

## **Banda Aceh to Meulaboh Rehabilitation and Reconstruction Road Project**

### **Environmental Monitoring Plan**

**Final Report  
November 2005**

## FOREWORD

The Regional Infrastructure Bureau Working Unit for Planning and Supervision of Roads and Bridges (P2JJ) for the Province of Nanggroe Aceh Darussalam is proposing to upgrade existing sections and develop a new two-lane, seven-meter wide road of approximately 240 kilometers long from Banda Aceh to Meulaboh including related infrastructure in the Province of Nanggroe Aceh Darussalam in Indonesia. The Banda Aceh to Meulaboh Road Rehabilitation and Reconstruction Project is an emergency response to the severe damage caused by the earthquake-generated tsunami in December 2004; the biggest calamity experienced in the history of the Nanggroe Aceh Darussalam Province.

As Project proponent, P2JJ, wishes to obtain environmental approvals for the project according to the laws and regulations of the Republic of Indonesia and to satisfy the policies and requirements of all relevant stakeholders.

P2JJ is committed to developing a safe and environmentally responsible project that benefits the project stakeholders, in particular local government and local communities. The Project has been undertaken with a balance between scientific research on environmental impacts and the pressing imperative to re-establish damaged livelihoods.

Banda Aceh, November 2005

**Project Proponent**

**Ir. Khalidin, MT**

*Kepala Satuan Kerja P2JJ*

*Departemen Pekerjaan Umum Prov. NAD*

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**GLOSSARY :**

<b>A-E</b>	Architect-Engineer
<b>AMDAL</b>	Environmental Impact Assessment
<b>ANDAL</b>	Environmental Assessment Process
<b>AASHTO</b>	Association of American State Highway and Transportation Officials
<b>BAKOSURTANAL</b>	Badan Koordinasi Survey dan Pemetaan Nasional (Coordinating National Agency for Survey and Mapping)
<b>BANGDES</b>	Badan Pembangunan Desa (Village Development Agency)
<b>Bapedalda</b>	Badan Pengendalian Dampak Lingkungan (Agency of Environmental Impact Management)
<b>BAPPEDA</b>	Badan Perencanaan Pembangunan Daerah ( <i>Regional Development Planning Program</i> )
<b>BNA-MBO</b>	Banda Aceh - Meulaboh
<b>BOD</b>	Biological Oxygen Demand
<b>BPS</b>	Badan Pusat Statistik ( <i>Central Agency of Statistics</i> )
<b>BRR</b>	Agency in charge of the Rehabilitation and Reconstruction of Aceh
<b>CDR</b>	Crude Death Rate
<b>CO</b>	Carbon Monoxide
<b>COD</b>	Chemical Oxygen Demand
<b>dB (A)</b>	Decibel
<b>GIS</b>	Geographic Information System
<b>GR</b>	Government Regulation
<b>GRDP</b>	Gross Regional Domestic Product
<b>INP</b>	Important Index Value
<b>IMR</b>	Infant Mortality Rate
<b>IOM</b>	International Organization for Migration
<b>IMC</b>	International Medical Corps
<b>IPA</b>	Index Point of Abundance
<b>ISPA</b>	Infeksi Saluran Pernapasan Atas (Upper Respiration Canal Infection Disease)
<b>Hi-Vol</b>	High Volume Air Sampler
<b>Km</b>	Kilometers
<b>Kg</b>	Kilograms
<b>m</b>	Meters

<b>MP-ASI</b>	Makanan Pendamping Air Susu Ibu (Breast Milk Supplement)
<b>m/dt</b>	Meter per detik ( <i>meters per second</i> )
<b>NAD</b>	Nanggroe Aceh Darussalam (Province)
<b>ND</b>	Not Detected
<b>NO</b>	Nitrogen Oxide
<b>NS</b>	Not Significant
<b>O3</b>	Ozone
<b>PAD</b>	Pendapatan Asli Daerah ( <i>Original Local Revenue</i> )
<b>P2JJ</b>	The Planning And Supervision of Roads and Bridges Division
<b>PUSKESMAS</b>	Pusat Kesehatan Masyarakat ( <i>Public Health Center</i> )
<b>RKL</b>	Rencana Pengelolaan Lingkungan (Environmental Management Plan)
<b>RPL</b>	Rencana Pengelolaan Lingkungan (Environmental Monitoring Plan)
<b>RUTR</b>	Rencana Umum Tata Ruang (General Proposed Spatial Planning)
<b>S</b>	Significant
<b>SO2</b>	Sulfur Dioxide
<b>SPL</b>	Sound Pressure Level
<b>Susenas</b>	Survey Sensus Nasional (National Census Survey)
<b>t/ha/th</b>	ton/hectar/year
<b>USAID</b>	United States Agency for International Development
<b>ug/m<sup>3</sup></b>	Microgram per cubic meter

## **1 INTRODUCTION**

The Environmental Monitoring Plan (RKL) is a part of the AMDAL documents for a rehabilitated and reconstructed road, approximately 240 kilometres long, from Banda Aceh to Meulaboh, prepared by the Regional Infrastructure Bureau Working Unit for Planning and Supervision of Roads and Bridges (P2JJ) Nanggroe Aceh Darussalam to minimize negative impacts and to maximize positive benefits from the road corridor and associated infrastructure activities.

### **1.1 BACKGROUND**

In December 2004, the island of Sumatra experienced severe damage to its public infrastructure, settlements and living inhabitants by a devastating earthquake and tsunami. In response to the natural disaster, the U.S. Agency for International Development (USAID) is offering assistance to the nation of Indonesia in the form of road design and construction support for the reconstruction and repair of the related transportation corridor and its facilities in Sumatra. Included among these projects is an agreement for assistance from the U.S. Army Corps of Engineers, Honolulu District (POH) for a renovated road, approximately 240 kilometres long, from Banda Aceh to Meulaboh. (see Figure 1.1). The road from Banda Aceh to Meulaboh was no longer passable, so a temporary road has been fashioned out of necessity until proper planning, design and construction can begin. The construction of the road will be upgraded to a two-lane, seven-meter wide roadway and utilize existing corridor segments wherever practicable.

The project scope includes the widening, upgrading and reconstruction of existing roadway and the construction of newly re-aligned sections of roadway between Banda Aceh and Meulaboh. The road design will include, but is not limited to; roadway geometrics, earthworks, foundation and pavement, drainage, roadway appurtenances, roadway signage and markings, bridges and other structures, facilities foundations, causeways and shoreline protection, erosion and sedimentation control, environmental protection, rights-of-way verification and definition, bus stops, lookouts and other traffic turnouts. The design is intended to be in accordance with Class II, 2-lane, the Association of Southeast Asian Nations (ASEAN) highway standards and the Association of American State Highway and Transportation Officials (AASHTO) standards.

Construction activities will include:

- clearing and grubbing,
- earthworks,
- laying of pavement,
- temporary and permanent slope protection and erosion control,
- bridge and causeway construction;
- installation of guardrails, signage and traffic control devices.

Deviations from the former alignment due to subsidence or other factors will be within the corridor of the temporary road or newly established rights of way. There are approximately 110 bridges and culverts along the original road that will need to be repaired or replaced. Some portions of the road are submerged due to subsidence and will need to be reconstructed landward of the existing alignment.

Projects identified for funding by the USAID are subject to the Environmental Procedures established by Title 22 of the U.S. Code of Federal Regulations (CFR), Part 216 (22 CFR 216). Pursuant to those procedures, penetration road building or road development projects are listed as activities that have a potential for significant impact. Such activities require the preparation and subsequent approval of an Environmental Assessment (EA) and the implementation of its recommendations to avoid or otherwise mitigate potential adverse environmental impacts (22 CFR 216.2(d)(1)).

Project construction is planned to commence during the last quarter of 2005 and will last for approximately 3 years. Project operation is continuous and future road maintenance and upgrades are planned as required. Project activities from the pre-construction until post-construction stage may cause impacts on the physical-chemical and biological environment. Other impacts that may occur are related to socio-economic, socio-cultural and public health components

## **1.2 OBJECTIVES AND PURPOSE OF ENVIRONMENTAL MONITORING PLAN**

The main objectives and purpose of the Environmental Monitoring Plan are to:

- Monitor compliance with prevailing Indonesian regulations;
- Monitor environmental components predicted to be significantly affected, and to measure changes that occur;
- Assess the adequacy of environmental monitoring such as selected monitoring locations, schedule, monitoring methods, as well as required supervision, and to suggest improvements, if appropriate, in the light of the results;

- Monitor the effectiveness of adopted environmental management programs to ensure compliance with the Indonesia national policy in relation to ecologically sustainable development and utilization of natural resources; and to
- Ensure that environmental management is being performed effectively in accordance with technical requirements and relevant laws and regulations.

The proponent may, after consultation with relevant authorities, decrease or increase the frequency and/or parameters of specific monitoring if circumstances are demonstrated that warrant such change.

### 1.3 *USE OF ENVIRONMENTAL MANAGEMENT PLAN*

The uses of the Environmental Monitoring Plan are as follows.

- Provide a set of guidelines for project management and related institutions to implement monitoring programs, during the pre-construction, construction, and operation stages;
- Describe the basic methods and procedures to detect environmental changes at an early stage of the project development, including any changes that may not have been predicted in the environmental impact analysis;
- Provide a feedback mechanism to government policies on project execution, particularly in regards to similar projects in the future, by providing data and information on environmental impacts resulting from road and associated infrastructure activities;
- Demonstrate Project Proponent's commitment to monitor potential impacts to the community;
- Provide quantitative data relating to environmental and social impacts to demonstrate Project Proponent's compliance with agreed management actions; and to
- Contain data obtained from environmental monitoring that may be used to support or defend the company against unjustified allegations of environmental damage.

#### 1.4 *SUMMARY OF SIGNIFICANT AND IMPORTANT IMPACTS*

The key project environmental components include air, land, water, biota, and people, which are further described below.

##### 1.4.1 *Air*

Earthworks during site preparation will temporarily decrease the air quality, particularly due to dust and vehicle emissions. Heavy equipment used for excavation of the corridor will locally increase pollutant concentrations in the ambient air, particularly Carbon dioxide (CO<sub>2</sub>), Nitrogen oxide (NO<sub>x</sub>), Sulphur dioxide (SO<sub>2</sub>) and particulates. Emissions are likely to be present and continue during road construction and operation due to the long-term operational nature of the highway and use by all types of motorized vehicles.

##### 1.4.2 *Land*

Site preparation activities will cause minor changes in landforms and water bodies, and will temporarily increase soil erosion. Land surface, top soil, stream beds and shallow water coastal zones will be disturbed in rehabilitating and reconstructing certain road sections, cut and fill areas, bridges, borrow pits, quarries, construction camps and other supporting facilities.

##### 1.4.3 *Hydrology (Run off)*

Project activity during the construction and operation stages will create a degree of soil erosion and water column disturbance (both freshwater and shallow marine water) that has the potential to increase water turbidity. Run-off from sealed road surfaces may increase surface water discharge. Water quality may be affected by dust and tire particles as well as other debris accumulated over time from the road surface. Oil spills may occur and has the potential to affect surface water quality. During road operation, accidents may occur with the potential release of hazardous and toxic substances such as hydrocarbons.

The road alignment and run-off outlets may influence local drainage patterns with subsequent changes in flow and erosion patterns.

##### 1.4.4 *Water Quality*

During the operation and construction stage the project activities will cause soil erosion and water column disturbance. (either fresh water and sea water in the shallow area), this will potentially raise the unclear level of the water. The water run off on the streets could potentially cause floods on the road surface. Dust and other particles will also affect water quality in due course of

time. Oil spills may also occur and this will potentially affect the surface water. During the operation of the road accidents may happen with the potential of spills of hazardous and toxic chemicals.

The road reconstruction and water outlets may effluent effect the local drainage pattern resulting in charges impacting on stream pattern and erosion.

#### **1.4.5** *Biology*

**Biology Terrestrial-** The road development and supporting infrastructure will impact existing fauna and flora due to the diverse array of natural resource zones transected by the corridor and the variety of indigenous animal and plant populations. The baseline study, however, indicates there are few endangered species in the project location area other than the bird, and a couple turtle nesting sites. Reclamation and revegetation of disturbed areas will be necessary to mitigate negative impacts associated with the project construction activities. Special attention will be required wherever project activity encounters wetlands, mangrove areas, forest preserves and conservation zones due to their unique and valuable role in long-term ecosystem sustainability and related socio-economic benefits.

**Aquatic biota -** Potential impacts on aquatic biota (i.e. plankton and benthos) are a consequence of a decline in water quality and physical damage to the aquatic environment (i.e. stream bed preparation, run-off from disturbed areas and road surface drainage have the potential to impact water quality and surface water. Appropriate management measures are required to protect and preserve surface water quality and any exposed aquatic environments.

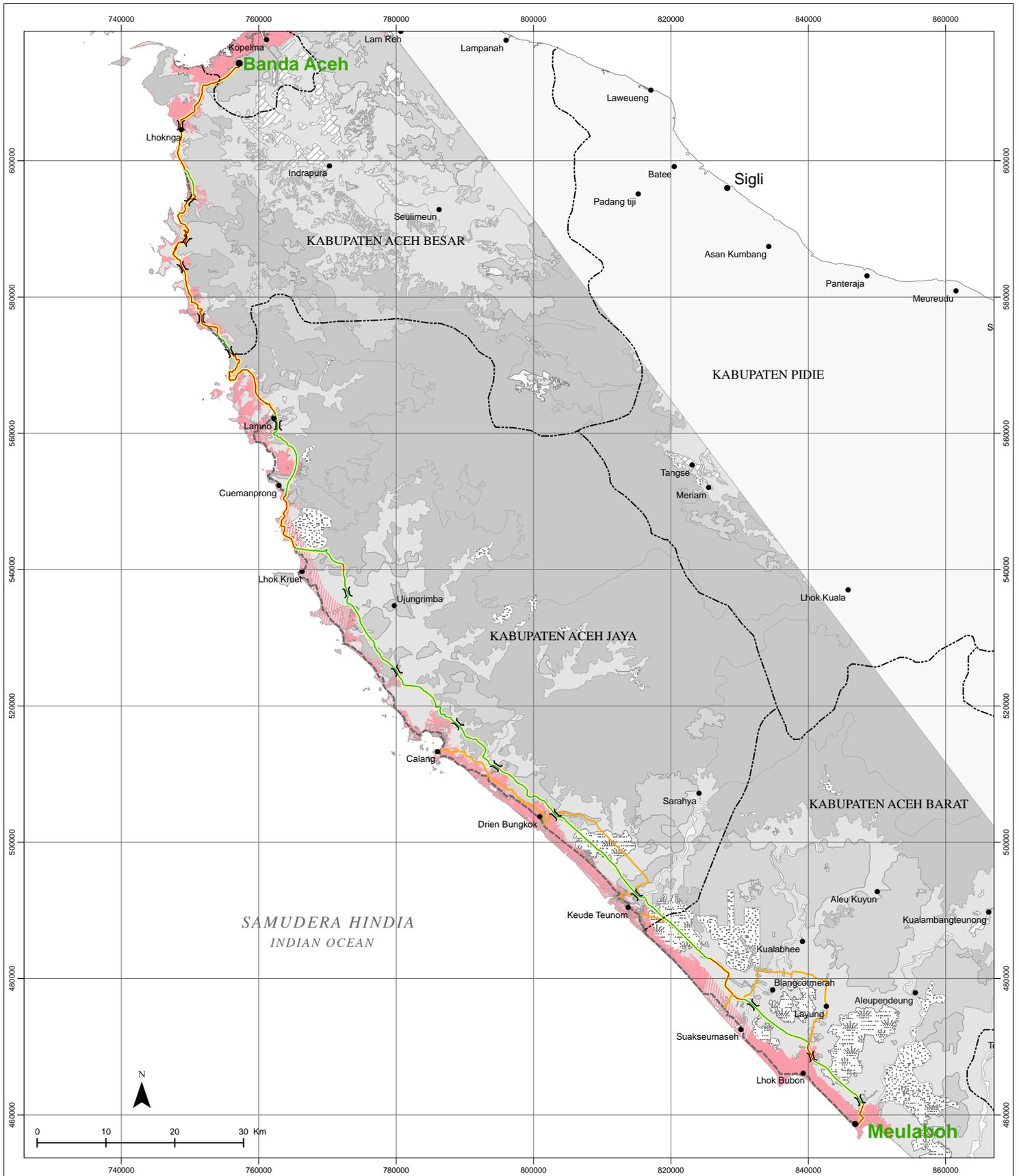
#### **1.4.6** *Social*

Social component the most important component of the living environment. There are no significant settlements along the road corridor, but many villages surround the project site area. The Project has the potential to affect the local and regional economy, demography, public health, local norms, values, and lifestyles. Since the proposed project primarily consists of rehabilitating damaged road, impacts related to resettlement and regional economy are limited. Community development programs need to be developed to maximize project benefits and to mitigate potential negative impacts typically associated with large-scale development projects.

Relocation of landowners and residing families is necessary and will command special attention during infrastructure development. Related efforts will be closely coordinated with and led by local government authorities.

#### 1.4.7 *Transportation*

Transportations impact include the road accident frequency which may occur during the project construction due to materials and equipment mobilization as well as during the operation stage. During the operational stage, accidents on the road will occur due to excessive speeding and due to overloaded commercial vehicles on the road. These incidences will impact on the community nearby the road.



## RENCANA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT PLAN

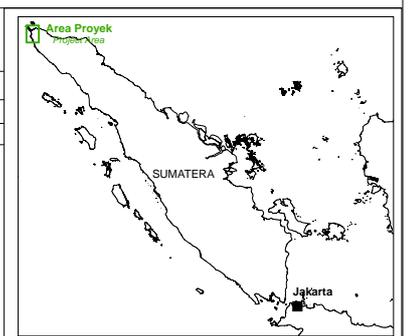
### LOKASI PERBAIKAN DAN REKONSTRUKSI JALAN DARI BANDA ACEH SAMPAI MEULABOH BANDA ACEH TO MEULABOH ROAD RECONSTRUCTION AND REHABILITATION

Sumber :  
Source :  
U.S Army Corps of Engineers, Honolulu District  
Sistem koordinat universal transverse mercator (UTM),  
Zona 46 Utara, WGS 84

Gambar / Figure	1.1	Digambar Oleh / Drawn By	GGG
No Revisi / Revision No	0	Diperiksa / Checked	KHS
Tanggal Revisi / Revision Date	03/07/05	Digabung Oleh / Compiled By	ERM

#### Legenda

● Ibu Kota Propinsi Provincial Capital	— Jalan Lama Tetap Dipakai Proposed Route (Existing)	⌋ Jembatan (hanya contoh, jumlah total lebih dari 100) Water Crossing (examples only, more than 100 in total)
● Ibu Kota Kabupaten/Kotamadya Regency Capital/Municipality	— Jalan Baru Proposed Route (New)	Area Dampak Tsunami Tsunami Affected Area
● Ibu Kota Kecamatan District Capital	- - - - - Jalan Lama (tidak dipakai) Abandoned Route	Area Dampak Tsunami (perkiraan) Tsunami Affected Area (estimated)
- - - - - Batas Kabupaten Regency Boundary	— Jalan Sementara (jepang) Japan Temporary Alignment	



## 2 ENVIRONMENTAL MONITORING PLAN

Chapter 2 details monitoring measures for selected environmental components, in particular all components that may be significantly affected by the road project. Environmental monitoring locations during pre-construction, construction and operation are shown in Figure 2.1, 2.2 and 2.3.

### 2.1 PRE-CONSTRUCTION STAGE

Physical change during the pre-construction stage will be very limited as the activities in the field will be confined to the survey and pegging of the proposed route. However, community relations during this time will be critical as discussions will be initiated with regard to the land acquisition process.

#### 2.1.1 Social Component

##### 2.1.1.1 Community Income

###### 1) Sources of Impact

- Decreasing community income in agricultural sector due to land acquisition process.

###### 2) Significant Impacts on the Environment

During the pre-construction phase, Project Proponent will need to initiate discussions with landowners and legitimate squatters to secure access for the road construction. The road construction may cause disruption in those areas affected by temporary land acquisition and concurrent effects on the way of life for local community members. Livelihood impacts result when a person or household ability to earn income through normal channels is affected.

###### 3) Indicators of Impact

- Attitude and Community Perception and community income for land acquisition process

###### 4) Monitoring Objectives

- To ensure equitable and timely property transactions through the land acquisition process.
- To ensure that grievances are resolved and do not escalate into conflict.
- To avoid unnecessary project delays.

5) *Monitoring Methods*

- Quarterly review of grievance register to identify outstanding issues not resolved.
- Quarterly review of land acquisition/ compensation program to evaluate
- Informal and formal discussions with local government to identify disturbances/ grievances in the affected communities as a result of land acquisition activities.

6) *Monitoring Locations*

All communities affected by road construction activities.

7) *Monitoring Period*

Quarterly review during pre-construction, extending into the construction stage as required.

8) *Institutions of Environmental Monitoring*

a) Implementor

Project proponent

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

Bapedalda, Public Work Department NAD Province, Mayor of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

2.1.1.2 *Attitude and Community Perception*

1) *Sources of Impact*

- The land acquisition process

2) *Significant Impacts on the Environment*

Handled well, management measures and land compensation should mitigate any impacts experienced by landowners and users due to construction. However, previous in country examples of land compensation have illustrated a range of tensions that land compensation can create between landowners and project proponents. If the compensation process is pursued in a transparent and equitable manner, tensions should be minimized.

3) *Indicators of Impact*

Attitude and Community Perception and community income for land acquisition process

4) *Monitoring Objectives*

- To ensure equitable and timely property transactions through the land acquisition process.
- To ensure that grievances are resolved and do not escalate into conflict.
- To avoid unnecessary project delays.

5) *Monitoring Methods*

- Quarterly review of grievance register to identify outstanding issues not resolved.
- Quarterly review of land acquisition/ compensation program to evaluate:
- Informal and formal discussions with local government to identify disturbances/ grievances in the affected communities as a result of land acquisition activities.

6) *Monitoring Locations*

All communities affected by road construction activities.

7) *Monitoring Period*

Quarterly review during pre-construction, extending into the construction stage as required.

8) *Institutions of Environmental Monitoring*

a) Implementor

Project proponent (Public Work NAD Province)

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

## 2.2

### *CONSTRUCTION STAGE*

It is likely that most significant impacts as a result of road construction will be experienced during the construction phase. Construction activities will impact the physical-chemical, biological and socio-economic and socio-cultural environment.

## 2.2.1 *Physical-Chemical Environment*

Aspects of the physical-chemical environment which may be impacted during the construction stage include air quality, noise and vibration, physiography and soils, hydrology and surface water quality, hydrogeology and groundwater quality and transportation and accessibility.

Monitoring of the physical-chemical environment during construction will be required, predominantly as a result of activities such as vegetation clearing and the crossing of watercourses.

### 2.2.1.1 *Air Quality*

#### 1) *Sources of Impact*

Sources of impact for air quality is mobilition of equipment, land clearing, earthwork, and borrow area activity.

#### 2) *Significant Impacts on Environment*

- The most significant potential fugitive dust impacts (would generally be expected to be localised to within about 100 to 200 m of the site preparation areas.
- Emissions from these sources would not be expected to result in a significant deterioration in local air quality, however, management measures can keep changes to local air quality to an absolute minimum.

#### 3) *Indicators of Impact*

Reported instances of respiratory irritation or noise and vibration disturbance by local residents.

#### 4) *Monitoring Objectives*

- To measure concentrations of dust and gaseous emissions at selected locations surrounding the project area, so that the results can be assessed in relation to air quality standard Government Regulation No. 41 of 1999 concerning Air Pollution Control.
- To ensure that adopted air pollution and noise controls and management are effective.

#### 5) *Monitoring Methods*

- Air quality sampling and analytical methods will be in accordance with Government Regulation No. 41 of 1999 concerning Air Pollution Control.
- Air monitoring parameters will include 24-hour readings of total suspended particulates (TSP) and particulate matter less than 10 $\mu$ m (PM10) for gravimetric determination. Other parameters may be monitored subject to specific complaints received from residents.

- 6) *Monitoring Locations*  
Active construction areas and nearby sensitive receptors.
- 7) *Monitoring Period*  
The construction stage – from initiation to completion in active construction areas.
- 8) *Institutions of Environmental Monitoring*
  - a) Implementor  
Construction Contractor
  - b) Supervisor  
Bapedalda, P2JJ, Supervision Consultant
  - c) Reporting  
Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

#### 2.2.1.2 *Noise and Vibration*

- 1) *Sources of Impact*  
Sources of impact for air quality is mobilization of equipment, land work such as cut and fill, and land clearing,
- 2) *Significant Impacts on Environment*  
The primary noise sources will be vehicles and equipment utilised for the construction stage including graders, bulldozers, general purpose vehicles, etc. Noise and vibration generated during this activity have the potential to result in the following impacts:
  - Annoyance and disturbance effects at noise sensitive receptors (i.e. community areas); and
  - Damage to structures as a result of vibration caused by heavy equipment movements, excavation, etc.
- 3) *Indicators of Impact*  
Reported instances of respiratory irritation or noise and vibration disturbance by local residents.
- 4) *Monitoring Objectives*
  - To ensure that noise levels produced by operation of project plant, machinery and equipment do not exceed the applicable Government standards set by the Minister of Environment Decree No. KEP-48/MENLH/11/1996.
  - To ensure that adopted air pollution and noise controls and management are effective.

5) *Monitoring Methods*

- Noise monitoring/measurement methods will follow guidelines stipulated in Minister of Environment Decree No. KEP-48/MENLH/11/1996 concerning Noise Level Standards.
- The measurement of noise levels will be conducted using an integrated sound meter. Since operation will be continuous over 24 hours, representative measurements will be made during all working shifts on the day of sampling.
- The grievance register will be monitored for reports by local residents for vibration causing human irritation or damage to property.

6) *Monitoring Locations*

Active construction areas and nearby sensitive receptors.

7) *Monitoring Period*

The construction stage - from initiation to completion in active construction areas.

8) *Institutions of Environmental Monitoring*

a) *Implementor*

Construction Contractor

b) *Supervisor*

Bapedalda, P2JJ, Supervision Consultant

c) *Reporting*

Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

2.2.1.3

*Soil Erosion*

1) *Sources of Impact*

Sources of impact soil erosion and landside is Construction of road and related earthwork activities such as site preparation, cut and fill, excavation of borrow pits, quarrying and other supporting activities.

2) *Significant Impacts on Environment*

Construction activities will require the removal of vegetation cover, potentially resulting in soil erosion and subsequent impacts on surface water quality due to uncontrolled rainwater run off or mechanical/ wind action.

3) *Indicators of Impact*

- Increased erosion, sedimentation and slope instability.

4) *Monitoring Objectives*

- To assess the effectiveness of environmental protection measures aimed to:
  - Minimize erosion;
  - Maximize sediment retention in surface runoff through sediment traps; and to
  - Minimize suspended solid loads downstream of disturbed areas.

5) *Monitoring Methods*

Erosion effects will be monitored by:

- Visual observation of landform and water turbidity and photographic documentation;
- Identification of areas of potential soil instability, soil erosion, and standing water.
- Reports on potential or existing problem areas.
- Water sampling and analysis of Total Suspended Solids (TSS), turbidity, water levels and flow rate.
- Visual observations should be undertaken to monitor for instances of soil contamination due to spillages etc. In the event of a major spill, nearby community wells should be monitored for contamination.
- An audit of waste management practices at active construction areas, maintenance yards and camps should be undertaken by the Site Manager.

To monitor soil movement can following equipment will be used :

- T-Bar, a simple equipment which will be used to monitor continuously, for a week in a year. It also monitor the vegetative area where soil movement is slow. T-Bar will be installed in several areas, the monitoring result will be organized graphically. Also measurement of rainfall, soil type will be conducted and analyze. A correlation between climate (rainfall) and soil movement will be attempted.
- Bubble Tiltmeter. Will be use to identify direction of soil movement..
- Iklinometer, will be used to identify the lateral pressure hence the horizontal vector of movement can be identified to determine the location of movement.
- Ekstensometer, will be used to identify the vertical pressure from top side thus vertical vector of movement can be identified

6) *Monitoring Locations*

- Monitoring will be conducted at every quarry location and at invlined the steep roads which may be subject to erosion and landslide. Monitoring will be conducted, at baseline locations which are sensitive

to soil movement specially on coordinate 5o28`N and 95o15`E. Monitoring will be conducted at the Layeun Village that crosser the fault at 5o15`N and 95o23`E. Also monitoring will be conducted at two other faults located at 4o53`N and 95o24`E and 5o58`N and 95o26`E near Desa Lho Jumeut.

- TSS measurements will be taken at selected surface water quality sampling sites downstream of the construction site .
- Visual monitoring soil contamination will be undertaken at all areas near fuel and chemical storage areas and maintenance activities

7) *Monitoring Period*

- Observation will be ongoing and reported where required
- TSS will be measured every three months as part of the water quality monitoring program, or more frequently if required.
- Visual observations of soil contamination should be ongoing, on a daily basis during construction.

8) *Institutions of Environmental Monitoring*

- a) Implementor  
Construction Contractor
- b) Supervisor  
Bapedalda, P2JJ, Supervision Consultant
- c) Reporting  
Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

2.2.1.4

*Land Contaminant*

1) *Sources of Impact*

- Management and clearance of both tsunami-generated and construction debris and wastes.

2) *Significant Impacts on Environment*

Soil contamination may occur as a result of accidental spills and leaks of fuel and oil and/or the inappropriate temporary storage of fuel.

Both construction and tsunami-generated wastes have the potential to impact soils (and water sources as a secondary impact) if not managed properly. The clearance of tsunami debris will be a critical part of the site preparation activities required to initiate construction. As such, this a positive benefit of the Road Project.

3) *Indicators of Impact*

- Evidence of spills and leaks
- Localized flooding.

4) *Monitoring Objectives*

- To assess the effectiveness of environmental protection measures aimed to : Minimize suspended solid loads downstream of disturbed areas.

5) *Monitoring Methods*

- Visual observations should be undertaken to monitor for instances of soil contamination due to spillages etc. In the event of a major spill, nearby community wells should be monitored for contamination.

6) *Monitoring Locations*

- Visual soil contamination monitoring should occur at all areas near fuel and chemical storage areas and maintenance activities

7) *Monitoring Period*

- Visual observations of soil contamination should be ongoing, on a daily basis during construction.
- Waste management audits should be undertaken every 3 (three) months during construction.

8) *Institutions of Environmental Monitoring*

a) Implementor

Construction Contractor

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

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2.2.1.5

*Surface Water Quality*

1) *Source of Impact*

- Site preparation (earthworks) such as land clearing and development of access roads and quarries
- Hazardous and non-hazardous waste management
- Planned and unplanned watercourse crossings
- Use of chemicals and fuel/ oil

2) *Significant Impact on Environment*

The clearing of land for the road alignment and additional clearing required for heavy vehicle access via temporary roads may contribute to sedimentation if undertaken near watercourses. Natural drainage channels may be blocked by poorly managed vegetation clearing, or traversing of shallow channels by heavy vehicles. These alterations in water flow/ water quality have the potential to result in secondary adverse effects on aquatic and terrestrial ecology.

Poor waste management practices at the base camp and active construction areas may lead to the contamination of potable surface water sources. Sewage and sanitary effluent has the potential to adversely affect the quality of receiving water bodies unless properly treated and managed. The primary contaminants in sanitary effluents will be organic matter, coliform bacteria and suspended solids resulting in decreased dissolved oxygen content, elevated organic and coliform levels in downstream watercourses.

3) *Indicators of Impact*

- Increased sediment load and turbidity in the receiving surface water due to soil erosion.
- Changes in discharge rates.
- Water quality/potability reduced due to contamination.

4) *Monitoring Objectives*

- To evaluate compliance of water quality with Government Regulation No. 82 of 2001
- To assess the effectiveness of environmental management programs designed to minimize surface water contamination.
- To document changes in surface water flow if they occur.

5) *Monitoring Methods*

Surface water quantity and quality will be monitored during the construction stage by:

- Visual observation of construction areas and surrounding areas, with particular attention to eroded areas and sites of standing water.
- Stream gauging by use of a flow meter to monitor river flow.

Water quality samples are taken at sampling locations shown in Figures 2.1, 2.2 and 2.3; and will be analyzed for the parameters listed in Table 2-1.

**Table 2.1** *Parameters for Surface Water Quality*

<i>Parameter</i>	<i>Unit</i>	<i>Method</i>
<b>In-Situ Measurement</b>		
PH		Electrometric
Conductivity	µmhos/cm	Conductivity meter
Temperature	°C	Thermometer
<b>Physical Parameters</b>		
Total Dissolved Solid (TDS)	mg/L	Gravimetric
Total Suspended Solid (TSS)	mg/L	Gravimetric
<b>Dissolved Anions</b>		
Chloride	mg/L	Titrimetric
Fluoride	mg/L	Spectrophotometer
Sulphate	mg/L	Turbidimeter
Sulphide	mg/L	Colorimetric
Cyanide	mg/L	Colorimetric
Total Cyanide	mg/L	Colorimetric
<b>Nutrients</b>		
Ammonia	mg/L	Spectrophotometer
Nitrate	mg/L	Spectrophotometer
Nitrite	mg/L	Spectrophotometer
Phosphate	mg/L	Spectrophotometer
<b>Miscellaneous</b>		
BOD	mg/L	Incubation
COD	mg/L	Reflux
Selenium	mg/L	Spectrophotometer
<b>Organics</b>		
Surfactants	mg/L	Spectrophotometer
Total Phenol	mg/L	Spectrophotometer
<b>Microbiology</b>		
Total Coli form	MPN/100 ml	Fermentation
E-Coli Bacteria	MPN/100 ml	Membrane filter
Dissolved Metals As, Al, Ag, Cd, Cr (VI), Co, Cu, Fe, Pb, Mn, Hg, Zn	mg/L	AAS
<b>Extractable</b>		
Oil and Grease	mg/L	Extraction

Source: Government Regulation No. 82 of 2001

6) *Monitoring Locations*

Surface water flow measurement and water quality sampling is at the sites shown in Figures 2.1, 2.2 and 2.3 include:

- Sediment ponds outlet (once ponds become operational).
- Downstream of watercourse crossings (temporary and permanent).

- Sensitive areas, such as wetlands during and immediately after periods of nearby active construction.

7) *Monitoring Period*

Stream gauging and water quality monitoring will be carried out every three months following commencement of earthworks.

8) *Institutions of Environmental Monitoring*

a) Implementor

Construction Contractor

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

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2.2.1.6 *Hydrology (run off)*

1) *Source of Impact*

- Site preparation (earthworks) such as land clearing and development of access roads and quarries

2) *Significant Impact on Environment*

The clearing of land for the road alignment and additional clearing required for heavy vehicle access via temporary roads may contribute to sedimentation if undertaken near watercourses.

3) *Indicators of Impact*

The impact indicator is the amount of float from the water's body which is closest to the activities location.

4) *Monitoring Objectives*

- To assess the effectiveness of environmental management programs designed to minimize surface water flow

5) *Monitoring Methods*

- Visual observation of construction areas and surrounding areas, with particular attention to eroded areas and sites of standing water.
- Stream gauging by use of a flow meter to monitor river flow.

6) *Monitoring Locations*

Surface water flows will be measured at the sites shown in Figures 2.1, 2.2 and 2.3 include:

- Sediment ponds outlet (once ponds become operational).
- Downstream of watercourse crossings (temporary and permanent).
- Sensitive areas, such as wetlands during and immediately after periods of nearby active construction.

7) *Monitoring Period*

Stream gauging and water quality monitoring will be carried out every three months following commencement of earthworks.

8) *Institutions of Environmental Monitoring*

a) Implementor

Construction Contractor

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

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2.2.1.7

*Transportation*

1) *Sources of Impact*

- Construction or upgrading of access roads.
- Construction of road facilities and other infrastructure.
- Movement of material and equipment.

2) *Significant Impacts on the Environment.*

The re-alignment and re-building of the Banda Aceh to Meulaboh Road will have a long term positive impact on local transport and accessibility by providing a primary north-south connector between two major economic centres within the region. In addition, communities are currently isolated and 'shut-off' due to a lack of access. As construction proceeds, access to old areas will be regained and new areas will inevitably be opened up for development. During the construction phase, however, accessibility on local supporting roads may be reduced due to congestion associated with raw material supply and road detours around construction areas.

These factors may result in increased localised congestion and longer trip times during the construction phase. This can have secondary negative impact on local air quality and noise levels.

At the same time, the construction of access roads to facilitate the construction of the Banda Aceh to Meulobah Road will temporarily increase accessibility. These roads may be retained and upgraded in the long term to boost the local road network.

3) *Indicators of Impact*

- Increased traffic congestion along the Banda Aceh to Meulaboh road and supporting road network.
- Complaints from villagers.
- Increased road accidents.
- Increased noise and air pollution.

4) *Monitoring Objectives*

- To document disturbances to local villagers due to transportation if they occur.
- To avoid traffic accidents.
- To mitigate nuisance of increased traffic due to increased noise level.

5) *Monitoring Methods*

- Formal and informal feedback from villagers living close to the active construction areas.
- Compilation of statistics on numbers of accidents in conjunction with local authorities.

6) *Monitoring Locations*

All villages in active construction areas.

7) *Monitoring Period*

Accident numbers and community feedback will be recorded on an ongoing basis, commencing with the start of the construction stage.

8) *Institutions of Environmental Monitoring*

- a) Implementor  
Construction Contractor
- b) Supervisor  
Bapedalda, P2JJ, Supervision Consultant
- c) Reporting  
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## 2.2.2

### *Biological Environment*

Monitoring of the biological environment will be required, particularly in instances where the road construction activities have the potential to negatively impact sensitive areas, such as wetland habitats.

### 2.2.2.1

#### *Flora and Fauna*

##### 1) *Source of Impact*

- Clearance of vegetation;
- Noise from construction activities (disturbance);
- Gathering/ hunting of flora and fauna by workers;
- Land clearing.

##### 2) *Significant Impacts on Environment*

Potential significant impacts on flora as a result of construction activities include:

- Net vegetation loss, resulting in secondary impacts on fauna due to habitat loss.
- Increased predation (i.e. from hunting of fauna/ gathering of flora).

Potential significant impacts on fauna as a result of construction activities include:

- Injury and mortality due to increased road traffic, particularly protected fauna species.
- Direct loss or damage to habitat leading to reduced foraging/food resources, disturbance and displacement.
- Obstruction/interruption of movement/migration patterns due to new access roads.
- Increased exposure to hunting and trapping.

##### 3) *Indicators of Impact*

- Total area of vegetation cleared and subsequently rehabilitated following the completion of construction activities.
- Changes in fauna population in project area.

##### 4) *Monitoring Objectives*

- To document terrestrial flora and fauna prior land clearing.
- To monitor the extent of land clearing and of rehabilitated areas following completion of preparation activities.
- To document rehabilitation success.

##### 5) *Monitoring Methods*

- Site surveys and photographic records of land clearance, and subsequently rehabilitation.
- Rehabilitation progress will be recorded by measuring stem density and projected foliage cover.

##### 6) *Monitoring Locations*

All disturbed land.

7) *Monitoring Period*

- Monitoring of the extent land clearance and subsequently rehabilitation will continue throughout the construction and operation stages.
- Vegetation monitoring on rehabilitated sites will be carried out at six-monthly intervals, over two years after planting of vegetation.

8) *Institutions of Environmental Monitoring*

a) *Implementor*

Construction Contractor

b) *Supervisor*

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c) *Reporting*

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2.2.2.2

*Aquatic Biota*

1) *Source of Impact*

- Clearance of stream bank vegetation.
- Construction of road, bridges and watercourse crossings.
- Operational supporting infrastructure

2) *Significant Impacts on Environment*

Aquatic biota will be sensitive to physical changes in surface water quality as a result of construction activities. Sedimentation and turbidity changes, pooling due to stream flow obstructions and the removal of stream bank vegetation will contribute to changes in the physical-chemical characteristics of watercourses with secondary impact on aquatic flora and fauna.

3) *Indicators of Impact*

- Biodiversity index and abundance index
- Fish deaths
- Visible changes in stream flow and turbidity.

4) *Monitoring Objectives*

- To determine the effectiveness of water quality management
- To determine the progress of recovery of water biota following the surface water quality management.

5) *Monitoring Methods*

Aquatic surveys will be carried out using a variety of sampling methods including nets of various sizes, followed by laboratory quantification and identification of the organisms recovered.

For calculating of Diversity, similarity and dominant index is below :

- Index of Diversity (H')

$$H' = -\sum P_i \log_2 P_i$$

$$P_i = N_i / N$$

$N_i$  = number of individual species in-i

$N$  = total number of species

- index of Similarity (E)

H

$$E = \frac{H}{H'_{\max}} ; H'_{\max} = \log_2 S$$

$H'$  = Diversity species index

$S$  = number of species

- Dominant index (C)

$N_i^2$

$$C = \left( \frac{N_i^2}{N} \right)$$

$N_i$  = Individual number in-I

$N$  = total Number of individual species

6) *Monitoring Locations*

Monitoring location as the same for monitoring water quality

7) *Monitoring Periods*

Monitoring during the construction stage and at least first year of project operation will be every six months.

8) *Institutions of Environmental Monitoring*

a) Implementor

Construction Contractor

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

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### 2.2.3 *Social Environment*

There will be significant benefits for the socio-economic and socio-cultural environment during construction, predominantly as a result of increased economic activity. The monitoring of impacts during this phase will assist to address outstanding and ongoing social issues in the region during the post-tsunami phase.

#### 2.2.3.1 *Local and Regional Economics*

##### 1) *Sources of Impact*

- Demobilization of construction workforce
- Loss of field work for local workers
- improving accessibility
- Improving economic growth

##### 2) *Significant Impacts on Environment*

- Local and regional economic

##### 3) *Indicator of Impact*

- Improving economic family
- Number of new small business enterprises.
- Average household income levels over the operation stage

##### 4) *Monitoring Objectives*

- To anticipate impacts potentially caused by incoming workforce.
- To evaluate the effectiveness of recruitment policy to give preference to local villagers to the extent practical and feasible.
- To document the extent of secondary business opportunities created by road construction.

##### 5) *Monitoring Methods*

- Formal and informal discussions with local community representatives and local government personnel, regarding project employment, socialization of recruitment policy, and any issues or conflicts that may arise from recruitment.
- Compilation of records regarding recruitment and employment for direct project and contractor employees.
- Formal survey at project-affected villages towards the end of construction activities.
- Compilation of information on source and value of purchased goods and services.
- Relevant Government statistics will be obtained when available.

- Additional information regarding local economic activities, including new business registrations, will be sought from local government authorities.
- 6) *Monitoring Locations*  
Project-affected villages.
- 7) *Monitoring Period*
- Monitoring will commence at the start of the pre-construction stage and continue through construction and operation stages.
  - Community survey after 6 months into project construction.
  - Employment records are maintained on an ongoing basis.
- 8) *Institutions of Environmental Monitoring*
- a) Implementor  
Construction Contractor
  - b) Supervisor  
Bapedalda, P2JJ, Supervision Consultant
  - c) Reporting  
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#### 2.2.3.2 *Opportunity working*

- 1) *Sources of Impact*
- Recruitment of construction workforce.
  - Mobilization and supply of construction materials and equipments .
- 2) *Significant Impacts on Environment*  
The construction of the Banda Aceh to Meulaboh Road will generate an opportunity for increased employment and business growth for local communities. Whilst this additional employment and economic growth may be limited to the construction stage, the project will contribute to a diversified skills base and collective business acumen of the region, which will have secondary benefits in the long term. The construction activity will generate spin-off economic activity, which will directly increase local household incomes, spending power and overall living standards.
- 3) *Indicator of Impact*
- Total proportion of local versus migrant workforce involved in construction activities.
  - Average income levels.

4) *Monitoring Objectives*

- To anticipate impacts potentially caused by incoming workforce.
- To evaluate the effectiveness of recruitment policy to give preference to local villagers to the extent practical and feasible.
- To document the extent of secondary business opportunities created by road construction.

5) *Monitoring Methods*

- Formal and informal discussions with local community representatives and local government personnel, regarding project employment, socialization of recruitment policy, and any issues or conflicts that may arise from recruitment.
- Compilation of records regarding recruitment and employment for direct project and contractor employees.
- Monitoring community base development program .

6) *Monitoring Locations*

Project-affected villages.

7) *Monitoring Period*

- Monitoring will commence at the start of the pre-construction stage and continue through construction and operation stages.
- Community survey after 6 months into project construction.
- Employment records are maintained on an ongoing basis.

8) *Institutions of Environmental Monitoring*

a) Implementor

Construction Contractor

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

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2.2.3.3

*Accident number*

1) *Sources of Impact*

- Mobilization and supply of construction materials and equipments .

2) *Significant Impacts on Environment*

Accident number due to project activity to which might be occurred to community/local people and livestock (b)

- 3) *Indicator of Impact*
  - Total number and frequency of accidents die sing in the road project
- 4) *Monitoring Objectives*
  - To monitor the impact of the traffic accident and effectiveness of its management and safe use of the road and bridges.
- 5) *Monitoring Methods*
  - Monitoring for traffic control and signage in location accident
  - To pass the information to the community.
- 6) *Monitoring Locations*

Project-affected villages.
- 7) *Monitoring Period*
  - Monitoring will commence at the start of the pre-construction stage and continue through construction and operation stages.
  - Community survey after 6 months into project construction.
  - Employment records are maintained on an ongoing basis.
- 8) *Institutions of Environmental Monitoring*
  - a) Implementor  
Construction Contractor
  - b) Supervisor  
Bapedalda, P2JJ, Supervision Consultant
  - c) Reporting  
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#### 2.2.3.4 *Community Perception and Attitudes*

- 1) *Sources of Impact*
  - Presence of contractors in local area and contractor behavior.
  - Land acquisition process/ownership disputes.
  - Transparency of employment/recruitment process.
  - Construction and upgrading of access roads.
  - Construction of supporting infrastructure.
  - Unnecessary disturbance to the natural environment/existing land uses and areas of cultural heritage value.

2) *Significant Impacts on Environment*

Positive perceptions and attitudes will result from activities that have real or perceived benefits for the environment or local community.

Negative perceptions result from evidence or perception of environmental damage or the emergence of social conflicts and the mismanagement of construction issues affecting the community, such as the land acquisition process.

3) *Indicators of Impact*

- Complaints and grievances from local community members.
- Criticism published in local and national media.
- Increased vandalism and security disturbances.

4) *Monitoring Objective*

- To identify community concerns so that they can be addressed before they develop into serious community relations issues.
- To evaluate local community perception towards the project during the preparation stage to guide community consultation and community development programs during operation stage.

5) *Monitoring Methods*

- Establish and maintain a Grievances Register.
- Carry out regular formal and informal meetings with community groups to actively address community concerns.
- Collect and evaluate relevant data or observations from local communities, local NGOs, and local government agencies.
- Formal survey at project-affected villages towards the end of construction activities.

6) *Monitoring Locations*

- Villages affected by construction activities.

7) *Monitoring Period*

- Programs will be ongoing, commencing at the start of pre-construction and continuing to the operation stage.
- Frequency of meetings will vary depending on the need, but meetings with each community would be held at intervals of not more than three months.
- Formal survey will be conducted 6 months into construction.

8) *Institutions of Environmental Monitoring*

a) *Implementor*

Construction Contractor

- b) Supervisor  
Bapedalda, P2JJ, Supervision Consultant
- c) Reporting  
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#### 2.2.3.5 *Social Processes*

##### 1) *Sources of Impact*

- The creation of employment for both local and migrant workers; and
- Community development programs.

##### 2) *Significant Impacts*

- Whilst there may be positive effects from the interaction between a migrant workforce and the local population (i.e. cultural exchange, knowledge sharing, increased racial tolerance) the concentration of a predominantly male, migrant workforce living in camps adjacent to villages can increase the incidence of social ills such as:
  - A possible associated rise in the incidence of illness, such as sexually transmitted disease, and
  - Other marginal activities such as gambling, illegal drug or alcohol use which may conflict with local sensitivities.
- These practices or activities will not be acceptable to local communities. There will be a greater impact if the majority of workers have migrated to the area (i.e. a non-local workforce). The local communities may incur indirect impacts such as increased rate of traffic accidents (i.e. workers driving under the influence of alcohol or drugs), potential increases in prostitution and the spread of disease. Such impacts can:
  - Be habit-forming.
  - Incur trauma.
  - Affect family relationships.
  - Compromise the saliency of local values and law and order.
  - Decrease the productivity of the project workforce.
- The impacts of social ills are commonly experienced by local populations as a result of new projects requiring the in-migration of a temporary workforce, particularly in rural locations.
- Another source of tension could be the formation of an outside workforce particularly in instances where it is perceived that local employment needs have been overlooked.

3) *Indicators of Impact*

- Changes in norms, values, and lifestyle associated with family relationships, religious observances and community relationships.
- Domestic dispute, social disharmony and crime.

4) *Monitoring Objectives*

- To limit interaction between the construction workforce and the resident population.
- To ensure that grievances are resolved and do not escalate into conflict.
- To avoid unnecessary project delays.

5) *Monitoring Methods*

- Quarterly review of grievance register to identify outstanding issues not resolved.
- Quarterly review of land acquisition/ compensation program.
- Consult local business operators regularly to determine reports of inappropriate behavior by construction workers.
- Informal and formal discussions with local government to determine disturbances and grievances in the affected communities as a result of land acquisition activities.

6) *Monitoring Locations*

Villages affected by road construction activities.

7) *Monitoring Period*

Construction phase – initiation to completion in active construction areas.

8) *Institutions of Environmental Monitoring*

a) Implementor

Construction Contractor

b) Supervisor

Bapedalda, P2JJ, Supervision Consultant

c) Reporting

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2.2.3.6

*Public Health*

1) *Sources of Impact*

- Develop and Operational supporting infrastructure
- mobilization equipments and materials, and
- Constructions road and bridge activity

2) *Significant Impacts*

The presence of a non-local workforce has the potential to increase the risk of diseases spreading to the local communities. Diseases such as HIV-AIDS, Hepatitis A and B and common colds, influenza, measles and chicken pox may spread within the workforce and then onto the community at large. Such diseases are particularly spread where people are in close proximity to each other and also through unsafe practices such as intravenous drug use. The additional population relocating to the area may overload existing sanitation facilities.

3) *Indicators of Impact*

- Prevalence of infectious and non-infectious diseases over time.
- Distribution of diseases in amongst workers and different community groups and settlements.
- Environmental sanitation and public health condition.

4) *Monitoring Objectives*

- To support government and local communities to prevent and to combat diseases.
- To ensure that the opportunity for the spread of disease between the non-local workforce and local residents is kept to a minimum.
- Avoid any deterioration in public health and environmental sanitation as a result of the project.
- To determine whether the presence of the construction workforce is negatively impacting the provision of local health services.
- To determine whether the treatment of ailments as a direct result of construction activities is placing pressure on local health services.

5) *Monitoring Methods*

- Medical check-up of new recruits.
- Conduct regular medical check-ups for employees, and compile statistic on employee health to enable year-to-year comparison.
- Collect and analyze relevant primary and secondary data from the company medical clinic and public medical centres (PUSKESMAS).
- Quarterly consultation with local health service providers.
- Consultation with local government to determine sanitation as part of community development needs assessment.

6) *Monitoring Locations*

All settlements within proximity to the road construction activities and construction camps.

7) *Monitoring Period*

Data will be summarized annually during the construction stage and can be extended during operation stage.

8) *Institutions of Environmental Monitoring*

a) *Implementor*

Construction Contractor

b) *Supervisor*

Bapedalda, P2JJ, Supervision Consultant

c) *Reporting*

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## 2.3 *OPERATION STAGE*

The operation stage will render some initial short term negative impacts on local communities, but should in the long term, replace the access and mobility that has been lost since the tsunami in December 2004. In addition, with the re-alignment of some sections, new areas will be opened-up for potential development.

### 2.3.1 *Physical-Chemical Environment*

#### 2.3.1.1 *Transportation*

1) *Sources of Impact*

- Traffic activity and increasing economic development

2) *Significant Impacts on the Environment.*

Traffic flow after road and bridges operation

3) *Indicators of Impact*

- Increased traffic congestion along the Banda Aceh to Meulaboh road and increasing of traffic accident number.

4) *Monitoring Objectives*

- To document disturbances to local villagers due to transportation if they occur.
- To avoid traffic accidents.
- To mitigate nuisance of increased traffic due to increased noise level.

5) *Monitoring Methods*

- Formal and informal feedback from villagers living close to the active construction areas.
- Compilation of statistics on numbers of accidents in conjunction with local authorities.

6) *Monitoring Locations*

All road long Banda Aceh – Meulaboh .

7) *Monitoring Period*

Continuously for operation road and bridges

8) *Institutions of Environmental Monitoring*

a) *Implementor*

Public Work NAD Province and Local Government

b) *Supervisor*

Bapedalda, P2JJ, Supervision Consultant

c) *Reporting*

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## 2.3.2 *Social Environment*

### 2.3.2.1 *Community Income*

1) *Source of impacts*

The source of impacts relating to society income is the road and bridge operational activities, which indirectly provide the chance for business development and to improve trading activities between the regions that previously had difficulty to be reached as well as demobilization of construction equipment and manpower.

2) *Significant of Impact*

The type of significant impacts which require monitoring is the society income caused by demobilization of construction manpower that has been involved in the project activity.

3) *Impact Indicator*

The indicators of impacts to determine the influence of road operation is the improvement of family income, and the development of local economy which is characterized by an improvement of buying power of society fro costumer goods and other needs. Another indicator is the establishment and

improvement of social economic system created by the new transportation pathway.

#### 4) *Objective of Monitoring*

- To establish sustainable development for Aceh society by planning for the improvement in job opportunity and project according to the regional planning
- To reduce the number of family separations due to manpower supply requirement and the pursuit prosperous generation.
- To ensure that employees have good capability to work on other projects or find long term employment after the construction completion of Banda Aceh-Meulaboh road
- To verify the social and economical impact of road construction and operation through preparation of a social impact assessment for the project.

#### 5) *Monitoring Methodology*

- Survey of society perceptions after the completion of the operational phase of the road construction
- Consultation with the local society during the construction preparation phase performing the social impact assessment and related social impact management plan

#### 6) *Monitoring Locations*

Villages and communities that have construction access to the new road.

#### 7) *Monitoring Period*

At least 1 year after completion of the project construction phase.

#### 8) *Institutions for Environmental Monitoring*

- a) **Implementor**  
The institution to perform the environmental monitoring is the construction contractor
- b) **Supervisor**  
Bapedalda, P2JJ, Supervision Consultant
- c) **Reporting**  
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### 2.3.3 *Other Activity*

#### 2.3.3.1 *Illegal Logging*

1) *Sources of Impact*

- Easier accessibility to the forest due to the operation of the road and bridges.

2) *Significant Impacts*

- Illegal logging activity along the road from Banda Aceh to Meulaboh

3) *Indicators of Impact*

- Increasing illegal local activity along the road from Banda Aceh – Meulaboh

4) *Monitoring Objectives*

- To monitor effectiveness of preventing illegal logging activity along the road from Banda Aceh – Meulaboh

5) *Monitoring Methods*

- Collecting data from Local Forestry Agency.
- Coordination with all other relevant agency (Forestry, Police, Government Provincial, Regency, and District) to survey local locations illegal logging activity

6) *Monitoring Locations*

Protected forest (Mount Paroe and Mount Geruteea) and villages that have access to forest area .

7) *Monitoring Period*

Every six month during operation road and bridges

8) *Institutions of Environmental Monitoring*

a) *Implementor*

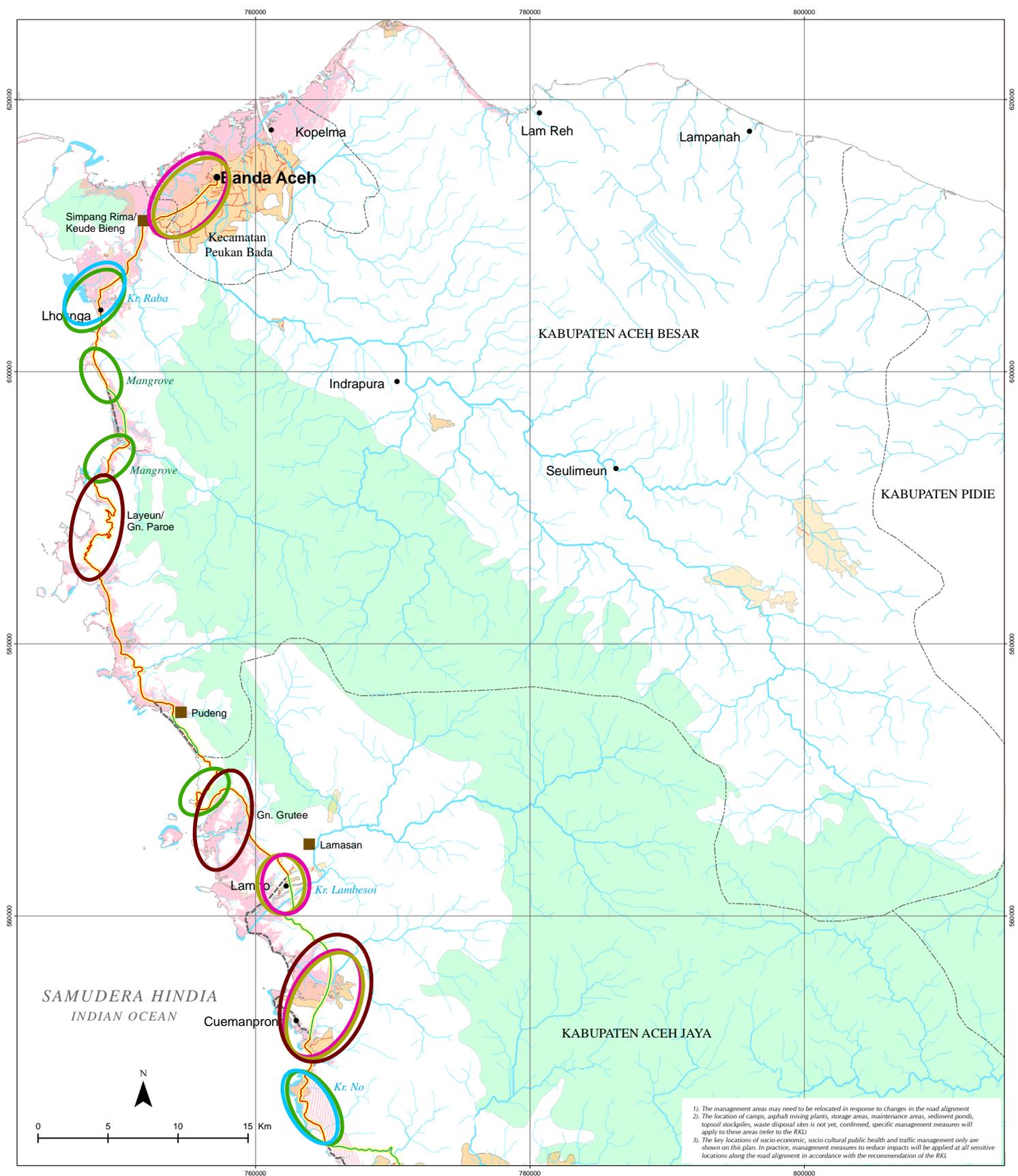
Public Work NAD Province and Local Government (Forestry Agency)

b) *Supervisor*

Local government coordinate with P2JJ NAD province, Forestry Agency in Banda Aceh, Aceh Besar, Aceh Jaya and Aceh Barat, and local police.

c) *Reporting*

Bapedalda Province, Forestry Agency in Banda Aceh, Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and Local Police



- 1). The management areas may need to be relocated in response to changes in the road alignment
- 2). The location of camps, asphalt mixing plants, storage areas, maintenance areas, sediment ponds, topsoil stockpiles, waste disposal sites is not yet confirmed, specific management measures will apply to these areas (refer to the RKL)
- 3). The key locations of socio economic, socio cultural public health and traffic management only are shown on this plan. In practice, management measures to reduce impacts will be applied at all sensitive locations along the road alignment in accordance with the recommendation of the RKL

## RENCANA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT PLAN

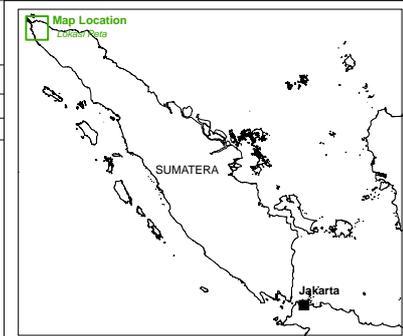
### PETA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT MAP

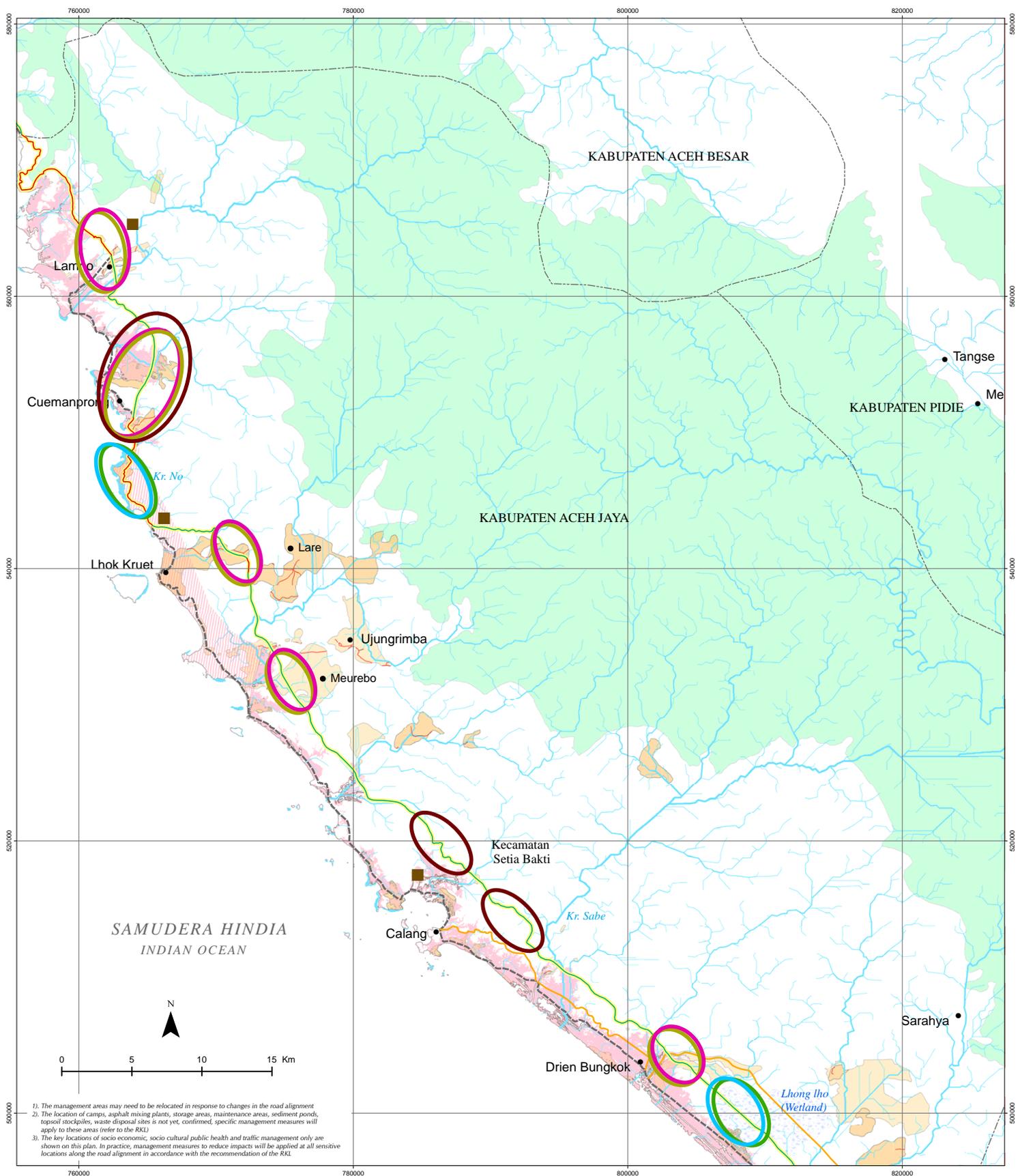
Legenda		Legend	
	Jalur Lama Tetap Dipakai Proposed Route (Existing)		Jalan Akses Access Road
	Jalur Baru Proposed Route (New)		Sungai River
	Jalur Lama (tidak dipakai) Abandoned Route		Lahan Basah Wetland
	Jalur Sementara (Jepang) Japan Temporary Alignment		Pemukiman Village
	Batas Kabupaten Regency Boundary		Karang Coral Reef
	Hutan Lindung Protected Forest		Area Dampak Tsunami Tsunami Affected Area
	Area Dampak Tsunami Tsunami Affected Area (estimated)		Lokasi Borrow Pit/Quarry Borrow Pit/Quarry Location Soil Water Management
	Pengelolaan Konservasi Tanah/Lereng Slope/Soil Conservation and Management		Pengelolaan Transportasi Traffic Management
	Wilayah Pengelolaan Kualitas Air Water Quality Management Area		
	Pengelolaan Flora dan Fauna Flora & Fauna Management		
	Pengelolaan Sosial Ekonomi Budaya dan Kesehatan Masyarakat Socio Economic Cultural and Public Health Management		

Sumber :  
Source :

Sistem koordinat universal transverse mercator (UTM),  
Zona 46 Utara, WGS 84

Gambar Figure	2.1	Digambar Oleh Drawn By	GGG
No Revisi Revisi No	0	Diperiksa Checked	KHS
Tanggal Revisi Revisi Date	10/06/05	Digabung Oleh Compiled By	ERM





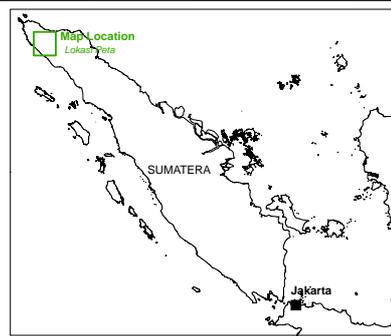
- 1). The management areas may need to be relocated in response to changes in the road alignment
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- 3). The key locations of socio economic, socio cultural public health and traffic management only are shown on this plan. In practice, management measures to reduce impacts will be applied at all sensitive locations along the road alignment in accordance with the recommendation of the RKL

## RENCANA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT PLAN

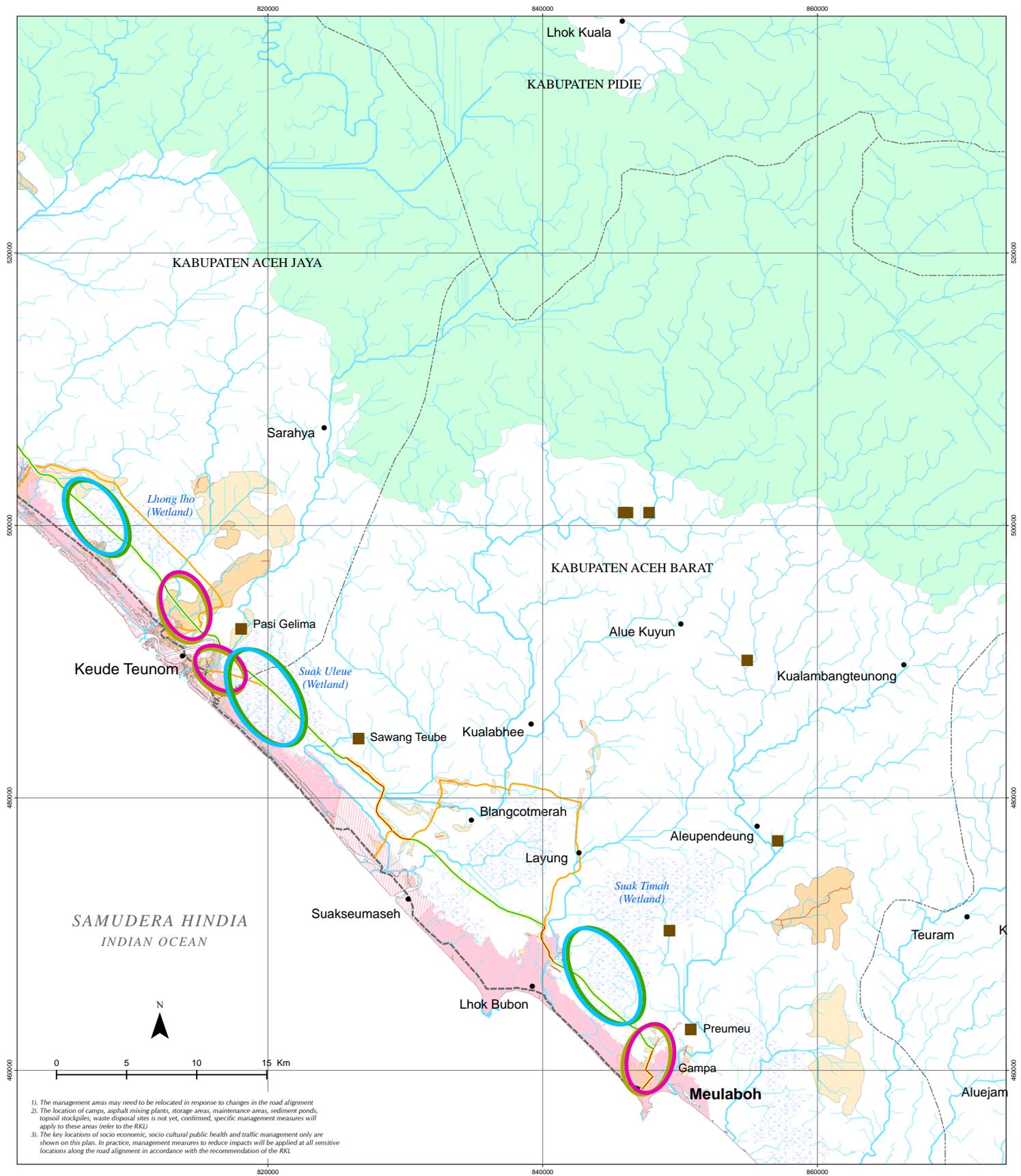
### PETA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT MAP

Sumber :  
Sistem koordinat universal transverse mercator (UTM),  
Zona 46 Utara, WGS 84

Gambar Figure	2.2	Digambar Oleh Drawn By	GGG
No Revisi Revision No	0	Diperiksa Checked	KHS
Tanggal Revisi Revision Date	10/05/05	Digabung Oleh Compiled By	ERM



Legend	
Jalur Lama Tetap Dipakai Proposed Route (Existing)	Jalan Akses Access Road
Jalur Baru Proposed Route (New)	Sungai River
Jalur Lama (tidak dipakai) Abandoned Route	Lahan Basah Wetland
Jalur Sementara (Jepang) Japan Temporary Alignment	Pemukiman Village
Batas Kabupaten Regency Boundary	Karang Coral Reef
Hutan Lindung Protected Forest	Area Dampak Tsunami Tsunami Affected Area
Area Dampak Tsunami Tsunami Affected Area (estimated)	Area Dampak Tsunami (perkiraan) Tsunami Affected Area (estimated)
Pengelolaan Kualitas Air dan Tanah di Lokasi Borrow Pit/Quarry Water Management	Pengelolaan Kualitas Air dan Tanah di Lokasi Borrow Pit/Quarry Water Management
Pengelolaan Transportasi Traffic Management	Pengelolaan Konservasi Tanah/Lereng Slope/Soil Conservation and Management
	Wilayah Pengelolaan Kualitas Air Water Quality Management Area
	Pengelolaan Flora dan Fauna Flora & Fauna Management
	Pengelolaan Sosial Ekonomi Budaya dan Kesehatan Masyarakat Socio Economic Cultural and Public Health Management



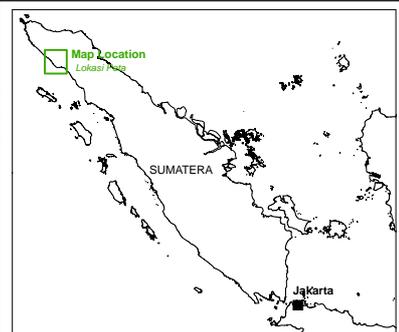
- 1). The management areas may need to be relocated in response to changes in the road alignment
- 2). The location of camps, asphalt mixing plants, storage areas, maintenance areas, sediment ponds, topsoil stockpiles, waste disposal sites is not yet confirmed, specific management measures will apply to these areas (refer to the RKL)
- 3). The key locations of socio economic, socio cultural public health and traffic management only are shown on this plan. In practice, management measures to reduce impacts will be applied at all sensitive locations along the road alignment in accordance with the recommendation of the RKL.

## RENCANA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT PLAN

### PETA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT MAP

Sumber :  
Source :  
Sistem koordinat universal transverse mercator (UTM),  
Zona 46 Utara, WGS 84

Gambar / Figure:	2.3	Digambar Oleh / Drawn By:	GGG
No Revisi / Revision No:	0	Diperiksa / Checked:	KHS
Tanggal Revisi / Revision Date:	10/05/05	Digabung Oleh / Compiled By:	ERM



#### Legenda

- |   |                            |  |  |
|---|----------------------------|--|--|
| Jalur Lama Tetap Dipakai<br>Proposed Route (Existing) | Jalan Akses<br>Access Road | Hutan Lindung<br>Protected Forest  | Pengelolaan Konservasi Tanah/Lereng<br>Slope/Soil Conservation and Management                                      |
| Jalur Baru<br>Proposed Route (New)                    | Sungai<br>River            | Area Dampak Tsunami<br>Tsunami Affected Area   | Wilayah Pengelolaan Kualitas Air<br>Water Quality Management Area  |
| Jalur Lama (tidak dipakai)<br>Abandoned Road          | Lahan Basah<br>Wetland     | Area Dampak Tsunami (perkiraan)<br>Tsunami Affected Area (estimated)   | Pengelolaan Flora dan Fauna<br>Flora & Fauna Management  |
| Jalur Sementara (lejang)<br>Japan Temporary Alignment | Pemukiman<br>Village       | Pengelolaan Kualitas Air dan Tanah di Lokasi Borrow Pit/Quarry<br>Borrow Pit/Quarry location Soil Water Management | Pengelolaan Sosial Ekonomi Budaya dan Kesehatan Masyarakat<br>Socio Economic Cultural and Public Health Management |
| Batas Kabupaten<br>Regency Boundary                   | Karang<br>Coral Reef       | Pengelolaan Transportasi<br>Traffic Management   |  |



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**DEPARTEMEN PEKERJAAN UMUM  
DIREKTORAT JENDERAL BINA MARGA  
DIREKTORAT JALAN DAN JEMBATAN I**  
SATUAN KERJA SEMENTARA PERENCANAAN DAN PENGAWASAN JALAN DAN JEMBATAN PROV. NAD  
JALAN JENDRAL SUDIRMAN NO. 1 BANDARA ACEH - KODE POS 23239 TEL/FAX (0651)47150

### **3 IMPLEMENTATION AND ADMINISTRATION OF ENVIRONMENTAL MONITORING**

#### **3.1 IMPLEMENTATION OF ENVIRONMENTAL MONITORING**

Environmental monitoring in the pre-construction, construction and operation stages is carried out by the Construction Contractor.

#### **3.2 SUPERVISION OF ENVIRONMENTAL MONITORING**

Environmental monitoring by the Construction Contractor will be supervised by:

- Regional Infrastructure Bureau
- Working Unit for Planning and Supervision Roads and Bridges Division and (P2JJ)
- The supervising consultant
- Bapedalda Nanggroe Aceh Darussalam Province.

#### **3.3 REPORTING**

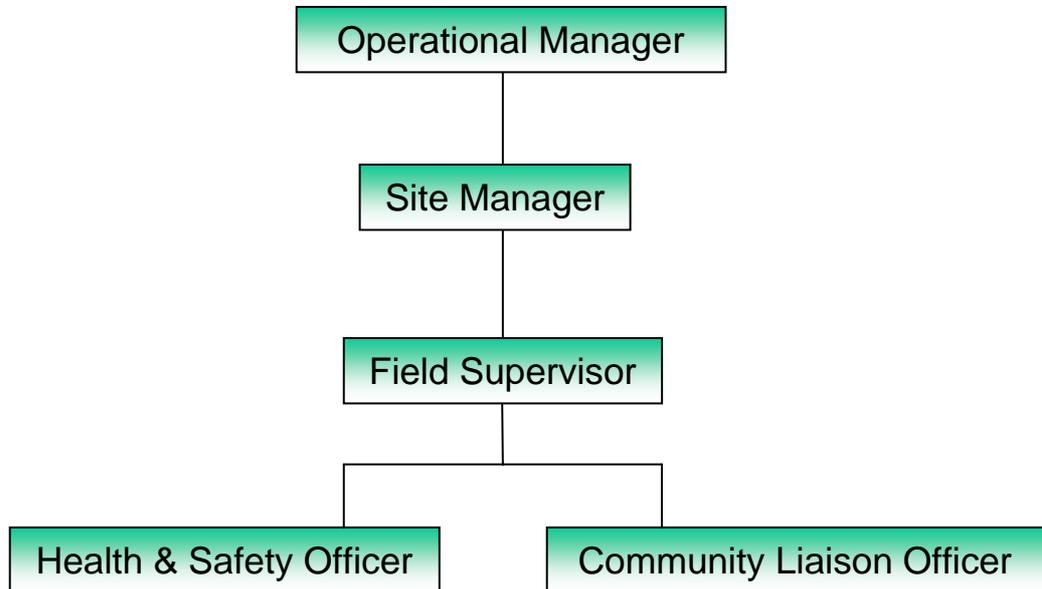
The Construction Contractor will submit quarterly reports on implementation of the environmental monitoring program as described in this RPL. Reports will be submitted to:

- Working Unit for Planning and Supervision Roads and Bridges Division and (P2JJ)
- Environmental Protection Agency (BAPEDALDA), Nanggroe Aceh Darussalam Province;
- USAID (United States Agency for International Development); and
- Agency for Rehabilitation and Reconstruction (BRR - Badan Rekonstruksi dan Rehabilitasi).

#### **3.4 WORKING PROCEDURES AND ORGANIZATION**

Implementation and supervision of the environmental monitoring programs within the construction company will be carried out by the Site Manager by reporting to the Operational Manager (Figure 3-1).

Figure 3.1 Organization Structure



- Anonimous (1997). *Kriteria Penetapan Lahan Kritis*. Direktorat Rehabilitasi dan Konservasi Tanah. Departemen Kehutanan.
- APHA, 1992.. *Standard Methods*, APHA, AWWA, WPCF, Washington DC
- Arsyad, S. (1979). *Konservasi Tanah dan Air*. Institut Pertanian Bogor, Bogor.
- Bappeda (2003), *Data Pokok Pembangunan Kabupaten Aceh Barat*, Meulaboh.
- Bapedalda, 2000. *Neraca Kualitas Lingkungan Hidup Derah Tahun 1999 Propinsi Daerah Istimewa Aceh*. Pemerintah Propinsi Daerah Istimewa Aceh, Banda Aceh.
- Bennet, J.D. McC. Bridge, D. Cameron, N.R. Djunuddin, A. Ghazali, S.A. Jeffrey, D.H. Kartawa, W. Keats, W. Rocks, N.M.S. Thompson, S.J. and Whandoyo, R. (1981) *Geologic map of the Banda Aceh Quadrangle, Sumatra*. Geological Research and Development Centre.
- Bowles, J.E., 1979, *Physical and Geotechnical Properties of Soils*, McGraw Hill International Book Company, Tokyo, Japan.
- Badan Pusat Statistik (BPS), 2001. *Hasil Sensus Penduduk 2000.*, Badan Pusat Statistik Propinsi Nanggroe Aceh Darussalam, Banda Aceh.
- Badan Pusat Statistik (BPS), 2004. *Statistik Kesejahteraan Rakyat 2003.*, Badan Pusat Statistik Propinsi Nanggroe Aceh Darussalam, Banda Aceh.
- Badan Pusat Statistik (BPS), 2004. *Aceh Dalam Angka 2003.*, Badan Pusat Statistik Propinsi Nanggroe Aceh Darussalam, Banda Aceh.
- Cameron, N.R. Bennet, J.D. McC. Bridge, D. Clarke, M.C.G. Djunuddin, A. Ghazali, S.A. Harahap, H. Jeffrey, D.H. Kartawa, W. Keats, W. Ngabito, H. Rocks, N.M.S., and Thompson, S.J. (1983) *Geologic map of the Tapaktuan Quadrangle, Sumatra*. Geological Research and Development Centre.
- Cameron, N.R. Bennet, J.D. McC. Bridge, D. Djunuddin, A. Ghazali, S.A. Harahap, H. Jeffrey, D.H. Kartawa, W. Keats, W. Rocks, N.M.S., and Whandoyo, R. (1982) *Geologic map of the Tapaktuan Quadrangle, Sumatra*. Geological Research and Development Centre.
- Chow, Ven Te, 1998, *Applied Hydrogy*, McGraw Hill International Edition, Singapore.
- Djojohadikusumo, Sumitro , 1994. *Perkembangan Pemikiran Ekonomi : Dasar Teori Ekonomi Pertumbuhan dan Ekonomi Pembangunan*, LP3ES, Jakarta.
- Dumbois, D. M. and Ellenberg, H., 1974, *Aim and Methods of Vegetation Ecology*, John Wiley and Sons, New York.

- International Organization for Migration (IOM), 2005. *Post Disaster Damage Assessment in Nanggroe Aceh Darussalam*, Directorate General of Human Settlement Ministry of Public Works, Banda Aceh.
- ISEI, 2005. *Pembangunan Kembali Daerah Pascabencana di Aceh dan Sumatera Utara : Sebuah Pendekatan Sosial Ekonomi dan Politik*. Focus Group Discussions & International Conference, Jakarta.
- Kabupaten Aceh Besar., *Kompas*, Terbitan tanggal 14 Juni 2002.
- Kabupaten Aceh Barat., *Kompas*, Terbitan tanggal 21 Juni 2002.
- Kabupaten Aceh Jaya., *Kompas*, Terbitan tanggal 31 Maret 2004.
- Krebs, C.J, (1978), *Ecology The Experimental Analysis of Distribution and Abundance*. Harper and Row Publ., New York.
- MacKinnon., J, 1991. *Panduan Lapangan Pengenalan Burung-burung di Jawa dan Bali*, Gajah Mada University Press, Yogyakarta.
- Mansoer, Teuku, 1970. *Sanggamara.*, Teuku Mansoer Foundation, Jakarta.
- Odum, E.P, (1971), *Fundamental of Ecology.*, W.B. Saunders and Co. Philadelphia.
- Schwarz, L.A. 1978. *A Generic Regional Model for Interdisciplinary Impact Analysis Computing Center*, University of Hamburg, Hamburg, Germany.
- Soemarwoto, O. 1991. *Analisis Dampak Lingkungan*. Gajah Mada University Press, Yogyakarta.
- Smith, Holly S., 1997. *Aceh : Art and Culture*. Oxford University Press, Kuala Lumpur.
- Thomson, K.R., 1987, *Principles of Water Surface Quality Modelling* and Todaro, M.P., 1977, "Economic Development in Developing Countries" Control, Harper & Ron Publishing, New York.
- Tsunokawa, K. and Hoban, C., 1997, *Road and The Environment a Handbook*, World Bank Technical Paper No.376, Washington DC.
- U.S. Forest Service, 1980. *An Approach to Water Evaluation of Non-Point Silvicultural Sources : An Procedural Handbooks* U.S. Environmental Protection Agency. Athens G.A.
- U.S. Soil Conservation Service, 1972. *Natonal engineering Handbooks. Bagian 4. Hydrology*. GPO, Washington, D.C.
- Wangsa, AB Lila, 1988. *Lila Wangsa (Bangsa nyang Tangouh)*. Naskah Ketikan.
- Wischmeier, W.H. and D.D. Smith, 1978. *Predicting Rainfall erosion Losses, A Guide to Concervation Planning*. U.S. Department of Agriculture Handbook. No. 237.

Appendix A

## Monitoring Matrix

**Appendix A**  
**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)**  
**FOR BANDA ACEH TO MEULABOH ROAD PROJECT**  
**(PRE-CONSTRUCTION STAGE)**

Sources of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
<b>Community Income</b>									
Decreasing community income in agricultural sector due to land acquisition process	During the pre-construction phase, Project Proponent will need to initiate discussions with landowners and legitimate squatters to secure access for the road construction. The road construction may cause disruption in those areas affected by temporary land acquisition and concurrent effects on the way of life for local community members. Livelihood impacts result when a person or household ability to earn income through normal channels is affected	Attitude and Community Perception and community income for land acquisition process	<ul style="list-style-type: none"> <li>To ensure equitable and timely property transactions through the land acquisition process.</li> <li>To ensure that grievances are resolved and do not escalate into conflict.</li> <li>To avoid unnecessary project delays.</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly review of grievance register to identify outstanding issues not resolved.</li> <li>Quarterly review of land acquisition/ compensation program to evaluate</li> <li>Informal and formal discussions with local government to identify disturbances/ grievances in the affected communities as a result of land acquisition activities</li> </ul>	All communities affected by road construction activities.	Quarterly review during pre-construction, extending into the construction stage as required	Project proponent (Public Work NAD Province)	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Barat Regency, BRR, and USAID

**Appendix A**  
**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)**  
**FOR BANDA ACEH TO MEULABOH ROAD PROJECT**  
**(PRE-CONSTRUCTION STAGE)**

Sources of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
<b>Attitude and Community Perception</b>									
The land acquisition process	Handled well, management measures and land compensation should mitigate any impacts experienced by landowners and users due to construction. However, previous in country examples of land compensation have illustrated a range of tensions that land compensation can create between landowners and project proponents. If the compensation process is pursued in a transparent and equitable manner, tensions should be minimized	Attitude and Community Perception and community income for land acquisition process	<ul style="list-style-type: none"> <li>▪ To ensure equitable and timely property transactions through the land acquisition process.</li> <li>▪ To ensure that grievances are resolved and do not escalate into conflict.</li> <li>▪ To avoid unnecessary project delays</li> </ul>	<ul style="list-style-type: none"> <li>▪ Quarterly review of grievance register to identify outstanding issues not resolved.</li> <li>▪ Quarterly review of land acquisition/ compensation program to evaluate:</li> <li>▪ Informal and formal discussions with local government to identify disturbances/ grievances in the affected communities as a result of land acquisition activities</li> </ul>	All communities affected by road construction activities	Quarterly review during pre-construction, extending into the construction stage as required	Project proponent (Public Work NAD Province)	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

**Appendix A**  
**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)**  
**FOR BANDA ACEH TO MEULABOH**  
**(CONSTRUCTION STAGE)**

Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
<b>Air Quality</b>									
Sources of impact for air quality is mobilization of equipment, land clearing, earthwork, and borrow area activity	<ul style="list-style-type: none"> <li>▪ The most significant potential fugitive dust impacts (would generally be expected to be localised to within about 100 to 200 m of the site preparation areas.</li> <li>▪ Emissions from these sources would not be expected to result in a significant deterioration in local air quality, however, management measures can keep changes to local air quality to an absolute minimum.</li> </ul>	Reported instances of respiratory irritation or noise and vibration disturbance by local residents.	<ul style="list-style-type: none"> <li>▪ To measure concentrations of dust and gaseous emissions at selected locations surrounding the project area, so that the results can be assessed in relation to air quality standard Government Regulation No. 41 of 1999 concerning Air Pollution Control.</li> <li>▪ To ensure that adopted air pollution and noise controls and management are effective.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Air quality sampling and analytical methods will be in accordance with Government Regulation No. 41 of 1999 concerning Air Pollution Control.</li> <li>▪ Air monitoring parameters will include 24-hour readings of total suspended particulates (TSP) and particulate matter less than 10µm (PM10) for gravimetric determination. Other parameters may be monitored subject to specific complaints received from residents.</li> </ul>	Active construction areas and nearby sensitive receptors.	The construction stage - from initiation to completion in active construction areas	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID
<b>Noise and Vibration</b>									
Sources of impact for noise and vibration is mobilization of equipment, land work such as cut and fill, and land clearing	<ul style="list-style-type: none"> <li>▪ Annoyance and disturbance effects at noise sensitive receptors (i.e. community areas); and</li> <li>▪ Damage to structures as a result of vibration</li> </ul>	Reported instances of respiratory irritation or noise and vibration disturbance by local residents.	<ul style="list-style-type: none"> <li>▪ To ensure that noise levels produced by operation of project plant, machinery and equipment do not exceed the applicable</li> </ul>	<ul style="list-style-type: none"> <li>▪ Noise monitoring/ measurement methods will follow guidelines stipulated in Minister of Environment Decree No. KEP-48/MENLH/11/1996 concerning Noise Level Standards.</li> <li>▪ The measurement of noise</li> </ul>	Active construction areas and nearby sensitive receptors.	The construction stage - from initiation to completion in active construction areas	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat

**Appendix A**  
**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)**  
**FOR BANDA ACEH TO MEULABOH**  
**(CONSTRUCTION STAGE)**

Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
	caused by heavy equipment movements, excavation, etc.		Government standards set by the Minister of Environment Decree No. KEP-48/MENLH/11/1996. <ul style="list-style-type: none"> <li>▪ To ensure that adopted air pollution and noise controls and management are effective</li> </ul>	levels will be conducted using an integrated sound meter. Since operation will be continuous over 24 hours, representative measurements will be made during all working shifts on the day of sampling. <ul style="list-style-type: none"> <li>▪ The grievance register will be monitored for reports by local residents for vibration causing human irritation or damage to property.</li> </ul>					Regency, BRR, and USAID
<b>Soil Erosion</b>									
Construction of road and related earthwork activities such as site preparation, cut and fill, excavation of borrow pits, quarrying and other supporting activities	Construction activities will require the removal of vegetation cover, potentially resulting in soil erosion and subsequent impacts on surface water quality due to uncontrolled rainwater run off or mechanical/ wind action	Increased erosion, sedimentation and slope instability.	To assess the effectiveness of environmental protection measures aimed to: <ul style="list-style-type: none"> <li>▪ Minimize erosion;</li> <li>▪ Maximize sediment retention in surface runoff through sediment traps; and to</li> <li>▪ Minimize suspended solid loads downstream of disturbed areas</li> </ul>	Erosion effects will be monitored by: <ul style="list-style-type: none"> <li>▪ Visual observation of landform and water turbidity and photographic documentation;</li> <li>▪ Identification of areas of potential soil instability, soil erosion, and standing water.</li> <li>▪ Reports on potential or existing problem areas.</li> <li>▪ Water sampling and analysis of Total Suspended Solids (TSS), turbidity, water levels and flow rate.</li> <li>▪ Visual observations should be undertaken to monitor for instances of soil contamination due to spillages etc. In the event of a major spill, nearby community wells should be monitored for</li> </ul>	<ul style="list-style-type: none"> <li>▪ Monitoring will be conducted at every quarry location and at invlined the steep roads which may be subject to erosion and landslide. Monitoring will be conducted, at baseline locations which are sensitive to soil movement specially on cordinate 5o28`N and 95o15`E. Monitoring will be conducted at the Layeun Village that crosser the fault at 5o15`N and</li> </ul>	<ul style="list-style-type: none"> <li>▪ Observation will be ongoing and reported where required</li> <li>▪ TSS will be measured every three months as part of the water quality monitoring program, or more frequently if required</li> </ul>	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

**Appendix A**  
**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)**  
**FOR BANDA ACEH TO MEULABOH**  
**(CONSTRUCTION STAGE)**

Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
				<p>contamination.</p> <ul style="list-style-type: none"> <li>▪ An audit of waste management practices at active construction areas, maintenance yards and camps should be undertaken by the Site Manager</li> </ul> <p>To monitor soil movement can following equipment will be used :</p> <ul style="list-style-type: none"> <li>▪ T-Bar, a simple equipment which will be used to monitor continuously, for a week in a year. It also monitor the vegetative area where soil movement is slow. T-Bar will be installed in several areas, the monitoring result will be organized graphically. Also measurement of rainfall, soil type will be conducted and analyze. A correlation between climate (rainfall) and soil movement will be attempted.</li> <li>▪ Bubble Tiltmeter. Will be use to identify direction of soil movement..</li> <li>▪ Iklinometer, will be used to identify the lateral pressure hence the horizontal vector of movement can be identified to determine the location of movement.</li> <li>▪ Ekstensometer, will be used to identify the vertical pressure from top side thus</li> </ul>	<p>95°23` E. Also monitoring will be conducted at two other faults located at 4°53` N and 95°24` E and 5°58` N and 95°26` E near Desa Lho Jumeut.</p> <ul style="list-style-type: none"> <li>▪ TSS measurements will be taken at selected surface water quality sampling sites downstream of the construction site .</li> <li>▪ Visual monitoring soil contamination will be undertaken at all areas near fuel and chemical storage areas and maintenance activities</li> </ul>				

**Appendix A**  
**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)**  
**FOR BANDA ACEH TO MEULABOH**  
**(CONSTRUCTION STAGE)**

Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
				vertical vector of movement can be identified					
<b>Land Contaminant</b>									
Management and clearance of both tsunami-generated and construction debris and wastes	<ul style="list-style-type: none"> <li>▪ May occur as a result of accidental spills and leaks of fuel and oil and/or the inappropriate temporary storage of fuel</li> <li>▪ The clearance of tsunami debris will be a critical part of the site preparation activities required to initiate construction</li> </ul>	Evidence of spills and leaks Localized flooding	To assess the effectiveness of environmental protection measures aimed to : Minimize suspended solid loads downstream of disturbed areas	Visual observations should be undertaken to monitor for instances of soil contamination due to spillages etc. In the event of a major spill, nearby community wells should be monitored for contamination.	Visual soil contamination monitoring should occur at all areas near fuel and chemical storage areas and maintenance activities	<ul style="list-style-type: none"> <li>▪ Visual observations of soil contamination should be ongoing, on a daily basis during construction.</li> <li>▪ Waste management audits should be undertaken every 3 (three) months during construction</li> </ul>	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID
<b>Surface Water Quality</b>									
<ul style="list-style-type: none"> <li>▪ Site preparation (earthworks) such as land clearing and development of access roads and quarries</li> <li>▪ Hazardous and non-hazardous waste management</li> <li>▪ Planned and unplanned</li> </ul>	The clearing of land for the road alignment and additional clearing required for heavy vehicle access via temporary roads may contribute to sedimentation if undertaken near watercourses. Natural drainage channels may be	<ul style="list-style-type: none"> <li>▪ Increased sediment load and turbidity in the receiving surface water due to soil erosion.</li> <li>▪ Changes in discharge rates.</li> <li>▪ Water quality/portability reduced due to</li> </ul>	<ul style="list-style-type: none"> <li>▪ To evaluate compliance of water quality with Government Regulation No. 82 of 2001</li> <li>▪ To assess the effectiveness of environmental management programs designed to minimize surface water</li> </ul>	Visual observation of construction areas and surrounding areas, with particular attention to eroded areas and sites of standing water. Stream gauging by use of a flow meter to monitor river flow	<ul style="list-style-type: none"> <li>▪ Sediment ponds outlet (once ponds become operational).</li> <li>▪ Downstream of watercourse crossings (temporary and permanent).</li> <li>▪ Sensitive areas, such as wetlands during and immediately after periods of nearby active</li> </ul>	Stream gauging and water quality monitoring will be carried out every three months following commencement of earthworks	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

**Appendix A**  
**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)**  
**FOR BANDA ACEH TO MEULABOH**  
**(CONSTRUCTION STAGE)**

Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
watercourse crossings ▪ Use of chemicals and fuel/ oil	blocked by poorly managed vegetation clearing, or traversing of shallow channels by heavy vehicles. These alterations in water flow/ water quality have the potential to result in secondary adverse effects on aquatic and terrestrial ecology.	contamination.	contamination. ▪ To document changes in surface water flow if they occur		construction.				
<b>Hydrology (runoff)</b>									
Site preparation (earthworks) such as land clearing and development of access roads and quarries	The clearing of land for the road alignment and additional clearing required for heavy vehicle access via temporary roads may contribute to sedimentation if undertaken near watercourses	The impact indicator is the amount of float from the water's body which is closest to the activities location	To assess the effectiveness of environmental management programs designed to minimize surface water flow	<ul style="list-style-type: none"> <li>▪ Visual observation of construction areas and surrounding areas, with particular attention to eroded areas and sites of standing water.</li> <li>▪ Stream gauging by use of a flow meter to monitor river flow</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sediment ponds outlet (once ponds become operational).</li> <li>▪ Downstream of watercourse crossings (temporary and permanent)</li> <li>▪ Sensitive areas, such as wetlands during and immediately after periods of nearby active construction</li> </ul>	Stream gauging and water quality monitoring will be carried out every three months following commencement of earthworks	Pelaksana Konstruksi	Dinas Praswil NAD, Dinas Perhubungan Kota Banda Aceh, Kabupaten Aceh Besar, Aceh Jaya, dan Aceh Barat, dan Konsultan Supervisi	Bapedalda Provinsi dan Kota Banda Aceh, Kabupaten Aceh Besar, Aceh Jaya, dan Aceh Barat dan Dinas Pekerjaan Umum dan Dinas Perhubungan Provinsi Nanggroe Aceh Darussalam , USAID serta BRR
<b>Transportation</b>									
<ul style="list-style-type: none"> <li>▪ Construction or upgrading of access roads.</li> <li>▪ Construction</li> </ul>	The re-alignment and re-building of the Banda Aceh to Meulaboh Road will have a long term	<ul style="list-style-type: none"> <li>▪ Increased traffic congestion along the Banda Aceh</li> </ul>	<ul style="list-style-type: none"> <li>▪ To document disturbances to local villagers due to transportation if</li> </ul>	<ul style="list-style-type: none"> <li>▪ Formal and informal feedback from villagers living close to the active construction areas.</li> <li>▪ Compilation of statistics on</li> </ul>	All villages in active construction areas	Accident numbers and community feedback will be recorded on an	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City,

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<p>of road facilities and other infrastructure.</p> <ul style="list-style-type: none"> <li>▪ Movement of material and equipment</li> </ul>	<p>positive impact on local transport and accessibility by providing a primary north-south connector between two major economic centres within the region. In addition, communities are currently isolated and 'shut-off' due to a lack of access. As construction proceeds, access to old areas will be regained and new areas will inevitably be opened up for development. During the construction phase, however, accessibility on local supporting roads may be reduced due to congestion associated with raw material supply and road detours around construction areas. These factors may result in increased localised congestion and longer trip times during the</p>	<p>to Meulaboh road and supporting road network.</p> <ul style="list-style-type: none"> <li>▪ Complaints from villagers.</li> <li>▪ Increased road accidents.</li> <li>▪ Increased noise and air pollution</li> </ul>	<p>they occur.</p> <ul style="list-style-type: none"> <li>▪ To avoid traffic accidents.</li> <li>▪ To mitigate nuisance of increased traffic due to increased noise level</li> </ul>	<p>numbers of accidents in conjunction with local authorities</p>		<p>ongoing basis, commencing with the start of the construction stage.</p>			<p>Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID</p>

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	<p>construction phase. This can have secondary negative impact on local air quality and noise levels.</p> <p>At the same time, the construction of access roads to facilitate the construction of the Banda Aceh to Meulobah Road will temporarily increase accessibility. These roads may be retained and upgraded in the long term to boost the local road network.</p>								
<b>Flora and Fauna</b>									
<ul style="list-style-type: none"> <li>▪ Clearance of vegetation;</li> <li>▪ Noise from construction activities (disturbance);</li> <li>▪ Gathering/hunting of flora and fauna by workers;</li> <li>▪ Land clearing.</li> </ul>	<p>Potential significant impacts on flora as a result of construction activities include:</p> <ul style="list-style-type: none"> <li>▪ Net vegetation loss, resulting in secondary impacts on fauna due to habitat loss.</li> <li>▪ Increased predation (i.e. from hunting of fauna/ gathering of flora).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Total area of vegetation cleared and subsequently rehabilitated following the completion of construction activities.</li> <li>▪ Changes in fauna population in project area</li> </ul>	<ul style="list-style-type: none"> <li>▪ To document terrestrial flora and fauna prior land clearing.</li> <li>▪ To monitor the extent of land clearing and of rehabilitated areas following completion of preparation activities.</li> <li>▪ To document</li> </ul>	<ul style="list-style-type: none"> <li>▪ Site surveys and photographic records of land clearance, and subsequently rehabilitation.</li> <li>▪ Rehabilitation progress will be recorded by measuring stem density and projected foliage cover</li> </ul>	All disturbed land	<ul style="list-style-type: none"> <li>▪ Monitoring of the extent land clearance and subsequently rehabilitation will continue throughout the construction and operation stages.</li> <li>▪ Vegetation</li> </ul>	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

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Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
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	Potential significant impacts on fauna as a result of construction activities include: <ul style="list-style-type: none"> <li>▪ Injury and mortality due to increased road traffic, particularly protected fauna species.</li> <li>▪ Direct loss or damage to habitat leading to reduced foraging/food resources, disturbance and displacement.</li> <li>▪ Obstruction/interruption of movement/migration patterns due to new access roads.</li> <li>▪ Increased exposure to hunting and trapping</li> </ul>		rehabilitation success			monitoring on rehabilitated sites will be carried out at six-monthly intervals, over two years after planting of vegetation			
<b>Aquatic Biota</b>									
<ul style="list-style-type: none"> <li>▪ Clearance of stream bank vegetation.</li> <li>▪ Construction of road, bridges and watercourse crossings.</li> <li>▪ Operational supporting infrastructure</li> </ul>	Aquatic biota will be sensitive to physical changes in surface water quality as a result of construction activities. Sedimentation and turbidity changes, pooling due to stream flow obstructions and the removal of stream	<ul style="list-style-type: none"> <li>▪ Biodiversity index and abundance index</li> <li>▪ Fish deaths</li> <li>▪ Visible changes in stream flow and turbidity</li> </ul>	<ul style="list-style-type: none"> <li>▪ To determine the effectiveness of water quality management</li> <li>▪ To determine the progress of recovery of water biota following the surface water quality management.</li> </ul>	Aquatic surveys will be carried out using a variety of sampling methods including nets of various sizes, followed by laboratory quantification and identification of the organisms recovered. For calculating of Diversity, similarity and dominant index is below : <ul style="list-style-type: none"> <li>▪ Index of Diversity (H')</li> </ul>	Monitoring location as the same for monitoring water quality	Monitoring during the construction stage and at least first year of project operation will be every six months	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

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Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
	bank vegetation will contribute to changes in the physical-chemical characteristics of watercourses with secondary impact on aquatic flora and fauna			<ul style="list-style-type: none"> <li>▪ Index of Similarity (E)</li> <li>▪ Index of Dominant (C)</li> </ul>					
<b>Local and Regional Economics</b>									
<ul style="list-style-type: none"> <li>▪ Demobilization of construction workforce</li> <li>▪ Loss of field work for local workers</li> <li>▪ improving accessibility</li> <li>▪ Improving economic growth</li> </ul>	Local and regional economic	<ul style="list-style-type: none"> <li>▪ Improving economic family</li> <li>▪ Number of new small business enterprises.</li> <li>▪ Average household income levels over the operations</li> </ul>	<ul style="list-style-type: none"> <li>▪ To anticipate impacts potentially caused by incoming workforce.</li> <li>▪ To evaluate the effectiveness of recruitment policy to give preference to local villagers to the extent practical and feasible.</li> <li>▪ To document the extent of secondary business opportunities created by road construction</li> </ul>	<ul style="list-style-type: none"> <li>▪ Formal and informal discussions with local community representatives and local government personnel, regarding project employment, socialization of recruitment policy, and any issues or conflicts that may arise from recruitment.</li> <li>▪ Compilation of records regarding recruitment and employment for direct project and contractor employees.</li> <li>▪ Formal survey at project-affected villages towards the end of construction activities.</li> <li>▪ Compilation of information on source and value of purchased goods and services.</li> <li>▪ Relevant Government statistics will be obtained when available.</li> <li>▪ Additional information regarding local economic activities, including new</li> </ul>	Project-affected villages	<ul style="list-style-type: none"> <li>▪ Monitoring will commence at the start of the pre-construction stage and continue through construction and operation stages.</li> <li>▪ Community survey after 6 months into project construction.</li> <li>▪ Employment records are maintained on an ongoing basis</li> </ul>	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

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Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
				business registrations, will be sought from local government authorities					
<b>Opportunity Working</b>									
<ul style="list-style-type: none"> <li>▪ Recruitment of construction workforce.</li> <li>▪ Mobilization and supply of construction materials and equipments</li> </ul>	<p>The construction of the Banda Aceh to Meulaboh Road will generate an opportunity for increased employment and business growth for local communities. Whilst this additional employment and economic growth may be limited to the construction stage, the project will contribute to a diversified skills base and collective business acumen of the region, which will have secondary benefits in the long term. The construction activity will generate spin-off economic activity, which will directly increase local household incomes, spending power and overall living standards</p>	<ul style="list-style-type: none"> <li>▪ Total proportion of local versus migrant workforce involved in construction activities.</li> <li>▪ Average income levels</li> </ul>	<ul style="list-style-type: none"> <li>▪ To anticipate impacts potentially caused by incoming workforce.</li> <li>▪ To evaluate the effectiveness of recruitment policy to give preference to local villagers to the extent practical and feasible.</li> <li>▪ To document the extent of secondary business opportunities created by road construction</li> </ul>	<ul style="list-style-type: none"> <li>▪ Formal and informal discussions with local community representatives and local government personnel, regarding project employment, socialization of recruitment policy, and any issues or conflicts that may arise from recruitment.</li> <li>▪ Compilation of records regarding recruitment and employment for direct project and contractor employees.</li> <li>▪ Monitoring community base development program</li> </ul>	Project-affected villages.	<ul style="list-style-type: none"> <li>▪ Monitoring will commence at the start of the pre-construction stage and continue through construction and operation stages.</li> <li>▪ Community survey after 6 months into project construction.</li> <li>▪ Employment records are maintained on an ongoing basis</li> </ul>	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

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Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
<b>Accident Number</b>									
Mobilization and supply of construction materials and equipments	Accident number due to project activity to which might be occurred to community/local people and livestock	Total number and frequency of accidents die sing in the road project	To monitor the impact of the traffic accident and effectiveness of its management and safe use of the road and bridges	<ul style="list-style-type: none"> <li>▪ Monitoring for traffic control and signage in location accident</li> <li>▪ To pass the information to the community</li> </ul>	Project-affected villages	<ul style="list-style-type: none"> <li>▪ Monitoring will commence at the start of the pre-construction stage and continue through construction and operation stages.</li> <li>▪ Community survey after 6 months into project construction.</li> <li>▪ Employment records are maintained on an ongoing basis</li> </ul>	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID
<b>Attitude and Community Perception</b>									
<ul style="list-style-type: none"> <li>▪ Presence of contractors in local area and contractor behavior.</li> <li>▪ Land acquisition process/ownership disputes.</li> <li>▪ Transparency of employment/recruitment process.</li> <li>▪ Construction</li> </ul>	<p>Positive perceptions and attitudes will result from activities that have real or perceived benefits for the environment or local community.</p> <p>Negative perceptions result from evidence or perception of environmental damage or the emergence of social</p>	<ul style="list-style-type: none"> <li>▪ Complaints and grievances from local community members.</li> <li>▪ Criticism published in local and national media.</li> <li>▪ Increased vandalism and security disturbances</li> </ul>	<ul style="list-style-type: none"> <li>▪ To identify community concerns so that they can be addressed before they develop into serious community relations issues.</li> <li>▪ To evaluate local community perception towards the project during the preparation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Establish and maintain a Grievances Register.</li> <li>▪ Carry out regular formal and informal meetings with community groups to actively address community concerns.</li> <li>▪ Collect and evaluate relevant data or observations from local communities, local NGOs, and local government agencies.</li> <li>▪ Formal survey at project-affected villages towards</li> </ul>	Villages affected by construction activities	<ul style="list-style-type: none"> <li>▪ Programs will be ongoing, commencing at the start of pre-construction and continuing to the operation stage.</li> <li>▪ Frequency of meetings will vary depending on the need, but</li> </ul>	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

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Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
and upgrading of access roads. <ul style="list-style-type: none"> <li>▪ Construction of supporting infrastructure.</li> <li>▪ Unnecessary disturbance to the natural environment/ existing land uses and areas of cultural heritage value</li> </ul>	conflicts and the mismanagement of construction issues affecting the community, such as the land acquisition process		stage to guide community consultation and community development programs during operation stage	the end of construction activities		meetings with each community would be held at intervals of not more than three months. <ul style="list-style-type: none"> <li>▪ Formal survey will be conducted 6 months into construction</li> </ul>			
<b>Social Process</b>									
<ul style="list-style-type: none"> <li>▪ The creation of employment for both local and migrant workers; and</li> <li>▪ Community development programs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Whilst there may be positive effects from the interaction between a migrant workforce and the local population (i.e. cultural exchange, knowledge sharing, increased racial tolerance) the concentration of a predominantly male, migrant workforce living in camps adjacent to villages can increase the incidence of social ills such as:               <ul style="list-style-type: none"> <li>o A possible associated rise in the incidence of illness, such as sexually</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Changes in norms, values, and lifestyle associated with family relationships, religious observances and community relationships.</li> <li>▪ Domestic dispute, social disharmony and crime.</li> </ul>	<ul style="list-style-type: none"> <li>▪ To limit interaction between the construction workforce and the resident population.</li> <li>▪ To ensure that grievances are resolved and do not escalate into conflict.</li> <li>▪ To avoid unnecessary project delays</li> </ul>	<ul style="list-style-type: none"> <li>▪ Quarterly review of grievance register to identify outstanding issues not resolved.</li> <li>▪ Quarterly review of land acquisition/ compensation program.</li> <li>▪ Consult local business operators regularly to determine reports of inappropriate behavior by construction workers.</li> <li>▪ Informal and formal discussions with local government to determine disturbances and grievances in the affected communities as a result of land acquisition activities</li> </ul>	Villages affected by road construction activities	Construction phase - initiation to completion in active construction areas	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID

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Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
	<p>transmitted disease, and</p> <ul style="list-style-type: none"> <li>o Other marginal activities such as gambling, illegal drug or alcohol use which may conflict with local sensitivities.</li> <li>▪ These practices or activities will not be acceptable to local communities. There will be a greater impact if the majority of workers have migrated to the area (i.e. a non-local workforce). The local communities may incur indirect impacts such as increased rate of traffic accidents (i.e. workers driving under the influence of alcohol or drugs), potential increases in prostitution and the spread of disease. Such impacts can: <ul style="list-style-type: none"> <li>o Be habit-forming.</li> <li>o Incur trauma.</li> <li>o Affect family relationships.</li> <li>o Compromise the saliency of local</li> </ul> </li> </ul>								

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							Implementor	Supervision	Reporting
	<p>values and law and order.</p> <ul style="list-style-type: none"> <li>o Decrease the productivity of the project workforce.</li> <li>o The impacts of social ills are commonly experienced by local populations as a result of new projects requiring the in-migration of a temporary workforce, particularly in rural locations.</li> <li>▪ Another source of tension could be the formation of an outside workforce particularly in instances where it is perceived that local employment needs have been overload</li> </ul>								
<b>Public Health</b>									
<ul style="list-style-type: none"> <li>▪ Develop and Operational supporting infrastructure</li> <li>▪ mobilization equipments and materials, and</li> </ul>	The presence of a non-local workforce has the potential to increase the risk of diseases spreading to the local communities.	<ul style="list-style-type: none"> <li>▪ Prevalence of infectious and non-infectious diseases over time.</li> <li>▪ Distribution of diseases in</li> </ul>	<ul style="list-style-type: none"> <li>▪ To support government and local communities to prevent and to combat diseases.</li> <li>▪ To ensure that the opportunity</li> </ul>	<ul style="list-style-type: none"> <li>▪ Medical check-up of new recruits.</li> <li>▪ Conduct regular medical check-ups for employees, and compile statistic on employee health to enable year-to-year comparison.</li> <li>▪ Collect and analyze</li> </ul>	ll settlements within proximity to the road construction activities and construction camps	Data will be summarized annually during the construction stage and can be extended during operation stage	Construction Contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya,

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Source of Impact	Significant Impact on Environment	Indicators of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution			
							Implementor	Supervision	Reporting	
<ul style="list-style-type: none"> <li>▪ Constructions road and bridge activity</li> </ul>	<p>Diseases such as HIV-AIDS, Hepatitis A and B and common colds, influenza, measles and chicken pox may spread within the workforce and then onto the community at large. Such diseases are particularly spread where people are in close proximity to each other and also through unsafe practices such as intravenous drug use. The additional population relocating to the area may overload existing sanitation facilities.</p>	<p>amongst workers and different community groups and settlements.</p> <ul style="list-style-type: none"> <li>▪ Environmental sanitation and public health condition.</li> </ul>	<p>for the spread of disease between the non-local workforce and local residents is kept to a minimum.</p> <ul style="list-style-type: none"> <li>▪ Avoid any deterioration in public health and environmental sanitation as a result of the project.</li> <li>▪ To determine whether the presence of the construction workforce is negatively impacting the provision of local health services.</li> <li>▪ To determine whether the treatment of ailments as a direct result of construction activities is placing pressure on local health services</li> </ul>	<p>relevant primary and secondary data from the company medical clinic and public medical centres (PUSKESMAS).</p> <ul style="list-style-type: none"> <li>▪ Quarterly consultation with local health service providers.</li> <li>▪ Consultation with local government to determine sanitation as part of community development needs assessment</li> </ul>						<p>and Aceh Barat Regency, BRR, and USAID</p>

**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)  
FOR BANDA ACEH TO MEULABOH  
(OPERATION STAGE)**

Source of Impact	Significant Impact on Environment	Indicator of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
<b>Transportation</b>									
Traffic activity and increasing economic development	Traffic flow after road and bridges operation	Increased traffic congestion along the Banda Aceh to Meulaboh road and increasing of traffic accident number	<ul style="list-style-type: none"> <li>▪ To document disturbances to local villagers due to transportation if they occur.</li> <li>▪ To avoid traffic accidents.</li> <li>▪ To mitigate nuisance of increased traffic due to increased noise level.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Formal and informal feedback from villagers living close to the active construction areas.</li> <li>▪ Compilation of statistics on numbers of accidents in conjunction with local authorities</li> </ul>	All road long Banda Aceh - Meulaboh	Continuously for operation road and bridges	Public Work NAD Province and Local Government	Bapedalda and P2JJ	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR
<b>Community Income</b>									
The road and bridge operational activities, which indirectly provide the chance for business development and to improve trading activities between the regions that previously had difficulty to be reached as well as demobilization of	The type of important impacts which require monitoring is the society income caused by demobilization of construction manpower that has been involved in the project activity	<ul style="list-style-type: none"> <li>▪ The indicators of impacts to determine the influence of road operation is the improvement of family income, and the development of local economy which is characterized by an improvement of</li> </ul>	<ul style="list-style-type: none"> <li>- To establish sustainable development for Aceh society by planning for the improvement in job opportunity and project according to the regional planning</li> <li>- To reduce the number of family separations due to manpower supply requirement and the pursuit prosperous generation.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Survey of society perceptions after the completion of the operational phase of the road construction</li> <li>▪ Consultation with the local society during the construction preparation phase performing the social impact assessment and related social impact management plan</li> </ul>	Villages and s communities that have construction access to the new road.	At least 1 year after completion of the project construction phase.	Construction Contractor	Bapedalda and P2JJ	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR

**SUMMARY MATRIX ENVIRONMENTAL MONITORING PLAN (RPL)  
FOR BANDA ACEH TO MEULABOH  
(OPERATION STAGE)**

Source of Impact	Significant Impact on Environment	Indicator of Impact	Monitoring Objectives	Monitoring Methods	Monitoring Location	Monitoring Period	Institution		
							Implementor	Supervision	Reporting
construction equipment and manpower.		buying power of society fro costumer goods and other needs. Another indicator is the establishment and improvement of social economic system created by the new transportation pathway	<ul style="list-style-type: none"> <li>- To ensure that employees have good capability to work on other projects or find long term employment after the construction completion of Banda Aceh-Meulaboh road</li> <li>▪ To verify the social and economical impact of road construction and operation through preparation of a social impact assessment for the project</li> </ul>						
<b>Illegal logging</b>									
Easier accessibility to the forest due to the operation of the road and bridges	Illegal logging activity along the road from Banda Aceh to Meulaboh	Increasing illegal local activity along the road from Banda Aceh - Meulaboh	To monitor effectiveness of preventing illegal logging activity along the road from Banda Aceh - Meulabo	<ul style="list-style-type: none"> <li>▪ Collecting data from Local Forestry Agency.</li> <li>▪ Coordination with all other relevant agency (Forestry, Police, Government Provincial, Regency, and District) to survey local locations illegal logging activity</li> </ul>	Protected forest in road and bridge and access roads project	Continuously for operation road and bridges	Public Work NAD Province and Local Government (Forestry Agency)	Bapedalda, Forestry Agencvy and P2JJ	Bapedalda, Public Work Department NAD Prov., Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR