EIA Addendums
(Final)

Prepared for:

PT Panca Amara Utama

April 2013

Delivering sustainable solutions in a more competitive world

ERM

EIA Addendum 1

Biodiversity
Prepared by ERM

EIA Addendum 2

Pollution Controls
Prepared by ERM

EIA Addendum 3

Resource Efficiency
Prepared by ERM

EIA Addendum 4

Earthquake Impact Mitigation
Prepared by PAU

EIA Addendum 5

Cumulative Impact Assessment
Prepared by ERM

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Framework Environmental Management and Monitoring Plan
Prepared by ERM

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Social Impact Assessment and Management Plan
Prepared by ERM

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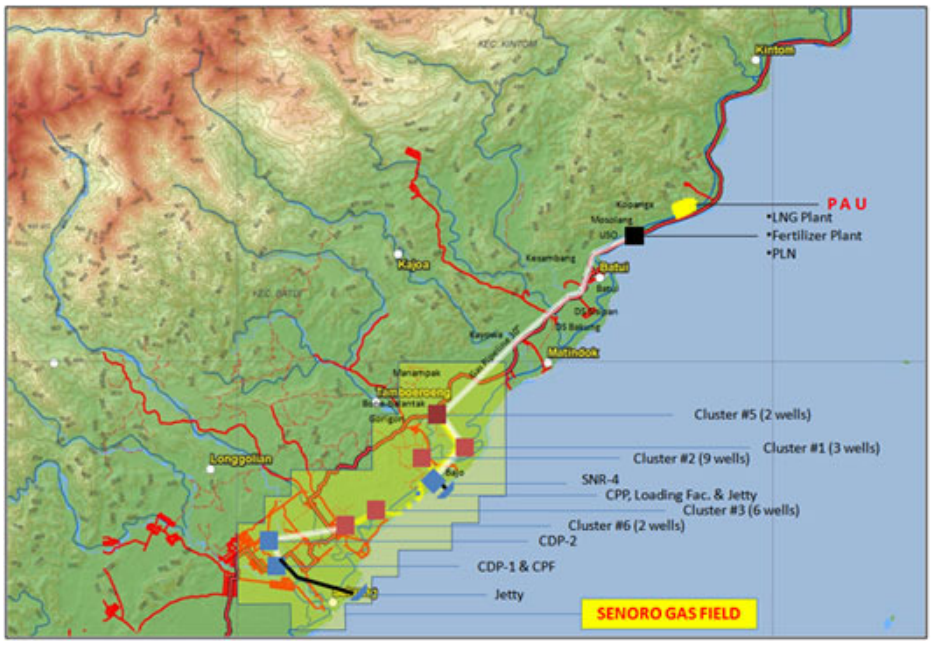
1 INTRODUCTION

PT Panca Amara Utama (PAU) is proposing to build a 700,000 tonnes per annum (TPA) Ammonia production facility near the village of Uso in the Banggai District, Central Sulawesi (Figure 1). The production facility is located on the East coast of Sulawesi, on the eastern boundary of the Donggi Senoro LNG (DSLNG) facility (Figure 1).

Figure 1 Site Location



In accordance with Indonesian Government Regulations an Environmental Impact Assessment (EIA) was prepared for the project and was granted approval on 8 October 2012. The Indonesian EIA process is known as AMDAL and includes the Environmental Impact Analysis (ANDAL), Environmental Management Plan (RKL) and Environmental Monitoring Plan (RPL).

PAU is now seeking funding from the IFC for the future construction of the project. The IFC recently undertook a review of the Project ANDAL and RKL/RPL and recommended a number of further actions to ensure the project is fully compliant with IFC's Performance Standards. These actions were listed in a Terms of Reference (ToR) which outlined Seven EIA addendums which were required to be prepared for the project.

ERM has significant experience in the region and with the requirements of the IFC Performance Standards and EHS Guidelines, and was engaged to prepare draft EIA addendums to address the gaps summarized by the FC within the ToR. This report has been prepared to address the gaps between the ANDAL

information and IFC PS (2012) requirements (specifically IFC PS6) identified by the IFC review.

1.1 PROJECT OVERVIEW

1.1.1 PROJECT DESCRIPTION

A detailed project description is provided within the ANDAL document. Key components of the project include the following;

- Construction of an Ammonia production facility covering an area of approximately 22 ha and a construction camp covering approximately 18 ha. A nearshore laydown area will also cover approximately 2ha.
- Feed gas is to be sourced from upstream fields routed to the Ammonia production facility via a pipeline connecting the adjacent DSLNG facility to upstream onshore gas fields;
- All freshwater requirements for the project will be supplied via a seawater desalination plant constructed for the project;
- A wastewater treatment plant will be constructed for the project and all grey water and production waste water is to be treated prior to discharge via an outfall constructed for the project;
- Process cooling water will also be discharged separately to the wastewater stream.
- Onsite runoff water is to be stored within retention ponds;
- A construction jetty and a 80 meter cargo jetty will be constructed for Ammonia export.

The Project layout is provided at Figure **2**

Figure 2 *Project layout*

1.2 LIMITATIONS

In completing this EIA addendum, ERM has used the project ANDAL and also its understanding of environmental values within the region. Site specific data on some marine and terrestrial biodiversity information is lacking while there are also some significant gaps in the ANDAL identification and assessment of project impacts. Where possible ERM has used its professional judgment in considering the potential biodiversity risks and in some instances it has been recommended that further site surveys be conducted to verify these findings. In some instances it has also been recommended that management plans be developed to detail ongoing environmental management and monitoring activities during construction and operations.

1.3 SCOPE OF THIS REPORT

This draft report has been developed to provide an understanding of the risks and likely impacts to biodiversity. While impacts to biodiversity were considered as part of the project ANDAL the IFC review identified gaps in this assessment that require further consideration. This report will use the available ANDAL information and also ERM's understanding of the region and synthesise these into an assessment that considers project risks to biodiversity in a format that addresses the gaps identified by the IFC.

Recognising the known limitations, this report will specifically address the following gaps in biodiversity information identified within the IFC ToR;

- Biodiversity value of the cropping and plantation areas within the project site;
- Potential presence of Maleo Birds and potential impacts and management measures;
- Potential presence of sea turtles at the project site;
- Potential impacts to coral reefs as a result of marine construction activities and marine discharges during operations; and
- Suggest potential mitigation and monitoring activities that should be considered for the project.

Due to the information gaps and also time constraints, ERM has not attempted to undertake a detailed assessment of potential project impacts, but instead has considered the potential risks to biodiversity values, based on the information available.

In some instances ERM has made recommendations for the collection of further data to verify the risk findings or help inform the preparation of construction management plans. Rather than requiring additional data be collected to inform the impact assessment, it has been recommended that some additional data be collected to inform the development of future environmental and management and monitoring plans.

2 *METHODOLOGY*

ERM's methodology to understand potential impacts to biodiversity relies heavily on a broad assessment of potential risks based on existing baseline information, project information and existing and proposed management measures. Once this information is collated and assessed, a judgement has been made as to the risk posed by the project to the biodiversity value under consideration. In some instances recommendations for further survey or for incorporation into an ongoing management and monitoring plan have been made. The methodology is summarised as follows.

The project ANDAL and other publically available ANDAL and UKL/UPL reports from the area were reviewed to provide a baseline understanding of the marine and terrestrial biodiversity values known to exist within the project area. The following projects approval documents were reviewed:

- PPGM AMDAL (incorporating both the upstream and downstream components of the adjacent DSLNG Project).
- Matindok Gas Project JOB Senoro-Toili Upstream Gas operation ANDAL – incorporating central processing facilities supplying gas to DSLNG, condensate shipping and Senoro gas fields production activities; and
- Condensate pipeline re-routing project UKL/UPL.

Existing data bases were also searched to identify species listed as either Endangered (E) or Critically Endangered (CR) that may exist or that have the potential to occur.

This information, as well as the potential project impacts identified from the project ANDAL were compiled into an excel sheet to screen whether potential project impacts to biodiversity had been adequately considered. The project description was also used as the basis for this and where relevant, additional project impacts were considered.

The Assessment sheet provided at Annex A is the basis for considering project impacts and shows the following information;

a) The relevant environmental aspect or issue considered within the project ANDAL, in most instances a detailed scoping process would be completed to identify relevant project environmental aspects and factors, to ensure that all potential impacts as a result of the project are considered. This process occurs as part of AMDAL however differences between the Indonesian regulatory environmental approval process (through AMDAL) and an international lender Environmental and Social Impact Assessment (ESIA) have resulted in

a number of areas where the IFC has requested further consideration of potential impacts. ERM has used the ANDAL document baseline information and project description (including additional data provided by PAU), as well as ERM's understanding of the project area to further define those potential project impacts as requested by the IFC;

b) A high level summary of existing baseline information (based on AMDAL information and also follow-up studies where relevant);

c) The impact source, project phase and impact description described within the ANDAL;

d) The required RKL/RPL monitoring and mitigation measures were then listed (noting that very few were identified to manage biodiversity impacts);

e) Based on this information a risk assessment was completed using a Risk matrix Table 1, both the inherent and residual risks were considered; and

f) Where a major or moderate risk or lack of information to adequately complete an assessment was identified, recommendations for further follow-up or actions or management actions were made for incorporation into future construction or operational management plans.

2.1.1 RISK ASSESSMENT METHODOLOGY

A risk assessment procedure was used to screen the potential environmental risks that the project poses to the biodiversity values identified within the area, both from the project ANDAL and from other information sources identified by ERM.

The risk assessment tables are provided at Table 1.

Table 1 Risk Methodology Table

Consequence References

Consequence	Catastrophic 5	Major 4	Medium 3	Minor 2	Low 1
Protected Species	Eradication of a local population. Loss of critical habitats or activities	Disruption to a significant portion of the population. Impacts on critical habitats or activities. No threat to overall population viability	Minor disruption or impact on a significant portion of the population. Minor impacts on critical habitat or activities. No threat to overall population viability.	Minor disruption or impact on portion of the population. Minor and temporaty impact on critical habitat or activities. No threat to overall population viability.	Minor and temporary disruption to a small portion of the population. No impact on critcal habitat or activity.
Marine Habitats	Permanent eradication of primary producers on a regional scale	Localised but long term effect. Recovery > 10 years or permanent.	Localised and medium term effect. Recovery 5-10 years.	Localised and medium term effect on key primary producers	Localised and short term effect on ley primary producers.
Community	Permanent or irreversible social harm Irreparable damage to site or item of cultural significance Formal censure by state or national agency for poor social performance Severe, prolonged community dissent; greater than 3 years public exposure	Significant social harm with Client implications Repairable damage to site or item of cultural significance Breach of state or national law relating to communities and/or non compliance with formal community agreement Severe community dissent; greater than one year public exposure	Community dissatisfaction and/or social harm with business implications Unresolved low level community dissatisfaction Breach of local laws Repeated community complaints requiring site management or business response	Non-compliance with external community relations standards Isolated social/communities incident	Community complaint resolved via existing site procedures No impact on the community
Reputation	Damage to reputation of Queensland Government/Alliance partners Criticism from international NGO Public exposure in international media	Damage to Reputation of Western Corridor Criticism from national NGO which impacts credibility with neighbours/regional government Public exposure in national media	Damage to reputation of Alliance Significant public exposure in local media	Damage to reputation of several work areas within the operation One off public exposure in local media, word of mouth or local mythologies	Damage to reputation of work area within the operation

Likelihood References

Likelihood of the impact occurring		
Rating	**Description**	**Frequency**
Almost Certain 5	Recurring event during the lifetime of the operation/project	Typically occurs once per week or more than once per month
Likely 4	Event that may occur frequently during the lifetime of the operation/project	Typically occurs once per month
Possible 3	Event that may occur during the lifetime of the operation/project	Typically occurs once or twice per year
Unlikely 2	Event that is unlikely to occur during the lifetime of the operation/project	Typically occurs in 1 – 10 years
Rare 1	Event that is very unlikely to occur during the lifetime of the operation/project	Greater than 10 year event

Risk Assessment Matrix

Likelihood	Consequence				
	Catastrophic 5	Major 4	Medium 3	Minor 2	Low 1
Almost Certain 5	Critical 25	Critical 20	Critical 15	High 10	Moderate 5
Likely 4	Critical 20	Critical 16	High 12	High 8	Moderate 4
Possible 3	Critical 15	High 12	High 9	Moderate 6	Low 3
Unlikely 2	High 10	High 8	Moderate 6	Low 4	Low 2
Rare 1	High 5	Moderate 4	Low 3	Low 2	Very Low 1

Risk Management Response

Risk Class	Risk Management Response
Critical	Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention
High	Risks that exceed the risk acceptance threshold and require proactive management.
Moderate	Risks that lie on the risk acceptance threshold and require active monitoring.
Low	Risks that are below the risk acceptance threshold and do not require active management.
Very Low	Risks that are well below the risk acceptance threshold and do not require active management.

The purpose of this initial screening exercise was to screen the information within the existing approvals documents, and also taking into account proposed management and mitigation measures, assessing the level of risk to the terrestrial and marine biodiversity values under consideration. This information was used to determine whether, based on existing project information (and also taking into account experience on similar projects) there was a sufficient understanding of potential impacts to biodiversity values. This information was then used to determine if further assessment was warranted, and also identity further mitigation measures or follow-up actions, should these be warranted.

The risk assessment findings and also a summary of the rational to support the risk ranking are provided within the assessment tables (Annex A).

Environmental aspects with a risk ranking of moderate to major or above have had follow-up actions proposed.

2.1.2 FURTHER CONSIDERATION OF POTENTIAL IMPACTS

Where gaps were present and the existing project and baseline information was available, an assessment of potential impacts was undertaken. As there is limited baseline information for the site, it was not possible to undertake a detailed assessment based on this information. Rather, a subjective consideration of potential impacts was undertaken, with reference to IFC PS6 in order to provide an understanding of whether project impacts were likely to be significant and also if they were capable of being managed, either through the adoption of follow-up monitoring or management measures.

The further assessment of impacts was restricted to some marine components of the project and also terrestrial biodiversity. There is still some outstanding baseline information that is required to refine this impact information and further mitigation measures have been recommended.

2.1.3 RECOMMENDATIONS FOR FURTHER ACTIONS

Where necessary, recommendations for further actions have been summarized at Annex A. These are primarily recommendations to be incorporated into the development of further environmental management and monitoring plans and in most instances these actions are proposed to commence prior to construction, particularly in relation to marine biodiversity.

3 BASELINE BIODIVERSITY INFORMATION

With the exception of nearshore corals, the project AMDAL did not identify any significant marine or terrestrial biodiversity values within the project area. This appears to be somewhat due to the level of survey effort and subsequent reporting. Some important marine and terrestrial biodiversity values are known from the local area and while corals were discussed in the ANDAL the location of these areas were not provided. As noted by the IFC, it is difficult to understand biodiversity impacts in accordance with the requirements of IFC PS 6, based on the information provided. Information for terrestrial and marine biodiversity, based on both baseline information and other data sources is summarized as follows.

3.1 TERRESTRIAL BIODIVERSITY

3.1.1 FLORA AND VEGETATION

The land for the development of ammonia industry and supporting facilities constitutes a community plantation area. The area has not been actively cultivated since 2004, following acquisition of the land by PAU.

The area of land to be used for the development of ammonia industry and supporting facilities at this stage is approximately 50 ha.

Mixed garden plants cultivated by the community included Coconut (*Cocos nucifera*), cocoa (chocolate, *Theobroma cacao*), hazelnut (*Aleurites moluccana*), cashew (*Anacardium occidentale*), clove (*Syzygium aromaticum*) and coffee *(Coffea arabica*). Besides these garden plantations that are commercial crops, other fruit trees are cultivated.

The natural types of plants that form the shrubs include palm grove (*Arenga pinnata*), wooden goat (*Garuga Floribunda*), renghas (*Gluta renghas*), bintinu (*Melochia umbellate*), katapang (*Terminalia catappa*), bamboo rope (*Gigantochloa apus*), mara (*Macaranga tanarius*), sea hibiscus (*Hibiscus tiliaceus*), chrysolite (*Michelia champaca*), lame (*Alstonia scholaris*) and kapok (*Ceiba pentandra*). The other natural shrubs are kirinyuh (*Eupatorium inulifolium*), saliara (*Lantana camara*), jarong (*Stachytarpeta jamaicensis*), honje hutan (*Phoemeria speciosa*), gamal (*Gliricidia sepium*) and shelled (*Ixora javanica*) whereas herbaceous plant species are sadagori (*Sida rhombifolia),* babadotan (*Ageratum mexicanum*), pulutan (*Urena lobata*), jarong lelaki (*Hyptis brevipes*) and rumput hutan Gahnia (*Gahnia javanica*).

Outside the boundaries of the project site is primary forest that still is dominated by native forest trees. These forest areas are dominated by Sulawesi endemic trees such as damar babi (*Dacryodes rostrata*), palapi (*Herietia javanica*), damar (*Agathis dammara*), jelutung (*Dyera costalata*), nyamplung hutan (*Callophyllum celebicum*), gopasa (*Vitex cofassus*), kolaka

(*Parinaria corymbosa*), omboyuan (*Metrosideros petiolata*), koti-koti (*Lindera* sp.), dihi (*Planchonella obovata*), longori (*Santiria laevigata*) and gaharu (*Aqularia cumingiana*).

This vegetation description is consistent with that provided for both the DSLNG ANDAL and also the ANDAL for the proposed re-routing of a condensate pipeline through the Bakiriang Conservation Area. Community use of the coastal vegetation is a common activity and it would appear that a mosaic of native forest and cultivated areas is common within the local area.

Based on information reviewed no flora species listed under the Indonesian Regulations or listed as Endangered or Critically Endangered under the IUCN Red List were identified within the site nor have been recorded by other studies that were reviewed (namely the condensate pipeline and DSLNG project ANDALs). In addition to this, no vegetation communities of significance have been identified.

3.1.2 FAUNA

Fauna surveys have been conducted within the project site and also as part of studies to support other approvals within the area. Habitats within the project site include fields and cultivated areas, coastal vegetation and forest vegetation. Only relatively brief surveys were completed within the site and no species listed under Indonesian Regulations or listed as Endangered or Critically Endangered by the IUCN were identified. The following fauna species were recorded.

3.1.2.1 Mammals

Only six species of mammals were recorded in the project site and surrounding areas. These were the black macaque (*Macaca tonkeana*), forest cat (*Macrogalidia musshenbroekii*), squirrel (Sciurus vulgaris), squirrel (*Callosciurus notatus*), Flying Fox (*Pteropus edulis*) and rat (*Rattus, rattus*).

These species occupy shrub vegetation habitats, coastal vegetation and forest vegetation outside the project site.

3.1.2.2 Birds

Nineteen bird species were recorded within the site, these included kacamata bird (*Zosterops consobrinorum*), honey birds (*Nectarina aspasia*), turtledoves (*Streptopelia chinensis*), cekakak sungai (*Halcyon fumebris*), kepinis (*Apua affinis*), crows (*Corvus enca*), gereja (*Passer montanus*), sea hawk (*Halistur Indus*) and Sulawesi hawk (*Spilornis rutipectus*).

3.1.2.3 Reptiles

There are only 9 species of reptiles group recorded in the study area namely, biawak / monitor lizards (*Varanus salvator*), kadal / lizards (*Mabouia multifasciata*), water snakes/ular air (*Natrix piscator*), ular sanca/python (*Phyton molurus*), ular hijau/ green snakes (*Trimesurus albolabris*), ular belang/ striped snake (*Bungarus fascitus*), ular sendok/cobra (*Naya sputatrix*), cecak (*Hemidactylus frenatus*) and bunglon/ chameleon (*Calotes jubatus*). These species are not listed under the Indonesian Regulations nor as Endangered or critically Endangered by the IUCN.

3.1.3 REVIEW OF OTHER ANDAL REPORTS

To provide a further understanding of potential biodiversity values present within the project site, other ANDAL studies were reviewed to gain an understanding of whether other significant terrestrial fauna values have been identified within the area, and in turn, may be relevant to the Project site. The following documents were reviewed;

- PPGM Project ANDAL (incorporating the upstream and downstream DSLNG project);
- Condensate re-routing Project UKL/UPL;
- Senoro Upstream ANDAL; and
- In addition to these, databases were searched to identify the potential presence of conservation significant fauna species.

For these approval documents, fauna surveys were conducted covering Birds, Mammals, Reptiles and Amphibians. Similar the Project site, the habitats also consisted of cultivated and mixed farming and some forested areas. Species identified were relatively common and no species listed as Endangered or Critically Endangered by the IUCN were recorded. However, based on database searches and ERM's experience within the region, the Maleo (*Macrocephalon maleo)* is known to occur within the area. The species is listed as Endangered by the IUCN.

Of particular note, the Bakiriang Animal Conservation Area is located approximately 50 km to the south west of the project site and is also a dedicated Maleo Conservation Area. There are also anecdotal reports of the Maleo occurring in close proximity to the DSLNG project site. While not recorded within the PAU Project site, it is considered possible that the species may occur, given local records of the species.

The Maleo is endemic to Sulawesi and Buton Islands, Indonesia (Dekker et al. 2000, BirdLife International 2001). It inhabits lowland and hill rainforest, up to at least 1,065 m, and man-modified habitats when travelling to coastal nesting grounds. It nests communally, at traditional sites, typically sandy beaches, lakeshores and riverbanks. Females lay 8-12 eggs in pits, heated by

solar and/or geothermal radiation, over a 2-3 month period, peaking markedly at some localities during the regionally variable dry season.

Of the 142 known nesting grounds, 48 have been abandoned, 51 are severely threatened, 32 are threatened, 7 are of unknown status, and only 4 are not yet threatened (Baker 2002). The global population has been estimated to be in the region of 4,000-7,000 breeding pairs, and declining rapidly, in places by up to 90% since 1950 (Butchart and Baker 2000).

3.2 MARINE BIODIVERSITY

The summary of baseline marine biodiversity information is based on the information contained within the project ANDAL and also previous studies conducted within the area. A search of available databases was also conducted.

3.2.1 FISH

Seven Fish species were recorded within the Musolang River, located near the western boundary of the project site. The river is relatively small and shallow and those species identified are expected to be relatively common within the local area.

Marine surveys recorded approximately 25 fish species. These species were predominately recorded around coral habitats identified within the survey area. The project ANDAL does not identify these species as being listed under Indonesian Regulations, while a review of the IUCN Red list confirms that none are listed as Endangered or Critically Endangered.

The presence of coral communities are discussed in further detail below and it is likely that the presence of these habitats plays an important role in supporting some local fish populations.

3.2.2 CORAL AND MARINE HABITATS

The Project ANDAL identifies coral communities as occurring in front of the PAU Project site. Four transects were surveyed and while the transect locations are not provided within the project ANDAL, Table 2 and Table 3 below provide the coral and benthic fauna results from each transect. The Project ANDAL reports that coral cover appears better at observation points towards the west (Batui) than towards the east side (Luwuk). While the average coral cover is reported as being 52.64%. The percentage coral cover at each transect provided within the ANDAL is shown at Table 2. The ANDAL also reports that the coral communities may provide an important function within the local marine ecosystem. The PPGM (2008) ANDAL also reports the presence of coral communities however, these are identified as having an

environmental quality ranking of 'Bad'. This is based on the coral cover and type of reef however no further rational is provided

The presence of algal and benthic communities was also noted within the PAU Project ANDAL. The results from each transect are provided at Table 2 and Table 3.

No map showing the transect locations is available at this point. Figure 3 provides an aerial image of the nearshore environment in the vicinity of the Project site. Nearshore structures are visible and these are likely to represent the communities reported within the Project ANDAL.

Table 2 The percentage of Coral Cover and other benthic fauna at transect location

Benthic Fauna	Coverage percentage (%)			
	1	2	3	4
Acropora	5.47	0.63	9.17	0.17
Non-acropora	69.93	27.10	53.00	45.07
Dead Scleractinia	6.07	18.67	14.03	22.70
Algae	10.90	18.93	19.03	13.17
Other fauna	7.30	6.30	3.27	9.59
Abiotic	0.33	28.37	1.50	9.33

Source: Panca Amara Utama 2006

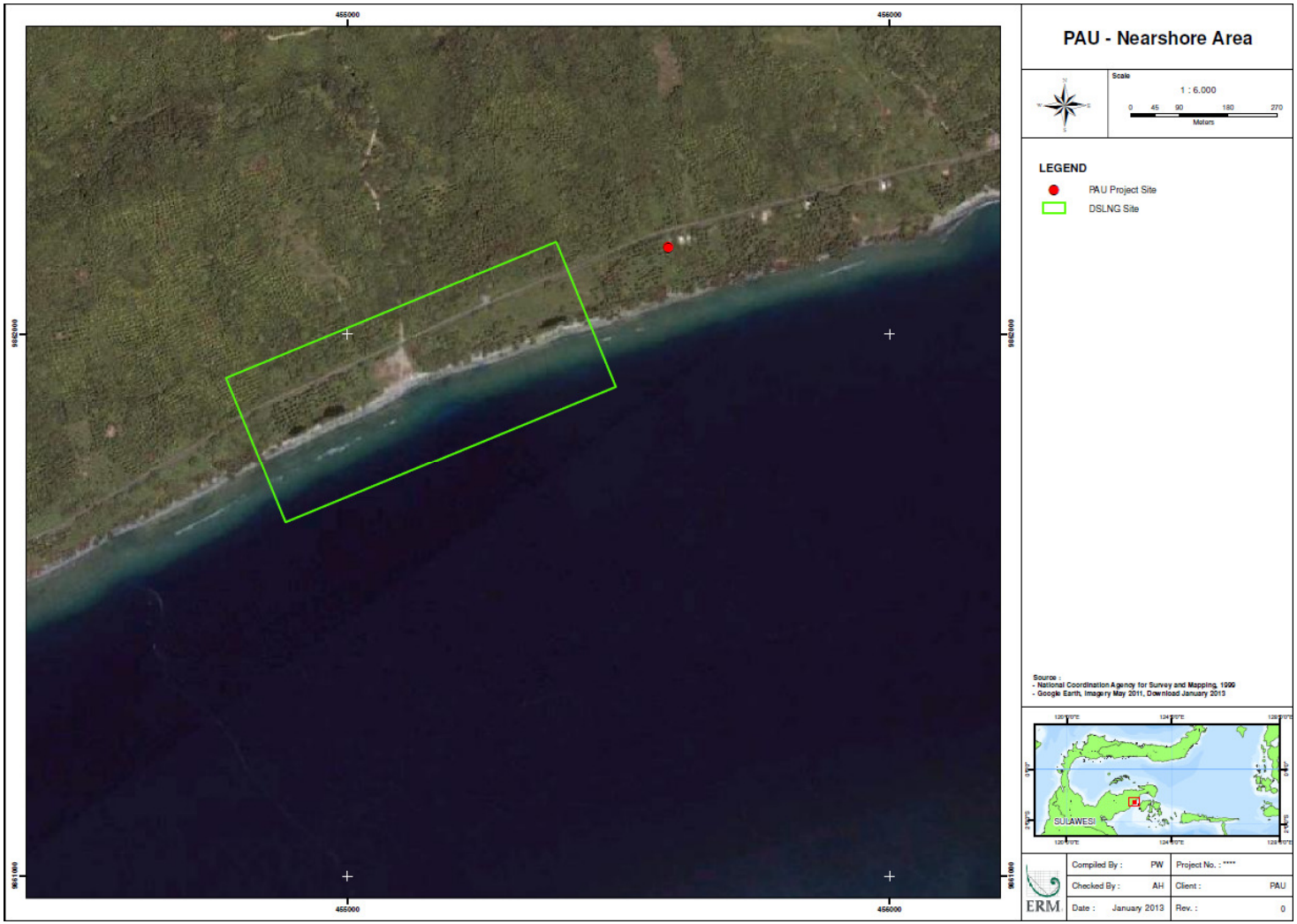
Table 3 Marine Survey Transect Results

Location identity	Benthos	Total	Environmental Record
1	Coral Mushroom	422	The coast consists of gravels, vegetation, nyamplung and coconut. Coral growup to -20 m and dominated by Acropora sp. And interspersed hydroids. Reef flat short ±20m and its dominated by macro algae (Turbinaria sp.) and massive corals (Poritidae and Faviidae). Transects at -5m
	Linkia sp	6	
	Tridacna spp	4	
	Achanthaster planci	7	
	Culcita novaeguinea	1	
2	Coral Mushroom	47	Coast consists of gravel, vegetation, nyamplung and coconut. Corals up to -10m, continued sand levels and ramps ½ sleep. Reef flat ±20m dominated by macro algae (Turbinaria sp.) step slope. Dominance hydroid, coral slope angle of 60°. Directions Reef flat is dominated by Poriles cyindrica and Poriles lutes. Transects at -5 m
	Linkia sp	32	
	Tricdacna spp	5	
	Achanthaster planci	4	
	Culcita novaeguinea	2	
3	Coral Mushroom	51	Coast river having stones and while sand, palm vegetation. Reef ±50 m, the dominance of macro algae (Turbinarfa sp.) followed by coral slope angle 40° slightly starting, coral growth up to 7 m, slope to the bottom is slightly slanting consisting coral rubble and patches and dominated by hydroids, Poriles cylindrical, and Poriles lutea. Transects at -5 m
	Linkia sp	39	
	Tricdacna spp	7	
	Hipoppus sp	1	
	Achanthaster planci	3	

Location identity	Benthos	Total	Environmental Record
	Diaderna sp	2	
4	Coral Mushroom	383	Coast having gravels, vegetation ketapang, coconuts, crystal clear water. Reef flat ±25 m, dominance of massive corals (*Poritidae* and *Faviidae*) interspersed. Acropora cytherea and Acropora robusta and macro algae (*Sargassum* sp.). Growth at coral slope up to -15 m further to the sand levels. Transects at -5 m

Source: Panca Amara Utama 2006

Figure 3 Nearshore Aerial Map



3.2.3 NEARSHORE WATER QUALITY

Nearshore water quality sampling was conducted for the ANDAL. These results showed that a number of water quality parameters were above the Indonesian Water Quality standard. This has been identified by the IFC as a likely sampling error and further sampling has been recommended to inform the development of future monitoring plans.

3.2.4 HYDRODYNAMIC CONDITIONS

The highest tidal range at Strait Peling coastal waters is known as 1.71 m with the highest spring tide reaching 0.68 m and low tide of -1.03 m from the mean sea level average, whereas the lowest tidal range is 1.66 m with the highest tide reaching 0.65 m and lowest tide reaching -1 m.

The simulation results of flow pattern hydrodynamic model in the coastal waters of Strait Peling shows that on high tide a mass movement of water towards the coast with speeds ranging between 0.0003 m/s to 0.0009 m/s occurs.

The flow velocity during ebb tide at Strait Peling are highly variable with a range between 0.01 m/s to 0.11 m/s.

The stream pattern resulting from the simulation results of hydrodynamics model during lowest tide (low water) indicates orientation movement dominated by the mass movement of water toward the southeast at very low speeds ranging from 0.0002 m/s to 0.001 m/s.

3.2.5 REVIEW OF OTHER SOURCES

The DSLNG ANDAL and also other publically available information was reviewed to understand if there are additional marine biodiversity values known from nearby the project site.

The primary source of additional information is the PPGM ANDAL (2008) which includes the DSLNG site. It does not appear that detailed marine studies were undertaken for this ANDAL. While not providing significant detail this ANDAL identified the environmental quality of the marine habitat for fish as being good (scale 3). The PPGM ANDAL does not provide a rationale behind these rating.

It is known that coral communities occur along the coast line in front of, and to the east and west of the project site. It is worth noting that Indonesia is a signatory to the Coral Triangle Initiative, which seeks to support people-centered biodiversity conservation, sustainable development, poverty reduction and equitable benefit sharing. The formation of this initiative recognizes the marine biodiversity values and more specifically coral values contained within South East Asia. A review of available databases identified

the potential presence of several species of coral which are listed as Endangered or Critically Endangered by the IUCN Red list. None of the species are listed at Table 2, however the Project ANDAL does not provide a complete species list.

Several species of marine mammals may also potentially occur in offshore waters. Species listed as Endangered by the IUCN are listed below. Based on present information it is unlikely that these species would utilize nearshore areas such that they may be impacted by the project.

- *Bubalus depressicornis* Lowland Anoa (Endangered)
- *Balaenoptera physalus* Fin Whale (Endangered)
- *Balaenoptera musculus* Blue Whale (Endangered)
- *Balaenoptera borealis* Sei Whale (Endangered)

There are anecdotal reports of marine turtles occurring within the area and nesting on beaches within the region. The database search identified the Green Turtle (*Chelonia mydas*) as potentially occurring within the area. This species is listed as Endangered by the IUCN. Like most sea turtles, green turtles are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes. It is understood that these turtles recruit to neritic developmental areas rich in seagrass and/or marine algae where they forage and grow until maturity (Musick and Limpus 1997). While the species may periodically utilize nearshore waters, the nearest known nesting beaches are understood to occur approximately 10 km to the south of the Ammonia Project site.

Finally, databases also identified the Narrowsnout Sawfish (*Pristis zijsron*) and Knifetooth Sawfish (*Anoxypristis cuspidate*) as potentially occurring within the region. These species are listed by the IUCN. It is difficult to make an assessment of the potential presence of these species at this stage.

4 AMDAL IMPACT ASSESSMENT FINDINGS

A review of the ANDAL is provided at Annex A. Within this table the environmental aspects and factors relevant to impacts on marine and terrestrial biodiversity from the ANDAL are summarized. This table forms the basis of understanding the impacts assessed as part of the ANDAL and also for identifying gaps in this assessment and subsequently allow for further consideration of potential risks.

The ANDAL impact assessment and subsequent RKL/RPL contains significant gaps in both the consideration of impacts to terrestrial and marine biodiversity values and also follow-up management and monitoring requirements. ERM has not conducted a detailed scoping exercise and based on the current understanding of the project description and environmental

information within the ANDAL and known from the area, key identified gaps include the following;

- No management or follow up monitoring has been prescribed to manage site clearing activities;
- Impacts associated with marine discharges have not considered impacts to coral communities and the marine environment more broadly;
- No consideration of impacts to marine fauna including marine turtles;
- No consideration of impacts to conservation significant fauna species such as the Maleo; and
- No requirements outlined for construction or operational environmental management.

As a result of this review and also based on the review conducted by the IFC, the following section will consider potential risks to the following environmental factors;

- IUCN listed species and particularly the Maleo bird and Green turtle;
- Coral communities;
- Marine environment as a result of construction activities, marine discharges, spills and runoff.

5 IMPACT ASSESSMENT REVIEW

Following consideration of existing baseline data and also the existing EIA documentation and the project description, this section of the report presents a review of potential project risks to the terrestrial and marine environmental factors listed below. At this point, the baseline information is not available to conduct a further impact assessment, however based on the existing information available, it is possible to adequately understand potential project risks in relation to the requirements of IFC PS6 and also propose potential management measures to further monitor and understand these risks.

The following environmental factors will be considered;

Terrestrial

- Impacts to the Maleo as a result of vegetation clearing;
- Impacts to terrestrial vegetation communities as a result of vegetation clearing.

Coastal/Marine

- Impacts to coral as a result of marine construction activities and marine discharges;
- Impacts to marine turtles and other marine mammals as a result of construction and operations;
- Impacts to marine water quality as a result of construction activities, marine discharges, spills and runoff.

5.1 TERRESTRIAL RISK REVIEW

The ANDAL and risk review considered potential impacts to terrestrial fauna as a result of clearing activities. The Risk review found that this posed a **Major** inherent risk. It is understood the PAU will discuss possible options to mitigate this risk with the IFC. Potential Impacts to the Maleo are described in further detail below.

Maleo

The Maleo is listed as Endangered by the IUCN. Consistent with the requirements of IFC PS6, it is necessary for the project to understand the potential risk to these species and more specifically the potential presence of Critical Habitat within the project site.

Critical Habitat is a concept within IFC PS6 to facilitate the identification of areas of high biodiversity value. The intention of delineating Critical Habitat is to define areas in which development would be of a particularly sensitive nature and require special attention were it to go ahead. Critical Habitat is not limited to pristine or highly biodiverse areas but rather includes the broader landscape that supports the biodiversity values that trigger the Critical Habitat designation, which typically include a mosaic of modified, natural, and critical habitats. The provisions by which Critical Habitat is defined are laid out in Paragraph 9 of PS6 and related Guidance Note (GN) 6.

The potential presence of the Maleo is likely to be the primary issue of concern in relation to the requirements of IFC PS6. While the species has not been recorded within the project site, there are anecdotal reports of the species occurring in close proximity to the project site, while the species is known to occur within the Bakiriang Animal Conservation Area, approximately 50 km to the south west of the project site.

Based on the existing project information the risk review determined that the potential presence of this species represented a **Major** inherent risk (Annex A). There is limited information upon which to make a detailed assessment of likely presence within the site. There are anecdotal reports from the local community that the species has not been recorded within the site, and site activities conducted to date have not identified the Maleo. The species appears to occur relatively widely, where suitable habitat occurs and the presence of nesting habitat is likely to be an important consideration. The presence of nesting activity is likely to be a key determining factor in whether the site represents critical habitat.

As identified at Annex A, with the adoption of the following follow-up actions the potential the potential presence of this species is considered to represent a **Medium** risk to the project.

- Site survey to identify if Maleo nesting activity or habitat usage is occurring or has occurred within the project site. Should the species be identified within the site (and more specifically the construction footprint), then a detailed assessment of potential impacts is recommended; and
- Development of a flora and fauna management plan to be implemented during site clearing, this is to detail specific actions should the species be encountered during clearing activities;

Vegetation Removal

Approximately fifty hectares of vegetation consisting primarily of crops and plantation areas would be disturbed as a result of the project. The vegetation within the site is likely to be classified as modified habitat based on the definition provided within IFC PS6. Modified habitat represents areas that have been subject to cultivation and ongoing human use, such is the case within the project site. It is however recognised that these areas may still in some instances represent critical habitat, depending on the species present.

Based on the information provided, it is unlikely that the vegetation being removed is of particular importance. This is based on the assumption that the species does not occur within the site. Furthermore similar areas of modified habitat occur locally and vegetation would be retained within the site, outside of the disturbance footprint.

Pending the results of the further site survey to confirm whether the Maleo potentially occurs, vegetation removal is considered to represent a low risk to biodiversity.

5.2 MARINE RISK REVIEW

Following the review of existing baseline information and also the ANDAL document, the following environmental factors will be considered further. This is important as the ANDAL assessment on considered increases in sea water temperature and marine discharges. The ANDAL did not provide an assessment of potential impacts to marine environmental factors such: Impacts to coral as a result of marine construction activities and physical presence of nearshore Infrastructure;

- Impacts to coral and marine habitat as a result of marine discharges;
- Impacts to marine fauna as a result of construction and operations;
- Impacts to marine water quality as a result of construction activities, marine discharges, spills and runoff.

As with the terrestrial review, the purpose of this exercise is to understand likely risks to the project in light of the requirements of IFC PS6. Again the absence of site specific data makes it difficult for a detailed impact assessment to be undertaken, however an understanding of potential risks and development of follow-up actions to further understand and manage those risks is possible.

5.2.1 IMPACTS TO CORAL

It is understood from the ANDAL document and also anecdotal information from nearby areas that, while coral is present along the shoreline, these coral communities have been subject to past disturbance and are not known to be of significant importance. This is a preliminary assessment and it will be recommended that further baseline studies are conducted to gather a baseline understanding of coral conditions prior to the commencement of ongoing monitoring activities.

At this stage the three key project activities which have the potential to affect corals are;

- Physical disturbance as a result of marine construction activities, through either direct removal, alteration of the hydrodynamic environment or increased turbidity from remobilized suspended sediments;
- Impacts as a result of physical presence of nearshore infrastructure
- Habitat degradation as a result of marine discharges.

These are discussed below.

Impacts to Coral as a Result of Marine Construction and Physical Presence of nearshore Facilities

A permanent construction jetty and cargo jetty to export Ammonia will be constructed for the project. The cargo jetty will extend approximately 80 m from the coast to a depth of 15 m. It is understood that it will be constructed on piles, hammered into the sea bed.

The construction jetty will cover a nearshore area of approximately 50x25 m and would extend to a depth of 5 m. Similar to the cargo jetty it would be a pile construction with some leveling and compaction of the nearshore area.

Impacts may potentially occur as a result of the physical removal of coral communities during construction. Impacts may also occur due to the physical presence of marine infrastructure affecting hydrodynamic flows and sediment loads to nearby coral communities.

For both of these marine impacts the proximity and extent of potential disturbance to corals, if at all is uncertain. The ANDAL report notes the presence of corals within the vicinity of the project area however the

location/s are not specified. While it is possible that a pile construction method may assist in avoiding direct physical impacts to coral, the extent of, location and quality of corals are unknown.

Based on current information, disturbance of corals as a result of the project are considered to represent a **Major** risk due to the uncertainties discussed. Given the lack of further baseline information, ERM has taken a conservative view at this point. However with the implementation of follow-up actions and proposed mitigation measures, as listed below, potential risks are considered to be **Moderate**. This finding may be further downgraded if physical disturbance to corals is not expected to occur as a result of the project.

- Completion of a marine baseline survey to determine the presence, and quality of coral communities, offshore of the Project site (and particularly in relation to the jetty location);
- Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project; and
- Nearshore facility design to take into consideration the location of coral communities.

Impacts to Coral and Marine Habitat as a Result of Marine Discharges

Liquid wastes will be generated as a result of the project and are to be discharged to sea via an outfall, following treatment at a Waste water Treatment Plant (WWTP). The following waste streams are to be routed to the WWTP prior to discharge;

- Production waste water;
- Desalination brine;
- Grey water and domestic wastewater; and
- Oily wastes.

Other non-contaminated runoff from the site is expected to be routed to onsite storage ponds.

Cooling water will also be discharged and it is understood that while the quality will not be affected, it may be up to ten degrees warmer than the surrounding seawater.

In relation to both the discharge of cooling water and wastewater the ANDAL concluded that these impacts would not be significant and no further management or monitoring requirements have been specified within the RKL/RPL. For wastewater discharges this finding was based on the requirement for discharges to meet Indonesian Regulation.

Impacts to corals as a result of marine discharges are considered to represent a **Major** risk. This ranking is primarily attributed to the lack of information regarding the presence of coral communities and lack of definition with regards to the waste water discharge location(s) and also absence of any ongoing monitoring and management activities. Based on past experience impacts to corals or marine habitats may include a decline in habitat quality or death as a result of reduced water quality. With the adoption of the following management recommendations the potential risks to corals are considered to be **Moderate**.

- Completion of a marine baseline survey to determine the presence, and quality of coral communities, offshore of the Project site (and particularly in relation to the jetty location);
- Collection of additional baseline water quality data;
- Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project to confirm that discharges will remain within recognized limits;
- Nearshore facility design to take into consideration the location of coral communities;
- Preparation of construction and operational waste water management plans; and
- Preparation of construction and operational spill response procedures.

5.2.2 IMPACTS TO MARINE FAUNA AS A RESULT OF CONSTRUCTION AND OPERATIONS

Potential impacts to marine fauna were identified as a **Moderate** risk. At present it is understood that the nearest turtle nesting beaches occur approximately 10 km to the south of the project site. While habitat for marine reptiles as well as other marine fauna species has the potential to be disturbed during construction and operations this is not considered to represent a significant risk to biodiversity. This finding is based on the current understanding that Endangered of Critically Endangered marine fauna are not currently utilizing the Project area. It is noted that local communities are likely to rely on some marine resources such as fish. As such impacts to marine resources may also negatively affect these communities. Impacts of the project on local communities, including fishing activities are considered within the Social Impact Assessment EIA Addendum.

With the adoption of the following management recommendations, risks to marine biodiversity are considered to be low.

- Marine construction environmental management plan to be developed and incorporate controls for marine fauna; and
- Adoption of marine recommendations described at Section 5.2.1.

5.2.3 IMPACTS TO MARINE WATER QUALITY AS A RESULT OF DISCHARGES AND CONSTRUCTION ACTIVITIES

Liquid waste streams during operations have been described at Section 5.2.1. Other sources of potential impacts to water quality may include increased runoff and sediment loads during construction activities or the potential for spill sand leaks during construction and operations.

As described previously there are a number of environmental aspects such as coral and marine fauna that are potentially impacted by a decline in seawater quality.

Impacts to water quality as a result of marine discharges is considered to represent a **Major** risk. This ranking is primarily attributed to the lack of information regarding the actual potential impact of marine discharges on marine environmental values and also absence of ongoing monitoring and management activities. With the adoption of the following management recommendations the potential risks are considered to be **Moderate.**

- Collection of additional baseline water quality data;
- Preparation of construction and operational waste water management plans;
- Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project to confirm that discharges will remain within recognized limits;
- Nearshore facility design to take into consideration the location of coral communities; and
- Preparation of construction and operational spill response procedures.

6 SUMMARY OF RECOMMENDED ACTIONS

The following recommended actions have been described in the preceeding subsections and are proposed to confirm the findings of this EIA addendum and also to ensure that potential biodiversity impacts are adequately managed throughout construction and operations. The project's environmental management framework is described in further detail within an Environmental Management and Monitoring Plan EIA addendum.

6.1 TERRESTRIAL

- Site survey to identify if Maleo nesting activity or habitat usage is occurring or has occurred within the project site. Should the species be identified within the site (and more specifically the construction footprint), then a detailed assessment of potential impacts is recommended;

- Development of a flora and fauna management plan to be implemented during site clearing, this is to detail specific actions should the species be encountered during clearing activities;
- Preparation of a Construction Environmental Management Plan (CEMP) to site runoff, erosion, waste storage and disposal and other construction activities; and
- Other management actions to be agreed with the IFC.

6.2 MARINE

- Completion of a marine baseline survey to determine the presence, and quality of coral communities, offshore of the Project site (and particularly in relation to the jetty location);
- Collection of additional baseline water quality data;
- Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project to confirm that discharges will remain within recognized limits;
- Nearshore facility design to take into consideration the potential for coral communities to be present in the construction location;
- Preparation of construction and operational waste water management plans;
- Marine management plan to describe marine discharges including discharge parameters, such as for cooling water and limits on temperature elevation within an established distance from the point of discharge;
- Marine construction environmental management plan to be developed and incorporate controls for marine fauna. This should also incorporate quarantine procedures; and
- Preparation of construction and operational spill response procedures.

Annex A

Biodiversity Risk Review

ESH Aspect/Issue	Summary of relevant Baseline data from Project ANDAL	Impact Source	Project Phase				Impact Description within ANDAL Report	Management from the RKL/RPL	Potential Risks and Considerations from ERM Review	Inherent Risk Ranking			Proposed Mitigation and Follow-up actions	Residual Risk Ranking		
			Pre-construction	Construction	Operation	Post operations				Likelihood	Impact	Risk Ranking		Likelihood	Impact	Risk Rating
Loss of Flora	No conservation significant flora species were identified within the Project site. Vegetation communities consist of cultivated areas with some native vegetation,	Land Clearing	X				Disappearance of vegetation due to land clearing may be categorized Insignificant Negative Impact, because those vegetation which would be disturbed are not rare plant species and therefore are not categorized as protected plants by the law. The land used for the ammonia industry does not represent conservation land.	No management or monitoring specified in RKL/RPL.	No significant flora species or vegetation communities were identified within the project site, nor were they identified within the ANDAL documents reviewed or data base searches.	Unlikely	Minor	Low	Clearing procedures and management to be detailed within a CEMP.	Unlikely	Minor	Low
Disturbance to Fauna	No conservation significant fauna species were identified during studies conducted within the project site	Land Clearing	X				Land clearing activities will disturb some faunal species however they are expected to disperse to nearby vegetated areas. The faunal species recorded are not identified as animals protected by the law and are abundant in nature, therefore the impact of land clearing towards animals is considered as Insignificant Negative Impact.	No management or monitoring specified in RKL/RPL.	Anecdotal evidence suggests that the Maleo may occur within or nearby to the project site. A further consideration of potential presence is warranted given known occurrences within the area.	Possible	medium	Major (9)	• Site survey to identify if Maleo nesting activity or habitat usage is occurring or has occurred within the project site. Should the species be identified within the site (and more specifically the construction footprint), then a detailed assessment of potential impacts is recommended; • Development of a flora and fauna management plan to be implemented during site clearing, this is to detail specific actions should the species be encountered during clearing activities; • Other specific actions to be agreed with the IFC	Unlikely	Medium	Moderate (6)
Sea water Temperature	Water Temperature measures were 26.1. The ANDAL does not describe seasonal fluctuations on water temperature.	Cooling water discharge			X		The project AMDAL considered the impact of cooling water discharged at ten degrees. This is acceptable under Indonesian Regulations, however it is understood that project design has progressed since completion of the ANDAL. The use of heat recovery methods (also energy efficiency improvements) or other cooling methods to reduce the temperature of heated water prior to discharge to ensure the discharge water temperature does not result in an increase greater	No management or monitoring specified in RKL/RPL.	Baseline data and also information from the local area indicates that marine habitats such as corals occur. It is uncertain at this point what impact potential water temperature increases would have on marine values. The IFC EHS guidelines specify that cooling water must not be more than 3 degrees above ambient seawater at the boundary of an	Possible	medium	Major (9)	• Collection of additional baseline water quality data • Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project; and • Nearshore facility design to take into consideration the location of coral communities; • Marine management plan to describe marine discharges	Unlikely	Medium	Moderate (6)

ESH Aspect/Issue	Summary of relevant Baseline data from Project ANDAL	Impact Source	Project Phase				Impact Description within ANDAL Report	Management from the RKL/RPL	Potential Risks and Considerations from ERM Review	Inherent Risk Ranking			Proposed Mitigation and Follow-up actions	Residual Risk Ranking		
			Pre-construction	Construction	Operation	Post operations				Likelihood	Impact	Risk Ranking		Likelihood	Impact	Risk Rating
							than 3°C of ambient temperature at the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity among other considerations;, as per the IFC EHS Guidelines; Environmental Wastewater And Ambient Water Quality.		established mixing zone. The project has committed to meeting this requirement however at this stage it is uncertain where the mixing zone is located in relation to surrounding marine values.				including discharge parameters. • Preparation of construction and operational waste water management plans; • Other follow-up actions to be agreed with the IFC			
Sea Water Quality	Seawater quality sampling has indicated that ambient water quality conditions are significantly above many of the threshold values. This includes salinity, lead and copper. The ANDAL does not provide a possible reason for these values.	Ammonia Production		X	X		Ammonia Plant activities will produce liquid waste to be treated before finally sent into the sea through pipe and or concrete channel. As the result, sea water may be affected as per specific water quality such as DO (Dissolved Oxygen), BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) are parameters which are normally used for water quality standard. Liquid waste from the ammonia plant during normal operation consists of several sources such as ammonia plant itself, chemicals, ion exchanger unit, warehouse, and storm water to guard retention pond. Domestic and process waste water discharges will comply with Environment State Minister Regulation No. Kep-51/MENLH/10/1995)..	No management or monitoring specified in RKL/RPL. It is assumed that the project is required to meet Indonesian discharge requirements.	The impact of wastewater discharges including process wastes and brine discharges has not been adequately evaluated. Based on impacts may occur as a result of the following; -Impact from soil erosion during pre-construction and construction -Impact from jetty construction -Impact from high temperature sea cooling water -Impact from wastewater discharge -Impact from rainwater runoff -Impact from potential ammonia spills It is understood that all waste water will be treated within a WWTP prior to disposal to the nearshore environment.	Possible	Medium	Major (9)	• Collection of additional baseline water quality data • Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project; and • Nearshore facility design to take into consideration the location of coral communities; • Marine management plan to describe marine discharges including discharge parameters. • Preparation of construction and operational waste water management plans; • Other follow-up actions to be agreed with the IFC	Unlikely	Medium	Moderate (6)

ESH Aspect/Issue	Summary of relevant Baseline data from Project ANDAL	Impact Source	Project Phase				Impact Description within ANDAL Report	Management from the RKL/RPL	Potential Risks and Considerations from ERM Review	Inherent Risk Ranking			Proposed Mitigation and Follow-up actions	Residual Risk Ranking		
			Pre-construction	Construction	Operation	Post operations				Likelihood	Impact	Risk Ranking		Likelihood	Impact	Risk Rating
Impacts to Coral Communities	Overall, the coral cover appears better at observation points towards the west (Batui) than towards the east side (Luwuk). Average coral cover in the free sea base is 52.64%. This shows quite important function of the coral colony in the sustainable ecosystem. Coral communities are also known to occur to the south of the project site.	**Not assessed within ANDAL**		x	x		Not considered	Not considered	Risks include direct loss of coral during construction, physical presence of marine facilities affecting near shore conditions, and a decline in water quality as a result of project activities listed for sea water quality.	Possible	Medium	Major (9)	• Completion of a marine baseline survey to determine the presence, and quality of coral communities, offshore of the Project site (and particularly in relation to the jetty location); • Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project; and • Nearshore facility design to take into consideration the location of coral communities; • Other follow-up actions to be agreed with the IFC	Unlikely	Medium	Moderate (6)
Impacts to marine Fauna, particularly Marine reptiles	Coral fish species were recorded within the nearshore areas. Marine mammals and reptiles are not discussed within the AMDAL. A database search reveals that conservation significant marine fauna species are known from the area. The nearest known turtle nesting beach is understood to be ten kilometres to the south of the project site.	**Not assessed within ANDAL**		x	x		Not considered	Not considered	It is understood that the nearest nesting beach for marine reptiles occurs approximately ten kilometres to the south. Risks include light spill, direct habitat loss or disturbance physical disturbance during construction or operations. The extent of marine construction activities and vessel activities are unlikely to pose a significant risk to other marine fauna species.	Unlikely	Medium	Moderate (6)	• Marine construction environmental management plan to be developed and incorporate controls for marine fauna.	Unlikely	Minor	Low (4)

EIA Addendum 2 - Pollution Controls

Prepared for:

PT Panca Amara Utama

April 2013

Delivering sustainable solutions in a more competitive world

ERM

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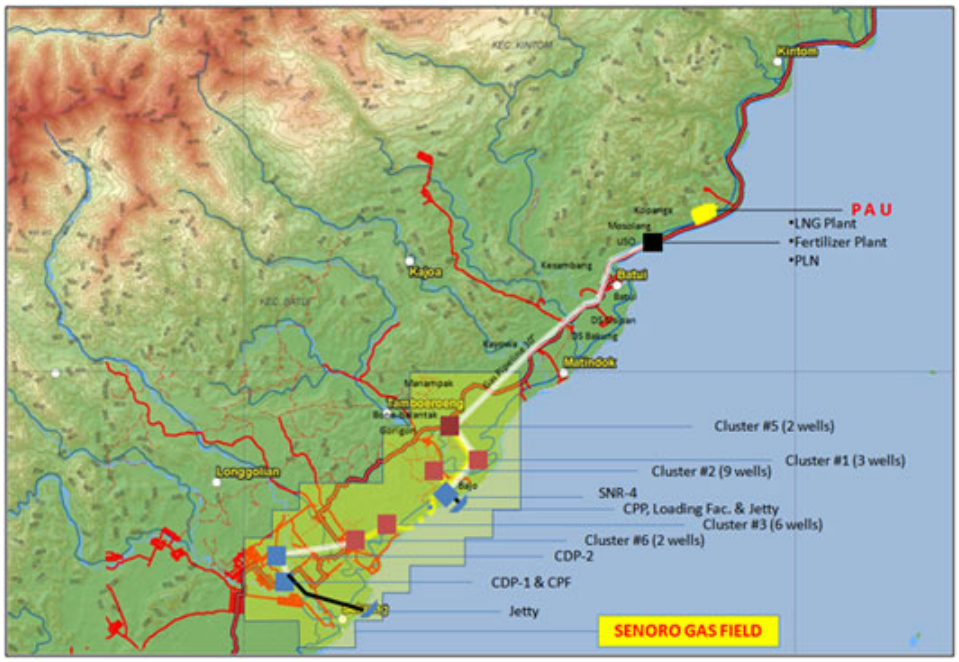
1 INTRODUCTION

PT Panca Amara Utama (PAU) is proposing to build a 700,000 Tons per annum (TPA) Ammonia production facility near the village of Uso in the Banggai District, Central Sulawesi (Figure 1). The production facility is located on the East coast of Sulawesi, to the east of the Donggi Senoro LNG (DSLNG) facility (Figure 1).

Figure 1 Project Location



In accordance with Indonesian Government Regulations an Environmental Impact Assessment (EIA) was prepared for the project and approval granted. The project EIA/AMDAL provides a detailed project description including pollution control and management measures that would be incorporated into the project design.

PAU is now seeking funding from the IFC for the future construction of the project. The IFC recently undertook a review of the Project ANDAL and RKL/RPL and recommended a number of further actions to ensure the project is fully compliant with IFC's Performance Standards. These actions were listed in a Terms of Reference (ToR) which outlined Seven EIA addendums which were required to be prepared for the project.

The IFC ToR required that the following matters relating to pollution control be addressed to satisfy the requirements of the IFC PS 3 and EHS Guidelines (incorporating the Industry Specific Guidelines for Nitrogenous Fertilizer Production);

- Comparison of proposed liquid waste and air emission discharges against IFC requirements; and

- Discussion of liquid effluent controls and discussion of runoff and wastewater controls to be adopted and comparison of effluent characteristics against Indonesian Regulations and IFC EHS guidelines.

1.1 PROJECT OVERVIEW

1.1.1 Project description

A detailed project description is provided within the ANDAL document. Key components of the project include the following;

- Construction of an Ammonia production facility covering an area of approximately 22 ha and a construction camp covering approximately 18ha. A nearshore laydown area will also cover approximately 2ha;

- Feed gas is to be sourced from upstream fields routed to the Ammonia production facility via a pipeline connecting the adjacent DSLNG facility to upstream onshore gas fields;

- All freshwater requirements for the project will be supplied via a seawater desalination plant constructed for the project;

- A wastewater treatment plant will be constructed for the project and all grey water and production waste water is to be treated prior to discharge via an outfall constructed for the project;

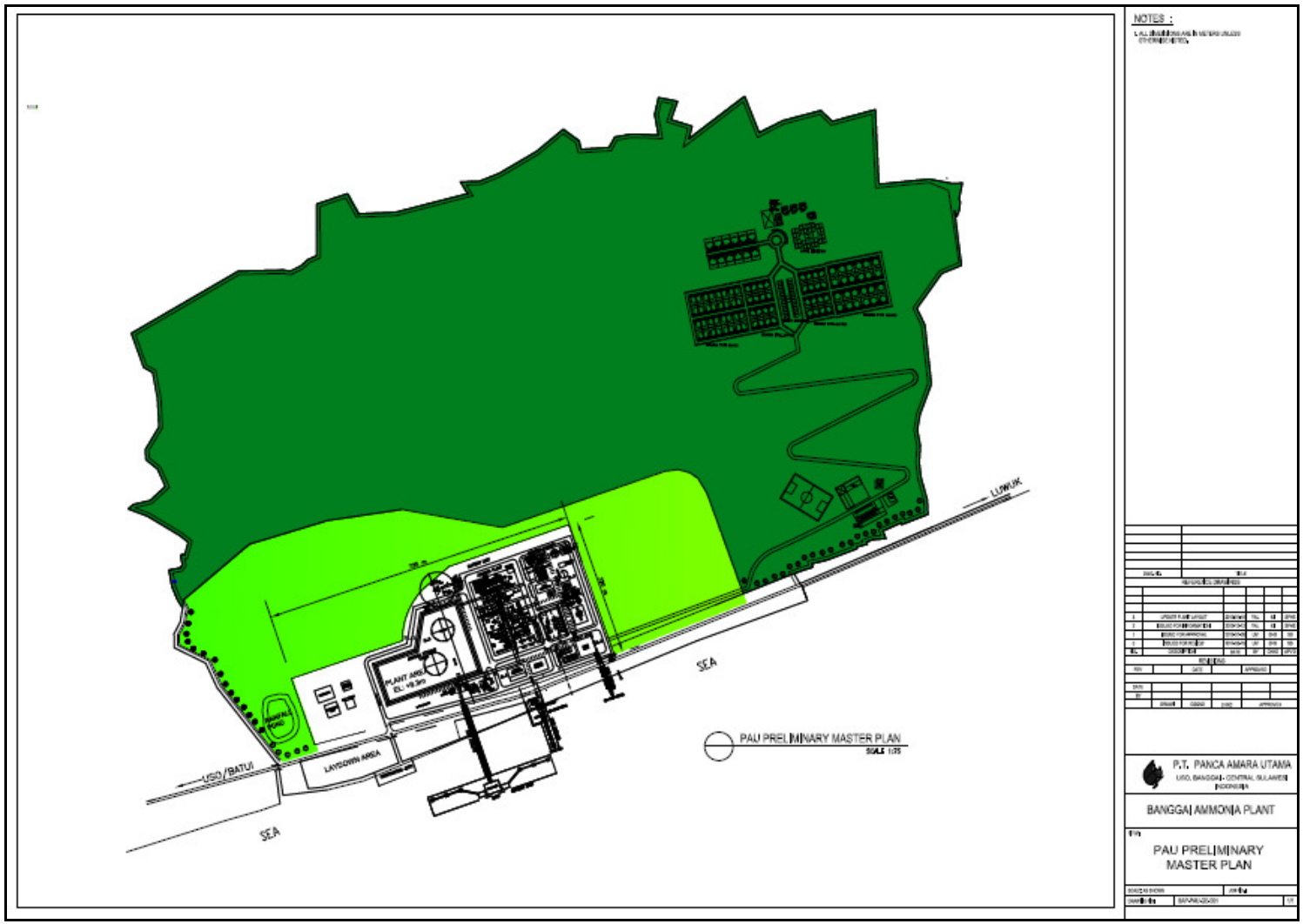
- Brine waste water discharge will also occur while process cooling water will also be discharged;

- Onsite runoff water is to be stored within retention ponds; and

- A construction jetty and a70 meter cargo jetty will be constructed for Ammonia export.

The Project layout is provided at Figure 2.

Figure 2 The Project layout



1.2 LIMITATIONS

In completing this EIA addendum, ERM has used the project ANDAL and also other environmental and engineering information provided by the client. As noted within EIA addendum 1, there are some uncertainties regarding impacts to marine biodiversity values as a result of marine discharges. This report relies heavily on follow-up actions and the development of management plans to clearly define how wastewater streams and air quality will be managed and monitored during the construction and operational phases of the project.

1.3 SCOPE OF THIS REPORT

This report tabulates the air quality and liquid effluent discharges for the project and compares these to the requirements of the local Indonesian Regulations and IFC EHS Guidelines. This is based on information contained within the ANDAL and also data supplied to ERM by PAU.

Where non compliances have been identified these are discussed and recommendations made in order to reduce the emissions to acceptable limits.

Some further management recommendations have been made and it is expected that there would be incorporated into an overarching waste water management plan.

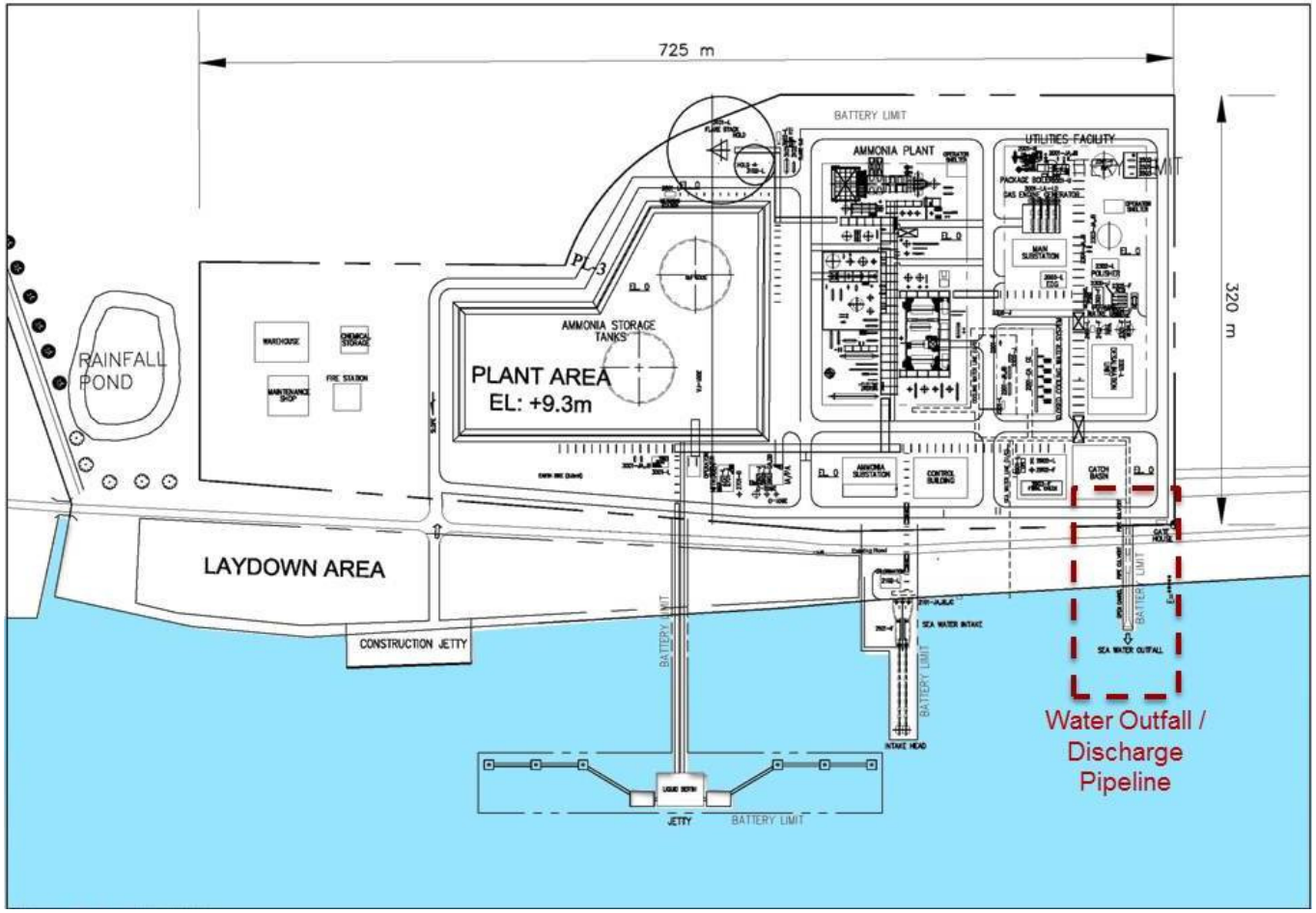
2 PROJECT OVERVIEW

2.1 PROPOSED WASTEWATER TREATMENT AND DISPOSAL

Liquid wastes will be generated as a result of the project and are to be discharged to sea via an outfall, following treatment at a Waste water Treatment Plant (WWTP). The following waste streams are to be routed to the WWTP prior to discharge. The Location of the discharge outfall/pipeline is shown at Figure 3;

- Production waste water;
- Desalination brine;
- Grey water and domestic wastewater; and
- Oily wastes.

Figure 3 Location of the discharge outfall/pipeline



Other non-contaminated runoff from the site is expected to be routed to onsite storage ponds while oily and other contaminated runoff water is expected to be routed to the WWTP for treatment.

Cooling water will also be discharged and it is understood that while the quality will not be affected, it will be up to three degrees warmer than the surrounding seawater. It is noted that while the ANDAL considered the impact of cooling water discharges of ten degrees higher than surrounding seawater, the project has since committed to discharging cooling water inline with IFC requirements (this being a temperature increase on no more than 3 degrees at the edge of an established mixing zone.) This cooling water would be discharged separately to the WWTP discharges.

In relation to both the discharge of cooling water and wastewater the ANDAL concluded that these impacts would not be significant and no further management or monitoring requirements have been specified within the RKL/RPL. For wastewater discharges this finding was based on the requirement for discharges to meet Indonesian Regulation.

The following further wastewater treatment information additional to that contained within the ANDAL has also been provided.

Following treatment at the WWTP final catch basin is installed to monitor and control quality of waste water before discharging to the seawater outfall. All kinds of waste water from the Plant including polisher regeneration water after neutralization, oily water after treated by a CPI separator, boiler blow down, RO waste water, process condensate and sanitary waste water are collected in the final catch basin, while cooling seawater return and non-contaminated storm sewer will directly flow into the seawater outfall. Caustic and acid dosing systems are equipped for the final catch basin for adjusting the quality of the waste water.

The seawater outfall will be an open channel connecting the final catch basin and sea. The waste water discharged from the seawater outfall to sea shall meet the quality requirements of the most conservative between the World Bank guidelines and Indonesian regulations for the industrial waste.

The fate and management of contaminated and clean rainfall and cleaning runoff water has not been specifically described. Based on accepted practices it is assumed that contaminated runoff water will be routed to the WWTP while clean runoff water would be routed to the retention ponds or discharged. This will be confirmed as part of a water and wastewater management plan.

Simplified block flow of the waste water system is shown in the below diagram.

Figure 4 Waste Water System Flow Diagram

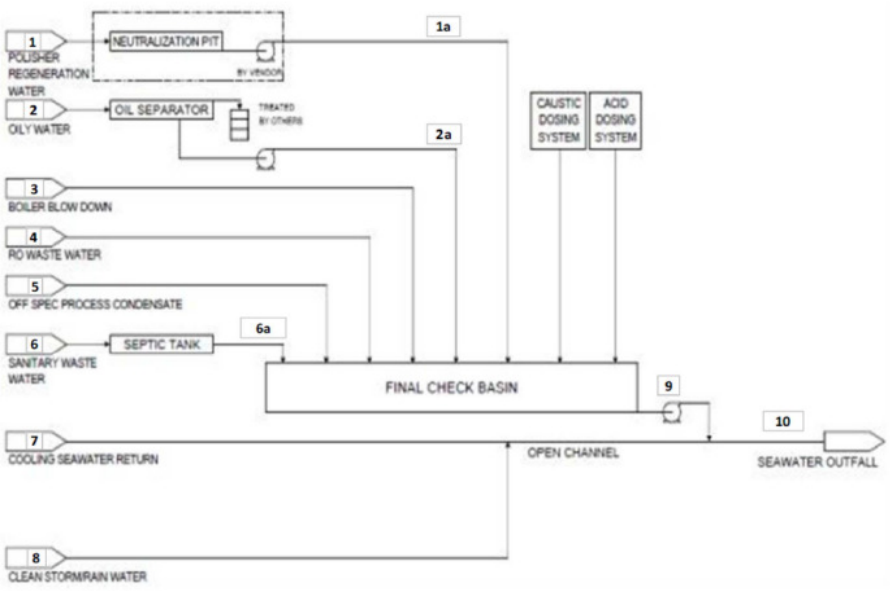


Table 1 provides a summary of the predicted waste water stream against both the IFC EHS Guidelines and Indonesian Regulations. The IFC requirements and Indonesian Regulatory limits are generally fulfilled, however, the following key exceedances are noted for the outfall (point 10);

- IFC requires the total nitrogen (TN) less than 10 mg/L. However, the EIA indicates the TN in effluent is 19.2 while the most recent design information shown at Table 4 shows TN as 15 mg/L at the outfall. TN is mainly from sanitary wastewater. PAU may need to propose pretreatment of sanitary wastewater (septic tanks, precipitation tanks, etc.) to ensure the TN in final effluent is less than 10 mg/L; and
- IFC requires the temperature increase is less than 3^0 C for the cooling water at an established mixing zone and this has been committed to by the project. . The temperature increase for the sea cooling water discussed in the ANDAL is 10^0 C, while the maximum discharge temperature of cooling water will be at 43^0 C at the outfall. The IFC EHS Guidelines on Wastewater and Ambient Water Quality require that a three degree increase does not occur at the edge of a scientifically established mixing zone (taking into account ambient water quality, receiving water use, potential receptors and assimilative capacity among other considerations). This has not been established for the project and as such it will be necessary to ensure that measures are adopted to manage this, particularly given the potential presence of coral habitats within the Project area. Potential management may include discharge locations to avoid coral habitats, or pre-treatment and cooling. This would be confirmed and discussed in more detail within a detailed wastewater management plan.

Table 1 Waste Water Emissions

PARAMETERS	WBG/IFC Maximum Levels	Indonesia Maximum Levels	Predicted Performance at Discharge (Point 10)
pH	6 - 9	6 - 10	6 - 9
Biochemical oxygen demand*4)	30 mg/l	100 mg/l	0.0 mg/l
Chemical oxygen demand (COD)	125 mg/l	250 mg/l	19.8 mg/l
Oil and grease	10 mg/l	25 mg/l	0.0 mg/l
Total suspended solids (TSS)	30 mg/l	100 mg/l	1.7 mg/l
Ammonia	10 mg/l	50 mg/l	1.4 mg/l
Nitrogen	15 mg/l	N/A	15 mg/l
Phosphorus	2 mg/l	10 mg/l	0.00 mg/l
Temperature increase	3˚C *1)	N/A *2)	≤ 3˚C *3)

NOTES:

*1) The effluent should results in a temperature increase of no more than 3˚C at the edge of the zone where initial mixing and dilution take place.

*2) Indonesian regulation does not specify the maximum level of temperature increase, however it specifies Maximum Discharge Temperature which is 45˚C

*3) Predicted Performance of PAU: Temperature increase ≤ 3˚C, Maximum Discharge Temperature 43˚C

*4) COD of sea water is assumed as < 5 mg/l

2.1.1 Potential Gaps

Aside from the two exceedances discussed previously, the following gaps in the current wastewater management and disposal processes exist. It is expected that this would be clarified as part of a detailed water and waste water management plan:

- The treatment and disposal of wastewater generated during construction and prior to operation of the WWTP requires clarification. It is expected that this will be confirmed as part of a water and waste water management plan; and
- The quality of water stored within the retention ponds requires confirmation. It is assumed that this will meet the relevant IFC EHS requirements prior to any discharge or reuse onsite.

2.1.2 Further management and Corrective Actions

In general it is recommended that a detailed wastewater management plan be developed to describe the ongoing management of surface water runoff and construction and operational waste water. The EIA Addendum 1 addressing biodiversity impacts has also recommended that a marine water quality monitoring plan be developed for the project. A wastewater management plan should address the following;

- Confirm that clean and contaminated rainfall and cleaning runoff waste water streams will be separated onsite with clean runoff routed to the detention ponds or discharged elsewhere, while contaminated runoff should be routed to the WWTP;
- Describe wastewater treatment practices and disposal during construction and prior to the establishment of the WWTP;
- Confirm or predict water quality to be discharged from the retention ponds;
- Provide a detailed description of all WWTP process and discharge pipeline including the discharge location and proximity of this discharge stream to areas of marine importance including corals;
- Describe specific treatment for total Nitrogen to ensure this meets IFC EHS and Indonesian discharge requirements; and
- Discuss management of cooling water.

2.2 AIR EMISSIONS

2.2.1 Background

As described within the project ANDAL, emissions as a result of the project will occur from;

- Flue gas from the primary reformer
- Gas effluent from the CO^2 absorber unit
- Purge and flash gases from ammonia synthesis unit (used as a supplementary fuel for primary reformer unit)
- Non-Continuous emissions (venting and flaring); and
- Construction activities including vehicle emissions and dust generation.

To obtain air quality data prior to commencement of construction, air samples are collected from three locations, i.e. at the western side of project site (ST U-01), at the eastern side of project site (ST U-02) and at the project site (ST U-03). The air samples were then analyzed in a laboratory. Table 2 shows the laboratory analysis of the 3 (three) air samples obtained from the three locations. All measurements were within the Indonesian Air Pollution Regulation.

Table 2 Baseline Air Quality Conditions.

No	Parameter	Unit	ST U-01	ST U-02	ST U-03	Quality Standard
1	**Climate**					
1.1	Temperature	^{0}C	31	31	31	
1.2	Wind Rate	m/second	1,6	3,4	1,5	
1.3	Humidity	%	74	78	74	
2	**Pollutant**					
2.1	NO_2	g/Nm^3	19,03	6,72	11,04	400*
2.2	SO_2	g/Nm^3	24,18	10,64	14,61	900*
2.3	CO	g/Nm^3	182,9	92,1	136,7	30.000*
2.4	Dust	g/Nm^3	79,4	64,8	67,5	230*
2.5	Particulate Matter ($PM_{2,5}$)	g/Nm^3	003	0,003	0,01	150*
2.6	$PM_{2,5}$	g/Nm^3	-	-	-	65*
2.7	Leads	g/Nm^3	0,002	tt	0,001	2*
3	**Odor**					
3.1	NH_3	ppm	0,001	tt	0,001	2.00**
3.2	H_2S	ppm	tt	tt	tt	0,02**

Source: Primary data, 2012
*) RI Government Regulation No. 41 of 1999 concerning Control of Air Pollution
**) Decree State Minister of Environment No.: Kep-50/MENLH/11/1996 concerning quality of odor level

2.2.2 *Predicted Air Emissions*

A comparison of the projects anticipated air emissions against the IFC EHS Guidelines and also Indonesian Regulations are presented at Tables 3-4. These project components represent the primary source of emissions expected as a result of the project.

As shown at these Tables, it is expected that all operational emissions will remain below the maximum levels for both the IFC EHS Guidelines and Indonesian Regulations.

The proposed PAU ammonia plant will utilize the latest state-of-art Low Energy *KBR's PURIFIERplus™* Ammonia Technology using *KRES™* (KBR Reforming Exchanger System) and *Purifier™* Units. The process in general is considered to be Best Available Technology (BAT) to date in terms of being energy and environment efficiency. The proposed gaseous emissions from the plant are small both in absolute and relative terms.

The gaseous emissions under normal operation will be oxides of nitrogen (NOx) & sulfur (SOx) and particulate matter from the primary reformer, boiler and gas engine generators. The NOx emissions from the proposed

ammonia plant (7.25 g/s) are relatively small as ultra-low NOx burners shall be used in the reformer furnace.

Table 3 Boiler Emissions

PARAMETERS	WBG / IFC Maximum Levels (mg/Nm3)			Indonesia Maximum Levels (mg/Nm3)			Predicted Performance (mg/Nm3)		
	Engine	Turbine	Boiler	Engine	Turbine	Boiler	Gas Engine Generator	Emergency Diesel Generator	Package Boiler
Particulate matter									
Gas Fuel	N/A	N/A	N/A			230	1	N/A	-
Liquid Fuel	50-100	N/A	50-150				N/A	-	N/A
Nitrogen oxides (NOx)									
Gas Fuel	200-1600	25-100 ppm	320		125	1000	190 as O^2 15%	N/A	-
Liquid Fuel	1460-1850	74-150 ppm	460				N/A	-	N/A
Sulfur dioxides (SOx)									
Gas Fuel	N/A	N/A	N/A			800	0.1 as O^2 15%	N/A	-
Liquid Fuel	1.5-3% S	0.5% S	2000				N/A		N/A
Volume of Flue Gas (Nm3/hr)							82,000	-	-
Temperature of Flue Gas (°C)							451	-	-

Table 4 Process Emissions

PARAMETERS	WBG/IFC Maximum Level		Indonesia Maximum Level		Predicted Performance	
PM from other processes	50	mg/Nm^3	250	mg/Nm^3	NIL	mg/Nm^3
Nitrogen oxides (as NO^2)	300	mg/Nm^3	700	mg/Nm^3	123.2	mg/Nm^3
Sulfur dioxides (as SO^2)	150	mg/Nm^3	-	mg/Nm^3	Max. 14.3	mg/Nm^3
Ammonia	50	mg/Nm^3	300	mg/Nm^3	NIL	mg/Nm^3

2.2.3 Proposed Monitoring and Follow-up Actions

The Project ANDAL did not identify air quality emissions as representing a potential impact to the environment and therefore no ongoing monitoring was specified within the Project RKL/RPL.

A monitoring program will be required throughout the construction and operational phases of the project. This would intend to measure air quality at onsite and offsite locations and assess whether both IFC and Indonesian emission requirements are being breached and also where relevant, look for opportunities to improve emissions quality.

An air quality management and monitoring plan will be developed for the construction and operational phases of the project, specifying monitoring locations, frequency, relevant air quality standards and parameters to be measured. It is expected that these would be addressed within a Construction and Operational Environment Management Plan.

Likely parameters requiring monitoring and maximum levels are provided at Table 5 below. Between both the Indonesian Regulations and IFC EHS limits, it would be expected that the project applies the most stringent standard and monitors performance against this. The location of monitoring points and frequency of monitoring will be confirmed.

Table 5 Proposed Air Quality Monitoring Table

PARAMETERS	WBG/IFC Maximum Level		Indonesia Maximum Level		Predicted Performance	
PM from other processes	50	mg/Nm^3	250	mg/ Nm^3	NIL	mg/ Nm^3
Nitrogen oxides (as NO_2)	200	mg/Nm^3	700	mg/ Nm^3	123.2	mg/ Nm^3
Sulphur dioxides (as SO_2)	150	mg/Nm^3	-	mg/ Nm^3	Max. 14.3	mg/ Nm^3
Ammonia	50	mg/Nm^3	300	mg/ Nm^3	NIL	mg/ Nm^3
Nitrogen oxides (NOx)	300	mg/Nm^3			190 as O2 15%	
CO_2	1.15-1.30	ton/ton NH3	N/A	ton/ton NH3	1.27	
Sulphur dioxides (SOx)			900	mg/ Nm^3	0.1 as O2 15%	
NH_3	50	mg/Nm^3	2.00	ppm	TBC	
H_2S			0.02	ppm	TBC	

EIA Addendum 3 - Resource Efficiency

Prepared for:

PT Panca Amara Utama

January 2013

Delivering sustainable solutions in a more competitive world

ERM

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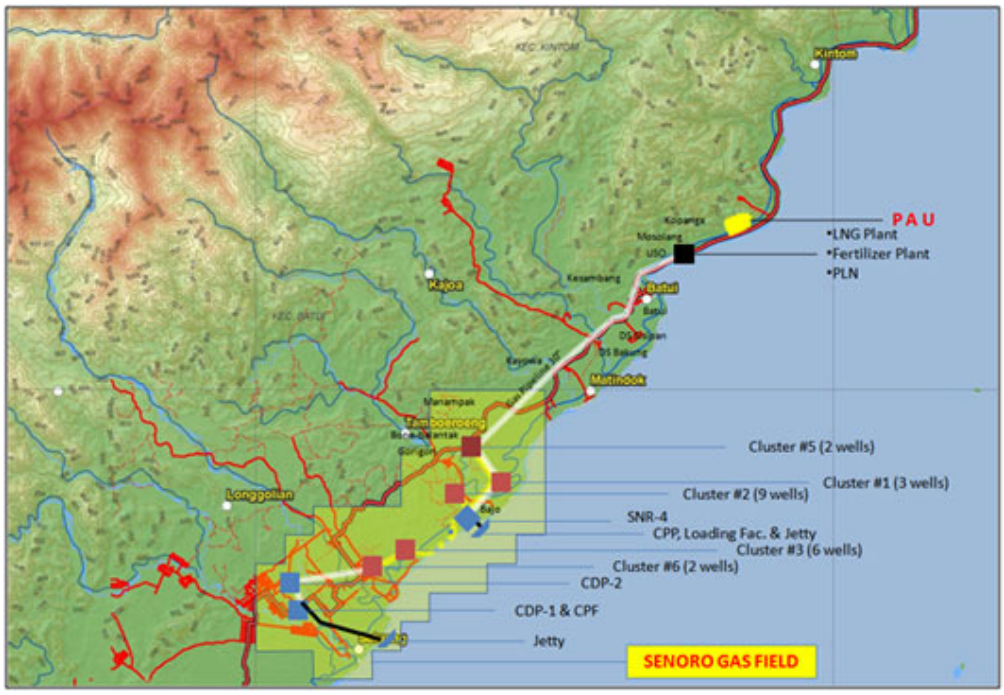
1 INTRODUCTION

PT Panca Amara Utama (PAU) is proposing to build a 700,000 Tons per annum (TPA) Ammonia production facility near the village of Uso in the Banggai District, Central Sulawesi (Figure 1). The production facility is located on the East coast of Sulawesi, to the east of the Donggi Senoro LNG (DSLNG) facility (Figure 1).

Figure 1 Project Location



In accordance with Indonesian Government Regulations an Environmental Impact Assessment (EIA) was prepared for the project and approval granted. The project EIA/AMDAL provides a detailed project description including pollution control and management measures and efficiency measures that would be incorporated into the project design.

PAU is now seeking funding from the IFC for the future construction of the project. The IFC recently undertook a review of the Project ANDAL and RKL/RPL and recommended a number of further actions to ensure the project is fully compliant with IFC's Performance Standards. These actions were listed in a Terms of Reference (ToR) which outlined Seven EIA addendums which were required to be prepared for the project.

IFC PS 3 – Resource Efficiency and Pollution Prevention, discusses the need for projects to demonstrate their approach to resource efficiency and pollution prevention. This can be achieved through the use of internationally accepted technologies, selection of energy and resource efficient design options and adoption of stringent pollution control requirements, these being either the relevant IFC EHS guidelines (including the industry specific guidelines for

Nitrogenous Fertilizer Production) or Indonesian Regulatory requirements as a minimum. Importantly, IFC PS 3 also recognises that private sector companies should adopt such technologies and practices as far as their use is feasible in the context of a project that relies on commercially available skills and resources

1.1 PROJECT OVERVIEW

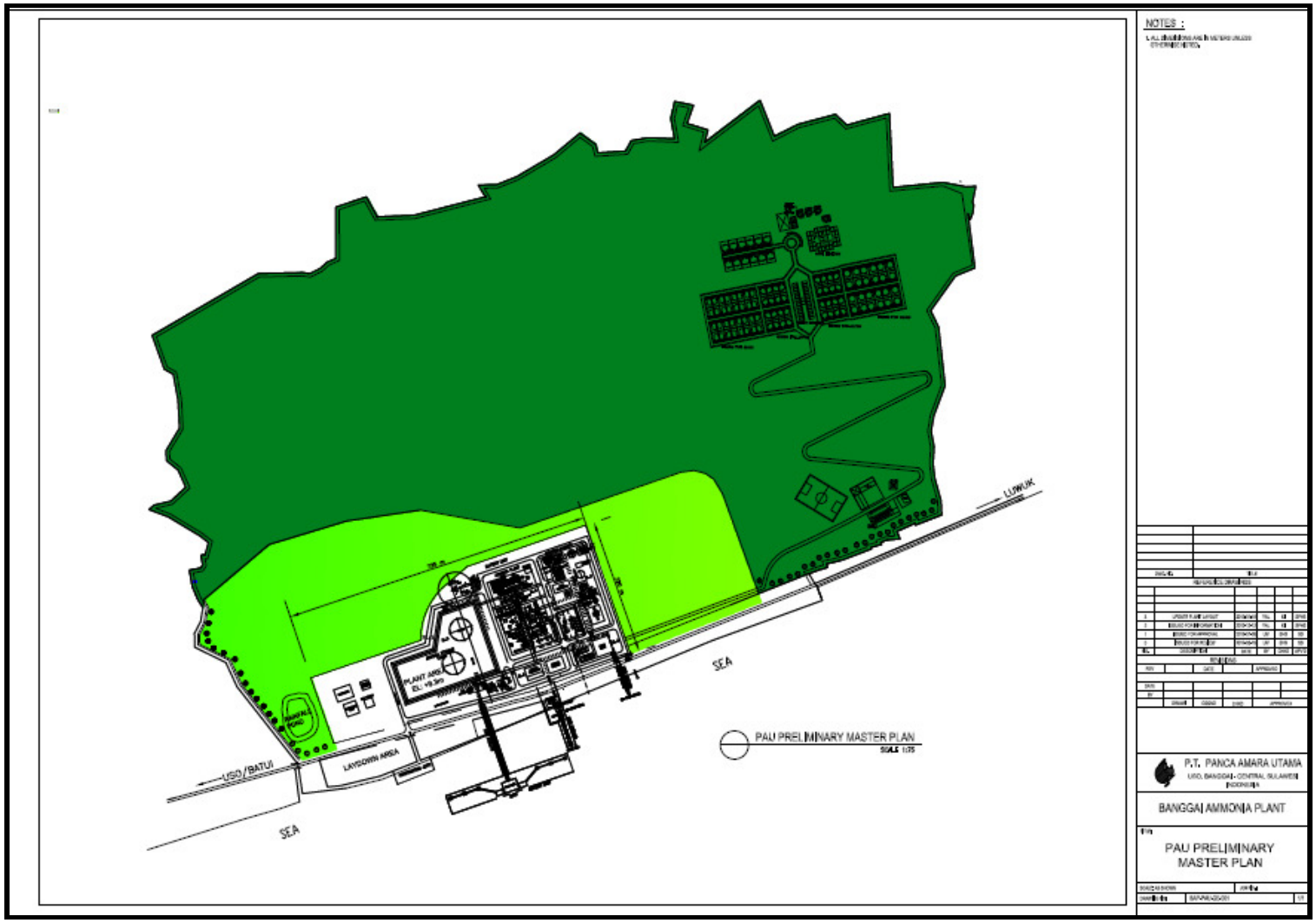
1.1.1 Project description

A detailed project description is provided within the ANDAL document. Key components of the project include the following:

- Construction of an Ammonia production facility covering an area of approximately 22 ha and a construction camp covering approximately 18ha. A nearshore laydown area will also cover approximately 2ha;
- Feed gas is to be sourced from upstream fields routed to the Ammonia production facility via a pipeline connecting the adjacent DSLNG facility to upstream onshore gas fields;
- All freshwater requirements for the project will be supplied via a seawater desalination plant constructed for the project;
- A wastewater treatment plant will be constructed for the project and all grey water and production waste water is to be treated prior to discharge via an outfall constructed for the project;
- Brine waste water discharge will also occur while process cooling water will also be discharged.;
- Onsite runoff water is to be stored within retention ponds; and
- A construction jetty and a 80 meter cargo jetty will be constructed for Ammonia export.

The Project layout is provided at Figure 2.

Figure 2 The Project layout



1.2 LIMITATIONS

In completing this EIA addendum, ERM has used the project ANDAL and also other environmental and engineering information provided by the client. Detailed project design is progressing and it is possible that project changes may occur during this time.

1.3 SCOPE OF THIS REPORT

This report describes the resource efficiency measures adopted for the project. In line with the ToR prepared for this EIA addendum this report will consider resource efficiency options that will be adopted for the project in relation to the following:

- Water sources, usage rates and sustainability;
- Analyze the water balance in the processes and water usage efficiency;
- Water efficiency suggestions for operations;
- Natural gas sources and sustainability;
- Any other fuels and consumptions rate (coal, furnace oil, gasoline etc.);
- Power plant capacity (MW);
- Equipment supplier and energy efficiency analysis;
- Energy efficiency suggestions for operations; and
- Discuss the energy efficiency against WBG EHS Guideline benchmark (28.8 to 31.5 GJ lower heating value/ton NH^3 and 1.15-1.3 ton CO2/ton NH^3)

2 PROJECT OVERVIEW

2.1 WATER USAGE EFFICIENCY

The projects operational and domestic water requirements will be met by seawater, however it is possible that freshwater will be trucked to site to supply some of the water requirements during construction, particularly prior to the establishment of a desalination plant.

Seawater will be pumped from the seawater intake pipe and distributed to the following systems:

- Seawater cooling water system;

- Chlorination unit; and
- Desalination unit.

The majority of seawater used relates to the seawater cooling system. The turbine surface condensers and ammonia condenser in the ammonia plant are directly cooled by seawater. Also seawater is used to exchange heat with sweet cooling water in the plate type heat exchangers. Warm seawater return is sent back to sea through the seawater outfall to be located on the coast. Seawater quality is not affected during cooling however it is discharged at a higher temperature than surrounding seawater. The discharge of this cooling water is discussed in further detail within EIA Addendum 2.

Seawater is also sent to the Desalination Unit after treatment through sand filters in order to remove suspended solids. The desalination unit then supplies the domestic and operational freshwater needs of the project.

A small part of seawater stream is supplied to the Chlorination Unit where required amount of sodium hypochlorite will be produced for injection and controlling microorganisms.

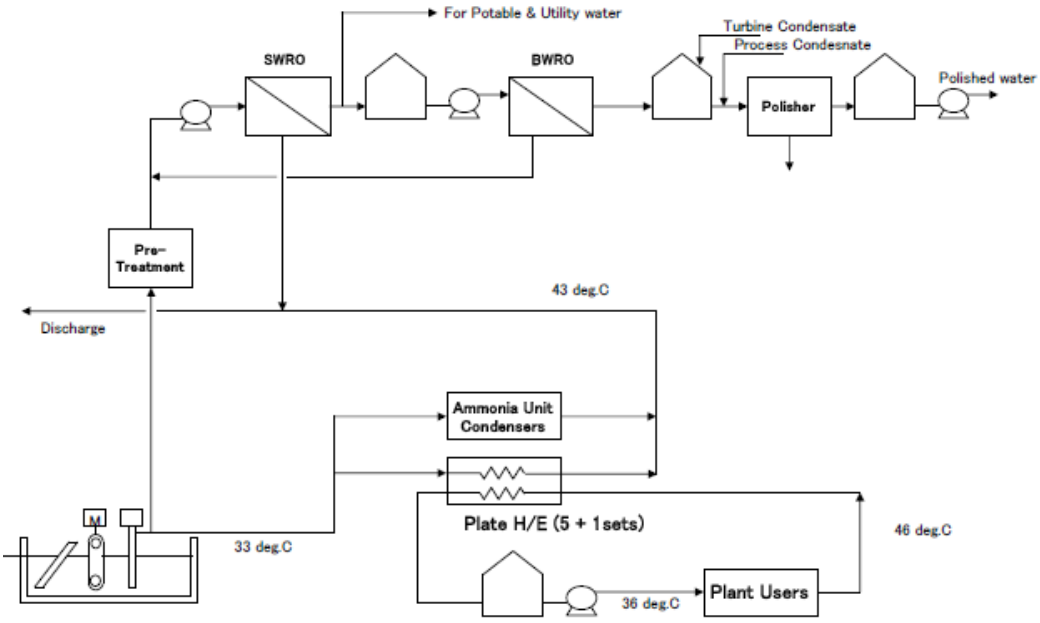
The seawater requirements of the project are tabulated at Table 1.

Table 1 Project Water Requirements

Description/Unit	m3/h
Marine Plate Heat Exchangers	7,300
Surface/Ammonia Condensers	12,600
Desalination	250
Chlorination	50
Project Total	**20,200**

A Block diagram of water usage is shown at Figure 3.

Figure 3 Project Water Use Flow Diagram



2.1.1 Desalination unit

The Desalination Unit consists of Seawater Reverse Osmosis (SWRO), Brackish Water Reverse Osmosis (BWRO) and associated filters, pumps, analyzers and buffer tanks. Before treating in the BWRO, a part of stream is branched to potable water unit (the design capacity is 20 m^3/h), service water system and fire-fighting water system. Desalinated water from the BWRO is then sent to the Polishers for further treatment.

Desalination unit consist of 3 units of SWRO with 170 m^3/h design capacity each and 3 unit of BWRO with 60 m^3/h design capacity each. In normal operation, 2 units of SWRO and 2 units of BWRO are in service and 1 unit stand-by. The efficiency of SWRO and BWRO are 40 % and 80 % respectively.

Polishers

Mixed Bed Polishers are installed to treat desalinated water together with process and turbine condensate returned from the Ammonia plant. Polished water is sent to the deaerators in the Ammonia plant and Package Boiler (only for Ammonia plant start-up) for producing steam.

Polishers unit consists of 3 units with 175 m^3/h design capacity each. In normal operation, 2 units in service and 1 unit stand-by.

Polished water requirements are provided at Table 2.

Table 2 Polished Water Requirements

Description/Unit	m3/h
Ammonia Plant	305
Project Total	**305**

2.1.2 Sweet Cooling water

The Sweet Cooling Water system is a closed circuit system consisting of cooling water pumps, plate type heat exchangers, filters, chemical dosing units and pipe works. This system is supplied by untreated seawater with a very small amount of make-up water (around 2 m^3/h of freshwater), to balance some losses in the system. The sweet cooling water is used to cool fluids in the Ammonia plant, Utility and Power and Steam Generation Facilities except for turbine surface condensers and ammonia condenser. The closed circuit loop will be divided into at least two sections; one for the Ammonia plant and the others for ease of maintenance. The main supply and return headers to the Ammonia plant will be buried underground.

Sweet Water cooling requirements are provided at Table 3.

Table 3 Cooling Water Requirements

Description/Unit	m3/h
Ammonia Plant	6,750
Utility, Power, etc.	500
Project Total	**7,250**

2.1.3 Water Balance and Usage Efficiency

The bulk of the projects water demands will be met by seawater and as such this is unlikely to place additional pressure on existing freshwater supplies. Local freshwater may be required for the initial construction and also to supplement the cooling water system.

It is acknowledged that the desalination of seawater will require power inputs as well as the discharge of desalination brine. Power for the project will be supplied by onsite gas fired generators while the desalination brine will be routed through the WWTP prior to disposal.

Water use efficiencies have been fed into the project design and include the following:

- All steam condensate from extraction turbines, process condensate from process units and condensate from steam traps will be recycled post treatment in polisher unit;

- Jacket water from transfer line, secondary reformer, reformer exchanger and waste heat boiler can be used as make-up water to sweet water cooling water system;
- Only boiler feed water make-up, potable water and service water need fresh water supplied from desalination unit; and
- Runoff water retention ponds will be retained on site, potential onsite uses of this water will be investigated.

Further water saving measures will also be identified during detailed engineering design while water saving measures may also be investigated though the development of construction and operational environmental management plans.

2.2 *POWER EFFICIENCIES*

Power for the project will be supplied via combustion engine generators, these will use natural gas as the fuel source. An emergency diesel engine generator set will be installed for the black start purpose and safe shutdown in case of emergency conditions. The design capacity of emergency diesel generator is 2 MW.

Multiple engine generator sets will be installed to meet power demands of the Project. The generator sets consist of combustion engines, generators, radiators, jacket cooling system, lubricating oil system and exhaust system.

A combustion engine is the most efficient means of converting gas fuels into energy. Combustion engines incorporating modern combustion technology are capable of very high shaft efficiency which translates into considerable savings in fuel costs compared to other technologies.

Gas engine generator units will consist of 4 units with 5 MW design capacity each. In normal operation, 3 units in service and 1 unit stand-by.

The power requirements of the different Project units are provided at Table 4. The natural gas requirements of the project are discussed in further detail at Section 2.3.

Table 4 Power Supply Requirements

Description/Unit	MW
Ammonia Plant	3.0
Utility, Power, etc.	3.0
OSBL Buildings	1.4
Housing Colony	1.0
Project Total	8.4

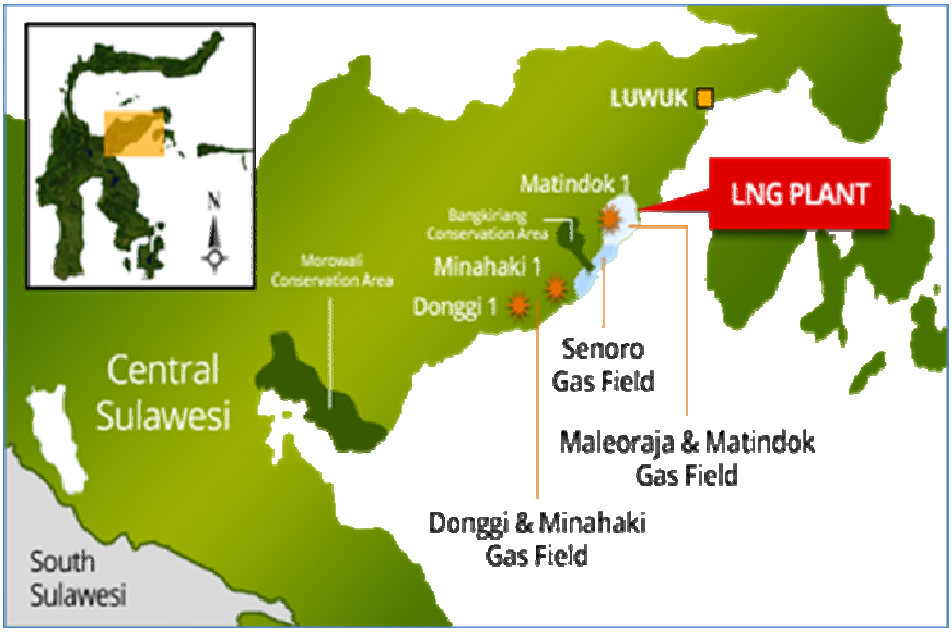
2.3 *ENERGY EFFICIENCY*

The guaranteed energy consumption for the proposed ammonia plant shall be 29.92 GJ/t NH_3 (corrected to standard conditions). This compares favourably with the European Fertilizer Manufacturers Association (EFMA) benchmark of 28.4 – 32 GJ/t NH_3 for BAT provided within the IFC EHS Guideline for Nitrogenous Fertilizer Production (IFC 2007). This is for a standalone plant with no energy export and no other import, other than feedstock and fuel.

2.4 *NATURAL GAS SUPPLY*

Natural gas for the project will be supplied from the onshore Senoro, Donggi & Minahaki and Matindok & Maleo-Raja Gas Fields (Figure 4). These upstream facilities are currently under construction and will supply feed gas to the adjacent DSLNG facility. Natural gas for the PAU Ammonia project will be supplied via an offshoot from the DSLNG feed gas pipeline.

Figure 4 Upstream Facility Location



Natural Gas will be used for the following sources with the estimated consumption provided at Table 5.

- Feed for ammonia plant;
- Fuel for ammonia plant;
- Fuel for gas engine generator; and
- Fuel for package boiler (for ammonia plant start-up only).

Table 5 Estimated Natural Gas Requirements

Description/Unit	MMscfd	GJ/h (LHV)	GJ/t (LHV)
Process Feed	46.00	2,026.41	25.60
Fuel for Reformer	6.72	297.26	3.75
Ammonia Plant Total	52.72	2,323.67	29.35
Fuel for Engine Generator	1.64	71.17	0.90
Project Total including Housing Colony	54.36	2,394.84	30.25

Natural gas is the primary input during the ammonia production process with ammonia formed through a conversion of methane gas. The production process is described in detail within the Project ANDAL.

The ammonia plant is based on the latest KBR's Reformer Exchanger and Purifier Process, a low energy natural gas reforming process offered and licensed by KBR. The plant capacity for the ammonia plant is 1,900 MTPD as 100% cold ammonia product at -33˚C.

2.4.1 Natural Gas Efficiency

PAU will only use equipment from reliable vendors who have experience and a proven record in Ammonia Plant design and construction. PAU shall develop an approved vendor list of potential EPC Contractors with PAU Resident Representatives to be present at the EPC Contractor Home Office. Energy efficiency will be one important criterion in the selection of a successful bidder.

Detailed below are some of the equipment that contribute to the efficiency of the Ammonia plant and need more attention from both the contractor and owner during design, fabrication, construction and operation of the plant. The design of this equipment is likely to achieve the most significant efficiencies for the project.

Reformer Exchange

The REFEX system is optimally integrated into this ammonia flowsheet to provide a heat balanced and steam balanced plant. REFEX is added in parallel to the existing primary and secondary reformers. The steam generation in the ammonia plant is balanced to provide steam for process, running key compressors and ID/FD fans and boiler feed water pump. There is no import or export of steam from the ammonia plant ISBL. The key principles behind integration of REFEX are :

- Utilize the high grade waste heat exit secondary reformer for generating synthesis gas rather than passing to generate HP steam which is a lower grade carrier of energy;

- Maximize recovery of lower grade heat elsewhere in the plant to minimize reduction in production of HP steam due to incorporation of REFEX. Incorporation of BASF two stage MDEA CO2 removal unit (now called OASE White) is one such lower grade energy recovery initiative;
- Pressure drop through the front-end is not increased since the flow through is in parallel to the primary reformer; and
- Waste Heat boiler duty is reduced as part of the heat from the secondary reformer effluent is used to reform gas in REFEX. By doing this the steam generation is reduced to have a balanced plant.

Approximately 17 % of desulfurized feed gas is mixed with process steam keeping a molar steam to carbon ratio of about 3.0 for REFEX mixed feed. This feed stream is preheated to about 550˚C in mixed feed coil located in the convection bank of primary reformer. The preheated feed flows through tubes of REFEX (filled with conventional Ni catalyst based rings) where reforming and shift reactions takes place (same as described earlier for the primary reformer). The reformed gas exiting the REFEX tubes gets mixed with the secondary reformer outlet gas and flows through the shell-side of KRES supplying necessary heat for reaction in REFEX.

The methane content of the process gas exit KRES/secondary reformer is reduced to 1.7 mol % percent on dry basis. The effluent from the REFEX shell side goes to Secondary Reformer Waste Heat Boiler, which is a natural-circulation design and produces high pressure steam. The gas then passes to HP Steam Super heater. A bypass arrangement is provided to maintain the required feed temperature of 371˚C for High Temperature Shift Converter located downstream. The bypasses also provide some flexibility in the division between boiling and superheating duty.

Because of the very high process gas temperatures, transfer line, secondary reformer, REFEX including its transfer lines and Secondary Reformer Waste Heat Boiler (inlet channel) are internally refractory insulated and all up to the inlet of Secondary Reformer Waste Heat Boiler are water-jacketed. The water is supplied from the steam condensate system.

Purifier

Cryogenic Purification Dried raw synthesis gas is cooled to about minus 129 °C in the cryogenic purifier by heat exchange with make-up syngas and with purifier vent gas in the upper plate fin exchanger, feed/effluent exchanger. The gas then flows through a turbo expander, purifier expander, where energy is removed to develop the net refrigeration required for the purifier. Expander energy is recovered by generating electricity in purifier expander generator.

The expander effluent is further cooled to about minus 173 °C and partially condensed in the lower section of feed/effluent exchanger and then enters the purifier rectifier column. Liquid from the bottom of the rectifier is partially evaporated at reduced pressure in the shell side of the rectifier overhead condenser. This cools the rectifier overhead and generates reflux for the rectifier.

The rectifier bottoms contain the excess nitrogen, all of the methane and about 60 percent of the argon. The partially evaporated liquid leaving the shell side of the rectifier overhead condenser is reheated and vaporized by exchange with the purifier feed and then leaves the purifier as waste gas. The waste gas is used to regenerate the syngas drier and then burned as fuel in the primary reformer.

The make-up syngas from the top of the rectifier overhead condenser is reheated by exchange with purifier feed to about 1.8 °C and sent to the syngas compressor. The operation of the purifier is controlled by a hydrogen analyzer on the syngas, to maintain the exact ratio of 2.998 to 1 (hydrogen to nitrogen). The only remaining contaminant in the make-up syngas is about 0.32 percent argon.

Unitized Chiller

This specially designed exchanger provides cooling of the converter effluent through interchange of heat with synthesis gas returning from the Ammonia Separator, and boiling ammonia liquid at four different temperature levels (16.7˚C, -2.2˚C, -17.8˚C and -33˚C). By its unitized design, it replaces four separate exchangers, four refrigerant drums, feed/effluent exchangers and the interconnecting piping.

Mechanically, the unitized chiller consists of multiple concentric tubes, which run through the boiling ammonia compartments. Synthesis gas recycle vapor from the downstream Ammonia Separator, passes through the center tubes counter-currently to the converter effluent as it flows through the annular space between tubes. Thus, the synthesis gas is being cooled from the larger outside tube by boiling ammonia and from the inside tube by cold recycle vapor from the primary separator. The condensed gas exit temperature of the unitized chiller is -17.8˚C, with the liquid ammonia product disengaged from the synthesis gas in Ammonia Separator immediately downstream of the exchanger.

Approximately 2.7 percent of the vapor from Ammonia Separator is removed from the synthesis loop to purge it of argon, which is contained in the makeup gas. This high pressure purge gas flow is adjusted to maintain the inert gas level in the ammonia converter feed gas to approximately 3.5 mole percent and is directed to the purge gas recovery section.

Recycle vapor from the ammonia separator, containing nearly 2.63 mole percent ammonia is reheated in the Unitized Chiller as described above. The reheated recycle vapor is directed to the synthesis gas compressor and recirculated for reuse as feed to the converter.

The purge gas stream from Ammonia Separator flows to the HP Ammonia Scrubber, for recovery and removal of the ammonia it contains down to a level about 20 ppmv (50 ppmv max). The essentially ammonia free gas is divided into two parts. One part is normally sent to the fuel system (or alternatively recycled upstream of the Purifier for recovery of the hydrogen and nitrogen). The other part is mixed with the feed natural gas upstream of vessels hydrotreater and desufurizer.

Liquid ammonia from Ammonia Separator is depressurized and flashed to a pressure of 1,862 kpaa in the Ammonia Letdown Drum. The flashed vapor, primarily dissolved synthesis gas, is mixed with the refrigeration system purge gas and sent to the LP Ammonia Scrubber. The remaining liquid ammonia product is then split into streams leading to the ammonia refrigeration system in Unitized Chiller, and the Ammonia Refrigerant Receiver. The washed gas stream exiting the LP Ammonia Srubber is sent to the fuel system.

2.4.2 Greenhouse Gas Emissions

The proposed BAP ammonia project will emit about 1.14 million tonnes of carbon dioxide (CO_2) per year. Relatively small quantities of the greenhouse gas, methane will also be released, resulting in a total greenhouse gas emission of approximately 1.21 million tonnes of carbon dioxide equivalent (CO_2 E) per year.

A number of significant process improvements have led to a large decrease in energy consumption for ammonia plants from 1960 to the mid nineties. The decrease has been primarily due to better recovery and utilization of waste heat, improvements in boiler design and compressor efficiencies, increase in plant size and the use of aMDEA (activated methyl diethanolamine) solution to remove carbon dioxide.

The greenhouse intensity (unit discharge of carbon dioxide per tonne of ammonia produced) for the proposed ammonia plant is expected to be 1.66 tCO_2/tNH_3 (on a corrected basis) and compares favorably with BAT and intensities for other new and proposed plants. It represents a decrease in greenhouse gas intensity of almost 15% on an estimated "business as usual" 1990 base case of 1.95 tCO_2/tNH_3. The 1990 base case being derived from what was considered BAT for energy consumption for steam reforming ammonia plants from 1960 to 2000 (KBR, 2001) and for 1995 and 2000 (EFMA 1995 and 2000).

As shown at Table 6, CO_2 product from PAU's Ammonia Plant is 1.27 ton/ton NH_3. This figure is in the range of WBG EHS Guideline benchmark (1.15 – 1.3 ton CO_2/ton NH_3).

Table 6 Process and Emission Control Efficiency

PARAMETERS	WBG/IFC Benchmark	Indonesia Maximum Level	Predicted Performance
CO2 from manufacturing process	1.15-1.30 ton/ton NH_3	N/A ton/ton NH_3	1.27 ton/ton NH_3
NOx (advanced conventional reforming processes and processes with reduced primary reforming)	0.29-0.32 kg/ton NH_3	1.87 kg/ton NH_3	0.314 kg/ton NH_3
NOx (heating exchange autothermal reforming)	0.175 kg/ton NH_3	N/A kg/ton NH_3	N/A kg/ton NH_3

Further to the predicted performance detailed above, additional "no regrets" measures to minimise greenhouse gas emissions from the project will include the following:

- Latest state-of-art Low Energy KBR's PURIFIERplusTM Ammonia Technology using KRESTM (KBR Reforming Exchanger System) and PurifierTM Units
- Adoption of the low energy excess air reforming process
- Recovery of waste heat wherever possible
- Recovery of fugitive gases such as methane and hydrogen
- Hydraulic turbines to recover energy

2.5 OTHER FUEL SUPPLY

Aside from diesel required for back-up generators, diesel fuel will be required throughout the construction process to supply plant and equipment. The volumes and source of fuel are not confirmed at this stage however it would be sourced from a licenced supplier. Fuel will also be required to supply power generators prior to the establishment of the permanent power supply facilities.

EIA ADDENDUM 4
EARTHQUAKE IMPACT MITIGATION

Prepared by:

PANCA AMARA UTAMA

January 2013

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1 PROJECT INTRODUCTION

PT PANCA AMARA UTAMA (PAU) plans to build a petro-chemical/fertilizer plant by utilizing natural gas from Donggi – Senoro gas field, Central Sulawesi, supplied by JOB Pertamina-Medco E&P Tomori Sulawesi. The natural gas will be processed to produce ammonia, the main material for producing urea fertilizer as well as raw material for various chemical products. This project is parallel to the government's program for maximizing domestic utilization of natural gas produced in Indonesia, and at the same time, strengthening security of national food supply by enhancing production of fertilizer. An ammonia plant as a petrochemical plant will involve big investment since it needs unique technology and sophisticated project execution as well as proper planning management from the start of its development.

PAU is currently communicating with the International Finance Corporation (IFC) regarding possible loan and equity financing.

This report was composed as an addendum to the Environmental Impact Analysis as a requirement of IFC. Considering that Sulawesi is an earthquake prone area, an addendum is needed to explain earthquake mitigation methods devised to ensure the process and storage safety.

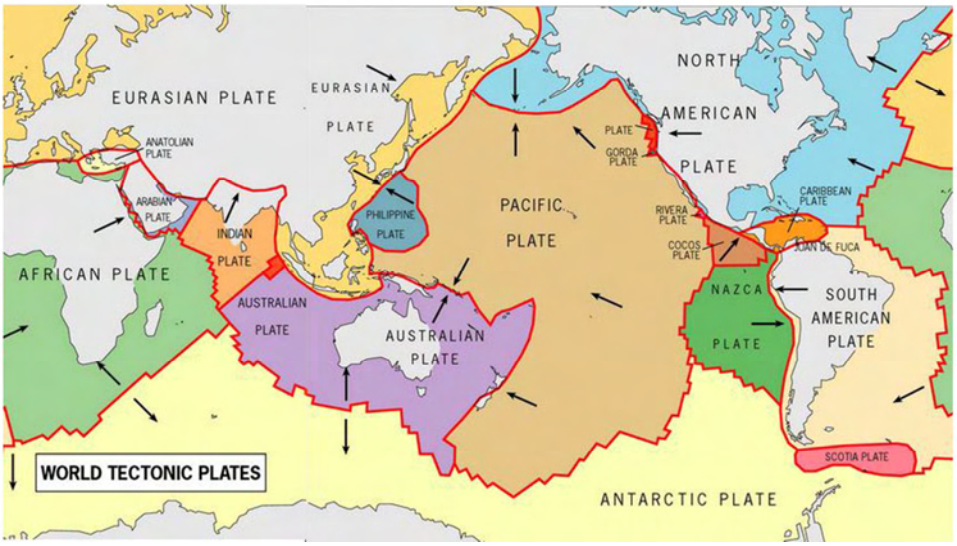
2 *SEISMICITY*

2.1 *INTRODUCTION TO SEISMICITY*

The outer layers of the Earth are divided into lithosphere and asthenosphere. Lithosphere is the crust and the uppermost mantle of the Earth, which constitute the hard and rigid outer layer of the Earth. The lithosphere is underlain by the asthenosphere, the weaker, hotter, and deeper part of the upper mantle.

The lithosphere is broken up into tectonic plates, each plate extends on a depth of about 80 kilometers. There are seven or eight major plates (depending on how they are defined) and many minor plates (Figure 1).

Figure 1 World Tectonic Plates



The location where two plates meet is called a *plate boundary*, and plate boundaries are commonly associated with geological events such as earthquakes and the creation of topographic features such as mountains, volcanoes, mid-ocean ridges, and oceanic trenches.

There are three types of boundary:

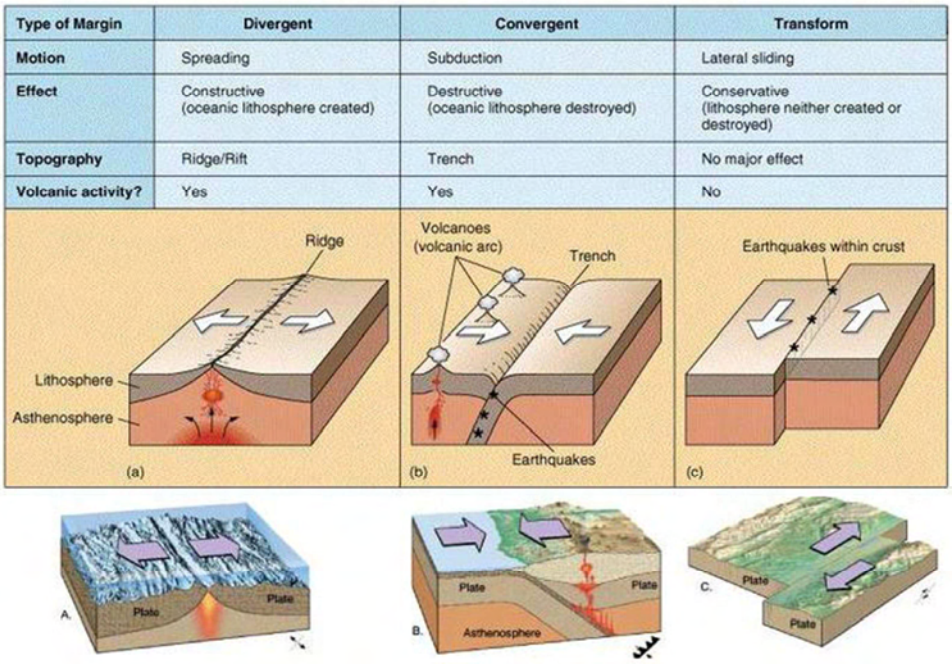
1. *Divergent boundaries (Constructive)* occur where two plates slide apart from each other.

2. *Convergent boundaries (Destructive)* (or *active margins*) occur where two plates slide towards each other commonly forming either a subduction zone (if one plate moves underneath the other) or a continental collision (if the two plates contain continental crust). Deep marine trenches are typically associated with subduction zones, and the basins that develop along the active boundary are often called "foreland basins".

3. *Transform boundaries (Conservative)* occur where plates slide or, perhaps more accurately, grind past each other along transform faults. The relative motion of the two plates is either sinistral (left side toward the observer) or dextral (right side toward the observer).

4. *Plate boundary zones* occur where the effects of the interactions are unclear and the boundaries, usually occurring along a broad belt, are not well defined, and may show various types of movements in different episodes.

Figure 2 Tectonic Plates Boundaries Detailed



The plates have moved with respect to one another. Generally, it is accepted that tectonic plates are able to move because of the relative density of oceanic lithosphere and the relative weakness of the asthenosphere. Dissipation of heat from the mantle is acknowledged to be the original source of energy driving plate tectonics, through convection or large scale upwelling and doming.

An earthquake is the result of a sudden release of energy in the Earth's crust that creates seismic waves.

Moving plates of the Earth's surface provide mechanisms for a great deal of the seismic activity of the world. Collisions between adjacent lithospheric plates, destruction of the slab-like plate as it descends or *subducts* into a dipping zone beneath island arcs, and spreading along mid oceanic ridges are all mechanisms that produce significant straining and fracturing of crustal rocks.

Tectonic earthquakes occur anywhere in the earth where there is sufficient stored elastic strain energy to drive fracture propagation along a fault plane. The sides of a fault move past each other smoothly and aseismically only if there are no irregularities or asperities along the fault surface that increase the frictional resistance. Most fault surfaces do have such asperities and this leads to a form of stick-slip behaviour. Once the fault has locked, continued relative motion between the plates leads to increasing stress and therefore, stored strain energy in the volume around the fault surface. This continues until the stress has risen sufficiently to break through the asperity, suddenly allowing sliding over the locked portion of the fault, releasing the stored energy. This energy is released as a combination of radiated elastic strain seismic waves, frictional heating of the fault surface, and cracking of the rock, thus causing an earthquake. This process of gradual build-up of strain and stress punctuated by occasional sudden earthquake failure is referred to as the elastic-rebound theory. It is estimated that only 10 percent or less of an earthquake's total energy is radiated as seismic energy. Most of the earthquake's energy is used to power the earthquake fracture growth or is converted into heat generated by friction.

Earthquakes are caused mostly by rupture of geological faults. An earthquake's point of initial rupture is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

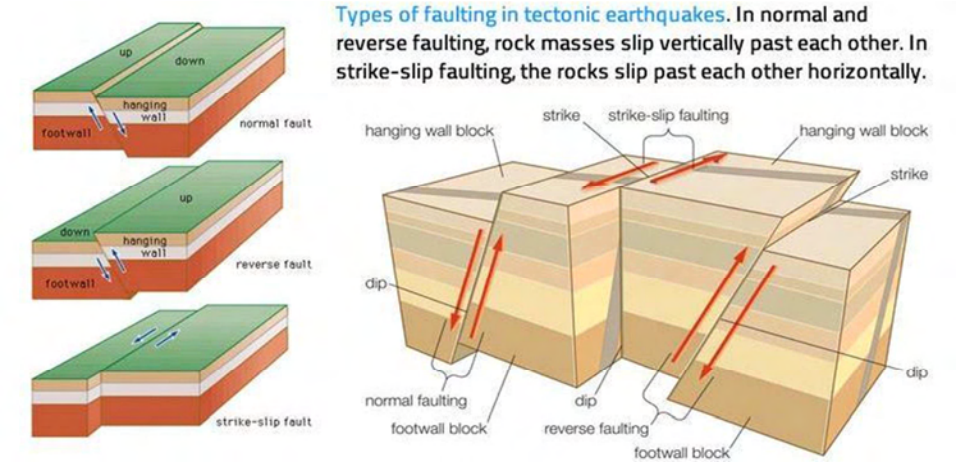
There are three main types of fault, all of which may cause an earthquake: normal, reverse (thrust) and strike-slip. Normal and reverse faulting are examples of dip-slip, where the displacement along the fault is in the direction of dip and movement on them involves a vertical component. Normal faults occur mainly in areas where the crust is being extended such as a divergent boundary. Reverse faults occur in areas where the crust is being shortened such as at a convergent boundary. Strike-slip faults are steep structures where the two sides of the fault slip horizontally past each other; transform boundaries are a particular type of strike-slip fault. Many earthquakes are caused by movement on faults that have components of both dip-slip and strike-slip; this is known as oblique slip.

Reverse faults, particularly those along convergent plate boundaries are associated with the most powerful earthquakes, including almost all of those of magnitude 8 or more. Strike-slip faults, particularly continental transforms can produce major earthquakes up to about magnitude 8. Earthquakes associated with normal faults are generally less than magnitude 7.

Earthquakes are measured using observations from seismometers. The moment magnitude is the most common scale on which earthquakes larger than approximately 5 are reported for the entire globe. The more numerous earthquakes smaller than magnitude 5 reported by national seismological observatories are measured mostly on the local magnitude scale, also referred to as the Richter scale. These two scales are numerically similar over their

range of validity. Magnitude 3 or lower earthquakes are mostly almost imperceptible or weak and magnitude 7 and over potentially cause serious damage over larger areas, depending on their depth. The largest earthquakes in historic times have been of magnitude slightly over 9, although there is no limit to the possible magnitude. The most recent large earthquake of magnitude 9.0 or larger was a 9.0 magnitude earthquake in Japan in 2011 (as of October 2012), and it was the largest Japanese earthquake since records began. Intensity of shaking is measured on the modified Mercalli scale. The shallower an earthquake, the more damage to structures it causes, all else being equal.

Figure 3 Fault Type



At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacement of the ground. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Earthquakes can also trigger landslides, and occasionally volcanic activity.

2.2 *SEISMICITY OF INDONESIA*

Indonesia is located at convergent of three major tectonic plates i.e. Australian Plate, Pacific Plate and Eurasian Plate and in the Pacific "Ring of Fire" where earthquakes and volcanic activity are common.

Figure 4 Tectonic Plate Convergence

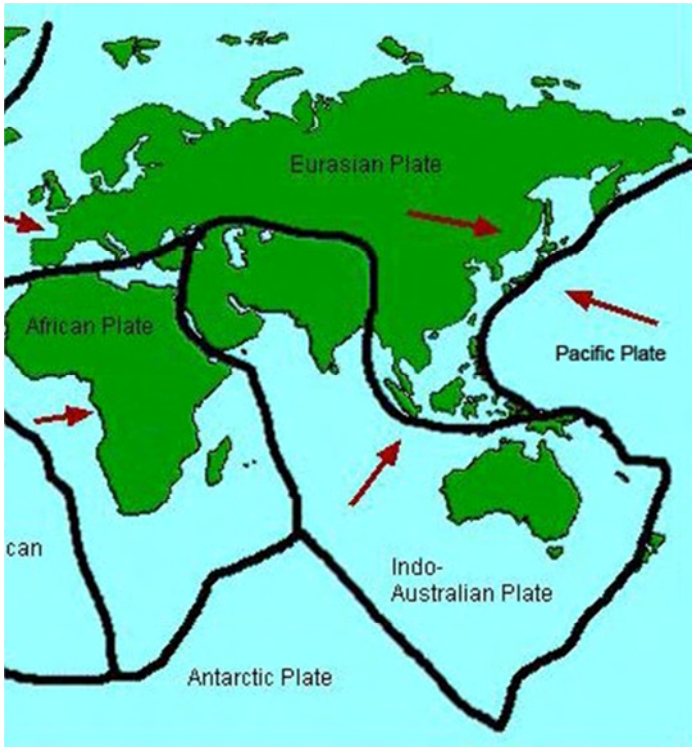


Figure 5 Active Volcanoes, Plate Tectonics, and the 'Ring of Fire'

Table 1 shows a list of earthquake in Indonesia 1917 – 2010, 56 earthquakes were recorded.

Table 1 List of Earthquake in Indonesia 1917 – 2010

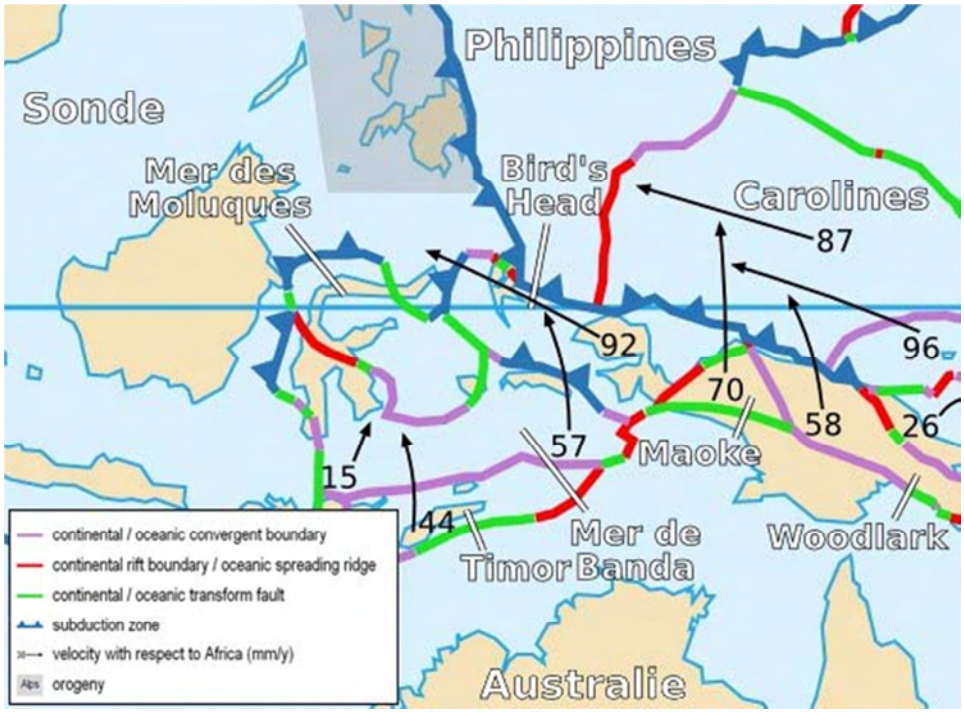
Date	Earthquake Notes
1/20/1917	Bali, Indonesia Fatalities 1,500
2/1/1938	Banda Sea, Indonesia - M 8.5
1/24/1965	Sanana, Indonesia (Ceram Sea) - M 7.6 Fatalities 71
6/25/1976	Papua, Indonesia - M 7.1 Fatalities 5,000
12/12/1992	Flores Region, Indonesia - M 7.8 Fatalities 2,500
6/4/2000	Southern Sumatera, Indonesia - M 7.9 Fatalities 103
10/10/2002	Irian Jaya, Indonesia - M 7.6 Fatalities 8
11/2/2002	Northern Sumatera, Indonesia - M 7.4 Fatalities 3
5/26/2003	Halmahera, Indonesia - M 7.0 Fatalities 1
1/28/2004	Seram, Indonesia - M 6.7
2/5/2004	Irian Jaya, Indonesia - M 7.0 Fatalities 37
2/7/2004	Irian Jaya, Indonesia - M 7.3
7/25/2004	Southern Sumatra, Indonesia - M 7.3
11/11/2004	Kepulauan Alor, Indonesia - M 7.5 Fatalities 34
11/26/2004	Papua, Indonesia - M 7.1 Fatalities 32
12/26/2004	Sumatra-Andaman Islands - M 9.1 Fatalities 227,898
1/1/2005	Off the West Coast of Northern Sumatra - M 6.7
2/19/2005	Sulawesi, Indonesia - M 6.5
2/26/2005	Simeulue, Indonesia - M 6.8
3/2/2005	Banda Sea - M 7.1
3/28/2005	Northern Sumatra, Indonesia - M 8.6 Fatalities 1,313
4/10/2005	Kepulauan Mentawai Region, Indonesia - M 6.7
5/14/2005	Nias Region, Indonesia - M 6.7
5/19/2005	Nias Region, Indonesia - M 6.9
7/5/2005	Nias Region, Indonesia - M 6.7
11/19/2005	Simeulue, Indonesia - M 6.5
1/27/2006	Banda Sea - M 7.6
3/14/2006	Seram, Indonesia - M 6.7 Fatalities 4
5/16/2006	Nias Region, Indonesia - M 6.8
5/26/2006	Java, Indonesia - M 6.3 Fatalities 5,749
7/17/2006	South of Java, Indonesia - M 7.7 Fatalities 730
1/21/2007	Molucca Sea - M 7.5 Fatalities 4
3/6/2007	Southern Sumatra, Indonesia - M 6.4 Fatalities 67
7/26/2007	Molucca Sea - M 6.9
8/8/2007	Java, Indonesia - M 7.5
9/12/2007	Southern Sumatra, Indonesia - M 8.5 Fatalities 25
9/12/2007	Kepulauan Mentawai region, Indonesia - M 7.9
9/20/2007	Southern Sumatra, Indonesia - M 6.7
10/24/2007	Southern Sumatra, Indonesia - M 6.8
11/25/2007	Sumbawa Region, Indonesia - M 6.5 Fatalities 3
2/20/2008	Simeulue, Indonesia - M 7.4 Fatalities 3
2/25/2008	Kepulauan Mentawai region, Indonesia - M 7.2
11/16/2008	Minahasa, Sulawesi, Indonesia - M 7.4 Fatalities 6
1/3/2009	Near the North Coast of Papua, Indonesia - M 7.7 Fatalities 5
1/3/2009	Near the North Coast of Papua, Indonesia - M 7.4
2/11/2009	Kepulauan Talaud, Indonesia - M 7.2
8/16/2009	Kepulauan Mentawai region, Indonesia - M 6.7
8/28/2009	Banda Sea - M 6.9
9/2/2009	Java, Indonesia - M 7.0 Fatalities 81

Date	Earthquake Notes
9/30/2009	Southern Sumatra, Indonesia - M 7.5 Fatalities 1,117
10/1/2009	Southern Sumatra, Indonesia - M 6.6
10/24/2009	Banda Sea - M 6.9
11/8/2009	Sumbawa region, Indonesia - M 6.6 Fatalities 2
4/7/2010	Banyak Island, Sumatera, Indonesia - M 7.8
5/9/2010	Northern Sumatra, Indonesia - M 7.2
10/25/2010	West Coast of Sumatera, Indonesia - M 7.7

2.3 *SEISMICITY OF SULAWESI*

The East Arm of Sulawesi, where Kabupaten Banggai located, is in the Molucca Sea Microplate (Molucca Sea Plate). The Molucca Sea Plate (*Mer des Moluques*, in French) was theorised to be a small tectonic plate carrying northern Sulawesi, the Molucca Sea and a portion of the Banda Sea in a region littered with numerous small plates. The theory suggested a subduction zone lies along its northern border with the Sunda Plate. A small divergent boundary exists along the Sulawesi part of the border with the Banda Sea Plate and transitions into a convergent boundary as it bisects the Banda Sea; the rest of the borders being transform boundaries.

Figure 6 Molucca Sea Plate



More recent scientific studies suggest the Molucca Sea Plate has been totally subsumed by the Halmahera Plate and the Sangihe Plate, so that no portion of the Molucca Sea Plate remains exposed to the Earth's surface.

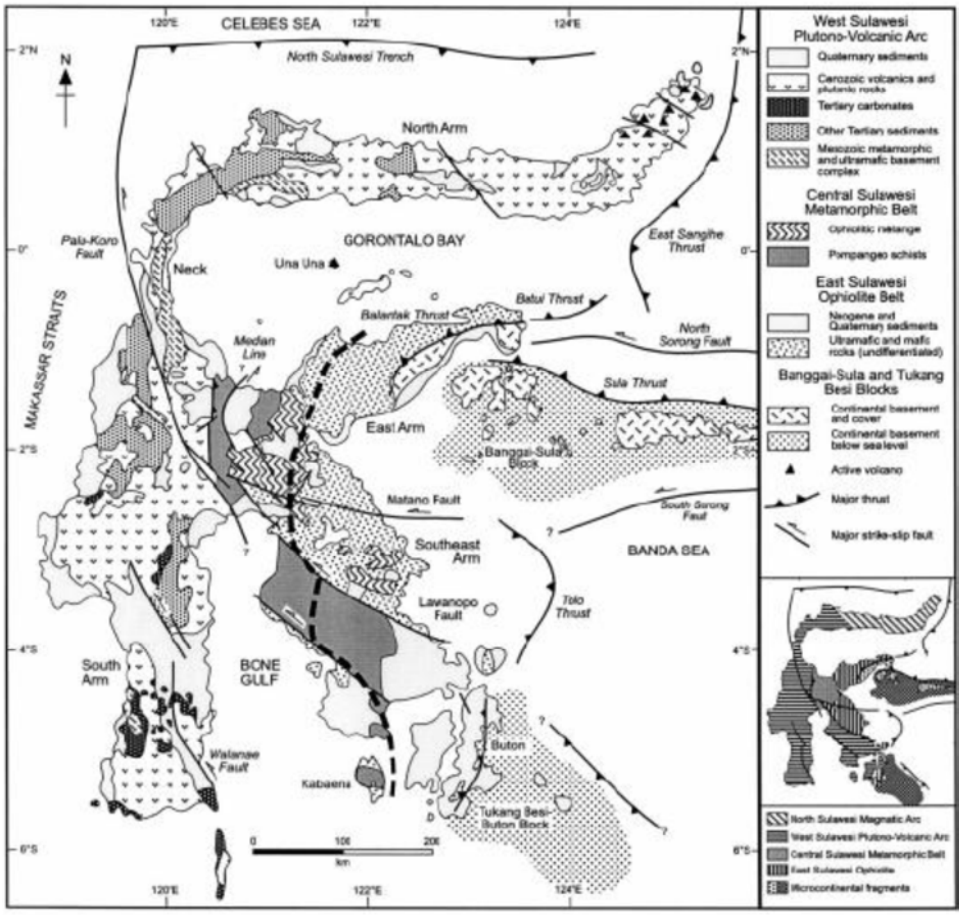
Convergence of three major tectonic plates i.e. Australian Plate, Pacific Plate and Eurasian Plate, especially in Sulawesi, Balantak Thrust, Batui Thrust, East Sangihe Thrust, North Sorong Fault, Sula Thrust and Matano Fault are potential seismic generator for Kabupaten Banggai and surrounding (Figure – 7).

Based on *South East Asia Association of Seismology and Earthquake* (SEASEE) report, some earthquakea in Sulawesi are shown in Table 2.

Table 2 List of Earthquake in Sulawesi

Date	Earthquake Notes
12/29/1828	Bulukumba, South Sulawesi, VIII – IX MMI.
7/30/1907	Lemo, Central Sulawesi, VIII MMI.
12/1/1927	Donggala, Central Sulawesi, VII MMI.
5/20/1938	Teluk Tomini, Central Sulawesi, VIII – IX MMI.
12/22/1939	Sulawesi Tengah, VIII MMI.
4/29/1960	Una-Una, Central Sulawesi, VII – VIII MMI.
4/11/1968	Tinabung, South Sulawesi, VII – VIII MMI.
8/14/1968	Tambu, Central Sulawesi, VII – VIII MMI.
2/23/1969	Majene, South Sulawesi, VIII MMI.
9/6/1972	Mamuju, South Sulawesi, IV MMI.
8/23/1982	Una-Una, Central Sulawesi, VII MMI.
10/16/1983	Toli-Toli, CentralSulawesi, VI MMI.
10/25/1983	Palu, Central Sulawesi, VII MMI.
1/8/1984	Mamuju, South Sulawesi, VII MMI.
9/28/1997	Pare-Pare and Pinrang, South Sulawesi, VI – X MMI.
5/4/2000	Banggai, South Sulawesi, VI – VII MMI. Tsunami 3m high was reported in Totikum, east side of Banggai Island, but at the same time no report for Uso area.

Figure 7 Sulawesi Tectonic Map



3 PREVIOUS ANALYSIS

3.1 SEISMIC HAZARD ANALYSIS

Seismic Hazard Analysis had been done in 2005 by PT Rekagriya Sarana, Bandung, for PT PANCA AMARA UTAMA. The area where the Plant Site is situated thus falls in Zone 5 of Indonesian Standard for Seismic Design, SNI 03-1726-2002, with Peak Ground Acceleration (PGA) 0.25g.

3.2 LIQUEFACTION

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking. Liquefaction occurs in saturated granular soils, that is, granular soils in which the space between individual particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the particles themselves are pressed together. Prior to an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other and then the soils lose their supporting capability because no friction between soil particles.

The resistance of the granular soils or cohesionless soil to liquefaction will depend on the density of the soil, confining stresses, soil structure (fabric, age and cementation), the magnitude and duration of the cyclic loading, and the extent to which shear stress reversal occurs.

4 MITIGATION

As result of Seismic Hazard Analysis, seismic zone for Plant Site area is SNI Zone 5 with PGA 0.25g. However, PAU will use much more conservative approach and the design for buildings and structures will use the most stringent criteria in accordance with Indonesian Standard for Seismic Design, SNI 03-1726-2002, Zone 6 with PGA = 0.3g and for all process building and structures including Ammonia Storage, UBC-1997 Zone 4 with PGA =0.4g will be used.

The liquefaction potential will be studied and analysis by expert and then foundations and structures will be designed accordingly.

Although no tsunami was reported at Uso area but 3m high at Totikum, east side of Banggai Island, however the Plant Site will be built at elevation + 9.00 m.

Cumulative Impact Assessment

Prepared for:
PT Panca Amara Utama

January 2013

Delivering sustainable solutions in a more competitive world

ERM

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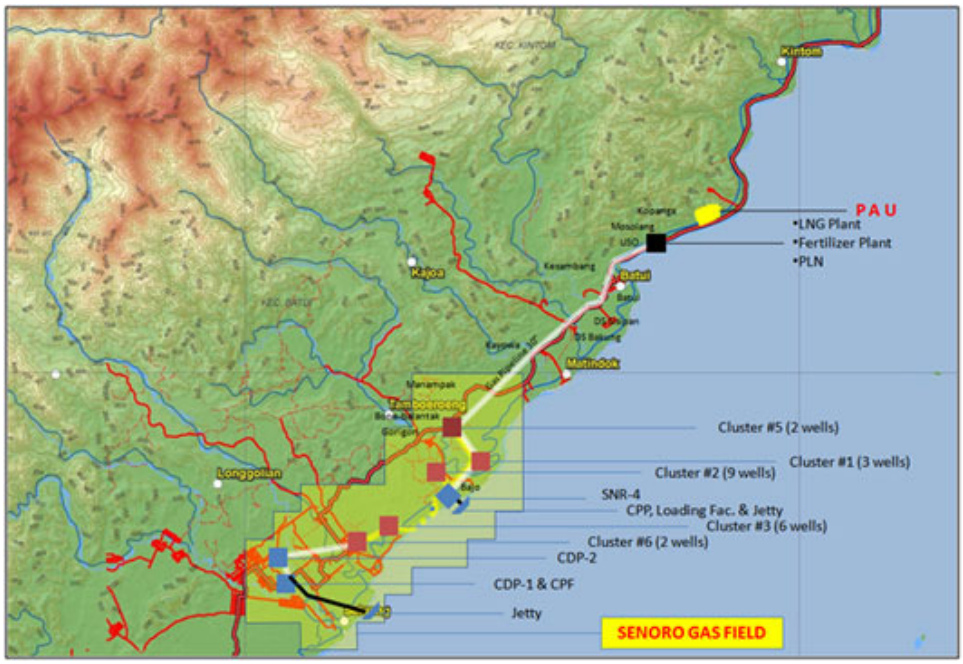
1 INTRODUCTION

PT Panca Amara Utama (PAU) is proposing to build a 700,000 tonnes per annum (TPA) Ammonia production facility near the village of Uso in the Banggai District, Central Sulawesi (Figure 1). The production facility location is on the East coast of Sulawesi, on the eastern boundary of the Donggi Senoro LNG (DSLNG) facility (Figure 1).

Figure 1 Site Location



In accordance with Indonesian Government Regulations an Environmental Impact Assessment (EIA) was prepared for the project and was granted approval on 8 October 2012. The Indonesian EIA process is known as AMDAL and includes the Environmental Impact Analysis (ANDAL), Environmental Management Plan (RKL) and Environmental Monitoring Plan (RPL).

PAU is now seeking funding from the IFC for the future construction of the project. The IFC recently undertook a review of the Project ANDAL and RKL/RPL and recommended a number of further actions to ensure the project is fully compliant with IFC's Performance Standards. These actions were listed in a Terms of Reference (ToR) which outlined Seven EIA addendums which were required to be prepared for the project.

ERM has significant experience in the region and with the requirements of the IFC Performance Standards and EHS Guidelines, and was engaged to prepare draft EIA addendums to address the gaps summarized by the IFC within the ToR.

The IFC ToR identified that a Cumulative Impact Assessment (CIA) would be required (EIA addendum 5). This report has been prepared to consider cumulative impacts that may occur as a result of the PAU project and other projects occurring within the region.

1.1 BACKGROUND TO CUMULATIVE IMPACT ASSESSMENT

IFC Performance Standard 1 identifies cumulative impacts as those resulting from the incremental impact, on areas or resources used or directly impacted by the project, from other existing or reasonably defined projects.

Paragraph GN38 of Guidance Note 1 on Social and Environmental Assessment and Management Systems (updated on January 1, 2012) discusses the consideration of cumulative impacts as follows:

… GN38 *'where the project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, the risks and impacts identification process should include an assessment of the combined effects of the multiple components associated with the project (e.g., quarries, roads, associated facilities) in the context of the project's area of influence. The determination of the project's area of influence should take into consideration the findings and results of any related cumulative, regional, sectoral, or strategic environmental assessments that may have been undertaken by a government authority. In situations where multiple projects occur in, or are planned for, the same geographic area, as described above, it may also be appropriate for the client to conduct a Cumulative Impact Assessment (CIA) as part of the risks and impacts identification process. In certain instances, however, it may not be practical or appropriate for the CIA to be performed by the client or individual project developers: for example (i) impacts from multiple existing and future third party projects or developments over a large area that may cross jurisdictional boundaries (e.g., watershed, airshed, forest), (ii) effects that may have occurred or will occur over a longer period of time, (iii) impacts on specific ecosystem components or characteristics that will increase significance and/or irreversibility when evaluated in the context of a series of existing or future third party projects or developments, and not just in the context of effects associated with the project under review…'*

The objective of the cumulative impact assessment is to identify those environmental and/or socio-economic aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s).

In conducting this cumulative impact assessment, the PAU Ammonia facility will be considered in the context of other known developments occurring within the region and the environmental and social impacts of these combined activities will be considered.

This cumulative impact assessment will consider the major known projects currently occurring within the region. These are primarily related to the Matindok upstream development and also the Donggi Senoro LNG project.

The following projects will be considered in the context of this cumulative impact assessment;

- PAU Ammonia development (the Project);
- DSLNG Downstream construction and operations;
- Matindok Gas Project JOB Senoro-Toili Upstream Gas operation – incorporating central processing facilities supplying gas to DSLNG (and PAU), condensate shipping and Senoro gas fields production activities;
- The Road Re-routing Project; and
- Condensate pipeline re-routing project.

The cumulative environmental and social impacts of these developments will be addressed further within this report. At this point in the project development it is difficult to identify any additional proposed developments or facilities that would be considered to be associated. Aside from the facilities listed, it is currently unknown if there are additional proposed projects that would significantly affect the findings of this cumulative impact assessment. If such projects do become apparent, then PAU will review the need for any further consideration of cumulative impacts, commensurate with their level of operational influence or control.

1.2 SCOPE OF THIS REPORT

This draft report has been developed to provide an understanding of potential cumulative impacts. Social and environmental impacts for the PAU and other individual projects identified within this report have been considered within the relevant Indonesian approval documents. Further to this, ERM have been responsible for preparing a Biodiversity EIA addendum and a Social Impact Assessment (SIA) to address gaps between the Indonesian ANDAL and IFC PS requirements, identified by the IFC.

The IFC ToR prepared for the PAU projects provided detailed requirements for completing a CIA. ERM have reviewed this and a complete CIA addressing these requirements was not possible with the data and within the timeframe available.

This report will use the available ANDAL information from the various projects considered and also ERM's understanding of the region and synthesise these into an assessment that considers potential cumulative impacts. The environmental and social aspects identified from the PAU

ANDAL, and also the ERM EIA addendums, have been used as the basis for screening and considering potential cumulative impacts. Where relevant further follow-up actions have been recommended or data limitations which affect the CIA findings noted. A detailed methodology is provided at Section 3.

1.3 LIMITATIONS

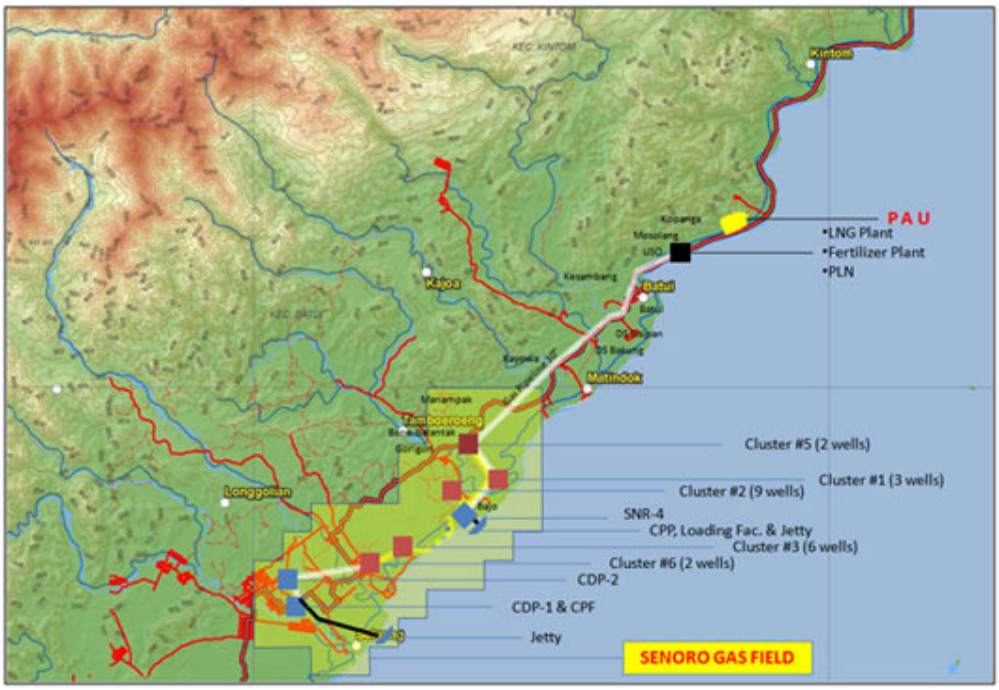
As noted above, there have been time and information constraints which have meant that the detailed CIA requirements outlined within the IFC ToR could not be fulfilled. However, ERM have used their understanding of the project (and others within the region) to screen and consider potential cumulative impacts.

Site specific data on some marine and terrestrial biodiversity information and also social data is lacking while there are also some gaps in the ANDAL identification and assessment of project impacts. Where possible, ERM has used its professional judgment in considering potential cumulative impacts. In some instances it has been difficult to assess the cumulative impact, and in this case the individual project impacts and proposed management measures have been considered in isolation and a finding made as to the likelihood of significant cumulative impacts occurring.

2 *PROJECTS CONSIDERED CONISIDERED*

The following projects have been considered as part of this cumulative impact assessment. They represent the major projects that are currently understood to be occurring within the area. A map of these project locations is shown at Figure 2.

Figure 2 Projects Occurring Within the Region



2.1 *PAU AMMONIA PROJECT*

PT Panca Amara Utama (PAU) is proposing to build a 700,000 tonnes per annum (TPA) Ammonia production facility near the village of Uso in the Banggai District, Central Sulawesi (Figure 2). The production facility is located on the East coast of Sulawesi, on the eastern boundary of the Donggi Senoro LNG (DSLNG) facility (Figure 2).

A detailed project description is provided within the ANDAL document. Key components of the project include the following:

- Construction of an Ammonia production facility covering an area of approximately 22 ha and a construction camp covering approximately 18ha. A nearshore laydown area will also cover approximately 2ha.
- Feed gas is to be sourced from upstream fields routed to the Ammonia production facility via a pipeline connecting the adjacent DSLNG facility to upstream onshore gas fields;

- All freshwater requirements for the project will be supplied via a seawater desalination plant constructed for the project;
- A wastewater treatment plant will be constructed for the project and all grey water and production waste water is to be treated prior to discharge via an outfall constructed for the project;
- Process cooling water will also be discharged separately to the wastewater stream;
- Onsite runoff water is to be stored within retention ponds; and
- A construction jetty and a 80 meter cargo jetty will be constructed for Ammonia export.

In accordance with Indonesian Government Regulations an Environmental Impact Assessment (EIA) was prepared for the project and was granted approval on 8 October 2012. The Indonesian EIA process is known as AMDAL and includes the Environmental Impact Analysis (ANDAL), Environmental Management Plan (RKL) and Environmental Monitoring Plan (RPL).

The Project layout is provided at Figure ***3.***

Figure 3 Project layout

2.2 *DONGGI-SENORO LNG PROJECT*

The Donggi Senoro LNG Project (DSLNG Project) involves the construction and operation of an onshore Liquefied Natural Gas (LNG) Plant and related marine facilities, located nearby Luwuk, in the central Sulawesi Provence of Indonesia. The DSLNG site is located to the west of the PAU site.

The DSLNG Project was initially approved through an AMDAL undertaken for the downstream LNG facilities and the upstream Matindok gas field (PPGM 2008).

The natural gas for the DSLNG Project will be sourced from upstream gas fields consisting of;

I. Five onshore gas fields that are part of the Matindok Block, 100% owned by Pertamina, and

II. The Joint Operating Body (JOB) Senoro-Toili onshore natural gas field owned by Pertamina (50%), Medco (30%) and Mitsubishi Corporation (20%).

The downstream project is described in detail within the project AMDAL (PPGM (2008) and consists of the following key components;

- Gas liquefication and storage facilities;
- Marine export facility (including marine terminal and docking facilities of LNG tankers);
- Grey water and process water marine discharges; and
- Worker offices and accommodation facilities during construction and operations.

2.3 *UPSTREAM MATINDOK DEVELOPMENT*

Matindok Gas Development was considered as part of the PPGM (2008) AMDAL, with a subsequent revision for an increase in gas production. This project will produce gas from 5 natural gas fields, namely Donggi, Matindok, Maleoraja, Sukamaju, and Minahaki gas fields.

The development of Matindok Gas Project, comprises of the following components:

- 5 natural gas fields, including: gas field of Donggi, Matindok, Maleoraja, Sukamaju, and Minahaki. Production capacity of these gas field is 65 MMSCFD;
- Operation of Blok Stations, Manifold Station, Gas Processing Facility (GPF) AGRU (Acid Gas Removal Unit), SRU (Sulphur Recovery Unit); and

- The AMDAL for the Matindok development (PPGM 2008), included a gas pipeline connecting the Upstream Donggi field and Senoro CPF which was initially routed along the coast. Since this time a UKL/UPL has been approved to re-route the pipeline for 2.8 km along the ROW of Luwuk – Toili Provincial Road through Bangkiriang Animal Conservation in Banggai Regency.

2.4 JOB SENORO-TOILI PROJECT

The JOB Senoro-Toili project comprises the Senoro gas field and onshore pipeline (Senoro-Kintom), connecting to the Matindok pipeline and continuing to the DSLNG facility.

Generally, JOB Senoro-Toili upstream gas operation development comprises:

- Central processing facilities (CPF) with a maximum operation capacity of ± 310 MMSCFD (250 MMSCFD will supply DSLNG, generated from 2 trains), and supporting facilities for condensate processing, separation of H_2S concentration and produced water management.
- Production and gas use details are 230 MMSCFD of gas which meets gas sales specification to be transmitted to buyer in Kintom Sub-district, 10 MMSCFD for own use, and 10,000 BCPD of condensate (side product) for sales through shipping.
- Five clusters of exploration wells which consist of three re-entry exploration wells (namely Senoro #1, Senoro #2, and Senoro #3 wells), one appraisal drilling of well (Senoro #4) and newly drilled exploration wells (Senoro #5 to Senoro #9).
- Five cluster stations, including installation of flow line manifold and trunk line with diameter of 8" from cluster station to CPF at Senoro #2.
- Gas pipeline installation (diameter 24") from CPF to Kintom length ± 40 km.
- Condensate pipe installation (diameter of 8") from Senoro CPF to the jetty for as long as ± 3 km and the construction of reservoir facility (tank) of 2 x 60,000 bbls condensate. The condensate will be shipped to a buyer outside Central Sulawesi area.

2.5 ROAD RE-ROUTING PROJECT

The Banggai Local Government (Pemda Banggai) is currently revising the existing Area Master Plan and Industrial Area Master Plan for Banggai Regency. Consequently the existing Luwuk-Batui provincial road (which currently connects Tangkiang village in Kecamatan Kintom to Uso village in Kecamatan Batui) needs to be relocated by construction of a new Lingkar-Tangkiang-Uso road.

The proposed Road Re-routing Project (RRP) includes the re-routing of the inter-provincial road (Luwuk-Batui road) connecting the Matindok and Senoro-Toili gas

field facilities. This activity will affect the transportation routes between Morowali Regency and Banggai Regency.

A UKL/UPL (environmental management and monitoring plan) has been prepared and approved for this road diversion and the cut and fill land clearing activities. As this project requires only a UKL-UPL document, the RRP is considered a low-risk category project (category B).

ERM understands that construction of the RRP has commenced.

3 CONSIDERATION OF CUMULATIVE IMPACTS

The assessment of cumulative impacts has been considered by using the existing environmental and social impact assessment findings for the projects described at Chapter 2.

The Impact assessment methodology is described below while the results of the environmental and social cumulative impact assessment are presented at Chapter 4. The cumulative impact assessment tables are provided within the Social and environmental assessment chapters. These tables form the basis of the consideration of cumulative impacts and also provide a high level summary of proposed mitigation measures.

There are still some information gaps regarding the extent of potential impacts associated with the PAU Ammonia project, particularly in relation to potential impacts to biodiversity (including coral and the maleo bird), marine quality and some social aspects. These have been considered further within the Biodiversity (Addendum 1) and SIA EIA (Addendum 7) mentioned previously.

This draft cumulative impact assessment is designed to serve as a high level screening exercise to identify if any significant environmental and social risks are apparent and require further mitigation. It is intended that a final draft be prepared following review by the IFC.

3.1 IMPACT ASSESSMENT METHODOLOGY

The following steps were taken in considering the cumulative impacts of the project and the other projects known to be occurring within the area. The cumulative impact assessment summary tables which support this assessment are provided at *Annex A* ;

- A summary of the PAU Ammonia Project and associated project activities that are likely to cause impact to the environmental and social aspects identified for the PAU project were compiled (based on existing approval documents);
- Based on ERM's review of the other project reports from the area, an assessment was made as to whether the impact identified for the PAU was also relevant to the other projects;
- The ongoing RKL/RPL or UKL/UPL monitoring commitments for each environmental aspect and for each project were also complied;

Using this information the cumulative impacts of the project and relevant projects within the region were considered by using the assessment methodology described below. The consideration of potential cumulative impacts also assumes that the mitigation and management measures required as part of the RKL/RPL

commitments, or proposed as part of any follow-up environmental or social studies will be implemented.

Using this approach it is possible to screen potential impacts and identify whether environmental and social aspects relevant to each project are being adequately managed. This is then used as the basis for considering the significance of any cumulative impacts that may potentially occur.

Where potential cumulative impacts are identified as **Major**, further mitigation measures or follow-up actions have been recommended.

Impact significance can be assessed by comparing the potential severity of the impact against the likelihood of the impact occurring. The severity of the impact is assessed based on a number of criteria including:

- **Duration** – if the combined impact is short-term, medium-term or long-term;
- **Extent** – the number of people/ communities affected, or the extent of environmental disturbance;
- **Sensitivity of the receptor/ Ability to Adapt** – the extent to which those communities, groups or the environment impacted are able to adapt to the change; and
- **Outcome** – the consequence of the cumulative impact in terms of scope and scale.

Likelihood categories were divided into the following:

- **Low likelihood** - Not heard of in the oil and gas industry in Indonesia
- **Moderate likelihood** - Has occurred in the oil and gas industry in Indonesia; and
- **High likelihood** - Has occurred during construction of the DSLNG project or associated facilities. .

The existing proposed management regime was also taken into account.

The overall significance of the impacts was therefore determined by using the following matrix (*Table 1).* Where major impacts or above were identified further potential mitigation or management measures have been suggested.

Table 1 Significance matrix

	Likelihood		
Severity	***Low***	***Moderate***	***High***
Low	Insignificant	Minor	Minor
Medium	Minor	Moderate	Moderate
High	Moderate	Major	Major
Positive			

The Cumulative impact assessment Tables are is located at *Annex A*, while a summary of the impact findings are provided at Chapter 4 4.

4 CUMULATIVE IMPACT ASSESSMENT FINDINGS

The cumulative environmental and social assessment tables are provided within each section. These tables draw together a summary of project activities likely to impact relevant environmental and social aspects and also the existing proposed management and monitoring regime. The table also shows the results of the impact assessment, utilising the matrix described at Chapter 3.1.

A summary of management measures to be implemented for each project is provided within the Environment and Social Management Plan (EMMP), prepared under a separate cover.

4.1 SOCIAL CUMULATIVE IMPACT ASSESSMENT

The social cumulative impact assessment is presented at *Annex A*, a summary of findings in relation to each social aspect is provided within this Chapter. The proposed management and mitigation measures are described either within the PAU project RKL/RPL or within a subsequent Social Impact Assessment completed for the project. Management measures for the DSLNG project and others, are described within the Project RKL/RPL or other documents and plans that have been prepared.

The highest impact was assessed as being Moderate Negative. At this stage it is considered that the potential cumulative impacts are likely to be adequately managed through existing and recommended management actions for the PAU Project and also considering those that are currently in place for the DSLNG project.

4.1.1 *Impact to Local Economic Development*

The Project pre-construction, construction, and operation create direct and indirect employment opportunities which are likely increase local community income, while within the relatively similar time and area, DSLNG, the upstream development and RRP are also developed and create similar opportunities. As such, the cumulative Project impacts to increased community income from employment opportunity assessed as **positive**.

The construction and operation of the Project facilities (i.e. main plant, power plant, worker camp, workshop, administrative office, warehouse, jetty)and also other projects within the area will also create demand for goods and services (e.g. via on-going maintenance, transportation, catering, cleaning service, security services). Further, non-local worker and in-migrants spend locally will also increase demand for goods and services. These are potential for the existing local business and entrepreneurs to expand and grow and for new businesses to develop, formally and informally (directly and indirectly). Given this context, the cumulative Project impacts to increased community income from business opportunity assessed as **positive**.

In addition, the Project land compensation encourages claimants reinvesting into the area, as the compensation is often above the land market value and has considered the replacement and livelihood restoration cost. The compensation process was based on voluntary sale and purchase process; the value to be agreed with the affected land owner. This was followed by a commitment that the employment opportunities will be prioritized to be provided for the land acquisition affected people in accordance with the job function requirements. It is also known that DSLNG land compensation was conducted since 2007, while RRP land compensation is currently on-going since 2011. As such, the cumulative impact of land compensation to increased community income is identified as being **positive**. At the same time, it is noted that land acquisition may have a **Moderate Negative** impact on local communities as a result of compensation discrepancy and changes to land use and livelihood patterns.

The impact assessment identified high community expectation towards local labour employment and business development from the Project, as well as from DSLNG and Matindok-Senoro upstream project. They are expected to be able to increase community income and enhance quality of life while there are limitations for the Project to recruit local workers due to limited locals' education level and relevant experience. This is likely to create community unrest if the projects cannot meet the community expectation, which is assessed as **moderate negative** impact significance.

Continuing implementation and monitoring on the management measures, as summarised within Annex A to maintain the sustainability of community income along the Project duration, as well as minimize impact from the communities high expectations of the Project, are required. A number of management and monitoring measures already required by the RKL-RPL include:

- Identify local manpower potential to be recruited;
- Absorption of local workers based on qualification and competence; and
- Coordination contractors and locals in a communication forum for local recruitment process.

Additional recommendations were made as part of the SIA completed for the PAU project including the following measures:

- Develop detailed local labour recruitment procedure including a commitment for % of local workforce to be employed during each project phase;;
- Coordinate with local government for local recruitment process;
- Improvement of grievance mechanism (as specified within the SIA addendum (Addendum 7);

- Community development plan to include job training for locals (e.g. related construction skill) and also commitment to retaining a specified % of local community members within the workforce and also local business involvement targets.

It is also known that the nearby DSLNG project has developed management plans to manage the issue through established and disclosed local recruitment procedure, and coordination agreement with local government.

4.1.2 Impact to Community Health and Safety

The local community faces a number of existing health and environmental sanitation challenges. Noise, increased waste, and disturbance of soil and water quality due to construction and operation of the Project, DSLNG, Matindok-Senoro upstream project, and RRP may exacerbate these conditions. As such, the cumulative impact of decreased environmental quality resulting to poor community health condition (increased number of respiratory infection, diarrhoea, malaria, etc.) is assessed as **moderate negative**.

A numbers of environmental management and monitoring measures have been adopted by each project (i.e. PAU, DSLNG, Matindok-Senoro upstream project, and RRP) as required by the various project RKL/ RPL. In addition, development of community health program collaborating with local government and proper consultation with the community for health and environmental sanitation awareness and knowledge are recommended for the PAU Project. DSLNG is also known to be developing such program.

Increase pressure on public road during construction due to mobilization of heavy vehicles and equipment, and transport of labour and material for the PAU Project, DSLNG, Matindok-Senoro upstream project, and RRP are likely to cause road damage. In addition, increased traffic movement has the potential to elevate the potential risk of a traffic incident. These conditions may create a disturbance to public transportation and community safety in the locations frequently traversed by community. These impacts are assessed as being **moderate negative** significance.

Traffic management plan should be developed to mitigate this potential impact. In addition, the compliance to emergency response plan is required, followed by consultation and disclosure information to the local community concerning emergency response plan, traffic safety and awareness. Traffic management and emergency plan are identified currently in place for DSLNG project, followed by continuous consultation with community.

During the operation of the PAU and DSLNG projects, potential threats to community safety may occur from gas spill and leakage. Precautions and technology to prevent spills and leakages will be applied. As such, the potential

impact to community safety is assessed as **moderate negative**. The compliance to emergency response plan followed by disclosure of plan to community should be applied to mitigate the impact.

4.1.3 Impact of Land Acquisition

The impact of land acquisition from the Project development may occur due to inappropriate compensation process. This assessment identified the following potential cumulative impacts of the Project land acquisition occurring within the relatively similar time and place with DSLNG, its associated facilities, and RRP land acquisition:

- There is potential community unrest due to land price discrepancy and unclear compensation basis between the projects. The PAU Project land acquisition process has been started since 2005, land acquisition for DSLNG has been conducted since 2007, and for RRP is currently on-going since 2012. This is assessed as **moderate negative**; and

- The land acquisition for the Project, DSLNG, and RRP create changes in land ownership pattern and land use into industry which create disturbance on community farming activities. This impact is assessed as **moderate negative**, particularly for the households which depend on their income from agricultural sector.

The following management measures already in place:

- The Project land acquisition process was based on a voluntary sale and purchase process. The value agreed with the affected land owner, was generally above the market value, and it also considered the replacement and livelihood restoration cost. The compensation payment was acknowledged by the Head of Uso Village and Head of Batui Sub-District, outlined within the Sale and Purchase Deed; and

- Bi-annual monitoring and reporting to the government are required by RKL/ RPL with regards to the Project land acquisition process.

Additional management and monitoring measures might be required for the significant affected people are as follow:

- Livelihood assistance in the form of a community empowerment program to be developed and implemented in collaboration with local government development programs;

- Improvement of public consultation on potential adverse impact of the Project;

- Detailed land acquisition procedure should be established for the PAU project outlining the compensation procedure from consultation, negotiation, compensation determination, payment, and grievance mechanism.

It is known that a range of mitigation measures to mitigate impacts of land acquisition is currently in place for DSLNG and RRP.

4.1.4 Impact of Influx Migration

The labour recruitment for the Project, DSLNG, Matindok-Senoro upstream project, and RRP during peak of construction requires a large number of skilled, semi-skilled, non-skilled labour, and some positions cannot be fulfilled by local labour, due to education and skill requirements. This will create influx migration (non-local labour and in-migrants looking for employment opportunities), and some migrants may choose to stay after construction. In addition, supply of goods and services demanded by the Projects require certain quality, some of which might not be fulfilled by local business. This may attract in-migrants seeking business opportunities. Given this context, potential cumulative impacts are assessed as follows:

- Increased in-migrants likely create pressure on local source of income potentially lead to community unrest. This is assessed as **moderate negative**;

- With incoming workers and other migrants to the Project area, there is likely additional pressure to local settlements, public facilities, and social services, as these migrants will require an availability of space to live (land and housing) and to run business. There will be also additional pressure on health services, which are already under resourced, and to natural resources. This is assessed as **moderate negative**;

- Establishment (or possibly augmentation) of a local sex worker industry and increase demand for alcohol and drugs are likely to occur as a result of increased population from non-local migration. This issue has not yet emerge currently within the communities in the Project area, however previous similar Project experience indicate such impacts are potentially occur. This is assessed as **moderate negative**.

AMDAL has required the Project to prioritize local employment, while the RKL/ RPL has also required bi-annual monitoring and reporting to the government with regards to potential influx migration resulting from Project activities. However, the following additional management and monitoring measures should be applied to manage the above cumulative impacts of influx migration:

- Community development focuses on local community empowerment;

- Influx migration management plan should be established to outline the project comprehensive approach to address in-migration related issues.

DSLNG is currently developing similar management plan to mitigate influx in-migration issue.

4.2 *ENVIRONMENT CUMULATIVE IMPACT ASSESSMENT*

The cumulative assessment findings for each environmental aspect are summarised below. The cumulative assessment table is at *Annex 1*. In most instances potential cumulative impacts were considered to be **Moderate.** Mitigation and management measures are required as part of the RKL/RPL for each project, while for the PAU project further management measures have been recommended within the project Environmental Management and Monitoring Plan (prepared under a separate cover).

While Moderate cumulative impacts were identified, no further management or mitigation measures to those already proposed for the various projects were considered necessary.

4.2.1 Air Quality

The assessment considered cumulative impacts to air quality as being of **Moderate** significance. Sufficient management controls need to be implemented for the project and when combined with emissions from the DSLNG project, there are the potential for a cumulative reduction in local air quality to occur. Additional key considerations are summarised as follows

- For the Ammonia project modelling undertaken has found that emissions concentrations will remain below Indonesian quality criteria, however the emissions concentrations in a cumulative sense, incorporation the DSLNG Project were not required to be modelled under the AMDAL;
- Recommendations have been made for ongoing air quality monitoring to occur during construction and operations
- For the DSLNG project ANDAL, modelling indicated that air emissions would be below Indonesian quality criteria, while the project RKL and RPL required ongoing monitoring and management during construction.
- Significant population increases would only expected during construction and as such contribution to a decline in air quality would be temporary in nature.

4.2.2 Noise

The assessment considered cumulative noise impacts as being of **Moderate** significance.

The Project AMDAL considered impacts during construction and found that noise impacts at the nearest receptor would remain below Indonesian quality criteria.

Impacts during construction were not considered however recommendations for ongoing construction and operational monitoring have been made.

During operations ongoing monitoring for both the Upstream and Downstream Senoro and DSLNG projects and requirements to comply with Indonesian quality standards, are likely to be sufficient at this stage, to manage ongoing noise impacts. However given the proximity to the DSLNG project, there is the potential for ongoing cumulative noise impacts to occur.

4.2.3 Soil Erosion

The assessment considered cumulative impacts to soil erosion as being of **Minor** significance.

Potential soil erosion impacts are restricted to the construction phase for both the PUA Project and adjacent DSLNG project. Impacts have been considered within the AMDAL documents and mitigations and monitoring measures will be implemented during construction. This is unlikely to result in impacts, such that further assessment or consideration of cumulative impacts would be warranted.

4.2.4 Runoff

The assessment considered cumulative impacts to irrigation and drainage systems as being of **Minor** significance.

Potential direct impacts to waterbodies are largely restricted to the construction phase for both the PUA Project and adjacent DSLNG project. Impacts have been considered within the AMDAL documents and mitigations and monitoring measures will be implemented during construction. For PAU runoff ponds will be established on site during construction and operations, while runoff controls are currently established within the DSLNG site. The Project and other projects within the region are unlikely to result in significant cumulative impacts.

4.2.5 Disturbance to Vegetation

Potential cumulative impacts as a result of vegetation disturbance were considered to be **Moderate.**

While areas of important vegetation and floristic values are unlikely to be disturbed, clearing requirements for all project components are relatively large and represent a moderate cumulative impact.

The pipeline re-routing project will result in some disturbance to Bakiriang Animal Conservation area.

A green belt and other areas of vegetation will be retained within the project site and it has been recommended that a flora and fauna management plan be developed for the construction and operational phases of the project.

4.2.6 Disturbance to Terrestrial Fauna

Potential cumulative impacts to wild animals were considered to be **Moderate.**

Vegetation and habitat clearance will occur as a result of the Project and a large area has already been cleared in the local area for both the DSLNG project and Road Rerouting Project.

The existing AMDAL documents did not identify significant biodiversity values. There are anecdotal records of the Maleo (Endangered IUCN) occurring nearby at the DSLNG site and while the species has not been identified within the PAU site, the species absence still requires confirmation.

Should potential habitat be identified within the PAU site then a further consideration of impacts is warranted.

4.2.7 Disturbance to Marine Biota (plankton, Benthos, Coral Reef, Marine Turtles and Fish)

Potential cumulative impacts to marine biota were considered to be **Moderate.**

Disturbance to marine biota has not been considered within the project ANDAL and limited management has been recommended within the Project RKL/RPL. At this stage management and monitoring recommendations have been made in the Project EMMP (Addendum 6) and also within the Biodiversity Addendum (Addendum 1)

Increased human populations within and surrounding the project areas associated with both construction and operations may place increased pressures on coral communities. Marine discharges will also occur for the processing facilities associated with the nearby DSLNG project and also Senoro project (however wastewater management and monitoring controls are required for both of these projects).

It is understood that DSLNG have established a marine management and monitoring plan and this has also been recommended for the PAU project (EIA Addendum 1).

4.2.8 Seawater Quality

Potential cumulative impacts to seawater were considered to be **Moderate.**

Disturbance to seawater has not been considered within the project ANDAL and limited management has been recommended within the Project RKL/RPL. The Draft Biodiversity EIA addendum has recommended that some additional baseline investigations be conducted before the draft findings are finalised. At this stage management and monitoring recommendations have been made in the Project EMMP Addendum.

While marine discharges are required to meet Indonesian Guidelines, marine discharges associated with both the Project and nearby DSLNG Project may result in a cumulative reduction in local seawater quality.

Increased human populations within and surrounding the project areas associated with both construction and operations may also place increased pressure on sea water quality.

It is understood that DSLNG have established a marine management and monitoring plan and this has also been recommended for the PAU project (EIA Addendum 1).

5 CONCLUSION

The environment and social component of the cumulative impact assessment found that there are unlikely to be **moderate** cumulative impacts as a result of the PAU Project and other projects occurring within the region. This finding is primarily based on the on-going and proposed management measures that would be implemented for the PAU Project and also management commitments for other projects within the region.

Some limitations relevant to this assessment have been outlined at Chapter 1.3. The ERM review of the relevant projects concludes that cumulative impacts are capable of being adequately managed through the implementation of required and recommended management measures for each project, this finding should be read in light of the limitations specified.

Annex A

Cumulative Assessment Tables

Annex 1.1 Cumulative Social Impact Assessment

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
LOCAL ECONOMIC DEVELOPMENT							
Increased community income due to local employment opportunities	Pre-construction, construction, and operation activities create direct and indirect employment opportunities. Approximately 2000 people will be employed at the peak of construction phase.	• DSLNG and its associated facilities labour recruitment during construction and operation • RRP labour recruitment during construction • Labour recruitment for Matindok and Senoro upstream projects.	• Management and monitoring measures required by the PAU RKL-RPL are include: o Identify local manpower potential to be recruited; o Absorption of local workers based on qualification and competence; o Coordination contractors and locals in a communication forum for local recruitment process. • The following recommendations were made as part of the SIA completed for the PAU project: o Develop detailed local labour recruitment procedure, including targets for local employment; o Coordinate with local government for local recruitment process; o Improved grievance mechanism; o Community development plan to include job training for locals (e.g. related construction skill). • It is also known that the nearby DSLNG project has developed management plans to manage the issue through established and disclosed local recruitment procedure, and coordination	2013 onwards	Positive	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government • Man Power Agency of Banggai Regency	Cumulative impacts are considered likely to be positive. The PAU project is likely lead to an increase in community income as a result of local employment opportunities. Based on current information for the DSLNG, Matindok-Senoro Upstream, and RRP construction, these projects are also likely to generate local employment and increase community income. There is likely to be community expectations regarding employment opportunities and management measures required to maintain the sustainability of community income during the Project duration have been proposed. It is also known that the DSLNG project has developed plans to manage local recruitment.

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
			agreement with local government.				
Local business development	• Project construction and operation activities facilities (e.g. main plant, power plant, worker camp, workshop, administrative office, warehouse, jetty) create business opportunity to meet the Project supply demand for goods and services; • The Project non-local worker spend locally will increase demand for goods and services.	• DSLNG and its associated facilities construction and operation activities • RRP construction activities; • Labour recruitment for Matindok and Senoro upstream projects	• The Project is committed to optimize available local sources for Project supplies, as required by RKL/RPL and communicated during public consultation; • Additional management recommendations made as part of the SIA completed for the PAU project includes the development of a community development plan to provide assistance and facilities for locals to obtain business opportunities, responding to the Project's supplies demands. This is to include targets for local business involvement in the project. • Similar measures are also applied for DSLNG, as the project is optimizing the use of available local material for it supplies and committed to provide assistance and facilities to local business.	2013 onwards	Positive	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government • Industrial and Trade Agency of Banggai Regency	The construction and operation of the Project and also DSLNG, Matindok-Senoro upstream, and RRP are likely to create demand on goods and services, which create a potential for existing local business and entrepreneurs This is considered to be a positive project impact. It is recognised that there maybe some difficultly in local businesses accessing these projects (due to skill or equipment requirements) and local businesses will have expectations regarding business opportunities as a result of the various projects. It has been recommended that a community development plan be developed to optimize local business participation in the PAU Project. It is understood that the DSLNG project is also committed to providing assistance to local businesses.
Increased income due to land	The Project land compensation	• DSLNG and its associated	• The following measures already in place and will be implemented	Pre-construction	Positive/	• PAU • DSLNG and	The land compensation from the PAU Project land

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
compensation	during pre-construction up to early construction phase	facilities land compensation • RRP land compensation	continuously as also required by RKL/RPL: ○ The Project land acquisition process to be based on voluntary sale and purchase process; the value to be agreed with the affected land owner; ○ Bi-annual monitoring and reporting to the government with regards to the Project land acquisition process. • In addition, a commitment has been communicated during public consultation that the employment opportunities will be prioritized to be provided for the land acquisition affected people in accordance with the job function requirements. • It is also known that a land compensation process for DSLNG and the RRP has occurred.			JOB Pertamina – Medco • Related sub-district and village government	acquisition process encourages claimants reinvesting into the area, as the compensation was above the land market value and has considered the replacement and livelihood restoration cost. This is considered to represent a positive impact. The land acquisition process for the DSLNG project has occurred, while the RRP is ongoing. These projects are understood to be following Indonesian Legislation and also IFC requirements. Similar to the PAU project it is expected that income provided as a result of the land acquisition process may have a positive impact.
Community unrest due to high expectation of employment and business opportunities	• Pre-construction, construction, and operation employment opportunities; • Construction and operation activities facilities create	• DSLNG and Senoro facilities labour recruitment and other construction and operation activities • RRP labour recruitment	The following recommendations were made as part of the SIA completed for the PAU project: • Comprehensive community development plan should be developed with specific programs for different groups of affected people, along with continuous public consultation and, where possible, partnership and	2013 onwards	Negative/ Moderate	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government	There are high community expectations for local labour employment and business development, while there are limitations for the Pau project and also other projects, ability to recruit local workers due to limited locals education level and relevant experience. This is likely to represent a

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
	business opportunity to meet the Project supply demand for goods and services.	and other construction activities; • Labour recruitment for Matindok and Senoro upstream projects	coordination with local government during the program planning and implementation; • Implementation of SEP to maintain good relation with community and other stakeholders as well as mitigate any potential conflict; and • An appropriate grievance mechanism should be detailed to formalize a way for the Project to accept, assess, and resolve community complaints related to the employment issue and other communities concern. • It is known that to mitigate such issue, DSLNG has established and disclosed local recruitment procedure in coordination with local government, along with implementation of community development and stakeholder engagement plan.				moderate negative impact. Management recommendations have been made for the PAU project while the DSLNG project is also understood to be implementing its own recruitment procedure.
COMMUNITY HEALTH and SAFETY							
Decreased environmental quality resulting to poor community health condition (increased number of respiratory infection,	• Noise and disturbance on soil and water quality surround the Project area due to construction and operation activities;	• DSLNG and Senoro facilities construction activities • RRP construction	• A Number of environmental management and monitoring plan have been proposed and conducted, particularly during construction as detailed within the environment assessment table. • PAU has also established a health, safety, and environment (HSE) policy as a high level measure to	Construction	Negative/ Moderate	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government	The local community face a number of existing health and environmental sanitation challenges. The Project construction and operation related activities may exacerbate these conditions, particularly considering the nearby DSLNG Project. This is

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
diarrhoea, malaria, etc.)	• Creation of disease vector breeding grounds i.e. mosquito, due to construction activities; • Increased waste from Project related activities.		manage its occupational health, safety, and environmental performance; • Additional management and monitoring measures are proposed: o Code of conduct for worker and contractors for related community issue; o Community health program as part of PAU CSR; o Consultation and disclosure information to local community concerning health care and clean environment knowledge and awareness. • Environmental management and monitoring plans and procedures are in place for DSLNG and RRP, as well as community health program.			• Environmental Management Agency of Banggai Regency • Health Agency of Banggai Regency	considered to represent a moderate negative impact. The proposed environmental management measures relevant to all projects are expected to be applied along with a community health program collaborating with local government and proper consultation to community (awareness and knowledge assistance).
Disturbance to community safety	Project construction activities (mobilization of heavy vehicle and equipment, and transport of labour and material)	• DSLNG and Senoro Project construction activities • RRP construction	• PAU has established a health, safety, and environment (HSE) policy as a high level measure to manage its occupational health, safety, and environmental performance; • Additional management and monitoring measures required are as follow: o Emergency response plan to include community-related emergency prevention, preparedness, and response arrangements;	Construction	Negative/ Moderate	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government • Transportation Department of Banggai Regency	Increased pressure on public roads during project construction is likely cause road damage. In addition, increased traffic movement has the potential to elevate the potential risk of a traffic incident. These conditions are likely to impact community safety, and further encourage complaints from the community. A traffic management plan

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
			○ Traffic management plan followed by periodic monitoring towards the accident numbers occurred within the Project area; and ○ Consultation and disclosure information to local community concerning emergency response plan and safety knowledge and awareness. • Traffic management and emergency plans are identified currently in place for DSLNG project, followed by continuous consultation with community.				has been recommended for the PAU project while one is currently in operation for the DSLNG project. These are likely to be sufficient to manage local cumulative impacts.
Threat to community safety from plant operation	Project plant operation	DSLNG and Senoro facilities operation	• Precautions and technology to prevent spills and leakages will be applied; • Additional management and monitoring measures required are as follow: ○ Emergency prevention, preparedness, and response arrangements to be coordinated and collaborated with DSLNG and related government agency; and ○ Consultation and disclosure information to local community concerning emergency response plan. • Emergency response plan is identified currently in place for	Operation	Negative/ Moderate	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government • Related government agency of Banggai Regency	During the operation of the PAU and DSLNG project, potential threats to community safety are may occur from gas spill and leakage. This is likely to represent a moderate negative impact. Compliance with an emergency response plan (for both projects) followed by disclosure of plan to community should be applied, along with proper precautions and technology to prevent spills and leakages. This is likely to be appropriate to manage this impact.

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
			DSLNG project				.
LAND ACQUISIITON							
Community unrest due to land price discrepancy and unclear compensation basis	The Project land compensation during pre-construction up to early construction phase	• DSLNG and Senoro facilities land compensation • RRP land compensation	• The following measures already in place and will be implemented continuously as also required by RKL/RPL: o The Project land acquisition process to base on voluntary sale and purchase process; o The compensation payment acknowledged by the Head of Village and Head of Sub-District, outlined within the Sale and Purchase Deed; o Bi-annual monitoring and reporting to the government on the Project land acquisition process; • In addition, detailed land acquisition procedure should be established outlined the compensation procedure from consultation, negotiation, compensation basis, payment process, and grievance mechanism. • It is known that a range of mitigation measures to mitigate impacts of land acquisition is currently in place for DSLNG and RRP.	Pre-construction	Negative/ Moderate	• PAU • DSLNG and JOB Pertamina – Medco • Related sub-district and village government	The PAU Project land acquisition process started in 2005, however details of this process requires confirmation. Various land compensation processes within the area (specifically for the DSLNG and RRP Projects), may lead to community unrest due to discrepancy in prices paid. This is considered to represent a moderate negative impact. Along with management measures currently in place, a detailed land acquisition procedure should be established for the PAU Project to outline the compensation procedure, negotiation, compensation basis, payment process, and grievance mechanism.
Change in land use and	• Project land acquisition	• DSLNG and Senoro facilities	• Management measure currently in place:	2005 onward	Negative/ Moderate	• PAU • DSLNG and	The land acquisition for the Project and others occurring

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
ownership pattern create disturbance on community farming activities	process decrease plantation area; • Project construction activities.	land compensation • RRP land compensation	○ The Project land acquisition process based on voluntary sale and purchase process; ○ The value of compensation paid to the affected land owner was above the market value, as it also considered the replacement and livelihood restoration cost; • Additional management and monitoring measures might be required for the significant affected people are as follow: ○ Livelihood assistance in the form of a community empowerment program to be developed and implemented in collaboration with local government development programs; and ○ Improvement of public consultation on potential adverse impact of the Project. • It is known that a range of mitigation measures to mitigate impacts of land acquisition is currently in place for DSLNG and RRP, which include continuous consultation with the affected people.			JOB Pertamina – Medco • Related sub-district and village government	within the region creates a change in land ownership patterns and land use. This process creates disturbance to community farming activities. This is likely to represent a moderate negative impact. Additional livelihood assistance might be required, particularly for those who cannot restore their livelihood due to loss of agricultural land.
INFLUX MIGRATION							
Community unrest due to increase in In-	• Labour recruitment during	• DSLNG and Senoro project labour	• AMDAL has required the Project to prioritize local employment;	2013 onwards	Negative/ Moderate	• PAU and contractors	The non-local labour recruitment and increased number of in-migrants as a

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
migrants	construction and operation require numbers of skill, semi-skill, non-skill labour, some cannot be fulfilled by local labour; • Supply demand for the Project require certain quality, some cannot be fulfilled by local business.	recruitment and supply demand during construction and operation • RRP labour recruitment and supply demand during construction	• The RKL/ RPL has also required bi-annual monitoring and reporting to the government with regards to potential influx migration resulting from Project activities; • The following additional management and monitoring measures should be applied: o Community development focuses on local community empowerment; o Influx migration management plan should be established to outline the project comprehensive approach to address in-migration related issues. • DSLNG is currently developing similar management plan to mitigate influx in-migration issue.			• DSLNG and JOB Pertamina – Medco • Related sub-district and village government	result of all projects is likely create pressure on local source of income. This may occur as a result on in-migrants filling jobs or outside businesses supplying the project. This represents a moderate negative impact. Influx migration management plan should be established for the PAU project to outline the project comprehensive approach to address in-migration related issues. It is understood that DSLNG have developed an influx management plan.
Increased pressure on local settlements, and public infrastructure and services	• Labour recruitment during peak of construction create influx migration (non-local labour and in-migrants looking for employment opportunities), which might continue stay	• DSLNG and Senoro Project facilities labour recruitment • RRP labour recruitment	Influx migration management plan should be established to outline the project comprehensive approach to address in-migration related issues. DSLNG is currently developing similar management plan to mitigate influx in-migration issue.	2013 onward	Negative/ Moderate	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government • Health Agency of Banggai Regency	With incoming workers and other migrants to the Project area, there is likely to be additional pressure on local settlements, public facilities, and social services, as these migrants will require an availability of space to live (land and housing) and to run business. There will be also additional pressure on health services, currently under resourced, and to

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
	after construction; • Project construction and operation activities attract in-migrants seeking business opportunities.						natural resources. This represents a moderate negative impact. Influx migration management plan should be established for the PAU project, to outline the projects comprehensive approach to address in-migration related issues. It is understood that DSLNG have developed an influx management plan.
Increased demand for commercial sex, alcohol, and drugs due to increase in-migration	• Labour recruitment during peak of construction create influx migration (non-local labour and in-migrants looking for employment opportunities), which might continue stay after construction; • Project construction and operation activities attract	• DSLNG and Senoro project labour recruitment • RRP labour recruitment	Influx migration management plan should be established to outline the project comprehensive approach to address in-migration related issues. DSLNG is currently developing similar management plan to mitigate influx in-migration issue.	2013 onwards	Negative/ Moderate	• PAU and contractors • DSLNG and JOB Pertamina – Medco • Related sub-district and village government • Health agency and other related government agency of Banggai Regency	Establishment (or possibly augmentation) of a local sex worker industry and increase demand for alcohol and drugs are likely to occur as a result of increased population due to local projects. This is considered to represent a moderate negative impact. This issue has not yet emerged within the communities in the Project area, however previous project experience indicates such impacts potentially occur. Influx migration management plan should be

Social Aspect	PAU Project Activities	Other Relevant Projects	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Responsible Parties Involved	Summary of Rationale
	in-migrants seeking business opportunities.						established for the PAU project to outline the project comprehensive approach to address in-migration related issues. It is understood that DSLNG have developed an influx management plan

Annex 1.2 – Cumulative Environmental Assessment Table

Environmental Aspect	Relevant Project Activities	Relevant Associated Facilities	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Summary of Rationale
Air Quality	• Emissions from operations; • Dust emissions during construction.	Matindok Upstream – Emissions during construction and operations of gas production facilities; Senoro - Emissions during construction and operations of gas production facilities and LNG plant; Donggi – Emissions during construction and operations of gas production facilities; Senoro pipeline re-routing project – emissions during construction; DSLNG – Emissions during LNG plant operations; Decrease in air quality as a result of increased population.	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL • None specified Further Management and monitoring recommended within the EMMP includes; • Emissions and dust control measures to be implemented during construction; • Monitoring of air emissions during construction with comparison to Indonesian and IFC EHS air quality standards to occur; • Monitoring of air emissions during operations with comparison to ambient air quality standards to occur. • Monitoring of odour to occur during operations. Air quality monitoring during construction and operations is required for the DSLNG Project to demonstrate compliance with Indonesian Regulations.	2013 Onwards	Moderate	The project ANDAL states that air quality parameters will remain below Indonesian requirements. However, when combined with operational activities at the adjacent DSLNG site, there is the potential for moderate cumulative impacts to local air quality to occur. For upstream gas fields and also the Senoro and DSLNG development, management controls and monitoring will be implemented during the construction and operational phases of these projects. Significant population increases are only expected during construction however there will be a permanent local increase in population as a result of both the project and DSLNG project, as such there is the potential for a decline in local air quality as a result of population increase.
Noise	• Noise emissions from the Ammonia facility	Matindok Upstream – Noise emissions during construction	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL	2013 Onwards	Moderate	The AMDAL study found that some baseline noise levels were above the Indonesian quality standard. This was

Environmental Aspect	Relevant Project Activities	Relevant Associated Facilities	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Summary of Rationale
	operation; • Noise emissions during construction.	and operations of gas production facilities; Senoro - Noise emissions during construction and operations of gas production facilities and condensate unloading facilities DSLNG – Noise emissions construction and operations of gas production facilities; Senoro pipeline re-routing project – Noise emissions during construction;	• None specified Further Management and monitoring recommended within the EMMP includes; • Noise reducing control measures to be implemented during construction, includes no night time construction for some activities; • Monitoring of noise during construction and operation with comparison to Indonesian Noise Quality Standard and IFC EHS requirements; • Implementation of operational noise controls where appropriate. Noise monitoring is required as part of the construction and operation of the DSLNG Project			as a result of a nearby road. The assessment only considered noise generation during site preparation and found that that noise levels would remain below the Indonesian quality standard at the nearest receptor. During operations ongoing monitoring will be required to ensure that the project complies with relevant standards. If exceedances are identified then measures to reduce noise emissions should be investigated. The DSLNG project is required to comply with Indonesian quality standards, however there is the potential for cumulative noise impacts given the proximity of this project to the Ammonia facility.
Soil Erosion	Potential for increased soil erosion during site clearing and preparation.	Potential soil erosion during construction of the adjacent DSLNG project	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL • Selective clearing and revegatation of disturbed areas with *Paspalum conyugatum* • To construct drainage channels at the around of the site and make the effort to flow run-off to the channels and caught in retention pond. • Retention of green belt.	Construction only	Minor	Potential soil erosion impacts are restricted to the construction phase. Impacts have been considered within the AMDAL documents and mitigations and monitoring measures have been proposed. The DSLNG project ANDAL specifies erosion control requirements during construction. Soil erosion would be restricted to the project site and cumulative impacts are

Environmental Aspect	Relevant Project Activities	Relevant Associated Facilities	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Summary of Rationale
			Further Management and monitoring recommended within the EMMP includes; • Implementation of erosion controls during construction; • Erosion and sediment control plan in place for project construction; • Erosion monitoring during construction. Construction erosion management is required as part of the DSLNG project construction.			considered unlikely. .
Runoff	Increase in runoff as a result of construction and operations.	Construction of all upstream facilities and the DSLNG project.	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL • To construct drainage channels at the around of the site and make the effort to flow run-off to the channels and caught in retention pond. • Keeping drainage to able to channel run-off on the whole. • Keeping retention pond to catch run-off from drainage. Detail of proposed management and monitoring provided within the EMMP. Management and monitoring includes the following; • Avoiding disturbance to normal flows and irrigation during construction; • Capture and treatment of	Construction and operations	Minor	Impacts as a result of runoff during construction and operations have been considered within the AMDAL documents and mitigations and monitoring measures have been proposed. The DSLNG project ANDAL specifies management measures for impacts to natural water flows. Impacts to runoff would be restricted to the project site and cumulative impacts are considered unlikely.

Environmental Aspect	Relevant Project Activities	Relevant Associated Facilities	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Summary of Rationale
			contaminated runoff; • Avoiding permanent disturbance to irrigation and natural stream flows; • runoff and erosion controls to be specified within a CEMP.			
Loss of Flora	Clearing within project site	Vegetation clearing during construction of upstream facilities and the DSLNG site.	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL • None specific though a green belt will be retained within the site. Detail of proposed management and monitoring provided within the EMMP. Management and monitoring includes the following; • Clearing procedures and management to be detailed within a CEMP.	Permanent	Moderate	Impact of vegetation clearing has not been specifically addressed within the ANDAL, however it is understood that the project site does not contain significant floristic values. While areas of important vegetation of floristic values are unlikely to be disturbed, clearing requirements for all project components are relatively large and represent a moderate cumulative impact.
Disturbance to terrestrial fauna	Clearing within Project site	Vegetation clearing during construction of associated facilities	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL • None specific though a green belt will be retained within the site. Detail of proposed management and monitoring provided within the EMMP. Management and monitoring includes the following; • Development of a flora and fauna management plan to be implemented during site clearing,	Permanent	Moderate	Cumulative habitat clearance is likely to have a moderate cumulative impact. Records of the Maleo (Endangered IUCN) are known from the region. Besides potential habitat for the Maleo it is unlikely that important terrestrial habitat values are contained within the project site. Cumulative clearing activities include those for the DSLNG site and also a proposed condensate pipeline through Bakiriang Animal Conservation area.

Environmental Aspect	Relevant Project Activities	Relevant Associated Facilities	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Summary of Rationale
			this is to detail specific actions should the species be encountered during clearing activities. • PAU are understood to be confirming follow-up actions in relation to the Maleo, with the IFC The DSLNG Project is understood to be implementing a dedicated Maleo conservation program.			

Environmental Aspect	Relevant Project Activities	Relevant Associated Facilities	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Summary of Rationale
Disturbance of Marine Biota (plankton, benthos, coral reef, fish, marine reptiles)	Marine discharges, marine construction and operations of the offloading facility have the potential to impact marine biota.	Marine discharges, marine construction and operations of the DSLNG and Senoro project have the potential to also impact marine biota.	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL • No RKL/RPL requirements for marine management. Detail of proposed management and monitoring provided within the EMMP. Management and monitoring includes the following; • Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project; and • Nearshore facility design to take into consideration the location of coral communities. • Marine construction environmental management plan to be developed and incorporate controls for marine fauna. The DSLNG project is currently implementing a marine biodiversity monitoring program, along with periodic monitoring as a requirement of the project RKL/RPL.	Construction and operations.	Moderate	Coral communities are known to occur within the local area and have the potential to be directly impacted as a result of both the PAU and DSLNG Project. DSLNG discharges are required to meet Indonesian regulations while a monitoring program to ensure that PAU discharges meet IFC EHS guidelines has been recommended. There are the potential for cumulative impacts due to impacts from both projects and marine monitoring programs are being conducted. Increased human populations within and surrounding the project areas associated with both construction and operations of the project and other facilities may place increased pressures on coral communities and other marine resources.
Seawater Quality	Marine discharges during construction and operations, including cooling water and spills and	For the Senoro and DSLNG project, Marine discharges during construction and operations, spill	Detail of proposed management and monitoring provided within the ANDAL RKL/RPL • No RKL/RPL requirements for	Construction and operations.	Moderate	Coral communities are known to occur within the local area and have the potential to be directly impacted as a result of both the PAU and DSLNG Project. DSLNG discharges are required

Environmental Aspect	Relevant Project Activities	Relevant Associated Facilities	Proposed Management Measures	Impact Period	Cumulative Impact Ranking	Summary of Rationale
	leaks during construction and operations.	and leaks during construction and operations. Potential for increased runoff and discharges as a result of population influx during construction	marine management. • ANDAL requires WWTP discharges meet Indonesian Regulations. Detail of proposed management and monitoring provided within the EMMP. Management and monitoring includes the following; • Collection of additional baseline water quality data • Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project; and • Nearshore facility design to take into consideration the location of coral communities; • Marine management plan to describe marine discharges including discharge parameters. • Preparation of construction and operational waste water management plans. The DSLNG project is currently implementing a marine biodiversity monitoring program, along with periodic monitoring as a requirement of the project RKL/RPL.			to meet Indonesian regulations while a monitoring program to ensure that PAU discharges meet IFC EHS guidelines has been recommended. There are the potential for cumulative impacts due to impacts from both projects and marine monitoring programs are being conducted. Increased human populations within and surrounding the project areas associated with both construction and operations of the project and other facilities may reduce local water quality conditions.

Framework Environmental Managament and Monitoring Plan

Prepared for:

PT Panca Amara Utama

January 2013

Delivering sustainable solutions in a more competitive world

ERM

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1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

1.1 INTRODUCTION

This Environmental Management and Monitoring Plan (EMMP) is a key document that provides information and instructions on how environmental aspects of the Project will be managed from pre-construction through to the completion of the construction phase. It is expected that a revised version of the document will be prepared prior to the commencement of operations. It is likely that a plan to manage health and safety (EHS), security and community aspects of the project will also be developed. The EMMP is a living document which will:

- incorporate the Environmental mitigation measures identified as a result of the EIA process into a comprehensive framework to facilitate and ensure appropriate management throughout the Project cycle;
- provide a framework for procedures and plans required to manage relevant environmental aspects;
- provide a framework for the implementation of specific management plans by construction contractors;
- present roles and responsibilities for meeting EMMP requirements including the provision of training;
- define the monitoring, auditing and reporting programme; and
- incorporate a feedback loop into the EMMP and associated plans and procedures.

1.2 DOCUMENT SCOPE AND BACKGROUND

This EMMP document has been prepared to provide a framework for understanding the environmental management and mitigation measures that will be implemented for the PAU Ammonia Project, focusing at this point on project construction. The scope of this EMMP covers the terrestrial and marine components of the PAU Ammonia Project

1.3 ENVIRONMENTALPLANS

It is intended that a set of management plans will be implemented as part of the Project construction, which together constitute the Project approach in managing its environmental and social impacts. The scope of these plans is still being developed and at this point they are likely to include the following:

- Emergency Response Plan;
- Health, Safety, and Environment Management System;
- Construction Environmental Management Plan (CEMP);

- Contractor Environmental, Health, and Safety Management Plan (CEHSMP) ;
- Construction Waste Management Plan;
- Waste Water Management Plans and Procedures;
- Soil and Water Management Plan (SWMP);
- Marine Management Plan (proposed);
- Water Management Plan;
- Erosion and Sediment Control Plan;
- Noise and Vibration Assessment Management Plan;
- Chemical/Oil Spill Response Plan; and
- Terrestrial and Marine Biodiversity Management Plan (pending results of further studies).

An outline of some of these plans is provided at Section 1.6 of this report.

1.4 ROLES AND RESPONSIBILITIES

Roles and responsibilities wil be confirmed as procurement progresses and provided in future updates to this EMMP.

1.5 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The EMMP describes the actions necessary to implement the various sets of mitigation measures necessary to avoid, reduce, ameliorate or compensate for adverse environmental impacts. These impacts have been described within the project ANDAL and have also been considered as part of the EIA addendums developed for the project. The IFC Performance Standard 1 has been used as a reference for the development of this EMMP.

At this point of the procurement process it is the direct responsibility of PAU to implement all environment related controls. As the procurement process progresses it is likely that some of these responsibilities will be led by the Engineering Procurement and Construction (EPC) contractor. These roles and responsibilities will be updated as part of future revisions to this document.

Management plans and procedures have been developed to manage environmental issues during the construction phase of the project. There are also some follow-up actions and plans wich relate to the operational phase of the project (for example water, air and noise monitoring activities.)

Table 1 and *2* below provides a summary of the marine and terrestrial environmental monitoring activities required by the AMDAL approved RKL/RPL documents, and also suggested management actions following review of this document. As part of the approval requirements the project is required to submit

six-monthly compliance reports to the Indonesian Government to demonstrate compliance.

The ANDAL and RKL/RPL review revealed that there are limited monitoring requirements for some environmental aspects (such as marine water quality, coral, noise and air quality.) As a result of the EIA addendums, further monitoring requirements have been recommended. Some of these will require further elaboration during the development of detailed management plans and follow-up actions that have been recommended. These plans are summarized at Section 1.6, while basic controls are identified at *Table 1* and *2*.

Table 1 Project Marine Management and Monitoring Requirements

ESH Aspect/Issue	Summary of relevant Baseline data	Project Phase		Potential Environmental/ Social/Health Impact	Proposed Management from RKL/RPL report	Proposed additional mitigations and controls
		Construction	Operations			
ESMP Marine						
Disturbance of Marine Biota (plankton, benthos, coral reef, fish)	Overall, the coral cover appears better at observation points towards the west (Batui) than towards the east side (Luwuk). Average coral cover in the free sea base is 52.64%. This shows quite important function of the coral colony in the sustainable ecosystem. Coral communities are also known to occur to the south of the project site.	X	X	Based on ERM experience impacts are likely to include. Introduction or Spread of invasive marine species. Loss of coral reef and other fish habitats. Degradation in marine environmental values including decline in water quality.	Not specified as part of AMDAL process.	• Detailed marine management plan to be developed. Facility design to take into consideration location of coral communities; • Implementation of specified marine discharge controls and construction and operation controls (see controls for marine water quality) • Further measures to be agreed with IFC.
Marine Fauna (mammals, and turtles)	Coral fish species were recorded within the nearshore areas. A database search reveals that conservation significant marine fauna species are known from the area. The nearest known turtle nesting beach is understood to be	X	X	Marine noise and vibration Noise and vibration during construction and operations has the potential to disturb marine mammal and turtle behaviour within the local area.	Not specified as part of AMDAL process.	• Basic construction noise management practices will be detailed within a marine management plan, however current understanding is that this is unlikely to be a significant issue, in part owing to the absence of important marine habitats surrounding the project area.

ESH Aspect/Issue	Summary of relevant Baseline data	Project Phase		Potential Environmental/ Social/Health Impact	Proposed Management from RKL/RPL report	Proposed additional mitigations and controls
		Construction	Operations			
ESMP Marine						
	ten kilometres to the south of the project site.	X	X	Disturbance as a result of light impacts Artificial light sources can affect marine turtle nesting behaviour.	Not specified as part of AMDAL process. Marine risk assessment identified impact as being of minor significance	• Impact potential in relation to marine turtles. Current understanding is that nearest nesting beaches are approximately 10 km to the south of the DSLNG project site. Management measures to be developed as part of marine management plan.
		X		Physical disturbance to habitat and nesting areas Construction of the plant site and nearshore components may have the potential to impact turtle nesting areas (if present).	Not specified as part of AMDAL process. Marine risk assessment identified impact as being of minor significance	• Current understanding is that nearest nesting beaches are approximately 10 km to the south of the DSLNG project site. Management measures to be developed as part of marine management plan.

ESH Aspect/Issue	Summary of relevant Baseline data	Project Phase		Potential Environmental/ Social/Health Impact	Proposed Management from RKL/RPL report	Proposed additional mitigations and controls
		Construction	Operations			
ESMP Marine						
Seawater Quality	Further sampling to confirm baseline seawater conditions has been recommended. Based on the results of laboratory analysis, the quality of sea water around the study area shows the parameters which are above the Indonesian threshold values.	X	X	Ammonia Plant activities will produce liquid wastes which are to be discharged to sea. Domestic and process waste water as well as contaminated runoff will be treated in a WWTP prior to discharge. Desalination brine will also be sent through the WWTP. Cooling water will be discharged separately to the WWTP discharges and will be a higher temperature than the surrounding seawater. Seawater has the potential to be impacted by the following; • Impact from jetty construction • Impact from high temperature sea cooling water • Impact from wastewater discharge • Impact from rainwater runoff • Impact from potential ammonia spills	Not specified as part of AMDAL process.	• Drain the water runoff through drains and sedimentation ponds before discharged into receiving water bodies. • Periodic measurement of the quality of sea water sampling (Further details provided at Section 1.6.6) • Collection of additional baseline water quality data; • Development of an ongoing marine management and monitoring plan for the construction and operational phases of the project; • Nearshore facility design to take into consideration the location of coral communities; • Marine management plan to describe marine discharges including discharge parameters; and • Preparation of construction and operational waste water management plans.

Table 2 Project Terrestrial Management and Monitoring Requirements

ESH Aspect/Issue	Summary of relevant Baseline data	Project Phase		Potential Environmental/ Social/Health Impact	Proposed Management from RKL/RPL report	Proposed additional mitigations and controls
		Construction	Operations			
Terrestrial						
Soil Erosion and run-off	**From AMDAL** The ANDAL estimated that baseline soil erosion at the site is 7,62 to 21,74 ton / ha / year.	**X**	**X**	Land clearing and site preparation will increase the potential for erosion to occur. This is expected to be a very low to medium increase only. Significant increase of runoff volume is expected as the plant and supporting facilities covers a wide area of about 50 hectares.	Planting with grass of *Paspalum conyugatum* species. Prior to land clearing, drainage and sedimentation pond should be constructed for controlling runoff that does not flow into the settlement and Public Road in the downstream area (southern part of the site). Rain-water runoff will be collected in the sedimentation pond through drainage. Maintain the drainage and pond system to be capable to handle run-off water To construct drainage channels at the surrounding site and to ensure the runoff to flow to the channels and caught in retention pond. If there is overflow of water, it will flows into seawater outfall to the sea. Drainage to drain runoff of the project site vis-a-vis topography is directed into three retention ponds / rainwater	A construction Environmental Management Plan will be developed prior to commencement of clearing and construction activities. This will be required to detail run-off and erosion controls to be implemented during construction (including those specified within the project RKL/RPL). A key indicator will be the avoidance of uncontrolled run-off entering the nearshore environment or other water bodies.

ESH Aspect/Issue	Summary of relevant Baseline data	Project Phase		Potential Environmental/ Social/Health Impact	Proposed Management from RKL/RPL report	Proposed additional mitigations and controls
		Construction	Operations			
Terrestrial						
					harvesting (rainfall pond) in steps. Runoff from the final rainfall ponds shall be discharged to the sea through the drainage channel.	
Noise	Noise measurements were conducted at three locations and noise levels were recorded as being between 49 – 69 dBA. The recording of 69 dBA is higher than the quality standard. This reading is understood to have been influenced by the nearby national road.	X	X	An increase in noise intensity is ikely to occur as a result of both construction and operation. The project ANDAL did not identify noise impacts as being potentially significant. This is based on an understanding that project noise will not significantly affect baseline noise conditions.	Not specified as part of AMDAL process.	• Establishment of a noise monitoring program with comparison against Indonesian and IFC EHS requirements (details provided at Section 1.6.7) • Noise controls to be established within a construction and operational environmental management plans. These may include; • Hearing protection for employees; • Use of noise attenuation devices for high noise generating activities; • Regular maintenance of plant and equipment; • Noise screening using native vegetation;

ESH Aspect/Issue	Summary of relevant Baseline data	Project Phase		Potential Environmental/ Social/Health Impact	Proposed Management from RKL/RPL report	Proposed additional mitigations and controls
		Construction	Operations			
Terrestrial						
Terrestrial Biodiversity	Result of observation of type of fauna at the region of examination study there are 22 birds group, 11 types of reptiles and 3 types of amphibian have successfully been inventoried. No conservation significant fauna species were identified during studies conducted within the project site. This has included extensive topographic surveys which did not record presence of species such as the Maleo. No conservation significant flora species were identified within the Project site. Vegetation communities consist of cultivated areas with some native vegetation.	X	X	Disappearance of vegetation due to land clearing may be categorized Insignificant Negative Impact, because those vegetation which disappeared are not the kind of rare plant species and therefore is not categorized as protected plants by the law. The land used for the ammonia industry also does not a conservation land, but grown by coconut only. It was also considered that the project would not have a significant impact on biodiversity values. The Maleo is known to occur in the region and is listed as Endangered by the IUCN.	Not specified as part of AMDAL process.	• Development of a flora and fauna management plan to be implemented during site clearing, this is to detail specific actions should the species be encountered during clearing activities; • Other mitigation measures to be agreed with the IFC.

1.6 PROPOSED MANAGEMENT PLAN FRAMEWORK

This EMMP was developed to draw together all the existing environmental requirements for the project, incorporating both those required by the project RKL/RPL and those recommended as part of the EIA addendums into a single framework.

Prior to the commencement of construction, the selected contractor will be required to develop a Construction Environmental Management Plan (CEMP) and a Construction Health and Safety Plan. More specific plans will also be required to manage issues such as waste management and other environmental matters.

The following more detailed management plans and follow-up actions have been recommended to appropriately manage environmental and social issues in accordance with IFC PS expectations. These plans will detail the management and mitigation measures required to be implemented the time frame and responsibilities for their implementation, detailed training requirements, inspections/audits to check implementation, and reporting requirements.

Once the operational phase of the project commences a new suite of plans will also be required.

1.6.1 Emergency Response and Preparednes Plan

An Emergency Response and Preparedness Plan should be developed for the construction phase of the project and should incorporate procedures to assist with the local community response to emergency situations. The plan should include some of the following aspects:

- the plan should cover emergencies that affect and/or require response from both, its employees as well as local communities and authorities, and should be communicated accordingly. It should be prepared by each EPC Contractor for the construction phase of the Project;
- some accidents may be beyond the capacity of the project operator, in which case, the proper government agency will have to be identified. Involvement of public agencies, such as hospital, fire department, environmental bureau, police, and emergency services, as part of the response and preparedness framework is required within the plan;
- during construction, the storage of fuel, lubricant, and any explosive must be carefully planned and secured, provisions for containment, fire control, and first aid must be provided;
- given proximity to the DSLNG project, procedures for coordination with DSLNG and other nearby parties should be considred;
- consultation with the community and relevant Gorvernment and Non Government Organisations (NGO's); and

- drills and exercise may have to be carried out once a year to test the preparedness of the project operator team, government agencies and the community to respond to major accidents.

1.6.2 Construction Environmental Management Plan (CEMP) and Contractor Environmental, Health, and Safety Management Plan (CEHSMP)

Construction management plan should be developed by PAU to manage their health, safety, and environment system, this plan may then be provided to and implemented by the EPC contractor and the workforces during construction of the project. The document should provide guidance on some following aspects:

1. Company health, safety and environmental policy;
2. Planning the health and safety hazards, and environmental aspect, legal requirements, objectives, and program;
3. Implementation and operation, including:
    - resources, roles, responsibilities, and authority;
    - competence, training, and awareness;
    - communication;
    - documentation, control of documents and records;
    - operational control;
    - traffic management plan; and
    - emergency preparedness and response;
4. Detail or provide reference to environmental management and monitoring reruirements for the project;
5. Monitoring and measurement, corrective and preventive action, and internal audit; and
6. Procedure for Management review.

1.6.3 Waste Management Planning

1.6.3.1 Hazardous and non Hazardous Waste Management During Construction

Waste generated within the project construction sites is likely to come from construction activities, including waste producing sites, waste storage, and treatment areas.

The plans should be developed to fulfill the requirements of relevant Indonesian Regulations and also the requirements of IFC PS 3 and specifically IFC Environmental Health and Safety Guideline 1.6.

In addition to these considerations, Contractors waste management plans will be required to demonstrate the following.

- avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, the client will reduce the generation of waste, and recover and reuse waste in a manner that is safe for human health and the environment;
- when hazardous waste disposal is conducted by third parties, the client will use contractors that are reputable and legitimate enterprises, licensed by the relevant government regulatory agencies, and obtain chain of custody documentation to the final destination. The client should ascertain whether licensed disposal sites are being operated to acceptable standards and where they are, the client will use these sites;
- the client will avoid or, when avoidance is not possible, minimize and control the release of hazardous materials. In this context, the production, transportation, handling, storage, and use of hazardous materials for project activities should be assessed; and
- the client will not purchase, store, use, manufacture, or trade in products that fall in WHO Recommended Classification of Pesticides by Hazard Class Ia (extremely hazardous); or Ib (highly hazardous).

The plans should also at a minimum include;

- waste management and disposal at associated facilities such as offices, camps and buildings and activities outside of the construction area;
- confirm that no waste is currently being transported to local landfill sites;
- provide map of location of waste disposal sites in relation to the project;
- details of waste facility licencing including hazardous waste contractor to be provided as part of waste management planning framework; and
- plan to confirm that hazardous wastes are not retained onsite for in excess of 90 days.

1.6.3.2 Wastewater Management

A waste water management plan will be required for both the construction and operational phase of the project.

It is likely that wastewater management during construction could be adequately addressed through the CEMP, however a separate management plan to cover discharges during operations will be required.

During construction wastewater management planning should address the following;

- sediment and erosion control procedures, including onsite containment and runoff management;

- surface water management procedures including contaminated runoff capture and treatment;

- management of construction and domestic liquid wastes and particularly those associated with the workforce and construction camp; and

- detail of any marine discharges that are proposed.

During operations waste water treatment will occur with some discharges to seawater occurring, provided that it complies with specific quality criteria. Further detail on the wastewater facilities during operation is currently being sought. This includes detail on the waste types, volumes and location of the wastewater discharge outfall. It is expected that operational wastewater management will be detailed in a separate plan developed prior to the commencement of operations. It is understood that the primary operational liquid wastes are discharges from the WWTP and cooling water discharge.

As described in the Biodiversity EIA addendum, the development of a marine monitoring plan is recommended.

1.6.4 Spill Prevention Control

Spills during construction (and operations) come from hazardous substances (oil, fuel, or chemical) storage, handling, transportation, dispensing, refuelling of vehicles and construction plant and equipment, as well as plant equipment maintenance and servicing bay. Accidental spills might occur within the project construction sites and therefore pose a potential risk to nearby water bodies or will pose a contamination risk.

To prevent, minimize and control any spills of hazardous substances and facilitate response to accidental releases occurring within the project construction sites, and also to avoid the potential hazards to humans and its environment, spill response procedures will be developed.

Potential managemet controls during construction may include the following;

- prevent spills that occur at the fuel storage and handling areas;
- perform a scheduled maintenance and servicing in a designated and appropriately constructed maintenance and servicing bay/workshop areas in order to prevent spills from seeping into the ground;
- provide storage facilities for hazardous waste that are compatible with the waste's substance, such as primary storage that also provides protection to prevent spills to the drainage system; and
- provision of spill kits and potential spill risk areas.

During construction spill containment and response is likely to be adequately addressed through a CEMP however a separate plan to cover the operational stage, and risks such as product loading, may be required.

1.6.5 Terrestrial Biodiversity

Land clearing impacts both vegetation and fauna within and surrounding the Project site site. The presence of conservation significant species such as the Maleo is considered unlikely and it is understood that PAU will discuss possible management options with the IFC. It is expected that flora and fauna impacts during construction can be adequately managed through the CEMP. Potential management actions to be considered would include;

- relocation of fauna species disturbed during construction;
- appropriate storage and disposal of cleared vegetation; and
- avoidance of unnecessary clearing and retention of native vegetation where possible.

A relatively large area of vegetation would be retained within the site during construction and this includes a green belt area along the coastal fringe. A management plan should be developed following completion of construction to detail efforts to conserve biodiversity values within the site.

1.6.6 Marine Management Plan

The project RKL/RPL document did not specify any marine monitoring requirements. A Biodiversity EIA addendum was completed and this addressed some gaps in the EIA information and also recommended some follow-up actions including the collection of further marine baseline water quality data, as well as preparation of a marine management plan, incorporating monitoring requirements. Some basic marine monitoring requirements have been specified at *Table 3* and these are designed to ensure that discharge water water paramaters, including temperature, remain within the IFC and Indonesian regularory requirements.

Based on the findings of the biodiversity EIA addendum, the marine management plan should consider the following areas;

- Invasive Marine Species Management (IMS) associated with marine construction and operations;
- vessel management;
- marine discharges; and
- coral and marine biodiversity monitoring.

Table 3 Effluent Monitoring Requirements

PARAMETERS	WBG/IFC Maximum Levels	Indonesia Maximum Levels
pH	6-9	6-10
Boichemical oxygen demand	30 mg/l	100 mg/l
Chemical oxygen demand (COD)	125 mg/l	250 mg/l
Oil and grease	10 mg/l	25 mg/l
Total suspended solids (TSS)	30 mg/l	100 mg/l
Ammonia	10 mg/l	50 mg/l
Nitrogen	15 mg/l	N/A
Phosphorus	2 mg/l	10 mg/l
Temperature increase	3°C *1)	Disch 45°C max

NOTES:

*1) The effluent should results in a temperature increase of no more than 3°C at the edge of the zone where initial mixing and dilution take place.

1.6.7 *Noise and Vibration Assessment and Management Plan*

The project EIA did not specify any noise monitoring requirements during construction or operations.

Section 1.7 of the IFC EHS Guidelines: Environmental Noise Management is the Project benchmark for assessing and mitigating the predicted impacts of noise beyond the project boundary. The IFC EHS Noise guidelines as well as the Indonesian Noise Standards specified by Decree of the Environment State Ministry No. KEP/48/MENLH/11/1996 regarding Noise Level Standards, are detailed at *Table 4* below.

Table 4 Project Noise Guidelines

Receptor	One Hour L_{Aeq} (dBA) IFC Guideline		Indonesian Regulation
	Daytime (7am to 10pm)	Night time (10pm to 7am)	Noise Level dB (A)
Residential, institutional or educational	55	45	55
Industrial, commercial	70	70	70

Based on previous experience, it is expected that construction noise management can be adequately addressed through the CEMP. Some basic monitoring

requirements have been outlined in *Table 4*. These are designed to monitor construction noise at local sensitive receptors against the established Indonesian Regulations and IFC requirements.

Operational noise management and monitoring will also be required and it is expected that this would be detailed within an Operational Environmental Management Plan.

During both construction and operations, noise monitoring will be required at nearby sensitive receptors and also within the construction area. The project will be required to monitor against the guidelines provided in *Table 4*. The Indonesian requirements are the same as the IFC EHS requirements with the exception of the IFC Guideline value of 45 dBA for nighttime activities.

1.6.8 Air Quality Management

The project EIA did not specify any air quality monitoring requirements during construction or operations.

It is expected that construction air quality management can be adequately addressed through the CEMP. This may include dust management and regular servicing of construction vehicles. Some basic monitoring requirements have been outlined in *Table 5*. These are designed to monitor construction air quality at local sensitive receptors against the established Indonesian Regulations and IFC requirements.

Table 5 Air Quality Monitoring

PARAMETERS	WBG/IFC Maximum Level		Indonesia Maximum Level		Predicted Performance	
PM from other processes	50	mg/Nm^3	250	mg/ Nm^3	NIL	mg/ Nm^3
Nitrogen oxides (as NO_2)	200	mg/Nm^3	700	mg/ Nm^3	123.2	mg/ Nm^3
Sulphur dioxides (as SO_2)	150	mg/Nm^3	-	mg/ Nm^3	Max. 14.3	mg/ Nm^3
Ammonia	50	mg/Nm^3	300	mg/ Nm^3	NIL	mg/ Nm^3
Nitrogen oxides (NOx)	300	mg/Nm3			190 as O_2 15%	
CO_2	1.15-1.30	ton/ton NH_3	N/A	ton/ton NH_3	1.27	ton/ton NH_3
Sulphur dioxides (SOx)			900	mg/ Nm^3	0.1 as O_2 15%	
NH_3	50	mg/Nm^3	2.00	ppm	TBC	
H_2S			0.02	ppm	TBC	

Operational air quality management and monitoring will also be required and it is expected that this would be detailed within an Operational Environmental Management Plan.

1.6.9 Recommended Management Plan Actions

The project is in the initial stage of construction planning and as such the recommended plans have not yet been prepared. Additional requirements may also become apparent following completion of the recommended actions detailed within the Biodiversity EIA Addendum.

This section may be updated following preparation of the draft plans and also as part of future revisions to the ESMP.

1.7 MONITORING PLAN

Included within *Table 1* and *2* are requirements for monitoring biological, physical, chemical related aspects, as required by the project RKL/RPL monitoring plan and also those recommended as part of the EIA review.

As construction planning commences, responsibility for the completion of monitoring activities will be confirmed. In all cases it is likely that a third party will be commissioned to conduct the monitoring during the construction and operation on behalf of the Project to provide transparency and reliability of the report.

Following completion of the recommended project management plans it is recommended that an overarching marine and terrestrial monitoring plan is developed for both the construction and operational phases of the project.

1.7.1 Reporting

Reporting requirements will be confirmed as construction planning progresses. At this stage the primary reporting requirements is the preparation of twice yearly RKL/RPL monitoring reports.

EIA Addendum 7
Social Impact Assessment and Management Plan

Prepared for:

PT Panca Amara Utama

February 2013

Delivering sustainable solutions in a more competitive world

ERM

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Revision	Description	By	Checke	Approve	Date

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1 INTRODUCTION

1.1 OVERVIEW

The proposed PT Panca Amara Utama (PAU) ammonia plant and supporting facilities (the "Project") is located in Uso Village, Batui Sub-District, Banggai Regency, Central Sulawesi Province. The Project is being developed to produce ±2,000 tons per day or about 700,000 tons per year production capacity of liquid ammonia. The Project is being developed to support the domestic and export market for ammonia. At the regional level the project is expected to support the increased local revenue, employment opportunities, and accelerate the growth of industries in Central Sulawesi Province and Banggai Regency.

PAU has been allocated 55 MMSCFD (million standard cubic feet per day) of natural gas from Senoro-Toili onshore gas fields. The Project is scheduled for pre-commissioning and full gas intake in 2015, while currently basic engineering design is being progressed.

The Project has gained approval from the Indonesian Government through the updated version of Environmental Impact Assessment (*Analisis Mengenai Dampak Lingkungan* – AMDAL/ EIA) on 8 October 2012. Due to the funding being pursued by PAU, this Social Impact Assessment (SIA) is being prepared as an EIA Addendum to the project AMDAL, to ensure significant social impacts are managed appropriately; reflecting the requirements of the relevant 2012 International Finance Corporation (IFC) Performance Standards.

1.2 SIA OBJECTIVE

The objectives of this SIA are to:

1. Obtain an understanding of the existing socio-economic and public health baseline conditions relevant to receptors that could be significantly impacted by the Project;

2. Identify Project components likely to result in significant impacts to identified receptors;

3. Document how stakeholders have been engaged by the Project and considered in the assessment process;

4. Predict and evaluate the social impact significance of the Project;

5. Identify the social aspects of the Project that need to be managed and recommend appropriate mitigation and enhancement measures;

6. Propose recommendations for the management and monitoring of impacts, including plans for ongoing stakeholder engagement.

1.3 SIA SCOPE

The scope of this SIA covers the pre-construction, construction, and operation of the Project. The "Project Area" is defined as the areas and communities located within and surrounding the Project as identified within the EIA, i.e. the Villages of Uso, Hombola, and Lamo in the Batui Sub-District and the Villages of Tangkiang, Kalolos, and Babang Buyangge in Kintom Sub-District.

The IFC conducted a review of the Project ANDAL and subsequently prepared a Term of Reference (ToR) for the SIA (and other EIA addendums). While social impacts were considered as part of the Project ANDAL, the IFC review identified gaps in this assessment that require further consideration. This report will use the available ANDAL information and also ERM understanding of the region to synthesize this into an assessment that addresses the IFC's ToR requirements.

1.4 LIMITATIONS

General limitations identified during the undertaking of this SIA:

1. ***Data limitations:*** This EIA addendum has been completed through a desktop exercise using available information in the Project AMDAL/ EIA (2012), the Environmental Impact Statement (EIS) of Matindok Gas Development (2008) and other publicly available related documents, interpreted with ERM's understanding of social conditions within the region. Site specific data on some social, economic, and cultural information is lacking and there are also some gaps in the AMDAL identification and assessment of Project social impacts. Where possible ERM has used its professional judgment in considering the potential social impacts and it has been recommended that further social measures be undertaken to verify these findings. In some instances it has also been recommended that social management plans be developed during construction and operations;

2. ***Land Acquisition Data:*** There is limited availability on socio-economic baseline data of the land acquisition affected people to inform the impact assessment, some findings may require revisiting;

3. ***Tight Timeframe:*** There has been limited time to carry out primary research due to the tight financing process deadline, while some findings require revisiting. Additional surveys and interviews at the local level

would have been valuable to triangulate the secondary data that was gathered.

1.5 STRUCTURE OF THE REPORT

This report presents the results of social impact assessment, including the Project description, an overview of the Indonesian and international framework to conduct the assessment, summary of previous and current consultation, socio-economic profile of the affected community, an assessment of Project's social impacts, and a set of recommendations for consideration moving forward.

The remainder of this report is structured as follows:

Section 2 *Project Description* – presents an overview of the Project's key components;

Section 3 *Regulatory and Administrative Framework* – summarizes the requirements in which the Project is required to comply with;

Section 4 *Approach and Methodology* – outlines the methodology utilized for this social impact assessment;

Section 5 *Baseline Profile* – describes the social baseline information relevant to the Project and its area of influence which serves as a basis for an assessment of potential social impacts;

Section 6 *Social Impact Assessment* – provides an overview of impact screening, identification, significance evaluation, and recommended additional mitigation measures;

Section 7 *Social Management Plan* - describes how the Project will manage and ensure the implementation of the proposed mitigation measures will be monitored and audited;

2 PROJECT DESCRIPTION

This section describes the features and scope of activities proposed by the Project proponent. This information will serve as basis, along with the baseline, to support identification of the potential significant social impacts resulting from the Project activities during the pre-construction, construction, and operation stages. The Project is also described in detail within the ANDAL.

2.1 PROJECT LOCATION

The PAU ammonia plant and its supporting facilities are proposed to be developed in an area of 200 hectares (ha) in the Uso Village, Batui Sub-District, Banggai Regency, Central Sulawesi Province *(see Figure 2.1)*. The Project supporting facilities include a power generator station, warehouse, waste water treatment plant, and shipping jetty. These whole facilities will be operated in a total area of 501,200 m^2, with the following details layout *(see Table 2.1)*.

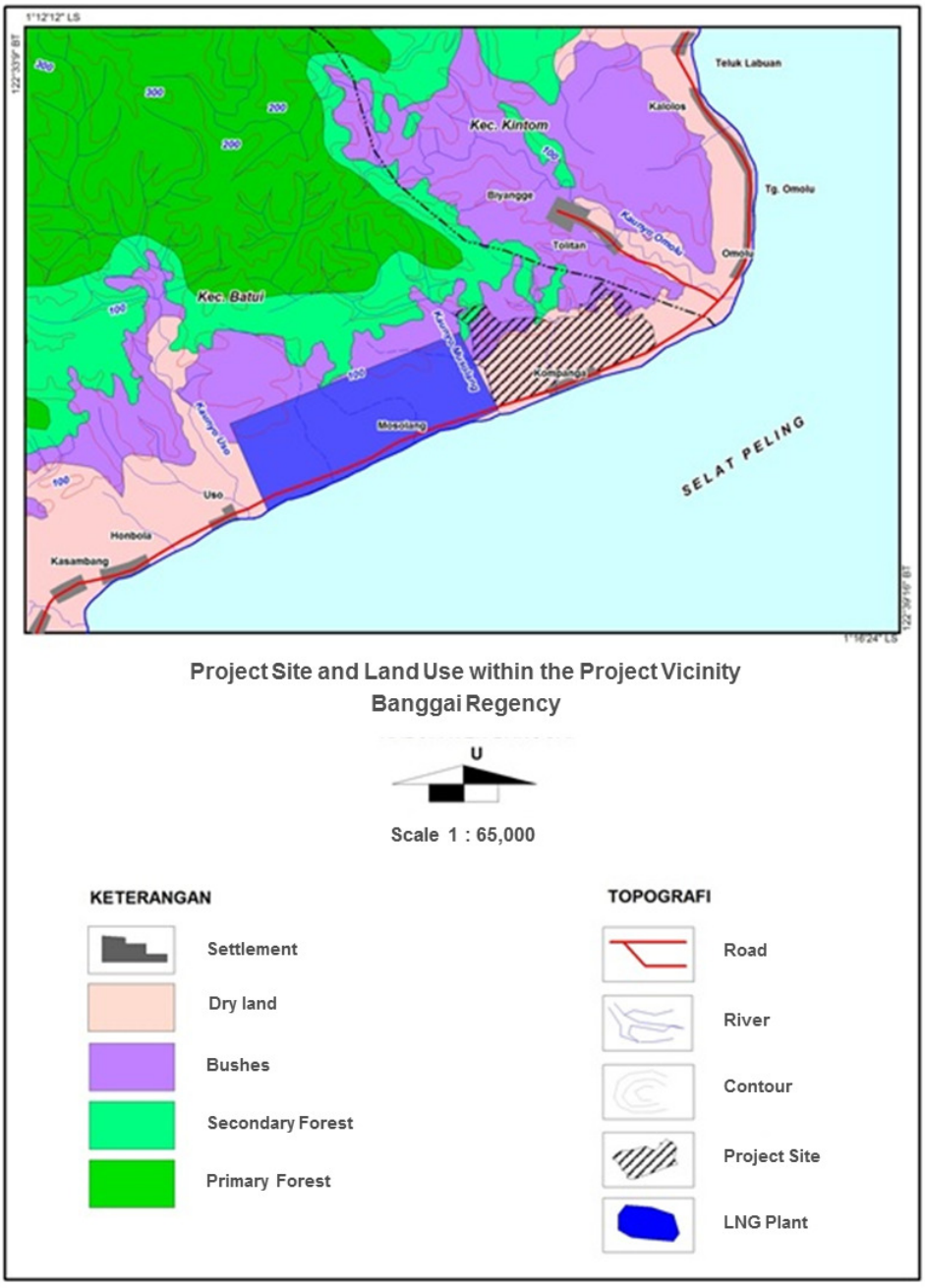
Table 2.1 Project Facilities Area

Project Facilities	Area (m2)
Ammonia plant	32.600
Power Generator and Sub-Station	12.850
Supporting Utilities	10.450
Warehouse and Workshop	10.800
Office premises and parking	9.000
Fire extinguishing unit	500
Ammonia tank area	22.500
Waste water treatment plant (WWTP)	3.000
Laydown area	20.000
Road and parking area at the factory	40.000
Water intake	1.500
Green open area	300.000
Retention pond	23.000
Shipping dock	15.000

Source: EIA, 2012

Key receptors in the vicinity of the Project area are settlements (including the Villages of Uso, Hombola, Lamo, Kalolos, Tangkiang, and Babang Buyangge), community plantations (largely coconut, cocoa, coffee, etc.), secondary forests, and an LNG (liquefied natural gas) plant operated by PT Donggi Senoro LNG (DSLNG). The DSLNG plant is currently being constructed at the eastern boundary of the Project site.

Figure 2.1 PAU Project Area



Source: EIA, 2012

2.2 PROJECT COMPONENTS

2.2.1 Pre-Construction Phase

2.2.1.1 Location permit

The Project has obtained permission from the Banggai Regency Government through Banggai Regent Permit Letter No. 503/857/Bag.Tapem, dated 18th July 2005. This letter was then updated through Banggai Regent Permit Letter No. 503/108/Bag.Adm.Tanah, dated 24th April 2012, concerning Location Permit for PAU for Business Purposes in Petrochemical and Natural Gas Industry in Uso Village, Batui Sub-District, Banggai Regency, with an area of ±200 Ha.

2.2.1.2 Public consultation

EIA socialization for the development of the Project has been conducted twice; the first was held on January 2006 during the first version of EIA preparation; the second was held in May 2012 during the updated version of EIA preparation. These are in accordance with the Decree of the Head Environment Impact Management Agency No. 08/2000 concerning community involvement and disclosure of information in the process of EIA development.

2.2.1.3 Land acquisition

An area of ±205 ha located in Uso Village was planned to be acquired for the Project; however only 50 ha is required for the main development. Currently, about 186 ha or 90% of the land previously owned by 174 people from different villages nearby has been acquired by the Project through direct sale and purchase processes with the land owners. Approximately 19 ha belonging to 34 people has not been acquired, however, the Project has confirmed that the acquired land is sufficient for the construction to commence, with possibility of purchasing the remaining plots at a later date.

The Project land acquisition process has been started since 2005; initiated with land survey and obtain data of land ownership from BPN and village and/or sub-district officers. The compensation was based on voluntary sale and purchase process, while the value was agreed with the affected land owner. As such, no compulsory procedures were applied to the land owners during the Project land acquisition process.

The compensation was paid through bank account transfer, acknowledged by the Head of Uso Village and Head of Batui Sub-District. This is as outlined

within the Sale and Purchase Deed signed by both parties; the Project and affected land owner.

2.2.1.4 *Manpower mobilization*

Numbers of labour force for various functions required for the Project pre-construction phase are presented within the following table.

Table 2.2 Manpower Requirements for Pre-Construction Stage

Job Position	Number of People
1. Land Preparation	
Supervisor	5
Machine operator	30
Dump truck operator	45
Laborer	50
2. Peripheral fencing	
Supervisor	2
Brick layer	13
Laborer	55
Total	200

Source: EIA, 2012

The above table shows approximately 200 people will be recruited by the Project during pre-construction stage. From this number, the updated EIA identified more than 50% of the labour requirements are categorized into non-skilled job function.

Priority for the labour recruitment shall be given to the local community, particularly from Uso Village where the Project is located. Preference for recruitment will then take place in other villages within the vicinity of the Project (such as Hombola, Lamo, Kalolos, Tangkiang, and Babang Buyangge). However, when qualified manpower for the proposed job position is not available, recruitment will be conducted in other areas.

2.2.1.5 *Equipment mobilization*

Roughly 62 different types of equipment and other required materials for site preparation will be mobilized into the Project area through the national road connecting Luwuk City (the capital of Banggai Regency) with Batui Sub-District. The road is 6 m wide, with 4 m paved and 1 m shoulders each side. The Matindok Gas Development EIS (2008) identified the road was in good hardening level.

2.3.1.6 Other Pre-Construction Activities

Other pre-construction phase works include:

1. Construction of the basecamp within the area of 200 ha which will be utilized for workers accommodation, materials storage, workshops, and parking lots for equipment. It will be equipped with appropriate camp disposal facilities, such as septic tanks, waste bins, and for temporary oil disposal. In addition, when the capacity of basecamp are not sufficient, local residential will be rented for some workers;

2. Land preparation, cutting and filling, land grading, and peripheral fencing; and

3. Drainage development.

2.2.2 Construction Phase

The following construction activities will be undertaken during this phase of work:

1. Development of the construction jetty;

2. Construction of the ammonia shipping jetty, which will be developed for ships and loading facilities to transport ammonia. The ship shall be sufficient for capacity of up to ± 44,000 tons of ammonia. For this capacity, the ship will require a minimum water depth of 13 meters. As such, the jetty will be developed at a distance of ± 80 meters from the sea-coast to reach a sea depth of about 15 meters;

3. Plant construction;

4. Construction of equipment support structure made of concrete and/ or steel which will require sand blasting;

5. Green belt development for buffer zone, ground water recharge, carbon sunk, and aesthetics function, in which numbers of local species will be planted, include mango, cashew, and durian; and

6. Demobilization of heavy equipment.

These activities will take place over approximately 2.5 years after site preparation is completed, with ±2,300 workers recruited at the peak of Project construction. These numbers consist of:

1. Approximately 300 workers recruited directly by PAU (roughly 100 of these will be laborers); and

2. Approximately 2,000 workers will be recruited by EPC contractor (1,200 of which will be laborers).

The same provisions for pre-construction recruitment are applied during this construction phase. Demobilization of manpower will occur at the end of the construction stage as the Project workforce size will decline during operation phase.

2.2.3 *Operation Phase*

The following activities will be conducted during the Project operation stage:

1. Manpower mobilization, in which approximately 300 workers will be recruited. Construction workers with relevant expertise will remain in employment where feasible. The employment composition based on required academic backgrounds is presented in the below table. It indicates that from a total 300 laborers required, about 30% (manager and staff) will be required to possess higher education and relevant expertise, while the remainder can be categorized as non-skilled job functions.

Table 2.3 Manpower Requirements for Operation Stage

Job Position	Academic Background	Number of People
Manager	Master or Bachelor	67
Staff	Bachelor, Diploma or High School	24
Operator/ Technician	High School or equal degree	104
Outsourcing	High School, Junior High School or equal degree	105
Total		300

Source: PAU Data, 2013

2. Ammonia processing, include ammonia manufacturing process, desulphurization process, primary and secondary reformer, shift conversion, CO_2 removal, methanation, compressed gas and ammonia synthesis;

3. Operation of utility units, include plant air supplies and instrumentation, a seawater cooling system, chlorination, sweet cooling water, desalination and polisher, and power generation;

4. Presence of ammonia storage tanks and shipping activities;

5. Emissions and waste production which include flue gas, gas effluent, purge and flash gases, non-continuous emission from flaring process,

liquid waste, and solid waste. Gas emissions will be drawn to the centralized flare stack system with sufficient height to reduce the air pollution, while liquid waste will be further processed in waste water treatment (WWT) facility, and solid waste to be stored within the containers placed in the building to protect from the direct sunlight and rain-water;

6. Health, safety, and environment (HSE) management, in which an HSE policy, HSE standard operating procedure (SOP), emergency and disaster response plan, and HSE training program will be applied.

3 REGULATORY AND ADMINISTRATIVE FRAMEWORK

3.1 OVERVIEW

This chapter provides an overview of the regulatory and administrative framework for the Project. This includes the Indonesian Government regulation, international best practice standards relevant to the Project due to its proposed financing process, and existing corporate policies applied for the Project social and environmental performance.

An AMDAL (environmental impact assessment) based on the national regulation requirements has been approved by the Indonesian Government in 2006 and updated in 2012. In addition, to receiving and retaining support for the Project from international finance institutions, where feasible, this social impact assessment (SIA) has been undertaken to address gaps between the project AMDAL and IFC requirements, as outlined within the TOR.

3.2 INDONESIAN REGULATORY FRAMEWORK

3.2.1 AMDAL Process Outline

The AMDAL process comprises an integrated and comprehensive assessment of major and significant impacts of a project or activity. This includes assessment of ecological, socio-economic, cultural and public health aspects. The AMDAL process aims to evaluate the environmental feasibility of a project or activity and is used as a provision by the authority for granting the subsequent permits for the project or activity.

Law No. 32 (Article 22) of 2009 (Previously Law No. 23 [Article 18] of 1997) followed by Government Regulation No. 27 of 1999 concerning AMDAL stipulates that an AMDAL should be carried out for the proposed activities which are expected to have significant environmental impacts. Thereafter, various legislation and guidelines have been issued to specify activities that require a full AMDAL process as defined in the Minister of Environment Decree No. 11 Year 2006. The AMDAL document's format is defined in the Minister of Environment Decree No. 08 Year 2006.

The Project AMDAL was approved by the Indonesian Government in 2006 and updated in 2012. A range of community-related impacts were identified within the document, as follow.

1. Impact to public participation from the public consultation activities during pre-construction phase;

2. Impact from land acquisition to public income and potential social conflict during pre-construction phase;

3. Impact from equipment and material mobilization to road damage, increased dust, and traffic during pre-construction phase;

4. Impact from Project manpower mobilization to employment and business opportunities, potential social conflict, and public income during pre-construction, construction, and operation phase; and

5. Decrease air and sea water quality from ammonia production process during operation phase.

3.2.2 *Other National Regulation*

Other Indonesian regulations relevant to the Project are as follows.

Table 3.1 Indonesia Regulation Relevant to the Project

Regulation	Content
A. Laws	
Law of the Republic of Indonesia No. 13/2003 on Manpower	Related to recruitment of workforce and working conditions
Law of the Republic of Indonesia No. 2/2004 about Industrial Relations & Dispute Settlement	Related to industrial relationships and settlement of industrial disputes
Law of the Republic of Indonesia No. 22/1999 and Law No. 32/2004 on Regional Government	Related to governmental activity program for the interest of the people and supporting the Regional Government's program
Law of the Republic of Indonesia No. 40/2004 concerning social security	Related to social security of workforce
Law of the Republic of Indonesia No. 22/2009 on Traffic and Public Transportation	Related to activities that use heavy equipment transportation through the surrounding road
Law of the Republic of Indonesia No. 36/2009 on Health	Associated with the health of workers in the project activities, public health impact due to the various activities and also related to the role of society/private in improving health of the local people
B. Presidential Decree / Government Regulation	
Government Regulation of Indonesia No.41/1993 on Road Transportation	Related to activities that use heavy equipment to transport material and equipment through the surrounding road
Government Regulation of Indonesia No.43/1993 concerning Infrastructure and Road Traffic	Related to activities that use heavy equipment to transport material and equipment through the surrounding road
C. Ministry Decree/ Ministerial Regulation	
State Minister of Environment Decree / Head of EIA Agency No. KEP-299/11/1996 concerning Technical Guidelines for study of Social aspects in EIA	Related to technical guidelines for the study of socio-economic and cultural aspects in EIA
Decree of the Head of EIA Agency No. 124/1997 concerning Guidance for Study of public health aspects in EIA Compilation	Related to preparation of technical guidelines for study of public health aspects in EIA

State Minister for Agrarian Affairs / Head of National Land Affairs Agency Regulation No. 21/1999 concerning Procedure of Land Purchasing for Company Investment	Related to land acquisition for the planned activities
Decree of the Head of EIA Agency No. 08/2000 concerning Society Participation and Information Openness in EIA Process	Related to the proposed activities and EIA process that requires involvement / participation of the society
Minister of Health Decree No. 876/ MENKES/SK/VIII/ 2001 concerning Technical Guidelines for Environmental Health Impact Analysis	Related to technical guidelines pertaining to public health aspects in EIA
Regulation of the Head of National Land Affairs Agency No. 2/1993 on the Procedure for obtaining location license and land rights to the Company	Related to land acquisition by the company

Source: EIA, 2012

3.3 INTERNATIONAL BEST PRACTICES

The IFC PS defines roles and responsibilities for managing projects and outlines the requirements for receiving and retaining IFC support. The IFC PS has become globally recognized as good practice in dealing with environmental and social risk and impact management. The IFC also requires the application of the PSs to manage environmental and social risks and impacts to enhance the project development opportunities.

The eight PSs considered as part of this SIA are:

1. *Performance Standard 1: Assessment and Management of Social and Environmental Risks and Impacts*

   An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between company, workers, and the local communities.

2. *Performance Standard 2: Labour and Working Conditions*

   The aim of performance standard 2 is to recognize that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. For the company, the workforce is a valuable asset, and a sound worker-management relationship is a key ingredient in the sustainability of a company.

3. *Performance Standard 3: Resource efficiency and pollution prevention*

   This performance standard recognizes that industrial activity and urbanization often generate increased level of pollution to air, water and land that may threaten people and the environment at the local, regional and global level. Accordingly, the Project is required to avoid the release of pollutants or, when avoidance is not feasible, minimize or control the intensity or load of their release. In addition, the Project should examine and incorporate in its operations resource conservation and energy efficiency measures, consistent with the principles of cleaner production.

4. *Performance Standard 4: Community Health, Safety and Security*

   The project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities. This Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

5. *Performance Standard 5: Land Acquisition and Involuntary Resettlement*

   This standard recognizes that project-related land acquisition and restrictions on land use could have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood.

   To avoid expropriation and eliminate the need to use governmental authority to enforce relocation, the company is encouraged to use negotiated settlements meeting the requirements of this PS even if they have the legal means to acquire land without the seller's consent.

6. *Performance Standard 7: Indigenous Peoples*

   Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also come under threat. As a consequence, Indigenous Peoples may be more vulnerable to the adverse impacts associated with project development than non-indigenous communities. This vulnerability may include loss of

identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and diseases.

Furthermore, Indigenous Peoples may play a role in sustainable development by promoting and managing activities and enterprises as partners in development. Government often plays a central role in the management of Indigenous Peoples' issues, and clients should collaborate with the responsible authorities in managing the risks and impacts of their activities. In addition, the company can create opportunities for Indigenous Peoples to participate in, and benefit from project-related activities that may help them fulfil their aspiration for economic and social development.

7. *Performance Standard 8: Cultural Heritage*

Cultural heritage is important for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this PS aims to ensure that the company protect cultural heritage in the course of their project activities. In addition, the requirements of this PS on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

3.4 CORPORATE POLICY AND ASSOCIATED REPORTS

3.4.1 Health, Safety, and Environment (HSE) Policy

PT PAU is committed to conduct all its activities in a safe and eco-friendly manner through:

1. Full compliance towards all Government Laws and Regulations related to the Employees and Labour, Safety, Occupational Health and Environment;

2. Developing harmonious relationships with its surrounding community by implementing CSR activities;

3. Continuously improving environment quality, natural resources conservation and implementing eco-green measures;

4. Implementing the Good Corporate Governance principles of Transparency, Accountability, Fairness and Responsiveness in all aspects of Safety, Health and Environment.

3.4.2 Security Management Plan

For the security service, PT PAU contracted PT Global Security Service Indonesia (GSSI) on November 1, 2012 who is also used by PT Surya Esa Perkasa (Majority Shareholder of PAU) for their security services for the LPG plant near Palembang.

GSSI is a professional security service company that aims to provide maximum service particularly in the areas of service and security, which in the case of operations in the field; the Project obtains support from the police and military officers.

In the operation, GSSI also coordinate with other stakeholders in the Project area, such as with the contractor (Toyo and IKPT), sub-contractor, DSLNG, JGC as well as the police in Batui, Kintom and Luwuk.

3.4.3 Human Resources Plan for Recruitment and Training

In terms of recruitment and training procedures, PT PAU has several policies:

1. All recruitment to be completed 18 months before Plant Acceptance. Recruited employees to be trained for pre-commissioning and commissioning. The peak number of PAU employees during Plant Acceptance is around 300 personnel, including outsourced manpower;
2. Preferential employment to local people;
3. The estimated peak EPC contractor manpower number is around 2,000. Contractors are also required to provide preferential employment to local people;
4. Training of PAU employees is part of the EPC contract;
5. Consultancy and O&M arrangements with Major Fertilizer company being considered.

3.4.4 Land Acquisition Procedure

The Project land acquisition process has been conducted independently by PAU, and a procedure has been established separately from this document.

3.4.5 Stakeholder Engagement Plan and Grievance Mechanism

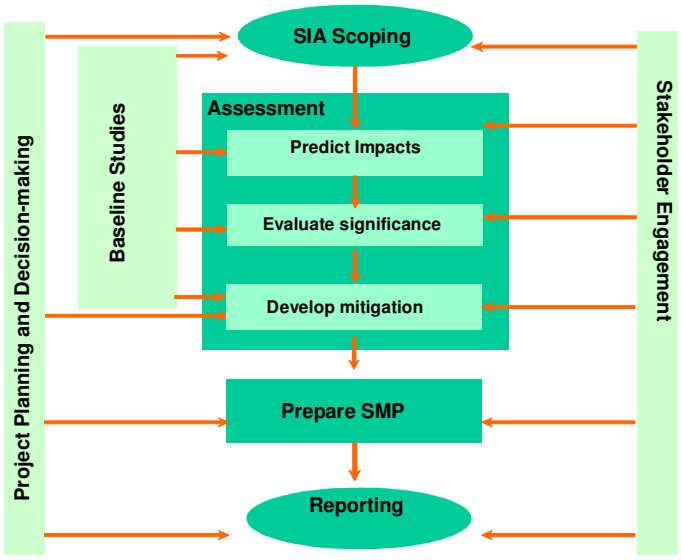
A stakeholder engagement plan (SEP) has been developed by PAU separately from this document, recognizing the Project effort for effective engagement and consultation to build and maintain constructive relationship with stakeholders over time. The plan has also defines PAU mechanism for handling grievances from internal worker as well as from stakeholders.

4 APPROACH AND METHODOLOGY

4.1 OVERVIEW

This chapter presents an overview of the SIA process undertaken to identify and evaluate the potential positive and negative effects of the Project. SIA is a systematic process that identifies and evaluates the potential impacts a proposed project may have on the socio-economic and human health environment and develops mitigation measures that will be incorporated in order to eliminate, minimise or reduce these impacts. The SIA process is one where several stages are carried out in parallel and where the assumptions and conclusions are revisited and modified as the project progresses. Figure 4.1 outlines the interactions of the key SIA steps.

Figure 4.1 Overview of SIA Process



4.2 INFORMATION SOURCES

In completing this SIA, ERM has relied on the following publically available sources of social baseline information. In some instances ERM's understanding of social issues within the area was also used. This is based on ERM experience from social surveys and reporting conducted for the nearby DSLNG project.

1. The updated version of PAU Project Environmental Impact Assessment (EIA) – 2012;

2. The 2011 data of Banggai Regency in Figure, Banggai Regency Health Profile, Batui Sub-District in Figure, and Kintom Sub-District in Figure;

3. Environmental Impact Statement (EIS) of Matindok Gas Development in Banggai Regency, Central Sulawesi Province (PPGM 2008), incorporating the downstream DSLNG Project; and

4. Environmental Management and Monitoring Plan (EMMP – UKL/ UPL) of Road Rerouting Project (RRP) of Tangkiang, Omulu, Tolitan in Kintom Sub-District and Kompanga and Uso in Batui Sub-District, Banggai Regency (2008).

Some of the Projects existing policies and management plans were provided to complete the baseline data information, along with series of consultation with the Project related person, to support the impact assessment, which include these documents below.

1. HSE policy;

2. Security management;

3. The Project manpower plan;

4. Land acquisition process and claimants data;

5. Stakeholder engagement plan; and

6. The Project public consultation documentation, include minutes of meeting of IFC consultation meeting with related stakeholders.

ERM has also used its understanding of social conditions within the Project surrounding, and where possible, its professional judgment in considering the baseline information for assessing the potential social impacts.

4.3 SCOPING

ERM has used the existing AMDAL, ERM experience and also other social reports from the area to identify relevant social aspects that have the potential to be affected by the project. In additional to this, a detailed TOR for a SIA was prepared by the IFC and where possible (given time and data limitations), ERM used this as the basis for preparing the SIA.

The following steps were undertaken for the scoping:

1. A review was undertaken to the term of reference (TOR) prepared by IFC which identify gaps against the Project EIA. The TOR identifies social issues that warrant further consideration within the SIA;

2. A review of the previously listed information sources was undertaken to screen the available baseline data and also relevant social aspects, the potential impacts, and the existing controls. This information is used as a basis for further assessment on Project potential social impact during the pre-construction up to operation phase, which include issues related to local economic growth, community health and safety, influx migration, and land acquisition; and

3. Consultation with the Project related person was conducted to gain comprehensive understanding of the Project; and with the IFC person to identify the SIA objective and expected outcome.

4.4 IMPACT ASSESSMENT APPROACH

At the initial stage of the impact assessment, preliminary information was provided to aid in the determination of what legal and other requirements apply to the Project. This step was conducted utilising a high level description of the Project. Screening and scoping are undertaken to identify the potential area of influence for the Project and the impacts resulting from the interaction between the Project and receptors within the area.

Impact significance can be assessed by comparing the potential severity of the impact against the likelihood of the impact occurring. The severity of the impact is assessed based on a number of criteria including:

1. Duration – the time period over which a receptor is affected (short-term, medium-term or long-term);

2. Extent – the reach of the impact, e.g. number of people/ communities affected or size of the area impacted (local, regional, provincial, national, international); and

3. Sensitivity of the receptor/ ability to adapt – the extent to which those impacted are able to adapt to the change.

Likelihood categories were divided into the following:

1. Low likelihood - Not heard of in the similar industry;

2. Moderate likelihood - Has occurred in the similar industry; and

3. High likelihood - Has occurred in the similar industry in Indonesia.

The overall significance of the impacts was therefore determined by using the following matrix *(Table 4.2)*.

Table 4.2 ***Significance matrix***

	Likelihood		
Severity	*Low*	*Moderate*	*High*
Low	Insignificant	Minor	Minor
Medium	Minor	Moderate	Moderate
High	Moderate	Major	Major
Positive			

As part of the process, both direct and indirect potential social impacts were assessed. Direct impacts result from a direct interaction between the project activities and a receptor; whereas an indirect impact follows on from the direct interaction between the project activity and a receptor and often occurs at a different time.

4.5 *DEVELOPMENT OF MITIGATION MEASURES*

A key element and outcome of the SIA process is to explore and develop practical measures of avoiding or reducing potential impacts associated with the Project. These are commonly referred to as mitigation measures and will be incorporated into the Project either as direct design measures, or as commitments to be implemented.

Impacts that have been confirmed to be moderate or major require mitigation measures to minimise or reduce the impact to as low as reasonably practicable (ALARP) and optimizing and maximizing any potential benefits of the project, where applicable. Impacts assessed as insignificant or minor require no additional mitigation - on the basis that the magnitude of the impact is sufficiently small or that adequate controls are already included in the planning. However, on-going monitoring during the construction phase will be necessary to ensure the impact significance does not increase.

5 BASELINE PROFILE

5.1 OVERVIEW

This section provides the current baseline conditions within the Project area which have been characterized based on consideration of available secondary data, mainly from the updated version of the EIA (2012). In addition, a secondary review of some other documents was conducted to gain a broader understanding of social conditions in the area.

The Project has recognized that its development activities will have some level of interaction with the local communities particularly in:

1. The Village where the Project is located (i.e. Uso Village in Batui Sub-District); and

2. Potential impacted surrounding areas (i.e. Hombola and Lamo Village in Batui Sub-District, and Kalolos, Tangkiang, and Babang Buyangge Village in Kintom Sub-District).

Almost all of these villages are coastal area, except Babang Buyangge Village which is a valley; however, the main community source of income is from plantations (coconut, cocoa, and guava) and farming (paddy). In addition, an industrial development is currently being developed within the Project vicinity (i.e. DSLNG and its associated facilities). It is anticipated this will create new sources of income for the community.

The following sub-sections are organized by the categorization of baseline information relevant to the Project and its area of influence.

5.2 DEMOGRAPHY

The population and density in each village in the two sub-districts in 2011 are presented in *Table 5.1*. It can be seen that the population density in Kintom is higher compared to Batui.

The table also explains the number of households and population according to gender ratio in both sub-districts (the ratio is higher in Batui than in Kintom).

Table 5.1 ***Population in the Project Area - 2011***

Sub-District/ Village	Area (km^2)	Population			Household	Population Density (people/km^2)
		Male	Female	Total		
A. Batui						
Uso	126.36	524	489	1049	253	8
Hombola	123.27	446	412	858	192	7
Lamo	113.02	861	793	1654	435	15
B. Kintom						
Kalolos	40.52	273	276	549	155	14
Tangkiang	40.50	314	284	598	598	15
Babang Buyangge	20.00	172	169	341	341	17

Source: Batui and Kintom Sub-District in Figure, 2011

From these data, the Sub-District in Figure (2011) identified higher number of productive age population in Batui (85.5%) and Kintom (88.2%) compared to the unproductive age. This indicates approximate number of job seeker in the two sub-districts.

The following table presents the increased number of population in the two sub-districts in 2006 to 2010. The data shows an increasing population in three years, from 2008 to 2010, particularly in Batui.

Table 5.2 ***Increased Populations in the Project Area 2006-2010***

Sub-District/ Village	Population (people)				
	2006	2007	2008	2009	2010
A. Batui					
Uso	961	997	995	1.016	1.049
Hombola	940	1.017	920	939	858
Lamo	1.542	1.596	1.590	1.625	1.654
B. Kintom					
Kalolos	370	396	369	375	549
Tangkiang	813	811	797	809	598
Babang Buyangge	347	371	412	418	341

Source: Batui and Kintom Sub-District in Figure, 2011

5.3 EDUCATION CONDITION

The education condition of the population within the Project area is identified from the education level and the availability of education infrastructure, as shown in *Table 5.3* and *5.4*.

Table 5.3 Education Level

Sub-District/ Village	Education Level (%)			
	Not Graduate Elementary School	Elementary School Graduated	Junior High School Graduated	High School Graduated
A. Batui				
Uso	39.4	15.2	30.3	15.2
Hombola	5.0	55.0	25.0	15.0
Lamo	0.0	40.0	25.0	35.0
B. Kintom				
Kalolos	0.0	40.0	26.7	33.3
Tangkiang	0.0	53.3	26.7	20.0
Babang Buyangge	0.0	44.4	44.4	11.1

Source: EIA, 2012

Based on the EIA primary data (2012), it is identified that the community in the Kintom sub-district has no problem accessing elementary education, as most of the community are elementary school graduated. While in Uso and Hombola Village in Batui Sub-District, there are a number of residents who are not elementary school educated.

The following table presents the availability data of education facilities at the Sub-District level in 2010. It indicates that the low level of education of communities within the Project area might be caused by limited access to higher education (i.e. high school).

Table 5.4 Education Facility and Services

Sub-District/ Village	Kindergarten			Elementary School			Junior High School			High School		
	School	Teacher	Student	School	Teacher	Student	School	Teacher	Student	School	Teacher	Student
A. Batui												
Government-own	0	0	0	19	193	3874	3	33	906	1	25	365
Private-own	8	37	284	1	23	108	3	37	325	2	31	223
Total	8	37	284	20	216	3982	6	70	1231	3	56	588
B. Kintom												
Government-own	0	0	0	18	128	1862	3	50	416	1	29	289
Private-own	12	54	432	1	13	40	3	58	194	3	40	161
Total	12	54	432	19	141	1902	6	108	610	4	69	450

Source: Batui and Kintom Sub-District in Figure, 2011

5.4 LIVELIHOOD

As seen in *Table 5.5*, livelihoods of the community within the Project area, as recorded in EIA (2012), are mostly farming based as well as fishing in Batui (25.6%) and the private sector in Kintom (25.9%).

Table 5.5 Main Community Livelihoods

Sub-District/ Village	Livelihood (%)					
	Fishing	Farming	Private Sector	Entrepreneur	Laborer	Other
A. Batui						
Uso	20.0	36.0	28.0	0.0	4.0	12.0
Hombola	5.6	77.8	0.0	0.0	0.0	16.7
Lamo	0.0	81.8	0.0	0.0	9.1	9.1
B. Kintom						
Kalolos	0.0	56.3	18.8	6.3	0.0	18.8
Tangkiang	7.1	71.4	7.1	0.0	14.3	0.0
Babang Buyangge	0.0	100.0	0.0	0.0	0.0	0.0

Source: EIA, 2012

The EIA primary data also identified that most of the people in the Project area have very few secondary livelihoods as shown in *Table 5.6*.

Table 5.6 Community Secondary Livelihood

Sub-District/ Village	Livelihood (%)					
	Fishing	Farming	Private Sector	Entrepreneur	Other	No Secondary Livelihood
A. Batui						
Uso	16.0	4.0	0.0	0.0	8.0	72.0
Hombola	0.0	9.5	4.8	4.8	0.0	81.0
Lamo	0.0	0.0	0.0	0.0	0.0	100.0
B. Kintom						
Kalolos	0.0	0.0	0.0	0.0	0.0	100.0
Tangkiang	0.0	0.0	0.0	0.0	0.0	100.0
Babang Buyangge	0.0	0.0	0.0	0.0	0.0	100.0

Source: EIA, 2012

In addition, the Regency in Figure (2011) identified that agricultural sector produce the highest regional domestic income for Banggai Regency, while the second domestic income came from trading industry which includes retail

and restaurant. However, the mining industry which includes oil and gas has the highest growth number compare to other sector.

There is lacking of community income data for the whole communities within the Project area. The UKL/UPL of RRP (2008) identified that the average monthly income of the communities in Uso, Kalolos, Tangkiang, and Babang Buyangge was IDR 1,383,204; however the predominant income was IDR 500,000 per month. As such, considering the minimum wage in Central Sulawesi Province is IDR 885,000 per month, most of the community within the 4 villages can be categorized as poor.

5.5 *LAND OWNERSHIP*

Based on the community livelihood data in Project area, it is shown that the community mainly work in agricultural sector. This is influenced by the land ownership in the two sub-districts. *Table 5.7* presents community land ownership conditions, categorized into plantation garden and dry land. The table indicates that most people in Batui and Kintom own about 0 - 0.5 ha area for plantation garden and dry land.

Table 5.7 Land Ownership

Sub-District/ Village	Area of Plantation Garden (% of land ownership)			Area of Dry Land (% of land ownership)		
	0 – 0.5 ha	0.5 – 1 ha	> 1 ha	0 – 0.5 ha	0.5 – 2 ha	> 2 ha
A. Batui						
Uso	52.0	16.0	32.0	100.0	0.0	0.0
Hombola	90.5	9.5	0.0	61.9	14.3	23.8
Lamo	80.0	5.0	15.0	95.0	5.0	0.0
B. Kintom						
Kalolos	85.7	7.1	7.1	100.0	0.0	0.0
Tangkiang	73.3	0.0	26.7	100.0	0.0	0.0
Babang Buyangge	55.6	11.1	33.3	100.0	0.0	0.0

Source: EIA, 2012

5.6 *HOUSING CONDITION*

The EIA primary data on 2012 identified the community housing condition in Batui and Kintom, as seen in *Table 5.8.* It can be seen that most of community in Batui are living in non-permanent housing (above 50%); while in Kintom most (above 70%) have settled into permanent housing made from brick.

Table 5.8 ***Housing Condition***

Sub-District/ Village	Housing Condition (%)		
	Permanent	Semi-Permanent	Non-Permanent
A. Batui			
Uso	40.0	8.0	52.0
Hombola	19.0	0.0	81.0
Lamo	25.0	20.0	55.0
B. Kintom			
Kalolos	73.3	6.7	20.0
Tangkiang	86.7	0.0	13.3
Babang Buyangge	0.0	44.4	55.6

Source: EIA, 2012

5.7 ELECTRICITY

According to the EIA primary data (2012), the majority of households in the Project area have access to the state electricity company (PLN). However, 40% of households in Batui and 57% of household in Kintom still share electricity with other houses. The following table also identified that 8% of households in USO and 4.8% in Hombola are still using oil lamp as source for lighting.

Table 5.9 ***Electricity***

Sub-District/ Village	Source of Electricity (%)			
	PLN (government electricity)	Share Electricity with Other House	Private Generator	Oil Lamp
A. Batui				
Uso	60.0	28.0	4.0	8.0
Hombola	52.4	42.9	0.0	4.8
Lamo	50.0	50.0	0.0	0.0
B. Kintom				
Kalolos	46.7	53.3	0.0	0.0
Tangkiang	60.0	40.0	0.0	0.0
Babang Buyangge	22.2	77.8	0.0	0.0

Source: EIA, 2012

5.8 TRANSPORTATION

Table 5.10 indicates that the community mainly use motorcycles as means of transportation in both sub-districts. However, many do not own a vehicle, and thus use public transportation.

Table 5.10 Vehicle Ownership

Sub-District/ Village	Type of Vehicle (%)			
	Motorcycle	Boat	Other (Bicycle, etc.)	No Vehicle
A. Batui				
Uso	84.0	0.0	4.0	12.0
Hombola	23.8	4.8	4.8	66.7
Lamo	30.0	5.0	0.0	65.0
B. Kintom				
Kalolos	28.6	0.0	0.0	71.4
Tangkiang	33.3	0.0	0.0	66.7
Babang Buyangge	22.2	0.0	0.0	77.8

Source: EIA, 2012

For the road infrastructure, Banggai Regency Profile (2011) identified the roads conditions in Kintom are generally classified as in good condition, constructed of gravel or asphalt. While in Batui, the roads conditions are generally considered of a moderate condition.

The Matindok Gas Development EIS (2008) indicates the average traffic volume of vehicle in the road along Kintom to Batui was 36 vehicles per hour. The most heavy traffic volume occurs at 8 to 9 am, in which approximately 85 vehicles pass through the road.

5.9 HEALTH

5.9.1 Environmental Sanitation

Environmental sanitation is one of the indicators used to understand the quality of community health conditions. There are three aspects which are an important concern for sanitation; it includes toilet use, household waste disposal, and availability of clean drinking water. The condition of sanitation facilities is an important consideration for community health condition.

Based on the data in the following *Table 5.11* most of the people in both sub-districts already have a private toilet in their house. However, some people (more than 20%) still use the sea/river/pond as toilet.

Table 5.11 Toilets Use

Sub-District/ Village	Toilet Use (%)			
	Private Toilet	Public Toilet	Sea/ River/ Pond	Other
A. Batui				
Uso	63.6	4.5	31.8	0.0
Hombola	100.0	0.0	0.0	0.0
Lamo	76.9	0.0	23.1	0.0
B. Kintom				
Kalolos	100.0	0.0	0.0	0.0
Tangkiang	100.0	0.0	0.0	0.0
Babang Buyangge	0.0	0.0	50.0	50.0

Source: EIA, 2012

Community lack of health knowledge is also identified from *Table 5.12* which shows how households manage their waste disposal.

Table 5.12 Household Waste Disposal

Sub-District/ Village	Waste Disposal (%)				
	Burnt	Collective Management	Dumped in the Pit	Dumped in the Sea	Others
A. Batui					
Uso	64.0	0.0	4.0	28.0	4.0
Hombola	33.3	0.0	33.3	33.3	0.0
Lamo	50.0	0.0	20.0	20.0	10.0
B. Kintom					
Kalolos	46.7	0.0	40.0	0.0	13.3
Tangkiang	20.0	6.7	66.7	6.7	0.0
Babang Buyangge	55.6	0.0	44.4	0.0	0.0

Source: EIA, 2012

Based on the table above, the community in both sub-districts burn waste than collective management; however, some also dump the waste in the pit or sea, without burning it.

Identification on the environment condition in the vicinity of the Project area can be also identified from the availability of clean water for drinking. The following table presents the availability of clean water for the community.

Table 5.13 Clean Water Source for Drinking

Sub-District/ Village	Water Source (%)			
	Mountain Spring	Private Well	Public Well	Other
A. Batui				
Uso	0.0	96.6	0.0	4.0
Hombola	0.0	81.0	9.5	9.5
Lamo	0.0	65.0	25.0	10.0
B. Kintom				
Kalolos	0.0	86.7	13.3	0.0
Tangkiang	0.0	73.3	26.7	0.0
Babang Buyangge	11.1	33.3	22.2	33.3

Source: EIA, 2012

As shown, most of community in both of sub-districts use private wells. This indicates quite good environmental condition within the Project area, as there is no difficulty in obtaining clean water.

5.9.2 Community Health

The following tables present a high level overview of community health conditions based on the Regency Health Profile data. It provides a general overview of community health condition in Banggai regency.

Table 5.14 Sub-District Average Birth Rate

No	Sub-District	Male			Female			Total		
		Baby	Children	Total	Baby	Children	Total	Baby	Children	Total
1	Batui	3	0	3	2	0	2	5	0	5
2	Kintom	2	0	2	2	0	2	4	0	4

Source Banggai Regency Health Profile, 2011

Table 5.14 shows that in 2010, Batui Sub-District had a higher life expectancy rate compared to Kintom, as it has higher number of birth rates. However both Sub-districts still identified as having a low number of birth rates compare to the Banggai Regency.

Table 5.15 Sub-District Infant Mortality Rate

No	Sub-District	Male			Female			Total		
		Life	Dead	Total	Life	Dead	Total	Life	Dead	Total
1	Batui	114	1	115	118	0	118	232	1	233
2	Kintom	78	1	79	86	2	88	164	3	167

Source Banggai Regency Health Profile, 2011

Table 5.15 shows that in 2010, Batui Sub-District had higher life expectancy rates compared to Kintom, as it had lower infant mortality rates. However

both Sub-districts still identified as having a low number of infant mortality rates compared to the Banggai Regency, which is up to 8 mortality cases per one life.

Table 5.16 Sub-District Maternal Mortality Rate

No	Sub-District	Maternal Mortality during Pregnancy				Maternal Mortality at Birth				Maternal Mortality after Birth			
		<20 Thn	20-34 Thn	≥35 Thn	Total	<20 Thn	20-34 Thn	≥35 Thn	Total	<20 Thn	20-34 Thn	≥35 Thn	Total
1	Batui	-	-	-	0	-	-	-	0	-	-	1	1
2	Kintom	-	-	1	1	-	-	-	0	-	-	-	0

Source Banggai Regency Health Profile, 2011

The Banggai Regency Health Profile also identified that both sub-districts still having a low number of maternal mortality rates compared to the Banggai Regency, which is up to 11 mortality cases identified in 2010.

In addition, community health condition can be also identified from the disease status of the community, as shown in *Table 5.17* and *5.18*.

Table 5.17 Disease Status in Batui Sub-District

Disease	Patient (%)
Respiratory infection *(ISPA)*	41.8
Gastritis	16.7
Hypertension (high blood pressure)	9.8
Diarrhea	9.6
Allergic	8.6
Arthritis	6.5
Bronchitis	2.5
Tonsillitis	2.5
Traffic accident	1.5
Conjunctivitis	0.6

Source: EIA, 2012

In the Batui Sub-District, the top three diseases in the community in 2011 were respiratory infections, gastritis, and hypertension, as shown in the table above. Kintom conditions were similar.

Table 5.18 Disease Status in Kintom Sub-District

Disease	Patient (%)
Respiratory infection *(ISPA)*	32.3
Gastritis	15.2
Diarrhea	10.9
Hypertension (high blood pressure)	10.1
Arthritis	7.7
Dermatitis	4.4
Malaria	4.0
Hypotension	2.1
Tonsillitis	2.0
Allergic	1.3

Source: EIA, 2012

5.9.3 Public Health Service

Public health service availability and condition are presented in the following *Table 5.19* and *5.20*.

Table 5.19 Public Health Facilities

Public Health Facility	Sub-District	
	Batui	Kintom
Sub-district health center *(Puskesmas)*	1	1
Health center support *(Puskesmas Pembantu)*	5	4
Village clinic	6	2
Integrated services unit *(Posyandu)*	14	16
Drugstore	2	-

Source: EIA, 2012 and Batui and Kintom Sub-District in Figure, 2011

Based on the data in the table above, several public health facilities are available in both sub-districts in the Project area, as well as the medical personnel, however manpower is an issue as seen in the table below.

Table 5.20 Medical Personnel

Medical Personnel	Sub-District	
	Batui	Kintom
General Doctor	1	1
Dentist	1	0
Pharmacist	2	0
Midwife	14	7
Nurse	7	10
Health and sanitation staff	5	2
Traditional healer	-	12

Source: EIA, 2012 and Batui and Kintom Sub-District in Figure, 2011

5.10 SOCIAL CULTURAL

This section provides an overview of community social condition relevant with the Project potential area of influences. This can be identified through the community kinship and social activities, access to information, and the leadership pattern, as described in the following sub-sections.

5.10.1 Kinship and Social activities

To understand the community social and cultural value, the EIA identified the interactive pattern shown by the community members which includes kinship and social activities regularly occurring within the community in the Project area.

There are several activities that the community practice, such as religious events, women gathering activities, and youth events (e.g. sport events). The highest frequency is for ethnic ceremonies (i.e. *Tumpe* ceremony) and celebration of events for religious days.

The EIA also identified that visits among neighbours are still very frequent and the degree of cooperation between community members is relatively high. These indicate a high kinship bond among the community. Helping each other through economic difficulties, sharing food, and attending meetings are also still considered important for the community.

Other social values considered important by the community include land ownership, education levels for children, and the level of local business development.

5.10.2 *Access to Information*

The EIA concluded that most people in both of sub-districts within the Project area have no difficulty to access information from TV. It is identified that most of them already own television in the house. The community survey for the EIA also found that the community in the Project area prefer audio visual than printed media, such as newspaper or magazine, or audio media, such as radio.

5.10.3 *Community Leadership*

The leadership pattern can be identified from the community opinion of the local figure they consider as leader, which can be categorized into formal and informal patterns. The community opinion on the local leadership pattern within the Project area is presented in the *Table 5.21* below.

Table 5.21 Community Leadership

Sub-District/ Village	Community Figure (%)			
	Religious Leader	Head of Village	Custom Leader	No Answer
A. Batui				
Uso	4.0	84.0	0.0	12.0
Hombola	0.0	76.2	14.3	9.5
Lamo	0.0	30.0	70.0	0.0
B. Kintom				
Kalolos	0.0	0.0	100.0	0.0
Tangkiang	0.0	20.0	80.0	0.0
Babang Buyangge	0.0	33.3	66.7	0.0

Source: EIA, 2012

The table indicates that the traditional custom leader and head of village are the two figures considered by the community as local leaders. The traditional custom leader which is believed to be the descendent of the previous Banggai Kingdom is considered as informal leader, while the head of village is the formal community leader. Both have a strong influence and power over the community decision making process. This condition varies between villages and sub-districts. In Batui, the head of village is the most influential figure, however in Kintom; the traditional custom leader is considered the most influential.

For conflict resolution, such as family or neighbourhood matters, in general, the community will go first to the traditional custom leader. The Head of Village will be referenced to assist the conflict resolution once the conflict level has risen and cannot be resolved by the custom leader.

5.10.4 *Indigenous People and Cultural Heritage*

There are three main native ethnic groups in Banggai, i.e. Banggai, Saluan, and Balantak, which are ethnically and linguistically distinct, but share a common ancestry and heritage from Kingdom of Banggai. Other different ethnic groups which can be found throughout the Banggai are from Java, Gorontalo, Bugis, Poso, Kalimantan, and Manado. There are also several Bajau settlements in Banggai, but not located within the Project area. The Bajau is a fishing community originally from Borneo, though their settlements have scattered throughout Sulawesi (Blust, 2005).

Based on ERM understanding on the area, there are no indigenous people residing within the vicinity of the Project area, as the Banggai, Saluan, and Balantak are no longer categorized as indigenous people, but are recognised as ethnic groups.. It is also known that there is an ethnic group potentially identified as indigenous people called Loinang found in Banggai, however they aren't residing within the vicinity of the Project area.

The IFC consultation with the project affected people and stakeholders (village and sub-district government) also indicates that the Loinang people are found around Morowali which is about two days travelling or approximately 100 km away from the Project plant location. As such, the Project is unlikely to impact the Loinang people.

The people in Banggai still value and maintain their tangible and non-tangible heritages. One of their cultural practices is *Tumpe*, a traditional performance art in the form of traditional dance and music. *Tumpe* ceremony is a tradition to deliver the first Maleo bird egg from Banggai main land (Bangkiriang) to Banggai Islands Kingdom across the sea. The objectives and intentions of this traditional ceremony of Batui culture are (1) to serve as a prayer for community safety and security, (2) to serve as a cultural day or celebration, (3) to celebrate the birth of Islam in Banggai, and (4) to celebrate the anniversary of Banggai government.

Some tangible heritages are known to be located within the Banggai Regency, such as *Pata Alam*, *Makam Tua Tangan Besi*, and Jere *Mian Bungin*. These are known as sacred graves; however, these sites are not located within the vicinity of the Project area.

5.11 *COMMUNITY PERCEPTION AND EXPECTATION*

The existence of the Project and other industry within the Project area has resulted in high expectations within the community in relation to increased working opportunities which may result in increased incomes.

Table 5.22 Community Expectation to the Project Benefits

Sub-District/ Village	Benefits of the Project (%)				
	Increased Works Opportunity	Increased Income	Village Development	No Benefits	No Answer
A. Batui					
Uso	68.0	4.0	4.0	4.0	20.0
Hombola	28.6	9.5	4.8	0.0	57.1
Lamo	55.0	35.0	5.0	0.0	5.0
B. Kintom					
Kalolos	0.0	53.3	0.0	0.0	46.7
Tangkiang	20.0	13.3	0.0	0.0	66.7
Babang Buyangge	44.4	33.3	0.0	0.0	22.2

Source: EIA, 2012

However, as seen in the table above, many interviewed did not reveal their expectations. This may indicate a lack of information about the Project. The EIA also identified that most of the community cannot yet identify potential Project disadvantages, as shown the in the following table.

Table 5.23 Community Concern on the Project Disadvantages

Sub-District/ Village	Disadvantages of the Project (%)			
	Increased Pollution	Decreased Agricultural Land	No Disadvantages	No Answer
A. Batui				
Uso	0.0	0.0	96.0	4.0
Hombola	0.0	4.8	95.2	0.0
Lamo	0.0	0.0	100.0	0.0
B. Kintom				
Kalolos	0.0	0.0	100.0	0.0
Tangkiang	0.0	6.7	93.3	0.0
Babang Buyangge	1.1	0.0	88.9	0.0

Source: EIA, 2012

6 SOCIAL IMPACT ASSESSMENT

6.1 OVERVIEW

This chapter presents the assessment of potential social impacts associated with the Project pre-construction, construction, and operation related activities. A range of baseline information from the current EIA has informed the assessment for the following key impacts:

1. Local economic development;
2. Community health, safety, and security;
3. Influx migration; and
4. Impacts from land acquisition.

Other potential social impacts were screened, including impacts to indigenous people and cultural heritage, as the secondary data review identified some local ethnic groups are potentially residing within the vicinity of Project area and cultural practices are still performed by the communities. However, these impacts cannot be fully assessed due to limitation of baseline data. It is therefore recommended that these impacts are revisited upon collection of additional relevant data.

6.2 IMPACT TO LOCAL ECONOMIC GROWTH

6.2.1 *Impact Identification*

The Project development potentially encourages local economic growth as a number of local services and goods will be required to support the Project activities.

1. Increased income

It is anticipated that local direct and indirect employment during the pre-construction, construction, and operation phase will contribute directly to the local community income, as it will increase salaries and wages paid to local and non-local workers. This is likely to increase the demand in goods and services which will generate more local economic growth. In addition non local worker spend will also boost the local economy along with local project spend.

About 200 workers are employed during the pre-construction phase. This will increase within the construction and operation phase when about 2300 and 300 workers will be employed. These local direct and indirect

employments will contribute directly to local community income. It is anticipated that wages obtained through these opportunities will support the affected communities to enhance their quality of life.

As identified within the baseline chapter, communities within the Project area mainly depend on the farming sector as the main livelihood and source of income, with income still below the regional minimum wage; therefore the Project activities will provide more various sources of income for the communities to improve their economic status.

The construction and operation of Project facilities (e.g. main plant, power plant, worker camp, workshop, administrative office, warehouse, jetty) are likely to create demand for goods and services (e.g. via ongoing maintenance, transportation, catering, cleaning service, security services). This is as well potential for the existing local business and entrepreneur to expand and grow, for new businesses to develop, formally and informally (directly and indirectly), and further to increase the locals income.

The realisation of opportunities however, will depend not only on the opportunity from the Project, but also on the initiative and business skill of local entrepreneurs.

2. Land compensation

Compensation from the land acquisition process, which affects numbers of land owner, will contribute to the broader economic development of the area due to claimants reinvesting into the area. It is identified that the value of compensation paid to the affected land owner was above the market value at the time of compensation, as it also considered the replacement and livelihood restoration cost. Approximately IDR 50,000,000 to 100,000,000 was paid for each hectare of affected land in 2005, when the market value was only about IDR 1,000,000 per ha (PAU Data, 2013).

3. Community expectation

The baseline information identified a low level of education within the community. As such, the proportions of local villagers that are anticipated to be suitably qualified for a skilled job are likely to be limited. However, it is also identified that the community have high expectations for the Project to increase employment and business opportunities. The Project is expected to be able to increase community income and enhance quality of life. This is likely to create unrest if the Project cannot meet the community expectation, as there are limitations for the Project to recruit local workers due to limitations in education and relevant experience as the majority of sustainable job opportunities are skilled in the operations phase.

Similar issues have been identified as occurring in the neighbouring industry (e.g. with the LNG plant operated by PT Donggi Senoro), causing

demonstration and protest which can lead to damaged relationships with local communities

6.2.2 Control in Place

The updated EIA has stated the Project will prioritize employment of the local community, particularly from Uso Village where the Project is located and couple of villages within the vicinity of the Project (Hombola, Lamo, Kalolos, Tangkiang, and Babang Buyangge). However, when qualified manpower for the proposed job position is not available, recruitment will be available for other areas in a broader range. PAU has developed a recruitment and training plan to manage this process.

A commitment has been made during the public consultation to coordinate with local government to verify the identity of the suitable applicants. As such, stakeholder engagement plan (SEP) has been established for the Project and a corporate social responsibility (CSR) plan is being developed, containing Project commitments to support local community development.

The RKL/ RPL has also required bi-annual monitoring and reporting to the government (regency and province environmental agency, industrial agency, manpower and transmigration agency, regional planning agency) with regards to labour requirements and recruitment process during pre-construction and construction phase of the Project.

6.2.3 Impact Evaluation and Significance

Given the above context and assuming the current management plan to enhance local economic development and growth is in place, the significance of impact as result of the Project is assessed below.

Table 6.1. Assessment of Impact to Local Economic Growth

Impact to Local Economic Growth					
Impact Issue	**Impact Period**	**Receptor(s)**	**Severity**	**Likelihood**	**Significance**
Increased community income due to employment and business opportunities	Construction, operation	Community within the Project area			+
Increased income due to land compensation	Pre-construction	Land claimant			+
Community unrest due to high expectation to employment and business opportunities	Construction, operation	Community within the Project area	Medium	High	Moderate-

6.2.4 *Additional Mitigation Measures*

The following additional management plans are required to mitigate potential impact of the high expectation of local employment and business opportunities:

1. Detailed human resources procedure for local employee recruitment should be developed, and to include fair opportunity for the local community and transparency in coordinating with the local government to implement the procedure. In addition, the procedure should comply with the internationally recognized labour practices for e.g. child and women labour. Accordingly, disclosure of the recruitment procedure to be publicly available is required as part of the transparency;

2. Comprehensive community development plan should be developed with specific programs for different significant groups of affected people with various impacts of the Project in each different area. The program will include education assistance for local people, local business empowerment, and workforce capacity building (e.g. construction skill training). It is identified that the majority of the community within the Project area are currently engaged in agricultural and fishing activities (e.g. coconut, cocoa, paddy and fishing) thus it will be important to offer training for those who are interested to respond to the Project's employment and supplies needs. In addition, continuous public consultation and, where possible, partnership and coordination with local government during the program planning and implementation are required;

3. Implementation of SEP to maintain good relation with community and other stakeholders as well as mitigate any potential conflict; and

4. The existing grievance mechanism should be improved to detail a formalized way for the Project to accept, assess, and resolve community complaints, including those related to the employment issue.

6.3 IMPACT TO COMMUNITY HEALTH AND SAFETY

6.3.1 Impact Identification

1. *Community health*

Baseline data on the communities within the Project area indicates a number of health challenges including high prevalence of respiratory infection and diarrhoea and limited availability of healthcare facilities and services. Environmental impacts as a result of construction and operations such as a reduction in air quality or noise generation have been considered in the project AMDAL and preparation of a separate project Environmental Management and Monitoring Plan (EMMP). It is likely that proposed onsite construction management and mitigation would be sufficient to manage these risks.

In addition, the Project will create waste which may cause disturbance to soil and water quality, which may affect local environmental conditions. These impacts are also addressed in the project ANDAL and EMMP. Construction activities also have the potential to result in an increased number of mosquito breeding grounds – i.e. water logged trenches or pot holes with stagnant water. This may in turn contribute to an increase in the incidence of malaria and other vector diseases common to the area. The lack of facilities for waste disposal will cause some challenges in terms of construction and domestic waste disposal.

2. *Community safety*

The potential impact on community safety is mostly associated with mobilization of heavy equipment, vehicles, and workforce transportation using the local road network which will result in increased traffic movements. This increase in traffic has the potential to elevate the potential risk of a traffic incident. In addition, the operation of the Project plant could potentially add threat to community safety, e.g. from gas leakage.

Other Project activities, i.e. the vessel movement and development of the coastal area for jetty are likely create disturbance to community fishing activities, e.g. in Uso Village fishing is identified as one of community source of income. However, it was also identified that fishing is not the main source

of income for most communities, while vessel movements are not expected to significantly interrupt current fishing practices; as such the impact from the Project activities is not anticipated to be significant.

6.3.2 Control in Place

PAU has established a health, safety, and environment (HSE) policy to be implemented during the life of the Project as a high level measure to manage its occupational health, safety, and environmental performance.

A corporate social responsibility (CSR) plan is being developed, containing Project commitments to support community health. One of the plans is to provide additional health services for workers which will be able to be accessed by local community within the Project area.

The project is also required to implement environmental management and monitoring activities that are outlined within the project RKL/RPL and also the Draft Environmental Management and Monitoring Plan that has been prepared. These are designed to monitor and ensure that predicted project emissions, discharges and impacts remain within acceptable limits.

6.3.3 Impact Evaluation and Significance

Given the above context and assuming the current management plan to minimize the impact of Project construction and operation related activities to community health and safety is in place, the significance of impact as result of the Project is assessed below.

Table 6.2. Assessment of Impact to Community Health and Safety

Impact to Community Health and Safety					
Impact Issue	**Impact Period**	**Receptor(s)**	**Severity**	**Likelihood**	**Significance**
Poor environmental sanitation and community health resulting from noise, dust, and other contamination to air, soil, and water	Construction and operation	Community within the Project area	Medium	Moderate	Moderate-
Disturbance to community safety resulting from mobilization of heavy equipment, vehicles, and worker transportation	Construction and operation	Community within the Project area	Medium	Moderate	Moderate-
Threat to community safety from plant operation	Operation	Community nearby to the Project plant	High	Low	Moderate-

6.3.4 *Additional Mitigation Measures*

With regards to potential incident with community member that might result in damaged community relations with the Project, a community health and safety plan should be developed which will include a traffic management plan. Code of conduct which recognizes Project commitment for good health and safety performance related with community issues should be established, along with training to socialize it to the worker and contractors.

The plan will be conducted in line with public consultation to disclose the plan and to improve community health and safety knowledge and awareness.

In addition to manage the potential threat to community safety from Project activities, an emergency prevention, preparedness, and response arrangements should be developed to prepare to respond to community emergency situations in a manner appropriate to the level of Project risk. Affected communities and relevant government agencies to be consulted and coordinated as part of the emergency system.

The community emergency response plan will provide guidance and procedures for the Project in term of preparedness and response in view of an emergency, and ensures that the Project will have proper management oversight during the community emergency from construction phase up to operation phase.

The existing grievance mechanism procedures should be improved and applied to enable community to deliver any concern or complaints related to Project activities and impact. The mechanism should include the development of centralized grievance log and tracking system, appropriate record and reporting system, proper fact-finding process through free discrimination and coercion consultation, and local approaches/ involvement for resolution decision-making. This procedure will enable PAU to identify proper feedback and mitigation measures in addressing these concerns as any incidents with community likely to be potential source of conflict.

6.4 IMPACT OF INFLUX MIGRATION

6.4.1 Impact Identification

The local economic growth will attract in-migrants to the region. These in-migrants will be seeking Project employment opportunities, as well as opportunistic entrepreneur and trader business opportunities which may limit opportunities for the local communities.

The Project manpower mobilization during pre-construction, construction, and operation require; both skill and non-skilled workers. The project aim to prioritize recruitment from local people; however, the baseline data reported the comparatively low ability of the local communities to absorb this opportunity, as most of them are only junior high school graduated, although some are high school graduated.

In addition, supplies of service and good demand for the Project require certain quality, which may not be able to be fulfilled by local business. As such, the locals would have to compete with in-migrants to secure these opportunities. This condition is likely to create disparity on increased income between locals and in-migrants.

With incoming workers and other migrants to the Project area, there is likely additional pressure to local settlements, public facilities, and social services, as these migrants will require an availability of space to live (land and housing) and to run business. There will be also additional pressure on health services, which are already under resourced, and to natural resources, potentially decreasing environment sanitation conditions and resulting in a negative impact on community health.

Other negative impact of influx migration to community health occur as there will be increased number of population from in-migration of worker (which most are likely male) and people seeking opportunities from the Project, creating potential increased number of communicable disease and establishment (or possibly augmentation) of a local sex worker industry and increase demand for alcohol and drugs. This issue has not yet emerged currently within the communities in the Project area, however previous similar Project experience indicate such impacts are potentially occur as the Project reach its peak of construction phase.

6.4.2 Control in Place

The RKL/ RPL has also required bi-annual monitoring and reporting to the government (regency and province environmental agency, industrial agency, manpower and transmigration agency, regional planning agency) with regards to potential influx migration due to Project activities. Along with this requirement, the EIA has stated the Project will prioritize employment of the local community whenever possible and appropriate with the expected job requirements, particularly from Uso Village where the Project is located and couple of villages within the vicinity of the Project (Hombola, Lamo, Kalolos, Tangkiang, and Babang Buyangge).

For the in-migrant workers, a basecamp will be established within the plant area of 200 ha, while only when the capacity of basecamp are not sufficient, local residential will be rented for the workers.

6.4.3 Impact Evaluation and Significance

Given the above context and assuming the proposed management plan to minimize the impact of influx migration is currently in place, the significance of impact as result of the Project is assessed below.

Table 6.3. Assessment of Impact of Influx Migration

Impact of Local Employment and Business Opportunities					
Impact Issue	**Impact Period**	**Receptor(s)**	**Severity**	**Likelihood**	**Significance**
Community unrest due to competition to obtain opportunities with migrants	Construction, operation	Community within the Project area	Medium	High	Moderate-
Additional pressure to settlement, public facilities, and services due to increased in-migrants	Construction	Community within the Project area	Medium	Moderate	Moderate-
Increased demand for commercial sex, alcohol, and drugs due to increased in-migration	Construction and operation	Community within the Project area	Medium	Moderate	Moderate-

6.4.4 *Additional Mitigation Measures*

An influx migration management plan should be established to outline comprehensive approach to address in-migration related issues, with the following objectives:

1. Discouraging in-migration into the Project area;
2. Managing the footprint of influx migrants that arrive in the Project area;
3. Staging the in-flow of migrants and plan Project access routes, so as not encourage the emergence of in-migrant hotspots to other parts of Project area;
4. Strengthening Project capacity to address negative social impacts caused by in-migration;
5. Strengthening Project security to protect the Project against negative in-migration impacts; and
6. Planning Project workforce, contractor and supplier recruitment and management policies that minimize in-migration.

The development of the plan is seen as the logical next step to be taken by the Project to ensure that the potential impacts of influx migration identified are appropriately prevented and/or mitigated; this is largely due to the fact that many of the causes of Project-induced in-migration (such as push and pull factors) and many of the solutions are beyond the Project's ability to control. Many of the impacts identified can only be prevented and controlled through comprehensive planning that allow for sustainable development management of the Project area, through coordination with local government

In addition, a code of conduct is being developed simultaneously for the worker and contractors which recognizes Project commitment for good health and safety performance related with community issues.

6.5 IMPACT FROM LAND ACQUISITION

6.5.1 Impact Identification

The impact of land acquisition from the Project development is likely occurs due to inappropriate compensation process resulting to poor living and economic condition of the people affected by the process. However PAU is committed to prioritising land owners during the Project recruitment process as well as when selecting suitable local contractors to service the Project.

1. Land compensation

The Project land acquisition process has been started since 2005; approximately 19 ha belonging to 34 people are still in the process of being acquired, while the price of land has risen significantly over recent years. This condition is likely to encourage the increased demand on compensation value from land owners whose land have not yet been acquired. If this concern is not addressed properly, the affected people will find difficulty in obtaining like for like replacement land. It is identified that the value of compensation was determined without a land appraisal study, but based on agreed negotiation with the land claimants. As such, there is no specific basis to determine the compensation value. This practice has the potential risk in unequal standard of compensation paid to all affected people, and may create community unrest.

2. Land acquisition outcome to community agricultural activities

The Project initially has been designed to minimize physical displacement and has not affected a settlement area. However, the Project acquired a number of small farms and forest land which are utilized by the local community for both subsistence and commercial agriculture. This has created changes in land ownership and land use pattern.

As such, the land acquisition will impact the loss of land and income, particularly for the households which depend on their income from their land. Further, it may impact not only the land owner, but also the sharecroppers and farming labour workers for the land. The EIA data identified agricultural activities were important for the communities within the Project area.

6.5.2 Control in Place

The Project land acquisition process has already occurred. Land compensation was based on voluntary sale and purchase process, while the value was agreed with the affected land owner and the payment acknowledged by the Head of Uso Village and Head of Batui Sub-District. This is as outlined within the Sale and Purchase Deed signed by both parties; the Project and affected land owner.

In addition, bi-annual monitoring and reporting to the government (regency and province environmental agency, industrial agency, manpower and transmigration agency, regional planning agency) are required by RKL/ RPL with regards to the Project land acquisition progress and issue.

For the affected people due the Project land acquisition, a commitment has been communicated during the consultation process that in addition to the land compensation, the employment opportunities will be prioritized to be provided, however in accordance with the job function requirements.

6.5.3 Impact Evaluation and Significance

Given the above context and assuming the proposed management plan to mitigate impact from land acquisition is currently in place, the significance of impact as result of the Project is assessed below.

Table 6.4. Assessment of Impact from Land Acquisition

Impact from Land Acquisition					
Impact Issue	**Impact Period**	**Receptor(s)**	**Severity**	**Likelihood**	**Significance**
Community unrest due to land price discrepancy and unclear compensation basis	Pre-construction and construction	Land claimants	Medium	High	Moderate-
Change in land use and ownership pattern which create disturbance on community farming activities	Pre-construction and construction	Land claimants and agricultural worker for the affected land	Medium	High	Moderate-

6.5.4 *Additional Mitigation Measures*

Additional mitigation measures should be provided for the significant affected people, including those who are landless or whose remaining landholdings do not allow for continuation of agricultural livelihoods, as well as addressing potential community unrest due to land issue. The following components should be considered as inclusion for the measures:

1. Livelihood assistance in the form of a community empowerment program to be developed and implemented in collaboration with local government development programs. This program will focus on the most affected people;
2. Improvement of public consultation with the affected communities and implementation of a stakeholder engagement plan related with land issues to minimize community unrest due to land issue; and
3. Improved the existing grievance mechanism procedure which includes availability of grievance redress unit (GRU) to address complaints arising from the affected communities due to land acquisition process.

Simultaneously, a proper land acquisition procedure for the remaining land that has not been acquired should be established outlined the Project land acquisition process from consultation, negotiation, compensation determination, payment, and grievance mechanism.

7 SOCIAL MANAGEMENT PLAN

7.1 OVERVIEW

A Social management plan (SMP) is a key document that provides recommendations on how the Projects performance related with social aspects will be managed from pre-construction through to completion of construction and operational phase. The SMP is a living document to be adjusted and updated throughout the lifetime of the Project.

This chapter summarises the PAU management plans required to manage the potential social impacts that were predicted to occur as a result of the Project pre-construction, construction, and operation related activities. The plans aim to avoid, minimise, or reduce negative impacts and enhance positive impacts. This will be needed to take into account the systems and processes of the contractual measures for the contractors to ensure that their activities are also consistent with the provisions of the SMP.

The following plans incorporate the proposed mitigation measures as a result of the SIA process into a comprehensive framework, including specific plans, organizational arrangements, and contractor management, training, and monitoring programs, to ensure appropriate management throughout the Project cycle. Some of the measures were detailed within the existing Indonesian Government environmental management and monitoring plans (RKL/ RPL) to manage the social impacts identified in the EIA.

7.2 DETAILED SOCIAL MANAGEMENT PLAN

7.2.1 *Stakeholder Engagement and Public Consultation Plan*

PAU understands that engagement activities can help create value, ensure integrity of the Project and the community; maintaining its social license to operate. An engagement plan (SEP) has been developed accordingly as a strategic approach to enable the Project to build constructive and long-term relationships with stakeholders. Continuous coordination with stakeholders and consultation with the community are also required as part of RKL/RPL to mitigate potential conflict.

PAU has committed to an ongoing consultation and engagement process that extends throughout the life of the Project. A wide range of stakeholders have been identified within the SEP, comprising institutions and organizations from various stakeholder groups. The SEP also presents the following aspects:

1. Record of the Project historical consultation including IFC consultation meeting with related stakeholders and project affected people, discussed a number of issue, include land acquisition, indigenous people, biodiversity, community livelihood, and perception towards the Project;

2. Stakeholder main concern raised during the process; and

3. The Project commitments for on-going and future engagement, consultation, and disclosure of information.

As such, information on stakeholder profile, their control over resources (power), interest, and networking should be added and updated properly in future revisions of the SEP. In addition, continuous monitoring is required to update the Project future engagement strategy in accordance to consultation and disclosure plan of other management measures, i.e. improved grievance mechanism , community development plan, emergency response plan, influx migration management plan, indigenous people screening, and chance find procedure.

7.2.2 Grievance Mechanism

PAU has an established grievance process however a more detailed grievance process should be developed to include the following five stages:

1. Receipt of grievance; a centralized grievance log and tracking system that will equip management to identify, understand and address vulnerabilities in Project implementation;

2. Record and delegate; grievances recorded and delegated to a resolution agent. In situations where a coordinated response to grievances is necessary, the Grievance Unit will ensure the effective and timely communication of receipt of grievance notifications. In addition Initial Reporting will be prepared which includes all details known at the time that the grievance is registered. This initial report will also serve to provide context and guidance for the ensuing fact-finding investigation;

3. Fact-finding; the investigations shall seek to establish a clear picture of the circumstances surrounding a particular grievance, which rely on consultation that is free of discrimination and coercion. It will verify the information contained in the initial grievance report about: i) the identity of the complainant and nature of complaint; ii) the status of the complaint, including if it has been resolved by any immediate remedial actions, if the aggrieved expects that any particular actions need to be implemented, or if no action toward resolution is known or expected; and iii) supporting evidence for any disputed claims;

4. Resolution or appeal; involves decision-making about grievance redress actions. Resolution processes and approaches will rely, whenever

possible, on local approaches to conflict resolution. When appropriate, local authorities and/or respected personages will be consulted for their insights and advice on the grievance and its proper resolution. When an appeal is registered, it is incumbent upon the Grievance Unit to investigate the cause for dissatisfaction, and identify follow-up actions and resolution measures;

5. Feedback and closeout; the complainant shall be invited to give feedback about the resolution process and asked to indicate their level of satisfaction with the mitigation measures. Finally, close-out Reporting will be established for the completion of the grievance resolution process.

The presence of a third party from the local community level, or related government official, civil society organization, external expert should be considered within the process. The grievance resolution report should be publicly available.

7.2.3 Community Development Plan

PAU is currently developing a Corporate Social Responsibility (CSR) Plan, in which a community development program framework to manage social issues related to the Project will be developed as part of the plan. The implementation of a community development as one of the Project's sustainable development approach is expected to create broader social support for the investment, reduce social risks, maintain local license to operate, and enhance the reputation of a company. Promoting the social well-being of local communities is also one of the main objectives of Project development financed by the IFC.

The community development plan should be detailed to consider the following steps to optimize positive impacts and minimize adverse impacts of the Project:

1. Engage and optimize communication with local communities;
2. Identification and updating the community socio-economic baseline data, socio-politic structures, decision making process, local business and commercial structures, economic supporting infrastructure, perception, and expectation, as well as information on other economic or industrial development plan for the area, which may reveal local potencies and opportunities;
3. Develop a community needs mapping and assessment through intensive consultation with community and stakeholders which will serve an important role in determining an effective community development program;

4. Raise community awareness to increase their participation into the process of community development program planning;
5. Develop a strategic long term program plan with timeframe and budget to articulate the Project benefits sharing initiative in a systematic, transparent, and balanced manner. It is believed to be critical for the successes of the project development in the medium to long term; and
6. Develop program performance indicators as a tool to monitor and evaluate the outcomes of the program.

In addition, the plan should be developed with specific programs for different significant groups of affected people with various impacts of the Project in each different area. The program is expected to include education assistance for local people, local business empowerment, and workforce capacity building. Public consultation and coordination with local government during the program planning and implementation are also required.

7.2.4 Human Resources Plan

The Project has committed to the following measures in managing the potential impacts for manpower mobilization:

1. Labour recruitment will prioritize local people, in accordance with the Project needs and requirements;
2. Numbers of locals employed will be distributed to a couple of villages within the Project area based on the proximity to the Project site;
3. The project will coordinate with Head of Batui Sub-District (One Door Policy) for the recruitment process;
4. Bi-annual monitoring and reporting to the government (regency and province environmental agency, industrial agency, manpower and transmigration agency, regional planning agency), with regards to labour requirements and recruitment processes during pre-construction and construction phase of the Project, as stated within the RKL and RPL.

In addition, a detailed human resources procedure for local employee recruitment should be developed to include fair opportunities for the local community and transparency in coordinating with the local government to implement the procedure. In addition, the procedure should comply with the internationally recognized labour practices for e.g. controls over child and women labour. Accordingly, disclosure of the recruitment procedure to be publicly available is required as part of the transparency.

7.2.5 *Community Health and Safety Plan*

PAU has established a health, safety, and environment (HSE) policy to be implemented during the life of the Project as high level measure to manage its occupational health, safety, and environmental performance. The project is also required to implement environmental management and monitoring activities that are outlined within the project RKL/RPL and also the Environmental Management and Monitoring Plan that has been prepared. These are designed to monitor and ensure that predicted project emissions, discharges and impacts remain within acceptable limits.

In addition to manage the potential threat to community safety from Project activities, emergency prevention, preparedness, and response arrangements should be developed to prepare to respond to community emergency situations in a manner appropriate to the level of Project risk. Affected communities and relevant government agencies to be consulted and coordinated as part of the emergency system.

The community emergency response plan will provide guidance and procedures for the Project in term of preparedness and response in view of an emergency, and ensures that the Project will have proper management oversight during the community emergency from construction phase up to operation phase.

7.2.6 *Land Acquisition*

The RKL/RPL has required bi-annual monitoring and reporting to the government (regency and province environmental agency, industrial agency, manpower and transmigration agency, regional planning agency) for the Project land acquisition progress and issue. However, additional mitigation measures should be provided for the significant affected people, including those who are landless or whose remaining landholdings do not allow for continuation of agricultural livelihoods, as well as addressing potential community unrest due to land issue. A comprehensive land acquisition procedure should be established for the remaining properties outlining the Project land acquisition process from consultation, negotiation, compensation determination, payment, and grievance mechanism.

7.2.7 *Influx Migration*

The Project has committed to conducted bi-annual monitoring and reporting to the government (regency and province environmental agency, industrial

agency, manpower and transmigration agency, regional planning agency), with regards to potential influx migration resulting from Project activities. An influx migration management plan should be established to outline comprehensive approach to address in-migration related issues. The influx management plan will contain. A project-induced in-migration mitigation strategy and an institutional strengthening strategy that will satisfy international lender requirements;.

7.2.8 Cultural Heritage Chance Find Procedure

Although the Project is unlikely to impact cultural heritage values known from the area, as described in *Section 5.10.4*, a chance find procedure should be established to avoid and/or minimize project impacts on cultural heritage resource materials and define the management of previously unknown cultural heritage uncovered during construction. The development of this procedure will avoid adverse impacts taking place on the Project area during the construction activities. The objective is to avoid or minimize any accidental physical harm that further construction activities could cause. The function of the procedure is to:

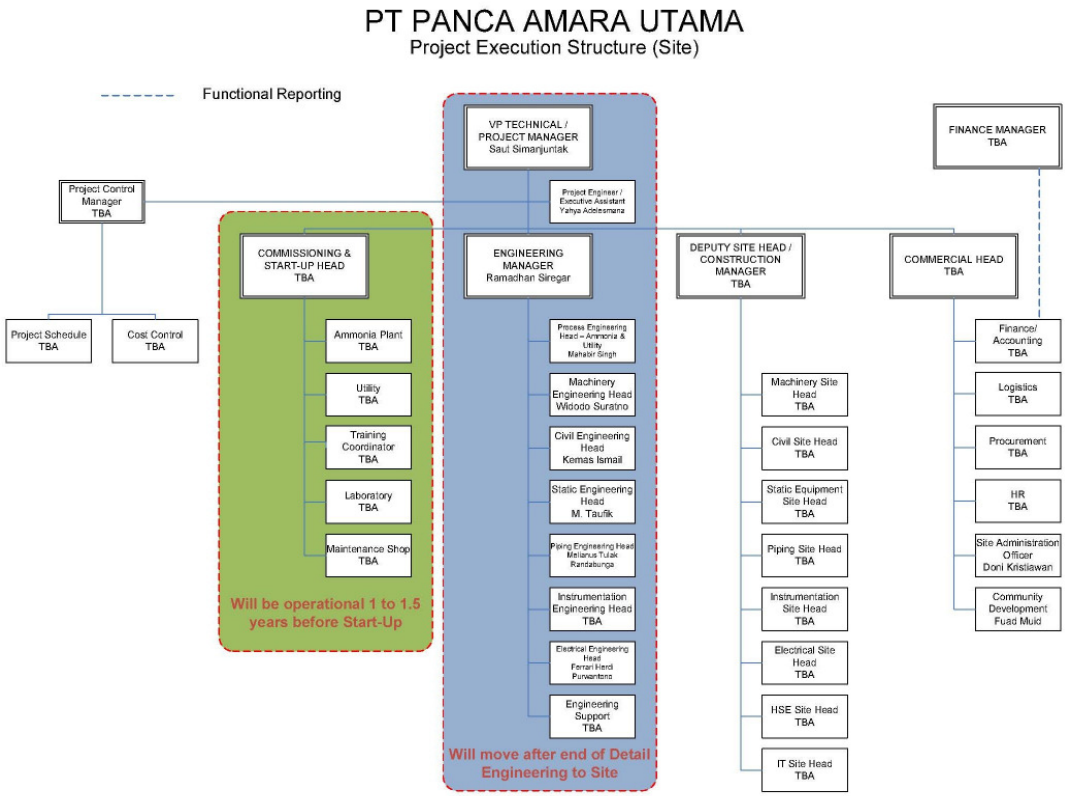
- Decide quickly whether possible archaeological finds are real through consultation with an appropriately qualified personnel;;
- Establishes their extent and importance; and
- Responds with appropriate procedures, within the context of ongoing construction operations and in compliance with the Indonesian Government's requirements and international standards.

This procedure includes record keeping and expert verification procedures, chain of custody instructions for movable finds, and clear criteria for potential temporary work stoppages that could be required for rapid disposition of issues related to any historical and cultural heritage items.

7.3 ORGANIZATIONAL STRUCTURE

The implementation of this SMP involves many functions across organization responsible for the construction of the Project. The following *Figure 8.1* presents the PAU current management structure for Project execution in the site. This will require revision, or a specific HSE department organization chart developed, to incorporate the positions detailed within the report section.

Figure 7.1 Project Execution Structure (Site)



Source: PAU, 2013

PAU HSE Department will have the overall responsibility for compliance with all health and safety, environmental and social management plans. The HSE Department will monitor that all contracts executed by the EPC Contractor and sub-contractors comply with mitigation measures and requirements given in the environmental and social management plans. PAU will cooperate with regulatory agencies and other stakeholders who may want to send their own teams in to monitor the activities during the construction and/or operation phases.

HSE Manager

The HSE Manager will be responsible for all health, safety, environmental and social program management systems, environmental awareness and training, health and safety training, waste management, regulatory compliance, compliance audits, stakeholder engagement, capacity building, social program monitoring and record keeping, stakeholder liaison, and dispute resolution. These responsibilities will be assigned to individual positions within the HSE Department as appropriate, but the main responsibility will lie with the HSE Manager. PAU is expected to fill this post in February to April 2013.

The ultimate management responsibility for health, safety, environmental and social matters will lie with the PAU HSE Manager and the Plant General Manager.

Key responsibilities of the HSE Manager include the following:

- Acting as the point of contact for the EPC Contractor with respect to environmental, social, health and safety issues;
- Documenting that environmental, social and health protection procedures are followed as planned by PAU and the EPC Contractor;
- Reviewing and assessing the adequacy of the EPC Contractor's ESMP and channels of communication to receive grievances that will be handled by PAU' grievance mechanism;
- Auditing the EPC Contractor's implementation of the ESMP;
- Liaising with members of the public and governmental organizations on environmental and social issues;
- Reporting results of mitigation and monitoring activities to authorities, project lenders, and other applicable parties.

Social and Community Relationship Officer

PAU has appointed Social and Community Relationship Officer, who is also one of the first employees of the company. This is because PAU recognizes the importance of HSE and social interaction with the communities.

The Social and Community Relationship Officer is responsible for managing stakeholder engagement and for implementing the SEP. He reports directly to the Project Manager / Plant General Manager. The Social and Community Relationship Officer maintains existing consultation ties established during the pre-construction phase and will conduct on-going stakeholder engagement during the construction period.

The Social and Community Relationship Officer also acts to manage the community complaints and grievances process. He is responsible for formalizing the complaints and grievances process before and after the project construction moves into full construction and regularly monitoring, tracking, documenting and assisting to resolve grievances. Aspects to be addressed include stakeholder engagement, due diligence and recommendations for CSR activities. The Social and Community Relationship Officer will be based in the plant site.

PAU shall ensure that the Social and Community Relationship Officer is made known to all construction teams, as well as to the local people. All PAU employees, the EPC Contractor and sub-contractors shall be trained to direct people with complaints to Social and Community Relationship Officer.

The Social and Community Relationship Officer's duties include:

- Ensuring that stakeholder engagement processes and procedures are developed and implemented to maintain effective relationships with local and other stakeholders throughout the duration of the project
- Managing all the activities related to implementing PAU policies, procedures and action plans pertaining to the social management program for both construction and operation
- Ensuring productive government relations with all the different levels of authorities concerned with the people
- Managing community development initiatives implemented through training centres, local organizations, etc.
- Managing the community complaints and grievances process, which include monitoring, tracking, documenting and assisting the grievances process

Industrial Health & Environmental Engineer

An Industrial Health & Environment Engineer will be appointed prior to Pre-Commissioning period. He will be trained to maintain a safe and healthy workplace for PAU's employees, to reduce workplace injuries and illnesses, and to protect employees from work-related risks and hazards due to ammonia. PAU is expected to fill this post by Feb-Apr 2013.

The Industrial Health & Environmental Engineer's duties include:

- Inspecting machinery and pipes to make sure they can withstand daily wear and tear;
- Ensuring that employees are following safety regulations, including wearing safety gear;
- Ensuring that chemicals and catalysts are stored safely in respective storage.

EPC Contractor and Sub-Contractors

The EPC Contractor will carry out field activities as part of the construction of Project. The EPC Contractor will be subject to liabilities under local laws, regulations and standards, and under their contract with PAU.

All environmental, health and safety responsibilities during the construction will be implemented by the EPC Contractor on behalf of PAU. In cooperation with the EPC Contractor, PAU will manage social responsibilities even during the construction period. EPC Contractor shall also follow the 'Code of Conduct' in particular to biodiversity and social issues.

Grievance Unit

In addition to the existing organizational arrangement to manage social issues, a grievance unit should be established for the following main roles:

- Manage grievance mechanism to ensure the overall process is effective. A centralised grievance log and tracking system will equip management to identify, understand and address issues in relation with Project implementation;
- Delegation of grievance redress, responding to grievances and overseeing redress;
- Initial reporting which will include all details known at the time that the grievance is registered, and will indicate what, if any, information is needed before a full account of the grievance can be logged, and further the result of fact finding investigations;
- Provide support to GRU Manager to establish resolution, involves decision-making about grievance redress actions;
- Feedback, the complainant shall be invited to give feedback about the resolution process and asked to indicate their level of satisfaction with the mitigation measures;
- Provide support to GRU Manager to develop Close-out Reporting, completion of the grievance resolution process;
- Conduct fact finding investigation to establish a clear picture of the circumstances surrounding a particular grievance, the cause for dissatisfaction, and to identify follow-up actions.

7.4 CONTRACTOR MANAGEMENT

For the construction phase of the Project, invitations to tender and contracts for the Project contractors should contain specific clauses that bind contractors and sub-contractors to safeguard numbers of provision in accordance with this SMP. Term of contract should be reviewed for such requirements prior to being published and signed. Penalties for non-compliance with the SMP will also be set out in the contracts and rigorously enforced.

Contractor selection criteria related with SMP will be developed by the Project based on the details included in the scope of work refer to this SMP. Contractors must be able to demonstrate that they have the competence to manage social issues and meet the selection criteria by providing references, details of experience, qualifications and skills, and information on their ability to manage such issues. The contractor should also be able to provide eligible personnel to implement the requirements.

The successful contractors shall complete a contractor SMP and supporting management plans, procedures and work instructions and submit it to the PAU Project Construction Manager for approval prior to commencement of work. PAU will establish checklist for the contractor to ensure its compliance with this SMP through monitoring program.

In addition, contractor and sub-contractor will be required to submit necessary documentation to show that their operation is in compliance with all the national related laws. As such, PAU will take commercially reasonably effort to ensure that contractors and sub-contractors comply with other applicable requirements through inclusion of conditions in contracts.

7.5 TRAINING

Inductions and training (when required) should be conducted for all employees and contractors performing tasks that have the potential to cause significant socio-economic impacts. The training should ensure that they have the competency to perform the tasks through awareness of the potential impacts and ability to conduct the task in a manner that eliminates/minimizes the risk. It is recommended that training is delivered to all the Project employees on:

- Health and safety awareness;
- Human resources policies;
- Chance find procedures; and
- Community development and stakeholder engagement.

7.6 MONITORING AND EVALUATION

Regular audits/inspections will need to be undertaken throughout the Project construction period. The frequency of which may be increased or decreased will be according to the findings and degree of confidence arising from the on-going audit programme.

In addition to assessing performance, audits will need to assess the effectiveness of the social plans and policies. All audit findings will need to be reviewed and where corrective actions are deemed necessary, specific actions (with designated responsibility and timing) will need to be developed aimed at achieving delivery of the socio-economic commitments to enable continuous improvement in performance.

Plans for public reporting will also need to be developed and agreed as the Project construction activities progress.