Ministry of Environment and Forestry
Republic of Indonesia

THE STATE OF INDONESIA'S FORESTS 2022

Towards FOLU Net Sink 2030

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Preface

In the wake of the 2018 publication of "The State of the World's Forests 2018" initiated by the Food and Agriculture Organization of the United Nations (FAO), Indonesia published its first biennial report entitled "The State of the Indonesia's Forests 2018" which showed the Government's concern to protect Indonesia's tropical forests. The first edition of the publication was then updated in 2020 by the publication of "The State of Indonesia's Forests 2020" reflecting the Government of Indonesia's commitment to communicating the way Indonesia's forests were managed, not only for the national interests but also as a contribution to the global community.

The State of Indonesia's Forests 2022 highlights the important role of Indonesia's tropical forests in tackling global climate change. As stated in the NDC, the Government has committed to reducing GHG emissions by 29 percent against business-as-usual (BAU) scenario through its own efforts (unconditional) and up to 41 percent with necessary international assistance (conditional) by 2030, in order to reduce climate change-related risks. Of the 29 percent unconditional target, 17.2 percent will be achieved through the forestry sector.

An enhanced NDC document has been submitted to UNFCCC to reflect raising ambition by increasing emission reduction target from 29 percent in the First and Updated NDCs to 31.89 percent unconditionally and, from 41 percent in the First and Updated NDCs to 43.20 percent conditionally. This Enhanced NDC is the transition towards Indonesia's Second NDC which will be aligned with the Long-Term Low Carbon and Climate Resilience Strategy (LTS-LCCR) 2050 with a vision to achieve net-zero emission. Moreover, it provides updates to reflect the current national context, clear milestones along with national development for the period 2020-2024.

Furthermore, in Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR), the Government envisages achieving the Forestry and Other Land Use Net Carbon Sink by 2030, referred to as FOLU Net Sink 2030. It is a set of strategic measures to reduce around 140 million tons of CO_2e by 2030 from the FOLU sector that have been successfully prepared and now started to be implemented on the ground.

Indonesia's FOLU Net Sink 2030 builds on outstanding emission reduction performance in the field. The performance is determined through several factors including the efforts to control forest and land fires, the permanent moratorium on primary forests and peatlands, the development of weather modification techniques, the efforts of rehabilitation and reforestation, the successful replication of the ecosystem and eco-riparian rehabilitation, the development of urban green spaces, the demarcation of protected areas and HCVF within concession areas, the efforts to cope with habitat fragmentation, and the efforts to strengthen law enforcement. All of these combined measures significantly reduced deforestation in the period 2019-2021.

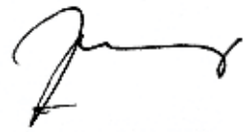
Moreover, Indonesia's FOLU Net Sink 2030 has become an inspiring model for the international community, and has been the central message of President Joko Widodo on several occasions, focusing on real work that can be publicly verified. It systematically organizes actions to reach the net sink target, strengthened by predicted measurement of carbon emission reduction, and then set to be fully implemented on the ground.

This publication was prepared by a collaborating team from several directorates under the Ministry of Environment and Forestry and the Peatlands and Mangrove Restoration Agency, presenting the up-to-date data and information on the management of Indonesia's tropical forests while illustrating the progress that has been made so far. This book presents the policies and technical highlights in the forestry sector taken by the Government of Indonesia towards the FOLU Net Sink 2030.

I express my gratitude to all those who have contributed to and actively participated in updating the State of Indonesia's Forests 2022; members of the writing team, all editors involved, and contributors from the private sector. I also appreciate the Food and Agriculture Organization of the United Nations (FAO) and the Association of Indonesian Forest Concessionaires (APHI) for their consistent supports in the publication of the State of Indonesia's Forests 2022.

Jakarta, September 2022

The Minister of Environment and Forestry



SITI NURBAYA

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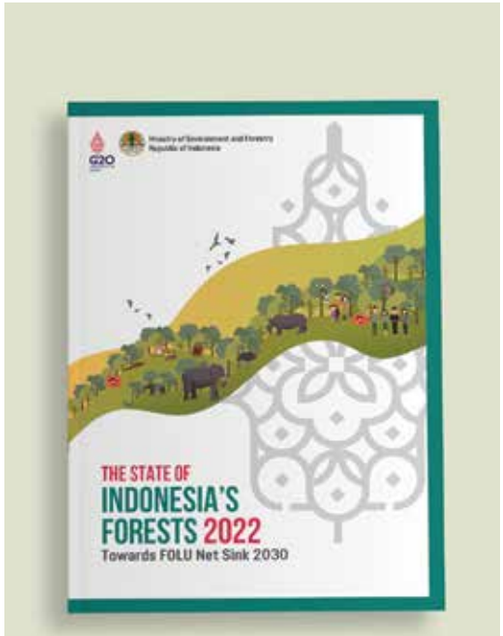
Prof. Dr. Siti Nurbaya and Dr. Efransjah, as the editors, coordinated the writing and preparation of the publication, with significant input and contributions from a top-echelon team consisting of representatives of a number of Directorate Generals of the Ministry of Environment and Forestry, including the Directorate General of Forestry Planning and Environmental Governance; the Directorate General of Climate Change; the Directorate General of Pollution and Environmental Degradation Control; the Directorate General of Natural Resources and Ecosystem Conservation; the Directorate General of Sustainable Forest Management; the Directorate General of Environmental and Forestry Law Enforcement; the Directorate General of Social Forestry and Environmental Partnership; the Directorate General of Watersheds Management and Forest Rehabilitation; and the Agency for Standardization of Environment and Forestry Instruments. The Secretariat General of the Ministry of Environment and Forestry through Data and Information Center (Pusdatin) has facilitated necessary coordination.

The Ministry of Environment and Forestry of the Republic of Indonesia expresses its appreciation to all individuals and entities that have contributed to the preparation of this document.



ABBREVIATIONS AND ACRONYMS

APBD	*Anggaran Pendapatan dan Belanja Daerah* (Regional Government Budget)
APL	*Area Penggunaan Lain* (Other Use Area)
Bappenas	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
BAU	Business as Usual
BBSDLP	*Balai Besar Penelitian dan Pengembangan Sumber Daya Lahan Pertanian* (Indonesian Center for Agricultural Land Resources Research and Development)
BIG	*Badan Informasi Geospasial* (Geospatial Information Agency)
BK Kehati	*Balai Kliring Keanekaragaman Hayati* (Biodiversity Clearing House)
BKSDA	*Balai Konservasi Sumber Daya Alam* (Natural Resources Conservation Office)
BMKG	*Badan Meteorologi, Klimatologi dan Geofisika* (Meteorological, Climatological and Geophysical Agency)
BNPB	*Badan Nasional Penanggulangan Bencana* (National Agency for Disaster Management)
BPDLH	*Badan Pengelola Dana Lingkungan Hidup* (Environmental Fund Management Agency)
BPPT	*Badan Pengkajian dan Penerapan Teknologi* (Agency for the Assessment and Application of Technology)
BRGM	*Badan Restorasi Gambut dan Mangrove* (Peat and Mangrove Restoration Agency)
CA	*Cagar Alam* (Strict Nature Reserve)
CB	*Cagar Biosfer* (Biosphere Reserve)
CBD	Convention on Biological Diversity
CCTV	Closed-Circuit Television
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CM1, CM2	Counter Measure 1, Counter Measure 2
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COP	Conference of the Parties
CSR	Corporate Social Responsibility
DAS	*Daerah Aliran Sungai* (Watershed)
DBH-DR	*Dana Bagi Hasil Dana Reboisasi* (Revenue Sharing from Reforestation Fund)
DR	*Dana Reboisasi* (Reforestation Fund)
EFDB	Emission Factor Data Base
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FMU	Forest Management Unit (*Kesatuan Pengelolaan Hutan*, KPH)
FREL	Forest Reference Emission Level
GDP	Gross Domestic Product
GHG	Greenhouse Gas
ha	Hectare(s)

HA	*Hutan Alam* (Natural Forest)
HCVF	High Conservation Value Forest
HK	*Hutan Konservasi* (Conservation Forest)
HKm	*Hutan Kemasyarakatan* (Community Forest)
HL	*Hutan Lindung* (Protection Forest)
HP	*Hutan Produksi tetap* (Permanent Production Forest)
HPK	*Hutan Produksi yang Dapat Dikonversi* (Convertible Production Forest)
HPT	*Hutan Produksi Terbatas* (Limited Production Forest)
HT	*Hutan Tanaman* (Plantation Forest)
HTI	*Hutan Tanaman Industri* (Industrial Plantation Forest)
HTR	*Hutan Tanaman Rakyat* (Community Plantation Forest)
IBSAP	Indonesian Biodiversity Strategy Action Plan
ICC MAB	International Coordinating Council of the Man and the Biosphere
IDR	Indonesian Rupiah
IFCA	Indonesia Forest Climate Alliance
IPCC	Intergovernmental Panel on Climate Change
IPPKH	*Izin Pinjam Pakai Kawasan Hutan* (Lease Forest Area Permit)
IPPU	Industrial Processes and Product Use
IPL	*Indeks Prioritas Lokasi* (Location Priority Index)
ISPO	Indonesian Sustainable Palm Oil
ITPC	The International Tropical Peatlands Center
IUPHHK-HT	*Izin Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Tanaman* (Business License for the Utilization of Timber Forest Products in Plantation Forest)
IUPHHK-HTI	*Izin Usaha Pemanfaatan Hasil Hutan Kayu untuk Hutan Tanaman Industri* (Business License for Utilization of Timber Forest Products in Industrial Plantation Forest)
IUPHHK-RE	*Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem* (Business License for the Utilization of Timber Forest Products in Ecosystem Restoration Forest)
IUP PAN-KARBON	*Izin Usaha Pemanfaatan Penyimpanan Karbon* (Business License for the Utilization of Forest for Carbon Storage)
IUP RAP-KARBON	*Izin Usaha Pemanfaatan Penyerapan Karbon* (Business License for the Utilization of Forest for Carbon Sequestration)
JICA	Japan International Cooperation Agency
KAN	*Komite Akreditasi Nasional* (National Accreditation Committee)
KHG	*Kesatuan Hidrologis Gambut* (Peat Hydrological Unit)
KLHK	*Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia* (Ministry of Environment and Forestry, Republic of Indonesia/ MoEF)

KPA	*Kawasan Pelestarian Alam* (Nature Conservation Area)
KPH	*Kesatuan Pemangkuan Hutan* (Forest Management Unit, FMU in Perum Perhutani)
KPHL	*Kesatuan Pengelolaan Hutan Lindung* (Protection Forest Management Unit)
KPHP	*Kesatuan Pengelolaan Hutan Produksi* (Production Forest Management Unit)
KSA	*Kawasan Suaka Alam* (Sanctuary Reserve Area)
KSDAE	*Konservasi Sumber Daya Alam dan Ekosistem* (Conservation of Natural Resources and Ecosystems)
KULIN-KK	*Pengakuan dan Perlindungan Kemitraan Kehutanan* (Forestry Partnership Recognition and Protection)
LAPAN	*Lembaga Penerbangan dan Antariksa Nasional* (National Institute of Aeronautics and Space)
LCCP	Low Carbon Compatible with Paris Agreement scenario
LDCM	The Landsat Data Continuity Mission
LIPI	*Lembaga Ilmu Pengetahuan Indonesia* (Indonesian Institute of Sciences)
LTS-LCCR	Long-Term Strategy for Low Carbon and Climate Resilience
LULUCF	Land Use, Land-Use Change and Forestry
MPA	*Masyarakat Peduli Api* (Fire Care Community)
MAB	Man and the Biosphere Programme
MODIS	Moderate Resolution Imaging Spectroradiometer
MoEF	Ministry of Environment and Forestry
MoFor	Ministry of Forestry
MSME	Micro, Small and Medium Enterprises
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration, U.S. Department of Commerce
NTFP	Non-Timber Forest Product
OLI	Operational Land Imager
PHPL	*Pengelolaan Hutan Produksi Lestari* (Sustainable Production Forest Management)
PIAPS	*Peta Indikatif Areal Perhutanan Sosial* (Indicative Map of Social Forestry Area)
PIPPIB	*Peta Indikatif Penundaan Pemberian Izin Baru* (Indicative Map on the Suspension of the Issuance of New Licenses)
PKKNK	*Pemanfaatan Kayu Kegiatan Non Kehutanan* (Permit for the Utilization of Timber Produced From Non-Forestry Activities)
PKS	*Perjanjian Kerja Sama* (Cooperative Arrangement)
PLN	*Perusahaan Listrik Negara* (State-owned Electricity Company)
PNBP	*Penerimaan Negara Bukan Pajak* (Non-Tax State Revenue)
POLRI	*Kepolisian Republik Indonesia* (Indonesian National Police)

PPNS	*Penyidik Pegawai Negeri Sipil* (Civil Servant Investigator)
PROPER	*Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan* (Corporate Performance Rating Program for Environmental Management)
PBPH	*Perizinan Berusaha Pemanfaatan Hutan* (Forest Business License)
PB PJWA	*Perizinan Berusaha Penyediaan Jasa Wisata Alam* (Business License for Providing Nature-based Tourism Services)
PB PSWA	*Perizinan Berusaha Penyediaan Sarana Wisata Alam* (Business License for Providing Nature-based Tourism Facilities)
RBM	Resort-Based Management
RBP	Results-Based Payment
REDD+	Reducing Emissions from Deforestation and Forest Degradation, Role of Conservation, Sustainable Management of Forest and Enhancement of Forest Carbon Stocks
RIL-C	Reduced Impact Logging - Carbon
RPJMN	*Rencana Pembangunan Jangka Menengah Nasional* (National Medium-Term Development Plan)
SEA	Strategic Environmental Assessment
SILIN	*Silvikultur Intensif* (Intensive Silviculture)
SIMATAG	*Sistem Informasi Muka Air Tanah Gambut* (Peatland Water Level Information System)
SiPongi	*Sistem Monitoring Kebakaran Hutan dan Lahan* (Forest and Land Fire Monitoring System)
SiPPEG	*Sistem Informasi Pengelolaan dan Perlindungan Ekosistem Gambut* (Peatland Ecosystem Protection and Management Information System)
SIPUHH	*Sistem Informasi Penatausahaan Hasil Hutan* (Forest Product Administration Information System)
SIS	*Sistem Informasi Safeguards* (Safeguards Information System)
SOIFO	The State of Indonesia's Forests
SPOT	Satellite Pour l'Observation de la Terre
SIDIK	*Sistem Informasi dan Data Indeks Kerentanan* (Information System for Vulnerability Index Data)
SLK	*Sertifikasi Legalitas Kayu* (Certification of Timber Legality)
SDG	Sustainable Development Goals
SM	*Suaka Margasatwa* (Wildlife sanctuary)
SRN	*Sistem Registri Nasional* (National Registry System)
SVLK	*Sistem Verifikasi Legalitas dan Kelestarian* (Forest Legality and Sustainability Assurance System)
Tahura	*Taman Hutan Raya* (Grand Forest Park)
TB	*Taman Buru* (Grand Hunting Park)
TMAT	*Tinggi Muka Air Tanah* (Water Table)

TMC	*Teknologi Modifikasi Cuaca* (Weather Modification Technology)
TN	*Taman Nasional* (National Park)
TNI	*Tentara Nasional Indonesia* (Indonesian Military)
TORA	*Tanah Obyek Reforma Agraria* (Lands for Agrarian Reform)
TPT	*Tempat Penampungan Terdaftar* (Registered Shelter)
TPTI	*Tebang Pilih Tanam Indonesia* (Indonesian Selective Cutting and Replanting System)
TWA	*Taman Wisata Alam* (Nature Recreation Park)
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPT	*Unit Pelaksana Teknis* (Technical Management Unit)
UNFCCC	United Nations Framework Convention on Climate Change
USAID	US Agency for International Development
USD	United States Dollar
WMC	World Mangroves Center

GLOSSARY

***Adat* Forest (*Hutan Adat*)**	An *Adat* Forest is a forest which is located in an *Adat* Law Community's area.
***Adat* Law Community/*Adat* Community (*Masyarakat Hukum Adat*, MHA)**	A group of people settled in a certain geographical area demonstrating ancestral ties to that area and strong relationships with the environment as well as practicing value system that underlie economic, political, social, and legal institutions; therefore they are entitled to a recognition in accordance with the provisions of national legislation.
Community Forest (*Hutan Kemasyarakatan*, HKm)	A type of social forestry license that provides access to a part of the Forest Area for local communities, so that they can be economically empowered.
Community Plantation Forest (*Hutan Tanaman Rakyat*, HTR)	A social forestry license that allows communities to establish timber plantations in a Production Forest.
Compliance Points	Sites used to conduct groundwater measurements in peat ecosystem management.
Conservation Forest (*Hutan Konservasi*)	One of three main administrative classifications of the Forest Area aimed at conserving the diversity of floras and faunas and their ecosystems.
Convertible Production Forest (*Hutan Produksi yang Dapat Dikonversi*, HPK)	Parts of the Production Forest that can be converted into uses other than forestry.
Deforestation	The permanent alteration of forested area to a non-forested area as a result of human activities.
Ecosystem restoration	Efforts to restore both the biological (flora and fauna) and non-biological (soil and water) elements of an area of land to its original state to facilitate the achievement of biological and ecosystem balance.
Ecosystem restoration in conservation area	Efforts to restore degraded ecosystems, including restoring land cover in Conservation Forests as well as re-planting and rehabilitating water bodies and seascapes, for restoring biological natural resources and their ecosystems to their original condition.
Forest	Under the Indonesian Forestry Act of 1999, defined as a unified ecosystem in a landscape dominated by tree communities, found in the natural world.
Forest and Land Rehabilitation	Efforts to restore, maintain and promote the functions of forests and land so that their capacity, productivity and role in supporting systems of life will be sustained.
Forest Area (*Kawasan hutan*)	The Forest Area covers more than 60 percent of Indonesia's terrestrial area designated by the government as a permanent forest.
Forest Degradation	Decline in forest cover and carbon stocks over a specific period, as a result of human activities
Forest Legality and Sustainability Assurance System (*Sistem Verifikasi Legalitas dan Kelestarian*, SVLK)	A system to ensure the legality of forest status and forest products from Indonesia's forest for which the forest products are legally guaranted and certified as sustainably managed.
Forestry Partnerships (*Kemitraan Kehutanan*)	Partnerships among local communities, forest managers, concession holders, service providers, holders of forest land use rights and/or holders of primary forest industry business licenses.
Grand Forest Park (*Taman Hutan Raya*)	A type of nature conservation area intended to provide a variety of indigenous and/or introduced plants and animals for research, science, education, breeding enhancement, culture, recreation and tourism purposes.
Gross Deforestation	A loss of only natural forest cover, excluding the dynamic change (harvesting) of the man-made forest.
Indonesia's FOLU Net Sink 2030	A systematic and integrated approach in the management of forest and other land use sector toward emission levels to -140 million tons of CO_2e or net sink by 2030, which summarizes three fundamentals, namely sustainable forest management, environmental governance, and (forest) carbon governance.
Limited Production Forest (*Hutan Produksi Terbatas*, HPT)	Parts of the Production Forest with specific characteristics such as steep slopes, sensitive soil types and high precipitation intensity which, therefore the forest needs to be less intensively managed compared to the Permanent Production Forest (*Hutan Produksi Tetap*).
MPA Paralegal	A community involvement strengthening program through training on legal aspects of forest and land fires, fires prevention and control, carry out integrated patrol activities, and empowering communities to diversify types of livelihoods.
National Park (*Taman Nasional*)	The most common type of nature conservation area. They posess native ecosystems managed through a zoning system and are intended to facilitate research, science, education, breeding enhancement, recreation and tourism.
Natural mechanism	A technique to remedy the decline of the function of an ecosystem, and entail the protection of processes of natural continuity, with the aim of achieving a balance of biological natural resources and ecosystems and returning them to their original condition.
Nature Conservation Area (*Kawasan Pelestarian Alam*)	A specific terrestrial or marine area whose main function is to preserve the diversity of plant and animal species, as well as to allow for the sustainable utilization of living resources and their ecosystems.
Nature Recreation Park (*Taman Wisata Alam*)	A type of nature conservation area mainly intended for recreation and tourism purposes.
Net Deforestation	The change/reduction of forested land cover classes (natural and man-made forest) over a period of time that accounts for forest re-growth and forest plantations detected by satellite imagery over the same period of time.

Other Use Area (*Areal Penggunaan Lain*, APL)	Public lands which are not designated as Forest Area.
Peat	A naturally occurring organic material produced from imperfectly decomposed plant residues that accumulates in swamp land, with at least 50 centimeters of thickness.
Peat Ecosystem	An area both in and around a peat swamp, which form a unity as a whole, and are necessary for maintaining balance, stability, and productivity.
Peat Hydrological Unit (*Kesatuan Hidrologis Gambut*, KHG)	Peat ecosystem located between two rivers, between a river and the sea, and/or in a swamp area.
Permanent Production Forest (*Hutan Produksi Tetap*, HP)	The Production Forest that has characteristics such as less steep slopes, less sensitive soil types and less precipitation intensity, therefore these areas may be selectively logged or intensively managed through plantation forests.
Production Forest (*Hutan Produksi*)	One of the three main classifications found in the Forest Area. Its main function is to provide forest products.
PROPER (*Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan*/ Corporate Performance Rating Program for Environmental Management)	A regulatory mechanism which can promote and enforce compliance with pollution control standards, encourage pollution reduction, introduce the concept of "clean technology," and promote an environmental management system and conduct the business ethically through the implementation of community development.
Protection Forest (*Hutan Lindung*)	One of the three main types of Forest Area. Its main function is to serve as buffer system, so that water systems can be regulated, floods can be prevented, erosion can be controlled, sea water intrusion can be prevented, and soil fertility can be maintained.
Reforestation	Forest and land rehabilitation in which the activity is carried out inside of the Forest Area.
Reforestation Fund (*Dana Reboisasi*, DR)	Name of a volume-based fee collected on timber felled by natural forest timber concession holders, as well as the name of a Fund into which these fees are placed. The Reforestation Fund is used to finance reforestation and rehabilitation activities.
Revenue Sharing from Reforestation Fund (*Dana Bagi Hasil Dana Reboisasi*, DBH-DR)	A shared revenue managed by the central government to be transferred to provincial and/or district governments in the form of percentages of the Reforestation Fund that was collected from natural forest logging that took place within those provinces and/or districts. The proceeds may be used not only for reforestation and land rehabilitation, but also to support climate change mitigation and adaptation programs, social forestry schemes, and forest and land fire prevention and control.
Sanctuary Reserve Area (*Kawasan Suaka Alam*)	A terrestrial or marine Conservation Area which has sanctuary as its main function and which is intended to preserve plant and animal biodiversity, and ecosystems.
Severely degraded land (*Lahan Kritis*)	A land with low soil function to be used as production media, for both plant cultivation as well as naturally grown plants.

Social Forestry	Community-based sustainable forest management systems implemented within the Forest Area or titled forest/*Adat* forest lands by members of local communities or *Adat* community groups, intended to facilitate improvements to the welfare, environmental balance and socio-cultural dynamics through establishment of Village Forests, Community Forests, Community Plantation Forests, Private Forests, *Adat* Forests and Forestry Partnerships.
Strict Nature Reserve (*Cagar Alam*)	A sanctuary reserve area where its plants, animals and ecosystems must be protected to allow natural interaction.
Village Forest (*Hutan Desa*, HD)	A type of social forestry license which is managed by village-level authorities for the benefit and welfare of the village community.
Wildlife Sanctuary (*Suaka Margasatwa*)	An area that has a high level of species diversity and/or unique animal species, in which habitat management may be conducted in order to assure the continued existence of these species.
WorldClim	A set of global climate layers (gridded climate data) with a spatial resolution of about one km^2 that can be used for mapping and spatial modelling.

NOTE: The Glossary provides definitions for easy reading of this publication.

LOCATION
Mondulambi Beach, Matalawa National Park
East Nusa Tenggara

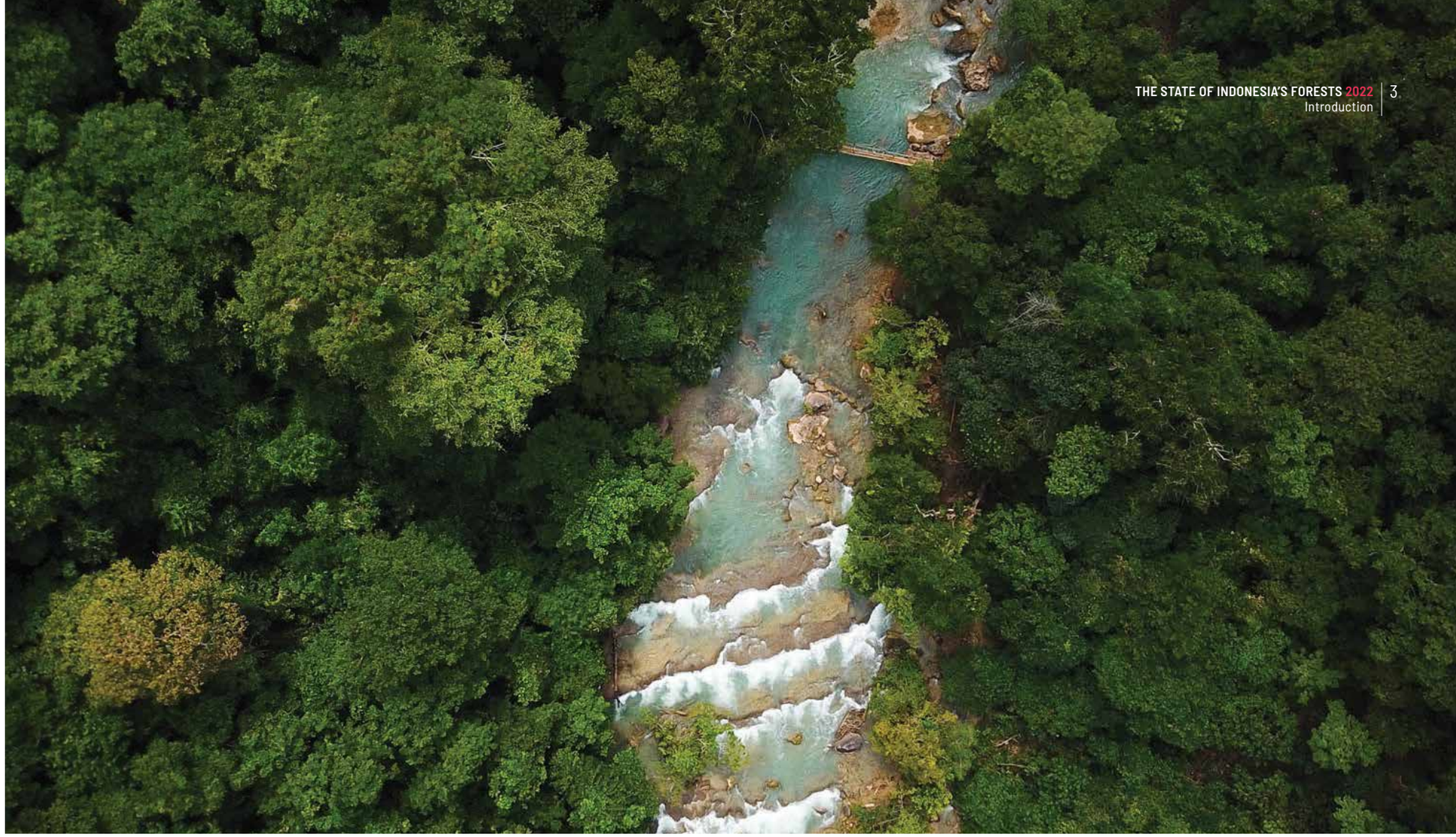
PHOTO BY
Dwi Putro (2021)

CHAPTER 1

Introduction

From 2016 to 2021, corrective measures to improve forest management were developed and implemented through strengthened policies, more organized programs, and improved work processes, including monitoring and verification systems for outputs, outcome, and impacts of the measures. The policies and program implementation will continue to be reinforced and improved to address challenges faced by the forestry sector and the impacts of climate change. Among the policies and program implementation that have come through significant changes and progress include:

1. reorientation of forest management from a wood-based to a sustainable forest ecosystem and community-based approaches;
2. consideration of the principle of environmental carrying capacity in forest utilization schemes. The principle is internalized into the National Forestry Plan as a macro spatial plan for forestry development for the period 2011-2030;
3. prevention of biodiversity loss within and outside conservation areas, by preventing further damage to landscapes of the conservation area and by enriching species;
4. strengthened policies and the implementation of national development by incorporating economic and environmental balance. Economic development is necessary to support the national economic recovery that is able to create new job opportunities for communities; and
5. affirmative policies on the community access to forest utilization, on local and regional dispute resolution, as well as on the local community rights and forest use-related conflict resolution for customary communities.



Magnificent Lapopu Waterfall

LOCATION
Manupeu Tanah Daru and Laiwangi Wanggameti National Park, Sumba Island, East Nusa Tenggara

PHOTO BY
Dwi Putro (2021)

Land cover in forest areas is dynamic and subject to rapid changes. Several contributing factors include: the conversion of forest areas for uses by other sectors; unsustainable forest management; illegal logging; unsustainable mining activities; encroachment; and forest fires, less effective and failures to optimize reforestation and land rehabilitation have also contributed to an increase in the area of severely degraded land. To address worsening forest conditions and disappearing forest cover, the systems of forest governance have been improved, including: forest rehabilitation, revegetation, water-soil conservation, and developing large scale of nursery centers, as well as monitoring of forest resources; the use of environment and forestry thematic geospatial information for a National One Map; and legal certainty and legitimacy of forest areas.

Climate Change Mitigation and Adaptation

As an archipelagic country, Indonesia is highly vulnerable to climate change impacts, including extreme events such as floods and droughts, and long-term changes such as sea level rise, shifting rainfall patterns and rising temperature. The data from National Agency for Disaster Management (BNPB) shows that natural disasters in Indonesia have experienced a sharp increase within the period 2011-2021, with 24,270 cases being dominated by hydrometeorological disasters such as flood and fires. The increasing frequency and intensity of disasters has resulted in humanitarian and environmental casualties.

The Ministry of Environment and Forestry (MoEF) published two important documents in 2021: the Updated Nationally Determined Contribution (NDC) and the

Citron-crested cockatoo (Kakatua Jambul Jingga, *Cacatua sulpurea citrinocristata*)

LOCATION
Manupeu Tanah Daru and Laiwangi Wanggameti National Park, Sumba Island, East Nusa Tenggara

PHOTO BY
Heri Andri (2022)

Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR). The Updated NDC document is an update of the First NDC submitted by the Government to the United Nations Framework Convention on Climate Change (UNFCCC) in 2016. The updates include: (1) detailing climate change adaptation by outlining key programs, strategies, and adaptation actions; (2) elaborating transparency the framework and method of its implementation; and (3) adding sections that serve as entry points for the long-term vision of climate change. Furthermore, the adaptation elements in the updated NDC highlight the goals of climate resilience that need to be supported by economic resilience, social and livelihood resilience, and ecosystem and landscape resilience. These three pillars are then further translated into key programs, strategies, and actions.

The LTS-LCCR document reflects Indonesia's long-term vision for controlling climate change, containing several key issues including the projection of peak emissions in 2030, ambitions of the FOLU (Forestry and Other Land Use) net sink 2030, and the Net Zero Emission (NZE) target by 2060 or earlier.

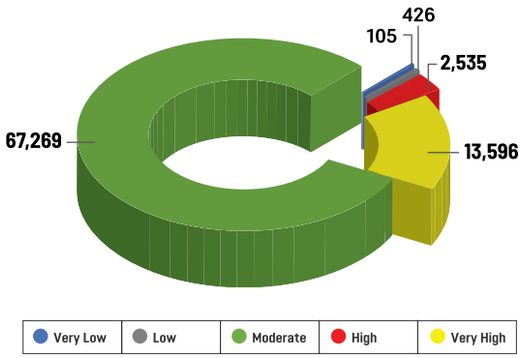
Furthermore, an NDC roadmap on adaptation is prepared to elaborate the targets stated in the document, into practical strategies and directives for adaptation actions. It specifically determines both the baseline and the target of adaptation measures including the climate resilience, so that the achievement can be accurately measured. Meanwhile, the impact of climate change is estimated by the potential loss of the national GDP. Climate change is predicted to cause a potential loss of 0.55-3.45 percent of the 2020 National GDP by 2050. The NDC target on adaptation is therefore aimed at reducing the potential loss by 2.87 percent of the 2020 National GDP by 2030. The roadmap also determines strategies to implement the adaptation measures as well as strong linkages between key programs and activities and national development priority agendas on food, water, energy, health, and ecosystems. Strengthening disaster and climate change resilience is also one of the development agendas in the national medium-term development plan (RPJMN) 2020-2024.

With the enactment of Presidential Regulation[1] on Carbon Pricing in 2021, the NDC targets has a strong legal basis to be implemented by both central and local governments as well as by other relevant stakeholders. One of the mandates of the Presidential Regulation is to implement adaptation measures at the national and regional levels, involving all stakeholders including the private sector and the community, with an emphasis on the fields of food, water, energy, and ecosystems.

The Information System for Vulnerability Index Data (SIDIK) presents information of village-level climate vulnerability based on village potential data in 2008. The most recent information from SIDIK shows that 2,535 out of 83,931 villages in Indonesia are categorized as highly vulnerable to climate change, while 13,596 villages have climate vulnerability index at very high level as presented in Figure 1.1.

[1] Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Pricing to Achieve the Nationally Determined Contribution Target and Control Over Greenhouse Gas Emissions in the National Development

FIGURE 1.1. Village Level Climate Vulnerability Assessment in Indonesia (number of village)



SOURCE: KLHK, 2017

The MoEF has been reviewing the methodology of climate vulnerability analysis and changing the unit of analysis from an administrative to geographical boundary. In 2021, the MoEF conducted a climate vulnerability and risk assessment of coastal mangrove ecosystems. The indicators used for the analysis consist of climate aspects that are atmospheric and oceanographic conditions, as well as bio-physical and socio-economic aspects. Using two climate projection scenarios from WorldClim and marine climate projection from the Third National Communication document, high levels of climate risk in mangrove ecosystems were identified in Jakarta, Papua, Riau, and West Sumatra.

Contribution of the Forestry Sector to the NDC Targets

Nationally Determined Contributions (NDCs) are the fundamental principle of the Paris Agreement, which was agreed upon at COP 21 UNFCCC. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. Indonesia's First NDC was submitted to the UNFCCC in November 2016, setting targets for reducing GHG emissions by 2030 in five sectors: forestry, energy, industrial processes and product use (IPPU), waste, and agriculture. In particular, climate change adaptation aims to reduce the risk of climate change in all development sectors including agriculture, water, energy, forestry, marine and fisheries, health, public services, infrastructure, and urban systems through strengthening local capacities, enhancing knowledge, developing convergent policies on climate change adaptation and disaster risk management, and applying adaptive technologies.

In Indonesia's NDC, the largest contribution to GHG emission reduction is targeted from the forestry sector 17.2 percent of the 29 percent unconditional reduction target, or around 23 percent of the 41 percent conditional reduction target. The energy sector contributes another 11 percent to the unconditional target or 14 percent to the conditional target. Subsequently, the Government has set the emission reduction target for waste management, IPPU, and agriculture sectors.

The Government of Indonesia has prepared NDC Implementation strategies since 2017, followed up by the preparation of an NDC Road Map on Mitigation in 2019 and an NDC Roadmap on Adaptation in 2020. As mandated by Paris Agreement[2], Indonesia then submitted the updated NDC on 21 July 2021. The Updated NDC reflects conditions beyond the first NDC and new elements in the climate change agenda, namely (1) increased ambition on adaptation; (2) more clarity on mitigation by adopting the Paris Rulebook; and (3) the national context that connects current conditions and milestones to national development for the 2020–2024 period and an indicative pathway towards a long-term vision.

Indonesia's FOLU Net Sink 2030 aligns with the Paris Agreement. It emphasizes forest policies and their implementation that are set to reach a net carbon sink by 2030 in which carbon sequestration from the forestry and other land use (FOLU) sector will be greater than its carbon emission. The FOLU sector contributes 60 percent to Indonesia's total emission reduction target and is targeted to achieve carbon neutrality by 2030 and "net zero" by 2060 or sooner.

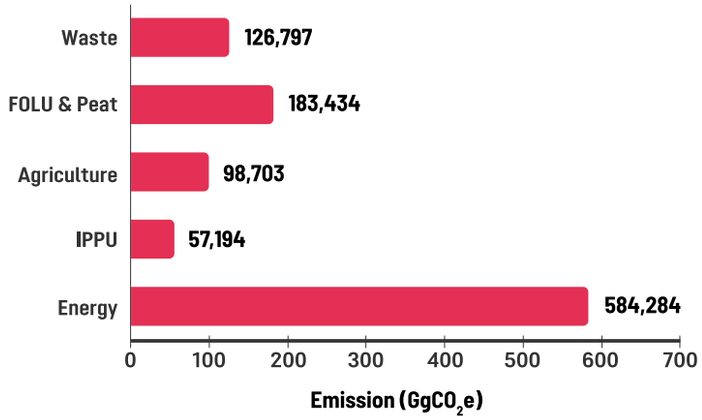
Taking into account higher ambition launch in COP 26 UNFCCC Glasgow, Indonesia has pushed the implementation of mitigation actions on forestry. It determined some strategies to reduce emissions in the land use sector begining in 2022 through government decree. They include legally instituting a moratorium on new forest concessions in primary forests and peatlands, addressing deforestation and forest degradation, restoring ecosystem functions, and establishing sustainable forest management. These strategies are then implemented on the ground through, among others, replanting, managing and conserving peatland and mangrove ecosystems, developing social forestry mechanisms carried out with the active participation of local governments, the private sector, small and medium enterprises, civil society organizations, and marginalized groups such as local communities, customary communities, and women in the planning and implementation stages.

Greenhouse Gas Emission Sources

The Government of Indonesia has published an annual National GHG Emission Report, which explains verified data and information on emissions and the achievement of emission reductions. This report refers to IPCC guidelines to estimate GHG emissions and removals, containing information on emissions from five sectors: forestry, energy, IPPU, waste, and agriculture, as follows:

1. The baseline emission for 2020 according to the NDC baseline emission was 1,999 Mton CO_2e;
2. GHG emission level in 2020 reached 1,050 MTon CO_2e;
3. The achievement of verified GHG emission reductions from mitigation actions carried out by each sector/ministry in 2020 reached 574 MTon CO_2e; and
4. The total GHG emission reduction obtained from the 2020 baseline emission reduction and the achievement of GHG emission reduction in 2020 reached 948 MTon CO_2e.

FIGURE 1.2. The Profile of National Greenhouse Gas Emissions 2020



SOURCE: KLHK, 2021c

[2] Article 4 paragraph 2 of the Paris Agreement and Decision I/CP.24, Section II of the Post-202 Implementation and Ambition para 23.

The average GHG emissions level from forests and peatlands during the period 2000-2020 stood at 499 MTon CO_2e/year, with around 40 percent of the emissions coming from peat fires. Excluding peat fires, the average annual emissions level was around 230 MTon CO_2e. The 2020 emissions level was 183 MTon CO_2e, 80 percent lower than the 2019 emission. The higher emission level occurred in the El-Nino event years (i.e., 2006, 2009, 2014, 2015, and 2019), dominated by emissions from peat fires. The implementation of mitigation actions has resulted in a downward emission trend, whereby emissions from the peat fires in 2020 fell to around 18 MTon CO_2e, the lowest in the last two decades (see Figure 1.3).

The national greenhouse gas emission inventory calculated the emissions level in 2020 at 1,050 MTon CO_2e, or around 11 MTon CO_2e higher than the emissions level in 2000, the baseline year of the inventory. The emissions significantly increased to 236 MTon CO_2e higher than those in 2010, which is a baseline year for the emissions level in the NDC.

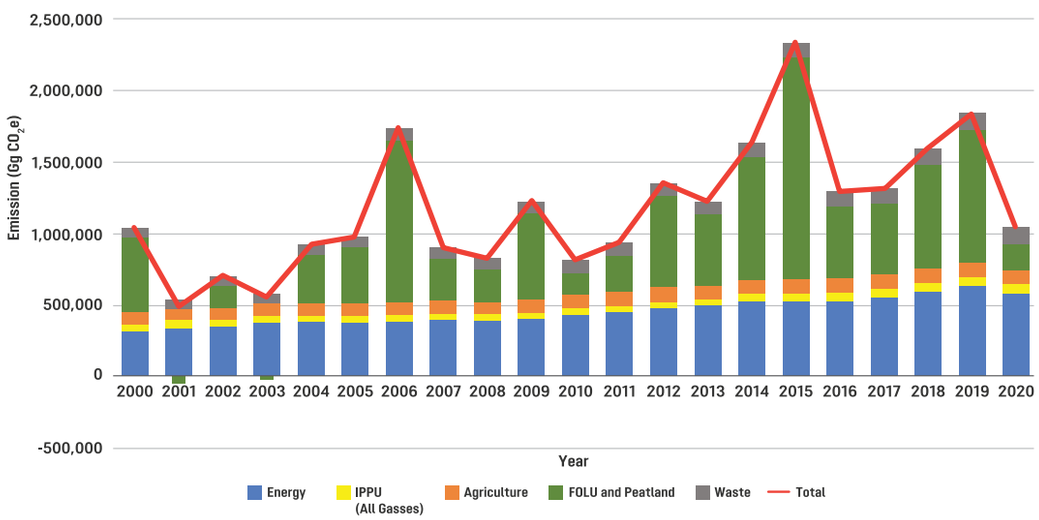
In 2020, the energy sector contributed the most to national emissions (56%), followed by the forestry sector and peatland fires (18%), waste (12%), agriculture (9%), and IPPU (5%). This figure represents a significant change in the composition of emission contributions from various sectors in 2020 because of the large reduction in emissions from peatland fires in the forestry sector.

Emissions from peatland fires shows a fluctuating downward trend since 2015. The average annual emissions from peatland fires during the period 2000-2020 was around 269 MTon CO_2e. The highest emissions occurred in 2006 and 2015. The El Niño phenomenon was likely to have caused long and high intensity fires, covering large areas of peatlands.

In 2020, the actual emissions from peatland fires were approximately 18 MTon CO_2e, down from 457 MTon CO_2e in 2019 (see Figure 1.4). This is conforming to the decrease in the area of peatland burned, from 494,450 hectares in 2019 to 19,998 hectares in 2020.

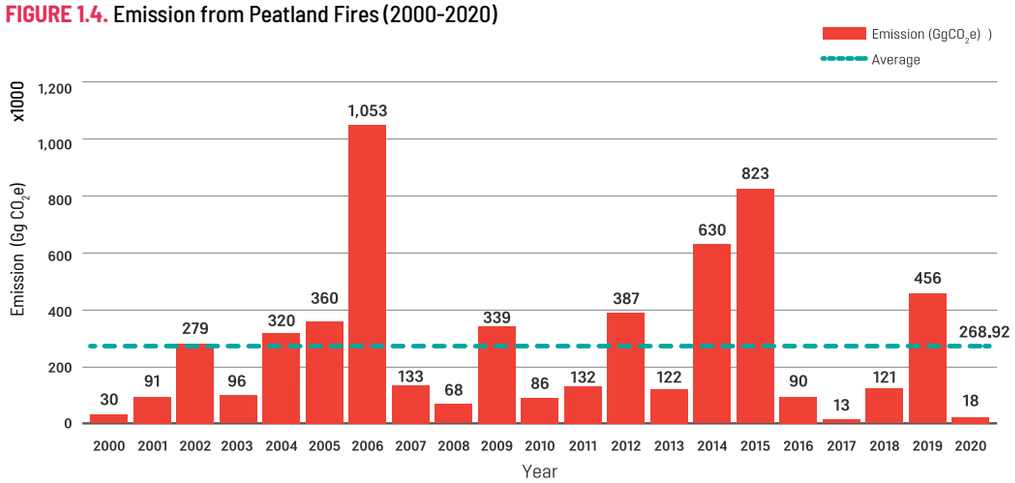
The NDC has set the unconditional emission reduction target (CM1) by 2030 of 834 MTon CO_2e, or 29 percent against the business-as-usual (BAU) scenario which is calculated at 2,869 MTon CO_2e. While the BAU emission level for 2020 was calculated at 1,999 MTon CO_2e, the GHG inventory carried out in 2020 calculated the emission level for that year at 1,050 MTon CO_2e. This means there was a reduction in GHG emissions in 2020 of

FIGURE 1.3. National Emissions from the NDC's Sectors (2000-2020)



SOURCE: KLHK, 2021c

FIGURE 1.4. Emission from Peatland Fires (2000-2020)



SOURCE: KLHK, 2021c

948 MTon CO_2e below the BAU emission level, or 47.45 percent of the BAU level (see Table 1.1 and Figure 1.5).

Based on Figure 1.5, by optimizing various climate change mitigation strategies and policies, emissions levels have been declining. The strategies and policies will continue to be strengthened to keep the emissions level lower than the BAU level, so that the NDC target is achieved by 2030 as expected.

According to the NDC, the Unconditional target (CM1) of the forestry sector is 17.2 percent or 497 MTon CO_2e in 2030. Based on the 2020 GHG inventory, the sector's GHG emissions were 183.43 MTon CO_2e, against the NDC baseline for the 2020 forestry sector's emissions, which were approximately 764 MTon CO_2e. Therefore, in 2020 the forestry sector achieved around 581 MTon CO_2e emission reduction, or 75.99 percent of the 2020 BAU level.

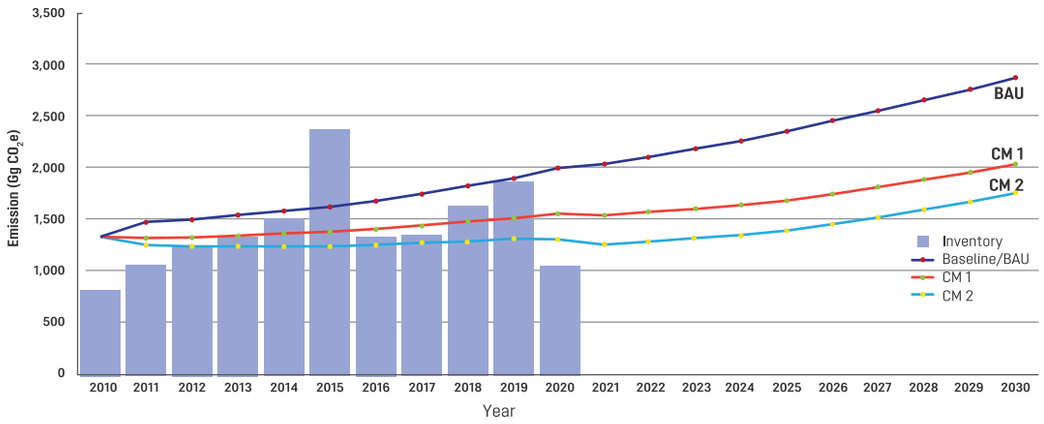
The FOLU sector is not only a source of GHG emissions, but also a GHG sink, because of the dynamics of land cover and land-use changes. This sector is expected to make the largest contribution to the achievement of the total national emission reduction target. Net zero emission means achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions absorbed. Net Sink refers to a condition in which the absorbed GHG is higher than its emissions. In this case, vegetation and carbon-storing ecosystems play an important role in absorbing GHG.

TABLE 1.1. GHG Emission Reduction (2010-2020)

	2010	2011	2012	2013	2014	2015	2016	2017	20118	2019	2020
Baseline / BAU (MTon CO_2e)	1,334	1,530	1,569	1,611	1,671	1,702	1,769	1,860	1,863	1,911	1,999
Inventory (MTon CO_2e)	810	1,054	1,245	1,331	1,509	2,374	1,336	1,354	1,637	1,865	1,050
Emission reduction / year	524	476	324	280	162	-672	433	506	226	46	949
Achievements (%)	39.3%	31.1%	20.7%	17.4%	9.7%	-39.5%	24.5%	27.2%	12.1%	2.4%	47.5%

SOURCE: KLHK, 2021c

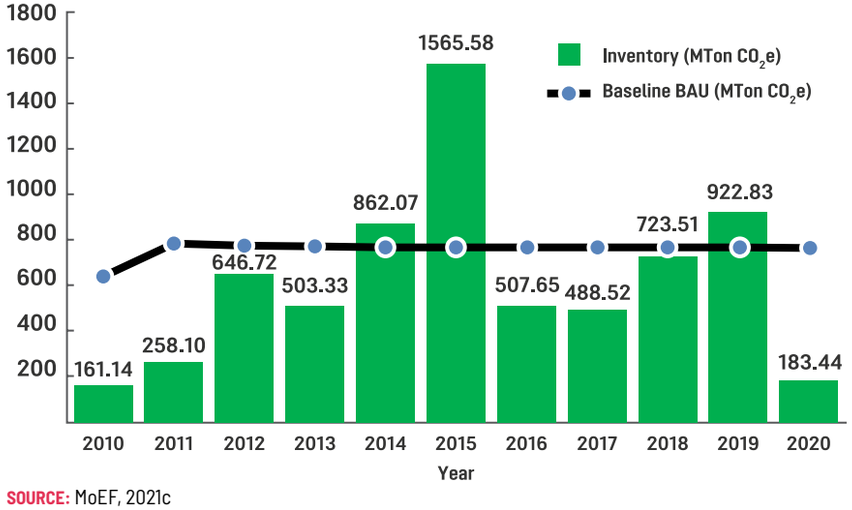
FIGURE 1.5. GHG Emissions (2010-2020) against BAU, CM1, and CM2 Targets



SOURCE: KLHK, 2021c

Indonesia's FOLU Net Sink 2030 depicts a condition of carbon sequestration higher than the emission level in the forestry and land sector that is targeted to be achieved by 2030 through mitigation actions. The net sink is set to be achieved at 140 MTon CO_2e, meaning negative emissions of 140 MTon CO_2e, and continues to be increased to negative emission of 304 MTon CO_2e by 2050. This brings net emissions at the national level from all sectors to 540 MTon CO_2e, or equivalent to 1.6 tons CO_2e per capita.

FIGURE 1.6. Comparison of Forestry Sector's GHG Inventory to BAU of Forestry Sector Emissions (2010-2020)



SOURCE: MoEF, 2021c

Climate Change Adaptation

Climate change has impacts on the national economy, especially food, water, energy, and health. Analysis of the National Action Plan for Climate Change Adaptation (RAN-API) reveals that the impacts of climate change in four priority sectors - marine and coastal, waters, agriculture, and health can reduce Indonesia's GDP by USD 7,967 million[3] in 2024. Therefore, the Government will take mitigation and adaptation measures to avoid a 2.87 percent decline in GDP by 2030 driven by climate change.

The Government is committed to mainstreaming the Sustainable Development Goals (SDGs), including climate change adaptation into national development planning. The National Medium-Term Development Plan (RPJMN) 2020-2024 manifests and is congruent with Indonesia's first NDC and the sixth SDGs agenda "Development of the Environment and Increasing Resilience to Disasters and Climate Change", particularly on aquatic, agricultural, health, as well as coastal and marine ecosystems.

The Environment and Forestry Ministerial Regulation (EFMR)[4] on Guidelines for Developing Climate Change Adaptation Actions refers to preparing climate change adaptation action plans. Meanwhile, EFMR[5] on Guidelines for Climate Vulnerability, Risk and Impact Analysis guides the analysis of climate change vulnerability, risk, and impacts. The Government has also developed a tool to assess village-level climate vulnerability, the so-called SIDIK, which can be accessed at http://sidik.menlhk.go.id. Through the EFMR[6] on Climate Village Program, the Ministry of Environment and Forestry encourages climate change adaptation and mitigation at the site level, for which 3,270 climate villages had been registered by 2021.

[3] Exchange rate: USD 1 = IDR 14,500

[4] Environment and Forestry Ministerial Regulation No. 33 of 2016

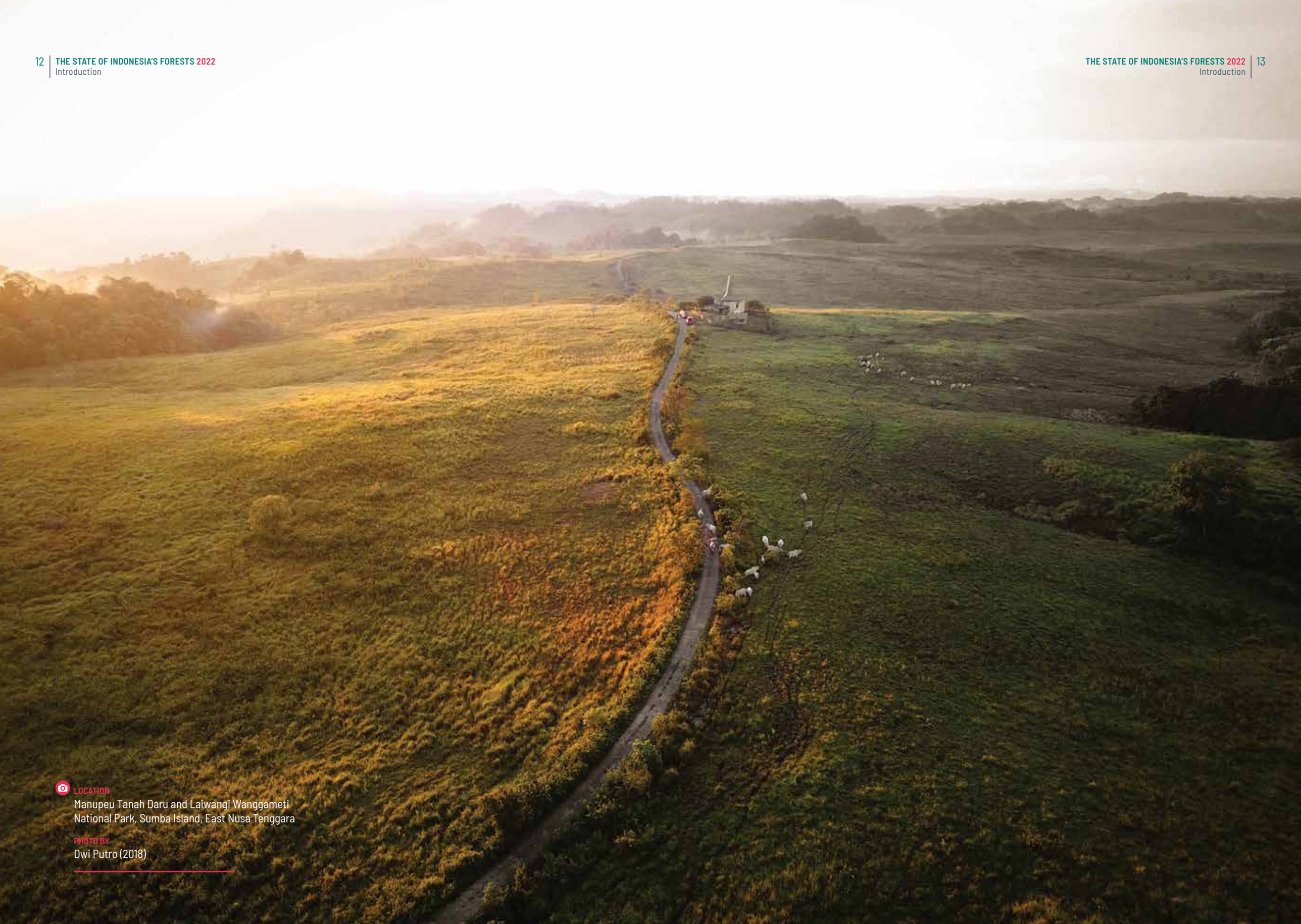
[5] Environment and Forestry Ministerial Regulation No. 7 of 2018

[6] Environment and Forestry Ministerial Regulation No. 84 of 2016

BOX 1.1. SIDIK: Village-Level Vulnerability Index

Vulnerability Assessment is used to support the decision-making process by relevant stakeholders in order to deal with impacts of climate change. Vulnerability Assessment is central to the development of sound adaptation strategies. As stated in the Environmental Law, Vulnerability Assessment has to be embedded in any Strategic Environmental Assessment (SEA). SEA is a systematic, comprehensive, and participatory decision support process, aiming to ensure that environmental and possibly other sustainability aspects are considered effectively in local and regional development as well as in policy, plan, and program-making processes.

The Ministry of Environment and Forestry has developed a tool to measure the village-level climate vulnerability rate, the so-called SIDIK (Information System for Vulnerability Index Data). SIDIK uses village potential data published by Statistics Bureau, as a primary reference to produce the information of vulnerability index and climate change risk. SIDIK is regularly updated following village potential data updates. SIDIK releases the information of vulnerability index according to the release year of the village potential data, namely 2011, 2014, and 2018. SIDIK in 2011 and 2014 employed nine socio-economic and bio-physical indicators, while since 2018 the indicators have been expanded to 21 variables, which enables to more closely track the Sustainable Development Goals (SDGs). SIDIK found that 2,535 of the 83,931 villages (3.02 percent) in the country were highly vulnerable to climate change, and 13,596 villages (16.2 percent) had climate vulnerability rate at very high level.



LOCATION
Manupeu Tanah Daru and Laiwangi Wanggameti National Park, Sumba Island, East Nusa Tenggara

PHOTO BY
Dwi Putro (2018)

CHAPTER 2

Contribution of Forests to a Green Recovery and Transition to Sustainable Economy

2.1. Sustainable Forest Management for Sustainable Economy

Indonesia is the world's largest archipelagic country where 120.5 million hectares or 63 percent of its total land area are designated as State Forest Area. Most of Indonesia's remaining land area is made up of non-forest areas or public lands, known as Other Use Areas (APL). In addition, 5.3 million hectares of its water territories are designated as marine conservation areas managed under the Ministry of Environment and Forestry authority. As of December 2021, the total of these areas stood at 125.8 million hectares.

Indonesia employs a specific definition of "forest" that may be different with some other parts of the world. However, the Indonesian definition on forest has been recognized by the UNFCCC through its approval of Indonesia's National Forest Reference Emission Level (FREL) for Deforestation and Forest Degradation. Under Indonesian law, the area legally designated as "Forest Area" is under the jurisdiction of the Ministry of Environment and Forestry. The Forest Area includes land that is both forest or "forested" and not covered by forest or "non forested". Similarly, public lands that are categorized under Indonesian law as "Other Use Areas

Mangrove Park near Pangkal Pinang, Bangka Belitung Islands

This mangrove park is a tourism area managed by local community through Community Forest scheme.

LOCATION
Pangkal Pinang, Bangka Belitung Islands

PHOTO BY
Iskandar (2021)

"can be both "forested" or "not forested". The full extent of Indonesia's forest is usually referred to as the "forested area" or "forest cover area", a term that encompasses both the Forest Area and APL. It relates to forest land status and forest land cover by tree vegetation.

On the land designated as Forest Area and APL, land cover may take several different forms, including natural forests (consisting of primary forests and secondary forests), plantation forest, plantation/estate crops, agriculture, shrub, settlements, and others. There are 23 land cover categories in Indonesia and these are used for forest and forest resource monitoring. Based on a reassessment of land cover conducted in 2020 using image interpretations derived from the Landsat Data Continuity Mission (LDCM)/Landsat 8 OLI for 2020 coverage, 79.9 percent of Indonesia's conservation forest areas; 81.7 percent of its protection forest areas; and 81.2 percent of its limited production forest areas are covered by forests. In permanent production forest areas, the forest cover is 63.6 percent, while in convertible production forest the figure is 50.2

percent. Another type of a forest is a planted forest, which is land covered with trees planted that fulfill the definition of a forest. This is known as an Industrial Plantation Forest or reforested and rehabilitated areas, within and outside the Forest Area. The remaining land cover types found in the Forest Area are estate crops, agriculture, shrub, settlements, and so on which are classified as non-forested areas or areas without forest cover. Table 2.1 quantifies forest cover in and outside the Forest Areas.

TABLE 2.1. Extent of Land Cover in Indonesia in 2020

No.	Land Cover	Forest Area (million hectares)							Non-Forest Area	TOTAL	%
		Permanent Forest					HPK	TOTAL			
		HK	HL	HPT	HP	TOTAL					
I	**Forested**	17.49	24.16	21.75	18.59	81.99	6.42	88.41	7.15	95.56	50.90
	A. Primary forest	12.56	16.10	9.76	4.57	42.99	2.53	45.52	1.48	47.00	25.03
	B. Secondary forest	4.82	7.79	11.58	10.06	34.25	3.85	38.10	5.02	43.12	22.96
	C. Plantation forest	0.11	0.28	0.41	3.96	4.76	0.04	4.80	0.65	5.45	2.90
II	**Non-Forested**	4.39	5.40	5.05	10.64	25.48	6.37	31.85	60.34	92.19	49.10
TOTAL		**21.87**	**29.56**	**26.80**	**29.23**	**107.47**	**12.79**	**120.26**	**67.49**	**187.75**	**100.00**

SOURCE: KLHK, 2021b

Charismatic Tarsius (*Tarsius fuscus*) Looking through the Night

LOCATION
Bantimurung Bulusaraung National Park, South Sulawesi

PHOTO BY
Iskandar (2012)

Indonesia's Forest Area is categorized into three different functions: (1) production forests/HP (68.8 million hectares); (2) protection forests/HL (29.6 million hectares); and (3) conservation forests (22.1 million hectares). Production forests consist of Permanent Production Forests (HP), Limited Production Forests (HPT), and Convertible Production Forests (HPK). The protection forests are Forest Area designed as buffer zones to: (1) regulate hydrology; (2) control floods; (3) prevent erosion; (4) avert abrasion; and (5) maintain soil fertility.

The conservation forests area is categorized into Sanctuary Reserve Areas (KSA) and Nature Conservation Areas (KPA). KSA consists of Strict Nature Reserves (CA) and Wildlife Sanctuaries (SM). Meanwhile, KPA consists of National Parks (TN), Nature Recreation Parks (TWA), and Grand Forest Parks (Tahura). KSA/KPA can be terrestrial or marine. All types of KSA/KPA with a majority of areas on land are classified as terrestrial KSA/KPA and cover a total of 22.1 million hectares. On the other hand, all types of KSA/KPA where the majority of the area is located in the sea are classified as marine KSA/KPA and cover a total of 5.3 million hectares.

2.2. Addressing Deforestation and Forest Degradation while Protecting Forest Environmental Services

Measures to Reduce Deforestation

Land cover in forest areas, particularly forest cover, is dynamic and subject to rapid change. The deforestation rate has been changing, either increasing or decreasing, due to human anthropogenic causes reflected in land use resulting the loss of or an increase in forest cover. Several contributing factors include: the conversion of forest areas for other development purposes such as: (1) plantations and transmigration; (2) unsustainable forest management; (3) illegal logging; (4) changes in forest use purposes; (5) legal conversion into other use areas; (6) mining activities; (7) illegal land occupation; (8) forest fires; and (9) natural disasters. Less effective and failures to optimize reforestation and land rehabilitation have also contributed to an increase in the extent of severely degraded land.

Deforestation and forest degradation are of major concern to many developing countries, including Indonesia. From 1966 to the late 1980s, Indonesia was the world's biggest raw log exporter and the world's largest plywood producer. Timber was the second biggest contributor to the Indonesian economy after oil and gas, during the years immediately following the decrease in the price of oil in 1982.

To address worsening forest conditions and disappearing forest covers, several measures have been taken by the Government. One of them is instructing the Ministry holding authority on forest and land management, as well as all governors and regents to postpone the issuance of new permits in primary forests and peatlands through a presidential instruction[7] in 2011 which was valid for two years.

The moratorium has been extended three times and then made permanent through a presidential instruction[8] in 2019. In 2021, soon after the nomenclature adjustment in accordance with the Job Creation Law[9], and the Government Regulation[10] on Forestry, the Minister of Environment and Forestry established an Indicative Map for the Termination of the Issuance of Business Licenses (PIPPIB). With this regulation, new permits were no longer issued until the governance of primary forests and peatlands is improved. The permanent moratorium covers approximately 66.2 million hectares of primary forests and peatlands.

[7] Presidential Instruction No. 10 of 2011 on Moratorium of the Issuance of New Licenses and Governance Improvement of Primary Forests and Peatlands

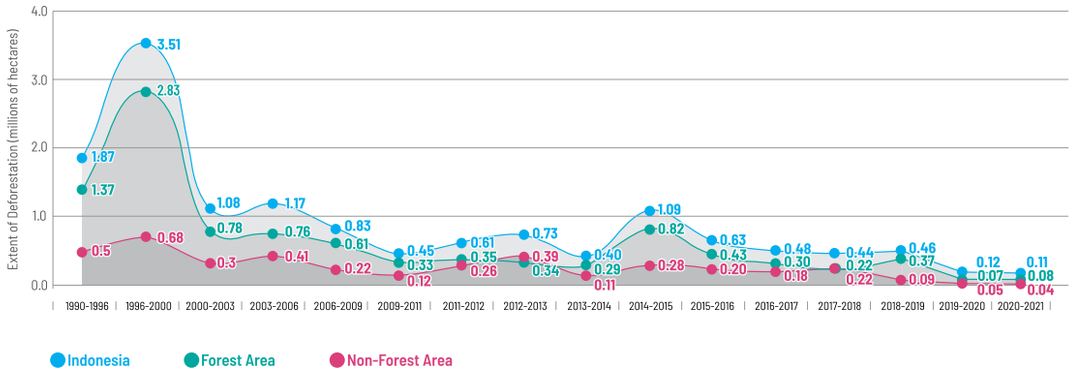
[8] Presidential Instruction No. 5 of 2019 on Termination of the Issuance of New Licenses and Governance Improvement of Primary Forests and Peatlands

[9] Law No. 11 of 2020

[10] Government Regulation No. 23 of 2021

The high pressure on forests has been detected through periodic forest resources monitoring activities, carried out at three-year intervals 2000-2009. Since 2011, monitoring forest resources has been conducted on a yearly basis, with more complete information than before. Prior to 2000, data were only available for two periods, namely 1990 and 1996 due to the lack of a monitoring system. The Ministry of Environment and Forestry consistently monitors Indonesia's deforestation rate, comparing against the baseline information of 1990. The deforestation rate from 1990 to 2021 is presented in Figure 2.1, while Net Deforestation is presented in Table 2.1.

FIGURE 2.1. Deforestation Trends (1990-2021)



SOURCE: KLHK, 2021a

TABLE 2.2. Indonesia's Net Deforestation (2020-2021)

No.	FOREST TYPE	FOREST AREA (thousand hectares)							APL	GRAND TOTAL
		PERMANENT FOREST					HPK	TOTAL		
		HK	HL	HPT	HP	TOTAL				
1	Net Deforestation in Natural Forest (A+B)	6,164	12,659	33,633	37,233	89,720	7,300	97,020	37,411	134,431
	A. Primary Forest	1,406.8	2,541.5	1,574.9	1,223.9	6,747.0	180.7	6,927.7	807.3	7,735.0
	B. Secondary Forest	4,757.5	10,117.7	32,088.3	36,009.5	82,973.0	7,119.4	90,092.4	36,604.0	126,696.4
	C. Plantation Forest*	220.5	-	- 1,592.9	- 19,299.5	- 20,671.9	- 111.3	- 20,783.2	- 113.9	- 20,897.1
2	Net Deforestation (A+B+C)	6,384.8	12,659.2	32,070.2	17,933.9	69,048.1	7,188.8	76,236.9	37,297.4	113,534.3

*Plantation forests within conservation and protection forest areas are not classified as Industrial Plantation Forests/IUPHHK-HT

SOURCE: KLHK, 2021a

The deforestation rate in the period 2019-2020 decreased by 75 percent to 115 thousand hectares, which was the lowest rate since 1990. The rate of deforestation 1996-2000 was 3.51 million hectares. Deforestation fell to 1.09 million hectares between 2014-2015, and 470 thousand hectares in 2018-2019. This decline was driven by a decrease in forest and land fires of up to 82 percent. In addition, about 3 million hectares of degraded land have been rehabilitated over the last 10 years. Around 600 thousand hectares of mangrove forests are projected for rehabilitation by 2024, which is the most ambitious target ever. Since 2017 about 3 million hectares of peatland have been rehabilitated. The Government has made consistent efforts in controlling the rate of deforestation to pursue the NDC targets. The net deforestation for the period 2021-2022 was 113.5 thousand hectares, showing a modest decline from 115.5 thousand hectares recorded in the previous period (2020-2021).

BOX 2.1. Deforestation

Deforestation is the conversion of forests to other land uses or the long-term reduction in tree canopy cover below a 10 percent threshold (FAO, 2000). The FAO's use of "long-term" is debatable, and complicated for Indonesia, a country with fast rate of vegetation regrowth.

The Forestry Ministerial Decree No. 30 of 2009 defines deforestation as the "permanent alteration from a forested area into a non-forested area as a result of human activities" (MoFor, 2009). The definition of deforestation as "permanent alteration" helps highlight the importance of natural forests. Areas of natural forests with temporary de-stocking which then experience regeneration do not count as having undergone deforestation. The definition nevertheless takes account of the fact that, in most cases in Indonesia, natural forest cover that has been changed (cleared) to become non-forested land rarely grows back into natural forest. Such areas are most typically utilized for non-forest purposes. Any forest regeneration following succession stages that does occur in such places will most likely be interrupted by other large-scale anthropogenic activities.

The definition of deforestation in this document as a one-time permanent conversion of natural forest cover into other land cover categories was selected for the sake of practicality, simplicity, and the clarity it lends to land cover class identification and classification processes.

The related term "gross deforestation" was introduced in a 2008 Indonesia Forest Climate Alliance (IFCA) document. It counts only what has been lost (cleared natural forests) and does not take into consideration the possibility of forest regrowth (both naturally and by human intervention), nor carbon sequestration from forest regrowth. Gross deforestation is different from "Net deforestation" where re-growing secondary forests and forest plantations are counted. (The Ministry of Environment and Forestry, 2016)

In August 2019, the latest Presidential Instruction on forest concession moratorium changed nomenclature from "suspension" to "termination" to emphasize permanent moratorium. The Ministry of Environment and Forestry then issued a ministerial decree as an "Indicative Map for the Termination of the Issuance of New Licenses for the Utilization of Primary Natural Forests and Peatlands.

As of the revision of the PIPPIB Period II in 2021, the area covered by the moratorium stood at 66.1 million hectares, of which 51.2 million hectares were accounted for by the entire extent of Indonesia's terrestrial Conservation Forests and Protection Forests; 5.3 million hectares consisted of all peat forests that are unencumbered with licenses and which stand in either in Production Forests or in Other Use Areas (APL); and 9.6 million hectares of primary natural forest that are unencumbered with licenses and stand in either in Production Forests or APL. In a 2022 Indicative Map for the Termination of New Licenses, the figures changed slightly, to 66.5 million hectares in total, with 51.6 million hectares of Conservation and Protection Forests, 5.3 million hectares of unencumbered peat forests inside Production Forests or APL, and 9.7 million hectares of unencumbered primary forests inside Production Forests and APL, respectively.

The Shining Flycatcher (*Piezorhynchus alecto*) is a Species of Bird in the Family Monarchidae

LOCATION
Aketajawe Lolobata National Park, North Maluku

PHOTO BY
Akhmad David (2021)

Moratorium of Oil Palm Expansion

Indonesia and Malaysia dominate the world market in Crude Palm Oil (CPO) and contribute to approximately 80 percent of global palm oil trade. Oil palm produces 4 to 10 times more oil per hectare than any other edible oil crop. In addition, the oil palm sector makes a significant contribution to the Indonesian economy.

The Indonesian government has placed environmental considerations as an administrative priority to halt tropical forest degradation. The Indonesian Sustainable Palm Oil (ISPO) System is a palm oil standard adopted by the Indonesian Government to improve the competitiveness of Indonesian palm oil in the global market and to minimize impacts on the environment, climate, and biodiversity, including to apply a certification system to safeguard rainforests.

In order to protect peatlands from oil palm plantation expansion, the government has issued a government regulation on peatland ecosystem management and protection. After almost three-year discussions, on September 19, 2018, a presidential instruction[11] on 'Oil Palm Licensing Review' was signed into force by the President Joko Widodo.

[11] Presidential Instruction No. 8 of 2018 on the Suspension and Evaluation of Oil Palm Plantation Permits and Increasing Productivity of Oil Palm Plantation

BOX 2.2. Moratorium of New Issuance of Concession Licenses and Governance Improvement in Primary Forests and Peatlands

The first milestone of Indonesia's Moratorium Policy occurred at the UNFCCC Conference of the Parties (COP) 13 in Bali 2007. Soon after, the Government introduced a new regulatory measure restricting any new concession license in primary forests and peatlands, widely known as the "moratorium policy." This moratorium policy was legalized through a Presidential Instruction in 2011 temporarily suspending issuance of new concession licenses in primary forests. The Presidential Instruction was for a period of, and was renewed, every two years, until 2017. Each Presidential Instruction has been implemented by the issuance of Moratorium Map by the Minister of Forestry (since 2014, the Minister of Environment and Forestry), and this map had been revised every 6 months. In 2019, the Presidential Instruction No. 5 of 2019 permanently stopped the issuance of new licenses in primary forests and peatlands. This last Presidential Instruction was aims to further improve the governance of primary forests and peatlands. This means the moratorium on the issuance of new licenses in primary natural forests and peatlands is permanent, and the Moratorium Map is fixed, even though revisions to it will be undertaken every six months in order to accommodate any exceptions, as stated in the Presidential Instruction. The moratorium will be "permanent," until primary forest and peatland governance is improved.

Indonesia's decision to make the moratorium permanent was based on the following considerations:

1. The continuing stability of the size of the area under moratorium since 2017, about 66 million hectares;
2. A significant decline in the deforestation rate (in 2017, deforestation stood at only 38 percent of what it was in 2011);
3. To optimize existing concession licenses based on forest concession-related policy directives since 2011;
4. Moratorium areas' contribution to NDC targets through the REDD+ mechanism and it may receive REDD+ result-based payments through the Environmental Fund Management Agency which has been being developed; and
5. To simply administrative processes by not having to renew the moratorium every two years.

Reducing Forest Degradation in Concession Areas

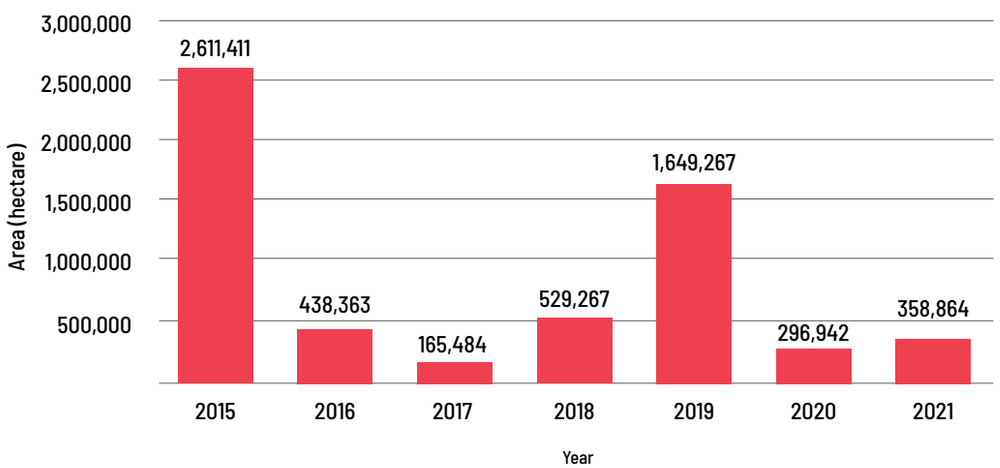
While forest degradation contributes to an increase in greenhouse gas emissions, actions to reduce GHG emissions towards net sink 2030 need to be carried out with the synergy of various parties, including concession companies. Concessionaires can take action to prevent the degradation of primary forests within their concession. The undisturbed primary forests that still exist in logging and plantation concession areas (PBPH-HA and PBPH-HT) amount to 4.89 million hectares and 0.30 million hectares respectively. Most of the logging concessions with extensive undisturbed primary forests are in the Provinces of West Papua, Papua, and North Kalimantan, in which the primary forests cover an area of 3.69 million hectares or 75 percent of the total primary forest in concessions. The primary forests within the plantation concessions cover around 0.212 million hectares or about 70% of the total primary forests in concessions, where mostly located in the provinces of Central Sulawesi, Papua, Maluku, and West Kalimantan.

In accordance with the Low Carbon Scenario Compatible with Paris Agreement (LCCP), protecting primary forests within concession areas and preventing them from severe degradation are considered significant contributions from concession companies to expediting the achievement of the net sink target. Degradation of natural forests within concession areas during the period 2013-2019 was 0.44 million hectares, leaving 1.8 million hectares (0.18 million hectares per year) as the remaining forests for planned deforestation until 2030. In order to achieve the net sink, the current forest degradation rate within concession areas has to be lower than the historical rate, which can be reached through a number of measures including forest protection and restoration by applying enrichment planting techniques, particularly in degraded primary forests.

Forest and Land Fire Management

Forest and land fires in Indonesia have attracted global attention since the devastating fires in 1982/1983 and in 1997/1998. Significant forest and land fires occurred again in 2007, 2012 and 2015, causing transboundary haze pollution in the ASEAN region and again attracting global attention (Syaufina, 2015).

FIGURE 2.2. Total Burnt Area (2015-2021)



SOURCE: KLHK, 2022

In the aftermath of the 2015 catastrophic fire events, the Government rolled out a new strategy of forest and land fire management, prioritizing forest and land fire prevention. The President paid special attention to forest and land fires by issuing Presidential Instruction No. 15 of 2015 on Improvement of Land and Forest Fire Control, later amended by Presidential Instruction No. 3 of 2020 on Management of Forest and Land Fires. This regulation becomes a legal basis to develop strong coordination and cooperation between agencies at the central and regional levels. To implement the instruction, the Minister of Environment and Forestry issued Ministerial Regulation No. 32 of 2016 which highlights three interrelated forest and land fire control activities: fire prevention, fire suppression, and post-fire management. A significant policies have been adopted including issuance of Government Regulation No.57/2016 regarding protection and management of peat ecosystem, replacing Government Regulation No.71/2014 related to strengthening the implementation of peat management. Peat fire was a significant part of the large forest fire and haze in 2015. Based on this experience, monitoring and peat governance have been much strengthened particularly in the private concession areas.

Furthermore, Indonesia demonstrated its commitment to transboundary haze pollution mitigation by ratifying the ASEAN Agreement on Transboundary Haze Pollution in 2014. To implement the agreement, some actions to prevent forest and land fires were carried out including routine patrols and integrated patrols, fire prevention campaigns, application of weather modification technology, forest and land fire awareness and community empowerment programs, and application of zero-burning system in land preparation. Community awareness and empowerment programs are conducted using social media, mass media, relevant exhibitions, public service advertising, faith-related programs, and other society and school-based programs. As a result, during 2020-2021 Indonesia succeeded in reducing fire events and preventing transboundary haze.

The Government of Indonesia accomplished this feat using several strategies. First, Weather Modification Technology (TMC) were used to control forest and land fires since 2015. TMC operations have been further enhanced since 2020 by involving more parties in regular weather modification activities, such as the Indonesian National Army (TNI), Agency for the Assessment and Application of Technology (BPPT), National Agency for Disaster Management (BNPB); and supported by the data, as well as climate and weather monitoring system from the Meteorology, Climatology, and Geophysical Agency (BMKG).

Second, capacity building and improving forest and land fire control activities include various approaches such as increasing the number of fire brigades and capacity building for them, developing the Indonesian National Qualification Framework and Competency Certification system (SKNI) to support the management of forest and land fires; and the provision of assistance and supervision to support the forest and land fire management activities of several private sector entities. Those approaches are also supported by improvements to forest and land fire control infrastructure to intensify forest and land fire mitigation actions.

BOX 2.3. Zero Burning-Land Clearing System and Community Empowerment

Community empowerment programs have been conducted to establish community awareness and involvement. The purpose of these programs is to increase community awareness, so that communities can be actively involved in forest and land fire prevention and suppression activities. There is also an effort to improve the ability and skills of communities to control forest and land fires, as well as to mitigate and adapt to climate change. Various stakeholders are involved in the program, including the central government, local governments, and the private sector.

Regulation to apply zero-burning systems in land preparation has come into force and has to be obeyed by forestry and plantation companies. Concession holders are not allowed to use fire for their land preparation activities and must have a capable fire brigade including sound firefighting equipment to address fire incidents within their working areas.

Practices of zero-burning systems are also introduced to fire-care communities and fire-care farmer groups by promoting some programs such as fire-free villages, provision of livelihood options, and various relevant training.

The zero-burning system program has also been implemented to encourage communities to engage in activities including composting, charcoal briquetting, vinegar production, and so on. Some other innovations that have been developed to support forest and land fire management include:

1. In West Kalimantan, *Manggala Agni* (fire brigades) assists communities how to make wood vinegar and use it as fertilizer. Since 2019, *Manggala Agni* has implemented the "*Langit Biru*" (blue sky) pilot project with support from the army to practice zero-burning system in several villages in West Kalimantan;
2. Communities are encouraged to produce charcoal briquettes from pieces of organic material such as wood, twigs, and sawdust - all residue from land clearing; and
3. *Paludiculture* is also encouraged as a technique for restoring degraded peatland ecosystems. It entails the growing of non-timber forest products that emulate the ecology of peat forests, by using native peat species

Third, since mid-2020, Indonesia has been trying to improve the fire-care community (MPA) programs by strengthening communities whose land was burning through the program of Legal Awareness of Community Development (Paralegal), hereinafter known as MPA Paralegal. This activity is a collaboration between KLHK and BNPB, TNI, The Indonesian National Police (POLRI), Local Governments, and other parties and has so far been carried out in 12 villages in the provinces of Riau, Jambi, South Sumatra, Central Kalimantan, West Kalimantan, and West Java, where repeated fires occur every year due to fish drying by fishing communities and/or land burning by cultivators.

Forest and land fires in Indonesia have become an annual occurrence, with the peak season occurring from July to October. However, in some provinces the peak season often occurs in February- March and July-October, following the weather and rainfall pattern in their area. Forest and land fire events will significantly increase during extreme weather due to El Niño.

Finally, a new method of calculating the burnt area developed by Indonesia has resulted in essential changes. In the past, Indonesia only relied on reports of forest and land fire incidents from the regions. Since 2015, Indonesia has implemented a more comprehensive and precise method of calculating burnt areas using a mapping method based on satellite imagery to acquire data on hotspots, fire suppression coordinates, and ground check locations. Since 2022, a verification process has employed two approaches: data verification and direct ground checks that involve field officers.

BOX 2.4. The Need for Ground-Checking Calculations of Forest and Land Fire Areas

Indonesia has taken a step forward by calculating the area of forest and land fires periodically in a systematic and scientific manner. Indonesia is the first country in ASEAN to apply this method, which is open for adoption by other countries. It is essential to provide data on the extent of forest and land fires since they will serve as the basis for calculating emissions from forest and land fires, as well as for implementing law enforcement and restoration of the burnt areas.

Since 2018, the Ministry of Environment and Forestry has collaborated with the National Institute of Aeronautics and Space/LAPAN (now: the National Research and Innovation Agency) to develop a more comprehensive and precise method for calculating the area of forest and land fires using a semi-automatic approach. LAPAN has been developing an algorithm for automatic burnt area calculation in the form of supervised machine learning which can produce a polygon of predicted burnt area. This polygon is then overlaid with satellite imagery and ground check data. The overlaid patch is marked as the total burnt area, while the rest of mismatched polygons will be corrected. At the end, the data produced from the machine learning will be compared with the manual delineation. Recently, Indonesia has been using multi satellite imageries derived from both Landsat and Sentinel as two main sources. This method continues to be developed in accordance with technological advances and the data available from any existing satellites.

Data on the extent of forest and land fires are currently available for the years 2000 to 2022, although this method is still under further development. The data is open to the public, but the use of the data must comply with applicable regulations and prioritize the principle of expediency.

The forest and land fire monitoring system has been well developed in Indonesia. To guarantee synergized data and information of forest and land fires, intensive coordination and cooperation with many parties that have responsibility for data provision continues to be enhanced. All related parties have agreed to share roles and responsibilities including implementing one data policy. The MoEF as the main institution responsible for forest and land fire management will use hotspot data officially released by the National Aeronautics and Space Agency (LAPAN). The data will be further disseminated to other relevant government agencies including BMKG, BNPB, and Geospatial Information Agency (BIG) for relevant uses.

Early monitoring, detection, and suppression is a main principle in forest and land fires suppression, optimizing information from SiPongi (see Box 2.5) and from patrol officers, and direct information from local communities. The information will be further followed up with a ground check on the identified hotspots.

Early fire suppression is done through direct ground suppression, water bombing, or combination of the both methods based on specific condition on the ground. Suppression in peatlands is more difficult because the source of a fire is often underground, generates a lot of smoke and requires more resources and time to handle, and also requires separate specifications such as injection of water into peat. The latter is a tool invented by fire brigades, popularly known as *Manggala Agni* which were formed by the Government in 2003 and tasked with controlling forest and land fires at the local level. In recent years the tool has been replicated by several private companies in Indonesia.

Rescue and evacuation activities are another important aspect of controlling forest and land fires. In addition, post-forest and land fire management is conducted to identify the causes of, and the damage caused by, forest and land fires. Post-fire management involves activities such as collecting data and information, monitoring areas affected by fires; putting out any remaining fire, mapping affected areas; rehabilitating affected areas; and law enforcement.

BOX 2.5. Forest and Land Fire Monitoring System "SiPongi"

Indonesia has been monitoring forest and land fires since 1984. At an early stage, efforts were based on ground reports provided by government officers in regions across the country, including occurrences of fires and estimates of burnt areas. Starting in 1997, Indonesia developed a satellite-based system to monitor hotspots. The work was developed with the support from Japan International Cooperation Agency (JICA) in the period 1997-2006, and from Australia through Land Western Australia in 2007.

Furthermore, since 2014 Indonesia has established an independent hotspot monitoring system. In March 2015, the Ministry of Environment and Forestry launched SiPongi, a forest and land fire early warning and detection system that combines early warning data based on the Fire Danger Rating System with hotspot data from NOAA, Terra/Aqua, SNPP, Landsat, and field data from other relevant agencies such as BMKG, Peatlands and Mangrove Restoration Agency (BRGM), LAPAN, BNPB, and the Ministry of Communication and Information Technology. In 2019, the system was further developed using Thermal CCTV installed at 15 fire-prone locations in order to expand its coverage and improve the monitoring effectiveness.

The system continues to be developed as Indonesia's commitment to providing fast, precise and accurate forest and land fire-related data and information to the public. By the continuous Innovation in the SiPongi system, field officers responsible for fire management can respond faster to fire events, from 3 days to only 1 day; and fire suppression can be done earlier even from small uncontrolled fires. As a result of all these development efforts, in 2021 and 2022 SiPongi was a nominee to receive a United Nations Public Service Award.

Forest and land fire management is now focus on:

1. Prioritizing forest and land fire prevention;
2. Increasing active participation of the private sector working in the field of agriculture, industrial timber plantations, and mining, with respect to their impact on forest and land fires;
3. Multiplying both independent patrols and integrated patrols, especially in fire-prone provinces;
4. Increasing community awareness of and participation in forest fire management, through intensive campaigns and propagation, online media and social media, as well as collaboration with various parties including educational institutions, religious and social groups;
5. Encouraging Provincial/Regency/City Governments to allocate sufficient budgets, and optimally use DBH DR (reforestation funds) for forest and land fire early warning systems to make forest and land fire control more optimum;
6. Strengthening the capacity of *Manggala Agni* (fire brigades) and increasing the role of the fire-care communities as forest and land firefighters;
7. Regularly upgrading technology for early warning and detection of forest and land fires;
8. Improving a community-based online monitoring and reporting system at http://sipongi.menlhk.go.id, informing activities carried out by the forestry and plantations-related private sector; and
9. Law enforcement.

2.3. Scenarios of the Indonesia's FOLU Net Sink 2030

Towards Net Zero Emissions

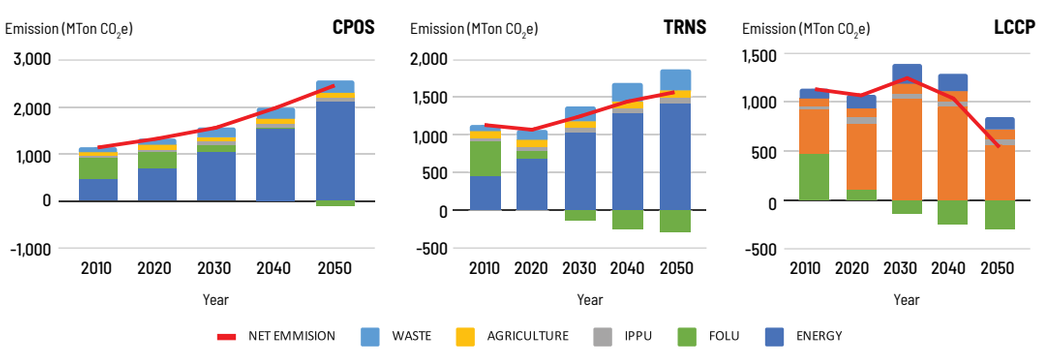
In the LTS-LCCR 2050 document, Indonesia has boldened its climate initiative to make the FOLU sector a net sink by 2030 based on two priorities: (1) corrections to policies and measures in the forestry sector addressing issues that have been a concern for at least seven years, and (2) addressing a number of forest sector issues that have been going on for a dozen years or more.

Based on the LTS-LCCR document, with the most ambitious scenario (Low Carbon Scenario Compatible with Paris Agreement target; LCCP) Indonesia's total GHG emissions reductions will peak at 1,244 MTon CO_2e by 2030, equivalent to 4,23 tons CO_2e per capita. Afterwards, in order to achieve net zero emissions (NZE) by 2060 or earlier, the net emissions will need to continue to be reduced to 540 MTon CO_2e by 2050 or equivalent to 1.6 tons CO_2e per capita (Figure 2.3). The LTS-LCCR target will strengthen Indonesia's 100 Year vision (Vision Indonesia 2045) toward an advanced and prosperous country.

The FOLU sector will reach a net sink with sequestration of 140 MTon CO_2e, and it continues to increase up to 304 MTon CO_2e. The sector plays an important role in emissions offsets of other sectors, which have constraints to reduce their emissions, particularly the energy sector. The FOLU sector's ability to maintain the net sink from 2030 onwards will then determine the achievement of Indonesia's NZE by 2060.

In order to achieve the FOLU net sink target, systematic actions will be carried out. They include forest and land fire management, forest moratorium, development of weather modification technology, forest and land rehabilitation, and law enforcement on forest crimes such as illegal land occupation and illegal logging. The results of these efforts are reflected in significantly reduced deforestation in 2021. Indonesia's long-term vision to establish a climate- resilient low-carbon development pattern by 2050 is transformed into three main scenarios: (1) the current policy scenario (CPOS), (2) the transition scenario (TRNS) and (3) the Low Carbon Scenario Compatible with Paris Agreement target (LCCP).

FIGURE 2.3. Emissions Projections under CPOS, TRNS, and LCCP Scenarios



SOURCE: Indonesia LTS-LCCR, 2021d

The comparison of the three graphs in Figure 2.3 shows the current policy scenario (CPOS) where Indonesia is not likely to reach a net sink in 2050. In contrast, by implementing the LCCP scenario, Indonesia is predicted to achieve NZE by 2060, or even sooner. The CPOS scenario is an extension of the unconditional NDC scenario (CM1), while the LCCP scenario proposes more progressive mitigation actions with the aim of achieving NZE, a more ambitious target than the conditional NDC scenario (CM2). The transition scenario bridges the transition process from the CPOS to the LCCP scenario. By sector, the FOLU and agricultural sectors are only translated into two scenarios, namely the CPOS and LCCP scenarios.

Under the CPOS scenario, emissions are projected to increase sharply, and even after 2030 will reach 1.55 MTon CO_2e and continue increasing to 2.45 MTon CO_2e by 2050. The largest contributor to the emissions during that period will come from the waste sector at 272 MTon CO_2e.

The TRNS scenario shows a slowing of the increase in emissions after 2030, in comparison with the CPOS scenario, reaching net emissions of 1,526 MTon CO_2e or 4.53 Ton CO_2e per capita by 2050. This scenario takes into account development programs in accordance with the Paris Agreement climate change scheme. Under TRNS scenario the mitigation actions after 2030 will continue to be scaled up.

Under the LCCP scenario, emissions will decline rapidly after 2030 and reach 540 MTon CO_2e by 2050 or 1.61 Ton CO_2e per capita (Figure 2.3). The LCCP scenario intensifies climate change mitigation actions to significantly reduce the emissions from all NDC sectors and eventually achieve the net sink target by 2050.

The LTS chart by sector (Figure 2.3) indicates that to achieve its most ambitious LTS-LCCR commitment, Indonesia must reduce emissions from the energy sector while pushing a shift in the FOLU sector from a net emitter to a net sink. According to the Ministry of Environment and Forestry (2021), significant efforts to reduce FOLU sector emissions and shift them into net sink 2030 are highly dependent on the success of several actions, including: (1) reducing emissions from deforestation and peatlands, particularly from peat decomposition and peatland fires, (2) increasing the carbon sequestration capacity of natural forests by reducing degradation and increasing forest regeneration, (3) restoring peatlands, (4) implementing forest restoration through enrichment planting and increasing carbon sequestration, (5) adopting sustainable forest management practices, and (6) maximizing the use of unproductive or low carbon land for the development of forest plantations, and other perennials (industrial crops).

The National Strategy for FOLU Net Sink 2030 employs four main strategies, namely:

1. Avoiding deforestation: curbing on deforestation rates in order to achieve the FOLU Net Sink 2030 which limits planned deforestation up to 6.8 million hectares by 2030;
2. Conservation and sustainable forest management: reducing forest degradation driven by excessive logging and production forest encroachment, and extending protected forest area in both production forests and other use areas (APL);
3. Protection and restoration of peatlands; emissions from peatlands account for 50 percent of total emissions in the AFOLU sector, which mostly come from peatland fires and dry peatland decomposition; and
4. Sink enhancement: accelerating afforestation and reforestation of severely degraded land outside and inside forest areas as well as urban revegetation.

Preparation of the operational plan of the Indonesia's FOLU Net Sink 2030 uses three main types of spatial information. These include (1) the map of bio-geophysical indices (IBGF) that covers carbon sequestration and forest and land fires-related emissions, (2) a directional map for optimizing forest utilization based on environmental services index (IJL), and (3) a map of institutional typology of forest management units and social capital on the ground. It also considers the plans of forest uses as outlined in the Forest Area Utilization Direction/RKTN 2011-2030.

All actions proposed in the Operational Plan are designed in detail and integrate approaches. They are aimed at giving rise to multiple benefits in the form of reducing emissions, increasing forest and land cover, enhancing law enforcement, and improving essential functions of forests such as water management, microclimate, ecosystems, biodiversity conservation, including community welfare, equity, and health.

Indonesia has demonstrated a high commitment to mitigating emissions from the FOLU sector through the following government policies in which the government of Indonesia has:

1. ratified the Paris Agreement through Law No. 16 of 2016 on Ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC);
2. increased its ambitious targets of global emission reduction with the support of international technical cooperation. The

commitments are stated in the Updated Nationally Determined Contribution (NDC) and Long-Term Strategies for Low Carbon and Climate Resilience (LTS-LCCR) 2050, which were submitted to the UNFCCC COP-26 Glasgow;

3. targeted the FOLU sector to reach a net sink (sequestration level equal to or higher than its emission level) by 2030 based on the Environment and Forestry Ministerial Decree No. SK. 168/2022, on the Indonesia's FOLU Net Sink 2030 for Climate Change Control;
4. targeted net-zero/carbon neutral for all NDC sectors by 2060 or earlier;
5. implemented the Carbon Pricing Policy based on Presidential Regulation No. 98 of 2021 to achieve nationally determined contribution targets and control over GHG emissions in the National Development; and
6. standardized Carbon Emission, Removal, and Stock Estimation in the Forest and Land Use Sector (Guaranteed validity of the Estimation of the FOLU Net Sink 2030 and Net Zero Emission 2060).

As the National Focal Point for the UNFCCC, the Ministry of Environment has submitted an enhanced NDC document to the UNFCCC on 23 September 2022. The newly submitted document reflects current progress particularly in: a). Enhanced ambition on climate adaptation as elaborated in the programs, strategies and actions to achieve economic, social and livelihood, and ecosystem and landscape resiliences. b). Mainstreaming it into the national context that relates the existing condition, milestones along with national development for the period of 2020-2024, and indicative pathways towards long- term visions (Visi Indonesia 2045 and the Long-Term Strategy on Low Carbon and Climate Resilient Development 2050). c). Translating the Paris Agreement Rule Book (Katowice Package) into Indonesia's context with a view to enhance effectiveness and efficiency in implementing the agreement and in communicating its progress and achievement. Moreover, the enhanced NDC depicts increases in emission reduction targets compared to those of the First and Updated NDCs. Modified emission reduction targets of 31.89 percent unconditionally, and 43.20 percent conditionally have been adopted.

Financing Indonesia's FOLU Net Sink 2030

Indonesia's emissions reduction target in the Forestry sector will contribute around 497 MTon CO_2e to emissions reduction in the 29 percent scenario or Counter Measure 1 (CM 1), and up to 692 MTon CO_2e in 41 percent conditional scenario or counter measure 2 (CM2). Slightly higher than the target, the forestry sector's combined reduced emissions with the other land-use sectors will contribute approximately 540 MTon CO_2e to the emission reduction by 2030, with the main strategy of land allocation management.

In 2022, the Ministry of Finance released data showing that financing for the forestry and land use sector required for achieving the target of net sink 2030 is USD 21,311 million, eleven times lower than that required for the energy and transportation sector which will reach USD 241,379 million. The FOLU sector is predicted to be the focus of the main strategy for climate mitigation actions.

With the issuance of the Presidential Regulation on Carbon Pricing, three instruments of carbon pricing: carbon markets, carbon taxes, and performance-based payments, will provide a great opportunity for financing climate actions. The carbon price is predicted to positively fluctuate with currency exchange rates and trust amongst sellers and buyers in carbon transactions. Improvements in land-use governance are likely to result in improvements to carbon price. Therefore, the validity of carbon emission, removal, and stock estimation will strongly correlate to the trust of buyers.

A Snapshot of Natural Production Forest

LOCATION
Kotawaringin Barat, Central Kalimantan

PHOTO BY
Hajrah (2022)

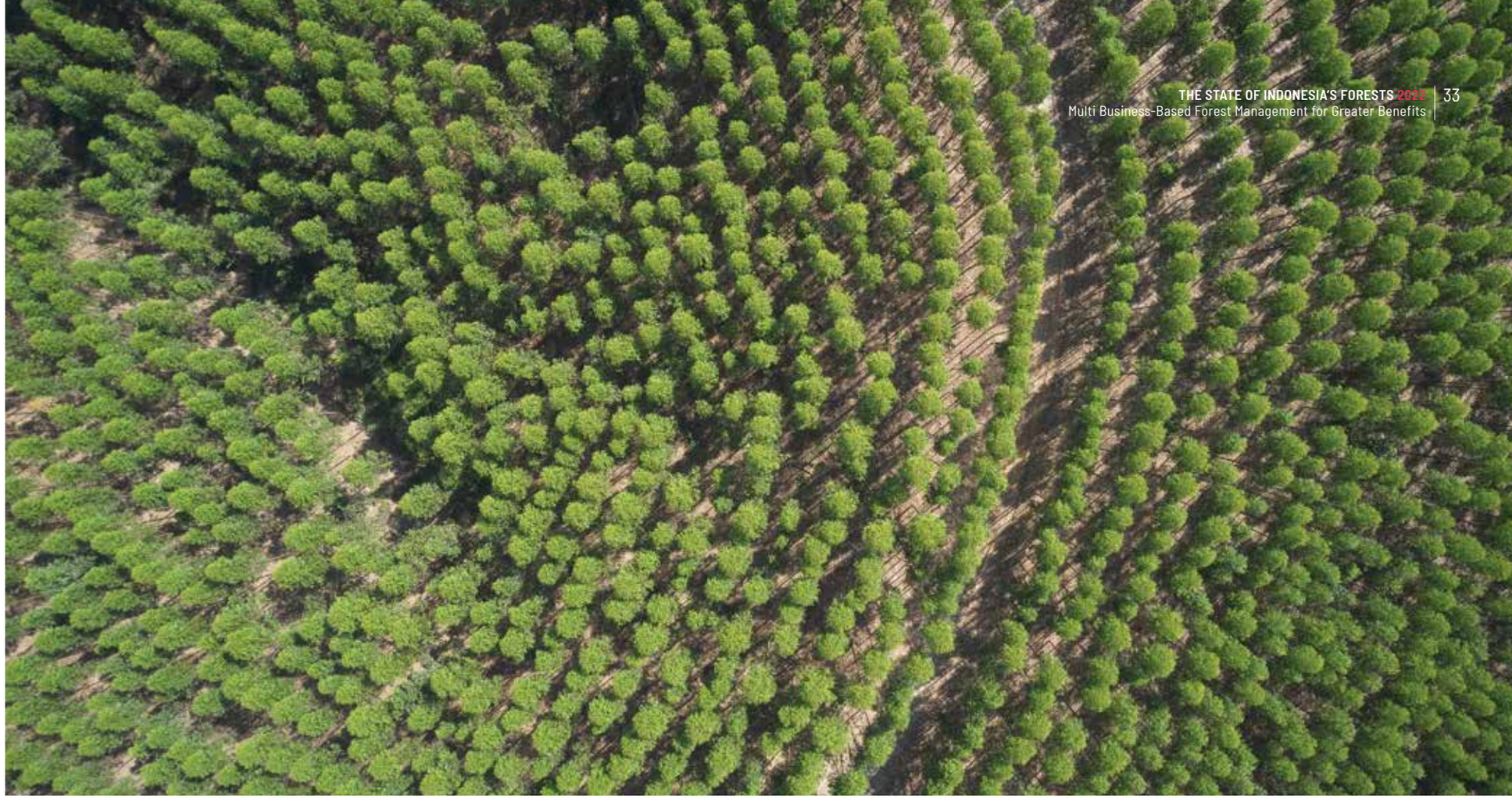
CHAPTER 3

Multi Business-Based Forest Management for Greater Benefits

A change in forest management paradigm, from timber-based to multi-forestry business approaches, is expected to generate a higher economic value of production forests, as well as to improve equity and community access to forest resources. The expectation is stated in the Job Creation Law, and its implementing regulations[14]. The new paradigm of sustainable forest management employs five pillars-legal certainty of forest areas, guarantee for business legality, productivity, product diversification, and competitiveness.

A multi-forestry business concept developed in the new paradigm is an opportunity to apply a new set of forestry business configurations including forest area utilization, timber and non-timber forest product utilization, and environmental service utilization to get greater forest benefits, particularly in the protection and production forests. Multi-forestry business, as an entry strategy to achieve optimum forest resource utilization and green investment development, simplifies business licensing systems from the concept of one single permit for one business activity to for multi-business activities. The implementation of multi-forestry businesses significantly increases the economic value of forests resulting from optimum forest resource utilization, increased forest cover, improved forest productivity and forest product exports, and greater job opportunities.

[14] Government Regulation No. 23 of 2021 and the Environment and Forestry Ministerial Regulation No. 8 of 2021



Industrial Plantation Forest

LOCATION
Riau

PHOTO BY
APHI's member, APRIL Group

3.1. Investment in Sustainable Forest Management

Portrait of Production Forest Management

Indonesia's Production Forest area covers a total area of 68.8 million hectares, of which 34.18 million hectares have been allocated to different types of forest business licenses (PBPH), while the remaining 34.62 million hectares are without such licenses. Of the 34.18 million hectares of area for which forest business licenses have been granted, 55 percent (18.8 million hectares) are under Business Licenses for the Utilization of Timber Forest Products from Natural Forests (PBPH-Natural Forests) and 33 percent (or 11.27 million hectares) are under Business Licenses for Utilization of Timber Forest Products from Industrial Plantation Forests (PBPH Plantation Forests). The third type of forest business license is the Business License for the Utilization of Timber Forest Products from Ecosystem Restoration (PBPH Ecosystem Restoration), which stands at 2 percent (or 0.62 million hectares) of the total production forests. The last 10 percent or 3.49 million hectares are devoted to collecting non-timber forest products, environmental services business licenses, and social forestry schemes.

PBPH Ecosystem Restoration is a business license to restore degraded production forests so that biodiversity and ecosystem balance can be maintained. Ecosystem restoration areas have a potentially important role to play in reducing carbon dioxide emissions and increasing forests' carbon stock. These will be achieved through activities such as forest restoration, forest protection, and

conservation which will increase the standing biomass. The ecosystem restoration business is a multi-faceted business with multiple products because it involves different types of businesses that may utilize the forest areas for ecotourism, non-timber forest products, and ecosystem services purposes. These multiple forms of businesses cover various activities of sustainably managing and protecting natural forests including restoring degraded forest areas. From 2007 to 2021, 16 PBPHs Ecosystem Restoration were granted, covering a total of 621,646.87 hectares in Riau, Jambi, South Sumatra, Bengkulu, West Kalimantan, Central Kalimantan and East Kalimantan provinces.

Forestry business licenses can contribute to the climate change mitigation through carbon market schemes, including Business Licenses for Utilization of Forest for Carbon Sequestration and/or Carbon Storage (PBPH Carbon), which have been awarded to some businesses. Carbon sequestration can be done through planting trees, maintenance of trees, enrichment planting, and improving stand growth productivity. Meanwhile, carbon storage can be done through longer cutting cycles or felling rotation, environmentally friendly felling (such as Reduced-Impact Logging), the extension of protection and conservation areas inside Ecosystem Restoration concessions, and the maintenance of High Conservation Value Forest (HCVF) areas.

PBPH Natural Forests and PBPH Plantation Forests are the main producers of logs in Indonesia. Logs are still the primary commodity of these upstream industries. However, the non-timber forest products and ecosystem services are now increasingly coming into focus. Log production from natural forests from 2017 to December 2021 was still below annual targets, while log production from Industrial Plantation Forests from 2018 to 2021 was higher than the annual targets.

The gap between targeted and actual log production is due to several problems in the field. Low log production with high production costs has lowered the profits of many natural forest concessions. This diminishing profitability is part of the reasons that 28.8 percent of natural forest concessionaires no longer conduct activity in their concessions. The government is evaluating the performance of natural forest timber concessions and encouraging their commitment to managing the Production Forests in sustainable ways.

The low productivity of natural forests has affected the performance of the forest concession business. Rehabilitation activities need to be encouraged to address this issue so that natural forests can continue to maintain life support systems. An Intensive Silviculture (*Silvikultur Intensif*/SILIN) technique is one of the ways to rehabilitate forests and improve natural forest productivity in concession areas. This technique may produce 200 m^3 per hectare of high-value natural forest timber species.

Meanwhile, 27 percent of PBPH Plantation Forests in Indonesia have no management activity in the field. This is because of social conflicts, weak financial performance, and the production capacity gap between PBPH Plantation Forests and downstream industries, including in infrastructure and accessibility. Social conflicts occurring in PBPH Plantation Forests are often related to communities inside or at the edges of the plantations. These conflicts are usually about communities' intention to utilize forest resources in the areas overlapping with the plantation forest areas. In order to resolve this problem, the Government has instructed concessionaires to:

1. conduct conflict mapping in the plantation forest area and develop appropriate conflict resolution plans;
2. initiate multiple streams of business, focusing not only on timber management; and
3. help facilitate access for affected communities to Social Forestry schemes, including Forestry Partnerships, Community Plantation Forests, Community Forests, Village Forests, and Customary Forests, to the extent that plantation forest concessionaries have the standing and capacity to do so, and to the extent that doing so would help mitigate conflicts.

In 2021, a ministerial regulation[15] on the management and utilization of protection and production forests was issued. This regulation provides opportunities for PBPH Plantation Forest concessionaires to optimize their concession areas not only for conventional timber plantations, but also to develop Non-Timber Forest Products (NTFP) including environmental services through agroforestry systems, construction of NTFP processing industries, and to strengthen of Social Forestry through a Forestry Partnership scheme. The Forestry Partnership scheme has been identified as a conflict resolution approach that can reduce the number and intensity of conflicts between forest concession holders and communities. As of July 2022, 1,133 units of social forestry using a Conservation Partnership scheme, and a Forestry Partnership Recognition and Protection (KULIN-KK) scheme, covering a total of 571,053.42 hectares were granted to local communities, involving 165,542 households in several provinces.

Production forest management is now more sustainable, more productive in some areas, and more inclusive of communities. An important emerging strategy is a multi-business approach that combines timber and non-timber forest products. Community involvement has increased timber production and community welfare through the implementation of community forest plantations (HTR) and NTFP. The shift in the paradigm was based on: a new set of business configurations for the management of production forest resources, with a more diverse set of forests-based businesses including food, renewable energy, ecotourism, agroforestry, non-timber forest products, and environmental services; an increase in the proportion of resources made available to communities; conflict resolution; and increased effectiveness of forest management. This new business configuration has now been adopted and become the basis for the "Production Forest Development Roadmap 2019-2045" (APHI, 2019).

[15] Environment and Forestry Ministerial Regulation No. 8 of 2021 on Management and Utilization of Protection and Production Forests

BOX 3.1. Box RIL-C - PHL

The Environment and Forestry Ministerial Regulation No 8 of 2021 was issued in order to reduce the impact of logging in terms of the volume of carbon emissions (Reduced Impact Logging-Carbon, RIL-C). The regulation applies to all production forest concessionaires. RIL-C is an intensive logging practice that involves the use of low impact techniques and equipment, with close monitoring to ensure the minimum possible damage to soil and remaining forest stands, and thus a minimum release of carbon. The implementation of RIL-C is expected to reduce emissions by up to 40 percent against the Business-as-Usual baseline for normal selective logging practices. As of 2022, 31 forest concessionaires have implemented RIL-C. In addition to reducing carbon emissions, RIL-C also has the potential to reduce harvesting production costs while increasing productivity.

Practices of RIL-C have positive impacts such as a double increase in log production compared to conventional logging, and a decrease in the use of harvesting equipment and fuel by 25-92 percent. Another positive impact of implementing RIL is the increase in the income of logging operators.

Successful RIL implementation is determined by the commitment of concessionaires, training/capacity of human resources in the field, internalization of the RIL concept to logging operators and forest managers in the field, the willingness of concessionaires to try and implement it continuously, regulatory support, mentoring, monitoring and evaluation, as well as research and development.

The regulation of Reduced-Impact Logging for Climate Change Mitigation is applied voluntarily for all production forest concessionaires. Protecting ecological functions of production forests will help achieve Indonesia's National Contribution (NDC) mitigation target, reducing emissions by at least 29 percent (17.2 percent from the forestry sector) by 2030. Adaptation measures are simultaneously focused on strengthening climate resilience including economic resilience, social and livelihoods resilience, and ecosystem and landscape-based climate resilience.

3.2. Management of Timber and Non-Timber Forest Products

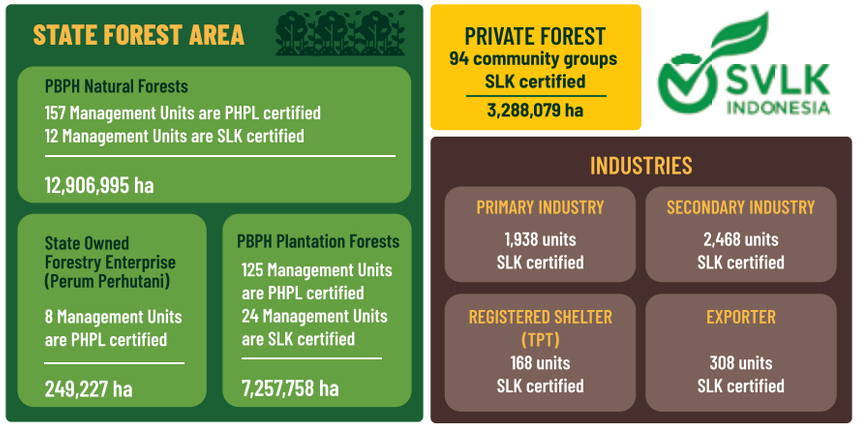
Certification of Sustainable Forest Management and Timber Legality

The establishment of the SVLK (Timber Legality Assurance System) was guided by three main principles-good governance, representativeness, and credibility. In the implementation of the system, the Government serves as the regulator, with a range of stakeholders involved in assessment and verification procedures, such as the National Accreditation Committee (KAN), business enterprises and their representative organizations, and independent monitors, including non-governmental organizations and academic institutions.

SVLK provides two forms of certification, Sustainable Production Forest Management Certification (S-PHPL) and Timber Legality Certification (SLK). In the case of S-PHPL, PBPH Natural Forest concessionaires have made significant advances in achieving certification of sustainable production forest management. In the case of the SLK, the focus is on the downstream sector (timber industries, registered log yards near timber mills known as TPT-KB, handicraft/home industries, and exporters), in terms of the legality of these business units, and of the timber they source as raw material for production, processing, and marketing. The upstream sector is also obliged to follow the SLK, including PBPH plantation forests, community-based forests, private forests, and permits for utilization of timber produced from non-forestry activities (PKKNK).

The implementation of SVLK has implications for improving forest governance in Indonesia, including in terms of improving the level of transparency and availability of public information, deregulation of licensing in the regions, applying enhanced management practices and achieving improved compliance. As of December 2021, 5,302 management units or business entities had obtained PHPL certificates or SLK certificates (Figure 3.1).

FIGURE 3.1. Progress of PHPL and SLK Certification as of December 2021



SOURCE: KLHK, 2022

In addition to forest product sustainability, SVLK increased forest product exports in 2021 at the value of USD 13.57 billion which was the greatest forest product export of Indonesia in the last five years (Figure 3.2). Micro, Small, and Medium Enterprises (MSMEs) have been required to participate in the SVLK since 2013. To enable their participation, MSMEs have been provided with facilitation by donor agencies, NGOs, and community associations (see Table 3.1). This facilitation involves not only the provision of financing for certification, but also institutional capacity building.

Indonesia was the first and is still the only country to have a fully EU FLEGT-compliant legality verification system. SVLK is a manifestation of the EU FLEGT system. The rapid development of SVLK is inseparable from the role of local governments in promoting application of the SVLK. A number of districts have issued district-level regulations related to the implementation of the system, including Jepara, Jombang, Klaten and Buleleng. The effectiveness of the system has also been recognized by the international community, as evidenced by the interest of a number of countries in studying or conducting comparative studies of the system, including China, Laos, Myanmar, Malaysia, Thailand, Cambodia, Vietnam, Ghana, and Japan.

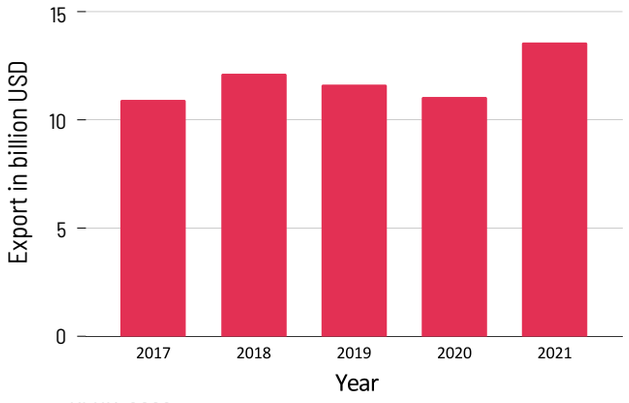
The Timber Legality Assurance System (SVLK) has been transformed and rebranded becoming Forest Legality and Sustainability Assurance System. The brand, launched at COP 26 UNFCCC in 2021, strengthened Indonesia's commitment to sustainability.

TABLE 3.1. Facilitation provided to MSMEs to implement SVLK (2015-2021)

ACTIVITY	2015	2016	2017	2018	2019	2020	2021
Certification	21 Private Forests and 18 MSME	13 MSME	2 MSME	120 MSME	353 MSME	0	73 MSME
Surveillance	22 Private Forests and 1 MSME	2 MSME	13 MSME	32 MSME	53 MSME	9 MSME	229 MSME

SOURCE: KLHK, 2022

FIGURE 3.2. Forest Product Export of Indonesia (2017–2021)



SOURCE: KLHK, 2022

Establishment and Management Plantation Forests

Inside existing plantation forest concession areas (PBPH Plantation Forests), there are still around 1.8 million hectares of unused land. In addition, some other parts of these concession areas are allocated for seasonal crops and community plantations. Both types of land can be optimized to support expansion of forest plantations. However, implementation is challenged by tenure-related conflicts and high social costs. Multi-forestry business[16] is proposed as a conflict resolution optimizing partnership schemes that enhances cooperation to develop fast-growing species and short-cycle crops to support the national food security program.

The expansion of forest plantations is aimed at meeting the demand for processing wood and reducing dependence on natural forests. A target of development of 11.227 million hectares of forest plantations by 2030 has been outlined in the NDC and the Long-Term Strategy for Low Carbon Scenario Compatible with Paris Agreement (LTS-LCCP). As of 2019, forest plantation concession areas in Indonesia reached 5.117 million hectares (See Table 3.2).

According to the APHI roadmap document, plantation forests under plantation forest concessions (PBPH plantation forests) in 2019 were 3,140 million hectares, while in 2020 it was 3,500 million hectares. The remaining quota is the difference between the target area and the actual area that has been developed.

Of the 5.12 million hectares of plantation forest cover, only 2.48 million hectares are located within PBPH-HT, while 1.82 million hectares are outside the PBPH-HT area, including the indicative Perhutani areas, indicative PIAPS areas, and Community Plantation Forests. An area of 0.82 million hectares is located in the APL areas, namely indicative private forests. To meet the Indonesia's FOLU Net Sink 2030 target, an additional 6.1 million hectares of forest plantations need to be established by 2030 or around 0.6 million hectares per year (See Table 3.2).

TABLE 3.2. Target of Forest Plantation Establishment as a Climate Mitigation Action under NDC-CM1 and LTS-LCCP Scenarios

Mitigation Action	Actual (x 1000 ha)	NDC Target (x 1000 ha)			Net Sink Target (x 1000 ha)		
	2019	2011-2024	2011-2030	Remaining quota[2]	2011-2024	2011-2030	Remaining quota
Forest plantation establishment	5.117[1]	9.307	11.227	6.110	9.307	11.227	6.110

Notes: [1]Based on satellite data, the area of forest plantations is 0.816 million hectares in non-forest area (APL) and 4.303 million hectares in forest area (forest species area covers 2.479 million hectares, and non-forest species area covers 1.824 million hectares).

SOURCE: Operational Plan of Indonesia FOLU Net Sink 2030

[16] The scheme of multi-forestry business has been legally regulated in the implementing regulations of the Job Creation Law, namely the Government Regulation No. 23 of 2021 and the Environment and Forestry Ministerial Regulation No. 8 of 2021

Woman Empowerment in Forestry Sector, Nursery Management

LOCATION
Riau

PHOTO BY
APHI's member, APP (2017)

Sustainable Forest Management

According to the policy of multi-forestry business, natural forest concession areas with primary forests can be managed using the Selective Cutting and Replanting System (TPTI), with the techniques of low impact logging for lower emission (RIL-C) and intensive silviculture (SILIN). Concessionaires are directed to carry out enhanced natural regeneration (ENR) in severely degraded areas, as part of the assessment of sustainable forest management certification (PHL). The single reduced impact logging technique is directed at primary forests inside natural forest concession areas (PBPH HA), while SILIN (Selective logging and gap planting; Selective Cutting and Line Planting) is prioritized in secondary forests. By 2021, SILIN was applied to 167,374 hectares of forest areas, while RIL-C application covered 61,582 hectares.

Enhanced natural regeneration is one of the climate mitigation actions to accelerate natural forest regeneration and increase carbon sequestration in order to achieve the NDC and Net Sink 2030 target. Under the Net Sink 2030 scenario, carbon sequestration of secondary forests in a 0.313 million hectare concession area applying ENR techniques can reach 2.5 tC/ha/year.

Forest degradation threats exist within 3.3 million hectares in natural forests outside concession areas, but inside production forest management units (KPHP) or protection forest management units (KPHL), with a location priority index (IPL) of 5-9 (moderate

to extreme high threat level). Twenty two percent of which are in high priority areas (IPL 7-9) and 78 percent are in moderate-to-high priority areas; thus, they are prioritized for forest ecosystem restoration permit areas.

Increasing carbon sequestration capacity of secondary forests is also one of the strategies to achieve the net sink target. When almost all available land has been optimized or there is no land availability, carbon sequestration can only be increased through the expansion of secondary forests. Therefore, the sustainable management of 3.10 million hectares of secondary forests is projected to support the achievement of the Net Sink 2030 target. The sustainable forest management approaches applied to 2.2 million hectares of secondary forests will contribute to the LTS-LCCP target.

The emissions reduction target through sustainable forest management activities, as stated in the NDC, is in line with the Environment and Forestry Ministerial Regulation No. 8 of 2021 on Forest Management and Forest Utilization in Protection and Production Forests. Sustainable forest management to reduce emissions is carried out through the application of RIL and ENR Techniques that can minimize environmental impacts on forest stands and soils.

Furthermore, the Government launched forest Product Administration Information System (SIPUHH) in January 2016, which was useful to reduce bureaucratic costs in the forestry business sector, and to make companies more efficient, better structured, and more compliant with regulations. This system has been able to simplify bureaucratic procedures, requiring less government official work so that the process can be faster with accurate information. The SIPUHH is the main facility of public services in the administration of forest products, operating 24 hours a day and providing services to more than 3,000 business actors who produce timber, manage distribution hubs, and produce primary forest products. SIPUHH can be accessed at http://sipuhh.menlhk.go.id.

3.3. Utilization of Forest Environmental Services

Nature-based Tourism and Ecotourism

As an attempt to increase the tourist's visitation number to conservation areas, the Ministry of Environment and Forestry has opened opportunities for the private sector and local communities to develop ecotourism business in conservation areas. Tourist visitation to conservation areas will significantly contribute to Non-Tax State Revenue (PNBP), which is obtained from admission tickets for persons and vehicles, tourism activities, guest houses, commercial film snapshots, and research activities carried out within conservation areas. The conservation areas that can be used for ecotourism include national parks, nature tourism parks, hunting parks, wildlife reserves and strict nature reserves. In 2020, the number of tourist visits to conservation areas was 3,304,268 tourists, consisting of 3,257,581 domestic tourists and 46,687 foreign tourists. In 2021 the number of tourist visits to conservation areas decreased to 2,947,971 tourists due to pandemic situation, consisting of 2,937,960 domestic tourists and 10,011 foreign tourists.

Among many bioprospecting activities in the country, some are found in conservation areas. Microbes for anti-frost were found in Gunung Ciremai National Park. *Candidaspongia sp.* was found in Teluk Kupang Marine Recreation Park and has potential for anti-cancer drug. *Taxus sumatranus*, which has potential uses for chemotherapy, was found in Kerinci Seblat National Park, together with several other plants with potential for medical uses (Wiratno, 2019). Meanwhile, a recent study in Gunung Merapi National Park found that no fewer than 48 understory species have the potential to be developed as free radical scavengers. Of the 48 species, six have the potential as antioxidants, namely *Clidemia hirta, Melastoma candidum, Phyllantus urinaria, Polygonum chinense, Emilia sonchifolia*, and *Shuteria vestita*. Phytochemical analysis of these species found that all of them contain saponin, flavonoid, and terpenoid, while alkaloid is found in *Clidemia hirta* and *Melastoma candidum* (Nurwijayanto, 2020).

The business of nature-based tourism in conservation areas can be carried out either by conservation area managers or other partners who have proposed to develop the business in Wildlife Sanctuaries, National Parks, Natural Tourism Parks, and Grand Forest Parks, under specific permit mechanisms. There are two types of ecotourism businesses in conservation areas which consist: 1) Development and the Use of Nature-based Tourism Facilities (PB PSWA), and 2) Development of Nature-based Tourism Services (PB PJWA). PB-PSWA can only be carried out in Utilization Zones of all types of conservation areas (National Parks, Natural Tourism Parks, and Grand Forest Parks). PB PSWA consists of the development of water-based and adventure tourism facilities, accommodation, and transportation.

Rhinoceros Hornbill (*Buceros rhinoceros*)

LOCATION
Sebangau National Park, Central Kalimantan

PHOTO BY
Ismin Ikhwanur (2021)

In 2022 to date, 85 PB PSWA permits were granted and were spread throughout several conservation areas. The permits have positive impacts on tourism development, the socio-economics of local communities, and this country's economic development. They also provide job opportunities and contribute to reviving tourism activities-supporting businesses around forest areas. Meanwhile, PB PJWA is allowed to be carried out within all zones of all types of conservation areas, except for a core zone. A core zone is pristine areas and has not been disturbed by humans that is absolutely protected and functions to protect the original and unique biodiversity within a conservation area. By the end of 2021, 647 PB PJWA permits had been granted, involving 4,675 nature-based tourism workers.

In order to continue developing nature-based tourism, the Government has carried out several advertising and marketing campaign using the Android and iOS App called "Indonesian Nature Adventure Tourism', and several books such as "Wandering the Indonesian Nature", "Natural Tourism of Indonesia 54 National Parks", and virtual tours of national parks/natural tourism parks.

Ecosystem Services

Conservation of natural resources and ecosystems can significantly contribute to the global climate change agenda in terms of mitigation and adaptation. Mitigation measures that have been carried out in conservation areas include restoration of degraded ecosystems and expansion of conservation activities outside conservation areas such as the establishment of High Conservation Value Area in non-forest areas. Adaptation measures have also been carried out, especially by improving the welfare of communities living around conservation areas through conservation partnership schemes.

Despite limited methods, estimations of carbon stocks in conservation forests have started. Carbon stock in conservation areas is often estimated based on permanent sample plots established in each typology of an ecosystem in order to measure the change in carbon stock over a certain period. In addition, conservation forests provide a number of non-timber forest products and environmental services including nature-based tourism services which become a leading commodity of conservation areas. Other products and services include wildlife, carbon, water, and geothermal, the use of them particularly in national parks has been legally regulated.

A part from tourism, conservation areas have ecosystem services that have value that is seldom recognized. These ecosystem services include water ecosystem services (water for drinking, household activities, and hydropower) and geothermal power.

The potential of geothermal electricity generation in conservation areas is up to 6,169.63 MW (about 25.96 percent of the total geothermal resources in Indonesia). Within conservation areas, there are 47 geothermal working areas, or preliminary survey and exploration assignment areas which, spread across 12 national parks, 21 natural tourism parks, seven grand forest parks, six wildlife reserves, and 30 natural reserves.

As of 2022 four geothermal business permit holders operated Exploitation and Utilization Phases in conservation areas with a total generation capacity of 883 MW. The permit was operated in the (1) Utilization Zone of Gunung Halimun Salak National Park covering an area of 228.69 hectares, (2) Utilization Zone of Gunung Halimun Salak National Park covering an a rea of 13,725 hectares, (3) Utilization B lock of K amojang Crater TWA with an area of 56.85 h ectares, and (4) Utilization Blo c k TWA G unung Papandayan covering an area of 26 hectares. The operation created jobs for around 2,089 local workers, while the electricity generated was used to supply Java-Madura and Bali network areas.

Another potential contribution of conservation areas to the national economy is from bioprospecting. Bioprospecting is an attempt at achieving nature-based solutions to mankind's problems, and serves as a potential community-based economic mover. As a megadiverse country, many of Indonesia's biodiversity resources have not been optimally utilized, or are underutilized.

CHAPTER 4

The Role of Communities in Sustainable Forest Management

4.1. Community Involvement in Forest Management

Protection Forest Management and Conservation Partnership

One of the Government's measures addressing forest management is social forestry programs. Social forestry programs are focused in the areas that are prone to deforestation and where communities are forest dependent as designated in the Indicative Map for Social Forestry Areas (PIAPS). The programs are carried out through rehabilitation activities applying several techniques, such as agroforestry, continuous assistance and institutional development of social forestry groups.

The Government Regulation on Forestry Management[17] states that tenurial conflicts could be addressed using social forestry. Through relevant social forestry activities, conflicts among communities, between the communities and concession holders, and between communities and forest managers can be resolved. By the end of March 2022, 618 complaints had been received, of which 92 files were returned as incomplete. Of the accepted cases, 266 were in the assessment stage, 195 were in mediation, and 65 were closed with an agreement to end the conflict.

The government regulation also states that forest utilization through social forestry schemes is carried out to realize forest sustainability, community welfare, and environmental and socio-cultural balance. Thus, it is necessary to provide approval, recognition, and capacity building to the community. Social forestry provides communities with legal access to production and protection forests for such as planting timber species and using non-timber forest products and environmental services.

After the issuance of the Director General of KSDAE Regulation in 2018[18], activities for using conservation areas were regulated in more detail, taking into account the sustainability of the conservation areas, the biodiversity potential, as well as community welfare. There are two conservation partnership schemes: conservation partnerships for community empowerment, and conservation partnerships for ecosystem restoration. Conservation partnerships for community empowerment provide local communities with access to conservation areas in the form of collecting Non-Timber Forest Products (NTFPs), utilizing traditional aquatic resources, traditional cultivation, and hunting for unprotected species. Those activities are carried out in traditional zones/blocks. Meanwhile, conservation partnerships for ecosystem restoration are partnerships with community groups in rehabilitation areas/blocks that aim to restore conservation areas that have been degraded due to unsustainable uses, but then the community groups have intention to restore the area.

At the site level, the protection forest management unit helps communities use protection areas to improve their welfare and engage communities in forest protection activities. The conservation partnership policy provides a legal umbrella for the activities of using conservation areas carried out by local communities. It is a strategy to respond to current situation in conservation areas,

Kalang River under Shady Trees

LOCATION
Bukit Baka Bukit Raya National Park, Central Kalimantan

PHOTO BY
Aji Badrunsyah (2020)

[17] Government Regulation No. 23/2021 on Forestry Management

[18] The Regulation of Directorate General of Natural Resource and Ecosystem Conservation (KSDAE) No. 6 of 2018 on Technical Guidance for Conservation Partnership on KSA and KPA

especially increasing social pressures and tenure conflicts. This is inseparable from the high interaction and community dependence on the conservation areas as source of their livelihood.

Conservation partnerships are collaborations between the head of a forest management unit and local communities living around conservation areas in using the potential of the areas based on the principles of mutual respect, trust, and mutual benefit. The conservation partnership is part of the community empowerment program in the conservation area management, and aims to realize the community's self-sufficiency and welfare towards good conservation forest governance and enhanced biodiversity preservation.

The communities around conservation areas usually have been using conservation areas for generations, sometimes prior to the designation as a conservation area. Currently, there are 19,410 villages located around forests, with a population of about 48.8 million people whose lives are dependent on forests. An analysis carried out by the Directorate of Conservation Areas and the Directorate of Patterning and Information of Nature Conservation using the shape file of the Indonesian Village Administration - Geospatial Information Agency in 2021 showed 7,043 villages existed near conservation areas.

Prior to the issuance of the Regulation of the Director General of KSDAE, activities for utilizing conservation areas by local communities were legalized through a cooperation scheme with community groups in order to strengthen functions of the conservation areas. Furthermore, the provincial and district/city governments are obliged to empower local communities living around conservation areas. It is the mandate of the Government Regulation issued in 2011[19] amended in 2015[20] on the Management of KSA and KPA, and taking into account the Environment and Forestry Ministerial Regulation[21] on Criteria for Zone and Block Management of KSA and KPA, the Environment and Forestry Ministerial Regulation[22] on Community Empowerment around KSA and KPA, and the Environment and Forestry Ministerial Regulation in 2014[23] amended in 2017[24] on Procedures for Implementing Cooperation in KSA and KPA.

Some good examples of community-based conservation area management can be found in Betung Kerihun Danau Sentarum National Park in the form of utilization of NTFPs such as honey, pine resin, resin, dragon's blood, medicinal plants, rattan, candlenut, mushrooms, and other forest fruits. Collection of non-timber forest products makes up the largest proportion of partnerships by providing local communities with access to conservation areas around Betung Kerihun Danau Sentarum National Park. Conservation partnerships are also carried out in Gunung Palung National Park in West Kalimantan, Mount Halimun Salak and Mount Gede Pangrango National Parks in West Java, Bukit Barisan Selatan National Park in South Sumatra, Ujung Kulon National Park in Banten, Mount Merbabu National Park in Central Java, Manupeu Tanadaru and Laiwangi Wanggameti National Parks in East Nusa Tenggara, and Bukit Baka Bukit Raya National Park in Central Kalimantan and several other conservation areas.

Since 2018, conservation partnerships covering an area of 232,975.04 hectares have been signed. They involved 508 community groups or a total of 17,823 people in 375 villages in 76 conservation areas under 58 technical management units (UPT) of the Ministry of Environment and Forestry. The figure of conservation partnerships in the context of community empowerment and ecosystem restoration are presented in Tables 4.1, 4.2, and 4.3.

[19] Government Regulation No. 28 of 2011

[20] Government Regulation No. 108 of 2015

[21] Environment and Forestry Ministerial Regulation No. P.76 of 2016

[22] Environment and Forestry Ministerial Regulation No. P.43 of 2017

[23] Environment and Forestry Ministerial Regulation No. P.85 of 2014

[24] Environment and Forestry Ministerial Regulation No. P.44 of 2017

TABLE 4.1. Community Empowerment-Based Conservation Partnership (unit)

Year	Area (ha)	Partner	Member	Village	KK	UPT
2018	9,297.93	31	1,133	21	9	9
2019	95,228.95	126	4,243	112	34	32
2020	63,396.62	79	2,304	65	28	27
2021	47,826.21	110	4,164	111	30	25
2022*	6,324.67	17	371	12	5	5
Grand Total	**222,074.37**	**363**	**12,215**	**308**	**62**	**51**

SOURCE: KLHK, 2022

TABLE 4.2. Ecosystem Recovery-Based Conservation Partnership (unit)

Year	Area (ha)	Partner	Member	Village	KK	UPT
2018	700.00	2	84	2	2	2
2018	1,533.75	14	499	4	2	2
2019	3,131.03	37	1,480	17	10	8
2020	2,746.34	38	1,465	26	10	10
2021	3,459.55	55	2,143	27	11	10
2022*	30.00	1	21	1	1	1
Grand Total	**11,600.67**	**147**	**5,692**	**70**	**22**	**18**

SOURCE: KLHK, 2022

TABLE 4.3. Total Conservation Partnership for Community Empowerment and Ecosystem Recovery (unit)

Year	Area (ha)	Partner	Member	Village	KK	UPT
2018	10,831.68	45	1,632	25	11	11
2019	98,359.98	163	5,723	129	43	38
2020	66,142.96	117	3,769	90	36	33
2021	51,285.76	165	6,307	138	39	32
2022*	6,354.67	18	392	13	6	6
Grand Total	**232,975.04**	**508**	**17,823**	**375**	**76**	**58**

SOURCE: KLHK, 2022

NOTES:
KK: Conservation Area, UPT: Technical Management Unit.

*as of June 2022

Community Partnership Program for Grazing and Fire Wood

LOCATION
Kalipasang, Gunung Merbabu National Park
Central Java

PHOTO BY
Ferry Harsi Purniawati (2022)

Community-based forest conservation management can be carried out by developing community-based ecotourism activities, such as those conducted in Tangkahan, Gunung Leuser National Park; Bukit Seribu Bintang, Gunung Ciremai National Park; Gunung Tunak Natural Recreation Park; and Sebangau National Park. Currently, the main concern for conservation area management is National Parks, where the National Park Authority manages 59.79 percent of conservation areas as technical management units under the Ministry of Environment and Forestry. Meanwhile, the management of non-national park conservation areas is managed by the Natural Resources Conservation Office at the provincial level and the regional technical management unit of Grand Forest Park (Tahura) at the provincial or district level.

4.2. Management of *Adat* Forests by Customary Law Communities

Forest areas overlapping the areas claimed by communities using customary law may apply to use *adat* forest social forestry scheme, which recognizes the customary management of forest by *adat* communities for generation. Adat forests must be managed according to their designation, taking into account local wisdom, local knowledge, and adat law. If it initially functioned as a protection forest, then the communities are only allowed to collect non-timber forest products such as honey, rattan, wood resin, and others, and not to harvest wood. If the area functions as a conservation forest, only activities that do not interfere with the function of the conservation forest are allowed. However, if it initially functioned as a production forest, *adat* communities are permitted to cut trees after developing a long-term management plan and

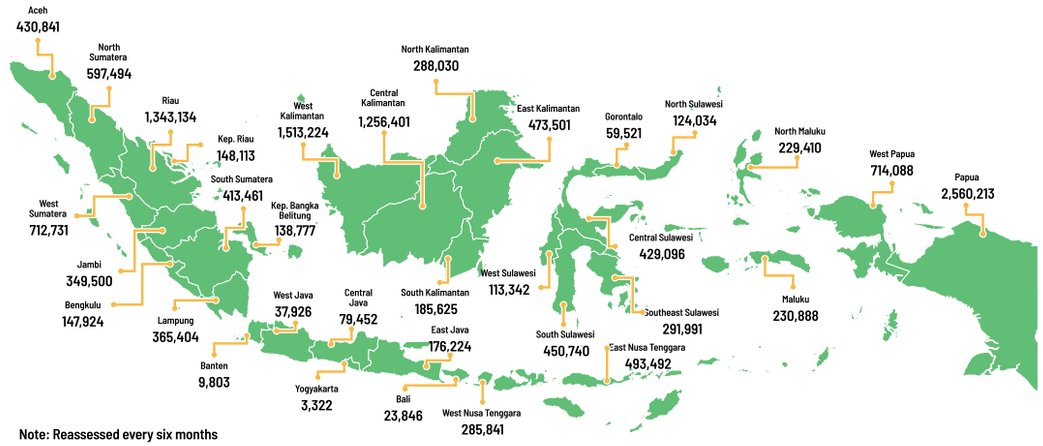
an annual work plan. Adat forest management is adjusted to local wisdom and coordinated with the relevant *adat* stakeholders.

President Joko Widodo granted nine *adat* forests covering an area of more than 13,000 hectares at the State Palace on 30 December 2016. Since then, progress on adat forest designation has continued. As a result, the extent of *adat* forests by May 2022 increased to 76,137 hectares (89 units), managed by 44,798 head of families in 15 provinces and 34 districts, namely North Sumatra, West Sumatra, South Sumatra, Riau, Jambi, South Sulawesi, Central Sulawesi, West Java, Central Java, Bali, Banten, West Kalimantan, Central Kalimantan, East Kalimantan, and Maluku. Based on the indicative map of the *adat* forest, the area allocated for *adat* forest designation is 1,152,600 hectares.

By July 2022 the area of social forestry, which includes *Adat* Forests has reached 5,019,111.09 hectares consisting of 7,644 environment and forestry ministerial decrees granted to 1,106,221 families spread across 33 provinces, 367 districts/cities, 2,015 sub-districts, and 3,800 villages in Indonesia.

FIGURE 4.1. Indicative Map and Social Forestry Area (PIAPS) Revision VII

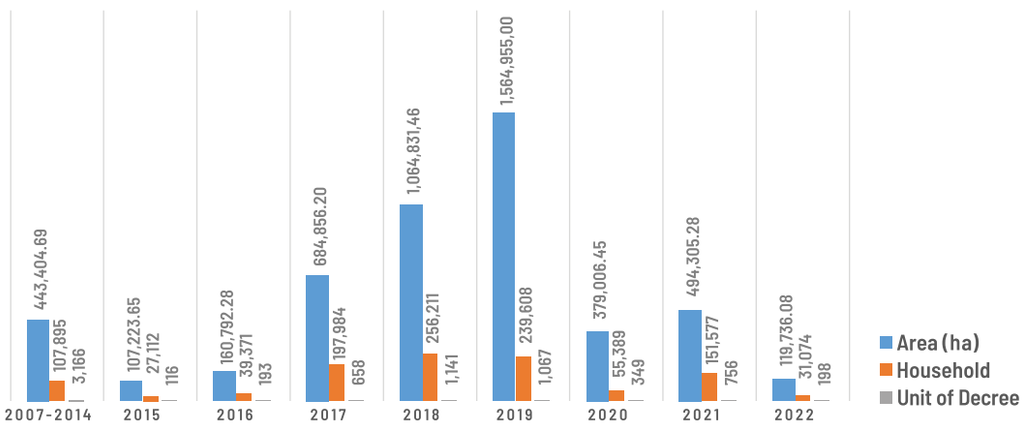
Area in hectares



Note: Reassessed every six months

Environment and Forestry Ministerial Decree No. SK. 8878/Menlhk-PKTL/REN/PLA.0/12/2021

FIGURE 4.2. Approval for Social Forestry and Community Access by July 2022



SOURCE: KLHK, 2022

4.3. Community-Based Climate Change Mitigation and Adaptation Actions

Climate change is a global challenge and has the potential to affect people's lives around the world. Climate change is a major problem recognized at the local, national, regional, and international levels that can severely impact certain countries, including those in the tropical zone such as Indonesia. Indonesia is a mega biodiverse country. However, natural resources and the environment face disturbances due to human activities (anthropogenic factors), which contribute to global warming.

Indonesia also faces serious challenges due to air pollution, as well as exploitation of forests and mineral resources, which has threatened access to water. In addition, the situation has worsened due to forest fires (especially during El Nino) and landslides and floods (during La Nina), contributing to GHG emissions. As an archipelagic country, Indonesia has many large and small islands with low water levels. The situation has made Indonesia highly vulnerable to climate change due to rising sea levels, increased dry season duration, and extreme weather events resulting in floods, landslides, and other disasters.

Indonesia identified and adopted adaptation measures in the first NDC and also included them in the Updated NDC. The reduction in forest area and land affected by fires has encouraged an increase in the number of areas implementing adaptation measures. Currently, key adaptation programs in the forestry sector have been identified, including:

1. Economic resilience through integrated watershed management, reduction of deforestation and forest degradation, land conservation, and utilization of degraded land for renewable energy;
2. Social security and livelihoods through capacity building and community participation in local planning processes to secure access to natural resources, identification of highly vulnerable areas in local spatial planning and land use planning, and conflict prevention and resolution; and
3. Ecosystem and landscape resilience through social forestry programs, coastal area protection, and ecosystem conservation and restoration.

Climate change mitigation and adaptation activities need active participation of communities. The Ministry of Environment and Forestry (MoEF) launched Climate Village Programs (ProKlim) on 1 December 2016 to accommodate community participation. As of 2021, 3,270 Proklim villages were registered with the National Registry System (SRN). The Government is making efforts to increase the coverage of Proklim by synergizing various similar programs/initiatives both within the scope of the MoEF (social forestry, conservation villages, Fire Care Communities (MPA), etc.), as well as outside the MoEF (including the climate-healthy villages program under the Ministry of Health, disaster-resilient villages under BNPB, and villages resilient coast under the Ministry of Marine Affairs and Fisheries). Increasing resilience to climate change is implemented with the following strategies:

1. Adaptation to climate change through the preparation of data and information on vulnerabilities and risks of climate change and recommendations for climate change adaptation strategies; development of climate-resilient villages and expanding the coverage of *Proklim*; development of an integrated SIDIK with climate and vulnerability data of the priority sectors; and monitoring, reporting and verification over the National Action Plan for Climate Change Adaptation (RAN-API) as well as cross-sector integrated programs;
2. Climate change mitigation to realize the NDC by preparing mitigation policy instruments amendment; and determination of policy control to reduce the use of ozone-depleting substances against the 2019 baseline;
3. Implementation of GHG inventory and monitoring, reporting, verification, and registry of mitigation actions at national and sub-national levels. This include providing data and information on GHG emissions profiles (level, status, and trend) for five sectors; verifying and registering mitigation actions carried out by five sectors; reporting national GHG emissions to the international community through annual reports of GHG and MPV inventories; developing a bottom-up approach to the implementation and reporting of GHG inventories carried out by provincial, district and city governments;
4. More effective forest and land fire control through efforts to prevent and control forest and land fires, including restoration of the natural function of peatlands that have wet, watery and swampy characteristics; changes in community behavior through integrated counseling for better community's economy; integrated patrols for forest and land fire prevention particularly in fire-prone villages; increasing the role of fire brigades (*Manggala Agni*) and Fire-Care Communities (MPA) as a firefighting team in a Forest Concession areas; facilitation of infrastructures and other resources provided to all villages in fires-prone provinces; establishment of a fire prevention and suppression task force under one command; development of Vulnerability Index Data Information System (SIDIK) integrated with climate vulnerability data of the priority sectors; monitoring, reporting and verification over the Nationally Determined Contributions (NDCs) adaptation, National Action Plan for Climate Change Adaptation (RAN API) as well as the cross-sector integrated programs for climate change adaptation; strengthening the detection and early warning system in order to provide fast response to fire incidents; early operation of weather modification technology; and increasing speed in ground and air firefighting operation;
5. Preparation of a policy framework to mobilize resources needed to address climate change and support climate change-related international negotiation forums;
6. Capacity building of local community through enhancing their understanding, knowledge, and science related to climate change, including information on low carbon technology and the importance of low-carbon development in addressing climate change; and
7. Identification and development in land use and agricultural practices, such as application of minimum tillage in land management prior to planting of annual crops, as well as plantation of sorghum for diversification of rice as food resilience.

CHAPTER 5

Restoration and Rehabilitation of Watersheds and Forest Ecosystems

A Peatland Area Managed by Remai Gemilang Forest Farmer Group

LOCATION
Padang Kamal Village, Meranti Islands District, Riau

PHOTO BY
Sebastian Pandu and Achmad Pachlevy (2021)

5.1. Peatland Ecosystem Management

Peatland ecosystems have unique characteristics, including the enormous capacity to hold water, and serve as a hydrological buffer zone for the surrounding area. They store high levels of carbon, and absorb GHGs from the atmosphere. Peatlands are highly vulnerable to damage if not managed properly, in the form of subsidence, or fire if peat forest is cleared and drained (peat drainage) through canal construction (peat canalization). The Indonesian Peat Hydrological Units *(KHG)* cover an area of 24.7 million hectares, of which 9.6 million hectares are located in Sumatra; 8.4 million hectares in Kalimantan; 6.6 million hectares in Papua; and 0.06 million hectares in Sulawesi. Although a number of regulations have been issued since 1990, peat drainage is still frequently used for agricultural land preparation, causing the peat to dry out, increasing the potential for fires that contribute to carbon emissions.

Protection of peatlands in Indonesia began with the issuance of the Presidential Decree on the Management of Protected Areas in 1990, which mandated the protection of peat areas featuring peat soils having a depth of three meters or more. The depth of three meters is still used as a neutral, unambiguous, and measurable standard, and in theory the government can determine which peat areas should be protected. Compliance with the 1990 Presidential Decree and subsequent regulations has been a challenge. Industrial plantation forests and oil palm continue to exist and be planted on peat soils with a depth of three meters or more. Many agricultural and plantation activities continue to employ canal construction for transportation and draining peat soils so that they can be planted with dry land crops, inevitably having potential adverse impacts to the environment.

The Government issued a regulation on Peatland Ecosystem Protection and Management in 2014[25] and amended in 2016[26], followed by five implementing environment and forestry ministerial regulations[27]. Further, the Environment and Forestry Ministerial Regulation[28] on Government Facilitation on Industrial Plantation Forests calls for the protection and management of peatland ecosystems. Managers of underperforming Industrial Plantation Forests located in peatland ecosystems risk having their permits revoked, or adjustments made to protect the protection function of the peatland ecosystem.

The stipulation of peatland-related regulations provides authority and power in the implementation of the protection and management of peatland ecosystems by focusing on the regulation, characteristics, and criteria for peat damage, as well as peatland ecosystem management based on their corresponding hydrological unit. Furthermore, there is a sharpening of aspects of preventing damage and restoring the function of peatland ecosystems, which are

[25] Government Regulation No. 71 of 2014

[26] Government Regulation No. 57 of 2016

[27] (1) Environment and Forestry Ministerial Regulation No. 14/2017 on Procedures for Inventorying and Determination of Peat Ecosystem Functions; (2) Environment and Forestry Ministerial Regulation No. 15/2017 on Procedures for Measuring Groundwater Levels at Peat Ecosystem Compliance Points; (3) Environment and Forestry Ministerial regulation No. 16/2017 on Technical Guidelines for Restoring Peat Ecosystem Functions; (4) Environment and Forestry Ministerial Regulation No. P.10/2019 on Determination, Determination and Management of Peat Dome Peaks Based on Peat Hydrological Units; and (5) Environment and Forestry Ministerial Regulation No. 60/2019 on Procedures for Preparation, Determination, and Amendment of Peatland Ecosystem Protection and Management Plans

[28] Environment and Forestry Ministerial Regulation No. 40/2017

regulated in more detail. The regulations also regulate the standard criteria for damage to the peatland ecosystem as a measure of the boundary of the peatland ecosystem that can preserve its function.

Efforts to protect peatland ecosystems through the designation of the permanent moratorium status of the Indonesian primary forests and peatlands, and through law enforcement have been successful. One of the peatland protection efforts involving grassroots communities is the "Peatland Village Awareness" program, an integrated peatland management model.

To further strengthen the protection of peatland ecosystems, Indonesia is making efforts to restore more than two million hectares of peatlands in seven provinces, which are Riau, Jambi, South Sumatra, West Kalimantan, Central Kalimantan, South Kalimantan, and Papua. Since 2016, this work has been coordinated by the Peatland Restoration Agency, which has become the Peatland and Mangrove Restoration Agency (BRGM). The Government has adopted new policies on peatland governance and management, including (1) taking more comprehensive measures to prevent forest and land fires; (2) suspending the issuance of new permits for the use of protected peat; (3) prohibition of further land clearing on protected peatlands; (4) reviewing existing forest/plantation permits and rearranging the existence of concessions by taking into account the existence of peatlands and their hydrological functions; (5) implementing a strict monitoring system on peatland burned in 2015; and (6) requesting industrial plantation forest managers to restore peatlands by closing canals to maintain a minimum water level of 0.4 meters.

Peatland governance in Indonesia has just passed a new milestone, with the issuance the Environment and Forestry Ministerial Decree[29] on the National Peatland Ecosystem Protection and Management Plan. This decree provides details on strategic plans for the use of peatland ecosystems, controlling degradation (prevention, mitigation, and restoration), maintenance (reserve and conservation areas), and climate change mitigation and adaptation in peatland ecosystems. The National Peatland Ecosystem Protection and Management Plan (NPEPMP) has become a reference in the preparation of development plans, such as long/medium term development plans, spatial plans, and forestry plans. This protection and management plan was developed in accordance with other sectoral strategic plans, including those developed by provincial and district/city governments, as well as stakeholders. Land managers whose areas are located on peatlands are required to prepare these documents for their respective management areas that are in line with the national level plan.

[29] Environment and Forestry Ministerial Decree No. 246 of 2020

5.2. Peatland Ecosystem Restoration

Indonesia has a strong commitment to the protection and management of peatland ecosystems. The restoration of the hydrological function of the peatland ecosystem is carried out in concession areas as well as in non-concession areas by involving communities, and encouraging the private sector to carry out restoration in their concession areas. The basic principles used in the restoration of peatland ecosystems are improving water management by building rewetting infrastructure (rewetting), rehabilitating vegetation (revegetation), and improving people's social, cultural, and economic wellbeing and livelihoods (revitalization). Peatland restoration interventions through water management maintain the stability of the water regulation in the peatland ecosystem so that it remains wet and can support various uses.

Indonesia has 24.7 million hectares of tropical peatland ecosystems. In 2019, the area of peatland in Indonesia was about 13.43 million hectares (BBSDLP, 2019), 1.5 million hectares smaller than in 2011 which was 14.95 million hectares (BBSDLP, 2011). The difference in peatland area in Indonesia is partly due to the latest peatland mapping using a semi-detailed scale of 1:50,000 compared to the previous 1:250,000. Peatlands spread over four) islands– Sumatra (5.85 million hectares), Kalimantan (4.54 million hectares), Papua (3.01 million hectares), and Sulawesi (0.024 million hectares).

Peatland restoration plays an important role in supporting the emissions reduction target from the forestry and other land use (FOLU) sector by 2030. With an area of 13.9 million hectares, peatlands have the high potential for carbon storage. The potential for carbon storage on peatlands in Indonesia reaches from 13.6 to 55 Gigatons (Jaenicke et al., 2008, Warren et al., 2017). The emissions mitigation action in peatland restoration is directed at keeping peatlands wet so as to avoid organic matter decomposition and peatland fires by rewetting and planting peatland-adaptive commodities.

The obligation of peatland restoration in concession areas is imposed on all concessionaires with Business Permit for the Utilization of Timber Forest Products and oil palm plantations. Peatland restoration activities are carried out based on the recovery plan document set by the Director General of Environmental Pollution and Degradation Control, the Ministry of Environment and Forestry. Recovery is carried out by conducting hydrological restoration through the construction of canal blocking, rainfall monitoring stations, manual Groundwater Level (GWL) monitoring wells, and automatic GWL monitoring devices. Vegetation restoration is carried out by carrying out rehabilitation of vegetation and natural succession. Companies are required to periodically measure and report water level points as well as water depth measurements set by the Ministry of Environment and Forestry to ensure that groundwater is not more than 0.4 meters below ground level. Companies are also required to report on the implementation of recovery periodically and submit monitoring data on groundwater levels and rainfall monitoring data. Data on the progress of peatland ecosystem restoration in concession areas are presented in Table 5.1.

The restoration of peatland ecosystems in concession areas continues to increase and as of December 2021 had reached 3.66 million hectares in 72 industrial forest plantations and 248 oil palm plantations. In these peatland restoration areas, the peat groundwater level has been monitored through 10,450 units of groundwater level monitoring equipment (see Table 5.1) and managed through the Peat Ground Water Level Information System (SiMATAG-0.4m).

TABLE 5.1. Achievements of Peatland Restoration in Concession Areas as of 2021

Data	Industrial forest	Oil palm plantation	Total
Number of companies	72	248	320
Restored area (ha)	2,268,199.70	1,398,485.49	3,666,685.18
TMAT compliance point (unit)	5,086	5,364	10,450
Rainfall station (unit)	269	599	868
Canal blocking construction (unit)	8081	22,597	30,678
Vegetation rehabilitation (ha)	5,943.67	-	5,943.67

SOURCE: KLHK, 2022a

Community involvement is very important to implement peatland conservation and restoration at the site level. Restoration of the Peatland ecosystem in non-concession areas is carried out through the Peatland Stewardship Village Program, involving the community in efforts to protect and manage peatland ecosystems. In this program, the community is involved in restoring the peatland ecosystem and changing attitudes and behaviors that are more responsible to the sustainable peatland ecosystem management, particularly peatland fire prevention. Restoration of peatland ecosystems in non-concession areas from 2016 to December 2021 reached 208 villages and covered 46,297 hectares.

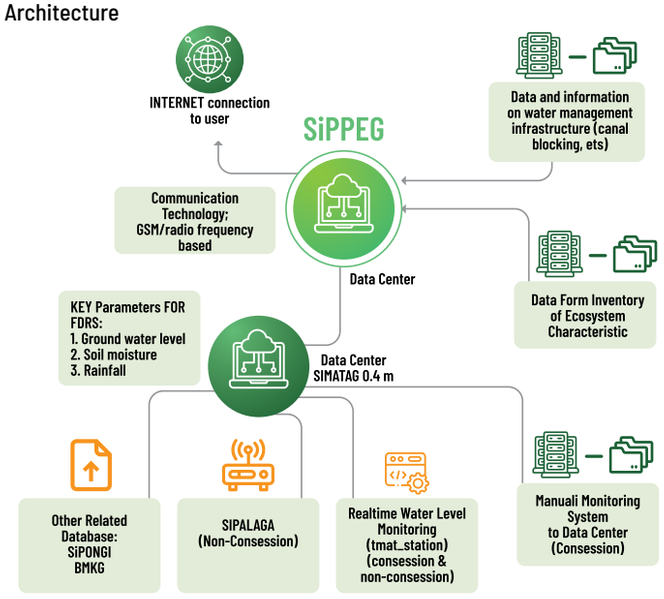
Activities for protecting and managing peatland ecosystems at the community level are accompanied by field facilitators. The field facilitator and the community formed a Peatland Ecosystem Protection and Management Working Team at the village level and compiled a participatory Community Work Plan document for the restoration and protection of the peatland ecosystem.

Peatland Ecosystem Protection and Management Information System

The Ministry of Environment and Forestry is currently developing the Peatland Ecosystem Protection and Management Information System (SiPPEG). This system was developed from several existing sub-systems, including SiMATAG-0.4m, SIPALAGA (water level monitoring data for community areas, provided by BRGM), and Canal Blocking Infrastructure.

SiPPEG will provide the latest information on water level monitoring data - SiMATAG-0.4m upper layer, water balance, fire early warning system or fire danger rating system (FDRS) to prevent potential peatland fires, reduce GHG emissions, prepare RPPEG, measure environmental performance rating for permit holders (PROPER), and others. SiPPEG will be connected to other related systems, including SIPONGI, SIPALAGA, Rainfall data system from BMKG, and integrated with satellite imagery. SiPPEG development involved the Ministry of Environment and Forestry as the operator working together with stakeholders, such as

FIGURE 5.1. SiPPEG Architecture



local governments, BMKG, concession holders (the private sector), and communities.

Figure 5.1 shows a complex system and input entities that stream data into the SIPPEG database sourced from existing applications such as SIPONGI, SIMATAG, SIPALAGA, manual data on groundwater level monitoring from companies and real time data from sensors. Field sensors are integrated into the SIPPEG database using internet network technology and monitored in real time using GIS-based digital maps and dashboards, and operated effectively from a command center with information and communication technology.

SIMATAG 0.4m, one of the sub-systems in the SIPPEG, is *Peatland Water Level Information System* that monitors peatland groundwater levels. SIMATAG database is useful for:

1. Early detection of peatland fires (early warning system), monitored based on the wetness condition of peatlands using overlaid SiMATAG upper layer analysis with hotspot distribution; and
2. Calculation of carbon emission reductions generated from peatland restoration activities, particularly raising peatland groundwater levels and water management of peatland ecosystems.

Peatland Conservation, Sustainable Management, and Food Security

Tropical peatlands have enormous benefits including flood and fire control, ecotourism, climate stability, biodiversity, community livelihoods, education, and research. Although peat soils have few nutrients, in some places peatland ecosystems can provide food for most subsistence communities. Shallow peatlands (<100 cm) can be used for the cultivation of vegetables and annual crops (Sabiham, 2008). The Strategic Environmental Study for the development of food estate on peatlands began in early 2020.

The MoEF has developed a plan for restoration and rehabilitation of several peatland areas, including in Central Kalimantan, Jambi, South Sumatra, and Papua. In Central Kalimantan, 36,936 hectares of peatlands are in a very badly damaged condition, due to the former one-million-hectare peatland-mega rice project. This area is undergoing restoration and rehabilitation involving collaboration with local governments, universities, experts, local leaders, communities, and the private sector. Restoration activities to date have reached 36,298.7 hectares.

Indonesia is one of the leading countries in the management and research of tropical peatlands, as well as one of the founding countries of the International Tropical Peatlands Center (ITPC) with the Democratic Republic of Congo, Republic of Congo, and Peru. Other parties supporting ITPC's work include the Center for International Forestry Research (CIFOR), the United Nations Environment Program (UNEP), and the United Nations Food and Agriculture Organization (FAO). Indonesia is committed to conserving tropical peatlands and taking a proactive approach to restoring and protecting peatlands, as well as increasing the capacity of itself and other countries to manage tropical peatlands.

ITPC was launched in Jakarta on 30 October 2018 to promote multi-stakeholder, and South-South cooperation on peatland research and management, ITPC is built on the principles of true cross-sector collaboration and integration. Recognizing the importance of this collaboration, the ITPC's roles are: (1) to become a go-to-go space for South-South cooperation, which will support the dissemination of tropical peatland management strategies and practices through coordination and support of collaborative international relations and linking different stakeholders; (2) conduct and disseminate scientific research on tropical peatland management for sustainable development; (3) become a center of excellence for tropical peatland research to support policy development; and (4) provide capacity building and technical services.

ITPC has organized and participated in many international events, such as Global Landscapes Forum, UN Forum on Forests, Asia-Pacific Forestry Week, UN Climate Week, IUFRO World Congress, and UNFCCC COP, to promote sustainable management of tropical peatlands. During the Fourth United Nations Environment Assembly (UNEA-4)

meeting in March 2019, Indonesia initiated the first global resolution for 'Conservation and Sustainable Management of Peatlands'. The resolution calls for the recognition of peatlands and their important role in global ecosystems and encourages cooperation with national, regional, and international peatland management organizations and all actors for the conservation and sustainable management of peatlands.

Peatland Restoration in Non-Concession Areas

The Government is strongly committed to restoring burnt and degraded peatlands in seven provinces, namely Riau, Jambi, South Sumatra, West Kalimantan, Central Kalimantan, South Kalimantan, and Papua, which since 2016 has been coordinated by the Peatland Restoration Agency. Currently, this agency is transformed to Peatland and Mangrove Restoration Agency (BRGM) that works focused on non-concession areas. Overall, restoration efforts carried out by BRGM are done using three forms of intervention, including (i) rewetting of peatlands that are already dry (rewetting) through the development of peat wetting infrastructure (canal blocking, deep wells, and canal backfilling); (ii) land cover restoration (revegetation) through the construction of peatland rehabilitation demonstration plots; and (iii) revitalization of local livelihoods. All those three interventions are formulated from the real challenges that exist in the field, improving the physical condition of peatlands while looking for alternative solutions for structuring the local community's economy.

As of December 2021, the implementation of peatland restoration carried out in seven provinces had reached 1,135,623 hectares, in which that 835,288 hectares were achieved between 2016 and 2020, while 300,345 hectares were achievements in the restoration area in 2021. This hydrological restoration is carried out by building 7,405 units of canal blocking, 14,004 units of deep wells, and 333 units of canal backfilling. In areas where hydrological restoration has been carried out, demonstration plots for revegetation of burnt peat lands covering an area of 1,892 hectares have also been implemented (see Table 5.2). In addition, economic support for communities who lived around peatlands had reached about 1,085 groups with the value of assistance reaching around USD 11.5 million.

Peatland restoration activities include increasing and strengthening community participation with the Peatland-Care Village (DPG) or Peatland Stewardship Villages (DMPG) programs. DPG spearheads the framework for integrating restoration and protection of peatland ecosystems into village

TABLE 5.2. Peatland Restoration Achievements in Non-Concession Area (2016-2021)

Province	Deep Wells (unit)	Canal Blocking (unit)	Canal Backfilling (unit)	Revegetation (ha)	Revitalization (group)
Riau	1,125	1,639	5	285	234
Jambi	741	660	152	325	128
South Sumatra	354	1,057	61	340	154
West Kalimantan	491	806	0	150	154
Central Kalimantan	10,664	3,108	115	750	261
South Kalimantan	629	135	0	42	47
Papua	0	0	0	0	107
Total	**14,004**	**7,405**	**333**	**1,892**	**1,085**

SOURCE: BRGM, 2022

development. As of 2021, 702 DMPGs had been formed, supported by both government and third parties' budgets. In detail, there are about 403 DMPGs (57.41%) that had been formed using government budget. Meanwhile, as many as 299 DMPGs (42.59%) were formed and facilitated by the budget of public and private partners. Those DPMGs spread over seven locations with the most in Central Kalimantan with about 196 villages, followed by Riau with 179 villages, West Kalimantan with 116 villages, South Sumatra with 91 villages, Jambi with 62 villages, South Kalimantan with 40 villages, and lastly Papua with 18 villages. At the DMPG locations, village institutions were strengthened, as well as education and community capacity was strengthened through Peat Farmer Field School (SLPG) training. The programs include zero-burning systems, organic fertilizer production, and making natural pesticides from resources available on site. By 2021, 1,740 people had attended the Field School.

To monitor the condition of the groundwater level on peatlands, BRGM installed the Groundwater Level Monitoring Tool (AP TMA) which is displayed in the Peatland Water Monitoring System (SIPALAGA). As of 2021, 153 units of AP TMA had been built, spread over 52 units in Riau Province, 16 units in Jambi, 13 units in South Sumatra, 20 units in West Kalimantan, 41 units in Central Kalimantan, nine units in South Kalimantan, and two units in Papua.

BOX 5.1. Implementation of Peatland Restoration at Site Level

Parit Banjar Village, East Mempawah District, Mempawah Regency, West Kalimantan Province is one of the locations for peatland restoration. Parit Banjar Village has an area of 1,360 hectares, in which 949.63 hectares or 70 percent of the village area is dominated by peatlands. Based on the Environment and Forestry Ministerial Decree No. 129/2017 on the Determination of the Peat Hydrological Unit (PHU), Parit Banjar Village is located in the Mempawah-Peniti River PHU, covering about 467.71 hectares of peatland ecosystem protection function and 481.92 hectares for cultivation function.

The Lembah Hijau Farmer Community I, chaired by Marhaji, is one of the community groups involved in peat restoration activities in Parit Banjar Village. This community group consists of 25 people and is a group that maintains canal blocking built by BRGM in 2018. This group is also a beneficiary of the assistance program for community livelihood revitalization activities through horticulture. The community is increasing their awareness of peat protection and zero burning approaches. Canal blocking is beneficial for local residents because it increases the water storage capacity of the canal body and its surroundings, while preventing the decrease of water levels, so that their peatland remains wet and difficult to burn.

In addition to canal blocking, in 2019 the Lembah Hijau Farmer Group I managed a horticultural community economic revitalization program. The program is provided incentives for the community to maintain the canal blockings that have been constructed and conducting fire prevention patrols on peatlands. BRGM provided USD 11,020 to carry out land preparation without burning, agricultural facilities and plant maintenance. The group plants chili, long beans, tomatoes, eggplant, corn, watermelon, ginger and other crops for consumption and sale. Through this assistance, the community could get various jobs to increase their income, such as in harvesting and replanting. The group members have increased their income by USD 20,381, some of which has been saved for the maintenance and operation of canal blocking.

5.3. Mangrove Ecosystem Rehabilitation

The preparation of the National Mangrove Map has been carried out since 2013. In 2021, the National Mangrove Map was updated, considering the dynamic changes in mangrove cover. The data and information are updated annually.

TABLE 5.3. Current Mangrove Area, Mangrove Habitat Potential, and Forest Areas

No.	Area Function	Existing Mangroves (ha)	Mangrove Habitat Potential (ha)	Total (ha)
1	Protection forest	907,724	83,732	991,456
2	Conservation Forest	748,271	48,838	797,109
3	Production forest	1,005,287	142,961	1,148,248
4	Other Use Areas	702,798	480,651	1,183,449
Total		**3,364,080**	**756,183**	**4,120,263**

SOURCE: KLHK, 2022c

Accelerated Mangrove Rehabilitation and Conservation

According to the State of the World's Mangrove in 2016, the area of mangrove forests worldwide reached 136,000 km2 with 20 percent located in Indonesia . Therefore a World Mangrove Center (WMC) has now been initiated by Indonesia.

The purpose of establishing the WMC is to serve and share Indonesia's experiences in mangrove rehabilitation and conservation, and collaborate with global stakeholders to save the world's mangroves. Mangroves have high blue carbon potential, as part of the national low carbon development strategy. Research and development of mangrove cultivation technology are increasing so there is a need for a sharing and learning platform for stakeholders. WMC is designed as a reliable center of excellence, a knowledge-sharing space oriented to mitigation and adaptation that will support the implementation of Indonesia's NDC and SDGs, as well as being able to function as a Clearing House, and a reliable provider of data and information about mangroves. WMC functions as an International Hub to provide access to knowledge database of mangrove ecosystems for better understanding mangrove ecosystems, as well as to connect, coordinate, and encourage collaboration between different mangrove-related stakeholders from various sectors in many countries.

The mangrove ecosystem, as depicted in the National Mangrove Map, provides information according to the existing and the potential mangrove habitats. The existing mangroves are grouped based on canopy density class: dense canopy with about 3,121,240 ha (92.78 percent), medium canopy density with 188,366 ha (5.60 percent) and rare canopy density with 54,474 ha (1.62 percent). While the potential for mangrove habitat consists of various land cover conditions that are identical to mangrove habitats, specifically abraded mangroves (8,200 hectares), bare land (55,889 hectares), abraded areas (4,129 hectares), fish ponds (631,802 hectares), and accreted land (*tanah timbul*) (56,162 hectares).

One of the tasks of BRGM is to accelerate the rehabilitation of 600,000 hectares of mangroves from 2021-2024. In 2021, BRGM and MoEF had carried out the work-intensive acceleration of Mangrove Rehabilitation within the National Economic Recovery scheme reaching 34,911 hectares in 654 villages, in addition to the regular pattern of mangrove forest rehabilitation reaching 1,381 hectares from the target of 1,250 hectares.

A Flock of Birds Flying crossing Mangrove Forest

LOCATION
Sembilang National Park, South Sumatra

PHOTO BY
Hary Sanjaya (2021)

The challenges faced in accelerating mangrove rehabilitation relate to past land-uses, future land-use plans, and technical problems. Mangrove ecosystems have undergone changes in function and use. Changes in mangrove land cover are caused by economic interests, especially for plantations, agriculture, and fish ponds.

In addition, land needs for buildings/settlements also often change the mangrove cover. Fish ponds are an example of land cover change in coastal areas. Based on the National Mangrove Map, fish ponds covered 631,802 hectares. Rehabilitation of mangroves in fish pond areas uses a silvofishery system or associated mangrove aquaculture system. The success of rehabilitation in fish pond areas depends on stakeholder synergy between communities, private sector actors, and government. The availability of seeds and biophysical conditions such as currents and waves also affect the success of mangrove rehabilitation.

By 2021, BRGM had established 250 Mangrove Stewardship Villages, using the government budget for 220 villages, and 30 others were formed and facilitated by partner budgets. Interventions in Mangrove Stewardship Villages include educational activities and community capacity building with mangrove community field school training. In 2021, 176 cadres were formed through mangrove field schools, consisting of 150 cadres of mangrove rehabilitation field schools and 26 cadres of environmentally friendly ponds field schools. Field schools enhance community capacity in mangrove management practices such as participatory mapping, mangrove rehabilitation techniques, identification of mangrove species, seeding, preparation of planting sites, planting, maintenance, monitoring, and evaluation.

5.4 Forest and Land Rehabilitation

Forest and land rehabilitation is an effort to restore, maintain and improve the function of forests and land so that their carrying capacity, productivity, and role in supporting life support systems are maintained or improved. The targets of forest and land rehabilitation are degraded lands in prioritized watersheds in all types of forest areas (except nature reserves and core zones of national parks) and land. Upstream watersheds are prioritized because they are prone to floods, droughts, and landslides, catchment areas from reservoirs, dams, and lakes, recharge areas in upstream watersheds, river border areas, springs, lakes, and reservoirs, as well as downstream watersheds that are prone to tsunamis, seawater intrusion, and river abrasion.

Forest rehabilitation is an effort to plant forest tree species in damaged forest areas in the form of bare land, reeds, or shrubs to restore forests. Reforestation is prioritized in protection forests that aim to restore basic functions to protect life support systems to regulate water systems, prevent flooding, control erosion, prevent seawater intrusion, and maintain soil fertility. Land rehabilitation activities are aimed at planting trees/greening on degraded land outside forests. Forest and land rehabilitation activities from 2015 to 2021 can be seen in Table 5.4).

TABLE 5.4. Area for Forest and Land Rehabilitation in 34 Watersheds (2015-2021)

Year	2015	2016	2017	2018	2019	2020	2021
Conservation/Protection Forests	10,508	7,087	19,482	25,170	206,000	15,434.30	69,961
Mangrove Forests/ Beaches/Swamps/Peat	481	497	1,175	960	1,000	18,709.54	1,381
Urban Forest	240	215	452	-	-	-	-
Agroforestry	7,624	13,416	15,875	-	-	-	-
Land rehabilitation with seedlings from community nurseries and Permanent Nursery	181,594	177,151	164,006	162,500	188,168	78,276	81,112
Total	**200,447**	**198,366**	**200,990**	**188,630**	**395,168**	**112,419.41**	**152,454**

SOURCE: KLHK, 2022c

Tree seedlings for forest and land rehabilitation activities are sourced from 57 permanent nurseries spread throughout Indonesia and the provision of productive seeds for communities. From 2015 to 2021, seedling production from permanent nurseries and provision of productive seedlings is presented in Table 5.5.

TABLE 5.5. Number of Seedlings Produced for Forest and Land Rehabilitation (2015-2021)

Year	2015	2016	2017	2018	2019	2020	2021
Seedling produced by Permanent Nursery	37,378,014	48,718,521	52,069,475	49,549,368	50,231,461	25,473,489	36,513,499
Productive seedling produced by community		664,130	3,210,211	2,623,573	4,653,082	3,050,571	2,916,173
Total	**37,378,014**	**49,382,651**	**55,279,686**	**52,172,941**	**54,884,543**	**28,524,060**	**39,429,672**

SOURCE: KLHK, 2022c

In June 2022 President Joko Widodo innagurated Rumpin Nursery in West Java to demonstrate public private partnership collaboration in field work involving government, state-owned enterprise and private sector (Ministry of Environment and Forestry, Ministry of Public Works and Housing, and APRIL Group). Rumpin Nursery could produce 12 to 15 million seedlings per year. As of mid 2022, there were about 4.97 million seedlings have been produced at Rumpin Nursery which includes timber and fruit trees.

The President commended public private partnership since 2021 in which private sector has supported the establishment of nursery in large scale in many provinces in Indonesia. It was reported the progress of nursery development in:

- Rumpin, West Java
- Danau Toba, North Sumatra
- Likupang, North Sulawesi
- Labuan Bajo, East Nusa Tenggara
- Mentawir, East Kalimantan
- Mandalika, West Nusa Tenggara
- Bali
- South Kalimantan

Rehabilitation efforts include forest and land rehabilitation in reservoir catchment areas, prioritized lakes and river borders, mangrove forests and check dams, gully plugs and infiltration wells are also constructed to manage water. Forest and land rehabilitation in 2021 was supported by 70,445,044 stems of seed sourced from community nurseries (MoEF, 2022). At the same year, 152,454 hectares of forests and land were rehabilitated, consisting of vegetative rehabilitation, mangrove rehabilitation, incentive planting, watershed rehabilitation and forest reclamation (MoEF, 2021). In addition to vegetative activities, forest and land rehabilitation was carried out through the construction of soil and water conservation buildings. Furthermore, 391 Retaining Dams and 1,163 gully plugs were built.

Community participation in forest and land rehabilitation represents job opportunities for communities around the forest. Within the next five years, rehabilitated land and forests are expected to become a center for the production of fruit, nuts and

Germination Facility

LOCATION
Rumpin, West Java

PHOTO BY
Humas KLHK (2021)

other NTFPs. In the long-term, communities can harvest fruits and non-timber forest products (NTFPs) such as pine resin, rubber, and eucalyptus from rehabilitated forests. Nearly 80 percent of the seeds planted for rehabilitation purposes are fruits and nuts, such as macadamia, candlenut, durian, avocado, guava, soursop, spicy peanuts (*jengkol*), and gum and resin-producing species, especially pine and rubber.

Forest and land rehabilitation programs are often carried out in areas affected by natural disasters, where rehabilitation activities are carried out to prevent and mitigate the impact of floods and landslides in the rainy season and drought in the dry season. Forest rehabilitation supports food security programs in disaster-prone areas, increases community income, and increases awareness of the importance of planting trees.

Holders of Mining and Non-Mining Business Permits with Lease Business Permits (IPPKH) are required to rehabilitate watersheds around their concession areas based on the Government Regulation. From January 2013 to December 2021, IPPKH holders had replanted 148,069 hectares in Indonesia. Of this amount, 39,989.3 hectares had been handed over to the government.

Restoration of Production and Conservation Forest Ecosystems

Forest restoration activities are also carried out in areas where natural forests have been logged, in natural forests with logging concession permits (PBPH Natural Forests), and ecosystem restoration concession permits (PBPH Ecosystem Restoration), as well as in industrial plantation forests (PBPH Plantation Forests). Replanting by the company is one of the obligations that must be fulfilled after tree felling. PBPH Ecosystem Restoration does not allow logging before the biodiversity and ecosystem balance is achieved, but it still allows various business activities such as non-timber forest products and environmental services.

Forest reclamation activities have been carried out by PBPH Natural Forests, mining and non-mining holders of lease permits. Many parts of the mining site and the area surrounding the infrastructure have been replanted by the concessionaire. As of September 2020, 36,123.3 hectares had been reclaimed. Of the reclamation area, 2,765 hectares have been successfully handed back to the Government.

Ecosystem restoration in conservation areas takes a different approach from that used in protection and production forests, as well as other ecosystem restoration programs outside forest areas. Conservation forest restoration is concerned with restoring trees and entire ecosystems, including plant and animal populations and biodiversity in land and marine conservation areas.

In conservation areas, partnerships with stakeholders, especially local communities living within or on the outskirts of conservation areas is important. Local communities who were once considered "encroachers" become partners in ecosystem restoration in conservation areas. Although the number is still small, of the 558 land and sea conservation areas in Indonesia, 13 areas demonstrated successful ecosystem restoration with this new collaborative approach.

The realization of ecosystem restoration in conservation areas is also supported by partners through funding schemes. Another scheme of partnership is in the form of corporate obligations that have a Lease Forest Area Permit (IPPKH) or a Utilization Permit (PKM) for non-forestry activities in production/protection forests, where one of the obligations of the permit-holder is to carry out land rehabilitation/ecosystem restoration activities.

Partners may involve NGOs, ministries/agencies (BRGM), community groups, private sector/companies, and others such as PT. PLN (Persero) and PT. Antam. By the end of 2021, there were 32 partners who contributed to the restoration of ecosystems in conservation areas with an area of 32,542 hectares.

The largest areas of non-rotational rehabilitation are production forest areas that have not been granted a permit, PBPH-plantation forests, and social forestry areas, which generally have high conservation values, and are animal crossing areas. The central government (MoEF) is responsible for 60.2 percent of non-rotational rehabilitation. The private sector is responsible for 24

percent, the community and local government with the support of the central government is responsible for 15.8 percent.

The results of the analysis for priority locations for forest and land rehabilitation shows that the potential area reaches 0.69 million hectares. The largest area is in South Sumatra Province, reaching 0.21 million hectares. In general, conservation forests and PBPH plantation forests comprise the largest area for forest and land rehabilitation without rotation. Forest and land rehabilitation without rotation in the PBPH areas feature a high environmental service index for protection and rehabilitation directives.

Ecosystem restoration is an effort to return the degraded production forest ecosystem to a condition close to its original state. Increasing deforestation and forest area degradation has a significant impact on ecology, economy, and social relations and culture. One of the concepts of ecosystem restoration management is optimizing the utilization of production forest areas through the use of environmental services, use of NTFPs, and/or utilization of wood, after reaching ecosystem balance.

The main problem in safeguarding biodiversity is the loss of habitat and the decline in supporting ecosystems for the welfare of wildlife. Restoration of key animal habitats is carried out through enrichment activities and provision of animal feed, while habitat development is carried out through monitoring of wildlife populations, availability of food, and the release of wild animals. Release activities that have been carried out in ecosystem restoration areas include orangutans in East Kalimantan, Central Kalimantan, and Jambi; the release of Sumatran elephants in South Sumatra; and the release of Sumatran tigers in Riau.

Rehabilitation with Rotation

The potential land area for rehabilitation activities with rotation in high-priority areas covers 2.53 million hectares, and is mostly located in the provinces of East Kalimantan, Central Kalimantan, West Kalimantan, and South Sumatra. The potential land available is significant to achieving NDC or LTS targets. Taking into account the degradation rate of land and watershed conditions, the land area for forest and land rehabilitation with rotation in high priority index areas is only 0.83 million hectares and is spread over the provinces of East Kalimantan, West Kalimantan, and South Sumatra.

The main targets of rotational rehabilitation activities are areas that based on environmental service permits that were previously designated for production of timber and mineral extraction land located on peatland. The largest high-priority areas are in non-HGU APL, PBPH-HT, and non-concession production forests, covering 1.23 million hectares, 0.57 million hectares, and 0.39 million hectares respectively. The degraded land located in watersheds that need to be restored is 0.30 million hectares, 0.34 million hectares, and 0.07 million hectares, respectively.

Rehabilitation activities with rotation are part of the mitigation actions to increase carbon stocks aimed at areas that have been designated for production based on environmental service permits. The rotational rehabilitation activities that must be carried out until 2011-2030 to achieve the emissions reduction target of NDC-CM1 are 3.46 million hectares while achieving the FOLU Net Sink 2030 (LTS-LCCP scenario) is about 2.787 million hectares.

Rumpin Nursery

LOCATION
Rumpin, West Java

PHOTO BY
Humas KLHK (2021)

CHAPTER 6

Forest Biodiversity Conservation

Green peafowl (*Pavo muticus*) is an endemic species to Java.

LOCATION
Alas Purwo National Park, East Java

PHOTO BY
Alas Purwo National Park (2020)

6.1 The Prevention of Biodiversity Loss

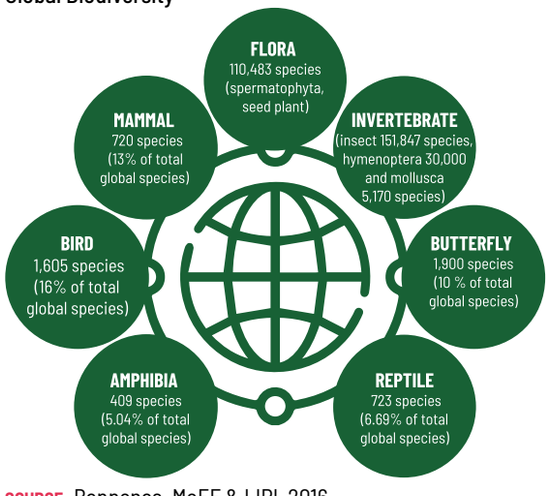
Indonesia has invaluable biodiversity assets, and it is a shared responsibility to optimally and sustainably manage the assets for the sake of community welfare. The richness of flora and fauna has made Indonesia the third most biodiverse country in the world. Indonesia's iconic wildlife species include the Sumatran tiger (*Panthera tigris sumatrae*), the Sumatran elephant (*Elephas maximus sumatranus*), the Sumatran rhino (*Dicerorhinus sumatrensis*), the Javan rhino (*Rhinoceros sondaicus*), the Bornean orangutan (*Pongo pygmaeus*), the Sumatran orangutan (*Pongo abelii*), Anoa (*Bubalus quarlesi*) in Sulawesi, the Komodo dragon (*Varanus komodoensis*) in East Nusa Tenggara, and the bird of paradise (*Paradisaea spp.*) in Papua. These species are not only biodiversity icons in Indonesia, but also loved by the people of Indonesia as well as the global community.

The Indonesia's Biodiversity Strategy and Action Plan (IBSAP) 2016-2020 document recorded no fewer than 720 mammalian species (13 percent of total global species), 1,605 bird species (16 percent of total global species), and the updated data on bird species richness has been verified by Burung Indonesia (2021), which is 1,812 species. In addition, Indonesia has 385 amphibian species (6 percent of total global species), 723 reptilian species (18 percent of total global species), 1,900 butterfly species (11 percent of total global species), and 19,232 seed plant species (8 percent of total global species), inhabit various land and water habitats throughout Indonesia's wide archipelago.

Given the high biodiversity, the government has prioritized biodiversity management by considering Indonesia's natural resources. The state of Indonesia's biodiversity compared to global biodiversity is presented in Figure 6.1.

Biodiversity conservation includes designing and analyzing data in conservation areas and outside the state forests on nature conservation, management of biodiversity, species and genetic conservation, environmental services utilization in conservation areas, and environmental quality improvement programs through conservation management. Based on ecosystem environmental services, many areas outside conservation forests have high conservation values and are important wildlife habitats. These areas therefore should be included in biodiversity conservation planning. This includes natural forests outside conservation areas with protection functions, with a medium to high priority index, which includes 6.9 million hectares, and 2.2 million hectares with a high to extremely high priority index.

FIGURE 6.1. Indonesia's Biodiversity Compared to Global Biodiversity



SOURCE: Bappenas, MoEF & LIPI, 2016

6.2. Management of Conservation Areas

Resort and High Conservation Value-Based Management of Conservation Areas

The management of Indonesian conservation areas uses the resort-based management (RBM) model to understand the site-level situation, comprehend the diversity of problems and the potentials of various places, and understand the cultural diversity and the history of the relationship between local communities and conservation forests.

Modern approaches to conservation engage wisdom of local communities, including a*dat c*ommunities. Therefore, approaches to biodiversity conservation work with local communities that live nearby (or inside) conservation forests across the country. The MoEF engage "resort-based system" to improve the effectiveness of the area management. This system facilitated the development of a transparent, effective, and efficient management culture, with cooperation among all stakeholders, and appropriate mechanisms for recording, documenting, and resolving conflicts.

The Effectiveness of Conservation Areas Management

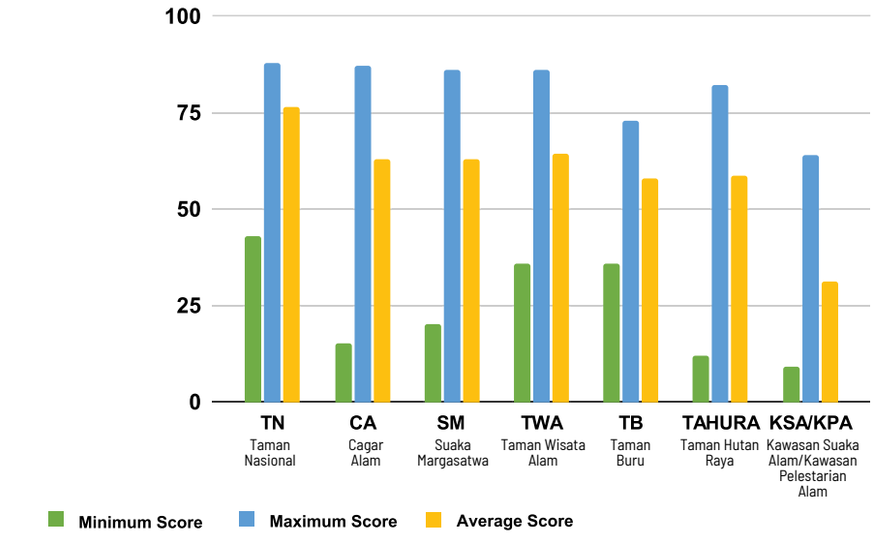
Managing 560 units of conservation areas with a total area of more than 27 million hectares is a big challenge. Each conservation area has a specific management mandate considering conservation potential and threat variation. According to functions, conservation areas in Indonesia are dominated by 212 units of strict nature reserves (*Cagar Alam*, CA) and 131 units of Nature Recreation Park (*Taman Wisata Alam,* TWA). Meanwhile, based on total area, national parks have the largest proportion, comprising 16.24 million hectares or more than 60% of total conservation areas.

Indonesia has been adopting the *Management Effectiveness Tracking Tool* (METT) method as a tool to assess the effectiveness of terrestrial conservation areas management since 2015. An assessment tool specific to marine conservation areas has also been developed- the *Score Card to Assess Progress in Achieving Management Effectiveness Goals for Marine Protected Areas.*

As of 2021, national park areas have the highest average effectiveness index for their management compared to other areas, at score of 76.54 points (see Figure 6.2). National Park management is more focused than other areas and have their own management units. As a result, they have sufficient resources, such as budget, human resources, and facilities to support implementation.

Currently, management units of three national parks have not been established- Zamrud National Parks, Gandang Dewata National Park, and Gunung Maras National Park. These three national parks score lower on management effectiveness compared to other national park areas. The lowest management effectiveness scores are from Sanctuary Reserve Areas/Nature Conservation Areas (*Kawasan Suaka Alam/ Kawasan Pelestarian Alam*, KSA/KPA of 31.29 points), indicating that those areas have not been managed in accordance with its mandates. The results of the management effectiveness assessment for conservation areas are presented in Figure 6.2.

FIGURE 6.2. Management Effectiveness Assessment for Conservation Areas



SOURCE: KLHK, 2022

6.3 Wildlife Conservation and Management

Site Monitoring and the Improvement of Wildlife Population in Indonesia

In order to monitor the wildlife population, the government of Indonesia has targeted 25 priority species and site monitoring in conservation areas (see Table 6.1).

TABLE 6.1. 25 Priority Species and Site Monitoring

No	Wildlife species	Scientific name	Total Site
1	Sumatran tiger	*Panthera tigris sumatrae*	24
2	Sumatran elephant	*Elephas maximus sumatranus*	13
3	Javan & Sumatran rhinoceros	*Rhinoceros sondaicus*	1
		Dicerorhinus sumatrensis	3
4	Banteng	*Bos javanicus*	9
5	Gibbon and Siamang	*Hylobates moloch*	10
		Hylobates klosii	6
		Hylobates agilis albibarbis	1
		Symphalangus syndactylus	3
6	Orangutan	*Pongo pygmaeus*	21
		Pongo abelii	3
7	Proboscis monkey	*Nasalis larvatus*	17
8	Komodo dragon	*Varanus komodoensis*	8
9	Bali myna	*Leucopsar rothschildi*	5
10	Maleo	*Macrocephalon maleo*	12
11	Hairy babirusa	*Babyrousa babyrussa*	10
12	Lowland anoa and Mountain anoa	*Bubalus quarlesi*	12
		Bubalus depressicornis	3
13	Javan Hawk-eagle and Flores Hawk-eagle	*Nisaetus bartelsi*	18
		Nisaetus floris	3
14	Cockatoo	*Cacatua sulphurea*	16
		Cacatua moluccensis	3
		Cacatua alba	4
		Cacatua galerita triton	2
		Cacatua s. citrinocristata	3
15	Javan leopard	*Panthera pardus melas*	9
16	Bawean deer	*Axis kuhlii*	1
17	Bird of Paradise	*Paradisaea spp.*	6
		Seleucidis melanoleuca	6
		Paradisaea rubra	2
		Paradisaea minor	2

No	Wildlife species	Scientific name	Total Site
18	Surili	*Presbytis fredericae*	2
		Presbytis comata	1
19	Tarsier	*Tarsius fuscus*	1
20	Celebes crested macaque and Celebes macaque	*Macaca nigra*	1
		Macaca maura	3
21	Sumba hornbill	*Rhyticeros everetti*	5
22	Purple-naped lory	*Lorius domicella*	2
23	Hawksbill Turtle and Green Turtle	*Chelonia mydas*	2
		Eretmochelys imbricata	17
24	Dingiso	*Dendrolagus mbaiso*	1
25	Rinjani scops owl	*Otus jolanodae*	1
Total			**272**

SOURCE: KLHK, 2022

Efforts to increase the population of these prioritized endangered wildlife species include: habitat protection; population inventories and monitoring to identify species distribution and population status; habitat management and ecosystem restoration; establishment of conflict resolution mechanisms; wildlife rescue through rehabilitation and release of wildlife illegally held in captivity, and the development of a monitoring database.

The Government of Indonesia has conducted a population and habitat analysis for priority species such as the Sumatran tiger, Javan leopard, Orangutan, Javan rhino, and Sumatran rhino to estimate the population and their habitat. About 71,820 orangutans remain in Sumatra and Borneo Islands (including Kalimantan, Sabah and Sarawak), in a total habitat of 17,460,600 ha and distributed across 52 population (Directorate General of KSDAE, 2016).

Populations of the Sumatran rhino are distributed across several habitats in East Leuser, West Leuser, Bukit Barisan Selatan and Way Kambas in Sumatra Island, as well as West Kutai and Mahakam Ulu in Kalimantan (Directorate General of KSDAE, 2015). The Sumatran rhino population in East Leuser, Bukit Barisan Selatan, West Kutai and Mahakam Ulu is estimated to be no fewer than 15 individuals. An emergency rhino rescue action plan has been developed to prevent the extinction of the Sumatran rhino in the next 10 years.

A Population Viability Analysis (PVA) also has been conducted for the Sumatran tiger. It estimates that 600 Sumatran tigers are distributed across 23 landscapes in Sumatra. These data are important to support better planning of the Sumatran tiger conservation strategy (Directorate General of KSDAE, 2016). The births of wildlife in 2021 (Table 6.2) include 18 species with a total of 120,868 births. The government, in collaboration with conservation institutions, encourages the quality improvement of conservation institutions to increase wildlife populations through ex-situ conservation. The populations of several priority species have been increasing. They will be the government's target to maintain Indonesia's high biodiversity.

The Sumatran rhino (*Dicerorhinus sumatrensis*)

Rosa is a rhino evacuated from Bukit Barisan Selatan National Park to Sumatran Rhino Sanctuary for rehabilitation.
On 24 March 2022 Rosa gave birth to a newborn baby rhino named Sedah Mirah.

LOCATION
Sumatran Rhino Sanctuary, Way Kambas National Park, Lampung

PHOTO BY
Simon Onggo (2022)

TABLE 6.2. The Births of Wildlife In-situ Conservation (January – December 2021)

No	Scientific Name	Wildlife Species	Number of Individuals
1	*Anhinga melanogaster*	Oriental darter	200
2	*Chelonia mydas*	Green sea turtle	116,300
3	*Eretmochelys imbricata*	Hawksbill sea turtle	1,261
4	*Ictinaetus malayensis*	Black eagle	1
5	*Lepidochelys olivacea*	Olive ridley sea turtle	2,803
6	*Leucopsar rothschildi*	Bali myna	28
7	*Mycteria cinerea*	Milky stork	77
8	*Nisaetus bartelsi*	Javan hawk-eagle	3
9	*Nisaetus floris*	Flores hawk-eagle	2
10	*Pavo cristatus*	Indian peafowl	3
11	*Rhinoceros sondaicus*	Sumatran rhino	2
12	*Sus scrofa*	Wild boar	7
13	*Bos javanicus*	Banteng	1
14	*Macaca fasicularis*	Long-tailed macaque	32
15	*Macrocephalon maleo*	Maleo	144
16	*Panthera pardus melas*	Javan leopard	1
17	*Pongo pygmaeus*	Bornean orangutan	2
18	*Trachypithecus auratus*	East Javan langur	1
Total			**120,868**

SOURCE: KLHK, 2022

The wildlife births in in-situ conservation areas indicate that the habitats are well managed. As a result, biodiversity can be protected and the habitats could provide safe places for breeding. Wildlife breeding is expected to be developed in ex-situ conservation areas.

Storm's stork (*Ciconia stormi*) is one of the rarest bird species.

LOCATION
Tanjung Puting National Park, Central Kalimantan

PHOTO BY
Efan Ekananda (2015)

In Strategic Action on Natural Resources and Ecosystem Conservation 2020-2024, the government targeted 70 million hectares inside and outside conservation areas that are verified as high conservation value areas. The achievement of this target as of 2021 is 8,829,440.39 hectares.

Conflict Resolutions

To resolve animal-human conflicts, the Government of Indonesia has carried out, among others: (1) setting a moratorium on primary forests and peatlands, in which this moratorium has protected three million hectares of Sumatran elephants and Sumatran tigers habitat; (2) issuing PBPH Ecosystem Restoration permits in Sumatran elephants and tigers habitat areas; (3) improving the protection of Sumatran elephants and tigers by conducting security patrols which involve the army (TNI), the police, and the regional stakeholders, especially in areas where conflicts often occur; (4) initiating the issuance of the Presidential Instruction on biodiversity mainstreaming as a guideline for all sectors to carry out their main tasks and will issue ministerial instructions regarding wildlife protection from entrapment; and (5) encouraging law enforcement to improve

the quality of criminal penalties and fines for environmental and forestry crimes. The government has also increased post-translocation monitoring by installing GPS Collars, establishing task forces to reduce wildlife conflicts, establishing rescue units, as well as raising public awareness regarding the importance of human-wildlife harmony.

A total of 54,308 animals were successfully released back into their habitats in 2021. The highest number of releases is from Aves (40,862 individuals), followed by reptiles (12,300 individuals), mammals (518 individuals), Pisces (245 individuals), and other classes (383 individuals). Wildlife release is a measure to increase population, by providing opportunities for confiscated animals to return to their habitat and breed in their natural habitats. Wildlife that does not meet the requirements to be released into the wild will be bred in ex-situ conservation areas.

Wildlife Repatriation

Repatriation is an effort to save wildlife from smuggling or international illegal trades. The Indonesian Government repatriated orangutans and endemic birds in 2021. These species were returned to Indonesia, and their health and behavior were checked and rehabilitated. They were returned to their habitat so that they can breed to ensure population viability. Indonesia is an active member of CITES and actively voices the importance of combating illegal wildlife trade and illegal wildlife trafficking.

A total of 52,329 wildlife species were released into their natural habitats in 2021. Between 2006 and 2021, 187 Indonesian origin-species found in Malaysia, Singapore, Thailand, Vietnam, Australia, Kuwait, UK, and the USA, which were repatriated.

Zoonosis such as rabies, avian influenza, zoonotic tuberculosis, leptospirosis, and other wildlife diseases are a serious threat to species and genetic diversity. A wildlife health reporting system (SEHATSATLI) was built in 2017 to improve the early detection of zoonosis. SEHATSATLI is managed by MoEF to collect wildlife health data from field officers. Data are sent through SMS, an android app, and written reports. Data can be accessed on the website and through the Android application.

The SEHATSATLI Information System provides data for stakeholders to facilitate decision-making related to wildlife health by utilizing processed data and information. The development of the SEHATSATLI reporting information system is a collaboration between the Ministry of Environment and Forestry and FAO Indonesia supported by USAID. SEHATSATLI was first implemented in four pilot areas: Riau, Central Java, West Kalimantan, and North Sulawesi. Currently, SEHATSATLI has been applied in 38 KSDAE technical management units across 22 provinces.

Genetically Engineered Products

From a biosafety perspective, biodiversity is not only threatened naturally from invasive alien species and zoonosis, but also from potential negative impacts from biotechnology developments including the use of genetically engineered products (GEP). Risk assessments need to be conducted before the GEP is launched to ensure that they are safe for the environment. The results of the GEP risk assessment show that several GEPs have been declared environmentally safe, consisting of four GEP microorganism products in 2019, one GEP microorganism product and two GEP plant products in 2020, and two GEP microorganism products and five field testing approvals for limited GEP crops in 2021.

6.4. Global Biodiversity Conservation

International Commitments to Biodiversity Conservation

As a mega-biodiversity country, Indonesia plays a highly strategic role in the international forum to preserve biodiversity. Indonesia has ratified a number of international agreements and conventions related to biodiversity, including Convention on Biological Diversity (CBD) and the Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES), the UNESCO Man and Biosphere Program (MAB), the World Heritage Convention and the Ramsar Convention (the Convention on Wetlands of International Importance as Waterfowl Habitat).

Convention on Biological Diversity

Indonesia ratified the Convention on Biological Diversity (CBD) in 1994. At the national level, the convention is implemented through the Indonesian Biodiversity Strategy and Action Plan (IBSAP). Indonesia has also ratified a number of agreements related to the CBD Convention, including the Cartagena Protocol on Biosafety in 2004, and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from the Utilization of Biodiversity Resources in 2013.

As a manifestation of its commitment to the Cartagena Protocol, Indonesia established a Biosafety Clearing House in 2001. In 2010, Indonesia established the Biosafety Commission for Genetically Engineered Products (*Komisi Keamanan Hayati Produk Rekayasa Genetik*), which is directly responsible to the President. To support the implementation of the Nagoya Protocol, in 2018, the Ministry of Environment and Forestry issued a Regulation concerning Access to the Genetic Resources of Wild Species and Profit Sharing from their Utilization. As a further manifestation of the Government's commitment to the CBD Convention, a Biodiversity Clearing House (BK Kehati), as mandated by the Convention, was established in 2002 by the Ministry of Environment and Forestry.

During the CBD's COP 14 held on 25 November 2018 in Sharm el-Sheikh Egypt, Indonesia received a Gold Award from CBD Secretariat. This award is a formal recognition and encouragement to CBD member countries for their development and improvement of their Clearing House Mechanisms. Currently, CBD is negotiating the post-2020 Global Biodiversity Framework (post-2020 GBF) to replace the Aichi Biodiversity Targets which ended in 2020.

Several of Indonesia's basic positions on post-2020 GBF targets include emphasizing the effectiveness of protected area management by considering ecosystem connectivity and wildlife habitats, using indicators that are suitable to the national context, and applying realistic targets for post-global pandemic review. At the national level, Indonesia will also prepare the development and formulation of national targets according to the post-2020 GBF which will be agreed upon.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is an international agreement aimed at ensuring that trade in plant and/or wildlife species does not threaten these species' existence. Indonesia became a member of CITES in 1975, and ratified the Convention in 1978, with implementation commencing in 1979. Indonesia currently plays a strategic role as a member of the Standing Committee, the Animals Committee and as an alternate member of the Plants Committee as a representative from the Asia region. Indonesia also serves on CITES Tree Species Advisory Committee. The Ministry of Environment and Forestry is the national focal point for management authority, while the Indonesian Institute of Sciences (LIPI) is the national focal point for scientific authority. To strengthen the implementation of the CITES mechanism, other agencies are also involved, including the National Police, the Office of the Attorney General, the Supreme Court, the Army, Customs, the Ministry of Marine Affairs and Fisheries, the Ministry of Trade, as well as the private sector.

As of 2021, 4,381 Indonesian wildlife species are listed in CITES Appendix I and II. To ensure the utilization of Appendix II species from its natural population degradation (non-detrimental findings), the Indonesian government has regulated annual utilization quotas, which affected 657 animal species and 1 plant species in 2021.

Ramsar Convention

Indonesia ratified the Ramsar Convention in 1991, with its implementation commencing in 1992. Signatories to the Ramsar Convention are obliged to register at least one wetland site of international significance as a waterfowl habitat. To date, seven Indonesian wetland sites have been designated as Ramsar sites, which are Berbak National Park (1992), Danau Sentarum National Park (1994), Wasur National Park (2006), Rawa Aopa Watumohai National Park (2011), Sembilang National Park (2011), Pulau Rambut Wildlife Sanctuary (2011), and Tanjung Puting National Park (2013). The total area covered by these seven sites is 1,372,976 hectares.

UNESCO Man and Biosphere Programme (MAB)

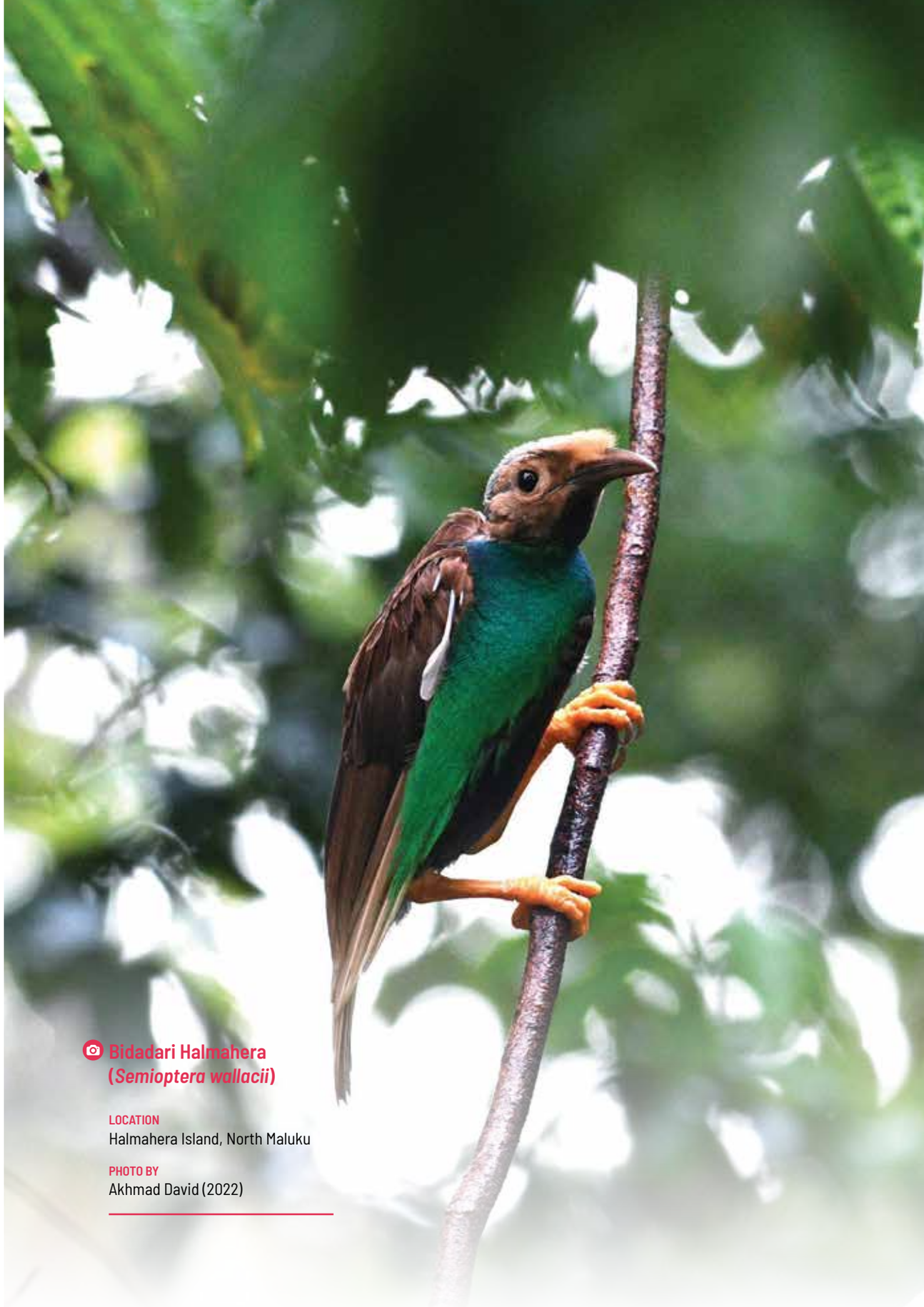
The CBD serves as an umbrella for the conservation of biodiversity on a global scale. However, before ratifying this convention in 1994, 22 years earlier, Indonesia had already committed itself to the Man and Biosphere Programme (MAB), conceived by UNESCO in 1968 and launched in 1971. In 1974, the concept of the Biosphere Reserve was developed, followed by the World Network of Biosphere Reserves in 1976. In 1977, four Indonesian conservation areas were designated as Biosphere Reserves (*Cagar Biosfer*, CB), these being Cibodas/Gunung Gede Pangrango, Komodo, Lore Lindu, and Tanjung Puting, all of which have since been formally categorized as National Parks.

Over time, seven new locations were designated as biosphere reserves, these being Siberut National Park (1981), Gunung Leuser National Park (1981), Giam Siak Kecil-Bukit Batu Biosphere Reserve (2009), Wakatobi National Park (2012), Bromo Tengger Semeru National Park (2015), Taka Bone Rate National Park (2015) and Belambangan Biosphere Reserve (2016). This brought the total number of biosphere reserves in Indonesia to 11 units. Then in 2017, three additional biosphere reserves were proposed, these being Berbak Sembilang, Rinjani Lombok, and Betung Kerihun-Danau Sentarum. Decisions related to this matter were taken at the 30th International Coordinating Council on Man and the Biosphere (ICC MAB) in 2018. By December 2021, the number of conservation areas in Indonesia designated as biosphere reserve areas had reached 22 units.

ASEAN Heritage Parks

As a member of the ASEAN, Indonesia participates in the ASEAN Heritage Parks program, which is a regional cooperation program for the ASEAN Member States committed to effectively managing selected and representative conservation areas within the jurisdiction of member countries, which then become the legacy of ASEAN. The initiative of ASEAN Heritage Park is a regional effort to support the improved management of protected areas and promote these protected areas at regional and global levels. Conservation areas that have the status of ASEAN heritage must be managed within the framework of maintaining ecological processes and life support systems, preserving genetic diversity, ensuring the sustainable use of species and ecosystems, and preserving the natural values of landscape, cultural and tourism values. At present, Indonesia has seven conservation areas that have the status of ASEAN Heritage Parks:

1. Gunung Leuser National Park, listed in 1984;
2. Kerinci Seblat National Park, listed in 1984;
3. Lorentz National Park, listed in 1984;
4. Way Kambas National Park, listed in 2015;
5. Kepulauan Seribu National Park, listed in 2017;
6. Wakatobi National Park, listed in 2017; and
7. Bantimurung Bulusaraung National Park, listed in 2018.



Bidadari Halmahera (*Semioptera wallacii*)

LOCATION
Halmahera Island, North Maluku

PHOTO BY
Akhmad David (2022)

CHAPTER 7

Forest Law Enforcement

7.1. Law Enforcement Instruments

Forest-related crimes, in many cases, are well organized and transnational, involving many parties. The crimes by their nature are trans-boundary and involve cross-border criminal syndicates. Therefore, an effective law enforcement instrument is needed to stop these crimes.

Ultimately, enforcement for forest-related crimes is intended to create a deterrent, improve compliance culture, and restore state, and public losses. Therefore, there are three interrelated instruments imposed on forest crime cases (see Figure 7.1) consisting of administrative sanctions, civil lawsuit, and criminal charges. Administrative sanctions are targeted to non-compliant companies, criminal sanctions are aimed to punish violators, while civil lawsuit are intended to restore the environment and compensate for losses.

Administrative sanctions are applied to companies that do not comply with regulations. They include warning letters, government coercions, administrative fines, suspension of licenses, and revocation of business licenses. The imposition of administrative sanctions does not relieve the violator of from the responsibility for recovery and criminal charges.

Siti, a baby Sumatran orangutan (*Pongo abelii*)

Siti was adopted by Siti Nurbaya, the Minister of Environment and Forestry of the Republic of Indonesia

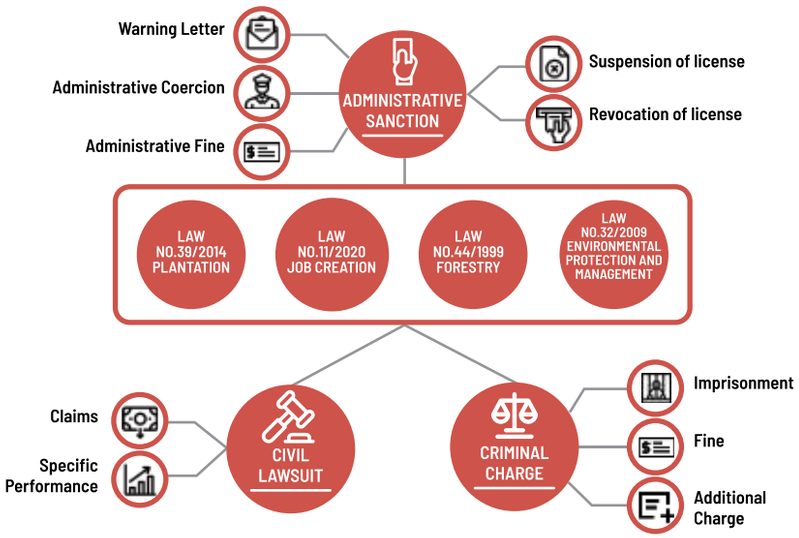
LOCATION
Orangutan Rehabilitation Center, Jambi

PHOTO BY
Iskandar (2021)

Criminal sanctions are in the form of imprisonment, fines, or additional penalties e.g., environmental restoration responsibilities and confiscation, asset, and recovery of the proceeds of crime. Criminal sanctions consider the principle of subsidiarity, that is criminal law as the primary solution (*primum remedium*) or as ultimate solution in law enforcement (*ultimum remedium*). This is different from civil lawsuits, which can be imposed at the beginning of a case or after other sanctions have been imposed (administrative and/or criminal sanctions). The civil verdicts are in the form of claims and/or specific performance such as environmental restorations or other actions aimed at stopping violations and restoring environmental functions.

In order to achieve the ultimate goal of forest-related crime enforcement, multiple legal instruments (a combination of administrative, criminal, and civil lawsuits) are implemented. The focus of applying multi-instrumental law is to punish orchestrators of criminal activity, recover assets of proceeds of crimes, and ensure environmental recovery.

FIGURE 7.1. Law Enforcement Instruments for Forest-related Crimes



Another innovation to impose deterrent effect is a multidoor approach. In This approach, additional penalties, as well as restoration and natural resources-related law enforcement are carried out by other ministries/agencies that have the authority to enforce natural resources law, not only the Ministry of Environment and Forestry. Strengthening cooperation between investigators will consequently intensify efforts to recover losses due to forest-related crimes. Efforts to force restoration are not only based on forestry laws but can also use laws in other sectors such as Law No 27/2007 Management of Coastal Areas and Small Island and Law No 8/2010 Prevention and Eradication of Money Laundering. Furthermore, through the application of the "follow the money, follow the suspects" method, the multidoor approach eases the tracking burdens on other actors tracking and increases the effectiveness of law enforcement. In 2021, Ministry of Environmental and Forestry Investigators are granted the authority to investigate money laundering related to environmental and forestry crimes. In the future, the Ministry will continue to seek settlement of forestry cases by imposing predicate crimes and crimes related to money laundering.

7.2. Law Enforcement and Deforestation

Protection of forests from deforestation is one of the key actions for the success of FOLU Net Sinks by 2030. In the context of NDCs and net sinks, high-risk forest protecting activities are carried out through forest protection and law enforcement actions. Law enforcement actions to reduce deforestation are focused on land fires, activities without forestry license, and illegal logging. Law enforcement measures are carried out through the supervision of business permits and monitoring the application of legal instruments. Preventive measures are taken by developing a daily monitoring system, integrated patrols, regular supervision for licensed activities, and forest protection and prevention operations for illegal activities.

Law Enforcement for Illegal Logging and Unlicensed Business

Criminals are subject to sanctions in the form of additional penalties and administrative fines. Law enforcement efforts to control deforestation driven by unlicensed business, illegal logging and civil lawsuits on environmental degradation can be seen in Table 7.1.

TABLE 7.1. Law Enforcement to Control Deforestation Caused by Unlicensed Business, Illegal Logging, and Environmental Degradation

NO	Crime Typology	Law Enforcement Instruments	Year							
			2015	2016	2017	2018	2019	2020	2021	TOTAL
1	Illegal Logging	Operation	25	39	88	172	163	124	70	681
		Criminal Cases	43	66	66	94	104	124	110	607
		Facilitation of Police and Prosecutors Cases	6	0	0	0	0	0	0	6
2	Unlicensed Business	Operation	27	18	137	217	101	89	84	673
		Criminal Cases	28	29	8	26	11	26	28	156
		Facilitation of Police and Prosecutors Cases	2	7	1	1	0	5	0	16
		Administrative Sanction	-	-	-	-	-	-	6	6
3	Environmental Degradation	Civil Lawsuit	0	7	6	9	13	6	0	41

SOURCE: KLHK, 2021

Struggling to extinguish fires in the peat areas.

LOCATION
Sebangau National Park, Central Kalimantan

PHOTO BY
Ismin Ikhwanur (2020)

Law Enforcement for Forest and Land Fires

Forest protection to achieve net zero emissions cannot be separated from the role of law enforcement as a key factor in handling forest and land fires. Law enforcement of forest and land fires is carried out to increase compliance culture and provide a deterrent for violators. The application of law enforcement instruments can be applied individually (partially) or jointly by prioritizing the principles of prudence, accuracy, justice, and transparency to provide a maximum deterrent. Furthermore, law enforcement for the prevention of forest and land fires is also carried out by involving multi-stakeholders and cross-investigation authorities through various laws, supervised by investigators.

Efforts to permanently prevent forest and land fires are carried out through both preemptive and preventive measures, and repressive measures. Prevention instruments are carried out to increase the culture of compliance of companies and individuals, and law enforcement instruments to create a deterrent effect.

Improvement of compliance culture is carried out firstly through intensive supervision. It is conducted by daily monitoring of hotspots in forest and non-forest areas and company concessions using forest and land fire monitoring system. The following step is the issuance of warning letters to concessionaires having hotspots within their permit area, and direct inspections to monitor the company's facilities, infrastructure, and fire prevention resources. This is followed by direct supervision and law enforcement actions if violations are repeated, and in the case of intentional violations, or when public complaints are made. By 2021, 244 forest and land fires-related supervisions of forestry and plantation companies were carried out by environmental inspectors.

By 2021, the Ministry of Environment and Forestry had issued 1,022 administrative sanctions for forest and land fires-related violation. The sanctions were applied to concessionaires indicated having hotspots within their area, companies that do not comply to forest and land fires regulations, and companies whose concessions are burned.

As targeted in the FOLU Net Sink operation plan, efforts to prevent forest and land fires through monitoring the compliance of business entities are fundamental to joint efforts to reduce emissions and control climate change from 2022 to 2030. Every year, companies located in high, very high and extremely high priority index area are targeted for surveillance. The location priority index indicates the urgency of the target location for compliance monitoring actions.

TABLE 7.2. Law Enforcement for Forest and Land Fires (2015–2021)

No	Sanction Type	Year							
		2015	2016	2017	2018	2019	2020	2021	TOTAL
1	Supervision of Companies	53	30	13	42	58	43	5	244
2	Administrative Sanctions	23	133	11	10	351	186	308	1,022
3	Civil Lawsuits	20	0	0	0	0	0	0	20
4	Criminal Cases	0	1	1	2	1	5	2	12
5	Facilitation of Police and Prosecutors Cases	31	26	9	5	10	7	7	95

SOURCE: Statistik Tahun 2021 Direktorat Jenderal Penegakan Hukum Lingkungan Hidup dan Kehutanan

Law enforcement can be targeted and forest and land fire incident can be significantly reduced. As a result, this system contributes to the emissions reduction from forest and land fires and to the achievement of net zero emissions target.

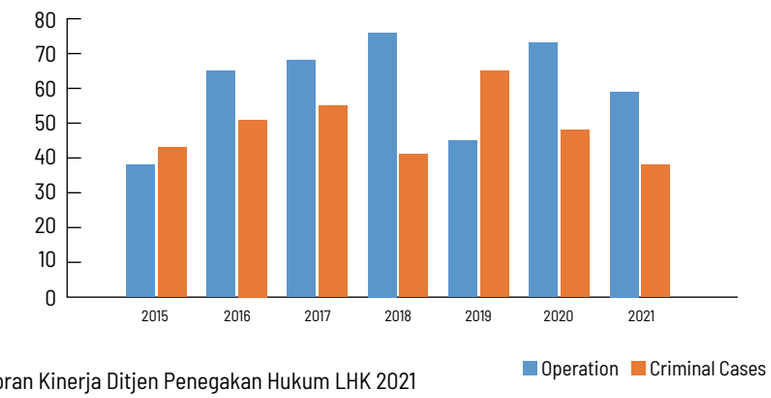
Violators of forest and land fires can also be subject to criminal sanctions in the form of imprisonment, fines, or additional penalties if the case meets the criminal elements. Investigations into forest and land fire crimes are carried out jointly by the Ministry of Environment and Forestry investigators, the National Police, and the Prosecutor's Office. The Ministry of Environment and Forestry actively facilitates investigators from the Indonesian National Police and the Attorney to solve forest and land fires cases. By 2022, the MoEF handled 107 cases of forest and land fires, including facilitation by the National Police and Prosecutors. On 6 May 2021, the Minister of Environment and Forestry, the National Police Chief, and the Attorney General issued a Joint Decree declaring that law enforcement on forest and land fires is carried out among the Police Investigators, Civil Investigators (PPNS), and Prosecutors at the central and regional levels. The decree emphasizes integrated law enforcement for forest and land fires cases. Twelve cases were successfully filed by the MoEF, and another 95 cases were handled by the police and the prosecutor's office.

Civil lawsuits against forest and land fires are also imposed to violators in order to restore the environment and compensate for losses due to forest and land fires. By 2021, out of 20 civil lawsuits pertaining to forest and land fires, nine lawsuits had permanent legal force (*inkracht van gewjisde*), with a total lawsuit value of USD 241.4 million. Companies continue to have absolute responsibility or strict liability as stipulated in the Environmental Law[31]. Proving the element of guilt of the plaintiff is not necessary as long as the efforts and/or its activities pose a serious threat to the environment. Therefore, corporation must assume responsibility if a fire occurs in their concession area, whether or not it was intentional. the principle of absolute responsibility has been consistently applied to forest and land fires-related cases. Table 7.2 shows the number and types of legal sanctions imposed by the Ministry of Environment and Forestry from 2015 to 2022.

7.3. Law Enforcement to Prevent Biodiversity Loss

Strict law enforcement is carried out to deter perpetrators of poaching and wildlife trafficking to preserve Indonesia's biodiversity. These efforts are carried out intensively, especially in the sites those crimes take place, in ports, and in the border areas. Preventive actions are carried out through routine patrols as well as tracking and operation of illicit trade of protected wild plants and animals (see Figure 7.2).

FIGURE 7.2. Law Enforcement on Illicit Trade of Protected Wild Plants and Animals



SOURCE: Laporan Kinerja Ditjen Penegakan Hukum LHK 2021

From 2015 to 2021, tracking and operations of illegal wildlife circulations had been carried out 424 times, and it continues to increase every year. Meanwhile the number wildlife trafficking-related crime cases remains relatively the same.

Biodiversity protection is carried out through criminal law enforcement to create a deterrent in order to achieve a healthy living environment and sustainable forests. Applying criminal law is part of a repressive effort to take action against crimes and violations. The operational findings that meet the criminal element are followed up with criminal law enforcement. Forest-related criminal law enforcement is carried out in an integrated manner starting from the stages of an investigation, prosecution, examination in court, and execution of court decisions. The criminal law applied in the forestry sector is not only imprisonment and fines but also additional penalties, particularly liability to restore the degraded environment. The Ministry of Environment and Forestry investigators have strengthened the measures to enforce criminal law against forestry crimes through joint investigation carried out together with the Prosecutor's Office. Through a number of aforementioned prevention and law enforcement actions, the biodiversity loss can be significantly reduced.

Crimes in the illegal wildlife trade have now involved online media which therefore making this crime transnational and organized crime. According to the data of 2018-2021, there was 4,463 illegal wildlife trade content found in ten e-commerce platforms in 32 provinces across the country. There were 8,423 wildlife species illegally traded.

Indonesia has prosecuted of no less than 178 arrest operations, 231 perpetrators, and 148 cases have received permanent sentences (verdicts).

The Indonesian government's actions to combat illegal wildlife trade online, include:

- the establishment of cyber patrol units under the Directorate General of Law Enforcement of the Ministry of Environment and Forestry;
- collaboration with the Indonesian Association marketplace (e-commerce);
- collaboration with the Ministry of Information to take down accounts that trade illegally on wildlife;
- strengthening regulations and prohibition of illegal online purchasing and selling of wildlife, as well as the imposition of punitive sanctions according to laws and regulations.

Never Give Up! Crossing rough terrain protecting forest line.

LOCATION
Central Kalimantan

PHOTO BY
Heriyanto (2022)

CHAPTER 8

Towards the Indonesia's FOLU Net Sink 2030

For more than seven years, corrective measures have been pursued, designed, and adopted for better governance of natural resources and the environment in Indonesia, based on scientific principles and the perspective of state politics. Ever since 2014, there have been significant changes in managing the environment and forests, taking into account the development and dynamics of government, political condition, and alignment with public and community interests and perspectives (Ministry of Environment and Forestry, 2020a).

The government serves as a negotiating node for various interests and aspirations. In government practice, the changes are reflected in policy and decision-making. Policy development and decision-making are generally influenced by legal, political, traditional, practical, and scientific factors (Hill & Varone, 2021).

In accommodating and articulating various interests, many technical, socio-economic, political, local, national, and global challenges are faced. It is not easy to make changes with these various contexts. However, the changes could be carried out properly found on a solid scientific basis, including actions to improve communities' welfares in and around the forest.

Scenic morning view of a river

LOCATION
Katingan, Central Kalimantan

PHOTO BY
Ismin Ikhwanur (2019)

The Indonesia's FOLU Net Sink 2030 affirms mitigation actions that shows the ambitious commitment to the net zero emissions target through more structured and systematic approaches so that the country can realize its NDC commitments. In this sense, Indonesia's FOLU Net Sink 2030 constitutes an innovation of strengthening environmental and forestry governance. The policy has been conceptualized and developed based on the robust theoretical and scientific knowledge, including good environmental and forestry governance.

Good governance is reflected by appropriate policies that encompass: (1) public campaigns, (2) economic arrangements, and (3) environmental regulations. Environmental policies are directed at maintaining and improving the quality of human life, which is indicated by the fulfillment of the following needs: (1) Basic: food, water, housing, and energy; (2) information, education, and training; (3) recreation and culture; (4) freedom (political, individual, participation, free from criminalization or persecution); (5) access or goods and services circulation; (6) sufficient and fair income; (7) job opportunities; (8) physical and mental health; and (9) beauty/aesthetics (place, space, object). In this case, the role of the government is to ensure the existence of (1) stability and governmental order, (2) access to material welfare, (3) citizenship, and (4) the development of democracy.

Buaya sepit or Senyulong crocodile (*Tomistoma schlegelii*)

LOCATION
Tanjung Puting National Park, Central Kalimantan

PHOTO BY
Efan Ekananta (2015)

Environmental governance summarizes the rules, practices, policies, and institutions that shape how humans and the environment interact (UNEP, 2009). Environmental governance can be understood as interventions aimed at changing incentives, knowledge, institutions, decision-making, and behaviors related to the environment (Lemos & Agrawal, 2006). Good environmental governance notices the important roles of actors that have power to influence the environment, such as NGOs, civil society, businesses, and the government, and those with little power or influence such as marginalized groups. Collaboration and synergy are critical to achieving effective governance, which can help achieve a sustainable future.

Key principles in environmental governance include (1) coherent and interrelated decision-making and real actions at various levels (from central to regional and village levels); (2) the concept of territory and community, including the principles of interrelated economic and political systems; (3) the close relationship between communities and the ecosystems in which they live; and (4) a circular system, meaning recovery resources rather than depleting them perpetually.

Good forest governance includes the norms, processes, instruments, people, and organizations that control how humans interact with forests. One of the essential instruments of forestry governance is forestry planning. In principle, forestry planning is oriented to maintain the existing forests, and resolve forest uses-related conflicts. However, with the projected increase in demand for land from various sectors and the dynamics of development in Indonesia, forest areas are optimized to harmonize multi-sector needs to support national development. This measure is taken to ensure the continued existence and wellbeing of *Adat* communities and local communities that are dependent on forests, and to provide legal and business certainty in the forestry sector.

The effective extent of the forest area is proportionally designated to maintain the fulfillment of forested areas and state forest areas, as mandated in the forestry law. Determining the forest area takes into account spatial planning, environmental protection and management, national and regional development plans, disaster vulnerability, biophysical conditions, and the land rights of third parties including communities.

Indonesia's FOLU Net Sink 2030 is designed, propagated, and implemented based on this concept. For the first time in the history of forestry sector development, all programs in the environment and forestry sector carry the same indicator and unit of measurement-CO_2e. In the past, performance of the development or a program used various measurements including hectares, m^3, tons, and rupiah. Indonesia's FOLU Net Sink 2030 places a target of GHG emissions level of -140 MTon of CO_2e by 2030 for all activities carried out in the environment and forestry sector.

Indonesia's FOLU Net Sink 2030 uses three working modalities: Sustainable Forest Management, Environmental Governance, and Carbon Governance. Indonesia has continued to take a number of actions to provide enabling condition for Good Carbon Governance. Carbon governance and carbon trading procedures (carbon pricing/trading/cap and trade) have been being developed by the government, and supposed to be the future primary power. The procedures are made a priority to be completed immediately as one of the enabling conditions towards Indonesia's FOLU Net Sink 2030. However, there are still challenges in implementation due to the broad spectrum of stakeholders and the wide geographic area coverage that requires intensive vertical and horizontal coordination. This can be assisted by the use of remote sensing technology and high-resolution satellite imagery to leverage forest and land management for climate actions. Figure 8.1 shows how the Indonesia's FOLU Net Sink 2030 has been conceptualized and placed as the central paradigm shift in Indonesia's forest management.

FIGURE 8.1. The Conceptual Basis of Indonesia's FOLU Net Sink 2030

8.1. Challenges Towards the Indonesia's FOLU Net Sink 2030

Indonesia's FOLU Net Sink 2030 is a measure taken by the Government of Indonesia to achieve carbon neutrality through low carbon compatibility with the Paris Agreement (LCCP) scenario within the framework of the Long-term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050. However, several things must be considered in order to realize Indonesia's FOLU Net Sink 2030 targets (Bakar, 2022):

1. Safeguards to cope with failure in the LCCP scenario due to conditional and unconditional factors. Safeguard in Indonesia must remain consistent in following legally binding commitments (NDC), which shows its ambition to achieve the target under the LCCP scenario. The 1945 Constitution, with the mandate of Article 28H and Article 33, is the safeguard basis for Indonesia;
2. Cross-sectoral issues that will affect the Indonesia's FOLU Net Sink 2030 target. The emissions reduction targets in the FOLU sector often conflict with the target of biomass-based energy development, and food security that require extensive land availability.
3. The use of more detailed map scales in fieldwork;
4. Organize intensive fieldwork, taking into account the existence of stakeholders with their respective local wisdom, and the diversity Indonesia's geographical area;
5. Continuous efforts to adopt spatial and remote sensing technologies as working instruments to support cooperation developed between relevant work units such as central and local governments, state and non-state actors, and to align perceptions between parties based on compatible methodologies;
6. There have been changes in policies and work procedures to streamline the actualization of the principles of Sustainable Forest Management, Forest Governance, and Carbon Governance. However, there is still the possibility of institutional constraints, especially for implementers in the regions. This requires coherence within the rule base framework, which need to be addressed through learning by doing;
7. Funding availability is essential for the implementation of the Indonesia's FOLU Net Sink 2030, which is a key to achieving Indonesia's net zero emissions targets by 2060. Climate mitigation in the land-based sector can be financed by the State Budget (APBN), provincial/district/city Regional Budget (APBD), central and regional government partnerships, government and private partnerships, foreign/domestic grants, public-private partnerships, as well as other legal fund resources in accordance with laws and regulations. Blended finance including a market mechanism becomes also potential financing, as regulated in the Presidential Regulation on Carbon Pricing;
8. Decentralization of natural resources and the environment management continues to be dynamic. Therefore, the Indonesia's FOLU Net Sink 2030 will be influenced by the coherence of central and regional natural resource management policies, the development of policies on central-regional financial balance, and market decentralization;
9. As part of the global community, Indonesia will not be separated from the dynamics of global natural resource politics, which continues to evolve. For this reason, Indonesia needs diplomatic strength, innovative efforts, and determination in the policy direction of environmental and natural resource management, especially in the forestry sector. Indonesia also needs to generate convincing evidence of actual work as a manifestation of global commitments, which means "leading by example"; and
10. Continuous intellectual support is a necessity for the development of new policies and the discovery of methodologies. Academia and researchers are essential for Indonesia's progress in developing innovation and producing new policy breakthroughs. For this reason, cooperation and partnerships with academia are prerequisites. They need to be enabled in real terms to inform basic policies and new science-based policies.

8.2. Resource Mobilization Strategy Towards the Indonesia's FOLU Net Sink 2030

Mitigation actions in the FOLU sector towards a net sink in 2030 indicate the need for transformational change that requires support of domestic resources and international partnerships. Furthermore, the ambitious targets in the FOLU sector have implications for the financial sector to support economic growth, green recovery from the COVID-19 pandemic, and climate resilience in the principles of equitable development.

Indonesia initially estimated financing for the FOLU net sink 2030 based on the mitigation cost standard in the NDC roadmap document. This estimate shows that the total financing required to implement mitigation actions towards a net sink by 2030 is USD 16.5 billion. Forest protection to curb deforestation requires USD 7.6 billion, 34 percent of which is expected to be supported by the private sector, while the rest will be funded by the government and communities. Forest protection to reduce degradation requires financing of USD 3.2 billion, which is expected to come from the private sector. To attract private investment, the scheme of results-based payments for environmental services needs to be well developed as a commensurate compensation for the investment. Enrichment activities require funds of USD 42 million, with private sector contributions of 94 percent. Reduced Impact Logging (RIL) activities require funds of USD 52.9 million, all of which is expected to come from the private sector.

Rehabilitation with rotation requires USD 1.2 billion, 47 percent of which will be financed by the private sector. Rehabilitation without rotation requires USD 275 million, with the private sector's contribution of 24 percent. Furthermore, water management activities' output is predicted to far exceed the LTS target, with total financing contribution from the private sector of USD 21 million. Peatland restoration requires total financing of USD 827 million, with a contribution from the private sector of around 16 percent.

Currently, most of the financing for mitigation actions is still borne by the state budget (APBN), which is far from sufficient. However, Indonesia has developed several policies that open up opportunities to expand financial sources, both from national and international sources, as well as from the private sector and the general public. Furthermore, Indonesia continues to mobilize international financial resources, optimizing bilateral, regional, and multilateral channels, including results-based payments for REDD+ under the Paris Agreement, grants, and other potential sources and mechanisms.

As stated in the LTS-LCCR document, the most ambitious scenario of LTS-LCCP is estimated to result in an annual growth of national investment of 4.13 percent with a total investment of USD 5 million in 2050, followed by an increase in green jobs (The Republic of Indonesia, 2021). However, if the FOLU sector's commitment to net sink by 2030 is not supported by adequate funding, mitigation actions will be hampered, increasing the risk of the FOLU sector to enter "a locked-in" condition, which will require much greater funding to restore damaged and severely degraded ecosystems. Indonesia's ambition stipulated in the LTS LCCP scenario is not likely to be achieved without the support from various parties, both national and international.

By using the mitigation action cost standard for FOLU sector listed in the NDC implementation roadmap document (Ministry of Environment and Forestry, 2019), the total costs required for LTS-LCCP mitigation activities towards net sinks from 2020 to 2030 are projected to be USD 14 billion (USD 1.27 billion per year). However, the total cost is still far above the availability of funds (deficit). According to the budget tagging of financing for mitigation action from 2020 to 2024 as stated in the medium-term national development plan (RPJMN), USD 1.3 billion or

USD 270 million per year is budgeted (KLHK, 2021). Therefore, there is still financing gap of up to USD 1 billion per year.

Several blended financing scenarios and policies have been carried out to obtain optimum results. For example, in addition to the state and regional budget, financing may come from private funds in the form of private partnership programs and CSR, as well as funds from mining corporation which has an obligation to rehabilitate degraded watersheds.

Other forms of financing that have taken place so far include collaborative activities between communities and the private sector for tree planting, including by community groups, as well as in the form of tree adoption. Other obligations imposed to land-based business entities are developing and maintaining protected areas and operating technical steps to reduce deforestation through reduced-impact logging and site silviculture that will grow endemic hardwood species.

The issuance of the presidential regulation[30] marks the development of regulation and recognition of carbon pricing. Thus, community initiatives, businesses, and community groups can take advantage of the economic value of carbon through tree planting. Later, the carbon economic value generated from the planted trees will be calculated using the Result-Based Payment scheme and the income distribution system developed by the Ministry of Environment and Forestry. Other financial support comes from international funds such as the World Bank, the German Government, the European Union, ASEAN, and others distributed through technical cooperation such as mangrove management and peatland management programs, as well as Social Forestry programs.

Financing the FOLU Net Sink 2030 target requires a comprehensive strategy, starting from increasing the diversification of funding sources, increasing the capacity of financial institutions, to increasing the capacity of stakeholders to access funding.

Identification of funding sources for the implementation of forest sector mitigation actions for 2021-2030 results in an estimated allocation of funding responsibilities, where 45 percent of the total financing required will be provided by the government, and 55 percent is expected to be borne by the private sector (KLHK, 2021). The funding distributed by the government are from optimized state budget (APBN) through (1) green Sukuk instruments and the domestic carbon market; (2) ecological fiscal transfers; (3) optimization of funding at the regional level through the Regional Original Revenue (PAD) instrument and regional green bonds; and (4) optimization of the Result-Based Payment scheme for REDD+. Funding from the private sector will be directed to several instruments including investments, grants, green bonds, loans, private equity, Corporate Social Responsibility (CSR), etc.

The Indonesian Government has a good track record in attracting investment of USD 1.25 billion through the green Sukuk /green bond scheme in 2018. Although the green bond market has developed rapidly at the international level, the implementation of green bond markets in developing countries still requires evaluation at an early stage for the technical process of its implementation. These considerations include the definition of asset classes, setting standards, structuring transactions, and efforts to attract investors. In addition to green bonds, intergovernmental fiscal transfer instruments that are reformed based on ecological parameters can also be optimized.

The Indonesian government is currently developing the domestic carbon market, which will be directed through levy and tax schemes as well as the mechanisms regulated in the presidential regulation on carbon pricing. Compared to funding sources from the Government, private financing for mitigation actions in the forestry sector is rather limited and still dominated by commercial activities including the utilization of forest products. However, the lack of private contribution may also be caused by the unavailability of financing information from the private sector due to an unintegrated data collection system, despite the fact that many potential schemes can be used to involve the private sector (equity, private debt, CSR, green bonds, insurance, microcredit, etc.). An option that can be considered is a guarantee scheme that is designed to bear the risk and to encourage private investment related to climate change in the forestry sector.

Funding managed by the Environmental Fund Management Agency (BPDLH) is also a potential funding alternative, given the potential for BPDLH support in efforts to build better environment through small grants, investment, and capacity-building schemes for the community and for government officials. At this time, BPDLH has completed the stages for determining the funding channeling institution.

In addition to private and government financing sources, exploration of other potential sources must also be carried out, for example, Payment for Ecosystem Services (PES) which has been widely explored in various studies. Protection of ecosystems with important regulatory services, supported by policies from the central and local governments, can be used as the basis for determining payments from PES schemes. However, in identifying other funding sources, it is necessary to conduct a feasibility analysis regarding the potential for funding and the available funds that will be closely related to the potential for sustainability.

Regarding capacity building, Indonesia has a long history of international cooperation for capacity building in the forestry sector. There has been an increasing trend in forest and climate-related capacity-building programs over the past 20 years, not only as stand-alone programs but also as part of a wider scope of collaboration. International support for capacity building under the Paris Agreement and forest-related conventions will continue to be mobilized to support the achievement of the 2030 FOLU net sink.

Research will play an essential role in supporting the implementation of the Indonesia's FOLU net sink 2030. Indonesia will strengthen research collaboration between domestic and national institutions and international partners. In technology development, Indonesia will increase the role of endogenous technology and seek opportunities for technological cooperation within the framework of technology development and transfer, as a manifestation of the Paris Agreement.

[30] Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Pricing to Achieve the Nationally Determined Contribution Target and Control Over Greenhouse Gas Emissions in the National Development

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About the Editors

Editor-in-Chief

PROF. DR. SITI NURBAYA obtained her PhD in Environmental Science in 1998 from a joint program between IPB University and Siegen University, Germany. In 2022, Brawijaya University awarded her an Honorary Professor in Natural Resources Management Science recognizing her excellent works in environmental and forestry governance during her tenure in the Ministry of Environment and Forestry where she always uses scientific bases for making decisions, formulating policies, negotiating Indonesia's interests in international fora, as well as delivering lectures in universities. She is now promoting a shift in the paradigm of Indonesia's forest management through the agenda of Forestry and Other Land Use (FOLU) Net Sink 2030. For such agenda, she promotes forest, environmental and carbon governance.

She began her career as a government officer at Lampung Provincial Government in 1981 and a few years later was appointed as the Deputy Head of Provincial Development Planning Agency. In 1998 she was transferred to Jakarta, assigned as the Director of Planning Bureau in the Ministry of Home Affairs, and in 2001 was promoted as the Secretary General of the Ministry. Her career then continued as Secretary General of the Regional Representative Council of the Republic of Indonesia (Indonesian Senate) for the period 2006-2013. She was also the first Secretary General of the Council.

In October 2014, President Joko Widodo appointed her to join the Government Cabinet, to serve as the Minister for Environment and Forestry, a consolidated portfolio from the two previously Ministry of Forestry and Ministry of Environment, housing more than 16,000 national civil servants. For the second period of the Joko Widodo Administrative Government, she was again entrusted to serve as the Minister for Environment and Forestry in October 2019. The Ministry also serves as the focal point for climate change, biodiversity and other forestry and environmental issues.

Managing Editor

DR. EFRANSJAH was born in Lima Puluh, Asahan, Sumatera Utara in 1956. He has more than 35 years of experience working with government, international organizations, including the United Nations, and civil society. After graduating from the Faculty of Forestry in Bogor Agricultural University (IPB) in 1980, he pursued higher learning in France under government fellowship and obtained a Master and Doctoral degree in Sciences du Bois from Universite de Nancy 1, in 1988. He started his career with the Ministry of Forestry in Jakarta in 1980.

Efransjah was appointed as the CEO of WWF Indonesia for two terms from 2010 to 2016. Prior to this, he served as Regional Coordinator for Southeast and Middle Asia for CIFOR, an international forestry research organization based in Bogor.

For more than six years he was in Kuala Lumpur (2002-2008), serving as the Chief Technical Advisor for UNDP's GEF large initiative for conservation of peat swamp forests in Pahang, Sarawak and Sabah. He was also based in Yokohama, Japan for 10 years working as the Projects Manager for Asia and Pacific in the International Tropical Timber Organization (ITTO) from 1993 to 2002. He is currently serving as a Senior Advisor to the Minister of Environment and Forestry (starting in 2016, until the present).

The black water of the peat swamp forest reflects the beauty of a clear sky.

LOCATION
Sebangau, Central Kalimantan

PHOTO BY
Hidayat Turrahman (2020)

Ministry of Environment and Forestry
Republic of Indonesia