



REPUBLIC OF INDONESIA



**THE FIFTH NATIONAL REPORT OF INDONESIA
TO
THE CONVENTION
ON BIOLOGICAL DIVERSITY**



MINISTRY OF ENVIRONMENT AND FORESTRY OF INDONESIA

2014

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Published by :

Deputy Minister of Environmental Degradation Control and Climate Change
Ministry of Environment and Forestry
Building A, 6th Floor
Jalan D.I. Panjaitan Kav.24, Jakarta Timur
Tel: +62-21-85904923
Fax: +62-21-85904923

THE FIFTH NATIONAL REPORT TO THE CONVENTION ON BIOLOGICAL DIVERSITY

Steering Committee:

Ir. Arief Yuwono, MA (Deputy Minister of Environmental Degradation Control and Climate Change, as the National Focal Point for the Convention on Biological Diversity)

Coordinator:

Ir. Antung Deddy Radiansyah, MP (Assistant Deputy for Biodiversity Conservation and Land Degradation Control)

Team:

DR. Suseno Amien, Dra. Vidya Sari Nalang, M.Sc, Lu'lu' Agustina, SP., M.Si.

Translator:

Dr. Teguh Triono

Reviewer:

Lijie Cai

Contributors:

Bambang Nooryanto, SP (KLH), Titi Astuti, SAP (KLH), Enu Wahyu, S.Sos., MM (KLH), Prof. Dr. Yohanes Purwanto (Program MAB Indonesia), Dr. Risna Rosniati (Kebun Raya), Dr. Titiek Setyawati (Puskonser, Kemhut), Ir. Tiur Sudiaty Silitonga, MS (BB Biogen), Bambang (P20 LIPI), Ria Saryanthi (Burung Indonesia), Retno Setyaningrum (WWF), Warsidi (PVT, Kementan), Renata Puji Sumedi (Yayasan Kehati), Basuki Rahmat (Yayasan Kehati), Mangara Silalahi (Hutan Harapan Management Unit), Dr. Rahman Kurniawan (UNHAS).

Cover Design:

Nararya Gunadharna, S. Hut.

Funding Support:

Global Environment Facility (GEF)/ United Nation Development Programme (UNDP)



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Reporting Party


Contracting Party	
NATIONAL FOCAL POINT	
Full name of the institution	Ministry of Environment and Forestry
Name and title of contract officer	Arief Yuwono Deputy Minister for Environmental Degradation Control and Climate Change
Mailing address	6th Floor, Building A, Jl. DI. Panjaitan Kav. 24 Kebon Nanas, Jakarta Timur 13410 Indonesia
Telephone	62-21-85904923
Fax	62-21-85904923
E-mail	ay.yuwono@gmail.com
CONTACT OFFICER FOR NATIONAL REPORT (IF DIFFERENT FROM ABOVE)	
Full name of the institution	Ministry of Environment and Forestry
Name and title of contract officer	Antung Deddy Radiansyah Assistant Deputy for Biodiversity and Land Degradation Control
Mailing address	4th Floor, Building B, Jl. DI. Panjaitan Kav. 24 Kebon Nanas, Jakarta Timur 13410 Indonesia
Telephone	62-21-85905770
Fax	62-21-85905770
E-mail	balaikliringkehati@yahoo.co.id
SUBMISSION	
Signature of officer responsible for submitting national report	
Date of submission	February 2015

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LIST OF ABBREVIATIONS

AMAN	: Peoples Alliance of the Archipelago
AMDAL	: Environmental Impact Assessment
ASEAN	: <i>The Association of Southeast Asia Nations</i>
BAPI	: <i>Biodiversity Action Plan for Indonesia</i>
BAPPENAS	: National Planning and Development Agency
BMKG	: National Meteorology, Climatology and Geophysics Agency
B POM	: Drug and Food Monitoring Agency
BPS	: Statistics Indonesia
BT	: East Longitude
BUMN	: State Owned Enterprise
CBD	: <i>Convention on Biological Diversity</i>
CH	: Rainwater level
CHM	: <i>Clearing house mechanism</i>
CI	: <i>Conservation International</i>
COP	: <i>Conference of the Parties</i>
CSR	: Corporate Social Responsibilities
DAS	: Watershed
Dephut	: Ministry of Forestry
Dihidros-TNI AL	: Indonesian Navy Hydrological Division
DJF	: December January February (west monsoon)
DKK	: <i>et al.</i>
DKP	: Ministry of Marine and Fisheries
DPRD	: Local/provincial parliament
ESDM	: Energy and Mineral resources
FAO	: <i>Food and Agriculture Organization</i>
FFI	: <i>Fauna and Flora International</i>
GEF	: <i>Global Environment Facility</i>
IBA	: <i>Important Bird Area</i>
IBSAP	: <i>Indonesian Biodiversity Strategic and Action Plan</i>
IPCC	: <i>International Panel on Climate Change</i>
IPCC-AR4	: <i>Intergovernmental Panel on Climate Change Assessment Report 4</i>
IPTEK	: Knowledge/Science and technology

ISBN	: <i>International Standard Book Number</i>
ISPO	: <i>Indonesian Sustainable Palm Oil</i>
ITPGRFA	: <i>International Treaty on Plant Genetic Resources for Food and Agricultural</i>
IUU	: <i>Illegal Fishing, Unreported and Unregulated Fishing</i>
JAI	: Invasive Alien Species
JJA	: June July August (East Monsoon)
KEHATI	: Biodiversity
KKH	: Biodiversity Conservation
KPAI	: Nature-Care Indonesia
KPH	: Forest Management unit
KPHL	: Protected Forest Management Unit
KPL	: Forest Management Unit
KSA	: Nature Protection Area
KSDAHE	: Bio-Natural Resources and Ecosystem Conservation
KUKP	: Office of President special envoy
LEISA	: <i>Low external input sustainable agricultural</i>
LIPI	: Indonesian Institute of sciences
LS	: South Latitude
LSM	: Non-Governmental Organization
LU	: North Latitude
MAB	: <i>Man and Biosphere</i>
MDGs	: <i>Millennium Development Goals</i>
MOF	: <i>Ministry of Forestry (now Forestry and Estate Crops – MoFEC)</i>
MTA	: <i>Material Transfer Agreement</i>
NFP CBD	: <i>National Focal Points Convention on Biological Diversity.</i>
NOAA	: National Oceanic and Atmospheric Administration. USA
NSDH	: Forest Resources Balance
P20	: Research Center for Oceanography
P30-LIPI	: Research and Development Center for Oceanology
PAKLIM	: Policy Advice for Environmental and Climate Change
PBB	: United Nations
PES	: <i>payment for environmental services</i>
pH	: <i>potential of Hydrogen</i>
PHBM	: Community Collaborative Forest Management
PHKA	: Forest Protection and Nature Conservation
PHL	: Sustainable Forest Management
PNPM	: National Program for Community Empowerment
PPN	: Value added tax
PSDG	: Management of Genetic resources
PSDKP-KKP	: Marine and Fisheries Monitoring

PU	: Public Work
PVT	: Plant Variety Protection
RAD	: Local/Provincial Action Plan
RAN-API	: National Climate Change Adaptation Action Plan
RENSTRA	: Strategic Plan
RHL	: Forest and Land Rehabilitation
RIP	: Management Master Plan
RKPD	: Local/Provincial Work Plan
RKTN	: National Forest Plan
RKTP	: Provincial Forest Plan
RPJM	: Medium-term Development Plan
RPJP	: Long-term Development Plan
RSPO	: <i>Roundtable on Sustainable Palm Oil</i>
SDG	: Genetic resources
SDM	: Human resources
SEEA	: System of Economic and Environmental Accounting
Sekwilda	: Regional Secretary Office
SKPD	: District Working Unit
SLHI	: Environmental Status of Indonesia
SM	: Wildlife Sanctuary
TEEB	: The Economics of Ecosystems and Biodiversity
TN	: National Park
TPL	: Sea surface temperature
UNCBD	: <i>United Nations Convention on Biological Diversity</i>
UNDP	: <i>United Nation Development Program</i>
UNESCO	: <i>United Nations Educational, Scientific, and Cultural Organization</i>
UNIKU	: University of Kuningan
UPHHK	: Utilization of Timber ForestProduct
UPT	: Technical Implementation Unit
UU	: Law
WALHI	: Friends of the Earth Indonesia
WCS	: <i>Wildlife Conservation Society</i>
WPP-NRI.	: National Fisheries Management Area Republic of Indonesia
WWF	: <i>World Wide Fund for Nature</i>

EXECUTIVE SUMMARY

The 5th National Biodiversity Report is a report on Indonesia's national implementation of the Convention on Biological Diversity articles and work programs. An overview on Status, Trend, and Threats of Biodiversity is presented in Chapter 1. In this Chapter, Indonesia's biodiversity condition is reported. The documented species diversity comprised of 1,500 species of algae, 80,000 fungal species, 595 species of lichens, 2,197 fern species, and 30,000 – 40,000 of spermatophyte species, accounting for 15.5% to the world flora. Additionally, 8,157 fauna species of mammal, bird, reptile, fish and 1,900 butterfly species accounting for the 10% species on the earth have also been documented.

The number of species that utilized for food and agriculture has increased with respect to total species reported in the 4th National Biodiversity Report. Similar situation occurred in the number of species for animal farming. Under the limited resources to covers Indonesia's 3.25 million km² of water areas and over 2.55 million km² of Economic Exclusive Zone with 80,791 km coastal line of total 7.81 million km² of the Republic of Indonesia's territory, the number of documented fauna reached 5,319 species. Documented data on mangrove plant, algae and sea grasses have shown 6,396 species. Of those 6,396 species, total of 1,077 algae and marine flora were found in Indonesia's waters. The main threats to biodiversity are: (i) habitat change; (ii) influx of Invasive Alien Species; (iii) pollution; (iv) over exploitation; and (v) climate change. The threats must be eliminated through executable action plans and strategy.

Indonesia is in the process of updating Indonesia Biodiversity Strategic and Action Plan (IBSAP) 2015-2020. The description of IBSAP content is presented in Chapter II. Based on the 2012 review on IBSAP implementation, the National Development and Planning Agency (BAPPENAS) showed that at least eight components influenced biodiversity policy development and activity. Those components are: (i) inadequate local/provincial insight on the function of biodiversity; (ii) biodiversity issue has not yet become the main issue; (iii) insufficient political support; (iv) inadequate human capacity with biodiversity issue recognition; (v) lack of synergy of biodiversity programs; (vi) less-publicized biodiversity policy; (vii) the absence of monitoring and evaluation institution at local level; and (viii) lack of stakeholders participation. Progress towards Global Strategy for Plant Conservation Target achievement and other efforts of Indonesia for the implementation of IBSAP are correspondingly reported in this Chapter II.

Following the previous Chapters, Chapter III reported on the progress towards the achievement of 2011-2020 (*Aichi Targets*) Global Biodiversity Targets and the progress towards the achievement the MDGs targets relevant to biodiversity. Numerous efforts have been executed to accomplish Aichi Targets, amongst others was, updating IBSAP 2015-2020 for Target 2; identification of invasive alien species increased concurrently to the development of regulation and national action plan to achieve Target 9; anthropogenic pressure on coral reef showed the increasing number of coral reefs in good and fair conditions and the declined number of poor coral reef condition from 1993 to 2013 as the achievement of Target 10; Population of fourteen species of 25 endangered species prioritized to increase 3% by 2014 following Target 12; the raised number

of local crop and cattle genetic resources to minimize genetic erosion and safeguarded genetic diversity as mandated in Target 13; the ratification of the Nagoya Protocol in 8 May 2013 was a significant milestone for Indonesia in achieving Target 16 as well as marked the implementation of Convention on Biological Diversity in Indonesia; the utilization of traditional knowledge, innovation and local and indigenous people practices relevant to conservation increased in line with biodiversity development for supporting cultural use, sustainable source of livelihood/income, local food security and medical treatment and financial resource effectively mobilized and incorporated into the ongoing development of updated IBSAP 2015-2020.

The achievement of *Millennium Development Goals* based on designated indicator reflected in a variety of results. Implementation of the Convention on Biological Diversity in Indonesia requires support from various stakeholders; strengthening communication and coordination among stakeholders especially at local level; mechanism or regulation for ensuring the programs; contribution from sector action plan; upscale monitoring and integrated data and valuable information for developing policy as the foundation in the implementation of the Convention.



REVIEW OF STATUS, TRENDS, THREATS, AND CONSERVATION OF BIODIVERSITY

1. Introduction

As stated in the preamble of the Convention on Biological Diversity, Biological Diversity or Biodiversity and its components have intrinsic, ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values. In addition, the conservation of biodiversity is a common interest of humankind. Indonesia has ratified the United Nations Convention on Biological Diversity (UNCBD) into Law No. 5 in 1994. Not only was the Convention ratified to achieve three main objectives, namely (i) the conservation of biological diversity, (ii) sustainable use of its components, and (iii) fair and equitable sharing of benefits arising from use of genetic resources, but also it is in line with Indonesia's long-term development plans.

Indonesia is a tropical archipelago with 13,466 verified islands out of 17,499 islands, with a land area of 2.01 million km² and a water area of about 5.8 million km² consisting of 3.25 million km² of Indonesian waters and 2.55 million km² of Exclusive Economic Zone and an 80,791 km long coastline (Dihidros-Indonesian Navy 2012, in the Marine and Fisheries Figures 2013). Indonesia is also flanked by the Pacific Ocean and the Indian Ocean which makes Indonesia rich in biodiversity and is also known as a megadiversity country. Indonesia's biodiversity includes the diversity of living things with their variety of resources, in terrestrial, marine and aquatic ecosystems as well as their ecological complexity (LIPI, 2014). Broecker (1991) stated that Indonesia's position between two oceans namely the Pacific Ocean and Indian Ocean at 6°N – 11°S and 95°E – 141°E is very important for the global thermohaline circulation. The species and genetic diversity are also believed to be very high if based on the ecosystem diversity ranging from Indonesia's area from the east to west, at sea and on land as well as on each island. Indonesia is also an archipelagic country with a complex topography that is believed to have the richest marine biodiversity in the world (Sasai et al., 2011). However, Indonesia's high biodiversity and strategic position needs to be balanced with its preservation and utilization to achieve UNCBD's goals for Indonesia.

The important value of Indonesia's biodiversity can be viewed from various aspects. It can be values of existence, services, heritage, options, consumption, production, and socio-cultural. Research on estimating the economic value of biodiversity is still limited. An example is the Economic Analysis of Mangrove Management in Merawang, Bangka Regency in 2008 that can be broken down into several assessment components, namely Mangrove Seed Value, Firewood Value, Crab Value, Shrimp Farming Value, Pond Fish Value, Milkfish with Shrimp Value, Milkfish Ponds Value, Breaking Wave Value, Natural Food Providers Value, Biodiversity Value, and Existence Value of the mangrove forest itself. Thus the economic value of biodiversity will continue to increase in line with the needs, and even continues to be very valuable when there is damage or loss of a region.

Indonesian biodiversity has been utilized to support livelihoods, especially for food, health and energy, and basic industrial materials that ultimately aim to meet human necessities. However, the number of

biological diversities utilized to meet those needs is still very small compared to the number of biodiversity species that have not been studied yet. The limited number of researchers, resources and institutional capacity are constraints faced in researching and utilizing the biodiversity of Indonesia. Ecosystem, which is one of the components of biodiversity, can serve as a provider of water, clean air, aesthetics and culture. In line with a 50% world population growth, and Indonesia’s estimated population increase by 68% by 2050 (FAO, 2010), the availability of food needs to be increased two-fold, meaning conservation efforts and utilization of food sources must be continued to meet those needs. In principle, efforts for conservation, utilization and preservation of biodiversity aim to maintain the integrity of the ecosystem and provide added value to the importance of biodiversity through the application of traditional and modern knowledge.

1.1. Status and Trends of Biodiversity

Species diversity has been reported in the 4th National Biodiversity Report, especially the number of plant species that positions Indonesia in the world big five. Of this species, 55% are endemic plants. In the diversity of fauna, about 12% of the world mammals (515 species) occur in Indonesia. Recent status of Indonesia biodiversity (LIPI, 2014) showed that the number of documented species diversity consisted of 1,500 species of algae, sporophytic plant such as 80,000 species of fungi, 595 species lichen, 2,197 species fern, and spermatophytes plant 30,000 – 40,000 species. These numbers contribute to 15,5% of total world flora, meanwhile fauna consists of 8157 species of vertebrates; mammal, bird, reptile and amphibian and fish; and invertebrates, 1900 species of butterflies that contributes to 10 % of the world species.

Indonesia position with geological uniqueness sets off high endemism on flora, fauna and microbe. The number of endemic fauna comprises of 270 mammal species, 386 bird species, 328 reptile species, 204 amphibian species and 280 fish species. In addition, species diversity in Indonesia triggers off very high genetic resources. Table 1 shows the number of accession, species and collector institutions for genetic resources in food and agriculture sector.

Table 1. Number of Accessions, Species and Collector Institutions of the Genetic Resources in Food and Agriculture Sector

Genetic Resources	Number of accession, species		Collector
	Accession	Species	
Food crop	11435	20	Institute for Biotechnology and Genetics, Indonesian Beans and Tuber Research Institute, Indonesian Cereal Research Institute
Horticulture	2065	32	Indonesian Fruit Research Institute, Indonesian Citrus and Subtropical Fruits Research Institute, Indonesian Vegetable Research Institute
Plantation	7714	20	Plantation, Industrial Crop
Cattle	61	6	Research and Development Center for Animal Husbandry
Microbe	2669		Food, Plantation, Veteriner, Horticulture, Animal Husbandry

Source: Haryono (Agricultural Research and Development Agency, Ministry of Agriculture, 2013)

Instead of high genetic diversity for plant, Indonesia possesses high number of genetic resources for cattle and poultry.

Table 2. Number of Species and Accession for Animal Husbandry Sector

Species	Number of Species Accession	Total Accession
Cow	10	4,482,843
Buffalo	8	304 ,632
Sheep	11	14,506,700
Goat	11	11,000,020
Chicken	13	17,702
Duck	8	4,247,242

Source: Haryono (Agricultural Research and Development Agency, Ministry of Agriculture, 2013)

Indonesia also possesses high diversity and complexity in Ecosystem, that are linked and interdependent. The amazing ecosystem diversity of Indonesia discovered form about 74 types of ecosystems that galvanizing a very complex formation one to another. This ecosystem variation shows a rich species of flora and fauna, amalgamated from diversity of flora and fauna species in each of the ecosystems (Kartawinata 2013). For the maritime country, Indonesia owns sea area as the media for living organism that 70% wider than total terrestrial area (30%) (LIPI, 2014).

1.2. Biodiversity of Marine Ecosystem in Indonesia

Indonesia has a water area of 3.25 million km² with 2.55 million km² of Exclusive Economic Zone an 80,791 km long coastline out of a total territory of 7.81 million km² (Dihydros-AL 2012, the Marine & Fisheries in Figures 2013). In 2010, Indonesia's population reached more than 237 million people, of which 80% live in coastal areas. Therefore, biodiversity in the waters is vital to be delivered in this report. LIPI (2014) has made important terminologies concerning marine waters: two important parts of marine waters, the deep sea and shallow sea.

The deep sea is part of the marine environment that lies below the depth illuminatable by sunlight in the open sea and deeper than the continental shelf (> 200m). Organisms that live in marine waters can survive in very low oxygen levels, high hydrostatic pressure, low water temperature, and dark environments. There are only species of consumers and decomposers, and producers do not exist as sunlight is unable to penetrate in this area. One of protected species found in Indonesia deep sea is Coelacanth (*Latimeria manadoensis*) so-called King fish.

The shallow sea covers an open coastal area which is not affected by a large river or is located between steep rock walls. The shallow sea ecosystems are located along the coast during high tide, generally dominated by various types of algae and plants or grass.

Coral reef is a marine ecosystem that is occupied by types of coral such as hermatypic, stony coral or ahermatypic, soft coral and gorgonian. In Indonesia, coral reef categorizes into four types; fringing reef/shore reefs, barrier reef, patch reef and atoll. Coral reef ecosystem is very important for marine biota

hatching and serves as habitat for reef associated marine biota such as coral fish, shrimp, mollusca and various marine invertebrates. Indonesia owns high diversity of coral reef that comprises about 590 species (82 genus) stony coral, 210 species soft coral and 350 species gorgonian (Hutomo & Moosa 2005).

Additionally, about 2,057 fauna species live in coral reef in Indonesia marine area including 97 endemic species. *Crustacean* group comprises about 1,400 species of Brachyura. The mollusc group records 1,500 species gastropod (oyster/snail) and 100 species of bivalvia (clamp). The *Echinodermata* group is recorded 91 species of crinoids (sea lilies), 87 asteroids (sea star), and 142 species of holothurians (sea cucumber). Sponges (demospongia) consist of 830 species. There are also 30 species of sea mammals; whale, dolphin, and dugong as well as seven species of sea reptile; turtle and crocodile. Seagrass (macro algae) has 196 species green algae, 134 species brown algae, and 452 species of red algae. There are many un-documented marine flora and fauna in the presented data (Hutomo & Moosa 2005 in Kekinian Kehati, 2014). Table 3 describes number of location and condition of coral reef in Indonesia based on area for period of time 2008-2013.

Table 3. Number of location and condition of coral reef in Indonesia based on area 2008-2013

Area	Number of location/ condition		Year				
			2008	2009	2010	2011	2012
East	Number of location		272	290	297	290	321
	Condition (%)	Very good	5,88	5,52	5,39	5,52	4,98
		Good	17,28	19,31	19,87	19,31	21,18
		Fair	34,19	34,48	34,68	34,48	34,58
		Bad	42,65	40,69	40,07	40,69	39,25
Indonesia	Number of location		985	1008	1048	1008	1133
	Condition (%)	Very good	5.48	5.56	5,44	5,56	5,3
		Good	25.48	25.89	26,72	25,89	27,18
		Fair	37.06	37.1	37,21	37,1	37,25
		Bad	31.98	31.45	30,82	31,45	30,45

Source: *Marine and Fisheries in Number 2013*

Note: Very Good = 75 -100% life coral coverage
 Good = 50-74% life coral coverage
 Fair = 25-49% life coral coverage
 Bad = 0-24% life coral coverage

In addition to coral reef ecosystem, Indonesia also possesses wide seagrasses ecosystem area. According to Kuriandewa et al. 2003 in Kekinian Kehati, 2014 stated that Indonesia memiliki sekitar 31,000 km² seagrasses area. About 13 plant species are found in this seagrasses ecosystem, although these species are difficult to be found in a single place. There are many biotas found in association with seagrass ecosystem such as sea cucumber, sea urchin, mantis, oyster, sea snail, sea star, and many fish species.

In the diversity of marine fauna, fish group has the highest number with 3,476 species of 241 families followed by echinodermata with 557 species, then Polychaeta, Coral and Crustacea. Indonesia's marine area hosts about 1,700 species (Stomatophod/shrimp/Mantis, Brachyura/Crab, and Anomura/Hermit Crab) (Table 4.). Examples of sharks and ray fish are commonly caught in Indonesian waters are Hammer shark (*Zygaena sp*); capingshark (*Galeorhynchus australis*); porbeagle shark (*Lamna nasus*); thresher shark (*Alopias vulpinus*) and blue shark (*Prionace glauca*).

Table 4. Number of Marine Fauna found in Indonesia Marine area

Biota	Famili	Species
Echinodermata	60	557
Polychaeta	44	527
Crustacea (shrimp and crab)		309
Coral	17	450
Fish	241	3,476
Total		5,319

Source: Research Center for Biology - LIPI (2014)

From Table 4 above, if elaborated further, species belonging to the group Echinoderms include starfish (*Linckia spp.*), Sea urchin (*Diadema spp.*), Sea cucumber (*Holothuria spp.*), Sea lilies (*Lamprometra sp.*), brittle stars (*Ophiothrix spp.*), a thousand crowns or crown of thorns (*Acanthaster spp.*) (Lilley 1999). The most number of species for Echinoderms is the Ophiuroidea Class consisting of 142 species (11 families), while the least number is found for the Echinoidea Class (84 species from 21 families).

The diversity of Indonesian marine crustacean species recorded to date are 5 families with a number of species most owned by the mantis shrimp (*Stomatopoda*) with 118 species and least owned by the Syllaridae family with only 2 species. Several species of crustaceans have an important economic value, such as “lobster” and shrimp. The presence of crustaceans in natural populations has declined, some even close to extinction and must be protected, for example the mimi (*Tachypleus gigas*). According to Moosa (1984), Moosa & Aswandy (1984) Indonesian waters own six known species of shrimps with an economic value.

The number of bristleworms (*Polychaeta*) species recorded is mostly for the Terebellidae family (70 species), followed by Plynoidea family (67 species) and Nelerididae family (57 species). While other families have a number of species less than 35, even with 1 specie. In Indonesia, sponges have a very high diversity. Across the Indonesian waters it is estimated that there are at least 850 species of sponges (Crews 2013). In West Sulawesi there are at least 151 species included in 68 genera, 37 families.

According to a coral expert (Suharsono, P20 LIPI) the number of identified coral species in Indonesian waters is more than 70 species. Mollusks according Marwoto & Sinthosari (1999) are divided into 7 classes: Monoplacophora, Polyplacophora, Aplacophora, Gastropoda, Pelecypoda / Bivalvia, Scaphopoda, and cephalopods. Several species of marine mollusks in Indonesia have economic value for cultivation.

Algal biodiversity by color can be divided into 3 groups: (1) Chlorophyta, namely algae that have green pigment, such as: *Halimeda sp.*, *Caulerpa sp.* and *Ulva sp.* (2) Phaeophyta, namely algae that have brown pigment, such as: *Padina spp.*, *Sargassum spp.* (3) Rhodophyta, namely algae that have red pigments, such as: *Gracilaria spp.*, *Euचेuma spp.*, *Gelidium spp.* and *Hypnea spp.* (Pratiwi 2006). The number of Algae that can be found in Indonesian waters can be seen in Table 5.

Table 5. Number of Algae and Marine Flora discover in Indonesian Waters

Biota	Family	Species
Seagrass	2	13
Algae	88	981
Mangrove	20	48
Mangrove Associate	25	35
Total	135	1,077

Source: Research Center for Biology - LIPI (2014)

Marine flora that are often found in Indonesian coastal waters is sea grass. Seagrass covers 1,868,890.08 km² of area (Carter 2008 in Dermawan, MOE, 2010). There are only 13 known species of seagrass in Indonesia, including *Halophila spinulosa*, *H. decipiens*, *H. minor*, *H. ovalis*, *H. sulawesii*, *Enhalus acoroide*, *Thalassia hemprichii*, *Cymodocea serrulata*, *C. rotundata*, *Halodule pinifolia*, *H. uninervis*, *Syringodium isoetifolium* and *Ruppia maritima* (Romimohtarto and Yuwana, 1999). Flowering plants other than seagrass are mangroves. Various species of mangroves include *Avicennia spp.*, *Bruguiera spp.*, *Sonneratia spp.*, *Ceriops spp.* and *Rhizophora spp.* (Romimohtarto & Yuwana, 1999).

Marine waters is a good habitat for microbes because os liter of water contained 108-9 bacterial cells, estimated to represent about 20,000 species of bacteria (Venter et al., 2004). Meanwhile the number of Archaea species is estimated at 38,000 species per liter of seawater (Huber et al., 2007). A number of genera of bacteria is found in the waters around the Sangihe Talaud including *Alteromonas*, *Pseudomonas*, *Pseudoalteromonas*, *Shewanella*, *Vibrio* and other bacteria that can not be cultured (Patantis et al., 2012). Research results show that there are 14 classes of sea microbes around the Sangihe Talaud, which are *Acetobacteraceae*, *Actinobacteria*, α -*Proteobacteria*, *bacilli*, *Bacteroidetes*, β -*Proteobacteria*, *Chlorobi*, *Chroococcales*, *Clostridia*, δ -*Proteobacteria*, *Erysipelotrichia*, γ -*Proteobacteria*, and *Zetaproteobacteria Synergistia*. Bacteria that can not be identified and can not be cultured was also found. Referring to the results, it can be estimated that microbial biodiversity in Indonesia is very high.

Indonesia's vast waters area is a challenge for collecting and recording marine biological resources owned by Indonesia. The limited number of marine taxonomy experts is also an obstacle, thus the available number of recorded fauna resources in Indonesia is only around 5,319 new species. When combined with plant data such as mangrove, algae and seagrass, the number is around 6,396 species (LIPI, 2014). Indonesia's latest biological diversity is presented in *Kekinian Kehati* book which is issued by the Indonesian Institute of Sciences in 2014. This book is a reference for the writing of the 5th National Biodiversity Report.

1.3 Important Ecosystems in Indonesia

1.3.1 Karst

As reported in previous reports, Indonesia has an estimated 154,000 km² Karst area that is scattered among the islands of the archipelago (Surono, 1999). Several world renowned Karst areas include Maros (South Sulawesi), Bukit Barisan (Sumatra), Gunungsewu (DIY - Central Java - East Java), Sangkulirang (East Kalimantan), and Lorentz (Papua). Biodiversity in Karst areas shows a high diversity. This is indicated by differences in the characteristics of the Karsts. Karsts located on the earth's surface are called exokarst and those located under the surface are called endokarst (Suhardjono, 2012). Table 6 shows Karst characteristics with the amount of vegetation, habitat variation, and biodiversity contained in it. Karst areas also contain a reservoir of water. In addition, Karst areas contain natural resources such as limestone, utilized for the cement industry. Mining of these materials needs to be balanced with preservation and conservation efforts.

Tabel 6. Comparison of Environmental Conditions Outside and Inside Caves

Component	Exokarst	Endokarst
Light	Full	There are light zoning though not visible. Dim, dark, deep, stagnant
Humidity	Fluctuative	Nearly constant or stable
Temperature	Fluctuative	Nearly constant or stable
Food source	Abundant	Limited, need to be efficient, abundance limited to guano heap
Guano	None	Available, is a specific ecosystem, abundant in certain caves, can be harvested for fertilizer. Habitat for certain adapted taxons.
Vegetation	Abundant	Almost non existing, except near the mouth of the cave and the window (horizontal cave); along the walls of caves (vertical caves)
Habitat	High Variation	Low Variation
Fauna diversity	All groups, Low-High	All taxons exist, but are limited to the types that have been able to adapt to the unique ecosystem
Fauna Population	Abundant	Limited, abundant in certain cave conditions
Reproduction	Normal - High	Low reproduction, a longer life span

Source: Suhardjono et al. (2012)

Karst landscape area has been regulated by the Minister of Energy and Mineral Resources Regulation No. 17 Year 2012, aiming to protect, preserve and control the utilization of Karst Landscape area. Examples of Karst Landscape area is Luweng Jaran Cave Region and Gunung Sewu Karst. Gunung Sewu Karst very complex caving system with its long caves. One of the longest cave is Luweng Jaran with more than 11 miles of tunneling (Stoddard, 1986). The distribution of karst areas in Indonesia still refer to the map presented in the 4th National Biodiversity Report referring to Surono et al. (1999). Biodiversity estimation in the Karst region consists of one species of land jellyfish, 50 land fish species (1 new species), 90 species of bats (2 rare), 120 species of birds (30 endemic), 200 species of insects (4 new species), 400 vegetation (Pindi, 2011).

1.3.2 Mangrove

In the 4th National Biodiversity Report, it is reported that the potential area of mangrove forests in Indonesia is 9,204,840.32 hectares. Looking at its conditions, 2,548,209.42 hectares (27%) are in good conditions, 4,510,456.61 hectares (48%) are in poor conditions and 2,146,174.29 ha (23%) are in damaged conditions. However, the Directorate General of Land Rehabilitation and Social Forestry has planned efforts for Forest and Land Rehabilitation (RHL). Actual Implementation Recapitulation of RHL from 2010 to 2013 and the 2014 Plan can be seen in Table 7.

Mangrove is one of the most unique important ecosystems, with a recorded of at least 48 tree species, 5 shrubs species, 9 herbaceous species, 2 parasite species, 50 gastropods species, 5 bivalves species, 34 crustacea species, 30 insect species (Kusmana, 2013) and 35 mangrove associated plants species (Oceanography, 2013) found in the mangrove ecosystem. Indonesia has set the mangrove areas as a wildlife conservation area. In Indonesia there are 17 mangrove protection areas to protect certain wildlife species (Table 8) (Kusmana, 2013). The loss of mangrove ecosystems has disrupted populations of wildlife species including bats, thus impacting on the decrease in fruit yields pollinated by bats in Southeast Asia (Eardley, 2013).

In Indonesia, the diversity of mangrove species differ from one island to another. Of the 202 known species of mangrove, 166 species are found in Java, 157 species in Sumatra, 150 species in Kalimantan, 142 species in Papua, 135 species in Sulawesi, 133 species in Maluku and 120 species in the Lesser Sunda Islands. Specifically for Java, although it has the highest diversity of species, most of the species recorded are weed species such as *Chenopodiaceae*, *Cyperaceae*, and *Poaceae*.

Table 7. Actual Implementation Recapitulation of RHL from (2010 – 2013) and the 2014 Plan

No.	Activity	2010	2011	2012	2013	2014	Number
		Realization	Realization	Realization	Realization	Target	Total
1	Rehabilitation of Conservation / Protected Forest (KPL)	100,738	100,743	100,986	105,656	40,500	448,623
					17,857		17,857
2							
3	City Forest	1,173	1,395	1,032	1,036	1,362	5,998
4	Rehabilitation of Mangrove/Coastal Forest	-	10,401	8,871	12,403		31,675
5	Rehabilitation of Critical Land	51,504	400,608	398,629	557,517	776,789	2,185,047
	Total	153,415	513,147	509,518	676,612	818,651	2,689,047
	Actual Cumulative	153,415	666,562	1,176,080	1,852,692	2,689,200	
Strategic Plan 2010-2014				2,500,000 ha			

Tabel 8. Location of Mangrove Forests for Wildlife Protection in Indonesia

No.	Location	Total Area (ha)	Protected Species
1	Berbak, Sumatera	8.500	<i>Crocodylus spp.</i>
2	Kuala Langka, Sumatera	1.000	<i>Crocodylus spp.</i>
3	Kuala Jambuaye, Sumatera	3.000	<i>Crocodylus spp.</i>
4	Muara Angke, Jawa	15	<i>Egretta spp.</i> , <i>Haleyon spp.</i> , <i>Arhinga spp.</i>
5	Muara Cimanuk, Jawa	7.100	<i>Ibis spp.</i>
6	Muara Mauk, Jawa	1.000	<i>Bubulens ibis</i>
7	Pulau Sepanjang, Madura	2.430	<i>Ibis cinereus</i> , <i>Haleyon spp.</i> , <i>Ciconia episcopus</i>
8	Teluk Kelumpang, Kalimantan	13.750	<i>Nasalis larvatus</i>
9	Pamuka, Kalimantan	10.000	<i>Nasalis larvatus</i>
10	Muara Kendawangan, Kalimantan	150.000	<i>Nasalis larvatus</i>
11	Tanjung Putting, Kalimantan	11.000	<i>Nasalis larvatus</i> , <i>Arhinga sp.</i> , <i>Ibis cinerus</i>
12	Muara Kahayan, Kalimantan	150.000	<i>Nasalis larvatus</i>
13	Teluk Adeng dan Teluk Apar, Kalimantan	128.000	<i>Crocodylus spp.</i>
14	Gunung Lorentz, Papua		<i>Crocodylus spp.</i> , <i>Haleyon sp.</i> , <i>Ciconia episcopus</i>
15	Pulau Dolok, Papua	105.000	<i>Crocodylus spp.</i>
16	Bali Barat, Bali		Jalak Bali
17	Ujung Kulon, Jawa		Badak

Source: Kusmana (2013)

1.3.3 Wetlands

Wetlands include lakes, rivers, swamps, brackish and tidal areas. Indonesia has about 840 lakes and 735 situ (small lake) with a total area of about 500,000 ha. Lake Toba is the largest in Indonesia (110,260 ha), while the deepest lake is Matano (600 m). A total of 521 of 840 lake has an area of more than 10 ha, scattered in almost every island, especially in Sumatra, Sulawesi, Kalimantan and Papua (Nontji, 1996) and has 3 of the 20 deepest lakes in the world (> 400m) (KLH, 2008).

Tabel 9. Total Number and Area of Lakes in Indonesia

Island	Number of Lake (> 10 Ha)	Total Area (Ha)
Sumatra	170	190,043
Kalimantan	139	84,231
Java and Bali	31	6,270
NTT and NTB	14	6,041
Sulawesi	30	141,871
Maluku	10	3,438
Papua	127	59,830
Total	521	491,724

Source: Nontji, 1996

1.3.3.1 Swamp

Swamp forests are not influenced by the climate and grows in the alluvial soil habitats with limited aeration due to waterlogging either continuously or periodically. In some riparian areas during the rainy season, river water overflows and inundate the surrounding forest, forming a seasonally flooded swamp forest. This forest ecosystem is widely available in East Sumatra, West Kalimantan, Central Kalimantan, Maluku and Papua in the south. Vegetation of swamp forest ecosystems varies in the form of grass, palms and pandanus, even trees resembling a *pamah forest*. Tree species diversity in this ecosystem is generally low with several species including *Eucalyptus deglupta*, *Shorea uliginosa*, *Camposperma coriaceum* and *Xylopiya malayana*.

In some places, swamp forests also grow behind mangrove forests, generally in the form of permanently inundated swamp forests, due to the tides. Thus, there are times when its elements mix together with mangrove species such as palm (*Nypha fruticans*) and sago (*Metroxylon sagu*) and dominate the ecosystem.

1.3.3.2 Peatland

Indonesia possesses vast area of peatland and becoming the 4th country with biggest peatland in the world after Canada, Russia and USA. Indonesia's peatland is the biggest tropical peatland in the world that covers about 50% of the total world tropical peatland. Indonesia's peatland is presented in figure 1.

The Government of Indonesia conducted effort to protect Indonesia peatland through the issuance of Presidential Instruction (*Inpres*) number 10/2011 about Postponement on New Permit Issue and Perfecting of Primary Forest and Peatland Governance. This *Inpres* then extended through Presidential Instruction number 6/ 2013 aims for perfecting governance system in peatland management. The revision on the governance system will give impact on the reduction of GHG emission. According to the mandate of Presidential Regulation number 61/2011, Government Regulation number 71 on protection and management of peatland ecosystem determined to conserve peatland ecosystem function and to prevent peatland degradation in Indonesia.

Approximately 62% of the world's peat forests are located in the Indo-Malayan region, of which 80% are in Indonesia, 11% in Malaysia, 6% in Papua New Guinea and a fraction in Brunei, Vietnam, Philippines and Thailand. An estimated 20.7 million ha of Indonesian peat forests are spread out in Sumatra (4.7

to 9.7 million ha), Kalimantan (3.1 to 6.3 million ha) and Irian Jaya (8.9 million ha) (Silvius, 1989, Rieley et al., 1996, Page 2006). Several literatures present various information regarding the spread of peat in Indonesia, as presented in Table 10.



Figure 1. Map of Peatland in Indonesia

Source: National Sustainable Peatland Strategy in Indonesia, KLH, 2012

Table 10. The distribution area of peatlands in Indonesia

Author/Source of Data	The distribution of peatlands (Million Hectares)				
	Sumatra	Kalimantan	Papua	Others	Total (Million Ha)
Driessen (1978)	9,7	6,3	0,1	-	16,1
Puslittanak (1981)	8,9	6,5	10,5	0,2	26,5
Euroconsult (1984)	6,8	4,9	5,5	-	17,2
Soekardi dan Hidayat (1988)	4,5	9,3	4,6	0,1	18,4
Deptrans (1988)	8,2	6,8	4,6	0,4	20,1
Subagyo et al. (1990)	6,4	5,4	3,1	-	14,9
Deptrans (1990)	6,9	6,4	4,2	0,3	17,9
Nugroho et al. (1992)	4,8	6,1	2,5	0,1	13,5
Rajaguguk (1993)	8,2	6,8	4,6	0,4	20,1
Dwiyono dan Rachman (1996)	7,2	4,3	8,4	0,1	20,0
Wahyunto et al. (2005)	7,1	5,8	8,0	-	21,0

Source: Anonymous (2010)

Lowland peat forests in Kalimantan are aged <5000 years and is formed above sea mud and sand formations. However, some of them are more than 11,000 years old (Rieley, 1992, Page 2006). In Kalimantan, the number of species of flowering plants and ferns making up peat forest reaches 927 species (Anderson 1963), whereas in the Malay Peninsula, it reaches 260 species (Latiff 2005). Research results in several locations shows that the species grown in peat swamp forests in Kalimantan are approximately 808 species, growing in Sebangau National Park in Central Kalimantan. In several other locations in Kalimantan, such as Klampangan, Hampangen and Bawan, there are 394 species. Common plants include: *Buchanania sessilifolia*, *Calophyllum cf. calcicola*, *C. canum*, *C. elegans*, *C. pulcherrimum*, *Combretocarpus rotundatus*, *Cratoxylum glaucum*, *Dyera polyphylla*, *Garcinia rigida*, *Gluta rugulosa*, *Hopea ferruginea*, *Nephelium ramboutan-ake*, *Palaquium leiocarpum*, *Shorea balangeran*, *S. teysmannianna*, *Ternstroemia anuera*, *Tristaniopsis obovata* and *Vatica oblongifolia* (Rahajoe, 2014, in press).

In addition to the above plant species, other species from several other locations include *Calophyllum obliquinervium*, *Pseudosindora palustris*, *Dactylocladus stenostachys*, *Gonystylus bancanus*, *Palaquium cochleariifolium* and *Parastemon urophyllus*. For a peat forest in the form of savanna, dominating species are *Dactylocladus stenostachys*, *Garcinia cuneifolia*, *Litsea crassifolia* and *Parastemon urophyllus* (<http://www.eoearth.org/view/article/150734/>).

More than 300 peat plant species are recorded in Sumatra (<http://wetlands.or.id/PDF/Flyers/Silvi01.pdf>). Plant species common in Sumatran peat forest include: *Alstonia pneumatophora*, *Camposperma auriculatum*, *Combretocarpus rotundatus*, *Dyera lowii*, *Eugenia spp.*, *Garcinia spp.*, *Gonystylus bancanus*, *Koompassia mallacensis*, *Palaquium obovatum*, *P. leiocarpum*, *Shorea teysmanniana*, *S. uliginosa* and *Tetramerista glabra*. Peat swamp forests of South Sumatra are generally dominated by *Adinandra Dumoga*, *Ploiarium alternifolium*, *Polyalthia glauca*, *Tristaniopsis obovata* and *T. whiteana* (Anwar et al. 1984). In Sulawesi peat swamps are only found in Aopa Watumohae Swamp National Park.

1.3.3.3 Lake Ecosystem

Lake is large natural body of water surrounded by land and not connected to the sea, except through rivers. Lakes can be in the form of basins caused by natural events and then hold and store rain water, springs, seepage, and or river water (KLH, 2010). Indonesia has about 840 lakes and 735 situ (small lake) with a total area of about 500,000 ha. Lake Toba is the largest in Indonesia (110,260 ha), while the deepest lake is Matano (600 m). A total of 521 of 840 lake has an area of more than 10 ha, scattered in almost every island, especially in Sumatra, Sulawesi, Kalimantan and Papua (Nontji, 1996) and has 3 of the 20 deepest lakes in the world (> 400m) (KLH, 2008). Table 11 shows ecosystem status of several lakes in Indonesia.

Table 11. Condition/Status of Several Lake Ecosystems in Indonesia

No.	Name of the Lake	Ecosystem status		
		Terrestrial	Lake Border	Trophic Status
		Catchment Area		(Lake waters)
1	Toba	Threatened	Threatened	Eutrophic
2	Singkarak	Threatened	Threatened	Eutrophic
3	Maninjau	Damaged	Damaged	Hypereutrophic
4	Kerinci	Threatened	Threatened	Eutrophic
5	Rawa Danau	Threatened	Threatened	Eutrophic
6	Rawa Pening	Damaged	Damaged	Hypereutrophic
7	Batur	Threatened	Threatened	Eutrophic
8	Tempe	Damaged	Damaged	Eutrophic
9	Malano	Threatened	Threatened	Hypereutrophic
10	Poso	Threatened	Threatened	Eutrophic
11	Tonadano	Damaged	Damaged	Eutrophic
12	Limboto	Damaged	Damaged	Eutrophic
13	Mahakam (Semayang, Melintang, Jempang)	Threatened	Threatened	Eutrophic
14	Sentarusm	Damaged	Threatened	Eutrophic
15	Sentani	Threatened	Threatened	Eutrophic

1.3.4 Forest Coverage Area

Forest coverage area correlates with the number of biodiversity in the forest and its surrounding area. The plants in the forest functions as nutrition source for the survival of organic nutrition-dependent organisms. Condition of land/vegetation coverage in Indonesia interpreted from the complete Landsat 7 satellite imagery ETM+ data 2011. This land/vegetation coverage result is broken up into two main classifications; forest area and non-forest area. According to the Statistic book of the Ministry of Forestry 2013, estimated total land of Indonesia is $\pm 187,840.9$ million ha, with observation result; 98,072.7 million ha (52,2%) are forest area and 89,768.9 million ha (47,8 %) are non-forest area.

Data Program *Menuju Indonesia Hijau* (MIH)/Towards Green Indonesia, Ministry of Environment uses the interpreted Landsat satellite imagery 2012-2013, for monitoring vegetation coverage management activity at municipal (Kabupaten) level. This data shows the reduction of forest coverage (primary forest, secondary forest and mangrove) about 863,074.8 ha, This decline was estimated from the change of forest cover to non-forest (mix-garden, plantation, rice field, bushes, settlement, field/lea and bare land).

1.4 Main Threats to Biodiversity

Natural biodiversity extinction is lasting, however, fact shows that life needs and over exploitation expedite biodiversity extinction. Indonesian Institute of Sciences in *Kekinian Kehati* (LIPI, 2014) stated that the main biodiversity threat caused by habitat change, influx of invasive alien species, pollution, over exploitation and climate change.

1.4.1 Habitat Change

Changing process and habitat lost occur because of changing in land coverage. Data from 2000 to 2009 shows the decline of dry primary forest area from 42,255,832.09 ha to 32,185,720.41 ha. This alteration follows by escalated secondary dry forest area from 38,280,269.36 ha to 44.604.933.33 ha in 2009. On the other hand, the area of secondary swamp forest diminish and plantation area buildup. Fragmented habitat also shows the enlargement of bushes from 2000 to 2009. Changing in land use shrunked land coverage area that leads to biota lost as was reported by Widjaja & Pratama (2013) in Central Sulawesi.

Green turtle (*Chelonia mydas*) is an example of the impact from habitat change to animal species in waters. Green turtle forages seagrass in subtropical area of deep sea and lays egg and hatches in several sandy beach in Indonesia, for instance Pangumbahan beach in Sukabumi and the beach of Merubetiri National Park, Banyuwangi. This life pattern follows the turtle forage that abundantly available in subtropical area, meanwhile heat energy for turtle hatching egg originated in area with tropical sun. Therefore, turtle migrate to tropic. Habitat change will influence life pattern that finally influence population of green turtle.

It has also recorded that *Aceros undulatus* and *Anthracoseros albirostris*, the large-size fruit eater birds need tall trees for perching and nesting. However, the plummeting of tall tree population phenomenon expedites population declining for both large-size fruit eater birds. It is un-avoidable that forage must occur in the cultivation area for both species. Unfortunately, nowadays forage trees are relatively scarce in the cultivation area and the big trees for nesting also disappear/not available. Thus, both bird species are unable to live in the cultivation area (LIPI, 2014).

Habitat change in Malinau forest, North Kalimantan influenced population of nitrogen-fixation microbe, especially *Azospirillum* in natural forest with total population 46×10^6 , higher than forest land converted to garden with population 24×10^5 (Antonius et al. 2010). Similar trend occurred for population of denitrified bacteria observed from forest area in Mt. Gede Pangrango compared to land converted to vegetable farm (Agustiyani et al. 2011).

Furthermore, in the forest clearance for mining activity, especially open mining will triggers total change on soil surface condition as main habitat for microbe. Microbe abundance assessment (although not in detail diversity analyses) shows that microbe population plummeting in open land caused by mining (Table 12).

Table 12. Valuable Microbes Population in Several Forest Ecosystem Changes

Ecosystem	Phosphate Diluter Bacteria (BPF)	N Fixing Bacteria	Proteolithic Bacteria
Forest	106 X 10 ⁶	30 X 10 ⁶	37 X 10 ⁶
Cultivated land	98 X 10 ⁶	16 X 10 ⁶	20 X 10 ⁶
Mining area	50 X 10 ⁶	30 X 10 ²	20 X 10 ²

Source: Antonius, et al 2011 in *Kekinian Kehati* 2014

1.4.2 Influx of Invasive Alien Species

The introduced alien species by-purpose as ornamental plant, horticulture, pet and other domestic purposes or by-coincidence in ship (water ballast) are often becoming invasive and leading to the loss of local species and damage to ecosystem. Particular local species introduced to new natural environment could influence various forms of imbalance to ecological network. For example, the introduction of *Tilapia/mujair fish (Oreochromis mossambicus)* exterminates duck-beak fish (*Adrianichthys kroytii*) and endemic fish in Lake Poso, *Xenopoecilus sarasinorum*. The loss of local plants caused by alien species domination often happens in many parts of Indonesia. Instead of that, there is no data of species loss due to influx of alien species. *Calopogonium mucunoides* was brought to Indonesia as ground cover plant in rubber, coconut and palmoil plantations. This plant turned to cover the whole land surface and exterminates grass species and plants that previously grow in the area. In the book of *Kekinian Keanekaragaman Hayati* 2014 reported invasive alien species (IAS); Mammal (8 species), flora (342 species), insect (90 species), fish (20 species), Arachnida (22 species), Bird (76 species), Bacteria (76 species), Virus (47 species), Fungi (16 species).

IAS development often happened in lake area in Indonesia. The example of invasive water plants in lake waters is Eceng Gondok (*Eichhornia crassipes*). Picture 2A shows Lake Tondano in the City of Tondano, North Sulawesi with Mt. Lokon in background, meanwhile, Picture 2B shows Eceng Gondok covers parts of Lake Tondano. The coverage area of this plant reaches to 4,278 hectares. Government through the Ministry of Public Work has eradicated this plant from 80 hectares area or less than 10% (LIPI, 2014).



- A. Lake Tondano in the City of Tondano, North Sulawesi,
- B. Eceng Gondok
- C. Mujair/Tilapia Fish (*Oreochromis mossambicus*) in Lake Tondano

Figure 2. Lake Tondano and Eceng Gondok (*Eichhornia crassipes*), Sulawesi Utara

Nowdays, Agriculture Quarantine Agency through the FAO project TCP/INS/3203(D) entitled ‘*Strengthening Quarantine Control System on Invasive Alien Species*’ is encouraging determination of new policy for controlling destructive alien species. Simultaneously, Ministry of Forestry is also conducting project from GEF Trust Fund for *Removing Barriers for Invasive Alien species Management in Protection and Production Forest in South East Asia*. Inventory and identification of IAS are continuously implemented and further equipped with draft of National Strategy and Directive Action Plan for Management of IAS (Indonesian Invasive Alien Species Strategy and Action Plan). In line with those activities, Ministry of Environment has developed draft of Minister Regulation on the list of IAS banned from entering Republic of Indonesia’s territory. The number of 296 IAS comprises of IAS for agriculture sector (53 species), IAS for forestry sector (99 species) and IAS for fisheries sector (144 species) are proposed in the draft of Minister Regulation to be banned for entering Indonesia.

1.4.3 Pollution

Air, water and soil pollutions are results from human activities with direct and indirect negative impacts on the occurrence of biota. Pollution changes flow of energy, chemistry, environmental physical condition and species abundance in an ecosystem. For instance, factory and domestic waste discharged directly to Ciliwung River led to the declining of fish and Crustacea diversity (Wowor *et al.* 2010). Research result shows that extinction rate for local fish Ciliwung and Cisadane from 1890–2010 are 92.5% and 75.6% and 66.7% for crustacean. Pollution causes biodiversity loss for example smoke from cars in big cities that causes death or migration of birds. Other than that, smoke pollution mobil also block plant stomata in surrounding areas that leads to death and lost of local flora.

Smoke from forest and land’s fire contributes impact to biodiversity degradation. El Nino is one of trigger for smoke due to the less rain and dry land (Murdiyarso *et al.* 2002, Tacconi 2003, Florano 2004, Herawati & Santoso 2011). Long drought raises temperature and wind speed that leads to fire speed of spread, make it difficult to control. In May 2009 and 2011 with El Nino, BMKG Pekanbaru station recorded highest temperature of 35.4 and 36.5 °C and normal temperature of 32-33 °C. In those extreme temperatures (>35 °C), wind speed inclined between 10 – 20 knot. Data hotspots observation from NOAA satellite shows sharp inclines of hotspots in May of those years compared to previous months.

Water pollution such as acid rain, garbage and waste water direct disposal to water reservoir, irrigation cannal and sea can instigate mortality to fish and other water living organisms and plankton, algae or other water plants. The biggest pollution is caused by heavy metal high significant toxicity to micro-organism especially in high concentration. Heavy metal pollution is significant environmental stressor to terrestrial microbe’s community. Observation to microbe community and activity in Rancaekek paddy-field area polluted by heavy metal waste from textile shows low microbe population and activity in areas close to source of pollution compare to distance areas from source of pollution. Observation in Cipanas area on microbes community in soil with intensive agricultural practices (high pesticide and synthetic fertilizer application), semi-organic agriculture (moderate pesticide and synthetic fertilizer application) and organic farming shows the lowest respiration activity linked to abundance soil microbe and enzymatic activity involved in nutrient cycle found in land with intensive agriculture compare to land with organic farming. Additionally, number of soil fungal population in land with intensive agriculture is lower than land with organic farming.

1.4.4 Over Exploitation

Wildlife over exploitation places several species in endangered situation. Thus, harvesting of wild plants and animals for trade requires better regulation and not only based on buyer/businessman/local demand for exploitation. The examples of bird in over exploitation are *Sturnus contra* and *Gracula religiosa*. The local extinction of these two species is predicted because of regeneration chain-break due to people chasing juvenile birds from their nest. Over logging of tree of the economic important will cause ecosystem damage that finally leads to biodiversity lost, including lost of endemic species. Endemic species like *Agalmyla* is found only in primary dry land of High Mountain such as, Mount Lompobatang and Mount Latimojong, South Sulawesi.

1.4.5 Climate Change

Global climate change often linked to the irregular climate dynamics from its natural hundred-years' pattern. La Nina and El Nino cases reflected climate changing or shifting. This change influences distribution pattern change and the loss of non-adaptable biota. Despite of the current situation, the concrete and in-depth research on climate change impact to behaviour, distribution and extinction of Indonesia's biota is still limited. The existing report tends only to be theoretical or only indicative. Despite of the lack of in-depth research, indication of seasonal shifting impact on flowering has been found. The seasonal shifting also leads to behavioral pattern changing for pollinators and other animals with life dependent to availability of fruit and flower. Moreover, the lost of pollinator for particular plant species caused reproduction limit to this species.

In RAN-API 2014 based on data from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC-AR4) indicates that there will be changes in surface temperature, rainfall, sea surface temperature, sea levels, and extreme climatic events. Table 16 shows climate projections in Indonesia until 2020 based on the climate models of the IPCC-AR4.

At the national level in particular the Minister of National Development Planning/ Head of Bappenas has issued a Ministerial Decree No. Kep.38/M.PPN/HK/03/2012 concerning the establishment of the Climate Change Response Coordination Team, which consists of 6 (six) working groups, including an Adaptation Working Group. Climate change adaptation action programs aims to ensure or secure the achievement of the main objectives of development and increase community resilience, in physical and economic, social and environmental impacts of climate change. In addition, the anticipation of these changes, a "*Khabarovsk Statement*" document was produced in 2012 which includes a common understanding on issues of biodiversity, Green Growth approach, sustainable water resources and natural resources management, transboundary air pollution, climate change mitigation and adaptation.

Table 13. Climate Projection to 2020 based on output of Climate Model IPCC-AR4

Climate Change Indicator	Climate Projection Extrapolated to 2020
Surface temperature	Surface temperature increases about 0.5 °C relative to year 2000
Level of rain	Trends of more CH in wet months and less CH in transition months
Sea surface temperature	Average rises of TPL about 0.65 ± 0.05 °C in 2030, relative to TPL in year 2000
Sea water level	Increasing level of TML approximately 0.7–0.8 cm/year. TML raises 22.5 ± 1.5 cm in year 2030, relative to TML year 2000
Occurance of extreme climate	El Nino occurance with 2–5 years periode raises its frequency. The impact, transition between El Nino and La Nina associated with neutral condition is often happened and causes difficult estimation of rain water level for several areas in Indonesia (Malang, Tarakan, and South Sumatera).
Climate extreme occurence <ul style="list-style-type: none"> • Heavy rain • Storm • Strong wind • Stormy wave 	There is increasing probability occurrence of monthly rain water class 250–450 mm associated with 5% increases to 2020 extreme occurrence of daily rain water for Malang area.

1.5 Impacts of Biodiversity Change on Human Well-being

The main ongoing problem in Indonesia is over exploitation on natural resources that threaten the future of sustainable production. As it is known, in the plummeting of environmental quality, ecosystem will be degraded and sustainability of natural resources is threatened. Environmental degradation in ecosystem of small-island and lowland forest occurs in daily bases. Problem's roots are high population growth, poverty, deforestation, forest and land fires, degraded and fragmented habitats, over exploitation, dispersal of invasive species, pollution and climate change. In the mean time, research produced valid data receives less respect from politicians and policy holders.

The understanding of natural science and technology is the main capital for Indonesia development. Knowledge is the changing agent as well as the main actor for empowering socio-cultural landscape, politics, economy and market. Therefore, people of Indonesia need to re-position natural science and technology for the sake of sustainable development with humanity base. Various obstacles such as in-optimum assessment and exploration of biota in the area of potential new species discovery; the loss of species and genetic resources due to ecosystem damage in particular area; and limited number of scientists deals with basic science related to biodiversity assessment must be managed.

In the development era with prioritization to green economy and inline with Sustainable Development Goals (SDGs) program with objectives to enhance human prosperity through reduction of damage to environment, Indonesia biodiversity is the potential source to be further developed and utilized. The definition of green economy must be translated into an economy without carbon emission and environmental pollution. Therefore, environment sustainability could be safeguarded with wise management, (LIPI, 2014).

Important efforts to be taken are determination of effective policy with focus on mainstreaming biodiversity and sustainable development. Various activities are conducted to anticipate problem from the change on biodiversity in the future. These activities aim to conserve and protect biodiversity and to diminish damage that threatened biodiversity. The hope from those efforts is the upscaling people prosperity from the utilization of biodiversity. Several past, ongoing and upcoming activities for enhancing utilization of biodiversity will be explained in Chapter 2. Challenge and hope for future Indonesia biodiversity management as a whole can be seen in the book *Kekinian Kehati* (LIPI, 2014).

IBSAP, IMPLEMENTATION AND MAINSTREAMING OF BIODIVERSITY IN INDONESIA

2.1 Overview of IBSAP Updating

The new Indonesian Biodiversity Strategy and Action Plan (IBSAP) 2015-2020 is currently being prepared. However, various meetings to update IBSAP have resulted in several main points for the new IBSAP. IBSAP Implementation (2003-2013) has been running for more than 10 years. Result of implementation reviews of IBSAP carried out by National Development and Planning Agency (BAPPENAS) in 2012 showed that there are at least eight challenges that affect the implementation of biodiversity management through policy-making and field activities, namely: (i) lack of understanding of the function of biodiversity in the area; (ii) Biodiversity issues have not become major issues; (iii) lack of political support; (iv) lack of adequate human resources with knowledge of issues on Biological Diversity; (v) lack of synergy of the Biodiversity programs; (vi) lack of dissemination of the Biodiversity management policy; (vii) the absence of monitoring institutions and evaluation in the area; (viii) lack of stakeholders involvement in the area.

In addition an evaluation conducted by the Ministry of Environment in 2009 found several shortcomings of IBSAP 2003-2020 implementation, which include: lack of IBSAP legal standing, thus IBSAP implementation is voluntary, implementation monitoring and coordination is undeveloped, and there are no institutions specifically responsible for monitoring and implementation of IBSAP coordination. However, the review of IBSAP implementation in 2010, showed that there is an increase, especially in conservation and the sustainable use of biodiversity, an increasing number of protected areas, an increasing number of flora and fauna pursued in ex-situ conservation, as well as ecosystems rehabilitation efforts (mangrove forests and coral reefs). Furthermore, there is community involvement in managing biodiversity, development of sustainable consumption, increase of capacity building and rehabilitation in an effort to deal with biodiversity destruction.

The new IBSAP document will at least need to include recommendations of BAPPENAS review results in 2013 that mapped and assessed the biodiversity convention implementation strategy, which are (i) to improve the understanding of the importance and value of biodiversity through mainstreaming biodiversity issues on every institutional and community level, through a variety of strategies, (ii) to improve the quality of human resources, as well as political, regulatory, and budgeting support from various stakeholders in the implementation of biodiversity management, through various strategies, (iii) to improve the identification, inventory, mapping and publication of biodiversity potential and value, through a variety of strategies and, (iv) to improve biodiversity management whose impacts and benefits can be felt by various parties, especially the general public, through various strategies.

Additionally, improving the identification, inventory, mapping and publication of biodiversity potential and value, can be achieved by: (i) updating IBSAP at the national level by involving various parties, both at national and regional levels; by developing a Biodiversity Profile and Status, and Biodiversity Management

Master Plan (RIP) in every region, integrating potential and value mapping of Biodiversity in Indonesia through identification and inventory in every region, (ii) increasing scientific and popular publications on biodiversity potential and value to support data and information integration of Indonesian Biodiversity; support a variety of research on biodiversity potential and value by various parties, (iii) efforts to increase CHM (Clearing House Mechanism) activities at the central and local level in an integrated manner as well as perform exploration and application of local knowledge related to biodiversity conservation throughout the regions; (iv) increasing biodiversity management whose impacts and benefits can be felt by various parties, especially the general public, through various strategies, such as: i) engaging in activities that support biodiversity preservation outside protected areas (*ex-situ*); ii) applying appropriate learning in Biodiversity management from other areas; iii) supporting the efforts of environmental services that have an impact on biodiversity conservation through reward mechanisms for environmental services (PES, payment for environmental services); iv) making an effort to empower and increase community participation in the utilization of sustainable biodiversity potential in the region; v) make an effort to support the application of economic instruments in the utilization of biodiversity potential in a sustainable manner.

Implementation and action of IBSAP 2015-2020 and the achievement of Aichi Targets require a strategy. The result of discussion on updating IBSAP contains 4 strategic steps for IBSAP implementation, namely:

1. Conduct biodiversity management mainstreaming into national development and various aspects of people's life,
2. Enhance biodiversity conservation and restoration,
3. Improve utilization of biodiversity as basic capital of national development,
4. Increase biodiversity management capacity through the development of science and technology, policy and human resources capacity building, institution and budgeting

In updating IBSAP, national targets and indicators for biodiversity management 2015-2020 following Aichi Target framework were adjusted to national conditions and needs. The determined indicator for the accomplishment of National Target is a tool for measuring the accomplishment of planned activities or actions. National targets for biodiversity management 2015-2020, include, amongst others:

1. Create awareness and role of various parties through formal and non-formal education programs;
2. Conduct sustainable natural resources management in planning and implementing local and national development to improve people's economy;
3. Create incentive and disincentive system for business and sustainable natural resources management;
4. Increase availability and realization of supporting policy for sustainable production and consumption (SCP) in natural resources sustainable use;
5. Develop *ex-situ* conservation area to protect local species;
6. Ensure policy for sustainable management and harvest;
7. Increase agriculture area, plantation and animal farming managed in sustainable manner;
8. Reduce pollution level that destroy natural resources and ecosystem function;
9. Conduct prevention and eradication of Invasive Alien Species (IAS);
10. Reduce level of anthropogenic pressure on coral reef and other fragile ecosystem affected by climate change;

11. Conduct sustainable maintenance and improvement of conservation area;
12. Maintain endangered species population as species priority for national conservation;
13. Develop nursery system, genetic improvement, wildlife domestication and wild species breeding;
14. Enhance integrated ecosystem function to ensure the improvement of important services (water, health, income, tourism);
15. Realize ecosystem conservation and restoration in degraded area;
16. Ratify Nagoya Protocol and its derivative regulation instrument and form implementing bodies from central to local levels;
17. Determine and implement new IBSAP at all level;
18. Develop innovative local wisdom and improve bioprospecting capacity for natural resources conservation and sustainable use;
19. Enhance science and technology capacity for sustainable management of biodiversity;
20. Identify resource and effective financing in the implementation of biodiversity sustainable management.
21. Mapping data and information of biodiversity thoroughly and integrated
22. Conflicts resolution for biodiversity management in a comprehensive way.

2.2 Implementation of IBSAP

2.2.1 Conservation Area

As presented in the 4th National Biodiversity Report, total conservation areas between 2001-2007 was 27,968,929.66 ha, whereas in 2012 there is additional water and land conservation area of 11,741,636.48 ha. The number of new forest conservation areas is determined by the Ministry of Forestry Regulation Year 2009-2012 (Table 14). These conservation areas protect biodiversity and can either be nature reserve areas, wildlife sanctuaries, national parks, Nature Recreation Parks, nature recreation parks, grand forest parks, and game reserves in order to protect the diversity of Indonesian ecosystem types.

Based on Forestry Statistics Data of 2013, there are 222 units of terrestrial nature reserves with a total area of 3,957,691.66 hectares and 5 units of marine nature reserves with a total area of 152,610 hectares; meanwhile, there are 71 units of terrestrial wildlife sanctuaries with area 5,024,138.29 hectares and 4 units of marine wildlife sanctuaries with area 5,588.25 hectares. In the meantime, up to 2013, there are 43 units of Terrestrial National Parks with a total area of 12,328,523.34 hectares and 7 units of Marine National Parks with a total area 4,043,541.30 hectares. Additionally, there are 101 units of Nature Recreation Parks, comprised of Terrestrial Nature Recreation Parks with a total area of 257,323.85 hectares and 14 Marine Nature Recreation Parks with a total area of 491,248.00 hectares. There are also 23 units of Grand Forest Park with a total area of about 351,680.41 hectares and 13 units of Game Reserves with a total area of about 220,951.44 hectares. Forest as the highest biodiversity providers, not only contained natural resources in form of wood but also plays important role in various aspects of life. In regards to conservation area management, up to 2013, there are 54 conservation bodies managed with partners. Meanwhile, the number of breeding unit for wild plants and animals until 2013 has reached 776 units.

Table 14. New Forest Areas Based on Ministry of Forestry Decree (2010-2012)

No.	Province	Year of Decree	Conservation Area (Ha)		
			Waters	Terrestrial	Total
1	Bengkulu	2012	0.00	462,965.00	462,965.00
2	East Java	2011	3,506.00	230,126.00	233,632.00
3	West Nusa Tenggara	2009	11,121.00	168,044.00	179,165.00
4	Central Kalimantan	2012	22,542.00	1,608,286.00	1,630,828.00
5	South Kalimantan	2009	-	213,285.00	213,285.00
6	Gorontalo	2010	-	196,653.00	196,653.00
7	South Sulawesi	2009	606,804.00	244,463.00	851,267.00
8	North Maluku	2012	0.00	218,557.48	218,557.48
9	Papua	2012	1,019,017.00	6,736,267.00	7,755,284.00
Total			1,662,990.00	10,078,646.48	11,741,636.48

Source: Directorate General of Forest Planology (2012)

Indicator for sustainable management of marine conservation areas is measurable from the managed area. Sustainable management is an area management activity with consideration to utilization and management principles that ensure availability and sustainability and to maintenance and improvement of the quality value and diversity of the existing resources.

In order to assess management effectiveness of conservation areas, a standardized practical guideline has been developed for monitoring and assessment of management aspects of marine conservation areas. This standard determined through Decision of the Directorate General for Marine Conservation, Coastal and Small Islands Management Number Kep.44/KP3K/2012, 9 October 2012 on Guidance for Effectiveness Evaluation of Marine Conservation, Coastal and Small Islands Management (E-KKP3K). According to statistics data in *Marine and Fisheries in Number 2013* stated that 3 (three) areas managed in a bad status, 13 (thirteen) areas managed in good status and only 1 (one) area have very good management. Up to 2013, there are 31 Provinces, 85 districts and 89 locations with total managed conservation areas of about 5,565,821.64 hectares.

The additional conservation areas in 2013 are 24 districts with total area 648,888 hectares. This achievement has exceeded the target of 500,000 hectares additional area. Marine conservation areas managed by the Ministry of Forestry in 2013 are 32 areas with a total area of 4.7 million hectares, meanwhile, the marine conservation areas under the auspices of the Ministry of Marine and Fisheries and Local Governments are 99 areas of a total area of 11.07 million hectares. Hence, total conservation areas managed in a sustainable manner in 2013 is 15.77 millions hectares (Table 16) (KKP, 2013). Planning from Directorate Conservation of Area and Fish Species (KKJI) to boost up addition and utilization of conservation area 2015–2019 has been put in details in table 15. The enlargement of total conservation areas from 2003 to 2012 with slight decrease for 2013 is presented in Figure 3.

Table 15. Activity Plan of Directorate Conservation of Area and Fish Species 2015 - 2019

Activity Plan	2015	2016	2017	2018	2019
Total additional conservation areas (Ha)	500	600	800	900	1.000
Total number of conservation areas with protection and conservation efforts (areas)	15	28	30	33	35
Total areas with facilitated utilization efforts (areas)	15	20	25	30	35
Total species / groups of species of fish with established protected status (3 types / groups of species)	1	1	2	2	3
Total species / groups of species of fish with preservation efforts (7 species / species groups)	6	6	7	7	7
Total species / species groups of fish with managed utilization (10 species / species groups)	8	8	10	10	10
Total conservation networking / partnerships that support effective management (5)	3	3	3	5	5
Total conservation data and information that supports effective management (package)	1	1	1	1	1

Source: Suhardjono et al. (2012)



Figure 3. Marine Conservation Areas in Indonesia over the last 10 years

Table 16. Marine Conservation Areas in Indonesia 2013

Conservation Area	Number of Area	Area (ha)
Managed by Ministry of Forestry	32	4,694,947.55
Marine National Park	7	4,043,541.30
Marine Nature Recreation Park	14	491,248.00
Marine Wildlife Sanctuary	5	5,678.25
Marine Reserves	6	154,480.00
Managed by Local Governments and Ministry of Marine Affairs and Fisheries	99	11,073,621.85
Marine National Parks	1	3,521,130.01
Marine Nature Reserves	3	445,630.00
Marine Parks	6	1,541,040.20
Local Marine Conservation Areas	89	5,565,821.64
Total	131	15,768,569.40

Source: Ministry of Marine and Fisheries in 2013

Botanical Garden establishment is one of efforts in preventing biodiversity deterioration in Indonesia. Up to 2013, 21 new botanical gardens have been established and improved, bringing the total number of botanical gardens in Indonesia to 25 that represent 15 ecosystems. Total area of these 25 botanical gardens is 4,100.7 hectares. Indonesia still needs to develop at least 22 more botanical gardens representing the overall 47 types of Indonesian ecosystems. The name, province, area and theme of botanical gardens in Indonesia can be seen in Table 17.

In line with Botanical Gardens, Indonesia has developed Biodiversity Garden (Taman Keanekaragaman Hayati). Biodiversity Garden is a local biodiversity reserve with conservation function, located outside forest areas. The garden plants are local, endemic and rare plants. Ecosystem approach is utilized for guiding planting system in which the conserved plant is placed together with support plants (e.g. forage plant for pollinator). This ecosystem approach triggers the recovery of life cycle of flora and fauna in surrounding areas. The disturbed life cycle is the main reason for the species disappearance. Therefore, based on the ecosystem approach and life cycle, Biodiversity Garden is able to self-survive. Up to 2013, Biodiversity Garden has been established in 9 Provinces, 19 kabupaten and 10 cities in Indonesia.

There is another program that supports conservation, so-called MAB (Man And The Biosphere) Indonesia, a program for area development. This area is a spot for the development of model for sustainable development reflected through collaboration between the right holder of the area and other stakeholders in managing natural resources (see Box 1).

BOX 1

MAN AND THE BIOSPHERE PROGRAM (MAB) INDONESIA

Superiority or innovation of biosphere reserve concept implementation lays on the combination of its three functions, namely: (1) Function for natural resources and ecosystem and cultural diversity conservation. This function contributes to conservation of landscape, ecosystem, species and gene pool and cultural diversity; (2) Function for development that grows and enrich ecological and cultural wise sustainable economic development; and (3) Function for support to various logistics activities including research, education, training and monitoring related to conservation problem and sustainable development at local, regional, national and global.

In the process of integrating those three functions, implementation directed by zonation. Base on the function, area in biosphere reserve is divided into 3 zones; (a) Core area, is conservation area and supported by long term legal protection to ensure biodiversity conservation, monitoring of undisturbed ecosystem and conducting undamaged research and other passive activities such as education and training on environment and ecosystem services development; (b) Buffer zone is area in surrounding/side by side or adjacent to core area with clear function to protect core zone from impact of human activity. Buffer zone area could be in form of area own by people, individually, as institution, private, etc. Management of buffer zone remains with the right's holder and the management practices should comply with determined government regulation. Hence, the possible activities in this zone are activities that ecologically responsible such as research, education, training, ecotourism and sustainable use of biodiversity or renewable resources; (c) Transition area are the widest area that utilized for collaboration with local people. This area is located side by side with buffer zone.

Transition area owns by public as individual, organization, institution, private or other legal entities. This area is location for the development of various models for sustainable development under collaboration between right holders of the area and other stakeholders in managing natural resources in this area.

Now days, Indonesia possesses 8 Biosphere Reserves; Cibodas Biosphere Reserve (West Java), Komodo Biosphere Reserve (East Nusa Tenggara), Tanjung Puting Biosphere Reserve (Central Kalimantan), Lore Lindu Biosphere Reserve (Central Sulawesi), Siberut Island Biosphere Reserves (West Sumatra), Mt. Leuser Biosphere Reserve (NAD and North Sumatra), Giam Siak Kecil-Bukit Batu Biosphere Reserve (Riau) and Wakatobi Biosphere Reserve (Southeast Sulawesi).

Source: Prof. Dr. Yohanes Purwanto (Program MAB Indonesia)

Table 17. Name, Province, Area and Theme of Botanical Gardens in Indonesia

No.	Botanical Garden	Provinces	Area (ha)	Focus/Collection Theme
1	Bogor	West Java	87.0	Plant of wet lowland
2	Cibodas	West Java	120.0	Plant of wet highland
3	Purwodadi	East Java	85.0	Plant of dry lowland
4	“Eka Karya” Bali	Bali	157.5	Plant of dry highland
5	Cibinong	West Java	189.0	Indonesia Plant based on Bioregion
6	Balikpapan	East Kalimantan	309.0	Woody Plant of Indonesia
7	South Kalimantan	South Kalimantan	122.1	Medicinal Plant of Kalimantan
8	Batam	Riau Islands	86.0	Plant of Indonesian Small Islands
9	Baturraden	Central Java	142.0	Mountaneus Plant of Java
10	Bukit Sari	Jambi	425.0	Plant of Lowland Sumatra
11	Sangau	West Kalimantan	328.0	Plant of Equator Region
12	Jompie, Parepare	South Sulawesi	13.5	Coastal Plant of Wallacea region
13	Massenrempulu, Enrekang	South Sulawesi	300.0	Plant of Wallacea Region
14	Katingan	Central Kalimantan	127.0	Fruit Plant of Indonesia
15	Kendari	Southeast Sulawesi	113.0	Ultrabasic Plant
16	Kuningan	West Java	172.0	Plant of Rocky Area and Mt. Ciremai
17	Liwa	Lampung	116.0	Ornamental Plant of Indonesia
18	Lombok	West Nusa Tenggara	130.0	Plant of Lesser Sunda
19	Minahasa	North Sulawesi	186.0	Highland Plant of Wallacea Region
20	Pucak	South Sulawesi	120.0	Economical Plant
21	Sambas	West Kalimantan	300.0	Riparian Plant of Kalimantan
22	Samosir	North Sumatra	100.0	Plant of North Sumatra Highland
23	South Sumatra	South Sumatra	100.0	Medicinal and Wetland Plant of Sumatra
24	Solok	West Sumatra	112.6	Spice Plant of Indonesia
25	Wamena	Papua	160.0	Plant of Central Mountains of Papua

Source: LIPI (2014) modified

Mangrove forest is an important area in Indonesia of which conservation efforts has been executed. Efforts to meet the 30% target have been planned. Total area requirement for mangrove conservation per province is presented in Table 18.

Table 18. Mangrove Forest and Ecosystem Conservation for each province in Indonesia 2012

Province	Percentage of Protected Areas to Province Area (%)	Total Protected Area (ha)	Total Ecosystem (ha)	Area needed to achieve target (30%) (ha)
Bali	73.80%	1,604	2,171	
Banten	80.90%	2,012	2,486	
Yogyakarta	0.00%	-		
Jakarta	32.40%	84	260	
West Java	0.20%	3	1,537	458
Central Java	0.00%	4	9,202	2,757
East Java	28.50%	9,448	33,190	509
West Kalimantan	2.10%	2,741	131,445	36,693
South Kalimantan	50.20%	48,028	95,661	
Central Kalimantan	4.80%	3,118	65,470	16,523
East Kalimantan	12.20%	57,343	469,878	83,620
Maluku	4.30%	6,096	140,137	35,946
North Maluku	0.00%		50,386	15,116
West Nusatenggara	22.90%	3,066	13,370	945
East Nusatenggara	31.20%	6,220	19,958	
West Papua	21.40%	103,783	485,922	41,994
Papua	39.70%	458,817	1,154,802	
Gorontalo	15.90%	2,405	15,160	2,143
West Sulawesi	0.00%		3,179	954
South Sulawesi	0.00%		23,504	7,051
Central Sulawesi	24.20%	11,864	48,957	2,823
Southeast Sulawesi	6.10%	3,519	57,903	13,852
North Sulawesi	13.10%	1,675	12,801	2,165
Bangka-Belitung	0.00%		79,133	23,740
Bengkulu	53.40%	1,028	1,925	
Jambi	38.60%	2,127	5,512	
Riau Islands	24.60%	15,984	65,022	3,522
Lampung	89.60%	4,513	5,039	
Nanggroe Aceh Darussalam	7.90%	2,802	35,628	7,779
Riau	4.50%	8,067	180,408	46,055
West Sumatra	3.70%	627	16,980	4,467
South Sumatra	0.00%		201,293	60,388
North Sumatra	6.00%	1,492	24,716	5,923
National Waters	0.00%		13	4
	22.00%	758,470	3,453,048	415,427

In order to increase land coverage, programs in form of planning documents have been developed.. Progress of plan document development is presented in table 19.

Table 19. Progress of the Development of Forest Area Plan to 2012

No	Type of Plan	Progress
1	National Forestry Plan (RKTN)	National Forestry Plan (RKTN) 2011-2030 Ministry of Forestry Regulation Number P.49/ Menhut-II/2011 28 June 2011
2	Macro Plan for Forestry Implementation	<ol style="list-style-type: none"> 1. Macro Plan for Protection and Conservation of Forest Resources 2. Macro Plan for Forest Utilisation 3. Macro Plan for Stabilization of Forest Area 4. Macro Plan for Forestry Implementation at Sumatra Region 5. Macro Plan for Forestry Implementation at Java-Bali-Nusa Tenggara Region 6. Macro Plan for Forestry Implementation at Kalimantan Region
3	Provincial Forestry Plan (RKTP)	<ol style="list-style-type: none"> 1. D I Yogyakarta 2. West Sumatra 3. East Kalimantan 4. Central Java 5. West Nusa Tenggara 6. East Java
4	Forestry Plan Regulation	<ol style="list-style-type: none"> 1. Governor DIY Regulation Number 01/KEP/2012 2. Governor West Sumatra Regulation Number 92/2012 3. Governor East Kalimantan Regulation Number 19/ 2012 4. Governor Central Java Regulation Number 46/2012 5. Determination Process 6. Determination Process
		<ol style="list-style-type: none"> 1. Ministry of Forestry Regulation Number P. 42/ Menhut-II/2010 tanggal 14 September 2010 2. Ministry of Forestry Regulation Number I/ Menhut-II/2012, 9 January 2012 3. Determination Process

2.2.2 Species and Genetic Conservation

Several species conservation activities have been undertaken in Indonesia, amongst others; orangutan and elephant conservation. Progress of the activities and their success of safety efforts are presented in table 20.

Table 20. Orangutan Rehabilitation Center 2011-2013

No	Name of Location	Number (Individual)			Released			Note
		2011	2012	2013	2011	2012	2013	
1	ACEH							
	Orangutan Rehabilitation Center Janthoi	25	25	12	25	25	0	
2	NORTH SUMATRA							
	Bukit Lawang	14	14	8	0	0		
	Quarantine Station PKOS Batu Mbelin	87	87	50	0	0	27	
3	JAMBI							
	Orangutan Rehabilitation Station Sumatra (Sungai Pengian) – FZS	151	151	157	144	144	151	17 orangutan during released and 6 still in cage
4	CENTRAL KALIMANTAN							
	Care Center & Quarantine (OFI)	555	555	337	224	224	22	
	Nyaru Menteng	897	897	538	17	17	38	
5	EAST KALIMANTAN							
	Wanariset Semboja	228	228	226	0	0	14	
6	WEST KALIMANTAN							
	IAR Ketapang	51	51	67	0	0	0	
	JUMLAH	2.008	2.008	1.407	410	410	252	

Source: Forestry Statistics Data 2013

Table 21. Elephant Training Center(PLG) 2013

No	Name of PLG	Elephant Population	Trained Elephant	Number Utilized	User	Note
1	2	3	4	5	6	7
1	NANGROE ACEH DARUSSALAM					
	PLG Aceh Saree	43	43	17	CRU Manee 5 elephants	Rest of elephants in PLG : 26 (Male 11 and female)
		(Female : 27 & Male : 16)			CRU Tangkahan 8 elephants CRU Trumon 4 elephants	

No	Name of PLG	Elephant Population	Trained Elephant	Number Utilized	User	Note
1	2	3	4	5	6	7
2	NORTH SUMATRA					
	<i>Holiday Resort</i>	21	20	2	Medan Zoo (2 elephants)	1 elephant, un-trained, still juvenile
		(Female :15 & Male: 6)				
3	RIAU					
	<i>a. PLG Duri</i>	9	9	0		
		(Female: 7 & Male: 2)				
	<i>b. PLG Minas</i>	21	-	0		
		(Female: 7 & Male:14)	21			
	<i>c. Elephant Flying Squad TN Tesso Nilo</i>	10	10	0		
		(Female: 4 & Male:4)				
4	JAMBI					
	<i>PLG Seblat</i>	19	19	0		
		(Female: 15 & Male: 4)				
5	BENGKULU					
	<i>a. PLG Lahat</i>	18	18	0		
		(Female: 18 & Male: 2)				
	<i>b. PLG Jalur 21</i>	32	31	0		1 elephant, un-trained, still juvenile
		(Female: 18 & Male: 2)				
6	LAMPUNG					
	<i>Way Kambas</i>	67	67	2	Bumi Kedaton 2 elephants	Elephant in PLG Way Kambas 65
		(Female: 26 & Male: 41)				
	JUMLAH	240	175	21	0	

Source: Forestry Statistics Data 2013

Conservation efforts for species and genetic have also been conducted through the establishment of Community Nurseries (KBR). This kind of nursery is managed by a group of people; male and female with main activity is preparing seedling for various forest trees and/or for multi-utility plant (MPTS). Budget for financing the nursery comes from government and non-government sources (Ministry of Forestry Regulation Number P.17/Menhut-II/2012). The number of established Community Nurseries is presented in table 22.

Table 22. Development of Community Nursery in 2010-2013

No	BPDAS	Year							
		2010		2011		2012		2013	
		Unit	Trees	Unit	Trees	Unit	Trees	Unit	Trees
1	2	3	4	5	6	7	8	9	10
1.	BPDAS Krueng Aceh	266	6.650.000	356	8.900.000	360	9.000.000	175	4.375.000
2.	BPDAS Wampu Sei Ular	330	8.250.000	368	9.200.000				

Source: Forestry Statistics Data 2013

In marine and fisheries sector, fish conservation and sustainable utilization increased form year to year. There were 3 species prioritized for 2010 conservation, namely; turtle, dugong and Napoleon. The number of species increased to; 6 species in 2011 (Toli shad fish, banggai, cardinal fish and ornamental coral), to 9 species priority in 2012 (freshwater turtle, shark and sea bamboo), to 12 species in 2013 (Eel (sidat), arwana and sea horse) and to 15 priority species for 2014 (Lola, Kima and whale) (KKP, 2013).

2.2.3 Forests and Land Rehabilitation

Land rehabilitation implementation is prioritized on tree planting/re-planting in very critical and critical land areas beyond forest area and the development of soil conservation building. Rehabilitation achievement in the last 5 years period 2009-2013 is shown in table 23.

Table 23. Progress of Reforestation Activities 2009-2013

No.	Province	Year				
		2009 (ha)	2010 (ha)	2011 (ha)	2012 (ha)	2013 (ha)
1.	Nanggroe Aceh Darussalam	-	1,500	2,815	5,000	500
2.	North Sumatra	1,785	4,829	11,410	7,005	6,500
3.	West Sumatra	1,022	2,687	500	745	1,500
4.	Riau	1,725	6,000	3,615	2,562	1,500
5.	Jambi	-	515	3,690	7,750	6,350
6.	South Sumatra	-	1,530	1,760	5,000	3,500
7.	Bengkulu	1,765	5,014	5,300	5,000	6,000
8.	Lampung	46,920	7,500	15,000	8,800	8,300
9.	Bangka Belitung	375	60	-	-	-
10.	Kepulauan Riau	5,188	900	-	-	850
11.	DKI Jakarta	37	-	-	-	10
12.	West Java	3,245	10,964	5,600	3,496	1,740
13.	Central Java	7,050	3,730	200	939	500
14.	DI Yogyakarta	283	5,377	453	447	456
15.	East Java	15,998	4,533	1,500	650	500
16.	Banten	260	-	-	-	1,250
17.	Bali	530	636	200	200	1,000
18.	West Nusa Tenggara	3,991	1,000	500	3,000	4,000
19.	East Nusa Tenggara	1,340	975	3,500	4,552	3,900
20.	West Kalimantan	1,457	6,325	5,000	5,000	7,000
21.	Central Kalimantan	3,422	7,750	5,000	5,000	6,000
22.	South Kalimantan	-	4,825	650	666	1,300
23.	East Kalimantan	-	5,125	1,700	2,000	2,700
24.	North Sulawesi	1,590	1,400	1,350	1,100	1,300
25.	Central Sulawesi	-	1,008	3,000	3,000	2,750
26.	South Sulawesi	4,872	4,150	7,000	6,000	11,000
27.	Southeast Sulawesi	8,200	2,150	5,000	6,425	7,000
28.	Gorontalo	-	1,253	2,500	2,650	2,500
29.	West Sulawesi	-	1,000	-	500	6,750
30.	Maluku	150	1,000	3,000	3,000	1,500
31.	North Maluku	1,043	3,930	500	500	500
32.	West Papua	-	2,077	5,000	5,000	3,000
33.	Papua	794	1,045	5,000	5,000	4,000
	Total	113,042	100,738	100,743	100,987	105,656

Source: Directorate General of Watershed Management and Social Forestry

Box 2:

Development Ecosystem Restoration Concession in Indonesia through Hutan Harapan Initiative

Hutan Harapan initiated by A consortium of Burung Indonesia, The Royal Society for the Protection of Birds (RSPB) and Birdlife International which aims to conserve biodiversity, restore forest, bring great economic and livelihood for people, produce economic value and ecosystem services. Hutan Harapan is managed by PT Restorasi Ekosistem Indonesia (REKI), a company formed by the consortium, received the first and second ever ecosystem restoration concession license issued by the Indonesian Ministry of Forestry. Hutan Harapan is 98,555 ha of previously selectively logged lowland tropical rainforest, which lies on the border between Jambi and South Sumatra Provinces, Sumatra. Today, forest of this type is almost solely restricted to a few government protected areas, as it has dramatically declined both due to conversion to industrial forest and agricultural plantations since the 1970's as well as increasing small-holder development since 2000. Consequently, this lowland forest is not only one of the most bio-diverse but also one of the most critically threatened habitats on earth. Hutan Harapan represents more than 20% of this remaining habitat, and is a forest island surrounded by oil palm, rubber and pulpwood plantation concessions.

Hutan Harapan has many values both biologically, ecologically, economically, socially and culturally as follows:

- Biodiversity value, Harapan is home for 307 species bird species; place for 64 species mammal, including the Sumatran Tiger, Clouded Leopard, Agile Gibbon, Sumatran Elephant and Malayan Tapir. In addition, it is identified 728 trees species, found 71 reptiles including 5 species with IUCN endangered status; recorded 55 species Amphibian, including 8 species with IUCN endangered status; and identified 123 species of fish including 20 species are new recordings for Jambi Province and 4 species with IUCN endangered status.
- Ecologically Hutan Harapan provides ecosystem services including the provisioning of water, flood protection, local climate amelioration, carbon sequestration, pollination services and pest control, the absorption of pollutants and the aesthetic and cultural values of natural places.
- Economically Harapan is sources of income that are expected come from non-wood forest products (excluding the hunting or trapping of animals), and include eco-tourism, education as well as timber for long term.
- Socially and culturally Harapan is the home for 132 families or 596 people of the Batin Sembilan who are still dependent on the forest for hunting and gathering NTFPs and 24 village communities interact with the Hutan Harapan for gaining ecosystem services.

In the broader goal, ERC will have a potential contribution to the Aichi Biodiversity Targets. These targets include Target 5: Reducing rate of natural habitat loss (forests, etc), Target 11: Increasing % terrestrial habitats protected through area-based conservation measures integrated into the wider landscape, Target 12: Reducing rate of loss / improving status of threatened species, Target 14: Restoring and safeguarding essential ecosystem services benefiting the poor and vulnerable, and Target 15: Enhancing ecosystem resilience & contributing to climate change mitigation and adaptation by conserving & restoring forests. Thus ERC is believed that beside reducing emission and sequestering carbon but also protecting the biodiversity and increasing livelihood.

From modest beginnings just over 10 years ago, ecosystem restoration is now being mainstreamed into the Ministry of Forestry's policies. Since 2008 there have been 47 applications from private sector companies and 13 ERC licenses have been issued for a total of 519,505 ha (Ministry of Forestry 2014). At the same time, the Ministry of Forestry has designated almost 2.7 million ha of production forests for ecosystem restoration concessions.

Hutan Harapan does not only inspire 11 other ERCs in Indonesia, but it has also adopted by 14 countries in the world through "Forest of Hope" within BirdLife International's Global Forest of Hope Program. This great efforts and broader benefit and impact of ERC for new ways conservation forest in Indonesia, Burung Indonesia received the Kenton Miller Award of the year in 2014 at a ceremony at the IUCN World Parks Congress in November in Sydney. The prestigious award recognizes and promotes innovative approaches to conservation and sustainable management of forest ecosystem.

Source : Burung Indonesia and Hutan Harapan Management Unit

Greening activities, amongst others, are conducted through the establishment of City Forests and Public Forests (Hutan Rakyat). City forest establishment activity in 2013 has covered an area of 1,035.70 ha. Furthermore, public forest is forest that grows on land with property rights or with other rights with minimum area of 0.25 Ha. Establishment of public forest is directed to recover productivity of critical land, land conservation, forest protection and poverty reduction through community empowerment. Rehabilitation activities are also conducted in critical and damaged mangrove forest area. Realization of mangrove forest and coastal planting activity in Indonesia from 2009 to 2013 is presented in table 24.

Table 24. Mangrove Peat Swamp Forest Rehabilitation in 2009-2013

No.	Province	Year				
		2009 (ha)	2010 (ha)	2011 (ha)	2012 (ha)	2013 (ha)
1.	Nanggroe Aceh Darussalam	-	-	1.520	117	650
2.	North Sumatra	322	-	100	295	400
3.	West Sumatra	-	-	100	-	300
4.	Riau	327	-	500	2.850	600
5.	Jambi	-	-	200	-	150
6.	South Sumatra	-	-	-	-	400
7.	Bengkulu	-	-	170	-	100
8.	Lampung	-	-	250	0	400
9.	Bangka Belitung	-	-	90	5	193
10.	Kepulauan Riau	2.025	0	255	105	480
11.	DKI Jakarta	4	-	-	-	-
12.	West Java	350	-	330	736	240
13.	Central Java	18.200	-	290	454	600
14.	DI Yogyakarta	5.060	0	381	-	100
15.	East Java	168	-	250	1.160	1.050
16.	Banten	-	-	-	409	0
17.	Bali	25	-	150	-	-
18.	West Nusa Tenggara	75	-	150	0	140
19.	East Nusa Tenggara	45	-	400	-	150
20.	West Kalimantan	-	-	200	736	1.000
21.	Central Kalimantan	-	-	500	-	-
22.	South Kalimantan	-	-	200	67	300
23.	East Kalimantan	-	-	600	1.125	800
24.	North Sulawesi	-	-	150	-	400
25.	Central Sulawesi	8	-	600	-	200
26.	South Sulawesi	725	-	325	100	500
27.	Southeast Sulawesi	-	-	300	-	460
28.	Gorontalo	81	-	790	150	400
29.	West Sulawesi	-	-	330	0	150

No.	Province	Year				
		2009 (ha)	2010 (ha)	2011 (ha)	2012 (ha)	2013 (ha)
30.	Maluku	35	-	200	268	100
31.	North Maluku	11	-	270	140	140
32.	West Papua	3	-	500	160	1.000
33.	Papua	-	-	300	1.713	1.000
	Total	27,464	-	10,401	10,590	12,403

Source: Forestry Statistics Data 2013

2.2.4 Community Based Biodiversity Management

Burung Indonesia has implemented community based biodiversity management. Burung Indonesia manages Mbeliling Forest area located in Southwest Flores Island, West Manggarai District, East Nusa Tenggara Province. Mbeliling Forest comprises of 23,420 ha area broken up into protected zone (7,240 ha), converted forest (4,180 ha) and limited production forest (12,000 ha). Mbeliling Forest dominated by steep slopes with 60% of the total area located between 0-499 meter above sea level, 35% located at altitude 500-1000 meter above sea level, and the rest of area 5% situated in more than 1000 m above sea level (Bappenas, 2012).

Box 3:

Green Belt Mangrove in Northern Coast of Java

Local communities in Dukuh Pandan Sari, Kaliwlingi Village, Brebes District, Province of Central Java, are now released from tidal flood and abrasion. Since 2008, not less than 3 millions mangrove trees were planted by community group of Mangrove Sari who live in the northern part of Brebes Coast. The local communities were success in ecosystem restoration and provide good lesson learn from other regions in Central Java Provinces.

Restoration program of mangrove ecosystem was initiated by local community of Dukuh Pandan Sari, Kaliwlingi Village in Brebes District of Central Java Province. Previously, the community suffer from abrasion, seawater intrusion, tidal flood and massive land conversion into fishpond in Pandan Sari.

Having those problems, a group of local community, namely Mangrove Sari, supervised by Farmer Association for Integrated Pest Control (IPPHTI), proposed financing to Indonesian Biodiversity Foundation (Kehati Foundation) in order to gain support for creating innovation to manage their degraded land (approximately 129 ha) due to seawater intrusion and to restore degraded mangrove ecosystem in 2008.

Kehati Foundation provides assistance to the community on community based adaptation and mitigation program for coastal communities through empowerment of local community groups of mangrove and *tani lestari*. The program includes rehabilitation of degraded coastal area by planting mangrove trees and a pilot program to plant saltwater tolerant paddy rice. In addition, there is now regulation on mangrove protection at village level.

Kehati Foundation also supports local communities to seek financial and technical assistance from other resources, such as NGOs and University. In addition, 10 companies also participate in the program through Corporate Social Responsibility to expand restoration areas and community development. Local and National schools also contribute to the program.

Recently, neighbor villages develop similar local community groups and networking among coastal communities has been established in Brebes (Sawojajar, Grinting, Randusanga Kulon and Bangsri) and Central Java (Tegal, Demak dan Semarang). The community group now has ecological pilot fishpond and goat cattle, managed by the group. Woman groups also contribute in initiating food products from fisheries and

mangroves. The groups also plant local natural coloring plant and produce natural coloring plant in form of powder and paste.

The local community group success in develop value added from local natural resources and increase their income by producing local products made from mangrove fruits, seaweed culture, blood cockles farming, crab farming, saltwater tolerant paddy rice, goat cattle, and natural coloring plant. Paddy seed produced by *Tani Lestari* are also distributed to other regions in West Java Province and Central Java Province. The local communities is now aware of important value of coastal ecosystems as well as protect mangrove ecosystem.

Source : Kehati Foundation

2.2.5 Biodiversity Information System

Biodiversity information system (BCH) plays significant role in supporting biodiversity management in Indonesia. Several forms of BCH supports biodiversity management such as providing data and information on local biodiversity in form of Province Biodiversity Profile for 30 provinces and delivering other data and information from related stakeholders. The importance of BCH to optimizing implementation of IBSAP 2015-2019, places BCH as part of mechanisms for IBSAP implementation to date IBSAP target 2015-2020.

Various initiatives in procurement and development of biodiversity information system have been conducted to optimize BCH roles, amongst others:

1. Determination of Key institutions

Key institutions are institutions with main task closely related to biodiversity management. Hence, the linked data and information meet user requirements. Based on discussions and observations, there are 5 key institutions, namely:

- a. Indonesian Institute of Sciences
- b. Ministry of Environment and Forestry
- c. Ministry of Agriculture
- d. Ministry of Marine and Fisheries
- e. Indonesia Biodiversity Foundation (for NGO network)

Besides key institutions, there are mon-ministerial government institutions such as BIG and LAPAN with capacity to combine disseminated information from BCH with their spatial data.

2. Development of BCH network

Determination of key institutes should be followed up by implementation of several directed activities to BCH network development. These activities are; (i) Mapping types of data held by node candidates; (ii) Identification of gaps encountered by each of node candidates; and (iii) Identification of solution for obstacles encountered in the operation and function of BCH. The foundation for BCH network (between secretariat and nodes) established through the signing of the Memorandum of Understanding and collaboration agreements that are valid for a certain period of time. These agreements are periodically renewed.

3. Institutionalization of Biodiversity Clearing House

In BCH operation, several interlinked components require consideration. These components are:

- a. Clearing House Secretariat is a special unit formed by the Ministry that is responsible for the implementation of decisions made at CBD COP meetings.

- b. Human resources who are managing BCH, comprises of daily management and User's Advisory Group (UAG) with members who are representatives from key nodes. The UAG's task is providing advice, inputs and directive related to biodiversity information's user needs. BCH daily management must be equipped with skills for aggregating data (from nodes) into information needed by users and other technical skills related to Information Technology and Communication.
- c. Finance and its availability are two of the keys for activity functioning. BCH financing should be part of the budget of the responsible Ministry, under separated indicator and from other sources of fund beyond the national budget. This budget aims for financing routine coordination with nodes, updating computer hardware and software, development of website with required applications and for other financing related to the operation of BCH.

4. Biodiversity Clearing House as Knowledge Center, Monitoring and Evaluation, Reporting, as well as Access and Benefit Sharing

In IBSAP 2015-2020, BCH functions will be enhanced by means of Center for Biodiversity Knowledge; Reporting, Monitoring and Evaluation for IBSAP realization and by means of control supporting tool for implementation of the Nagoya Protocol. Those three functions will be developed using web-based special applications that combined spatial and text for user friendly front end.

2.3. Mainstreaming Biodiversity

Mainstreaming Biodiversity in Indonesia is a strategy to integrate biodiversity into planning, budgeting, implementation, monitoring and evaluation of policies, programs, and activities of national development, by involving various stakeholders in order to ensure the implementation of development that takes biodiversity into consideration. The Indonesian government is committed to the management of biodiversity in Indonesia. Indonesian government policies in the management of Biodiversity are embodied in laws and regulations that have been published, namely: (i) Law No. 5/1990 on Conservation of Biological Resources and Ecosystems regulating ecosystems conservation and species, especially in protected areas, (ii) Law No. 5 of 1994 on the Ratification of the United Nations Convention on Biological Diversity. In addition, in 1993, the National Development Planning Agency in collaboration with related Ministries and Institutes issued the Biodiversity Action Plan for Indonesia (BAPI). BAPI 1993 is then updated to become the Indonesian Biodiversity Strategy and Action Plan (IBSAP) 2003-2020.

Since 2013, the updating of IBSAP document has been continuing in accordance with the agreement on the 10th CBD Conference of the Parties (COP) in Nagoya. The Ministry of Environment (as the CBD National Focal Point), Bappenas and LIPI will administer this process. The IBSAP update completion time frame is from 2013 to 2015. Following the updating of IBSAP, biodiversity has been integrated within RPJPN 2005-2025 aims to enhance conservation and utilization of biodiversity as the basic capital for the development. Biodiversity has also been included into RPJMN 2015-2019 with a view to augment sustainable development reflected through safeguarded environmental carrying capacity and environmental resilience; improvement in management and utilization of natural resources, balanced with: conservation efforts for environmental functions and increasing awareness, mentality, and behavior of the public; and, improvement of institutional and spatial management capacities across the country.

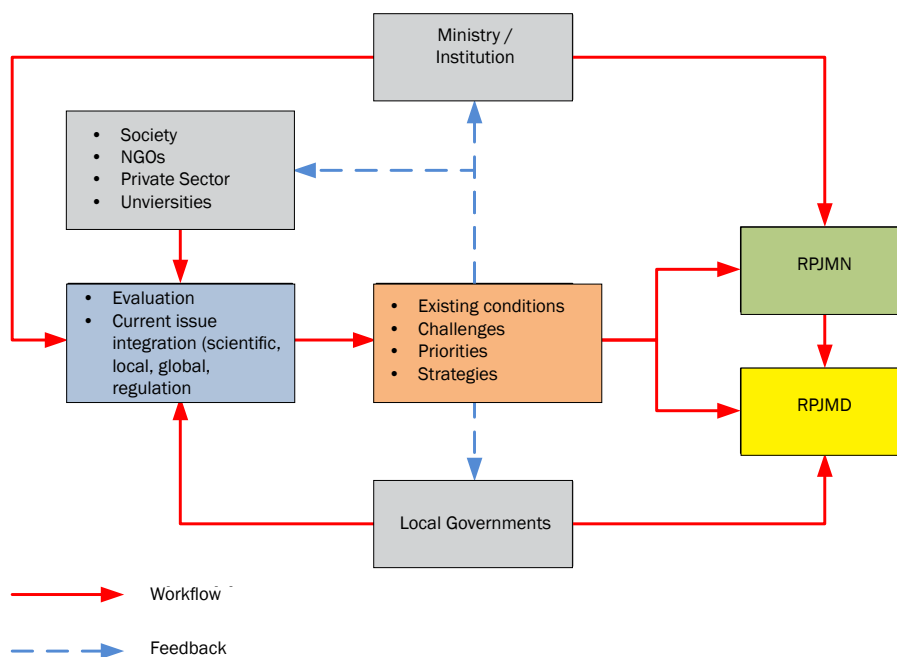


Figure 4. Stages in Mainstreaming Biodiversity in Indonesia

2.3.1. Biodiversity Management Policy

The Indonesian government is committed to the management of biodiversity in Indonesia. The regulations that have been published include:

- Law No. 5/1990 on Conservation of Biological Resources and Ecosystems regulating the conservation of ecosystems and species, especially in protected areas.
- In 1994, Indonesia ratified the CBD through Law No. 5 Year 1994 on the Ratification of the United Nations Convention on Biological Diversity. The Convention has three main goals: the conservation of biological diversity, sustainable use, and equitable sharing of benefits from the utilization of genetic resources.
- In 1993, the National Development Planning Agency in collaboration with related Ministries and Institutes issued the Biodiversity Action Plan for Indonesia (BAPI);
- In 2003, BAPI was updated to become the Indonesian Biodiversity Strategy and Action Plan (IBSAP) 2003-2020.
- Documents of BAPI 1993 and IBSAP 2003 serve as a bridge between the global and national commitment. Both documents also serve as a guide for setting national priorities and investment in the field of biodiversity conservation.
- Since 2013, the IBSAP document is being updated in accordance with the agreement on the 10th CBD Conference of the Parties (COP) in Nagoya. The Ministry of Environment (as the CBD National Focal Point), Bappenas and LIPI will administer this process. The IBSAP updating completion time frame is from 2013 to 2015.

2.3.2 Direction of Biodiversity Management Policy

- a. Improve the maintenance and utilization of biodiversity as a basic capital of sustainable development whose impacts and benefits can be felt by all parties, especially the society.
- b. Improvements of efforts to preserve the functions of biodiversity reflected by sustained environmental support capacities and recovery capabilities (restoration).
- c. Consolidation of institutions and the capacity of spatial planning, as well as increased awareness, mental attitude, and behavior in supporting the management implementation of Biodiversity.
- d. Improving the quality of human resources, as well as political support, regulatory, and budget management through mainstreaming Biodiversity issues at every level of institution and community.

2.3.3 Biodiversity Management Strategy

Indonesia divides the Biodiversity Management Strategy into four elements, namely:

1. Management Strategy (A)

Mainstreaming of biodiversity management in national development activities and various aspects of people's lives, through awareness-raising activities on the importance of bio-resources and biodiversity in the food sector, bio-energy, medicine and environmental services;

2. Management Strategy (B)

Improve the conservation and restoration of Biodiversity, through:

1. enhancing the quality and quantity of biodiversity by protecting species, ecosystems, and genetic diversity;
2. the development and implementation of biodiversity conservation policies both in-situ and ex-situ;
3. capturing flora and fauna for the preservation of endangered flora and fauna in their natural habitats, as well as meeting market demands;

3. Management Strategy (C)

Increase Biodiversity utilization as the basic capital for national development, through:

1. policy on the use of environmentally friendly technologies;
2. utilization of proven Biodiversity potentials;
3. improvement of relations between the industries and the results of the research by the Indonesian research institutes;
4. policies that support downstream industry comparative advantages (value added); Bioresource based industries (energy, pharmaceutical, health-care, cosmetic, food, and bio-materials).

4. Management Strategy (D)

Increase capacity of Biodiversity management through:

1. funding support for development in research, database and experts.
2. basic research on the utilization and management of Biodiversity, as well as development in science and technology and appropriate applied technology innovation (including local wisdom) that is integrated.

3. biodiversity valuation relating to its contribution to development;
4. cooperation between the government, private sector, society, and reserach institutes in the development of bio-based economy.
5. implementation of the Convention through planning, knowledge management, and capacity building

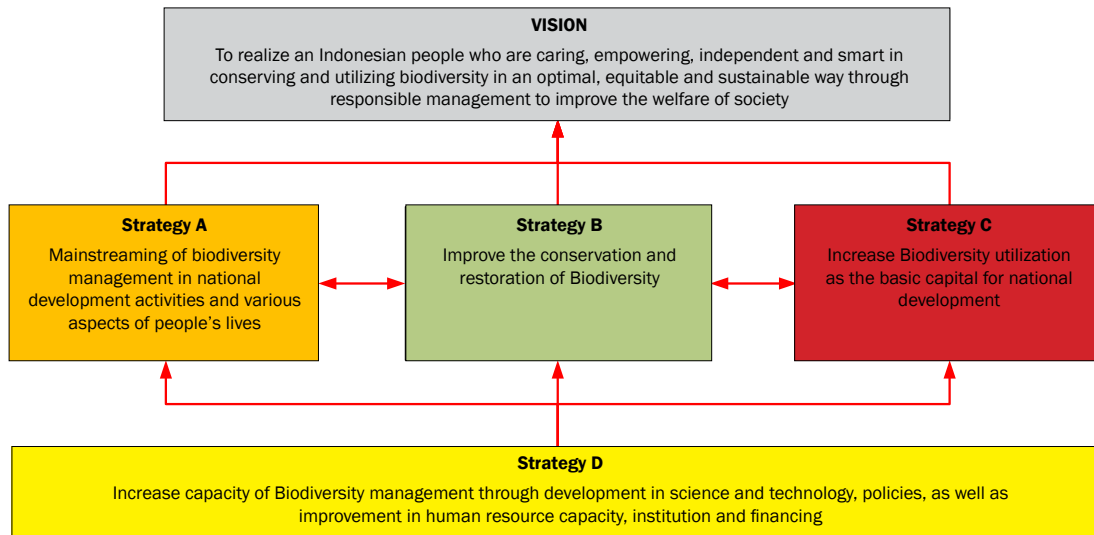


Figure 5. Biodiversity Management Strategy in Indonesia

PROGRESS IN ACHIEVEMENT OF “AICHI BIODIVERSITY TARGETS” AND CONTRIBUTION TO RELEVANT TARGETS OF MILLENNIUM DEVELOPMENT GOALS

Since, updating IBSAP is under process, which will include national targets to reduce biodiversity loss in 2020 based on Aichi Targets and other important issues, it is still premature to evaluate achievement of Aichi Targets. Nevertheless, some identified activities may contribute the achievement of Aichi Targets, as well as national targets. The activities involve multi-stakeholders, conducted by central and local governments, non governmental organizations, the private sectors, as well as many other collaborative initiatives among stakeholders. These activities also provide contributions to the achievement of *Millennium Development Goals* as was reported by Indonesia to United Nations in 2011.

Further evaluation should be carried out comprehensively by using indicators set out in the updating IBSAP, to assess achievement Aichi Targets.

3.1. Progress in Achieving “Aichi Biodiversity Targets”

Box 4:

Indonesia’s Contribution to Achieve Aichi Target 16th

Indonesia as a member of the Like Minded Mega Biodiversity Countries (LMMCs) has a significant role in the process of negotiation and adoption of the Nagoya Protocol . This followed by signing the Nagoya Protocol on 11 May 2011 at the UN headquarters, New York .In 2013 Indonesia ratified the Nagoya Protocol into National Act number 11 in order to protect the genetic resources. The ratification of the Nagoya Protocol, also contribute the achievement of Aichi Targets 16.

Ministry of Environment as the National Focal Point for the Convention on Biological Diversity and the Nagoya Protocol carried out some activities to facilitate ratification process of the Nagoya Protocol, such as and coordination with related institutions (government and non government organization), dissemination programmes (workshops and interactive dialogue with stakeholders), Dissemination programmes covered crucial topics i.e. potential biological richness of Indonesia and the benefits for the welfare of society, fair and equitable benefit sharing mechanisms, database management, traditional knowledge and measures to protect TK.

Following ratification, Government of Indonesia develop Strategy and Action Plan for the Implementation of Nagoya Protocol in Indonesia, an institutional framework for implementation of the Nagoya Protocol, guidance for Prior Informed Consent and Mutually Agreed Terms, including supplementary requirement for research permit purposes carried out by foreign researchers.Provisions of Nagoya Protocol are also included in the draft of National Act on Genetic Resources, which regulates management of genetic resources covering conservation, sustainable use and access procedures.

Source : Ministry of Environment

Table 25. Indonesia's contribution to progress towards Global Biodiversity Targets

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.</p>	<p>Establishment of scout "Satuan Karya Kalpataru"</p>	<p>Develop environmental friendly young generation with understanding to three main works (krida): Krida Biodiversity, Krida Climate Change and Krida 3R</p>	<p>Up to 2014, scout "Satuan Karya Kalpataru" has been established in 15 Provinces in Indonesia</p>	<p>Ministry of Environment, National and Local Kwartir Gerakan Pramuka, Local Government, Private sector, NGOs</p>
	<p>Adiwiyata Program</p>	<p>Encourage initiation on knowledge and awareness from school members to environmental and its biodiversity conservation</p>	<p>463 Adiwiyata Nasional and 120 Adiwiyata Mandiri schools have been established</p>	<p>Ministry of Environment, Ministry of National Education and Culture</p>
	<p><i>Biodiversity Warriors Program</i>, a youth environmental care movement</p>	<p>Biodiversity Warriors goals:</p> <ul style="list-style-type: none"> • Promote Indonesia Biodiversity • Develop popular catalogue on Indonesia Biodiversity to collect and well-manage information on its use and uniqueness for future ease study • Develop youth sensitivity to Indonesia rich biodiversity • Conduct environmental improvement due to public mindset change through stimulating information on biodiversity • Develop youth network that concentrates on biodiversity in its first year • Provides forum (online 	<p>Up to 2014, 516 warriors have been joined</p>	<p>Student, general public, Indonesia Biodiversity Foundation (Yayasan Kehati), environmental observer and scientist (as contributor)</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.</p>	<p>Development of RPJPN 2005-2025</p>	<p>and face to face) for youth and between youth and scientist interaction</p> <p>Integrate biodiversity values into the development of national development plan</p>	<p>Biodiversity included in RPJPN with a view to enhance biodiversity maintenance and use as foundation for development</p>	<p>National Planning and development agency (Bappenas), related ministries and institutions, Local Governments</p>
<p>By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant</p>	<p>Towards Green Indonesia Program (Program Menuju Indonesia Hijau)</p>	<p>Provide incentive to excellent district/ municipal/local government related to regulation in conservation and environmental damage control</p>	<p>In 2012, incentive awarded to Deli Serdang District (North Sumatera), Kolaka (South-east Sulawesi), Sangihe (North Sulawesi), Lombok and Sumbawa, west Nusa Tenggara. Four others Districts received certificate: Bantul (Yogyakarta), Banyumas (Central Java), Jombang (East Java), and Ciamis (West Java).</p>	<p>Ministry of Environment, Local Governments</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>international obligations, taking into account national socio economic conditions.</p>	<p>PROPER Green and Gold levels (additional contribution for GHG reduction, biodiversity conservation and Community Development)</p>	<p>Minister of Environment Republic of Indonesia Decree Number 06, 2013 on Program Evaluation on Corporate environmental management rank for (i) controlling environmental pollution, (ii) controlling environmental degradation, (iii) managing hazardous, and toxic wastes.</p>	<p>Program incentive or disincentive to business operators and/or activities for their achievement and legal/regulation compliance for controlling pollution and/or environmental degradation. For 2012-2013 period 12 companies were ranked gold and 113 companies were ranked green, as follows:</p> <ul style="list-style-type: none"> - 48 companies ranked green and gold, succeeded in reducing water pollution of 11.8 million tonnes. - 65 companies ranked green and gold, succeeded in reducing air pollution 2.930 ton and reducing emission of GHG 646,982 tonnes eq. CO2 	<p>Private sector, Ministry of Environment, Local Governments</p>
<p>By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.</p>	<p>ISPO (Indonesian Sustainable Palm Oil)</p> <p>Strategy for the development of innovative-adaptive technology bioscience based in agricultural sector</p>	<p>Application of mandatory system for oilpalm estate and industry development based on environmental sustainable principle to all oilpalm estate and industry in Indonesia.</p> <p>Optimum carbon efficiency/biomass/organic and zero waste through the use of organic fertilizer/compost, cattle food, biogas, bioenergy, etc.</p>	<p>Number of issued ISPO certificates for 40 companies to 2013</p> <p>Up to 2013, 8 organic certification institutions established in Indonesia. In 2011 certified organic agriculture area reached 90,135.30 ha and the ongoing certification process</p>	<p>Ministry of Environment, Private sector, Scientific Institutions/Universities, Certification Agency</p> <p>Ministry of Agriculture, Local Governments</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
			<p>about 3.80 ha, certified organic quality assurance 5.89 ha, uncertified 134,717.66 ha. The area increased to 2013.</p>	
	<p>Legal Wood Verification System (SVLK)</p>	<p>Legal Wood Verification System (SVLK) functions to ensure wood product and its material originated from legally managed sources. Wood is called legal if the source of wood, logging permit, system and logging procedure, transportation, processing, and trade or transfer proven fulfilled all legal requirements.</p>	<p>Up to 2014, 845 companies acquired Legal Wood Certificates</p>	<p>Ministry of Forestry</p>
<p>By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.</p>	<p>Forest and Land Rehabilitation</p>	<ul style="list-style-type: none"> • Conservation/Protection Forest Rehabilitation (KPL) • Establishment of City Forest • Mangrove/Coastal Forest Rehabilitation • Critical land rehabilitation 	<p>Total realization from 2010-2013 is 1.852.692 ha, with target by 2014 up to 2.5 million hectares</p>	<p>Ministry of Forestry, Local Governments</p>
<p>By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that</p>	<p>Fish Species Conservation</p>	<p>Number of identified fish species of endangered, rare, endemic mapped, protected, conserved, and sustainably used</p>	<p>Year 2010 - 3 species; 2011 - 6 species; 2012 - 9 species; 2013 -12 species; 2014 - 15 fish species have been conserved</p>	<p>Ministry of Marine and Fisheries</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.</p>	<p>Prevention efforts for over fishing has been established with National Action Plan for prevention and anticipation of Illegal, Unreported, and Unregulated Fishing (IUU Fishing) (2012-2016), signed in 27 December 2012 by Ministry of Marine and Fisheries as Minister of Marine and Fisheries Decree number KEP/50/MEN/2012.</p>	<p>Minister of Marine and Fisheries Decree as reference for each unit under Ministry of Marine and Fisheries in their prevention and anticipation activities to IUU Fishing activities in accordance to their duty and function and as material for coordination with other ministries/institutions in prevention and anticipation IUU Fishing activities.</p>	<p>Data for 2010 showed 4 jellyfish fisheries locations in Indonesia. Data production volume of edible jellyfish in Indonesia 2009 was 2,702 tonnes, 2010 was 1,527 tonnes, or decreased by 26.3% (Bioresource Indonesia, 2013)</p>	<p>Ministry of Marine and Fisheries</p>
<p>By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.</p>	<p>Sustainable management for agriculture, fisheries and forestry areas, to ensure biodiversity conservation (Kurniawan, 2014):</p> <ol style="list-style-type: none"> 1. Encourage management system for agriculture, fisheries and forestry based on local wisdom ; 2. Determine regulations that are understandable to public on introduced species cultivation/ farming; 3. Determine inevitable spatial planning related to land utilization for agriculture, fisheries and forestry development 4. Execute intergrated and synergized management programs for agriculture, fisheries and forestry 	<p>Program realization for enhancing sustainable use of biodiversity in cities and villages through model of sustainable house and food area (m-KRPL).</p>	<p>Establishment of Law of the Republic Indonesia number 41, 2009 in Protection of sustainable agriculture land for food.</p>	<p>Ministry of Agriculture, Ministry of Marine and Fisheries, Ministry of Forestry, Public and Private sector</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.</p>	<p>Efforts in diminishing environmental pollution have been executed; for instance throughout Program Assessment on Corporate Performance Ranking in Environmental Management (PROPER).</p>	<p>Encourage company to comply with environmental regulations and reach environmental excellency. The compliance and environmental excellency assessed in PROPER from integration of sustainable development principles into process production and service, implementation of environmental management system, 3R, energy efficiency, resource conservation and realization of business ethics and community responsibility reflected in the community development program.</p>	<p>In 2012-2013 PROPER, of total 1812 companies, 201 companies monitored by MoE, 1160 companies monitored by Province and 451 companies through Self-assessment mechanism. Of 1812 companies, there were no announcement for 20 companies due to ongoing legal scrutiny and discontinuue operation. In general, level of compliance for 2012 -2013 reached 65%, slightly down compared to 69% from the previous year due to the 38% addition of new participants.</p>	<p>Ministry of Environment, Public and Private sectors</p>
<p>By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.</p>	<p>Inventory and identification of invasive alien species</p>	<p>IAS and IAS management documented and identified</p>	<p>Government has designed regulation that includes determination of invasive alien species found in Indonesia and, developeddraft on Indonesian invasive species strategy and action plan.</p>	<p>Ministry of Environment, Ministry of Forestry, and Public</p>
<p>By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate</p>	<p>There is positive trend of better coral reef condition in Indonesia compared to observation data from 1993 to 2013.</p>	<p>Indonesian Institute of Sciences (LIPI) coordinated research halts/diminishes coral reef degradation.</p>	<p>Coral reef in good and fair condition increased from1993 to 2013, meanwhile the poor conditions of coral reefs decreased (Press Release: P20-LIPI (17 April 2014).</p>	<p>Ministry of Marine and Fisheries, Ministry of Forestry, Ministry of Environment, Indonesian Institute of Sciences</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>change or ocean acidification are minimized, so as to maintain their integrity and functioning.</p>				
<p>By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.</p>	<p>Marine Conservation Area</p>	<p>4.5 million ha marine conservation area are sustainably managed; with additional 2 million ha marine conservation area in 2014 (Target to 2020 about 20 million ha marine conservation area)</p>	<p>By 2013, 3.6 million ha managed with additional 500,000 ha (Total 1.7 million ha)</p>	<p>Ministry of Marine and Fisheries</p>
	<p>Terrestrial Conservation Area</p>	<p>Indonesia pronounces 571 Conservation Areas</p>	<p>Up to 2014, of 571 conservation areas, 182 have the endorsed management plans, 87 with non-endorsement management plans, and 252 without management plan. Of the formation Zone/Block 571 conservation areas, 67 have been endorsed, 18 have not been endorsed, and 436 have no zonation/block.</p>	<p>Ministry of Forestry</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.</p>	<p>Species and Genetic Conservation</p>	<p>Determination and prioritization of 14 endangered species for population boosting up to 3% in 2010-2014.</p> <ul style="list-style-type: none"> For 2014-2019, target increased to boost population up for 25 endangered species (according to IUCN Redlist) to 10% according to 2013baseline data. Ensured breeding of 10 species of endangered wildlife (according to IUCN Redlist) in conservation institution. The 60 breeding unit for TSL export certified Utilization and export of TSL and its bio prospecting increased to 5 billion/year or 25 billion in 5 years. Ensured the increasing amount of state non tax revenue (PNBP) from utilization of TSL to 10 million/year or 50 million in 5 years. 	<p>Population development of prioritized endangered species in 2010 and 2013:</p> <ol style="list-style-type: none"> Buffalo: 241 individuals in 2010 and 237 individuals in 2013. Javan Rhino: 48 individuals in 2010 and 58 individuals in 2013. Sumatran Tiger: 324 individuals in 2010 and 356 individuals in 2013. Sumatran Elephant: 1058 individuals in 2010 and 898 individuals in 2013. Roussa Pig: 674 individuals in 2010 and 719 individuals in 2013. Anoa: 1018 individuals in 2010 and 1059 individuals in 2013. Javan Gibbon: 592 individuals in 2010 and 596 individuals in 2013. Orang Utan: 12,912 individuals in 2010 and 10,817 individuals in 2013. Proboscis monkey: 117 individuals in 2010 and 344 individuals in 2013. Komodo dragon: 5483 	<p>Ministry of forestry</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
			individuals in 2010 and 6336 individuals in 2013. 11. Bali Starling: 114 individuals in 2010 and 133 individuals in 2013. 12. Maleo: 7114 individuals in 2010 and 8005 individuals in 2013. 13. Javan Eagle: 77 individuals in 2010 and 54 individuals in 2013. 14. Small yellow crested Caccatua: 621 individuals in 2010 and 781 individuals in 2013.	
	Establishment of botanical gardens based on Presidential Regulation No. 93, 2011.	Ex-situ conservation	Up to 2013, 21 new botanical gardens have been established and developed in provinces contributing to total 25 botanical gardens in Indonesia and representing 15 eco-regions, with total area 4,078.6 ha (Purnomo et al. 2014).	Indonesian Institute of Sciences
By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically	Empowering Genetic Resources management network	Optimum utilization of local genetic resources for people prosperity and for local economy. National Development Program of Parent Seed Garden for local genetic resources repository.	Up to 2014, 19 Provincial Commissions and 2 Municipalities/District Commissions for Genetic Resources have been established in Indonesia.	Ministry of Agriculture, Local Governments, Public

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.</p>	<p>Optimum utilization of garden through the concept of <i>Rumah Pangan Lestari</i> (sustainable food concept)</p>	<p>Utilize intensively and wisely the RPL as a house with garden for local genetic resources to ensure sustainable provision of diverse and qualified household food.</p>	<p>RPL activities have been conducted in all provinces in Indonesia with different area and variety of commodities.</p>	<p>Ministry of Agriculture, Public, Private sector</p>
	<p>Policy development through Minister of Agriculture Republic Indonesia Regulation Number 42/Permentan/Ot.140/3/2014 On monitoring seed and livestock production and distribution.</p>	<p>Inventory and identification of potential local stock for the assembling of superior variety</p>	<p>Number of documented accession to 2013: Cow 10, Buffalo 4, Sheep 11, Goat 11, Chicken 13, and Duck 8.</p>	<p>Ministry of Agriculture, Public</p>
	<p>Collection of potential local genetic resources for the assembling of superior variety.</p>	<p>Provide source of seed</p>	<p>Ministry of Agriculture c.q. Division of Plant Variety Protection reported that up to 2014 identification and collection have been done for 470 local genetic resources. It comprised of 229 accessions for fruits, 121 accessions for estate plant, 55 accessions for vegetable and 29 accessions for ornamental/flowering plant.</p>	<p>Ministry of Agriculture</p>
<p>By 2020, ecosystems that provide essential services, including services related to water, and contribute to</p>	<p>Water-source protection program (<i>Permata Program</i>)</p>	<p>Conduct recovery and protection activities for water quantity and quality and water continuity in watershed (DAS), in order to diminish degradation pressure and pollution level in water-source</p>	<p>(1) Socialization and campaign on water-source protection for increasing policy maker and stakeholders commitment and participation in the protection efforts;</p>	<p>Ministry of Environment, Local Governments</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>health, livelihoods and wellbeing, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.</p>	<p>Program 1 million tree planting</p>	<p>area and water catchment area and encourage climate change adaptation efforts. Implementation of this program is prioritized for area or island with relatively dense population.</p>	<p>(2) Development of tool and protection scheme for water-source and its surrounding area (institution, guidance and management plan);</p> <p>(3) Water-source area (destruction control) and its catchment area maintenance, surveillance and law enforcement.</p>	<p>Ministry of Forestry and all public component</p>
<p>By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.</p>	<p>Forest and land conservation, restoration and rehabilitation through the establishment of Management Agency for REDD.</p>	<p>Reduce impact of climate change and carbon emission and to further improve people wealth especially for people surrounding forest.</p> <p>Conduct efforts for reducing GHG emission from deforestation, forest and peatland degradation (REDD) to minimize global warming impact on environmental degradation.</p>	<p>Up to 2013, total of 1,815,180,535 trees has been planted since the establishment of the program in 2010.</p> <p>President of Republic Indonesia Decree number 62, 2013 has been issued related to government commitment to reduce GHG emission of: 26% through internal effort and 41% through international collaboration by 2020 from the condition without action plan. In regards to biodiversity recovery effort, Ministry of Forestry has issued Minister of Forestry Decision number 293/Menhut-II/2007, on license to operate for utilization of Forest Timber Product (IUPHHK) for 52,170 ha forest</p>	<p>Ministry of Forestry and all public component</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
			<p>ecosystem restoration in South Sumatra Province and Minister of Forestry Decision number 327/Menhut-II/2010, on IUPHHK for 46,385 ha forest ecosystem restoration in Jambi Province. This forest concession is managed by Restoration Ecosystem Conservation Indonesia (REKI) company and so called Harapan Forest. This is a significant innovation-based conservation for natural forest restoration from secondary ex-logging forest. Based on Birdlife Indonesia assessment, this restoration scheme in Harapan Forest could save habitats for more than 269 bird species, of which are 70 endangered species. Up to 2014, Ministry of Forestry has issued permits for 12 companies to conduct ecosystem restoration.</p> <p>Released data from Directorate General of Watershed (DAS) Management and Social Forestry showed that area of forest rehabilitation has continuously increased from year 2010 to 2013: 170,414 ha in 2010, 556,671 ha in 2011 507,716 ha, in 2012, and 664,067 ha in 2013.</p>	

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
			<p>Land Rehabilitation area increased from year 2010 to 2013: 25,311 ha in 2010, 405,179 ha in 2011, 407,145 ha in 2012 and 558,412 ha in 2013.</p> <p>Forest re-planting area continuously increased from year 2009 to 2013: 113,042 ha in 2009, 100,738 ha in 2010, 100,743 ha in 2011, 100,987 in 2012, and 105,656 ha in 2013.</p> <p>Critical Land Rehabilitation area increased from year 2010 to 2013: 56,951 ha in 2009, 23,831 ha in 2010, 403,741 ha in 2011, 406,140 ha in 2012, and 557,376 ha in 2013.</p> <p>Mangrove forest, swamp and peat rehabilitation increased from year 2011 to 2013: 10,401 ha in 2011, 10,590 ha in 2012, and 12,043 ha in 2013.</p> <p>Development of small water-dam (embung) air increased from year 2009 to 2012, but then decreased in 2013: 70 dams in 2009, 73 dams in 2010, 131 dams in 2011, 168 dams in 2012, and 133 dams in 2013.</p>	

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.</p>	<p>Ratification of the Nagoya Protocol</p> <p>Development of Draft of Law on Genetic Resources Management</p>	<p>Determine legal foundation for regulating access to genetic resources and fair benefit sharing from its utilization.</p> <p>Prepare regulation for genetic resources management including regulations to support for Nagoya Protocol implementation in Indonesia.</p>	<p>Ratification has been done through the issuance of Law number 11, 2013 enacted in 8 May 2013</p> <p>Draft Law PSDG has been prepared and included into long list Prioritized National Legislative Program 2010-2014 waiting for parliament assessment and discussion.</p>	<p>Parliament, Ministry of Environment Ministries/ Institution, NGOs, Private sector</p> <p>Parliament, Ministry of Environment Ministries/ Institution, NGOs, Private sector</p>
<p>By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.</p>	<p>Updating IBSAP 2015-2020</p>	<p>Evaluating previous implementation of IBSAP and develop a strategic plan for implementation of IBSAP 2015-2020</p>	<p>Ongoing updating of IBSAP 2015-2020, scheduled to be finished early 2015.</p>	<p>National Development and Planning Agency (Bappenas), Ministry of Environment, LIPI, NGOs, Academia, etc</p>
<p>By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected,</p>	<p>Kalpataru Award Program</p>	<p>Award Kalpataru as government reward to individual or group of people for their invaluable voluntary contribution and passion for safeguarding environmental function, categorized into Environmental Pioneer, Environmental Devotee, Environmental Savior and Environmental Patron.</p>	<p>Up to 2013, 326 prizes have been awarded for all categories. Of those awards, 97 granted to environmental pioneers and 99 to environmental savior group.</p>	<p>Ministry of Environment and Forestry, Local Governments, Public</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.</p>	<p>Inventory and documentation of traditional knowledge related to biodiversity</p>	<p>Provides source of information on applicable good practices for the public</p>	<p>Establishment of biodiversity information system related to traditional knowledge under Indonesian Biodiversity Information Facility (InaBIF)</p>	<p>Ministry of Environment and Forestry, Local Governments, Local People</p>
<p>By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.</p>	<p>Establishment of Biodiversity Clearing House (BCH)</p>	<p>BCH acts as information exchange media that covers local biodiversity (Biodiversity Profile), Law and Regulation, Species Protection Program through Local Flora and Fauna Identity Program, Biodiversity Park, etc.</p>	<p>Biodiversity Clearing House (BCH) has facilitated the development of 26 local BCH as potential nodes of BCH.</p>	<p>Ministry of Environment and Forestry, Local Governments, Local People</p>
	<p>Indonesian Biodiversity Information Facility (InaBIF)</p>	<p>Development of Indonesian Biodiversity Information Facility (InaBIF) aims to facilitate biodiversity data and information exchange that integrate interoperability of related government institution/agency database, as part of the Global Biodiversity Information Facility</p>	<p>Up to 2014, Ina BIF still in the development process for the effective implementation</p>	<p>Indonesian Institute of Sciences</p>

AICHI TARGET	ACTIVITY	GOAL	ACHIEVEMENT	STAKEHOLDER
<p>By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.</p>	<p>Financial resource mobilization effectively implemented and integrated into Biodiversity Strategic Plan and become an important part to be included in the ongoing updating process of IBSAP (2015-2020).</p>	<p>Development of Strategic Plan related to financial resource mobilization and Biodiversity Strategic Plan</p>	<p>Included in RPJMN 2015-2020</p>	<p>National Planning and development Agency, Ministry of Finance and other related Ministries.</p>

3.2. Contribution of Indonesia Towards Achievement of MDGs Target

Table 26. Indonesia contribution towards achievement of Millennium Development Goals, specifically, Goal-7 “Ensure environment sustainability”.

No	Target	Indicator	Acuan Dasar	Achievement	MDGs Target 2015
7A	Integrating Sustainable Development Principles Into National Policy And Program And Reducing Damage In Environmental Resource	Ratio of tree coverage area to land area, based on satellite imagery and aerial photograph survey	59,97% (1990)	52,52% (2010)	Increased, but still require special consideration to be accomplished
		Proportion of fish catch within biologically safeguarded limit	66,08% (1998)	98,86 % (2011)	Up to quota, predicted to be accomplished
		Ratio of protected area to maintain sustainable biodiversity to total forest area	26,40% (1990)	27,54% (2010)	Increased, predicted to be accomplished
		Ratio protected marine area to total marine territory	0,14% (1990)	4,97% (2011)**	Increased, predicted to be accomplished

Source: Ministry of National Development Planning/National Development Planning Agency (BAPPENAS), 2012, Report on Indonesia Millennium Development Goals Achievement 2011

3.3. Important Efforts for Accelerating MDGs Goals Achievement

Based on Indonesia Millennium Development Goals Achievement 2011 Report submitted to United Nations in 2012, important efforts exclusively related to biodiversity has been implemented to accelerate MDGs goals achievement, as follows:

- ◆ In order to increase the ratio of tree coverage area and the ratio of protected area, Government of Indonesia has undertaken priority activities in forest and critical land rehabilitation, including mangrove forest, coastal forest, peat and swamp forests along river basin/watershed territory in Indonesia to date 2.5 million hectares target for 2010-2014. Simultaneously, various efforts to improve forest area management at level site (tapak) to accelerate settlement of forest area delineation and to expedite of Forest Management Unit (KPH) operation. Furthermore, many efforts have been conducted in diminishing the number of hot-spots and forest burnt areas to reduce forest fire spread.
- ◆ In year 2011 Indonesia Government has implemented activities for enhancing fish resources quality and the quality of its environment such as fry's tranching in territorial sea and in archipelagic water through the "One Man One Thousand Fries" (OMOTF) program of the central and local governments. In addition, fish shelter development has also been conducted as part of the strategy for fish stock recovery and enrichment.
- ◆ The marine conservation area will be enlarged to 20 million hectares by 2020. Indonesia will also collaborate with 6 countries included in Coral Triangle Initiative/CTI; i.e. Malaysia, Papua New Guinea, Philippines, Solomon Islands, and Timor-L'este, as an integrated effort for sustainable preservation of marine resources in the area. The efforts for ensuring marine and coastal environment sustainability are made through rehabilitation activities and habitat and species conservation and status elevation and protection for marine species and biota. Expansion of marine conservation areas is in line with the effort for ensuring effective management. In 2011, The Government of Indonesia has developed a draft on management effectiveness assessment tool for auditing marine conservation areas in Indonesia.

Appendix 1. Development Process of the 5th National Biodiversity Report

The Ministry of Environment coordinated the development of the 5th National Biodiversity Report in collaboration with Government Institutions, Non-Governmental Organizations and biodiversity experts. Based on the mandate, the Ministry of Environment formed technical team and report development team. Technical team comprised of representative from Government Institutions and Non-Governmental Organizations, meanwhile, report development team comprised of Ministry of Environment supported by biodiversity experts from Indonesian Institute of Sciences (LIPI) and National Development and Planning Agency (Bappenas).

The stage of the 6 months (April – August 2014) report development process as follows:

- a. Translation of the 5th National Biodiversity Report guidelines from the CBD Secretariat to enable report development process.
- b. Development of report framework based on the translated guidelines. Began with official launching of the 5th National Biodiversity Report development process by the Minister of Environment as the National Focal Point for CBD in front of the biodiversity related stakeholders. The Minister explained the objectives of the 5th National Biodiversity Report development and its process.

Following the official launching, Technical team determined report framework that included; determination of information about biodiversity status based on ecosystem, species and genetic diversity; identification of national indicators for the national and global CBD target's achievement, implementation of IBSAP and strategic actions for relevant sectors as well as determined method for data and information collection.

- c. Inventory of required data and information. Performed through the updated data and information from the 4th National Biodiversity Report and collected information from multi-sources such as Indonesia Environmental Status and information from Government Institutions and Non-Governmental Organizations.
- d. Analyses of data and information collected by the development team.
- e. Data and information validation to collect inputs from technical team on the analytical results.
- f. Report writing by development team follows by report verification to obtain input from stakeholder and technical team on the draft report.
- g. Finalized report and translation into English by the development team.
- h. Endorsement of the report by National Focal Point for CBD and printing process.
- i. Submit the report to CBD Secretariat.
- j. Distribute Report to stakeholders and CBD and publication through Indonesia Biodiversity Clearing House (<http://www.indonesiachm.or.id>).

Appendix 2. Source of Information for the 5th National Biodiversity Report

International sources related to biodiversity

- Convention on Biological Diversity (Law No 5/1994): <http://www.cbd.int>
- TEEB The Initiative on Economics of Ecosystems and Biodiversity: <http://www.teebweb.org>
- Global Biodiversity Information Facility : www.gbif.org
- Millennium Development Goals: <http://www.un.org/millenniumgoals>
- The Ramsar Convention on Wetland (Presidential Decree (Keppres) 48/1991): <http://www.ramsar.org>
- International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA, Law No 4/2006): <http://www.planttreaty.org>
- Convention on Trade in Endangered Species (CITES, Presidential Decree No 4/ 1978): <http://www.cites.org>
- Access and Benefit Sharing provisions of the Convention on Biological Diversity (Nagoya Protocol, Law No 11 /2013) : <http://www.cbd.int/abs>

References for the development process of Update IBSAP (compiled in CD accessible through Indonesia Biodiversity CHM <http://www.indonesianchm.or.id>)

1. Recent Status of Indonesia Biodiversity
2. Resource Mobilization
3. Economic Valuation of Biodiversity
4. Institutional Biodiversity

Ministries/Institutions Related to Biodiversity

- Ministry of Environment
- Directorate General of Forest Protection and Nature Conservation (<http://ditjenphka.dephut.go.id>)
- Indonesian Biodiversity Information Facilities (INABIF) ([www. ibis. Biologi.lipi.go.id](http://www.ibis.Biologi.lipi.go.id))
- Ministry of energy and Mineral Resources
- Ministry of Marine and Fisheries
- Ministry of Agriculture
- Ministry of Forestry
- Ministry of Internal Affairs
- Ministry of National Development Planning/National Development and Planning Agency (BAPPENAS)

- Ministry of Finance
- Research Center for Biology, Indonesian Institute of Sciences (LIPI) <http://www.biologi.lipi.go.id>
- Center for Plant Conservation – Botanic Garden <http://www.bogorbotanicgardens.lipi.go.id>

Non-Governmental Organizations related to Biodiversity

- Yayasan KEANEKARAGAMAN HAYATI [www.Keanekaragaman Hayati.or.id](http://www.KeanekaragamanHayati.or.id)
- WWF Indonesia www.panda.or.id
- Conservation International (CI) www.conservation.org
- Wahana Lingkungan Hidup Indonesian (WALHI) www.walhi.or.id
- Wildlife Conservation Society (WCS) www.wcs.org
- Fauna and Flora International (FFI) www.fauna-flora.org
- Burung Indonesia www.burung.org
- The Nature Conservancy www.tnc.org
- Zoological Society of London www.zsl.org
- Aliansi Masyarakat Adat Nusantara (AMAN) www.aman.or.id
- Wetland International www.wetlands.or.id

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Appendix 3. Similarity Matrix of GSPC Target and Aichi Target

TARGET GSPC	AICHI TARGET																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1		■	■					■		■				■		■				X
2		■	■					■		■				■		■				X
3		■	■					■		■				■		■				X
4		■	■		X			■		■	X			■	X	■				
5		■	■					■		■	x			■		■				
6		■	■				x	■		■				■		■				
7		■	■					■		■		x		■		■				
8		■	■					■		■		x		■		■				
9		■	■					■		■			x	■		■				
10		■	■					■	x	■				■		■				
11		■	■	x		x		■		■				■		■				
12		■	■	x		x		■		■				■		■				
13		■	■					■		■				■		■			x	
14	x	■	■					■		■				■		■				
15		■	■					■		■				■		■				x
16		■	■					■		■				■		■	x			

■ Aichi target not aimed to GSPC target

Appendix 4. Indonesia's Achievement of GSPC Target

Implementation of targets contained in GSPC Indonesia is summarized in the table below, with symbol  for target achievement with no progress, symbol  for target achievement with less progress, meanwhile symbol  for target achievement with significant progress.

Goal I. Plant diversity is well understood, documented and recognized



Target 1. An online flora of all known plants.

Developed online and accessible plant databases at national level, regardless of their scatteredness. Integrated database has been initiated in 2013 under GBIF facility/platform (InaBIF). LIPI has developed a national database for specimen's collection (Herbarium and Museum) so-called BIS online (<http://ibis.biologi.lipi.go.id>).



Target 2. An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action

This target has not yet achieved due to vast number of species and their distribution. Cultivation efforts with limited results have been done for several species targeted including species in the IUCN species list (*Dipterocarpus cinereus* Sloot.). Re-assessment has also been done for conservation status on *Dipterocarpaceae* (*Vatica bantamensis*, *Dipterocarpus littoralis*, *D. cinereus*, *Hopea billitonensis*).



Target 3. Information, research and associated outputs, and methods necessary to implement the Strategy developed and shared

National Strategy for Plant Conservation has not specifically developed hitherto, although action plan and strategic plan for relevant sectors existed such as Botanic Gardens Action Plan, Forest Management Strategy, Guidelines for National Conservation Strategy 2008 - 2018, Indonesia's Sustainable Development I & II, including the ongoing updating of IBSAP. In year 2010, Indonesian Bioresources supported biological resources conservation in the medium term development plan to 2019.

Goal II. Plant diversity urgently and effectively conserved



Target 4. At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration.

Fifteen ecoregions of the 47 ecoregions in Indonesia have been represented in 25 botanical gardens for ex-situ conservation. In addition, many conservation sites have also established such as universities arboretum, 50 national parks, 170 nature conservation areas, 55 wildlife sanctuaries and 150 other forms of conservation areas.



Target 5. At least 75 per cent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants and their genetic diversity

National Action Plan for protected area 2010-2015 formed, but not yet covered plant genetic diversity status. Action Plan for sector has been developed; e.g. for mangroves (National Action Plan and Strategy 2012-2015)



Target 6. At least 75 per cent of production lands in each sector managed sustainably, consistent with the conservation of plant diversity

In year 2009, Law on protection of productive land for food adopted (UU No.41/2009).



Target 7. At least 75 per cent of known threatened plant species conserved *in situ*

Numerous endemic species have been protected in national parks, for instance; *Vatica bantamensis* in Ujung Kulon National Park, *Dipterocarpus littoralis* in Nusakambangan National Park and *Dipterocarpus cinereus* in Pulau Musala National Park.



Target 8. At least 75 per cent of threatened plant species in ex situ collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes

There are only 21.5% plant species conserved ex situ in botanic garden. Series of botanical explorations have discovered vast number of plant diversity. Presidential Regulation on Botanical Garden adopted (No. 93/ 2011).



Target 9. 70 percent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge

Percentage of the conserved cultivated plant has not yet been documented. Nonetheless, database related to Genetic Resources, Traditional Knowledge and Folklore has been developed since 2012 through law on sustainable use of traditional knowledge and folklore, publication of Plant Resources of South East Asia – 24 books, 19 volumes of 5952 useful plant species in ASEAN 1983, Indonesia Utilized Plant book and Medicinal Plant Conservation in Indonesia book



Target 10. Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded

List and National Strategy for invasive plant species has been established. National Strategy for management, eradication and prevention of alien plant species commenced in May 2014

Goal III. Plant diversity is used in sustainable and equitable manner



Target 11. No species of wild flora endangered by international trade

Insufficient data available for target 11. Nevertheless, Indonesia is conducting activities related to implementation of CITES at national level. Policy, regulation, methodology and evaluation formed for wood and ramin species. Indonesia Government developed single door policy for the trade of wild flora and fauna.



Target 12. All wild harvested plant-based products sourced sustainably

Ministry of Forestry has applied method for iron wood certification (System to Ensure Legality of Iron Wood) under sustainable forest management



Target 13. Indigenous and local knowledge innovations and practices associated with plant resources maintained or increased, as appropriate, to support customary use, sustainable livelihoods, local food security and health care

Database related to genetic resources, traditional knowledge and folklore has been developed since 2012. Research and protection of indigenous and local knowledge have been implemented at local level.

Goal IV. Education and awareness about plant diversity, its role in sustainable livelihoods and importance to all life on Earth is promoted



Target 14. The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes

Progress accomplished throughout the development of; education program and module, information center for botanical garden's visitors and community development. Plant diversity and conservation have been embedded into school's curriculum. Several local, national and international NGO's have played active role in the target achievement. The development of GSPC tool such as operation guide, brochure, and web-based information in Bahasa Indonesia are continuing

Goal V. The capacities and public engagement necessary to implement the Strategy have been developed



Target 15. The number of trained people working with appropriate facilities sufficient according to national needs, to achieve the targets of this Strategy

There are 300 botanists, plant technicians, horticulturists, and IT experts, as well as 90 botanists in the Research Center for Biology. Overseas management and plant conservation training has been conducted including advance study. Annual training organized for Bogor Botanical Garden staff. Research grant, collaboration and facility development have been increased



Target 16. Institutions, networks and partnerships for plant conservation established or strengthened at national, regional and international levels to achieve the targets of this Strategy

Network for Plant Conservation (INetPC) continuously developed to accomplish national GSPC target and the Indonesia Botanical Garden Society (MAPI=Masyarakat Perkebunrayaan Indonesia) has been established. Web-based network on social work for the achievement of GSPC target has also been developed. Similarity matrix of GSPC Target and Aichi Biodiversity Target described, to map GSPC achievements in relation to Aichi Target (Appendix 3.).