of large genera with edible fruits include *Artocarpus* (cempedak) and *Nephelium* (rambutan).

Available information on animal genetic resources relate to livestock or farm animals. Malaysian jungle fowls, wild pigs, swamp buffaloes, Kedah-Kelantan cattle and local goats are considered true indigenous animals of Malaysia. Non-indigenous animals are mainly breeding chickens, pigs, cattle and goats which have been imported into this country from all over the world. Importation of these animals has enriched the gene pool of the different species considerably.

The value

Malaysia is one of the 12 'megadiversity' countries of the world. Megadiversity countries are the 12 nations with the greatest biological diversity and species endemism. These nations together hold about 60 to 70 percent of the world's biodiversity.

The nation's biological diversity has important economic, technological and social implications. Of particular significance are economic benefits, food security, environmental stability and scientific, educational and recreational values.

The diversity of biological resources provides direct economic benefits. This biological diversity provides timber and non-timber goods in the forestry sector, food and industrial crops in the agricultural sector and food in the fisheries sector. Agriculture, forestry and fisheries have been major contributors to national wealth creation. They contributed 13.6 percent of the national gross domestic product in 1995, and accounted for 16 percent of total employment and 12.1 percent of total export earnings. The growing tourism industry relies on the country's diverse and unspoilt natural beauty, including unique species of plants and animals in national parks, wildlife reserves, bird parks and in marine parks and the adjacent coral reefs. In 1994, tourism contributed RM8.3 billion to the national economy.

Food is a basic necessity. Ensuring the availability of food is a major objective of the National Agricultural Policy. Rice is an important staple food for Malaysians, and a number of wild species and landraces are found in the country. Fish is an important source of protein for the nation, and mangrove swamps, the feeding and nursery grounds for fisheries, are habitats of the nation's several commercial fishes and shrimps.

A variety of beneficial organisms and their habitats are important for ensuring the protection and productivity of the nation's crops. Bats are important pollinators of the orchard fruit, durian and the jungle fruit, 'petai', while weevils are important pollinators of the major cash crop, oil palm. In biological control of pests, owls and snakes control rat populations in rice fields and oil palm plantations.

The nation's wealth in biological diversity means that there is complexity in ecosystems and hence environmental stability. This stability is important for maintaining ecological services, and though the development path has brought about changes to the environment and with it some deleterious effects, the necessity to balance development needs with environment concerns is fully recognised.

As in all over the globe, much of the nation's biological diversity has yet to be scientifically investigated. Research and development efforts require to be enhanced for the benefit of the nation, and biological diversity will continue to provide the resources for training and education. Biological diversity in protected areas provide recreational and ecotourism opportunities.

THE STATE OF NATURAL RESOURCES

Land use

Malaysia's land use policy is "use-oriented", i.e., designed for maximum utilization and development. Thus, conversion of land for urbanisation, industrial, agricultural, mining and forestry development has higher priority than that of conservation as it brings a much higher rate of return on investment.

The National Land Code (NLC), Sabah Land Ordinance and Sarawak Land Ordinance form the basis of land laws and administration in Malaysia. The Land Capability Classification (LCC), similar in all three regions, was introduced between 1963 and 1976. The LCC divides land use into five categories based on its potential productivity and economic yield: mining, agriculture (wide range of crops possible), agriculture (restricted range of crops possible), forestry and conservation in a declining order of priority.

Since its implementation, the LCC has introduced major land use changes which have been financially rewarding, and have done much to address problems of rural poverty and social inequality. The LCC's weakness is its limited application to adequately addressing biodiversity and conservation issues.

Similarly with the LCC, the NLC also adopts a long-term developmental perspective by categorising land into three major uses: agriculture, building and industry, and allowing state governments to acquire alienated land for development purposes. Although the NLC is a federal legislation, land is legally and administratively under the jurisdiction of the state governments. The NLC has no direct bearing on biodiversity conservation, although it provides certainty in use through the land categorisation system, and certainty in tenure in terms of ownership rights. The absence of a single central authority charged with land administration, given the division of functions between state and federal governments, implies that the maintenance of reserves for biodiversity conservation is dependent upon the economic decisions of individual states.

Forests

Forests are one of the most important components of the Malaysian biophysical system. The favourable climate and soil conditions enable largely evergreen tropical rain forest to flourish, mainly species-rich lowland and hill dipterocarp forest. There are also extensive areas of peat swamps and mangroves, and less extensive areas of freshwater swamps, highland forest and specialist communities such as those found on limestone, quartz and ultrabasic rocks, calcereous soils and others. The classification of the forests of Malaysia is as given in Table 1.

Table 1 : The rain forest types of Malaysia

Climatic climax forest	Edaphic forest
Lowland dipterocarp forest	Heath (or Kerangas/Kerapah) forest
Hill dipterocarp forest	Forest over limestone
Upper dipterocarp forest	Forest over ultramafic outcrops
Montane oak forest	Beach stand vegetation
Lower ericaceous forest	Mangrove forest
Montane subalpine vegetation	Brackish-water forest
Semi-evergreen seasonal forest	Peat swamp forest
	Fresh water swamp forest
	Seasonal swamp forest

The dipterocarp forests are of vital economic as well as ecological importance to the country. Mangrove forest are managed for the sustained yield of forest produce in the form of poles and firewood and for the manufacture of charcoal. They also have an important ecological role in coastal protection and the conservation of coastal ecosystems for fisheries.

The forestry sector contributes significantly to the socio-economic development of Malaysia, generating export earnings and providing employment opportunities. In 1996 this sector contributed about RM14.05 billion, or 7.3 percent of the country's total export earnings. State revenue from this sector aggregated around several billion ringgits in the form of premiums on timber concessions, royalties on log production and silviculture and development cess. The forestry and timber sectors provided direct employment opportunities to more than 150,000 people.

The forest has been systematically managed since 1901 when Malaya's first Forest Officer was appointed. Over the years, forest conservation and management practices have been developed to ensure forest renewal and sustained yield. A major shift in emphasis with respect to the management of the tropical rain forest in recent years is the recognition that the diversity of the flora and the tree species need not be a disadvantage to future national wood production policies and strategies.

Apart from the supply of timber and other traditional and non-traditional forest produce, forests also play a strategic role in the maintenance of the quality of the environment, especially in the protection of water quality and supply, prevention of soil erosion and

nutrient depletion, moderation of local climate, and the conservation of the diverse biological resources that are potentially important economic products. These are fully recognised in Malaysia's forest policy.

The extent of the forest resources

The first comprehensive forest inventory in Malaysia was conducted in 1962. The exercise was repeated in 1970, using aerial photograph techniques of scale 1:25,000, and updated in 1981 and 1982 using 1:40,000 aerial photographs.

Malaysia still has large areas under forest. Presently the total area under forest in Malaysia is estimated to be 18.91 million hectares or 57.5 percent of the total land area, (Table 2). The dipterocarp forest is the major forest type (Table 3). Taking into account forest plantations and other agricultural crops like rubber and oil palm, the percentage of tree cover to total land area is around 71 percent for the country as a whole.

Table 2 : Extent of forest cover in Malaysia in 1997 (million hectare)

	Peninsular Malaysia	Sabah	Sarawak	TOTAL
PFE	4.68	3.60	6.00	14.28
* Productive	2.78	3.07	5.00	10.85
* Protection	1.90	0.53	1.00	3.43
National and Wildlife Parks	0.74	0.38	1.00	2.12
Stateland Forest	0.43	0.47	1.61	2.51
TOTAL	5.85	4.45	8.61	18.91

- Total land area = 32.86 million hectares

Land has also been aside for both forestry and agricultural uses based on comprehensive forest inventory and land capability studies. In 1978, the National Forestry Council approved the setting up of the Permanent Forest Estate (PFE) amounting to 12.73 million hectares at that time but now enlarged to 14.28 million hectares. The main aim of this move was to ensure that the forest under the PFE will be maintained in perpetuity and

those areas designated for production will be subjected to sound forest management practices to maintain the forest as a renewable resource. Of this PFE area now, 3.43 million hectares have been designated as protection forest. At the same time, 2.12 million hectares of forest area have now been set aside as national parks and wildlife sanctuaries, and most of these areas are located outside the PFE.

Table 3 : Distribution and extent of the major forest types in Malaysia in 1997 (million hectares)

	Peninsular Malaysia	Sabah	Sarawak	TOTAL
Land Area	13.16	7.37	12.33	32.86
Dipterocarp	5.38	3.83	7.20	16.41
Swamp	0.30	0.19	1.20	1.69
Mangrove	0.10	0.32	0.20	0.62
Total Forested Land	5.85	4.45	8.61	18.91
of Forested Land	44.5	60.4	69.8	57.5

The Forestry Department implements the National Forestry Policy 1978 to manage Malaysia's forest resources under the broad categories of Permanent Forest Estate (PFE) and Stateland Forest (SLF). Protected Areas (PAs) are managed by PERHILITAN. The PFE is maintained permanently for economic, protection, recreational and/or other purposes. The Stateland Forest is essentially viewed as a land reserve for development and PAs are areas set aside for the conservation of nature.

Permanent forest estate (PFE)

The PFE is a term for the sum of forest reserves, areas maintained or managed for their maximum economic, social, and ecological benefits. There are four categories within the PFE: 1) Production Forest for the economic exploitation of the forest resources; 2) Protection Forest for its many ecological services, such as the maintenance of climate conditions, water resources, soil fertility, biodiversity conservation, flood mitigation, soil erosion and river siltation; 3) Education and Research Forest, and 4) Amenity Forest. The term PFE, however, may be misleading since it implies the forest area as permanent. Permanency is not guaranteed; the Executive Council within state governments can degazette any area of PFE for infrastructure development, agriculture, housing and other purposes (forests are the responsibility of state governments).

Production forest

Production Forest is maintained for the supply of its resources. Logging is currently the primary activity in the production forests of Malaysia. Timber and timber products contributed RM14.05 billion or 7.3% of the nation's total export earnings in 1996.

The most valuable non-timber forest product (NTFP) from Malaysian forests is rattan. The total export of rattan furniture was valued at RM111.6 million in 1994. Besides rattan, NTFPs that are of economic value to the local communities include *Parkia speciosa* (Petai), *Durio zibethinus* (Durian), *Mangifera* spp. (Macang), *Pithecellobium jiringa* (Jering), *P. bubalinum* (Kerdas) and *Baccaurea* spp (Tampoi). Other non-timber forest products such as medicine, oil and flavour are also being extracted. Wild plant products have always been used by the rural and ethnic peoples of Malaysia.

Forest rehabilitation/Reforestation practices

All harvested production forests are required to be silviculturally treated by the Forest Department of Peninsular Malaysia. These silvicultural activities include GCL (girdling and cutting of liana), enrichment planting, rattan planting and bamboo planting. By the end of 1994, a total of 1,387,663 hectares of logged-over forest had been silviculturally treated (GCL) and 20,137 hectares been enriched with indigenous timber species such as *Shorea leprosula* (Meranti tembaga), *Shorea parvifolia* (Meranti sarang punai), *Anisoptera* spp. (Mersawa), *Dryobalanops aromatica* (Kapur) and *Dyera costulata* (Jelutong).

The rehabilitation of harvested forests may be accompanied by the planting of rattan and bamboo. By the end of 1994, a total of 9,597 hectares of rattan had been planted with mainly *Calamus manan* (rotan manau) and *C. caesius* (rotan sega) in Peninsular Malaysia. In Sabah, the Sabah Forestry Development Authority (SAFODA) has developed 7,000 hectares of rattan plantations, in addition to the 15,000 hectares of rattan planted in the natural forests. The commercial planting of rattan in Sarawak covers an area of 2,546 hectares. The planting of bamboo in natural forests and the management of naturally occurring bamboo stands have been carried out in Peninsular Malaysia since the late 1980's. By the end of 1994, a total of 218 hectares had been planted primarily with *Dendrocalamus asper*.

In addition, the Forestry Department in Peninsular Malaysia has also planted a total of 2,198 hectares of *P. speciosa*, *D. zibethinus* and other fruit trees along fringes of forested areas in the vicinity of rural villages. In Sarawak, a total area of 388 hectares has also been planted, mainly with *Shorea macrophylla* and *S. splendida*, for the production of the valuable illipe nuts, primarily to assist rural populations improve their economic well-being. Enrichment planting is not practised in Sarawak in general, mainly because of logistical difficulties.

Monoculture plantation

A large area of tree cover in Malaysia is actually monoculture plantations of timber trees or agricultural crops (rubber and oil palm). Monoculture plantations lack the natural biodiversity of flora and fauna species in contrast to the rich biodiversity of natural forests. In 1997, there was a total of 4.49 million hectares of monoculture plantations in Malaysia.

Protection forest

Under the National Forestry Policy, protection forests are necessary to ensure sound climate and physical conditions, safeguard water supplies, soil fertility and environmental quality, and minimise flood damage and soil erosion to rivers and agricultural land. Protection forests also conserve biodiversity. Presently there are 3.43 million hectares of protection forest within the PFE.

Assessment of resource stocks

The total growing stock in natural forest was assessed at the end of 1982 at 5,209.3 million m³ or an average of 245 m³ per hectare. This included 3,024 million m³ of virgin forest, 1,851 million m³ of logged-over forest and 333 million m³ of peat swamp forest. (Stocking for mangrove forest is not included because the timber is of pole sizes only.) A later estimate in 1988 suggested that the total growing stock of commercial trees with a diameter at breast height of 45 cm and above in the PFE amounted to 1,134.4 million m³. Between 1982 and 1988, the total growing stock decreased by about 545.5 million m³ although the figures recorded for actual harvesting was only 226.8 million m³. This was due to the allowance made for logging damage to residual stands and conversion of forest to other land uses such as agriculture and shifting cultivation.

Agriculture

Malaysia's broad objectives for land resource utilization are to protect and manage the land so that it supports development by providing resources, goods and services to accommodate human needs in a sustainable manner and to promote adequate living conditions for the population.

To provide a clear management direction, Malaysia has evolved various land development programmes. These are implemented by the Regional Development Authorities of various states, so that coordinated and concentrated efforts could be directed towards optimising land use while reducing adverse environmental impacts. These *in situ* programmes have contributed significantly to increases in output from the agricultural sector. Existing villages and farms have been redeveloped through the provision of infrastructure and

replanting facilities as well as through the introduction of greater commercial orientation, thus improving productivity. A major component of the *in situ* programme is the Integrated Agriculture Development Programme, designed to provide an integrated package of infrastructural and support facilities.

Another major *in situ* programme is replanting, which contributes towards maintaining a high level of agricultural output such as rubber, palm oil and other commercial crops. Programmes are also underway to rehabilitate idle and uneconomic land areas. A total of 117,800 hectares of land has been rehabilitated through the various specialised agencies such as the Federal Land Consolidation and Rehabilitation Authority and the Sarawak Land Consolidation and Rehabilitation Authority.

The major crops planted in Malaysia are oil palm and rubber, based on land use and economic contribution. Other permanent crops include cocoa, bananas, coconuts, pineapples, coffee, sugarcane, fruits, fibre crops, sago palm and wet rice. Mixed horticulture of fruit, vegetable, ornamental plants and flowers, market gardening for the local market, and diversified crops, where more than one type of crop is planted in the same area, are practised on agricultural land. Shifting cultivation is also widely practised by the rural and indigenous peoples of Sabah and Sarawak.

Economic crops

The two main economic crops in Malaysia are oil palm and rubber. Malaysia is the world's largest producer of oil palm. Rubber is grown in estates and in smallholdings.

Rubberwood, long considered a waste by-product of the rubber industry, has emerged as a valuable commodity. Previously used only as fuel, an estimated 4.8 million cubic metres is still currently used for domestic purposes, and in the drying and curing of bricks, tobacco and rubber sheets. The primary demand for rubberwood is now the furniture industry which accounts for over 70% of the market.

Food crops

Padi is Malaysia's main food crop. The National Agricultural Policy (1992-2010) expects local rice production to meet 65% of the nation's needs by 2010. Although the land use area for padi has decreased by 2.3% since 1990, increased productivity has been achieved through the use of higher yielding varieties and improved farm management systems.

Fruit production has increased substantially, from 1.06 million tonnes in 1990 to 1.62 million tonnes in 1993 and an estimated 2.17 million tonnes for 1995, corresponding with an approximate 25% increase in land use area during the same period. Major fruits are durian, rambutan, guava, banana and papaya.

Vegetable growing is encouraged on idle land, tin-tailing areas and in the highlands. Forty-four major vegetables are grown in Peninsular Malaysia.

Agricultural land use

Over 10 million hectares, or 31% of Malaysia's total land area, is considered suitable for agricultural practices (National Agricultural Policy, 1992-2010). Of this, some 5.4 million hectares have been cultivated. However, the implication that another 4.6 million hectares could be converted to agricultural use is misleading; this would be impossible without major land use conflicts. For example, the conversion of 2.295 million hectares in Peninsular Malaysia for agricultural land use would conflict directly with the National Forestry Policy.

Agricultural development policies are guided by the National Agricultural Policy (NAP) 1992-2010 which aims for a "market-led, commercialised, efficient, competitive and dynamic agricultural sector within the context of sustainable development". The NAP encourages a more efficient use of present agricultural land to increase productivity rates, as opposed to clearing new land. An example is the integrated rearing of cattle and sheep in rubber and oil palm plantations.

Shifting cultivation

Shifting cultivation is an ancient form of agriculture commonly practised by the rural and indigenous peoples of Malaysia, particularly in Sarawak and to a certain extent, in Sabah. Land is cleared by burning the existing vegetation which is then replanted with fast growing crops such as hill paddy, maize, tapioca, and different types of vegetables. The crops produced are often just sufficient for the annual needs of the farmers and their families. After harvest, the area is abandoned and the people move to a new plot of land within the same area, usually returning to the same plot only after 20 years or more. Shifting agriculture uses approximately 2.7 million hectares in Sarawak (22% of its land area) with hill paddy as the main crop.

Shifting cultivation, if practised properly, is sustainable due to the long period of fallow, often exceeding 20 years, which allows for rejuvenation of the soil. In addition, the immediate replanting of quick-growing crops minimises soil erosion. In recent years however, external pressures of increased population and land use competition have led to unsustainable shifting cultivation practices; drastically reducing fallow cycles to be insufficient for the soil to regain its lost nutrients and driving the practice to remote inaccessible areas. With 80% of shifting cultivation currently practised on steep mountainous areas, the problems of soil erosion and land degradation are potentially serious.

Potential crops from the wild

The tropical rain forest of Malaysia contains a wealth of genetic resources,. Approximately 3,700 plant species have been identified to have some commercial potential.

Malaysia has great diversity in tropical fruit genetic resources. The majority of the fruit species currently being cultivated are indigenous and have wild relatives in the rain forest, particularly those from the genera *Durio*, *Nephelium*, *Baccaurea*, *Citrus*, *Mangifera*, *Musa*, *Salacca*, and others. Malaysian forests have over 500 fruit species, of which about 100 species are edible. However only a handful of these species are cultivated, mainly due to the tendency to assess trees from a timber-producing perspective, thereby neglecting their other uses. Wild fruit tree species can be used as rootstocks to improve present cultivated fruits. Edible plants such as `ranti' (*Solanum nigrum*), `cekur manis' (*Sauropus androgynus*), `ubi sarek' (*Amorphophallus* spp.) and *Centella asiatica* are potential species for widespread commercial vegetable cultivation.

Certain wild plant species, e.g., *Cinnamomum* spp. *Dipterocarpus* spp. (keruing) and *Polygonum minus* (kesum) contain essential oils suitable for perfumes, cosmetics, soaps and food flavouring. There is currently no essential oils industry in Malaysia. Most of the oils used are imported from Indonesia, Vietnam and China. Malaysia has 15 known native species of oil and flavour plants. More research is needed to utilise these and other potential oil and flavour plant sources to develop this industry.

Perhaps the most significant aspect of wild genetic resources is their potential to provide new sources of medicinal products. Tropical forests contribute nearly half of the currently used plant-derived prescription drugs. The majority of Malaysia's rural and ethnic peoples rely on traditional medicines derived from wild products. The tropical plants produce a large variety of phytochemicals or secondary metabolites, which are important products for synthesising pharmaceuticals, natural pesticides, and herbal medicines.

Water

There is abundant water in Malaysia as a whole. Annual rainfall over the land mass amounts to 990 billion m³, of which some 477 billion m³ appear as surface run-off and about 23 billion m³ recharge ground water. The balance of about 360 billion m³ returns to the atmosphere through evaporation and transpiration. The annual surface run-off and ground water recharge, amounting to 500 billion m³ make up the water resources of Malaysia.

The river systems in Malaysia are an important integral part of the water resources system. There are more than 100 river systems in Peninsular Malaysia and more than 50 river systems in Sabah and Sarawak. River systems on the whole, with and without impounding reservoirs, are estimated to contribute about 97 percent of the raw water supply sources.

Ground water sources are not widely used and account for only 3 percent of the raw water sources.

Overall water demand is growing rapidly, at around 11 percent per annum. It is projected that by the year 2000, the annual domestic and industrial water demand will grow to 4.8 billion m³ and irrigation demand to 10.4 billion m³. The annual water demand in 1980 was 1.4 percent, and by 2000 will be about 3 percent, of the water resource base.

In line with the government's development objectives, increasing numbers of the population are gaining access to piped water supply. In 1980, a total of 7.33 million people or 66 percent of the population (89 percent of the urban population and 46 percent of the rural population) were served with piped water. By 1990, 96 percent of the urban population and 76 percent of the rural were supplied with water. The aim is to supply water to the whole population by the year 2015.

The most important challenge in managing water resources is ensuring a constant and stable supply to meet the increasing demand of the population, industrial and agricultural sectors. Of prime importance is the issue of watershed management. There are two classes of inputs to the watershed system. The first is the natural, generally uncontrolled set of inputs such as precipitation and energy which are random variables. The other set of inputs are the result of man's actions which includes land use, treatments and practices.

Energy

Malaysia is fortunate to be blessed with generous and diverse energy resources ranging from fossil fuels such as oil, gas and coal to renewable energy resources such as hydropower, fuel wood and other biomass, and solar energy.

Among these sources, gas and hydro resources are particularly pertinent to economic development and progress of the country. In 1983, Malaysia began to export liquefied natural gas, and with the construction of major pipelines in the peninsular, utilization of significant levels of natural gas in the domestic energy economy has begun. With an annual rainfall averaging 2500 mm coupled with favourable topographical features, Malaysia also has considerable hydropower potential, the bulk of which is located in Sarawak (69 percent), with 17 percent in Sabah, and the remaining 14 percent in Peninsular Malaysia. In 1990, about 15 percent of electricity supply was supplied by hydropower.

As a major producer of agricultural commodities, and with intense solar insolation, Malaysia also has great interest in new and renewable energy sources, mainly biomass, such as agricultural wastes, and solar. Pilot projects and research in biomass (as well as garbage) are focused towards the twin aims of disposing of agricultural wastes with minimum environmental degradation and harnessing their energy content for commercial or economic benefits. Most of the 250 palm oil mill complexes in the country are self-

sufficient in energy through the utilization of palm oil fibre and shells as boiler fuel using cogeneration technology to produce process steam and generate electricity. In 1988 it was estimated that this use of biomass accounted for 0.5 percent of total energy use in Malaysia. Several projects using solar photovoltaic cells for lighting, small power sources and pumping have also been implemented for remote or island communities.

In the past, fuel wood was an important non-commercial energy resource for the rural community. Today, its share of consumption has declined sharply following rural development programmes, such as electrification, to increase the quality of life of the rural community. Due to the low rate of utilization, environmental problems associated with fuel wood have not been significant in Malaysia.

The Four-fuel Strategy, introduced in 1979, has been the mainstay of energy supply policies. This fuel diversification strategy identifies hydro, gas, oil, and coal as the primary energy sources to meet future energy needs. The emphasis is on utilization of indigenous energy resources, primarily the accelerated use of gas, and reducing heavy dependence on oil.

Fisheries

The marine fisheries of Malaysia, based on its territorial waters of 47,000 square nautical miles and 113,000 square nautical miles of exclusive economic zone (EEZ), currently support about 93,000 fishermen, who constitute about 1.7 percent of the total labour force. Direct employment provided by the fisheries sector of the industry accounts for approximately 4 percent of the economically active population.

Fisheries play an important role in the Malaysian national economy, contributing 1.61% of the GDP in 1994, with marine fisheries contributing 86.3% of the total production value, and aquaculture and ornamental fish production contributing 13.7% of the total production value. The fishery sector in Malaysia provides direct employment to 97,945 persons (81.5% fisherman and 18.5% aquaculturists), which constitutes about 1.3% of the total labour force in the country.

The marine fisheries resources are defined and managed as the inshore resource (within 5 nautical miles from shore), coastal resource (5-12 nautical miles from shoreline) and offshore resource (beyond 12 nautical miles till the EEZ boundary). Malaysia's marine waters are estimated to have the highest catch potential of demersal fish and is second only to Peru for pelagic fish. An estimated 4,000 species of marine fishes are believed to be found in Malaysia waters.

Marine fishing methods can be categorised as Inshore Fisheries and Deep Sea Fisheries. The Department of Fisheries' Annual Statistics for 1994 suggests that the inshore fisheries may already be oversaturated; the deep sea fisheries however, demonstrate potential for further development. Marine fisheries are managed under the Fisheries Act 1985 under

the authority of the Department of Fisheries Malaysia (a federal governmental body). The fisheries industry faces several threats, the most significant being the destruction of important breeding and feeding areas. Managing fisheries resources on a sustainable basis has become increasingly complex with the destruction of aquatic habitats and the degradation of the aquatic environment.

The inshore fishing zone currently supports 83 percent of fishermen and boats in the Malaysian fishing industry, and the bulk of the marine fish landings in Malaysia comes from the coastal zone.

Overall there is an estimated 421,800 tonnes of demersal and pelagic fish resources available in the offshore area beyond 12 nautical miles from the shore. From acoustic surveys a total potential of 255,000 tonnes of pelagic and semi-pelagic species has been estimated. Sarawak has the highest potential of 108,000 tonnes followed by the east coast of Peninsular Malaysia, with a potential of 67,000 tonnes, and Sabah with 54,000 tonnes. Over and above these, there was another estimated 50,000 tonnes of tuna available.

Besides marine fisheries, inland fisheries and inland aquaculture add to the stock of fisheries. Malaysian rivers exhibit very diverse riverine fisheries resources which support artisanal inland fisheries especially in remote rural areas. The production of riverine fish is small compared to marine fish, amounting to about 5,000 tonnes annually in Peninsular Malaysia, 17,000 tonnes in Sabah and 15,000 tonnes in Sarawak. The exploitation of riverine fish is mainly by riverine populations who catch fish primarily for their subsistence, fish being their principal source of animal protein.

The aquaculture industry in Malaysia is divided into freshwater and brackish water culture. The industry commenced in the early 1930s. Total annual aquaculture production has grown 118% in the years between 1990 and 1994, with freshwater aquaculture production growing 91% and brackish water aquaculture production increasing by 124%.

Fisheries are interdependent with coastal management and marine related activities. Deteriorating environmental conditions can be brought about by several factors, such as overfishing, coastal pollution, disruption of mangrove areas, coastal erosion and disruption of coral.

The extent of overfishing is related to the traditional practice of treating fisheries as a common property resource. The previous open access policy and relatively rich resource has led to too many fishermen. The presence of large numbers of trawlers in the inshore zone has exacerbated the problem.

Marine pollution and environmental degradation poses a threat to fishery resources. The Straits of Malacca which supports half of Malaysia's fishing population and yields half of its catch, including the bulk of its prawn resource, is subjected to very heavy traffic of sea-going vessels, including oil tankers. There have been a number of accidents where damage to the environment and inshore fisheries was caused. There is also concern with

respect to the potential effect of offshore oil exploration and production on fisheries resources. Though there is no immediate conflict with fishing activity, the possible effects of oil pollution are taken carefully into account in implementing oil exploration and production in offshore areas.

CONSERVATION AND MANAGEMENT OF BIOLOGICAL DIVERSITY

Overview

Malaysia's location in the humid tropics provides a favourable climate to support rich and diverse life forms, from the microscopic organisms such as bacteria and plankton to macroscopic species such as fishes, birds and mammals.

Within the terrestrial ecosystems, forests are the major repository of biological diversity. Over 90 percent of terrestrial biological species in Malaysia occur within natural forests. In comparison, agricultural land, which supports a number of flora and fauna with commercial values, is characterised by low species diversity.

Aquatic ecosystems include both freshwater and marine environments. Coral reefs and coastal mangroves have been identified as very important in terms of biological diversity. These are habitats which support diverse forms of life and are very productive.

Over the period 1970 to 1992, natural forest in the whole of Malaysia was reduced by 19.3 percent, mainly in conversion to the agricultural crops, oil palm and rubber. The forests cleared, with irreversible loss of biological diversity, were predominantly lowland dipterocarp forests and, to a lesser extent, swamp forests, both peat and freshwater, and mangrove forests. Very little of the lowland dipterocarp forests, the largest reservoir of genetic variation of terrestrial flora and fauna, remain and these require total protection, as do the remaining swamp and mangrove forests.

The genetic base of the nation's important agricultural crops is narrow. Malaysia relies on exotic germplasm, especially of rubber, oil palm, cocoa and pepper, for crop improvement. Further narrowing of the genetic base would lead to stagnation in the development of these commodity crops as well as require increased vigilance against pests and diseases.

In-situ conservation

To protect and conserve the diversity of biological species in Malaysia, a number of *in-situ* measures have been instituted. These, to maintain plants and animals in their original habitats, have to take into consideration as many representative natural ecological habitats as possible to sustain breeding populations of flora and fauna.

The current network of protected areas on land includes 2.12 million hectares of National and State Parks, Wildlife Sanctuaries, Turtle Sanctuaries and Wildlife Reserves. Another 3.43 million hectares are protected as water catchment areas. The network of Virgin Jungle Reserves in Peninsular Malaysia and Sabah protects a limited range of biological

diversity in small forested areas as gene pools within larger (usually commercial) forest reserves or agricultural areas.

By the end of 1994, the surrounding marine waters of 38 offshore islands in Peninsular Malaysia and Labuan had been gazetted as marine parks. In addition, one national park in Sarawak, three in Sabah and one state park in Terengganu protect coastal and marine ecosystems.

These conservation efforts need to be strengthened for a number of reasons:

- Several important habitats are under-represented. For example, wetlands such as mangrove forests, peat swamps and freshwater swamps are not adequately protected. Apart from being important as resting places for migratory birds, in regulating the hydrological regime, and in supporting fisheries, these habitats also support some unique flora and fauna because of their distinctive characteristics at the interface of terrestrial and aquatic systems. Limestone and quartz hills are other examples of unprotected habitats.
- Conservation efforts of individual species are targeted towards large animals, and to some extent birds. There is little emphasis on the conservation of individual species of plants, insects or fish (marine and freshwater). This is due mainly to the lack of adequate knowledge.
- Conservation is given low priority in existing land-use policies resulting in competition for land utilization.
- The establishment of marine parks in Peninsular Malaysia focuses on aquatic considerations. Additional attention must be accorded to the adjoining terrestrial components as these too, if unduly disturbed, will have negative impacts on the marine ecosystem.
- Common marine and terrestrial biological resources (e.g., in transboundary areas) lack adequate regional and international cooperation in their conservation and management.
- Efforts at conservation of landraces of indigenous plant species such as fruits and rice are inadequate, and these landraces are being eroded at a rapid rate.

Ex-situ conservation

Ex-situ conservation maintains species outside their original habitats in facilities such as arboreta, zoological gardens, seed genebanks, *in vitro* genebanks and field genebanks. Seed genebanks are considered safe and cost effective for seed-producing crop species. Field and *in vitro* genebanks are particularly useful for species with seeds that are difficult to store.

Ex-situ conservation makes it easier for scientists to access, study, distribute and use plant genetic resources.

Table 4 : Examples of *ex-situ* conservation in Malaysia

ARBORETA	<ul style="list-style-type: none"> medicinal plants fruit trees timber species ornamentals
SEED GENE BANKS	<ul style="list-style-type: none"> Rice Vegetables
FIELD GENE BANKS	<ul style="list-style-type: none"> Rubber Oil palm Cocoa Fruit trees Coconut Orchid Sweet potato
<i>IN VITRO</i> GENE BANKS	<ul style="list-style-type: none"> Cassava Timber species
CAPTIVE BREEDING CENTRES	<ul style="list-style-type: none"> Sumatran rhinoceros Seladang Sambar deer
REHABILITATION CENTRES	<ul style="list-style-type: none"> orang utan
TURTLE SANCTUARIES	<ul style="list-style-type: none"> marine turtle
TURTLE HATCHERIES	<ul style="list-style-type: none"> river terrapin marine turtle

Currently, *ex-situ* conservation of plants, including timber species, is solely in arboreta and small collection centres (Table 4, 5). Animals are being maintained in zoos, rehabilitation centres and captive breeding centres. Collections of specific microorganisms are deposited in universities and research institutions.

Table 5 : Examples of *ex-situ* collection centres in various states in Malaysia

Johor	Research Station, Palm Oil Research Institute Malaysia, Kluang
Malacca	Zoo, Air Keroh
Penang	Botanic Gardens Rice Genebank, Malaysian Agricultural Research & Development Institute, Seberang Perai
Perak	Terrapin Hatchery, Bota Kanan
Sabah	Agriculture Research Station, Ulu Dusun Arboretum, Forest Research Centre, Sepilok Orang-Utan Rehabilitation Centre, Sepilok Orchid Centre and Agriculture Research Station, Tenom Sabah Parks Orchid Garden, Poring
Sarawak	Botanical Research Centre, Semengoh Sungai Sebiew Agricultural Park, Bintulu Wildlife Rehabilitation Centre, Semengoh
Selangor	Arboreta, Forest Research Institute Malaysia, Kepong Bukit Cahaya Agricultural Park, Shah Alam Captive Breeding Station, Sungai Dusun Experimental Station, Rubber Research Institute Malaysia, Sungai Buloh Medicinal Plant Garden, Universiti Putra Malaysia, Serdang Orchid Collection, Malaysian Agricultural Research & Development Institute, Serdang
	Rimba Ilmu, Universiti Malaya, Kuala Lumpur Taman Pantun, Universiti Kebangsaan Malaysia, Bangi Zoo Negara, Ulu Kelang
Terengganu	Turtle Sanctuary, Rantau Abang

Whilst there are a number of *ex-situ* plant collection centres distributed around the country, a national botanical garden has yet to be established.

POLICIES AND LEGISLATION PERTAINING TO BIOLOGICAL DIVERSITY

Sectoral policies

In Malaysia, strategies for environmental management are continually evolving and undergoing improvement and upgrading. The country's awareness and commitment towards the environment can be traced at least as far back as the introduction of the Waters Enactment in 1920, followed by the Mining Enactment in 1929, and a large number of other environment related legislation enacted from time to time. A comprehensive approach to environmental legislation was the Environmental Quality Act (EQA) 1974, which was followed by the setting-up of the Department of Environment in 1975.

Development activities in the various economic sectors have profound impacts on biological diversity. To minimize such adverse impacts and to promote the conservation of biological diversity and the sustainable development of its components, it is essential that such considerations are incorporated into development plans at the planning stage itself. Biological diversity considerations need to be addressed as an important component in policy documents to ensure effective coordination and integration. The development plans concerned are the Five-year Development Plans and the Second Outline Perspective Plan (1991-2000) which embodies the New Development Policy.

The Seventh Malaysia Plan (1996-2000) retains and emphasises the concept of balanced development which was first introduced in the Sixth Malaysia Plan (1991-1995). The strategies of the 7MP focus on sustaining the country's economic growth while ensuring equal distribution of its benefits to all Malaysians.

Improvements in productivity are the main theme for sustaining economic growth. In this respect, the 7MP emphasises increased efficiency in production processes to achieve growth. There is less reliance on inputs of natural resources to achieve higher economic growth. This is in line with the recognition of the 7MP that economic growth should not be achieved at the expense of remaining environmental and natural resources. Therefore the 7MP subscribes to the concept of sustainable development.

The legislative framework

There is no single comprehensive legislation in Malaysia which relates to biological diversity conservation and management as a whole. Much of the legislation is sector-based, for instance, the Fisheries Act 1985 deals mainly with the conservation and management of fisheries resources, the Protection of Wild Life Act 1972 deals with the protection of wildlife, and the National Forestry Act 1984 deals with the management and utilization of forests alone. Some were legislated without specific consideration given to the issue of conservation and management of biological diversity as a whole. The

legislation is also inadequate in that species endangered due to habitat destruction are not protected by way of a national law for endangered species.

State governments have jurisdiction over their forest resources, with the federal government providing guidance on management and development, undertaking research and development, and promoting industrialisation and marketing. In 1984, the National Forestry Act was enacted to standardise and strengthen legislation in relation to administration, management, conservation and development of forest in the Malaysian states.

The Malaysian Constitution prescribes what laws may be made by Parliament and what laws may be made by State Legislatures. Matters regarding which laws may be made are divided by the constitution into three lists: the *Federal list*, the *State list*, and the *Concurrent list*. Under the federal and state lists, the power to enact laws is very clear, but under the concurrent list laws could either be made by Parliament or State Legislative Assemblies. Notwithstanding this division of power, there is a provision under the Constitution which states that if any state law is inconsistent with a federal law, the federal law shall prevail. A further provision enables the parliament, under special circumstances, to make laws in respect to matters in the state list. This is seldom practised.

The most distinct feature of the legislative framework relating to biological diversity is that under the Federal Constitution, the authority to legislate for matters relevant to biological diversity does not fall under one single authority. Although some responsibilities in respect of issues related to biological diversity conservation and management are shared between the Federal and State authorities, some others do fall under the responsibility of one authority alone, be it the Federal or State authority. This is specified by the Federal Constitution, under the Federal, Concurrent and State List of the Ninth Schedule. Thus there are some matters, for example, protection of wild animals and wild birds, and National Parks, which fall under the legislative authority of both the Federal and State Governments, in accordance with the Concurrent List of the Ninth Schedule. However, there are also some matters which fall under the legislative authority of the State alone, for example forest and agriculture. Furthermore, in respect of Sabah and Sarawak, the Concurrent and State Lists are modified.

To the extent that some laws are federal legislation and some are state enactments, in sum this means that not all legislation enacted will apply to the whole of Peninsular Malaysia, Sabah and Sarawak. Since this is the constitutional position, the question of how uniformity of laws may be promoted, particularly in respect of matters which may fall under State jurisdiction alone, needs to be properly addressed.

An example, among the legislation relevant to biological diversity, the Environmental Quality Act 1974 and the Fisheries Act 1985, being, federal legislation, may apply to Peninsular Malaysia, Sabah and Sarawak as well. However, there are other relevant enactments which are specific either to Peninsular Malaysia, Sabah or Sarawak, covering for example, native peoples' rights, forestry, protected areas and wildlife.

The conservation of rivers and seas resources is also spelt out clearly in the Fisheries Act 1985. The state authority or Minister regulates the conservation, enhancement, management and supervision of turtles and fresh water fish, while the formulation of sea gardens or sea reserves in Malaysian fishing waters for the prupose of conservation can be accomplished through the Government Gazette. Meanwhile, the Continental Shelf Act 1972 and the Exclusive Economic Zone Act 1984 contain provisions prohibiting any person from damaging or exploiting natural resources in areas covered by the legislation.

From the viewpoint of effective conservation and management of biological diversity and in light of the above, it appears that the current legislative framework creates some restrictions, thereby causing some deficiencies.

Firstly, there is an absence of an integrative approach across the sectors, due to the limited scope of various enactments in relation to biological diversity conservation. There is also lack of consideration of the overall objectives of biological diversity conservation. Secondly, this results in a lack of comprehensive coverage of biological diversity issues. Finally, the areas of jurisdiction of Federal and State Governments as defined in the Constitution lead to non-uniform implementation between states.

Table 6 : Partial list of legislation relevant to biological diversity

Federal	Environmental Quality Act 1974 Fisheries Act 1985 Pesticides Act 1974 Plant Quarantine Act 1976 Customs (Prohibition of Exports) (Amendment) (No.4) Order 1993
Peninsular Malaysia	Waters Act 1920 Taman Negara (Kelantan) Enactment 1938 Taman Negara (Pahang) Enactment 1939 Taman Negara (Terengganu) Enactment 1939 (The State Parks from the above three Enactments constitute Taman Negara) Aboriginal People Act 1954 Land Conservation Act 1960 National Land Code 1965 Protection of Wildlife Act 1972 National Parks Act 1980 National Forestry Act 1984
Sabah	Parks Enactment 1984 Forest Enactment 1968 Fauna Conservation Ordinance 1963
Sarawak	National Parks and Nature Reserve Ordinance (Chapter 127) (1958 Edition) Wildlife Protection Ordinance 1990 (Ordinance No. 2 of 1990) Forests Ordinance (Chapter 126) (1958 Edition) Natural Resources and Environment Ordinance (Chapter 84) (1958 Edition) Public Parks and Green Ordinance 1993 (Chapter 3)

MALAYSIA AND THE CONVENTION ON BIOLOGICAL DIVERSITY

Participation in the Convention on Biological Diversity

Malaysia participated actively in all expert and intergovernmental meetings that negotiated the text of the Convention on Biological Diversity (CBD). Malaysia signed the treaty at the Earth Summit in Rio de Janeiro in June 1992, and ratified the treaty on 24 June 1994, the 65th country to do so.

Malaysia has been participating actively in all post-Rio meetings of the Convention: the two Intergovernmental Committee Meetings, the Meeting of Scientific Experts, and all the three meetings of the Conference of the Parties (COP) and the three meetings of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to date. Additionally, Malaysia has been participating in all the workshops so far to develop a protocol on biosafety. Malaysia hosted the Asian Preparatory Meeting to the Third Meeting of the COP, and recently, the Asian Regional Meeting on the Clearing-House Mechanism.

Malaysia was a member of the Bureau of the CBD Presently, Malaysia holds the Chair of SBSTTA.

Soon after the Earth Summit in June 1992, Malaysia established the framework for strengthening biological diversity activities in the country. Committees dealing with policy as well as technical issues were established. Through this structure, the National Policy on Biological Diversity, which includes Strategies and Action Plan of Programmes, was developed. Separately, a Country Study on Biological Diversity was also carried out.

Malaysia is fully committed to the provisions of the Convention.

Framework for action

In 1992, soon after the Earth Summit in Rio de Janeiro, the Malaysian Cabinet directed that the Ministry of Science, Technology and the Environment (MOSTE) be responsible for all issues related to biological diversity. In early 1993 MOSTE formed a National Committee on Biological Diversity (NCBD), headed by its Secretary-General, to be responsible for policy matters on biological diversity. Relevant ministries, government departments, government research institutes and certain universities are members of the (NCBD). Under the (NCBD), the existing Malaysian National Committee on Plant Genetic Resources, headed by the Director General of the Forest Research Institute Malaysia, was transformed into the National Technical Committee on Biological Diversity (NTCBD) to cover all aspects of biological diversity - plants, animals and microorganisms. The NTCBD concerns itself with technical matters on biological diversity and reports

directly to the NCBD. The membership of the NTCBD consists of technical personnel from various government departments, government research institutes and the universities.

Task force groups, either under the NCBD or the NTCBD, undertake specific assignments on biological diversity. The National Policy on Biological Diversity was developed by such a task force. Other assignments have included the implementation of the Country Study on Biological Diversity and current efforts in developing a national Agreement for Access to Biological Resources/Genetic Resources.

Biological diversity is a sectoral issue. National policies in Malaysia are sectoral in nature. Recognising this, the Malaysian delegation to the pre-Earth Summit negotiating meetings of the CBD recommended to Government that a national policy on biological diversity be developed. In addition to addressing biological diversity issues across sectors, it was also felt that national strategies, plans or programmes for the conservation and sustainable use of biological diversity could be housed under the umbrella of a national policy.

The National Policy on Biological Diversity

After the Earth Summit, through the structure of the committees on biological diversity that was established, a National Policy on Biological Diversity was developed. The initiative on the policy was started in early 1993, a draft document was worked through by a task force, and through a series of reviews that included a workshop, a final draft developed. The document was reviewed by representatives from relevant ministries, government departments, research institutes, universities, state governments and non-governmental organisations (NGOs). The policy was endorsed by the Malaysian Cabinet on 22 October 1997. A copy of the National Policy on Biological Diversity is appended with this report.

The document consists of three parts: the Policy, the Strategies and the Action Plan of Programmes. The part on the Policy enunciates Vision and Policy statements and lists the Principles on which conservation and sustainable utilization of the nation's biological diversity will be based. It also defines the Objectives of the nation with respect to biological diversity and provides the Rationale for conservation and sustainable utilization.

The part on the Strategies first gives an account of the status of conservation and management of biological diversity and then outlines 15 strategies for effective management of biological diversity. The final part, the Action Plan of Programmes, identifies a number of programmes for each of the 15 strategies.

The National Policy on Biological Diversity, including the Strategies and the Action Plan of Programmes, is directed towards all Malaysians. The public and private sectors, as well as all citizens, are expected to play a role in implementing the Action Plan of Programmes.

INSTITUTIONAL CAPACITY

Institutions

Environment-related agencies under ministries, government research institutions, universities, non-governmental organisations (NGOs), as well as networks, committees and councils are involved in various ways in addressing the issue of conservation of biological diversity and sustainable use of its components: A comprehensive account is given in the document entitled *Assessment of Biological Diversity in Malaysia* which is appended to this report. A shortened account is as follows:

Government institutions

The **Ministry of Agriculture (MOA)** is charged with raising the productivity of agriculture and fisheries through efficient utilization of the nation's natural resources, stimulating food production for national and export needs, and diversifying agricultural, fishery and livestock production and other downstream activities in line with marketing opportunities within and outside the country.

The objectives of the *Department of Agriculture (DOA)* under the MOA are to increase farm productivity through the effective transfer of technology and research; to involve farmers in the use of technology; and to increase the contribution of the agricultural sector to the national economy through the cultivation of selected crops. DOA implements the Agriculture Information System, a database of information on soils, crops, farmers and DOA officers designed for use by DOA extensionists.

The functions of the DOA are implemented at both Federal and State levels. The functions of the Federal DOA are focussed on Farmers Training and Development, Commodities Development and Enforcement of Acts (Pesticides Act 1974 and Plant Quarantine Act 1976). The State DOAs implement development programmes and activities planned by the Federal DOA according to the needs of the State governments.

The *Fisheries Department* under the MOA is responsible for the overall management and protection of fisheries and related matters. Its primary objectives are to increase fish production to meet domestic needs; to increase export of fishery products; to sustain the level of production from inshore fishery resources; to expand deep-sea fishing; to accelerate the growth of aquaculture; and to increase the value of fishery products.

The Department also develops, administers and manages the waters of the 38 gazetted marine parks in Malaysia. The Fisheries Research Institute covers three major areas: aquaculture (oyster, prawn, crab, shrimp, etc.), resources (tuna fisheries, shrimp, demersal fish, lobster), and aquatic ecology (artificial reefs, mangrove ecosystems. Leatherback turtles, aquatic pollution).

The Planning and Research Division undertakes research in the management and conservation of fish stocks and the regulation of commercial fishing activities. Ecological activities include the development of artificial reefs to support fish and other marine life, and the study of mangrove ecosystems and its contributory role towards highly productive coastal fisheries. It also provides technical support for the aquaculture industry.

The Fishery Resources Management and Development Division administers and enforces the Fisheries Act 1985 and EEZ Act 1984 for the proper management and conservation of inshore and deep sea resources.

The *Veterinary Services Department (VSD)* of the MOA is responsible for the development of the livestock industry, and all aspects of animal and veterinary public health. The Animal Quarantine Station manages the import and export of wildlife.

The **Ministry of Primary Industries (MPI)** is responsible for the development of Malaysia's primary commodities, such as rubber, palm oil, timber, coconut oil, tobacco, pepper, pineapples, cocoa, tin, copper and other minerals. Activities include the research and development, production, processing, and marketing of products.

The *Federal Forestry Department* under the MPI is responsible for the administration and management of all forest resources. The Department is guided by the National Forestry Policy to establish the Permanent Forest Estate (PFE) for the production of timber and other commodities, and for the conservation of soil, water and environmental quality; to encourage multiple uses of forest land; and to ensure security of the PFEs against destructive agents.

States are empowered to formulate independent forest policies. The Federal Forestry Department merely provides advice and technical assistance to the states, maintains experimental stations, and conducts training and research. The Department has established a continuous monitoring system of forest resources in Peninsular Malaysia using remote sensing and Geographical Information System technology.

Current projects include: Rehabilitation of Natural Forest using silvicultural methods to increase forest productivity for sustainable use; ASEAN-New Zealand Project, Forest Conservation and Rehabilitation of Degraded Forests. This project has been implemented in the Tersang Forest Reserve, Pahang; Permanent Forest Management and Conservation in Peninsular Malaysia, joint project with GTZ, to restore and augment the forest resources management system for the permanent production of forest resources and services; Development of Values for Forest Recreational Areas: Valuation and Analysis of Consumer Demand, joint project with the UK Government, to test and evaluate alternative economic methods to measure consumer demand for Forest Recreational Areas.

The goal of the **Ministry of Science, Technology and Environment (MOSTE)** is to develop and expand science and technology activities for national development and at the same time, preserve the quality of life and the country's natural resources.

MOSTE's Conservation and Environmental Management Division's main objective is to ensure the sustainable development and utilization of Malaysia's resources and to enhance the country's overall environmental quality. This division formulates and coordinates policies, strategies and action programmes related to environment and conservation, and oversees the operational activities of the relevant departments. The Division also acts as a channel for regional and international cooperation in the field of environment and conservation, such as the follow up to the United Nations Conference on the Environment and Development, 1992. In 1994, three conventions were signed and ratified: the Convention on Biological Diversity, the Framework Convention on Climate Change and the RAMSAR Convention on Wetlands of International Importance.

The *Malaysian Centre for Remote Sensing (MACRES)* of MOSTE coordinates remote sensing related facilities and capabilities in the country, and promotes greater utilization of the technology for resource management, environmental control and strategic planning.

Research projects include Agroecological Zone Mapping, Structural Geology Mapping, Environmental Sensitive Zone Mapping, Development of the MICSIS software for soil erosion risk assessment, and Hydrological modelling in the Bakun Dam Project.

The primary objectives of the *Department of Environment (DOE)* under MOSTE are to enhance and improve the quality of the environment, to achieve a better quality of life, and to balance the goals of socio-economic development and environmental control for efficient and sustainable utilization of natural resources. The DOE administers and enforces the Environmental Quality Act 1974. It also assesses development projects subject to the EIA Order with respect to their impact on the environment through EIA studies.

The *Malaysian Meteorological Service (MMS)* of MOSTE meets the demands for effective meteorological and geophysical services. The MMS has established a network of air pollution and acid rain monitoring stations, an Atmosphere Ozone Monitoring Programme and eight Seismological Stations.

The objectives of the *Department of Wildlife and National Parks (PERHILITAN)* under MOSTE are to conserve and manage wildlife species with the goal of fulfilling needs and interests of the people; and to create and manage National Parks, Wildlife Reserves and Wildlife Sanctuaries for the preservation and conservation of flora, fauna and natural habitats. PERHILITAN enforces the Wildlife Enactment 1972.

The Database Unit of PERHILITAN supplies wildlife information for wildlife management, research, park management and law enforcement relating to the administration of CITES. Among its projects are Otter Research, Elephant Research, Bird Banding. The Laboratory Unit captures small mammals for ecological research and scientific collections, conducts parasitological studies on small mammals, and researches

food habits of small mammals. The Wildlife Management Unit focuses on wildlife damage, elephant translocation, shorebird conservation at Kuala Gula, Sumatran rhinoceros Management and management of the Wildlife Reserves and National Park.

The **Ministry of Culture, Arts and Tourism**, which develops and promotes the national culture and the tourism industry, recently commissioned a National Ecotourism Policy which is expected to be adopted in the near future. The Policy is expected to generate increased development of ecotourism and nature-based tourism in the country.

Several Government research institutions are mandated to carry out activities related to conservation of biological diversity and sustainable utilization of its components.

The *Malaysian Agricultural Research and Development Institute (MARDI)* under the MOA undertakes technological, economic and social research in agriculture, except rubber, oil palm and fresh water fisheries. Its general objective is to promote technologies to increase productivity and efficiency in the modernisation of the sector, in line with the National Agricultural Policy. MARDI maintains plant genetic resources of germplasm materials from both indigenous and non-indigenous crops. Over 16,000 accessions are stored in seed, field and in-vitro genebanks. It also manages a herbarium housing 8,515 specimens and an arboretum with 120 rare or indigenous fruit species.

Commodity Research Programmes of MARDI develop technology packages for crops such as rice, cocoa, coconut, fruits, tobacco and livestock. Fundamental Research Services support and strengthen applied research, and develop appropriate technologies for the exploitation and utilization of agricultural products, by-products and wastes.

The *National Institute of Animal Biotechnology (NIAB)* of the Department of Veterinary Services of the MOA, is committed to the development of the livestock industry through the conservation and genetic improvement of farm animal species. It has a Semen Bank (cryogenic storage) with semen from various breeds of cattle, goats and sheep.

NIAB's activities are focussed on improving the genetic quality of commercial farm livestock, conserving animal genetic resources, and improving farm livestock performance through the use of modern biotechnological techniques. It also undertakes research for efficient exploitation of farm animal resources and provides an advisory service on breeding and animal biotechnology.

The *Rubber Research Institute of Malaysia (RRIM)* reports to the MPI. Its mission is to carry out research and development to develop and sustain the growth of the natural rubber industry.

Important research activities include: breeding new clones through genetic engineering for disease-resistant and high yield species; soil and crop management research of soil suitability and fertiliser use; crop protection, including pest management, microbiology, screening for disease-resistant clones, etc; pollution control technologies.

The *Forest Research Institute Malaysia (FRIM)* also reports to the MPI. FRIM promotes the sustainable management and optimal utilization of forest resources through technology, research, development and application. Its objectives are to develop knowledge and appropriate technology for conservation, management, development and utilization of forest resources; to commercialise its R&D results; and to promote awareness of the environmental and conservation roles of forestry. FRIM manages an arboretum of 600 ha which has 722 woody plant taxa, mostly from Southeast Asia, of many dipterocarp species. It operates an extensive herbarium with more than 150,000 records of mainly tree species.

Among FRIM's many research studies are Planting Quality Timber Trees, Environmental Impact Assessment (EIA) in harvesting of Natural Forests, Silviculture of Plantation Species, Tree Flora of Sabah and Sarawak, Impact of Forestry Activities on Fauna, Pest and Disease Management, Urban Forestry, Non-wood Forest Products, and on the Valuation of Non-timber Forest Products.

The *Palm Oil Research Institute of Malaysia (PORIM)*, under the MOA, carries out research on all aspects of the Malaysian palm oil industry; from production, processing, to marketing new uses of palm oil products. The institute's research objectives are to expand the current uses of palm oil and to find new uses, in order to compete with other oils and fats.

Universities

The various universities in the country also play their role in research leading to conservation and sustainable utilization in a broad spectrum of the field of biological diversity. Research activities range from subjects such as ant and moth diversity to coral reefs. The Universiti Kebangsaan manages a Fernesium. The botanical garden of the Universiti Malaya houses medicinal plants, fruit trees and palms. At the Universiti Sains Malaysia, research activities include aquaculture and medicinal plants, with emphasis on marine and coastal studies. The emphasis at the Universiti Malaysia Sabah is on marine biodiversity as well as on arthropods, amphibians and lower plants on land. Among others, the Universiti Putra Malaysia has interest in Agriculture, Fisheries and Marine Sciences, Forestry and Animal Science.

Non-governmental organisations

There are a number of non-governmental organisations (NGOs) in the country that are active, in some way or another, with issues related to conservation of biological diversity and sustainable utilization of its components. Some of these are the Malaysian Nature Society (MNS), the Institute of Strategic and International Studies (ISIS), World Wide Fund for Nature (WWF) Malaysia, Wetlands International-Asia Pacific, Friends of the

Earth-Sahabat Alam Malaysia (SAM) and Environmental Protection Society of Malaysia (EPSM). While some of these work to influence policy and legislative decisions, others have full-time staff and work on projects, that include awareness programmes.

Networks

Networks, Committees and Councils include those that are made up of NGOs only, for example, the Malaysian Environment and Conservation Network and the Third World Network, or may be a combination of both government agencies as well as NGOs. Example are the National Advisory Council for Marine Parks and Marine Resources and the National Steering Committee on the RAMSAR Convention.

Private sector

The private sector too has a role to play in the conservation of biodiversity in Malaysia, especially in the field of technology development and research. The commercialisation of biodiversity resources for the biotechnology and pharmaceutical industries, for example, has tremendous potential economic benefit for conservation efforts if financial gains are distributed appropriately.

The private sector is also known for its innovations in environmental technology research and development. The business of providing solutions to environmental problems has grown tremendously both locally and internationally over the last two decades. The local market for environmental products and services was estimated at between US\$500 to 600 million for 1996. This huge potential has spurred the environmental industry to develop advanced technologies for pollution control and treatment.

As the Government continues to place emphasis on privatisation, the private sector is expected to play a dominant role in developing Malaysia's environmental infrastructure. Privatisation, more than any other single factor, has propelled the rapid growth in Malaysia's environmental market. Some privatisation projects include the 28-year concession for the national sewerage system; a 15-year concession for the construction and management of the national toxic waste treatment and disposal centre; and privatisation of municipal solid waste management services, which is currently in progress.

INTERNATIONAL COOPERATION AND LINKAGES

International Conventions, Treaties and Agreements represent a collective agreement among the global community over a common global issue. Malaysia has always participated actively and constructively in the international discussion and negotiation processes of numerous environment related Conventions, Treaties and Agreements, and then taken steps to translate the commitments on environmental and biodiversity conservation issues into domestic policies and action programmes.

Besides the Convention on Biological Diversity, selected international agreements and conventions related to biodiversity conservation that have been ratified by Malaysia are:

Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR). Malaysia ratified the RAMSAR Convention on 10 November 1994. It came into force on 10 March, 1995.

The Convention officially came into force in Malaysia on October 3rd, 1995 with the designation of Tasik Bera in Pahang state for inclusion into the List of Wetlands of International Importance. Tasik Bera is the largest freshwater lake in Malaysia (2,039 ha). The lake and its surrounding areas (38,466 ha) have been gazetted as the Tasik Bera Forest Reserve since 1970.

MOSTE is the lead agency in implementing RAMSAR in the country. Malaysia is also in the process of developing a national wetland policy.

Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). CITES entered into force on July 1, 1975. Malaysia signed the Convention in October 20, 1977 and ratified it in Jan 18, 1978.

MOSTE is the designated focal point for CITES with the Department of Wildlife and National Parks (PERHILITAN) as the implementing agency, overseeing activities in Peninsular Malaysia, while the Sabah Wildlife Department and Sarawak Forestry Department manage the activities in Sabah and Sarawak respectively.

PERHILITAN has incorporated the CITES-listed species of fauna into the Wildlife Protection 1972, Act 76 (does not include plant flora species). The Department also manages numerous conservation projects to ensure the continued existence of endangered wildlife species in Malaysia, with at least 15 conservation projects in Peninsular Malaysia.

Framework Convention on Climate Change. Malaysia signed the Convention on June 9, 1993 and subsequently ratified it on July 13, 1994.

MOSTE is the national focal point for the Convention with the Malaysian Meteorological Service Department as the supportive department. Preliminary impact assessments on climate change have been carried out with financial assistance from UNEP and the Asian

Development Bank. Efforts are underway to develop a national inventory of greenhouse gases, abatement measures and a thorough assessment of its impacts on the various economic sectors. The information will form the basis for the formulation of a national adaptation policy on climate change.

International Tropical Timber Agreement (ITTA). Under the aegis of the UN Convention on Trade & Development (UNCTAD), ITTA was adopted by 69 tropical timber producer and consumer countries in November 1984 and came into force on April 1, 1985. The Agreement expired on March 31, 1994 and was renegotiated with a new agreement attained.

The ITTO (International Tropical Timber Organization), which facilitates and runs the ITTA, had in 1990 developed guidelines for the sustainable management of natural tropical forests and criteria for the measurement of sustainable forest management.

MPI is the agency responsible for the implementation of the ITTA in Malaysia. The National Committee on Sustainable Management of Forests for Malaysia was established in 1994 to ensure that the ITTO criteria are fulfilled. Since 1995 Malaysia has been preparing the national standards on sustainable management of tropical forests.

United Nations Convention on the Law of the Sea. Malaysia signed the Convention on December 10, 1982. The Convention will come into force a year after the 60th instrument of ratification has been deposited with the United Nations, and this has yet to take place.

The Convention has had considerable positive impacts for the management of marine biodiversity in Malaysia leading to the formulation of the Fisheries Act 1983. The Convention places particular importance on issues surrounding fishery resources (Articles 63 and 64) and marine pollution (Article 211, 6a,c). Among the conservation efforts undertaken in Malaysia are protection of breeding and nursery grounds, especially coral reefs and mangrove areas, restriction of certain types of fishing gear such as trawl nets in the coastal areas, the creation of artificial reefs using old tyres for breeding grounds and the establishment of marine protected areas. The Convention has also been a catalyst for various bilateral arrangements with the neighbouring countries of Philippines, Thailand and Indonesia to coordinate efforts to conserve and protect marine resources.

Other environment and biodiversity related international conventions/agreements ratified by Malaysia include:

- Montreal Protocol on Substances that Deplete the Ozone Layer
- Basel Convention on Transboundary Shipment of Hazardous Wastes
- Convention on the Continental Shelf.

Malaysia is an active participant of the International Board for Plant Genetic Resources Regional Committee for South-East Asia (IBPGR/RECSEA). Through the IBPGR/RECSEA, Malaysia has participated in a highly successful cooperative programme in plant genetic resources with Indonesia, Papua New Guinea, Philippines and Thailand. The IBPGR is now known as the International Plant Genetic Resources Institute (IPGRI).

Malaysia became a member of the FAO Commission on Genetic Resources for Food and Agriculture in 1993.