

# 4

## BIODIVERSITY CRISIS IN INDONESIA

Although not comprehensive, the data and information provided in Chapter 3 indicate that ecosystem destruction, species extinction, and erosion of genetic resources in Indonesia has been increasing over the years. In other words Indonesia is facing biodiversity crisis.

This crisis occurs despite the efforts to manage biodiversity as will be described in the first part of this chapter. The factors and underlying causes are complex, and a brief analysis is provided in the second part of this chapter. The last part of this chapter examines the current and future context that will influence biodiversity management, including principles of sustainable biodiversity management.

### AN OVERVIEW OF BIODIVERSITY MANAGEMENT

Many efforts have been undertaken to deal with damage to biodiversity. This section describes government efforts in the areas of policy and institution, conservation, development of information system, and socio-economy. The role of non-governmental groups, such as individuals, Non-governmental Organisations (NGOs) and the private sector is also briefly touched upon.

#### Policy and institution

Early efforts in mainstreaming sustainable management of biodiversity were based upon international agreements. For instance, the government ratified CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna) through Presidential Decree (Keppres) No. 43/1978 and the Ramsar Convention on Wetlands through Keppres No. 48/1991. Both conventions are important, but their management principles have not been integrated into a comprehensive national policy.

Another policy basis on biodiversity conservation is Act No. 5/1990 on the Conservation of Biological Resources and their Ecosystems (KSDE), which governs ecosystem and species conservation, particularly in protected areas. This law cannot be considered compre-

hensive, since its coverage is limited to the forestry sector and conservation areas. But the fact is that many ecosystems outside protected areas are also threatened.

In the early 1990s, several policies that could have become comprehensive reference for biodiversity management were released. For example, the Ministry of Environment (MoE) published the Strategy for Biodiversity Management almost at the same time when the National Development Planning Agency (BAPPENAS) produced the Biodiversity Action Plan for Indonesia 1993 (BAPI 1993) described in Chapter 1. Another important policy was the ratification of the United Nations Convention on Biological Diversity (CBD) through Act No. 5/1994.

The three policies, viz., Act No. 5/1990, Act No. 5/1994 and BAPI 1993, if implemented effectively, may have become important tools for sustainable biodiversity management. However that is not the case. For instance, there are no implementation guidelines for Act No.5/1994 and the extent to which the government has fulfilled its obligations under CBD after ratifying it is also not clear. Some important elements and obligations that must be complied with under CBD are presented in Box 4.1. One of the agreements on marine and coastal biodiversity by Parties to the CBD is described in Box 4.2. Some of the obligations could have been fulfilled, partly by using the guidelines provided in BAPI 1993. However, since there are problems in the implementation of BAPI 1993, as described in Chapter 1, many of the obligations have not been fulfilled. In addition, there has been poor coordination and synergy in implementing various international conventions.

Furthermore, various sectoral policies related to biodiversity (forestry, agriculture, marine, and environment) are inadequate and some are even overlapping, contradictory with each other and therefore have not been supportive in the implementation of CBD or Act No. 5/1990. A list of some policies relevant to biodiversity management is given in Appendix 7.



Doc. BirdLife-Indonesia

Figure 4.1. Illegal trade in wildlife is rampant in many places in Indonesia.

In 1997, the MoE published the National Agenda 21 as an interpretation of the global Agenda 21 agreed upon during the 1992 Earth Summit in Rio de Janeiro. Chapter 16 of the document is on conservation of biodiversity, while other relevant chapters deal with forestry, agriculture, coastal and marine management and biotechnology.

The programs proposed in Chapter 16 are:

1. Enhancing the development and effective management of protected area systems.
2. Conserving biodiversity in agro-ecosystem and non-protected/production areas.
3. Ex-situ conservation of biodiversity.
4. Protecting and developing knowledge system on biodiversity conservation.
5. Developing and maintaining sustainable biodiversity management system, including equitable sharing of its benefits.

A review of the implementation of the 1997 National Agenda 21 by MoE in 2002 indicated that many parties, whether communities, NGOs or government, are not yet aware of the existence of the document, let alone use it as a reference to plan and implement sustainable development in their respective fields. This National Agenda, which was followed by the publication of sectoral Agenda 21 (covering settlement, forestry, tourism, mining and energy), was never adopted in the planning and implementation of national development or sectoral activities (MoE 2002).

Several other agencies also have their own biodiversity management policy. The Ministry of Marine and Fishery (MMF) has compiled a Marine and Fishery Strategic Plan in 2000, which outlines the work program for utilization and conservation of marine and fishery resources. Together with IPB and LIPI, MMF also issued National Policy and Strategy for Coral Reef Management. The MoF too had formulated several strategic plans for the conservation of forest ecosystem and species.

Several institutions are in charge of the management of biodiversity, as will be further discussed in **The Flaws in Biodiversity Management** section. Two institutions deserve to be mentioned here, i.e. MoE and the National Commission on Genetic Resources (KNPN). The function of MoE is to assist the President in formulating policies and undertaking coordination in environmental issues and managing their impacts. It is also the national focal point for CBD, whose task is to coordinate the implementation of the convention at the national level. However, many parties think that MoE is not provided with sufficient authority to enable it to function effectively.

KNPN, formed in 1976 by the Ministry of Agriculture (MoA), has its main task to coordinate research, utilization and conservation of genetic resources. KNPN membership consists of MoA, MMF, MoE and research institutions as well as universities. Some of its activities include coordinating a network for genetic resources conservation system, recommending regional flora and fauna symbols, formulating a concept for regulation of utilization of plant and animal genetic resources, and disseminating analysis on global issues related to genetic resources. Currently, conforming to the decentralization process, KNPN is compiling a guideline for the establishment of the Regional Commission on Genetic Resources.

## Management

### *In-situ conservation*

Indonesia is one of the first tropical countries in the world that possess protected area systems. They serve as an in-situ conservation areas, protecting natural ecosystems and the species and genetic diversity within them. Indonesia has gazetted 385 terrestrial and marine conservation areas, covering a total of 22.5 million hectares, as presented in Table 4.1. In addition, some 692 protected forest areas, covering 34 million hectares have also been established (Dephut 2002).

## Box 4.1

## CONVENTION ON BIOLOGICAL DIVERSITY: BENEFITS AND OBLIGATIONS

The United Nations Convention on Biological Diversity (CBD) is one of the products of The 1992 Earth Summit in Rio de Janeiro, Brazil. It was ratified by the Indonesian government 1994 through Act No. 5/1994 on the Ratification of United Nations Conventions on Biological Diversity. The Ministry of Environment is the national focal point for the implementation of CBD.

There are three main objectives of CBD: conservation of biodiversity, sustainable utilization of its components, and the equitable distribution of benefits arising from the use of genetic resources, including adequate access to genetic resources and transfer of technology and through the provision of adequate funding.

The CBD requires member countries to formulate conservation strategy, action plan and program for sustainable biodiversity utilization or to modify the existing similar documents to meet these requirements. The convention also stipulates that governments integrate sustainable biodiversity conservation and utilization as much as possible into their relevant national sectoral and inter-sectoral plan, program and policy. Based on the decisions of the Conference of Parties (COP), each member country has to undertake the following obligations:

1. Formulate national strategy and action plan (such as BAPI 1993 and IBSAP 2003);
2. Select a focal point for Global Taxonomy Initiative and for the biodiversity Clearing-house Mechanism;
3. Facilitate local and indigenous communities' participation in the implementation of CBD;
4. Support capacity building through education and communication on biodiversity;
5. Apply the ecosystem approach, if possible, and empower national and local capacities;
6. Develop regulation on access to genetic resources and equitable sharing of benefits.

In addition, member countries are also obliged to submit report on the implementation of CBD and how far the objectives of the convention have been effectively achieved at the national level. It is suggested that the report be prepared through a consultation process involving all stakeholders.

The ratification of this convention is deemed to bring benefits for Indonesia, which include, among others, access to and control of technology transfer, improvement of knowledge on biodiversity, collaboration in science and technology related to biodiversity, and mobilization of funding for biodiversity research and development.



(Doc. Ministry of Forestry)

Figure 4.2. Illegal logging is a major threat to many national parks in Indonesia.

Sources: Elucidation of Act No. 5/1994, UNEP and WCMC 2000, MoE (pers. comm.).

## Box 4.2

### THE JAKARTA MANDATE: CONSERVATION OF MARINE AND COASTAL BIODIVERSITY

The increasing pressures on marine and coastal ecosystems have prompted the COP to the CBD Convention on Biological Diversity to raise the issue of marine and coastal biodiversity as the main theme at the Conference of Parties II in Jakarta, in 1995. As the host of this meeting, the Government of Indonesia initiated the development of a global consensus on the sustainable use of marine and coastal biodiversity, known as “the Jakarta Mandate”. Then, in 1997, Indonesia hosted the First Meeting of Experts

on Marine and Coastal Biological Diversity that elaborated the work plan of the Jakarta mandate.

The Jakarta Mandate has five program components:

- Integrated marine and coastal area management.
- Marine and coastal living resources.
- Marine and coastal protected areas.
- Mariculture.
- Alien species and Genotypes.

There are six Biosphere reserves in Indonesia. The first four were selected in 1977 and are located in Gede-Pangrango, Tanjung Puting, Lore Lindu and Komodo national parks, while the last two are Leuser, and Siberut national parks, selected in 1981. In addition to its status as a biosphere reserve, the Komodo National Park was selected as World Heritage Site in 1989. For each of the biosphere reserve, the national park area serves as its core zone.

Under the United Nations Educational, Scientific and Cultural Organization (UNESCO) Biosphere reserves are defined as land and/

or coastal ecosystems selected by the program of Man And Biosphere (MAB) in promoting the balanced relationship between humankind and nature. The Biosphere Reserves are considered ideal to demonstrate models and approaches of management biodiversity through ecosystem management. There are three essential components in the management of Biosphere reserves: conservation, economic development and other activities supportive of research, training, and community-based development activities (Sukara pers. comm.).

The significance of protected areas (conservation and protection areas) management is not only seen at national level but also for the benefits of the global community. So many grants and loans have been given for such activities. Many international NGOs have actively been involved in saving conservation areas, mainly the national parks. Two main programs focusing on national park management are *Integrated Protected Areas – IPAs*, which mostly have been supported and funded through ADB loans and the *Integrated Conservation and Development Program (ICDP)*, funded by World Bank loans. There have been problems in their implementation, however, as summarized in Box 4.3. Illegal logging has been one of the main prevailing problems faced by many national parks, as explained in Box 4.5.

Biosphere reserves have also faced similar problems in their management. After almost 20 years, an evaluation on their effectiveness is needed Indonesia. More importantly because during the reform and decentralization era,



Figure 4.3. Millions hectares of mangrove forest have been converted into commercial fish ponds in the last decade.

(Doc. State Electricity Company)



**Table 4.1. Area and number of conservation areas, September 2002.**

Status	Area (Ha)	Unit
Nature Reserve	2,673,456.53	174
Wildlife Reserve	3,616,143.12	51
National Park	14,815,976.18	41
Nature Recreation Park	973,920.43	97
Grand Forest Park	241,656.50	17
Game Reserve	239,392.70	15
<b>Total</b>	<b>22,560,545.53</b>	<b>315</b>

Source: Dephut 2002.

forest encroachment, illegal logging are increasing while many conservation areas boundaries remain unclear. Forest degradation has worsened not only due to poor law enforcement but also because the long-term objectives and goals of development and the functions of Biosphere reserves, in particular, are still not well understood (Sukara pers. comm.).

Compared with the management of national parks, with a clear legal basis and implementation authority under the (MoF), the management of biosphere reserves still has no clear legal status. This means that only their core zones, i.e. the national parks, are under clear management authority, whereas their buffer and transition zones are not (Sukara pers. comm.). In its current situation, the management of biosphere reserves will be included in the revision of Act No. 5/ 1990 to conform with the conceptual basis of the Man and Biosphere (MAB) program.

#### *Ex-situ conservation*

Ex-situ conservation for species is conducted outside its natural habitat, usually in zoos, botanical gardens and arboreta. At present, there are four botanical gardens (under LIPI's management), 21 zoos, two safari parks, 17 of botanical gardens, 14 units of grand forest parks, 36 fauna breeding units, three bird parks, four locations of orangutan rehabilitation, and six of elephant training centers. They have been established as an effort to conserve species and genetic diversity.

In addition, the government has been encouraging captive breeding activities for endangered species of flora and fauna. Its specific aim is to preserve endangered species and their natural habitat while at the same time meeting

the market demands. There are 101 companies and 16 individuals who have been granted license and have started their captive breeding programs, and 44 other companies have received permission for developing captive breeding for non-protected species (Dephut 2002).

As for the conservation of genetic resources, in particular of cash and food crops and livestock, the Ministry of Agriculture has developed its germplasm collections through its research institutions. Data on their current collection is provided in Chapter 3 and in Appendix 4. The collection of germplasm is very crucial for plant and animal breeding, and for the development of new products such as medicines.

Ex-situ collection efforts are facing many problems such as inadequate funding, facilities and skilled human resources. For example, various institutions or research centers do not have long-term storage facilities, so their collections have to be continuously rejuvenated (replanted) to maintain their vigor. Funding for germplasm research is also limited.



(Doc. Bogor Botanic Garden)

Figure 4.4. Botanical gardens serve as conservation areas for plant species outside their natural habitats.

## Box 4.3

**ICDP: CHALLENGES AMIDST HOPE**

The Integrated Conservation and Development Project (ICDP) is a conservation approach that links biodiversity management in conservation areas with socio-economic development of local community (Wiratno et al. 2002). Before ICDP concept was implemented, conservation and development were regarded as two separate and even contradictory activities, and conservation was regarded as enemy of development.

Since its initiation in the early 1990s, ICDP became a popular project and well received by many NGOs, government and donor agencies. There were two reasons for this. First, this concept offered an alternative approach for conservation area management that was politically acceptable. Second, it contributed to the achievement of three main targets of the sustainable development agenda, i.e. effective conservation of biodiversity, increasing participation of local community in conservation and development as well as economic development for poor rural community (Wells et al. 1999; Wiratno et al. 2002).

In Indonesia, the goal was to implement ICDP in various categories of conservation areas, covering an area of about 8.5 million hectares or about 40% of total conservation area in Indonesia. The funding allocated was about US\$ 130 million, mainly from foreign loans and grants (Wells et al. 1999). Despite its popularity,

the success of ICDP needs to be questioned. Wells et al. (1999) who reviewed ICDP implementation in 24 conservation areas, stated that ICDP had limited success because:

1. The projects often failed to address the main threats on conservation areas.
2. Development activities sponsored legally by the government (road construction, timber concession, natural forest conversion and mining) have often been greater threats for conservation areas compared to small-scale illegal activities carried out by local communities.
3. Development program linked to ICDP did not provide enough incentives to change community attitude and behavior in the exploitation of forest resource and encroachment of forest areas.

However, some ICDPs were quite successful such as in Papua. So it can be concluded that the success of ICDP depends on a clear link between conservation and development activities, and there is a strong support from local community and government for conservation areas. Therefore in the future more attention must be given to these constraints. It is true that ICDP is not the only approach to implement sustainable development, which involves local community and effective law enforcement. However, without a clear strategy ICDP will become just a hope whose realizations would be full of challenges.

**Information system**

Some initiatives on the establishment and development of information biodiversity system have taken place, among others:

- Since the 1960s LIPI has been publishing the Economic Resources Series (*Seri Sumber Daya Ekonomi*). Some of its volumes deal with biological resources and they are known as The Green Booklet series. Later on Balai Pustaka published them as handbooks for school children.
- PROSEA had documented information on plant species diversity in Southeast Asia, including Indonesia, and published many series of books on cultivated and wild plants such as fruit trees, vegetables, and timber, etc.
- Publication of Ecology of Indonesia Series covering The Ecology of Sumatra, The Ecology of Sulawesi, The Ecology of Java and Bali, The Ecology of Kalimantan, The Ecology of Nusa Tenggara and Maluku, and The Ecology of Indonesian Seas. Periplus Editions published these English-language series while Prenhallindo did the Indonesian-language series. Each volume provides detailed description on the vegetation, flora, fauna, biogeography and ecosystems in and their interaction with people in Indonesia.
- The establishment of Information Center for Nature Conservation (*Pusat Informasi Konservasi Alam-PIKA*) under the Directorate General of Forest and Nature Con-

servation, MoF; its main function is to manage data on conservation areas in Indonesia. However, its data and information system are still not accessible to lay people.

- LIPI, international institutions and MoF have published many field guides for identifying Indonesian flora and fauna; these important tools for conservation have so far not stimulated the public to use them in nature conservation (see list of *Seri Panduan Lapangan* under References in this document).
- The Biodiversity Information Center (BIC) located in the Widyasatwaloka Building of the Zoological section of the Center for Biological Research–LIPI serves as the specimen-based data center for biodiversity management in Indonesia. Most of its data can be accessed through this website: <http://bio.lipi.go.id> or <http://biolipi.bogor.net>.

In addition there is an effort to improve access to information on genetic resources and specimen collections for users. The Research Center for Biotechnology and Crop Genetic Resources (MoA) has developed a computerized database for food crops such as rice, maize and soybean. The Center for Research in Biology (LIPI) (see Box 4.4) has also developed a database with 240,000 entries for plant specimen and 144,000 entries for animal specimen (Priyono pers. comm.). Together with the KEHATI Forum this center is establishing the Clearing House for Indonesian Biodiversity (see Box 4.4).

In spite of those efforts, many of the initiatives have not functioned optimally and most Indonesian people still have very limited access to relevant information necessary to improve their awareness and knowledge about the importance of biodiversity in their lives.

#### Socio-economic development efforts

One of the main objectives of development is poverty alleviation and improving community welfare. One of the programs to achieve the above objective is social forestry where local community is involved in forest management, and at the same time they can also enjoy its benefits. Another effort is to recognize the traditional forest and forest utilization by communities through clear government policies. Articles 1 and 5 of Act No. 41/1999

on Forestry define that traditional forest is state forest located within the jurisdiction of traditional community (*masyarakat hukum adat*), as long as the community exists and their area is acknowledged as such. The Forestry Ministerial Decree No. 677/1998 also set a legal basis for community forestry. These policies have not been effectively implemented, nevertheless, their existence can be a starting point to deal with socio-economic problems faced by communities living in and around the forest (MoE 2002).

In the agricultural sector, Integrated Pest Management (IPM) program has been implemented through an IPM Farmer Field Schools (IPM-FFS) as an effort to address environmental and community empowerment issues. Through this program farmers are trained to conduct environmentally-friendly farming practices by applying minimum or even zero chemical input, and at the same time, they are trained to organize themselves. Some of the IPM-FFS graduates are now leading their own farmer's group and deliver their aspirations to the government. Others are pioneering organic farming movement and promoting the use of local varieties (MoE 2002).

#### The role of non-governmental sector

In addition to government policies and efforts, NGOs, the private sector and other community groups have also been active in activities as briefly described below.

National environmental NGOs began to emerge in the 1980s and they began to raise biodiversity issues in the 1990s. Their activities have mainly been in policy advocacy, community education and community facilitation around the protected areas. During the 1990s more NGOs were established, whose main interests and activities are focused on biodiversity. For example, the KEHATI Foundation (Yayasan KEHATI) was established in 1994 with the main task to provide funding support and technical assistance for biodiversity conservation activities. Since 2000 it has given the KEHATI Awards to NGOs, individuals, scientists and business people who have made exemplary achievement in their efforts to conserve biodiversity. Another example is the establishment of Indonesian Network in Traditional Wisdom (JKTI), which accommodates various groups interested in protecting and developing traditional knowledge and wisdom for biodiversity management.

## Box 4.4

### INITIATIVES ON DEVELOPING BIODIVERSITY INFORMATION SYSTEM

At the moment there are four important initiatives in the development of information system concerning biodiversity.

#### 1. Indonesian Biodiversity Information System – IBIS

IBIS was developed by the Center for Biological Research – LIPI through funding provided by the GEF – for the **Biodiversity Collections Project**, implemented from 1994 to 2001. This activity had two main components: systematic research in botany and zoology and the management of collections together with its information system.

The activity also included rehabilitation of the specimen collections at herbarium and museum, enhancement of human resources, improvement of research facilities and publication of field guides on Indonesian flora and fauna. The achievements of this project include:

1. Restoration of 255.000 botany collection specimens and rehabilitation of all of the zoological specimens, then transferred from Bogor to the new Widyasatwaloka museum in Cibinong;
2. Enhancement of storage facilities for collection in the two institutes to international standard by following international regulations concerning health and safety. The use of hazardous chemical substances for storage were stopped and substituted by drying and freezing. Airtight storage system is now used to protect specimens from insects and fungi;
3. Publication of 17 series of field guides, including 4 on plants, 11 on wild animals, 2 on collection protocols and 1 on the natural history of Sulawesi. These publications were made possible through a collaboration with several institutes such as BirdLife International, Wetlands International and World Conservation Society (see list of these field guides in the Reference section).
4. Provision of nine small grants for junior researchers to improve their skills in taxonomic research; 20 researchers in botany and zoology were sent to study abroad for their graduate degrees.

For the information system management, this project had developed “specimen based” database for the botanical and zoological collections, called Indonesian Biodiversity Information System (IBIS). This database consists of 240.000 and 144.000 entries for plants and animals, respectively. Information in this database includes scientific and common names, date and location of collection, notes on locality including its abundance, uses and endemism. Application of this database can generate a distribution map for each species with geographical information on its existence. This project ended in 2001, however, data entry is still ongoing with the support of government funding.

#### 2. The Biodiversity Information Center and Nature Conservation Information Center

In 1997 the Center of Research in Biology-LIPI started a *Biodiversity Conservation Project* with the funding from the Government of Japan through the Japan International Cooperation Agency (JICA). During Phase I (1997-2000) the fund was used to build the Widyasatwaloka Building, which hosts the zoological collection, and install a laboratory with research equipment, and set up a *Local Area Network*. The purpose was to set up the Biodiversity Information Center (BIC) and the Nature Conservation Information Center (NCIC). Phase II (2000-2003) was devoted to continuing and upgrading integrated IBIS database on botanical and zoological collections, field surveys, upgrading references and database on researchers, while the microbiological collection is still in being developed.

#### 3. National Biodiversity Information Network – NBIN

NBIN was also initiated by the Center of Research in Biology-LIPI. It is a network of member institutions to facilitate exchange of data and information on biodiversity. It has three main purposes: 1) to develop a mechanism for data and information exchange; 2) to improve its capability to respond to the needs of information users; and 3) to strengthen its independence in the long-term.



Funding for this activity was provided by loan from the Asian Development Bank (ADB) and the CRB-LIPI acts as the executing agency, integrated at the Marine and Coastal Resources Management Project (MCRMP), under the MMF.

NBIN started its activity in 2002 when its members that include government institutions, universities, research and non-governmental organizations signed the memorandum of understanding. Members are expected to be both providers and users of information on biodiversity.

Its main activities include: 1) establishing the National Committee for Standardization of Biological Data Exchange; 2) forging relationship with International Community on Biodiversity through the establishment of a Biodiversity Clearing House; 3) providing support to the NBIN association; 4) establishing the Biodiversity Marketing Enterprise (BIOME); and 5) developing User Group.

#### **4. Establishment of Clearing House Mechanism**

One of the recommendations from the National Biodiversity Forum, organized by a coalition of various institutions (the KEHATI Foundation, other NGOs, and the Ministry of Forestry) in 2001, was to start a process to establish a

Clearing House Mechanism (CHM) as mandated by the CBD. This forum asked the KEHATI Foundation, Konphalindo (as convener of the CHM discussion) and MoE as the national focal point for CBD to form a CHM Working Group. This working group worked for one year to prepare the foundations for CHM.

The Minister of Environment had issued a Decree No. 76/2002 concerning the establishment of CHM working group, valid until December 2002. The working group have had several meetings to formulate their work plan, division of labor and tried to develop a common understanding of CHM. It is hoped that the CHM will become a mechanism where various non-profit and profit oriented institutions "meet" and "exchange" information on biodiversity. One way to do this is by setting up a virtual "Biodiversity Information Center" using open source information technology.

The working group agreed to a mechanism with which the secretariat will act as portal those links users with the nodes through the website of the secretariat. Each node provides information on their organizational profile and relevant references and specific information on biodiversity that each possesses. To facilitate this activity, the working group has set up partnership with other organizations such as NBIN, PIKA and Warintek.

International NGOs had started their activities in Indonesia since the 1970s and in the last decade their activities have increased. These include Conservation International (CI), World Wide Fund (WWF), Wetlands International, The Nature Conservancy, WCS, Fauna & Flora International (FFI) and others that focus more on protected areas. In addition, Indonesia hosts two international research institutions: the Center for International Forestry Research (CIFOR) and International Center for Research on Agro-Forestry (ICRAF).

The conservation of biodiversity, in particular the preservation of genetic resources, has long been practiced by Indonesian community, through their traditional wisdom and indigenous technology as described in Chapters 2 and 3. And there are some individuals, who, on their own initiatives preserve genetic resources as described in the following two examples.

Suko, a farmer in Mangunsari Village, Sawangan Sub-district, Magelang District, Cen-

tral Java Province had succeeded in preserving 27 local rice varieties. He had conducted this activity quietly since 1989; following failed harvests during 1985-1987 in his village. A graduate from IPM-FFS program, he periodically rejuvenates his local seeds by planting them without any chemical inputs. About 15 local rice varieties out of the 27 rice varieties in his collection have survived to date. Suko has been successful not only in preserving local rice seeds, but also in proving that he can get benefits from their cultivation without chemical inputs. He has been getting quite good yields, and also the rice taste better.

Gito Wiyono, a farmer from Brongkol Village, Bantul District, Yogyakarta, collected 100 species of tubers. He has been doing this since 1995 in an effort to generate income, following his failed rice harvest due to pests attacks. Besides financial gain, he is now also interested in conserving the tubers because he is aware that many of the tuber species have become endangered, so he looks for some tubers from

## Box 4.5

### ILLEGAL LOGGING

Illegal logging is one of the complicated most serious problems related to sustainable forest management. There two main causes of illegal logging, as briefly described below:

#### **Forestry sector policy and discrepancy between market supply and demand**

The total annual production capacity of Indonesia's timber industry (sawnwood, plywood, pulp and paper, etc.) is about 60-65 million m<sup>3</sup>. Meanwhile the capacity of the production forest to provide logs (raw material) at a sustainable level is only 22 million m<sup>3</sup> annually or only one third of the production capacity (CIFOR 2002; NRM/EPIQ 2002). In fact, FWI (2002) states that the annual supply of logs from legal sources was only 12 million m<sup>3</sup>. This means there is a shortage of more than 50 million m<sup>3</sup>. This figure has not taken into account logs smuggled out of the country, estimated to be about 10 million m<sup>3</sup> per year and the annual domestic demand for timber for construction of about 25 million m<sup>3</sup> per year. So the total annual demand for log is 63 + 25 + 10 = 98 million m<sup>3</sup>, which means that there is a shortage of 86 million m<sup>3</sup> or of 88% of the total annual demand. Logs from illegal logging activities probably meet this shortage.

Illegal logging caused a financial loss of about Rp. 30.42 trillion. The World Bank estimates that the loss amounts to US\$ 600 million/year or equivalent to four times government budget allocation for the entire forestry sector (*The Indonesian Nature Conservation newsLetter* No. 6-6b, 9 Feb. 2003). Illegal harvesting of timber occurs in many forest locations, mainly in logged-over forest areas with good access roads. Conservation areas and Protection Forests have also been suffering from illegal logging activities, for example in national parks of Bukit Tiga Puluh, Kerinci Seblat, Gunung Leuser, Gunung Palung, Kutai, Tanjung Puting, Betung Karihun, Lore Lindu, Rawa Aopa Watumohai, and Tanjung Api Nature Reserves (FWI 2002; FIPA 2002).

The social and environmental losses resulting from illegal logging are more difficult to estimate in monetary terms. The function of protected areas as refuge for wild plants and animals and the environmental services they provide have definitely been degraded. For example, illegal logging in Kerinci Seblat National Park has re-

duced the habitat and food sources of Sumatran tiger (*Panthera tigris sumatrae*). Consequently some tigers often wonder into the villages around this park leading to conflict between them and villagers, often ending with the killing of the tigers.

#### **Poor law enforcement**

Some efforts have been undertaken to solve the problem of illegal logging. For example, the government issued Presidential Decree No. 5/2001 on Elimination of Illegal Logging and Illegal Trade in Forest Products. The government has also allocated a budget of Rp. 20 billion especially to combat illegal logging in 2001 (Tempo 2002). President Megawati herself declared that illegal logging must be stopped and to give "the forest time to breath". But the problem remains unsolved.

Several structural problems have been identified as constraints in addressing with illegal logging. For instance, there is no supervision over stolen timber processing on location in the forest. In the case of the Kerinci Seblat as described above, there are only 105 forest rangers that are responsible for an area of 1.48 million hectares. This number is far from adequate to combat illegal logging, even with the assistance of the local police and military forces. So far 22 people have been sentenced between 4 to 18 months in prison as a result of illegal logging activities. However, this punishment was still much lenient compared to the stipulation in Act No. 5/1990 (which states that the punishment for involvement in illegal logging in national parks and protected areas is 10 years imprisonment or a fine amounting to Rp. 200 million). In addition, no investigation has been conducted to expose where the illegally cut timber was sent to and who receives them. Clearly hundreds of cubic meter of logs are taken out from the park everyday, and it is suspected that powerful timber barons, errant government and police officials are involved and they pay local people to cut timber illegally. In many cases when forest rangers apprehend a truck full of illegal logs, some law enforcing officials, members of the regional House of Representatives and government officials would request the park management to release such an evidence of illegal logging (Jakarta Post 19 November 2002).

Third, transportation documents for logs or sawn timber is often fake, indicating that there is collusion between forestry officials, local government and illegal loggers. There is suspicion that illegal logging is supported or protected by high ranking civil, military and police officials at national and regional levels (FWI 2002).

Illegal logging in Kerinci Seblat is only one of the many cases of illegal logging in other conservation areas. Without drastic actions and strong political will and law enforcement improvement on the part of the government, illegal logging will continue to be profitable only to a few people while the devastating results are borne by the state, local communities and the environment.

the local market and then plant them on his field. Among his collection are arrow root (*Marantha arundinacea*), yam (*Colocasia esculanta*), suweg (*Amorphophallus campanulatus*), and sweet potatoes (*Ipomoea batatas*). Gito's field has served as a living laboratory for the sustainable management of tubers (Jakarta Post 5 September 2002).

The private or business sector's initiative in biodiversity management is still very limited. For most business people, biodiversity is regarded as resource to be exploited optimally. They have exploited biodiversity without taking into account the ability of the resources to regenerate. Worse still, their business practices have brought destructive impacts on natural habitats and depleted the resource base.

There is increasing pressure on the business sector to be more accountable for the environmental destruction they have brought about. However, there has been very little change towards a more sustainable use of biodiversity. Nevertheless, some companies have started to be more aware of this and began to make efforts to manage biodiversity more sustainably.

For example, one traditional medicine company in Indonesia is working to conserve medicinal plants by preserving the tradition to use herbal medicines based on local medicinal plants. They also establish nursery of medicinal plants and cultivate the rare species, as well as conduct researches that involve universities, research institutions and local community. In cultivating medicinal plants, they collaborate with community groups such as farmers' groups and their co-operative. In addition to minimizing waste from their production activity, they recycle and reuse them as fodder, growing media for mushroom and for organic fertilizers (Haryatmo pers. comm.).

Another example of the involvement of the private sector is the initiative of some oil companies, to prepare a strategy and action

plans for biodiversity management in their operation areas. Initiatives of this kind is, however, still very limited and many companies still have very low awareness about sustainable management of biodiversity.

## THE FLAWS IN BIODIVERSITY MANAGEMENT

Many factors influence biodiversity crisis, some of them are often interlinked. These factors can be classified into two groups: technical (human activities, choice of technology, and the natural) factors, and structural (policies, institutional, and law enforcement) factors.

### Technical factors

Some of the technical factors, which lead to biodiversity degradation and to some extent to extinction, are described below.

#### *Low level of awareness and understanding of biodiversity*

A large part of the Indonesian society still have low level of awareness and understanding of the important value of biodiversity for their daily life and as an asset for national development. Most of stakeholders only know the short-term productive value of certain resources. For example, for many coastal communities, marine and coastal resources are only useful for them as sources of food, and this is even limited to fish. They do not know other important functions and values. Another example is forest concession holders who see the forest only as a source of and disregard other environmental services that the forest provides. This ignorance, the low level of awareness and knowledge of biodiversity have often led to its destruction. This is more so as it's long-term values are overlooked and ignored. On the other hand, this lack of awareness is aggravated by the greed of those possessing the means to exploit biodiversity.

**Over-exploitation**

Natural resources are often exploited beyond the carrying capacity of the environment. For example, many timber species, particularly the dipterocarps, have been over-exploited. Large-scale exploitation of trees with diameter larger than 50 cm have occurred to meet the demands of timber from both foreign and domestic markets. Consequently, some economi-



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Figure 4.5. Degraded forest is often a result of excessive exploitation with little regards for the overall integrity of the environment.

cally important species are difficult to find in production forest now. Based on Remote Sensing data at the Ministry of Forestry, from 1997 to 1999 there had been excessive logging in most production forest. Out of the total 46.7 million hectares of production forest, only 41% remain intact; the medium to good logged-over area was only 29%; and the rest (30%) is completely degraded. Over-exploitation of timber and non-timber forest products has caused some species to become endangered, as described in Chapter 3.

Similar problems occur in Indonesian waters, where some fish species have also become endangered due to over-exploitation. For example, exploitation of panaeids shrimp has reached 60% of the maximum sustainable yield level.

**Illegal harvesting and trade**

A clear example of this is illegal logging, mainly in protected area as described in Box

4.1. In addition, illegal trade in both protected and unprotected flora and fauna species is thriving in Indonesia. Wild fauna species traded in black markets include Sumatran tiger, orangutan, birds of paradise, palm cockatoo, swallow-tail butterflies. According to one estimate the value of illegal trade in wildlife may reach Rp. 100 trillion annually (Kompas 15 February 2003). In the marine and coastal sector, illegal fishing and over-exploitation resources, mainly by marine fishery fleet, incur a loss of about US\$ 3-4 billion or around Rp. 36 trillion to this country (Kwik 2002; Kompas 15 February 2003).

**Natural habitat conversion**

It is estimated that about 20%-70% of Indonesia's natural habitat are degraded (BAPPENAS, 1993). This is mainly due to natural habitat conversion for development purposes. For example, mangrove forest degradation was mainly caused by conversion for the development of commercial fish ponds, agricultural land, settlement areas, harbor and industrial estates, a common occurrence in the coastal areas of eastern Sumatra, northern coast of Java and southern Sulawesi. The Fishery Intensification Program (Protekan) of 2003 targets 350,000 hectares of fish pond development, for which the majority of land will be acquired through mangrove forest conversion. The largest catastrophic natural habitat conversion was the One Million Hectare Peat Land Project (PLG) as described in Box 4.6.

Natural habitat reduction and loss often led to reduction of wildlife habitats. Consequently, some wild animals have been forced to come in close contact with villagers and their agriculture fields, becoming perilous pests, and triggering human-wildlife conflicts. For example, elephant herds in Sumatra often destroy small-holder plantations because their previous habitat was converted into plantations, limiting their home range to find food. In 2002, several tigers had strayed into the Basalam Hilir Village, near the city of Dumai, Riau, and reported to have four people, including a six-year-old child. The angry villagers tried to kill the captured tiger (Jakarta Post 3 January 2003).

**Monoculture approach in cultivation**

The dominant approach in plant cultivation and uses has been the monoculture system. It puts only one value above others, cul-



## Box 4.6

## THE TRAGEDY OF ONE MILLION HECTARES PEAT LAND

The One Million Hectares Peat Land Clearing (*Pembukaan Lahan Gambut or PLG*) project was established through the Presidential Instruction issued on June 5 1995, followed by Presidential Decree No. 82 issued on December 26, 1995. Its main objective is to convert peat swamp forest into rice fields to maintain the country's self-sufficiency in rice, achieved in 1984.

The PLG is located between Sampit and towards the eastern upstream part of the Kapuas River, South Barito and a small part of Palangkaraya Regency. This is a swamp area dominated by peat soil with the thickness of 0.5-2 m and sulphate acid soil (Kartamihardja 2002). The PLG had been implemented gradually since 1996 and about 30,000 hectares of rice fields were established before it was completely stopped in 1999 as the wave of reform was beginning to take effect (Kartamihardja 2002). The project also brought in Javanese transmigrants to manage the rice fields, which triggered new social impacts. The PLG was launched without proper prior environmental impact assessment and has caused more negative than positive environmental and social impacts, as described briefly below:

1. The irrigation/drainage channels were constructed by cutting across Kapuas and Barito Rivers and their tributaries and by removing peat layers. This resulted in the formation of pyrite which is toxic to fish and it lowers the pH value of the river water (making it more acidic). It caused the massive death of the local fish population (Kartamihardja 2002).
2. Clear cutting trees in the peat swamp forest reduce the capacity of the top soil to absorb water, increasing the frequency of floods during the rainy season. During the dry season, the dry forests are more vulnerable to fire, and the peat swamp forest fire in 1997 was a major contributor to the haze. Some economically rare and pro-

tected timber species such as ramin (*Gonystylus* spp.), jelutung (*Dyera costulata*), kempas (*Koompassia malaccensis*), ketiau (*Ganua motilayana*), and nyatoh (*Dichopsis elliptica*) have become threatened. In addition, the unique and globally important black water ecosystem, with the unique Manau tempahas fish (*Calamus manau*) is also threatened.

3. A study on the impact of PLG on fishery in Central Kalimantan (Kartamihardja and Koeshendrajana 2001) shows that the peat swamp forest clearing caused the *beje* and *tatah* (traditional fishing techniques) to become dry, resulting in a drastic decline of fish yield.

The local community has lost part their income from the collection of forest products such as medicinal plants and wild game and the unique plants used for making handicrafts. The project also violated the spatial arrangement already agreed among the traditional communities. Prior to the project, they have had their own land use zonation in which 3 km from the riverbank, which is the fertile area, was for cultivation. The area more than 3 km and up to 5 km from edge of the river was the traditional forest owned communally and may be used on the basis of adat or traditional agreement. With the implementation of the PLG project, the agreement could no longer be implemented.

The project left behind many other social and environmental problems such as the uncertain fate of the transmigrants after the project caused disasters and was stopped, or the indigenous communities who lost their land. Meanwhile rehabilitation of the PLG area remains at the level of discourse and is far from reality. Thus the PLG case reflects the misdirection of a policy in which a fragile ecosystem such as peat swamp forest was converted without proper technical and scientific consideration.

tivate one or a few species, applying one method. For example, timber has been given more attention compared to other non-timber forest products, despite the fact that non-timber products can be harvested and collected with much less damage to forest cover. It also brings more sustainable and varied benefits to the surrounding communities. People consider productive value as more important than the social and ecological values of biodiversity. Economically valuable species have been excessively exploited. Meanwhile, those species with poorly-understood economic values are ignored and left to extinction without any cultivation efforts. In the agricultural sector, only one or a few rice cultivars and horticultural crops are cultivated, as described in Chapter 3. Similarly, in the intensive fish pond development, only one or two species of shrimps are cultivated. In reality, this monoculture approach in cultivation has led to imbalances, which in turn threaten species existence, and even cause erosion in genetic diversity.

#### *Unequal distribution of benefits*

So far, only a very small portion of the Indonesian population enjoy the benefits from the use of biodiversity, while the cost of its degradation are borne by the majority of people. For example, up to 1999, forest harvesting and management have mostly been awarded to private and state-owned companies (BUMN). Meanwhile, local and traditional communities have increasingly lost their access to or control of these resources. Although there are new regulations that attempt to improve this situation, the fact remains that inequality in forest utilization prevails, mainly to the loss of traditional communities. The state, through its government, still has full authority to determine to whom and how forest resource exploitation rights are given and even to define validity of traditional community existence. In this case, traditional communities who have been managing their forest in a sustainable manner over time get the least benefit but experience the most serious impacts of forest degradation in the form of forest fire, soil erosion, and flood as well as through the lost of their livelihood. As a result, many traditional communities are now reluctant to sustainably manage their forest, because they feel that their efforts will only be beneficial to outsiders.

In the agricultural sector, farmers' effort to preserve local varieties of cultivated plant are rarely appreciated and their work is often regarded as not up to the standards and criteria of innovation (new, unique, stable and homogenous – further discussed in the **Current and Future Context** section) to get intellectual property rights protection. In fact, local varieties are precious germplasm for plant breeding purposes (Mulyoprawiro pers. comm.). In the marine and coastal sector, fishermen do not get fair and proportional profit compare to the middlemen and owners of the fishery fleet and trawls. This situation makes local communities reluctant to manage biodiversity wisely because they do not enjoy its maximum benefits.

#### *Introduction of exotic species and varieties*

As described in Chapter 3, the introductions of exotic species have often been done with little consideration for their ecological aspect and negative impacts on local species. Consequently their competition with local species often led to the loss of the latter. Similarly, high yielding crop varieties (HYVs) have led to reduction in the local rice varieties. In the future, such introduction would be in the form of genetically modified species, which will be discussed separately in the later section.

One of the many ways exotic species are introduced into Indonesian waters is through the disposal of ballast water. This water often contains various bacteria, viruses, algae, *polychaeta* worms, fish larvae, and mollusks. If these 'hitch-hikers' are released into public waters, they will influence the ecosystem balance. Another example is the introduction of the very persistent *Acacia nilotica* which kills other plant species and are now invading most of the savanna of Baluran National Park in East Java. It has been virtually impossible to control this species and none of the resident mammals in this park eats its thorny twigs and leaves. The population of wild-cow (*Banteng*), the mascot of this park, has been declining as its feeding ground is mostly covered by this bush.

#### *The use of harmful technology*

Certain technologies, techniques, and equipment can have detrimental effects on ecosystems. For example, explosives, chemicals and poisons as well as trawls are destructive fishing methods. The level of damage to ma-

rine and coastal ecosystem is often more serious than those caused by waves, as a 20 m wide shrimp trawl can scour one square kilometer sea bottom in one hour. Intensive agricultural technology, such as commonly used in the green revolution (for rice) and blue revolution (for shrimp farming) has changed the polyculture approach, which is rich in species and cultivars, with a homogenous monoculture approach.

#### **Pollution**

It occurs mainly in fresh and marine water bodies. Pollutant sources in sea water are oil spill from boats or disposal of wastes from inland industrial and domestic activities. Its impact can be direct, affecting various marine biota, and killing certain species, or indirect, whereby its impact can only be identified in humans and other living beings only several years later. For example, since 1981, waste water from intensive and semi-intensive shrimp ponds has been directly released into northern coast of Java waters. However, its impact was only felt later in the 1990s when the water quality in the area declined and consumption of fish from the polluted waters became detrimental to people's health.

#### **Failure to value natural resources**

Indonesian natural resource has not been appropriately valued according to its various importance; in other words, it has been regarded as cheap and undervalued commodity.

This is reflected in the very little or almost no fine and taxing system for polluters and those who the environment nor is there incentive for conservation and sustainable use of resources. In reality, natural resource destruction brings great losses. For example, it is estimated that the economic loss of destructive fishing activity using explosives will reach US\$ 570 million in the next 20 years, and the annual loss due to the use of poisonous substances for fishing is estimated to reach US\$ 46 million (Burke et al. 2002). Similarly, conservation effort is often considered as a cost to development, although its long-term benefits, even from the monetary aspect only, can be more sustainable as discussed in Chapter 2.

#### **Population pressure, poverty, and greed**

Indonesia is the fourth densely-populated country in the world, with total population of 203 million people in 2000; with a growth rate of 1.2% in 2000-2005. The high population number with low quality of human resource is a burden and can be a serious threat for biodiversity conservation (MoE 2002). Moreover, about 60% or 140 million Indonesians live in coastal areas and their livelihoods depend on marine and coastal biodiversity (Dahuri 2000). This heavy burden will bring more serious threat to marine and coastal resources. Similarly, since the most severe poverty exists in rural areas, the pressure on natural resources would also be serious, particularly if the current development pattern continues. However,



(Doc. CIFOR)

Figure 4.6. Forest fires causing a change in local, regional and global climate.

the level of destruction on biodiversity as a direct result of poverty is smaller compared to that of the greed of a few people exploiting natural resources only for economic profit. This greed has led excessive fishing in some coastal areas, excessive logging, both legal and illegal, the smuggling of protected flora and fauna, and natural habitat conversion in the name of economic development.

### *Climate change*

The global climate change resulting from, among others, warming of the world's climate has an impact on the hydrological system of the Earth. This in turn influences the structure and functions of natural ecosystems and, human lives. During the last decade the global warming has had an impact on agriculture, food security, human health and settlement, their living environment, including water resources and biodiversity. The obvious impact that can be seen recently is the more frequent flood and long dry seasons in many parts of the world, including Indonesia. The serious forest fire that happened in 1997/1998 was caused mainly by human activities, but was aggravated by the change in climate in the form of a prolonged drought. There has not been much research on the direct impact of climate change on biodiversity, but it is suspected to be significant.

### **Structural factors**

There are two underlying causes or structural problems in the management of biodiversity in Indonesia. First is the development paradigm adopted by the government in the 1970-1990s era, which had not accommodated the importance of sustainable management of biodiversity. The government viewed biodiversity as valuable resources to be liquidated in order to earn foreign exchange, accelerate economic growth and diversify the economic base (Deuvergne in Sunderlin and Resosudarmo 1997). In other words, biodiversity utilization was based on the principle of total exploitation, quick exploitation and sell raw materials. Therefore, the rate of biodiversity degradation and extinction has been increasing as the economy grows. Secondly, good governance, characterized by a clean and accountable, representative and democratic government has as yet to be established (MoE 2002). These two structural problems have triggered the following problems:

### *Exploitative, centralistic, sectoral and non-participatory policy*

The economic growth paradigm has led to centralized development and control over natural resources on the part of the government (Barber 1996). This centralistic approach, as formulated by stakeholders during the Natural Resource Management National Conference in 2000, is characterized by a disregard for the importance of sustainable biodiversity management, as demonstrated by:

1. **State's right to dominate natural resources management.** This domination was required to boost large scale commercial business and facilitate natural resource liquidation process. This was done by ignoring people's rights to manage the resources. Natural resource management became a closed and non-transparent process as it excluded community from decision-making mechanism (MoE 1997).
2. **Economic growth and sector based approaches.** The economic growth orientation has hampered a more integrated planning because each sector has to compete to earn foreign exchange fast. In practice, each sector will disregard policies or regulations of other sectors that may hamper them to achieve their economic growth target. This made inter-sectoral coordination in resource management a difficult process (MoE 2002), especially as the institution charged with coordination function, the MoE, is considered weaker than other ministries. Two important examples on conflict between the economic and conservation interests are the policy to convert peat swamps into rice fields which ended in a big failure; the other is the conflict between mining and conservation activities in protected areas, as described in Boxes 4.6 and 4.7.
3. **Inefficient management of natural resources.** This is due to uncertainty and overlapping of rights and authorities over natural resources. This is compounded by inconsistency between various legal instruments that cause high economic cost in the management and trigger short-term economic rent-seeking behavior.
4. **The use of extra judicial forces in conflict management.** The centralistic and sector-based approach in resource management that disregards community rights