PT PLN (PERSERO)

ENERGY TRANSITION AND SUSTAINABILITY DIVISION

Biodiversity
MANAGEMENT GUIDELINE

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Key Abbreviation

ACA	:	Additional Conservation Action
AZE	:	Alliance for Zero Extinction
AOI	:	Area of Influence
BES	:	Biodiversity and Ecosystem Services
BMP	:	Biodiversity Management Plan
BOMP	:	Biodiversity Offset Management Plan
CHA	:	Critical Habitat Assessment
CR	:	Critically Endangered
EAAFP	:	East Asian and Australasian Flyway Partnership
EAAA	:	Ecologically Appropriate Area of Analysis
EN	:	Endangered
E&S	:	Environmental and Social
ESF	:	Environmental and Social Framework
ESMP	:	Environmental and Social Management Plan
ESMS	:	Environmental and Social Management System
ESS	:	Environmental and Social Standard
EHS	:	Environmental, Health and Safety
FPIC	:	Free, Prior and Informed Consent
GIS	:	Geographic Information Systems
GHG	:	Greenhouse Gas
IA	:	Impact Assessment
IBA	:	Important Biodiversity Area
IBAT	:	Integrated Biodiversity Assessment
IFC	:	International Finance Corporation
IUCN	:	International Union for Conservation of Nature
IAS	:	Invasive Alien Species
KBA	:	Key Biodiversity Area
METT	:	Management Effectiveness Tracking Tool
MoEF	:	Ministry of Environment and Forestry
NGO	:	Non-Governmental Organization
PS	:	Performance Standard
PPE	:	Personal Protective Equipment
SIA	:	Social Impact Assessment
SSC	:	Species Survival Commission
UNESCO	:	The United Nations Educational, Scientific and Cultural Organization

TCL	:	Tiger Conservation Landscape
VU	:	Vulnerable
WBG	:	World Bank Group
WDPA	:	World Database on Protected Areas
WRI	:	World Resources Institute
WWF	:	World Wildlife Fund

1 Introduction

PLN is committed to avoid programs/projects that are expected to have significant adverse impact upon biodiversity and maintain or enhance community and/or project benefits from ecosystem services throughout the life cycle of a project. To do so, this guideline is developed in order to manage biodiversity aspect for new project development, expanding an ongoing project or if there are changes in the operation, which are consistent with the E&S principles described in the ESMS Manual and based on international good practice, including the World Bank's Environmental and Social Standard (ESS) 6, WBG Environmental Health and Safety (EHS) Guideline, IFC Performance Standard (PS) 6 and also based on PLN's documents related to biodiversity (see **Section 15**) and other documents as listed in **Section 16** of this management guideline.

This guideline is developed to provide some guidance in managing biodiversity aspects on a project, whereby implementing the management plan, the following objectives could be achieved:

- To protect and conserve habitats of biodiversity and their value.
- To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity.
- To promote the sustainable management of living natural resources.
- To support livelihoods of local communities, including Indigenous Peoples, and inclusive economic development, through the adoption of practices that integrate conservation needs and development priorities.

The minimum goal of biodiversity management is 'no nett-loss of biodiversity'. 'No net-loss' is defined as the point at which project-related biodiversity losses are balanced by gains resulting from measures taken to avoid and minimize these impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale. Specifically for projects located in or adjacent to a critical habitat, the minimum goal of biodiversity in 'net gain'. 'Net gain' are additional conservation outcomes that can be achieved for the biodiversity values for which the natural or critical habitat was designated.

In managing the risk and impact on biodiversity, the following mitigation hierarchy shall be applied: avoid – minimize – restore – offset, from most desirable to least preferred strategy.

2 Disclaimer

This management guideline should not be taken as a standard, regulation, or manual and is not described to the detail level of a work instruction. If a more relevant or updated standard, regulation, or manual is available and demands a revision of this guideline, then such revision is permitted. If any revision is made; references, rationales and amended parts should be clearly defined.

To be able to serve its purpose, this guideline should be reviewed, implemented, and/or enforced by and to PLN staff with relevant authorities and competencies specified in the ESMS Manual Chapter 3. Any changes to this management guideline may potentially trigger the need to revise the associated procedures and other guidelines that connected with this guideline. Any update, deviation, or suggestion of this guideline will be followed up in alignment with the provision of Chapter 9 of the ESMS Manual (Management of Change).

3 Management Approach

The management of impact on biodiversity is a risk-based approach, which means that the management activities will be proportional to risk or impact. The base activities of a risk-based approach are identifying potential risk and impact on biodiversity and assessing the significance level of those impact, and based this impacts identification – assessment process, the management effort and activities will be determined proportional with the significance level of the impacts.

For example, based on screening process it is known that the project location is adjacent to endangered bird nesting area, as such it is considered that the project has potential significant impact to critical habitat, thus a critical habitat assessment is required. Another example, a small-scale solar PV is planned to be build in an urban area, a modified habitat with no indication of a presence of species included in IUCN, thus critical habitat assessment is not mandatory to be conducted.

Biodiversity loss and degradation of ecosystems may be irreversible, or reversible only over a very long time period and at great expense. At the same time, decisions with potential implications for biodiversity, habitats, and natural resources often must be made prior to completion of project designs and/or without the benefit of detailed or up-to-date baseline data. In addition, ecological systems are highly complex, which can make it difficult, sometimes impossible, to make reliable predictions concerning the longer-term impacts of project activities. For these reasons, a precautionary approach and adaptive management are two important strategies for managing risks when faced with a high degree of uncertainty. In the precautionary approach, the emphasis is on avoiding actions with potentially harmful (and particularly with irreversible) consequences until there is sufficient information available to properly assess and weigh the likely costs and benefits. Adaptive management involves adjusting actions and approaches based on the results of ongoing monitoring of outcomes. Adaptive management requires regular monitoring of environmental and social indicators, comparing these with expected outcomes, and revising actions as needed in order to realign the project with environmental and social safeguard objectives

Precautionary approach: Where project screening and scoping indicate any good reason to believe that important features with high biodiversity value may be present and could be adversely affected by project activities, key knowledge gaps should be addressed prior to making decisions on whether or how to proceed with those activities. The adage “absence of evidence is not evidence of absence” is particularly relevant to the question of whether there are unique or endangered species or evolutionary or ecological processes at a project site. Absolute knowledge and certainty are rarely if ever achievable in relation to biodiversity and ecological systems and avoiding or delaying development activities can carry economic and social costs. Consequently, adopting a precautionary approach does not mean demanding full and conclusive information or absolute certainty before taking an action. In some cases, data collection or analysis can also proceed in parallel with project development, but they should be completed prior to taking irreversible actions or decisions with significant implications for project impacts, as long as provision is made to allow for all possible outcomes. Advice from technical experts and stakeholder consultations should be used to determine what information

is sufficient for decision making and when the anticipated benefits of a development activity outweigh either known or suspected risks and impacts.

Adaptive management: Environmental and social assessments carried out during project preparation are necessarily constrained by the information available at the time and assessment-related decisions may need to be made based on assumptions and predictions. During project implementation, new information and unforeseen or changing circumstances can arise that may lead to the failure of mitigation measures or other unexpected results. Adaptive management includes regular monitoring of environmental and social indicators, comparing these with expected outcomes, and revising actions or developing new strategies, as needed in order to realign the project with the impact management objectives. For example, the monitoring of bird and bat mortality at a wind farm might find patterns that lend themselves to adaptive management, such as short-term shutdowns during peak bird periods, or a change in turbine cut-in speed to reduce bat fatalities (during low wind speeds when bats are most active). Similarly, the monitoring of a river-edge forest or wetland might lead to recommendations for changing the water flow releases from a dam. The use of leading indicators, which help to identify problems before they become significant and possibly irreversible, is particularly important for adaptive management in relation to maintaining biodiversity and ecological systems, making it important to develop reliable baseline data. Details of monitoring, criteria, and decision-making processes that will support adaptive management of the project should be set out in the Biodiversity Management Plan (BMP) as appropriate.

4 Habitat Definition

"Habitat" is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment[1]. Habitats vary in their significance for conserving globally, regionally and nationally important biodiversity, their sensitivity to impacts and in the significance different stakeholders attribute to them. Because, in most instances, habitat loss, degradation or fragmentation represents the greatest threat to biodiversity, much of the focus of biodiversity conservation actions is on maintaining or restoring suitable habitats.

Habitat categorized as follow:

(i) *Natural Habitat*
Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. Natural Habitats include nature protection areas, nature reserve areas, and other areas that have ecological functions and provide environmental services.

(ii) Modified Habitat
Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition[2]. Modified habitats

[1] World Bank ESS 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources

[2] A habitat will not be deemed to be a modified habitat where it has been converted in anticipation of the project.

may include, for example, areas managed for agriculture, forest plantations, reclaimed[3] coastal zones, and reclaimed wetlands.

Differentiating modified habitat from natural habitat may call for expert judgment as to whether the characters and functions of the habitat remain essentially natural. Habitats affected by potentially harmful human activities are typically still considered as natural habitats if such activities:

(a) Have limited impact on the species composition or ecological function of the habitat;
(b) Form part of a long-term pattern of traditional use, to which native species assemblages have adapted;
(c) Are no longer prevalent, and the habitat supports a mature and diverse community of predominantly native species; or
(d) Have not profoundly affected the habitat's ability to recover its former ecological characteristics.

(iii) Critical Habitat

Critical habitat is defined as areas with high biodiversity importance or value, including:

(a) habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches;
(b) habitat of significant importance to endemic or restricted-range species;
(c) habitat supporting globally or nationally significant concentrations of migratory or congregatory species;
(d) highly threatened or unique ecosystems;
(e) ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

Both natural and modified habitat can be classified as critical habitat.

(iv) *Legally protected and internationally and regionally recognized areas of biodiversity value*, which may encompass habitat in any of the previous habitat category.

Internationally recognized areas of high biodiversity value include World Heritage Natural Sites, Alliance for Zero Extinction Sites, Biosphere Reserves, Ramsar Wetlands of International Importance, Key Biodiversity Areas and Important Bird Areas, among others.

5 Process Overview

In order to achieve the objectives of each step of E&S safeguard process, the biodiversity aspect will follow the following process:

- Biodiversity screening;
- Biodiversity assessment;
- Planning of mitigation measures;
- Monitoring and review;

[3] Reclamation as used in this context is the process of creating new land from sea or other aquatic areas for productive use

The process above is conducted within the E&S safeguard process as regulated in the ESMS Manual, which includes the screening process and categorization, scoping, baseline study, analysing and assessing impact, management and monitoring strategies. In every step of the E&S safeguard process, the mitigation hierarchy will be taken into consideration.

6 Biodiversity Screening

Biodiversity screening is a quick expeditious and high-level analysis to identify the projects needs on biodiversity assessments based on limited data and information available. Biodiversity screening will be conducted at the project screening & categorization stage. The biodiversity screening objectives are:

- To gain information whether the biodiversity impact has an acceptable risk level for further development in PLN based on initial available data that may be limited;
- To determine the biodiversity aspect risk category based on preliminary assessment of the potential risk;
- To identify the needs for further study or assessment and the extent of that study;
- To inform PLN management on the resources needed to further assess the biodiversity risk and potential impact.

The biodiversity screening should be conducted at the earliest possible stage in the project lifecycle, whenever possible it should be concurrent with or part of the pre-feasibility and feasibility studies (or KKO and KKF)[4], and in collaboration with preparers of the feasibility assessments. This process is conducted by the Impact Assessment (IA) Sub-Team with support from a suitably qualified Biodiversity specialist and in consultation with ES Team (see ESMS Manual Chapter 5.2).

Early risk screening is a valuable tool to assess if a particular site or sites may pose an elevated biodiversity risk. It does not provide information on whether suitable but less risky locations exist elsewhere. Spatial plans and wildlife sensitivity mapping can provide this information.

At this stage of the process, preliminary data on the project location must be gathered, which needs to include the following but not limited to:

Administrative	To identify the project location and its vicinity administratively (as well as study area and/or Ecologically Appropriate Area of Analysis/EAAA) which will potentially affect the biodiversity values in terms of policies and stakeholders. The administrative information of the project location should also be used to identify the potential of transboundary impact that might occur.
Area Status	To identify the potential presence of national and global conservation and protected areas within the project, impacted and study areas within some distance based on best practice based on professional judgement and potentially affected species. This

[4] In existing PLN project development process, project that involves significant infrastructure development like a power plant or a transmission line, requires a Pre-Feasibility Study (Pre-FS) and Feasibility Study (FS); while for project that does not involve significant infrastructure development, such as distribution line establishment, a simpler assessment named Operational & Financial Work Assessments (*Kajian Kerja Operasional & Kajian Kerja Finansial*, or "KKO & KKF") is conducted

	identification should include regional and international initiative on biodiversity (habitat and species). For instance, Heart of Borneo Initiative, the Tiger Conservation Landscape (TCL), Coral Triangle Initiative, East Asian and Australasian Flyway Partnership (EAAFP), WWF Ecoregion, etc.
Habitat of Proposed Project and Surrounding Areas[5]	To identify the landcover, habitat, and ecosystem types within the project area and its relevant surroundings. The presence of natural and unique habitat/ecosystem will become project concern. Some of the natural and unique habitats may not designated as protected areas under Indonesia regulation or mentioned as internationally recognised areas.
Species of Conservation Significant	To identify the potential species of conservation significance that may inhabit the area. Species of conservation significance include: ❑ Critically Endangered, Endangered and Vulnerable species based on IUCN Red List; ❑ Endemic and/or restricted range species; ❑ Migratory Species; ❑ Protected species under Indonesia regulations.
Wildlife Sensitivity Map	To identify weather the project area and its vicinity located within sensitive area to the wildlife and its habitat. Several references on wildlife sensitivity map are listed in **Section 6.2**.
Stakeholders	To identify the potential stakeholders regarding wildlife and habitat protection and conservation on local level to international level. Liaison with IUCN/Species Survival Commission (SSC) Primate Specialist Group (PSG) Section on Great Apes (SGA) is required to conducted in advance especially where the great apes (orangutan) may potentially occur within the project are and vicinity (IFC, 2019). It's also suggested (if necessary) to liaise with other IUCN SSC Groups when critically endangered species occur within the project area and vicinity (within AOI).

At this early risk screening stage, preliminary scoping is also required to identify the data availability and gaps analysis. The preliminary scoping process should determine the spatial and temporal area of analysis including evaluation of the preliminary boundary of Area of Influence (AOI) and Study area and/or Ecological Appropriate Area of Analysis (EAAA). The preliminary scoping is also required to suggest the proposed survey location (if required), technical methodology and data analysis and minimum requirements to the surveyors and specialists.

Consultation with governments officials, conservation organization, local communities, and experts is important to be conducted in this early risk screening stage to help the project in identifying of key biodiversity impacts, including those linkages with livelihood and social

[5] Data collection on habitat is presented in Appendix 1

issues. In some situations, biodiversity aspects may need to be included in the FPIC (Free, Prior and Informed Consent) process for indigenous peoples.

At the screening stage, possible potential critical habitat shall be identified based on preliminary information of species protection and conservation requirements, land cover and habitat classification, including feedback from social receptors and stakeholders, and expert justifications. It should be referred to as “Preliminary identification of potential critical habitat”. The preliminary identification also needs to mention the baseline to be surveyed with detailed proposed targeted species and method of survey. In this preliminary identification, potential stakeholders also need to be identified and plan for further consultation can be developed. This preliminary identification can inform the project in the project risk categorization process.

National Conservation Forest Area

Forest status areas serve as a significant factor in determining the status of the land, which is implicated in the legal status and regulations that apply. In general, forest areas managed by the central government are divided into three functions, namely production, protection, and conservation.

Conservation forest is defined as a forest area with specific characteristics, primarily aimed at preserving the diversity of plants and animals, as well as their ecosystems. The main purpose of a conservation forest is to protect and maintain the natural habitats and biodiversity within it. Conservation forest comprises different types of protected areas, each with its specific purposes and management objectives. The main categories of conservation forest are:

- Nature Reserve Forest Areas: These include Nature Reserves and Wildlife Reserves, which are designated to protect and preserve specific natural habitats, ecosystems, and wildlife species.
- Nature Conservation Forest Areas: This category includes National Parks, Grand Forest Parks, and Nature Tourism Parks. National Parks aim to safeguard unique landscapes and ecological diversity. Grand Forest Parks are meant to protect large forested areas with high ecological value, while Nature Tourism Parks focus on promoting eco-tourism and raising environmental awareness.
- Hunting Parks: These areas allow controlled hunting activities to manage wildlife populations and maintain ecological balance, while still ensuring the conservation of species.

Conceptually, utilization activities are allowed in conservation forest areas, except in specific conservation management zones such as the core zone, wilderness zone, and nature reserve forest. These restricted zones are designated to ensure the protection and preservation of the forest's most ecologically sensitive and critical areas. In contrast, other parts of the conservation forest may be used for various activities that are deemed compatible with conservation objectives, balancing human needs with ecological preservation.

In the context of environmental screening, conservation areas, particularly Nature Reserve Forest Areas and the core zone - wilderness zones management areas, hold the highest level of importance. When conducting a screening process, it is crucial to consider the status of forest area data and its implications. Additionally, if the project spatially affects conservation areas other than Nature Reserve Areas, zoning data that supports the decision-making process is essential.

Notably, Nature Reserve Areas can act as significant obstacles to project implementation because there are no regulations that support their use. In this case, the concept of avoidance should be given the highest priority if the project is to proceed. This means avoiding any activities or development that may negatively impact the Nature Reserve Areas in order to prioritize their preservation and conservation

For ongoing project screening, a due diligent assessment will be required which aims to identify significant ecological conditions for both species and ecosystems within the impacted

landscape or seascape. Ongoing Project Screening may be conducted/updated as the unit's operations progress or due to changes in the business processes. The screening process will include a thorough examination of available pertinent official environmental documents (e.g., Environmental and Social Impact Assessments (ESIA, AMDAL, UKL-UPL, etc), Biodiversity Management Plan, SOPs on biodiversity, etc.) and if required, additional ecological data collection (e.g., the latest land cover, etc). The following screening process in principle will follows the screening process as guided in this guideline.

6.1 Preliminary Assessment of Biodiversity Impact for Project Categorization

Initial identification of potential impact on biodiversity will be conducted based on the available information that has been gathered as described above and the identified potential impact will be assessed. **Appendix 4** listed typical potential impact on biodiversity based on the several types of PLN's project. To be noted that these typical impacts is to be used as reference only, a more comprehensive identification based on the project location condition and the project activity still need to be done.

Assessment in this stage of project is an initial assessment where biodiversity offset is not necessarily taken into account. The presence of protected areas or potential critical habitat areas impose higher risk and higher mitigation efforts that must be implemented. Whenever possible, the project should avoid selecting project area with high risk on biodiversity.

The preliminary assessment will be conducted to assess the significance of the identified potential impacts. Significance of the potential biodiversity impacts is measured by assessing the probability and the consequence level, using reference criteria for probability and consequences as provided in Appendix 4 of the ESMS Manual, criteria for Biodiversity and Sustainable Use of Natural Resources.

The significance of biodiversity impact will contribute in calculating the likely E&S effect of a project when determining project's risk category. Potential biodiversity impacts assessed will likely consist of several impacts, such as impact on specific species, impact on habitat, etc., where each of these impacts will have its own level of significance. However, in context of determining project category, the risk category will follow the highest risk significance.

To be noted that the results of screening and categorization process are preliminary in nature and will be expanded and revisited as part of the Impact Assessment, when more information about the nature and the scope of a project becomes available or when project definition and circumstances change (e.g., screening of subprojects done during project implementation, change of project description and components, etc.). This is in line with the adaptive risk management approach.

The biodiversity impact assessment in the Project's Impact Assessment process may often require a longer timescale to ensure that a proper evaluation can be completed. This is because in some projects, some conditions below are met:

- Limited availability of baseline information which necessitates additional baseline studies (either desktop-based study or field survey) to be done;
- Baseline studies that are/will be conducted require long period of data collection (e.g., full annual cycle of biodiversity data and information);

- Confirmation of area with species of conservation significance and/or important habitat holder are required; and/or
- Liaison process with related stakeholders, such as conservation NGO and IUCN SSC Groups, etc., that may take longer time rather than expected.

Therefore, it is important at this screening and project categorization stage to identify any potential future biodiversity issues that might influence the timescale of the assessment. In some cases, the need for full cycle of biodiversity data and information can be identified at the feasibility study and/or at this screening and project categorization stage. The collection of such baseline can be commenced earlier than the scoping stage so when project's impact analysis is started, all the necessary data and information would be already available.

6.2 Screening Against Exclusion Criteria

The project location will be screened against the Exclusion Criteria as stipulated in the ESMS Manual (Chapter 4). There are two exclusion criteria related to biodiversity aspects as listed in **Table 6-1**.

Table 6-1 Exclusion Criteria with Respect to Biodiversity

No.	Exclusion Criteria with Respect to Biodiversity
1.	Project is expected to result adverse impact to feature or characteristic which qualifies as a location to become part of UNESCO World Heritage sites or Alliance for Zero Extinction (AZE) site.
2.	Project is expected to result adverse impact to existing or proposed protected conservation area and/or national and internationally protected ecosystem without legally and technically acceptable process to offset biodiversity net loss.

It should be noted that in case that certain international financial institution (or the financing scheme) demands the funded project to apply certain biodiversity screening criteria and standards, those standards will be adopted in addition to the screening criteria and standards provided in the ESMS Manual.

Screening against World Heritage Sites and AZE sites can be conducted through desktop study by confirming whether the proposed project location is in the list of UNESCO World Heritage Sites and/or AZE sites.

Screening against existing or proposed protected conservation area and/or national and internationally protected ecosystem can be conducted through overlaying the project location with spatial plans (which have information on protected area) and wildlife sensitivity map. Wildlife sensitivity maps include, but are not limited to:

- Area with international status e.g., Ramsar Wetlands of International Importance, Biosphere Reserves, etc.;
- Important area for biodiversity, e.g., Important Biodiversity Areas (IBA), Tiger Conservation Landscape (TCL), and other important areas such as Key Biodiversity Areas (IUCN), etc.;

- Presence and distribution of important species, e.g., IUCN List of threatened species, Global Biodiversity Information System, Species abundance: the Living Planet index.

Screening for sensitive wildlife, among others, can be done by using the Integrated Biodiversity Assessment – IBAT Tool[6].

Information that can be gathered and analysis that can be conducted at this screening stage is limited. This may cause the result of screening against exclusion criteria cannot be definitively concluded, e.g., regarding offset of the biodiversity net loss. In such cases, a more comprehensive study and assessment on biodiversity may be required, e.g. critical habitat assessment, specific species or habitat study, etc. The biodiversity specialist should give a clear understanding to PLN on the potential risk and efforts that are required related to this condition. For example, the studies that need to be conducted, the potential of mitigation effort required, etc. This should be noted by PLN and to be taken into consideration in taking decision on proceeding the project and/or the next step of E&S safeguard process.

7 Critical Habitat Assessment

Critical habitat is defined in the World Bank Environmental and Social Standard (ESS) 6 as areas with "high biodiversity importance value", including: a) habitat of significant importance to Critically Endangered and/or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches; b) habitat of significant importance to endemic or restricted-range species; c) habitat supporting globally or nationally significant concentrations of migratory species or congregatory species; d) highly threatened or unique ecosystems; and e) ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described in (a) to (d)."

Critical habitat assessment shall be carried out for project that located within internationally or nationally areas of high biodiversity value, or in areas that have strong indication to have high biodiversity value, or in potential critical habitat areas. Following the biodiversity screening process, the biodiversity specialist will give recommendation regarding the need of critical habitat assessment for the proposed project area.

Critical habitat assessment can be conducted as separate assessment prior project scoping or to be conducted as part of the Scoping – Analysis and Assessment of Impact process, dependant on the consideration of the effort that will need to be given to do the critical habitat assessment, the time, budget, and/or other technical and business consideration.

Critical habitat is not limited to pristine or highly biodiverse areas. It can include both modified and natural habitats supporting the biodiversity values that trigger the critical habitat criterion. Critical habitat can therefore be a subset of both modified and natural habitats.

Table 7-1 details the qualifying requirements for critical habitat criteria 1 to 3 (i.e., thresholds) where the details of the likely qualifying interests for Criterions 4 and 5 are defined based on research, expert opinion, and expert justification.

Table 7-1 The Qualifying Requirements for critical habitat

[6] Details on utilizing IBAT Tool/platform is presented in Appendix 2.

Criteria	Thresholds
Criterion 1: Critically Endangered (CR) / Endangered (EN) species:	Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (0.5% of the global population AND 5 reproductive units 15 of a CR or EN species) Areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in (a). As appropriate, areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species.
Criterion 2: Habitat of significant importance to endemic and/or restricted-range species;	Areas that regularly hold ≥10% of the global population size AND ≥10 reproductive units of a species.
Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species;	Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.
Criterion 4: Highly threatened and/or unique ecosystems; and/or	(a) Areas representing ≥ 5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. (b) Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.
Criterion 5: Areas associated with key evolutionary processes	No specific criteria
Notes: *Endemic Species* = an endemic species is one that has ≥ 95 percent of its global range inside the country or region of analysis; *Restricted-range Species* = Species with world distributions of less than 50,000km^2; *Migratory species* = Any species or lower taxon of wild animals, in which a significant proportion of the members of the entire population or any geographically separate part of the population cyclically and predictably crosses one or more national jurisdictional boundaries; *Congregatory Species* = Species that gather in globally significant numbers at a particular site and at a particular time in their life cycle for feeding, breeding or resting (during migration).	

Based on the critical habitat assessment, if the project area is defined as to contain critical habitat, a management plan will be developed to manage the criterion that triggered the critical habitat status. The management plan should be included in the biodiversity management plan (see **Section 13**), although the details of the management plan related this critical habitat can be documented in separate document.

8 Scoping of Biodiversity Impact Assessment

Scoping in Impact assessment is conducted to determine whether the project has the potential to affect areas important for biodiversity and living natural resources, which should include consideration of transboundary risk or impacts. Impact Assessment scoping aims to:

- Deepen the understanding of the potential biodiversity impacts (assuming that they have been identified during screening process);

- Clearly define what is within the scope of the assessment (activities, risks/impacts to be focused on, Area of Influence (AOI) and Study area and/or Ecological Appropriate Area of Analysis (EAAA), etc.);
- Identify the data availability and gaps analysis;
- Identify required expertise for the impact assessment process; and
- Identify a suitable methodology and sampling strategy.

The scoping exercise will ensure that the assessment take into account input from stakeholders on what they consider important and are assessed at an appropriate level of detail. To be noted that some of the information that need to be collected and works to be done in this scoping process have been conducted during the screening process.

If scoping indicates proximity of the project to areas important for biodiversity and living natural resources, the impact assessment will analyse specific risks and impacts, using the best available data for review and analysis. Depending on the nature and scale of the project, such analysis includes existing spatial data and landscape mapping, where possible. Resources that can be used for the analysis include land classification and land use maps, satellite imagery or aerial photographs, vegetation type and ecosystem maps, and topographical and hydrological mapping such as those for watersheds and interfluvial zones.

In such circumstances, a precautionary approach should be applied and where there is no full scientific certainty about adverse impacts on biodiversity, the Project should nevertheless apply cost-effective mitigation measures.

The scoping will include, but not limited to:

a. Understanding project activities, project description and project alternatives.

   At this stage of the project, information regarding the project is available in a more comprehensive manner, such as the project's phases, the technology to be applied, the site design, etc., including some alternatives of project components design. Understanding of the project activities and description will be needed to identify potential interaction between the project and resources/receptors in the Area of Influence (see point c).

b. Identify potential biodiversity impact

   Identification of potential biodiversity impact in the scoping stage is basically an iteration of identifying potential impact in the screening stage. However, usually more information about the project is available, detailed and more defined (although some alternatives of design and/or project locations may still exist, but not in a broad range of selection), compared to the information available during the project screening & categorization process. Therefore, the identification of impacts on biodiversity is further broadened and deepened in this scoping process.

   Identification of biodiversity impacts is based on the project's description, activities that pose impact to biodiversity and how it interacts with the receptors, and based on available information of the location characteristic and status. The impacts identification process will vary depending on the nature, scale, and location of the project. The risks and impacts identification in will consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts.

Impact identification will consider threats to biodiversity, which include habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, pollution and incidental take, and projected climate change impacts. Significance of these threats on biodiversity and habitat is determined based on their vulnerability and irreplaceability at a global, regional or national level and will also take into account the differing values attached to biodiversity and habitats by project-affected people and other interested parties.

The following are aspects that need to be considered when identifying biodiversity impacts:

(a) **Ecosystems Affected**. The different types of habitats that could be affected by the project and the existing quality of the potentially affected habitats.
(b) **Species Affected**. Species of global or national conservation interest and of significant local interest for livelihoods, nutrition, or other reasons which may potentially be affected by the project. Species of global or national conservation interest include those classified as Critically Endangered, Endangered, Vulnerable, or Near Threatened under international Red List criteria.
(c) **Ecosystem Services Affected**. Any important ecosystem services that are provided by the biodiversity and living natural resources that may be affected by the project, and their value to project-affected and other interested parties. Ecosystem services are the benefits that people derive from ecosystems.
(d) **Protection Status**. Whether the ecosystems (land, water, and air), species, or ecosystem services affected by the project have protected status, such as:
    (i) any category of formal protected area (for example, a national park, a marine protected area, a wildlife reserve, and so forth);
    (ii) other protection under national or local laws or regulations (such as restrictions on forest clearing or wetland conversion, or local parks);
    (iii) formal or informal protection by local communities or traditional authorities (such as community forests or grazing lands, or sacred natural sites); or
    (iv) have existing or proposed recognition as a Ramsar Wetland of International Importance, UNESCO Biosphere Reserve, World Heritage Natural Site, or other special international or national status.
(e) **Site Ownership and Control**. Ownership, control, and/or use of the biodiversity and natural living resources where project risks and impacts may occur.
(f) **Baseline Threats**. The description of the existing baseline including:
    (i) habitat loss or degradation;
    (ii) trends with and without the project; and
    (iii) existing and likely future threats, including cumulative impacts (as defined in ESS1).

    Threats might include, for example, ongoing habitat loss or degradation (including from the decline of overexploited species) from long-standing or recently initiated human activities, existing development plans for the area, or expected climate change.
(g) **Potential Project-Related Risks and Impacts**. Potentially significant physical, biological, chemical, and hydrological impacts to biodiversity and living natural resources resulting from the project. This includes:
    (i) an estimate of the extent of the impacts, for example, the size of habitats expected to be converted (lost) or modified (including degradation), and

(ii) the proportion of the specific species populations at risk.

Temporary or seasonal impacts on biodiversity and living natural resources are included as well. Impacts on wildlife may be temporary depending on their timing in relation to daily cycles of movement and activity, or seasonal depending on cycles of migration, breeding, and food abundance.

There are several important principles in the impact assessment of biodiversity components:

- The impacts of all stages of project development and operation should be assessed including feasibility study and exploration (if relevant), site development and construction, operation, rehabilitation, and project closure.
- The expected impacts on biodiversity and habitat should be compared with current environmental changes and trends in biodiversity that would be likely to happen without the proposed development.
- Both positive and negative impacts should be covered, with appropriate mitigation measures to address the negative impacts, as well as possible measures to enhance the positive ones.
- Whilst the focus of biodiversity impact analysis on the proposed project plan and development, there should also be a comparison of alternatives – alternative sites, routes for access roads, route of transmission line, high of dam, type of dam and etc. As a good practice, alternative sites would have already been considered in an earlier stage of the planning process, but, sometimes, the key findings should be included in the impact analysis for comparison. This is to demonstrate that the impact analysis is developed in awareness of environmental and biodiversity issues, i.e., avoiding high biodiversity risks.

c. Identify area of influence (AOI) and Study area

The project activities would impact spatial (area) and temporal (time) dimension. Based on the potential biodiversity impact that has been identified (both in the screening process and deepened in this scoping process), the area of influence for biodiversity impacts will be determined. The extent of AOI for biodiversity impact will consider the extent of the direct and indirect impact and location characteristic.

In order to define the AOI, the following factors should be considered:

- *Boundary of Impacts*
  In biodiversity impact assessment and analysis, a wider area should normally be considered. The exact geographic delineation (area of influence) may differ depending on local circumstances, but usually should take into account different types of project components and impact zones, such as:

  - The project boundary;
  - A buffer zone around the site, which may vary from several metres to several kilometres around the site, depending upon land uses, biodiversity condition and project nature;
  - Type of project components such as access roads, transmission line, pipelines, transportation routes that may cut across paths of wildlife movements or migration routes or disturb critical habitat;

- Areas ecologically connected to the site; in the case of several types of ecosystems, such connections might be numerous and widespread and may only be fully understood through a special investigation of the habitat and ecosystem characteristics (e.g., karst, peat, heat, mangrove, coral reef and the underground watershed);
- Wider areas linked to the site by particular species, such as migratory species that use the site or surrounding area for salting, resting or breeding.

- *Timescale*
  The following approach should be adopted regarding the time allocated for impact assessment:

  - Ideally and preferably, the time span for the biodiversity impact assessment should cover the potential issues of biodiversity that should be accommodated during the assessment;
  - Good-quality and adequate biodiversity data should be available for area (i.e., allows assessment of seasonal usage) to reduce the need for additional survey during the assessment;
  - Alternatively, if the Feasibility Study or at the screening and project categorization stage can indicate the need for a full annual cycle of biodiversity data and information, the collection of such baseline information can be commenced earlier so that it is available when conducting the impact analysis.

- *External influences*
  The assessment should recognise and realise that trends and changes in the environment can occur and can continue, even if the development of the project does not go ahead, either due to natural processes, changes in land-use patterns or other nearby developments with biodiversity impacts. Changes in environmental conditions can directly and/or indirectly influence the impact assessment. A careful evaluation of the impacts, secondary impacts, residual impacts, and cumulative impacts caused by other development allows a baseline to be defined, against which its specific impacts can be measured.

  Furthermore, detailed identification of external stakeholders is also required, some of the external factors concerning the biodiversity aspects might influence the assessment process, such as the opposition and objections by NGOs.

  Failure to identify and monitor external influences will result in a delay on the biodiversity assessment and delay subsequent work and could even cancel the project.

- *Social Assessment*
  The social impacts of the project will be the subject of special focus in the other part of the impact assessments. However, biodiversity-linked social impacts should not be neglected. These are usually related to the use of biodiversity by local communities (Ecosystem Services), e.g., as part of their livelihood (wild food, medicine, fuel, etc.), supporting their nature life (fresh air, freshwater sources, etc) and also include culturally important sites, such as waterfalls and sacred forests, or those related to the recreational, tourism and educational values of its biodiversity and habitat.

Consultation with stakeholders from communities surrounding the project and communities that use the services within the project site is required. Biodiversity-related questions should be included in social surveys where appropriate. Collaboration between the social team and the biodiversity team is required and the leader of the impact assessment team can become a leader in these linked assessments.

d. Identify Ecologically Appropriate Area of Analysis (EAAA)

Identification of EAAA is mandatory in the CHA process and will be required for further action on CHA. EAAA should be identified spatially to determine the presence of critical habitat for each species with regular occurrence in the Project's area of influence, or ecosystem covered by the critical habitat criteria 1-4. The boundaries of an EAAA should encompass wider distributions of potentially affected biodiversity features including the distribution of species or ecosystems, ecological patterns, processes, features, and functions that are necessary for maintaining them. This approach ensures that all-important biodiversity within the project footprint and linked surrounding habitats are taken into consideration. For some wide-ranging species, the EAAA should incorporate any important areas of aggregation, recruitment, and other habitat features, connectivity or ecosystem processes that are needed to maintain viable populations of the species.

An EAAA boundary determination depends on the extent of knowledge about a project context and is always an iterative process. It should be refined when baseline assessments have been completed. Where it can be shown that multiple species have largely overlapping ecological requirements and distributions, a common or aggregated area may be appropriate, otherwise EAAAs should be defined for each feature of concern identified through scoping. Practically, in general, EAAA boundary can be different for terrestrial, freshwater and marine biodiversity aspects.

e. Identify existing environment condition and social issues related to biodiversity and ecosystem services

Existing environment condition and social issues related to biodiversity and ecosystem services that can exacerbated by the project will need to be identified. For example, residents in few villages near the project location have been raising concern of inundation in several places and heavy run-off during the rainy days. Land clearing for the project that located at the upstream or catchment area may exacerbate this issue.

f. Define methodology for impact analysis and identify further specific study required.

In analysing the biodiversity impacts, there are methods that can be used, including quantitative, semi-quantitative, and qualitative methods. As much as feasible, the biodiversity impact assessment is carried on quantitatively.

Some biodiversity impact may require a deeper analysis and further specific study. For example, specific study to confirm the presence of specific sensitive species that is indicated to be in the project's AOI. The main objective of these further study is to ensure that reliable data is available to calculate the consequence/magnitude and/or probability of impact to occur during assessing impact significance (see **Section 10.2**)

g. Identify baseline data requirement

Baseline data that need to be collected will need to be identified, based on the previous activities, i.e., the potential impact identified, the AOI defined, and methodology for impact analysis that has been defined (including the requirements to conduct specific study), etc. Input from stakeholder engagement that has been conducted as part of the overall impact assessment process, especially related to biodiversity and ecosystem services, will be taken into consideration in determining baseline data that may require to be collected.

9 Baseline Study

The nature and level of detail of baseline data are determined during the scoping stage above, with the involvement of technical specialists, local communities, and other stakeholders, as appropriate. Characterization of baseline conditions will be conducted to a degree that is proportionate and specific to the anticipated risk and significance of impacts.

Baseline data studies may comprise a combination of literature review, stakeholder engagement, in-field surveys, and other assessments, using sound scientific practice, Good International Industry Practice (GIIP), and reflecting the nature and significance of potential risks and impacts of the project. In planning and undertaking the biodiversity baseline, the IA Team will follow relevant GIIP utilizing desktop review, consultation with experts, and field-based approaches, as appropriate. Where further investigations are needed to evaluate the significance of potential impacts, the IA Team will carry out additional investigation and/or monitoring before any project-related activities undertaken, and before irrevocable decisions about project design is taken that could cause significant adverse impacts to potentially affected habitats and the biodiversity that they support.

Literature Review

The literature review during the baseline study will cover the following, but not limited to:

- Assessing the project area and surrounding with respect to its status and if it is included in protected areas established by national laws and/or as an international recognise area including UNESCO World Heritage Area, KBA, IBA, AZE area, Ramsar site, and Regional Conservation Partnership Program/initiatives. This assessment should follow the national regulations and international requirements. This information may have been gathered during the screening stage. Any gaps in information or data required should be filled at this stage.
- Assessing the project area with respect to species of conservation significance that are confirmed to inhabit within the project area and its surrounding, based on interview and/or baseline surveys.

Baseline survey

Biodiversity baseline surveys should cover biologically important periods (such as breeding and migratory seasons, and dry and wet seasons) and consider all aspects of the life histories of species of conservation interest (such as availability of prey for predatory species, and of pollinators for flowering plants). The minimum approach in conducting biodiversity survey includes:

- The survey should be representative of the ecosystem, habitat, and vegetation types in the defined area of influence, such as primary forest, secondary forest, planted forest, plantation, agriculture, shrub, riverbank, river, lake, etc.
- The survey needs to cover all taxa including flora, mammals, birds, reptiles, amphibians, plankton, benthos, and fish species. The selection of taxa to be surveyed is depends on screening and scoping stage. Special survey technique and assessment may require to be applied during the survey such as Vantage for bats, camera trap for big mammals, electrofishing and ecological flow for dam project.
- When the screening phase and desktop review indicates that the potential species of conservation significance inhabit within the study area, and/or the critical habitat is triggered, a more detailed survey is likely to be required to be conducted for the targeted species.
- The baseline survey should be conducted by suitably qualified specialist that have knowledge on international requirements and best practices on biodiversity survey.

Consultation

Several types of consultation and discussion with relevant stakeholders regarding the baseline study might be required, especially when species of conservation significance inhabit the study area and are likely to receive a significant impact from the project. The relevant stakeholders may include specific Conservation NGO, IUCN, and/or IUCN SSC groups and scientific expert, and local community.

Some common best practices should be developed and applied temporally for typical project activities that have potential impact to habitat and biodiversity although the impact is not significant, for example:

- Policy on wildlife protection and conservation should available before any field activities of the project including site investigation, feasibility studies, filed survey, etc. Each worker on field activities is at risk of poaching animals and destroying habitat.
- General waste policy and management system should be available before any field activities of the project including site investigation, feasibility studies, filed survey, etc. Each waste produced by the project can impact the habitat and wildlife behaviour.
- Minimum induction and awareness should be delivered to each worker, visitor, contractor and subcontractor of the project from the early stages of the project. Developing workers behaviour and care to biodiversity conservation and protection need to be established.
- Free, prior and informed consent (FPIC) maybe required for specific project condition (e.g., project within Indigenous People area).

10 Analyse and Assess Biodiversity Impact

10.1 Prediction of impact and impact mapping

All the available information and data collected during the scoping process and from result of baseline study will be analysed to determine what could potentially happen to receptors as a consequence of the project and its associated activities. From the potentially significant interactions identified in scoping process, the impacts to the various receptors are described and evaluated. It is to be noted that impact assessment is not an isolated process, there may

be additional information obtained which indicate an impact will occur, where this impact has not been identified during the scoping process, including an impact on one receptor that can cause on downstream impacts to other receptors. This will require an assessment of the interaction of impacts that may intensify the scale and significance of the impacts.

All the impacts that have been collated, will be grouped based on stages of the project where they will potentially occur and the correlation between impacts (including impact other than biodiversity impact) will be mapped, which will give a clear picture on which impact that may influence other impact and any intersection amongst identified impacts that will enable identification of possible indirect and cumulative impacts.

10.2 Significance of impact

After the identified potential impacts are defined and mapped, they will be assessed for its significance, by the same method as preliminary assessment stage using risk matrix method. The significance of impact will be assessed based on the probability of the impact to occur and its consequences if it occurs. However, at this stage, more reliable data is available. When the project requires a Critical Habitat Assessment (CHA), the result of the CHA may contribute to the impact analysis, i.e., if based on CHA the project area is classified as “critical natural habitat”, the consequences of impact on habitat should be considered as significant or highly significant. The consequence of the impact will take into account the following factor:

- Type of impact (direct, indirect, and cumulative)
- Duration of impact (short, medium, or long term)
- Extent or size of the affected area
- Reversibility of impact (reversible or permanent)
- Sensitivity of receptor (vulnerability)

It is important to note that in determining the impact significance, embedded controls (i.e., physical or procedural controls that are included in Project Description) are taken into account.

Once the significance of an impact has been defined, the next step is to evaluate what mitigation and enhancement measures are warranted (see **Section 11**). The main objective of developing mitigation measures is to reduce the significance of an impact by reducing the consequence and/or lowering the likelihood that it will occur. Re-evaluation of impact significance value needs to be conducted, once mitigation measures are developed, the significance of the residual impact will be assessed with the same risk matrix, taking into account the application of mitigation measures.

All the impact that has been assessed will be managed, through mitigation measures (See **Section 11**) that has been defined and will be monitored (see **Section 12**). The management and monitoring strategies need to be developed in order to reduce the impact significance, prevent an impact to escalate, and to improve the E&S performance of a project. The management and monitoring strategies basically will be conducted through developing Biodiversity Management Plan (See **Section 13**).

11 Mitigation Measures

To manage the project’s impact on biodiversity, mitigation measures shall be identified, assessed and described carefully and appropriately. The mitigation measures shall be applied

following the mitigation hierarchy approach. The mitigation hierarchy emphasizes eliminating risk by design to the maximum extent possible (through avoidance and minimization), and only then implementing corrective measures as needed (through restoration and then compensation through offsets).

The mitigation hierarchy typically states that development project planners should (1) first seek to avoid damaging any biodiversity; (2) then aim to minimize any such damage; (3) then consider how to restore sites or species populations damaged by the project; and (4) then if adverse biodiversity impacts remain to compensate through specific actions (not merely cash) comprising a biodiversity offset (**Figure 11-1**).

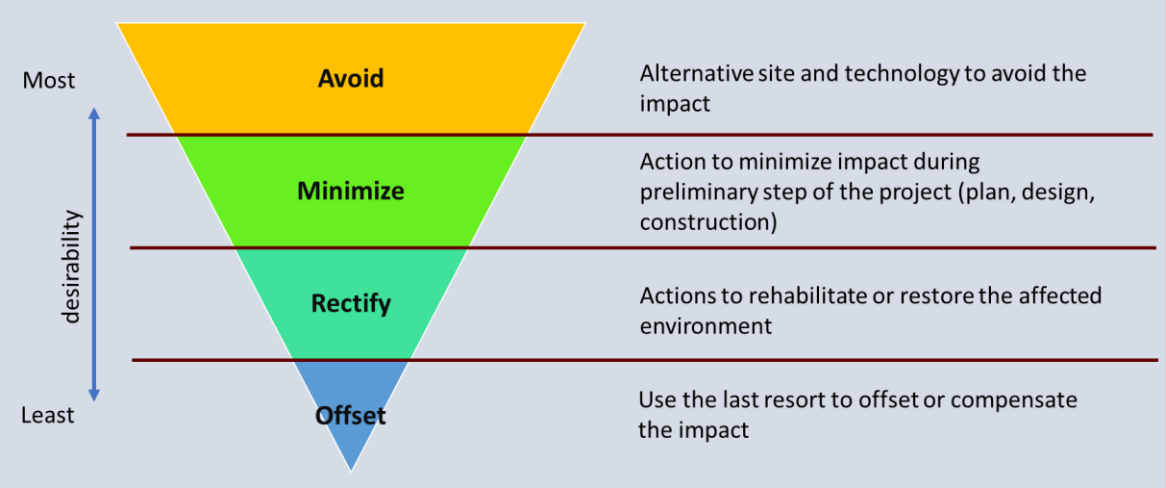

Figure 11-1 Mitigation Hierarchy

Applying the mitigation hierarchy to the original development project means biodiversity offsets are viewed as a last resort when considering different mitigation options. When avoidance is not possible, the project should plan mitigation measures to minimize the impact. The objective of biodiversity management is 'no net loss', therefore residual impact that still present will need to be managed through restoration and/or offset measures. For project within critical habitat area, where offsets are required, the mitigation measure goal is to achieve 'net gain'. The biodiversity mitigation hierarchy and the biodiversity value to be achieved is depicted in **Figure 11-2**.

Figure 11-2 Mitigation Hierarchy and Biodiversity Values

Mitigation activities for management of biodiversity include but are not limited to:

- new or expanded protected areas;
- site-specific habitat restoration, enhancement, or improved management;
- community benefit-sharing;
- livelihood restoration activities (to mitigate any negative socio-economic impacts from newly restricted access to natural resources);
- species-specific management interventions, such as breeding programs;
- monitoring of project implementation or biodiversity outcomes;
- or support for increased financial sustainability of conservation actions.

Several examples of biodiversity management actions that can be adopted and established are further described in **Appendix 3**.

Planned mitigation measures are arranged in Biodiversity Management Plan (BMP). The management plan can be part of the Project's Environmental and Social Management Plan (ESMP), or to be a stand-alone document.

Each activity must have a measurable/observable criterion by which implementation of biodiversity protection mitigation will be judged successful, and when they may be considered complete, unless measures are to be continued.

In developing and implement the mitigation measures, the following aspects will be taken into consideration:

1. Management commitment
   The PLN's policies and commitments, as described in the ESMS Manual Chapter 2, is very important for the success of mitigation measures and is a visible priority on policy, planning and operational levels. A high-level corporate-wide target such as the proposed ultimate aim of "no net biodiversity loss" would be one of the best ways of bringing biodiversity issues into everybody's mind. Such a high-level commitment would need to

appear regularly in internal and external corporate/project communications, such as inclusion of the biodiversity management outcome indicators in corporate sustainability reporting and ESG targets.

2. Management structure and process
   IA-sub team, which consist of E&S specialist, has been formed to conduct Impact Assessment starts from the screening stage up to the development of mitigation measures. The E&S specialist should have adequate expertise on biodiversity aspect, whom can be resourced internally within PLN or externally, to guide and advise on issues that will inevitably arise in managing biodiversity aspect of a project and implementation of the BMP. The specialist should be appropriately qualified in biodiversity conservation and have a clear understanding on national and international requirements and business practices.
   The appointment of a small biodiversity advisory group or committee is recommended, consisting of, for example, three external specialists and two internal members to advise PLN on biodiversity issues and provide expertise on sensitive biodiversity concern.
3. Inclusion in policies and guidelines
   A separate follow-up policy on biodiversity and possibly some separate guidelines on the policy should be developed and informed to all project workers, contractors and subcontractors as well as external stakeholders. A separate follow-up policy should target for various groups of project implementation, i.e., a follow-up policy on hunting bans may not be necessary for urban or office workers. Compliance with the BMP should be a contractual requirement for contractors and sub-contractors.
4. Operational handbooks/ detail standard operation procedures
   A series of project's guidelines, procedures and toolkits may be required to be developed and attached (if the relevant documents are already existed) to the project. These procedures are applied for PLN's employee related to the project, contractor and subcontractors on the ground. The content and format of these technical implementation aids will have to be aligned with BMP and apply principles that are easy for workers to understand. An internal information document is recommended, where it gives a general overview of the company's system and shows where the different contributions requested from field and management staff are docked into the system.
5. Skills, training, and awareness
   Capacity building and awareness raising activities can be part of mitigation measures and important factors to support successful implementation of mitigation measures. The implementation of BMP and associated programs requires a wide variety of skills. These required skills can be improved with increasing experience and mainstreaming of the BMP with training and awareness raising as part of normal operational process.
   A biodiversity training module should be developed that could be incorporated into existing PLN training courses at various levels of management. The training modules can be expanded and adjusted for the contractors and sub-contractors in a project.
6. External expertise and partnership
   It is recommended that partnerships with NGOs, academic institutions, or other institutions that could make a positive contribution to PLN's biodiversity management and external relations should be established wherever this is possible, particularly at sites with stated biodiversity management targets.

11.1 Avoidance

Avoidance in context of biodiversity impact mitigation measure refers to the actions taken to completely prevent impacts to biodiversity values. This often involves altering the project spatial design or location to avoid causing adverse effects on specific areas of ecological importance. The following are several actions which included as avoidance as part of mitigation measures for biodiversity impact, but not limited to:

- Site selection: Careful site selection helps identify areas with lower biodiversity value, thereby minimizing potential impacts. High-value ecological areas, such as protected areas, critical habitats, or areas with vulnerable species, can be avoided altogether.
- Spatial design planning: Adjusting the spatial layout or design of a project can help avoid sensitive habitats, important ecological corridors, or areas with high conservation value. For example, infrastructure projects may be rerouted or redesigned to avoid impacting critical habitats or wildlife movement routes.

Overall, the principle of avoidance underscores the importance of proactive planning and decision-making to prevent or minimize adverse effects on biodiversity, contributing to the sustainable development and conservation of ecosystems.

11.2 Minimize

Minimization measures are implemented to mitigate and limit the impact on biodiversity. Minimization is reducing the extent, intensity, and duration of impacts on biodiversity that are not prevented by avoidance. These measures focus on reducing the magnitude or severity of the impacts to minimize ecological harm. Some key strategies for minimization include:

- Application of best management practices: Implementing best management practices specific to the project or activity can help reduce impacts on biodiversity. This may include employing advanced technologies, utilizing ecofriendly materials, or implementing efficient operational procedures.
- Technological improvements: Adopting improved technologies or engineering designs can minimize the ecological footprint of a project. These advancements may reduce emissions, energy consumption, waste generation, or other negative environmental impacts.
- Buffer zones: Establishing buffer zones around sensitive areas can create a protective barrier that minimizes potential impacts. These buffer zones act as a transition zone between the project site and the surrounding ecosystems, providing additional protection to biodiversity.
- Timing and scheduling: Adjusting the timing or scheduling of activities can help minimize impacts on sensitive species or habitats. For example, construction activities can be timed to avoid critical breeding or nesting seasons, minimizing disturbance to wildlife.
- Adaptive management: Applying an adaptive management approach allows for ongoing monitoring and assessment of impacts. This enables timely adjustments to operations or management strategies to minimize impacts as new information becomes available.
- Stakeholder engagement: Engaging with local communities, experts, and stakeholders can provide valuable insights and alternative perspectives for minimizing impacts.

Collaboration can lead to innovative solutions that reduce ecological harm while meeting project objectives.

11.3 Restore

Restoration (or rehabilitation) is an important component of environmental management and biodiversity conservation. It involves taking actions to return degraded, damaged, or destroyed areas to a state of beneficial use and assist in the recovery of the affected ecosystems. The following are several key aspects of Restoration/rehabilitation:

- Ecological Recovery: The primary objective of rehabilitation or restoration is to facilitate the recovery of the ecosystem's structure, composition, and function. This may include restoring habitats, reintroducing native species, enhancing biodiversity, and promoting natural processes.
- Habitat Restoration: Efforts are made to restore or recreate habitats that have been impacted or lost due to human activities or natural disturbances. This can involve activities such as reforestation, wetland creation, coral reef restoration, or the rehabilitation of degraded landscapes.
- Soil and Water Conservation: Addressing soil erosion, sedimentation, and water pollution is often a crucial component of rehabilitation. Implementing erosion control measures, restoring natural hydrological processes, and improving water quality contribute to the recovery of ecosystems and their associated biodiversity.
- Species Recovery and Reintroduction: In cases where specific species have been severely impacted or extirpated, rehabilitation efforts may include captive breeding, population reinforcement, and reintroduction programs. These actions aim to restore viable populations and ecological interactions.

Rehabilitation and restoration efforts contribute to the recovery and resilience of ecosystems, enhancing their ability to provide ecosystem services, support wildlife, and sustain healthy ecosystems for future generations.

11.4 Biodiversity offset

Offsets will be considered as a last resort, only if significant residual adverse impacts remain after all technically and financially feasible avoidance, minimization, and restoration measures have been considered. A biodiversity offset will be designed and implemented to achieve measurable, additional, and long-term conservation outcomes that can reasonably be expected to result in no-net-loss and preferably a net-gain of biodiversity. When an offset is used to mitigate residual adverse impacts on any area of critical habitat, a net gain is required. The design of a biodiversity offset will adhere to the “like-for-like or better” principle and will be carried out in alignment with GIIP.

Net gain are additional conservation outcomes that can be achieved for the biodiversity values for which the natural or critical habitat was designated. Net gains may be achieved through full application of the mitigation hierarchy that may include the development of a biodiversity offset and/or through the implementation of additional programs in situ to enhance habitat and protect and conserve biodiversity.

The principle of “**like for like or better**” can be achieved in a number of ways and is based on an evaluation of the biodiversity and ecological values that may be at risk. Offsets are typically

"off-site," usually (though not always) located outside the area in which the project is located. For example, in restoration offsets, conservation gains are achieved by restoring the biodiversity value of an area that was previously degraded through causes not related to the project.

If, as a last resort, a biodiversity offset is being considered, it is important to include in the BMP both an evaluation of the offset and documentation that all technically and financially feasible measures have been taken to avoid, minimize, or mitigate significant adverse impacts.

The principles and the step-by-step process of biodiversity offset is further described in **Appendix 5**.

12 Monitoring and Review

Monitoring will serve as a tool to improve the E&S performance. As part of the biodiversity management, monitoring consists of monitoring upon management activities (i.e., mitigation measures planned) and review upon the management plan as whole.

12.1 Management activity monitoring

Each of the mitigation strategies that are planned should be monitored in order to ensure that management activities are carried out according to plan and ensure that project activities do not violate the provisions that have been regulated and determined.

In developing a monitoring plan for activities planned in the management plan, the following items should be taken into account, but not limited to:

- Parameters to be monitored
  Parameters to be monitored will depend on the mitigation measures planned and the performance indicator that have been determined when developing management plan. For example, parameters to be monitored for restoration measures by re-planting cleared area during the construction phase include the number of trees planted, grow and die, and the growth rate. The parameters should be measurable, biodiversity indicators are not always quantitative, but wherever possible quantitative metrics should be used.

- Monitoring location
  The monitoring location will depend on the mitigation measures planned, which include at the area where the mitigation measures are executed and at the area of influence of the project, and/or where an induced impact may occur.

  It should be noted, the project is also required to monitor their reputation regarding the biodiversity performance and issues from mainstream media and social media. Each negative news on project and company reputation regarding biodiversity issues should be documented and follow-up carefully and on target without frontal resistance to the media or the party. internal review should be carried out on each negative news in media.

- The frequency of inspection and monitoring.
  The frequency of monitoring will depend various factors, which includes the magnitude of impact, the sensitivity or limit of the receptor, the complexity of the mitigation measures planned, etc. Frequency of several parameters that should be monitored in the permit, if any, must comply with the provisions in the permit, at minimum.

- Instruments that will be used for monitoring, including calibration requirements.
  The method and instrument to be used will comply with applicable regulation (if any) and will follow the best practice as technically feasible.

- The resources
  The monitoring will determine the minimum required qualifications of persons who will conduct the monitoring and inspection. In some cases, public participation in monitoring can be a requirement or a strategy in a management. The public participation in monitoring should be also determined, including the requirement of the public that will participate.

12.2 Management plan review

A Biodiversity Management Plan is a living document and have to be referred to every stage along the project cycle, it's the target and approach established in the plan should be reviewed, modified, or renewed from time to time as deemed necessary to find the best possible result.

The following are items that need to be determined related with management plan review:

- Schedule for regular review. The management plan should be reviewed regularly. If the phase will be more than one year, then the regular review shall be conducted annually.
- The parties that responsible for conducting the review, making an amendment, and the party approving the result of the review.

13 Biodiversity Management Plan

Where significant risks and adverse impacts on biodiversity have been identified, PLN will develop and implement a Biodiversity Management Plan. Depending on the nature and scale of project risks and impacts, the Biodiversity Management Plan (BMP) may be presented as a stand-alone document and should be included as part of the Environmental and Social Management Plan (ESMP for the project).

The Biodiversity Management Plan provides the details by which impact avoidance, mitigation, and offsetting measures that have been identified during the assessment process, and/or required by permits and licenses, are to be implemented. The Plan may need to go beyond the mitigation measures required by the national law and regulation as determined by the assessment.

The components of Biodiversity Management Plan are described as follow.

13.1 Component 1: Objective(s)

The objectives and purpose of the management plan may differ between one project and another, which depend on the result of impact assessment process. As previously discussed, in general the objective of the project specific biodiversity management is 'no nett loss' on the

biodiversity value. However, for some cases, especially for project located within critical habitat area, will have a higher goal, which is 'net gain' on biodiversity value.

13.2 Component 2: Activities

All the activities planned as part of the mitigation measures and activities for managing the critical habitat (based on the critical habitat assessment) will be described in clear manner in the management plan. If an offset is planned, then it should be included as one of the management activities, while the detail of the offset may be documented in separate document.

13.3 Component 3: Project Requirement

The Biodiversity Management Plan should also state the project requirements that the implementing entities must follow to achieve its objectives, such as biodiversity-related prohibitions or specific restrictions for civil works contractors and project workers. These may cover, for example, the clearing or burning of natural vegetation; off-road driving; hunting and fishing; wildlife capture and plant collection; purchase of bush-meat or other wildlife products; free-roaming pets (which can harm or conflict with wildlife); and/or firearms possession. The use of fauna spotters during site clearing and preparation is also recommended.

Seasonal or time-of-day restrictions may also be needed to minimize adverse biodiversity impacts during construction or operation. Examples include (i) limiting blasting or other noisy activities to the hours of the day when wildlife are least active; (ii) timing of construction to prevent disturbance during the nesting season for birds of conservation interest; (iii) timing of reservoir flushing to avoid harming key fish-breeding activities; or (iv) curtailment of wind turbine operation during peak bird migration periods.

13.4 Component 4: Performance Indicator

Every mitigation measure or management activity planned should have an indicator of success as a tool to determine achievement targets and control the implementation of the management activity. Management indicators determined shall be measurable, wherever possible to be quantitative in nature and can be measured with applicable tools.

13.5 Component 5: Institutional Responsibility

The management plan must identify and describe the responsibilities of all parties (PLN, contractor or other relevant third parties) and competent authorities. The management plan must also identify the roles and responsibilities of individual positions within these organization, including the person or persons that are responsible to follow up and take action upon grievance related biodiversity, habitat, or ecosystem services that are submitted through the formal grievance mechanism.

13.6 Component 6: Implementation Schedule

The management plan should detail an implementation schedule for the key BMP activities, taking into account the planned timing of construction and other project activities, including any permit or license that should be obtain prior activity's commencing.

13.7 Component 7: Cost Estimates

The management plan should include cost estimates for BMP implementation, including up-front investment costs and long-term recurrent costs. The BMP also specifies the funding sources for project implementation as well as recurrent operating costs.

13.8 Component 8: Monitoring, Recordkeeping and Reporting

The management plan must call for inspection/monitoring of the project's footprint and activities, and of ecological and biodiversity mitigation and offsetting measures, in order to ensure compliance with the requirements of the Management Plan. The monitoring plan should specify:

- Monitoring location;
- Parameters to be monitored;
- Regulatory criteria and any specific requirement imposed on the project by government (as applicable);
- The frequency of inspection and monitoring;
- Instruments that will be used for monitoring, including calibration requirements;
- The required qualifications of persons who will conduct the monitoring and inspection, and of any members of the public who may participate in monitoring;
- Records that must be kept and the person responsible for keeping the records;
- Reports that will be prepared, to whom the reports are to be submitted for review, and the length of time records will be kept. This will include summary reports at intervals and to which institutional should be submitted.

13.9 Component 9: Management Plan Review

The management plan should determine and state the schedule of management plan review (see **Section 12**). Regular review of the management plan and the party responsible for conducting a review, making an amendment and the party approving the results of the review and the changes made (if any) must be stated in the management plan.

14 Procedure

In carrying out biodiversity management activities, procedures should be developed as necessary (e.g., biodiversity sampling, re-planting, etc). The procedures required is highly depend on the nature of the project and the impact and mitigation measure determined, although some procedures may be more general thus can be used for various project.

In general, there are several key items that need to be included in the procedures to be developed are, but not limited to:

- Procedure Information, which includes procedure title, identification number, number of pages.
- Purpose. The procedure should provide information on the objective of the procedure.
- Scope. The procedure should inform the boundary of the procedure, aspects or parties that are covered under the procedure, and limitation to the procedure.
- Definition. The procedure should define the terms used in the procedure.
- Responsibilities. The procedure should identify and state the parties that will be responsible to follow the procedure, supervise the implementation of the procedure, provide training of the procedure, and parties that will regularly review and update the procedure.
- Work instructions. The procedure should list, in a simple and clear manners, the specific steps that will be taken to implement the procedure.

- Reference documents. The procedure should list the relevant documents that support, utilized as the basis or provide additional information for the procedure, including rules and regulation that to be complied.
- Records. The procedure should provide information of the required documented outcomes of the procedures. Format for required records will be provided under the procedure, as necessary.
- Approving authority. The procedure should provide information on party that is responsible for approving the procedures.
- Issue date. The procedure should provide information on time of procedure issuance.
- Revision date. The procedure should provide information on time of procedure reviewed and revised (Procedures should be continually updated and improved).
- Other Environmental & Social components, if applicable. The procedure should include other environmental and social component, if applicable, related with the activities in the procedure. Example: PPE required for the activities must be clearly stated in the procedure.

15 Relevant Document

The following is list of PLN documents that are available for implementation of biodiversity management and aligned with this management guideline. To be noted that any changes to this management guideline may potentially trigger the need to revise or amend the following documents. PLN may develop further technical procedures (see **Section 14**) as deemed necessary to complement the implementation of this management guideline.

- Biodiversity Screening Tool – Practical Guidelines for Biodiversity Screening
- PT-K3L-33 Land Clearing Procedures in Natural Habitat

16 References

- Law No. 5 Year 1990 regarding Conservation of Living Natural Resources and Their Ecosystems
- Law No 5 of 1994 regarding Ratification of United Nations Convention on Biological Diversity
- Law No 21 of 2004 regarding Ratification of Cartagena Protocol on Biosafety to the Convention on Biological Diversity
- GOI Regulation No 22 of 2021 regarding List of Protected Area
- GOI Regulation No 23 of 2021 regarding Forest Management
- GOI Regulation No 105 of 2015 regarding The Utilization of Forest Area
- GOI Regulation No 7 of 1999 regarding Preservation of Flora and Fauna
- MOEF Regulation No 106 of 2018 regarding list of Protected Species
- MOEF Regulation No 94 of 2016 regarding Invasive Species
- MOEF Regulation No 48 2008 regarding Guidelines for Managing Conflicts Between Humans and Wildlife
- MOEF Regulation No 7 of 2021 Forestry Planning, Changes in Allocation of Forest Areas and Changes in Functions of Forest Areas, and Use of Forest Areas
- MOEF Regulation No 9 of 2021 Management of Social Forestry
- MOEF regulation No 27 of 2018 regarding The Utilization of Forest Area
- MOEF Regulation No 97 of 2018 regarding Swap Forest Area

- IFC Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. January 1, 2012 (updated June 27, 2019)
- Biodiversity Offset: A user Guide. World Bank Group. 2016.
- Business and Biodiversity Offsets Programme (BBOP). 2012. Biodiversity Offset Design Handbook-Updated. BBOP, Washington, D.C. Available from: BBOP Document Cover Sheet (forest-trends.org)
- World Bank Environmental and Social Framework (ESF), Environmental and Social Standard (ESS) 6: Biodiversity Conservation and Sustainable Management
- World Bank Environmental and Social Framework (ESF) Guidance Note, Environmental and Social Standard (ESS) 6: Biodiversity Conservation and Sustainable Management

17 *Appendix*

Appendix 1

Habitat Data Collection and Classification

In general, habitats can be classified into two broad categories, i.e. natural and modified habitat, based on various factors, including anthropogenic disturbance, native species composition, and natural ecological function. The International Union for Conservation of Nature (IUCN) has developed a standard classification of main habitats known as the IUCN habitat scheme. This classification system provides a reference for categorizing different types of habitats found around the world.

The IUCN habitat scheme[7] provides a standardized classification system for categorizing main habitats, facilitating international communication and comparison of habitat types. In general, it consists of a hierarchical structure with increasing levels of detail:

Level 1: This level represents the highest level of classification and divides habitats into major groupings, such as Forests, Grasslands, Wetlands, Marine, and Freshwater.

Level 2: This level provides further subdivisions within the major groupings of Level 1. For example, within the Forests grouping, there could be categories like Tropical and Subtropical Moist Broadleaf Forests, Temperate Broadleaf and Mixed Forests, etc.

Level 3: This level offers even more detailed classifications within the Level 2 categories. For instance, within Tropical and Subtropical Moist Broadleaf Forests, specific types like Lowland Rainforests or Montane Forests can be further identified.

In the early stages of habitat type classification, two levels of classification can be considered to differentiate between major habitat groupings and provide more detailed information on specific habitat types. Secondary land cover data, such as MoEF (Ministry of Environment and Forestry) land cover data or other relevant sources, can be used to obtain this information. Additionally, satellite imagery interpretation can be employed to complement the data.

Land cover data can be utilized to define Level 1 habitat type, which could distinguish between natural and modified habitat categories. The classification from level 1 can be further refined to level 2 in order to include more specific types. **Table 17-1** provide several land cover data links that can be used as a reference.

Table 17-1 Open Source of Landcover Data

No	Data Source	Link Address
1	Ministry of Environment and Forestry of Indonesia	https://geoportal.menlhk.go.id/server/rest/services
2	Esri Land Cover 10m	https://www.arcgis.com/home/item.html?id=d6642f8a4f6d4685a24ae2dc0c73d4ac
3	Global Land Survey (GLS)	https://www.usgs.gov/landsat-missions/data
4	Climate Change Initiative (CCI) Land Cover V2	http://www.esa-landcover-cci.org/

[7]https://nc.iucnredlist.org/redlist/content/attachment_files/dec_2012_guidance_habitats_classification_scheme.pdf

5	OSM Land Use Data	https://data.osmlanduse.org/
6	MCD12Q1 0.5 km MODIS-based Global Land Cover Climatology	https://modis.gsfc.nasa.gov/data/dataprod/mod12.php
7	USGS – Global Land Cover Characterization (GLCC)	https://www.usgs.gov/centers/eros/science/usgs-eros-archiveland-cover-products-global-land-cover-characterization-glcc
8	GlobeLand30	https://datacoregn.unepgrid.ch/geonetwork/srv/eng/catalog.search#/metadata/c67fa135-4360-463b-b2e6-b6d1def3a515
9	UN FAO Global Land Cover Network (GLC-SHARE)	https://land.copernicus.eu/global/products/lc
10	Land Cover Type Yearly L3 Global 0.05Deg CMG	https://lpdaac.usgs.gov/news/modisterra-land-cover-typesyearly-l3-global-005deg-cmg-mod12c1/
*) the link address may change anytime		

Level 1 Habitat Type Classification:

- *Natural Habitats*: This category includes areas with minimal anthropogenic disturbance and maintains their original ecological integrity. Examples of natural habitats can include:
  a. Forests: This includes various types of natural forests like tropical rainforests, temperate deciduous
  b. forests, boreal forests, etc.
  c. Grasslands: This encompasses natural grasslands, savannas, and prairies.
  d. Wetlands: This includes marshes, swamps, bogs, and other natural wetland ecosystems.
  e. Marine: This comprises marine habitats such as coral reefs, seagrass beds, and kelp forests.
  f. Freshwater: This includes various types of freshwater habitats like rivers, lakes, and ponds.

- *Modified Habitats*: This category includes areas that have undergone significant anthropogenic influence or land use changes. Examples of modified habitats can include:
  a. Agricultural Lands: This includes cultivated lands for crops and pasture for livestock.
  b. Urban Areas: This includes cities and towns with built-up infrastructure.
  c. Industrial Sites: This includes areas with industrial facilities and infrastructure.
  d. Managed Forests: This includes forests that have been actively managed or planted for specific purposes.
  e. Other Anthropogenic Areas: This can include reclaimed land, mining areas, and other human-modified landscapes.

Level 2 Habitat Type Classification:

At Level 2, the classification becomes more detailed, further refining the Level 1 habitat types into specific subcategories. For example:

- *Forest Habitat*:
  a. Tropical Rainforests;
  b. Temperate Deciduous Forests;
  c. Boreal Forests d. Montane Forests, etc.
- *Freshwater* Habitat:
  a. Rivers;
  b. Lakes;
  c. Ponds;
  d. Wetlands (inland), etc.

- *Modified* Habitat:
  a. Intensive Agriculture (large-scale monoculture);
  b. Urban Residential Areas;
  c. Industrial Zones;
  d. Agroforestry Systems, etc.

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Appendix 2

IBAT Tool/Platform

The preparation stage of biodiversity screening assessment with IBAT involves several key steps to ensure a comprehensive and effective evaluation of potential impacts on biodiversity for a proposed project. The typical steps in the preparation stage are preparation of project information such as providing a detailed description of the proposed project, including its location, scope, objectives, and potential activities that may interact with the natural environment.

The IBAT tool combines data from reputable sources, such as the International Union for Conservation of Nature (IUCN), the World Database on Protected Areas (WDPA), and the World Resources Institute (WRI), to create a comprehensive view of biodiversity assets in a specific region. The tool is widely used by businesses, governments, and organizations to conduct biodiversity screenings as part of their environmental impact assessments and risk assessments for development projects. It's important to note that IBAT is a tool for high level screening and identifying potential risks. For a more detailed and site-specific biodiversity assessment, additional surveys and studies may be necessary.

1 Data Preparation and Input

The preparation stage of biodiversity screening assessment with IBAT involves several key steps to ensure a comprehensive and effective evaluation of potential impacts on biodiversity for a proposed project. The typical steps in the preparation stage are preparation of project information such as providing a detailed description of the proposed project, including its location, scope, objectives, and potential activities that may interact with the natural environment.

IBAT is a spatially based platform that allows the direct uploading of project geometries from ESRI Shapefile, KML/KMZ, and CSV files, supporting up to 3000 project geometries. IBAT can integrate project locations with the platform's biodiversity datasets, including information on protected areas, key biodiversity areas, and species distribution. This spatial analysis identifies areas of potential concern and facilitates the evaluation of the overlap between the project and critical biodiversity areas including protected conservation areas and UNESCO World Heritage sites or Alliance for Zero Extinction (AZE) sites.

The following are the provisions for spatial data as input in the IBAT platform:

1. ESRI Shapefile (ESRI): All files must be compressed into a .zip file including type file .shp .shx .prj .dbf, Required Projection is Geographic (WGS 84). The input data consist of including lines, points, and polygons type geometries.
2. Keyhole Markup Language (KML)/Keyhole Markup Language Zipped (KMZ): KML is an XML-based file format used for displaying geographic data in three-dimensional maps. KMZ is a compressed version of KML that includes all the KML files and related resources in a single ZIP archive. KML files may be uploaded directly, while KMZ must be compressed into a .kmz file.
3. Comma Separated Values (CSV): CSV is a plain text file format used to store tabular data, with values separated by commas. It is often used to store attribute data related to geographic features. The following are general condition for CSV file:
    - CSV files may be used to upload point geometries only, with coordinates being specified in decimal degrees.

- In addition, the filename, as well as the names of the geometries, may only contain alphanumeric characters, hyphens and underscores "-_" or a space.
- The names of the geometries must be less than 40 characters long (including whitespace).

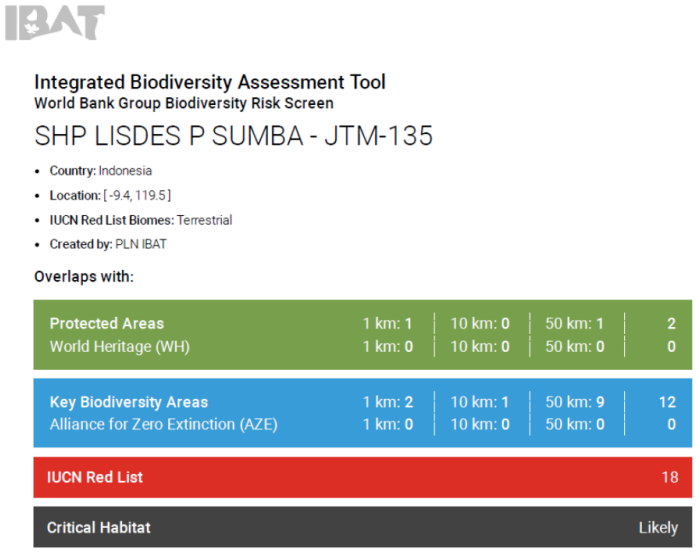
In addition, the following are several items that need to be paid attention to:

- The maximum supported file size for upload is 25MB and the maximum number of individual features/geometries per upload is 3000.
- Individual geometries in your GIS file will be interpreted as separate projects. After uploading your file, you will be asked to confirm the number of projects that will be imported.
- If a name attribute/column is present for the geometries in your file its value will be used to name each project. If a name attribute is not present the name of your file, appended by a number will be used instead.
- Any unknown characters found in your project names will be represented as □. It is possible to edit the name of your projects from the project screen.
- If there are invalid features present in the file you have uploaded you will receive an error message stating this, along with a downloadable error CSV that provides you with a more detailed description of each error.
- Please do not navigate away from the page while your upload is being processed. Navigating away will result in your upload being cancelled and your projects will not be imported.

2 IBAT Result Analysis

The project files will be registered in the "Project" section of the IBAT system. In the "Report" section, reporting will be generated for the purposes of ”PS6 & ESS6” assessment or “proximity” with buffer minimum, using the selected file's project location and biomes (marine, freshwater and terrestrial) that may potentially be impacted. The “Freshwater” module can be utilized to gather information regarding the impact of dam development on aquatic biota, particularly in hydropower projects. The system will provide reports related to location inputs, including proximity to Key Biodiversity Areas (KBA), Protected Areas, a list of threatened species, and a high-level assessment of the potential as a critical habitat.

The IBAT results (**Figure 2-1**) will be utilized as a resource to identify potential impact, and especially to assess against Exclusion Criteria. The assessment will encompass not only direct impacts but also indirect and induced impacts on biodiversity. The system will generate notifications for landscapes that exhibit high criticality (**Figure 2-2**). This information is based on a comprehensive database review owned by IBAT, encompassing species-habitat relationships and ecosystem vulnerability status. Further in-depth studies can be conducted during the project categorization stage.



IBAT

Integrated Biodiversity Assessment Tool
World Bank Group Biodiversity Risk Screen

SHP LISDES P SUMBA - JTM-135

- **Country:** Indonesia
- **Location:** [-9.4, 119.5]
- **IUCN Red List Biomes:** Terrestrial
- **Created by:** PLN IBAT

Overlaps with:

Protected Areas	1 km: 1	10 km: 0	50 km: 1	2
World Heritage (WH)	1 km: 0	10 km: 0	50 km: 0	0
Key Biodiversity Areas	1 km: 2	10 km: 1	50 km: 9	12
Alliance for Zero Extinction (AZE)	1 km: 0	10 km: 0	50 km: 0	0
IUCN Red List				18
Critical Habitat				Likely

Figure 2-1 Illustration of IBAT Report

Area name	Distance	IBA	AZE	Recommendation
Routa	1 km	No	No	Assess for critical habitat
Danau Mahalona	50 km	No	Yes	Highest risk. Seek expert help
Danau Towuti	50 km	No	Yes	Highest risk. Seek expert help
Feruhumpenai - Matano	50 km	Yes	Yes	Highest risk. Seek expert help
Mekongga	50 km	Yes	No	Assess for critical habitat

Figure 2-2 Illustration of notifications in IBAT for landscapes that exhibit high criticality

Appendix 3

Strategic Management Actions

Several strategic management action can be developed in order to mitigate the project's impact on biodiversity and or help the mitigation measures planned can be implemented comprehensively and sustain. The following are several strategic management actions that can be adopted and established:

- Habitat management.
- Wildlife population management.
- Poaching and deforestation Control.
- Database establishment.
- Awareness and education program.
- Land rehabilitation of site closure area.
- Cooperation partnership.
- Invasive species management.

It is to be noted that the management actions that can be developed is not limited to the above items and the biodiversity management plan can consist of several management actions that are synergistic with one and another.

1 Habitat Management

Habitat management is a crucial approach to conserving biodiversity and maintaining ecosystem functionality. It involves two main components: maintaining existing habitats in good condition and restoring degraded habitats to enhance their ecological value. Combining habitat conservation, restoration, connectivity conservation, and targeted management for priority species, habitat management approaches contribute to the overall conservation and recovery of biodiversity. These efforts help maintain ecosystem health, support wildlife populations, and promote the sustainable use of natural resources.

2 Wildlife Population Management

Conceptually, wildlife population management is a focus on the conservation and sustainable management of wild animal populations. It involves a variety of strategies and practices aimed at maintaining healthy population sizes, promoting biodiversity, and minimizing negative impacts on ecosystems. The following are some key concepts and approaches related to wildlife population management:

1. Monitoring and Assessment.
   Regular monitoring of wildlife populations is crucial to understand their dynamics, population sizes, and health. Techniques such as population surveys, camera trapping, and radio telemetry are used to gather data on species abundance, distribution, and behaviour.
2. Habitat Conservation.
   Protecting and managing natural habitats is fundamental for wildlife population management. It involves preserving intact ecosystems, restoring degraded habitats, and creating protected areas where wildlife can thrive. Habitat conservation includes managing factors such as food availability, water sources, and shelter for different species.
3. Hunting and Fishing Regulations.

The regulation of hunting and fishing activities is an essential tool for wildlife population management. Setting appropriate bag limits, establishing hunting seasons, and implementing size and catch limits help prevent overexploitation and ensure sustainable use of wildlife resources.

4. Wildlife Disease Management.
   Disease outbreaks can have devastating effects on wildlife populations. Wildlife population management involves monitoring and managing the spread of diseases, implementing vaccination programs when feasible, and implementing measures to prevent the introduction of diseases into vulnerable populations.
5. Predator Management.
   In some cases, the management of predator populations may be necessary to prevent excessive predation on prey species or conflicts with human activities. This can involve targeted predator control measures, such as selective hunting or trapping, to maintain a balance between predator and prey populations.
6. Translocation and Reintroduction.
   Wildlife population management may involve the translocation of individuals or the reintroduction of species into suitable habitats. This is done to establish or restore populations in areas where they have been extirpated or to enhance genetic diversity within existing populations.
7. Conservation Education and Awareness.
   Educating the public about the importance of wildlife conservation and the need for responsible management practices is vital. It helps foster a sense of stewardship and encourages individuals to support conservation efforts and engage in sustainable behaviours.

Wildlife population management should be science-based, adaptive, and consider the ecological needs and long-term viability of species and ecosystems. It requires collaboration among scientists, policymakers, local communities, and stakeholders to develop and implement effective strategies for the conservation and sustainable management of wildlife populations.

3 Controlling Poaching and Deforestation

Controlling poaching and deforestation are crucial for preserving biodiversity and maintaining ecosystem health. The following are some approaches and strategies that can be applied in controlling poaching and deforestation:

1. Strengthen Law Enforcement.
   Enhancing law enforcement efforts, including increasing patrols, implementing stricter penalties for poaching and illegal logging, and improving surveillance technologies, can act as a deterrent and help control poaching and deforestation activities.
2. Collaborative Conservation.
   Collaborating with local communities, indigenous peoples, and relevant stakeholders is essential. Involving them in decision-making processes, providing alternative livelihood

options, and empowering them to participate in conservation efforts can help reduce the incentives for poaching and deforestation.

3. Protected Areas and Wildlife Reserves.
   Establishing and effectively managing protected areas and wildlife reserves can create sanctuaries for endangered species and habitats. Proper enforcement and adequate resources are critical for the success of these protected areas.
4. Sustainable Forest Management.
   Promoting sustainable forest management practices, such as selective logging and reforestation, can help combat deforestation while allowing for sustainable use of forest resources.
5. Public Awareness and Education.
   Raising awareness among the general public about the importance of biodiversity conservation, the negative impacts of poaching and deforestation, and the value of sustainable practices can foster a culture of conservation and encourage responsible behaviour.
6. International Cooperation.
   Collaborations between countries, international organizations, and NGOs are essential for addressing poaching and deforestation, particularly when it involves transnational wildlife trafficking or illegal timber trade.
7. Economic Incentives.
   Creating economic incentives for local communities to engage in sustainable practices, such as ecotourism or sustainable harvesting of forest products, can provide alternative sources of income and reduce reliance on destructive activities.

4 Database Establishment

Biodiversity management relies on informed decision-making based on scientific data. Strengthening data in a time series manner is indeed crucial for adaptive biodiversity management. Time series data enables the evaluation of the effectiveness of biodiversity management measures. By comparing data before and after implementing specific actions, the response of biodiversity to those interventions can be assessed. This helps refine management strategies and adapt them over time to achieve desired conservation outcomes.

The following are several activities associated with database establishment:

- Data collection
  Data collection involves collecting and recording biodiversity data, which may include data on the past and present. Data collection can be obtained through several activities below, but not limited to:
  - Systematic field Surveys
    Conducting field surveys involves collecting data directly from the field, such as species inventories, abundance counts, habitat assessments, camera trapping, wildlife song recorder and ecological measurements. This activity often requires trained personnel to systematically sample and document biodiversity components, including flora, fauna, and ecosystem characteristics.

- Remote Sensing and GIS Analysis
  Remote sensing techniques, including satellite imagery and aerial surveys, can provide valuable information for biodiversity monitoring. Analyzing these data using Geographic Information Systems (GIS) allows for mapping and spatial analysis of biodiversity patterns, land cover changes, and habitat fragmentation.

- Data Management System Development
  Developing a data management system involves designing and implementing a structured framework to store, organize, and manage biodiversity data. This includes establishing database structures, data standardization protocols, and metadata documentation to ensure data integrity and accessibility.

- Database Population/Entry.
  Populating the biodiversity database entails transferring collected data into the designated data management system. This includes entering field-collected data, integrating existing important to ensure accuracy and proper data formatting.

- Data Quality Control
  Ensuring data quality control involves reviewing, validating, and cleaning the collected data to remove errors, inconsistencies, and outliers. This activity aims to enhance the reliability and accuracy of the dataset before analysis and further use.

- Data Analysis and Interpretation
  Data analysis and interpretation involve applying statistical methods, ecological modelling, and other analytical techniques to extract meaningful insights from the collected data. It includes examining trends, relationships, and patterns within the data to gain a deeper understanding of biodiversity dynamics.

By strengthening data collection in a time series manner, a deeper understanding of ecosystem dynamics can be gained and could assess the effectiveness of conservation measures and adapt management strategies in response to changing circumstances. It forms the foundation for adaptive biodiversity management, enabling informed decisions that contribute to the conservation and sustainable use of biodiversity.

5 Awareness and Education Program

Awareness is one of the supplementary approaches for wildlife conservation and impact mitigation which conducted through Additional Conservation Action (ACA). ACA is defined as an intervention intended to be positive for Biodiversity and Ecosystem Services (BES), but not providing measurable gains that can be set against residual impacts. ACAs may or may not targeting the BES features significantly impacted by a project.

Awareness and education programs can be an effective tool for mitigating various issues related to wildlife conservation and human-wildlife conflicts. Such a program aims to raise

awareness, provide information, and educate the public about the importance of wildlife conservation, habitat protection, and sustainable coexistence with wildlife.

Adapting programs specific to the target audience's context, culture, and wildlife conservation challenges is critical to the success of wildlife awareness and education programs. By implementing a comprehensive awareness and education program, communities can develop a greater appreciation for wildlife and actively participate in conservation.

6 Land Rehabilitation of Site Closure Area

PLN is committed to conducting habitat restoration within the previous project area. The objective of land rehabilitation of project area that located in natural ecosystem is to restore them to their original habitat condition; whilst for project situated in a modified habitat, the objective is to restore to its original functions, which are primarily social and economic in nature.

Management of habitat restoration plan will comply with national regulations[8] to ensure that habitat rehabilitation and restoration projects are in line with legal requirements and contribute to ecological preservation.

Land rehabilitation for site closure, whether during construction or after the operational phase, is essential to minimize environmental impact and ensure the responsible use of land. The following is general aspect that need to be taken into consideration in developing land rehabilitation plan.

- Preliminary Assessment
  A comprehensive assessment of the site's environmental conditions needs to be conducted, which including soil quality, vegetation, and any potential contamination. This assessment can be conducted during project's impact assessment process, or conducted in a separate study. Specific goals for land rehabilitation will be identified based on the project's impact.
- Regulatory Compliance
  Listed and understand local, regional, and national regulations and international standards related to land rehabilitation. Ensure that the rehabilitation plan comply with all legal requirements.
- Stakeholder Engagement
  Engage with relevant stakeholders, including local communities, environmental agencies, and indigenous groups to collect their inputs and ensure their concerns are taken into consideration in the rehabilitation plan.
- Detailed rehabilitation plan
  The rehabilitation plan will include:
  - Clear objectives and targets for land rehabilitation
  - Specific actions and techniques for soil restoration and re-vegetation
  - Detailed timeline for implementation
  - Budget allocation for rehabilitation activities
  - Institutional responsibility

[8] Minister of Environment and Forestry Regulation No. 23 of 2021 concerning the Implementation of Forest and Land Rehabilitation

- Monitoring, and reporting mechanisms.

- Soil Restoration
  Soil testing and analysis will be conducted earlier to give description of soil condition in the rehabilitation site. Depending on soil condition, soil restoration may need to be conducted as part of the rehabilitation plan. Soil restoration actions may include soil amendment with organic matter and nutrients, erosion control measures, contaminant remediation (if necessary).

- Vegetation Restoration
  In selecting plant species for vegetation restoration, prioritize the use of native plant species that are adapt to the local climate and soil conditions. Appropriate spacing and planting techniques need to be applied and some erosion control measures should be implemented, e.g. the use of cover crops.

- Maintenance, Monitoring and Reporting
  Maintenance plan will be developed to ensure the ongoing health of rehabilitated areas. This may include watering, weeding, and pest control. Monitoring program will also be developed to assess the success of the rehabilitation efforts over time. Monitoring should be ongoing and include key indicators such as vegetation cover, soil quality, and wildlife presence. Regular report on the progress of land rehabilitation should be submitted to relevant authorities and stakeholders. The report should include data on soil quality, vegetation growth, and any corrective actions taken.

- Documentation and Records
  Maintain detailed records of all rehabilitation activities, including soil testing results, planting records, maintenance activities, and monitoring data.

- Community Engagement
  The local community need to be engaged so they can participate in the rehabilitation process. Community engagement and participation may include employment opportunities in the land rehabilitation program, education on sustainable land use, and involving community members in monitoring efforts.

- Contingency Planning
  Develop contingency plans for unforeseen issues that may arise during the rehabilitation process, such as extreme weather events or unexpected environmental challenges.

- Long-Term Commitment
  A successful land rehabilitation is a long-term commitment. Continuous monitoring and maintenance effort beyond project closure need to be implemented to ensure the sustainability of rehabilitated areas.

- Adaptive Management
  Adaptive management need to be applied where some adaptation actions may need to be conducted based on monitoring data and/or changes on the site condition. Flexibility is key to successful rehabilitation.

- Knowledge Transfer.
  Lesson learned and best practices from the rehabilitation program shall be shared within the PLN organization (including contractors and sub-contractors) and among relevant stakeholders, in order to improve future action plans and projects.

7 Cooperation and Partnership

Biodiversity management is a collaborative effort that involves various stakeholders, including the government, communities, and the business sectors. The protection of threatened and protected species, including their habitats, is typically regulated by the regional or national authorities, through laws and regulations to safeguard these species and their habitats.

The following are several stakeholders in biodiversity management and their roles and responsibilities.

- Government
  The regional or national authorities play a crucial role in establishing and enforcing laws and regulations related to biodiversity conservation. The government establish laws that protect threatened and endangered species, designate protected areas, and set guidelines for sustainable resource use. Government agencies also monitor and manage biodiversity conservation efforts, provide funding and support for research and conservation projects, and work towards international commitments on biodiversity conservation.

- Communities
  Local communities in or surround the areas of high biodiversity value play a vital role in biodiversity management. They possess traditional knowledge and have a deep understanding of local ecosystems. Engaging communities in conservation efforts fosters their sense of ownership and responsibility towards protecting their natural heritage. Communities can contribute by participating in citizen science initiatives, implementing sustainable land and resource management practices, and promoting conservation education and awareness among their members.

- Business Sector:
  The business sector, including industries, corporations, and private enterprises, can give significant impact on biodiversity. However, they also have the potential to contribute to conservation efforts. Responsible businesses will adopt sustainable practices that minimize their environmental footprint and seek ways to integrate biodiversity conservation into their operations. This can include adopting ecofriendly production methods, determination of local high conservation value areas, supporting habitat restoration initiatives, and implementing corporate social responsibility programs that contribute to biodiversity conservation and support local communities.

Collaboration among these parties is essential for effective biodiversity management. It often involves partnerships between government agencies, Non-Governmental Organizations (NGOs), community-based organizations, and businesses. By working together, these stakeholders can pool their resources, knowledge, and expertise to develop comprehensive conservation strategies, ensure compliance with regulations, and promote sustainable practices that benefit both biodiversity and human well-being.

8 Invasive Species management

8.1 General

Invasive Alien Species (IAS) management aims to identify the most effective practices for identifying, controlling, monitoring, and preventing the spread and introduction of invasive species associated with company development in the surrounding environment, especially during construction. Construction activities are known to be a major factor in facilitating the establishment of invasive species. Invasive plants have a tendency to establish themselves aggressively and spread rapidly in new environments, leading to alterations in natural habitats, displacement of native species, and reduced effectiveness of habitats for wildlife.

The following are management approach of invasive alien management that need to be taken into account in a land management:

- Prevention
  The primary aim of invasive alien management is to prevent the introduction and establishment of invasive species in project area. This involves implementing measures to minimize the transportation of invasive species through various pathways, such as trade, transportation, and recreational activities.
- Collaboration and Partnerships
  The goal is to foster collaboration and partnerships among various stakeholders, including government agencies, landowners, conservation organizations, and the public. Cooperation is essential for sharing knowledge, resources, and expertise in invasive species management efforts; and
- Manage infestation levels so that the Project does not result in an increase population of invasive species relative to local and regional background levels.

The four fundamental principles (**Figure 8-1**) (prevention, detection, control, and restoration) can be applied to any species to offer the most suitable methods for mitigating their impact. For each principle, there will be various measures recommended to achieve effective control. By implementing continuous monitoring, adaptive management can be implemented to improve prevention, detection, and control strategies.

Figure 8-1 Flow of Invasive Alien Species Management

Monitoring will provide the necessary means to gather information and evaluate the effectiveness of prevention, detection, and control measures. After implementing control measures, regular monitoring and follow-up reporting will be conducted to assess whether the

eradication objective has been achieved and if the site has been adequately restored to the desired conditions, such as returning to pre-infestation conditions or reaching an acceptable equivalent level.

Adaptive management will be utilized to assess the effectiveness of IAS management. The management approach is deemed effective if the goals for addressing invasive alien species (IAS) are being achieved. The following are examples of management actions in IAS management

8.2 Prevention

Prevention of alien species introductions is the primary and most cost-effective approach. Exclusion methods that focus on pathways, rather than individual species, offer an efficient way to concentrate efforts on sites where pests are most likely to enter national or regional boundaries, intercepting multiple potential invaders associated with a single pathway.

Preventative measures are controls implemented to halt the initial establishment or spread of invasive species during construction and operation. The following are several measures that can be applied to prevent further invasions:

8.2.1 Interception

- Inspection of imported goods
  Imported used goods, such as containers, temporary housing units, or construction equipment from outside Indonesia, will undergo thorough inspections for dirt or alien species, such as spiders, at the landing checkpoint before being mobilized to the site. This step ensures that any potential contaminants or invasive species are identified and addressed before the goods are transported to their intended destinations within the country. The project needs to ensure that has been through this inspection and certified. By ensuring that the imported goods have been though these inspections, the risk of introducing invasive species or pests can be minimized, contributing to the prevention and control of biological invasions.
- Inspection of vehicles and construction equipment
  At the planned checkpoints and vehicle inspection stations, thorough checks for dirt and debris will be conducted. Vehicles and construction equipment may be denied entry if visible dirt, mud, or other debris that could potentially harbour or transport invasive plant material is detected. It is important to ensure that the inspection station is properly contained, preventing any contaminated water from flowing into the surrounding environment. This containment measure helps prevent the spread of invasive species and ensures that any potential contaminants are effectively managed and contained within the inspection area.
- Ballast water management
  If the detailed assessment of the jetty facility determines that ships should release ballast water as part of the project, it is crucial to consider the preparation of a ballast management plan. This plan aims to prevent the introduction of invasive species through the release of untreated ballast water.

8.2.2 Treatment

- Seeding of native species

In areas that are disturbed and have a high risk for invasive species establishment, a proactive measure will be taken by seeding the area immediately after the disturbance with an appropriate native seed mix. This helps to establish native vegetation quickly, reducing the opportunity for invasive species to take hold. Whilst for areas with a moderate risk of invasive species, monitoring will be conducted to assess the vegetation response. If necessary, seeding with native species will be carried out to enhance the establishment of desirable plants and further reduce the chances of invasive species colonization.

When implementing seeding activities, native seed mixes will be used, ensuring that the seed mixture consists of indigenous plant species that are appropriate for the local ecosystem. Additionally, it will be ensured that the seed mix is free from weed seeds by requesting a certificate of seed analysis for each seed mix. This quality control measure helps to prevent the introduction of weed species that could potentially become invasive.

- Manual removal techniques
  Manual removal techniques such as mowing or hand pulling can be implemented as part of measures to minimize the spreading of invasive species. If invasive species are detected within a specific area of the construction site, it is advisable to limit vehicle traffic in those areas.
- Prohibition of import, trade, or transport of specific commodities, fauna, and flora
  Prohibiting the import, trade, or transport of specific commodities, fauna, and flora can be an effective measure in preventing the introduction and spread of invasive species. This approach involves imposing restrictions or bans on the movement of certain items that are known to pose a high risk of introducing invasive species.
- Pets ban
  Pets (e.g., cats, dogs, birds, chicken) will not be allowed in camps.

8.3 Detection

To ensure early detection and rapid response to invasive species, a regular and systematic survey will be conducted on a regular basis. Early detection is crucial in effectively controlling the spread of invasive species. Accurate identification of the species involved provides valuable information about their growth rates, mechanisms of spread, preferred environmental conditions, and informs the most suitable control methods, if necessary.

The invasive species survey can take two primary approaches: species-specific surveys and site-specific surveys. By conducting regular assessment using species-specific or site-specific approaches, the project can effectively monitor and detect the presence of invasive species in a timely manner. This enables rapid response measures to be implemented, minimizing the potential impacts of invasive species on ecosystems, biodiversity, and other valued natural areas.

Walking surveys will be conducted in areas with known infestations or areas with a higher risk of infestation. When an invasive species is first detected, the following information will be recorded:

- Geographic location;
- Percent cover;

- Other species present amongst the infestation; and
- Extent of infestation.

Once an invasive species is identified, control measures will be promptly initiated as it is the most effective method to reduce the risk of its spread. At the same time, efforts will be made to determine and address the conditions that led to the infestation, such as how the invasive species were introduced to the area. This will help evaluate the effectiveness of prevention measures and identify if any adjustments are needed.

8.4 Control

When prevention measures have failed and invasive species have become established, eradication becomes the preferred course of action. Eradication refers to the complete removal and elimination of invasive species from the affected area. It is considered a successful and cost-effective solution, particularly when the species is detected early. Eradication programs typically employ a combination of the following approaches:

- Mechanical control, e.g., hand-pulling of weeds or handpicking of snails.
- Chemical control, e.g., using toxic baits against vertebrates.
- Habitat management, (e.g., prescribed burning); and
- Hunting of invasive vertebrates.

The specific combination of eradication measures will depend on factors such as the characteristics of the invasive species, the scale of the infestation, the ecological context, and the available resources. Eradication programs require careful planning, monitoring, and evaluation to ensure their effectiveness and minimize unintended consequences.

Each program will assess its unique situation to identify the most suitable methods for that particular area, considering the prevailing circumstances. The selection of treatment types will be based on the following criteria:

- Composition of native species and invasive species.
- Invasive species establishment risk and species invasiveness.
- Percent bare ground.
- Accessibility (e.g., terrain);
- Safety issues to contractors, the community, and the environment.
- Short and long-term effects of the treatment options are being considered.
- Effectiveness of the treatment options considered.
- Cost of the treatment.
- Benefits and limitations of each method.
- Weather conditions (e.g., wind, precipitation) for chemical application.
- Land use management practices of adjacent land and waterbodies.
- Sensitive environmental features such as habitat for species at risk (plants and wildlife);
- Herbicide properties such as toxicity, use around water, lag time before replanting/seeding, selectiveness, etc.;
- Revegetation strategies will consider soil type, moisture regime, compaction, growing season, etc.;
- Mulch from grass, bush clippings can suppress or stunt the growth of invasive species;

- Hand pulling is useful for annuals and tap-rooted plants where the infestation is small or in sensitive areas such as riparian zones; and
- Weeds will be bagged, removed from the site, and disposed of in a manner that will not result in an infestation in the disposal area.

If chemical control is employed, it will be carefully planned to adhere to relevant laws and regulations regarding the handling, application, and disposal of herbicides. The goal is to prevent any negative impacts on non-target species and the environment. The following practices will be implemented:

- Weed spraying is only to be undertaken by appropriately qualified and certified persons;
- Follow the manufacturer's guidelines for application methods and concentration;
- Conduct the application of herbicide from downwind to upwind of weeds;
- Spray as evenly as possible;
- Do not apply a higher volume than necessary;
- Do not apply at a higher pressure than needed to obtain good coverage;
- Spray weeds at the correct size or stage of growth;
- Spray weeds when they are actively growing (weeds should not be sprayed when they are under stress); and
- Store all chemicals (and equipment) appropriately.

When eradication is not feasible, the aim of control will be to reduce the density and abundance of an invasive organism to keep it below an acceptable threshold.

There are numerous specific control methods for invasive species:

- Mechanical control is highly specific to the target but always very labour-intensive.
- Chemical control is often very effective as a short-term solution. Biological control, when it is successful, is permanent, self-sustaining, and ecologically safe.
- Biological control is particularly appropriate for use in nature reserves and other conservation areas because of its environmentally friendly nature and the increasing instances of prohibition of pesticide use in these areas. Integrated pest management, combining several methods, will often provide the most effective and acceptable control.

Some control measures may require consultation with applicable stakeholders. Herbicides will only be proposed for use if they are the most appropriate means of control. If invasive species, introduced by the project, spread into the protected area, an Integrated Pest Management Plan will be created jointly with authorities and involve government authorities.

8.5 Restoration

The objective of restoration is to restore and rehabilitate areas that have been affected by invasive species. This includes restoring native vegetation, enhancing habitat quality for native wildlife, and promoting ecosystem resilience. Restoration focuses on rehabilitating and restoring ecosystems affected by invasive species. Restoration measures may involve activities such as habitat restoration, re-establishment of native species, erosion control, and ecosystem monitoring. Restoring the natural balance and functioning of ecosystems helps to prevent reinvasion by invasive species and promotes the recovery of native biodiversity.

Appendix 4

Typical Potential Impact on Biodiversity in PLN's Projects

Project Type	Project Phase	Typical Potential Impact
Solar Power Plant	Pre-construction and Construction	• Habitat loss • Aquatic habitat degradation due to erosion and sedimentation • Microclimate disturbance
	Operation	• Collision and mortality of bird and bat • Insect attraction and bird disorientation • Change in hydrology and water availability • Micro climate disturbance
Wind Turbine	Pre-construction and Construction	• Habitat loss • Habitat disturbance due to noise and vibration increment
	Operation	• Bird and bat collision • Habitat disturbance due to noise increment • Disruption of migratory pattern of birds, bat, etc.
Hydropower	Pre-construction and Construction	• Habitat loss and fragmentation • Habitat degradation (pollution of air and aquatic habitat, edge effect)
	Operation	• Barrier effect to fish • Downstream hydrological and ecological change • Terrestrial and aquatic fragmentation • Creation of island habitat • Invasive species • Alga blooming
Geothermal	Pre-construction and Construction	• Habitat loss and fragmentation • Habitat degradation (pollution of air and aquatic habitat, edge effect)
	Operation	• Habitat degradation (pollution of air, noise, edge effect)
Thermal Power Plant	Pre-construction and Construction	• Habitat loss and fragmentation • Habitat degradation (pollution of air and noise, edge effect)
	Operation	• Habitat degradation (artificial light, noise, edge effect)
Transmission Line	Pre-construction and Construction	• Habitat loss and fragmentation • Habitat disturbance due to noise and vibration pollution
	Operation	• Bird and bat collision • Disruption of migratory pattern of birds, bat, etc • Bird mortality due to electrocution

Project Type	Project Phase	Typical Potential Impact
Distribution Line	Pre-construction and Construction	• Habitat loss and fragmentation • Habitat disturbance due to noise and vibration pollution
	Operation	• Collision and mortality of bird and terrestrial fauna

Appendix 5

Biodiversity Offset

1 Biodiversity Offsets Principles

The principles of biodiversity offset are a set of factors that need to be considered during the biodiversity offset plan, design, and implementation. The principles are applied to ensure that biodiversity offsets are planned and implemented appropriately and that No Net Loss and Net Gain is achieved. The following are ten principles to establish a framework for designing and implementing biodiversity offsets and verifying the success of biodiversity offset implementation (BBOP, 2012[9]):

1) **Adherence to the mitigation hierarchy**: A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimisation and on-site rehabilitation measures have been taken according to the mitigation hierarchy.

2) **Limits to what can be offset**: There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.

3) **Landscape approach**: A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes, considering available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.

4) **No net loss**: A biodiversity offset should be designed and implemented to achieve in situ, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity (especially impact on natural or critical habitat).

5) **Additionality**: A biodiversity offset should achieve conservation outcomes above and beyond the results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity in other locations.

6) **Stakeholder participation**: In areas affected by the project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation, and monitoring.

7) **Equivalence**: A biodiversity offset should be designed and implemented equitably, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both the internationally and nationally recognised rights of indigenous peoples and local communities.

8) **Permanence**: The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, to secure outcomes that last at least as long as the project's impacts and preferably in perpetuity.

[9] Business and Biodiversity Offsets Programme (BBOP). 2012. Biodiversity Offset Design Handbook-Updated. BBOP, Washington, D.C. Available from: BBOP Document Cover Sheet (forest-trends.org)

9) **Transparency**: The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken transparently and timely.

10) **Science and traditional knowledge**: The design and implementation of a biodiversity offset should be a documented process informed by sound science, including appropriate consideration of traditional knowledge.

The steps for developing biodiversity offset document (sometimes known as a Biodiversity Offsets Management Plan – BOMP) are dependent on the location of the offset to be selected and the condition of the location based on the various accompanying components.

2 The Biodiversity Offset Step-by-Step Process

This section describes the steps in developing a Biodiversity Offset Management Plan (BOMP), adopted from World Bank, Business and Biodiversity Offsets Programs (BBOP) IUCN, and some related sources.

Step 1. Completing Biodiversity Assessment and Mitigation Measures

Biodiversity assessment (impact assessment and/or critical habitat assessment – if required) and mitigation measures must be carried on prior the offset planning process. The planned biodiversity assessment and mitigation measures must meet the requirements on factors in decision-making for biodiversity offsets. Such assessment and mitigation measures may be consulted with institution/organization that work on the respective critical habitat/species conservation.

For example, when a project has potential impact on Orangutan (Great Apes), then consultation with IUCN/Species Survival Commission (SSC) Primate Specialist Group (PSG) Section on Great Apes (SGA) is strongly recommended and any inputs from them should be taken into consideration in planning the mitigation measures[10]. If there is confirmation of Orangutan presence in an area, thus the area will be treated as critical habitat. Additional particular biodiversity study might be required when the planned biodiversity assessment and mitigation measures does not meet the requirements. Projects in the Great Apes habitat will be acceptable only in exceptional circumstances, and individuals from the IUCN/SSC PSG SGA must be involved in the development of any mitigation strategy.

Step 2. Estimate Residual Biodiversity Losses from the Original Project

The target for developing a biodiversity offset that compensate the residual adverse impacts on biodiversity caused by the project is to be balanced or ‘no net loss’ and to demonstrate the project may achieve the ‘net gain’ in biodiversity management.

The significance of the proposed project’s expected residual impacts on biodiversity should be assessed and discussed by the IA sub-team, including both direct and indirect (induced) impacts. It should also be taken into account the likely cumulative impacts from nearby, upstream or downstream, associated, follow-up, or repeater projects. Establishing the significance of the expected adverse biodiversity impacts is a key input to deciding whether a biodiversity offset might be needed. Additional assessment might be required when the existing assessment did not meet with requirements. The biodiversity offset plan can be

[10] GN 73 of IFC Guidance Note 2019.

processed after the additional assessments are completed or can be inline separately depending on the gaps condition.

Step 3. Selecting Conservation Site(s)

The site(s) selected for conservation offset activities should take into account the core principle of equivalence, seeking to achieve like-for-like or trading-up conservation outcomes. The site(s) selected should also take into account the landscape context such as the size of remaining patches of natural vegetation, and connectivity to nearby areas of similar habitat as well as the feasibility of establishing successful and sustainable conservation offset in that area. The following criteria are important to assess in the site selection process (but not limited to):

- Landscape Context
  The project should give priority to the choice of offset site based on the government's spatial planning at the landscape and seascape level

- Legal aspect
  Not all habitats can become biodiversity offset areas. The legal status of the land/forest is also important to be identified and assessed. This includes legal status based on the spatial plan, ownership, forest classification, land & habitat utilization, cultural condition, the presence of other projects and activities and potential agrarian conflict.

- Offset site baseline condition
  The baseline of each potential offsets site is important to be assessed. The baseline is not only for the biodiversity component but includes environmental and social aspects. A rapid survey on biodiversity and social aspect may be required to be conducted depending on the availability of data and information on each potential offsets site. Minimum data and information in supporting offsets planning should be done by the survey.

  It should be noted, the baseline survey for the non-biodiversity aspect is conducted to get a better understanding of each aspect condition in supporting the potential programs and activities on the offset's sites.

- Risk and impact assessment
  The risk and impact assessment of the proposed offset site(s) are required to be conducted based on potential offsets activities and baseline conditions. The biodiversity offsets activities will have impacts on the environment and are not allowed to have a significant negative adverse impact on the biodiversity and community.

- Stakeholder engagement and consultation
  Effective stakeholder engagement is needed to help ensure the success of all types of development and conservation projects, including biodiversity offsets. Robust stakeholder engagement begins sufficiently early and continues as needed to obtain stakeholder feedback during all key stages of offset planning and implementation.

- Information Sharing
  A key part of successful stakeholder engagement is a highly transparent information disclosure. Timely and thorough information sharing can deter harmful speculation

about the offset as well as the original project. It can also encourage stakeholders to share what they know and sometimes to collaborate further. Information disclosure is most useful when the information is presented in a readily understandable manner.

Step 4. Selecting and Developing Offset Activities

The development of activities and programs at the offsite site is very dependent on the local context, the conditions of the offset area and the offset goal (such as 'no net loss' or ideally a 'net gain'). However, in general, the following are several programs or activities in biodiversity offset.

- New or Expanded Protected Areas
  The project is highly recommended to apply or propose the offset site to become new or expanded Protected Areas (if directly adjacent to the existing protected area). For the local context, the offset sites can be proposed as new local protected areas based on local wisdom that potentially will support and conserved by the community. Some types of this local protection such as "*Lubuk Larangan* and *Hutan Larangan*".

- Improved Management or Habitat Enhancement
  Project support on area management is an important program to ensure the offset goal can be achieved. Collaboration with existing site management (governments or community institutions) is important to conducted.

  The project is also required to develop various programs regarding offset site management on the habitat enhancements with considering the existing habitat condition, surrounding area, socio-economic aspect, conservation issues, political will, budget, and effectiveness of the programs.

- Habitat Restoration
  This program will be applied only within offset sites with degraded conditions and not be applied in good habitat conditions. It should be ensured that this program is a long-term program where the project is required to involve for the long-term also.

  An effective restoration program requires a good understanding of both ecological concepts and practical considerations on the restoration area and vicinity. The project should adopt restoration best practice of the habitat restoration process that may be useful as a basis to understand the complexities of the restoration process and a pointer to plan further action.

- Livelihood or Community Support
  Biodiversity offsets should include support for addressing livelihood or community development issues in the vicinity of conservation areas, especially in the area where the community presents and/or take environmental services from that habitat.

  The livelihood or community support shall be developed in cooperation with the local context and community involvement itself in the preparation and development of the program. The requirements of the relevant standard within the development of Social Impact Assessment (SIA) are also applicable to this livelihood or community support such as World Bank ESS and IFC PS. The involvement of a third party might be required to bridge the communication between the project and the community.

- Species-specific Interventions
  To compensate for project-related reductions in the population of some species of conservation interest and ensure the offsets goal on species protection and species of conservation significance ('no net loss' or ideally a 'net gain'), biodiversity offsets can support measures to reduce other (non-project) threats to the same species within the offset sites. That is the reason of the selection of biodiversity offsets sites within the same landscape and similar habitat is important.

- Scientific research support
  The value of the biodiversity and habitat of the proposed offset site is often unknown or in a very limited information, therefore a continuous study and research program on offset sites are required to be developed, especially regarding the species of interest and the habitat. This program can be supported in collaboration with outside-project research and NGOs and/or universities.

  Continuous and sustainable research and study can produce significant input that helps the process of developing and conserving offset sites and of course, has a positive impact on the development of science and conservation. Supporting scientific research can also support the development of biodiversity offset in proposing the project area to become a new protected area and/or expand the existing protected areas.

- Financial support
  All types of biodiversity offset activities require some level of funding including from the project and/or the project sponsor/lenders. However, in some cases, the sponsor of the original project might simply provide additional support to an aggregate, large-scale conservation offset or even a conservation trust fund that was designed to compensate for the cumulative impact of multiple projects, rather than designing a separate, individual offset from scratch. A key consideration in such cases is ensuring (through monitoring) that the offset funding made results in verifiable on-the-ground conservation gains.

Step 5. Preparing the Biodiversity Offset Project Components

The following criteria are need to covered in biodiversity offset**:**

- Specific Activities and Inputs
  The type and number of investments on biodiversity offsite site should be assessed properly based on baseline conditions, offsets programs and activities and benchmarking from existing similar programs. Each potential investment in specific offsets programs and activities should be calculated properly and included in budget calculation. Where civil works (such as protected area facilities) are a part of the biodiversity offset, the biodiversity offset plan need to have sufficiently precise technical specifications, which should also be included in the bidding and contract document for construction.

- Institutional Responsibilities
  The biodiversity offset should clearly define the responsibilities of different organizations, whether government agencies, private firms, universities, organized

communities, NGO partners, or other entities with implementation responsibilities. Working groups or working committees are required to develop in terms of implementing effective and sustainable management of the offset area. Internally, the project is also required to provide specific staff or teams (depending on the size of the offset site). At least one dedicated staff is required to involve continuously in the management of the offset site.

- Implementation Schedule
  The time frames for implementing each biodiversity offset investment or action should be clearly defined, including the expected start date and (if not recurrent) the target completion target for each planned activity. The timing of biodiversity offset activities may need to take into account the implementation schedule for civil works or groundwork (if applicable) under the original development project.

- Cost Estimates
  The development of Biodiversity offsets shall provide the potential long-term cost estimate for each program and additional cost. This cost should be calculated properly considering various existing conditions in the field and possible future conditions. Consultation with stakeholders that have similar existing programs and reviewing the similar published program can support the project to be calculated properly.

- Financial sources
  Up-front investment costs normally should be met as a defined part of the original project's investment costs, since the original project provides the basis for doing the biodiversity offset in the first place. Securing the funding for long-term recurrent costs is often a challenge; various options should be considered.

Step 6. Monitoring the Implementation of the Biodiversity Offset Activities and Results

Biodiversity offsets, like other kinds of conservation projects, merit significant investment in the monitoring of implementation as well as outcomes. The following are several aspects that need to be covered in regards of monitoring the biodiversity offset project, but not limited to:

- Implementation monitoring (Supervision).
  Diligent monitoring of implementation by the responsible entity is important for achieving the desired outcomes on the ground. The offset documents should provide tools to supervise and monitor each offset's activities and programs. The monitoring of offsets program and activities should be recorded and reported periodically.

- Environmental rules for offsets team management and contractors
  Environmental rules for offsets team management and contractors are required to be developed. The rules are used to ensure that the offsets teams (and workers) and contractors working well manner and do not cause undue impact while working on the offset site. Rules such as these along with transparent penalties for non-compliance should be part of the relevant bidding documents and contracts for the biodiversity offset. Even more importantly, environmental rules are needed as part of the mitigation

hierarchy, to minimize the biodiversity-related and other potential adverse impacts of the implementation offsets program and activities work that are part of the original development project.

- Outcome Monitoring
  To verify that a biodiversity offset has indeed achieved it's 'no net loss' or other conservation objectives, a field-based outcome monitoring is needed. Outcome monitoring is also an essential part of adaptive management: If the biodiversity offset is falling short of achieving its goals, monitoring can provide the information needed to effectively adjust project implementation to improve on-the-ground outcomes. The scope, duration, frequency, and budget for outcome monitoring activities should be defined as part of the preparation of a biodiversity offset document. Outcome monitoring activities should be designed:

  b. to be feasible to carry out in the field;
  c. to obtain much-needed information; and
  d. to avoid undue complexity (such as too many indicators).

  Outcome monitoring reports and data should be routinely shared with interested stakeholders, exceptions should be limited to special cases, such as when disclosing the precise locations of threatened plants or animals that could cause them harm. Interested citizens and volunteers often usefully assist with outcome monitoring within a biodiversity offset conservation area, along with other protection and management functions.

- Management Effectiveness Tracking Tool
  For biodiversity offsets that involve a protected area (whether public or private), the Management Effectiveness Tracking Tool (METT) is a useful means to track progress in improving the management quality of protected area across a broad range of indicators. The METT was developed by World Wildlife Fund (WWF) International in collaboration with the World Bank Groups.

  At its core, the METT is a standardized questionnaire about different aspects of protected area management, with a theoretical "perfect" top score of around 100. The METT provides a useful instrument for tracking the effectiveness of protected area management and setting future goals, whether or not the protected area in question is part of a biodiversity offset. Due to the local context being an important consideration in the development of offset programs and activities, some adjustment of METT might be required. Adjustment on the tools should accommodate the offset plan, and the final adjusted tools should be included in the offset plan documents

- Reporting and evaluation

The offset implementation programs should be reported and evaluated periodically. The evaluation may require any change, improvement, termination or replacement of the offset programs and activities. As a living document, the biodiversity of set plan documents can be changed periodically by the additional program and activities assessment in the evaluation report documents. However, specifically for the termination and replacement of the offsets

program, the project must follow the step of the offsets program as described above from step 1.