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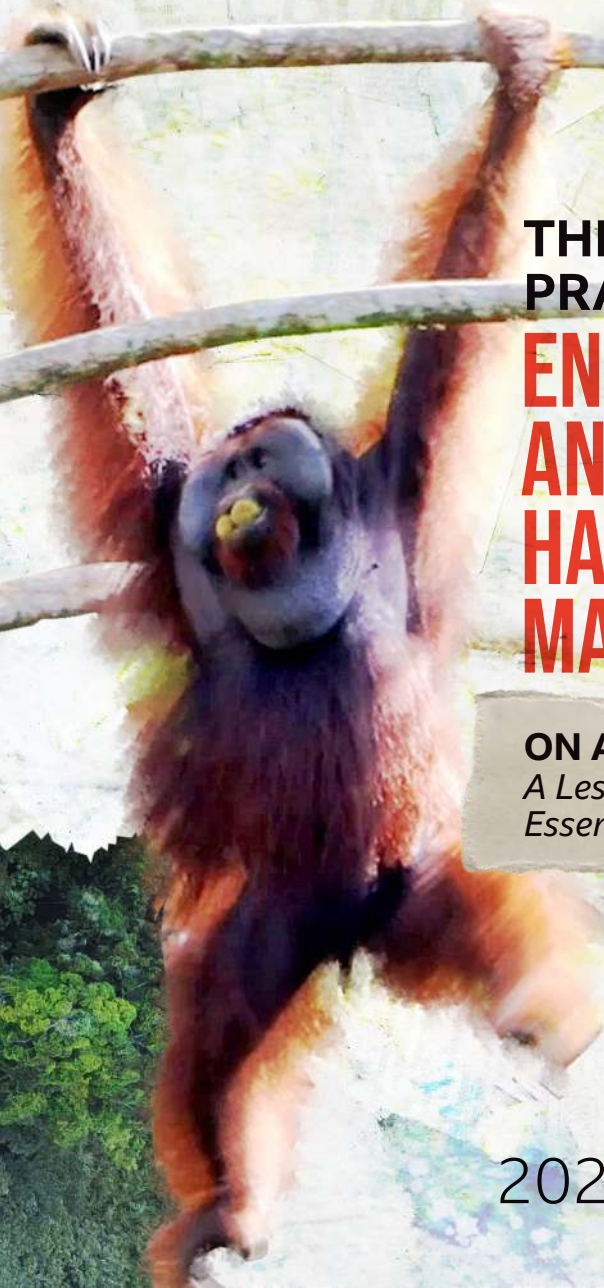
For Sustainable Indonesia



THE BEST PRACTICES FOR ENDANGERED ANIMAL HABITAT MANAGEMENT

ON A LANDSCAPE SCALE

A Lesson from the Wehea-Kelay Essential Ecosystem Areas

2021

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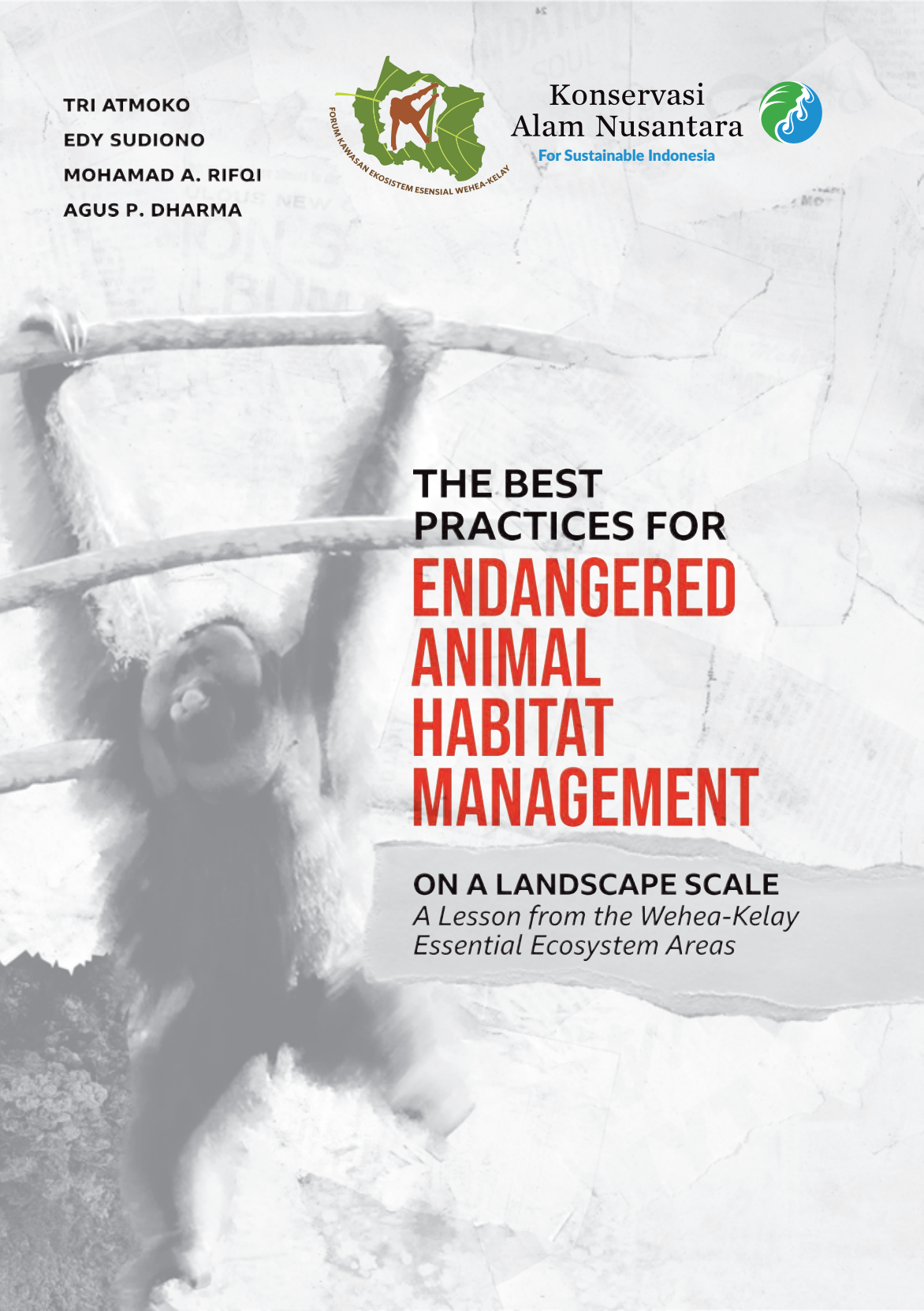

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The Best Practices for Endangered Animal Habitat Management on a Landscape Scale: A Lesson from the Wehea-Kelay Essential Ecosystem Area

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FOREWORD
BY THE GOVERNOR OF EAST KALIMANTAN

The high biodiversity potential in Indonesia, especially in East Kalimantan, is a priceless gift. Some play fundamental roles in people's livelihoods, ecosystem balance, food sources, medicines, and aesthetic values. Among ways of biodiversity management practices, one has been persistently shown by actors involved in the Wehea-Kelay Landscape management, thereby accelerating many valuable lessons culminating in this book.

The book entitled "The Best Practices for Endangered Animal Habitat Management on a Landscape Scale: A Lesson from the Wehea-Kelay Essential Ecosystem Area" demonstrates a robust scientific consideration combined with the uniqueness of the attributes and characteristics found at the site level. It results in collaborative nature conservation management and a tangible impact on the community and the surrounding environment.

I have high expectations for this book, and I highly recommend it to any audience in particular for those who have an interest in learning and developing integrated conservation practices with important supporting elements. Regardless of the issue, be it the preservation of wildlife, mangroves, water, and other things, it is necessary to constantly emphasize the community's social, economic, and cultural values. From where I'm standing, there is no absolute formula for sustainable natural resource management in Indonesia's diverse regions. However, one good example can inspire others and lead to another good thing.

I want to congratulate and appreciate the publication of this book. I hope that this book can be helpful for the nature of Indonesia and enrich knowledge for the Indonesian people.

Samarinda, May 2021

Signed and sealed

Dr. Ir. H. Isran Noor, M.Si.
Governor of East Kalimantan

FOREWORD

BY THE EXECUTIVE DIRECTOR OF YAYASAN KONSERVASI ALAM NUSANTARA

Management of Essential Ecosystem Areas (KEE) is a necessity, considering that most forest areas with high biodiversity are outside areas officially protected by the government. The areas are generally a diverse landscape and managed by various parties, so as a consequence, their natural resources can only be utilized and managed sustainably if the parties are willing and committed to working together.

The Wehea-Kelay Landscape in East Kalimantan Province is one of the Essential Ecosystem Areas (KEE) with the criteria above. Within the 532,143-hectare area, there are timber forest product management companies, industrial forest plantation companies, oil palm plantations, protected forests, indigenous peoples whose lives depend on forests, and 1,200 individual Bornean orangutans that need to be preserved from extinction. How can an area with the complexity of physical, interest, socio-cultural, and many other factors be able to embrace all parties through an inclusive process so that they can live together in harmony to achieve a larger goal that transcends individual interests?

This invaluable book outlines various theories and concepts relevant to landscape-scale ecosystem management. These theories and concepts provide the basis for determining management principles. In addition, this book also “grounds” these theories and concepts in the Wehea-Kelay Landscape and goes on to offer a general framework that can be adapted and used elsewhere.

We want to thank the government, companies, and local community of Wehea for their cooperation and achievements in protecting and managing orangutan habitats and maintaining the integrity of the ecosystem in the Wehea-Kelay Landscape. Congratulations and thanks to the team of writers, reviewers, and all parties who have worked hard to record the process and write this book.

We believe this book will be helpful and inspiring for practitioners who face the complex challenges of promoting the sustainable management of Essential Ecosystem Areas (KEE) and other landscapes. We also believe this book will enrich the knowledge and strengthen collaborative nature conservation actions to realize a Sustainable Indonesia.

Jakarta, May 2021

Herlina Hartanto, Ph.D.
The Chairman of Yayasan Konservasi Alam Nusantara

FOREWORD

Indonesia is well-known for its tropical forests, despite that there has been a lot of forest conversion. This condition not only reduces the existing forest area but also threatens the preservation of various wild animals. Without wildlife, the forest would be quiet, with no birds chirping, the sound of orangutans, or the duet of gibbons with their partners. Various efforts have been made to protect animals and their habitats, starting by publishing a list of protected animal species to determining multiple conservation areas. However, the present official conservation areas is considered insufficient compared to the vast richness of species and ecosystems. Many forest areas harboring a wealth of flora and fauna are located outside the conservation area. This area also needs to be protected and conserved.

The concept of Essential Ecosystem Areas (KEE) is like a breath of fresh air to the efforts of preserving biodiversity outside of conservation areas. KEE management has been initiated a lot, but some of them have not run as expected. Long before the KEE concept was widely discussed, The Nature Conservancy Indonesia and other parties had initiated collaborative management of the Wehea-Kelay Landscape in East Kalimantan. The management has been agreed since upon 2015 by the parties consisting of the government, the private sector, the community, and non-governmental organizations. To date, the activities of the KEE Wehea-Kelay Forum have produced various important outcomes in area management.

This book was written based on experiences during the initiation, planning, and implementation of the KEE Wehea-Kelay management. Various developments during the area management are very dynamic, so the concept of Best Management Practice (BMP) is always applied in collaborative management. We hope this book will become a reference source in managing landscape-scale areas elsewhere. The concepts described in this book are not fully applicable in other locations, therefore adjustments are needed to suit local conditions.

With many shortcomings in this book, we appreciate any suggestions and input from experts, practitioners, and conservationists to improve this book. In conclusion, we expect this book will be useful for others to use.

Samarinda, May 2021

Team of Writers

EXECUTIVE SUMMARY

The implementation of nature conservation in Indonesia must be carried out collaboratively by considering the impact of landscape-scale conservation. Collaboration for nature conservation requires support, cooperation, and contribution from all parties, including the community, government, university, private sector, and non-governmental organizations. It aims to protect biodiversity in a more integrated manner at the level of genetic diversity, species, and ecosystems. This effort should not be applied only to the conservation areas as there are still many important areas for biodiversity outside conservation areas that are not yet protected. Areas covered by forests with high biodiversity value can maintain important ecosystem functions and support the existing conservation areas.

There is a scientific basis explaining that nature conservation should be carried out on a landscape scale, especially in managing the habitats of endangered animals and keystone animals, which are the focus of the management. The best management practices discussed in this book are based on lessons learned from collaborative management of the Wehea-Kelay Essential Ecosystem Area. For it to be a reference that can be adapted elsewhere, it must be supported by a strong theoretical foundation. In addition, this management requires processes that must be carried out in stages. In general, there are six points that can serve as guidelines for managing the landscape-scale area described in this book.

The guidance is equipped with several tools to ease each stage of management. The tools provided are related to the stages of identifying the ecosystem's potential, rapid assessment of landscape delineation, identification of stakeholders and potentials for biodiversity, examples of a collaborative management process, gap analysis, and shared action plan preparations.

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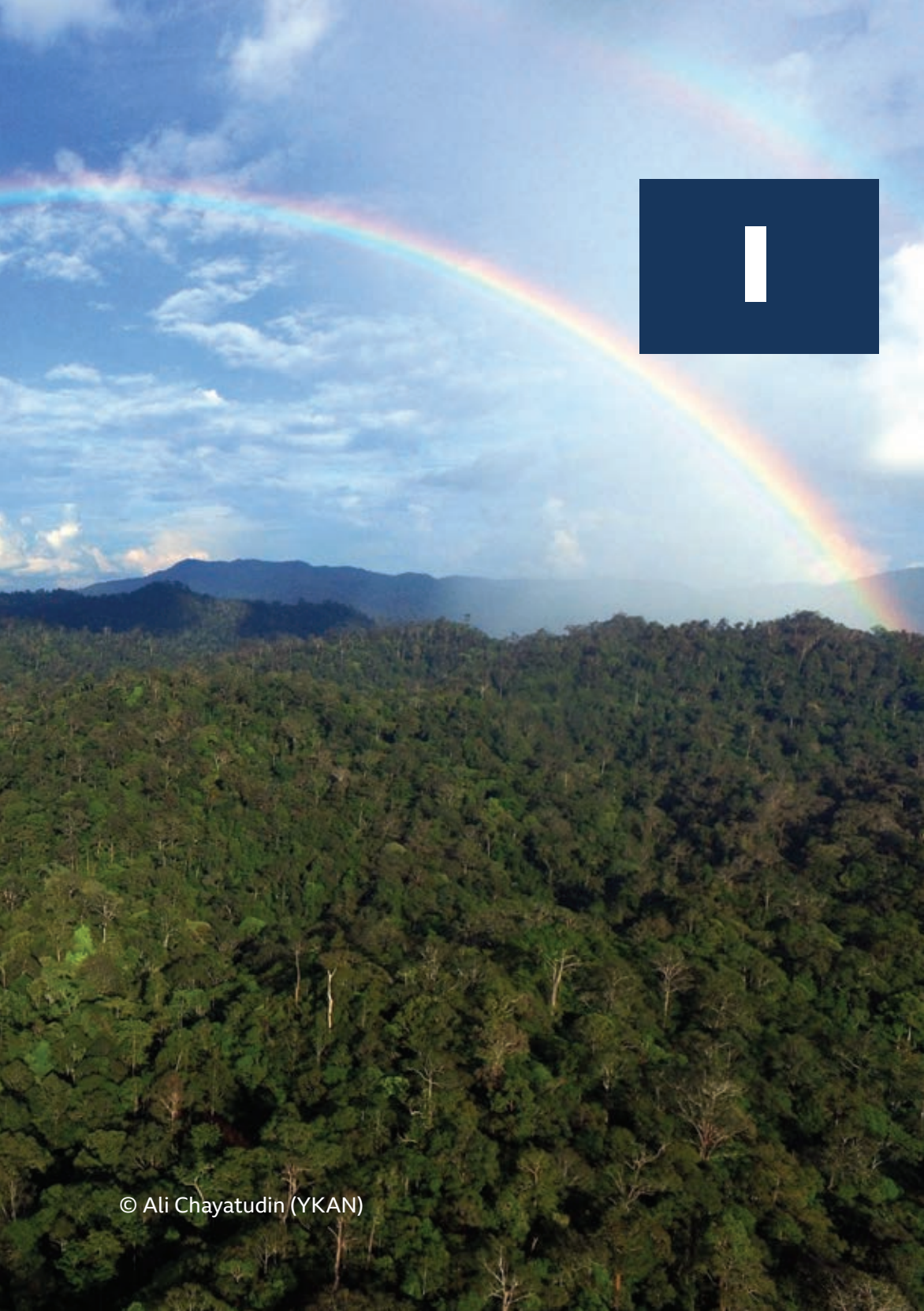

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INTRODUCTION

Indonesia has a total land area of more than 1.9 million km2 (Prayogi et al., 2019), which includes two biogeographical faunas of Asia and Australasia, and between the two is the Wallacea region. This condition makes Indonesia one of the countries with high biodiversity worldwide. It is also supported by the existence of tropical rain forests, which are home to various existing biodiversity. Although it only has a land area of about 1.3% of the world's total land area, Indonesia has a very high diversity of plant (flora) and animal (fauna) species (Widjaja et al., 2016).

Indonesia's flora wealth is estimated to be around 25% of the world's flowering plants, with a number of species reaching 20,000 species and 40% of them being endemic plants (Kusmana and Hikmat, 2015). Indonesia's fauna consist of 720 species of mammals (13% of the world's species), 1,605 birds (16% of the world's species), 723 reptiles (8% of the world's species), 385 amphibians (6% of the world's species), 1,900 butterflies (10% of the world's total species), and 1,500 dragonflies (23% of the world's total species) (Darajati et al., 2016).

Four main factors influence the high biodiversity in Indonesia. *First*, Indonesia is the world's fourth largest archipelagic country, covering an area of 8 million km^2. *Second*, Indonesia is an archipelagic country that is far apart by waters, encouraging the process of speciation (species formation). *Third*, Indonesia is located between two biogeographical regions, namely Indo-

Malaya in the west and Australasia in the east, which makes the characteristics of flora and fauna a combination of the two regions. *Fourth*, Indonesia has various ecosystems from the coast to the mountains, estimated to reach 19 ecosystems (Kartawinata, 2013).

Forest ecosystem takes a significant role in attributing to Indonesia's rich biodiversity. Therefore, the forest is critical for preserving this biological wealth. An area of 1.2 million km2 of the Indonesian land area consists of forest, while the rest is designated as other use areas (APL). About 43% of these forest areas (518 thousand km^2) are conservation and protected forests, plus 53 thousand km^2 of marine conservation areas (Efransjah et al., 2018).

Efforts to protect biodiversity have been carried out by the Indonesian government by establishing 554 units of conservation areas covering 271 thousand km^2, which consists of Sanctuary Reserves (Nature Reserves and Wildlife Sanctuary) and Nature Conservation Areas (National Parks, Nature Recreation Parks, and Grand Forest Parks) (Dirjen KSDAE, 2020). The conservation area represents various types of ecosystems, from marine ecosystems to the snowy mountains at the top of Lorentz National Park.

However, these conservation areas are considered insufficient to protect biodiversity in Indonesia since it is estimated that around 80% of important biodiversity at the gene, species, and ecosystem levels are still located outside the conservation area (Perdirjen KSDAE, 2016). Biodiversity protection should not only focus on conservation areas, but also on supporting areas around them and areas with ecological importance. Ecosystems are home to biodiversity at the gene and species levels. Thus, it is necessary to identify and protect these important areas as essential ecosystem areas. Ecosystem protection must be carried out on a landscape scale with a sufficient and intact area. Some animal species live in several ecosystems as their habitat (multi-

habitat), so connectivity within and between ecosystems and habitats must be maintained appropriately.

Unfortunately, most essential ecosystem areas have been converted into areas with numerous usages and management units. It causes the ecosystem fragmentation of animals' habitats into several smaller patches. As a result, many wildlife populations are isolated and separated from other populations, as consequence, gene migration is no longer occurring. Breeding pairs that appear randomly in the population are limited and the potential for inbreeding turns high. High potential inbreeding brings together two recessive genes that are generally negative to be expressed. These detrimental traits will appear in many individuals and weaken the fitness, which makes them vulnerable to extinction.

It is important to manage wildlife habitat ecosystems on a landscape scale. Despite being divided into management units, the landscape can still be a suitable habitat for biodiversity by aligning the vision and mission through various conformable environmental conservation programs and activities. Protecting biodiversity on a landscape scale, in addition to increasing the number and size of protected areas, will facilitate corridors connecting high conservation value areas with protected areas or nearby conservation areas.

The area complexity in a landscape scale requires a well-planned and targeted management strategy. It is important to equalize the vision and mission of stakeholders in the landscape area at early stages. An adaptive approach needs to be taken so that the objectives of landscape-scale collaborative management align with each management unit's core business.

This book contains experiences and lessons learned in managing the habitat of endangered animals on a landscape scale outside the conservation areas. This book focuses on the theoretical

approach and scientific-based data which works as a scientific reference for implementation in the field. It is in line with the conservation area management fundamentals stated by the Directorate General of Nature Resources and Ecosystem Conservation , i.e., 1) Evidence-based data, characterised by a valid information obtained from field events, 2) Scientific-based data, characterised by the correct data collection method and proper analysis built on scientific reference, and 3) Application of high technology to find the actual value of genetic resources for humanity (Wiratno, 2018).

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BIODIVERSITY CONSERVATION OUTSIDE THE CONSERVATION AREA

A. Biodiversity Conservation

Biodiversity conservation is carried out in three stages: genetic, species and ecosystem levels. Among the conservation efforts are managements at those three levels.

1) Genetic-Based Conservation

Genetic-based biodiversity means genetic variation within a species, which can be among individuals in one population or among populations that are geographically separated (Indrawan et al., 2012). Genetic diversity allows species to adapt, survive, maintain reproductive rates, and resist disease. Conservation at the genetic level is very important in supporting breeding activities for domesticated species to improve the quality of specific characteristics.

For example, the genetic conservation of banteng (*Bos javanicus*) will likely improve the genetic quality of several types of domesticated cattle. The physical characteristics of the banteng are similar to Bali cattle and they are even believed to be the elders of the cattle race. It makes banteng have a great potential to increase genetic diversity in Bali cattle through backcross (breeding Bali cattle with Javan banteng) (Qiptiyah et al., 2020).

2) Species-Based Conservation

Conservation at the species level can be carried out in three focuses: umbrella species, flagship species, and keystone species. Species-based conservation is carried out to preserve endangered species that have an important role in the ecosystem. Efforts to protect species can also maintain ecosystem stability and habitat regeneration. Several terms are used in species conservation, including keystone, umbrella, and flagship species.

- *Flagship Species*

  Flagship species are the most popular and charismatic species that function as symbols to raise public awareness or financial support for conservation (Barua et al., 2012). Generally, flagship species are chosen because these species have more value, such as cute, rare, unique, memorable, endemic, or large animals (Shekelle and Leksono, 2004). The flagship species may be a key species or an umbrella species.

  Some of the species included as flagship species in Indonesia are orangutans, tigers, rhinos, elephants, tarsiers, and Javan hawk-eagles. Orangutan, for example, is a flagship species for several reasons. Orangutans are the only non-human primates of the great ape living on the Asian continent. Orangutans are morphologically similar to humans and taxonomically close to humans. This fact gives it a unique appeal and attraction related to science. In addition, the large morphology of the orangutans, with its reddish-brown color that contrasts with the forest leaves in its habitat, makes it more attractive.

- Umbrella Species
  Umbrella species are related to strategies in area management and habitat development. It means that if we protect umbrella species, the existence of other species will also be covered. Therefore, the selection of umbrella species is based on the requirements of its life, which tends to be higher and broader than other species that occupy the same habitat. Orangutans can also be umbrella species because they require an extensive home range. These large bodies require relatively large and various amounts of feed and their arboreal movement requires an interconnected forest canopy (Kepmen LHK, 2019).

- Keystone Species
  Keystone species are species in their habitats that have the most important role in the ecosystem in terms of structure, function, and productivity. The loss of keystone species from the ecosystem will cause drastic changes and lead to the extinction of other species. Large predatory species such as tigers and leopards are usually keystone species in the ecosystem. If the predatory animals disappear, the herbivore population will increase dramatically so that these animals will exploit forage sources on a large scale. As a result, habitat quality decreases, and the ecological balance will be disturbed, which will damage the ecosystem.

  For several reasons, orangutans can also be categorized as keystone species in maintaining the regeneration of lowland forests. *First*, orangutans are seed dispersers of fruit trees in the forest. Orangutans are frugivores that will spread the seeds of the fruit

they eat away from the mother tree through their droppings. Second, orangutans build nests every day by bending and breaking tree branches. This behavior has the potential to open the tree canopy so that the seedlings on the forest floor get enough sunlight to grow and develop properly.

3) Ecosystem-Based Conservation

An ecosystem is where the living things (biotic) and physical environmental factors (abiotic) interact to a certain extent. Various components comprise an ecosystem, including plants, animals, soil, water, air, rocks, and energy cycles. In an ecosystem, interactions also happen between living things that form a food web, which is a series of processes of eating and being eaten (food chain) to maintain their survival. An ecosystem has its own uniqueness that can be distinguished from one another. Some examples of ecosystems are swamps, mangroves, rivers, savannas, beaches, rainforests, lowlands, and mountain forests.

B. Landscape-Scale Management

Wildlife management is basically ecosystem management using ecological principles as the basic concept (Alikodra, 2002). Ecosystem-based conservation can simultaneously protect species and genetic populations of individuals. However, many types of animals use more than one ecosystem to live. Thus, it is necessary to protect several ecosystems at once on a broader gradient in the landscape scale.

Ecosystem management needs to be carried out through an integrated approach by considering the ecological, socio-cultural, policy, and economic aspects. More broadly, biodiversity management is not only limited to one ecosystem but also includes several ecosystems that are incorporated into one spatial landscape.

C. Spatial Policy for Nature Conservation

Government Regulation Number 13 of 2017 regulates policies and strategies for developing spatial patterns in Indonesia (PP, 2017). One of them is the policy and strategy for developing, utilizing, and managing protected areas. The policy aims to preserve environmental functions and prevent the negative impacts of human activities that can cause environmental damage. The protected areas mentioned include land, sea, air, and other spaces inside the earth. The government designates different protected areas for each large island in Indonesia adjusted to its ecosystem's conditions, characteristics, functions, and proportional distribution. Sumatra and Sulawesi have a protected area of at least 40% of the island area. Meanwhile, Java-Bali, Maluku, and Nusa Tenggara have at least 30% of the island area, Kalimantan has at least 45% of the island area, and Papua is at least 70% of the island area.

The local government regulates spatial planning at the regional level. For example, in East Kalimantan, spatial planning is determined based on the Regional Regulation of East Kalimantan Number 1 of 2016. Spatial planning aims for equitable and sustainable green economic growth based on agro-industry and environmentally friendly energy. Based on this regulation, the protected areas in East Kalimantan are around 1.8 million hectares or about 11% of the total area. The protected area is considered insufficient to protect most of the existing biodiversity and ecosystems. There are still many areas with high conservation value (KBKT) and essential ecosystems that are important for protecting existing biodiversity. In addition, essential ecosystems can become corridors for the movement of animals between existing protected forests.

One of the local government's initiatives to increase the percentage of protected areas is establishing an indicative map of an essential ecosystem area of 2.7 million hectares in East Kalimantan based on Governor Regulation of East Kalimantan

Number 522.5/K.672/2020. The regulation has mapped two existing Essential Ecosystem Areas (KEE), namely the Wehea-Kelay and the Mensangat-Suwi. The other twelve Essential Ecosystem Areas are still on the indicative map. The twelve indicative Essential Ecosystem Areas are the Berau delta, Sangkulirang Mangkalihat Hulu Karst, Coastal Mangkalihat Karst, Sangkulirang Gulf, Long Pahangai, Mahakam dolphin habitat, Sumatran rhino habitat, Mahakam delta, Balikpapan Gulf, Mount Beratus, Paser-Taman Biodiversity Karst, and Karau Ibis habitat. The indicative map becomes the base map in the preparation and definitive determination of the Essential Ecosystem Areas in East Kalimantan.

D. Essential Ecosystem Areas

Essential Ecosystems are ecosystems outside conservation areas that are important ecologically, socially, economically, and culturally for biodiversity conservation, while Essential Ecosystem Areas (KEE) are essential ecosystems designated as protected and managed areas based on conservation principles as applied in conservation forest management. KEE consists of essential wetlands and terrestrial ecosystems. Wetland essential ecosystems are wetland ecosystems that primarily have a unique and important value of habitat and aquatic biota. It also functions as a migration area/path or has a high population of water bird species or another important aquatic biota. Terrestrial essential ecosystems is a land ecosystem in the form of a forest or non-forest that has uniqueness and/or species and acts as a corridor for wildlife and important habitat for wild plants and animals or has a high population of other important terrestrial species (Perdirjen KSDAE, 2016).

It is important to manage the essential ecosystems due to their uniqueness, biological richness, and relationship with the surrounding ecosystem. The responsibility of managing essential ecosystems belongs to not only one sector but also other relevant stakeholders, including local governments,

cross-ministerial, NGOs, universities, and the private sectors. The management carried out in an integrated manner primarily aims to equalize views and perceptions of the management of essential ecosystems and to synchronize programs for optimal and sustainable benefits. Thus, the Directorate of Essential Ecosystem Management needs to support the establishment of essential ecosystem area institutions in an effort to manage and maintain the sustainability of essential ecosystem areas (Perdirjen KSDAE, 2016).

Essential ecosystem areas can be formed specifically to protect certain plant species or what is known as a biodiversity park, as well as protect animal traffic lanes or referred to as a conservation area corridor. The steps and stages of determining the location of collaboration for essential ecosystem management include Identification, Inventory and Classification, Delineation, Proposal, Public Consultation, and Determination of Essential Ecosystem Areas (Perdirjen KSDAE, 2016).

Essential ecosystem areas, according to Government Regulation Number 28 of 2011 and the Director General of KSDAE (2020), include:

1. **Wetland**

   Wetlands are areas where water meets the ground. Some of the ecosystems included in wetlands are mangroves, peatlands, swamps, rivers, lakes, deltas, floodplain areas, rice fields, and coral reefs.

   A mangrove ecosystem is an ecotone area that is a meeting place of two or three habitats, habitat types, or ecosystems resulting in distinctive characteristics (Pirnanda et al., 2016). Mangrove vegetation can be classified into major mangroves, minor mangroves, and mangrove associates. Major mangrove plants are fully developed in tidal areas; can form pure stands; adapt to salinity through pneumatophores, viviparous embryos, filtration and salt

excretion mechanisms; and are taxonomically different from land plants. Minor mangrove plants are distinguished by their inability to form pure stands. Mangrove associate plants are tolerant of salinity and interact with major mangroves (Pirnanda et al., 2016).

2. **Wildlife Corridor**
   Wildlife corridors are areas or vegetated paths that are quite wide, both natural and artificial, which connect two or more habitats, conservation areas, open spaces, and other resources. A corridor allows the movement or exchange of individuals between animal populations or the movement of biotic factors to prevent adverse impacts on fragmented habitats. The adverse impacts on populations that can be prevented are inbreeding and a decrease in genetic diversity due to genetic erosion (genetic drift) often occurring in isolated populations (Perdirjen KSDAE, 2016).

3. **High Conservation Value**
   High Conservation Value (HCV) is defined as the values contained in an area, both environmental and social, such as wildlife habitat, water catchment protected areas, or archaeological (cultural) sites where these values are considered highly significant or very important locally, regionally, or globally (Consortium for the Revised HCV Toolkit Indonesia, 2008).

4. **Biodiversity Park**
   Biodiversity Park (Kehati Park) is a reserved area for local biological natural resources outside the forest area that has in-situ and/or ex-situ conservation functions, especially for plants of which pollination and/or seed dispersal needs animals' help, where the structure and composition of the vegetation can support the sustainability of pollinating and seed dispersal animals (Perdirjen KSDAE, 2016).


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5. **Landscape with geological and geomorphological characteristics**

   Areas with unique geology and landscapes are karst ecosystems. Regulation of the Minister of No. and Mineral Resoo.ces No. 17 of 2012 states that karst landscapes have unique geological components and function as natural regulators of water systems and store scientific values. Thus, its existence needs to be preserved and protected to prevent damage and support sustainable development and the development of science.

   Karst ecosystems have an important value for an environment that comes from water sources that can be used for water sources, carbon dioxide absorbers, fauna habitat, cultivation facilities, tourist destinations, fertilizer sources, limestone sources, and educational facilities (Mijiarto et al., 2014).

The analysis shows that the environment's carrying capacity for the habitat of keystone species nationally must be maintained at

a minimum of 43 million ha. This area is a primary forest for the habitat of keystone animals. If this area cannot be maintained, it will trigger ecosystem instability, which has the potential to cause major obstacles in achieving sustainable development in Indonesia (Bappenas, 2019). In 2020, the Directorate of Essential Ecosystem Management (BPEE) of the Directorate General of Nature Resources and Ecosystem Conservation conducted an inventory and verification of areas with high conservation value outside of sanctuary reserves, nature conservation areas, and hunting parks (Surya et al., 2020). The survey has identified and verified a high biodiversity area of approximately 6.6 million hectares, divided into six regions. The identification and verification target of 43 million hectares of high conservation value areas is planned to be gradually achieved by 2024. Based on data from the important ecosystem maps from the National Development Planning Agency, forest area maps, land cover and ecoregion maps from Forestry Planning and Environmental Management, the Directorate of BPEE (*Bina Pengelolaan Ekosistem Esensial or Essential Ecosystem Management Agency*) has mapped the area with high biodiversity value in Indonesia (Figure 1).

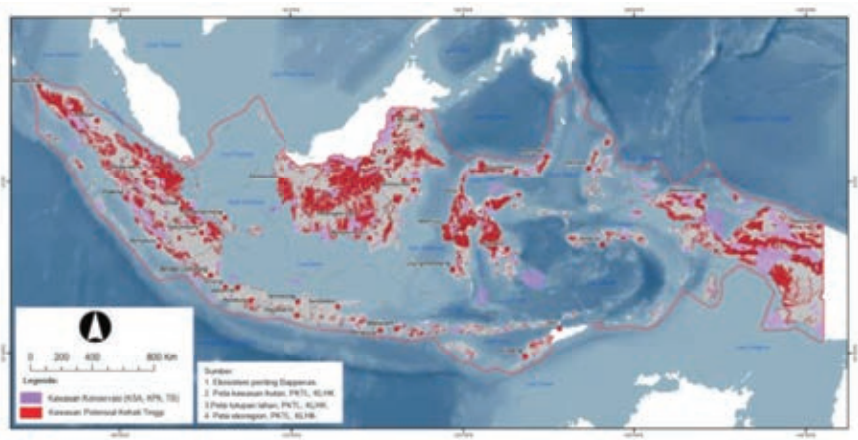

Figure 1. Indicative map of areas with high biodiversity outside the conservation areas (Surya et al. 2020)

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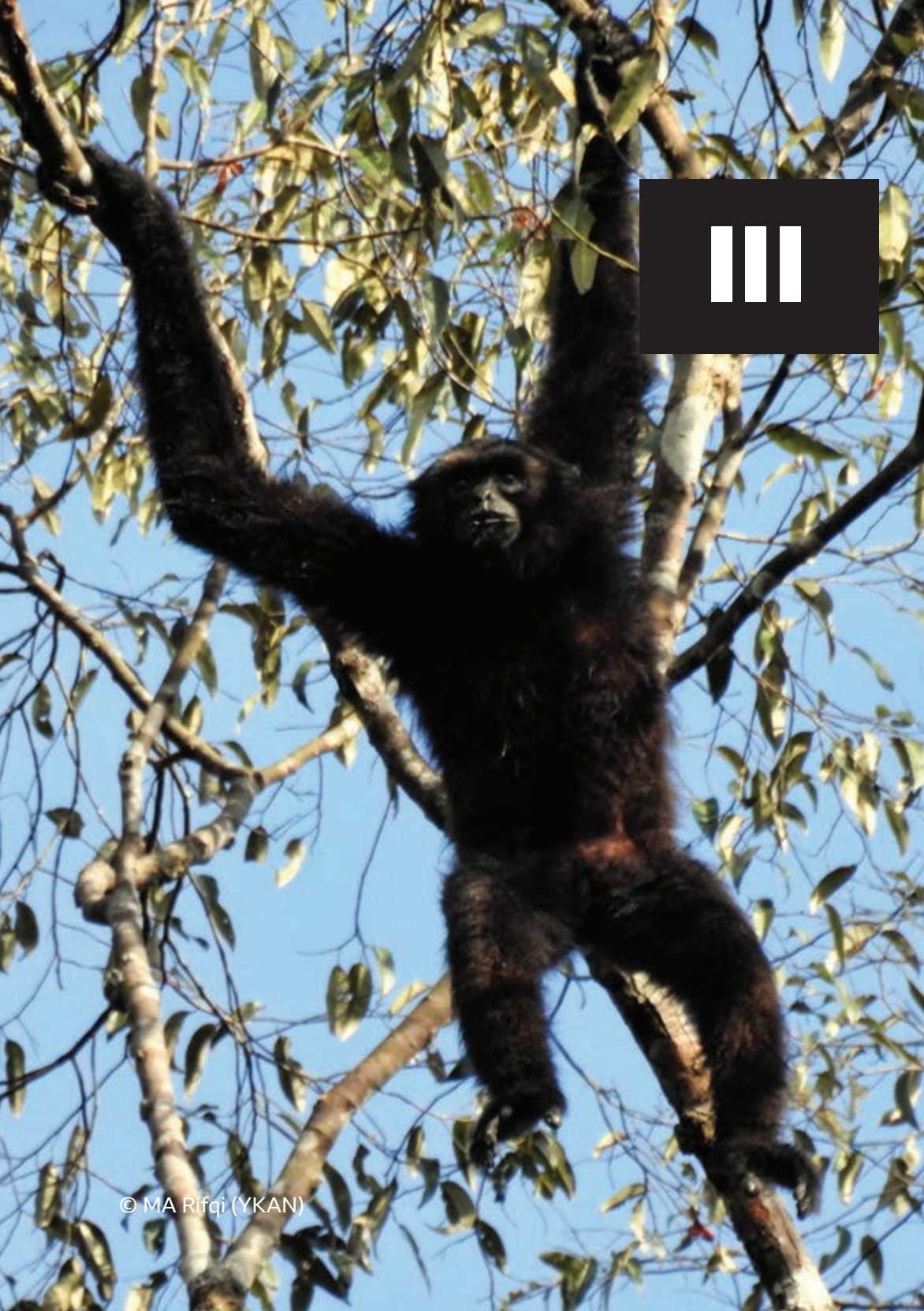

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THEORIES AND PRINCIPLES OF THE HABITAT MANAGEMENT OF WILDLIFE ON A LANDSCAPE SCALE

With rapid development and increased human populations, the pressure on natural resources is getting higher. Forests as centers of biodiversity have experienced a lot of decline in both quality and quantity. There have been a lot of conversions of forest areas and habitat fragmentations to meet the needs for settlements, plantations, mining, pond developments, and the construction of various infrastructures. As a result, biodiversity, including the gene, species, and ecosystem levels, is threatened. Even worst, most of the biodiversity is outside conservation areas where humans do their activities. Therefore, conservation efforts, in particular related to wildlife, are not only done inside the conservation area but also in the surrounding areas and other important ecosystems.

Various anthropogenic disturbances can potentially cause habitat degradation, loss, and fragmentation (Gunawan, 2010). Therefore, conservation approaches that pay attention to connectivity between conservation areas and various ecosystems and combine the remaining forest patches are highly in demand. To implement the strategies, management on a broader scale in the scope of the landscape is necessary.

The landscape-scale management has more complex challenges since it may consist of various ecosystems. It becomes even more complicated if the area is divided into different management governance units. The land cover mosaic formed in the landscape needs to be managed in an integrated manner with good coordination.

Considering the landscape's scope covering various land uses, several ecological concepts can be the basis for managing landscape-scale ecosystems. Approaches to theories related to landscape ecology, habitat use by wildlife, and metapopulation will be explained in this book. These theories are used to determine the principles of landscape area management, although the principles are difficult to be fully applied.

A. Habitat Management on a Landscape Scale

1) Landscape Ecology Theory

Landscape ecology is a part of ecology that studies how landscape structures affect (process and shape) the abundance and distribution of organisms (Gunawan and Prasetyo, 2013). Functionally, the landscape structure may consist of several ecosystems and land use patterns. The landscape structure consists of fragments, corridors, and matrices (Prasetyo, 2017). Fragment, known as a patch, is a relatively homogeneous area with a certain shape and spatial configuration. It can be described compositionally by internal variables such as the number of trees, tree species, tree height, or other similar measurements (Forman, 1995). Corridors are fragments/patches elongated in shape, while the matrix is the fragment that dominates the landscape (Forman & Godron, 1986). Changes in landscape structure from homogeneous to heterogeneous have the consequence of changing landscape functions (Prasetyo, 2017). Changes can be in habitat fragmentation, which results in an increase in the edge area and alterations in patch size.

The heterogeneity of the ecosystem will increase the richness of the species. Several types of animals occupy more than one ecosystem and often move from one ecosystem to another. Moreover, some species adapt to the transition area between two ecosystems (ecotone). In addition, the abundance of animal species depends not only on the ecosystem's heterogeneity and the area of its habitat but also on how large the pattern of relationships between the surrounding habitat plots is (Indrawan

et al., 2012). Relationships between habitats are formed by the existence of animal corridors, both naturally available and made by humans.

2) Island Biogeography and Metapopulation Theory

The theory of biogeography recognizes the term *true island*, which is an island surrounded by a barrier in the form of water or ocean. This condition causes some types of animals on the island difficult to spread to surrounding islands. Except for the types that have the ability to fly well, such as bird species. The current development of the true island concept can be compared to a habitat island where the barrier occurs due to habitat fragmentation on land. Habitat areas that were initially large became smaller. Fragmentation occurs due to various human activities, such as road construction, establishing oil palm plantations, fields clearing, settlements, forest plantations, and forest fires. Certain animals can only meet all the life necessities only in their remaining habitat and cannot expand their range or dispersal to the surrounding habitat.

The habitat island referred to in this case can be a habitat area (patch) surrounded by other areas, be it non-habitat, oceans, mountains, deserts, lakes surrounded by land, and forest patches surrounded by man-made landscapes. According to MacArthur and Wilson (1967), species richness on an island is determined by two things. The first is the combined effect of area and isolation, and the second is the dynamic equilibrium between colonization and extinction. This condition is formed by:

1. Equilibrium of the number of species. It lies at a balance point between colonization and the level of species extinction on the island. Colonization can replace extinct species (species turnover). The equilibrium point is determined by two factors, i.e., the size of the island (area) and the distance from the mainland (isolation).

2. The size of the island (area). It affects the rate of extinction. Large islands have more species than small islands. An island ten times as large is likely to have twice as many species. In addition, small islands are less protected, so the rate of extinction is higher.

3. Isolation of the island. It affects the rate of colonization. Islands that are isolated or located far from the mainland from which they were colonized will have fewer species than islands closer to the mainland that colonized them.

MacArthur and Wilson (1967) also describe an equilibrium model to predict an increase in the number of species along with the size of the island, but isolation due to the distance from the mainland or other islands will decrease the number of species. The occurrence of immigration (I) and the level of extinction (E) will eventually reach a certain point that indicates the equilibrium point. Colonization or migration can be caused by extinctions that vacate the patch and are replaced by other species, but local species extinctions can also occur due to the invasion of new species. The invasion of these new species can occur naturally or by human intervention (Guo, 2015).

Island biogeography theory is widely used as a basis for research on diversity in islands, and species-based models, especially for population and species-level conservation (Guo, 2015). One of the developments of biogeographic theory is to consider population dynamics on several islands (metapopulations) linked by individual movements (Warren et al., 2019).

The concept of metapopulation predicts the number of species that might survive on a newly created island (MacArthur and Wilson, 1967). According to Levins (1970), metapopulation consists of local populations predicted to be extinct and/or will be colonized again locally. Metapopulation can survive in an area only if the average extinction rate is less than the average

migration rate. A few scattered individuals will leave a patch to colonize an empty element or reinforce a small population at a time. However, the populations that emerged within a patch can disappear due to certain environmental events (fires, fallen trees) or demographic events (epidemic, aging) (Gunawan, 2010). In addition, local extinctions that vacate the patch can also occur due to invading new species, both naturally occurring and by human intervention (Guo, 2015).

3) Habitat Connectivity in a Landscape

Animals need functionally vast interconnected habitats (Phillips et al., 2008). Habitat connectivity is critical to species' successful dispersal, presence, and genetic diversity in fragmented landscapes (Schooley and Branch, 2011). Unfortunately, many habitats have been fragmented by various land use changes. To connect fragmented habitats, building corridors through habitat restoration is necessary.

Network flow is a new paradigm in assessing habitat connectivity in the context of developing habitat corridors to optimize the habitat restoration and designation of protected areas (Phillips et al., 2008). It is important to determine priority areas to be restored as habitat or designated as protected areas considering the high costs required for restoration and high competition for land use (Hodgson et al., 2016).

Animal distribution (dispersal) is crucial for animal survival. The existence of connectivity between habitats will provide opportunities for animals to 1) move to new habitats when a disturbance occurs, 2) regulate the dynamics of the number of individuals in the population within the remaining habitat, and 3) maintain gene migration between metapopulations to ensure a good genetically population condition (metapopulation) (Mardiastuti, 2018).

The landscape-scale management of animal habitats must pay attention to the connectivity between habitats and their ecosystem types. If a habitat is disconnected or isolated from the surrounding habitat, the management shall reconnect with the wildlife corridor. Animal corridors can be formed by replanting native species using references to species in the surrounding forest. In addition to native species, enrichment is also needed through planting wild animal feed species, such as fig tree species (*Ficus* spp.) and fruit tree species. The availability of an abundance of food sources will attract animals to come immediately and utilize the built corridors. However, the implementation scenario must be appropriately planned to prevent a potential conflict between humans and wild animals, as well as the misuse of corridors as access to illegal hunting.

B. Principle of Habitat Management

Based on the theoretical description described earlier, it shows that in designing protected areas for animals, the ideal area must be large enough and not fragmented, cover the entire ecosystem, be adjacent or connected to corridors, have stepping stones, cover several types of habitat, and combine large and small areas.

1) Representation of Ecosystem

Each type of wildlife has different needs and responses in utilizing the resources in their habitat ecosystem. It is closely related to their morphology, behavior, and physiology. These conditions make each type of animal has a preference for habitats in certain ecosystems. The selection of suitable habitats for animals to occupy goes through a lengthy adaptation process with the ability to adapt to different habitats. Different types of animals have different habitat specifications. Some animals require particular habitats, but some can occupy habitats with a wide ecological range. Meanwhile, several other types of animals can live in various kinds of habitats (multi-habitat type).

It is better to designate a protected area that includes many types of ecosystems than only one type of ecosystem (Figure 2). The availability of several types of protected ecosystems can protect more species with various habitat specifications.

Figure 2. Several types of the ecosystem are better than one type of ecosystem

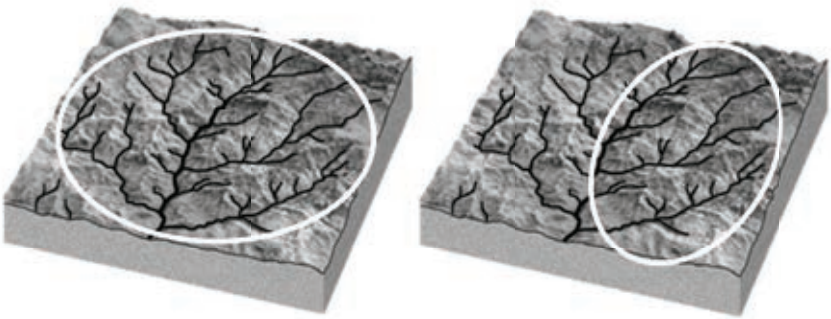


Figure 3. Protecting all types of the ecosystem is better than just one type of ecosystem

Determination of protected areas on a landscape scale covering various ecosystems and habitats will protect as many plant and animal species as possible. In addition, the protection of all specific ecosystems will provide optimal

protection for the area, in terms of the physical environment and the presence of existing flora and fauna (Figure 3). For example, protecting the entire watershed would be better than a small part of the watershed.

2) Interior Animals Protection

Forests are habitats for a variety of wildlife. Conditions in the forest indicate a microclimate (temperature, humidity, light) with a lower intensity than conditions outside the forest. The microclimate inside and outside the forest is a transitional area known as the edge. The edge area is still getting influenced and disturbed from around the forest or known as the edge effect. Some types of animals have certain characteristics in response to the conditions of the edge area. There are several types of animals tolerant to edge effects, but some animals are also sensitive to edge effects due to damage and external disturbances. Animals intolerant of edge effects will always inhabit the interior of the forest or are known as interior animals.

There are several criteria for wildlife related to the use of their habitat, especially responses to edge effects (Prasetyo, 2017) (Figure 4), namely:

- **Specialist animals** have specific habitats and are intolerant of edge effects. These specialist animal groups are usually interior animals since their activities are entirely in the core area of the habitat type used. There are two interior animals, namely edge exploiter specialists who like edge habitats and edge avoider specialists who avoid edge habitats. Some of the species that include interior animals are tigers (*Panthera tigris*), leopards (*Panthera pardus*), and rhinos (*Rhinoceros sondaica, Dicerorhinus sumatrensis*). In addition, several types of interior birds include the great argus (*Argusianus argus*), several types of trogon (*Harpactes* spp.), woodpeckers (*Picidae*),

jungle babblers (*Kenopia striata* and *Napothera* spp.) and Old World flycatcher (*Cyornis* spp. and *Ficedula* spp.) (Mardiastuti, 2018).

- **Generalist animals** are animals able to adapt to several different types of habitats, including transitional areas between these habitats. Generalist animals are divided into two, namely generalist edge avoider that tends to avoid edge areas and generalist edge exploiter or also known as edge animal. The presence of edge animals is often found in the edge areas, although they are able to live well in various types of habitats. Species that can be categorized as edge animals are several types of deer, bison, wild boar, long-tailed macaque, southern pig-tailed macaque, and peacocks (Mardiastuti, 2018).

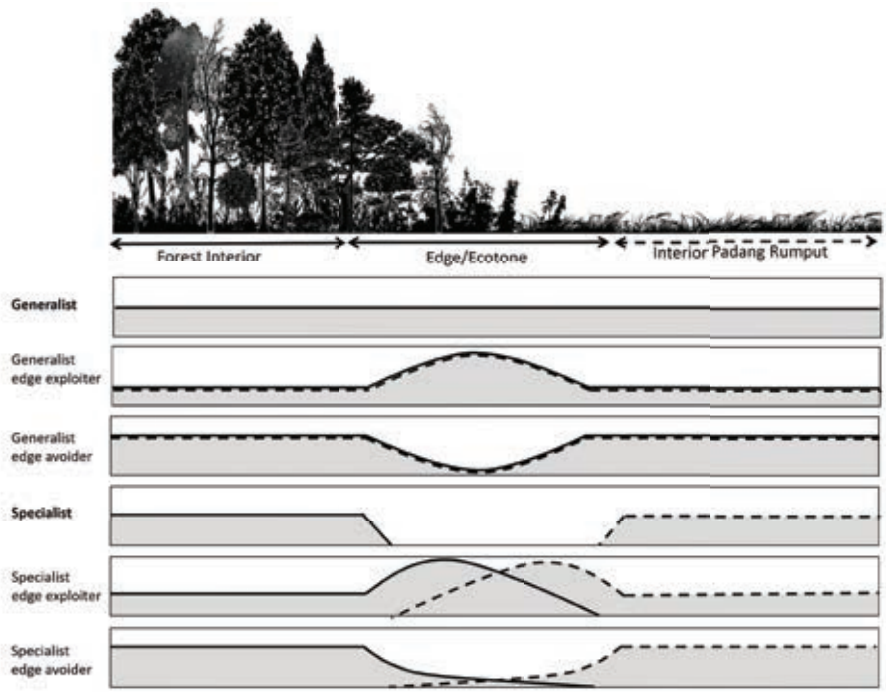


Figure 4. Criteria of wild animals regarding the use of their habitat

Determination and delineation of protected areas must pay attention to protecting various existing interior animals. In other words, the condition of the forest must be maintained with a sufficient and compact area to create a core forest area that meets the needs of the existing interior animals. Several considerations for an area to provide good protection for interior animals are as follows:

a. Protection area

Regarding the protection of interior animals, one large and compact area is better than several narrow areas, even though they have the same area size. Thus, a question frequently asked is what is the best patch structure and composition for wildlife conservation. The term Single Large or Several Small (SLOSS) is often used when choosing a large area or several small areas in a landscape area.

The smaller the area, the higher the percentage of the edge area (edge). Edge can be interpreted as part of an ecosystem adjacent to its perimeter (perimeter). The effects of adjacent patches can cause environmental differences between the interior of a patch and its edges. This edge effect includes species composition or abundance differences between inside forest patches and outside (Forman, 1995). According to Franklin (1990), edge effects can drastically reduce the area of interior habitat in forest patches surrounded by logging areas, and even edge effects often extend more than 200 m into the forested area. The smaller the remaining forest area, the larger the percentage of the area affected by the edge effect (Figure 5).

b. Habitat fragmentation

Along with the rapid development, the management of new protected areas on a landscape scale is often encountered with the complexity of land use. Various types of land use and the development of supporting infrastructure have resulted in the fragmentation of initially forest areas (Figure

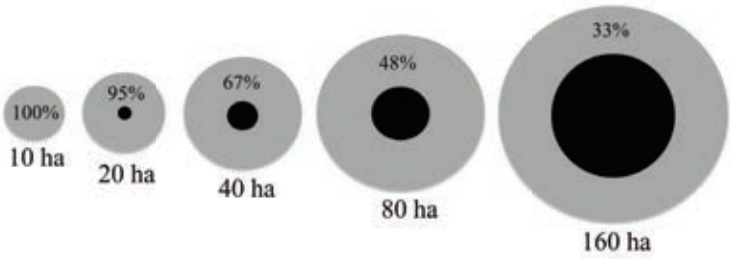


Figure 5. Implications of edge effects on the area interior (Franklin, 1990)

6). Fragmentation is one of the effects of landscape change.

The mechanism and process of fragmentation results in three effects, namely reduced patch size, increased edge effects, and increased isolation (Fahrig, 2003). Habitat breakdown due to fragmentation creates patches of remaining forest scattered within the protected landscape area to form a mosaic. Habitat shrinkage also results in the splitting of populations into smaller and more isolated populations that are vulnerable to disaster, demographic variability, genetic decline, or social dysfunction (Wilcove et al. 1986).

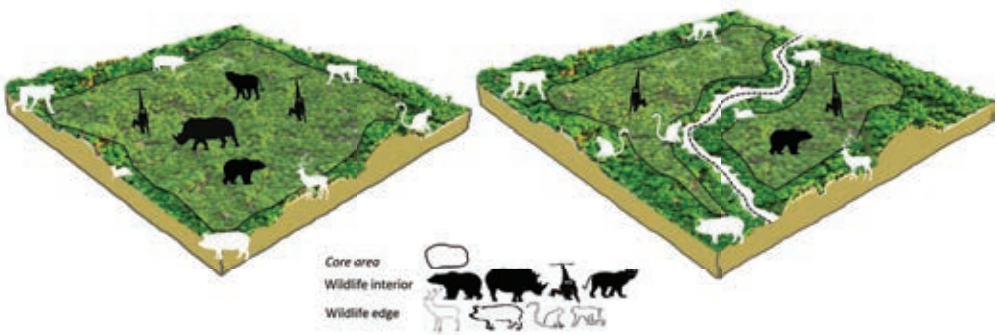


Figure 6. Impacts of habitat fragmentation caused by road development on the preservation of interior animal diversity

c. Shape of protected area
Areas whose shape is close to a circle are better than elongated areas because the core area is wider (Figure 7). The core area is very important for interior animal life. The loss of the core region will result in the extinction of interior

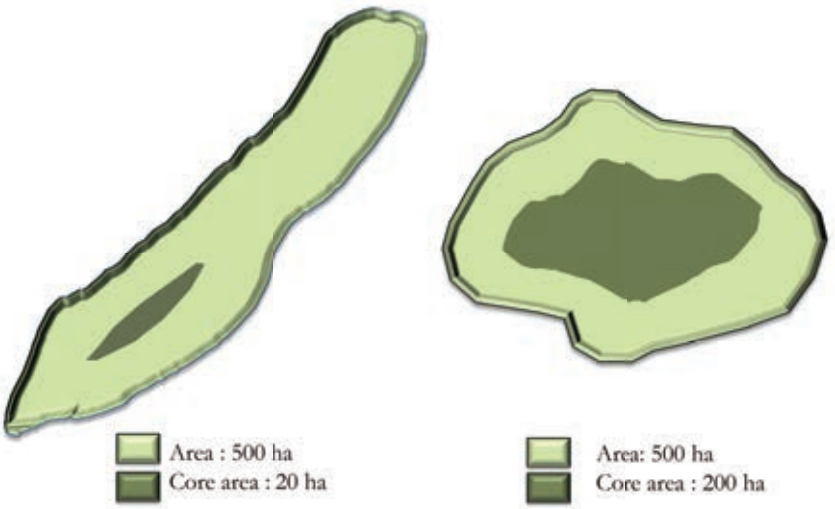


Figure 7. The core area is getting smaller or even disappears with an elongated shape

species.

3) Habitat Connectivity

a. Distance between areas

If the remaining habitats are small areas, then areas close to each other are better than those far apart since the migration rate will decrease as the distance increases (Figure 8). The distance between areas that are far apart will cause greater isolation and entire separation from one another.

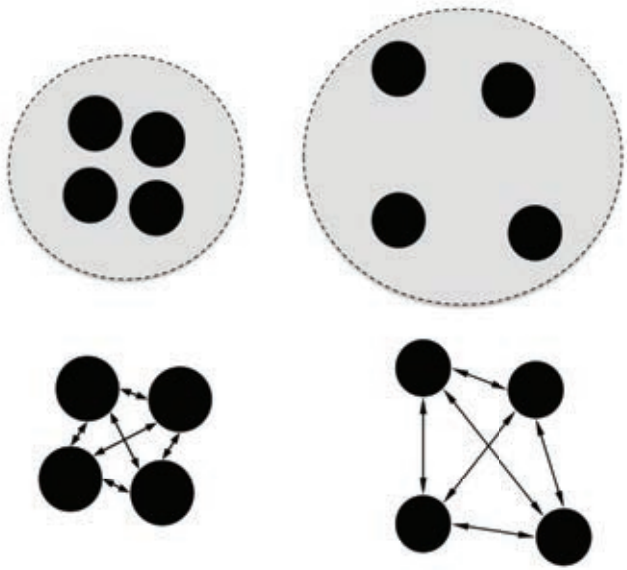


Figure 8. Locations of conservation areas that are close to each other are better than those that are far from each other

Adjacent protected areas have four advantages, especially for bird and bat species. First, it still provides opportunities for certain species to move/migrate to each other. Second, genetic flow is still possible. Third, colonization can occur in areas not previously inhabited by certain species. Fourth, the distance between adjacent areas can be built as animal corridors that can function more effectively than building corridors over long distances.

b. Habitat corridor

Habitat fragmentation often occurs cause of the construction of roads that cut off habitat connectivity. Several highly arboreal animals, such as gibbons, langurs, and amphibians, are confirmed to have lost their habitat connectivity. Some small habitats should be linked to larger protected areas. Several small high-conservation-value areas must have a connection or at least a habitat that serves as a stepping stone for the movement of animals between habitat patches (Figure 9). The connecting path in the form of corridors is designed for terrestrial and arboreal animals, while the stepping stones are intended for birds and bats.

Animal corridors in the form of crossing bridges both below and above the roadway can be a solution to maintain habitat connectivity. However, these facilities require high costs and good planning for the animal crossing bridge to work. The placement of the crossing path must be in the appropriate location, considering the target animal's roaming path, regional security, social factors, and spatial planning before carrying out bridge construction.

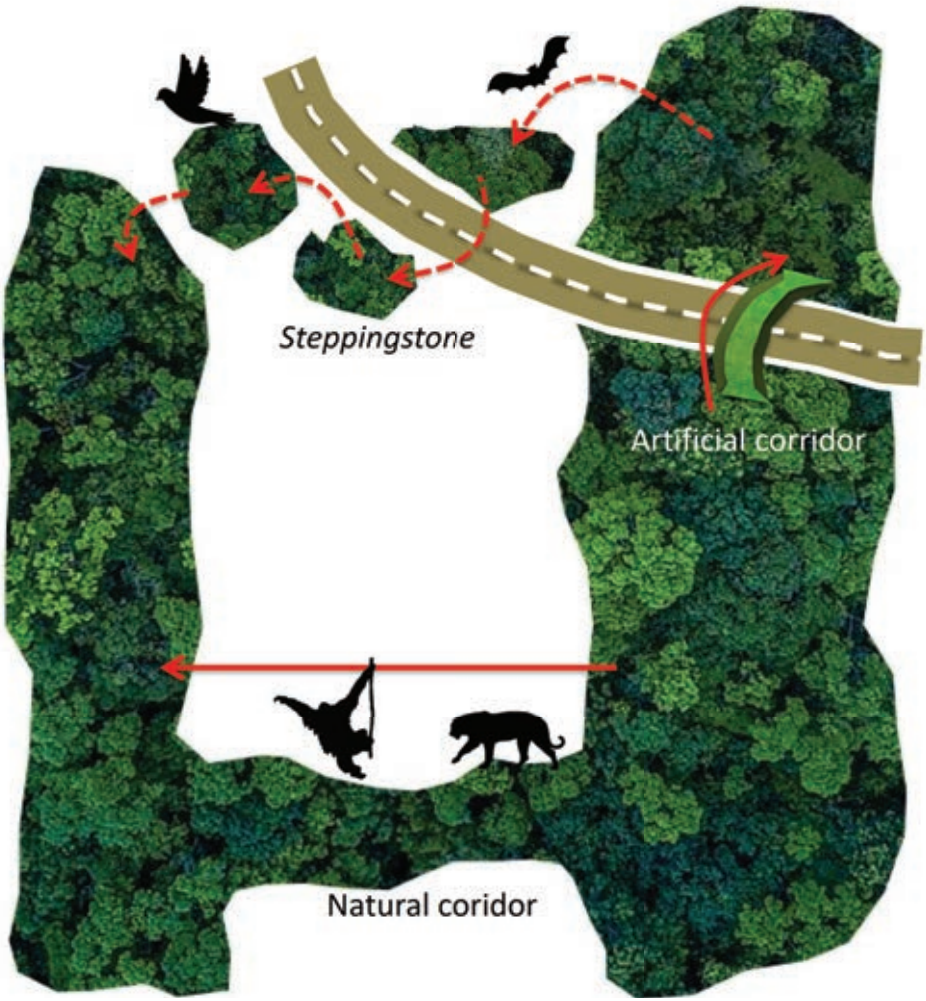


Figure 9. Maintaining habitat connectivity in the form of corridors and steppingstone

C. Model of Habitat Management

1. Collaborative Management

Managing multiple areas in the management unit is better than individual management. Landscape generally covers a large extent, and several management units of the concessionaires require joint management to undertake biodiversity protection. Landscape areas are rarely controlled by a single management unit owned independently. Animal home ranges never consider administrative boundaries, concession boundaries, and other anthropogenic boundaries. Therefore, managing landscape areas from several management units must be addressed collaboratively. Joint biodiversity management will provide opportunities for harmonizing conservation

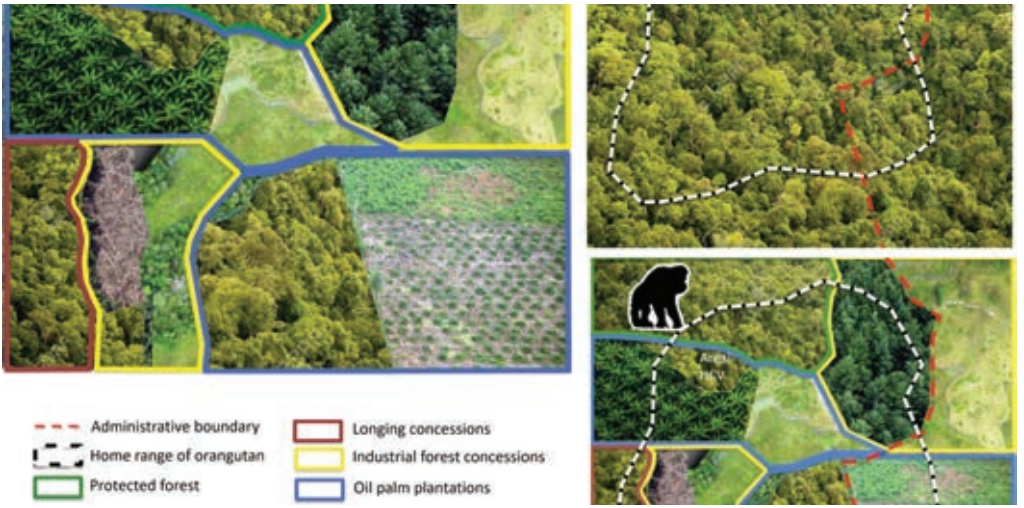


Figure 10. Illustration of the habitat condition of orangutan before (left) and after the operation of several permits for Cultivation Right (HGU)

and protection programs with the same vision and mission.

For example, Figure 10 shows the condition of the home range of orangutans in their habitat, regardless of administrative boundaries, protected forest boundaries, and concession boundaries of Cultivation Rights/HGU (HPH, HTI, oil palm plantations). After the HGU permit is operational, the management of the orangutan habitat aims to connect patches of forest that are still in use left through the corridors. The remaining forest can be HCV (High Conservation Value) areas or forest plots that have not been cleared for company operations. Considering that orangutan roams cover several concession areas, conducting collaboration in biodiversity conservation programs between management units is important.

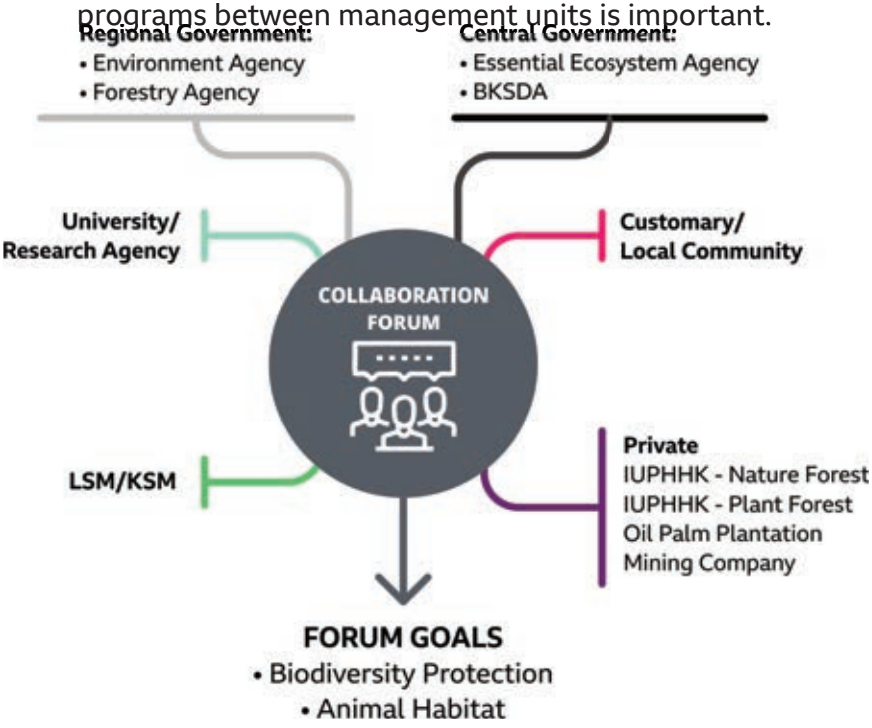


Figure 11. Collaboration forum as a communication and coordination media between management unit and stakeholders of landscape-scale biodiversity

Planning for making animal corridors in one management unit needs to regard the existing protected forests, river border areas, and HCV areas in the surrounding management units. Here, the communication and coordination between management units need to be strengthened through the collaborative management of biodiversity at the landscape scale (Figure 11). Furthermore, support from various stakeholders is necessary for gaining support regarding policy, scientific side, commitment, and funding.

2. Connection with the Community

Integrating human activities into areas regulated by zonation will be better than strictly prohibiting people's accessibility into the area (Figure 12).

Figure 12. Providing limited access for the local community in the area (left) is considered better than prohibiting them from entering the conservation area (right) than prohibiting them from entering the area (right)

The provision of limited access to local communities in meeting their daily needs and efforts to empower local communities are considered more appropriate. Meanwhile, strict restrictions on the local community to access the area will lead to antipathy towards the area and the potential for greater conflict. Giving local people limited access to certain zones will make monitoring existing resources and controlling all activities easier. However, efforts to foster empathy for the preservation of nature and all its contents must be carried out by raising local community awareness and engagement.

D. Management of Endangered Animal

Wild animals are all animals that live on land, water, and air that still have wild characteristics, both living freely and those kept by humans (UU, 1990). Wild animals have various beneficial values for humans and nature conservation, including ecological, commercial, social, recreational, beauty, educational, and scientific values (Imron et al., 2018). The existence of wild animals needs to be managed wisely with the principle of sustainability. Especially for endangered animals, their use needs to be protected and monitored strictly.

Efforts to manage and protect wild animals can be carried out in situ or ex situ. Ex situ conservation is carried out through captivities, zoos, and safari parks. Determination and management of conservation areas is one of the efforts for in-situ conservation. Wildlife outside the conservation area can be protected through the establishment of protected areas, high

conservation value areas, and essential ecosystem areas.

1. **Protected Animal**

   The determination of protected animals in Indonesia has been carried out since colonial times through the Regulations for the Protection of Wild Animals (Dierenbeschermings Ordonantie) number 134 and 266 of 1931 (Imron et al., 2018). At the time of independence, the Indonesian government issued Government Regulation Number 7 of 1999 concerning the Preservation of Plant and Animal Species, and the attachment was updated through Minister of Environment and Forestry Regulation Number 106 of 2018. Globally, the assessment of the conservation status of flora and fauna is based on the red list of IUCN (The International Union for Conservation). IUCN is an international organization that aims to influence, encourage, and assist communities around the world to preserve the integrity and diversity of nature and ensure that every use of natural resources is equitable and ecologically sustainable (www.iucn.org). Meanwhile, the trade status of flora and fauna is based on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international trade convention for wild plant and animal species. The Indonesian government ratified the CITES convention in 1978 based on Presidential Decree No. 43/1978. Based on the Regulation of the Minister of Environment and Forestry Number 106 of 2018, as many as 904 types of flora and fauna are protected, with 787 species being animal species. It is conceivable that protecting and preserving these species would cost a lot of money. Therefore, it is necessary to determine the types of priority for conservation efforts. The Indonesian government has established a strategic direction for national species conservation based on the Minister of Forestry Regulation No. 57/Menhut-II/2008. The regulation of the Minister of Forestry is an effort to screen protected plant and animal species that have

become a very high priority. The regulation became a reference for ten-year species management from 2008-2018, and most of the screening results are still relevant today. However, currently, it is necessary to evaluate and update data related to the status of the IUCN red list and protected animals in 2018.

2. Population Inventory and Monitoring

A population is a group of individuals of the same species that live in a particular area and can reproduce. Individuals in a population depend equally on the same resources, experience similar environmental problems, and depend on each other to survive over time (Tuff and Tuff, 2012).

Information related to animal species and population is the basis that must be known before planning wildlife management. The information was obtained from inventory and census activities in the field. Some information needed as initial data regarding the population is the total number, population structure, and distribution and movement (Alikodra, 2002). Inventory aims to record the types of animals in the area, including where these animals can be found. Inventory can be done through direct encounter observations or based on indications of the presence of animals. Indicators of the presence of animals can be through footprints, fingernail/teeth scratch marks on trees, nests, puddles, sounds, food scraps, body parts left behind (hair, horns, old skin marks, thorns), dirt, and odors (Atmoko et al., 2015). Before conducting an animal inventory, it is very important to know the various behaviors of the target animals. Several field guides for introducing animal species are available for this activity, including mammals (Phillips and Phillips, 2016), bats (Suyanto, 2001), birds (Elton et al., 2016), and snakes (Marlon, 2014).

Along with the development of technology, automatic cameras are increasingly practical and effective at an affordable cost. In addition, the latest method for animal identification is e-DNA (environment DNA), which can identify wild animal species based on DNA traces left in their habitat (Kelly et al. 2019). However, this technique is still developing, so it cannot accurately identify all the animals in the habitat. Another weakness is that there are no laboratories in Indonesia to perform the analysis, resulting in a high cost.

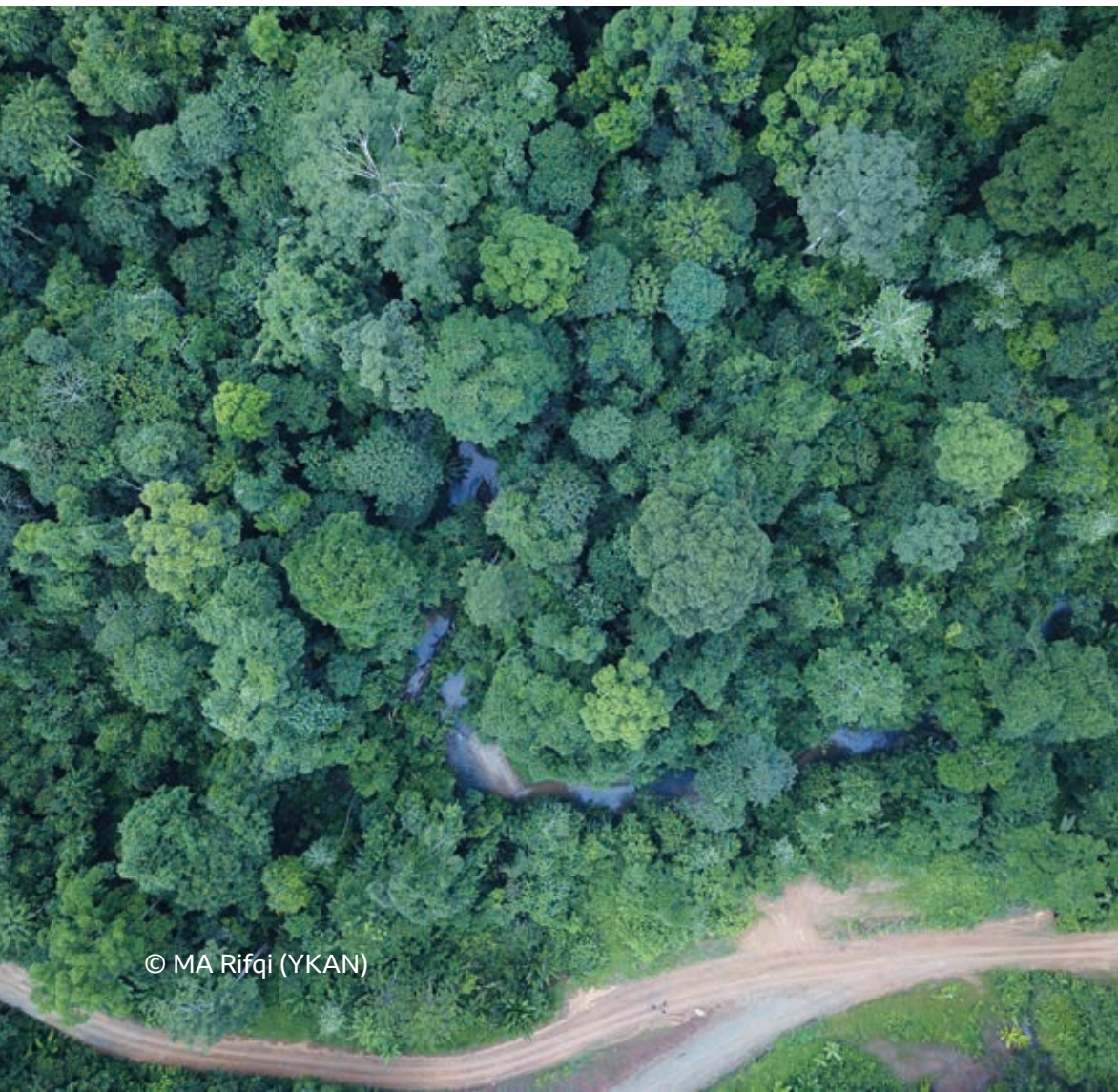
After the inventory is conducted, it is necessary to carry out a census. The purpose of the census is to determine the number of animals at a certain time and location (Alikodra 2002). Census can be done directly or indirectly. A 100% census is possible in a narrow area, but if the area is large, it can be done by sampling. The technique is adjusted to the target species type, time availability, cost, and human resources. Through inventory and census activities, data on the distribution of animals in the habitat can be obtained simultaneously.

3. Management of Animal Habitat

A wildlife habitat is a place to meet all the needs of wild animal life (Imron et al., 2018). The various necessities of life for organisms in the area of their living space generally consist of essential basic materials in the form of food, water, shelter or shelter, and space. The four main components are variables that can determine changes in the size of the wildlife population in a particular habitat (Supriatna, 2019).

Individual animals need space in different areas. In this space, animals get water, protection or shade and partners. Generally, those who manage wildlife are challenged with determining how large the space capacity is for the

animal population. In each case, the appropriate space or habitat area will depend on the size of the population being managed. Large animals need a large space related to the availability and productivity of feed and habitat diversity as a living requirement for each animal species. Carnivorous animals generally require much more space than herbivores (Imron et al., 2018).



IV

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MODEL OF THE LANDSCAPE-SCALE MANAGEMENT OF WILDLIFE HABITAT IN WEHEA – KELAY

A. Introduction

The Wehea-Kelay landscape is an important habitat for the morio orangutan (*Pongo pygmaeus morio*). The Morio orangutan is a subspecies of an orangutan whose natural distribution is only found in East Kalimantan and Sabah, Malaysia. Based on the 2016 PHVA (Population and Habitat Viability Assessment) orangutans, the population of orangutans in the Wehea-Kelay Landscape ranges from 806-821 individuals. Apart from being important for conserving the morio orangutan, the Wehea-Kelay Landscape also has high biodiversity. Based on the survey results and compilation of existing data, there are about 721 species of plants in the area, of which 87% of the land cover is still forest. In addition, there are 271 bird species, 47 reptile species, and 70 amphibian species (Atmoko et al., 2018).

The Wehea-Kelay Landscape is located between the regencies of Berau and East Kutai with an area of 532,143 ha. The area administratively includes the districts of Kongbeng and Muara Wahau in the East Kutai Regency, and the Kelay district in the Berau Regency. There are various stakeholders in the landscape area. In addition to the Wehea Protection Forest Management Agency and the Wehea Indigenous Community, several management units carry out their activities within the landscape, including seven IUPHHK–Natural Forests (IUPHHK-HA or IUPHHK-Hutan Alam), two IUPHHK–Plantation Forests (IUPHHK-HT or IUPHHK-Hutan Tanaman), and six oil palm plantation companies.

As an important area for the habitat of the morio orangutan and another biodiversity that also overlaps with various anthropogenic interests, management at the landscape scale of Wehea-Kelay needs to be done collaboratively with multiple parties. Since the area is outside a conservation area, establishing an essential ecosystem area is the right solution.

B. Pre-Management Dynamics

Various studies and research were carried out on the Wehea-Kelay Landscape at the beginning of its development. The Nature Conservancy (TNC) Indonesia is one of the institutions that, since 2002, started activities in the Wehea Protection Forest by working with the Dayak Wehea community to manage protected areas for orangutan habitat. The results of orangutan research in Wehea Protection Forests have been published by Loken et al. (2013), Loken et al. (2015), and Spehar et al. (2015). Several surveys and research on orangutans were carried out in addition to the Wehea Protection Forest in several surrounding IUPHHK concession areas such as PT Narkata Rimba, PT Gunung Gajah Abadi, PT Karya Lestari, PT DSN, PT AAU, PT NAS, and PT GPN (Utami-Atmoko et al., 2017). Research in the Wehea Protection Forest has also been carried out on other animal species, such as *Presbytis hosei canicrus* (Lhota et al., 2012), and *Neofelis diardi* (Loken, 2016).

Several HCV assessment activities have also been carried out by several management units in the Wehea-Kelay Landscape, including in the areas of PT Narkata Rimba (TNC and PT Narkata Rimba 2011; Ideas Consultancy Service 2015), PT Karya Lestari (PT Wana Kestava 2016a), PT Gunung Gajah Abadi (PPLH Unmul 2015), and PT Wanabhakti Persada Utama (PT Wana Kestava 2016b).

Studies conducted by Marshall (2002) and Marshall et al. (2006) indicate that the area currently referred to as the Wehea-Kelay Landscape area has potential habitat for at least 2,500 individual

orangutans. Based on the findings of Mathewson et al. (2008), and Husson et al. (2009), a half-value correction from the previous estimate. The results of these studies become one of the basics for the need for collaborative management in the area.

The results of TNC's 12-year study show that many orangutan conflicts occur outside the Wehea Protection Forest area, such as clearing fields, plantations, logging company activities, high conversion of habitat to oil palm plantations, and the threat of land fires. It is necessary to approach this situation by improving landscape-scale land management conservation practices with stakeholders through best practices for natural resource management or Best Management Practices (BMP).

C. Identification of Keystone Animals

The management of landscape areas needs to be determined by keystone animals that become the protection focus. The orangutan is the keystone animal of the Wehea-Kelay Landscape. Several reasons underlie the selection of the key animal:

- The Wehea-Kelay Landscape is an important habitat for the orangutan subspecies *Pongo pygmaeus morio*. The second largest population is in East Kalimantan, after Kutai National Park.
- Orangutans have an important ecological role as seed dispersers of important plants in lowland tropical forests and therefore assist the process of forest regeneration. Apart from that, studies on orangutan ecology regarding their role are still ongoing.
- Orangutans are umbrella species (umbrella species). By protecting orangutans and their habitats, we can concurrently protect various types of plants and animals under them. It is because orangutans need a wide range of land, requiring forests with interconnected canopies, large trees, and strong branches.

- The majority of orangutan habitats are scattered outside of sanctuary reserves/nature conservation areas, known as conservation areas.
- The Wehea-Kelay Landscape represents orangutan habitat outside the conservation area, where the majority of the site is forestry concessions, some oil palm plantation concessions, and community management areas.

Based on the considerations above, the parties agreed to determine orangutan as a flagship animal (flagship species) in the management of the Wehea-Kelay Landscape. The agreement was taken during a meeting between the parties at the office of the Environmental Agency in 2015.

D. Agency that Initiates the Process

The Nature Conservancy (TNC) Indonesia, the first institution to carry out activities in the Wehea-Kelay Landscape, became the initiator of the management process. With various data and information and good relationships with multiple parties in the landscape area, this is the initial provision in starting the collaborative management process.

TNC Indonesia is a non-profit organization that aims to protect plants, animal habitats, and natural communities that represent the diversity of life by preserving the land and sea. TNC Indonesia runs two main programs, i.e., the land program (often called the forestry program) and the marine program. East Kalimantan is one of the working areas. Specifically for the forestry program, TNC Indonesia has a mission that Indonesia will successfully reduce the rate of deforestation and forest degradation by adopting sustainable forest land management and balancing social, economic, and ecological values. One of the programs implemented is the orangutan conservation program.

TNC Indonesia's Forestry Program began its operations in Berau District based on the MoU (Memorandum of Understanding) between TNC and Berau District Government signed in 2001. Following the expiration of the Memorandum of Understanding between TNC and the Ministry of Marine Affairs and Fisheries (KKP) on October 19, 2019, and the issuance of a letter from the Directorate General of Multilateral Cooperation, Director of Socio-Cultural and International Organizations of Developing Countries, Ministry of Foreign Affairs on March 12, 2020, which stated that the principle and operational permit of TNC as a foreign mass organization operating in Indonesia had expired. Thus, TNC subsequently transferred all implementation of conservation programs and other activities to the Yayasan Konservasi Alam Nusantara (YKAN). Transferring TNC assets to YKAN started in Fiscal Year 2020 and will be completed in Fiscal Year 2021.

E. Initial Process

1) Initiation

Starting from the challenges, threats, and importance of the Wehea-Kelay Landscape as an important habitat for orangutans, the Provincial Government of East Kalimantan is committed to protecting areas with high conservation value, including orangutan habitat areas. The Ministry of Environment and Forestry in collaboration with the Government of East Kutai Regency, Berau Regency, East Kalimantan Provincial Environmental Service, the private sector, TNC, and the Wehea Customary Institution, agreed to build an understanding in the context of harmony between management units in orangutan conservation. The initiation was continued with outreach efforts, and approaches to several management units in the Wehea-Kelay Landscape.

2) Stakeholder Approach

Approaching management units one by one institutionally and personally to the top manager is an important initial step. At this stage, the role of TNC is central in approaching each management unit. TNC takes about 1.5 years to carry out this process. Different strategies are needed in approaching stakeholders based on their importance level within the landscape area. Approach efforts are emphasized on the following:

- The importance of teamwork in collaborative landscape-scale management
- Not only related to the interests of protecting forests, orangutans, and the animals in them but also aligning the business interests of companies and local communities
- Sharing perception and understanding of all management units regarding the importance of conserving biodiversity in the Wehea-Kelay Landscape, especially orangutans
- Convincing the managers that the proposed joint management will not change either the status or size of the working area and HGU (Cultivation Rights)
- Employ adaptive management, so the operation will not interfere with the company's processes and activities of each management unit.

The approach to the management units carried out according to the type and activities are as follows:

a. Oil Palm Plantation

The approach to oil palm companies is carried out by supporting companies to obtain the mandatory Indonesian Sustainable Palm Oil (ISPO-Indonesian Sustainable Palm Oil) certificate. Indonesian Sustainable Oil Palm Plantation is a business system in the field of oil palm plantations that is economically viable, socially viable, and environmentally friendly based on the prevailing laws and regulations in Indonesia.

The implementation of ISPO certification is carried out according to the Regulation of the Minister of Agriculture Number 11/Permentan/OT.140/3/2015 on the ISPO Certification System. In the ISPO, some principles and criteria must be met by oil palm companies, one of which is the obligation to maintain and conserve biodiversity in managed areas. The indicators include: 1) A list of plant and animal species inside plantation and around the plantation must be available before and after the plantation business opening, 2) Reporting the presence of endangered plants and animals to the Natural Resources Conservation Agency (BKSDA), 3) Conducting outreach to the surrounding community regarding the presence of rare plants and animals, and 4) Providing manuals in incident handling management if such case occurring with rare or wild animals.

Oil palm plantation companies must meet the requirements of the RSPO (Roundtable Sustainable Palm Oil) certification for the production of CPO (Crude Palm Oil) to make its way to the European market. The RSPO aims to promote sustainable palm oil production that helps reduce deforestation, conserve biodiversity, and value the lives of rural communities in palm oil-producing countries. Eight basic and 39 criteria must be met to get an RSPO certificate, one of which is the 5th basis, namely environmental responsibility and conservation of resources and biodiversity.

The joining of oil palm plantation companies with the KEE Wehea-Kelay Forum will support the achievement of ISPO and RSPO certification through the protection of biodiversity by managing the habitat of orangutans, which are rare and endangered species. Collaborative landscape-scale management provides much reinforcement for the

management units because, in the process, there will be an increase in human resource capacity, knowledge and learning sharing, and funding sharing. It is because the stakeholders involved are not only active management units in the landscape but are also supported by various research institutions, universities, government agencies, donor agencies, and local communities.

b. IUPHHK Company

The approach with the Timber Forest Product Utilization Permit (IUPHHK) company to join in the management of the Wehea-Kelay Landscape is carried out through support and assistance in achieving certifications of Sustainable Production Forest Management (PHPL) and FSC (Forest Stewardship Council). Those certificates are given to permit holders or management rights holders who successfully perform sustainable forest management. Based on Permen LHK Number P.30/Menlhk/Setjen/PHPL.3 /3/2016, all IUPHHK-HA/HT companies are required to have a PHPL (Sustainable Production Forest Management) certificate. There are several assessment indicators in PHPL such as in the Regulation of the Director General of PHPL Number P.14/PHPL/SET/4/2016 related to ecology, namely:

- The existence, stability, and condition of protected areas in each forest type
- Protection and security from forest fires, illegal logging, illegal grazing, forest encroachment, hunting, pests, and diseases
- Management and monitoring impacts of forest use on soil and water
- Identification of protected, endangered, rare, threatened, and endemic species of flora and fauna
- Management of flora and fauna through allocating certain areas of undisturbed production forest and parts that are not damaged for the preservation of protected, rare, endangered, and endemic flora species.

The joining of IUPHHK companies with the KEE Wehea-Kelay Forum will support the achievement of PHPL and FSC certification, especially in protecting biodiversity and endangered wildlife such as orangutans. Collaborative management reinforces management units in increasing human resource capacity, sharing knowledge and learning, joint security related to various disturbances, and sharing programs and funding.

c. Customary People
Efforts to educate and engage local communities are critical and will determine the success of area management on a landscape scale in achieving the goal of conserving biodiversity, especially orangutans. This process is not easy and takes a long time. Providing understanding to local communities regarding the importance of forests and biodiversity requires the right strategy by taking into account the sociocultural conditions of the community. Customary leaders are key persons in generating a shared understanding of area management.

3) Stakeholder Profile

Seven management units of stakeholders are committed to being involved in the early stages of forming an understanding of the management of the Wehea-Kelay Landscape (MoU dated April 17, 2015). At the Decree's signing for the KEE Forum's establishment on April 6, 2016, PT Wana Bakti Persada Utama joined, and on September 27, 2017, the second MoU was signed with the entry of PT Utama Damai Indah Timber and PT Global Primatama Mandiri. The profile of the management units is as follows:

a. The Wehea Nehas Liah Bing traditional institution is a traditional institution that has existed for a long time, along with the existence of the Wehea indigenous people. Members of the Wehea traditional institution are all members of the Dayak Wehea community in Nehas Liah Bing. The Wehea

Nehas Liah Bing traditional institution is very active not only in the social and cultural fields, but also in the conservation of living natural resources. In collaboration with the Wehea Protection Forest Management Agency (BP-Huliwa), which was formed by the East Kutai Regency Government in 2005, the Wehea Customary Institution is determined to manage and protect the Wehea Protection Forest area. The Customary Institution has also formed a forest ranger group (*Petkuq Mehuey*) which is currently in charge of effectively managing and protecting the protected forest area of Wehea.

b. PT Narkata Rimba (PT NR) is one of the private companies that obtained a Business Permit for the Utilization of Natural Timber Forest Products (IUPHHK-HA) in East Kutai Regency, East Kalimantan Province. Based on the Decree of the Minister of Forestry No. 278/MenhutII/2008 PT Narkata Rimba holds a concession permit covering an area of 41,540 ha for a period of 45 years (until 2053). In 2014, PT Narkata Rimba applied for the expansion of the working area and obtained the rights based on the Decree of the Minister of Forestry No. SK. 116/Menhut-II/2014 with a total area of 65,925 ha. The main commodity of timber forest product utilization in PT Narkata Rimba is from the Dipterocarpaceae group and since 2011 PT Narkata Rimba has received an International certificate (Forest Stewardship Council-FSC) in managing forests sustainably.

c. PT Gunung Gajah Abadi (PT GGA) is one of the private companies that received an IUPHHK-HA in East Kutai Regency, East Kalimantan Province, covering an area of 74,980 ha. PT Gunung Gajah Abadi has been operating since 1994 (period 1993-2013), with the main commodity being wood from the Dipterocarpaceae group, and is currently entering its second rotation with an extension period of 45 years (period 2013-2058).

d. PT Karya Lestari (PT KL) is one of the private companies that received an IUPHHK-HA permit in Berau Regency, East Kalimantan Province, covering an area of 49,123 ha. Previously, PT Karya Lestari was part of the PT Alas Helau Forest Concession Rights (HPH) area, whose license expired and since 1999 the Forest Concession Right was granted by the government to PT Karya Lestari for 55 years (period 1999 to 2054). The main commodities produced from the use of timber forest products at PT Karya Lestari are dominated by the Dipterocarpaceae group.

e. PT Acacia Andalan Utama (PT AAU) is a private company engaged in industrial forest plantations. PT Acacia Andalan Utama has a Plantation Forest Timber Product Utilization Business Permit (IUPHHK-HT) covering an area of 21,965 ha, which is located in Kongbeng District, Muara Wahau District, and Telen District, East Kutai Regency, East Kalimantan Province.

f. PT Nusantara Agro Sentosa, currently changing its name to PT Nusaraya Agro Sawit (PT NAS) is a private oil palm plantation company under the Palma Serasih Group. PT Nusantara Agro Sentosa has a location permit covering an area of 14,055 ha located in the districts of Kongbeng and Muara Wahau, East Kutai Regency, East Kalimantan Province. From 2013 to mid-2016, the area that has been planted with oil palm was 5,170 ha.

g. PT Wana Bakti Persada Utama (PT WPU) is one of the private companies that received an IUPHHK-HA in Berau Regency, East Kalimantan Province, covering an area of 44,402 ha. PT Wana Bakti Persada, located in Kelay District, Berau Regency, has been operating since 1999. The main commodity produced from the use of timber forest products at PT Karya Lestari is dominated by the Dipterocarpaceae group.

h. PT Utama Damai Indah Timber (PT UDIT) is one of the private companies that obtained the IUPHHK-HA in Berau Regency, East Kalimantan Province, covering an area of 49,250 ha. PT UDIT has been operating since 2005 with the main commodity being wood from the Dipterocarpaceae group. In June 2017 PT UDIT received a voluntary sustainable forest management certificate in the Forest Stewardship Council-FSC standard, which is valid for the period 2017–2022.

i. PT Global Primatama Mandiri (PT GPM) is a private company engaged in the oil palm plantation and processing industry under the auspices of the Palma Serasih Group. PT GPM already has a HGU SK in 2017 from the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency for 4,483.90 ha located in Merapun Village, Kelay District, Berau Regency, East Kalimantan Province. From 2016 to March 2018, the area already planted with oil palm is ±1,700 ha, while the rest of the land is still under development.

Several management units that are potential partners but have not joined the Wehea-Kelay Essential Ecosystem Area (KEE) forum are PT Amindo Wana Persada, PT Mardhika Insan Mulia, PT Belantara Pusaka, PT Dewata Sawit Nusantara, PT Karya Prima Agro Sejahtera, PT Gunta samba Jaya, PT Berau Sawit Prosperous and PT Yudha Wahana Abadi. There is still a need for coordination and consolidation with several of these companies so that comprehensive management of the area in the Wehea-Kelay Landscape can be carried out.

4) Stakeholder Roles

Some of the stakeholders related to biodiversity management in landscape scale areas include:

a. Government Agencies

The role of several government institutions needs to be present in the subsequent management process. Government agencies have the functions, duties, and capabilities to supervise, monitor, and manage the environment, including wild plants and wild animals in the protected list. Some of the formal institutions that play an important role in Wehea-Kelay Landscape management planning include:

i. Central Government

- East Kalimantan Natural Resources Conservation Center (BKSDA). BKSDA Kaltim is one of the Technical Implementation Units (UPT) of the Directorate General of Nature Resources and Ecosystem Conservation (KSDAE) Ministry of Environment and Forestry (LHK), which has the main task of managing conservation areas (Wildlife Sanctuaries, Nature Reserves, Nature Tourism Parks, and Hunting Parks) as well as conservation of wild plant and animal species both in inside and outside conservation areas.
- The Directorate of Essential Ecosystem Management of the Directorate General of Nature Resources and Ecosystem Conservation (KSDAE) has the task of carrying out the formulation and implementation of policies, technical guidance, and evaluation of technical guidance in the field of essential ecosystem management (mangrove conservation, wetland conservation, biodiversity parks, wildlife corridors, and high conservation value areas).
- Research and Development Center for Natural Resources Conservation Technology (Balitek KSDA), one of the UPT for Research, Development, and Innovation Agency and Ministry of Environment and

Forestry whose task is providing data strengthening, information, and scientific studies.

ii. Regional Government

- The Environment Service or Forestry Service of East Kalimantan Province, whose tasked with preparing policy formulation, technical guidance and evaluation of the management of important ecosystem value areas and buffer zones for conservation areas (Sanctuary Reserve Areas and Nature Conservation Areas), and establishing collaborative forums in the protection of high conservation value areas at the regional/provincial level.
- Regional Technical Implementation Unit (UPTD) of Forest Management Center, which participates in the implementation of supervision and control of the management of essential ecosystem areas (buffer zone outside the conservation area) within their working areas.

b. Management/Private Unit

The various management units incorporated in the management forum are partners who can support each other and cooperate in managing biodiversity together. An example is conducting joint training activities on biodiversity surveys by bringing in experts and professionals as resource persons. Cooperation can also be carried out to prevent and control forest and land fires within the concession area of the management unit that is part of the management forum.

c. Research Institutions/Universities

Research institutes and universities have an important role in various scientific studies of biodiversity. The partnership system built can be in the form of collaborative surveys and research on biodiversity as input to the regional management database.

d. Domestic and Foreign Cooperation
Cooperation with foreign parties can be related to funding and technology transfer in biodiversity management. Various donor agencies from abroad have various research support programs and efforts to conserve biodiversity in tropical forests such as Indonesian forests.

e. Non-Government Organization
Non-governmental organizations (NGOs) operate not under the direction of state-owned institutions controlled by the government. Various environmental NGOs are mobilized by volunteers and private parties who devote their work to preserving the environment and local communities. The position of NGOs is to fill the void in society that the government does not serve.

5) Stakeholder Roles

The next stage after approaching the stakeholders is to collaboratively build a joint commitment to the conservation of the environment and biodiversity in the Wehea-Kelay Landscape. Although not all management units can be approached intensively, with the commitment of 75% of the existing management units, it is sufficient to proceed to the next stage. The rest will be approached further in parallel with the following process. The commitment of the management units is shown by the approval of the owner or the highest management in the company (top management) to cooperate in protecting orangutans and their habitats in the Wehea-Kelay Landscape area.

F. Cooperation Agreement

After all management units had the same understanding and commitment, an agreement was made to establish cooperation in managing high conservation value areas in the Wehea-Kelay Landscape as an orangutan habitat. High conservation areas in question are based on biodiversity, environmental services and socio-culture at the local, regional and national levels. The draft memorandum of understanding is prepared in stages with the relevant parties in a bottom-up manner. All suggestions and inputs, as well as aspirations from the parties, are discussed and mutually agreed to be stated in a memorandum of understanding. Based on the discussions between the parties, an agreement was reached to manage a high conservation value area in the Wehea-Kelay Landscape of 264,480 ha in Muara Wahau and Kongbeng Districts, East Kutai Regency and Kelay District, Berau Regency, East Kalimantan Province. The aims of this collaboration are:

- Cooperating in conducting area management and conservation for orangutans and protected wildlife in protected areas and concession areas
- Cooperating in the management of high conservation value areas in the concession area by implementing the best management model to conserve protected animals in the concession area. Including efforts to protect animals from hunting and forest encroachment and construct wildlife corridors between landscape-based management units
- Increasing the capacity of human resources (HR) within an operational context by conducting training related to the technical matters of conserving orangutans and other protected wildlife, including efforts to prevent and control forest and land fires in concession areas
- Increasing community participation to involve in handling human and orangutan conflicts by establishing a task force for handling orangutan conflicts, managing the Wehea Protection Forest, and managing orangutan corridors as support for orangutans conservation and other protected wildlife, as well as prevention and control of forest and land fires

- Disseminating laws and regulations related to the conservation of living natural resources and the prevention and control of forest and land fires to the public
- Being a role model for developing science and research as well as collective learning in managing and protecting landscape-based forests.

The cooperation agreement is made by the parties, namely:

First Party	:	BKSDA East Kalimantan, BLH East Kalimantan Province, BPHL Wehea Long Skung Metgueen
Second Party	:	PT Gunung Gajah Abadi, PT Karya Lestari, PT narkata Rimba, PT Akasia andalan utama, PT Nusantara Agro Sentosa
Third Party	:	Customary Institution of Wehea
Fourth Party	:	The Nature Conservancy

The cooperation agreement was signed on April 17, 2015, at the governor's office of East Kalimantan, which the Governor of East Kalimantan acknowledged. Each party is represented by one of the institution's top management or company. The signing of the cooperation agreement document was carried out by the Head of BKSDA East Kalimantan, Head of BLH East Kalimantan Province, Head of BPHL Wehea Long Skung Metgueen, President Director of PT Gunung Gajah Abadi, Production Director of PT Karya Lestari, President Director of PT Narkata Rimba, President Director of PT Akasia Andalan Utama, Director of Operations of PT Nusantara Agro Sentosa, Head of the Dayak Wehea Tribe, and Director of the Terrestrial Program of TNC Indonesia Program.

G. Essential Ecosystem Area Forum

One year after the cooperation agreement was signed, on April 6, 2016, the Wehea-Kelay Essential Ecosystem Area Management Forum for Orangutan Corridor was formed. Ratification of the forum is based on the Decree of the Governor of East Kalimantan Number 660.1/K.214/2016. At that time, the number of forum members from the management unit increased by one, namely PT Wanabhakti Persada Utama. The organizational structure of the KEE Wehea-Kelay Forum is shown in Figure 13.

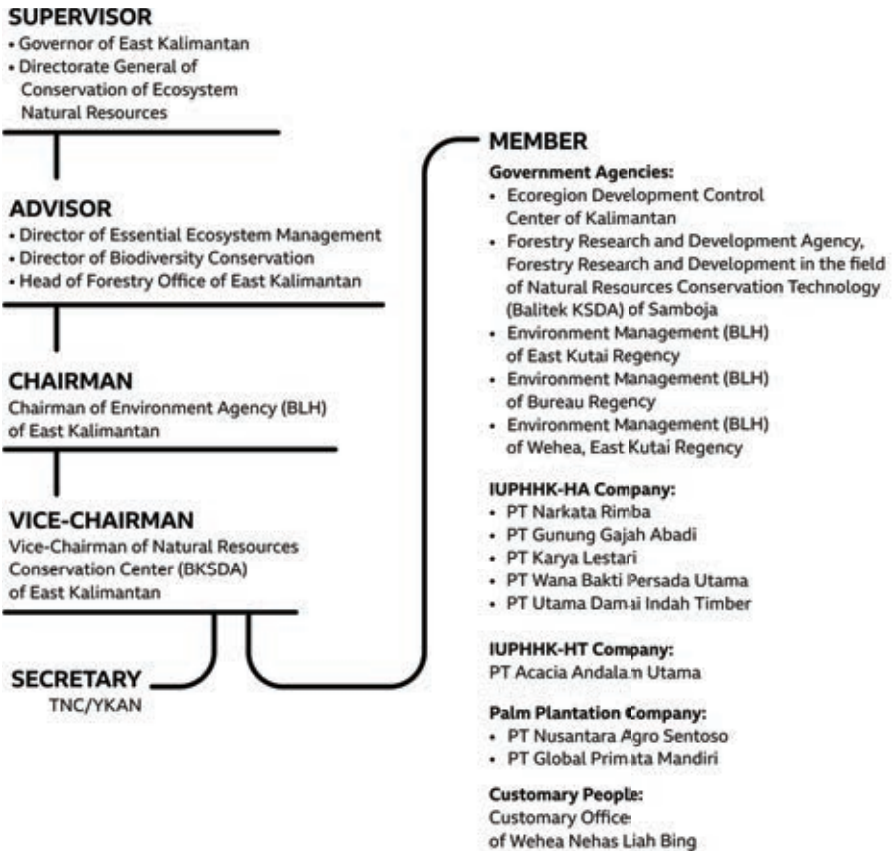

Figure 13. Organizational structure of the Wehea-Kelay Essential Ecosystem Areas

The tasks of the forum are:

- Developing a work plan related to the management and rescue of orangutans and their habitats in the Wehea-Kelay Landscape
- Protecting, fostering, and managing orangutan habitats, including monitoring the orangutan population in the Wehea-Kelay Landscape
- Facilitating and assisting in planning the development of the orangutan corridor, including the management of the Wehea-Kelay Landscape
- Facilitating the process of dialogue between stakeholders in the effort to manage corridors and save orangutans in the Wehea-Kelay Landscape
- Facilitating the formation of a task force (Satgas) and coordination team for conflict and wildlife management in the Wehea-Kelay Landscape which functions as a technical unit that has the ability and skills to manage conflict and rescue orangutans, protect and maintain the existence of corridors in the field
- Facilitating the increase in human resource capacity of the orangutan task force and other parties
- Assisting the process of conflict resolution in the Wehea-Kelay Landscape area, both in handling orangutan conflicts and helping find solutions to conflicts between the company and the community
- Carrying out monitoring and evaluation of work plans, Task Force activities and implementation in the field
- Establishing a shared vision and mission as the direction and goal of collaborative co-management of the Wehea-Kelay Landscape
- Developing working relations in the forum organization in facilitating collaborative forum collaboration
- Assessing and finding funding solutions for managing orangutans in a sustainable landscape

- Accepting parties who want to join in the management of the Wehea-Kelay Landscape area based on an agreement in the forum
- Reporting activities to the Governor once a year.

H. Work Group Formation

In an effort to ensure that the forum's objectives are effective, a Working Group (Pokja) was formed based on the Decree of the Directorate General of Natural Resources and Ecosystem Conservation Number 122/KSDAE/SCT/KSA.4/4/2016. Two important tasks of the Working Group (Pokja) are collecting data and information related to essential ecosystem areas of wildlife corridors and high conservation value areas in the Wehea-Kelay Landscape and drafting an action plan to manage the Wehea-Kelay Essential Ecosystem Area.

The Working Group consisting of several representatives from the parties, then carried out the following stages of work:

1) Area Delineation

The KEE concept used in the KEE Wehea-Kelay is an essential ecosystem of wildlife corridors using orangutans as a keystone species. However, the delineation of the area is based not only on the distribution and habitat of orangutans but also on district administrative boundaries, provincial roads, concession boundaries, and natural boundaries such as rivers. Using administrative and natural boundaries is more about considering operational convenience in the field, both from the planning aspect to the program's implementation, monitoring, and evaluation stages.

Based on various considerations, the northernmost boundary of the Wehea-Kelay Landscape is determined with the boundary of the Kelay River; south of the Wahau River and the PT Narkata Rimba concession site; and west of the Telen River, the district administrative boundary, and the Lu Besar River; and to the east of the provincial road body. A further delineation by the Pokja

resulted in the total area of the KEE Wehea-Kelay being 532,143 ha. The boundaries and size of the site are agreed upon by the parties but are open, so it is still possible to add or correct them as needed in the future.

2) Biophysics Identification

Physical identification of the area is based on spatial analysis based on existing thematic maps, while the potential biological data is based on research data and records on conservation area value assessment that exist in several management units.

The area based on the administrative area of government is ±266,523 ha in the East Kutai Regency, and ±265,620 ha in the Berau Regency area. Based on the interpretation of land cover 87% is still forest. Land use includes Protection Forest (101,848 ha), Limited Production Forest (288,057 ha), Production Forest (94,921 ha), Convertible Production Forest (187 ha), Other Use Areas (46,745 ha), and other water bodies (Pokja Forum KEE, 2016). Most of the area is located at an altitude below 500 m above sea level which is an ideal habitat for orangutans. Hydrologically the area is part of two main watersheds, namely the Wahau watershed and the Kelay watershed. It has an average air temperature of 26C with a high relative humidity of more than 80% and rainfall between 2,200 to 3,100 mm/year.

Tree species are generally dominated by the Dipterocarpaceae. In addition, there are many types of fruit trees, such as durian (*Durio* sp.), rambutan (*Nephelium* sp.), breadfruit (*Artocarpus* spp.), kapul (*Baccaurea* spp.), and mango (*Mangifera* spp) whose existence is important for local communities and also be a source for various wildlife that exist. The types of animals that exist, in addition to the Bornean orangutan (*Pongo pygmaeus*), northern grey gibbon (*Hylobates funereus*), red langur (*Presbytis rubicunda*), white-fronted langur (*P. frontata*), sun bear (*Helarctos malayanus*), sunda clouded leopard (*Neofelis diardi*), sambar deer (*Rusa unicolor*) and various other animals.

3) Developing an Action Plan

Action plans need to be developed to support the successful management of the Wehea-Kelay essential ecosystem area. The action plan is based on the results of the discussions between the parties and by taking into account the document of the Indonesian Orangutan Conservation Strategy and Action Plan (SRAK). In general, the specific priority action plans for orangutan conservation are:

- Conducting survey/monitoring of orangutan population, distribution, and habitat analysis
- Identifying and mapping habitat suitability and protecting important resource areas for orangutans (feeding trees and nests)
- Mapping various forms of threat to orangutans, managing conflict mitigation, and rescuing orangutans
- Identifying, mapping, managing, and protecting high conservation value areas, including the management and protection of protected areas (watersheds and buffers)
- Conducting surveys of potential habitat corridor development, corridor determination, implementation, resource enrichment efforts, protection and monitoring of the effectiveness of corridor development
- Opening communication for coordination of orangutan conservation efforts with other parties
- Establishing an anti-hunting task force for habitat protection and conflict.

In addition to the orangutan conservation program, action programs planned include capacity building of human resources (education and training, public awareness), database and institutional strengthening, and preparation of standard operational procedures (SOP).

4) Gap Analysis

Different activities related to the management and protection of orangutans have been, are currently and will be carried out by each management unit. Some management units already have programs that are in accordance with the orangutan protection action plan or have carried out studies on the identification and management of high conservation value areas, but there are also management units that have not. Therefore, a gap analysis is carried out to map which management units need to be encouraged and supported to implement programs related to efforts to protect orangutans and their habitats.

The result of the Working Group (Pokja) for about four months is the document Management of the Wehea-Kelay Essential Ecosystem Area of Orangutan Corridor, with the best management practices approach.

I. Implementation

Some of the action plans implementations that have been carried out on strengthening the database and human resources are as follows:

1) Field Survey

Surveys and field studies are carried out on the ecology of orangutans and other biodiversity as a basis for further management of the area. This activity is related to strengthening the biodiversity database as a baseline for further management. Some of the activities are:

- A pre-survey of the Wehea-Kelay Essential Ecosystem Area initiative to ground-check the orangutan habitat in the concession area of PT Gunung Gajah Abadi. The activity was held on 23–27 April 2016.
- Biodiversity survey and pre-survey of orangutans in:
  - PT Nusaraya Agro Sawit Conservation Area on 23 September–5 October 2016
  - HL Wehea, which was held around the Research Camp on 25–27 October 2017

  - HL Wehea, namely at Camp Sekung was held in 2016
  - The concession area of PT Narkata Rimba was carried out on 19–28 January 2017.
- Survey of orangutans in:
  - PT Wana Bhakti Persada Utama (2017)
  - PT Karya Lestari (2018)
  - PT Utama Damai Indah Timber (2018)
  - PT Gunung Gajah Abadi (2018)
  - PT Hutan Lindung Wehea (2018).

The results of the survey of orangutans in the Wehea-Kelay Nature Reserve are shown in Figure 14.

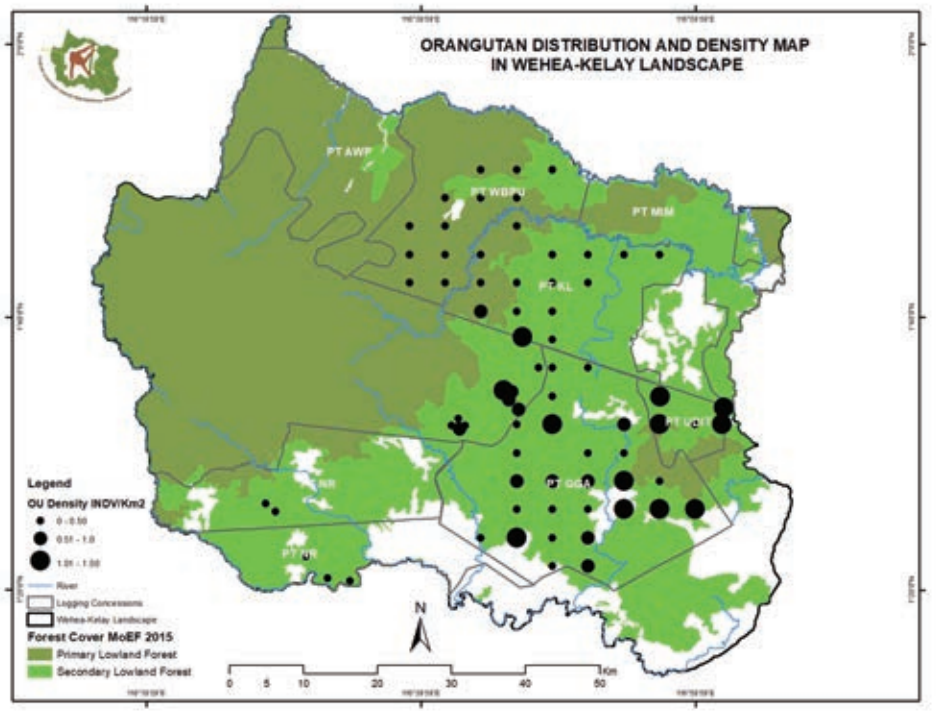

Figure 14. Distribution of the estimated density of orangutans based on the survey of the forum of the Wehea-Kelay Essential Ecosystem Areas

2) Training/Workshop

The development of internal learning is carried out to increase the capacity of forum members. Some of the activities carried out include:

- Human-orangutan conflict mitigation training for members of oil palm concessions and timber companies is conducted separately. It is due to different concession management models, so mitigation techniques are also carried out differently. Oil palm concessions carry out land clearing, so they require more active (curative) conflict mitigation techniques than IUPHHK-HA concessions. The Human-Orangutan Conflict Mitigation Training in Oil Palm Plantation was conducted at PT. Nusaraya Agro Palm Oil in 2017.
- The RAFT Scientific Article Writing Training was held on 7-9 May 2018 in Bangkok, Thailand. The activity was attended by staff and researchers from the Wehea-Kelay Essential Ecosystem Area (KEE) Forum.
- Bio-acoustic Training and Pilot Study of Bornean Gibbons (2018)
  The training was conducted at the Balitek KSDA Samboja and the pilot project was conducted at the KHDTK Samboja. The activity was attended by researchers and technicians from Balitek KSDA.
- Geographic information systems training. The management of the Wehea-Kelay Essential Ecosystem Area (KEE) cannot be separated from the development and application of science as the basis for management. Therefore, the capacity building aspect also includes capacity building for natural resource conservation researchers. The activity was carried out in March 2018 at the Research and Development Center for Natural Resources Conservation Technology in Samboja. The focus of the training was to increase the integration of spatial aspects in research using open-source software. Some of the case studies studied

include measuring the threat level of orangutan habitat with a scoring system and introduction to habitat suitability analysis using the Maximum Entropy (*MaxEnt*) program.

- The Wehea-Kelay Essential Ecosystem Area (KEE) Forum representative contributed as a speaker at the RSPO Remediation and Compensation Scheme Workshop and Compensation Support Facilities for Conservation Programs in East Kalimantan as well as the National Discussion in Jakarta on Protection of Important Ecosystems Outside Conservation Areas (KEE) to Support Green Development.
- Disseminating orangutan management and conservation activities at Wehea-Kelay Essential Ecosystem Area (KEE) at the Indonesian Primate Symposium and Congress on 18–20 September 2019 in Yogyakarta.
- Bio-acoustic Workshop
  The workshop aims to find out the basics of bio-acoustic and its development in nature conservation efforts. The activity was attended by field teams and researchers from the Essential Ecosystem Area (KEE) Forum. The workshop was held in Jakarta on November 5, 2019. The speakers were PhD students from Queensland University Technology.
- Gibbon Population Survey Training
  The training was held in Sokokembang Hamlet, Kayupuring Village, Petungkriyono District, Pekalongan Regency, Central Java on 13-17 January 2019. The activity was attended by the field team and researchers from the Wehea-Kelay Essential Ecosystem Area (KEE) Forum, while the speakers were from the Swara Owa Foundation. The training was conducted to improve the skills of field teams and researchers to use gibbon research methods appropriately. The training was carried out in the habitat of the Javan gibbon (*Hylobates moloch*) with the hope that it could serve as a reference for survey activities in the Wehea-Kelay Landscape, which is a habitat for the Kalimantan gibbon (*H. funereus*).

3) Publication/Dissemination

Some of the activity outputs that have been generated from the activities carried out by the KEE Forum are compiled in the form of reports and books. In addition, it is also printed in the form of leaflets as a means to circulate the results of activities. Some media coverage has been carried out for the purpose of disseminating the profile of the Wehea-Kelay Essential Ecosystem Area (KEE) as a lesson regarding models and mechanisms for managing orangutans and their habitat outside conservation areas with landscape-based stakeholders. Hopefully, these efforts can transmit a positive message in nature conservation activities on a landscape scale.

Publication books that have been produced by the forum and members of the Wehea-Kelay Essential Ecosystem Area (KEE) Forum are in the form of books and articles, as follows:

a. Books:
   - *Pengelolaan Kawasan Ekosistem Esensial Koridor Orang Utan Bentang Alam Wehea-Kelay* (Management of the Wehea-Kelay Essential Ecosystem Area of Orangutan Corridor) (KEE Wehea-Kelay Forum Working Group, 2016)
   - *Warisan Alam Wehea-Kelay* (Wehea-Kelay Natural Heritage) (Atmoko et al., 2018)
   - *Rencana Aksi Pengelolaan KEE, Kabupaten Berau dan Kabupaten Kutai Timur, Provinsi Kalimantan Timur Periode 2019-2021* (2019-2021 Action Plan for Essential Ecosystem Area Management, Berau Regency and East Kutai Regency, East Kalimantan Province) (KEE Wehea-Kelay Forum Working Group, 2019)
   - *Panduan Pengelolaan Habitat Orang Utan di Bentang Alam Wehea-Kelay* (Guide to Orangutan Habitat Management in the Wehea-Kelay Landscape) (KEE Forum, 2019)

- *Orang Utan Kalimantan dan Habitatnya di Bentang Alam Wehea-Kelay, Forum KEE* (Bornean Orangutans and their Habitat in the Wehea-Kelay Landscape, KEE Forum) (Rifqi et al., 2020)
- *Kanvas Alam Wehea-Kelay* (Wehea-Kelay Nature Canvas) (KEE Wehea-Kelay Forum, 2020)
- *Merangkai Kembali Habitat Orang Utan Morio (Pongo pygmaeus morio) di Bentang Alam Wehea-Kelay. Chapter Buku: Mengenal Lebih Dekat Satwa Langka Indonesia dan Memahami Pelestariannya* (Rebuilding the Habitat of the Morio Orang Utan (*Pongo pygmaeus morio*) in the Wehea-Kelay Landscape. Book Chapter: Getting to Know Indonesia's Endangered Animals and Understanding Their Conservation) (Atmoko et al., 2020).

b. Papers

- *Keanekaragaman Herpetofauna di Area Sungai Sekung, Kawasan Ekosistem Esensial Wehea-Kelay, Kalimantan Timur. Prosiding Seminar Nasional Biologi XXIV, Manado, 24-26 Agustus 2017* (Herpetofauna Diversity in the Sekung River of Wehea-Kelay Essential Ecosystem Area, East Kalimantan. Proceedings of the XXIV National Biology Seminar, Manado, 24-26 August 2017) (Sari et al., 2018).
- *Avifauna in The Wehea-Kelay Landscape, East Kalimantan, Indonesia. Dipresentasikan dalam the 11 International Conference on Global Resource Conservation* (Avifauna in The Wehea-Kelay Landscape, East Kalimantan, Indonesia. Presented at the 11th International Conference on Global Resource Conservation) (Mukhlisi et al., 2020).

J. Monitoring and Evaluation

Monitoring the implementation of the KEE Wehea-Kelay Forum activities has been carried out several times.

1. Monitoring on April 20, 2016, with the Directorate of Essential Ecosystem Management of the Ministry of Environment and Forestry. Field visits were carried out in Wehea Protection Forest, PT Gunung Gajah Abadi's IUPHHK-HA, and PT NAS's oil palm plantation. The monitoring aimed to determine the current condition of the Wehea-Kelay e Essential Ecosystem Area (KEE) and to seek input regarding the management of the orangutan habitat area in each management unit.

2. The annual meeting of the Wehea-Kelay Essential Ecosystem Area (KEE) Forum was held on December 5, 2017, at the DLH office in East Kalimantan Province and attended by all forum members. This meeting facilitated the opportunity to coordinate forum members, discuss the latest developments in the implementation of work plans, and review the latest draft of the Minister of Environment & Forestry Regulation on Essential Ecosystem Area (KEE).

3. The second field monitoring was carried out in mid-December 2017 with the East Kalimantan Natural Resources Conservation Center. The monitoring activity aimed to find out the latest developments in the Wehea-Kelay Essential Ecosystem Area (KEE) and discuss some technical matters regarding area management related to orangutan conservation and other biodiversity.

K. Challenges in the Management

There are still challenges in the management of the Wehea-Kelay Landscape, including:

1. Increasing stakeholders involvement
   Currently, there are still several potential partners who have yet to join the Wehea-Kelay Essential Ecosystem Area (KEE) Forum. Their involvement is very important for the management of the Wehea-Kelay Landscape to be carried out in a complete and optimal manner. Approaches and discussions need to be continued. In addition, the active participation of those who have already joined also needs to be maintained and improved.

2. Status certainty status of the area
   More than 8% of the area has APL (Other Use Area) status, so in the long term, it is still possible to change land use which has the potential to reduce the orangutan habitat area. For this reason, it is necessary to ensure the status of the area in the long term to protect the orangutan habitat.

3. Institutional and funding sustainability
   Sources of funding as one of the drivers of forum activities are still very limited. Therefore, sustainable funding sources and mechanisms are needed to support institutional development and implementation of the forum's work program.

4. Rewards/incentives for partners who manage orangutan habitat
   The initiation of the joining of management units and commitments in managing the habitat and population of orangutans in the Wehea-Kelay Essential Ecosystem Area (KEE) is not a direct business activity but rather towards fulfilling obligations and commitments of social and natural responsibilities. Therefore, there needs to establish a reward scheme for them as positive feedback towards the taken initiatives.

5. Illegal logging, illegal mining and wildlife hunting
   Illegal logging and illegal mining are still common in the Wehea-Kelay area. The large number of road networks entering the area and the extent of unlicensed sites have caused these disturbances to occur frequently. Wildlife hunting still occurs in many places, including on the border with the Wehea Protection Forest. The rangers (Petkuq Mehuey) who patrol intensively in the Wehea Protection Forest can prevent the entry of wildlife hunters.

6. Corridor implementation with Lesan Protection Forest
   The Lesan Protection Forest is an orangutan habitat around the Wehea-Kelay Essential Ecosystem Area (KEE) which is separated by the Muara Wahau Berau axis road. There are many orangutan nests in the trees along the road, which indicates that the orangutan population is estimated to be large in that location. There are many at that location. This habitat is still a metapopulation with KEE Wehea-Kelay, so it has the potential for re-connectivity.

7. Legal shelter for the Essential Ecosystem Area
   Currently, the legal protection for the Minister of Environment and Forestry Regulation regarding Essential Ecosystem Areas is ready and waiting to be ratified. The existence of the LHK Permen can strengthen the basis and reference for KEE implementation in the field, especially in the involvement of potential stakeholders to become members of the forum.

V

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IMPLICATIONS OF LANDSCAPE CONSERVATION AND MANAGEMENT

A. Conservation Implications

Efforts to protect areas on a landscape scale have the advantage of preserving the habitats of various flora and fauna from multiple types of ecosystems and ecotone. Site management from a landscape perspective needs to be applied to determine new conservation areas and protected areas outside the conservation area. Conserving more types of ecosystems in the landscape will provide broader and better protection for the residing animals, plants, and other organisms. Protected areas managed in an integrated approach on a landscape scale will minimize the occurrence of habitat fragmentation and isolated animals in small populations. It will be a fit conservation system since a small population is highly vulnerable to extinction due to natural disasters, disease, predation, hunting, or the long-term effects of inbreeding.

Landscape management will provide opportunities and more extensive spatial connectivity for animals to obtain available and needed resources. If the resources within a specific habitat type are depleted, the animals can migrate to the surrounding habitat type that still provides good resources.

Conservation areas and protected areas that currently exist are viewed as insufficient to protect Indonesia's rich biodiversity. Landscape-scale management, which contains conservation

areas, protected areas, important ecosystems, or areas of high conservation value, can accommodate a cohesive whole and allow them to be well-connected and integrated. This integration will provide a wider buffer for the existence of conservation areas as core areas for biodiversity protection.

B. Landscape Management Guide

Managing a landscape-scale area with various active management units in business is not a straightforward thing to implement. Several management stages can be used as a reference for the process to run well as expected. Various landscapes have different characteristics, even physically, the culture of the local community or the policy direction of the local government. The management steps described in this chapter are general guidelines that may need to be adapted to local conditions. The stages that can be used as a general reference include the initial stage, management plan, institutional, stakeholder partnership, funding, monitoring, coaching, reporting, and evaluation.

1) Initial stage

a. Area Identification

Identifying important ecosystems and delineating the area to be protected is the first step that must be done. Various data used to identify areas and their data sources are shown in Figure 15. Guidelines for landscape identification are as in Appendix 1. Furthermore, to determine the extent to which the delineation results produce well-protected areas, it is necessary to score the general condition of the delineated landscape areas. The area delineation scoring form can be found in Appendix 2.

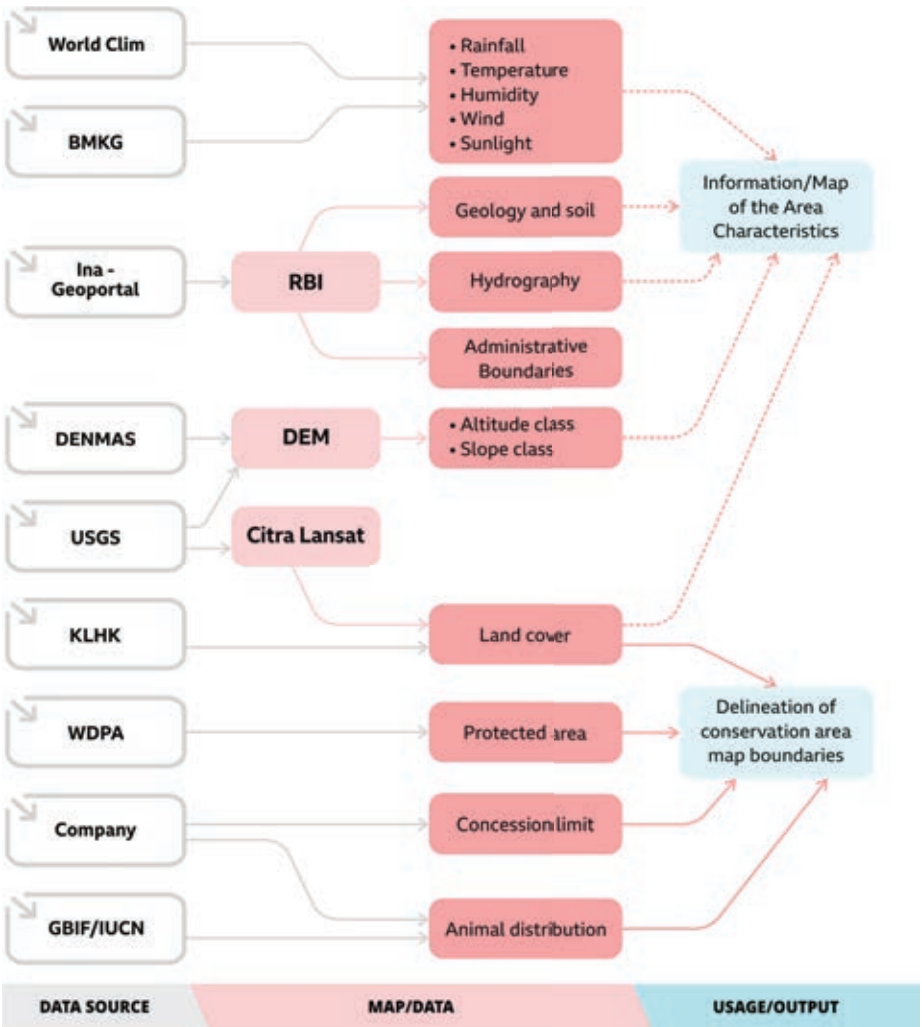

Figure 15. Data and data sources used in identification and delineation of the landscape area

b. Stakeholder Analysis
It is also necessary to identify stakeholders who are concerned about the conservation of this important ecosystem. These stakeholders include the central government, local governments, local communities, universities, research institutes, the private sector, LS/KSM, etc. The stakeholder analysis form is as in Appendix 3.

At this stage, it is necessary to take a special and in-depth approach to each party in the management unit of the HGU holder/area manager in the landscape. Efforts to approach are critical before proceeding to the next stage. This activity is to provide an excellent and in-depth understanding of the importance of managing wildlife habitats on a landscape scale, especially to the board of directors and their staff. In addition, it is also necessary to provide an understanding of what benefits will get the company if one is involved in collaborative management (discussion in Chapter 5.E.2).

c. Potential inventory and keystone animals
Conducting an inventory of potential biodiversity, discovering the ecosystem's function of potential KEE locations, and identification of the presence of key animals. The guide form for identifying key animals as priority protected species is in Appendix 4.

d. Collaboration forum (shared commitment)
Building a shared commitment in Essential Ecosystem Area (KEE) management efforts is carried out to align the vision and mission to protect priority endangered species on a landscape scale. An example of a memorandum of understanding format is presented in Appendix 6.

e. Delineation
A landscape-scale KEE area delineation was carried out. Provincial SKPD coordinates with UPT KLHK (P3E, BKSDA,

TN) and/or district SKPD/UPTD to verify and delineate of prospective KEE locations. The various data used in the delineation of the region and the data sources to obtain it are shown in Figure 14.

f. KEE Proposal
The forum submits a proposal for the determination of the Essential Ecosystem Area to the Head of the Level I/ II Region, then the regional head determines/ratifies the Essential Ecosystem Area and its managers by issuing a Decree. For landscape areas covering two or more regencies/ municipalities, the proposal needs to be submitted to the governor, but if it is only in one regency/municipal area, it is sufficient to submit it to the regent/mayor.

2) Management Plan

a. Gap Analysis
Several management units joined the forum have different concerns in managing protected areas. A gap analysis was conducted to identify activities carried out by each management unit related to the management of key wildlife habitats. The analysis was carried out based on a desk study on HCV report documents, certifications, biodiversity surveys, etc. Therefore it is known what activities and in which management units need to be strengthened. The gap analysis form is presented in Appendix 7.

b. Action Plan
Action plans were made as the basis for carrying out management activities at the landscape scale, as well as at the management unit level. The priority action plan form is as in Appendix 8. Several points of reference that can be used as a reference in formulating priority action plans include:

i. Area Protection
Protecting the area meaning protection from illegal logging, hunting for wildlife, and preventing forest and land fires. Security can be done by forming a patrol team for area security and a team for forest and land fire alerts. Forest fire patrol and alert teams can be formed by each management unit and cooperatively coordinate and support each member in efforts to protect the area.

ii. Preserving Biodiversity
Activities can be carried out by establishing protected and high conservation value areas, constructing a conservation park, and appointing arboretums and standing seed sources.

iii. Strengthening the Database
The biodiversity database is important information in planning future management. The data was obtained from the results of an inventory and population survey. Inventory activities are activities to record the types of flora and fauna biodiversity in the area. While the population survey is a follow-up step in an effort to find out the population and its distribution and further aims to monitor population dynamics.

iv. Improving Human Resources Capacity
Increasing the capacity of human resources in area management is not only in terms of technical skills in observing and surveying biodiversity but also in increasing understanding of the importance of maintaining and conserving the richness of flora and fauna and their habitats. Technical skills can be provided to company staff as additional capabilities in carrying out their main tasks and functions in the daily operations of the company. For example, 1) a

security guard in an oil palm plantation company, apart from having the ability to protect, also needs to be equipped with skills in anticipating a conflict with an orangutan, 2) a field worker in charge of cruising in an HPH company, apart from having skills in making paths and recording trees, also needs to be equipped with skills in observing orangutan nests, observing birds, and other animals.

The provision of additional skills will not impose a high cost on the company. The company does not need to recruit special employees to monitor biodiversity. It is enough to increase the workload of existing employees proportionally.

v. Restoring Ecosystem

In general, three efforts can be formulated to repair a damaged ecosystem. There are three efforts to improve ecosystem conditions: restoration, rehabilitation, and reclamation. Restoration activities are outstanding efforts to restore ecosystem conditions as close to initial conditions as possible. There are several principal differences between the three activities. Lamb and Gilmour (2003) distinguish the three terms as follows:

- Forest restoration is modifying the degraded ecosystem to achieve its original structure, productivity, and species diversity. Along with the restoration efforts, the ecological processes and functions are expected to return to the same as the former forest condition.
- Rehabilitation is the restoration of productivity but not all types of plants and animals that originally existed. This activity is carried out for ecological and economic purposes and can use plant species that did not initially exist. In time

the function of forest protection and ecological services can be restored.

- Reclamation is the restoration of productivity in degraded areas that mostly use exotic tree species and often use monoculture species. The original biodiversity is not restored, but the protection function and ecological function can be rebuilt.

vi. Sustainable Use

All activities carried out in the landscape are directed at sustainable use to the maximum extent possible while preserving nature. Two commonly used indications are proper assessment and certification.

The management unit is directed to achieve the results of the Proper assessment. Proper assessment is a Company Performance Rating Program in Environmental Management developed by the Ministry of Environment and Forestry (KLHK) to encourage companies to improve their environmental management. Through the proper assessment, the company will gain a certain reputation based on its efforts in environmental management. The reputation is assessed by color category according to the highest ranking, i.e., gold, green, blue, red, and black. Gold property is the best property, meaning the company has implemented comprehensive and continuous environmental management. On the other hand, if a company gets black property twice in a row, the company can be sued, and the business will be terminated.

Proper assessment criteria are 1) compliance criteria and 2) more than required criteria (beyond-compliance). The compliance criteria are used to

assess the blue, red, and black proper, while the beyond-compliance criteria are required to assess the green and gold proper. The beyond-compliance criteria are related to the protection of biodiversity. The priority assessment is efforts to maintain and care for biodiversity. One evidence that companies care about biodiversity is that companies have data and information systems that allow collecting and evaluating the status and trends of managed biodiversity resources.

The principles of sustainable management also encourage stakeholders to achieve various additional yet important certifications. For example, oil palm plantation companies are encouraged to achieve the Indonesian Sustainable Palm Oil Plantation (ISPO) certificate and the RSPO (Roundtable Sustainable Palm Oil) certificate through the protection of biodiversity within their area. Meanwhile, IUPHHK company management units are encouraged to achieve certificates of PHPL (Sustainable Production Forest Management) as well as FSC (Forest Stewardship Council).

3) Institutional

There are two institutional patterns in managing biodiversity in landscape scale areas, i.e., independent management and collaborative management. Self-managing institutions are applied if the landscape area is in one management unit. All stages of biodiversity management, from planning to evaluation, are carried out under one management roof. However, support from various other relevant stakeholders is still needed. Collaborative management institutions are applied if the landscape is in several different management units. The collaboration is actually meant that the program integration between management units is only limited to

management related to biodiversity at the landscape scale. The concept of collaboration that can be applied is in the form of a management forum.

4) Partnership between Stakeholders

The form of built institutions, both independent and collaborative institutions, will continue to be in touch with various relevant stakeholders. Stakeholders are parties who have interests and have their own goals in managing the area. Stakeholders can be individuals, organizations, communities, or social groups.

Relationships between stakeholders can be in the form of partnerships, coordination, coaching, monitoring, and evaluation. The role of each stakeholder involved in the management is then outlined in a memorandum of understanding. This role includes the rights and obligations that must be carried out in the formed forum.

5) Funding

There are several funding mechanisms in the management of landscape-scale areas. So far, several initiatives in the management of essential ecosystem areas on a landscape scale are a follow-up to international NGO projects, so in the early stages, a lot of financial support came from abroad. However, at a later stage, independence in management and funding is needed, especially from each management unit. Funding support from the central government can be provided if there is a conservation area (KSA/KPA) within the managed landscape area. Meanwhile, local governments can support funding, especially in protected forest areas which are currently under the management of the provincial government. Support from various donor agencies is also very much needed in assisting the management of the area and empowering the surrounding community.


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6) **Supervision, Evaluation, and Reporting**

Guidance is a business or activity carried out in an efficient and effective manner to achieve better area management results. Coaching is related to skills and abilities (specifically for employees to be successful in completing their work). Development of essential ecosystem area management can be carried out by a central agency from the Ministry of Environment and Forestry, in this case, the Directorate of Essential Ecosystem Management. In addition, coaching can be carried out by other institutions that have special competencies required by the management unit or all members of the management forum in general.

Monitoring the program implementation of the management action plans is carried out jointly with various relevant stakeholders. Technical recommendations regarding problems and obstacles in running the program and various alternative solutions to solve existing problems as an evaluation will be outlined in monitoring.

Reports are arranged to contain program achievements as planned. Reporting shows accountability of the activity implementation for several related institutions and also accountability for donor agencies. Reporting can be done annually as well as in five years. Quarterly and semi-annual reports can also be prepared if possible.

VI

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CLOSING

As development progresses, the need for land will increase. This condition will further put pressure on animal habitats, especially those outside conservation areas. It is important to do adaptive management by prioritizing a balance between land use and natural preservation. Designation of Essential Ecosystem Areas (KEE) is one of the efforts to maintain the conservation of biodiversity in the midst of various existing anthropogenic activities. No one wins; no one loses; a win-win solution is a challenge to be realized together. The balance between the planet, people, and profit is the foundation of management.

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ATTACHMENTS

Attachment 1. Guide to the identification and delineation of important ecosystems in landscapes

Steps for identifying and delineating important ecosystems:

1. Collecting various sources of map data and regional condition data.
    - Map data of regional boundaries (villages, districts, regencies, provinces), geology, hydrography, and soils from the RBI (Indonesia's Geospatial) map can be obtained at Ina-Geoportal which can be accessed via https://tanahair.indonesia.go.id/
    - Land cover: interpretation of good land cover sourced from the results of the interpretation of the Ministry of Environment and Forestry which can be obtained through the http://webgis.menlhk.go.id portal. In addition, land cover can be obtained through the interpretation of Landsat imagery. Landsat image maps can be downloaded from the USGS (United States Geological Survey) via https://earthexplorer.usgs.gov
    - Elevation and slope classes were analyzed based on DEM SRTM data which can be downloaded from USGS. DEMNAS can also be used, which can be downloaded at http://tides.big.go.id/DEMNAS/index.html
    - Climatic data (rainfall, temperature, humidity, wind, duration of sunshine) can be obtained from https://

dataonline.bmkg.go.id. Global climate and weather raster data can be obtained from WorldClim at https://www.worldclim.org/

- Map data of protected areas worldwide can be obtained from The World Database on Protected Areas (WDPA) at https://www.protectedplanet.net/
- Data on the boundaries of the concession area of HGU (Cultivation Right) can be obtained from the company concerned.
- Data on the distribution of priority animals to be protected is obtained from the concession owner company, especially data from the HCV assessment document. (Guidelines for identification of priority animals are described in Appendix 4. Data on animal distribution in general can be obtained from GBIF (www.gbif.org) or IUCN (www.iucnredlist.org).

2. Identify areas that need to be protected for biodiversity outside conservation areas. Especially essential areas, namely protected areas that function to provide protection for the area below which consists of local protected areas, including: river borders, coastal borders, areas around lakes/reservoirs and areas around springs, mangroves, peat, karst, heath, savanna, and swamp.

3. Delineation boundaries can use natural or artificial boundaries that already exist in the field. These boundaries include river flow boundaries, axis roads, concession area boundaries/protected areas, ridges, coastlines, and

Attachment 2. Rapid analysis for the scoring of landscape-scale delineation of protected area

NO	CRITERION	LOAD	SCORING				TOTAL (LOAD X SCORE)
1	Habitat connectedness		Distantly fragmented	Steppingstone	Closely fragmented	Corridor-connected	
	Score	1.67	5	10	15	20	
2	Type of ecosystem/habitat		1-2 type(s)	3-4 types	5-6 types	>6 types	
	Score	1.33	5	10	15	20	
3	Area		<100 ha	100-1000 ha	1000-10,000 ha	>10,000 ha	
	Score	1.00	5	10	15	20	
4	Distribution of priority animals for protection		< ¼ area	¼ - ½ area	½ - ¾ area	> ¾ area	
	Score	0.67	5	10	15	20	
5	Areal interior (border: 200 m)		<50%	50-65%	65-85%	>85%	
	Score	0.33	5	10	15	20	
TOTAL SCORE							
CRITERION			Poor/Fair/Good				

Table Filling Guide:

1. Ecosystem types include 19 types of natural ecosystems, according to Kartawinata (2013), namely:
    a. Marine Ecosystem (Seawater)
        - Neritic Region: nearshore area, along a shallow coast, 16-240 km wide.
        - Coral Reefs: includes areas inhabited by a variety of hard corals (hermatypic, stony coral), soft corals (ahermatypic, soft coral), and gorgonian.
        - Seagrass meadows: in Indonesia includes 13 species of plants in seagrass beds.
        - Oceania Region: an area of high seas ecosystem, with a depth that does not penetrate the sun's rays to the bottom so that the bottom is very dark.

    b. Limnic Ecosystem (Freshwater)
        - River Ecosystem: has its own uniqueness because it is a corridor that extends from upstream to downstream along the Watershed (DAS).
        - Lake Ecosystem: can be in lowland areas and mountainous areas, depending on the formation process, such as tectonic, volcanic, crater and caldera events; generally, in the highlands around the mountains. Meanwhile, inundation lakes are located in lowlands, are relatively shallow, and tend to be silted up due to siltation and invasive aquatic plants.

    c. Semi-terrestrial Ecosystem
        - Mangrove Ecosystem: an ecosystem whose plant composition is determined by substrate factors, tidal conditions, and salinity.
        - Riparian Ecosystem: a transitional ecosystem between water bodies and land outside the water environment.

d. Terrestrial Ecosystem (Land)
   - Flat Ground Ecosystem
     - Beach Forest: specifically, sandy beaches.
     - Dipterocarp forest: dominated by dipterocarp species such as (Shorea spp.), keruing (Dipterocarpus spp.), and camphor (Dryobalapnops spp.).
     - Kerangas Forest: usually grows on podsol, sandy, and acid soils; derived from the parent rock containing silica.
     - Swamp Forest: an area that develops on alluvial soil habitats with poor aeration due to continuous or periodic flooding.
     - Peat Swamp Forest: an ecosystem whose main constituent is about 65% organic matter, so this ecosystem can play a role in determining how much carbon emissions are each year.
     - Karst Ecosystem: includes areas of endokarst and exokarst that specifically develop from carbonate rocks such as limestone, and are composed of karstification processes in geological space and time scales.
     - Savanna: characterized by the presence of trees and shrubs in various patterns with low density, and associated with various types of understorey which are dominated by grasses.

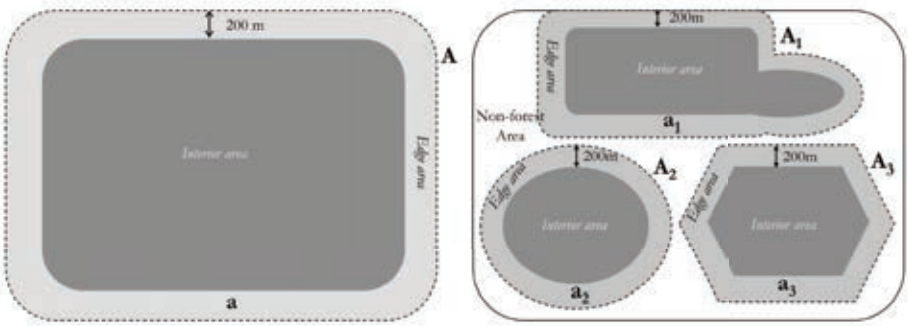
   - Mountain Ecosystem
     - Lower Mountain Forest: the boundary between the flat-ground forest at an altitude of 800 – 1,300 m above sea level.
     - Upper Mountain Forest: this ecosystem usually has one canopy layer so that it

can be easily distinguished from lower mountain forest.
- Sub-Alpine Forest: this ecosystem is found at an altitude of 2,400-3,000 m above sea level, with nutrient-poor habitat conditions and rocky soil (lithosol).
- Alpine forest: has an altitude of more than 3,000 m above sea level with vegetation in the form of communities of bush, grassland, heath, and tundra types.

2. The region area is the area resulting from the delineation of the proposed landscape boundary.

3. Habitat Connectedness:
   - Distantly fragmented: forest areas have been fragmented by non-forest areas and become forest patches that are far apart.
   - Steppingstone: in the large fragmented forest area, there are still smaller patches of forest that function as stepping stones for certain types of animals (birds and bats).
   - Closely fragmented: even though the forest area is already fragmented, the distance is close so that it is still possible for species of birds or bats to move between habitats.
   - Corridor-connected: forest plots are still connected to corridors so that it is still possible for terrestrial and arboreal animals to move between habitats.

4. Interior area is the percentage of forested area that is not affected by edge effects on the area of the edge.
   - The forest plot area within the landscape area is bordered from the forest edge as far as 200 m.



(a) (b)

Figure 16. Interior area in a compact (a) and fragmented (b) landscape.

- For the percentage of the interior area of the landscape where the forest area is compact and not fragmented (Figure 16a), the interior area is calculated using the formula:

  Interior Area (%) = $\frac{A}{a} \times 100$

  As for the landscape area where the forest is fragmented (Figure 16b), the interior area is calculated using the formula:

  Interior Area (%) = $\frac{(A1-a1)+(B1-b1)+(C1-c1)}{a+b+c} \times 100$

5. The distributions of priority animals identified in the area are as follows:

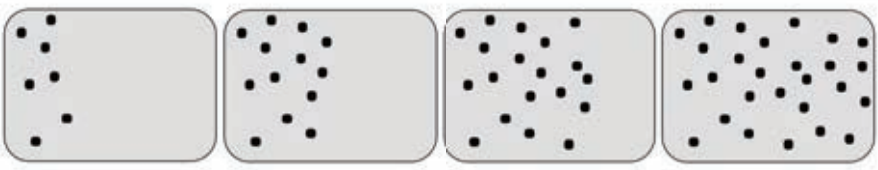


Figure 17. Criteria for distribution of priority animals in the landscape area.

6. The value of each criterion is the result of multiplying the weight value by the score. The total scoring is classified into three, namely:
   Score >75 : Good area delineation
   Score 50-75 : Fair area delineation
   Score <50 : Poor area delineation

Attachment 3. Stakeholder profile identification form

Stakeholder Identification
Management of Endangered Wildlife Protected Areas on a Landscape Scale

Landscape Name : … … …
Area : … … …
Location : … … …

- Stakeholder group : Central/regional government/private/ Regional Company/ State-owned Enterprise/NGO/ community group*.
- Stakeholder scale : local/regional/ national/multi-national*
- Organization name : … … …
- Type of business/main tasks & function :
- Address : … … …
  Contact person : (name, phone number)
- Organization legality : … … …
- Organization aims : 1. … … …
  2. … … …
  3. … … …
  4. … … …
- Working area/concession : … … …
- Level of importance : … … …
- Institution brief profile : … … …

Note: * circle accordingly

Attachment 4. Priority animal/plant identification form of Identification Priority Animals/Plants for Landscape-Scale Protection

No	Species	Keystone		Flagship					Umbrella						Interior Species	Score
		Top predator	Seed spreader	Rare / protected			Endemic	Unique / attractive	Wide roam	Large size	Feed a lot	Feed varied	Header connected	Multihabitat		
				PP	red list	CITES										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2																
3																
4																
5																

Explanation of the characteristics of the species:

- Keystone species are species in their habitats that have the most important role in the ecosystem, both in terms of structure, function and productivity. The loss of key species from the ecosystem will cause drastic changes in the ecosystem and can lead to the extinction of other species.
- Flagship species are the most popular and charismatic species that serve as symbols to increase public awareness or financial support for conservation efforts (Barua et al., 2012).
- Umbrella species: if the umbrella species is protected, automatically the existence of other species will also be protected. Therefore, the selection of umbrella species is based on the requirements of its life which are more numerous and wider than other species that occupy the same habitat.
- Interior species is a type of animal that has a special habitat only in the forest.

Attachment 5. Guidelines for filling out the Identification Form for Priority Animals/Plants for Landscape-Scale Protection

To conduct and identification, it is necessary to make a short list of potential plant and animal species as priority species in the management target. The priority species can be the keystone, umbrella, or flagship. The initial stage needs to identify each of the five potential plant and animal species for further assessment (Attachment 4).

Filling instruction:

Filling is done by marking √ for the appropriate column for that type.

Column 1 : The serial number of the list of assessed species.

Column 2 : Species can be animals or plants. The fields for plant species are limited to columns 3-5, 11, and 15.

Column 3 : Types of top predators, such as big cats, eagles, snakes, crocodiles, predatory fish, etc.

Column 4 : Types of seed dispersers are important, such as orangutans, hornbills, etc.

Column 5 : Protection status based on Indonesian government regulations, namely the Regulation of the Minister of Environment and Forestry number 106 of 2018. Documents can be downloaded via http://jdih.menlhk.co.id/.

Column 6 : Species conservation status based on the IUCN red list, can be accessed online via www.iucnredlist.org.

Column 7 : International trade status according to CITES, can be accessed online via www.speciesplus.net.

Column 8 : Endemicity status either locally or island.

Column 9 : Uniqueness can be in the form of unique and attractive characteristics (pattern, behavior, attractive appearance, subspecies).

Column 10 : Home range of animals can be identified based on literature searches.

Column 11 : The relative body size of an animal or plant depends on the taxa. Large mammal taxa are categorized as weighing more than 5 kg. The large Aves taxa are included in the Bucerotid group.

Column 12 : Animal feed requirements are usually associated with body size; it is related to the availability of feed and the productivity of feed available in the habitat.

Column 13 : Animals are species whose food sources include many types of plants whose presence is spread throughout the forest area.

Column 14 : Animal needs for habitats with interconnected canopy conditions. Generally, primates and arboreal species that require movement in trees.

Column 15 : Types of animals or plants that use or occupy several types of habitats (multi-habitat).

Column 16 : Types of animals that are included in the category of interior species, which require habitats that are still good and not affected by edge effects.

Column 17 : Scoring is based on the number of marks in each identified species. The highest score indicates the species that are the highest priority in the protection of the landscape area

Attachment 6. Example of Memorandum of Understanding (MoU)

COOPERATION AGREEMENT
BETWEEN
The First Party

AND
The Second Party

AND
The Third Party

CONCERNING
Landscape Management of …. Covering an area of … ha
in …. Regency, …..Province

On the ……. day of (date written in numbers) ……..(month) in ….. (year), it has been agreed by:

1. …… (name, title) : having the capacity as the Chairman of Natural Resources Conservation Center (BKSDA) of …. Province, acting as and on behalf of BKSDA ……., domiciled at Jl. ……
   Hereinafter referred to as 'THE FIRST PARTY"
2. …… (name, title) : having the capacity as the President Director of PT. ….., acting as and on behalf of PT. ….., domiciled at Jl. …..
3. …… (name, title) : having the capacity as the Operations Director of PT. …., acting as and on behalf of … PT. …, domiciled at Jl. …
   Hereinafter referred to as 'THE SECOND PARTY"
4. …… (name, title) : having the capacity as the Traditional Head of …., acting as and on behalf of … customary people of …, domiciled at Jl. …
   Hereinafter referred to as 'THE THIRD PARTY"

THE FIRST PARTY, THE SECOND PARTY, AND THE THIRD PARTY are hereinafter individually referred to as "PARTY" and collectively referred to as "PARTIES".
The PARTIES shall first explain the following:

1. THE FIRST PARTY is an organization of …….. that is responsible for ….

2. THE SECOND PARTY includes companies acting as Business License holders…. in the operational area of …….. landscape.
3. THE THIRD PARTY is the customary people of ….. domiciled in …. who committed to preserve environment and biodiversity.

Considering the above description, THE PARTIES agree to enforce an agreement with the terms and conditions set forth in the following articles:

Article 1

DEFINITION

This article contains an explanation of the terms used in this memorandum of understanding. Some general terms that are usually explained include landscape areas, biodiversity conservation, conservation areas, and high conservation value areas. In addition, it is necessary to explain some special terms adapted to the context of the collaboration to be carried out.

Article 2

OBJECTIVES

This article contains the objectives to be achieved in this memorandum of understanding. The objectives usually include joint management of the area, cooperation, capacity improvement of human resources, community participatory development, and model development for science & research. Other objectives can be adapted to the general conditions of the area and the social, economic, and cultural aspects of the local community.

Article 3

SCOPE

The scope of cooperation contains provisions related to the boundaries of activities to be collaborated, so that activities are more focused.

Article 4

ANNUAL WORK PROGRAM AND WORK PLAN

This article contains the work program that will be carried out and several matters related to the preparation of the annual work plan. The work program can be included directly in the articles of the cooperation agreement or stated in the attachments.

Article 5

OBLIGATIONS AND RIGHTS OF EACH PARTY

This article contains obligations and rights of each party in implementing the agreement.

Article 6

TERM

The term means the effective duration of the cooperation starting from the signing of the cooperation agreement. The term of the agreement is usually five years and can be extended afterward according to the agreement of the parties.

Article 7
FINANCING

This article explains the provisions for the financing of activities as a consequence of this agreement. The financing is usually charged to each party according to the commitment and ability of each party. In addition, it is necessary to open an opportunity to obtain funding sources from outside parties and various donors.

Article 8
REPORTING AND EVALUATION

This article contains the provisions related to reporting, including the substance, duration, and arrangement of the report. The duration of the report is usually prepared annually by the parties, which contains the progress of the activities and the various problems encountered. In addition to the annual report, it is also necessary to prepare a final cooperation report.

Article 9
DATA USAGE

This article contains the agreement of the parties not to use the data and information gained from the collaboration other than for the interests in accordance with the objectives of the cooperation. If one party intends to use it for other purposes, then the consent of the other party is required.

Article 10
TERMINATION

This article contains provisions relating to any matter that causes the termination of the agreement. The end of the agreement can be due to the expiration of the agreement or other matters based on the agreement of the parties. The involvement of either parties may end upon a written submission from the party concerned, its operational activities that have stopped, or its business license revoked by the authorities.

Article 11
FORCE MAJEURE

This article contains provisions in the event of a deviation from the provisions in the agreement in an emergency and beyond the control of the parties. It may happen when the parties experience obstacles and cannot fulfill their obligations due to various unexpected things such as natural disasters, epidemics, wars, riots and others.

Article 12
PROBLEM-SOLVING

This article contains various provisions related to efforts to resolve any problems that occur during the implementation of the agreement.

Article 13
NAME AND LOGO

This article contains the provisions related to the name of management forum and logo agreed upon by all parties.

Article 14
MISCELLANEOUS

IN WITNESS WHEREOF, the undersigned have signed this Memorandum of Understanding on the day, month, and year mentioned at the beginning of the Agreement. Each representative has signed four original MoU documents, all the documents being equally authentic.

THE FIRST PARTY

Signature Name and Title Position and Institution	Signature Name and Title Position and Institution
THE THIRD PARTY Signature Name and Title Position and Institution	THE SECOND PARTY Signature Name and Title Position and Institution
ACKNOWLEDGED BY, Signature Name and Title Governor/Regent	

Attachment 7. Gap analysis table of collaborative management

No.	Priority Program/Activity	Management Unit					Description
		Management Unit "A"	Management Unit "B"	Management Unit "C"	Management Unit "D"	Protected Forest "A"	
1	Program A						
	a) Activity 1						
	b) Activity 2						
	c) Activity 3						
	and so on...						
2	Program B						
	a) Activity 1						
	b) Activity 2						
	c) Activity 3						
	and so on...						
3	Program C						
	a) Activity 1						
	b) Activity 2						
	c) Activity 3						
	and so on...						

Attachment 8. Filling table of the action plan for landscape-scale area management

No	Action Plan	Period (Year n)					Executor	Target	Description
		1	2	3	4	5			
1	Program A								
	a) Activity 1								
	b) Activity 2								
	c) Activity 3								
	and so on...								
2	Program B								
	a) Activity 1								
	b) Activity 2								
	c) Activity 3								
	and so on...								
3	Program C								
	a) Activity 1								
	b) Activity 2								
	c) Activity 3								
	and so on...								

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