BIODIVERSITY MANAGEMENT PLAN (BMP)
UPPER CISOKAN PUMPED STORAGE HYDROPOWER
Achieving Biodiversity Conservation through Integrated Catchment Management

PT PLN (PERSERO)

MASTER DEVELOPMENT UNIT – UIP JBT I

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Preface

This Biodiversity Management Plan (BMP) for the Upper Cisokan Pumped Storage (UCPS) Project is the revised version of a BMP study conducted by PT. PLN UIP VI in cooperation with PPSDAL LPPM UNPAD. This update is undertaken by PT PLN Unit Induk Pembangunan Jawa Bagian Tengah 1 in cooperation with the Center for Environment and Sustainability Sciences Universitas Padjadjaran (CESS UNPAD) under the Agreement No. 006.PJ/HKM.02.01/4800002020, 31 March 2020, and with additional support from Prof. Erik Meijaard and Rona Dennis.

The revised BMP of 2021 updates the BMP of 2015 following a review of implementation of impact avoidance and mitigation measures between 2015 and 2020 and partial implementation of the restoration and offsetting strategies. The update complies with the World Bank Environmental and Social Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources. The current version also addresses the potential biodiversity impacts from the transmission line development which were not covered in the 2015 BMP.

The BMP UCPS consists of a project rational and vision in compliance with the World Bank Environmental and Social Framework a legal foundation, an analysis of the biodiversity of the project area, and a review of threats to biodiversity.

The BMP is implemented through an Integrated Catchment Management (ICM) approach that achieves positive biodiversity conservation outcomes through impact mitigation management, catchment-wide reforestation, direct management of wildlife threats, and community and other stakeholder participation. Implementation of ICM will result in Indonesia's first Green Dam, in which environmental, economic, social, and ecological issues are addressed simultaneously.

This plan is a major contribution to PLN's mission to generate electricity as an environmentally sound medium that improves the quality of people's lives and drives economic development.

Bandung, 27 April 2021

PT PLN UIP VI

Executive summary

PT PLN and its project partner the World Bank recognize that biodiversity can be impacted in a number of ways and these impacts are produced by a range of interacting threats. Major threats facing Java's biodiversity are habitat loss and fragmentation through clearing, ineffective management of protected areas, fire, agricultural encroachment, overhunting, the development of road systems, increased land clearing for urban development, pollution, exotic species, and climate change.

The Upper Cisokan Pumped Storage (UCPS) project has carried out a series of biodiversity surveys in the Cisokan project area, West Java, Indonesia, which indicate the biodiversity richness of the region. Altogether, the survey teams have found 36 species of land mammals, 114 species of birds, 48 species of reptiles, and 17 species of fish. Importantly, this includes several species listed by as Critically Endangered or Endangered by the International Union for Conservation of Nature (IUCN) (Pangolin, Grizzled Langur and Javan Slow Loris).

The UCPS covers several ecosystem types including natural degraded forest, state production forests (with stands of pine and teak), areas of mixed gardens or agroforestry (locally named *talun*), scrub areas, slash and burn cultivation areas that make up agricultural fields on slopes, rice fields in flat areas, and fishponds, settlements, and yards. The human population is distributed throughout the landscape in villages (hamlets) and comprising rural families and communities with strong kinship and traditional social and cultural attitudes.

The UCPS landscape qualifies as a Modified Habitat under ESS6 because of the significant and long-term anthropogenic interventions. The project area is contiguous with a larger landscape of >15,000 ha, with similarly disturbed vegetation types. The presence of two species triggers Critical Habitat thresholds under ESS6 (Javan Slow Loris, Pangolin), while another three species possibly trigger Critical Habitat (Javan Leopard, Javan/Silvery Gibbon, Javan Hawk-eagle). Surveys indicate that these species are widespread in the landscape, suggesting that all of the landscape is Critical Habitat.

Analysis of landcover change in the project area between 2016 and 2019 when limited biodiversity management actions were implemented, indicates that agroforestry areas, i.e., the core habitats for the species triggering Critical Habitat, are under threat. Without intervention, such trends will likely continue, resulting in ever smaller forest patches and more agricultural land. Assuming a constant rate of decline, the agroforest area will be reduced from 2262 ha in 2019 to less than 1,500 ha by 2050. This provides the counterfactual scenario.

An impact analysis predicts that in the UCPS project area, **400 ha of Critical Habitat will be directly impacted and 2,288 ha indirectly**, while along the transmission line, 100 ha will be directly impacted and 341 ha indirectly. This results in total impact estimates on Critical Habitat of 500 ha of directly impacted areas and 2,629 ha of indirectly impacted areas. Taken into consideration the counterfactual trends, the area impacted is smaller, i.e., 1,867 ha.

The Biodiversity Management Plan (BMP) is prepared to manage the direct and indirect impacts of the Cisokan hydropower project on the condition of biodiversity and for the maintenance of project-affected areas. This BMP updates and supersedes the previous BMP publicly disclosed in 2011 as a sub-plan to the ESMP, as well as the BMP prepared but not published in 2015.

Integrated Catchment Management through a Forest Partnership Framework aims to **offset impacts by reforesting a connected (agro-)forest landscape across 3,800 ha of land** around the UCPS reservoirs and project facilities. The 3,800 ha of restoration aims to provide a net positive gain, offsetting the 500 ha of direct impacts and the 2,629 ha of indirect impacts, or 1,867 ha under the counterfactual scenario. The net positive gain targeted from the biodiversity offset against the counterfactual scenario is estimated at **3,800 ha – 500 ha (direct impacts) – 2,629 ha (indirect impacts) + 762 ha (counterfactual loss) = 1,433 ha over a 30-year time frame**. It simultaneously aims to restore the terrestrial biodiversity component by significantly increasing ecological connectivity among forest areas, benefiting species that trigger the Critical Habitat criteria, such as Slow Loris and Grizzled Leaf Monkey, and the aquatic habitat by improving ecological conditions alongside tributaries flowing into the reservoirs and through improved fish management. The restoration and offsetting strategies aim to fulfil socio-economic objectives through the development of financially viable social forestry and agroforestry programs. These aim to restore original agroforestry-based land uses in the UCPS area that provide communities with improved income and reduce ecologically damaging land practices, such as open field agricultural on steep slopes.

The BMP provides practical guidance for reducing threats to biodiversity where practical, to manage identified risks, to engage with communities and stakeholders, and to pro-actively support the development of knowledge in biodiversity conservation using the ESS 6 mitigation hierarchy. Through this BMP, the aim is to engage with biodiversity professionals, government, the community, non-government organizations (NGOs), researchers and appropriate individuals to achieve a high standard of biodiversity and conservation management.

The Biodiversity Management Plan is implemented through an Integrated Catchment Management (ICM) approach that simultaneously addresses biodiversity, environmental and social aspects of landscape management. It provides a sound rationale for a range of actions that focus on:

- Construction-related impact mitigation and management;
- Reforestation and forest management;
- Wildlife management;
- Stakeholder participation; and
- Community engagement.

Within the project area of influence the BMP goals are:

- To achieve net gain of Critical Habitat and Natural Habitat.
- To protect and enhance the remnant forest communities (both the habitat and wildlife) to create a self-sustaining ecosystem.

- To protect and increase the populations of critically endangered and endangered species so that they are self-sustaining.
- To take into account the ongoing threats to biodiversity conservation from the community and rural development in the selection and implementation of conservation strategies.
- To create a common understanding amongst stakeholders and the community about the biodiversity values and threats.

This plan provides clear guidance on how to protect and restore habitats and to protect and manage endangered species in the project area of influence. The approach is based on adaptive management, requiring continuous monitoring of success. Depending on the on-going achievements or setbacks in the field, the plan is flexible and allows changes to the basic approach.

The ICM approach aims to deliver sustainable land and resource use outcomes for Upper Cisokan area, and with that develop a "Green Dam". The ICM Plan will be developed and implemented in parallel with the site-based conservation programs that focus more on the areas directly impacted by project development. The challenges to maintain Cisokan's highly threatened wildlife are large. A well-funded and executed, politically supported ICM approach is key to the long-term survival of these species.

Contents

List of Figures

List of Tables

1   Introduction

1.1   Background

PT PLN (Persero) plans to construct the Upper Cisokan Pumped Storage (UCPS) hydropower to significantly increase the peaking capacity of the power generation system in Java – Bali and to escalate the ability to absorb variable of renewable power electricity generation sustainably. The UCPS Scheme with a capacity of 1040 MW in Cisokan River and Cirumamis River, West Java, is the first type of pumped storage hydropower in Indonesia. The total area used for reservoirs construction, including the dam, transmission line, power plant, access road, mines, and other field activities is approximately 720 ha located in the hills of West Bandung District and Cianjur District. The permanent access road had been constructed in September 2019, while the main construction work is intended to be commenced in 2021.

The construction of UCPS hydropower will likely change the surrounding environment. In 2011 PLN prepared a comprehensive Environmental and Social Management Plan (ESMP). A Biodiversity Management Plan (BMP) was prepared in 2014/15 as a result of detailed assessments of the risks to the forests and wildlife.

With regard to the continuation of the UCPS hydropower main construction that will be commenced in 2021, the ESIA and ESMP have been updated and a review of BMP implementation and completing document of Forest Partnership Framework between PLN and Perhutani was made as an evaluation of the previous BMP implementation and the update of the BMP. The Forest Partnership Framework between PLN and Perhutani was updated in 2020, as a follow-up adaptive plan document managing "residual impact" and anticipating dynamic conditions of the construction related to land.

This updated Biodiversity Management Plan (BMP) is intended to provide practical guidance related to terrestrial biodiversity protection and enhancement as part of the integrated catchment management (ICM) approach to managing impacts from the UCPS hydropower project and land use in the catchment more broadly. Long term benefits to the tributaries and rivers in the catchment will come from the improved land cover, management and ecosystem connectivity.

1.2   Purpose, Vision and Goals of the BMP

The purpose of the BMP is:

- To provide a simple, well structured, adaptive management approach to terrestrial biodiversity conservation in the project area of influence;
- To provide detailed technical methods for land clearing, wildlife management, protection of biodiversity important areas to minimize the potential impacts on habitat and wildlife from project construction activities;
- To provide a long term vision and an integrated plan for the maintenance and enhancement of habitat for threatened terrestrial mammal species in the project area of influence, while also addressing the influences from, and on, resettlements and land uses in the catchment;
- To meet the World Bank ESF ESS6 and international best practice for biodiversity conservation.

Vision for the Upper Cisokan catchment:

Thriving and prosperous communities hosting Indonesia's greenest dams and a refuge for Java's endangered species.

Goals of the BMP:

Within the project area of influence:

- Protect and replant at least 3,800ha of contiguous forest habitat to provide sufficient habitat for viable populations of threatened wildlife and achieve net gain of critical and natural forest and riparian habitat;
- To cease all illegal hunting and poaching of wildlife and illegal logging and land clearance;
- All 10 listed endangered wildlife species (see Table 1) are present and populations are increasing in number;
- To take an Integrated Catchment Management (ICM) approach to UCPS safeguards and ecosystem improvement that takes into account the ongoing / baseline threats to biodiversity conservation from the community and rural development.
- To create a common understanding amongst stakeholders and the community about the biodiversity values and threats.

The BMP will be implemented by PLN. PLN will require ongoing support from, and collaboration with, Perhutani (government forestry agency and land owner), expert biodiversity conservation practitioners, conservation NGOs, government stakeholders and the host communities.

The priorities are:

1) Minimising the direct impacts from Construction on the Biodiversity Important Areas (BIAs);
2) Focus on the immediate and medium-term needs of the Critically Endangered Pangolin and Javan Slow Loris, Endangered Javan Gibbon and Grizzled Leaf Monkey, and Javan Leopard to sustain and enhance local populations;
3) Protecting and expanding forest habitats to connect the BIAs together and into the wider landscape while addressing the indirect impacts on biodiversity. Reforestation across the Upper Cisokan watershed will furthermore reduce sedimentation and increase dam life.
4) Ensuring community development programs, resettlement and other activities in the catchments are complimentary to the reforestation and wildlife protection efforts (and do not compromise /undermine them).
5) Develop an organizational structure and network that addresses the immediate and longer-term needs of effective ICM.

1.3 Development of the BMP and Integrated Catchment Management (ICM)

The UCPS has a comprehensive ESMP, which covers all aspects of the project that may impact on people and the environment, including aspects such as biodiversity management, quarry management, access road construction, environmental monitoring, and social and community impact management for the

project, during pre-construction, construction and operation. This ESMP was publicly disclosed in February 2021, and complies with the World Bank Environmental and Social Framework. It also encompasses the mitigation and monitoring requirements under the Environmental Management Plan or *Rencana Pengelolaan Lingkun*gan (RKL) and Environmental Monitoring Plan or *Rencana Pemantauan Lingkungan* (RPL) from the Indonesian authorities.

The ESMP is designed as an overriding document in a hierarchy of control plans throughout the project phases (Pre-construction, Construction and Operation). The ESMP sets out the framework of environmental management to be applied to the project. It includes the Environmental Principles, Communication, Reporting, Monitoring and Review Procedures to which all parties are required to comply with, including any sub plans.

The BMP is one of the sub-plans of the ESMP. The BMP provides a strategy and action plan for biodiversity management across the project area of influence and has been developed within the context of a wider, integrated approach to catchment management. The BMP document has been prepared in compliance with the ESS6 all relevant project standards and legal requirements.

Recommendations in this BMP are based on several years of qualitative and descriptive-analytical studies[1]. Information on the area's biodiversity was obtained directly through field surveys and indirectly through semi-structured interviews and focus group discussions (FGD) with local community members and other stakeholder in the area. These data provided a solid biodiversity baseline from which to develop appropriate management guidance.

In 2014 PLN started to explore 'Integrated Catchment Management (ICM) as an approach to manage and achieve all of the various outcomes from UCPS safeguards while also influencing the wider issues in the catchment that were impacting on habitat, soil erosion and water quality. Further thinking about what could be achieved with regard to protecting small populations of Endangered and Critically Endangered species in a highly fragmented ecological setting, it became clear that additional actions were required that would increase the availability of inter-connected forests habitats, thus increasing gene flow between populations and increasing their effective (and eventually self-sustaining) population sizes. However a biodiversity management plan would not be successful without considering the constraints of a densely populated landscape, with many landowners, many competing demands on land use, and limited opportunities for economic development. This thinking resulted in the concept of ICM and the vision of developing a Green Dam.

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[1]This assessment included a review of environmental documents that had been prepared as a supporting documents for UCPS hydropower development plans, such as AMDAL [2007], EIA [2011], EMP [2011], Rahmat Biodiversity Study [2009] and a Thematic Study of Flora and Fauna by the Indonesian Institute for Science's (LIPI) Biology Research Center [2012]., UNPAD. 2013. Biodiversity Management Issues and Options. Upper Cisokan Pumped Storage. Unpublished. UNPAD. 2014. Biodiversity Management Plan Upper Cisokan Pumped Storage. Unpublished. UNPAD have prepared two training modules (one for institutional stakeholders and one for the community) and publicity materials

This version of the BMP has been updated following review of the implementation and effectiveness of mitigation measures between 2015 and 2020 (Center for Environment and Sustainability 2020).

1.4 Version Control

This BMP is dated January 2021 and supersedes all other BMP documents, including the version attached as Appendix 8 to the publicly disclosed version of the UCPS ESMP dated March 2011, and the most recent BMP version prepared by UNPAD dated September 2015.

Current revisions are based on a review conducted in 2020, and the BMP will be further reviewed periodically and updated where necessary to achieve the goals and vision, and will be based on results in the field, consistent with the 'adaptive management' approach, or to adapt to social and environmental changes that occur or as a result of consultation with relevant stakeholders.

2   Background to Land use and Biodiversity Issues in Upper Cisokan

2.1   Indonesia – Megadiverse Nation

Indonesia is among the most biologically diverse nations on Earth, ranking third behind Brazil and Colombia in total species richness, and second in terms of endemic species (see Box 1) (Mittermeier et al. 2004; Whitten et al. 2004).

The country supports the third largest expanse of tropical forest in the world (behind Brazil and the Indonesia's species-rich forests support some 37,000 types of vascular plant. These include more than 400 species of dipterocarps, the most valuable commercial timber trees in Southeast Asia, and the world's greatest diversity of palms. The forests also provide a center of diversity for a variety of unique plant taxa, such as the carnivorous pitcher plants (*Nepenthes*) and members of the genus *Rafflesia*, of which one species, *Rafflesia arnoldii*, produces the world's largest flower.

Box 1. Megadiversity and Biodiversity 'Hotspots'

Megadiverse nations

The concept of megadiversity is based on the total number of species in a country and the number that are endemic (occur nowhere else in the world). The World Conservation Monitoring Centre recognized 17 megadiverse countries in 2000 of which Indonesia was among the three most species-rich. Together, these 17 countries support more than two thirds of the Earth's species.

Biodiversity hotspots

Hotspot analyses aim to identify global conservation priorities by highlighting regions where high concentrations of endemic species are subjected to high rates of habitat loss or degradation. These areas support the vast majority of the planet's most threatened mammals, birds, reptiles and amphibians.

In 2000, 25 regions were identified worldwide that contained up to 45% of all the world's vascular plants and 35% of terrestrial vertebrates on just 1.4% of the Earth's surface. The top 5 hotspots together contain 20% and 16% of all known plants and vertebrates on just0.4% of the Earth's surface.

"The biodiversity hotspots are the environmental emergency rooms of our planet." Russell A. Mittermeier, president of Conservation International.

Indonesia is equally rich in native fauna, ranking third in diversity and second in endemism among non-fish vertebrates. Its forests, wetlands and marine environments support the second highest number of mammal species, fourth highest number of reptiles, the fifth highest diversity of birds and freshwater fishes, and an array of invertebrate fauna, including the greatest diversity of swallowtail butterflies and dragonflies.

2.2 The Natural Resources and Biodiversity of Java

Java Island is located in the south-west of the Malayan Archipelago, an area of extremely high levels of species diversity in the contact zone between Australasian and Indomalayan biological regions. Some 6,500 species of plant have been reported on Java, of which 4,500 are native to the island, and some 325 only occur on Java, i.e., they are endemic to the island (Whitten et al. 1996). Some of the rarer and many endemic plants have only been collected once and their status in the wild is poorly known, making it hard to develop and implement effective conservation programs for protecting them.

Java is also rich in animal species, although not as rich as during the Pleistocene when a varied fauna existed that included dirk-toothed cats, pygmy hippopotamuses, and a range of elephant-like species (Louys & Meijaard 2010). Still, a rich fauna remains with a wide-variety of mammal species, many of which are endemic to the island, birds, reptiles, fish and amphibians, as well as numerous invertebrate species. A count of these vertebrate species in 1996 totaled 864 species on Java (Whitten et al. 1996), but since then many new species discoveries and taxonomic revisions have added a considerable number and the total is now close to 1,000 species.

Java mostly consists of a long chain of volcanoes which have created some of the most fertile soils in the South-East Asian region. The island therefore has a long history of agricultural use and it supports some of the highest human population densities in the world. This high population density and demand for agricultural land has resulted in high deforestation rates. Especially lowland and coastal forests have been targeted and few such stands now remain. More recently, since the 1990s, deforestation has started to affect previously safe mountain forests as well (Lavigne & Gunnell 2006). Presently only about 1.1 million hectares of forest remain on Java (Prasetyo et al. 2013), covering about 7% of the land area. Most of these forests, like those in Cisokan, are at high elevation.

Because most species on Java are ecologically associated with or dependent on forests, the island's high deforestation rates are a major threat to its species. In addition, collection and hunting pressure is also high. The Javan Tiger became extinct in the 1960s and the Javan Rhino is nearly extinct with only some 40 animals remaining in the wild. Smaller species are also targeted. With 58% of interviewed households on Java having had a cage bird in the past 10 years, and most birds being obtained from the wild (Jepson & Ladle 2009), it is obvious how high the collection pressure is in Indonesian forests. This also includes mammal species, such as pangolins, and reptiles such as the common gecko, which are both highly valued for the medicinal trade, and increasingly rare in the wild (Meijaard & Achdiawan 2011). Thus, there are few forests on Java that remain pristine and with a complete fauna. As a result, there are presently 44 species on Java listed as Critically Endangered or Endangered on the IUCN Red List of Threatened Species, the global authority on species conservation needs.

Considering the commitments made by the Government of Indonesia towards biodiversity conservation, the bottom line of the situation is that any responsible developments on Java should take the utmost care to prevent further species declines, and attempt where possible to restore natural habitats and prevent unsustainable harvest of species.

2.3 Responses to Reducing Indonesia's Biodiversity Loss

The Government of Indonesia has made positive steps towards curbing the loss of biodiversity. In the early 1990s, Indonesia was one of the first countries to sign the Convention on Biological Diversity (CBD) and to develop a national Biodiversity Action Plan (see Box 2). Indonesia is also an active member of other international organizations that deal with regional environmental issues, including the Asian Forest Partnership and the International Tropical Timber Organization (ITTO).

> **Box 2 - Indonesia's Biodiversity Action Plan (IBSAP)**
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> In 1992 the United Nations held its Conference on Environment and Development (UNCED), also known as the Earth Summit, in Rio de Janeiro, Brazil. At the summit, 189 parties, including Indonesia, signed the Convention on Biological Diversity (CBD), a legally binding international treaty aimed at the development of national strategies for the conservation and sustainable use of biodiversity.
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> In 1993 the Indonesian Government published its first Biodiversity Action Plan for Indonesia (BAPI), which set out a strategy to develop Indonesia's natural resources while preserving biodiversity for current and future generations. Following the administrative changes associated with the 1998 regime collapse, the National Development Planning Agency (BAPPENAS) produced a revised version of the document in 2003, known as The Indonesia Biodiversity Strategy and Action Plan (IBSAP), which will guide the implementation of national biodiversity initiatives through to 2020.
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> The IBSAP established a policy for ground-level biodiversity conservation in various parks and reserves. Additional biodiversity management is undertaken in botanical and zoological gardens, safari parks, breeding and cultivation centres and arboretums. However, the document is not legally binding, limiting the powers of the Ministry of Environment to enforce adherence to the IBSAP.

The Government of Indonesia has implemented numerous environmental policy initiatives relating to the forestry sector, agriculture, fisheries, energy and transport, industry and education. However, the ability of the central government to regulate the use of natural resources has been complicated by changes in administrative policy particularly, the rapid and far-reaching process of decentralization which transferred regulatory authority over forests to the provincial and district levels (Djogo & Syaf 2004; Duncan 2007).

One benefit of the new policy framework is the ability of local government officials to declare protected areas, increasing the involvement of local stakeholders who support the establishment of reserves and feel a sense of ownership in the process. However, decentralization has also complicated the implementation of a number of initiatives by slowing consensus between local and central governments and cooperation between departments operating at a similar level.

The pressures currently facing Indonesia's biodiversity have drawn high-level concern from the international community (Sodhi et al. 2004; Sodhi et al. 2010). Indonesia's environmental crisis has attracted practical support from a number of international stakeholders, including governments, NGOs and businesses. There are a host of international donors contributing to environmental programs in Indonesia. In addition, there are currently more than 600 local and international NGOs working on environmental issues throughout Indonesia. Negative biodiversity impacts of projects developments on the island are therefore likely to attract significant international attention.

2.4   Landscapes and Biodiversity of Cisokan

The UCPS hydropower project is located in the province of West Java, on the Indonesian island of Java. The watershed is west of the city of Bandung, about 3 hours travel from this city via the existing road network (Figure 1). The Cisokan River originates from a forest upland area (maximum elevation about 2,000 m above sea level (asl), about 15 km south of the project development site (the light green area south of the red star in Figure 1). After exiting the project area, the Cisokan waters flow towards the north where they feed into the existing Waduk Jangari and Waduk Jatiluhur reservoirs, and eventually into the Java Sea.
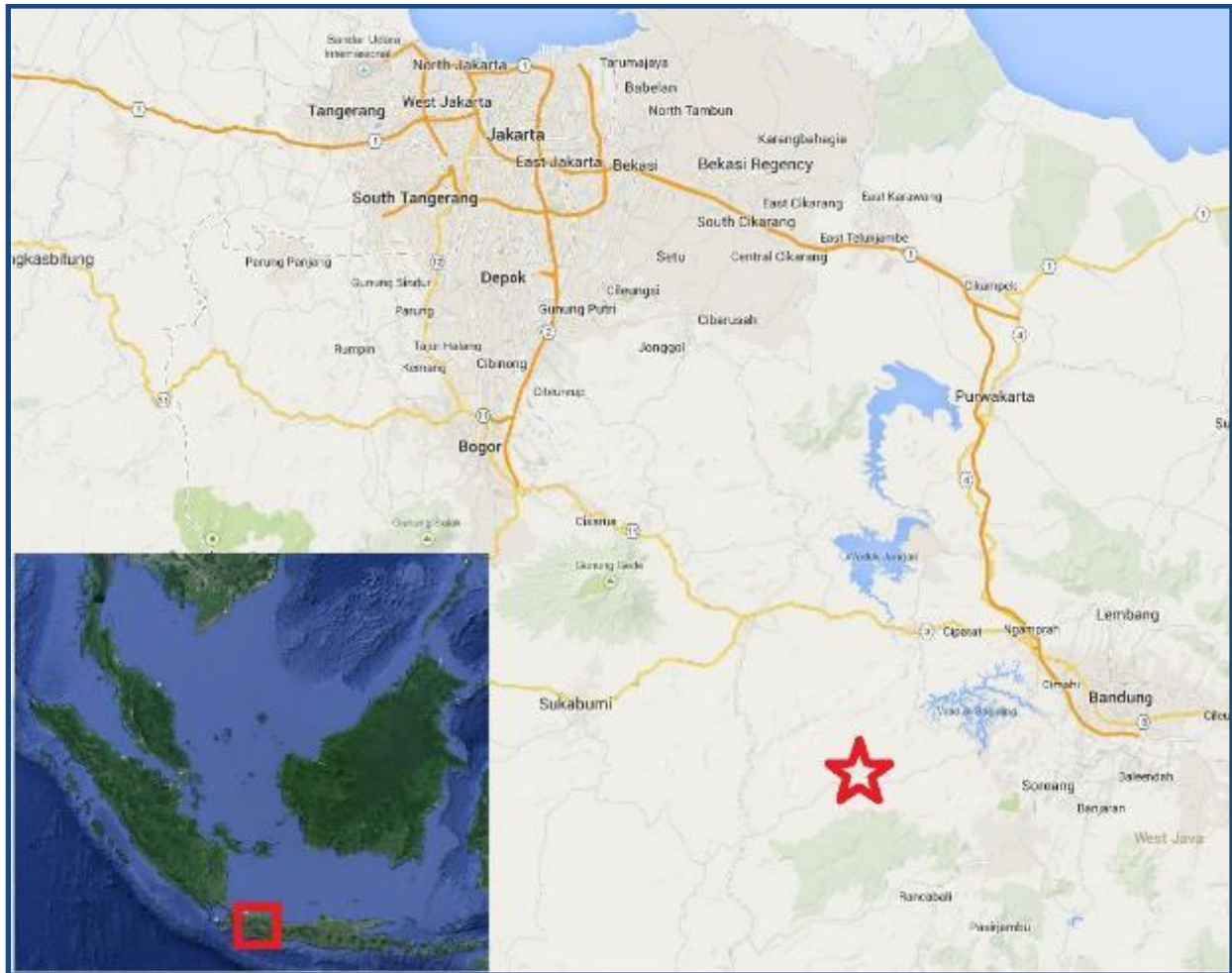
Figure 1. Regional map showing the position of the project area in regional context (red square in inset) and local context (red star).

The immediate Cisokan and Cirumamis catchments are made up of steep hills with a maximum altitude of about 880 m asl. The upper dam area lies at an altitude of about 800 m asl, while the Cisokan valley bottom that will become the lower reservoir is at an altitude of about 460 m asl, indicating the significant elevation differences between the two reservoirs (Figure 2).Figure 2 also shows the patchy nature of the land cover on the hills around the future reservoirs, with small forest patches being separated by grassy or bare areas.

Figure 2. Google Earth View (West to East) of the Cisokan watershed. The approximate location of the lower dam (foreground) and upper dam (background).

2.5 Threatened species, protected areas and Key Biodiversity Areas of Java

We used the Integrated Biodiversity Assessment Tool (IBAT) to generate a list of protected areas, Key Biodiversity Areas, and threatened species of Java, focusing on those in the vicinity of the project area.

Java is a geologically old island and therefore has a significant number of endemic species. Java also has one of the highest human population densities of any regions in the world, which has resulted in significant impacts on these endemic and other species. IBAT lists 30 Critically Endangered terrestrial and freshwater species that occur on Java and 51 Endangered terrestrial and freshwater species. Other Critically Endangered and Endangered species occur in marine habitats but are unlikely to be affected by the Upper Cisokan Pump Storage project. IBAT also list 69 restricted range species occurring in terrestrial and freshwater environments of Java. Many of these species are restricted to mountainous areas and have not been identified in surveys in Cisokan.

There are no protected areas and Key Biodiversity Areas in the immediate vicinity (10 km) from Cisokan, but within a 50 km radius there are 23 protected areas, 8 Key Biodiversity Areas and 1 Alliance for Zero Extinction area. The Gunung Masigit-Kareumbi Key Biodiversity Area is the closest to the project area, at a distance of about 20 km south of the project site. The small (0.21 km^2) Cadas Malang Nature Reserve lies at a distance of ca. 15 km to the south-west of the project site. This area was designated as a conservation in 1919 for the protection of its specialized flora. The large Gunung Gede Pangrango National Park lies some 30 km north-west of the project area (Figure 3).
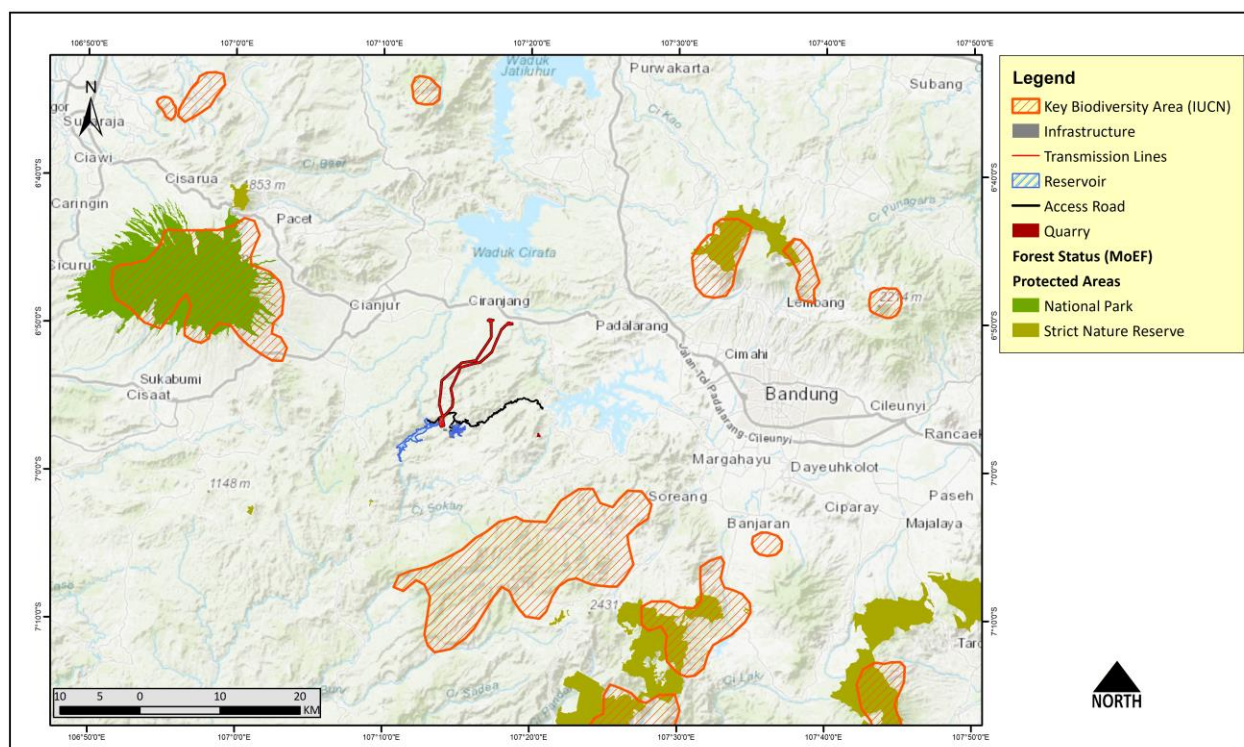
Figure 3. The UCPS project area in relation to protected areas and Key Biodiversity Areas

2.6 Major vegetation types and ecosystems in UCPS

To delineate the main vegetation types in Cisokan, we combined the results of biodiversity research conducted by the Indonesian Institute for Sciences (LIPI) in 2012, as well as earlier studies by Ade Rahmat in 2009, and the ANDAL UCPS hydropower study in 2007, with the results of the analysis of RapidEye imagery maps 2011–2012. The resulting analysis identified several ecosystem types (or vegetation communities), including natural degraded forest, production forest (with stands of pine, teak, or *Altingia excelsa*), areas of mixed gardens or agroforestry (locally named *talun*), scrub areas, slash and burn cultivation areas that make up agricultural fields on slopes, rice fields in flat areas, and fish ponds, settlements and yards (refer map in Appendix 8 titled 'Land Use and Land Cover Map').

2.6.1 Natural Forest

LIPI (2012) and Rahmat (2009) recorded at least 376 species of plants belonging to 268 genera and 160 tribes in the area of natural forest in UCPS hydropower project site and surrounding areas. From the 160 tribes recorded, the dominant tribes that make up the forest community include Euphorbiaceae (22 species), Moraceae (21 species), Meliaceae (15 types), and Fabaceae (23 species). These areas generally have the highest biodiversity. Refer to the Land Cover and Land Use Map in Appendix 8.

2.6.2 Mixed garden / Talun / Agroforestry

This system is also known as community forest and encompasses a variety of crops and plants. Some of the dominant plant species in this ecosystem types are sugar palm (*Arenga pinnata*), timber species such as *Albizia falcataria*, *Parasserianthe s*sp, and mahogany (*Swietenia mahogany*), as well as a range of fruit trees for human consumption, including soursop (*Annona muricata*), *menteng* (*Bacaurea racemosa*),

rambutan (*Nephelium lappaceum*), and mango (*Mangifera indica*). Some of the plant species here have high economic value such as durian (*Durio zibethinus*) and petai (*Parkia speciosa*). These areas can be quite valuable for biodiversity, depending on species composition, size of the area, and also other threats such as hunting.

2.6.3   Scrub and Upland Vegetation

These ecosystem types can be found along the Cirumamis River, Cilengkong River and on the east side of the Cisokan River, especially on slopes. Although the status of these areas is in many cases protected production forest, the areas are quite degraded because of illegal timber extraction, collection of grass for animal feed and other resource extraction. This is also evident in the production foreststo the west of the Cisokan River where communities havetrees such as *Albizia falcataria*, teak (*Tectona grandis*) and *calliandra* (*Calliandra calothyrsus*). Local communities also utilize these upland scrub areas and fields for slash and burn cultivation, often using annual cropsfor cultivation under stands of trees that had been planted earlier. These cultivated land systems contain lemongrass (*Andropogon citratus*), mixed with reed plants (*Imperata cylindrica*) and other grass species.

2.6.4   Settlement

Areas around houses are generally planted with various types of plants with economic or aesthetic value. These are generally small areas of vegetation measuring less than 150 m^2. Types of plants commonly found in settlement yards include banana (*Musa paradisiaca*), coffee (*Coffea* spp.), jackfruit (*Artocarpus heterophylla*), African Umbrella Tree (*Maesopsis eminii*), clove (*Eugeuna aromatica*), avocado (*Persea americana*) and bamboo (*Bambusa* spp.).

2.6.5   Fields, Fish Pools, and Rice Fields

Fish pools are used to grow fish such as tilapia (*Thylapia mozambica*). Fishponds are generally found in areas of land by the river where natural springs emerge. In addition to aquaculture, fishponds are alternately used for growing rice. Generally rice is grown in wet paddy systemsusing high-yielding varieties of rice, allowing 2 to 3 harvests per year. Surveys suggested that these environments are poor in native species.

2.7   Terrestrial Fauna

In the area of direct impact of the UCPS hydropower project development (including quarry, roads, dams and transmission lines) 213 vertebrate species have been recorded, consisting of 36 species of mammals, 114 species of bird, and 48 species of reptiles and amphibians.

Of the animals found so far in Cisokan several mammals are of immediate global conservation concern (Table 1), with two species, the Javan Slow Loris[2] and Pangolin (Figure 4) being considered Critically Endangered on the IUCN Red List of Threatened Species. This means that they are facing an extremely high risk of extinction in the wild. Their presence in Cisokan, and also their protected status in Indonesia,

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[2]The Javan Slow Loris *Nycticebusjavanicus* was recently upgraded to full species level (Groves & Maryanto 2008), and is the only species of slow loris on Java island, to which it is endemic. Previously surveys in Cisokan had identified the species as *Nycticebuscoucang.* The taxonomic revision means that this same population is now considered Critically Endangered.

means that the utmost effort is required to ensure that during project implementation not a single one of these animals is negatively impacted through direct or indirect project interventions.

Table 1. Key Target Species for Biodiversity Management in Cisokan

Taxa	Local name/English name	Status	
		Protection status in Indonesia	**IUCN Red List Category[3]**
Accipitriformes			
Nisaetus bartelsi	Elang Jawa/Javan Hawk-eagle	P	EN
Artiodactyla			
***Tragulus javanicus* (Osbeck, 1765)**	Pelanduk kancil/Javan Mouse-Deer	P	DD
Carnivora			
***Aonyx cinerea* (Illiger, 1815)**	Sero ambrang/Small-clawed Otter	NP	VU
***Arctictis binturong* (Raffles, 1821)**	Binturung muntu/Binturong	NP	VU
***Prionailurus bengalensis* (Kerr, 1792)**	Meong congkok/Leopard Cat	P	LC
***Panthera pardus melas* (Cuvier, 1809)**	Macan tutul jawa/Javan Leopard	P	Currently not evaluated
Pholidota			
***Manis javanica* (Desmarest, 1822)**	Trenggiling/Pangolin	P	CR
Primata			
***Presbytis comata* (Desmarest, 1822)**	Lutung surili/Grizzled Leaf Monkey	P	EN
***Trachypithecus auratus (*Geoffroy, 1812)**	Lutung budeng/Javan Langur	P	VU
***Hylobates moloch* (Audebert, 1798)**	Owa Jawa/ Javan Gibbon	P	EN
***Nycticebus javanicus* (Geoffroy, 1812)**	Kukang/Javan Slow Loris	P	CR

Although densities of the species of highest conservation concern vary throughout the area, most species appear to be wide-spread. Depending on their ecological needs (as well as local threats such as hunting and collecting), species may occur in just one or two of the largest forest patches (for example, the Javan Gibbon), in most large forest patches (for example, the Javan Leaf Monkeys), or wide-ranging throughout the area with particular areas used as shelter (for example, the Javan Leopard) (see map in Appendix 8 titled 'Selected species presence points in the UCPS area').

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[3](DD = Data Deficient; LC = Least Concern; VU = Vulnerable; EN = Endangered; CR = Critically Endangered; P = Protected; NP = Not Protected).

Figure 4. The Javan Slow Loris (left) is a small, nocturnal primate found only on the Indonesian island of Java. Slow lorises, including the Javan slow loris, are unique among primates in having a venomous bite. The Javan slow loris is seriously threatened by the illegal pet trade. The Javan Leopard is the largest remaining carnivore on Java (now that the Javan Tiger is extinct). It is widely persecuted and its prey base – deer, pigs and monkeys – is disappearing with ongoing deforestation.

It needs to be emphasized that so far most biodiversity survey efforts have been in the areas directly impacted by project development (access road, project infrastructure, and the two dam sites), with fewer surveys conducted in the broader watershed area. This gives a slightly biased view with more species records in the areas of highest survey effort. Overall it is possible to deduce, however, that any reasonably sized natural forest patch in the region will have at least some of the species of high conservation concern, and maintaining the ecological quality and integrity of any patches of natural (albeit degraded) forest should be a key objective of PLN's biodiversity program.

2.7.1   Mammals

The lower dam area is richest in mammal species with 34 species so far detected, compared to 25 in the upper dam area, 6 in the quarry area, 11 in the access road area, and 1 species in the area earmarked for transmission line development. The habitat for various types of mammals, including several monkey species, Javan deer, gibbons and leopards is highly fragmented into a number of small forest patches, and the populations of these species are in urgent need of forest habitat expansion to meet their ecological needs (LIPI, 2012). For example, the Javan Leopard (*Panthera pardus melas*) needs access to dense vegetation with a continuous canopy as a place to hide, hunt or rest, and with access to prey populations and water. It also needs to be part of a contiguous population of leopards allowing geneflow and reproduction.

Five species of primate occur in the area, including the earlier-mentioned Javan Slow Loris (*Nycticebus javanicus*), the Endangered Javan (or Silvery) Gibbon (*Hylobates moloch*), the Endangered Java Leaf Monkey (*Presbytis comata*), the Vulnerable Javan Lutung (*Trachypithecus auratus*), and Long- tailed Macaques (*Macaca fascicularis*). These species all occur in small forest fragments. Ecologically they can cope with such degraded conditions, apart possibly from the gibbons which are quite fruit dependent (and fruit availability tends to vary temporally). Also leaf monkeys and lutungs will come to the ground if needed, and can cross between forest patches. Gibbons and Slow Loris are, however, likely restricted to

one forest patch, where their survival is threatened by very small population sizes. The best primate habitats remain in forest patches around the Jagaprana waterfall near the upper dam and the forest areas around the Curuk Walet waterfall, Cimanggu, Cilengkong River, and the Gowek forest, all around the lower dam.

The Javan Leopard (*Panthera pardus melas*) is genetically and morphologically very distinct and there have been calls to assign it full species status (Meijaard 2004; Gippoliti & Meijaard 2007). The species is frequently persecuted on Java and under high threat. Ecologically it can however cope quite well with forest degradation. The existence of leopards in the Gowek and Pasir Nangka forest patches is evidenced by various animal signs and recorded by camera traps (LIPI, 2012). In addition, interviews with residents of the Babakan Bandung village and other villages indicate some level of conflict with leopards feeding on people's dogs and goats (LIPI, 2012).

Other mammal species of conservation interest that have so far been identified in the Cisokan area include the Critically Endangered Pangolin (*Manis javanica*), a species which is highly sought after for the Chinese medicine trade. Pangolins have been recorded in Cisokan within the last 2 years, including in the Gowek forest, Curug Walet, Manggu, and the access road area. In July 2013, a case of poaching by local communities was reported with the animal sold for USD 30/kg. There is apparently high market demand for pangolins in the nearby towns of Cianjur and Sukabumi. The Near Threatened Black Giant Squirrel (*Ratufa bicolor*) and the Vulnerable Small-clawed Otter (*Aonyx cynerea*) also occur in various parts of the Cisokan area, but like the primates and leopard they appear widely dispersed and affected by fragmentation and local hunting pressure. A final mammal of conservation interest is the Javan Mouse-Deer (*Tragulus javanicus*), a species considered Data-Deficient by the IUCN because it is unclear whether one or two species occur on Java. Hunting by the local communities prior to the 1960s has led to a major population decline, and the species is now locally very rare. In 2012, the presence of mouse-deer was reported along the accessroad around NR 25 and in the Gowek secondary forest, Pelesiran, Cimanggu and Batu Bedil (LIPI, 2012).

Most IUCN-listed species in Cisokan are protected according to Indonesian law, which prohibits any activities that harm the animal directly.

In a technical assessment of population viability based on an assessment of the ecological and genetic requirements of the most threatened mammal species occurring in the UCPS area, Meijaard (2014) estimated that a minimum area of some 3,800 ha would be required to maintain viable populations of these species. If such an area would largely consist of connected forest patches, all species, possibly with the exception of the Javan Gibbon and Javan Slow Loris, could retain viable populations, provided the hunting and collection pressures were low or absent. The Javan Gibbon and Javan Slow Loris populations would likely require active demographic and genetic management to maintain viable populations.

2.7.2   Reptiles and Amphibians
The surveys in UCPS have so far recorded 21 species of amphibians and 27 species of reptiles, of which two snakes (*Python reticulatus* and *P. molurus*) are protected in Indonesia. None of the reptiles and amphibians encountered so far in Cisokan is of global conservation concern.

2.7.3 Birds

In the project area 114 species of birds have been recorded, with 72 in the lower dam area species and 43 in the upper dam area, reflecting the greater forest cover in the former area. Forest area in the lower and upper dam contain some typical forest bird species, such as Orange-fronted Barbet (*Megalaima armillaris*), Blue-eared Barbet (*Megalaima australis*), Black-banded Barbet (*Megalaima javenensis*), Black Eagle (*Ictinaetus malayensis*), Changeable Hawk-Eagle (*Spizaetus cirrhatus*), and Banded Pitta (*Pitta guajana*). From the recorded 114 species of birds, 11 are endemic to the island of Java, and 18 are nationally protected by law. Two of the above-mentioned barbet species are listed as Near Threatened by the IUCN, but overall the area's avifauna is not rich in bird species of international conservation. This may because of high collection pressure of sought-after cage birds. Bird poachers were frequently encountered during surveys in the area.

2.8 Flora

No plant species have been identified in Cisokan that are international listed as threatened, either in earlier surveys (Rahmat 2009; Sutrisno et al. 2012) or during rapid assessments surveys in June and July 2013. One species was found that is CITES list (restricting international trade): the tree fern *Cyathea contaminans*. Surveys identified several species that are considered rare on Java, including *Pangium edule*, a tree with edible fruits, *Syzygium polycephala*, rosewood *Albizia procera*, *Bischofia javanica*, *Castanopsis javanica*, and *Arenga pinnata*. The latter three are protected by law.

Four vegetation type surveys have been conducted since 1995. The most comprehensive survey is conducted by Rahmat (2009). Based on field observations, there are 226 plant species found from about 69 plant families. The access road location has the largest number of plant species, which is 173 species, quite large when compared to the quarry area, which has the smallest number of plant species, which is 86 species. The access road has a variety of habitats along the path, while in the quarry area it has been opened for forest vegetation for quite a long time and is now dominated by grasses and bushes.

No rare or protected plants were found during the survey period, although *Eugenia polyantha*, *Magnolia glauca*, *Magnolia blumei*, and *Eugenis cuprea* were rarely encountered. The most intact and diverse native vegetation community is the secondary forest on the Cirumamis River site.

One species was found to be registered with CITES (limiting international trade), i.e., *Cyathea* spp. tree ferns. The survey identified several species considered rare on Java, including *Pangium edule*, trees with edible fruits, *Syzygium polycephala*, rosewood, *Albizia procera*, *Bischofia javanica*, *Castanopsis javanica*, and *Arenga pinnata*. The last three types mentioned are protected by law.

2.9 Land Cover

Land cover and land cover change were analyzed using WorldView 2 imagery data (0.5-meter resolution) for 2016 and 2019, plus Planetscope imagery (3-meter resolution) for 2016 and 2020 for cloud-covered areas in 2016 and 2019. The Land cover class used was a generalization of the land cover described previously. The land cover classification used is as follows:

1. Water body

2. Vegetated land
    a. Natural vegetation
        • Natural forests
    b. Man-made vegetation
        • Pines
        • Mixed gardens (Talun)
        • Upland fields (Huma)
        • Rice fields
3. No vegetation land
    a. Open lands
4. Developed land
    a. Settlements

Visual land cover analysis from land cover maps in 2016 and 2019 showed the dynamics of changes in the landscape of the UCPS area. Open land is dominant in the northern and eastern part of the Cisokan River as a result of the access road construction. In 2019, after the access road construction was completed, the residents began to utilize the area as upland fields or Talun.

When calculating the total area of each land cover in 2016 and 2019, a significant of agroforest has occurred in the three-year period. Table 2 shows the changes for each land cover within the range of ± 5 percent. In general, mixed gardens (talun) and dry field (upland field) were the two dominant land covers in the UCPS area. The land cover composition of both combined covered about 83 percent in 2016 and 2019.

Table 2. Composition of Landscape Scale Land Cover in The UCPS Area in 2016 and 2019

No	Land Cover	2016		2019		Change
		Hectares	Percent	Hectares	Percent	
1	Water bodies	40.63	1.18	27.27	0.79	-0.39
2	Mixed gardens	2359.30	68.34	2256.62	65.36	-2.97
3	Upland fields	506.98	14.68	612.63	17.74	3.06
4	Open lands	209.47	6.07	259.73	7.52	1.46
5	Settlements	55.37	1.60	87.54	2.54	0.93
6	Rice fields	149.39	4.33	193.58	5.61	1.28
7	Pines	10.22	0.30	9.92	0.29	-0.01
8	Forest	6.85	0.20	5.20	0.15	-0.05
9	No data	114.28	3.31	0	0	-3.31
	Total	**3452.49**	**100**	**3452.49**	**100**	**0.00**

The land cover classification shows a highly fragmented land cover, with small natural forest fragments embedded in a matrix of agricultural land and planted forest. Perhutani has allocated 303.24 ha of their forestry estate land to conservation purposes of which 58.9 ha (19.4%) is natural forest and 12.23 ha (4%)

industrial forestry plantation. Perhutani blocks allocated to production total 1,655.71 ha, of which 157.23 ha 9.4%) is natural forest and 292.15 ha (17.7% industrial forestry plantation). Most of the larger industrial forestry plantations in the region are located in the south of the Cisokan area, and there are few planted forest areas in the immediate vicinity of the UCPS project area.

2.10 Land Use in Cisokan

2.10.1 Land Allocated for Infrastructural Development

The area allocated to the UCPS Hydropower scheme footprint covers 775.64 ha (PLN, 2009) and is administratively located in two districts, West Bandung and Cianjur. This includes: 1) the construction of a major power house, surge tank, switchyard, upper and lower dam); 2) the access road; 3) inundation areas of upper and lower dam; 4) transmission lines and quarry and potential landslide areas.

Based on the land ownership maps of PT Perhutani III[4], most developments for the hydropower UCPS are in production forest areas that are managed by Perhutani (Forestry), in their Cianjur KPH and South Bandung KPH administrative management units. The forest type in these production areas that overlap with the UCPS hydropower infrastructural developments are mostly pine and teak forests.

Besides the production of forest land, the land that will be used by the UCPS hydropower also includes an area of community land area of approximately 310 – 328 ha [LARAP 2011].

2.10.2 Production Forest Land

The production forests in the Cisokan area are managed by the regional forest services of Cianjur and Bandung South Disticts. They have been differentiated into productive forest lands, non-productive forest lands, and protected areas. Perhutani has divided their area up into 72 blocks with a total area of 1,770.78 ha, of which 428 ha (37%)is classified as Protected Forest and the remainder as Production Forest. Of the 428 ha classified as protected, about 227 ha has either no vegetation on it or has been classified as rocky slopes. The Production Forest class (1342.40 ha) has been divided into production typesdepending on the soil, slope and other characteristics of the individual management blocks. Most of these areas have been planted with pine trees (543.79 ha), and the remainder have stands of mahogany, pine, natural forest, *Altingia excelsa*, teak, *Gmelina* spp., *Melia azedarach*, or no tree cover.

2.10.3 Community Land

In the Cisokan area there is significant overlap between community-owned or community-claimed land and areas used by Perhutani for forest production. The main villages of Lembur Sawah, Cimarel, Citapang, Cipateunteung, Cimanggu, Cipedes, and Cilawang all use lands that are owned by Perhutani. Because legally much of the land in the Upper Cisokan area belongs to Perhutani an informal use system exists in which communities pay Perhutani a fee for the use of production forest land, especially on steeper areas where slash-and-burn cultivation practices are used. As explained in the vegetation section above, these community lands comprise of mixed garden, *talun*, agroforestry, rice fields, and fish ponds. Biodiversity values vary spatially depending on the size and ecological integrity of remaining forest patches, but at a

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[4]State Owned Forestry Company

landscape level these values are generally low on community land, with the obvious examples of the few forest patches that retain highly threatened wildlife such as Javan Gibbons.

2.11 Existing and Ongoing 'Baseline' Threats

2.11.1 Deforestation and forest degradation through agricultural conversion

The main impact on vegetation is associated with land clearing, primarily for agricultural development. No clear information is available on the history of land clearing, but there have likely been long-term human impacts on the original forest vegetation. A vegetation map from 1950 shows the uplands around Cisokan as still covered in natural forest (Planning Department of the Forest Service 1950), with lower-lying areas likely used for community agriculture. A 1919 photo from the Cisokan River area where the project is being developed shows mostly forested slopes, and also provides an idea of what the original vegetation looked like, in case re-establishing this original vegetation cover becomes a longer-term a management objective. Even then there would likely have been some level of degradation of forested slope areas. Since about the 1960s, legal production forestry and illegal deforestation has significantly increased to the present point at which there are few remaining forest areas larger than a few dozen hectares.
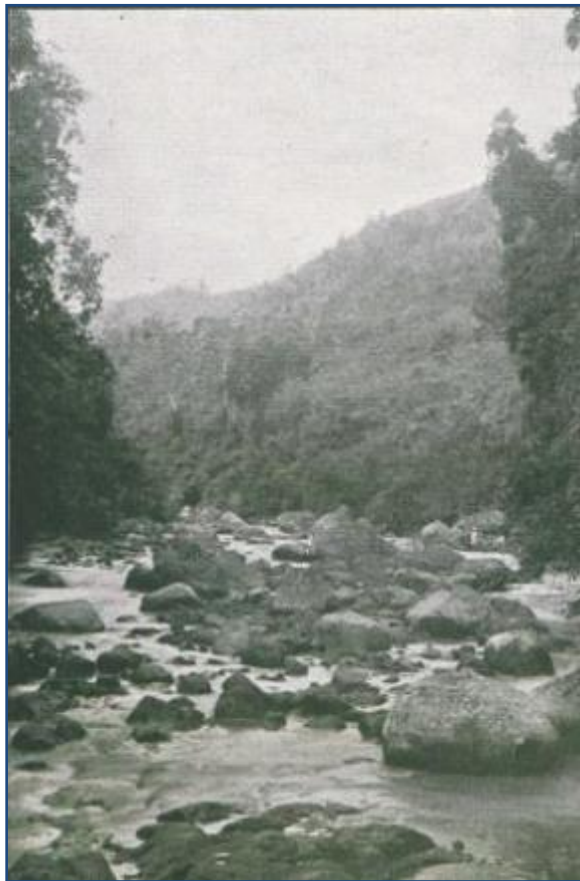
Figure 5. Photo by Ten Berger (1919) taking during a geological expedition in the upper Cisokan area, showing the originally forested slopes in the steep river valley.

Community land use has significantly impacted areas of previously forested slopes, mainly through slash-and-burn activities, with more permanent rice agriculture focused on the valley floors adjacent to the rivers. Cutting and burning of the vegetation usually results in not only the clearing of undergrowth, but also forest trees, such as teak and pine. The nature of this shifting type of agriculture has resulted in a mosaic of forest patches—with the best forests often on the steepest slopes least suitable for cultivation—and a matrix of more or less degraded forest and scrub areas, as well as grasslands. Some dry rice is also grown on the slopes and some areas steep areas are planted with lemongrass crops that grow well there. These community activities have had a major impact also on production forest areas (under Perhutani management), and it is very hard to find a good pine tree now.

2.11.2 Hunting and Collecting of Wildlife

Communities also pose a threat to local biodiversity because of hunting and collecting activities, which are legal, unless involving protected species, and can be hard to control, especially if the monetary value of species is high. Such commercial collecting primarily targets species such as pangolin and a wide range of bird species which are popular in the pet trade. Pet trade also affects some of the primates, with especially Slow Loris being in high demand in South East Asian animal markets, but also other species such as leaf monkeys are traded.

Wildlife conflict also poses a threat to species, especially pigs and deer feeding on agricultural crops. Communities consider these species pests and hunt or trap them when they can. Indirectly this also affects predators such as Javan Leopard, for whom the disappearance of the prey base forces it on occasions to feed on dogs or other domestic animals, with potentially fatal consequences for the leopard.

Communities hold some traditional believes regarding the protection of some species or forest areas, but considering the rapid decline in forest cover over the past 6 decades and generally declining wildlife values, these positive forces have not been able to effectively counteract threats. Still, long-term biodiversity management in the area should make use of traditional belief systems that help protect wildlife where possible.

2.12 Assessment of Critical and Natural Terrestrial Habitat

The project site is located in a mountainous area with intensive land use for gardens, production forests, rice, and other crops. One area of secondary forest remains close to the lower reservoir area, which will not be inundated. The entire landscape is habitat for a range of Critically Endangered, Endangered or otherwise rare species, including Pangolin and Slow Loris. These species also occur elsewhere on the island of Java, as well as other parts of South-East Asia.

The PLTA Cisokan project site is not in a protected area, but in several places REEPS animals were found, so it is necessary to classify the habitat in the Cisokan hydropower area. Analysis of the biodiversity characteristics with reference to ESS 6 is presented below.

The objectives of ESS 6 are:

- To protect and conserve biodiversity and habitats.

- 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.

2.12.1   Critical Habitat Triggers According to ESS 6

2.12.1.1   Definitions and concepts

ESS 6 requires a differentiated risk management approach to habitats based on their sensitivity and values. ESS addresses all habitats, categorized as 'modified habitat', 'natural habitat', and 'critical habitat', along with 'legally protected and internationally and regionally recognized areas of biodiversity value' which may encompass habitat in any or all of these categories.

The relevant definitions are as follows:

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.

Net gains 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.

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. Modified habitats may include, for example, areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

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.

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).

Restricted-range/ Endemic Species = Species with world distributions of less than 50,000 km^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). For the purposes of the assessment and as outlined within the IFC PS6 Guidance Note, the assessment of populations has occurred according to the Estimated area Of Occurrence (EOO) as outlined in the IUCN Red List.

In areas of critical habitat, the Borrower will not implement any project activities that have potential adverse impacts unless all of the following conditions are met:

a) No other viable alternatives within the region exist for development of the project in habitats of lesser biodiversity value;
b) All due process required under international obligations or national law that is a prerequisite to a country granting approval for project activities in or adjacent to a critical habitat has been complied with;
c) The potential adverse impacts, or likelihood of such, on the habitat will not lead to measurable net reduction or negative change in those biodiversity values for which the critical habitat was designated;
d) The project is not anticipated to lead to a net reduction in the population of any Critically Endangered, Endangered, or restricted-range species, over a reasonable time period;
e) The project will not involve significant conversion or significant degradation of critical habitats;
f) The project's mitigation strategy will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated; and
g) A robust and appropriately designed, long-term biodiversity monitoring and evaluation program aimed at assessing the status of the critical habitat is integrated into the Borrower's management program.

2.12.1.2   Critical Habitat triggers

There are five criteria that can be 'triggers' if an area of habitat meets any one of them. That area will then be considered critical habitat irrespective of failing to meet any other criterion (Table 3). Therefore, critical habitat can be determined through a single criterion or where a habitat holds biodiversity meeting all five criteria. This approach is generally more cautious but is used more widely in conservation. Critical habitat criteria therefore have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two levels of conservation significance, those that trigger critical habitat and those that do not. Second, each criterion is applied separately and not in combination, meaning that the scores are not cumulative. The assessment for critical habitat was undertaken as a screening process against the criteria defined within the IFC PS 6 Guidance Note, involving GIS analysis and desk-based data collection, including a review of previous biodiversity studies.

Table 3. Criteria that can trigger the identification of Critical Habitat and the thresholds that provide these triggers.

Criteria	Thresholds
Criterion 1: Critically Endangered (CR) / Endangered (EN) species:	(a) 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 of a CR or EN species)[5]; (b) 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). (c) 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;	(a) 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;	(a) 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. (b) 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 set criteria

2.12.1.3   Critical habitat evaluation in the UCPS terrestrial system

The species screening process initially identified the species so far recorded in the UCPS area which are categorized on the IUCN Red List as Critically Endangered, Endangered or Vulnerable, endemic to Java or otherwise range-restricted, or likely to aggregate in the UCPS area during migration. Each of the species resulting from this initial screening was subsequently tested for the thresholds in Table 3 to determine whether or not they could trigger the criteria for Critical Habitat. Results are in Table 4.

Table 4. Species that trigger Critical Habitat in UCPS

Common Name (Indonesian / English)	Scientific Name	IUCN Listing or migratory status	Species information	Critical Habitat (CH) rationale
Sero ambrang/ Oriental Small-	*Aonyx cinereus* (Illiger, 1815)	VU	Small-clawed otters are ecologically versatile species, often persecuted because of their impact on fish farms. They	The species has a large range across South-East and South Asia and the Cisokan population does not support a globally-important concentration of an

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[5] This refers to the criteria for identifying Key Biodiversity Areas (KBA Standards and Appeals Committee 2019)

Common Name (Indonesian / English)	Scientific Name	IUCN Listing or migratory status	Species information	Critical Habitat (CH) rationale
clawed Otter			persist in a range of human-dominated habitats as well as forests (Meijaard 2014).	IUCN Red-listed VU species. CH not triggered.
Trenggiling/ Pangolin	*Manis javanica* (Desmarest, 1822)	CR	This once common species of forests and human-dominated landscape has declined sharply because of unsustainable harvest for medicine and food (Challender et al. 2019).	The species has a large range across South-East and South Asia and the CIsokan population is unlikely to contain > 0.5% of the global population. CH not triggered.
Surili/ Grizzled Leaf Monkey	*Presbytis comata* (Desmarest, 1822)	EN	This is an endemic species of West and Central Java of which < 2,500 are thought to remain. The species depends on forests (Nijman & Setiawan 2020).	The species was found in most of the BIAs. No formal population estimates exist, but Cisokan population likely exceeds 0.5% of global population and > 5 reproductive units. **CH triggered.**
Lutung budeng/ West Javan Ebony Langur	*Trachypithecus auratus* (É. Geoffroy Saint-Hilaire, 1812)	VU	This species was recently split into a West Javan and East Javan species, with the species boundary approximately in the Cisokan area. It is unclear which species occurs in the project area. Both species are VU.	There are no reliable population estimates for either of the Trachypithecus species on Java, but it is not likely that the Cisokan population supports a globally-important concentration. CH not triggered.
Owa Jawa/ Javan Gibbon	*Hylobates moloch* (Audebert, 1798)	EN	Javan Gibbon is a forest-dependent species unlikely to come to the ground and therefore dependent on connected forest areas. Nevertheless, the species occurs in a surprisingly large number of BIAs and forest corridors in Cisokan.	There are no reliable population estimates but the total population is likely only a few thousand (Nijman 2020). If the Cisokan area has some 10-20 gibbons it could possibly exceed 0.5% of the global population and 5 reproductive units. **CH possibly triggered.**
Kukang/ Slow Loris	*Nycticebus javanicus* (Boddaert, 1785)	CR	This species does well in anthropogenic areas that seem to mimic a secondary tree fall zone, especially with pioneering plants, including bamboo (their most important sleep site), if it is not hunted or collected by communities. Cisokan seems to have an important population with suitable ecological conditions.	Population probably > 0.5% of global population, although no reliable population estimates exist for Java (Prof. Anna Nekaris pers. comm.). Species was found over the years in 14 grid cells, likely representing > 5 reproductive units. **CH triggered**.
Macan tutul jawa/ Javan Leopard	*Panthera pardus melas* (Cuvier, 1809)	Not eval.	Leopards require shelter and prey but are generally resilient in human-dominated landscapes. The Javan leopard, a highly distinct subspecies (Meijaard 2004) occurs in an area of ca. 1,159,864 ha (Wibisono et al. 2018)	The Javan subspecies is currently listed as Not Evaluated and the species does not trigger the other Critical Habitat criteria. The taxon used to be listed as Critically Endangered by IUCN, however, and there is no clear evidence that the conservation has improved. The UCPS population probably exceeds 0.5% of the global population, and records indicate that there could be >5 individuals. **CH possibly triggered**.
Javan Hawk Eagle	*Nisaetus bartelsi*	EN	The status of this species in UCPS is unclear. There is one apparent record in Gowek from 2017 but this is not included in the baseline report (2020). This Javan endemic could well occur in the	This species requires confirmation but if present in UCPS would likely exceed more than 0.5% of the global population and trigger Critical Habitat. **CH possibly triggered**.

Common Name (Indonesian / English)	Scientific Name	IUCN Listing or migratory status	Species information	Critical Habitat (CH) rationale
			area, as it depends on forested hilly areas.	
Sikepmadu Asia / Crested Honey Buzzard	*Pernis ptilorhynchus* (Temminck, 1821)	M	This bird of prey has a resident population as well as a migratory one. Global populations are estimated at 100,000 – 1,000,000 (BirdLife International 2016).	The northern form of the species migrates south, among others through Java. No population estimates are available but the species has only sporadically been recorded in Cisokan and is unlikely to harbour > 1% of the global population. CH not triggered.
Anis Kembang / Chestnut-capped Thrush	*Zoothera interpres* (Temminck, 1828)	EN	This is a forest-bird that does not well in disturbed forest areas and is heavily poached as a popular cage bird (BirdLife International 2020).	The species is recorded in Cisokan but likely very rare and unlike to exceed 0.5% of the global population as it also occurs on Borneo, Peninsular Malaysia and the Lesser Sundas. CH not triggered.
King Cobra	*Ophiophagus hannah*	VU	The Kind Cobra occurs across large parts of SE Asia, but is considered very rare in Indonesia because of deforestation and harvesting of individuals for skin, food, pets, and especially traditional Chinese medicine (Stuart et al. 20112)	There are no reliable population estimates for this cobra on Java, but it is not likely that the Cisokan population supports a globally-important concentration. CH not triggered.
Rosewood	*Pterocarpus indicus*	EN	Rosewood is a highly sought-after timber, overharvested in many parts of its SE Asian range locally resulting in extinction. The IUCN consider it native to Java (Barstow 2018), but it may have been planted in Cisokan.	It's been recorded in three locations in Cisokan, but the population is not likely to exceed 0.5% of the global population because of its wide distribution across many parts of mainland and island SE Asia. CH not triggered.
Merkus's Pine	*Pinus merkusi*	VU	This pine is endemic to the Philippines and Indonesia and naturally only occurs in the latter country in northern Sumatra. It's been extensively planted throughout Indonesia, and the Cisokan stands should therefore be considered non-native	CH not triggered.

2.12.1.4 Critical Habitat evaluation along Transmission Line route

No systematic studies exist in Indonesia that have quantified the risk of transmission infrastructure to wildlife, and the risk of electrocution and collision is therefore difficult to estimate. Collision by birds and electrocution of birds, mammals and reptiles are key concerns, with the latter also avoiding potentially large costs for the company if animal electrocution leads to power outages. It is easier to mitigate these risks during the construction phase when mitigation measures are a small part of the budget, then during the maintenance phase when such measures are relatively more expensive (Prinsen et al. 2012). The precautionary principle should therefore be kept in mind when identifying mitigation needs.

No Critically Endangered species are likely to be impacted by electrocution or collision risks in the UCPS transmission line area, although there might be some electrocution risk to slow lorises. The transmission

lines, however, run perpendicular to an area likely important for the Asian Flyway bird migration route, with especially raptors using this region in the September to November migration season. Furthermore, the habitat of at least two Critically Endangered species, Slow Loris and Pangolin will be affected by forest clearing for transmission line development in the forested part of the transmission route.

The total length of the new transmission line is 31.4 km and the width is 20-40 m, requiring an area of over 100 ha of cleared land, of which 50% is in secondary and plantation forest. No primary forest occurs along the transmission line route. The two Critically Endangered mammal species indicate that the forest areas converted for the transmission line are Critical Habitat. The Slow Loris will be affected by the significant non-forest barrier as it is a forest-dependent species. Other primates such as the Grizzled Leaf Monkey would also be affected as they need to come to the ground to cross the non-forest barrier, where they are more likely to be hunted. Where new roads are built into forest areas, increased access to forest will increase hunting pressure and deforestation risks. Elsewhere on Java, it was found that proximity to roads is a driver for land use and land cover change, particularly up to 1 km off the road but tapering off further than a kilometer away (CarbonTropic 2017). Published research also shows that a 1 km buffer around roads represents an indication of indirect impacts from increased hunting, which decline linearly with distance from roads (Clayton et al. 1997; Laurance et al. 2006). Access to forests via transmission line routes will be much more difficult than roads due to the lack of vehicle access or ability to settle and use land within the corridor, but it is possible, due to land pressures in Java, that the cleared route could increase informal agriculture, settlement and hunting in the project area, even without road access. Indirect impacts on critical habitat are therefore estimated at 31.4 km (transmission line length) * 0.5 (percentage in forest) * 0.2 km (zone indirectly impacted, applying lower rate of impact compared to roads) = 314 ha indirectly impacted.

2.12.1.5 Critical Habitat evaluation in the aquatic system
While parts of the upper river areas are in a relative natural condition, the UCPS aquatic system should be considered as modified because of the significant proportion of species of non-native origin (ca. 20%), with human activity having substantially modified the area's primary ecological functions through damming of the Cirata River downstream, deforestation and agricultural land use and altering species composition through unsustainable fishing. None of the aquatic species identified so far in UCPS trigger Critical Habitat.

2.12.2 Determining the counterfactual scenario
ESS 6 requires that if Critical Habitats occur that the project's mitigation strategy will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated, i.e., net positive impacts need to be achieved. The IUCN has argued that net present impacts are most feasible when a counterfactual is used as a reference frame (Aiama et al. 2015). Establishing an objective baseline or reference frame for the original condition of the selected priority biodiversity values prior to project interventions is therefore an important part of a net positive impact approach. The project's progress towards achieving its net positive impact goals is evaluated against this reference frame. Two options exist for evaluating the outcomes of net positive impact goals: reference frames can be fixed baselines (i.e., known condition of biodiversity features at a fixed point in time) or counterfactuals (i.e., a scenario that would have occurred without the project interventions (Aiama et al. 2015).

Counterfactuals are important for showing additionality, and thus whether offset gains are real. The counterfactual answers the question whether outcomes are the result of biodiversity offset actions, or would they have happened anyway? Biodiversity gains to compensate for losses must come about as a result of conservation actions financed through the offset. If biodiversity gains are not caused by the offset actions, the offset does not demonstrate additionality (IUCN and ICMM 2012). Baseline considerations are obviously important in the UCPS area of operation, where deforestation, forest degradation, and over-hunting are threatening wildlife populations and changing the distribution of their habitats. Demonstrating additionality (the green hatched area in Figure 6) requires that offset areas and actions are sought in places where the business-as-usual scenario would expect deteriorating conditions for wildlife populations. Offset actions would then seek to counteract the threats that cause deteriorating conditions. Furthermore, when considering impacts on conservation values, the impact that needs to be offset is the difference between the conservation value that would eventuate after business-as-usual trends had occurred and the additional impact of UCPS development.
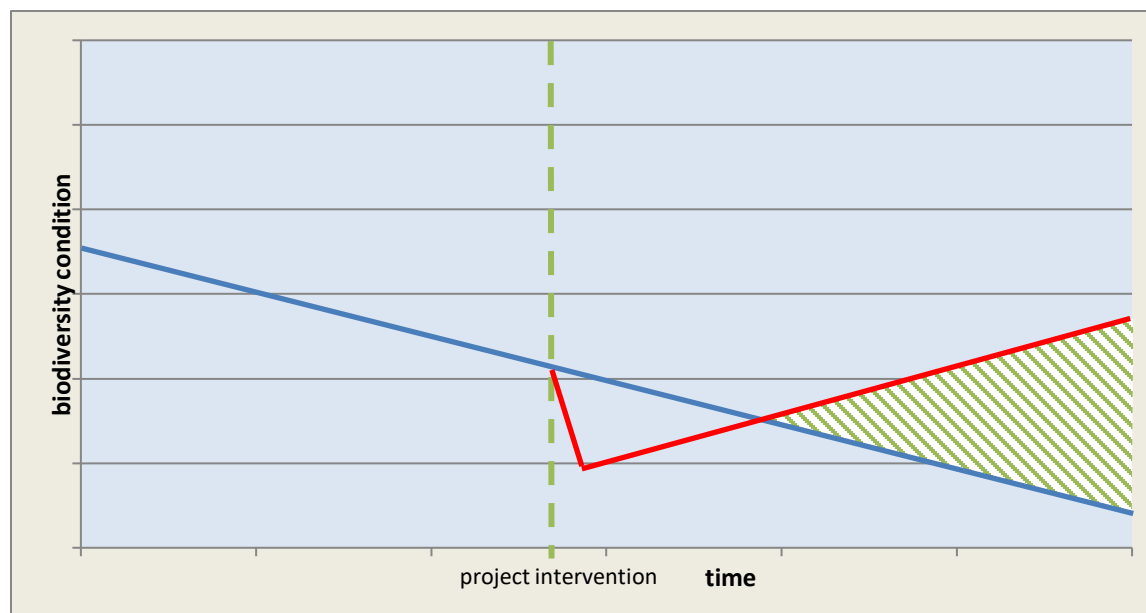
Figure 6. Impact of offset intervention against a declining condition baseline. The blue line indicates the business-as-usual scenario in a landscape, i.e., without intervention. The green line indicates the start of project development. The red line shows the biodiversity condition following impacts from project development, and biodiversity benefits that accrue from biodiversity offsets. The hatched green area depicts the net gain value of the offset.

The above indicates that the choice of baselines and counterfactual and the consideration of time spans across which offsets are applied are crucial in estimating offset requirements. The estimated life time of the UCPS project could be several and the landscape around the mine development areas is likely to undergo major changes. It is therefore important to assess what is likely to happen in and around the project area. The UCPS landscape is undergoing change irrespective of the development of the project. Landcover change analysis between 2016 and 2019 indicates two main trends: 1) Loss of forest of ca. 4.4% over a 3-year period; and 2) Increase in agricultural land and settlements at a rate of 25% over a 3-year period (Table 5). This likely relates to an increasing human population in the area, possibly reduced yields from agricultural lands (loss of soil fertility and soil erosion) and thus the need to open up new

land, and income from agriculture exceeding that from agroforestry. Without intervention, such trends will likely continue, resulting in ever smaller forest patches and more agricultural land. **Assuming a constant rate of decline, the agroforest area will be reduced to less than 1,500 ha by 2050.** Especially where agriculture is developed on steep slopes, soil erosion will negatively impact sedimentation rates in the aquatic systems.

The loss of forest habitat would undermine the ecological viability of the area for maintaining forest species. This may already have resulted in the recent extinction of some species. For example, One individual of the Binturong *Arctictis binturong*, a large, frugivorous mammal species, primarily feeding on figs (*Ficus* spp.) (Nakabayashi & Ahmad 2018), was found in 2009 and 2012 in the Curug Walet forest area (Sutrisno et al. 2012; Husodo et al. 2019), but has not been recorded since (Husodo et al. 2019), suggesting it is likely extinct in the area. The species has large ranging requirements of ca. 6 km^2 (Grassman Jr et al. 2005), and its dependence on fruit species may have undermined its ability to persist in Cisokan's dwindling forest areas. Many bird species similarly are unlikely to survive in increasingly small forest patches (Diamond et al. 1987; Mardiastuti et al. 2019).

Table 5. Composition of landscape scale land cover in the UCPS area in 2016 and 2019

Land Cover	2016 (ha)	2019 (ha)
Agroforest and natural forest	2,366	2,262
Pine forest	10	10
Upland fields, rice fields and open lands	866	1066
Settlements	55	88
TOTAL AREA (incl. water and infrastructure)	**3,452**	

Not only habitat loss is threatening biodiversity under the counterfactual scenario. Unsustainable poaching and collecting rates is also threatening species, such as the commercially valuable Pangolin, and a range of song bird species that have been collected for many years in the area (Rahmat 2009). Many bird species that were once common in these kinds of lowland and hilly parts of Java are now extinct in the area and have never been encountered in recent surveys. This includes species like Crescent-chested Babbler (*Stachyris melanothorax*), Western Yellow Wagtail (*Motacilla flava*), Great Tit (*Parus major*), and Javan Myna (*Acridotheres javanicus*), which should be common in human-dominated areas on Java but have rapidly decreased populations because of bird hunting activities (Hakim et al. 2020). One fish species, *Hampala macrolepidota*, may also have disappeared because of unsustainable fishing.

In conclusion, the counterfactual scenario is one of declining ecological values in an already heavily modified landscape, resulting in the extinction of especially larger forest-depending species such as gibbons and langurs. The question is whether the no net loss needs to take this counterfactual into consideration. Should the project's impacts be measured against the project's biodiversity baseline, or against the trend that would likely have occurred if the project had not been implemented? Either way, it is difficult in this environment to de-link the baseline with the project and it seems obvious that major ecological restoration is needed in the area to avoid further declines in biodiversity. This includes

significant reforestation efforts with species that provide both social and environmental benefits. Such reforestation would increase the ecological viability of remaining forest patches from a current estimated 25% of what the ecological value would be in primary forest conditions, but also improve the quality of the aquatic system by protecting streams that flow into the reservoirs, providing improved fish spawning sites, better habitat for invertebrates, reducing the temperature of the water through increased shading, etc. The ecological restoration and biodiversity management objectives aim to increase the ecological value of the landscape from 25 now to 50% after forest restoration has been fully implemented.

2.12.3 Extent of Critical Habitat impacted

To determine whether or there will be no measurable net reduction or negative change in those biodiversity values for which the critical habitat was designated, and no significant conversion or significant degradation of critical habitats, we assessed where Critical Habitat areas occurred in the wider landscape of the UCPS project area and along the access road and transmission line.
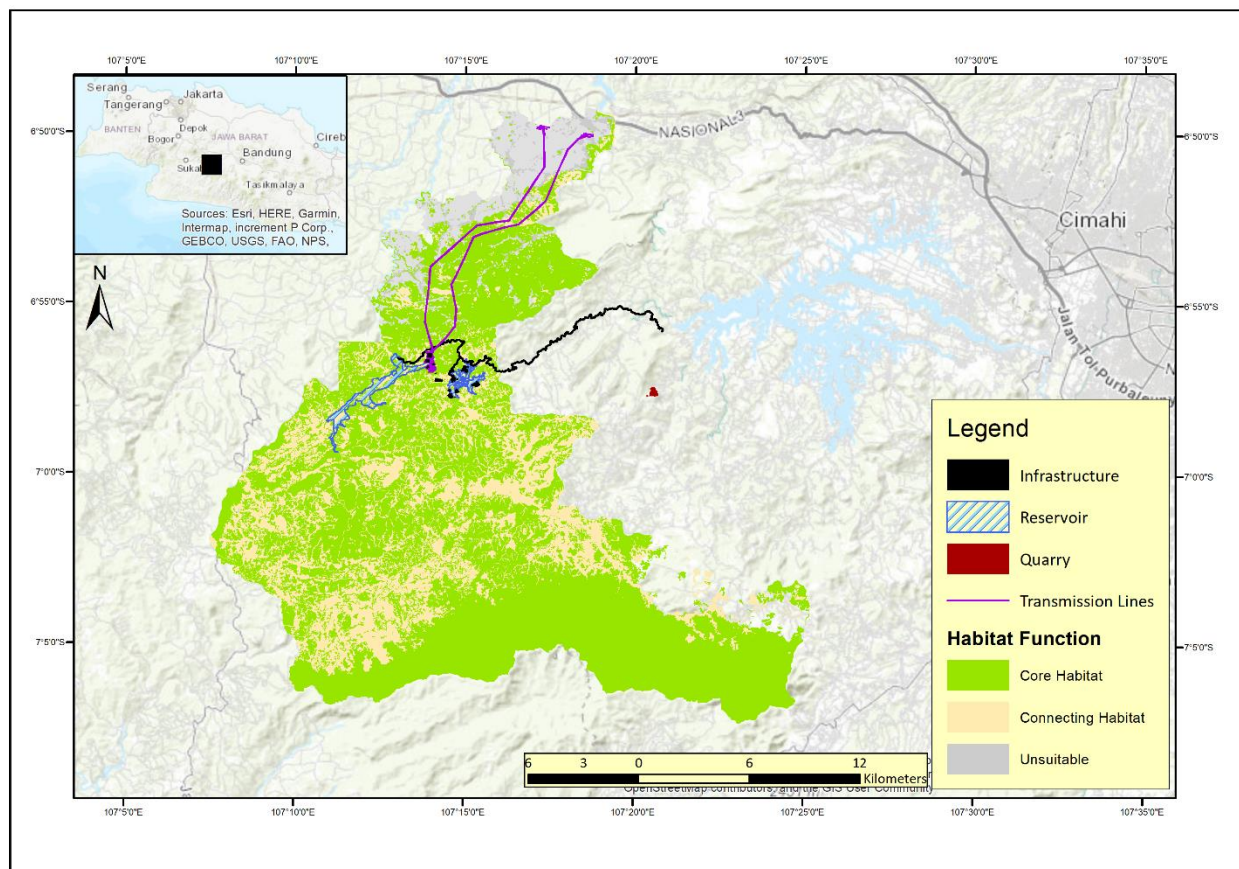
Figure 7. Larger landscape context of the project area with green areas indicating core habitats for the species trigger Critical Habitat and yellow areas indicating connecting habitat. No detailed recent land cover map was available for the area around the access road and quarry.

Before determining what net losses and net gains mean in this landscape, a clearer description is needed of the key ecological elements of the landscape that maintain the species triggering the Critical Habitat threshold. The UCPS landscape is strongly human-modified with a long history of conversion of

forests to agricultural fields, and also maintenance of structural forest-type conditions in agroforestry areas. The terrestrial landscape is therefore a Modified Habitat, parts of which provide habitat to species triggering Critical Habitat. Species like Javan Leopard, Grizzled Leaf Monkey, and Slow Loris (Table 4) depend on core habitat such as the agroforestry elements in the landscape, as well as the ecological connections between these core habitats. Such connections can include land covers like open land or scrub, if these provide essential connections between two core habitats. In essence this means that the entire landscape around the project site is Critical Habitat for species that have adapted to some extent to the human modifications in the landscapes. Figure 7 shows that around the project site a landscape exists of modified habitat that covers at least some 15,000 ha. Some species, such as wide-ranging leopards might even use a larger landscape, dispersing to other forested parts of West Java.
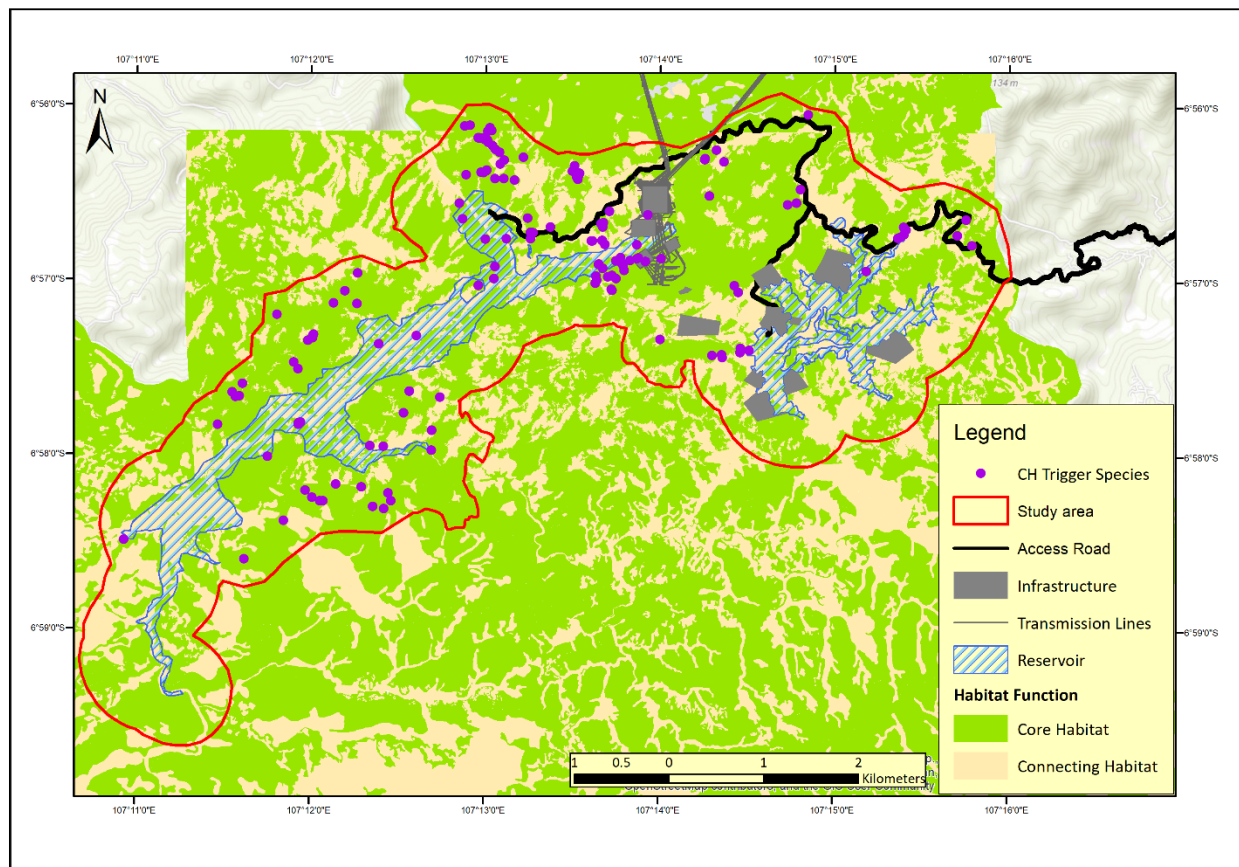
Figure 8. UCPS landscape showing land cover, presence of species triggering Critical Habitat, and the approximate extent of the study area in which these species have been assessed.

We mapped the presence records of species that trigger Critical Habitat (Table 4). This provides a general area of the core and connecting habitats that are important for maintaining these species. Species records are, of course, only available for the areas that were surveyed, and for all species that trigger Critical Habitat it is likely that their ranges extend beyond the surveyed areas. Nevertheless, this provides a first view on Critical Habitat near the project area (Figure 8). The size of the of study area where species records were collected is approximately 2,688 ha, consisting for ca. 66% of agroforest areas where trees and tree crops are cultivated for human use, but which also provide important biodiversity habitat. This does not

include the study area around the part of the access road closer to the quarry, where two locations were studied in 2009 but no species were found triggering Critical Habitat (Sutrisno et al. 2012). This study area above also does not include the field sites around the transmission line that were surveyed for biodiversity. The study area was selected on the basis of the assumption that this area would be influenced by project impacts.

Mapping the area of project infrastructure and inundated areas, indicates that **the area of Critical Habitat that will be directly impacted by project infrastructure is ca. 400 ha** (Figure 8 and Table 6). Indirect impacts are more difficult to estimate. They consist of a range of factors, such as the construction of the access road improving access, and relocation of people that could result in greater pressure on remaining forest stands. No data are currently available to more accurately measure the indirect impacts. Also, it is difficult to de-link these indirect impacts from the counterfactual (see section 2.12.2), since there is ongoing degradation and decline already. Taking a precautionary approach, we have considered the remaining part of the study area as being indirectly impacted, i.e., 2,688 ha minus 400 ha = 2,288 ha).

Referring to ESS 6, the habitat around the transmission line sampling points is dominated by modified habitats because there is much human interference and the transmission line project site is not in a protected area. Several species that trigger Critical Habitat were found in forested parts of the transmission line route, and directly and indirectly impacted areas were estimated above. Table 6 provides an overall indication of direct and indirect impacts from reservoir and transmission line development, resulting in **a total of 2,629 ha of Critical Habitat impacted**.

Table 6. Estimated areas of direct and indirect impacts on critical habitat

Area	Direct Impacts (ha)	Indirect Impacts (ha)
UCPS	400	2,288
Transmission Line	100	341
Estimated total impacts	500	2,629
Estimated total impacts based on counterfactual	500	1,867

As noted in the counterfactual analysis below, the prediction is that the Upper Cisokan agroforestry habitat could decline from 2,262 ha to 1,500 ha over a 30-year time period, indicating a loss of 762 ha that would occur even if the project was not implemented. It could thus be argued that the net loss of Critical Habitat caused by the project (i.e., considering the counterfactual of no project impacts) is 2,629 minus 762 ha = **1,867 ha of Critical Habitat indirectly impacted based on the counterfactual assumption**.

2.13 Direct and Indirect Threats from UCPS Development

The conclusion from the Critical Habitat assessment is that two species occurring in UCPS pass the thresholds for Critical Habitat, with an additional three species possibly doing this (Table 4). As no viable alternatives have been identified for the project, ESS 6 requires that: 1) the impacts will not lead to measurable net reduction or negative change in those biodiversity values for which the critical habitat was designated; 2) the project is not anticipated to lead to a net reduction in the population of any Critically Endangered, Endangered, or restricted-range species, over a reasonable time period; 3) the

project will not involve significant conversion or significant degradation of critical habitats; and 4) the project's mitigation strategy will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated.

Below, the impacts and biodiversity threats from project development are discussed in more detail to inform mitigation and offsetting strategies.

2.13.1 Land Clearing and Inundation

Within the area directly impacted by hydropower infrastructure development (access road, reservoir area, dams, switchyard, transmission lines, temporary access roads, spoil banks etc.), land clearing and / or inundation in those parts that are still forested will add to pressure on remaining forest patches, and will result in a net loss of forest area in the larger landscape unless reforestation activities are undertaken.

Land clearing along the access and other roads will impact an area of 27 km long width 40 m wide (an area of approximately 107 ha), but impacts on biodiversity differs between road segments depending on the type of vegetation the road dissects. Land clearing between km-0 and km-13 will primarily occur in settlement, yard, mixed garden, *talun*, rice fields, and fish pond land cover types. The road section between km-13 and km-25 towards the lower and upper dam will primarily cross the production forest and remaining natural forests vegetation types, including six Biodiversity Important Areas (BIAs).

Plant species that will be lost due to understory clearing, tree felling or brush cutting between km-0 up to km-13 (NR0 up to NR 13) will primarily include cultivated plant species with economic value to the communities. This includes sugar palm (*Arenga pinnata*), bamboo (*Bambusa apus*) and coffee (*Coffea arabica*), the loss of which can affect people's income. The clearing could also affect plant species that are rarely found in West Java such as Kepel (*Stelechocarpus burahol*), Menteng (*Bacaurea racemosa*), Putat (*Planchonia valida*) and *Litsea resinosa*.

Land clearing will also lead to the loss of natural forest. No protected plant species were found in these natural forest areas. Land clearing during project development can also indirectly impact biodiversity when this affects fruit-producing plants that provide food for different types of animals. This especially concerns species of fig (*Ficus* spp.) and other fruits that contain high fat or protein and are important for wildlife.

Further impacts from land clearing and associated damages include a decrease in the complexity of the vertical stratification (stratum) and reduced horizontal canopy connectivity, impeding wildlife movement. Canopy impacts and forest fragmentation also increase edge effects and induce micro-climatic changes within the remaining forests.

The project footprint associated with the upper and lower dam inundation areas of 105 ha and 357 ha respectively will create barriers to wildlife movements, as well as the loss of some habitat from the BIA[6].

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[6]Appendix 1 illustrates the overlap between the project footprint and the BIA.

2.13.2 Induced Development from Improved Access

Construction of the access road to the project area will facilitate commodity transportation produced by shifting cultivation and farms to nearby cities and towns, increasing the net revenues that can be obtained from agriculture. This could increase the demand for shifting cultivation areas increasing the pressure on remaining forests. Improved access may also attract immigrants who seek a living in the area, increasing the pressure on scarce land and wildlife resources. Unless managed carefully, these changes will increase the damage on vegetation and threaten the existing biodiversity in the UCPS hydropower area. Furthermore, during forest clearing, the ease of access would potentially facilitate the transportation of stolen timber.

2.13.3 Hunting and Collecting by Workers

A final threat related to land clearing during the construction phase comes from project workers who could engage in wildlife poaching and collection of timber from forests for construction or other purposes. This primarily concerns areas where construction occurs adjacent or in natural forest areas. These workers also increase the risk of fires that, especially during the dry season, could go out of control and affect larger forest areas.

2.14 Threats from Transmission Line Development

Two 500 kV transmission lines will connect the Upper Cisokan Power Plant with the Java-Bali Network on the Saguling-Cibinong network in the North (15.5 km and 15.9 km). The total length of the new transmission is 31.4 km, and the 'free space' corridor is 34 m long. The towers and corridors will require an area of approximately 100.38 ha consisting of forest, agricultural and plantation land. The connection locations on the grid have been selected with detailed modeling of the Java-Bali network, to maximize the efficiency of the Upper Cisokan Pump Hydropower Plant and the limitations and redundancies of the existing transmission line system.

The environmental and biodiversity impacts of the transmission lines can be categorized into three main problems, each requiring specific mitigation strategies: (1) Electrocution; (2) Collision; and (3) Habitat loss and fragmentation. There are also some potentially beneficial impacts of transmission lines. For example, powerline infrastructure is regularly used by numerous bird species for roosting, foraging and hunting, nest building, and rearing young. Species range from small birds that perch on powerlines to much larger birds (e.g., eagles) (Hunting 2002). Ospreys (*Pandion haliaetus*) or White-bellied Sea-eagles (*Haliaeetus leucogaster*) nest on towers, for example. Such nesting can cause transmission outages, or even fires, if their nest materials or faeces provide a pathway for electrical current. Power outages can also be caused by snakes (see below) and avoiding these are both important from the perspective of financial risk management and biodiversity protection.

2.14.1 Electrocution risks

Electrocution from power infrastructure threatens many mammal species, yet knowledge of effective evidence-based mitigation strategies is limited (Katsis et al. 2018). Roosting fruit bats and gliding mammals (flying squirrels, colugos), and also carnivores (Kolnegari et al. 2018) are also sometimes killed through electrocution, including leopards of which several cases of electrocution have occurred in India. Electrocutions of primates tend to be concentrated in particular locations along the powerlines structures,

as shown in studies in India (Ram et al. 2015), Bangladesh (Al-Razi et al. 2019), Brazil (Lokschin et al. 2007) and Kenya (Katsis et al. 2018), and affect especially those species that are commonly using horizontal structures, such as slow lorises (*Nycticebus*) and langurs (*Trachypithecus sp.) (Al-Razi et al. 2019). There have been anecdotal stories of slow lorises between electrocuted on Java, but this was likely on smaller transmission line infrastructure (V. Nijman, pers. comm.).*

Mortalities in snakes from electrocution on powerlines are anecdotally documented but have not been well studied. Larger, climbing snakes such as pythons could be at particular risk. For example, on the island of Guam, the Brown Tree Snake (*Boiga irregularis*), which is non-native species on Java, causes frequent electrical power outages, especially on high voltage transmission lines, on transformers, and inside electrical substations (Fritts 2002). These snakes caused more than 1600 power outages in a 20-yr period, with a single outage spanning the entire island and lasting 8 or more hours estimated to cost in excess of $3,000,000 in lost productivity.

Avian electrocution can occur if a bird simultaneously contacts either two phase wires or an energized phase wire and a grounded (earthed) contact, such as a steel member. Avian electrocutions can cause line faults and outages that negatively impact system reliability and power quality. Because of behavioral factors, raptors are more susceptible to electrocution than other groups of birds, although many other bird species are larger than raptors (Eccleston & Harness 2018). For Java, the raptor species that are most likely to be affected are Crested Serpent Eagle (*Spilornis cheela*), Crested Hawk-Eagle (*Nisaetus cirrhatus*) or Black Eagle (*Ictinaetus malaiensis*) that might perch or nest on power infrastructure, and which have all been identified as present in the transmission line area. Storks, herons and egrets can also be affected, although no stork species have been recorded in the UCPS or transmission line areas.

2.14.2 Collision risks

Collisions with transmission infrastructure are mostly a problem for birds. Bird collisions most often occur in raptors, species with either poor maneuverability (e.g., egrets), fast fliers, such as imperial pigeons (*Ducula* spp.) and quails (Janss 2000), or waterbirds, such as ducks and rails (MWH and Stantec 2018). For Java, the raptor species that is of most concern for being affected by the transmission infrastructure is the endemic and Endangered Javan Hawk-eagle (*Nisaetus bartels*). Furthermore, migratory species that, especially during the September to November migration pass west-to-east through the Javan highlands and to the north of these (Nijman et al. 2006) could collide with towers or powerlines (Figure 9). This includes Chinese Goshawk (*Accipiter soloensis*), Japanese Sparrowhawk (*Accipiter gularis*), Oriental Honey-Buzzard (*Pernis ptilorhynchus*), Black Baza (*Aviceda leuphotes*), and Short-toed Eagle (*Circaetus gallicus*).
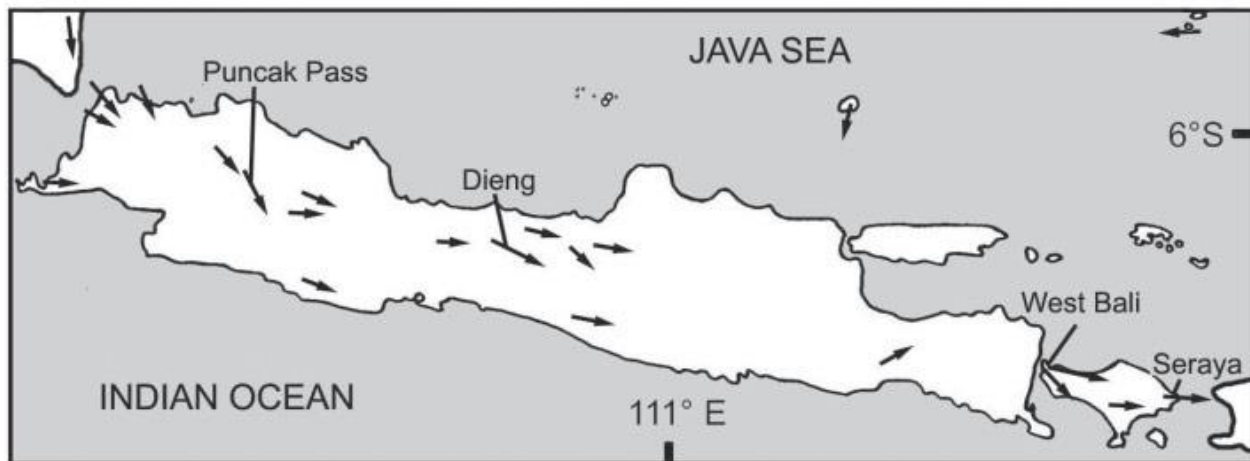
Figure 9. Map showing general direction across Java of September – November raptor migration, which follows a general course through and north of the central mountain range on the island, and runs perpendicular to the main transmission line route (Nijman et al. 2006).

2.14.3 Habitat loss and fragmentation from Transmission Line Development

Mapping results show that >50% of the land cover in the transmission line route is forest, with the remainder mostly consisting of fields and rice fields, and settlements. Two Critically Endangered mammal species, Pangolin and Slow Loris, were identified to be present in the transmission line area. Within the forest area, the transmission line will require opening up 20-40 m of land around the line, creating a significant barrier for forest dependent species. The species that will likely most be affected are those avoid coming to the ground such as Slow Loris and also Grizzled Leaf Monkey. In places where the access road provide access to forests that did not previously occur, the risk of catching and hunting of birds, mammals and other species also increases.

2.15 Applying the mitigation hierarchy

ESS 6 states that for the protection and conservation of habitats and the biodiversity they support, the mitigation hierarchy includes biodiversity offsets. 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 (Figure 10).

The BMP has sought to avoid and minimize impacts where possible, through improved management of threats to wildlife (e.g., patrolling, community outreach, fire prevention), mitigating loss of ecological connectivity through road culverts and arboreal bridges, and other measures. As clarified in the analysis of the counterfactual, there is an ongoing trend, however, of biodiversity and habitat quality decline that occurs irrespective of the project's impact. The BMP is therefore focusing strongly on a major effort of ecological restoration that benefits both the terrestrial and aquatic systems, and provides benefits to communities, making it more likely to get their buy-in on sustainable (agro-)forest management and reducing threats to biodiversity (poaching, unsustainable collecting, poison fishing etc.).
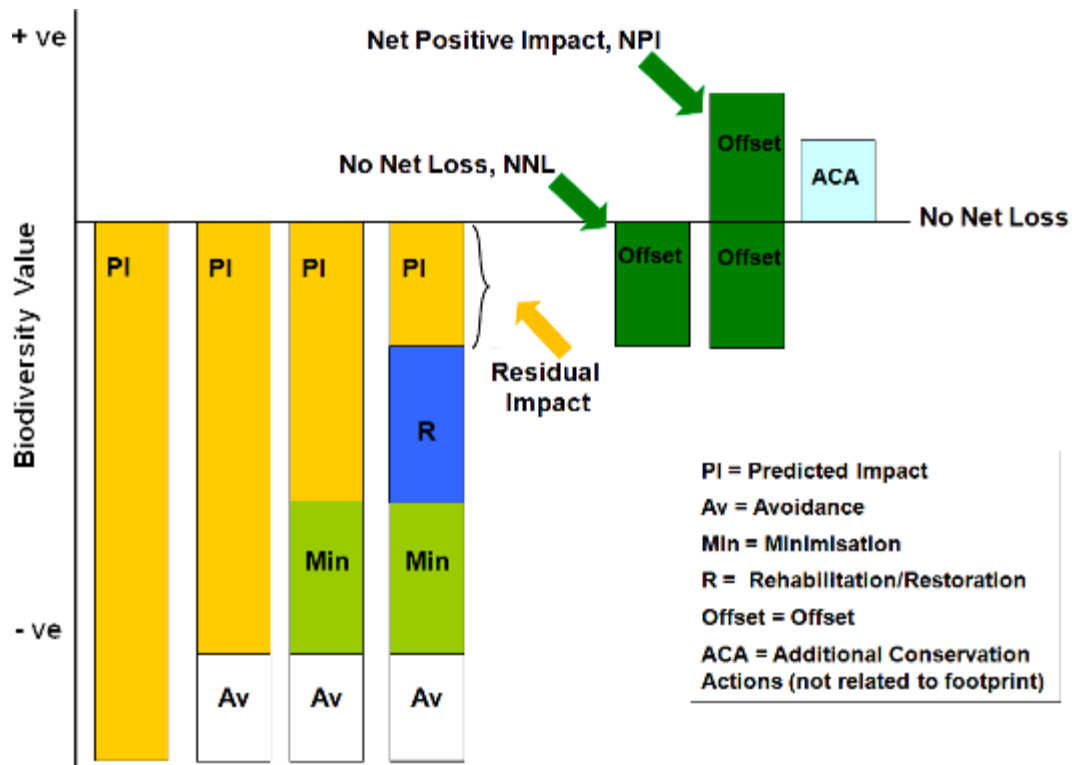
Source: BBOP, adapted from Rio Tinto & Govt of Australia

Figure 10. Mitigation hierarchy in relation to impacts and biodiversity values

2.16 Biodiversity offsetting

For the protection and conservation of habitats and the biodiversity they support, 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 a net gain of biodiversity.

The Forest Partnership Framework provides the key strategy for addressing the restoration and offset components of the mitigation hierarchy. The framework is designed with a long-term goal to restore a connected (agro-)forest landscape across 3,800 ha of land around the UCPS reservoirs and project facilities. **The 3,800 ha of restoration aims to provide a net positive gain, offsetting the 500 ha of direct impacts and the 2,629 ha of indirect impacts, or 1,867 ha under the counterfactual scenario**. It simultaneously aims to restore the terrestrial biodiversity component by significantly increasing ecological connectivity among forest areas, benefiting species that trigger the Critical Habitat criteria, such as Slow Loris and Grizzled Leaf Monkey, and the aquatic habitat by improving ecological conditions alongside tributaries flowing into the reservoirs and through improved fish management. Finally, the restoration and offsetting strategies aim to fulfil socio-economic objectives through the development of financially viable social forestry and agroforestry programs. These aim to restore original agroforestry-based land uses in the UCPS area that provide communities with improved income and reduce ecologically damaging land practices, such as open field agricultural on steep slopes.
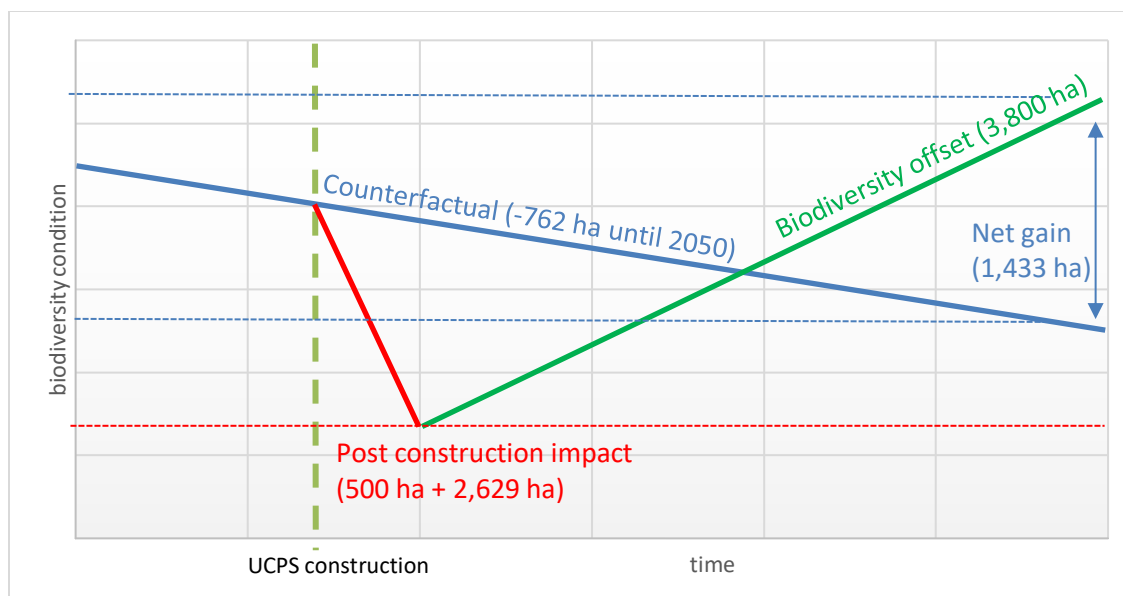
Figure 11. Net gain scenario of the biodiversity offset against the counterfactual scenario and in relation to direct and indirect impacts.

The biodiversity offset is additional to the losses that would have occurred under the counterfactual scenario (see Section 2.11.2). This scenario indicates that, assuming a constant rate of forest decline, the agroforest area will be reduced by 762 ha to less than 1,500 ha by 2050. The net positive gain targeted from the biodiversity offset against the counterfactual scenario is therefore estimated at **3,800 ha – 500 ha (direct) – 2,629 ha (indirect) + 762 ha (counterfactual loss) = 1,433 ha over a 30-year time frame** (Figure 11).

3 BMP Strategy

3.1 Introduction to the ICM Approach

Biodiversity management will happen within a broader context of UCPS safeguards management and management of wider catchment issues. With many competing demands for land and water resources and existing natural resource challenges in the Project catchment area, PLN is aware that the impacts from the UCPS (both direct and indirect) need to be managed carefully to avoid further forest loss and land degradation and negative socio-economic impacts in this regionally and nationally important river basin. The complexity of overlaying multiple safeguard plans in an already crowded landscape requires intense integration, coordination and supervision efforts to ensure synergy between plans and guard against the plans working at cross-purposes. Sustainability of any of the mitigation measures cannot be ensured if they are implemented in a piecemeal approach.

However well integrated PLN's UCPS safeguards measures are, PLN is also now aware that sustainability can also not be ensured by their work alone. The scheme is just one small part of the catchment, and without addressing the interlocking issues of poverty, scarce land resources, inefficient land uses, and environmental degradation, PLN's efforts will be unsuccessful. Perhutani and the communities who own, live in, work and manage the land surrounding the UCPS project will have to be involved to build on PLN's work and address some of the interlocking issues. Other stakeholders such as government agencies, NGOs and universities will need to be involved to bring resources, funding and expertise to support PLN, Perhutani and the communities. The ICM approach relies on strategic thinking and innovation on how to bring together these key stakeholders.

This connected thinking has resulted in PLN championing the concept of ICM for the Upper Cisokan catchment. PLN have a vision of UCPS being a Green Dam – a hydropower project that will enhance the host environment by managing the catchment landscape for multiple outcomes (e.g., economic, biodiversity, hydrology and social). ICM has the potential to produce substantial and sustainable benefits to both the UCPS scheme and the Upper Cisokan catchment. PLN, supported by the World Bank, wants to use the UCPS as the catalyst for a sustainable catchment, where all stakeholders are better off, and the future for the critically endangered and endangered animals is secure.

Based on an assessment of the ecological and genetic requirements of the most threatened species occurring in the UCPS area, we determined that a minimum area of some 3,800 ha should be targeted for an ICM program. If such an area would largely consist of connected forest patches, all species, possibly with the exception of the Javan Gibbon and Javan Slow Loris, could retain viable populations, provided the hunting and collection pressures were low or absent. The Javan Gibbon and Javan Slow Loris populations would likely require active demographic and genetic management to maintain viable populations.

We anticipate that the most practical way to establish the ICM program is to pursue a collaborative forest management option between PLN, local communities and Perhutani. This strategy would build on existing land use patterns and land ownership, facilitating a relatively easy entry point to get the principal ideas of ICM established and tested.

Without a biodiversity project, threatened Cisokan wildlife will go extinct within the foreseeable future.

A biodiversity project focused solely on protection of small forest fragments will prolong species survival, but populations are too small to guarantee long term viability.

Integrated catchment management seeks to reforested degraded land, simultenously reconnecting fragmented populations of threatened species, increase economic outputs for communities and other stakeholders, and strengthen environmental service delivery. It is the only possible way to save Cisokan's threatened species.

Figure 12. ICM Objectives and Milestones.

3.2 Biodiversity Management Fundamentals

The BMP management recommendations for the Upper Cisokan area are developed on the basis of a range of fundamental concepts that lay the foundation for selecting particular approaches. The fundamentals embrace the ICM approach that seeks to deliver biodiversity outcomes alongside a range of financial, legal, political, socio-economic, and broader environmental objectives. Key to its future success are high quality of planning and execution of its action, recognition of pre-existing rights (legal and informal) of Cisokan land owners and users, and a learning-based approach that continuously translates project feedback about the extent to which objectives are achieved into adapted management practices.

3.2.1 Fundamental 1 – Managing Impacts on Biodiversity and Targeting Net-Gain of Critical Habitat

To achieve biodiversity conservation PLN is committed to:

- In-situ management of biodiversity[7]. The key to *in situ* management will be to 1) minimize direct impacts from developments during the construction phase and mitigate the direct impacts where these cannot be avoided; and 2) enhance habitat and mitigate the indirect

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[7] The BMP publicly disclosed in 2011 had considered the translocation of threatened and protected species away from the development sites as one of the potential management options, but a review of the logistical challenges of implementing translocations safely, and also the difficulty of finding suitable release site for translocated species—especially for animals like leopards that few people want near their village—the decision has been made to address biodiversity conservation *in situ*.

impacts (e.g., increased pressure on remaining forest because of changing socio-economic conditions).

- Focus on the 10 'species of interest' (Table 1) because of limited resources, and knowing that habitat improvements made for the high priority species will have benefits for non-target species.
- Having in-depth knowledge of the habitat and species affected by development activities.
- Basing the biodiversity management decisions on a thorough understanding of species requirements.
- Consulting with leading practitioners (such as tropical ecologists) with regard to specific species management plans.
- Making decisions based on the best available species knowledge.
- Actively working towards improving species information and knowledge.
- Minimizing the physical impacts of development activities to the greatest possible extent through rigorous planning, design and monitoring.
- Continuously assessing the direct and indirect, cumulative biodiversity, and ecosystem services impacts.
- Revegetating disturbed areas consistent with pre-existing conditions or alternate land uses as agreed with our key stakeholders.
- Creating buffer zones around areas with highest conservation values.
- Thoroughly assessing baseline data/information and seeking to improve and augment.
- Within the BIA's the aim is to ensure that impacts on biodiversity are reduced to a minimum.
- In the broader landscape, the aim is to create a network of connected forest set asides that overall provide sufficient habitat for threatened species for maintaining viable populations.
- Aim to provide a net benefit to the area's biodiversity in the long term, through net gain of habitat hectares and improving connectivity and reducing fragmentation.

3.2.2   Fundamental 2 - Adapt Biodiversity Management through Continuous Improvement

Through continual monitoring programs and continuous adaptation of biodiversity management plans, PLN will incorporate new knowledge as it becomes available and use it to adapt management approaches to changed circumstances. The BMP includes the following:

- The biodiversity strategy design is built around the baseline studies, Indonesian legislation, World Bank safeguard policies and other relevant policies, procedures and standards.
- Project design, development and operations need to be revised as additional information becomes available.
- Biodiversity management is adapted and updated following analysis of monitoring data and evaluation of outputs.

3.2.3   Fundamental 3 - Leading Practice

Leading practice will be used with the following components in support of the BMP:

- Site Biodiversity Plans have been developed by biodiversity specialists for each Biodiversity Important Area (BIA) and each major infrastructure development (dams, access road and

others) (Appendix 1). The plans capture design input, habitat set-asides, vegetation, plans and revegetation requirements.

- SOPs, management modules and training modules developed by biodiversity specialists from UNPAD will contribute throughout construction, operations, and maintenance (e.g., Appendix 7).
- The ICM approach has been developed with technical advisory from ICM and biodiversity specialists.
- PLN will continue to engage specialists, undertake research and incorporate opportunities from other approaches to biodiversity management and implement improvement, replication, transferring knowledge and capturing the benefits.

3.2.4   Fundamental 4 – Identifying Opportunities to Enhance Biodiversity Conservation

We recognize that Cisokan's biodiversity is of a highly fragmented and depleted nature and that species survival without effective conservation intervention is unlikely in the medium or long term. Considering the Indonesian regulations on species conservation (Act No. 5 of 1990) and ESS6, maintaining viable populations of these threatened and protected species is therefore a key component of the project. This can only be achieved through landscape-level management of a larger network of connected forest fragments where threatened species are effectively protected from threats and through which they can freely disperse, thus maintaining gene flow. These considerations are the core idea that will be managed through an ICM approach that aims to achieve landscape level restoration of ecological values, but which also integrates local socio-economic, environmental, and regulatory goals. Implementing effective ICM will enhance biodiversity values in Cisokan over the longer term.

3.2.5   Fundamental 5 – Engagement and Partnerships

The reforestation and conservation of wildlife cannot happen without strong engagement by communities, NGO's, Perhutani and local and Government agencies. Funding, resources and expertise is required from a range of stakeholders in order to achieve the goals of the BMP. We will form partnerships and establish research programs with industry, government and other stakeholders to contribute to biodiversity conservation.

An MOU has been signed with Perhutani to enable forest protection and enhancement work to be undertaken on Perhutani land. Review of the existing working agreement is underway between PLN and Perhutani at a Regional level to determine further practical steps and implementation plan for the reforestation work. Further MOU and working agreements, including the Forest Partnership Framework, will be developed as necessary with key land owners and other stakeholders to achieve the ICM vision.

Engagement and communications are fundamental to the success of the Biodiversity Management Plan and ICM. This includes:

- Engaging project managers, contractors and engineers and implementing induction and training so as to achieve leading practice; and
- Engaging external stakeholders such as NGOs, government and local communities to support the development and delivery of biodiversity conservation goals.

3.2.6   Fundamental 6 – Performance and Measurement

The BMP has metrics to assess and report biodiversity performance and identify opportunities for improvement. This includes a set of key performance indicators that will be monitored by PLN with input from a biodiversity conservation task force comprising our key stakeholders.

3.2.7   Fundamental 7 – Integrated Management

As clarified in Chapter 3.1., PLN will integrate the biodiversity action plans with other safeguards responsibilities such as resettlement of displaced people, management of construction-related impacts, watershed management and the management of environmental changes from hydropower operation.

The plans to resettlement of displaced people take into account the reforestation goals and plans. The BMP has taken account of the potential social and socio-economic impacts from reforestation into account and allowed for the development of opportunities for alternative livelihoods both on Perhutani land and village-owned land. The BMP Action Plan shows how the community will be engaged to find alternatives to illegal hunting, poaching and logging, and to explore options for cooperative forest management.

The BMP action plans take into account the recommendations from PLN's Watershed Management Study by Geotrav (2013)[8] and recognise that there will be dual roles of the reforestation process – increased habitat and reduced erosion potential. Geotrav (2013) notes the entire upper Cisokan catchment shows widespread signs of degradation with high erosion risk over 50% of the basin, and moderate risk over the remaining 50%. Geotrav (2013) recommended a participatory planning approach with local communities and related agencies to develop actions plans and an integrated strategy for upper Cisokan catchment management. The needs of the local communities were recommended to be accommodated through the design of crop and tree planting patterns, and selection of planted species, which would give an optimum output for soil conservation and also income for the local communities. The BMP has taken these recommendations into account.

3.3   Location

The location covered by this plan is defined by the near-catchment area of the UCPS area (*Figure 6*), and in which an area of 3,800 ha of connected and improved quality forest will be created through reforestation and sustainable forest management.

3.4   Biodiversity Important Areas (BIA)

Based on the biodiversity studies, the identification of species of main conservation concern (see Table 1), and the presence and size of good habitat, 15 Biodiversity Important Areas (BIA) have been identified in the immediate project area, with a total area of about 425 ha (map titled Distribution of Biodiversity Important Areas in the Cisokan area in Appendix 8). Parts of these BIAs overlap with the project footprint, for example, in the inundation areas. It is important to note that the BMP Action Plan focusses on protecting the land in the BIA that will not be inundated or converted for project development.

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[8] Insert reference to GEotrav report

These areas form the core of the biodiversity conservation plan. Protecting wildlife and minimizing habitat loss in these BIA is the short term priority (see Section 3.5 Working zones and timeframes). The biodiversity values and threats are well studied and understood, and the mitigation measures provide protection mechanisms (developing 'no-go areas', reducing the footprint of land clearance activities) and enhancement mechanisms such as reforestation of disturbed areas. These actions will be supervised by PLN in partnership with Perhutani but many aspects of the plan will be implemented by specialist biodiversity consultants and the civil works Contractors. The longer term plan is to expand habitat to connect the BIAs and extend the forested areas into the wider landscape to achieve the goals of the BMP, and this will be implemented in an integrated way with the other social and watershed issues in the catchment.

Table 7. BIA Descriptions, Predicted Impacts and Management Guidance

BIA	Area and land cover prior to development	Important wildlife and ranging needs	Planned activities and area remaining after development	Management guidance
BIA-1 Datarmala	10 ha. Production forest, scrub, shifting cultivation, banana plantings	Pangolin. Range: 5-7 ha.	Access road. 8 ha	Avoid impact where possible. Selective land clearing, habitat rehabilitation, wildlife connectivity structures
BIA-2 Cipateung-teung	12.4 ha. Production forest, shifting cultivation, agroforestry with sugar palm	Javan Slow Loris. Range: 0.4-25 ha.	Access road. 10.4 ha	Avoid impact where possible. Selective land clearing, habitat rehabilitation, wildlife connectivity structures
BIA-3 Above Cipateung-teung	13.1 ha. Agroforestry with bamboo and sugar palm	Javan Slow Loris. Range: 0.4-25 ha.	Access road. 11.8 ha	Avoid impact where possible. Selective land clearing, habitat rehabilitation, wildlife connectivity structures
BIA-4 Boundary Bandung-Cianjur	7.8 ha. Production forest with pine and other species, scrub land, shifting cultivation, agroforestry with bamboo and sugar palm	Javan Langur. Range: 2.5-20 ha.	Access road. 6.6ha.	Avoid impact where possible. Selective land clearing, habitat rehabilitation, wildlife connectivity structures
BIA-5 Puncak Haur	15.5 ha. Forest with *Calliandracalothyrsus*, scrub land, agroforestry dominated by sugar palm	Javan Porcupine. Range: 5-30 ha; Javan Mouse Deer. Range: 4.3 ha; Javan Slow Loris. Range: 0.4-25 ha.	Access road and switch yard. 11.6 ha.	Avoid impact where possible. Selective land clearing, habitat rehabilitation, especially towards the east, wildlife connectivity structures
BIA-6 Pasir Nangka	44.7 ha. Agroforestry and natural forest. Also Production forest, scrub and shifting cultivation.	Grizzled Leaf Monkey. Range: 5-30 ha; Javan Langur. Range: 2.5-20 ha. Javan Slow Loris. Range: 0.4-25 ha; Javan Porcupine. Rage: 5-30 ha; Javan Mouse Deer. Range: 4.3 ha; Javan Leopard. Range:500-1,500ha.	Lower reservoir inundation, access road, Lot 1B spoil bank and concrete plant.20.2ha.	Avoid impact where possible. BIA-6 needs to be connected to BIA-8. Reforestation, selective land clearing, habitat enrichment, wildlife connectivity structures.
BIA-7 Power House	26.0 ha. Agroforestry with bananas, production forest with pine, scrub land and shifting cultivation.	Javan Gibbon. Range: 5-30 ha; Grizzled Leaf Monkey. Range: 5-30 ha; Javan Mouse Deer. Range: 4.3 ha; Oriental Small-Clawed Otter: Ranging needs unclear	Lower reservoir inundation, tail race tunnel portal, 500Kv cable portal,. 20.0ha.	Avoid impact where possible. Connect BIA-7 with BIA-9, BIA-10, and BIA-11 through reforestation to the north and south; selective land clearing, habitat rehabilitation, especially towards the east, wildlife connectivity structures.
BIA-8 Gowek	26.6 ha. Natural forest.	Grizzled Leaf Monkey. Range: 5-30 ha; Javan Langur. Range: 2.5-20 ha; Javan Porcupine. Rage: 5-30 ha; Javan Mouse Deer. Range: 4.3 ha; Javan Leopard. Range 500-1,500 ha;	No change in area.	Expand forest area to Pasir Taman and Pasir Nangka (BIA6 and 12); habitat enrichment.

		Pangolin. Range: 5-7 ha; Javan Leopard. Range: 500-1,500 ha.		
BIA-9 Upper Dam, Japarana	48.1 ha. Pine forest, scurb land, shifting cultivation, agroforestry.	Javan Gibbon. Range: 5-30 ha; Javan Langur. Range: 2.5-20 ha; Pangolin. Range: 5-7 ha; Javan Porcupine. Rage: 5-30 ha; Leopard Cat. Range: 200-400 ha.	Upper Dam, Temporary Access Road, diversion channel. 45 ha.	Connect BIA-9 with BIA-7, BIA-10, and BIA-11through reforestation, habitat enrichment, wildlife connectivity structures.
BIA-10 Between Japarana and CurugWalet	2.8 ha.Natural forest along Cirumamis River, with pine forest and scrub land.	JavanLangur. Range: 2.5-20 ha.	No change in area.	Connect BIA-10 with BIA-7, BIA-9, and BIA-11through reforestation.
BIA-11 Curug Walet	24.8 ha. Natural forest, with quite dense tree cover.	Javan Gibbon. Range: 5-30 ha; Javan Langur. Range: 2.5-20 ha; Pangolin. Range: 5-7 ha; Leopard Cat. Range: 200-400 ha.	Lower reservoir inundation. 21.3ha.	Habitat enrichments, and habitat expansion by connecting BIA-11 with BIA-7, BIA-9, and BIA- 10.
BIA-12 Lemburhor eam-PasirTaman	29.4 ha. Teak forest, scrub land, and agroforestry.	Javan Leopard. Range: 500-1,500 ha; Grizzled Leaf Monkey. Range: 5-30 ha; Javan Langur. Range: 2.5-20 ha.	Lower reservoir inundation, spoil bank (within reservoir). 20.7 ha	Habitat enrichment and expansion by connecting BIA-12 with BIA-8.
BIA-13 Across from Cangkuang	56.0 ha. Agroforestry	Leopard Cat. Range: 200-400 ha; Grizzled Leaf Monkey. Range: 5-30 ha; Javan Langur. Range: 2.5-20 ha; Javan Slow Loris. Range: 0.4-25 ha; Wild Boar (ranging needs unclear)	Lower reservoir inundation. 45.2ha.	Habitat expansion to the north and habitat enrichment.
BIA-14 Ciawitali	78.3 ha. Pine forest, scrub land, shifting cultivation, and agroforestry with bamboo.	Leopard Cat. Range: 200-400 ha; Javan Gibbon. Range: 5-30 ha; Wild Boar (ranging needs unclear); Javan Slow Loris. Range: 0.4-25 ha; JavanLangur. Range: 2.5-20 ha.	Lower reservoir inundation. 54.5ha.	Habitat expansion by connecting with BIA-15.
BIA-15 Bungbulang	0.7 ha. Remnant natural forest above waterfall, pine forest, scrub land, shifting cultivation and agroforestry.	Javan Langur. Range: 2.5-20 ha; Javan Leopard. Range: 500-1,500 ha; Pangolin. Range: 5-7 ha.	No change in area	Habitat expansion by connecting with BIA-14.

3.5 Working zones and timeframes

The BIAs are presently forested islands in a non-forest landscape. They provide insufficient ecological resources to sustain viable populations of threatened species. As pointed out above, at least 3,800 ha of connected forest landscape is needed for species to survive. The ICM approach therefore uses reforestation programs to restore the ecological functions of the landscape. A scaled working area is proposed in terms of spatial boundaries and time periods.

Small to Medium Scale – Short (2 – 5 years) to Medium Term (10 years): Over the scale and time frame of immediate concern for the ICM action plans, four forest management zones of increasing size are proposed for the ICM approach within the near-catchment of the UCPS upper and lower reservoirs (*Figure 6*):

- *Working Zone 1 – BIAs (319 ha) – Short Term (2022 - 2024):* At the smallest scale and short time frame the ICM approach will focus on the 15 BIAs (*Figure 6*) which closely surround the UCPS upper and lower reservoirs. They are the most critical habitats that are at risk from UCPS

construction and hunting and agricultural land clearance pressures, and require immediate and ongoing protection.

- *Working Zone 2 – Adjacent Forest Corridors (280 ha) – Short Term (2022 - 2027):* the reforestation of 21 Corridor Areas (Figure 13) which closely surround and link the above Zone 1 BIAs. Management of these corridor areas, including reforestation, is needed to enlarge the available forest habitat of endangered species. Corridors that connect BIAs allow forest-dependent animals to move through the landscape.

- *Working Zone 3 – 500 m Re-greening Zone (2195 ha) – Short Term (2023 - 2026):* Re-foresting the forest buffer zone defined by Ministry of Forestry Law[9] with boundary 500 m from the high water mark of the UCPS reservoirs (Figure 14).

- *Working Zone 4 – Near-Catchment Extended Corridors (3800 ha) – Medium Term (2026 - 2031):* Reforest Extended Corridor Areas (Figure 13) with natural and production forest (*Figure 6*).

Large Scale – Long Term (20 to 25 years; 2026 - 2040)

- *Working Zone 5*: At the largest scale and over the longer term, to address the dual goals of catchment management and wildlife habitat expansion, the area is bounded by the Upper Cisokan catchment boundary (Figure 13) (area 374 km^2) and by the boundaries of the forest reserves and concessions on the catchment watershed along the catchment boundary. This boundary represents the ultimate expansion of the ICM approach with a focus to extend the work commenced in Working Zones 2 and 4 described below to develop natural and production forest corridors, to extend the community development program to improve land use management and soil conservation in agricultural, agro-forest and forest lands, and to implement a broader scale soil and water (catchment) conservation program in the entire catchment to reduce erosion levels and sediment transport into the lower Cisokan reservoir.

3.6 Reforestation targets

- *Working Zone 1 – BIAs (319ha) – Short Term (2022 - 2024):* 100% of BIA forested by end of 2017, a total of 31ha reforested (Table 3).

- *Working Zone 2 – Adjacent Forest Corridors (280 ha) – Short Term (2022 - 2027):* 100% of the 21 connectivity areas to be forested by end of 2020 (280 ha), a total of 219ha reforested (Table 3).

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[9] The zone consists of a 500 m logging exclusion zone as required by Forest Law (U.U. No. 41 of 1999, article 50, line 3), 100 m zones of catchment protection forest around the reservoirs and along streamlines and protection forest on steep slopes (> 40%) as required by the Presidential Decree on the Management of Reserve Areas (Kepres 32 of 1990, articles 8, 16 and 18).

- *Working Zone 3 – 500 m Re-greening Zone (2195 ha) – Short Term (2022 - 2025):* 100% of a 500m Reservoir Zone forested by end of 2025, a total of 1081ha reforested (12% or 216ha per year) (Table 3 and Figure 7).

- *Working Zone 4 – Near-Catchment Extended Corridors (3800 ha) – Medium Term (2026 - 2031):* 3,800ha of extended corridors to be forested in near-catchment area and across the watershed by 2031, a total of 1470 ha reforested (bare lands and upland agriculture lands) (Table 3).

Table 8. Reforestation targets. CA = corridor areas.

	End of 2014 (prior to project implementation and reservoir inundation)				End of 2022	End of 2023	End of 2024	End of 2025	End of 2026	End of 2027	2028
	Forest	Other Wood Land	Planta-tions	Total wooded cover	Total wooded cover	Total wooded cover	Total wooded cover	Total wooded cover	Total wooded cover	Total wooded cover	Total wooded cover
BIA_01		0.4	7.2	7.5	8.0	8.0	8.0	8.0	8.0	8.0	8.0
BIA_02		10.0		10.0	10.4	10.4	10.4	10.4	10.4	10.4	10.4
BIA_03	9.1	2.3		11.4	11.8	11.8	11.8	11.8	11.8	11.8	11.8
BIA_04		3.7	3.5	7.1	6.6	6.6	6.6	6.6	6.6	6.6	6.6
BIA_05		12.2		12.2	11.6	11.6	11.6	11.6	11.6	11.6	11.6
BIA_06		30.1		30.1	15.0	18.0	20.2	20.2	20.2	20.2	20.2
BIA_07	6.7	8.5		15.2	15.2	16.0	16.0	16.0	16.0	16.0	16.0
BIA_08	18.2	8.0		26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2
BIA_09	28.0	4.6		32.7	32.7	32.9	32.9	32.9	32.9	32.9	32.9
BIA_10			2.0	2.0	2.0	2.8	2.8	2.8	2.8	2.8	2.8
BIA_11	15.3	3.6	0.3	19.1	19.1	20.0	21.3	21.3	21.3	21.3	21.3
BIA_12	13.2	1.4	0.1	14.7	17.0	19.0	20.7	20.7	20.7	20.7	20.7
BIA_13		30.2	4.8	35.0	38.0	42.0	45.2	45.2	45.2	45.2	45.2
BIA_14	0.6	19.4	21.2	41.2	47.0	53.0	54.5	54.5	54.5	54.5	54.5
BIA_15	17.3	5.4	0.0	22.7	25.5	28.5	30.7	30.7	30.7	30.7	30.7
TOTAL BIA				**287.2**	**286.0**	**306.8**	**318.9**	**318.9**	**318.9**	**318.9**	**318.9**
CA 1		1.7	0.8	2.5	2.8	3.3	4.7	6.5	8.5	8.6	8.6
CA 2	0.2	2.2		2.5	2.7	3.2	4.5	6.4	6.6	6.6	6.6
CA 3	0.2	4.5		4.6	5.1	6.1	8.6	12.0	12.0	12.3	12.3
CA 4	0.1	0.3	0.2	0.5	0.6	0.7	1.1	1.6	2.4	2.9	2.9
CA 5	0.0	4.8	5.4	10.2	11.2	13.5	18.8	26.4	32.1	32.1	32.1
CA 6	0.8	1.3	0.7	2.9	3.4	4.5	6.7	10.1	15.1	18.5	18.5
CA 7		2.7		2.7	3.0	3.6	5.0	7.0	7.7	7.7	7.7
CA 8	1.2	1.7		2.9	3.2	4.2	6.3	9.4	15.1	19.4	19.4
CA 9	0.2	2.2		2.4	2.6	3.4	5.1	7.7	12.3	13.0	13.0
CA 10		0.0	0.1	0.1	2.5	5.0	7.5	10.0	12.5	15.2	15.2
CA 11		0.3		0.3	2.0	4.0	6.0	8.0	10.0	11.8	11.8
CA 12	0.1	3.2		3.3	3.6	4.6	7.0	10.5	16.7	26.8	26.8
CA 13	0.3	0.6	0.4	1.3	1.9	2.9	4.3	6.5	9.7	11.0	11.0
CA 14		8.4		8.4	9.2	11.0	15.4	21.6	24.4	24.4	24.4
CA 15		1.3		1.3	1.9	2.8	4.2	6.3	9.0	9.0	9.0

CA 16	0.3			0.3	0.7	1.1	1.6	2.4	3.5	4.2	4.2
CA 17	11.9	2.6		14.5	16.0	19.2	26.8	37.5	40.1	40.1	40.1
CA 18				0.0	1.0	2.0	3.0	4.0	5.0	5.0	5.0
CA 19				0.0	1.0	2.0	3.0	4.0	4.5	4.5	4.5
CA 20				0.0	1.0	2.0	3.0	3.3	3.3	3.3	3.3
CA 21		0.2		0.2	1.0	2.0	3.0	3.5	3.5	3.5	3.5
TOTAL CA				**60.8**	**76.4**	**101.1**	**145.7**	**204.7**	**254.1**	**279.9**	**279.6**
500m zone	**279.5**	**685.3**	**148.9**	**1113.6**	**1247.3**	**1396.9**	**1564.6**	**1752.3**	**1962.6**	**2195.0**	**2195.0**
3800 ha	**466.6**	**1488.2**	**375.6**	**2330.4**	**2464.0**	**2613.7**	**2781.3**	**2969.1**	**3179.4**	**3411.8**	**3800.0**

Figure 13. Small to medium scale boundaries of the ICM Approach (Working Zones 1 to 4). Red line show largest reforestation target area (zone 4)

Figure 14. Reforestation target for 500 m zone (black line, zone 3)
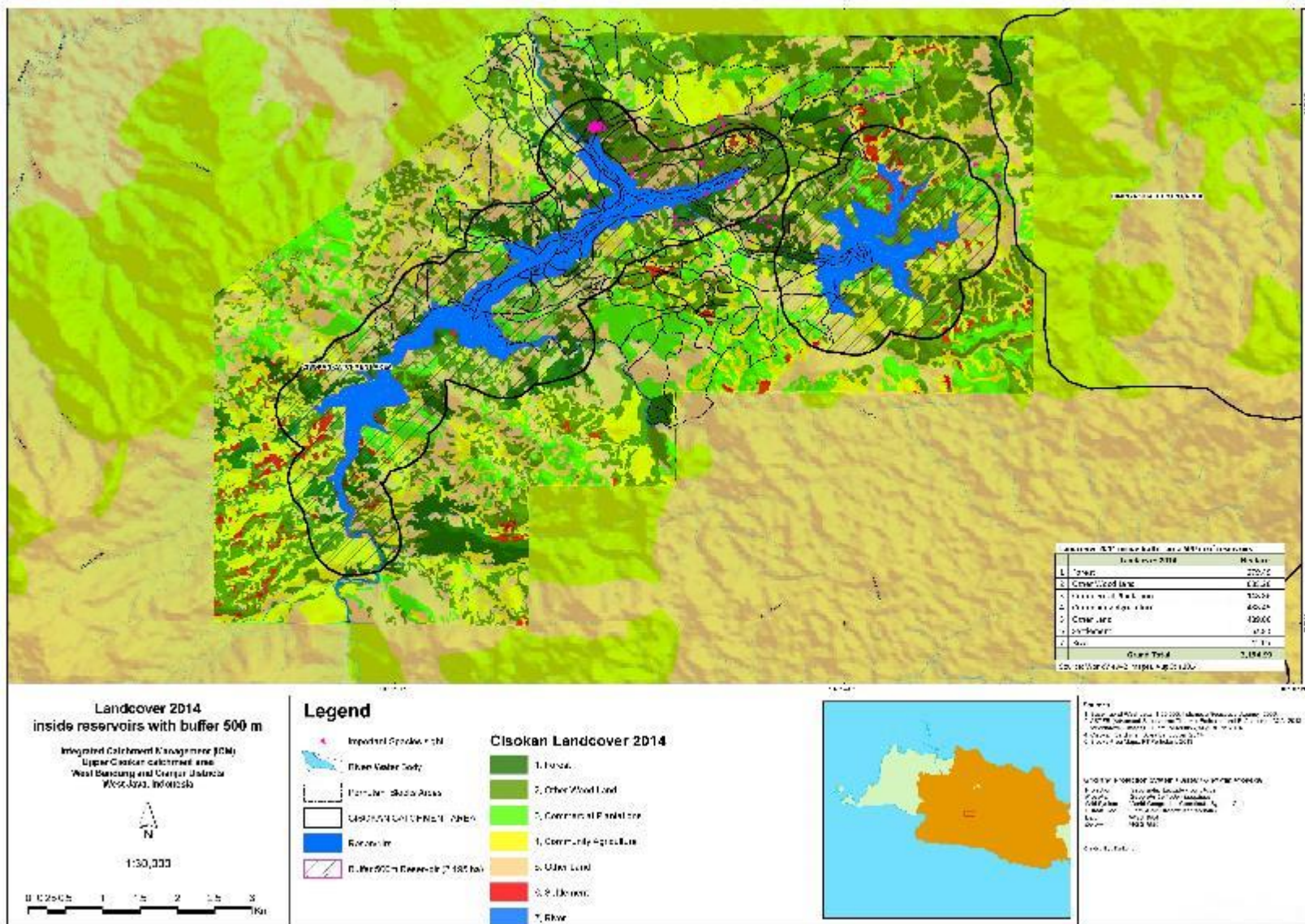
4 Indonesian Regulations and Institutions

4.1 Environmental Regulations for Flora and Fauna

The following list of Indonesian environmental regulations specifically pertains to flora and fauna. A full list of environmental regulations is presented in the ESMP.

- Indonesian Act Number 5, 1990 about Conservation of Natural Resources and Ecosystems.
- Indonesian Act Number 32, 2009 about Protection and Environmental Management.
- Indonesian Act Number 27, 1999 about Environmental Impact Assessment.
- Indonesian Act Number 13, 1999 about Animal Poaching
- Indonesian Act Number 7, 1999 about Preservation of Fauna and Flora.
- Indonesian Act Number 8, 1999 about Utilization of Plants and Wildlife.
- Presidential Regulation Number 23, 1990 About Environmental Impact Management Agency
- President Regulation Number 4, 1993 about National Flora and Fauna.
- West Java Provincial Regulation 2/2006 about management of protected areas

The Indonesian Act no. 5 of 1990 is of most direct relevance to biodiversity conservation in the UCPS area, as far as this concerns legally protected species. Article 21 of the Act states that:

I. Each person is forbidden to

a) take, cut, possess, damage, destroy, take care of, carry out and trade protected flora or its part alive or dead
b) export protected flora or its part alive or dead from any places in Indonesia into other places either inside or outside the country

2. Each person is forbidden to

a) catch, wound, kill, store, possess, carry out and trade protected fauna alive
b) store, possess, care of, and trade dead protected fauna
c) export protected fauna from any places in Indonesia into other places either inside or outside the country
d) trade, store or possess skin, body or other part of protected fauna or things made from part of fauna and export to any part of Indonesia to other places inside or outside the country
e) take, damage, destroy, trade, store or possess eggs and/or nests of protected fauna

Act Number 7 of 1999 clarifies which species are protected, with the fauna and flora sections above indicating which species are concerned in Cisokan.

4.2 Water Resource, Forestry and Catchment Management Regulations

The Indonesian government has passed Law No. 7 of 2004 on Water Resources and issued Government Regulation (GR) No. 42 of 2008 on Water Resource Management and other relevant regulations to be used as the basis for the legal framework to manage river basin and catchment areas. Both regulations

have comprehensive rulings, which incorporate, principles, scale and criteria, water use and management, water conservation, public participation and community rights, authority, financing, and punishment. These regulations stipulate principles that would ensure, among others, use sustainability, water balance, social welfare, and integrated and environmentally-friendly approaches. Any model developed for the Upper Cisokan area therefore has to adhere to such principles.

Spatial and land use planning related regulations are key to integrating catchment area management with good forest and land management. To date, the Indonesian government has passed Law No. 26 of 2007 on Spatial Planning and issued, among others, GR No. 26 of 2008 on National Spatial Planning, GR No. 15 of 2010 on the Implementation of Spatial Planning, GR No. 68 of 2010 on Form and Procedures of Public Participation in Spatial Planning, Presidential Regulation (PR) No. 28 of 2012 on Java-Bali Island Spatial Planning, Presidential Decree (PD) No. 32 of 1990 on Protected Area Management, Minister of Public Works Regulation (MoPWR) No. 15 of 2009 on Guidance to Formulate Provincial Spatial Planning and MoPWR No. 41 of 2007 on Technical Guidelines on Criteria for Cultivated Area. These regulations can be used to guide the planning, implementation and monitoring forest and land management including in important areas of a river basin.

As discussed above, various regulations stipulate two key points when it comes to forest and ecosystem protection and management in the Upper Cisokan area. These are (a) a strong objective to have forest and ecosystem protection and (b) development of sustainable forest based on protection functions and community welfare. According to Law No. 41 of 1999 on Forestry and Law No. 5 of 1990 on Conservation of Biodiversity and Ecosystems and regulations the following forest areas have protection and/or conservation status:

- Protection forest: a forest area that has the main function of protecting life-supporting systems for hydrology, preventing floods, controlling erosion, preventing sea water intrusion and maintaining soil fertility;
- Conservation forest: a forest area with specific characteristics, having the main function of preserving plant and animal diversity and its ecosystem;
- Nature reserve: a forest area with specific characteristics, having the main function of preserving plant and animal diversity and its ecosystem, and also as the place for life-supporting system;
- Nature conservation forest: a forest area with specific characteristics, having the main function of protecting life supporting system, preserving species diversity of plants and animals, and sustainable use of biological resources and its ecosystem;
- Hunting park: a forest area that is designed to be used as a park area for hunting.
- Other areas with protection and/or conservation status.

Importantly for the UCPS area, Law No. 26 of 2008 regarding national spatial planning requires that logging in production forests can only be done, among others, outside 500 m of the edge of reservoirs. This means that in the UCPS area a zone needs to be created of 500 m around both reservoirs in which no timber can be harvested.

4.3   Institutions

Table 9. Summary of Institutions involved in Upper Cisokan, and the status of their planning documents

Institution	Activity Description	Notes	Relevance to ICM & Proposed Actions
PEMDA	**District Spatial and Development Plans:**	20 year development plans which outline the development zones and restrictions for District development. The time schedule for review of these plans has not been identified.	UCPS project and ICM activities (infrastructure, forestry, conservation & agriculture development) will need to be integrated into the official district spatial plans. The spatial plans have been collected, yet require review through GIS overlays to assess where the ICM plans support or contradict the district government plans
Cianjur District	*Rencana Tata Ruang Wilayah* (RTRW) Kabupaten Cianjur 2011 - 2031		
Bandung Barat District	*Rencana Tata Ruang Wilayah* (RTRW) Kabupaten Bandung Barat 2008 - 2028		
Local government (Desa)	**Village (Desa) Level Development Plans -** RPJM (*Rencana Pembangunan Jangka Menangah*) 2015 - 2019 Desa developed in linkage with the BAPPENAS National Development Plan RPJMN 2015 - 2019	Five year village development plans which link with the national (BAPPENAS) development plan	Official village development plans for villages surrounding UCPS project not yet identified. Verification needed of their existence and contents. Review needed of overlap with LARAP developed development plans for villages involved in the re-settlement program
Regional Agency for Catchment Management (BBWS) (*Balai Besar Wilayah Sungai*) Citarum-Cisadane	**River basin management plan -** Integrated River Basin Water Resources Management Plan for Citarum River Basin (1998)	River basin water management and water resource development master plan for the Citarum basin. The planning period or schedule for review have not been identified.	The plan provides a technical guidance for the ICM reforestation and UCPS dam operation to be developed in accordance to the downstream water resource use and river basin management plans. Follow-up is required with BBWS to collect the plan, review its contents and input maps (e.g. critical land surveys) into GIS to determine how far ICM and UCPS development and activities are compatible with the broader plan.
Regional Agency for Catchment Management (BPDAS) (*Balai Pengelolaan DAS*) Citarum - Ciliwung	**Catchment Management Plan -** Integrated Catchment Management Plan (*RP DAS*) Citarum 2011 - 2026	15 year integrated catchment management plan outlining the surveys, spatial analysis and a strategy for catchment conservation in the Citarum basin. The time schedule for review has not been identified.	The plan provides a highly relevant technical background for the ICM reforestation, community development and upper catchment conservation programs. PLN need review plan contents and input relevant maps (e.g. critical land surveys) into GIS as a first step.

Institution	Activity Description	Notes	Relevance to ICM & Proposed Actions
Perum Perhutani III	**Forest Management Plan** - RPKH (*Rencana Pengelolaan Kawasan Hutan*) 2009 - 2015	15 year forest and forestry concession management plan outlining the spatial analysis and a strategy for production and non-production forest management in the Badung Selatan and Cianjar KPHs. The plan is currently scheduled for review in 2015, with the integration of the UCPS development, reservoirs and catchment management needs yet to be integrated.	The UCPS BMP and Perhutani RPKH require close integration. The process should progress with the PLN - Perhutani PKS development, or become an on-going planning exercise under the PKS guidance.

5   BMP Action Plan

5.1   Construction-Related Impact Management

5.1.1   Minimizing Further Habitat Fragmentation and Losses

5.1.1.1   Management Purposes

A.   Habitat gaps and habitat losses caused by land clearing and cut and fill for access road, inspections roads, dam site, switch yard, power house, disposal, and surge tanks need to be minimized.

B.   Revegetating and reforesting degraded areas.

5.1.1.2   Management Actions

To minimize further habitat fragmentation due to land clearing, the following will be carried out:

1.   Prior to construction starting in any area, survey and clearly mark the BIAs (Working Zone 1) and any areas in Working Zone 2 or 3 confirmed for reforestation by the PLN/Perhutani PKS with tags/markers at least 1 month before.

2.   Review and revision of the agreement for BIA (and blocks in Working Zone 2 and 3) management in accordance with the BMP is required from Perhutani under the MOU and FPS agreement process. Shapefiles of the boundaries of BIAs need to be uploaded onto Geographic Positioning Systems (GPS) and used in the field to work out exactly where these boundaries are and where the physical markers that demarcate the boundary should be placed.

3.   Actions 1 and 2 are to be repeated for any new areas in Working Zone 2 and 3 confirmed for reforestation by the PLN/ Perhutani PKS during the period of Construction, where the land is at risk from impact from construction activities and / or encroachment.

4.   Implement the land clearing SOP[10] during any necessary works with in the BIA.

5.   Provide features such as tunnels or rope bridges along temporary roads to enable wildlife movement and to reduce potential traffic incidents (refer to guidance in Appendix, also see Action 52 below).

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[10]The land clearing SOP (see Appendix 7) provides detailed guidance on the management of land clearing, both in the context of the development roads, dams and other infrastructure, as well as land clearing in the reservoir areas, which requires a different approach.
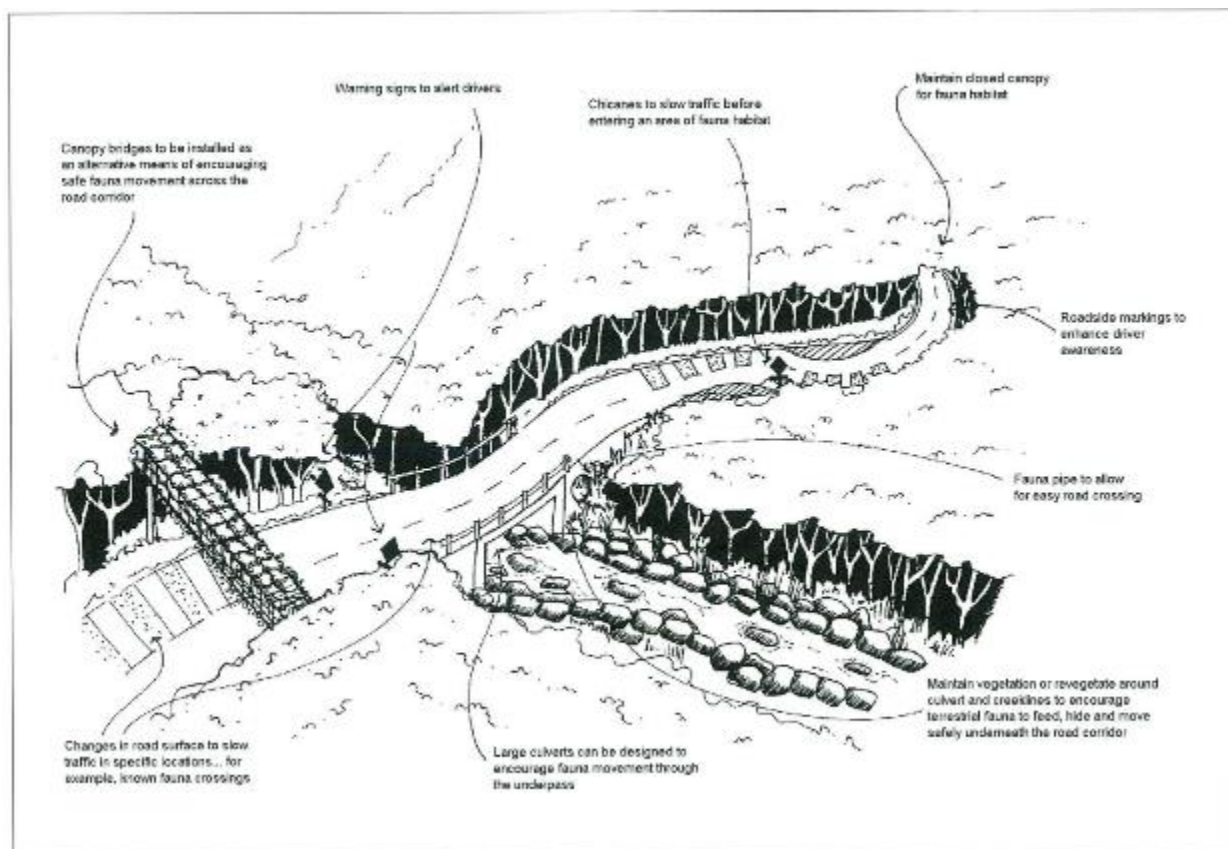
Figure 15. Example of good road design through forest areas that minimizes wildlife impacts (State of Queensland 2000).

Slope stabilisation and revegetation will be implemented in areas disturbed for project construction. Specific guidance on this is provided in the SOP for Land Clearing and Rehabilitation, including methods for establishing and maintaining tree nurseries (Appendix 7):

6. Along the road between km 13 to km 22, especially in degraded road side areas, perennials plants should planted, from the "support zone type", see Appendix 2, for suggested species.

7. In areas close to settlements, reforestation of the road cuttings will be done with plants that are beneficial to the community (non-timber benefits). These could include plants from the "support zone type" or "agroforestry type", see Appendix 2. Final plant species selection depends on preferences from the communities for particular species, the extent to which these species would be used by local wildlife (and thus provide a possible of human-wildlife conflict), and their value for wildlife. Selection of species should be informed by the Biodiversity consultant.

8. Along steep areas adjacent to the road between km 22 and km 25 native shrubs and trees should be planted. In addition to functioning for habitat enrichment, planting the shrubs and trees also aims to stabilize slopes and provide wildlife habitat. Prior to planting, terracing should be considered, also in reference to slope stabilization.

9. In soil disposal areas, dam sides and around main buildings, revegetation is required to stabilize soils. Consultation with communities and other stakeholders should determine what

type of plants should be used for revegetation. This component will be further developed by PLN, once locally optimal and jointly agreed trade-off solutions have been developed between the social, economic and environmental objectives of the area's management.

10. Manage the UPK nursery to supply the type of plants and the volume of plants needed for road and construction site landscaping, as recommended in the planting list. Plants need to be supplied in a timely manner to avoid excessive time periods of soil exposure. Plant seeds, seedlings and saplings need to be collected during land clearing, and maintained in tree nursery areas before being used to restore the area (see Appendix 7). Plants can be sourced from other nurseries as required.

11. Contractor's landscape plan to be consistent with the BMP.

5.1.2 Controlling Access

5.1.2.1 Management Purposes

A. Minimize the increased potential for forest encroachment and wildlife poaching by people who could use new roads to access forest areas.
B. Avoid forest encroachment.
C. Minimize the intensity of poaching.
D. Tree cutting by the people, due to improved access to the area through the access and inspection roads.

5.1.2.2 Management Actions

Develop a practical management plan with Perhutani, local communities, and other land owners. Suggestions include:

12. Create guard post on access and inspections roads near residential areas such as Cipateungteung and Datarmala, and near protected forest areas such as Gowek forest and the Japarana and Walet waterfalls.

13. Perform routine surveillance inspections on roads and in BIAs with the cooperation of local landowners in order to remove traps and deter hunting, logging and removal of plants. These activities should initially focus on the area directly impacted by development, where PLN has legal ownership.

14. Install and maintain signs banning the use of roads by unauthorized people.

15. Install and maintain signs banning hunting, snaring, and other activities that could harm protected wildlife, particularly near BIA and Working Zones.

To avoid or minimize habitat loss due to encroachment:

16. Work with the local communities to improve the understanding of environmental conservation, and minimize encroachment in the BIAs and other Working Zones. These actions need to be developed early on in the project, but are likely to be relevant over longer time frames after enough trust has been built up with communities to start discussing access and use of reforestation areas. Community engagement timing and content should be

integrated with other community consultation and engagement programs for the UCPS (such as community land use mapping, resettlement planning, etc.).

5.1.3 Fire Management

5.1.3.1 Management Purposes
A.   Prevent any project workers and locals from using fires in a way that could impact any forested areas.

5.1.3.2 Management Actions
The efforts to prevent and control forest fires are as follows (will also be covered in SCMP):

17. Project workers are prohibited from making fires for cooking, burning trash, or campfire except within the base camp or other locations specified by the Contractors' Environmental Manager or PLN. Prohibit careless disposal of cigarette butts.
18. A firefighter team is formed by the Contractors to fight fires when these do occur.
19. Fire risk factors within the vicinity of the site need to be identified and monitored, e.g. proximity to active slash-and-burn clearing for cultivation by local communities.
20. Fire breaks shall be established around areas of potential high fire risk, e.g. the camp and offices.
21. Education and awareness raising of local communities with regard to fire management and prevention, and collaborative approaches to multi-objective management of areas that targets both increased community incomes and more permanent tree cover (and reduced fire use) on the area's slopes. (Community engagement to occur in an integrated way with other UCPS programs (such as social mapping, project consultation etc.)).

5.1.4 Managing Impacts of Traffic on Native Fauna

5.1.4.1 Management Purpose
A.   To prevent wildlife deaths and minimize disturbance to wildlife along access and inspection roads.

5.1.4.2 Management Actions
To prevent negative impacts of vehicle traffic on wildlife (animal collisions, disturbance etc.) the following actions will be implemented by Contractors:

22. Information campaigns to explain to drivers about the biodiversity management objectives that seek to avoid wildlife collisions and disturbance, including:
    - Explanations of the kind of animals likely to be encountered on roads (snakes, nocturnal wildlife etc.), and the appropriate action to be taken to avoid road kills.
    - The importance of adhering to local vehicle speed limits, and the consequences of not doing so.
    - The need to report when animals have been hit, and clarity about where these reports are kept and who they need to be reported to.

23. Install and maintain signs in areas of frequent wildlife crossings, saying "beware of animal crossing" (complete with pictures of animals).

24. Develop a system in which drivers report locations of wildlife crossing and wildlife sightings.

5.2 Risk Mitigation of Transmission Infrastructure

Impacts will be mitigated through the mitigation hierarchy with a focus on avoidance (especially of collision and electrocution risk), mitigation (especially of habitat fragmentation effects), and offsetting of residual impacts. Key actions are in Table 10, with technical details provided further below.

Because the risk of bird collision and electrocution on Java remains largely unstudied, a survey, desktop or interview study is needed to determines which species are most vulnerable, the kind of mortalities to be expected per kilometer of transmission line, and the best mitigation options, given the behavioural and morphological characteristics of the most vulnerable species.

Table 10. Key mitigation actions to reduce impact of transmission lines on biodiversity

Actions	BMP action item	Relevant Document
Conduct survey to determine which species on Java are vulnerable to electrocution and collision	Not yet in BMP	Contract of PLN and contractor
Bring line design in line with avian-safe structures, using appropriate horizonal and vertical cable spacing	Not yet in BMP	Contract of PLN and contractor
Insulate energized parts	Not yet in BMP	Contract of PLN and contractor
Apply anti-perch structures	Not yet in BMP	Contract of PLN and contractor
Create canopy bridges where mammal mortalities occur	5. Develop, repair and maintain features that will be used by wildlife such as tunnels and rope bridges	Contract of PLN and contractor
Wire-marking to avoid collisions	Not yet in BMP	Contract of PLN and contractor
Monitoring of animal fatalities by checking along entire length of transmission lines	54. Report wildlife incidences, such as animals getting hit by cars or a tree falling in the project area based on the Human-Wildlife Conflict Reporting form that has been compiled	SOP Fauna Encounter/Accident Report
Surveillance of inspection roads, protected BIA and Working zones for poaching, hunting, timber harvesting etc. with the cooperation of local landowner	BMP Action 13	This activity should be part of the revised MoU and PKS with Perhutani, and it should engage the community in its implementation.
Install and maintain signs banning hunting, snaring and other activities that could harm protected wildlife,	BMP Action 13	This activity should be part of the revised MoU and PKS with Perhutani or in the contract between PLN and contractor, depending on legal authority on transmission line land.
Community consultation regarding conservation, and risks of encroachment and over exploitation of forest resources	BMP Action 16	The outreach should be carried out jointly by the "BMP Facilitation Team" consisting of representatives of PLN,

		Perhutani, and the community (LMDH).
Offsetting strategy	BMP Actions 25 – 44 for reforestation and Actions 45 – 51 for community-based forest management	See for details the action plan in BMP

5.2.1 Mitigating animal electrocution

Reducing power line electrocutions is a raptor conservation priority worldwide. The best strategy is to bury the power lines underground, but this is estimated to be 3 to 20 times more expensive than above-ground infrastructure, especially for high voltage lines (Prinsen et al. 2012). If burying power lines is not an option, physical separation between distribution structures that avoid animals from touching two structures simultaneously is a key mitigation strategy. APLIC (2006) recommends a minimum of 152 horizontal centimeters (cm) and 102 vertical cm of separation between phase-to-phase and phase-to-ground contacts in the vicinity of a likely perch. Structures meeting APLIC's recommendations for eagles are described as "avian friendly." Above 230kV, engineering considerations usually dictate operational safety clearances that exceed recommended avian spacing recommendations (MWH and Stantec 2018).

Retrofitting for avian-safe structures can include one or more of the following strategies (APLIC 2006):

i) line design or configuration: increasing separations to achieve adequate separation for the species involved. When the power line is located within the distribution area of large raptors or storks, this distance should be increased to 1.4 m;
ii) insulation: covering energised parts and/or covering grounded parts with materials appropriate for providing incidental contact protection to birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered. The length of insulated chains should be higher than 0.70 m;
iii) applying perch management techniques.

Avian electrocution risk is lower for transmission structures than distribution poles because engineering requirements necessitate larger clearances (APLIC 2006). For transmission lines, APLIC (2006) recommends an additional 0.5 cm of separation for each additional 1kV over 60kV. Transmission line ratings reflect the phase-to-phase voltage differential; the phase-to-ground voltage differential is smaller. The phase-to-ground voltage can be calculated by dividing the line voltage by the square root of three (1.732), and should be used to determine the appropriate phase-to-ground clearance for transmission lines (MWH and Stantec 2018).

An additional key mitigation measure to prevent primate electrocution is permanent insulation of the wires (Lokschin et al. 2007). While this requires additional investment from the power company, it avoids expensive power outages when animal electrocution causes short-circuits. The following structures require different insulation measures (Prinsen et al. 2012):

- Terminal structures - All terminal structures should be constructed with sufficient insulation on jumper wires and surge arrestors;

- Strain structures (where jumpers are used) - At least two jumper wires should be suspended below the cross-arm, and the third jumper insulated. Alternatively all jumpers should be insulated;
- Take-off structures - Switches should be designed so that perching by birds on switch gear is unlikely, and/or all dangerous components are insulated. Switch gear should preferably be mounted below the cross-arm. Alternatively, insulated perch sites are installed way above the switch gear over the whole length;
- Intermediate structures with horizontal configuration of lines - Large enough to accommodate the wingspan (or 'wrist-to-wrist') of the largest perching bird species in the country if all three phases are above the cross-arm. Alternatively, two outer conductors should be suspended below cross-arm.
- Intermediate structures with vertical or 'delta' configuration of lines - Large enough to accommodate the 'tip-of-toe to tip-of-beak or outstretched wing' or 'head-to-foot' dimension of largest species present (leopard).

Anti-perch devises can be useful to prevent birds from perching and potentially getting electrocuted, but they need to be carefully positioned and shaped so that they do not force birds to perch even closer to energized parts. Alternatively, if many birds are attracted to the nesting opportunities provided by transmission towers, and removal of such nests is costly, the provision of artificial nests has shown to be a cost-effective way to reduce natural nests in Japan (natural nests decay quickly and can cause short circuits) (Shimbun 2017).

Furthermore, maintenance of natural canopy bridges, and the preparation of artificial canopy bridges over the roads and over or under electric power supply lines could further minimize mortality of primates and other arboreal mammals in forest patches (Lokschin et al. 2007; Al-Razi et al. 2019). This requires regular patrolling of transmission line routes to look for electrocuted animals and determine whether alternative crossing structures such as canopy bridges could guide animals away from transmission infrastructure. Community monitoring along powerlines further helps identify electrocution hotspots, so that mitigation measures (e.g., arboreal bridges) can be spatially targeted (Lokschin et al. 2007).

5.2.2 Mitigation of bird collision

Although different bird species fly at different heights above the ground, there is general consensus that the lower power line cables are to the ground, the better for preventing bird collision. There is also consensus that less vertical separation of cables is preferred as it poses less of an 'obstacle' for birds to collide with (Figure 16). Horizontal separation of conductors is therefore preferred (Prinsen et al. 2012).

The most frequently used measure is wire-marking, which alerts birds to the presence of power lines and provides them with more time to avoid the collision (Janss 2000). Since the assumption is that birds collide with overhead cables because they cannot see them, fitting the cables with devices to make them more visible to birds in flight has become the preferred mitigation option worldwide. Besides thickening, coating or colouring the often least visible thin ground wires, a wide range of potential 'line marking' devices has evolved over the years, including: spheres, swinging plates, spiral vibration dampers, strips, bird flappers, aerial marker spheres, ribbons, tapes, flags, fishing floats, aviation balls and crossed bands. There is generally a lack of quality evaluative research of the effectiveness of these devices at the international

level, the evidence to date suggests generally positive results (Prinsen et al. 2012). Jenkins et al. (2010) conclude that, barring some notable exceptions, "any sufficiently large form of marker (which thickens the appearance of the line at that point by at least 20 cm, over a length of at least 10-20 cm), placed with sufficient regularity (at least every 5-10 m) on either the ground wires (preferably) or the conductors, is likely to lower general collision rates by 50-80%". Barrientos et al. (2011), reviewing 21 wire-marking studies, similarly conclude that wire marking reduced bird mortality by 55-94%.

Figure 16. A 400 kV line, with all conductor wires in the same horizontal plane. This picture also demonstrates the almost invisible thin earth wire (black arrow) in top (Photo: EWT-WEP) (Prinsen et al. 2012).

5.2.3   Mitigating habitat loss and fragmentation

The key mitigation strategies to compensate the direct and indirect impacts to Critical Habitats are to:

1. Provide mitigation strategies that reduce impacts from forest fragmentation, unauthorized and illegal land clearing away from the road, and illegal hunting.
2. Offset the areas directly and indirectly affected by transmission line infrastructure to ensure net gain for the habitat of Critically Endangered species, following ESS6.

Where the transmission line passes through Perhutani land, the collaboration between PLN and Perhutani through the renewed PKS should ensure that Perhutani as the legal authority for these forest areas implements actions that prevent illegal logging and hunting, including the placement of sign post, patrolling of forest edges and areas, community outreach, and law enforcement.

Where Critical Habitat is lost, this will be offset through the landscape-level reforestation program in the UCPS landscape, under the working agreement (PKS) between PLN and Perhutani for reforestation in working zones 1, 2, 3 and 4.

5.3 Reforestation and Forest Management

5.3.1 Collection of Plant Material, Management of Nurseries and Planting Services

5.3.1.1 Management Purposes

A. Fulfil annual reforestation targets as shown in Table 3.

B. Ensure a suitable supply of plants, including appropriate varieties / species, to replant roadsides and construction areas in a timely manner.

C. Ensure good supply of plants, including appropriate varieties / species, for reforestation and agroforestry activities in BIA and Working Zones 1 – 3 initially, and in future, Working Zone 4. Work with Perhutani and communities to determine appropriate choice of tree species for replanting (balancing ecological and economic goals).

D. Identify opportunities for local income from collecting seeds and seedlings, operating nurseries and planting.

5.3.1.2 Management Actions

25. Contractor to prepare planting / landscaping plans for construction sites on PLN land consistent with the BMP, and revegetate exposed areas quickly to avoid erosion and weed infestations.

26. Review options and confirm a reliable supply of planting materials for BIA Working Zone 1 and Working Zone 2: UPK Nursery, Perhutani nurseries, commercial nurseries and / or locally run nurseries. Nurseries must be able to provide the appropriate species for ecological restoration (preferably locally sourced materials), in a volume and quality required, and in a timely manner. Ensure coordination between nurseries where required.

27. Review and ensure capacity (skills, labour force) for reforestation activities: UPK nursery, Perhutani, commercial nurseries / foresters, local nurseries / labour.

28. Scope local interest in collecting local materials, nursery operation and tree planting contracts. Consider developing local capacity and capability to be able to carry this out. This may require some external expertise to train and support locals. Equal opportunity should be provided to men, women and young people. Locals could be subcontracted by commercial or Perhutani forest operators.

29. All replanting shall follow the recommendations for species in the BMP (Appendix 3) and the planting plans for each block.

5.3.2 Forest Restoration and Ecological Connectivity

5.3.2.1 Management Purposes

A. Guarantee that the remaining wildlife habitats are protected and expanded through reforestation and development of forested corridors and a green belt around the inundated areas.

B. Increase the quality of wildlife habitat, and increase other ecosystem functions, such as drinking water provision, and prevention of erosion and landslides.

C. Maximize the ecological connectivity between forest patches and other species habitats and develop a network of connected forest areas in the larger watershed that ensures that

biodiversity, environmental, legal, and socio-economic targets are met. Reforestation will be prioritised according to the Working Zones as follows:

- Reforestation of PLN land around the construction areas and the 5m vertical green belt (2015 – 2020).
- Working Zone 1 – BIAs (319ha) – (2015 – 2017).
- Working Zone 2 – Adjacent Forest Corridors (280 ha) – (2015 – 2020).
- Working Zone 3 – 500 m Re-greening Zone (2195 ha) – (2017 – 2020).
- Working Zone 4 – Near-Catchment Extended Corridors (3800 ha) – (2020 – 2025).

5.3.2.2 Management Actions

30. Confirm the legal requirements for forest and land protection as defined in Indonesia's laws and regulations for protection of watersheds and waterways, reforestation of land identified as critical, and protection of habitats of protected and endangered wildlife. Refer to Figure 8 and discussion in Section 4. Develop a proposal to change relevant blocks of land to *Hutan Lindung* and other types of protected forest, in accordance with the relevant legislation and relevant to the planting plans for each Working Zone. Outline the likely steps, and who will be involved. Liaise with the relevant government ministries to seek land use classification changes.

31. Confirm the planting plans for BIA / Working Zone 1 in partnership with Perhutani, PEMDA and local community. All existing forest / land uses in the BIA will be identified, and if there are any share croppers or other forest / land uses by the community then the affected people will be part of the consultation process. The goals of the planting plan are: 1) to restore or enhance ecological function for the key species known to be present, 2) to protect slopes from erosion; and 3) provide tree-based incomes to communities. The plans should be consistent with laws relating to conservation and protection forest (refer to action 30 above), and should not adversely impact on people's livelihoods or access to resources without mitigation. Preferred species are native species with maximum ecological value for target species. In the BIAs, no agriculture, monocultures or agro-forestry or sharecropper activity (other than non-timber forest products) should be allowed. Agree on the blocks that will be subject to replanting, prepare maps, confirm reality on the ground, and confirm the species list to meet the appropriate goal(s), the timing and who will be responsible for supplying the plants, planting, monitoring and maintenance, and the reporting progress. Input any community requirements into the plan. The plan will be integrated into Perhutani's forest management program.

32. Facilitate community involvement and consultation in the reforestation planning and implementation. If there will be any relocation of sharecroppers or adverse impacts on livelihoods, the World Bank Safeguard Policy OP4.12 applies and mitigation measures must be consistent with the policy.

33. Implement the planting plan for BIA / Working Zone 1.

34. Confirm the planting plans for Working Zone 2 in partnership with Perhutani. All existing forest / land uses in the Zone will be identified, and if there are any share croppers or other forest / land uses by the community then the affected people will be part of the consultation

process. The goals of the planting plan is to 1) restore or enhance ecological function for the key species known to be present in the adjacent Working Zone 1 / BIA; 2) provide corridors of habitat to allow animal movement between remnants; and 3) to protect slopes from erosion. The plans should be consistent with laws relating to protection forest (refer to action 30 above) and should not adversely impact on people's livelihoods or access to resources without mitigation. Native species should be prioritized for maximum habitat value for target species. Other tree species for 'traditional' agro-forestry and non-timber forest product harvesting can also be planted, but no agriculture or tree monocultures. Agree on the blocks that will be subject to replanting, prepare maps, confirm reality on the ground, and confirm the species list to meet the appropriate goal(s), the timing, and who will be responsible for supplying the plants, planting, monitoring and maintenance, and reporting progress. Input any community requirements into the plan (where relevant). The plan will be integrated into Perhutani's forest management program.

35. Facilitate community involvement and consultation in the Working Zone 2 reforestation planning and implementation. If there will be any relocation of sharecroppers or adverse impacts on livelihoods, the World Bank Safeguard Policy OP4.12 applies and mitigation measures must be consistent with the policy.

36. Implement the planting plan for Working Zone 2.

Working Zone 3 is called the 'Reservoir Re-greening Zone' and covers an area extending to 500m horizontal around each reservoir where logging is excluded. The proposed zone is based on an interpretation of National Law No. 26 of 2008 (see Chapter 5.2). The land within Working Zone 3 is a mix of PLN, Perhutani, private and community land.

37. Liaise with the Ministry of Environment and Forestry regarding legal zoning of the 500m logging exclusion zone under the Forest Law (U.U. NO. 41 of 1999), and a 100m zone of catchment protection forest around the reservoirs, along stream lines and to protect steep slopes as required by the Presidential Decree on the Management of Reserve Areas (KePres 32 of 1990).

38. Determine the land available within Working Zone 3 that is available for reforestation and protection by mapping ownership and forest cover, and develop a plan to reforest and protect the land. Agreements will need to be made with land owners and users:
    - PLN and Perhutani to develop a PKS regarding the reforestation and protection of land from logging on land controlled by Perhutani.
    - PLN and land owners / communities to develop agreements for reforestation and cessation of land clearance on private / community land.
    - PLN or Perhutani strategically acquire private or community land for reforestation through land swaps, direct purchases and /or leases (depending on the land owner).

39. Confirm the planting plans for the blocks within Working Zone 3 in partnership with Perhutani and the community. This will be done in an iterative way, following the agreement process above. There are multiple goals for the planting plans: 1) To restore or enhance ecological function for the key species known to be present in the adjacent Working Zone 1 / BIA, 2)

provide corridors of habitat to allow animal movement between renmants, 3) provide income to communities (and avoid adverse impacts on income and livelihood) and Perhutani and 4) protect land from soil erosion. Any resettlement would be voluntary. Native tree species are preferred, but traditional agro-forestry or species with non-timber forest values can be planted too. No logging or agriculture. The plans should be consistent with laws relating to protection forest (refer to action 30 above). Agree on the blocks that will be subject to replanting, prepare maps, confirm reality on the ground, and confirm the species list to meet the appropriate goal(s), the timing, and who will be responsible for supplying the plants, planting, monitoring and maintenance, and reporting progress. Input any community requirements into the plan (where relevant). The plan will be integrated into Perhutani's forest management program.

40. Implement the planting plans for Working Zone 3.
41. Review progress of Working Zones 1, 2 and 3 reforestation approaches, practices, successes and failures, and revise the approach to planting plans as required through the implementation phase.

Working Zone 4 is a longer term aim (2020-2025) and the location of the blocks for reforestation is indicative only, based on the review of forest cover undertaken in 2014. Working Zone 4 is essential to achieve the 3,800 ha of contiguous forest cover and the minimum habitat requirements for in-situ conservation of the key species of interest.

42. Find the most suitable land outside of Working Zones 1, 2 and 3, but within the wider catchment, which could be useful for biodiversity conservation as part of the ICM. This will involve conducting biodiversity surveys in the forest fragments in the wider landscape (those identified in Working Zone 4 and the surrounds) to determine the nature of the habitat and the presence of threatened species, and surveys of land / forest use by Perhutani and communities. These areas shall be GPS mapped and documented, and recommendations made for Working Zone 4.
43. Based on learnings from Working Zone's 1 – 3, and the field surveys above, start detailed planning for Working Zone 4. Revise and refine the location of the connected blocks, and plan for a phased approach to reforestation across the Zone. Develop a set of criteria for prioritisation of blocks, and follow those criteria through the planning process. Engage the community in the process, and other stakeholders as required. Outputs are an updated Working Zone 4 outline map showing the phased approach to reforestation 2020 – 2025.
44. Implementation of above to follow the planning phase.

5.3.3 Forest Management

5.3.3.1 Management Purposes

A. Protect the forested areas of the Working Zones to avoid future logging, land clearance, hunting or poaching.
B. Explore ways to incorporate community benefits from forest management.
C. Monitor progress.

45. Blocks reforested in accordance with the BMP and the PLN / Perhutani PKS shall be GPS mapped and entered into the PLN ICM database and Perhutani forest management database, with the purpose of the land use documented (ecosystem services, agroforestry, non-timber forest products etc.).

46. All reforested blocks require ongoing protection on the ground. This will be a combination of awareness raising, patrolling and signage. PLN and Perhutani (and assisting organizations, see under 6.4) to develop and implement a management strategy for BIA / Working Zone 1 and 2 that addresses the commercial, ecological, social and socio-economic incentives and disincentives to keep the forests intact. Involves fire management, encroachment, illegal and legal logging. This will involve community engagement / consultation. This is likely to be the responsibility of Perhutani to manage on their land, however PLN and supporting implementing organization (see 6.4) will support in terms of assisting with awareness raising, research into incentives and disincentives and other methods to get community buy in. Community may participate by providing patrolling services, maintaining tree plantings, running awareness campaigns etc.

47. All reforested blocks in Working Zone 3 require protection on the ground. This will be a combination of awareness raising, patrolling and signage. PLN, village leaders and Perhutani to develop and implement a management plan for Working Zone 3 that addresses the commercial, ecological, social and socio-economic incentives and disincentives to keep the forests intact. Involves fire management, encroachment, illegal and legal logging. For example, any land used for agroforestry is maintained with full canopy, and not cleared for alternative land uses. This is likely to be the responsibility of Perhutani to manage on their land, and village heads to manage on village land, however PLN and supporting implementing organization (see 6.4) will support in terms of assisting with awareness raising, research into incentives and disincentives and other methods to get community buy in. Community may participate by providing patrolling services, running awareness campaigns etc.

48. Review various models for long term community involvement in forest management such as Community Forest Management (CFM), Community Forest (HkM) and other tenure or benefit sharing options. This is to identify incentives for communities to keep forests intact and also to identify alternative livelihoods to replace 'slash and burn' and other degrading agricultural practices. Models may be voluntary, or provided for under Indonesian legislation. Update the legal review on options provided in 2014 in the ICM Technical Advisory Report. Workshop ideas with Perhutani and village representatives and explore possibilities. Prepare a decision paper or similar to confirm the issues and options and recommendations / way forward.

49. Consider other models of long term forest management other than as proposed above, such as status quo (Perhutani management), NGO management, changes to land status under Indonesian legislation to conservation or protection forest. Perhutani and PLN to develop possible scenarios and consult widely on proposals.

50. Implement forest management recommendations as appropriate. Perhutani and community to lead the process, supported by PLN, ICM Facilitation Team, and other external parties as required.

51. Annual forest cover to be measured using satellite imagery to document reforestation efforts. This will be the responsibility of PLN to collect, analyse and report to stakeholders. The methodology and outputs is to be consistent with the 2014 forest cover mapping and reports (see Chapter 10. 2 on monitoring methods).

5.4 Wildlife Management

5.4.1 Wildlife and Habitat Management

5.4.1.1 Management purposes

A. To ensure that threatened or protected wildlife can survive and eventually expand population sizes by reducing direct and indirect threats) and increasing available habitat.
B. Prevent wildlife disturbance and wildlife deaths (nest, eggs, infant, juvenile).
C. Avoid dangerous encounters between project workers and wildlife (e.g., venomous snakes).

5.4.1.2 Management Actions

To minimize impacts on animal movement due to the dissection of habitats by infrastructure:

52. Dry culverts (faunal underpasses) and canopy bridges will be installed to enhance opportunities for fauna to safely cross the barrier imposed by the temporary and permanent roads, distribution and transmission lines and similar infrastructure. Vegetation growth around the culverts will be encouraged to provide cover for animals and facilitate entry into culverts. Where arboreal species such as monkeys frequently cross, rope bridges will be constructed to facilitate their movement across roads. Rope bridges will be made more attractive to fauna by placement of branches and ropes, which will provide easier access. For specifications for each BIA see Appendices 1 and for general guidance refer to Appendix 3, 4 and 5.

To prevent wildlife disturbances, hunting, poaching etc:

53. PLN ensures that project personnel understand the laws and legislation on protected species, Law number 5 in 1990, and government regulation number 7 in 1999. Training will be part of project / site inductions. All employees, consultants and contractors are prohibited from the following activities at any time on the site:
    • Hunting terrestrial or aquatic fauna
    • Collecting native flora for personal or commercial use
    • Possessing firearms, traps, snares, or other hunting equipment
    • Chasing or disturbing fauna
    • Keeping domestic cats, dogs, chickens, ducks, other domestic pets or otherwise Feeding of wild animals
54. PLN will report and record any incidences involving wildlife, such as animals getting hit by cars or a tree falling in the project area.

The ongoing monitoring and management of the 10 species of interest (Table 1) is important to determine the success of the BMP and ICM.

55. Confirm presence of Javan Slow Loris in BIA 2, 3, 5, 6, 13 and 14 through rapid survey (Little Fireface Project in West Java specialize in slow loris surveys, see http://www.nocturama.org/). Biodiversity management in BIA 2 and 3 is presently only justified on the reported (but unconfirmed) presence of Javan Slow Loris and getting confirmation on species presence would be valuable[11].

56. Develop patrol teams consisting of Perhutani staff, PLN staff, ICM Facilitation Team members, community members, and / or, if required, government representatives. Teams conduct regular patrols in the demarcated BIAs initially, and then the Working Zones 2 and 3 progressively as they are reforested. Teams check for illegal activities, remove traps and generally protect these retained forests from encroachment. Patrols teams will be established in:
    • 2 teams - Sukaresmi (to cover the upper dam and access road BIAs)
    • 1 team - Cibule (to cover the Gowek, Curug Walet and Pasir Salamareas)
    • 1 team - Sukanagara (to cover higher reaches of Cisokan River in lower reservoir area)
    • These teams report to the Pos Komando in the project camp, which in turn coordinates with PLN and the ICM facilitator, and if required BKSDA, Perhutani, Puskesmas and other relevant organizations.
    • Data collection and analysis will be conducted by competent, independent wildlife experts.

57. Implement an ongoing wildlife monitoring programme, focussed on the 10 species of interest. Maintain data collecting efforts on species populations and habitat extent (see Monitoring and Evaluation section below) to provide feedback to management and ensure an effective adaptive management process that learns from successes and setbacks. This requires contracting competent scientists that understand data collection and analysis to do the work, who are able to extract information from the data that directly informs the adaptive management process.

58. Based on the recommendations from monitoring reports, implement wildlife management projects to sustain the individuals or populations. The actions will be specific to the issue raised, but may include:
    • Supplementary feeding
    • Protection in the form of fencing, signs and increased patrolling
    • Camera traps or other methods of intensive monitoring
    • Providing veterinary care

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[11] In 2015, a slow loris was confirmed to occur near the PLN base camp in Cisokan.

5.4.2 Wildlife Encounters

5.4.2.1 Management Purposes
A. To reduce wildlife conflict with community members and resources (for example damage to livestock or crops).
B. Avoid further negative impacts by local communities on wildlife, their habitats, and their food resources (e.g., prey species for carnivores, fruit trees etc.).

5.4.2.2 Management Actions
Management actions that will be performed to manage wildlife encounters, protect wildlife and minimize human-wildlife conflict include:

59. Implement wildlife encounter protocols and train project workers about what to do when potentially dangerous wildlife is encountered, including a prohibition on handling (or killing) snakes, catching animals deemed to be a threat, or taking any action potentially harmful to wildlife. The best response is always to leave wildlife alone, and to leave wildlife management to experts (see below).
60. Set up a rapid response wildlife management unit that has the ability to react quickly to human-wildlife conflict. This function can be provided by a third party, rather than in-house within PLN or Perhutani.
61. Provide information to the community, related to the behaviour of animals that can cause interference, including how to avoid and deter the wildlife.

5.5 Stakeholder Participation

5.5.1 Strengthening Capacities for Institutionalizing Integrated Catchment Management
PLN cannot implement the BMP, or achieve the aspirations of a Green Dam without engagement and participation by communities and stakeholders. PLN needs to raise awareness of the project and the issues, seek partnerships, find funding and resources and get broad buy in and commitment to the vision and goals. Engaging a BMP advisor is needed. The person and a group of Technical Assistants will design detailed programs, implement actions on the ground, engage with and facilitate between external stakeholders, and arrange financing. This team is referred to as the ICM Facilitation Team.

5.5.1.1 Management Purposes
A. Increase knowledge and awareness of ICM for Upper Cisokan and biodiversity management.
B. Increase the participation of local stakeholders ICM for Upper Cisokan, and in the management of biodiversity.
A. Improving coordination and cooperation within PLN and between PLN, Perhutani, local government, and the local communities related to ICM.
B. Harmonize the activities of the various parties (e.g., PLN, Perhutani and Community) in the project area of influence to optimize the protection of habitat and wildlife populations, including effectively addressing the interests of the public and other related parties.

To build capacity within PLN for using ICM as a way to integrate the numerous safeguards activities during the Construction Period, and to integrate PLN's activities into the near catchment:

62. Engage an ICM Facilitation Team that will assist PLN to champion the integrated approach to safeguards, and to achieve results on the ground. The Team is responsible for assisting PLN to implement biodiversity management, monitoring its impacts, and informing the stakeholders about best management practices.

To develop and maintain relationships between key stakeholders:

63. Improve the stakeholders' understanding of ICM and BMP by running stakeholder workshops, field trips, and one-on-one meetings etc. This is an ongoing process, focusing on sharing information, data, plans, resources etc. The outcome is engagement with the ICM vision and goals.
64. PLN/Perhutani MOU to be reviewed and updated and Forest Partnership framework finalized and jointly agreed.
65. Continue reforestation program with other stakeholders as required (such as PEMDA, BKDSA) to achieve specific projects as required.
66. Continue to build trust and engagement with key stakeholders with the purpose of developing an entity that will have long term responsibility for ICM in the catchment, align stakeholder funding and projects with the goals and vision of ICM, and seek funding support.

To engage with other activities in the catchment, and ensure that they are aligned with the BMP vision and goals:

67. Work with PEMDA and villages to contribute to Village Development Plans. Ensure the plans are consistent with the vision and goals of the BMP and consistent with an ICM approach to management of resources in the catchment. PLN will do this as part of the resettlement and livelihood restoration process.

5.5.2   Gaining Political Support

Implementing the first successful Green Dam project in Indonesia has the potential to gain significant political support, as well as financial support from local and national governments.

5.5.2.1   Management Purposes

A.   Present a convincing case to local and national level government institutions for the social, environmental and economic benefits that can be derived from an effectively implemented ICM program in Cisokan.
B.   Seek political support that can assist in diverting funding and resources into the catchment.

68. Develop clear materials that explain the ICM vision, and local and national costs and benefits of ICM in language and graphics that policy and decision-makers can easily understand and use.

69. Develop plans for how government could support the ICM implementation (e.g., through use of Indonesia's reforestation fund; engagement with the REDD+ working group, and others).

70. Present the case for ICM in Cisokan at local, national and international fora to create a 'buzz' about the program, getting media, NGOs, and other donor organizations interested, and generating public support.

5.6   Community Engagement

In addition to community awareness raising and consultation actions mentioned elsewhere in the Action Plan, this section outlines plans to build a working relationship with communities and to facilitate the transition to alternative, more environmentally sustainable livelihoods.

5.6.1   Biodiversity Awareness, Communication and Education

5.6.1.1   Management purposes

A.   Increase knowledge and awareness of the issues and management of biodiversity.

B.   Coordinate communications with wider project communications.

C.   Effectively engage with communities to ensure that they can participate fully in the ICM plans for the catchment and can maximise the benefits from development.

5.6.1.2   Management Actions

Improve awareness and understanding through various consultation methods:

71. Improve the communities' understanding of PLN's ICM approach to catchment issues, and the BMP more specifically, and how forest-based incomes and improved and intensified agricultural production can ultimately deliver net positive benefits to community economies and forest production targets by running community-based workshops, field trips, meetings etc. This will be coordinated by the BMP Facilitation Team and PLN's stakeholder engagement team for UCPS . Discussions can include both the development opportunities in the context of the Cisokan project but also bring in environmental and biodiversity co-management ideas when communities are receptive. The communications need to be inclusive of all community members.

72. Increase the public awareness about the importance of threatened and protected wildlife. Materials will be developed. Communications need to be addressed tactfully. Communities are experiencing significant change during the project development, and biodiversity issues are unlikely to be very high on their agendas. Environmental and biodiversity issues need to be addressed as part of a jointly agreed strategy to increase community income and welfare, and part of the wider UCPS Social and Community Management Plan (SCMP).

73. Develop a participatory process for ongoing community engagement / liaison – agree with community leaders who will be involved, how, frequency, and how best to disseminate information.

Communities will need support to engage with PLN on the BMP and the ICM approach. Communications will need to be on their terms, and they may require expertise or assistance from PEMDA (or other organisations) to be effective.

74. Engage PEMDA to be part of the communications to provide expertise and capacity.
75. Formulate MOU or similar between PLN, villages and PEMDA (and Perhutani where relevant) to implement specific activities.
76. Support communities to engage by providing technical assistance, or facilitating the involvement of an NGO to build capacity.

5.6.2 Aligning Resettlement Programmes with the BMP

Resettlement of people displaced from the UCPS project cannot be in conflict with the goals and actions of the BMP.

5.6.2.1 Management Purpose

A.   To integrate the BMP into the Resettlement Planning process to ensure that the resettlement of displaced people does not impact on the goals and actions of the BMP.

B.   To highlight the potential opportunities for resettled areas to contribute to reforestation and watershed management and to achieve a more successful and sustainable livelihood restoration program.

C.   To ensure that any livelihoods that are adversely affected by the BMP will be addressed under World Bank Safeguard Policy OP4.12 Involuntary Resettlement.

5.6.2.2 Management Actions

77. Provide the resettlement team with a checklist to assess each village against World Bank safeguard principles the ESMP and the BMP. Review quick survey information such as the location of dwellings and agricultural land, and review the draft resettlement plans, to ensure that the above has been done.

78. Work with the resettlement team, PEMDA and village communities in a participatory way to find solutions to resettlement that avoid conflicts with the BMP and to enhance any opportunities to improve land use, land cover etc. in a way that meets the goals and actions of the BMP. Influence the livelihood restoration and infrastructure development to be environmentally sustainable. Ensure all social and environmental impacts are mitigated or avoided (such as impacts on host community livelihoods). Sign MOU, or other agreement as required, to formalise any arrangements. Assist with implementation (funding, resources etc.). If necessary this may include specialist expertise (agricultural NGOs etc.) to assist with the livelihood restoration in sensitive areas near BIAs or other Working Zones as required.

5.6.3 Alternative Sustainable Livelihoods for Communities

5.6.3.1 Management Purposes

A. Increase community incomes with activities that are aligned with biodiversity conservation and broader ICM objectives. Increased community income in the UCPS area aims to decrease the pressure on lands, reducing forest encroachment, and reducing the collecting and hunting of wildlife.

B. Improve the sustainability of land use on Perhutani land by communities, to reduce environmental impacts and increase income potential. This is intended to reduce the pressure for land clearance and other high-impact agricultural practices.

5.6.3.2 Management Actions

Facilitate the opportunities for local income from reforestation activities:

79. Facilitate the opportunities for income from the reforestation process: plant material collection, tree nursery management and / or tree planting contracts. Ensure there is equal opportunity for men, women and youth.

80. Work with communities to identify keen groups or individuals to work with Perhutani on forest patrolling activities in the BIA / Working Zone 1 and Working Zone 2 (and 3 once established). Facilitate the development of patrols until such time as they are self-sufficient. Refer to action number 56.

Facilitate the communities across the near catchment of UCPS to improve land use and transition to sustainable livelihoods with improved income potential.

81. Through the collaborative approach of ICM, identify land uses that deliver both socio-economic and biodiversity benefits. Work together with communities and specialists (government agencies, NGOs, consultants, development partners) to identify and then develop potential opportunities for alternative livelihoods on community or private land. Prioritise land / communities in or near the reforestation Working Zones, and consider opportunities for men, women and youth. Consider various approaches for assisting the transition to new livelihoods (training, networking, mentoring, cooperative structures, fair trade, infrastructure development, micro-finance, agricultural extension, provision of tools/ equipment/ raw materials). Develop community programs that link directly to the success of maintaining (re)forested areas, and make community support conditional on forest management performance. Community opportunities may include:
    - Alternative methods of agriculture – higher value products, agro-forestry, non-timber forest products.
    - Adding value to agricultural or forest products –manufacturing, processing, packaging.
    - Tourism.

Much of the village income is derived from legal and illegal use of forestry land for share cropping, shifting agriculture, timber harvesting and non-timber forest products. Many hundreds of households rely solely on forestry land in this way. The reforestation plan will change the way some people access

and use land, and this needs to be mitigated to ensure people are not worse off and that the reforestation program is not compromised. Ideally, working together with the communities there is an opportunity to provide alternative, sustainable livelihoods, with improved income potential.

82. Work with Perhutani, PEMDA and communities to refine plans for changes to community land uses (share cropping, non-timber forest products etc.) on Perhutani land in the BIA / Working Zone 1 and Working Zone 2. Through participatory processes, agree (through MOU) to suitable land uses for alternative livelihoods (agroforestry, non-forest-timber products, agriculture that protects soils from erosion), where these should be located, how they should be 'regulated'. Develop MOUs or similar to formalise the arrangements.

83. Implement the plans as described above.

84. Work with Perhutani and communities to develop plans for changes to land uses on Perhutani land in Working Zones 3 and 4. Through participatory processes, agree (through MOUs) to suitable land uses for alternative livelihoods (agroforestry, non-forest-timber products, agriculture that protects soils from erosion), where these should be located, how they should be 'regulated'. Develop MOUs or similar to formalise the arrangements.

85. Implement the plans as described above.

86. Livelihood restoration plans need to be developed for any people adversely affected by the reforestation process.

6 Program

Table 11. BMP Program – Significant Activities and Project Phases

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
A.	**Construction-Related Impact Management**							
A1.	**Minimizing Further Habitat Fragmentation and Losses**							
1	Survey and mark out BIA on the ground prior to construction at least 1 month before	(1) Mark out BIA boundary both on the map and on the ground				Perum Perhutani	MoU PT. PLN (Persero) and Perum Perhutani, Contract of PT. PLN (Persero) and Contractor	The installation of boundary markers is necessary to facilitate monitoring, and also to make it easy for the public to recognize.
								The delineation of BIA territorial boundaries and corridors in the BMP AP 2020 should be included in the revised MoU and PKS between PT. PLN (Persero) and Perum Perhutani.
2	Agreement for BIA (and blocks in Working Zone 2 and 3) management in accordance with the BMP is required from Perum Perhutani under the MoU and PKS	(2) Extend MoU and PKS with Perum Perhutani				PT. PLN (Persero) and Perum Perhutani	MoU PT. PLN (Persero) and Perum Perhutani, Perum Perhutani Revegetation Report	The contents of the revised MoU and PKS are adjusted to several findings of the BMP 2020, such as community engagement from seedling nursery to planting maintenance as well as tree species selection based on the BMP AP 2020 recommendations.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
3	Confirm the planting plans for Working Zone 2 and 3 as required during the period of construction	(3) The planting plan in Working Zones 2 and 3 is adjusted to the goal of improving the quality of wildlife habitat and accommodate community to meet their daily needs				PT. PLN (Persero) and Perum Perhutani	MoU PT. PLN (Persero) and Perum Perhutani	It should be included in the revised MoU and PKS between PT. PLN (Persero) and Perum Perhutani
4	Implement the land clearing SOP12 during any necessary works in the BIA	(4) Continue to implement the land clearing SOP12 during any necessary works in the BIA as long as land clearing takes place				Main contactor	Contract of PT. PLN (Persero) and contractor	
5	Provide features such as tunnels or rope bridges along permanent and temporary roads (refer to guidance in Annex also action 51)	(5) Repair and maintain features that will be used by wildlife such as tunnels and rope bridges that have been built				Main contactor	Contract of PT. PLN (Persero) and contractor	Repairs should consider the suitability of materials and designs for the target species. Work steps: 1. Maintain tunnels as corridors 2. Repair rope bridges by considering the existing conditions (in 2020) between NR24,550 to NR25,150 (BIA 6) because the impact of AR development on the rope bridges of BIA 3, 4, and 5 is permanent with geographical isolation permanently (residue impact)

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
								3. Data management related to the condition of the features that have been built and placed in a location in accordance with the BMP AP 2015 recommendations
6	Perennial planting along the access road between km 13 to km 22 for stabilization, especially in degraded road side areas (see appendix 2)	(6) Continue perennial planting in some landslide-prone areas along the access road, including the replanting between km 13 to km 22 if required					Contract of PT. PLN (Persero) and contractor	The plant chosen should refer to the recommended plant species in the BMP AP 2020 document. The database of species planted along the access road between km 13 – km 22 should be developed.
7	Planting of trees for community use near resettlements. These could include plants from the "support zone" or "agroforestry type", see appendix 2.	(7) Continue planting of trees for community use near resettlements					MoU PT. PLN (Persero) and Perum Perhutani	Plant species and agroforestry models are adjusted to the recommendations in the BMP AP 2020.
								Plant species and agroforestry types in the BMP AP 2020 are the results of the study of the PRA by Perum Perhutani, FGD with the community, and a list of BMP 2015 plant species. Work steps:

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
								1. Planting according to the species listed in the species recommendation list (appendix 2) in the area near the settlement. 2. Monitor the planting that has been done 3. Data management related to plantings near the resettlements area
8	Native shrubs and trees planted for stabilization on steep slopes areas adjacent to the road between km 22 and km 25	(8)Continue planting native shrubs and trees for stabilization on steep slopes areas adjacent to the road between km 22 and km 25				Main contactor	Contract of PT. PLN (Persero) and contractor	Planting has been carried out, but landslides still occurred. The species planted should be in accordance with the recommendations in the BMP AP 2020. The database of species planted along the access road between km 22 – km 25 should be developed.
9	Stabilize soil disposal sites, dam sides and around main buildings with revegetation. Consult with community about type of plants.	(9) Continue to stabilize soil disposal sites, dam sides, and around main buildings with revegetation.				Main Contractor, in consultation with PT. PLN (Persero) and Perum Perhutani	Contract of PT. PLN (Persero) and contractor	Plant species can refer to the BMP AP 2020. The selection of plant species for revegetation during the construction and operation phases needs to consider the benefits aspect for the local community.
10	Manage the UPK nursery to keep up with demand	(10) Continue to manage the UPK nursery to keep up with demand (type, quantity,				PT. PLN (Persero)	PT. PLN (Persero)	UPK is currently conducting nurseries only for planting around the office purposes so

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	(type, quantity, quality) for road and construction site landscaping, as recommended in the planting list (see Appendix 7)	quality) for road and construction site landscaping		(blue)				that UPK should work with the community in preparing seedlings to be planted around the road or around the project site with the plant species recommended in the BMP AP 2020.
11	Contractor's landscape plan to be consistent with the BMP	(11) Contractor's landscape planning to be consistent with the BMP should be continued	(blue)	(blue)		Main contractor and Consultant E/S		These activities are included in the contract between PLN and the main contractor. The recommendation in the BMP AP 2015 should be taken into account in landscape planning.
A2	**Controlling Access**							
12	Create guard post on access and inspections roads near residential areas such as Cipateungteung and Datarmala, and near forested areas such as Gowek forests and the Japarana and Curug Walet waterfalls.	(12) Re-create guard post on access and inspections roads near residential areas such as Cipateungteung and Datarmala, and near forested areas such as Gowek forests and the Japarana and Curug Walet waterfalls		(blue)		Main contractor and PT.PLN (Persero)	Contract of PT. PLN (Persero) and contractor	Guard posts have been built but now it is gone. Thus, it is necessary to build a new guard post, especially near settlements and around BIA. The establishment of this guard post should be included in the contract between PLN and the contractor so that the financing for the construction of this guard post is part of the construction cost. Develop database for any security measure proceeded.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Pre-construction	Construction	Operational	Contact person	Document	Remark
13	Surveillance of inspection roads, protected BIA and Working zones for poaching, hunting, timber harvesting etc. with the cooperation of local landowner	(13) Continue surveillance of inspection roads, protected BIA and Working zones for poaching, hunting, timber harvesting, etc. with the cooperation of the local landowner				Perum Perhutani	No specific document	Surveillance in BIA and other Working Zones agains natural resources extraction needs to be done intensively. Surveillance should engage the community so there is a need for cooperation among Perum Perhutani, PT. PLN (Persero), and the community.
								This activity should be part of the revised MoU and PKS with Perum Perhutani, and it should engage the community in its implementation.
14	Install and maintain signs banning the use of roads by unauthorized people	(14) Continue to maintain signs banning the use of roads by unauthorized people				Main contractor	Contract of PT. PLN (Persero) and contractor	Surveillance of the access road users needs to be done more intensively.
								1. Maintain existing signboards
								2. Evaluate the effectiveness of the installation of signboards based on data and incident handling report/ SOPs that have been recorded previously.
								3. Increase the number of signs if needed
15	Install and maintain signs	(15) Continue to maintain signs banning hunting,				Main contractor		Maintenance of signboards is included in the contract

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	banning hunting, snaring and other activities that could harm protected wildlife, particularly near BIA and Working Zones	snaring, and other activities that could harm protected wildlife, particularly near BIA and Working Zones					Contract of PT. PLN (Persero) and contractor	between PLN and the contractor
								1. Evaluate the effectiveness of the installation of signboards based on data and incident handling report/ SOPs that have been recorded previously.
								2. Increase the number of signs if needed.
16	Community consultation regarding conservation, and risks of encroachment and over exploitation of forest resources	(16) Regularly implement community consultation regarding conservation, and risks of encroachment and over-exploitation of forest resources				PT. PLN (Persero) and Perum Perhutani	PT. PLN (Persero) Report	Public awareness activities have been carried out about conservation and the risks of land conversion and excessive exploitation of forest resources, but community understanding is still low.
								1. Continue existing socialization activities
								2. The outreach should be carried out jointly by the "BMP Facilitation Team" consisting of representatives of PT. PLN (Persero), Perum Perhutani, and the community (LMDH).
A3	Fire Management							

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
17	Prohibit use of fires by workers for cooking, burning trash, or campfire except within the base camp or other location specified. Prohibit careless disposal of cigarette butts.	(17) Continue to prohibit the use of fires by workers for cooking, burning trash, or campfire except within the base camp or other location specified. Prohibit careless disposal of cigarette butts.				Main contractor	Contract of PT. PLN (Persero) and contractor	This regulation has been included in the contract between PT. PLN (Persero) and the main contractor.
								1. Training for Trainers/Inductors needs to be carried out on a regular basis for authorized people to deliver education to the workers
18	Form a firefighting unit by the Contractors to fight fires when these do occur	(18) Maintain a firefighting unit by the Contractors to fight fires when these do occur				Main contractor	Contract of PT. PLN (Persero) and contractor	This activity has been included in the contract between PT. PLN (Persero) and the main contractor.
19	Identify potential fire risks within the vicinity of the site	(19) Continue to identify potential fire risks within the vicinity of the site				Main contractor	Contract of PT. PLN (Persero) and contractor	This activity has been included in the contract between PT. PLN (Persero) and the main contractor.
20	Establish fire breaks around areas of potential high fire risk, e.g. the camp and offices.	(20) Maintain fire breaks around areas of potential high fire risk, e.g. the camp and offices				Main contractor	Contract of PT. PLN (Persero) and contractor	This activity has been included in the contract between PT. PLN (Persero) and the main contractor
21	Work with communities to reduce slash and burn cultivation (education and raising awareness)	(21) Continue to work regularly and planned with communities to reduce slash and burn cultivation (education and raising				Main contractor	Contract of PT. PLN (Persero) and contractor	Engage the community in each village and community representatives in the "BMP Facilitation Team" (LMDH)

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
		awareness) through outreach, leaflet distribution, etc.						
A4	**Managing Impacts of Traffic on Native Fauna**							
22	Work with road users to inform about biodiversity management objectives	(22) Continue to work regularly and planned with road users to inform about biodiversity management objectives until the construction is completed				Main contractor	Contract of PT. PLN (Persero) and contractor	The ESMP and SSHP documents will be disseminated to the workers by the main contractor.
23	Install and maintain signs in areas of frequent wildlife crossings, saying "beware of animal crossing" (complete with pictures of animals)	(23) Maintain the installed signs in areas of wildlife crossings. If a new crossing encountered, the signs should be installed.				Main contractor	Contract of PT. PLN (Persero) and contractor	Some of the signboards were damaged.
24	Develop a system in which drivers report location of wildlife sightings or crossings	(24) Develop a report system of wildlife sightings or crossings that not only for the drivers and workers but also for the community				Main contractor	Contract of PT. PLN (Persero) and contractor	A simple reporting system should be prepared to make it easier for drivers and the public to report encounters with wild animals.
B.	**Restoration and Forest Management**							
B1	**Collection of Plant Material, Management of Nurseries and Planting Services**							

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
25	Contractor to prepare planting plans consistent with the BMP	(25) PLN's policy that requires contractors to carry out revegetation around the project site in accordance with the guidance in the BMP AP must be implemented until the construction phase is completed				Main contractor	Contract of PT. PLN (Persero) and contractor	This obligation is included in the contract between PT. PLN (Persero) and the contractor
26	Review options and confirm a reliable supply of planting materials for BIA Working Zone 1 and Working Zones 2 : UPK Nursery, Perum Perhutani nurseries, commercial nurseries and/or locally run nurseries	(26) The provision of seeds and planting is given to Perum Perhutani based on the MoU and PKS between PT. PLN (Persero) and Perum Perhutani. The community needs to be involved in the provision of seeds in accordance with the guidance in the BMP AP and suggestions from the community.				PT. PLN (Persero) and Perum Perhutani	MoU and PKS between PT. PLN (Persero) and Perum Perhutani	PT. PLN (Persero) partners with Perum Perhutani and the community (LMDH) in providing seeds. The determination of plant species refers to the BMP AP 2020 recommendations.
27	Review and ensure capacity (skills, labor force) for reforestation activities: UPK nursery, Perum Perhutani, commercial	(27) Improve community engagement as a provider of plant seeds, maintenance, and planting				PT. PLN (Persero) and Perum Perhutani	Perhutani Report of Planting Training for Community.	Perum Perhutani has provided training on how to conduct nurseries to plant maintenance for the community. Training should be continued from nursery to maintenance. Then the community put the training results into practice in

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	nurseries/foresters, local nurseries/labor							revegetation activities with Perum Perhutani.
28	Scope local interest in collecting local materials, nursery operation and tree planting contracts	(28) Improve community engagement in revegetation not only limited in the planting process but also starting from seedling to maintenance				Perum Perhutani	Perhutani RO Report.	Community engagement in the provision of new seedlings was carried out in 2019 although community involvement in planting activities has been carried out since 2017. Community involvement in the provision of plant seeds needs to be done in a planned manner and with clear contracts.
29	All replanting shall follow the recommendations for species in the BMP and the planting plans for each block	(29) All replanting shall follow the recommendations for species in the BMP AP 2020. Plant species selection also needs to consider community suggestions.				PT. PLN (Persero) and Perum Perhutani	Perhutani Revegetation Evaluation Report 2018 and 2019	

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
30	Develop a reforestation proposal following a review of forestry and watershed protection laws	(30) Develop a participatory/collaborative reforestation proposal following a review of forestry and watershed protection laws for all management zones (Zone 1, 2, 3) in partnership with Perum Perhutani and community representative				PT. PLN (Persero) and Perum Perhutani	No specific document	Reforestation is aimed at developing an agroforestry model that combines the objectives of fostering wildlife habitat and meeting community needs
31	Confirm the planting plans for BIA/Working Zone 1 in partnership with Perum Perhutani, PEMDA and local community	(31) The revegetation is fully given by PT. PLN (Persero) to Perum Perhutani as the leading sector and if necessary it can involve Pemda				PT. PLN (Persero) and Perum Perhutani	Perhutani Revegetation Evaluation Report 2018 and 2019	Further planting plan in WZ 1 should follow the recommendations in the BMP AP 2020. LMDH as community representatives.
32	Engage community in the planting plans in the Working Zone 1 and implement any livelihood restoration / resettlement	(32) Engage community in revegetation in planting, maintenance, and providing plant seeds				Perum Perhutani	Perhutani Revegetation Evaluation Report 2019	Community engagement in the planting process, starting from planning, determining the species, processing the nursery, to performing maintenance. Develop a forest management system and institution in accordance with Minister of Environment and Forestry Regulation No. 39/2017 concerning social forestry in

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
								the working area of Perum Perhutani.
33	Implement the planting plan for BIA/Working Zone 1	(33) Continue to implement revegetation in Working Zone 1 after the extension of the MoU and PKS between PLN and Perhutani is signed until the construction phase is completed				PT. PLN (Persero) and Perum Perhutani	Perhutani Revegetation Evaluation Report 2018 and 2019	Further revegetation in Working Zone 1 should follow the recommendations in the BMP AP 2020.
34	Confirm the planting plans for Working Zone 2 in partnership with Perum Perhutani	(34) Continue to implement revegetation in Working Zone 2 after the extension of the MoU and PKS between PT. PLN (Persero) and Perum Perhutani is signed until the construction phase is completed				PT. PLN (Persero) and Perum Perhutani	Perhutani Revegetation Evaluation Report 2018 and 2019	The revegetation plan in Working Zone 2 should follow the recommendations in the BMP AP 2020 and should be included in the extension of the MoU and PKS between PT. PLN (Persero) and Perum Perhutani.
35	Engage community in the planting plans in the Working Zone 2 and implement any livelihood restoration / resettlement	(35) Engage community not only in the planting process but also in the planting planning				Perum Perhutani	No specific document	Community engagement in revegetation should follow the recommendations in the BMP AP 2020.
								Develop a forest management system and institution in accordance with Minister of Environment and Forestry Regulation No. 39/2017 concerning social forestry in the working area of Perum Perhutani.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
36	Implement the planting plan for Working Zone 2	(36) Revegetation in Working Zone 2 need to consider community suggestions and be implemented after the extension of the MoU and PKS between PT. PLN (Persero) and Perum Pehutani				PT. PLN (Persero) and Perum Perhutani	Perhutani Revegetation Evaluation Report 2018 and 2019	Revegetation in Working Zone 2 should follow the recommendations in the BMP AP 2020 and should be included in the extension of the MoU and PKS between PT. PLN (Persero) and Perum Perhutani.
37	Liaise with the Ministry of Environment and Forestry regarding zoning of the 500m logging exclusion zone under the Forest Law (UU No. 41 of 1999), and a 100m zone of catchment protection forest around the reservoirs, along streamlines and to protect steep slopes as requires by the Presidential Decree on the Management of Reserve Areas	(37) Determine Working zone 3 which is an area of 500m from the reservoir boundary agreed upon by PT. PLN (Persero) and Perum Perhutani and included in the MoU and PKS between PT. PLN (Persero) and Perum Perhutani				PT. PLN (Persero) and Perum perhutani and KLHK/ watershed managers	No specific document	The determination of the regreening zone should follow the recommendations in the BMP AP 2020.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	(KepPres 32 of 1990).							
38	Determine the land available within the Working Zone 3 for reforestation by mapping ownership and forest cover and develop a plan to reforest and protect the land	(38) Delineating and mapping Working Zone 3 as the basis for environmental management around the reservoir, including reforestation led by Perum Perhutani. This plan is included in the ICM document.				PT. PLN (Persero) and Perum Perhutani and watershed managers	Perhutani Revegetation Evaluation Report 2018 and 2019	The Working Zone 3 delineation should follow the recommendations in the AP BMP 2020.
39	Confirm the planting plans for the blocks within Working Zone 3 in partnership with Perum Perhutani and the community	(39) Revegetation in Working Zone 3 is carried out by Perum Perhutani in partnership with the community until the construction phase is completed				PT. PLN (Persero) and Perum Perhutani and watershed managers	Perhutani Revegetation Evaluation Report 2018 and 2019	Further revegetation plan in Working Zone 3 should follow the recommendations in the BMP AP 2020 and should be included in the extension of the MoU and PKS between PT. PLN (Persero) and Perum Perhutani.
40	Implement the planting plans for Working Zone 3	(40) Revegetation in Working Zone 3 is carried out by Perum Perhutani in partnership with the community during and after the reservoir construction phase				PT. PLN (Persero) and Perum Perhutani and watershed managers	Perhutani Revegetation Evaluation Report 2018 and 2019	Further revegetation in Working Zone 3 should follow the recommendations in the BMP AP 2020 and should be included in the extension of the MoU and PKS between PT. PLN

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
								(Persero) and Perum Perhutani.
41	Review progress of Working Zones 1, 2 and 3 reforestation approaches, practices, successes and failures, and revise as necessary	(41) Continue to review the progress of reforestation in all working zones until the construction phase is completed				PT. PLN (Persero) and Perum Perhutani and watershed managers	Perhutani Revegetation Evaluation Report 2018 and 2019	Perum Perhutani has made a report on the evaluation of revegetation implementation in Working Zone 1, 2, and 3 during the pre-construction phase. The results of the evaluation should be used to improve the quality of reforestation planning and implementation at the construction phase.
42	Find suitable land for reforestation in Working Zone 4 which could be useful for biodiversity conservation as part of the ICM	(42) Delineating Zone 4 for expansion of reforestation areas and wildlife habitat. The existence of Zone 4 must be stated in the ICM document				PT. PLN (Persero) and Perum Perhutani and watershed managers	No specific document	The map of Working Zone 4 is attached in the ICM document and its boundaries should be agreed immediately. Reforestation and biodiversity conservation are carried out focused on working zones 1, 2, and 3, with the concept of reforestation based on harmonization modeling of the management of the Cisokan forest area.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
43	Detailed planting planning for Working Zone 4 based on learnings from Working Zone's 1-3 and the field surveys above	(43) Prepare a revegetation plan in Zone 4 during the construction phase covering the area to be planted, the estimated number of seeds required for planting and replanting, plants species suitable for the purpose of enhancing wildlife habitat and/or utilization by local communities, planting time and maintenance period, resource requirements (manpower, capital, and time).			▓	PT. PLN (Persero) and Perum Perhutani and watershed managers	No specific document	It is necessary to evaluate the revegetation process of Working Zone 1, 2, and 3 as recommendations for revegetation planning in WZ 4.
44	Implement the Working Zone 4 planting plan	(44) Implement the revegetation plan in the operational phase until the area planned for revegetation is completed to be planted			▓	PT. PLN (Persero) and Perum Perhutani and watershed managers		It can be started after Working Zone 4 boundareis have been set.
B2.	**Forest Management**							
45	GPS-based mapping of reforested blocks in accordance with the BMP and the PT. PLN (Persero)/Perum Perhutani PKS	(45) Mark out mapped locations on the ground to facilitate orientation while monitoring		▓	▓	PT. PLN (Persero) and Perum Perhutani	Perhutani Revegetation Evaluation Report 2018 and 2019	A map of the reforestation location is available in the evaluation report on revegetation by Perhutani. This map is a reference for reforestation in the construction and operation phases.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
46	Awareness raising, patrolling and sign age to protect Working Zone 1 and 2 blocks. All reforested blocks require ongoing protection on the ground.	(46) Improve the intensity of awareness raising and patrolling for all Working Zones 1 and 2 during the construction and operation phases		▓		PT. PLN (Persero) and Perum Perhutani	No specific document	The patrol is carried out by forest rangers of Perum Perhutani. Socialization of environmental conservation in BIA 14 has been carried out by PT. PLN (Persero) and raising awareness of the importance of protecting the environment has also been carried out by PT. PLN (Persero) in 2018 to elementary students with the theme of "peduli Lingkungan".
								PT. PLN (Persero) and Perum Perhutani should cooperate in carrying out patrolling and include this activity as part of the revised MoU and PKS between PT. PLN (Persero) and Perum Perhutani.
47	Awareness raising, patrolling and signage to protect Working Zone 3 and 4 blocks. All reforested blocks in Working Zone 3 require	(47) Expand patrolling area to Zone 4 during the construction and operation phases		▓	▓	PT. PLN (Persero) and Perum perhutani	No specific document	PT. PLN (Persero) and Perum Perhutani should cooperate in carrying out patrolling and include this activity as part of the revised MoU and PKS between PT. PLN (Persero) and Perum Perhutani. Implemented by the BMP Facilitation Team consisting of PT. PLN

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	protection on the ground.							(Persero), Perum Perhutani, and community representatives/LMDH.
48	Review various models for long term community involvement in forest management such as Community Forest Management (CFM), Community Forest (HkM) and other tenure or benefit sharing options	(48) Management models that integrate biodiversity conservation and the use of natural resources by local communities need to be agreed among the parties: PT. PLN (Persero), Perum Perhutani, and the community.				PT. PLN (Persero) and Perum Perhutani and local government	Document is still in draft version	The forest management model should follow the recommendations in the FPF which is part of the BMP AP 2020. Review the PHBM program and Social Forestry for long term community involvement in forest management.
49	Consider other models of long-term forest management other than as proposed above, such as status quo (Perum Perhutani management), NGO	(49) Planning for the development of integrated management models at a landscape scale (covering zones 1, 2, 3, and 4) in terms of conserving biodiversity and its use to improve the economy of local communities				PT. PLN (Persero) and Perum perhutani and KLHK / watershed managers	Document is still in draft version	Long-term forest management models should refer to the FPF which is part of the BMP AP 2020. Develop a forest management system and institution in accordance with Minister of Environment and Forestry Regulation No. 39/2017

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	management, changes to land status under Indonesian legislation to conservation or protection forest							concerning social forestry in the working area of Perum Perhutani
50	Implement forest management recommendations as appropriate (no 48 and 49)	(50)Implement integrated management models at the landscape scale				PT. PLN (Persero) and Perum Perhutani and KLHK / watershed managers	Document is still in draft version	Implement forest management recommendations based on FPF which is part of the BMP AP 2020.
51	Measure forest cover annually using satellite imagery to document reforestation efforts.	(51)Measure forest cover annually using satellite imagery to document reforestation efforts				PT. PLN (Persero) and Perum Perhutani		This activity is carried out in the framework of an agreement between PT. PLN (Persero) and Perum Perhutani.
C	**Wildlife Management**							
C1.	**Wildlife and Habitat Management**							

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
52	Provided dry culverts (faunal underpasses) and canopy bridges in the temporary and permanent roads, distribution and transmission lines and similar infrastructure	(52) Maintain dry culvert and canopy bridges for animal crossing on permanent and temporary access roads and provide these artificial corridors on transmission lines and other similar infrastructure				PT. PLN (Persero) and main contractor	BMP 2014 Document - Appendix 1, 3, 4, 5	Artificial corridors for animals have been installed in habitats that were fragmented due to access roads development. Several rope bridges in BIA 5 and 6 were damaged.
53	Site induction training for wildlife protection under the laws and legislation on protected species, Act No. 5 in 1990, and government regulation No. 7 in 1999	(53) Site induction training for wildlife protection under the laws and legislation on protected species, Act No. 5 in 1990, government regulation No. 7 in 1999, and ministerial decree of LHK No. P.20 of 2018. The training for trainers (TFT) program needs to be carried out until the operation phase, as well as to evaluate the knowledge and abilities of trainers				Main contractor	Act No 5/1990, Government Regulation No 7/1999	Socialization to contractors is carried out regularly every month.
54	Report wildlife incidences, such as animals getting hit by cars or a tree falling in the project area	(54) Report wildlife incidences, such as animals getting hit by cars or a tree falling in the project area based on the Human-Wildlife Conflict Reporting form that has been compiled				PT. PLN (Persero), BKSDA and main contractor	SOP Fauna Encounter/Accident Report	It is necessary to make an accident reporting SOP.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
55	Confirm presence of Javan Slow Loris in BIA 2, 3, 5, 6, 13 and 14 through rapid survey	(55) Conduct regular monitoring to observe the presence and movement of Javan slow lorises in BIA 1, 2, 3, 4, 6, 7, and 14				PT. PLN (Persero)	BMP Monitoring 10 Species 2017	The presence of Javan slow loris has been confirmed in BIA 1,2,3,4,6,7, 14, Corridor BIA 5 and BIA 6, and access to Pasir Laja
56	Develop patrol teams consisting of Perum Perhutani staff, PT. PLN (Persero) staff, BMP Facilitation Team, ICM Facilitation Team members, community members, and/or, if required, government representatives. Surveillance of protected BIA and Working zones for poaching, hunting, timber harvesting etc. (long term solution to No. 13 above).	(56) Strengthening the patrol team consisting of personnel staffs from Perum Perhutani, PT. PLN (Persero)N, BMP Facilitation Team, ICM Facilitation Team members, community members, and/or, if required, government representatives. Improve surveillance of hunting and illegal logging activities in Zones 1, 2, and 3.				PT. PLN (Persero) and Perum Perhutani	Decree Team Patroll Forming	The patrol team has not been formally formed. PT. PLN (Persero) only formed an animal patrol team during the land clearing process. Develop BMP Facilitation Team.
57	Implement an ongoing wildlife monitoring programme,	(57) Continue to implement an ongoing wildlife monitoring programme,				PT. PLN (Persero) and main contractor	BMP Monitoring 10 Species 2017	It has been implemented in the BMP monitoring program for 10 species in 2017. Recommendations will

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	focused on the 10 species of interest	focused on the 10 species of interest						be implemented in action plan 58
58	Implement wildlife management projects based on monitoring report and outputs from No. 57	(58) Expanding wildlife monitoring programs beyond the 10 target species				PT. PLN (Persero)	BMP Monitoring 10 Species 2017	The recommendations of BMP monitoring for 10 species in action plan 57 have not been implemented
C2	**Wildlife Encounters**							
59	Implement wildlife encounter protocols and train project workers about what to do when potentially dangerous wildlife is encountered	(59) Continue to implement wildlife encounter protocols refers to SOP Human - Wildlife Conflict and train project workers about what to do when potentially dangerous wildlife is encountered during operation phase. The contact person in handling conflict needs to be written on the signboard.				PT. PLN (Persero) and main contractor	SOP Human - Wildlife Conflict and Wildlife Management Protocol (See SOP Handling and Rescue)	The animal encounter protocol has referred to the SOP Human - Wildlife Conflict but has not been disseminated to project workers. The awareness to project workers is only carried out based on the action plan 53.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
60	Set up a rapid response wildlife management unit that has the ability to react quickly to human-wildlife conflict	(60) Establish a quick response unit of wildlife management that has the ability to take quick actions and follow the SOP Human - Wildlife Conflict. In addition, it is also necessary to strengthen the relationship between the PT. PLN (Persero) Environmental Unit and the BBKSDA Human-Wildlife Conflict Management Team.				PT. PLN (Persero), BKSDA, and main contractor	SOP Human - Wildlife Conflict and Wildlife Management Protocol (See SOP Handling and Rescue)	The animal encounter protocol has referred to the SOP Human - Wildlife Conflict, but a team that has a special task to prevent conflicts between humans and wildlife has not been formed. It is necessary to include the contact person in handling conflict on the signboards.
61	Consult with the community about wildlife encounters to discourage killing and trapping wildlife.	(61) Conduct regular outreach to the community regarding actions that must be taken in the event of an encounter with wild animals to reduce poaching.				PT. PLN (Persero) and main contractor	SOP Human - Wildlife Conflict and Wildlife Management Protocol (See SOP Handling and Rescue)	The animal encounter protocol has referred to the SOP Human - Wildlife Conflict, but the provision of information about wildlife activities and wildlife encounter procedures was only through the BIA signboards. The outreach method was only implemented in two hamlets, Lembur Sawah and Pasir Laja. It is necessary to include the contact person in handling conflict on the signboards.
D	Stakeholder Participation							
D1	Strengthening Capacities for Institutionalizing ICM							

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
62	Develop and maintain and ICM facilitation team.	(62) Re-establish and maintain ICM facilitation team for assisting PLN to plan and implement biodiversity management in the UCPS area				PT. PLN (Persero)	GM PLN UIP JBT I Decree (SK) 2014 dan 2015 about Team ICM	Develop BMP Facilitation Team
		Multi-stakeholder coordinating body arrangement that will have long term responsibility for ICM in UCPS including higher education and research institution involvement to provide scientific-based biodiversity and environmental management				PT. PLN (Persero)		PLN can convince the relevant agencies or ministries to assist in the estabilishment and development of a multi-stakeholder coordinating body
		Revitalize PLN's internal structural unit to manage BMP implementation including restoring Assistant Manager position to be person-in-charge focus on BMP implementation assisted by technical assistance				PT. PLN (Persero)		
63	Stakeholder workshops, field trips, and one-on-one meetings etc., to improve understanding	(63) Carry out meeting forums (workshops, outreach, socialization, training, etc.) in order to improve understanding and institutionalization of ICM				PT. PLN (Persero)	ICM Cisokan Planning Documents 2015	Workshops, meetings, etc. can be performed as needed

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
64	Prepare and implement revised MOU and PKS with Perum Perhutani	(64) Evaluate the implementation of previous MoU and PKS as well as prepare MoU and PKS extension (and revision if required) between PT. PLN (Persero) and Perum Perhutani which will serve as a basis for implementing BMP AP during the operation phase				PT. PLN (Persero); Perum Perhutani	MoU PT. PLN (Persero) and Perum Perhutani 2015	
65	Prepare and implement reforestation program with other stakeholders as required	(65) Engage other stakeholders (government agencies, NGOs, etc.) to harmonize, combine, and implement related programs, including, but not limited to, reforestation, technical assistance, etc.				PT. PLN (Persero); Perum Perhutani, local Government and Stakeholders	ICM Cisokan Planning Documents 2015	Reforestation is adjusted to the PHBm / social forestry program in accordance with the Ministry of Environment and Forestry Regulation No, 39/2017
66	Continue to build trust and engagement with stakeholders. Seek funding support.	(66) Improve coordination, communication, and cooperation among relevant stakeholders and make joint efforts in finding sources of funding other than the budget provided by PT. PLN (Persero) and Perum Perhutani				PT. PLN (Persero) and Perum Perhutani	ICM Cisokan Planning Documents 2015	Can refer to action plan No. 62

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
67	Work with PEMDA and villages to contribute to Village Development Plans.	(67) Work with the Pemda (West Bandung and Cianjur), and Pemprov of West Java in the preparation of physical and economic development plans for villages that interact with UCPS based on priority scales				PT. PLN (Persero) and Perum Perhutani	LARAP Report 2011, IMA Report 2013, IMA Monev Report 2017	Refer to the Alternative Sustainable Livelihoods for Communities section
D2	**Gaining Political Support**							
68	Develop clear materials that explain the ICM vision	(68) Develop materials such as booklets, flyers, modules, etc. about ICM (vision, mission, policies, programs, activities) to be disseminated to stakeholders				PT. PLN (Persero) and stakeholders	ICM Cisokan Planning Documents 2015	Making materials as needed
69	Develop plans for how government could support the ICM implementation	(69) Build communication and coordination with Pemda for implementing ICM as well as aligning it with Pemda's programs				PT. PLN (Persero) and stakeholders	ICM Cisokan Planning Documents 2015	Can refer to action plan No. 65
70	Present the case for ICM in Cisokan at local, national and international fora	(70) Promote ICM in UCPS to the public audience through various media				PT. PLN (Persero)	ICM Presentation Material	
E	**Community Engagement**							
E1	**Biodiversity Awareness, Communication and Education**							

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
71	Improve the communities' understanding of PLN's ICM approach to catchment issues, and the BMP	(71) Integrate ICM approach, biodiversity and wildlife awareness, and education effort with other issues such as illegal hunting, cut and fill, reforestation, etc., to improve communities' understanding. It should be implemented regularly.				PT. PLN (Persero)	ICM Cisokan Planning Documents 2015	Through the BMP Facilitation team
72	Increase the public awareness about the importance of threatened and protected wildlilfe	(72) Activities aimed at improving public awareness of the presence of wildlife around UCPS are carried out regularly until the operation phase.				PT. PLN (Persero)	ICM Cisokan Planning Documents 2015, PLN Biodiversity Eduaction Material	Can refer to action plan No. 71
73	Develop a participatory process for ongoing community engagement / liaison	(73) Arrange programs/activities with the community from 38 villages around UCPS, including monitoring to prevent illegal hunting, forest encroachment (for example through joint patrols), etc. for biodiversity conservation and utilization of natural resources.				PT. PLN (Persero) and Perum Perhutani, and local goverment	Perhutani Participatory Rural Appraisal Report	Participatory processes using a retrospective approach to reviewing current engagements can be undertaken as needed. Engage community (representatives) from each hamlet/ LMDH.

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
74	Engage PEMDA to be part of the communications	(74) Engage Pemda (Cianjur and West Bandung) in community empowerment programs related to the management of working zones 1, 2, and 3				PT. PLN (Persero) and Perum Perhutani, and local goverment	ICM Cisokan Planning Documents 2015, IMA Monev Report 2017	Can refer to action plan No. 65
75	Formulate MOU or similar between PLN, villages and PEMDA (and Perum Perhutani where relevant) as required	(75) Arrange an MoU between PLN, Pemda, and the community to support the MoU between PT. PLN (Persero) and Perum Perhutani in the implementation of the updated BMP AP				PT. PLN (Persero) and Perum Perhutani, and local goverment	ICM Cisokan Planning Documents 2015	Refer to the Alternative Sustainable Livelihoods for Communities section
76	Support communities to engage by providing technical assistance and capacity building	(76) Provide technical assistance and mentoring to communities related to local economic empowerment during the construction and operation phases. PT. PLN (Persero) can engage other stakeholders (government agencies, NGOs, etc.) as needed.				PT. PLN (Persero) and Perum Perhutani, and local goverment	ICM Cisokan Planning Documents 2015	Through the BMP facilitation Team
E2	**Aligning Resettlement Programmes with the BMP**							

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
77	Provide the resettlement team with a checklist to assess each village against World Bank safeguard principles the ESMP and the BMP	(77) Identify hamlets that interact with the UCPS area and make an inventory of natural resource utilization in working zones 1, 2, and 3 as information for the LARAP team and develop a spatial database for the purposes of wildlife management and local economic empowerment. It can be further integrated with SOP Handling and Rescue and SOP Fauna Encounter / Accident Report.				PT. PLN (Persero) and Perum Perhutani,	ICM Cisokan Planning Documents 2015, Resettlement Team Field Notes 2015	
78	Work with the resettlement team, PEMDA and village commu-nities in a partici-patory way to find solutions to re-settlement that avoid conflicts with the BMP	(78) Coordinate with the LARAP team to work together with Pemda and the community to find agreements and solutions so that conflicts do not occur in the implementation (updated) BMP AP				PT. PLN (Persero) and local Goverment	LARAP Report 2011, IMA Report 2013, IMA Monev Report 2017	Refer to the Alternative Sustainable Livelihoods for Communities section
E3	**Alternative Sustainable Livelihoods for Communities**							

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
79	Facilitate the opportunities for income from the reforestation process: plant material collec-tion, tree nursery manage-ment and / or tree planting contracts	(79) Empower local communities in reforestation by providing plant seeds, planting, and maintaining plants based on clear contracts				PT. PLN (Persero) and Perum Perhutani,	ICM Cisokan Planning Documents 2015	Can refer to action plan No. 32 and No. 35 (BMP 2015)
80	Establish and maintain community forest patrols in Working Zone 1 and 2 (and 3 once established)	(80) Work with Perum Perhutani and carry out bottom-up approach to establish community forest patrol				PT. PLN (Persero) and Perum Perhutani,	ICM Cisokan Planning Documents 2015	Can refer to action plan No. 56 BMP Facilitation Team
81	Develop land use plans for village / community land that generate increased community income from improved and intensified agricultural practices.	(81) Maintain and prioritize communities' economic restoration through various programs as recommended in BMP 2015 Action Plan, including, but not limited to: (1) Alternative methods of agriculture (higher value products, agroforestry, non-timber forest products), (2) Adding value to agricultural or forest products – manufacturing, processing, packaging, and (3) Tourism, etc.				PT. PLN (Persero) and Perum Perhutani,	ICM Cisokan Planning Documents 2015, PLN CSR Report for Village Tourism 2019	

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
82	Develop land use plans that generate increased community income from improved and intensified silvicultural practices in zones 1 and 2 (Perum Perhutani land).	(82) Develop agroforestry models in accordance with the characteristics of BIA and corridors and provide ongoing assistance for community economic restoration programs				PT. PLN (Persero) and Perum Perhutani,	Forest Partnership Framework document	
83	Implement the plans as described above (No. 81 and 82)	(83) Develop a Forest Partnership Framework (FPF) which will serve the basis for the Forest Partnership Action Plan (FPAP) for Perum Perhutani land (WZ 1-4) utilization to restore and provide alternative livelihoods in accordance with the objectives of biodiversity conservation				PT. PLN (Persero); Perum Perhutani, and local Goverment	Forest Partnership Framework document	
84	Develop land use plans that generate increased community income from improved and intensified silvicultural practices in zones	(84) Develop agroforestry models and other agricultural cultivation				PT. PLN (Persero); Perum Perhutani, and local Goverment	Forest Partnership Framework document	Develop a forest management system and institution in accordance with Minister of Environment and Forestry Regulation No. 39/2017 concerning social forestry in the working area of Perum Perhutani

No	BMP Action Plan 2015	Updated BMP Action Plan 2020	Project Stages			Contact person	Document	Remark
			Pre-construction	Construction	Operational			
	3 and 4 (Perum Perhutani land).							
85	Implement the plans as described above (No. 84)	(85) Implement agroforestry models and other agricultural cultivation in accordance with the characteristics of the buffer zone and provide ongoing assistance for community economic recovery programs				PT. PLN (Persero); Perum Perhutani, and local Goverment	Forest Partnership Framework document	
86	Livelihood restoration plans need to be deve-loped for any people adversely affected by the reforestation process	(86) Planning and implementing programs and activities for the economic restoration of communities affected by restrictions due to the establishment of working zones 1, 2, 3, and 4 in the UCPS area				PT. PLN (Persero); Perum Perhutani, and local Goverment	ICM Cisokan Planning Documents 2015	Livelihood restoration plan is designed for 10 years

7 Institutional Framework, Roles and Responsibilities

This section outlines:

Institutional frameworks – 1) how the governance and coordination of safeguards under the ICM approach will be achieved by PLN in the short term and 2) how the governance and coordination of a wider catchment program under an ICM approach will be achieved by multiple stakeholders in the medium to long term.

Roles and responsibilities – 1) stakeholder and 2) individual roles and responsibilities for implementing the tasks in the BMP.

7.1 Stakeholder engagement

Listed below (Table 12) are the key stakeholders who have a direct interest in the project area and / or the Upper Cisokan catchment. Other interested and affected parties (government agencies, non-governmental organisations etc.) will be identified and consulted as required through the implementation of the plan.

As the majority land owner and manager in the area, and the government authority for forest management and reforestation, Perhutani plays a key role in achieving the biodiversity offsetting goals. Perhutani was part of the original MOU and PKS development for the 2015 version of BMP, and they remain committed to the reforestation plans stated in this BMP. This commitment will be formalized when a revised OU will be signed.

Table 12. Key stakeholders for implementing the BMP.

Stakeholder	Role	Commitment
Communities and Local Government (Desa Kecamatan) Land owner, land user, inhabitants in local area.	The communities will need to participate in planning and implementation. The impacts and benefits on the people living and working in the area need to be well understood. Communities need to be able to maximise their benefits.	Communities are interested and are keen to discuss the income generating opportunities and work with Perhutani and PLN
Perhutani / Perhutani KPH (South Bandung and Cianjur) / Forest Resource Management Division	Manager of lands on behalf of the Government of Indonesia. Forestry planning and management. Partner in the reforestation and forest protection program.	BMP / FPF MOU signed in 2015. MOU requires an update to reflect the 2020 BMP and FPF. Perhutani and PLN have discussed the BMP and Perhutani remain committed to their role in developing community forestry agreements and replanting for biodiversity gains.
PEMDA / Local Govt / Governers Office (West Bandung, Cianjur)	Responsibilities for infrastructure and other community services on community (non-forest) land. Support of community development activities.	Committed to engaging with PLN and communities to support the goals of the BMP and FPF.

BAPPEDA District Planning Agency (West Bandung, Cianjur)	District planning agency responsible for development & integration of spatial plans, agency development & social support programs. Support and integration of plans.	Further consultation required as per the Action Plan to identify the specific roles and responsibilities.
District Forest & Plantation Agency (DisHutBun)	District agency responsible for spatial plans & management programs in forestry lands. Support of BMP and integration of plans in catchment.	Further consultation required as per the Action Plan to identify the specific roles and responsibilities.
District Environmental Agency D	District agency responsible for monitoring environmental, biodiversity & catchment management programs. Support of BMP and integration of plans in catchment.	Further consultation required as per the Action Plan to identify the specific roles and responsibilities.
Regional Agency for Catchment Management (BPDAS)	Regional agency for Citarum river basin, forest & land management. Support of BMP and integration of plans in catchment.	Further consultation required as per the Action Plan to identify the specific roles and responsibilities.
Regional Agency for Natural Resource Conservation (BKSDA) - Citarum - Ciliwung	Regional agency for biodiversity conservation & protected area management. Support for BMP and integration of plans in catchment.	Further consultation required as per the Action Plan to identify the specific roles and responsibilities.

Table 13. Stakeholder engagement related to Biodiversity Management Plan

Consultation leads	Stakeholder(s)	Period of advice	Activities
M. Taufiq Afiff, Jeffry Anwar, Wayne Petrass, Martin ter Woort	Field visits	25 Oct - 5 Nov 2010	Field visit and meeting
M. Taufiq Afiff, Jeffry Anwar, Wayne Petrass, Martin ter Woort	Field visits	24-28 January 2011	Field visit and meeting
Peter Johansen (Team Lead), Alessandro Palmieri, Masaki Takahashi, Puguh Imanto, Warren Waters, Lis Nainggolan, Krisnan Isomartana, and Erik Meijaard	Universitas Padjajaran, community meetings	21 April to 2 May 2013	Field visit and meeting
Peter Johansen, Satoru Ueda, Masaki Takahashi, Puguh Imanto, Yash Gupta, Yun Wu, Arip Syaman Sholeh, Lis Nainggolan, Krisnan Isomartana, Pene Ferguson, Erik Meijaard	Universitas Padjajaran, community meetings	5-14 February 2014	Field visit and meeting

Erik Meijaard, BMP Specialist	Prof. Anna Nekaris	2014-2015	Consultation about Slow Loris conservation management
Erik Meijaard, BMP Specialist	Prof. Vincent Nijman	2014-2015	Consultation about langur, gibbon and leaf monkey conservation and management
Erik Meijaard, BMP Specialist	Fitrian Ardiansyah and Astari Anjani	July 2014	Consultation legal framework biodiversity offset
Erik Meijaard, BMP Specialist	Resit Sozer	2015	Consultation about conservation management in Cisokan
Erik Meijaard, BMP Specialist	Sukianto Lusli	2014-2015	Consultation about conservation management in Cisokan
Erik Meijaard, BMP Specialist	Asep Adhikerana	2015-2016	Engaged by PLN as biodiversity expert
PLN - ICM Design advisors (lead), UIP environmental & social-legal teams, UPK ICM assistant manager & social - community coordinator. Local Community - members, leaders & village (Desa & Sub-District) government. Perhutani - KPH field staff		March 2015	Local community introductory meetings on ICM community development program
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Perhutani Regional Office	2014-2015	Consultation on Integrated Catchment Management, data sharing, discussion on MOU with PLN and ICM / BMP work plan
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Perhutani Concessions Office (PKH), South Bandung, Cianjur	2014-2015	Consultation on Integrated Catchment Management, data sharing, discussion on MOU with PLN and ICM / BMP work plan
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	District Planning Agency (BAPPEDA), West Bandung, Cianjur	2014-2015	Consultation on Integrated Catchment Management, data sharing
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	District Forest & Plantation Agency (DisHutBun), West Bandung, Cianjur	2014	Consultation on Integrated Catchment Management, data sharing
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	District Environmental Agency, West Bandung, Cianjur	2014	Consultation on Integrated Catchment Management, data sharing
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Cicadas village - West Bandung	2014	Consultation on Integrated Catchment Management, data sharing, LARAP meeting
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Bojong & Sukaresmi villages - West Bandung	2014	Consultation on Integrated Catchment Management, LARAP, environmental screening, data sharing
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Camat Cibeber - Cianjur	2014	Consultation on Integrated Catchment Management, data sharing

Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Karangnunggul village - Cianjur	2014	Consultation on Integrated Catchment Management, data sharing
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Indonesia Power - Saguling	2014	Consultation on Integrated Catchment Management, data sharing
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Regional Agency for Catchment Management (BPDAS) - Citarum - Ciliwung	2014	Consultation on Integrated Catchment Management, data sharing
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Regional Agency for Natural Resource Conservation (BKSDA)	2014	BMP, BIA management, wildlife management protocols along access road during construction and operation
Dr Kevin Jeanes - Integrated Catchment Management Consultant, developing ICM approach	Provincial Environmental Agency (BPLHD)	2014	Consultation on Integrated Catchment Management, data sharing
PLN	Perhutani - Regional Office	Sept 2014 - Jan 2016	Perhutani - Regional. Legal & technical role to oversee development & implementation of catchment & forest management plans, forest production enterprise & site monitoring within regional forest concessions. Lead role to integrate ICM plan, implementation programs & financing into existing Perhutani forest & catchment management program. Partner in ICM catchment & forest management with PLN under PLN - Perhutani MoU
PLN - UPK ICM assistant manager, BMP advisor, social-communication coordinator & ICM community development (lead) & BMP consultants. Perhutani - KPH field staff & Regional community development specialists. Local Community - members, leaders	Village (Desa) government. PEMDA - BAPPEDA, Forest & Environment agency representatives.	July - August 2015	Community meetings & field survey in pilot-villages to identify focus groups, sites & community development activities
PLN	Perhutani	2017	Capacity building Perhutani – Environmental Management Training – Environmental Measurement and Monitoring
PLN	Village (Desa) government. PEMDA - BAPPEDA, Forest & Environment	2015	Dissemination of information and consultation on biodiversity conservation and environmental protection.

	agency representatives.		
PLN	Kp. Cangkuang, Bojongsalam Village	2016	Dissemination of information and consultation on biodiversity conservation at BIA 14 area
PLN	Kp. Cangkuang, Bojongsalam Village	2016	Establishment of a grievance center/post for environmental (and social) issues
UPP Cisokan	Contractor on biodiversity management	2015-2019	Regular meetings on Occupational Health and Safety and Environment with and protected/endangered species
PLN	Village (Desa) government.	2016-2018	Donation of seedlings of timber plants (pine, rubber, suren) and fruit plants for revegetation activities
PLN	Cimarel Village.	2016	Environmental & social consultations with the community
PLN	Kp. Babakan, Sukarama Village, Bojojngpicung Sub-District	2019	Donation of fruit plant seedlings for forest tourism program - Wisata Hutan Karya Mukti.
PLN and BKSDA		2018	Release of wild animals that were caught by the community
PLN	Girimukti Elementary School	2018	PLN Teaching and raising environmental awareness
PLN	Hamlet 1 Sukalaksana, Maragaluyu Village, Cempaka Sub-District, Cianjur Regency	2018	Participatory Rural Appraisal
PLN	Dusun/Hamlet 2 Cipateungteung, Margaluyu Village, Cempaka Sub-District, Cianjur Regency	2018	Participatory Rural Appraisal
PLN	Dusun/Hamlet 3 Sukasari, Margaluyu Village, Cempaka Sub-District, Cianjur Regency	2018	Participatory Rural Appraisal
PLN	Dusun/Hamlet 4 Ciherang, Margaluyu Village, Cempaka Sub-District, Cianjur Regency	2018	Participatory Rural Appraisal
PLN	Margaluyu Village, Cempaka Sub-District, Cianjur Regency	2018	Workshops

PLN	Bojongsalam Village, Rongga Sub-District, Bandung Regency	2018	Participatory Rural Appraisal
UIP, UPP and Local Government KBB	Kp. Pasir Laja, Sukaresmi Village, Rongga Sub-District	2018	Revegetation activities
PLN	Gunung Halu Village members, PLN, Perhutani, LMDH Gunung Halu, Forestry Vocational School Gunung Halu	2019	Conservation and Revegetation program for Water Catchment Area UCPS and surrounding areas.
PLN	The discussions were held at each of the 38 sub-villages.	8-23 July 2020	Interviews/ discussions with community surround the forest area on socio-economic condition, getting feedback and inputs from the community regarding implementation of biodiversity management plan.
Unpad & PLN Unit Induk Pembangunan Jawa Bagian Tengah I		29 June 2020	Discussion on BMP implementation from 2015-2019
PLN, UNPAD and Perhutani		22 July 2020	Dicsussion on BMP review and Forest Partnership Framework
Erik Meijaard, BMP Specialist	Prof. Anna Nekaris	January 2020	Consultation about Slow Loris conservation management
Erik Meijaard, BMP Specialist	Dr Bas van Balen	January 2020	Consultation about transmission line collision risk

7.2   Institutional Framework

During the Construction Phase PLN will coordinate the catchment reforestation and protection and carry out activities in partnership with Perhutani, PEMDA and the community. PLN will engage an ICM Facilitation Team with the expertise and capacity to support the implementation, by providing technical skills and advice. The structure of how the safeguards activities are managed and interact with each other, and how they interact with stakeholders, is provided in Figure 17.

The vision is to transform this program from a focus on the UCPS project to a focus on wider catchment management, to produce multiple catchment benefits for multiple catchment stakeholders. A suggested medium to long term structure of ICM of the Upper Cisokan catchment is provided in Figure 18. It will be necessary for a multi-stakeholder group to take a coordinating role, if the program is to be sustainable.

A panel of independent experts will be set up for monitoring and evaluation of BMP implementation and strategic adjustments in the program if it fails to meet its main biodiversity offsetting targets. A terms of reference for the panel of experts is included in the Environmental and Social Management Plan.

PLN - Coordinator

Roles: Environmental and social safeguards, using an ICM approach.

Championing a catchment-wide ICM approach to managing the Upper Cisokan watershed. Engaging stakeholders and community to become involved in ICM and achieve the vision.

Panel of Experts

Roles: Independent review, monitoring and evaluation, and strategic advice to PLN and implementation facilitators

Implementation Facilitators

Roles: Implementing projects on behalf of PLN, providing technical skills, building networks with stakeholders, assisting community engagement, seeking and managing external funding and resources, monitoring, evaluation, reporting.

PEMDA, BAPPEDAS etc.

Regional / spatial planning and social support

Communities and village Government

PLN

PERHUTANI

Forestry concession management

COMMUNITY DEVELOPMENT

Infrastructure development

Village Development Plans

Sustainable village land uses

Sustainable forestry land uses

Partnerships with Perhutani for forest management

LARAP

Resettlement

Infrastructure

Support for sustainable livelihood development

UCPS ESMP

Construction impact management

Operation impact management

Watershed management strategy

Environmental monitoring

GIS database

Community engagement

Stakeholder consultation, MOU, PKS

BMP

BIA protection

3,800ha reforestation plan

Biodiversity technical advisory

Biodiversity monitoring and research

FOREST AND CONSERVATION

Forest planning

Forest management

Managing community access

Community partnerships for forest management

Key: —————— Core responsibility ---------- Implementation partner

2020 Structure

Multi-Stakeholder Coordinating Body
Roles: Institutional coordination, program development, supervision & policy guidance. Reporting to relevant authorities. (Membership from the entities listed below)

Implementation Facilitator
Role: ICM project management, implementation planning and oversight, implementation of projects on behalf of the Coordinating Body, seeking and managing external funding and resources, managing publicity, monitoring, evaluation, reporting

Community Development NGOs

Communities and Village Government

PEMDA
BAPPEDA etc.
Regional / spatial planning and social support

PLN UCPS

BPDAS
Catchment management
BBWS
River management

PERHUTANI
Forestry concession management

BKSDA Conservation

Conservation NGOs

COMMUNITY DEVELOPMENT

Infrastructure development

Village Development Plans

Sustainable land uses and livelihoods (agriculture, tourism, non-timber forest products) – village and forestry land

Community partnerships for forest management (with Perhutani)

WATERSHED MANAGEMENT

Soil protection and erosion control (land cover and land use management)

Water allocation and use

Water quality protection

Benefit sharing from hydropower

CSR from hydropower

FOREST AND CONSERVATION

Forest planning

Forest management

Community partnerships for forest management

Managing community forest land uses

Wildlife conservation management

Conservation tourism

Key: ———— Core responsibility –·–·–·– Funding, resources or other support ···························Participant / beneficiary

7.3   Roles and Responsibilities

7.3.1   PLN Environmental Manager UIP

- Ensure this BMP is included as part of the Environmental Management System for this project, including scheduling of tasks, inspections, monitoring, evaluation, reporting, etc.
- Ensuring the financial resources are available to implement the BMP.
- Ensuring the BMP is integrated into the wider project program (land acquisition, resettlement, construction, community consultation, etc.).
- Reviews are carried out and recommendations made regarding biodiversity coverage in Contractor environmental management plans.
- Monitoring changes to relevant legislation is monitored and where appropriate, recommending any necessary changes to monitoring or management arrangements.
- Supervise consultants as required.
- To ensure that the biodiversity requirements in this plan are incorporated into final designs and specifications.
- To ensure that appropriate clauses referring to protection of biodiversity and this biodiversity plan are included in contractual scopes of work and bid documents.
- To ensure that Contractors include the requirements from this BMP into their job specific Environmental Management Plans required under the Environmental Management Plan, and that these plans are complied with at all times.
- Review and update the BMP.

7.3.2   Construction Manager (PLN UPK)

Key responsibilities for the Construction Manager in relation to this BMP are as follows:

- To ensure that the biodiversity requirements in this plan are incorporated into final designs and specifications.
- To ensure that appropriate clauses referring to protection of biodiversity and this biodiversity plan are included in contractual scopes of work.
- To ensure that Contractors include the requirements from this BMP into their job specific Environmental Management Plans required under the Environmental Management Plan, and that these plans are complied with at all times.
- To ensure that biodiversity issues are included in the regular inspections required under the Environmental Management Plan.
- To ensure that the contractor/consultant workforce receives information on biodiversity and the requirements in this plan in any compulsory environmental inductions required prior to working on the Project.
- To ensure breaches of the biodiversity requirements in this plan are included as environmental incidents, investigated accordingly and the required incident reports forwarded to the relevant persons.

7.3.3   UCPS Stakeholder Engagement Team (PLN)

The responsibilities for the stakeholder engagement team in relation to this biodiversity plan concern:

- Requirements relevant to hunting, possession of wildlife, habitat protection etc. which may require cooperation of landholders nearby and/or;

- The induction of project personnel from local communities who traditionally hunt;
- Advising on the involvement of local communities in protecting and patrolling forests areas and conservation set asides.
- Advising on the involvement of local communities in the reforestation activities either through joined planning or employment in tree planting and maintenance activities.
- Promotional activities relating to the BMP, monitoring programmes, successes etc.

7.3.4 Panel of Experts
- Independent review and advice to PLN and Implementation team
- Monitoring and evaluation
- Strategic advice
- A full terms of reference for the Panel of Experts is included in the ESMP

7.3.5 Contractors – all Packages (Including all Staff and Sub-contractors)
- Contracts issued during the construction phases and subsequence stages and for any other major works required during project development are to include the biodiversity requirements.
- Any environmental management plan to be produced by the Contractor must include the requirements of this biodiversity plan.
- Comply with all aspects of the BMP.
- Implement aspects of the BMP such as forest protection measures, wildlife conflict management, incident reporting etc.
- Participate in all relevant training.

7.3.6 ICM Facilitation Team
- Provide technical assistance in ICM and BMP implementation to PLN.
- Provide a BMP Advisor to lead the team and assist PLN to achieve the BMP task list and goals.
- Assist PLN to implement the BMP and to synergise the efforts to effectively achieving the various safeguards related aspects of the UCPS project with efficiency.
- Facilitate engagement between PLN and Perhutani, BPDAS, BKSDA, host communities and other key stakeholders.
- Assist PLN and stakeholders to implement projects under the plan – by facilitating engagement, collaboration and efficiencies. Provide training or other capacity building as required.
- Assist PLN to develop a spatial GIS database and a plan for obtaining and managing catchment data.

7.3.7 BMP Facilitation Team
- A coordinated team including staff from PLN, Perhutani and community representatives, to improve engagement and outreach.

7.3.8 Technical Assistants
- Consultants will be engaged as required to conduct technical field work, species conservation work and ongoing monitoring required to measure the progress of the reforestation and habitat restoration project. This may form part of the TOR for the ICM Facilitation Team or may be separate contracts.

7.3.9 Patrol teams

- Teams based in the area, made up of Perhutani staff, PLN staff, BMP facilitation team, ICM facilitation team members, community members, and / or, if required, Government representatives, with purpose of patrolling the BIA and other reforested areas to:
    - Discourage poaching and illegal harvesting or land clearance
    - Monitor and report poaching and illegal harvesting or land clearance
    - Remove traps
    - Help to spread the word about biodiversity conservation and the key messages about the BIA.

8 Capacity and Training

8.1 Capacity

This BMP shall be implemented as part of the implementation of the UCPS ESMP. However PLN do not have biodiversity specialists or ecologists in-house and will rely on external consultants and other specialists to implement key aspects of the BMP and provide further training.

An ICM Facilitation Team will be engaged to carry out many of the BMP tasks, on behalf of PLN:

- Induction training on the BMP to Contractors and consultants, and for new PLN staff
- Consultation and engagement with stakeholders ()
- Assistance to PLN in the development and maintenance of GIS databases for ICM
- Legal reviews of land classification
- Assisting Perhutani, PLN and / or contractors' staff to demarcate BIA prior to construction starting, and to demarcate other working zones as required through the period of reforestation.
- Biodiversity surveys and monitoring of the BMP outcomes
- Species management
- Restoration planting guides
- Training PLN staff, communities and NGO's in seed sourcing and plant nursery operation

Other specialists will be engaged as required to complete other tasks, such as wildlife handling following an incident.

8.2 Training

All those responsible for the management and implementation/operation of any aspect of the BMP shall be adequately trained for their role. Evidence of training (records of attendance at workshops, evidence of formal training) should be maintained by PLN, for inspection and auditing purposes.

Table 14. Training Schedule for 2021

Implementer	Training scope	Purpose/objective	Training material	Trainees/audience	Schedule & budget
World Bank Technical Advisors	BMP Strategy and Action Plan	Vision Objectives Management strategies Monitoring and Evaluation	Detailed training of the content of the BMP, how to implement	PLN Engineering Consultants Contractors' Management	Q2 2021 Refresher Q1 2022
World Bank Technical Advisors	Supervision of the BMP (refresher)	Supervision, monitoring and auditing of the BMP How to manage non-compliance.	How to ensure that the actions are completed on time, and in an integrated way. How to supervise work done by consultants and contractors. Corrective actions.	PLN UIP VI Environmental Unit UCPS management team	Q2 2022
ICM Facilitation Team – Lead	BMP Strategy and Action plan	Specific – targeted training on aspects in the BMP relevant	Particular attention will be paid to the specific	Contractors	Ongoing as part of induction programs during

Implementer	Training scope	Purpose/objective	Training material	Trainees/audience	Schedule & budget
Biodiversity Advisor		to the work program. Relevant at the management level.	provisions in each contract's technical specifications indicating how the BMP is to be complied with	Engineering consultants	construction phase.
ICM Facilitation Team – Lead Biodiversity Advisor	BMP Strategy and Action plan	Induction to Biodiversity – relevant at the worker level.	Prohibitions Relevant Actions from the Action Plan	Contractors Workers	Ongoing as part of induction programs during construction phase.
ICM Facilitation Team – Lead Biodiversity Advisor	BMP Strategy and Action Plan	Management strategies Monitoring and Evaluation	Training of project drivers to identify and report wildlife encountered on roads	Contractors Workers	Q3 2021 and quarterly thereafter as required.
ICM Facilitation Team	BMP Strategy and Action Plan	Management strategies	Training of local patrol teams	Local patrol teams	Q3 2021
World Bank	ICM	Case Study	Site tour to visit examples of successful forest management in the Philippines.	PLN UIP VI Environmental Unit UCPS Team PLN Pusat Stakeholders	Q3 2021

The training schedule will be reviewed and updated in Q2 2022.

9 Monitoring and Evaluation

Monitoring fulfils two objectives. First, monitoring is required to show that PLN and its contractors meet the criteria of the BMP, i.e., implementation monitoring: are all actions done as prescribed? Second, PLN and its contractors are required to monitor the impact their own management and has on biodiversity values, i.e., validation monitoring: Is implementing actions in the BMP resulting in stable or growing populations of threatened wildlife?

9.1 Management Purposes

A. Maintain an administrative system that monitors implementation of each action in the BMP and checks against timelines.

B. Develop baseline data and compare with regular monitoring updates to determine the direct and indirect impacts of project development on the species of most conservation concern (Table 1) and their habitats. For most species, it will not be possible to obtain baseline data that are more accurate than absence/presence statements. For Javan Gibbons, which can be counted individually if directly sighted and which, as strictly arboreal species, are unlikely to move between distinct BIAs, the aim should be to get minimum population estimates. Similarly, for Javan Leopards, which can identified at the individual level through camera trapping, the aim should be to obtain a minimum population estimate for the area.

9.2 Management Actions

87. BMP Manager sets up and maintains a database in which all actions in the BMP and their associated implementation times lines are monitored. Where actions can be quantified (e.g., number of trees replanted; number of ha of land bought; number of community agreements on joint land management) this should be recorded.

88. Monitor the presence of populations of the most endangered species (see Table 1, Javan Mouse-Deer, Small-clawed Otter, Binturong, Leopard Cat, Javan Leopard, Pangolin, Grizzled Leaf Monkey, Javan Langur, Javan Gibbon, Javan Slow Loris) and their habitat and take action when their immediate survival seems threatened. PLN should hire independent wildlife experts to conduct the following monitoring programs and take action if populations are threatened. This may be the ICM Facilitation Team or a specialist consultant:

    • Camera traps should be installed in all BIAs to monitor the presence of terrestrial species. Cameras are maintained by patrol teams, and photos collected on a monthly basis and shared with the BMP Manager.

    • Independent wildlife experts, working with the locally hired patrol teams, conduct monitoring of arboreal species (especially primates) at least 3 times per year during project development to check whether primates are still there and what their physical condition is. If animals are in poor condition, immediate consultation and action is required to see if supplementary feeding or other actions can increase the likelihood of animal survival.

- Through annual analysis of remotely sensed imagery (high resolution) changes in vegetation cover will be monitored in and around all BIAs[12]. If forest areas decline, or if rehabilitation and reforestation activities are not resulting in visible increases in forest cover, immediate action is needed to ensure that these programs are effectively implemented.

89. Conduct annual interview surveys with communities to determine changes in attitudes towards threatened wildlife and activities that could be detrimental or beneficial.

90. All permanent and temporary access roads will be monitored to determine areas where wildlife cross, to record road kills, and to monitor whether wildlife tunnels and rope bridges are being used. This requires the establishment of a system that allows project drivers and other frequent users of the road to report wildlife sightings or report road kills. Training drivers with an interest in wildlife and an ability to reliably identify species is a cost-effective method that both results in regular data generation and increased buy-in from project staff about biodiversity objectives of the project.

91. Monthly inspections of the retained vegetation areas around the access road and construction sites during construction. Annual or bi-annual reforestation plots will be carried out to monitor tree mortality and repeat planting when needed.

92. Three-yearly evaluation of monitoring data and review / revision of BMP.

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[12] Methods for annual classification of vegetation cover

Sources: WorldView-2, 50 cm Resolution, updated every year
Output: Landcover map, Shapefile with land cover attributes
Vegetation classes: Natural forest, other woodland, monocultural planted forest, non-woodland (scrub, grass, agriculture)
FAO Definition forest: Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.
FAO Definition other wooded land: Land not classified as "Forest", spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5–10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
Area of interest: ca. 6000 ha/60km^2

10 Reporting

Table 15. Reports and Reporting Requirements.

Type of report and purpose	Frequency of Submission	Report submitted to:
Daily / weekly inspections	Monthly (except where incidents or non-compliance occurs)	Contractor to PLN Environmental Supervisor and BMP Coordinator.
Routine reporting	Monthly – within ESMP reporting structure	Contractor to PLN Environmental Supervisor and BMP Coordinator.
	3 monthly – within ESMP and Loan Agreement reporting structure	PLN to World Bank
	Annually – within ESMP and AMDAL reporting structure	BPLHD West Java Province Environment Agency Cianjur and West Bandung Districts
Non compliance report	Within 1 week of significant non compliance, otherwise incorporate into monthly reporting	From Contractor to PLN Environmental Supervisor and BMP Coordinator From PLN to: World Bank BPLHD West Java Province • Environment Agency Cianjur and West Bandung Districts
Incident report – memo or verbal report	As required, prior to remediation	From Contractor to PLN Environmental Supervisor and BMP Coordinator
Any updates or revisions to the BMP	As required, prior to implementation	PLN provides updated document to: World Bank, BPLHD West Java Province • Environment Agency Cianjur and West Bandung Districts
Monitoring and Evaluation report – results from 3 yearly monitoring	3 yearly	Consultant to provide to PLN, World Bank

11 Detailed Annual Task Lists and Budget until the end of 2023

The total costs for implementing the BMP and FPF between 2021 and 2030 is broadly estimated at $8,000,000. This includes estimated costs of implementing social forestry programs in 30 villages @ $ 200,000 per 10 year (Meijaard et al. 2020) ($ 6,000,000), the costs of engaging an external organization to provide expert input into program development ($1,000,000) and the implementation costs of the BMP in the first three years (Table 16, Table 17, and Table 18). This budget estimate needs to be further refined.

Table 16. Key Tasks and Budget Pre-Construction Phase – January 2021 – July 2021.

Action No.	Key Tasks	Detail	Estimated Budget $US	PIC
62	Recruit BMP Advisor and ICM Facilitation Team		15,500	PLN
1/2/45	Survey and mark all BIAs and upload information into GIS	Part of PKS PLN and Perhutani	0	PLN . Perhutani
2/31/64/82/	Finalize PKS with Perhutani and develop mutually agreed reforestation plans for Working Zone 1 and 2	Part of PKS PLN and Perhutani	42,000	PLN/ Perhutani
32/35/74/86	Engage PEMDA and community in reforestation planning zone 1 and 2	PLN BMP budget	25,000	PLN/ Perhutani
4/5	Install culverts and rope bridges and follow SOP for land clearances along access road.	Road Contractor's project budget for culverts, rope bridges installed by PLN	1,200	PLN ICM Facilitation Team
6/7/8/9	Reforest road sides, road cuttings, steep slopes adjacent to road. Ensure all areas are rehabilitated prior to signing off on Contract.	Road Contractor's project budget	0	Road Contractor
10	Manage UPK nursery to prepare for / keep up with demand	PLN budget	12,000	PLN BMP Technical Consultant team
11/12/14/15/17/18 /19/20/22/23/24/2 5/52/53/54/59/60	Sign off that the Main Contractors ESMP (landscape plan, planting plans, traffic management plans) is consistent with the BMP.	Main Contractor to prepare Contractors ESMP. PLN supervision budget	0	Main Contractor PLN
12	Create guard posts.	Main Contractor's budget	0	Main Contractor
13	Set up biodiversity patrolling and wildlife management	BMP Technical Consultant Team to develop plans	35,000	PLN BMP Technical Consultant team
14	Install prohibition signs on the use of roads (both of access road and temporary roads)	Main Contractor's project budget	1,200	Main Contractor
15/23	Install prohibition signs for hunting, snaring or other activities harmful to wildlife, and careful driving.	Main Contractor's project budget	1,200	Main Contractor
16/61/71/72/73/74 /76	Improve local understanding about environmental conservation.	Undertake during wider community consultation / awareness raising pre-construction. PLN consultation budget	1,400	PLN, BMP Technical Consultant team
53, 59	Inform all contractors and personnel about relevant wildlife legislation, and wildlife encounter protocols	Main Contractor's training budget	0	Main Contractor
54	Develop and implement system for reporting all wildlife incidences	Main Contractor's monitoring budget		BMP Technical Consultant team
55	Confirm presence of threatened species in BIAs through field and interview surveys	Biodiversity consultant need to confirm budget	15,000	PLN Short-term consultant
60	Set up a rapid response wildlife management unit (animal conflict)	PLN budget allocated to Technical Consultant	15,000	PLN

					BMP Technical Consultant team
67	Work with PEMDA to develop village development plans and promote ICM	Resettlement plan budget	10,000	PLN	
77/78	Provide safeguards details to resettlement team and work with them to ensure their work avoids conflict with BMP	PLN Supervision budget	0	PLN	
New action items transmission line	Survey on Java to determine bird mortalities from electrocution or collision		Not yet budgeted		
	Total (January – July 2021)		**281,000**		

Table 17. Key Tasks and Budget Year 1 Construction Phase – August 2021 – July 2022.

Action No.	Key Tasks	Detail	Estimated Budget $US	PIC
4/5/6/7/8/9/11/	Construction mitigation activities to minimise further habitat fragmentation and loss	Main Contractor's budget	0	Main Contractor PLN to supervise
45	At least annually, survey and mark reforested areas and upload information into GIS	PLN BMP budget, part of PKS PLN & Perhutani	28,000	PLN
17/18/19/20	Implement effective anti-fire strategies	Main Contractor's budget	0	Main Contractor
22/24	Traffic management and driver training.	PLN Supervision Budget Main Contractors Budget	0	PLN Main Contractor
26/27/28/29	Plan and prepare nursery operations	PLN BMP budget	2,820	PLN ICM Facilitation Team
31/32/33/46/56/80	Implement reforestation zone 1 and protect and manage reforestation blocks	PLN BMP budget, part of PKS PLN &Perhutani	28,000	PLN Perhutani BMP Technical Consultant team
34/35/36/45/56/64/65/80/82/83/86	Finalise planning and implement reforestation zone 2. Protect and manage reforestation blocks in zone 2	PLN BMP budget, part of PKS PLN &Perhutani	28,000	PLN Perhutani BMP Technical Consultant team
37	Legal forest planning for Working Zone 3 / Reservoir buffer zone.	PLN BMP budget, part of PKS PLN &Perhutani	28,000	PLN Perhutani BMP Technical Consultant team
51	Assess annual forest cover by December 2015.	PLN BMP budget	5,000	PLN
48/49/76	Develop models for community forest management	May require ICM Facilitation team or specialist consultancy advice	14,000	PLN
74/75/76	Engage with PEMDA and Develop MOU between PLN, villages and PEMDA if required	PLN BMP budget (LARAP??)	10,000	PLN BMP Technical Consultant team
53/54	Ongoing training and awareness of wildlife issues, and reporting of incidences.	Part of contractor's training budget	0	Contractor
57/58/88/90	Design and implement wildlife monitoring and adaptive wildlife management	BMP Technical Consultant team	14,000	PLN, Short-term consultant BMP Technical Consultant team
16/21/71/72/73/76/61	Continue with a program to improve local understanding about environmental conservation and ICM (Carrying on from pre-construction consultation)	To coincide with other community consultation / engagement programs under SCMP and Resettlement	10,000	PLN ICM Facilitation team
63/66/68/69	Promote ICM locally and nationally	ICM budget	7,000	PLN
87	Progress monitoring database / reporting system	PLN supervision budget	0	PLN
New action items transmission line	Bring line design in line with avian-safe structures, using appropriate horizonal and vertical cable spacing		Not yet budgeted	
New action items	Insulate energized parts		Not yet budgeted	

transmission line			
New items transmission line	**action**	Apply anti-perch structures	Not yet budgeted
New items transmission line	**action**	Wire-marking to avoid collisions	Not yet budgeted
		Total	**260,000**

Table 18. Key Tasks and Budget Year 2 Construction Phase – August 2022 – July 2023.

Action Plan No.	Key Tasks	Detail	Estimated Budget	
45	At least annually, survey and mark reforested areas and upload information into GIS	PLN BMP budget, part of PKS PLN & Perhutani	28,000	PLN
4/5/6/7/8/9/11/17/18/19/20/22/24/52/53/54/59/60	Ongoing construction mitigation activities to minimise further habitat fragmentation and loss, fire management, traffic management, wildlife encounters	Main Contractors Budget	0	Main Contractor
29/31/32/33/46/47/91	Implement reforestation zone 1 and protect and manage reforestation blocks	PLN BMP budget, part of PKS PLN & Perhutani	35,000	PLN Perhutani BMP Technical Consultant team
3/35/36/46/47/91	Implement reforestation zone 2 and protect and manage reforestation blocks	PLN BMP budget, part of PKS PLN & Perhutani	35,500	PLN Perhutani BMP Technical Consultant team
38/39/40/65/46/47/91	Implement reforestation zone 3 and protect and manage reforestation blocks	PLN BMP budget, part of PKS PLN & Perhutani	35,000	PLN Perhutani BMP Technical Consultant team
41	Review reforestation progress zones 1 and 2	PLN BMP budget, part of PKS PLN & Perhutani	35,000	BMP Technical Consultant team
42/43	Identify land for implementing reforestation zone 4 and start planning	PLN BMP budget, part of PKS PLN & Perhutani	35,000	PLN Perhutani BMP Technical Consultant team
51	Assess forest cover annually, before December 31 2016	ICM budget	5,000	PLN
50/79/82/83/84/86	Implement models for community forest management	PLN BMP budget, part of PKS PLN & Perhutani	14,000	PLN Perhutani BMP Technical Consultant team
56/57/88/90	Implement wildlife monitoring and adaptive wildlife management	BMP Technical Consultant team	14,000	PLN BMP Technical Consultant team
63/66/68/69/70	Promote ICM approaches, at local, national and international fora	BMP Technical Consultant team	7,000	PLN BMP Technical Consultant team
67	Work with PEMDA to develop village development plans and promote ICM	The aim is to seek external funding for implementation	10,000	PLN PEMDA BMP Technical Consultant team
21/61/71/72/73/74/75/76	Improve local understanding about wildlife conflict, environmental conservation and ICM	BMP Technical Consultant team	14,000	PLN PEMDA BMP Technical Consultant team
89	Annual community survey	PLN Supervision budget	0	PLN
87	Progress monitoring database / reporting system	PLN supervision budget	0	PLN
	Total		**507,500**	

12 Plan Update and Review

The BMP will be reviewed and updated as follows:

Table 19. Plan Update and Review Timeframe

Project Phase	Estimated timeframe
Following BMP Monitoring and Evaluation (3 yearly)	Mid 2024
At least 6 months prior to reservoir filling.	2025
Following an incident that reveals shortcomings in the BMP	Any time

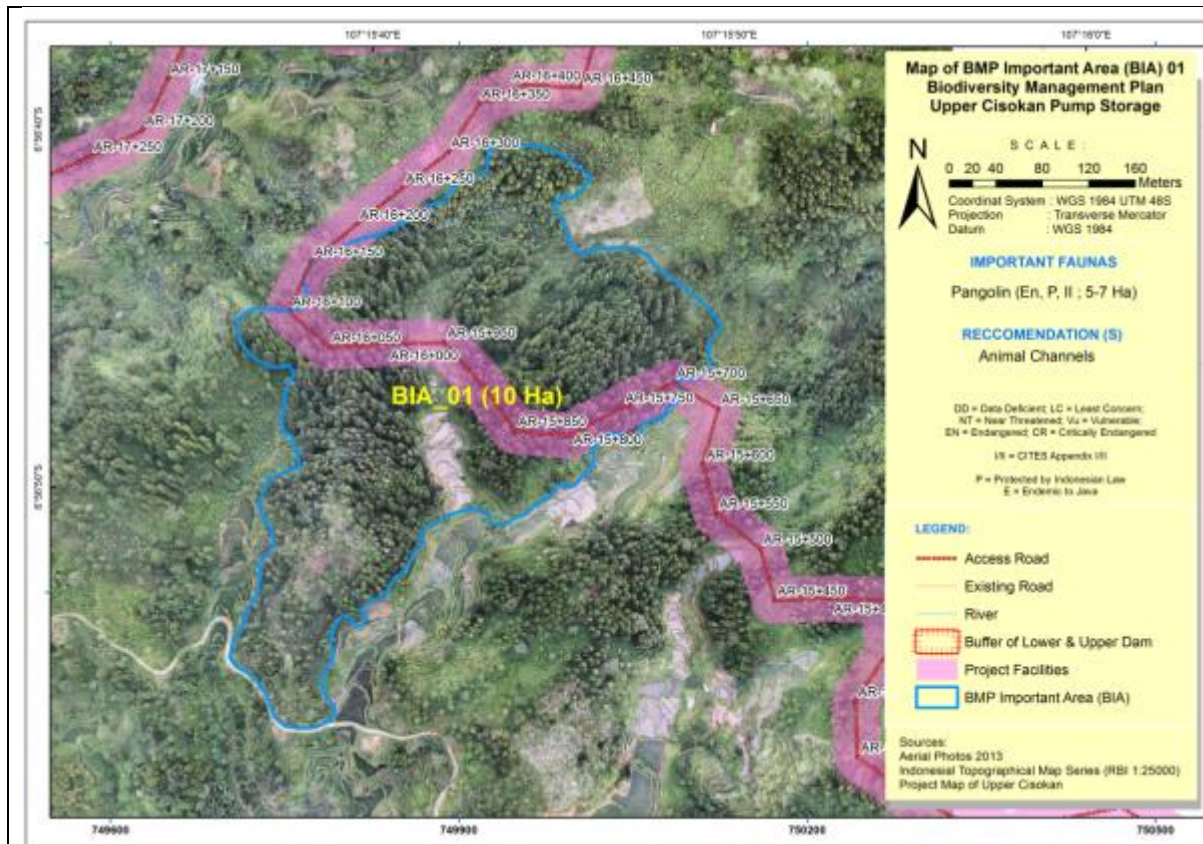A suitably qualified consultancy will be engaged to review and update the BMP.

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Appendix 1. Detailed maps and instructions

BIA 1 - Datarmala

Map of BMP Important Area (BIA) 01
Biodiversity Management Plan
Upper Cisokan Pump Storage

Description:
Located in the Datarmala area; an area of about 10 ha. Pangolin reported. Forest with pine, not too dense and lush, with stands of trees in bush/shrub land and fields. Intensive community use.
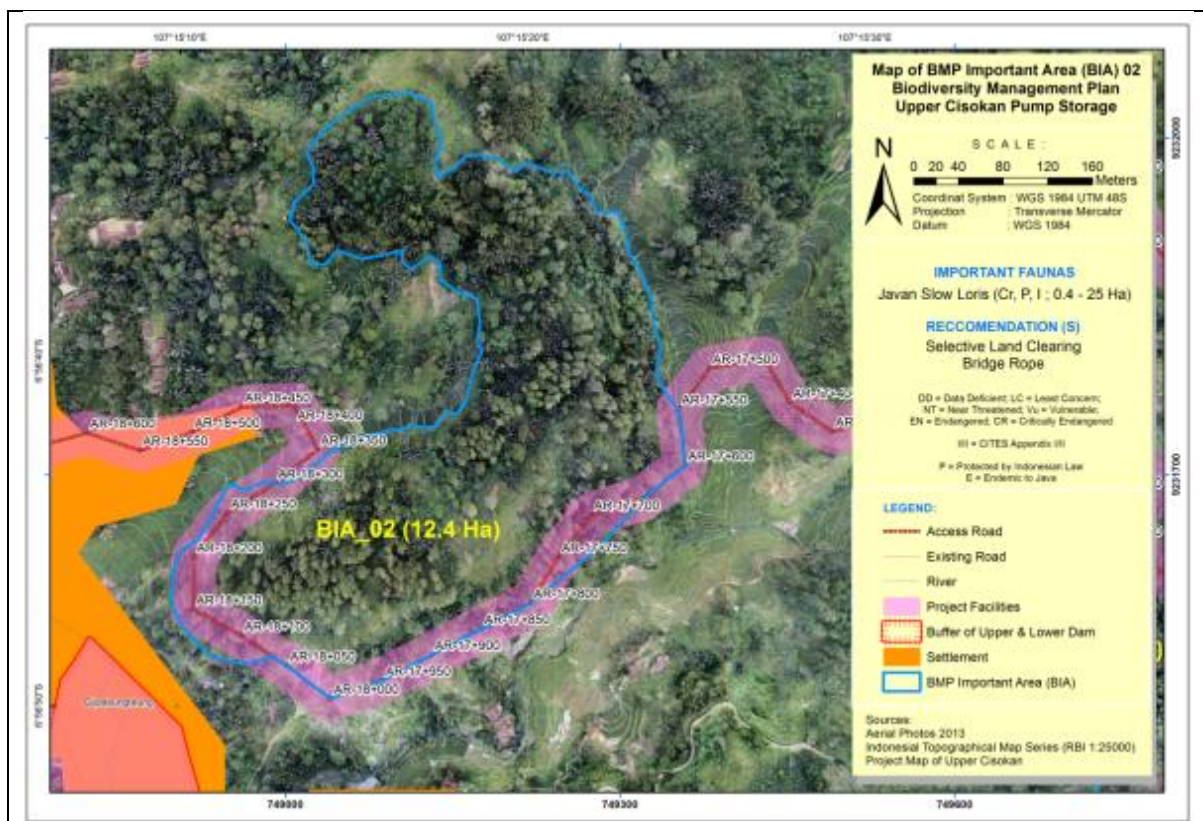
Threats:
Construction of access road will reduce the area by 2 ha. Access road can disrupt movement of pangolin.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Land clearing follows SOP (see Appendix 7).
3. Install culverts to facilitate pangolin movement.
4. Replant areas adjacent to road and other degraded areas.
5. Install traffic signs to avoid car collisions with wildlife.
6. Install signs banning hunting and trapping by project workers.

BIA 2 - Cipateungteung

Description:
Located in the Cipateungteung area; extent about 12.4 ha. Javan Slow Loris reported but not confirmed. In BIA-2, Slow Loris is reported in production pine forest habitat and planted sugar palm agroforestry.
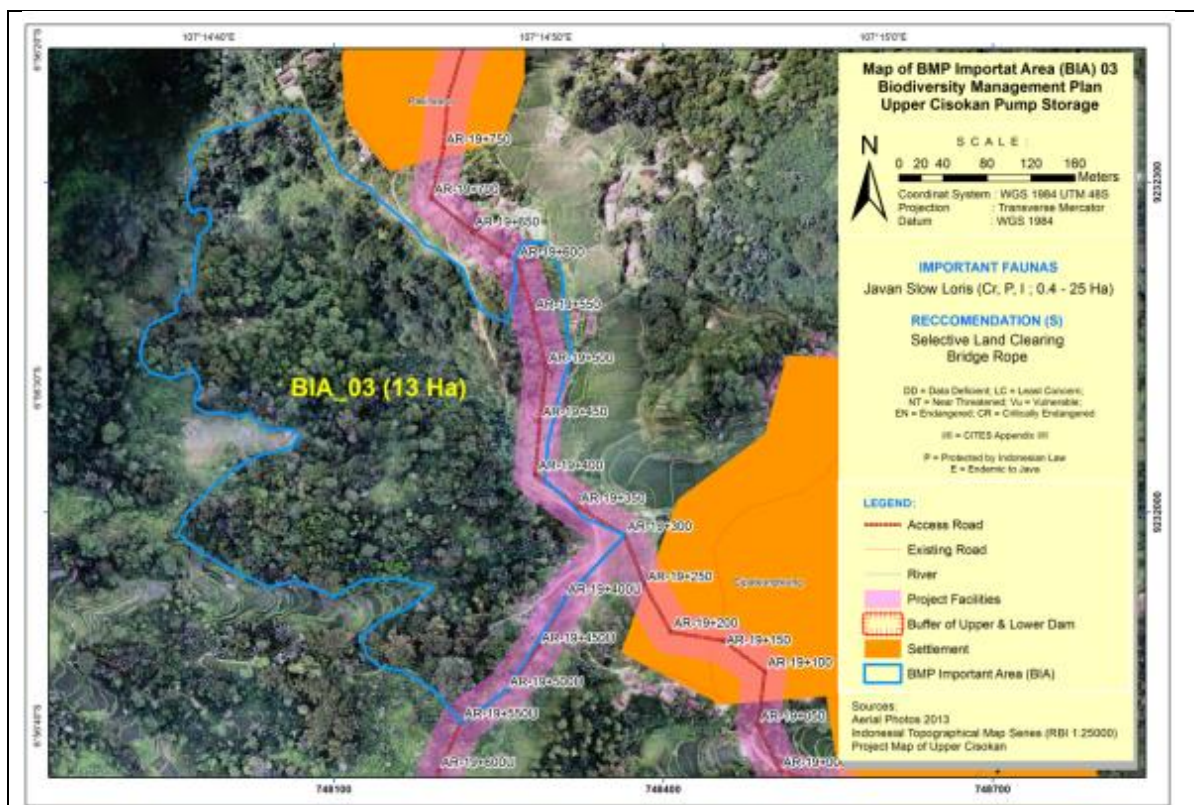
Threats:
Construction of access road will reduce the area by 2 ha. Access road can disrupt movement of slow lorises.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Invite slow loris specialist to survey BIA-2 and confirm presence of slow lorises.
3. Land clearing follows SOP (see Appendix 7).
4. Install rope bridges to facilitate movement of slow loris and other arboreal species.
5. Replant areas adjacent to road and other degraded areas.
6. Install traffic signs to avoid car collisions with wildlife.
7. Install signs banning hunting and trapping by project workers, specifically noting that slow lorises are protected by Indonesian law.

BIA 3 - above Cipateungteung

Description:

Located north of the village of Cipateungteung; extent about 13.1 ha. Javan Slow Loris reported but not confirmed. In BIA-3, Slow Loris is reported in production pine forest habitat and planted sugar palm agroforestry.

Threats:
Construction of access road will reduce the area by 1.3 ha. Access road can disrupt movement of slow lorises.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Invite slow loris specialist to survey BIA-2 and confirm presence of slow lorises.
3. Land clearing follows SOP (see Appendix 7).
4. Install rope bridges to facilitate movement of slow loris and other arboreal species.
5. Replant areas adjacent to road and other degraded areas.
6. Install traffic signs to avoid car collisions with wildlife.
7. Install signs banning hunting and trapping by project workers.

BIA 4 - Boundary area between Bandung and Cianjur
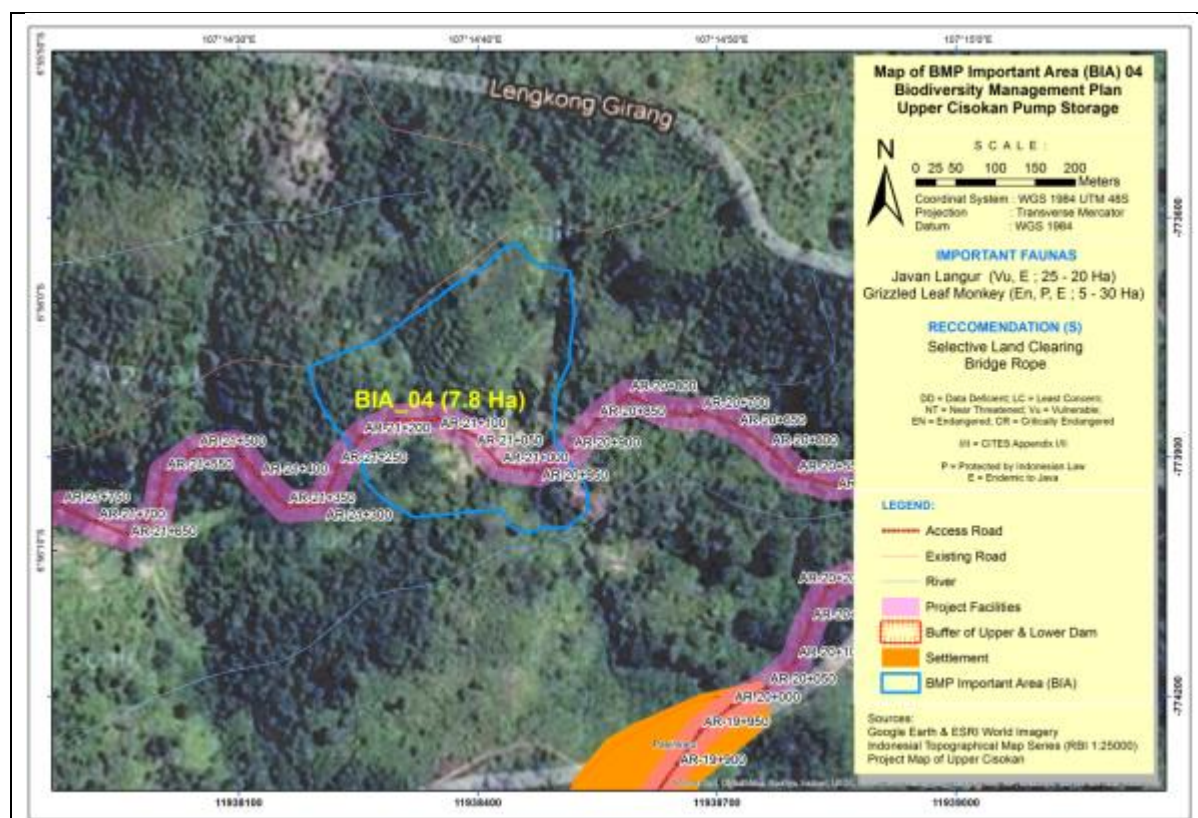
Description:

Located at the boundary between the Bandung and Cianjur Districts. This BIA is small with an area of about 7.8 ha. Javan Langur and Grizzled Leaf Monkey have been reported, which may indicate that these primates use a larger area around this BIA, because their homes ranges are generally larger than the area of the BIA. Fruit trees (especially figs) are important for these species, and such trees need to be protected at all costs. In BIA-4 the vegetation consists of pine, *Calliandra calotirsus*, bamboo agroforestry and sugar palm.
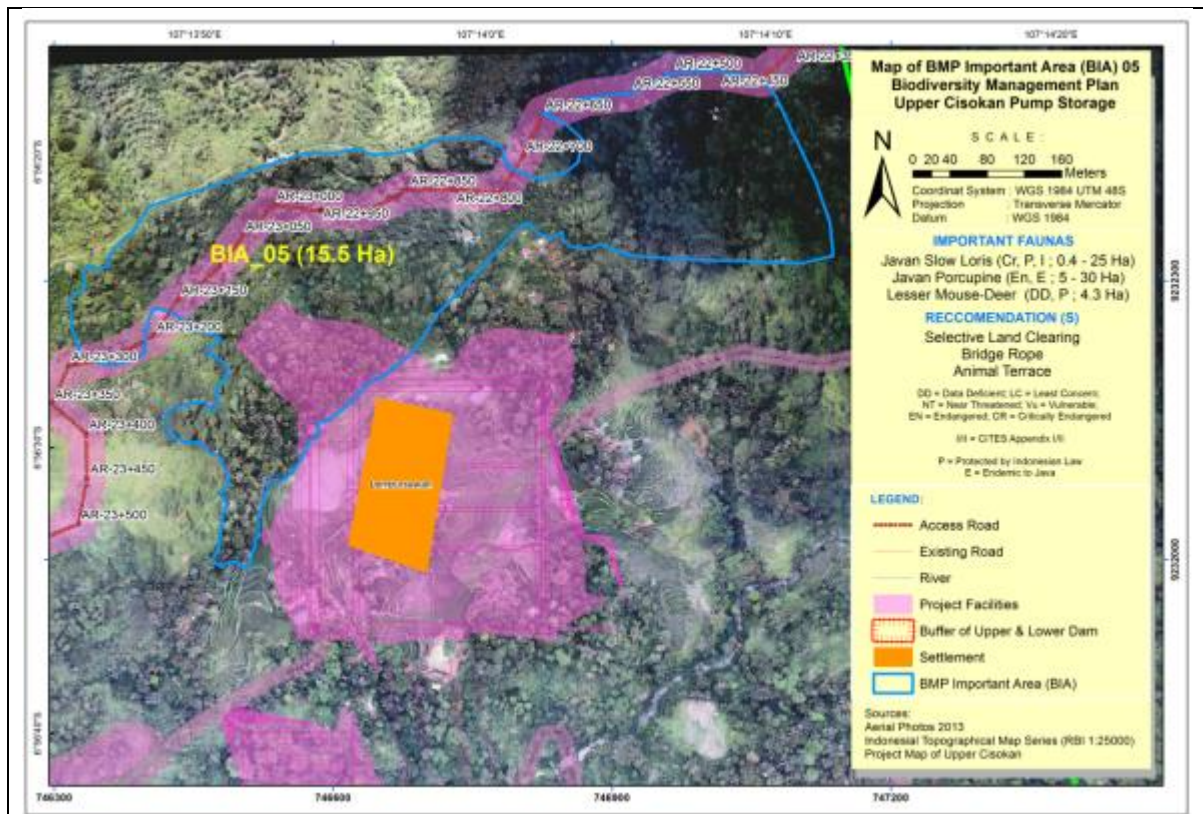
Threats:
Construction of access road will reduce the area by 1.2 ha, and disturbe these shy primates. Access road can disrupt movement of primates.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Land clearing follows SOP (see Appendix 7).
3. Install rope bridges to facilitate movement of primates and other arboreal species.
4. Replant areas adjacent to road and other degraded areas.
5. Install traffic signs to avoid car collisions with wildlife.
6. Install signs banning hunting and trapping by project workers.

BIA 5 - Puncak Haur

Map of BMP Important Area (BIA) 05
Biodiversity Management Plan
Upper Cisokan Pump Storage

Description:
Located in the Puncah Haur area; extent about 15.5 ha. Animals found at this location include Javan Slow Loris (reported, but not confirmed by field studies), Javan Porcupine, and Javan Mouse Deer. Porcupines generally occur in more open forest areas where they construct under-ground burrows. Vegetation consists of pine production forest with calliandra, and agroforestry and shifting cultivation dominated by palms.

Threats:
Construction of access road and switchyard building will reduce the area by 3.9 ha. Access road can disrupt movement of slow loris and increase risk of collissions with porcupines.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Land clearing follows SOP (see Appendix 7).
3. Install rope bridges to facilitate movement of primates and other arboreal species.
4. Replant areas adjacent to road and other degraded areas.
5. Expand habitat to the east through land acquisition and replanting
6. Install traffic signs to avoid car collisions with wildlife.
7. Install signs banning hunting and trapping by project workers.

BIA 6 - Pasir Nangka
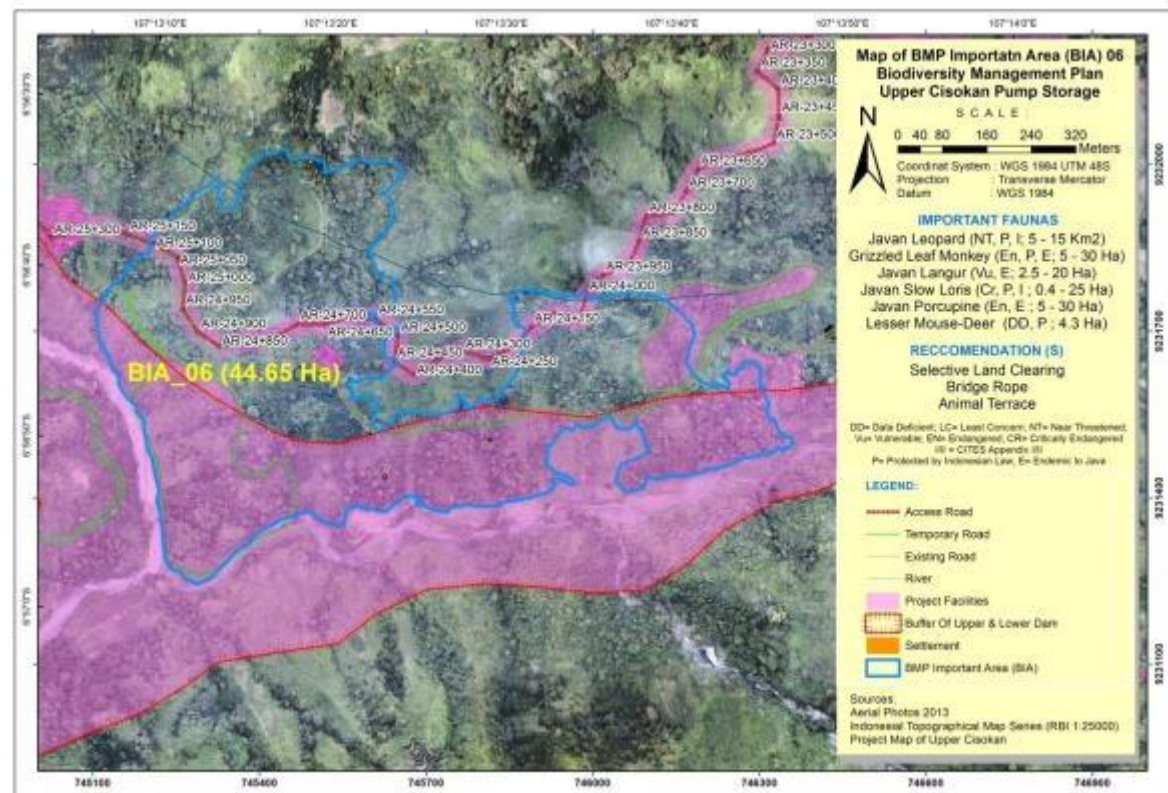
Description:
Located near Pasir Nangka; extent of about 44.7 ha. Seven important species recorded: Grizzled Leaf Monkey, Javan Langur, Javan Slow Loris, Javan Porcupine, Javan Mouse Deer and Javan Leopard. Vegetation consists of fairly dense agroforestry in Pasir Nangka and natural forest areas adjacent to Gowek forest (see below); in between the two locations, there is also production forest, scrub land, and shifting cultivation.

Threats:
Construction of access road, LOT 1B spoil bank, PH C Plant, Camp LOT 1B B & C, temporary office buildings, Temporary access road and the Lower Dam inundation area will reduce the area by 24 ha. Various developments are likely to cause significant disturbance to local wildlife populations.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Rearrange construction layout
3. Land clearing follows SOP (see Appendix 7).
4. Expanding the available amount of habitat by replanting areas to the north and also in area connecting BIA6 with BIA8 (Gowek) is important.
5. Replant areas adjacent to road and other degraded areas and plant greenbelt.
6. Install traffic signs to avoid car collisions with wildlife and install signs banning hunting and trapping by project workers.

BIA 7 - Power House area
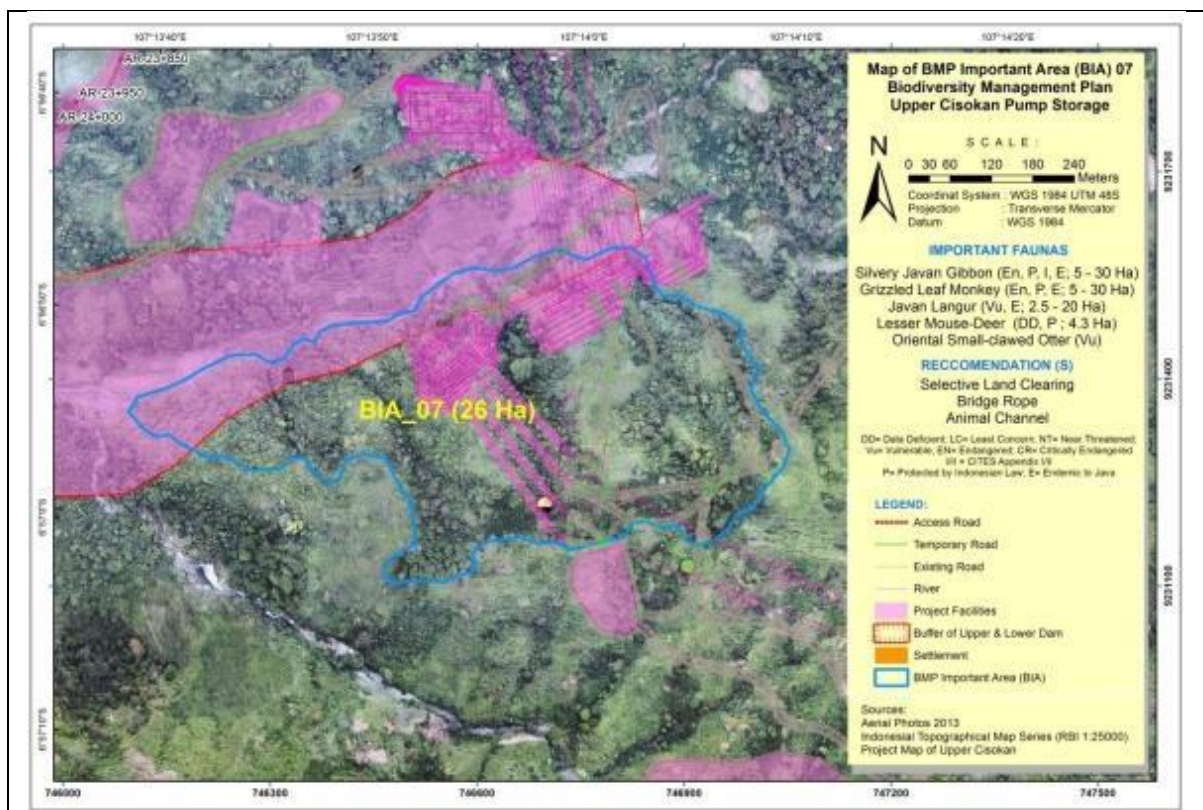
Description:
Located near the power house; extent about 26 ha. Four important species reported: Javan Gibbon, Grizzled Leaf Monkey, Javan Mouse Deer, and Small-clawed Otter. Vegetation consists of sparse pine forest and agroforestry land with banana plants, palms, and scrub land.

Threats:
Wildlife could be affected by the construction of the temporary access road, trailrace tunnel, outlet, generator house and 500kv cable, underground powerhouse, and the lower dam inundation area. This will reduce to remaining area to 16 ha. Disturbance and loss and fragementation of forest habitat are key concerns.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Land clearing follows SOP (see Appendix 7).
3. Expand the available amount of habitat by replanting areas connecting BIA-7 with BIA-9, BIA-10 and BIA-11.
4. Plant greenbelt around reservoir.
5. Install traffic signs to avoid car collisions with wildlife, and signs banning hunting and trapping by project workers.

BIA 8 - Gowek Forest

Map of BMP Important Area (BIA) 08
Biodiversity Management Plan
Upper Cisokan Pump Storage
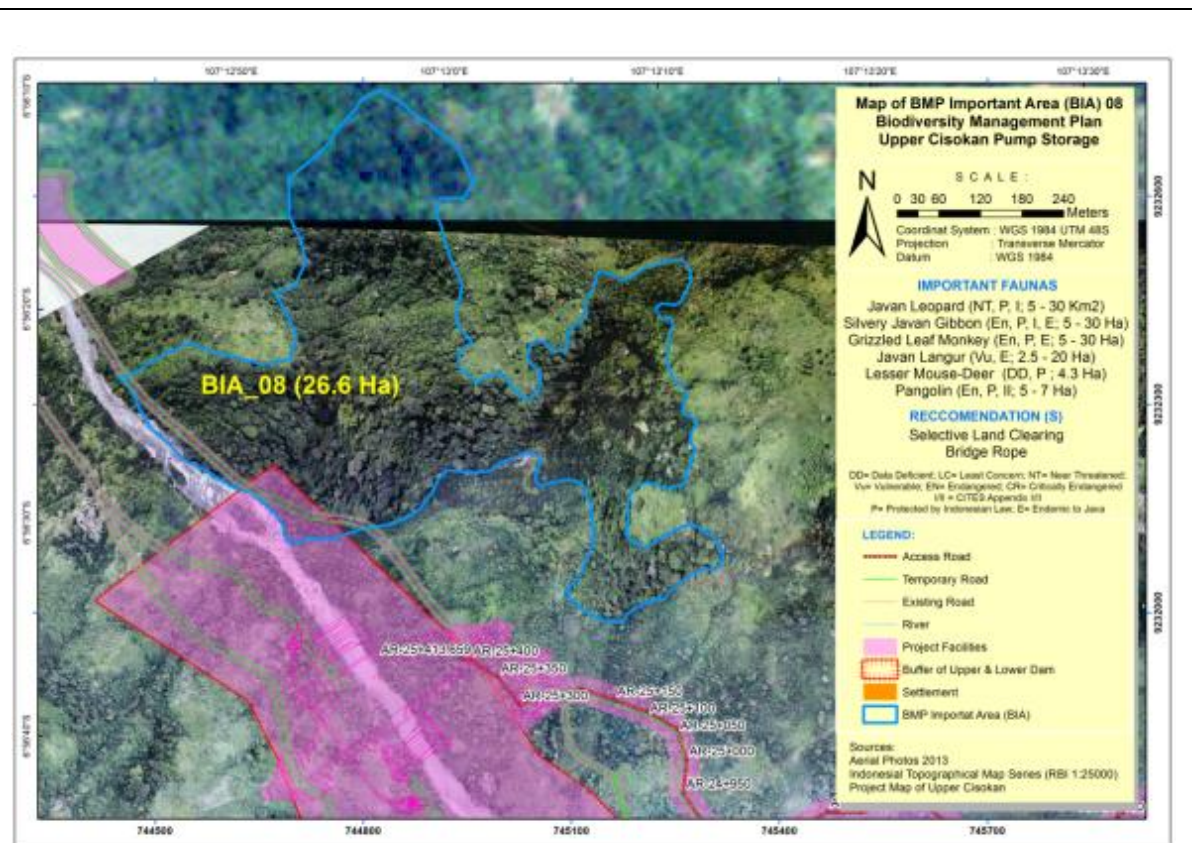
Description:
Located in Gowek forest, with an area of 26.6 ha. Gowek forest is still covered with natural forest tree species. Several important species occur: Javan Leopard, Javan Gibbon, Grizzled Leaf Monkey, Javan Langur, Javan Mouse Deer, and pangolin.

Threats:
Construction of temporary access road will reduce the area by 1.1 ha. Noise and dust from lower dam construction could impact wildlife in Gowek, and large number of construction workers could enter Gowek forest in search of forest products or wildlife. A small part will be inundated.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Land clearing follows SOP (see Appendix 7).
3. Expand the available amount of habitat by replanting areas connecting BIA-8 with BIA-12.
4. Plant greenbelt around reservoir.
5. Strictly prevent any workers from entering Gowek Forest by fencing off the forest area directly adjacent to dam construction site.
6. Install traffic signs to avoid car collisions with wildlife.
7. Install signs banning hunting and trapping by project workers.

BIA 9 - Upper Dam area and Japarana
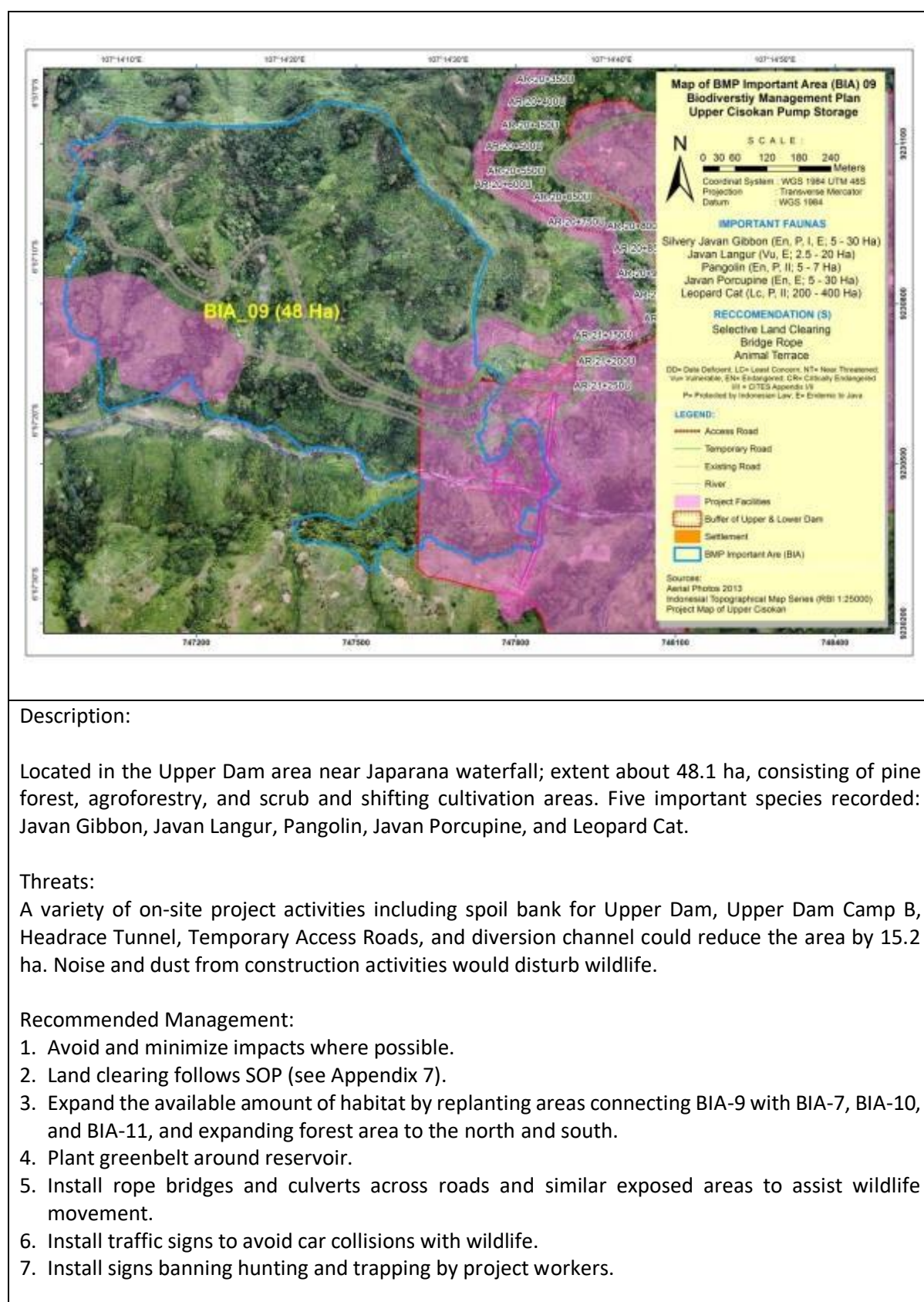
Description:

Located in the Upper Dam area near Japarana waterfall; extent about 48.1 ha, consisting of pine forest, agroforestry, and scrub and shifting cultivation areas. Five important species recorded: Javan Gibbon, Javan Langur, Pangolin, Javan Porcupine, and Leopard Cat.

Threats:
A variety of on-site project activities including spoil bank for Upper Dam, Upper Dam Camp B, Headrace Tunnel, Temporary Access Roads, and diversion channel could reduce the area by 15.2 ha. Noise and dust from construction activities would disturb wildlife.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Land clearing follows SOP (see Appendix 7).
3. Expand the available amount of habitat by replanting areas connecting BIA-9 with BIA-7, BIA-10, and BIA-11, and expanding forest area to the north and south.
4. Plant greenbelt around reservoir.
5. Install rope bridges and culverts across roads and similar exposed areas to assist wildlife movement.
6. Install traffic signs to avoid car collisions with wildlife.
7. Install signs banning hunting and trapping by project workers.

BIA 10 – Area between (Curug) Japarana and (Curug) Walet waterfalls
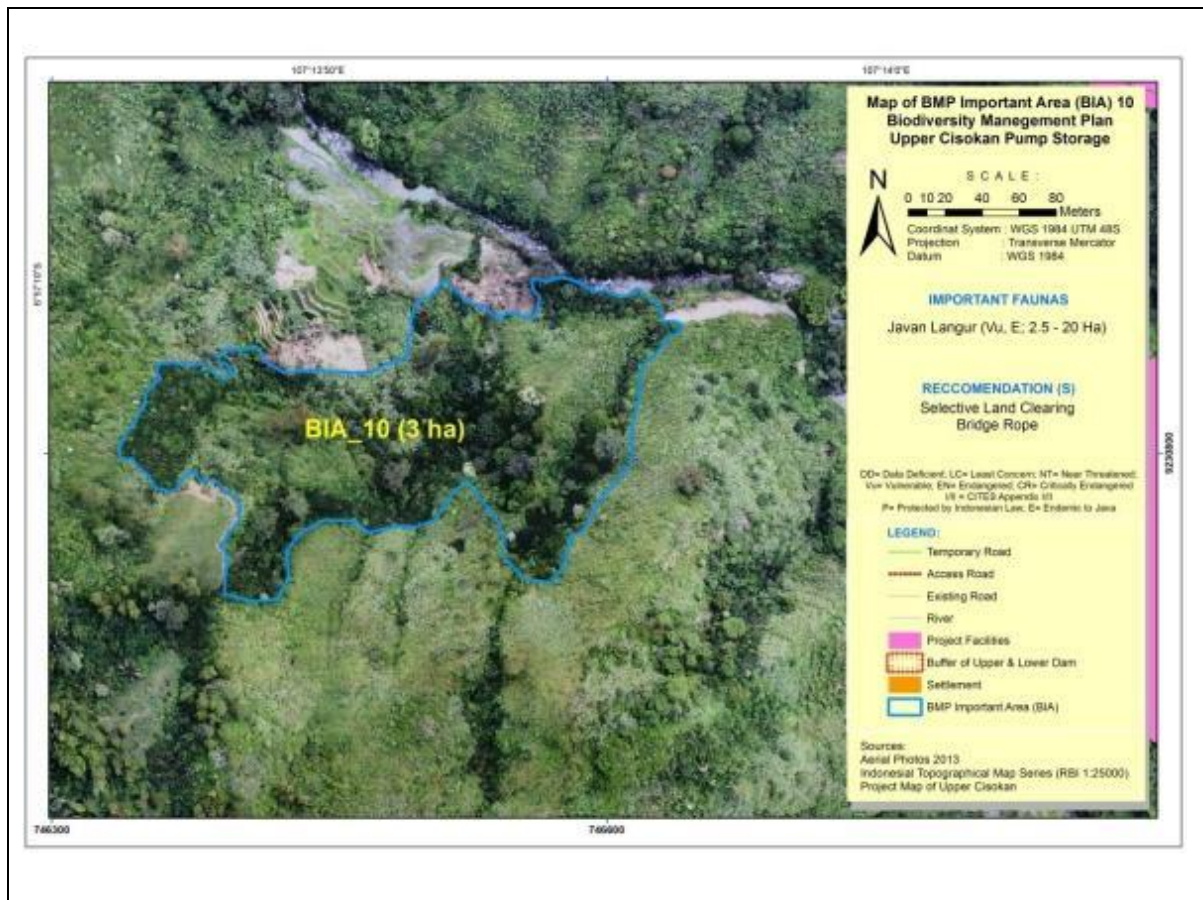
Description:
Located in the area between Curug Japarana and Curug Walet; extent about 2.8 ha. Some natural forest remains on the steep banks of Cimaramis River, mixed with remnant pine forests and scrub and shifting cultivation land. One important species has been recorded: Javan Langur.

Threats:
No direct impacts and no predicted reduction in the available amount of forest habitat from project. Community shifting cultivation and associated burning is an ongoing threat.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Replant the area to provide more natural forest for species such as Javan Gibbon in Curug Walet.
3. Implement ICM program to enlarge available forest habitats.

BIA 11 - Curug Walet

Map of BMP Important Area (BIA) 11
Biodiversity Management Plan
Upper Cisokan Pump Storage
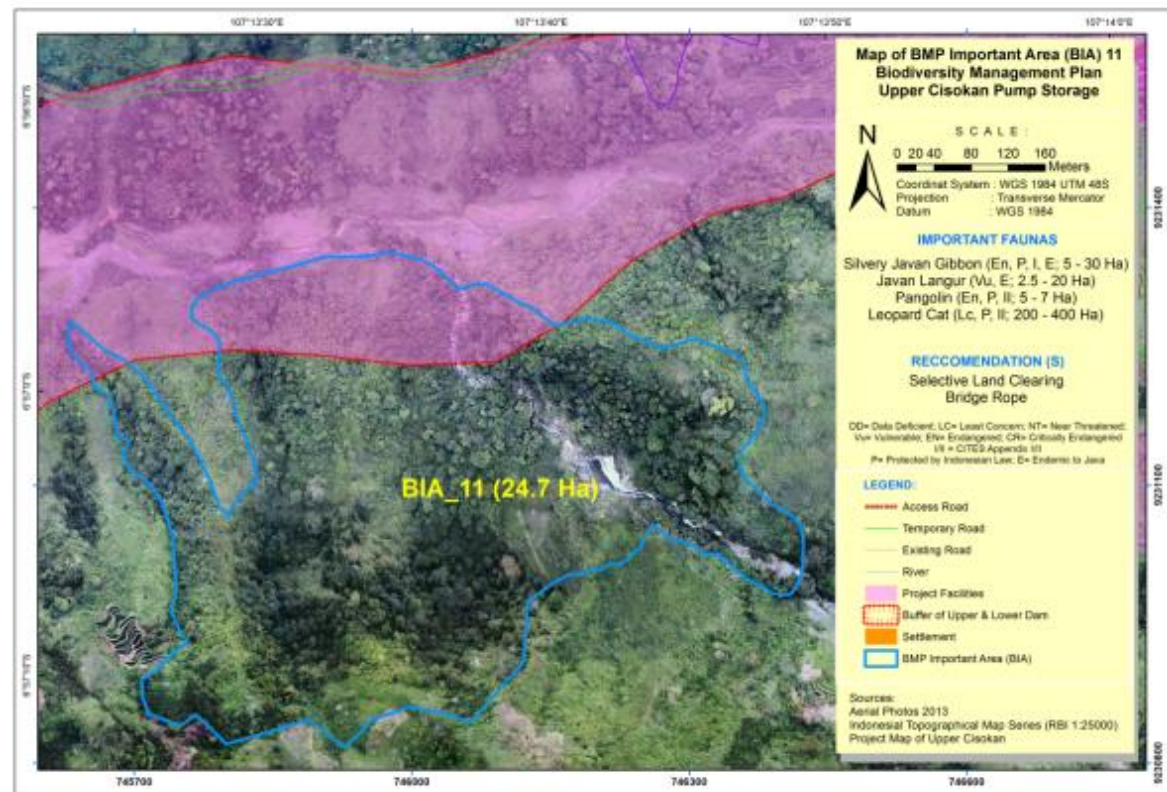
Description:
Located on either side of the Cirumamis River, up and downstream from the (Curug) Walet waterfall; extent about 24.8 ha. Mostly degraded natural forest on steep cliffs. Four species of importance recorded: Javan Gibbon, Javan Langur, Pangolin, and Leopard Cat.

Threats:
Part of the area (3.4 ha) will be submerged by the lower dam reservoir. Construction of the underground powerhouse is some distance (0.5 km) away but could still have some impact.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Expand the available amount of habitat by replanting areas connecting BIA-11 with BIA-7, BIA-10, and BIA-9.
3. Remove seedlings prior to inundation.
4. Plant greenbelt around reservoir.
5. Plant greenbelt along Cirumamis River.
6. Install rope bridges and culverts across roads and similar infrastructure to facilitate wildlife movements.

BIA12 - Pasir Taman

Description:
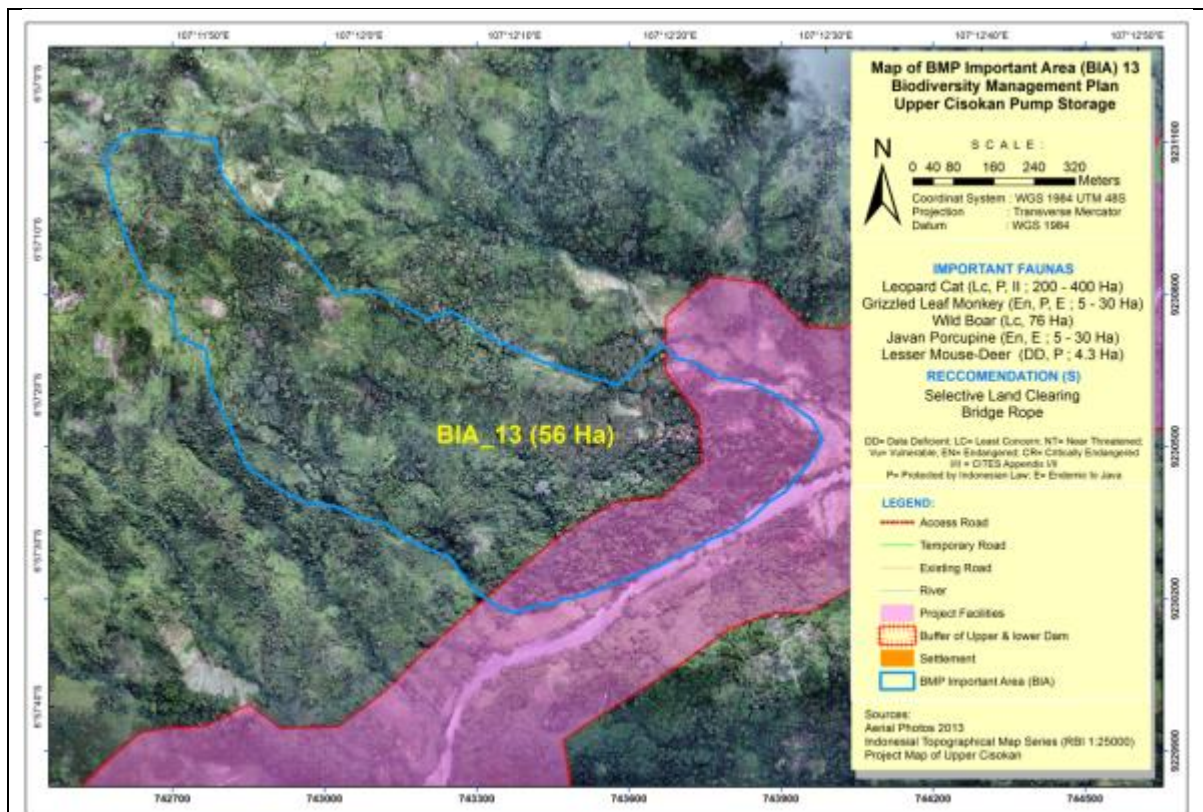Located near Taman Pasir, across the Cisokan River and opposite Gowek; extent about 27.9 ha. Teak production forest, quite open, and generally intercropped with quite lush agroforestry areas with palm trees and agricultural fields. Three important species: Javan Leopard, Grizzled Leaf Monkey, and Javan Langur

Threats:
Under the project activity, inundation by the lower dam reservoir and spoil bank require about 7.25 ha, reducing the area to 20.7 ha.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Plant greenbelt around reservoir.
3. Expand area through reforestation and merge with BIA-6 and BIA-8.
4. Enrichment planting in degraded parts of this BIA.

BIA13 - Cigintung area

Description:

Located near Cigintung, with an area of about 56 ha. BIA mostly consists of agroforestry, shifting cultination and open fields and scrub land. Five important species occur: Leopard Cat, Grizzled Leaf Monkey, Javan Langur, Javan Slow Loris, and Wild Boar (potentially important as a prey species for leopard). Pigs enter agricultural fields and destroy crops and are therefore considered agricultural pests.
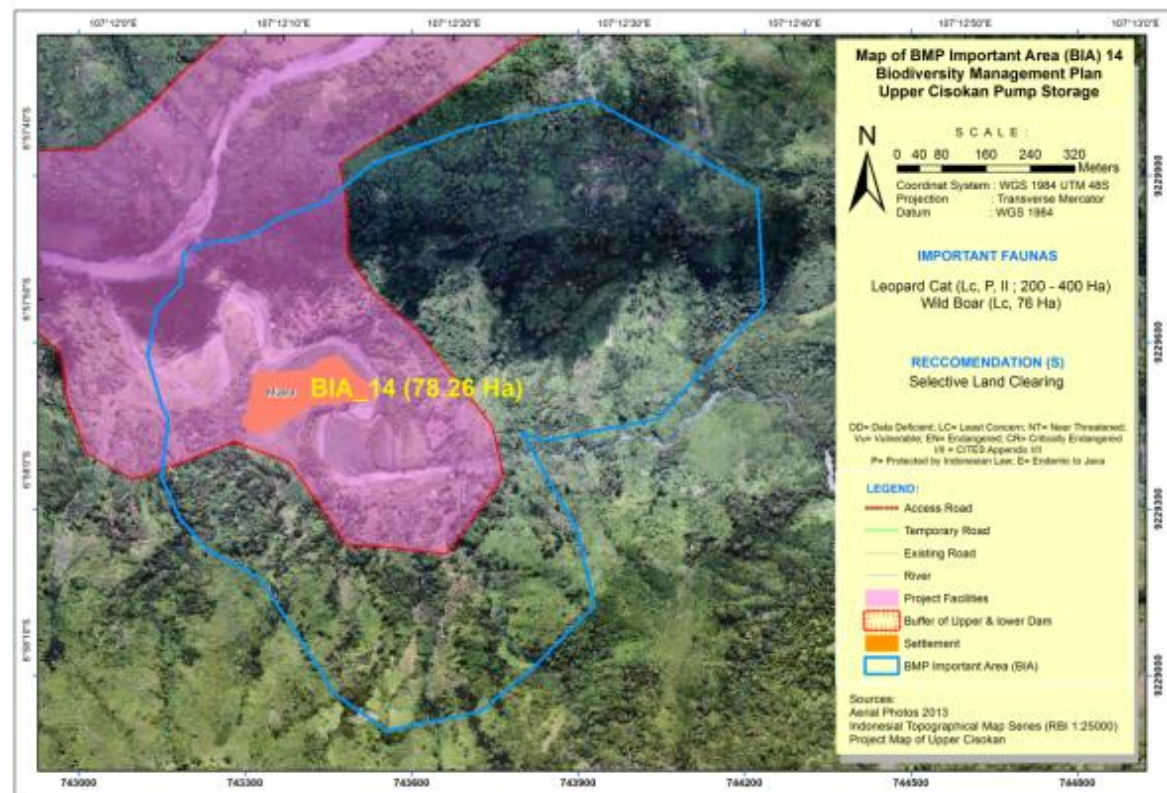
Threats:

Inundation of lower dam reservoir will reduce the area by 10.8 ha, thus leaving about 45.2 ha. Ongoing shifting cultivation could further degrade the area.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Plant greenbelt around reservoir.
3. Enrichment planting in degraded parts of this BIA.

BIA 14 - Ciawitali

Description:
Located near Ciawitali village, with an area of 78.3 ha. Land cover consists of fairly extensive and lush agroforestry with palms and bamboo and on higher slopes pine forests with shrubs. Five important species occur: Leopard Cat, Wild Boar, Javan Slow Loris, Javan Gibbon, and Javan Langur.

Threats:
Inundation of lower dam reservoir will reduce the area by 23.8 ha, thus leaving about 54.4 ha. Ongoing shifting cultivation could further degrade the area. Ongoing shifting cultivation could further degrade the area.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Plant greenbelt around reservoir.
3. Expand the area through reforestation and link it with BIA-15.
4. Enrichment planting in degraded parts of this BIA.
5. Implement ICM program to deal with resettlement impacts, shifting land use and expansion of forest habitats.

BIA 15-Kawasan Bungbulang

Map of BMP Important Area (BIA) 15
Biodiversity Management Plan
Upper Cisokan Pump Storage
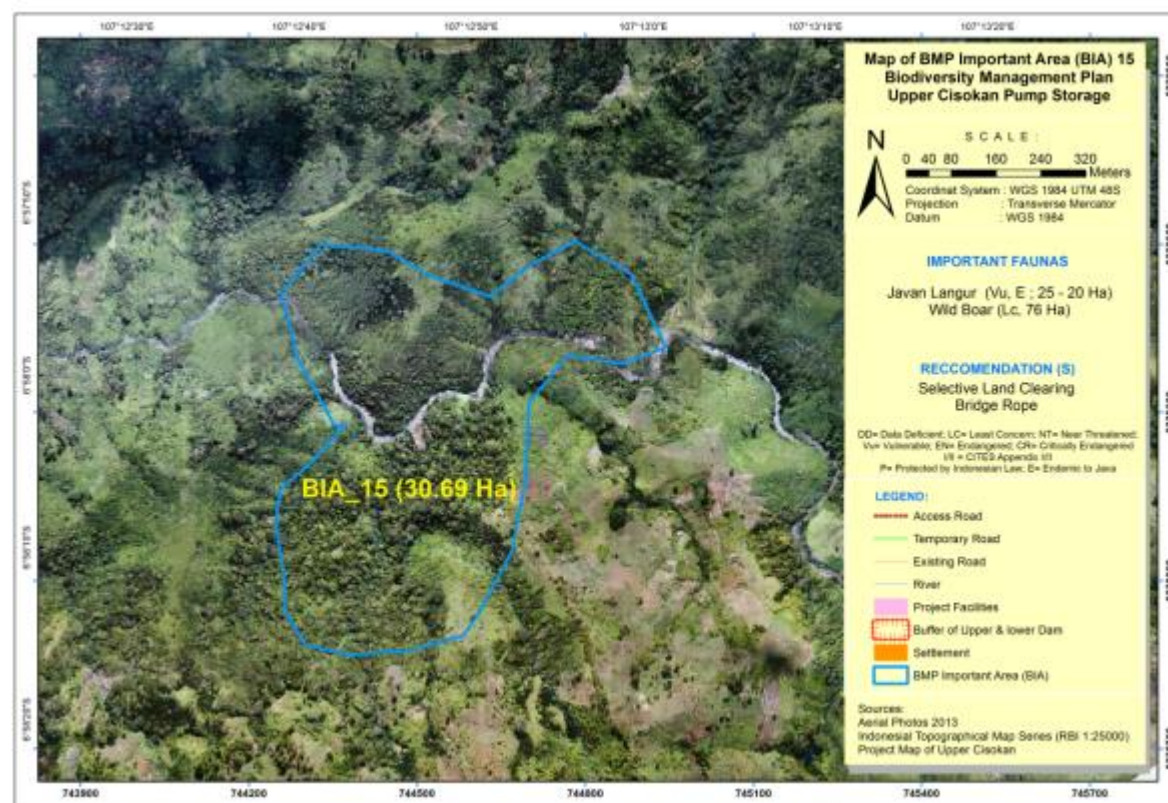
Description:
Located in the Bungbulang area, above the village of Citali; extent is about 30.7 ha. Land cover consists of natural forest remnants on steep cliffs around Ciawitali waterfall. Some pine occurs but not in dense stands, further scrub land and shifting cultivation. Areas bordering Citali village agroforestry vegetation is quite lush, with a variety of perennials planted (e.g., sugar palm, coconut, bamboo, coffee, durian, pine and teak). Based on local reports, three important species occur: Javan Langur, Javan Leopard, and Pangolin.

Threats:
No direct threats exist, although increased pressure to convert this forest for agriculture use needs to be countered. This could occur when people lose access to their agricultural lands in the inundated area.

Recommended Management:
1. Avoid and minimize impacts where possible.
2. Expand the area through reforestation and link it with BIA-14.
3. Enrichment planting in degraded parts of this BIA.
4. Implement ICM program to deal with resettlement impacts, shifting land use and expansion of forest habitats.

Appendix 2. Suggested plant species for use in reforestation

List of planted species for reforestation in the main zones used as ecological corridors

No	Family	Species	Local Name
1	Araucariaceae	*Agathis* spp.	Damar
2	Dipterocarpaceae	*Anipsotera costata*	Mersawa
3	Dipterocarpaceae	*Anipsotera grassivenia*	Mersawa
4	Dipterocarpaceae	*Anipsotera marginata*	Mersawa
5	Dipterocarpaceae	*Dipterocarpus borneensis*	Keruing daun halus
6	Dipterocarpaceae	*Dipterocarpus caudiferus*	Keruing anderi
7	Dipterocarpaceae	*Dipterocarpus confertus*	Keruing tempurung
8	Dipterocarpaceae	*Dipterocarpus cornutus*	Keruing gajah
9	Dipterocarpaceae	*Dipterocarpus crinitus*	Keruing bulu
10	Dipterocarpaceae	*Dipterocarpus hasseltii*	-
11	Dipterocarpaceae	*Dipterocarpus kunstleri*	Keruing logam
12	Dipterocarpaceae	*Dipterocarpus retusus*	Keruing gunung
13	Dipterocarpaceae	*Dipterocarpus Gracilis*	Keruing keladan
14	Dipterocarpaceae	*Dryobalanops aromatica*	Kapur singkal
15	Dipterocarpaceae	*Dryobalanops lanceolata*	Kapur tanduk
16	Dipterocarpaceae	*Hopea dasyrachis*	Merawan
17	Dipterocarpaceae	*Hopea dryobalanoides*	Merawan
18	Dipterocarpaceae	*Hopea mengarawan*	Merawan
19	Dipterocarpaceae	*Hopea sericea*	Merawan
20	Dipterocarpaceae	*Shorea acuminata*	Meranti rumbai
21	Dipterocarpaceae	*Shorea amithiana*	Merembong
22	Dipterocarpaceae	*Shorea atrinervosa*	Balau hutan
23	Dipterocarpaceae	*Shorea bracteolata*	Damar kedontang
24	Dipterocarpaceae	*Shorea javanica*	Damar kaca
25	Dipterocarpaceae	*Shorea lamellata*	Damar tunan
26	Dipterocarpaceae	*Shorea assamica*	Merkunyit
27	Dipterocarpaceae	*Shorea acuminatissima*	Damar parkit
28	Dipterocarpaceae	*Shorea faguetiana*	Damar siput
29	Dipterocarpaceae	*Shorea falcifera*	Balau laut
30	Dipterocarpaceae	*Shorea gibbosa*	Damar buah
31	Dipterocarpaceae	*Shorea glauca*	Balau bunga
32	Dipterocarpaceae	*Shorea hopeifolia*	Damar kunyit
33	Dipterocarpaceae	*Shorea johorensis*	Merkuyung
34	Dipterocarpaceae	*Shorea laevis*	Balau tanduk
35	Dipterocarpaceae	*Shorea lepidota*	Meranti katuko
36	Dipterocarpaceae	*Shorea leprosula*	Meranti tembaga
37	Dipterocarpaceae	*Shorea macrophylla*	Tengkawang katuko
38	Dipterocarpaceae	*Shorea macroptera*	Tengkawang jantung
39	Dipterocarpaceae	*Shorea multiflora*	Damat tanduk
40	Dipterocarpaceae	*Shorea ochracea*	Damar kabaeng
41	Dipterocarpaceae	*Shorea ovalis*	Meranti kelungkung

42	Dipterocarpaceae	*Shorea ovata*	Mandirawan
43	Dipterocarpaceae	*Shorea pachyphylla*	Meranti kerucup
44	Dipterocarpaceae	*Shorea palembanica*	Tengkawang majau
45	Dipterocarpaceae	*Shorea parvifolia*	Meranti sabut
46	Dipterocarpaceae	*Shorea pauciflora*	Meranti udang
47	Dipterocarpaceae	*Shorea pinanga*	Awang lanyang
48	Dipterocarpaceae	*Shorea platycarpa*	Meranti kait
49	Dipterocarpaceae	*Shorea platyclados*	Meranti abang
50	Dipterocarpaceae	*Shorea polyandra*	Meranti kenuar
51	Dipterocarpaceae	*Shorea quadrinervis*	Tengkolong
52	Dipterocarpaceae	*Shorea retinodes*	Damar munsarai
53	Dipterocarpaceae	*Shorea sandakanensis*	-
54	Dipterocarpaceae	*Shorea selanica*	Meranti bopak
55	Dipterocarpaceae	*Shorea stenoptera*	Tengkawang lelon
56	Dipterocarpaceae	*Shorea tayamanniana*	Kelopak
57	Dipterocarpaceae	*Shorea uliginosa*	Meranti long
58	Dipterocarpaceae	*Shorea virescens*	Damar maja
59	Dipterocarpaceae	*Vatica oblongifolia*	Resak
60	Dipterocarpaceae	*Vatica rassak*	Resak
61	Dipterocarpaceae	*Vatica venulosa*	Resak
62	Lauraceae	*Cinnamomum porrectum* (Roxb.) Kosterman	Kisereh
63	Leguminosae	*Acacia mangium*	Akasia
64	Leguminosae	*Aleurites moluccana* Wild.	Kemiri
65	Meliaceae	*Khaya anthotheca* (Welw.) C.DC.	Mahoni uganda
66	Meliaceae	*Swietenia macrophylla* King.	Mahoni berdaun lebar
67	Meliaceae	*Melia azedarach* L.	Mindi
68	Myrtaceae	*Eucalyptus* spp.	Eucalyptus
69	Myrtaceae	*Gonystylus bancanus* Kurz.	Ramiin
70	Pinaceae	*Pinus merkusii* Yung ett de. Vries	Tusam/Pinus
71	Santalaceae	*Santtalum album* L.	Cendana
72	Vebernaceae	*Peronema canescens*	Sungkai

List of planted species for reforestation in the support zone

No	Family	Species	Local Name
1.	Anacardiaceae	*Mangifera odorata* Griff.	Kuweni
2.	Anacardiaceae	*Mangifera indica* Blume	Mangga
3.	Anacardiaceae	*Mangifera foetida* Blume	Embacang
4.	Arecaceae	*Arenga pinnata* Merr.	Aren
5.	Arecaceae	*Cocos nucifera* Linn	Kelapa
6.	Arecaceae	*Salacca edulis* Reinw.	Salak
7.	Arecaceae	*Pinanga coronate* Blume	Binbin
8.	Anonaceae	*Annona muricata* Linn.	Sirsak
9.	Apocynaceae	*Alstonia scholaris* R.Br.	Lame
10.	Bombaceae	*Durio zibethinus* Murr.	Durian
11.	Bombaceae	*Ceiba pentandra* Gaertn.	Kapuk

12.	Ebenaceae	*Diospyros javanica* Bakh	Budengan/Ki oray
13.	Euphorbiaceae	*Aleurites moluccana* Willd.	Kemiri
14.	Euphorbiaceae	*Antidesma bunius* Sperng	
15.	Euphorbiaceae	*Bischofia javanica* Blume	Buni
16.	Euphorbiaceae	*Baccaurea racemosa* Muel. Arg	
17.	Euphorbiaceae	*Glochidion philipinensis* Willd.	Rambai
18.	Fagaceae	*Castanopsis javanica* A.DC.	Saninten/Kuliwang
19.	Leguminosae	*Albizia procera* Benth.	Albasiah
20.	Leguminosae	*Parasrianthes falcataria* (L.) I. Nielsen.	WangkalJengjen
21.	Leguminosae	*Pithecellobium jiringa* (Jack). Prain.	Jengkol
22.	Leguminosae	*Calliandra* spp	Kaliandra
23.	Leguminosae	*Parkia speciosa* Hassk.	Petai
24.	Lythraceae	*Lagestroemia speciosa* Pers	Bungur
25.	Malvaceae	*Hibiscus macrophyllus* Roxb.	Tisuk
26.	Malvaceae	*Hisbiscus tiliaceus* Linn.	Waru
27.	Meliaceae	*Aglaia dokoo* Grift	Pisitan
28.	Meliaceae	*Swietenia macrophylla* King	Mahoni
29.	Meliaceae	*Melia azedarach* Blanco	Mindi
30.	Moraceae	*Artocarpus elastica* Roxb.	Teureup
31.	Moraceae	*Artocarpus heterophyllus* Lam.	Nangka
32.	Moraceae	*Ficus glomerata* Hort ex Miq.	Loa
33.	Moraceae	*Ficus hispida* Linn.	Bisoro
34.	Moraceae	*Ficus superba* Miq	Ki krasak
35.	Moraceae	*Ficus variegate* Blume	Kondang
36.	Mimosaceae	*Leucaena leucocephala* Lam	Petai cina
37.	Mimosaceae	*Parkia speciosa* Hassk	Petai
38.	Myrtaceae	*Syzygium aqueum* Alston	Jambu air
39.	Myrtaceae	*Psidium guajava* L	Jambu biji
40.	Myrtaceae	*Syzygium polyanthum* Miq.	Salam
41.	Myrtaceae	*Syzygium pycnanthum* Merr. & Perry	Jajambuan
42.	Myrtaceae	*Syzygium polycephalum* (Miq.)	Gowok
43.	Pinaceae	*Pinus merkusii* Jungh. & de Vriese	Pinus
44.	Rubiaceae	*Coffea* spp	Kopi
45.	Rubiaceae	*Timonius timon* (Spreng.) Merryll.	Timon
46.	Rubiaceae	*Neonauclea calycina* Merryll	Cangcaratan
47.	Rutaceae	*Citrus* sp	Jeruk manis
48.	Rutaceae	*Citrus grandis* Hassk	Jeruk besar
49.	Sapindaceae	*Nephelium lappaceum* L.	Rambutan
50.	Sterculiaceae	*Pterospermum javanicum* Jungh.	Bayur
51.	Theaceae	*Schima walichii* Choisy	Puspa
52.	Ulmaceae	*Meisopsis eminii* (L.) Blume	Manii
53.	Ulmaceae	*Trema orientalis* L.	Anggrung
54.	Urticaceae	*Leucosycke capitelata* Wedd	Walik angin
55.	Urticaceae	*Villebrune rubescens* Blume	Ki Julang

List of planted species for reforestation in agroforestry areas

No	Family	Species	Local Name
1.	Anacardiaceae	*Mangifera foetida* Blume	Limus
2.	Anacardiaceae	*Mangifera indica* Blume	Mangga
3.	Anacardiaceae	*Mangifera odorata* Griff.	Kawini
4.	Anacardiaceae	*Spondias dulcis* Forst.f.	Kadongdong
5.	Annonaceae	*Annona muricata* L.	Manalika
6.	Araceae	*Colocasia esculenta* Schott.	Tales
7.	Arecaceae	*Arenga pinnata* Merr.	Kawung
8.	Arecaceae	*Cocos nucifera* Linn.	Kalapa
9.	Arecaceae	*Salacca edulis* Reinw.	Salak
10.	Bombacaceae	*Ceiba petandra* Gaertn.	Kapuk
11.	Bombacaceae	*Durio zibethinus* Murr.	Kadu
12.	Bromeliaceae	*Ananas comosus* (L.) Merr.	Danas
13.	Cannaceae	*Canna* sp.	Ganyong
14.	Caricaceae	*Carica papaya* L.	Gedang
15.	Convolvulaceae	*Ipomoea aquatica* Forssk.	Kangkung
16.	Euphorbiaceae	*Baccaurea racemosa* Muell. Arg.	Menteng
17.	Euphorbiaceae	*Aleurites moluccana* Willd.	Muncang
18.	Euphorbiaceae	*Manihot esculenta* Crantz	Sampeu
19.	Fabaceae	*Albizzia procera* Benth.	Albasiah
20.	Fabaceae	*Erythrina variegata* Linn.	Dadap
21.	Fabaceae	*Leucaena glauca* Benth.	Malanding
22.	Fabaceae	*Paraserianthes falcataria* (L.) I. Nielsen	Jengjen
23.	Fabaceae	*Parkia roxburghii* G. Don.	Petir
24.	Fabaceae	*Pithecellobium jiringa* (Jack)Prain	Jengkol
25.	Fabaceae	*Vigna sinensis* Endl. Ex Hassk.	Kacang panjang
26.	Flacourticaceae	*Pangium edule* Reinw.	Kelewek
27.	Gnetaceae	*Gnetum gnemon* Linn.	Tangkil
28.	Labiatae	*Orthosiphon stamineus* Benth	Kumis kucing
29.	Lauraceae	*Persea americana* Mill.	Alpuket
30.	Liliaceae	*Allium cepa* Banks. Ex Schult.f.	Bawang
31.	Malvaceae	*Hibiscus macrophyllus* Roxb.	Tisuk
32.	Malvaceae	*Hibiscus* sp	Wera
33.	Malvaceae	*Lansium domesticum* Correa	Dukuh
34.	Malvaceae	*Melia azedarach* Blanco	Mindi
35.	Malvaceae	*Swietenia mahagoni* Jacq.	Mahoni
36.	Malvaceae	*Toona sinensis* M. Roem	Suren
37.	Moraceae	*Artocarpus altilis* (Parkinson) Fosberg.	Sukun
38.	Moraceae	*Artocarpus heterophylla* Lam.	Nangka
39.	Musaceae	*Musa x paradisiaca* L.	Cau
40.	Musaceae	*Eugenia aromaticum* (L.) Merril & Perry	Cengkeh
41.	Musaceae	*Syzygium polyanthum* Miq.	Salam
42.	Musaceae	*Eugenia polycephalum* (Miq.) Merril & Perry.	Kupa
43.	Musaceae	*Psidium guajava* L.	Jambu batu

No	Family	Species	Local Name
44.	Musaceae	*Syzygium aqueum* Alston	Jambu air
45.	Musaceae	*Syzygium malaccense* (L.) Merrill.& Persl.	Jambu bol
46.	Orchidaceae	*Vanilla albida* Blume	Vanili
47.	Orchidaceae	*Abdominea miniflora* J.J.Smith	Anggrek
48.	Oxalidaceae	*Averrhoa carambola* Linn.	Balingbing
49.	Pinaceae	*Pinus merkusii* Jungh. & deVriese	Pinus
50.	Poaceae	*Bambusa apus* Schult.f.	Awi tali
51.	Poaceae	*Bambusa* sp.	Awi
52.	Poaceae	*Bambusa vulgaris* Nees..	Haur
53.	Poaceae	*Gigantochloa verticillata* Munro	Awi gombong
54.	Poaceae	*Oryza sativa* Hocht. Ex Steud.	Pare
55.	Poaceae	*Oryza sativa* (L.) *var glutinosa*	Pare ketan
56.	Poaceae	*Oryza sativa* (L.) *var IR 46*	Pare IR
57.	Rhamnaceae	*Maesopsis eminii* Engl.	Manii
58.	Rubiaceae	*Coffea arabica* Benth.	Kopi
59.	Rutaceae	*Citrus grandis* Hassk.	Jeruk gede
60.	Sapindaceae	*Pometia pinnata* Forst.	Lengsar
61.	Sapindaceae	*Nephelium lappaceum* L.	Rambutan
62.	Sapotaceae	*Palaquium* sp	Campolah
63.	Solanaceae	*Solanum blumei* Nees ex Blume	Cacabean
64.	Solanaceae	*Solanum lycopersicum* Blanco	Cengek
65.	Solanaceae	*Solanum melongena* Linn.	Terong
66.	Solanaceae	*Solanum nigrum* Acerb. Ex Dun.	Lenca
67.	Verbenaceae	*Duranta erecta* Linn.	Sinyo nakal
68.	Verbenaceae	*Tectona grandis* Linn.f.	Jati
69.	Zingiberaceae	*Alpinia galanga* Willd.	Laja
70.	Zingiberaceae	*Curcuma domestica* Valeton	Kunir

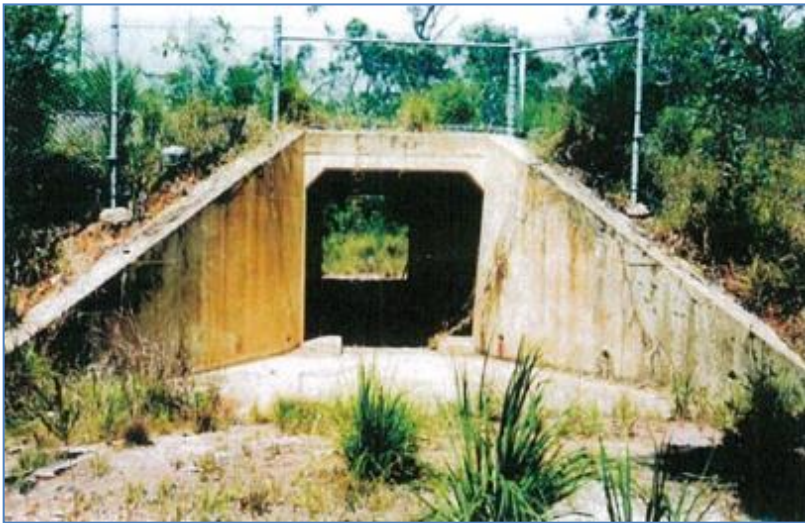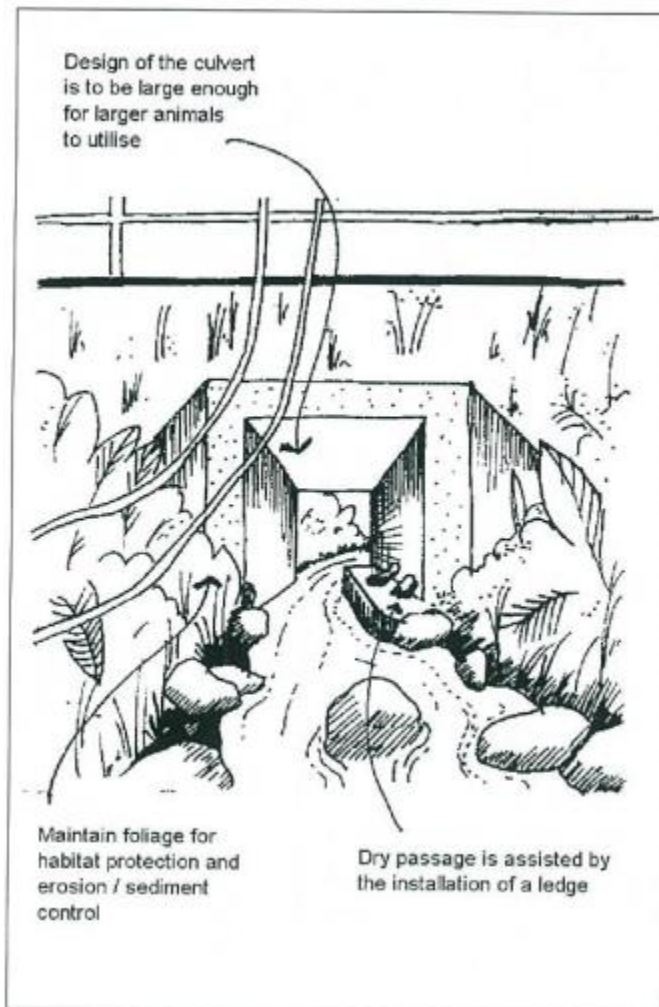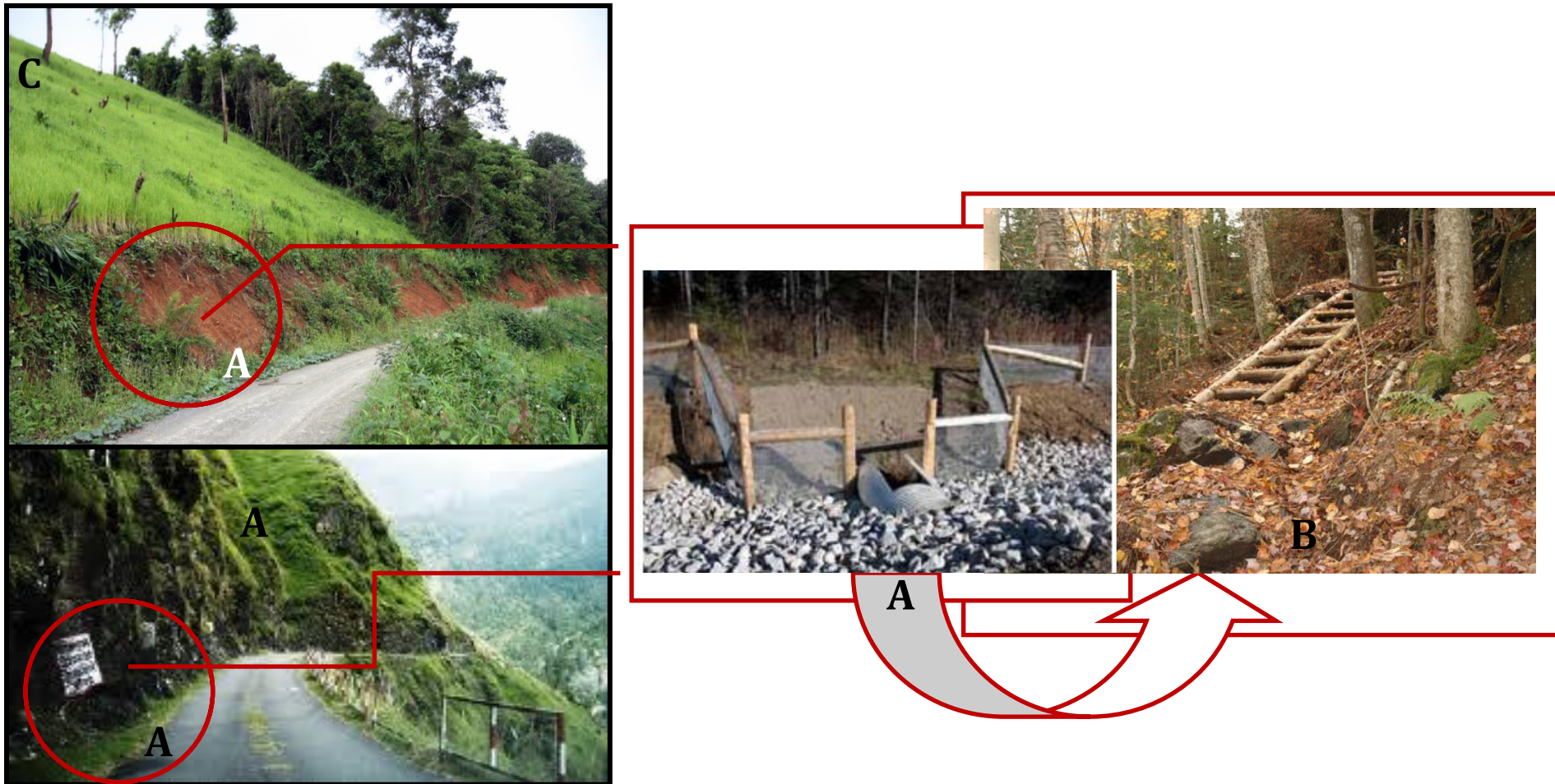# Appendix 3. Wildlife culvert examples

Figure 19. A box culvert with guiding fences and raised ledges

Design of the culvert is to be large enough for larger animals to utilise

Maintain foliage for habitat protection and erosion / sediment control

Dry passage is assisted by the installation of a ledge

Appendix 4. Structures facilitating wildlife dispersal on steep slopes

Picture from left to right shows an illustration of the access road NR15 - NR25 [A], where animals can become 'trapped' on the road and unable to avoid traffic. On the photos on the right, terraces are made facilitating animal movement [source: Ontario Road Ecology Group, Toronto Zoo, 2010, BLM National Science and Technology Center, 2007]

Appendix 5. Rope bridges and other structures facilitating arboreal wildlife movement

Picture from left to right shows an illustration of the access road NR15 - NR25 [A], where animals can become 'trapped' on the road and unable to avoid traffic. On the photos on the right, terraces are made facilitating animal movement [source: Ontario Road Ecology Group, Toronto Zoo, 2010, BLM National Science and Technology Center, 2007].

Appendix 6. Protecting tree cover close to the road edge maintains canopy connectivity, facilitating movement of arboreal species

Figure above shows an example of touching canopies across an open road which prevents terrestrial from having to come to the ground and thus accidents with cars [source: Working Forest Recreation Program, Company and State of New Hampshire Department of Resources and Economic Development, 2007].

Appendix 7. Standard Operational Procedures (SOP) for Land Clearing and Rehabilitation

Roles and Responsibilities

This SOP is relevant for PLN, contractors, and any other associated organizations.

Background

This implementation procedure for land clearing provides direction for avoiding or minimizing negative impacts on biodiversity during the construction phase. The clearing procedures take into account the types of wildlife that exist in the project site, the key species that the project aims to protect, and the impacts anticipated from vegetation clearing. In addition, the procedures consider the features of existing vegetation in the area, specifically around the access road, dam construction sites, as well as reservoirs.

The vegetation clearance procedure aims to:

1. Ensure that the implementation of land clearing is in accordance with the requirements of environmental management required by the funder (the World Bank), the UCPS EMP[13] (and sub-plan BMP[14]), and the UPL / UKL of the AMDAL in accordance with Indonesian Regulations.
2. Minimize the negative impacts of land clearing on biodiversity, particularly the reduction in the number of species and number of individuals of protected wildlife (see Table 1 in main report).
3. Minimize the negative impact from land clearing on habitat connectivity by minimizing fragmentation of Biodiversity Important Areas (BIA) as prescribed in the BMP and where possible maintaining canopy connectivity across cleared areas.
4. Maximize the use of various types of seedlings and saplings of plants that exist in areas prior to land clearing to be planted back in areas that need to be rehabilitated (e.g., spoil banks) or that are selected to function as forest corridors between BIAs.

Phasing of land clearing SOP
Land clearing procedures are divided into several distinct phases:

- Preparation phase: Intended for land clearing planning, notification of clearing procedures to the contractor, and training for contractor and workers to ensure SOP is fully understood. The location and management of tree nurseries also need to be determined at this stage.
- Pre-clearing phase. Areas that will not be cleared are clearly demarcated on the ground to ensure that no forest areas or trees are damaged beyond what has been planned. Within the areas scheduled for clearing, any trees with endangered or protected wildlife (e.g., nesting birds) are marked, as well as underground burrows or other places currently used by wildlife. Input from a biodiversity expert is required to determine next steps regarding the safe relocation of these animals. At this stage, seedlings and saplings with the potential for habitat enrichment will be collected, moved to the tree nurseries and properly maintained.
- Clearing phase: Intended to ensure that the felling of trees will not damage vegetation bordering on clearing areas by careful directional felling. This coincides with PLN and contractors what refer to as the land clearing, clearing and grubbing, and excavation works.
- Post-clearing phase: Seedlings and saplings that have been maintained in tree nurseries are planted back in areas designated for rehabilitation (e.g., spoil banks) or reforestation (selected corridor areas). Wildlife monitoring programs are implemented both in areas adjacent to land clearing sites and in rehabilitation/reforestation zones.

Preparation Phase Management Actions
PLN shall establish a land clearing project team responsible for land clearing implementation. This project team consists of environmental inspectors, wildlife experts, plant experts, ecological/conservation experts.

Task of the land clearing project team are:

1. The environmental inspectors determine the priority of the clearing block (at all locations across the project site, but especially when land clearing will happen in or near a BIA) and determine which trees will be cleared. Also, the environmental inspector can temporarily stop clearing

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[13] Environmental Management Plan
[14] Biodiversity Management Plan

activities when negative impacts on wildlife could occur. The environmental inspector generally provides direction to the contractor regarding the rules that must be obeyed.

2. A wildlife expert is tasked to observe whether or not the clearing block is being used by wildlife. The results of these inspections are reported to the environmental inspector.

3. A botanist is tasked to note the presence of plant seedlings and saplings which have the potential for habitat rehabilitation. The results of these observations are reported to the environmental inspector, and decisions are then made about which plants need to be taken to the tree nursery.

4. The contractor shall prepare a local tree nursery site for keeping the seedlings and saplings of plants, hire people to maintain plants in the nursery, and provide means to water plants to maximize survival.

5. The contractor shall set up a central information center for dealing with any human-wildlife conflict issues, as well as a place for public complaints about clearing. The center should be placed in a strategic location near the closest settlement, for example in the Village Hall, local school, health centers, etc.) and can be the same center as used for managing project greivances..

6. The contractor is responsible for preparing and installing signs on animals crossing points, and providing information to workers about a total ban on hunting or collecting. PLN will support the contractor to do this.

7. The environmental inspector shall conduct an evaluation to ensure that the preparation stage has been properly implemented.

Pre – Clearing Phase Management Actions

8. The wildlife expert marks all trees that are used by wildlife with yellow paint. This includes trees with hollows or ground burrows used for nesting or sleeping. Active ground burrows are marked by yellow stakes. Marked trees are not cut down before it can be ascertained with confidence that the animals have left. Similarly no clearing or soil works are allowed in a radius of 5 meters from an active burrow until the animal has left it.

9. The contractor is responsible for the collection of seedlings and saplings of potential for habitat enrichment as identified by the botanist in the preparation phase. Training will be given as required to ensure that there is maximum success rate with translocated plants. Seedlings and saplings will be moved in polybags with minimal disturbance of root systems. The plants are moved to a local nursery site, equipped with shade cloth and close to a permanent water source from where the plants can be easily watered. Sufficient competent workers are hired to ensure plants are kept alive until the time of planting. In the reservoir area (area to be inundated) nurseries are established close to the river to facilitate watering. Once the location of the greenbelt has been determined, seedling and saplings are planted at the start of the rainy season when survival chances are highest.

10. The contractor shall prepare the project area and physically demarcate clearing block boundaries with clear stakes at an interval of 25 meters to avoid unnecessary damage to soils and trees in the area adjacent to work sites.

11. The contractor shall install signs to ban hunting or catching of wildlife in the area.

12. Wildlife experts need to identify places where culverts, rope bridges and other structures are to be installed.

13. The environmental inspectors and wildlife expert need to ensure that all action items scheduled for the pre-clearing phase have been carried out.
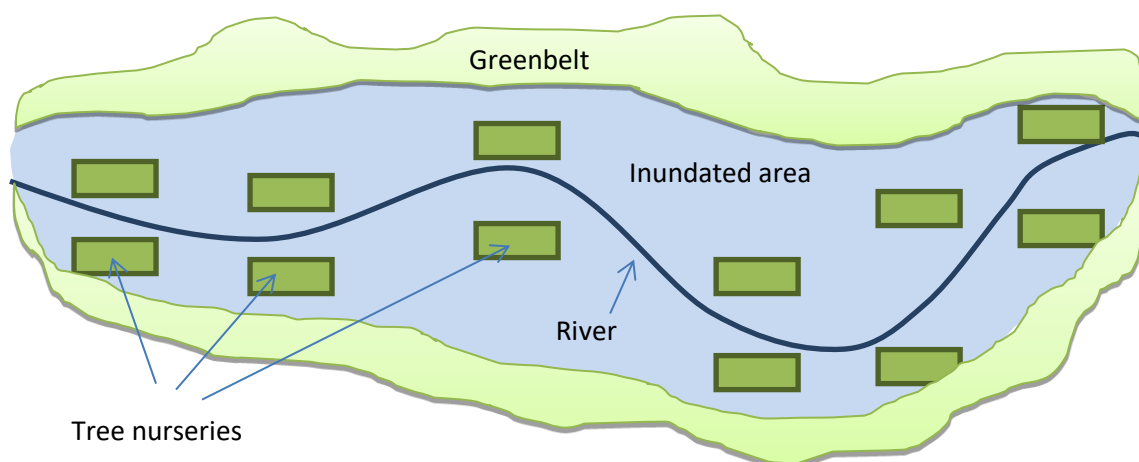

Figure 20. Diagram showing location of tree nursery in reservoir area in relation to river and greenbelt.

Clearing Phase Management Actions (i.e., land clearing, clearing and grubbing, and excavation)

14. The environmental inspector must ensure that the contractor and workers (local supervisor level) have received clearance and guidance or training on clearing procedures that should be implemented.

15. Trees marked with yellow are not felled before a wildlife expert has ensured that the tree is not being used by animals. Similarly, trees or burrows that are used by animals need to be protected from clearing activities until a wildlife expert has confirmed that no animals remain.

16. Felling of trees should be directed towards the clearing area to prevent damage to trees that will remain standing.

17. Hollow tree that have been felled (and have no commercial value), should be left in the remaining forest area as these provide important microhabitats for a range of wildlife species.

18. Any animals hurt during the land clearing process (despite the above precautions) should be handed over to the rapid response wildlife management unit (e.g., Aspinal Foundation). After the animal has been brought back to health, it is released back into the area. If they are endangered or critically endangered species then the individual will be monitored.

19. After each block is completed, a wildlife expert should make a clearing report which contains:
    - The type and number of individual seedlings and saplings of plants taken to be maintained in a nursery.
    - The type and number of animals found during clearing, as well as the direction of movement of animals. Including the number of bird's nest containing eggs or young birds.
    - The type and number of animals to be treated.
    - The number of suspected hollow tree inhabited by wildlife.
    - The number of locations used by ground animals (as nests or shelter) .
    - The number of damaged trees located in the area adjacent to the block clearing and embankment areas.

20. To prevent bush fires, any activities that could potentially cause a fire are prohibited including making a fire or discarding cigarette butts. The contractor is responsible for training staff reguarding fire risk, and maintaining a trained fire fighting squad.

21. The environmental inspector and wildlife expert need to ensure that all action items scheduled for the clearing phase have been carried out.

Post-clearing Phase Management Actions

22. The environmental inspector ensures that wildlife monitoring takes place (refer to Chapter 9 on Monitoring and Evaluation).

23. All exposed areas (road sides, cuttings, laydown areas, spoil banks etc.) shall be replanted as soon as practical following earthworks / construction / end of temporary use. The contractor shall follow the BMP, and seek input from wildlife and botanical experts, with respect to the types of plants that should be replanted (based on the location, slope, and long term land use).

24. With input from wildlife and botanical experts areas for habitat enrichment planting or reforestation are selected and at the right time of the year (start of the rainy season) trees from tree nurseries are transplanted to new areas.

25. For at least the first year, all planted trees need to be monitored (and replaced if dead), watered (if needed) and kept free from weeds, climbers and other plants that inhibit their growth. This work is best done in collaboration with Perhutani and local communities as part of the ICM program.

26. The environmental inspector and wildlife expert need to ensure that all action items scheduled for the post-clearing phase have been carried out.
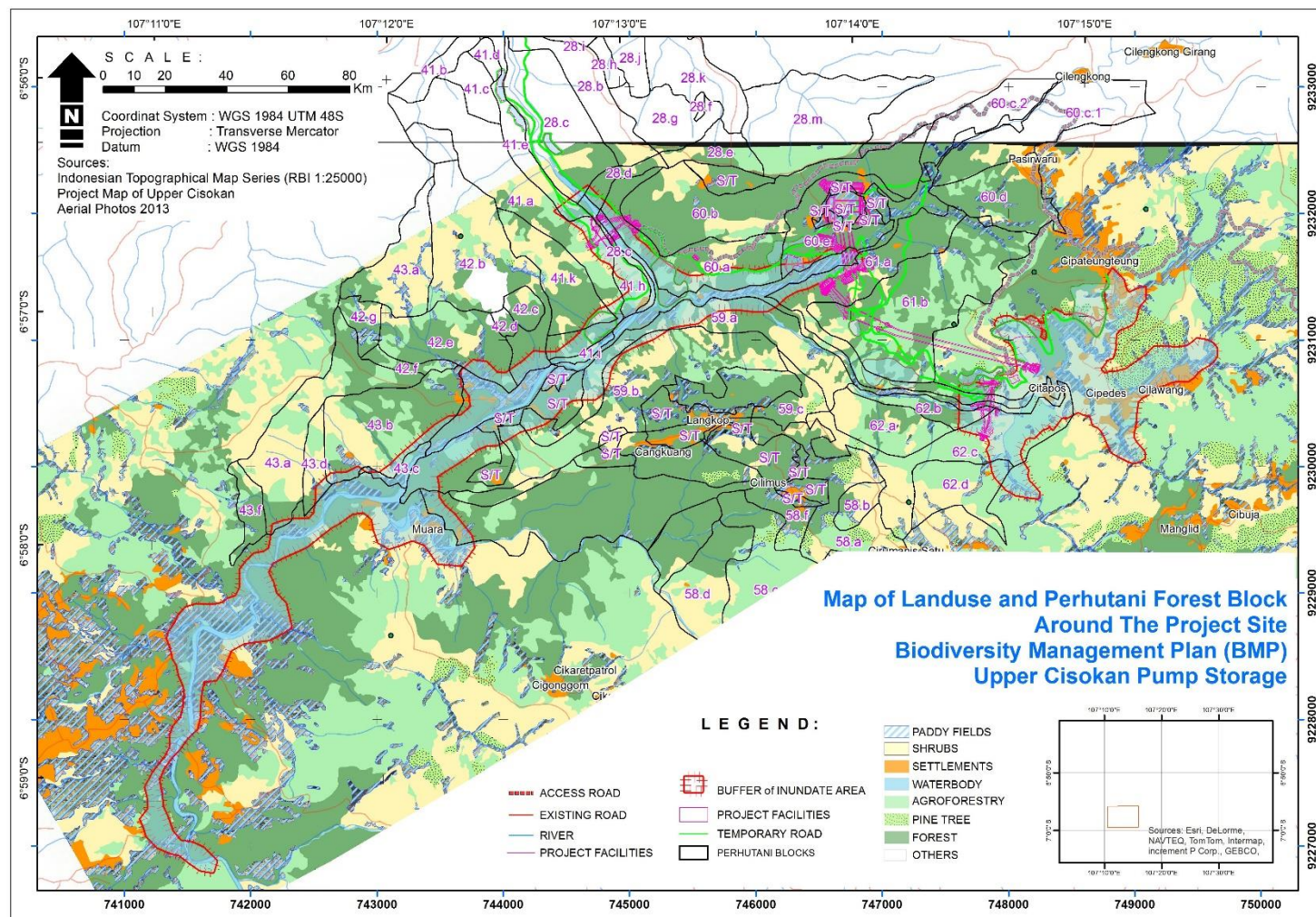
Appendix 8. Additional maps.

Figure 21. Land cover and land use map for the UCPS area