

Draft Environmental and Social Impact Assessment Report (ESIA) – Appendices 9 and 10

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INO: Eastern Indonesia Renewable Energy Project

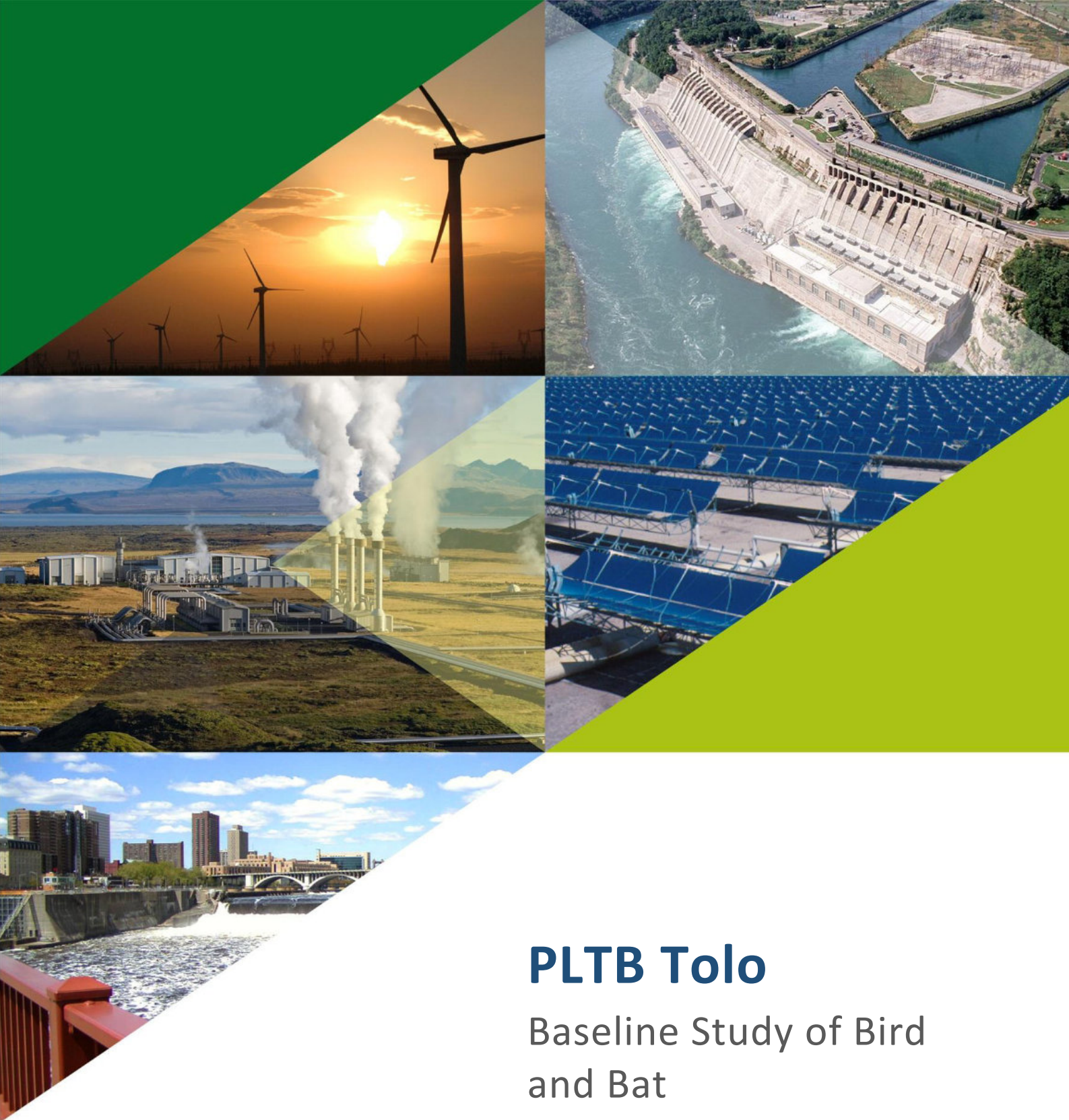
Prepared by ESC for PT Energi Bayu Jenepono (EBK) (Republic of Indonesia)

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Appendix 9

**Baseline Study of Bird
and Bat by ESC**



PLTB Tolo

Baseline Study of Bird
and Bat

PT. Energi Bayu Jeneponto

0310
2017



EXECUTIVE SUMMARY

The company PT EBJ under PT Redaya Energi has approached EQUIS for financing and is conducting an Environmental and Social Impact Assessment (ESIA) in parallel with the AMDAL according to their requirements. The Project is located in Jeneponto Regency, South Sulawesi as shown in **Figure 1-1**.

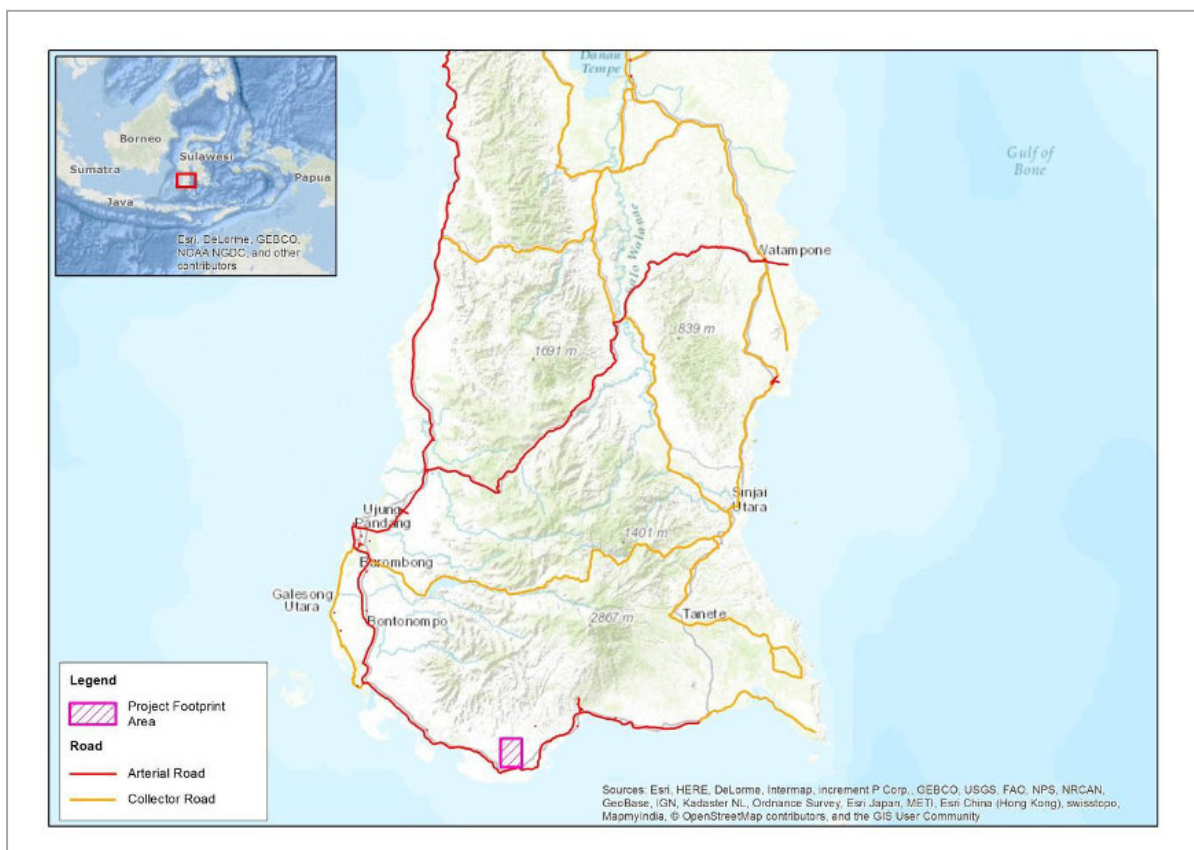


Figure 1-1 Project Location of Tolo Wind Power

The Project is located within modified habitat. The two habitats predominate are paddy field area and dry-land agriculture. The study focused on bat and bird groups with the field survey documenting 29 bird species of 20 families and 5 species of family for the bats group. The study did not identify any critical habitat trigger species of birds or bats groups. Eight species of bird group are protected under Indonesia Regulation and Law. Four of them are included on Appendix II of CITES. While for bat groups, there are no threatened species, according to both government regulations and international conventions.

The project area is not located in critical habitat. Critical habitat assessment conducted in accordance with IFC PS 6 about Biodiversity Conservation and Sustainable Management of Living Natural Resources.

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1 STUDY APPROACH DAN OBJECTIVE

In this section, objectives and approach of bat and bird baseline study of the Project are outlined, Scope of work and objective of data collection of the project are described in some detail along with the implementation phasing. Major regulatory requirements are outlined. The major project impacts are summarized, along with a summary of impact management plans.

1.1 Scope of Work

- Identify ecologically sensitive area regarding birds and bats which includes national and international protected areas (including marine protected areas), Important Bird and Biodiversity Areas (“IBAs”), Key Biodiversity Areas (“KBAs”), Alliance for Zero Extinction (“AZE”) sites, Ramsar Sites (Wetlands of International Importance), known congregatory sites, and unique or threatened ecosystems.
- Develop an inventory of all birds and bats which use the project and ecological sensitive area which the inventory shall contain but not limited to following data:
 - Local name, English name and scientific name
 - IUCN Global threaten status (i.e Red List Category)
 - Migratory status (e.g migratory bird or resident bird)
 - Local sensitive scale (e.g is a bird that is a symbol of the city)
 - Usage of the area e.g habitat, feeding, migratory path
 - Picture, link to IUCN of Birdlife International
- Liaise with relevant local, national and international conservation organisation(s) which could have interest in the potential impact of the project on birds and bats.
- Develop a survey procedure in accordance with international birds and bats surveys including A.R Jenkins et al., Best Practice Guidelines for Avian Monitoring and Impact Mitigation at Proposed Wind Energy Service, “Land-based Wind Energy Guidelines” (2012); and local laws and regulations. The procedure shall consider site specific issues, species specific issues and season specific issue, e.g feeding and roosting area for bats (e.g pond and fruit farm for feeding and cave for roosting) in the project and vicinity area.
- Conduct a survey according to the procedure and assess risk to the birds and bats from the farm including suggest IFC E&S risk categorization in ecological aspect.
- Prepare a management plan to mitigate the risk on birds and bats from the wind farm.
- All bird and bat assessments must be done to IFC performance standards and the methodology written up in a technical note or as part of a final report.

1.2 Deliverable

- Bird and Bat Inventory;
- Minute of Meeting with Conservation Organisation(s);
- Bird and bat survey procedure;

- Map contains Ecological Sensitive Area, Bird Migration Route, Bats Feeding and Roosting Areas

1.3 Methods

1.3.1 Literature Review

Secondary data will be gathered from relevant agencies from available relevant reference journals, reports and documents that describe the existing conditions in the project area and describe the existing environmental conditions in the project area (where possible and where information is available). Secondary data also includes the baseline study for ANDAL, and recent high-level biodiversity reports where available. Data and information was also collected from the Forestry Office in South Sumatera and other offices concerned. The following data sets listed in **Table 1-1** were consulted for the biodiversity assessment.

Table 1-1 Datasets used in the biodiversity assessment

No.	Dataset	Year	Source
1	Global Biodiversity Hotspots	2011	IBAT
2	WWF Terrestrial Ecosystems	2015	WWF
3	RAMSAR Wetlands	2015	IBAT
4	UNESCO MAB	2015	UNESCO
5	World Heritage Sites	2015	UNESCO
6	Key Biodiversity Areas	2015	IBAT
7	Endemic Bird Areas	2015	IBAT
8	World Database of Protected Areas	2015	IBAT
9	IUCN Threatened Species Grid	2014	IBAT download
10	IUCN Red list of threatened species	2015	IUCN Red List
11	Global Biodiversity Information Facility (GBIF)	2015	GBIF
12	Bird database	2016	Cornell University
13	Land cover	2013	Geospatial Information Agency

1.3.2 Habitat Mapping

Habitat mapping is uses a land cover approach. Land cover is analyzed using remote sensing technology based on classification criteria that is issued by the Geospatial Information Agency (*Badan Informasi Geospasial*). Based on literature review, habitat type classification is shown on **Table 1-2**.

Table 1-2 Habitat Type Classification

No.	Habitat Type	Description
1	Rain-fed paddy field	Paddy fields with water source from the rain.

No.	Habitat Type	Description
2	Dry land Agriculture (<i>Ladang</i>)	Dry land agriculture with seasonal crops, located separately from houses and settlements. Non-paddy crops, it does not require extensive irrigation (in comparison to paddy fields), artificial vegetation and requires human intervention to support survival.
3	Settlement	The area is used as residential area or residential environment and human related activities.
4	Bush / shrub	A terrestrial region that has been overgrown with natural vegetation which is heterogeneous and homogeneous with sparse to close density. The region is predominantly natural low vegetation.
5	River	Natural water flow.

Source: SNI7645:2010

1.3.3 Field Survey Methodology

The study was focused only on Bird and Bat groups. The field survey conducted in October 2016 was representative of the dry season and in January 2017, representative of the wet season.

▪ Bird

○ Point Transect

Point transect surveys are one of the most widely used and efficient methods for monitoring changes in populations, species composition and relative abundance for land birds. The point count method: carried out on transect line, marking and record all species of birds that were found during the predetermined (10 minutes) period, before moving to the next point.

Point transects are different to line transects, where the observer walks along a transect line and stops at points that have been determined and recording the bird species and count. Point transect surveys were done during active time of birds which are 5:30 to 08:00 and 15:30 to 18:00, and performed on the affected zone which follows the turbine corridor and transmission lines.

○ Concentration Count Sampling

Observations carried out concentrated at a point that is suspected as a place with high chances of wildlife encounters, such as locations of high availability of food/water sources or shelter. Observation count sampling was surveyed in locations that were predicted as centres of bird activity.

○ Observation Rapid Assessment

Observation methods thoroughly search areas and are designed to collect information such as habitat use, breeding activities, migration pathways, and unusual or unique behavior or observations within the project area not identified during point counts. These surveys are also useful in assessing areas within and near the project area such as small riparian zones, wetland areas, and side canyons that may not normally be included

in the above count locations. Area searches provide a more complete species list for the proposed project area, as rare and more secretive bird species may also be missed during bird use and breeding songbird counts. Besides collecting bird data, an evaluation of small mammal species presence, activity levels, and suitable habitat should be conducted and recorded. This will provide a better understanding of the sites potential prey abundances that may attract and concentrate raptors into the area. For example, high densities of small mammal burrows or prairie dog colonies that may not have been recorded during bird counts may be observed during area searches.

- Mist net trap

Mist nets have main pockets which function as bats traps when trapped in nets. In the net there are 4-5 main pockets. The length of mist nets can be customized based on needs e.g. 6 m, 9 m, 12 m, or 18 m, while its width is about 2.7 m with the mesh size ranging from 30-32 mm.

Mist nets were installed at three locations for three days in representative habitats, being paddy field, dry land agriculture and adjacent areas to paddy field and dry-land agriculture. Traps were checked on afternoons (12.00 – 14.00) and evenings (14.00 – 18.00).

- **Bat**

- Observation Method

Field observations using the rapid assessment method were aimed at identifying the bat's habitat characteristics and potential habitats. Habitat potential of bats is identified by availability of food sources such as fruit or insects.

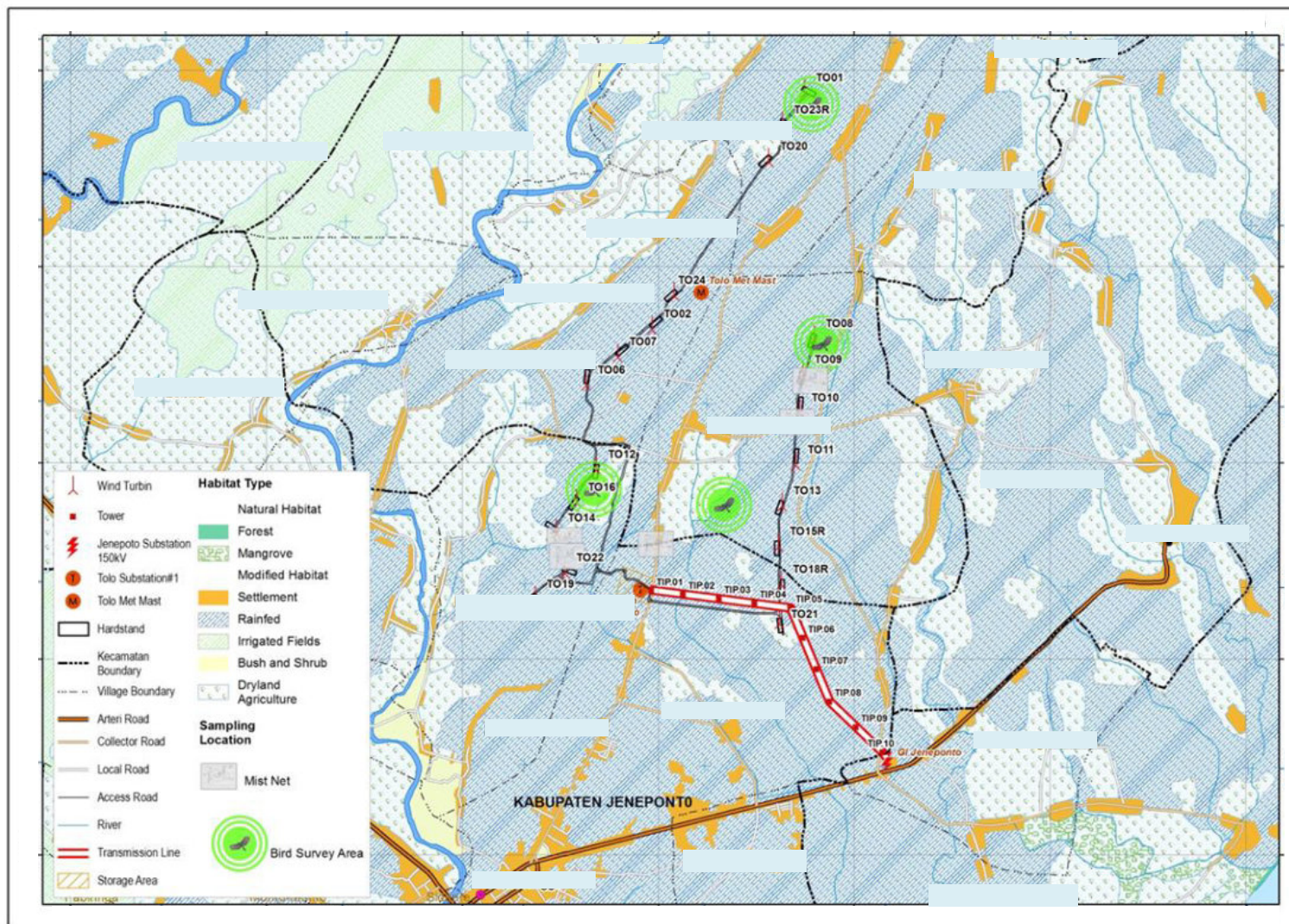
- Mist net trap

Mist nets have main pockets which function as bats traps when trapped in nets. In the net there are 4-5 main pockets. The length of mist nets can be customized based on needs e.g. 6 m, 9 m, 12 m, or 18 m, while its width is about 2.7 m with the mesh size ranging from 30-32 mm.

Sampling was conducted using a representative sampling method by installing mist nets in various habitats. Mist nets were installed at three locations for three nights with habitats representative of paddy fields, dry land agriculture and areas adjacent to paddy fields and dry-land agriculture. Traps were checked in the morning (05.30 – 07.00) and evening (18.00 – 19.00).

1.4 Study Area

Study area of bird and bat baseline evaluation followed the study area of AMDAL document. Study area and sampling location is show **Map 1-1**.



Map 1-1 Study Area and Sampling Location of Bird and Bat Baseline Study

2 RESULTS AND DISCUSSION

2.1 Literature review

2.1.1 Habitat

Nationally, land status of project is 'Other Use'. The entire project area is located within modified habitat. Habitat type is dominated by paddy fields and agriculture areas. Paddy field type is rain fed paddy field. The water source is dependent on rainfall. This is a main habitat of water bird species such as Eastern Cattle Egret for feeding ground area.

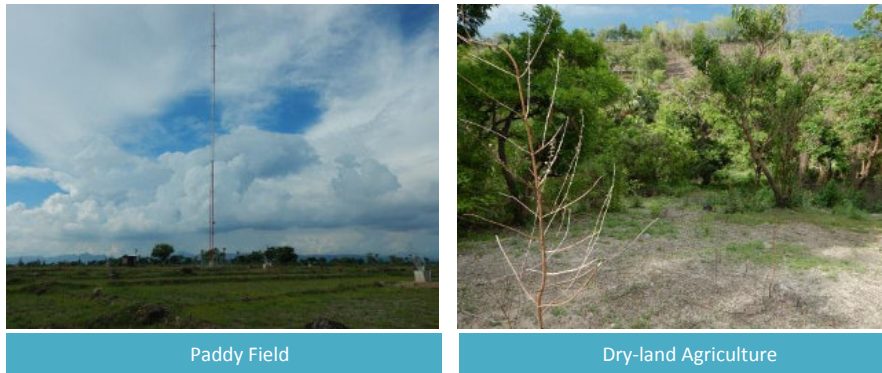


Figure 2-1 Habitat Type of Study Area

Vegetation types recorded in dry-land agriculture habitat includes corn, coconut, amboyna wood (*Pterocarpus indicus*), mangoes (*Mangifera sp*), breadfruit (*Artocarpus altilis*), *Kluwek* (*Pangium edule*), kapok (*Ceiba pentandra*), and sugar palm (*Arenga pinnata*).

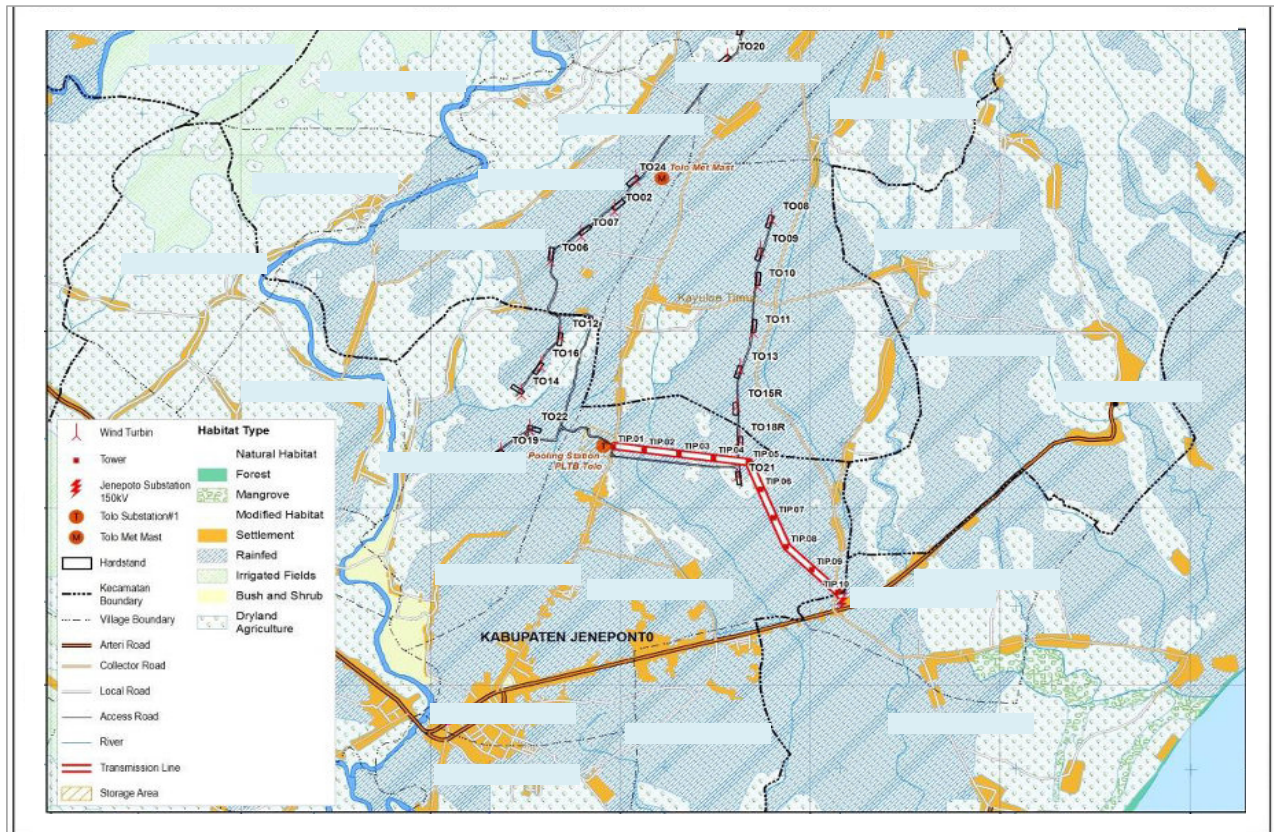


Figure 2-2 Habitat Type of Project Location

2.1.2 Protected Areas

2.1.2.1 National-level Protected Areas

Project location is located outside of any national protected area. Three national protected areas nearby the project location are:

- Komara

Komara is located 21 km to the Northwest of the Project area. Status area of Ko'mara is Wildlife Reserve and IUCN protected area category IV. Total area of Ko'mara natural reserve is around 29.72 square km. Category IV protected areas aim is to maintain, conserve and restore species and habitats. Protected areas aim to protect particular species or habitats and management reflects this priority. Many category IV Protected Areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category. Wildlife Nature Reserve is nature reserve forest areas which have characteristics of diversity and / or unique of species that require protection / management for survival.

The main ecosystem type is tropical lowland rain forest. This area is to conserve species and the habitat for Celebes Black Macaque (*Macaca nigra*), Hornbill bird, Buru babirusa (*Babyrusa babyrussa*), and cuscus.

- Malinau

It is located around 41 km to the Northeast of the Project area. Nationally, status area of Malinau is Nature Recreation Park and protected area category V. Total area of Malinau Nature Recreation Park is reported at 35 square km. Main objective of protected area category V is to protect and sustain important landscapes/seascapes and the associated nature conservation and other values created by interactions with humans through traditional management practices. It is areas where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values. (IBAT, 2017).

Nature Recreation Park is nature conservation area for tourism and outdoor recreation purposed.

- Abdul Latief

It is located around 41 km to the Northeast of the Project area. This is located 5 km of Malinau Nature Recreation Park. The area status of Abdul Latief is Grand Forest Park and protected area category VI. Total area of Abdul Latief Grand Forest Park is around 7.2 square km. The main objective of protected area category VI is to protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial. Generally large areas, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

Grand forest park is a nature conservation area with the objective of plant collection and/or animals that are natural or artificially, native species and/or non-native are utilized for research, science, education, cultivation support, culture, tourism and recreation.

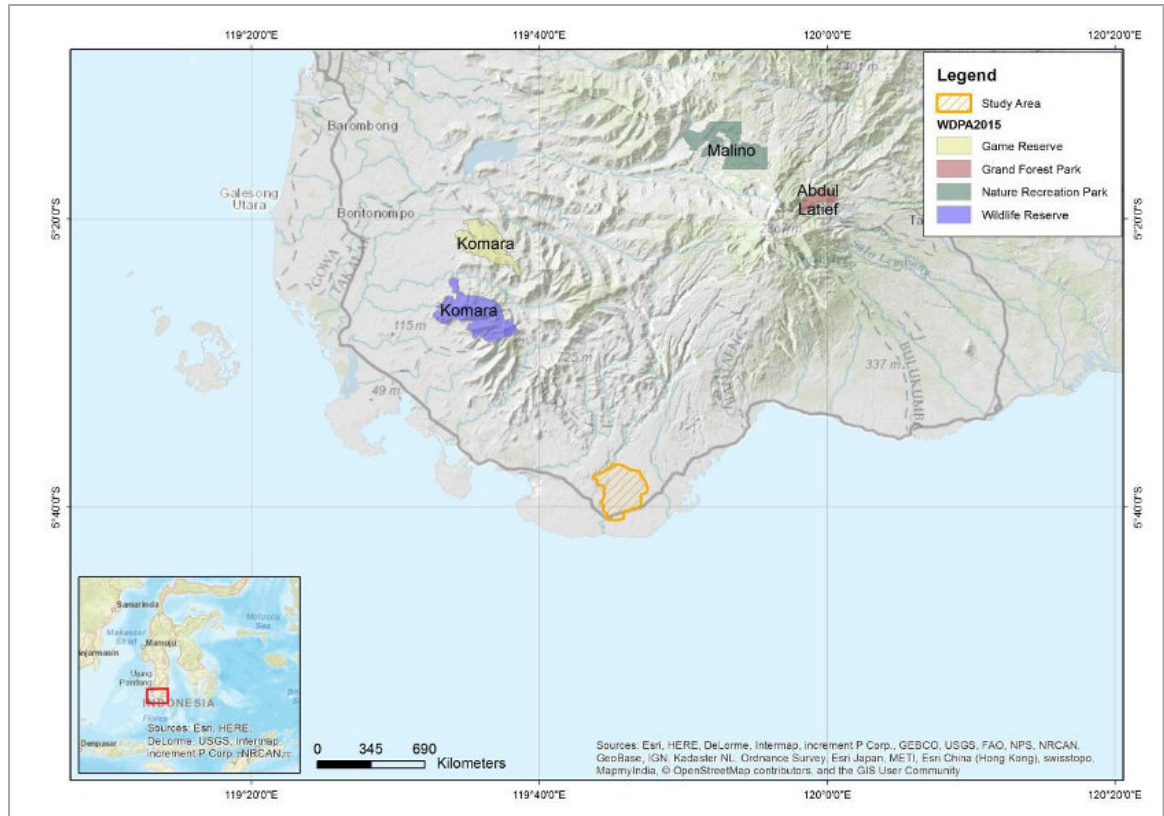


Figure 2-3 World Protected Area

2.1.2.2 Protected areas: regional level

Regional protected area is a protected areas designated under regional conventions and agreements. Information regional protected area referenced to Natura 2000 and Regional Sea. Natura 2000 is a network of nature protection areas in the territory of the European Union. It is made up of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) designated respectively under the Habitats Directive and Birds Directive. The network includes both terrestrial and marine sites (Marine Protected Areas (MPAs)).

There is no record of regional protected area in the project location and surrounding area.

2.1.2.3 Protected areas: International level

International protected area is area that designated protected under international conventions and agreements. The international protected area will reference to UNESCO for Natural/Mixed World Heritage sites and Man and the Biosphere Reserves, Wetland International for Ramsar Site.

There is no record of international protected area in the project location and surrounding area.

2.1.3 Key Biodiversity Area (KBAs)

KBAs are sites that contribute significantly to the global persistence of biodiversity on land, in water or in the seas. These sites have been identified over the last four decades. KBAs include

Alliance for Zero Extinction sites (AZEs), BirdLife Important Bird and Biodiversity Areas (IBAs), IUCN Freshwater KBAs and KBAs identified through the Critical Ecosystem Partnership Fund (CEPF) hotspot profiling process. These sites are maintained in the World Database of Key Biodiversity Areas (WDKBA).

The project area does not overlap with KBA. Two KBA's nearby to the project area are Komara and Karaeng – Lompobattang.

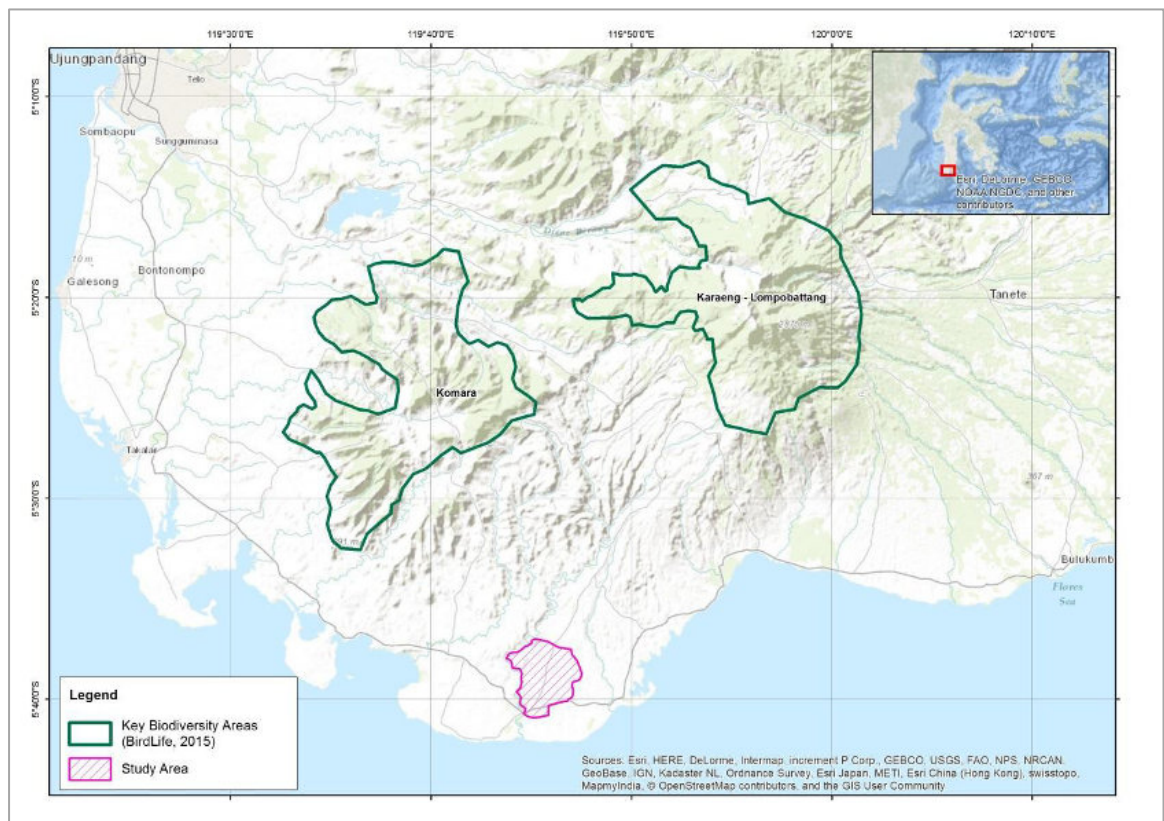


Figure 2-4 Key Biodiversity Areas nearby Project Area

2.1.3.1 Important Bird and Biodiversity Area

The Project area is located external to an Important Bird Area (IBA), namely Karaeng – Lompobattang. Total area of Karaeng – Lompobattang is estimated at 31,814 hectare (IBAT, 2017). It is located 20 km to the Northeast of the Project area. This IBA is categorized A1, meaning the site is known or thought regularly to hold significant numbers of a globally threatened species, or other species of global conservation concern.

This site has been identified as an Important Bird and Biodiversity Area and Key Biodiversity Area based on the presence of significant populations of globally threatened species and significant populations of endemic species known only to be found in a limited area

2.1.3.2 Alliance for Zero Extinction Site

The Alliance for Zero Extinction (AZE), a joint initiative of biodiversity conservation organizations from around the world, aims to prevent extinctions by identifying and safeguarding key sites, each one of which is the last remaining refuge of one or more Endangered or Critically Endangered species.

Based on website literature (www.zeroextinction.org), AZE is first focusing on species that face extinction either because their last remaining habitat is being degraded at a local level, or because their tiny global ranges make them especially vulnerable to external threats. Outside the scope of the Alliance, many AZE members are also working to protect highly endangered species that are more wide-ranging and require different conservation measures.

AZE uses the following criteria to identify priority sites (a site must meet all three to qualify):

- **Endangerment.** An AZE site must contain at least one Endangered (EN) or Critically Endangered (CR) species, as listed on the IUCN Red List.
- **Irreplaceability.** An AZE site should only be designated if it is the sole area where an EN or CR species occurs, contains the overwhelmingly significant known resident population (>95%) of the EN or CR species, or contains the overwhelmingly significant known population (>95%) for one life history segment (e.g. breeding or wintering) of the EN or CR species.
- **Discreteness.** The area must have a definable boundary within which the character of habitats, biological communities, and/or management issues have more in common with each other than they do with those in adjacent areas.

Karaeng – Lompobattang (IDN 6) also been identified as an Alliance for Zero Extinction (AZE) site based upon the presence of the one remaining population of at least one species on the IUCN Red List of Threatened Species assessed as either Critically Endangered or Endangered.

Two species are recognized as trigger species of AZE, they are Lompobattang Flycatcher and Lampobatang Bunomys.

Table 2-1 List of Potential Species on of Karaeng – Lompobattang

Taxonomic group	Scientific Name	Common Name	IUCN Red List Category
Amphibians	<i>Limnonectes arathooni</i>		EN
Amphibians	<i>Limnonectes microtympanum</i>		EN
Amphibians	<i>Oreophryne variabilis</i>		VU
Invertebrates	<i>Ficedula bonthain</i>	Lompobattang Flycatcher	EN
Invertebrates	<i>Rhabdotorrhinus exarhatus</i>	Sulawesi Hornbill	VU
Invertebrates	<i>Rhyticeros cassidix</i>	Knobbed Hornbill	VU
Invertebrates	<i>Macromia irina</i>		VU

Taxonomic group	Scientific Name	Common Name	IUCN Red List Category
Invertebrates	<i>Parantica sulewattan</i>	Bonthain Tiger	EN
Mammals	<i>Bunomys coelestis</i>	Lampobatang Bunomys	EN
Mammals	<i>Macaca maura</i>	Moor Macaque	CR
Mammals	<i>Macrogalidia musschenbroekii</i>	Sulawesi Palm Civet	EN
Mammals	<i>Rattus mollicomulus</i>	Lampobatang Sulawesi Rat	VU
Mammals	<i>Strigocuscus celebensis</i>	Small Sulawesi Cuscus	VU
Plants	<i>Cupaniopsis strigosa</i>		VU
Plants	<i>Diospyros celebica</i>	Indonesian Ebony	VU
Plants	<i>Taxus wallichiana</i>	Himalayan Yew	EN
Reptiles	<i>Ophiophagus hannah</i>	King Cobra	VU
Reptiles	<i>Python bivittatus</i>	Burmese Python	VU

Figure 2-5 is Important Bird and Biodiversity Area (IBA) and Alliance for Zero Extinction (AZE) Site nearby of project location.

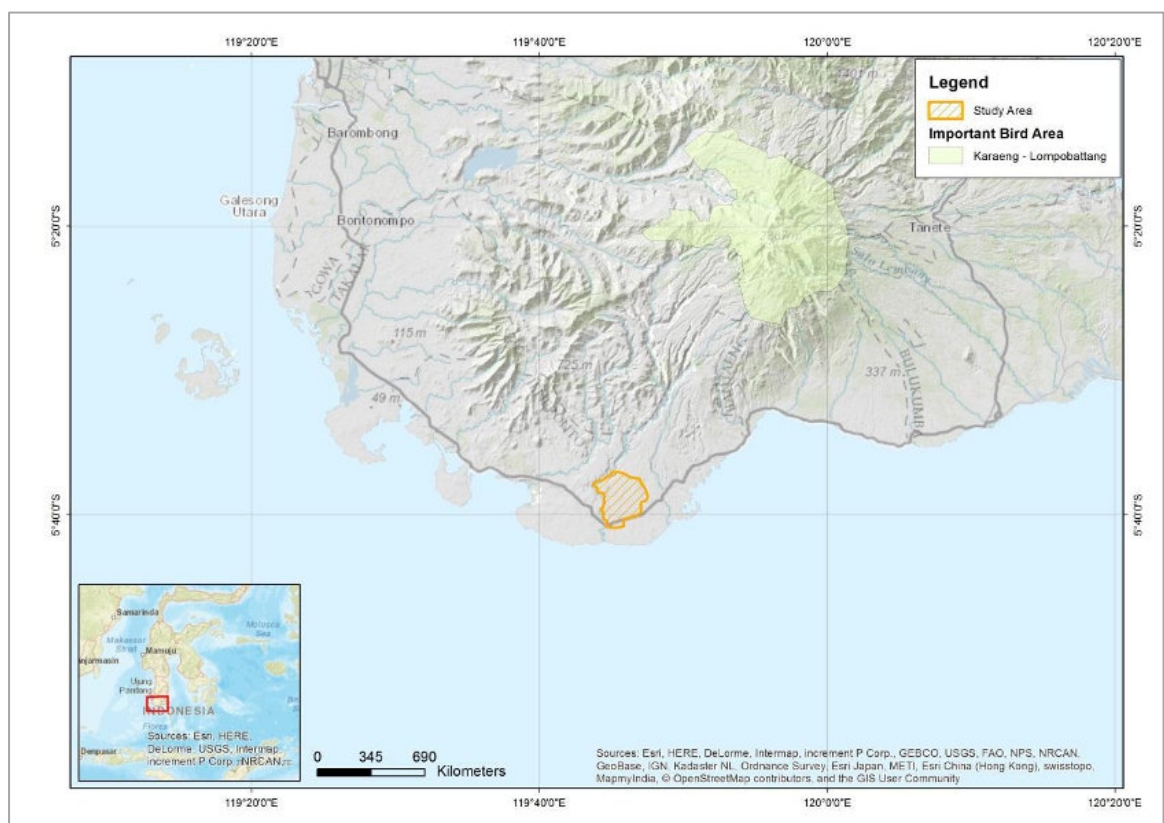


Figure 2-5 Important Bird and Biodiversity Area

2.2 Bird

2.2.1 Bird Habitat

In general, bird habitats are determined based on the findings of species. The survey documented two types of species of birds observed, namely land and water bird habitat. Some species of water birds found are White-breasted Waterhen, Javan Pond-heron and Cattle Egret.

2.2.2 Species Diversity

The study recorded 29 species of birds of 20 families, of which 9 species are protected species under Indonesia Regulation. Observation data shows most of the findings are terrestrial and shrub birds. This species has low flying paths, less than 20 meters from the ground.

Table 2-2 shows a list of bird findings on the Project footprint and surrounds. The observation site conditions were rainy rice fields post-harvest. This condition provides abundant food for bird groups; especially insectivorous birds such as the Sooty-headed bulbul and Cattle Egret. Weeds and shrubs provide abundant food for grain eaters such as the Scaly-breasted munia and Tricoloured munia.

In dry-land agriculture habitats, the study recorded abundant species. A transect was developed from Turbine 12 to Turbine 14 (T12 to T14). In that region, some water birds were recorded such as the White-breasted Waterhen and Collared Kingfisher. Landscape was predominantly paddy fields, making dry-land agriculture habitats as favorite places for shelter and cover as provided by the trees.

Presence of trees in paddy field habitats has an important role. Trees have a role as shelter and cover for small birds from predators, such as raptors. Some species that were commonly recorded in this setting were the Scaly-breasted Munia, Tricoloured munia and White-shouldered triller.

Local migration was recorded in the Project area, by the cattle egret. Every morning, cattle egrets were flying in groups to paddy field habitat for foraging, then returning in the evening to sleeping trees. These birds have the ability to fly fairly high, but during the survey cattle egret flying heights never exceeded 30 meters. Low flying of this bird group is influenced by the distance between location as sleeping and foraging sites were proximal to each other. The study noted mutual symbiotic relationships between livestock and cattle egret. Bush and paddy fields become communities' livestock grazing during dry season.



Figure 2-6 Local Migration of Cattle Egret and Symbiotic Mutualism Relationship

2.2.3 Raptor and Migration Bird

In addition to cattle egret birds that fly high when locally migrating, other bird species that favor high-flying are raptors. Raptors preferentially soar to hunt or maintain territory. Four raptor birds found during the survey were Oriental hobby, Spotted kestrel, Black winged kite and eagle Rofous winged buzzard. All species of raptors are resident species, meaning they live, feed and breed around these locations.

The project location is not traversed by global migration routes of bird species or other groups. **Figure 2-7** shows global migration routes of raptor groups. Some raptor species are migrating from the northern hemisphere to the southern hemisphere (Yamazaki et al, 2012) for the winter season. Migration activity for wildlife is movement from one location to another for specific purposes such as foraging or breeding (Clark, 1990). Migration is undertaken in groups with individual numbers in the hundreds or even thousands. Raptors will utilize thermals to reach certain heights and then glide towards the target location. This is done to conserve their energy for achieving flight over very long distances (Clark, 1990). Areas in South Sulawesi are already known to be regional trajectories and destinations for migration of raptors, based on results of monitoring with satellite tracking in Polewali - Mapili (Higuchi et al, 2005).

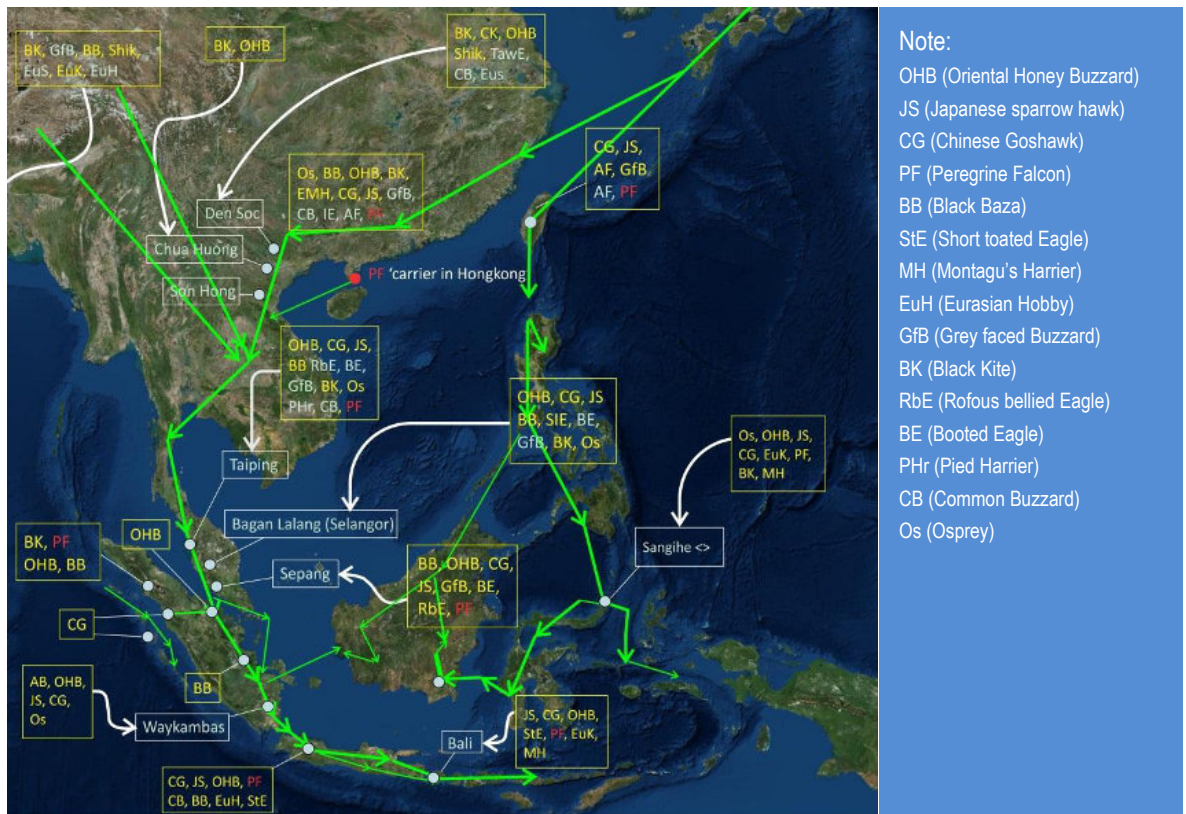


Figure 2-7 Raptor Bird Migration Route

Annually, there are several species of raptor birds that global migrate from the northern hemisphere towards the southern hemisphere for foraging purposes. **Figure 2-8** shows some species of migration raptor photos observed in Bali.



Figure 2-8 Observation of Raptor Group Migration in Bali (sources: <http://www.harnas.co/2014/11/07/festival-burung-pemangsa-2014-jadi-pemikat-wisatawan-ke-bali>)

Table 2-2 Number of bird species that was recorded on study area

No	Name			Family	Conservation Status			Restricted Range Distribution	Number	Diversity Index
	Local	English	Scientific		CITES	IUCN	PP 7/99			
1	Elang sayap coklat	Rofous winged buzzard	<i>Butastur liventer</i>	Accipitridae	App.II	LC	P	-	4	0.05
2	Elang tikus	Black winged kite	<i>Elanus caeruleus</i>	Accipitridae	App.II	LC	P	-	1	0.02
3	Cekakak sungai	Collared Kingfisher	<i>Todiramphus chloris</i>	Alcedinidae	-	LC	P	-	5	0.06
4	Walet linci	Linchi Swiftlet	<i>Collocalia linchi</i>	Apodidae	-	LC	-	-	10	0.10
5	Blekok sawah	Javan Pond-heron	<i>Ardeola speciosa</i>	Ardeidae	-	LC	-	-	1	0.02
6	Kuntul kerbau	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae	-	LC	P	-	50	0.28
7	Kekep babi	White-breasted Wood swallow	<i>Artamus leucorhynchus</i>	Artamidae	-	LC	-	-	10	0.10
8	Kapasan sayap putih	White-shouldered Triller	<i>Lalage sueurii</i>	Campephagidae	-	LC	-	-	10	0.10
9	Cerek asia	Oriental Plover	<i>Charadrius veredus</i>	Charadriidae	-	LC	-	-	16	0.14
10	Cici merah	Golden headed cisticola	<i>Cisticola exilis</i>	Cisticolidae	-	LC	-	-	10	0.10
11	Cici padi	<i>Zitting Cisticola</i>	<i>Cisticola juncidis</i>	Cisticolidae	-	LC	-	-	10	0.10
12	Perkutut jawa	Zebra Dove	<i>Geopelia striata</i>	Columbidae	-	LC	-	-	7	0.08
13	Punai gading	Pink-necked Green Pigeon	<i>Treron vernans</i>	Columbidae	-	LC	-	-	9	0.10
14	Tekukur biasa	Spotted Dove	<i>Streptopelia chinensis</i>	Columbidae	-	LC	-	-	10	0.10
15	Wiwik uncuing	Rusty-breasted Cuckoo	<i>Cocomantis sepulcralis</i>	Cuculidae	-		-	-	1	0.02
16	Bondol peking	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Estrildidae	-	LC	-	-	50	0.28
17	Bondol rawa	Tricoloured Munia	<i>Lonchura malacca</i>	Estrildidae	-	LC	-	-	10	0.10
18	Burung gereja erasia	Eurasian Tree Sparrow	<i>Passer montanus</i>	Estrildidae	-	LC	-	-	10	0.10
19	Alap – alap macan	Oriental hobby	<i>Falco severus</i>	Falconidae	App.II	LC	P	-	1	0.02
20	Alap – alap sapi	Spotted kestrel	<i>Falco moluccensis</i>	Falconidae	App.II	LC	P	-	9	0.10
21	Layang – layang batu	Pacific Swallow	<i>Hirundo tahitica</i>	Hirundinidae	-	LC	-	-	10	0.10
22	Apung tanah	Australasian Pipit	<i>Anthus novaeseelandiae</i>	Motacillidae	-	LC	-	-	10	0.10
23	Decu belang	Pied Bushchat	<i>Saxicola caprata</i>	Muscicapidae	-	LC	-	-	10	0.10
24	Burung madu kelapa	Plain-throated Sunbird	<i>Anthreptes malacensis</i>	Nectarinidae	-	LC	P	-	7	0.08

No	Name			Family	Conservation Status			Restricted Range Distribution	Number	Diversity Index
	Local	English	Scientific		CITES	IUCN	PP 7/99			
25	Burung madu sriganti	Olive-backed Sunbird	<i>Nectarinia jugularis</i>	Nectarinidae	-	LC	P	-	5	0.06
26	Gemak loreng	Barred Buttonquail	<i>Turnix suscitator</i>	Phasianidae	-	LC	-	-	3	0.04
27	Cucak kutilang	Sooty-headed Bulbul	<i>Pycnonotus aurigaster</i>	Pycnonotidae	-	LC	-	-	50	0.28
28	Kareo padi	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	-	LC	-	-	4	0.05
29	Kacamata laut	Lemon-bellied White-eye	<i>Zosterops chloris</i>	Zosteropidae	-	LC	-	-	10	0.10
					Total Individual (N)				343	
					Shannon Wiener Diversity Index (H')					2.91
					Richness Index (R)					1.57
					Evenness Index (E)					0.50

Note: CITES = the Convention on International Trade in Endangered Species of Wild Fauna and Flora, App. II = Appendix II; IUCN = The International Union for Conservation of Nature, LC = Least Concern; PP 7/99 = Preservation of Plants and Wildlife, P = Protected

2.3 Bat

2.3.1 Bat Habitat

Based on literature reviews and habitat mapping, bat habitats can fall under two categories, insectivorous bats prefer paddy fields and dry-land agriculture as their main area for foraging and dry-land agriculture for roosting habitat. The insectivore bat recorded was the Flute-nosed Bat.

For frugivore bat species, dry-land agriculture is their primary important ecological function. Dry land agriculture has fruit plants as food sources. Therefore, dryland agriculture habitats support foraging and roosting for the frugivore bat group.

2.3.2 Bat Diversity

The survey recorded five species of bats of two families, capturing four species of Pteropodidae and a species of Vespertilionidae. **Table 2-3** shows the list of bat species recorded in the Project area.

Table 2-3 Bat Species Findings

No	Name			Ordo - Family	Conservation Status			Restricted Range Distribution
	Local	English	Scientific		CITES	IUCN	PP 7/99	
1	Kalong Kelabu	Gray Flying Fox	<i>Pteropus griseus</i> (E. Geoffroy, 1810)	Chiroptera - Pteropodidae	II	DD	-	-
2	Nyap biasa	Geoffroy's Rousette	<i>Rousettus amplexicaudatus</i> (E. Geoffroy, 1810)	Chiroptera - Pteropodidae	-	LC	-	-
3	Codot barang	Greater Shortnosed Fruit Bat	<i>Cynopterus sphinx</i> (Vahl, 1797)	Chiroptera - Pteropodidae	-	LC	-	-
4	Cecadu pisang-kecil	Dagger-toothed Long-nosed Fruit Bat	<i>Macroglossus minimus</i> (E. Geoffroy, 1810)	Chiroptera - Pteropodidae	-	LC	-	-
5	Ripo flores	Flute-nosed Bat	<i>Murina florum</i> (Thomas 1908)	Chiroptera - Vespertilionidae	-	LC	-	-

Note: - = not applicable; CITES = the Convention on International Trade in Endangered Species of Wild Fauna and Flora, App. II = Appendix II; IUCN = The International Union for Conservation of Nature, LC = Least Concern; PP 7/99 = Preservation of Plants and Wildlife, P = Protected

2.3.2.1 Gray Flying Fox

The body length of 160 mm, no tail, forearms wing 113-130 mm and wingspan 900 mm. the characteristics of this species are long snouts, large eyes, a head with nose and ears were simple, without tragus. The body is covered with hair to the membrane between the thighs. The body color is gray with a yellowish coat to red brick, face with thin strips of dark gray-light.



Figure 2-9 Gray Flying Fox

Geographical distribution includes Sulawesi and its surrounding islands and Nusa southeast, including Flores, Sumba, Timor and the small islands in the vicinity. In the sampling area this species was caught in northern Empoang village, district Binamu. Distribution of habitat includes primary, secondary forest, plantations and gardens, especially those that have fruit plants as primarily diet, such as papaya (*Carica papaya*), guava (*Syzgium aquaeus*), guava (*Psidium guajava*), banana (*Musa sp.*) and cherry (*Muntingia calabura*).

In the sampling area gets caught up in their home gardens and small forests in the northern Empoang village. Figure 2-10 range distribution map of Gray Flying Fox.

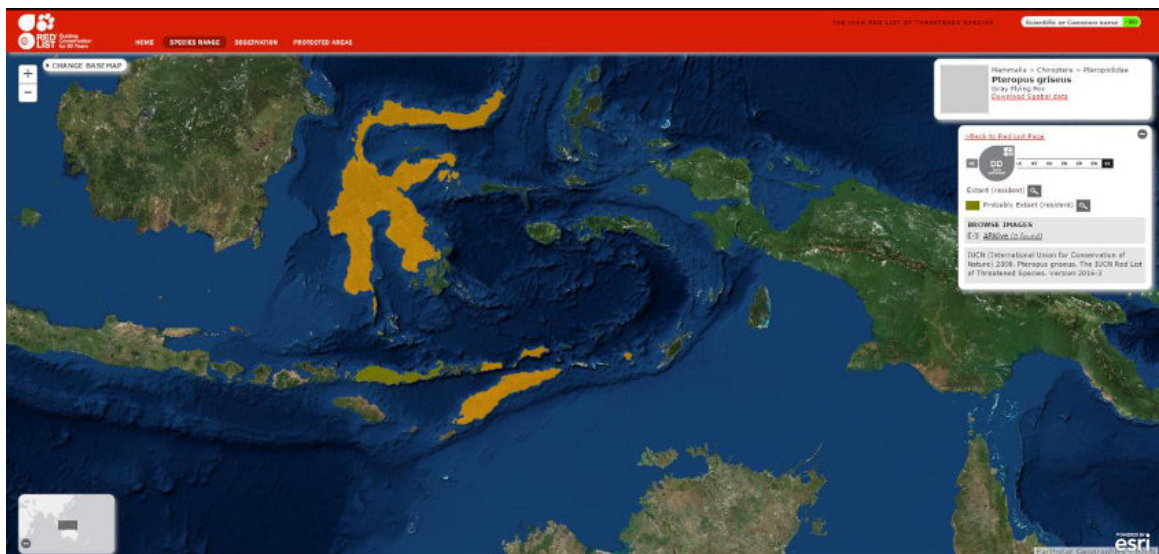


Figure 2-10 Distribution Range of Gray Flying Fox

2.3.2.2 Geoffroy's Rousette

The species characteristics are a body length of 110 mm, the lower arm wing 82-87 mm and wingspan 600 mm. Long snout, large eyes, head with simple nose without tragus. Color Upper body color is dark gray, and the bottom of pale brownish gray. In contrast to other fruit bats, wings of this species are connected directly to the side of the back and separated by a wide band of fur. The difference with other Pteropodidae family's species is having echolocation. Echolocation is the use of sound waves to determine the location of objects, based on reflection

of sound waves. The distance is determined by the time required for the sound waves to bounce back to its source.



Figure 2-11 *Rousettus amplexicaudatus*

Geographical distribution covers Southeast Asia, including Indonesia and the Philippines, to Papua New Guinea and the Solomon Islands. In the sampling area this species was caught in a house garden in the North Empoang Village, districts Binamu and small forests in the vicinity. Habitat includes secondary forests, plantations and gardens. Generally this species can found clustered in niches rocks and shallow caves. The diet are fruits and nectar, especially papaya (*Carica papaya*), guava (*Syzigium aquaeus*), guava (*Psidium guajava*) and sapodilla (*Manikara zapota*).

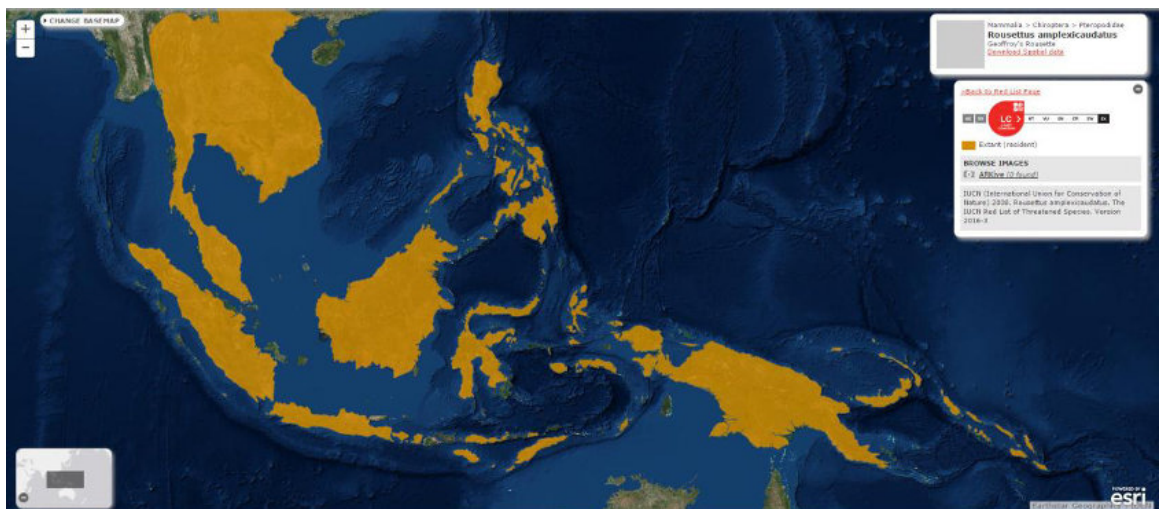


Figure 2-12 Distribution Range of Geoffroy's Rousette

2.3.2.3 Greater Shortnosed Fruit Bat

Greater short-nosed fruit bat characteristics are a body length of 95 mm, forearm wing of 65-70 mm and wingspan of 520 mm. The muzzle is short and wide, black. Big eyes, nose and ears are simple without tragus. Black body color is brownish-gray to black. Coat color is saffron during breeding conditions, especially with males. Black wings with bones striking white finger, Thickening of the ear with white edges.



Figure 2-13 *Cynopterus sphinx*

The geographic distribution includes South Asia and Southeast Asia, including Large Sunda Islands to Sulawesi. **Figure 2-14** is distribution of Dagger-toothed Long-nosed Fruit Bat. In the sampling area, this species was captured in a garden in the North Empoang Village, Binamu Kecamatan. Habitat includes secondary forests, plantations and gardens. In Daytime, these species is nesting under the leaves of trees, especially palm trees and rooftops. The diets are fruits, especially papaya, guava, guava, sapodilla and fig (*Ficus sp.*). In coastal, it was recorded eating the Ketapang fruit (*Terminalia catappa*).



Figure 2-14 Distribution Range of Greater Shortnosed Fruit Bat

2.3.2.4 Dagger-toothed Long-nosed Fruit Bat

Dagger-toothed Long-nosed Fruit Bats are a small size bat. This species has the body length of 75 mm, with or without a tail. Forearm wing of 35-45 mm and wingspan of 330-400 mm. The muzzle is very long (> half of head) with very long tongue (> half of head). Body and wings, light brown color with pattern nets on the wings. There is a dark brown stripe extending from the head to the back. Big eyes, nose and ears are simple without tragus. The adult male has a “V” patterned pink on the chest.



Figure 2-15 Dagger-toothed Long-nosed Fruit Bat

Geographical distribution covers southern Thailand, the Malay Peninsula, the Philippines and throughout the Indonesian archipelago, to Papua New Guinea, northern Australia and the Solomon Islands (**Figure 2-16**). In the sampling area this species was captured in a house garden in North Empoang village, Kecamatan Binamu. Habitats include plantation, garden and settlement, especially garden containing species of flowering and fruiting trees. The main diet is nectar from flowers, especially banana (*Musa sp.*). Ecologically, *M. minimus* play a big role as a pollinator of various species of families of plants such as Bignoniaceae, Bombacaceae, Fabaceae, Musaceae, Myrtaceae and Sonneratiaceae.

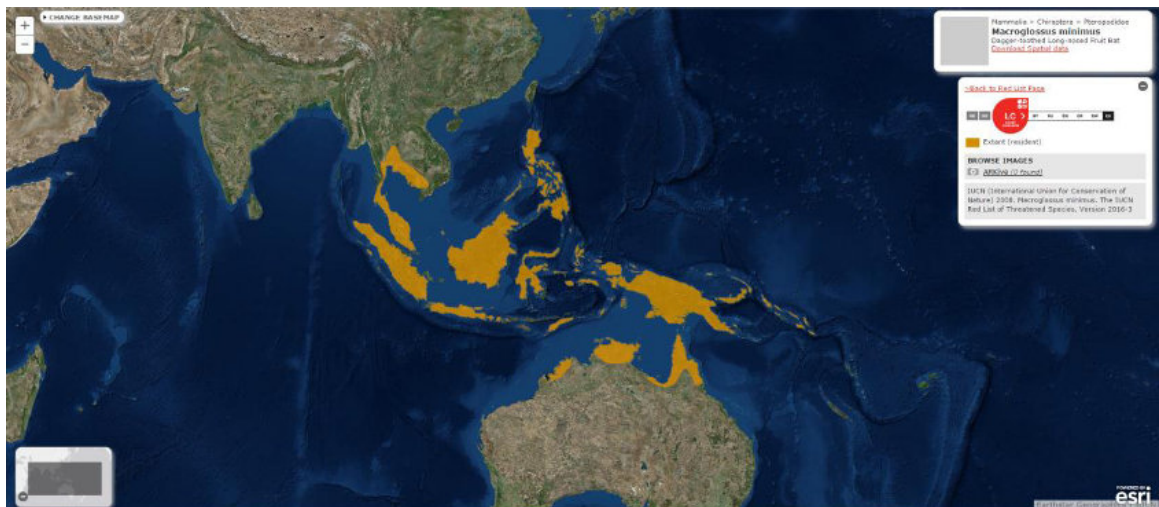


Figure 2-16 Distribution Range of Dagger-toothed Long-nosed Fruit Bat

2.3.2.5 Flute-nosed Bat

It is generally not uncommon, but typically occurs at low densities (20-30 per 1 square meters). The habitat range is lowland up to montane area with elevations of 2,800 m ASL. This species has reddish hair color, Forearm wing of 30 – 36.2 mm and wingspan of 7.6 – 9.0 mm, length of tail of 32.9 – 39.0 mm and length of ears of 10.6 – 15.8 mm.



Figure 2-17 Flute-nosed Bat

This species has been recorded from a range of tropical moist forest types (including rainforest with a eucalyptus undergrowth), and from dry and wet sclerophyll woodland. It has been found also in degraded forest habitats. It roosts as solitary animals, or in small groups, amongst dead leaves and other foliage, in caves, or in disused buildings (Bonaccorso 1998; Duncan *et al.* 1999). On study area this species is recorded on garden and dry-land agriculture.

Habitats reported in many types of humid tropical forests (including bushland eucalyptus), sclerophyll forests dry and wet. It was also found in degraded forest habitats. Resting solitary or in small groups among dried leaves and other leaves, cave or old buildings (Bonaccorso 1998; Duncan *et al.*, 1999).



Figure 2-18 Distribution Range of Flute-nosed Bat

3 CRITICAL HABITAT ASSESSMENT

3.1 Background Information

Desktop reviews and biodiversity studies show some of the findings trigger critical habitat in accordance with GN55, IFC PS6, 2012. Critical habitat is a description of the most significant and highest priority areas of the planet for biodiversity conservation. It takes into account both global and national priority-setting systems and builds on the conservation biology principles of 'vulnerability' (degree of threat) and 'irreplaceability' (rarity or uniqueness). Critical habitat assessment is analysis of the significant area for biodiversity and conservation.

Critical habitat criteria are as follows and should form the basis of any critical habitat assessment:

- Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species at global and/or national level
- Criterion 2: Endemic and/or restricted-range species
- Criterion 3: Migratory and/or congregator species
- Criterion 4: Highly threatened and/or unique ecosystems
- Criterion 5: Key evolutionary processes

The determination of critical habitat however is not necessarily limited to these criteria. Other recognized high biodiversity values might also support a critical habitat designation, and the appropriateness of this decision would be evaluated on a case-by-case basis. Examples are as follows:

- Criterion 6: Legally Protected Areas in IUCN Categories I-II; and
- Criterion 7: Internationally Recognized Areas.

GN58-GN62 of IFPS6 describes of gradient critical habitat. There are gradients of critical habitat or a continuum of degrees of biodiversity values associated with critical habitats based on the relative vulnerability (degree of threat) and irreplaceability (rarity or uniqueness) of the site.

3.2 Assessment of Critical Habitat

To determine whether the project is located in critical habitat, a comprehensive literature review and consultation with stakeholders and biodiversity specialists have been undertaken. In addition, biodiversity surveys were undertaken as part of the ESIA. The following potential critical habitat features are known or likely to be present in the DMU:

3.2.1 Critically Endangered (CR) and/or Endangered (EN) species at global and/or national level;

Biodiversity study and literature review did not recorded presence of species included as Endangered (EN) species in Project footprint or greater study area landscape. Therefore, Criterion 1 is not applicable to the Project site.

3.2.2 Endemic and/or restricted-range species;

Biodiversity study and literature review did not uncover presence of species that include endemic and/or restricted-range species in project footprint or study area landscape. Therefore, Criterion 2 is not applicable to the project site.

3.2.3 Migratory and/or congregatory species

Biodiversity study and literature review did not record presence of species that include migratory and/or congregatory species or the habitat in Project footprint or greater study area landscape. The Project is also not part of any global migration route. Therefore, Criterion 3 is not applicable to the Project site.

3.2.4 Highly threatened and/or unique ecosystems

Project footprint or study area landscape is located within modified habitat. The study did not observe any unique ecosystems in the Project area. Therefore, Criterion 4 is not applicable to the Project site.

3.2.5 Legally Protected and Internationally Recognized Areas

The Project foot print area is located in 'Other Usage' area. The Project location is not located within or adjacent to national level protected areas, regional protected area or international protected area.

It is however considered that the requirements in Paragraph 20 of the IFC PS6 (IFC, 2012a) are not applicable to the Project.

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Appendix 1

Bird Species Photos

Appendix 1 Bird Species Photos

			
Alap – alap macan (<i>F. severus</i>)	Alap – alap sapi (<i>F. moluccensis</i>)	Elang tikus (<i>E. caeruleus</i>)	Elang sayap coklat (<i>B. liventer</i>)
			
Kuntul kerbau (<i>B. ibis</i>)	Kekep babi (<i>A. leocorhynchus</i>)		

Appendix 10

Noise Modelling Study and Summary of Results

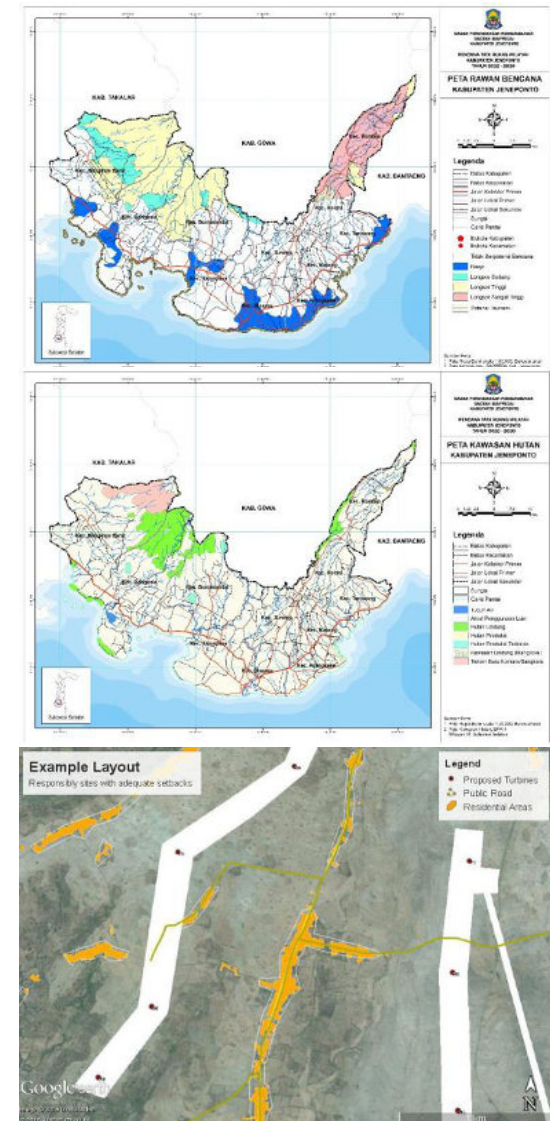


EQUIS ENERGY

Tolo 1 Wind Farm Design For Noise + Mitigation Plan

Principles Used in Early Site Layout Design

- Know your Buildable Area (BA)
 - Any regulations that exist
 - Responsible development
 - Active stakeholder engagement
 - Use of local PETA maps for land use, forestry, population density, spatial planning, strategic zones, geology, natural disasters, administration, etc.
- Know your terrain and site area
 - Use of high resolution 2.5 m terrain contours - aids in undertaking conceptual design of roads to minimise impact on surrounding paddy fields
 - Use of high resolution satellite imagery – aids in identifying sensitive receptors
- Noise and shadow modelling need to feature
 - Use of DNV GL's WindFarmer noise modelling modules to assess impact according to industry best practice guidelines and comply with regional requirements



World Bank Group Guidelines



ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES WIND ENERGY

August 7, 2015

ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES FOR WIND ENERGY

“1. The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP).¹ When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS Guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.”

“5. The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It should be applied to wind energy facilities from the earliest feasibility assessments, as well as from the time of the environmental impact assessment, and continue to be applied throughout the construction and operational phases. Annex A contains a full description of industry activities for this sector. EHS issues associated with the construction and operation of transmission lines are addressed in the EHS Guidelines for Electric Transmission and Distribution.”

Wind Farm Operational Noise

Wind turbines produce noise through a number of different mechanisms, which can be roughly grouped into mechanical and aerodynamic sources. Mechanical noise is radiated by the surface of the turbine and by openings in the nacelle housing. The interaction of air and the turbine blades produces aerodynamic noise through a variety of processes as air passes over and past the blades.

Source: "Environmental, Health, and Safety Guidelines Wind Energy" World Bank Group, August 7, 2015



Noise assessment output represented by green contours using DNV GL's WindFarmer for analysis

Noise Impact Assessment

Noise impact should be assessed in accordance with the following principles:

- The receptors should be chosen according to their environmental sensitivity (human, livestock or wild life)
- Preliminary modeling should be carried out to determine whether more detailed investigation is warranted. The preliminary modeling can be as simple as assuming hemispherical propagation (i.e., the radiation of sound, in all directions, from a source point). Preliminary modeling should focus on sensitive receptors within 2,000 meters (m) of any of the turbines in a wind energy facility.
- If the preliminary model suggests that turbine noise at all sensitive receptors is likely to be below an LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m height during day and night times, then this preliminary modeling is likely to be sufficient to assess noise impact; otherwise it is recommended that more detailed modeling be carried out, which may include background ambient noise measurements.
- All modeling should take account of the cumulative noise from all wind energy facilities in the vicinity having the potential to increase noise levels.
- If noise criteria based on ambient noise are to be used, it is necessary to measure the background noise in the absence of any wind turbines. This should be done at one or more noise-sensitive receptors. Often the critical receptors will be those closest to the wind energy facility, but if the nearest receptor is also close to other significant noise sources, an alternative receptor may need to be chosen.
- The background noise should be measured at 10 m height over a series of 10-minute intervals, using appropriate wind screens. At least five of these 10-minute measurements should be taken for each integer wind speed from cut-in speed to 12 m/s.

Source: "Environmental, Health, and Safety Guidelines Wind Energy" World Bank Group, August 7, 2015

Noise Impact - PPA Regulations

1. PPA Noise Regulation –

Ground level noise from all generating capacity when operating in steady state conditions shall comply with the requirements of SPLN 46-1:1981 and SPLN 46-2-2:1982. Noise levels shall be the quieter of i) no more than 70 dB (A) by day (6:00 to 22:00) and no more than 60dB (A) by night (22:00 to 06:00) at a distance of one meter from the base of each WTG tower or ii) at a distance of 300 meter from the base of the WTG tower, the noise levels shall be no more than 60 dB (A) by day (6:00 to 22:00) and no more than 55dB (A) by night (22:00 to 06:00).

Regardless of i) or ii) above, the noise levels at any adjacent residence shall be no more than 55dB (A) by day (6:00 to 22:00) and no more than 50dB (A) by night (22:00 to 06:00). These standards shall apply on land

2. Summary of PPA Noise Regulation -

- *maximum permissible noise level at resident is 50 dB(A) by night (22:00 to 06:00) – **defining case***
- *maximum permissible noise level at resident is 55 dB(A) by day (06:00 to 22:00)*

Noise Impact - Regional Regulations

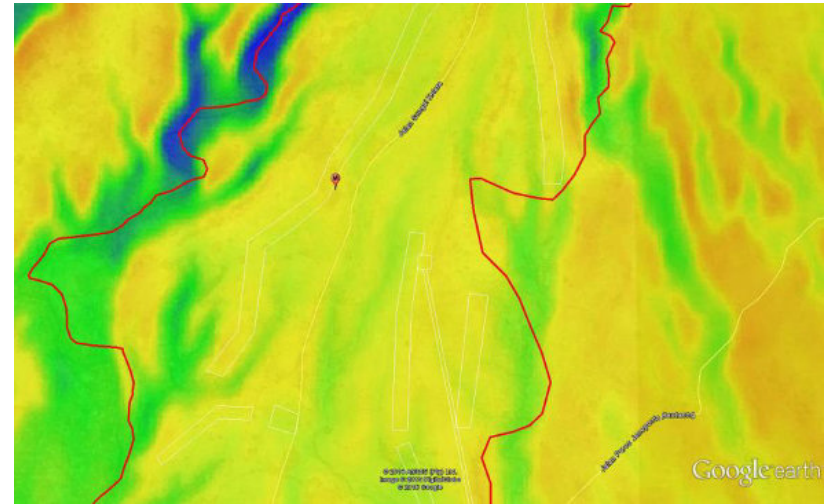
South Sulawesi Governor Regulation No. 69/2010:

Area	Noise Limit (dBA)
1. Residential	55
2. Trade and services	70
3. Office and business	65
4. Open green space	50
5. Industrial	70
6. Government office and public facilities	60
7. Recreational facilities	65
8. Special facilities/infrastructure	
1. Airport	75
2. Port	70
3. Cultural heritage sites	60
7. Hospitals (and similar health infrastructures)	55
8. Schools (and similar education infrastructures)	55
9. Place of worship (and similar religious infrastructures)	55

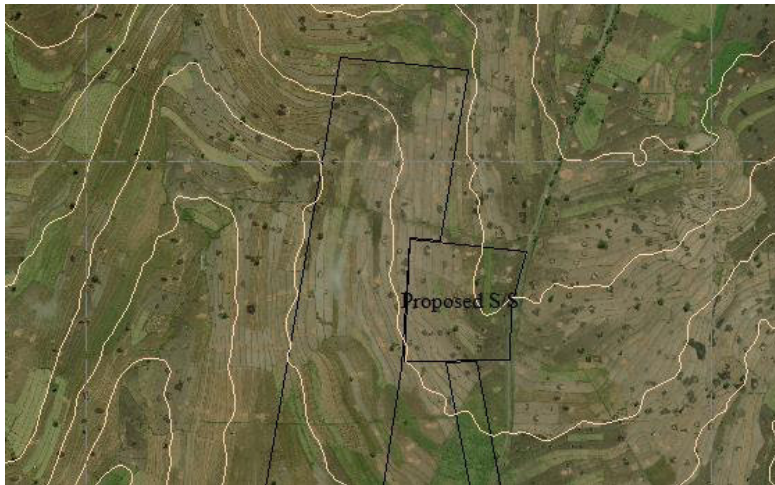
Wind Farm Layout Design – Process



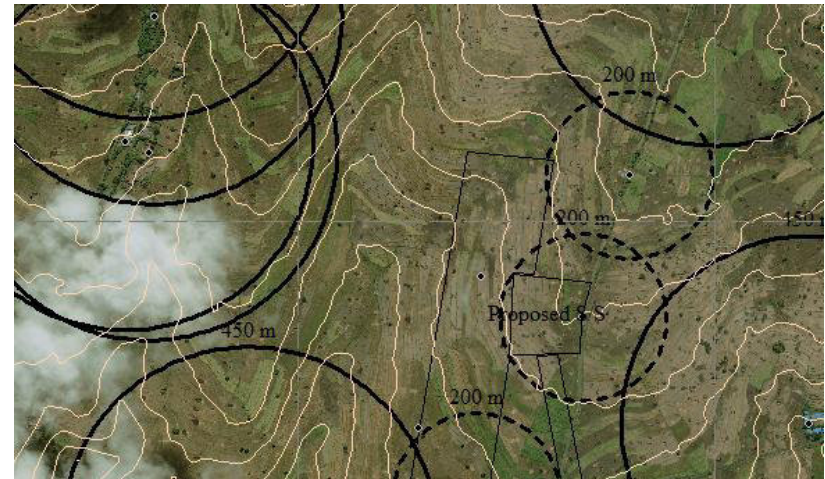
1. Use high resolution imagery to identify constraints



2. Overlay permitted corridors on wind map

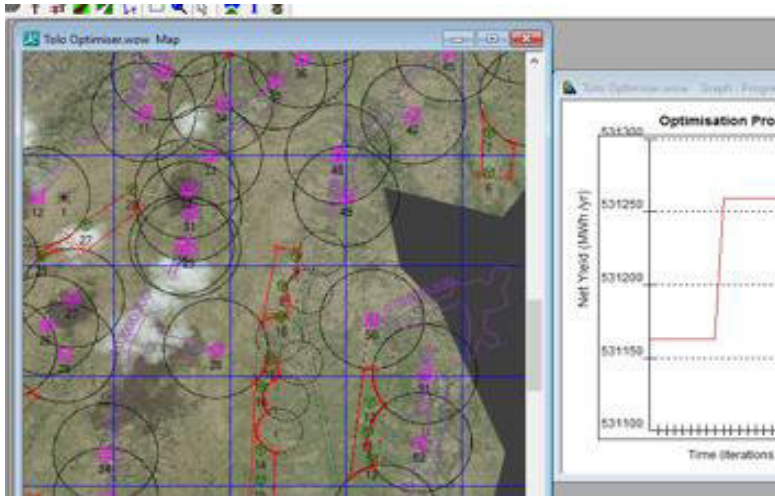


3. Overlay permitted corridors on high resolution imagery and high resolution 2.5m contours

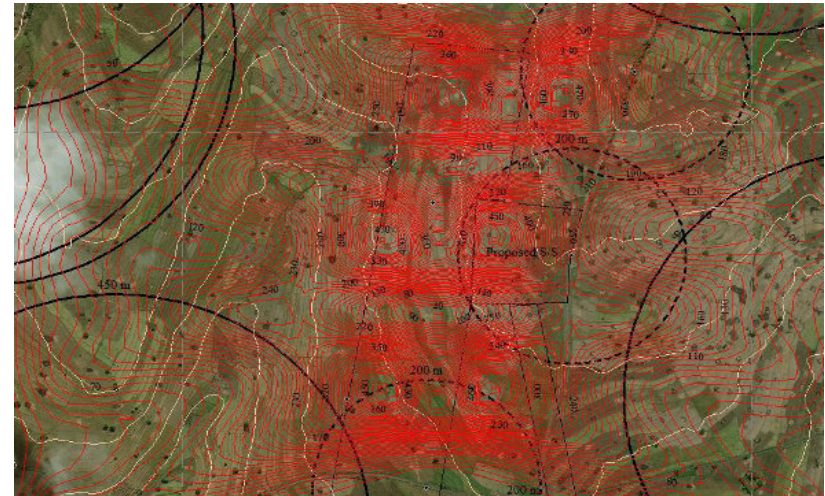


4. Use high resolution imagery and contours to define setbacks (i.e. from houses, roads, etc)

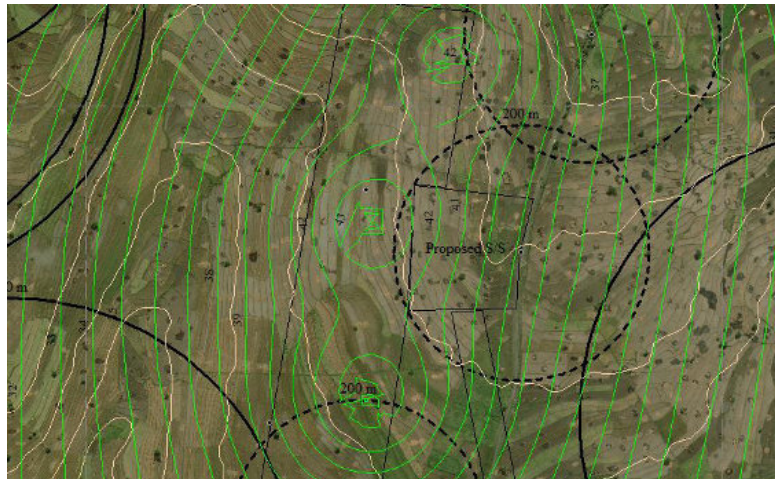
Wind Farm Layout Design – Process (cont'd)



5. Use WindFarmer to optimise layout for max energy using suitable spacing



6. Use optimized layout to undertake shadow flicker analysis and overlay results on high resolution imagery



7. Use optimized layout to undertake noise impact analysis and overlay results on high resolution imagery

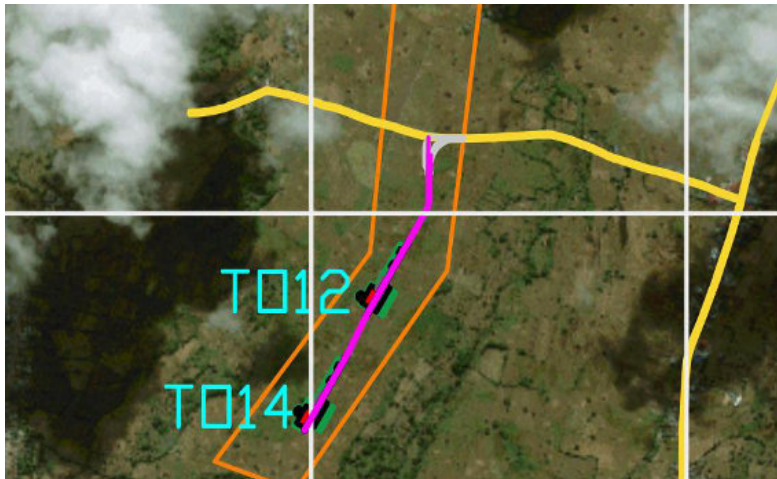


8. Remove/move turbine positions to mitigate shadow flicker and noise impact to conform to World Bank Group guidelines

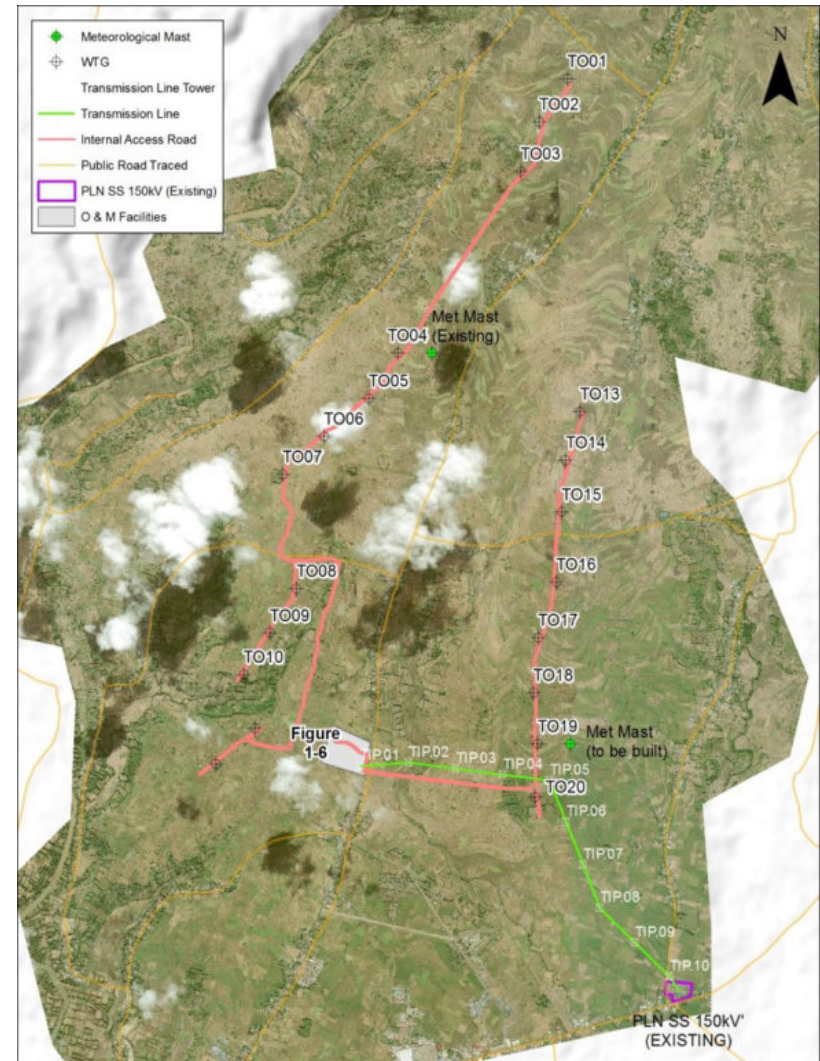
Wind Farm Layout Design – Process (Concluded)



9. Overlay final layout with Blok maps to understand land ownership patterns



10. Complete road plans and turbine hard stand and working area designs and overlay on high resolution imagery



11. Draft Final Wind Farm Master Plan

Layout Revision for the Tolo Wind Farm

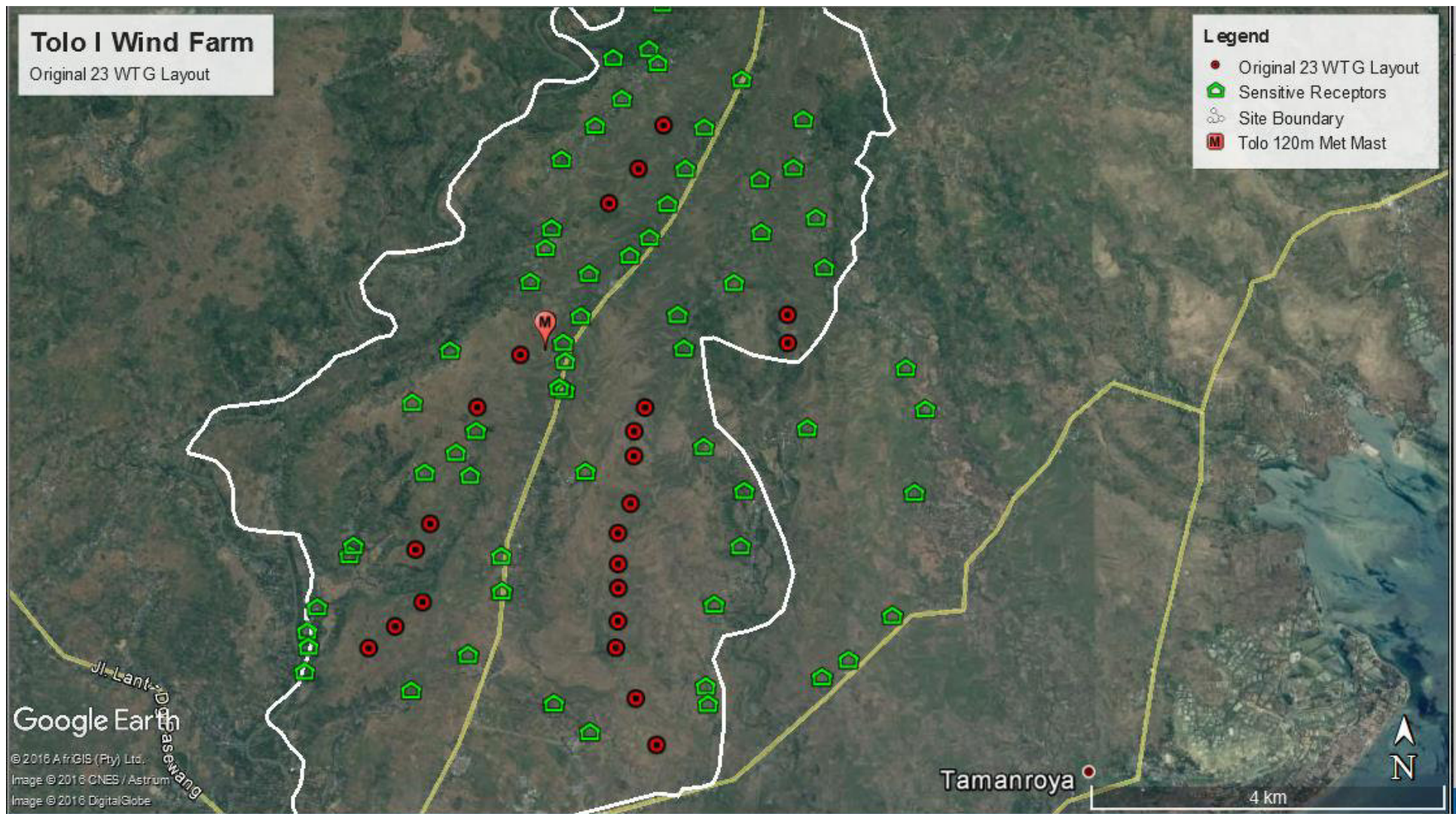
Original 23 Turbine Layout

- Compliant with World Bank guidelines on noise and shadow flicker impact metrics
- Drawbacks
 - Disturbance to larger portion of community due to larger spread of layout
 - Longer time to build project due to larger spread of layout
 - Longer road length and transmission line length
 - Higher project costs resulting in higher cost of energy to the public
 - Not optimal economically due to large extent of layout

Final 20 Turbine Layout

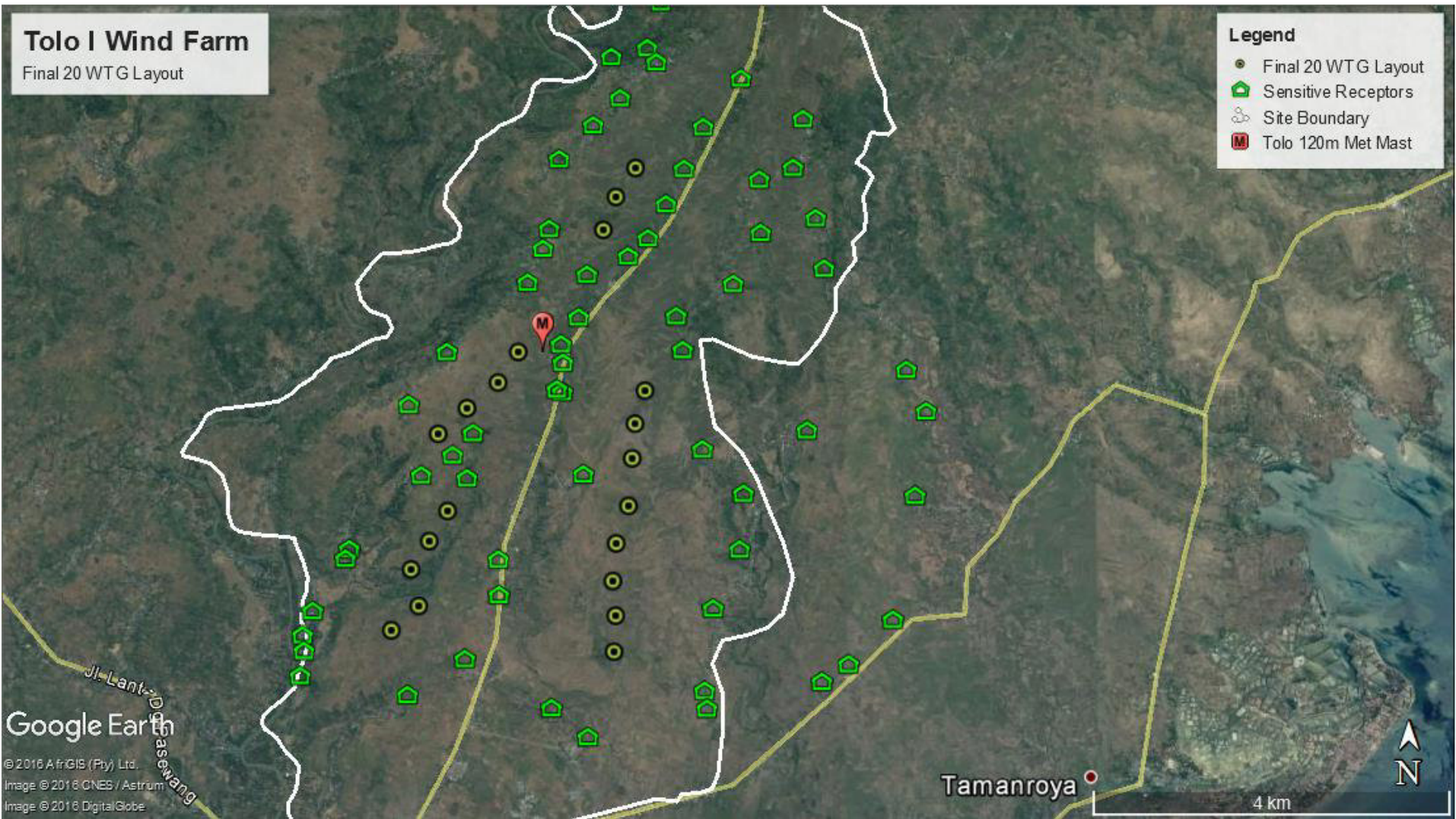
- Equis Energy revised the 23 WTG layout in order to reduce wind farm footprint to reduce social and environmental impact and increase financial viability to lower cost of energy to public
- Layout was reduced from 23 turbines to 20 turbines
- Identified 57 sensitive receptor location groups

Original 23 Turbine Layout



12. Original 23 turbine layout with sensitive receptors

Final 20 Turbine Layout



13. Final 20 turbine layout with sensitive receptors

Operational Noise Modelling

Criteria – Worst Case Scenario

- Manufacturer noise levels based on noise measurements used for varying wind speeds
- Worst case ground attenuation ground factor of 0 used (used for hard ground such as ice, paving).
- For atmospheric attenuation coefficients, the ISO 9613 standards were used based on site specific humidity and pressure levels.
- Meteorological correction factor was 0
- Miscellaneous types of attenuation was 0. However, in reality there is foliage (lots of trees) around all the sensitive receptors which would further minimise impact from operational turbine noise.
- DNV GL WindFarmer which has been used for noise modelling has a typical error of +/-3dB in accordance with the ISO.

Result

Location (sample ID)	Worst case - turbine operational noise (dBA)	Modelling threshold (Refer to EHS Guidelines for Wind Energy) in dBA
NS1	38	35
NS2	40.5	35
NS3	29	35

The result of noise modelling shows that in the worst case scenario, turbine operational noise exceeds the modelling threshold given in EHS Guidelines for Wind Energy of 35 dBA. As the consequence, the Project is required to measure the background ambient noise, especially at the sensitive receptors to assess the significance of noise impact.

Background Ambient Noise Level

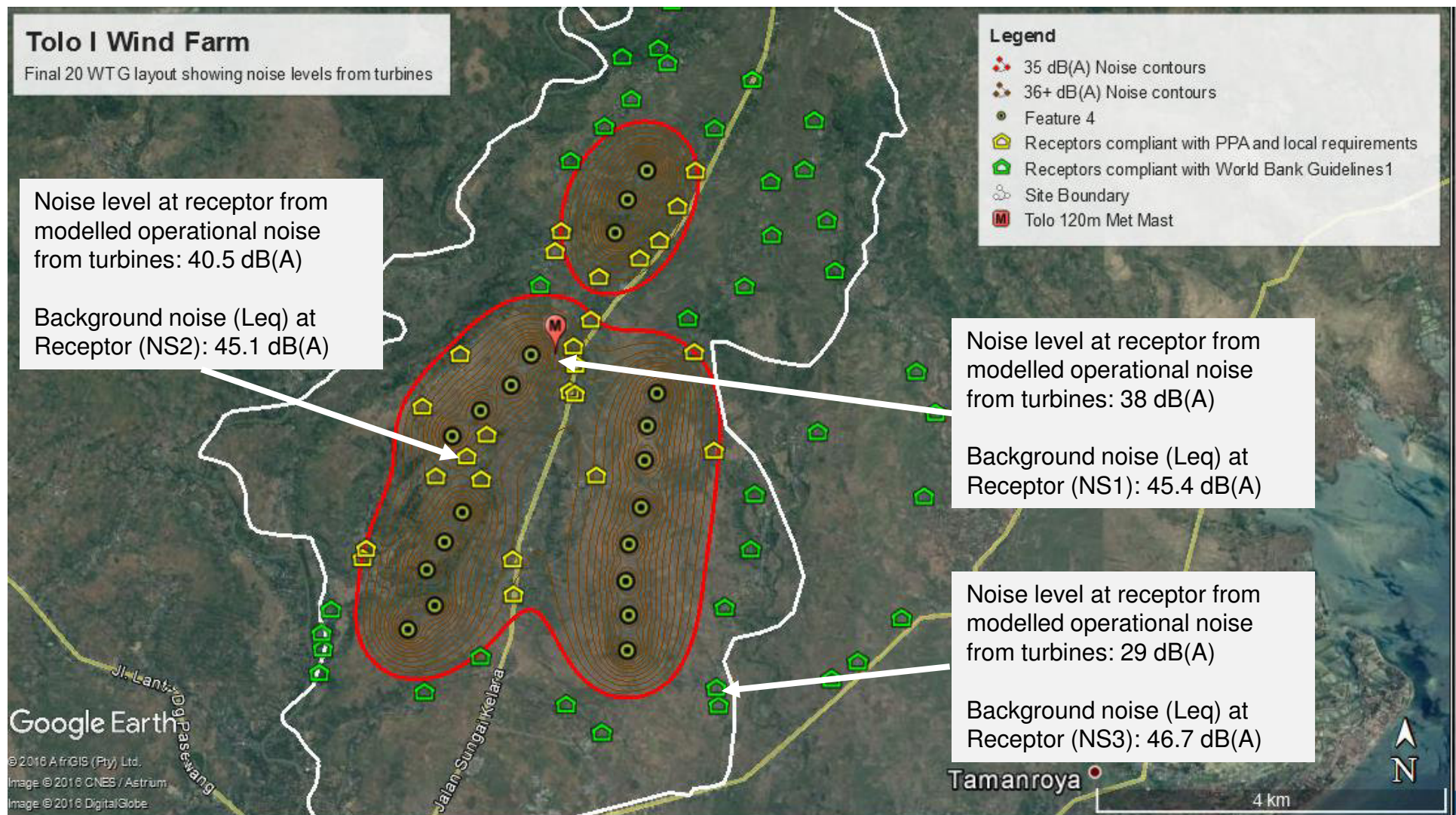
1. Consultant engaged to undertake the AMDAL has made the following direct background noise readings on site:

No.	Location	Coordinates	Sampling Date/Time	Sampling Result	Methodology
1	Near tower/mast at Ujung Boni village, Turatea District	5 37 26.44S 119 46 02.86E	6 Apr 2016 13h00 GMT+8	47.2 dBA	Direct Reading
2	Mangongi Village, Kelara District	5 39 17.25S 119 48 46.51E	6 Apr 2016 14h29 GMT+8	50.3 dBA	Direct Reading
3	Empoang Utara Village, Binamu District	5 30 36.32S 119 45 43.83E	6 Apr 2016 16h00 GMT+8	51.7 dBA	Direct Reading

2. The background noise measurements that were undertaken for the AMDAL were not deemed to be sufficient for the ESIA. Hence, Greencap undertook further background measurements according to and in exceedance of the World Bank and IFC Guidelines to obtain the following background measurements at the sensitive receptors:

Location (sample ID)	Date/Time	Total L _{eq} (dBA)	L max (dBA)	L min (dBA)	Day L _{eq} (dBA)	Night L _{eq} (dBA)
NS1	Start: 13/11/2016 12:00 PM End: 15/11/2016 12:00 PM	45.4	55.0	28.3	44.4	46.9
NS2	Start: 10/11/2016 11:00 AM End: 13/11/2016 11:00 AM	45.1	60.8	28.7	46.2	41.8
NS3	Start: 10/11/2016 12:00 PM End: 13/11/2016 12:00 PM	46.7	58.2	34.9	47.9	42.5

Turbine Layout with Noise Map



14. Final 20 turbine layout with assessed noise levels from turbines with sensitive receptors

Noise Impact Assessment

Noise Impact Assessment and Compliance

Location (sample ID)	Worst case - turbine operational noise (dBA)	Background ambient noise – Total Leq (dBA)	Accumulative noise level – background + operational noise (dBA)	Defining threshold – PPA noise regulation (dBA)
NS1	38	45.4	46.1	50
NS2	40.5	45.1	46.4	50
NS3	29	46.7	46.8	50

- Tolo I Wind Farm operational noise is compliant with PPA Regulation of 50 dBA, compliant with South Sulawesi Governor Regulation No. 69/2010 of 55 dBA at residential areas
- Tolo I Wind Farm operational noise is largely compliant with World Bank EHS Guideline of 35 dB(A) at resident with modelled worst case noise levels, only at the closest receptor of 40 dBA
- The majority of residences live in the immediate vicinity of roads where the primary source of noise is from vehicles, and local village activities
- Existing background noise levels along these roads far exceed the worst case modelled noise from turbines of 40 dBA. **At this location, the background noise level is 50.7 dB(A)**

Noise Impact Mitigation

- Wind turbines have been sited to ensure minimal operational noise impact using IEC Type certified turbines with Industry Best Practice Sound Level Guarantees.
- Furthermore, if it is deemed that operating turbines causing noise disturbance to the community, EBJ will explore the use of natural noise barriers such as trees around affected residences.
- Where it is deemed in project-specific circumstances that operational noise from the turbines and not background noise is causing disturbance to the community, EBJ may consider operating the turbines in reduced noise mode.

