

Banda Aceh to Meulaboh Rehabilitation and Reconstruction Road Project

Environmental Management 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 kilometres 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

CONTENTS

1	INTRODUCTION	1
1.1	Background	1
1.2	Primary Potential Impacts	2
1.3	Objectives and Purpose of Environmental Management	5
1.4	Environmental Management Policy	5
1.4.1	General Philosophy	5
1.4.2	Environment Policy	6
1.5	Use of Environmental Management Plan	6
2	ENVIRONMENTAL MANAGEMENT APPROACH	8
2.1	Technical Approach	8
2.2	Socio-Economic, Socio-Cultural and Public Health Approach	9
2.3	Institutional Approach	9
3	ENVIRONMENTAL MANAGEMENT PLAN	11
3.1	Pre-Construction Stage	11
3.1.1	Social Economic and Culture	11
3.2	Construction Stage	14
3.2.1	Physical-Chemical Environment	14
3.2.2	Biological Environment	26
3.2.3	Social Environment	30
3.3	Operation Stage	40
3.3.1	Physical-Chemical Environment	40
3.3.2	Social Environment	42
4	IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT	48
4.1	Implementation of Environmental Management	48
4.2	Supervision of Environmental Management	48
4.3	Reporting	48
4.4	Working Procedures and Organization	48
5	LITERATURE	50

LIST OF FIGURES

Figure 1.1	Project Location	7
Figure 3.1	Excavation Process at The Quarry To Prevent Erosion	19
Figure 3.2	Traffic controls/signage Standard The Construction Stage	34
Figure 3.3	Environmental Management Location part 1	45
Figure 3.4	Environmental Management Location part 2	46
Figure 3.5	Environmental Management Location part 3	47

APPENDIX A MANAGEMENT MATRIX

GLOSSARY

A-E	Architect-Engineer
AMDAL	Environmental Impact Assessment
ANDAL	Environmental Assessment Process
AASHTO	Association of American State Highway and Transportation Officials
BAKOSURTANAL	Badan Koordinasi Survey dan Pemetaan Nasional (Coordinating National Agency for Survey and Mapping)
BANGDES	Badan Pembangunan Desa (Village Development Agency)
Bapedalda	Badan Pengendalian Dampak Lingkungan (Agency of Environmental Impact Management)
BAPPEDA	Badan Perencanaan Pembangunan Daerah (<i>Regional Development Planning Program</i>)
BNA-MBO	Banda Aceh - Meulaboh
BOD	Biological Oxygen Demand
BPS	Badan Pusat Statistik (<i>Central Agency of Statistics</i>)
BRR	Agency in charge of the Rehabilitation and Reconstruction of Aceh
CDR	Crude Death Rate
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
dB (A)	Decibel
GIS	Geographic Information System
GR	Government Regulation
GRDP	Gross Regional Domestic Product
INP	Important Index Value
IMR	Infant Mortality Rate
IOM	International Organization for Migration
IMC	International Medical Corps
IPA	Index Point of Abundance
ISPA	Infeksi Saluran Pernapasan Atas (Upper Respiration Canal Infection Disease)
Hi-Vol	High Volume Air Sampler
Km	Kilometers
Kg	Kilograms
m	Meters
MP-ASI	Makanan Pendamping Air Susu Ibu (Breast Milk Supplement)
m/dt	Meter per detik (<i>meters per second</i>)
NAD	Nanggroe Aceh Darussalam (Province)
ND	Not Detected
NO	Nitrogen Oxide

NS	Not Significant
O3	Ozone
PAD	Pendapatan Asli Daerah (<i>Original Local Revenue</i>)
P2JJ	The Planning And Supervision of Roads and Bridges Division
PUSKESMAS	Pusat Kesehatan Masyarakat (<i>Public Health Center</i>)
RKL	Rencana Pengelolaan Lingkungan (Environmental Management Plan)
RPL	Rencana Pengelolaan Lingkungan (Environmental Monitoring Plan)
RUTR	Rencana Umum Tata Ruang (General Proposed Spatial Planning)
S	Significant
SO2	Sulfur Dioxide
SPL	Sound Pressure Level
Susenas	Survey Sensus Nasional (National Census Survey)
t/ha/th	ton/hectar/year
USAID	United States Agency for International Development
ug/m³	Microgram per cubic meter

1 INTRODUCTION

The Environmental Management 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, and
- 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 110 bridges and culverts along the original road that are likely to need repair or complete replacement. 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 three years. Project operation is planned to be continuous and future road maintenance and upgrades will be planned as required. Project activity from the pre-construction until operation stage may cause significant and important impacts on the physical-chemical and biological components in the project area environment. Other major impacts that may occur are related to socio-economic, socio-cultural and public health components.

1.2 *PRIMARY POTENTIAL IMPACTS*

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

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 (CO₂), Nitrogen oxide (NO_x), Sulphur dioxide (SO₂) 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.

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.

3) Hydrology

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.

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 chemical.

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

5) Biology

Terrestrial fauna and flora - The road development and supporting infrastructure will impact existing fauna and flora due to the diverse array of natural resource zones transacted by the corridor and the variety of indigenous animal and plant populations. The baseline study, however, indicates there are few endangered or protected species in the project

location area other than the occasional tiger, orangutan and a couple turtle nesting sites. Reclamation and re-vegetation 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 beds and coral reefs). Land 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.

6) Social Economics

People represent 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.

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.

1.3 **OBJECTIVES AND PURPOSE OF ENVIRONMENTAL MANAGEMENT**

The objectives and purpose of environmental management are to:

- Maximize potential project benefits and control potential negative impacts, and
- Comply with all relevant applicable Indonesian regulations related to pollution control, waste management and environmental quality.

1.4 **ENVIRONMENTAL MANAGEMENT POLICY**

The Indonesian Government Policy on Environmental Management is reflected in Act No. 23 of 1997, Article 1 regarding environmental management and reads as follows:

“Environmental Management is an integrated effort to conserve the environmental functions through arrangement, usage, development, maintenance, recovery, supervision, and control policies on the environment”.

To promote environmentally sustainable development, the Government requires an Analysis of Environmental Impacts (AMDAL) for all proposed activities with potential environmental impacts. In the AMDAL process, environmental impacts as a result of planned activities are evaluated and documented in an Environmental Impact Analysis Report (ANDAL). Subsequently, the project proponent designs preventive measures, negative impact mitigation, and positive benefit enhancement measures documented in the RKL (Environmental Management Plan) and RPL (Environmental Monitoring Plan) documents. Through this planning process, it is expected that development activities will be carried out with due consideration for environmental protection.

The Management Policies of the Project Proponent are as follows:

1.4.1 **General Philosophy**

Project Proponent develops and applies policies and management systems for the environment by referring to prevailing laws, regulations and standards, and ensures that all infrastructure operational stages, from planning and pre-operation to operation and post-operation, comply with said legislation and guidelines.

1.4.2 *Environment Policy*

- Project Proponent is obligated to make use of natural resources in an optimum manner in the context of conservation and waste minimization.
- Project Proponent is obligated to possess, implement and meet the provisions of the AMDAL in all operational activities.
- Project Proponent is obligated to minimize disturbed land and to rehabilitate the same by land recovery according to its intended conditions as well as to protect and conserve the flora and fauna existing therein.
- Project Proponent is obligated to have project completion, post-construction and operation plans for all infrastructure activity.

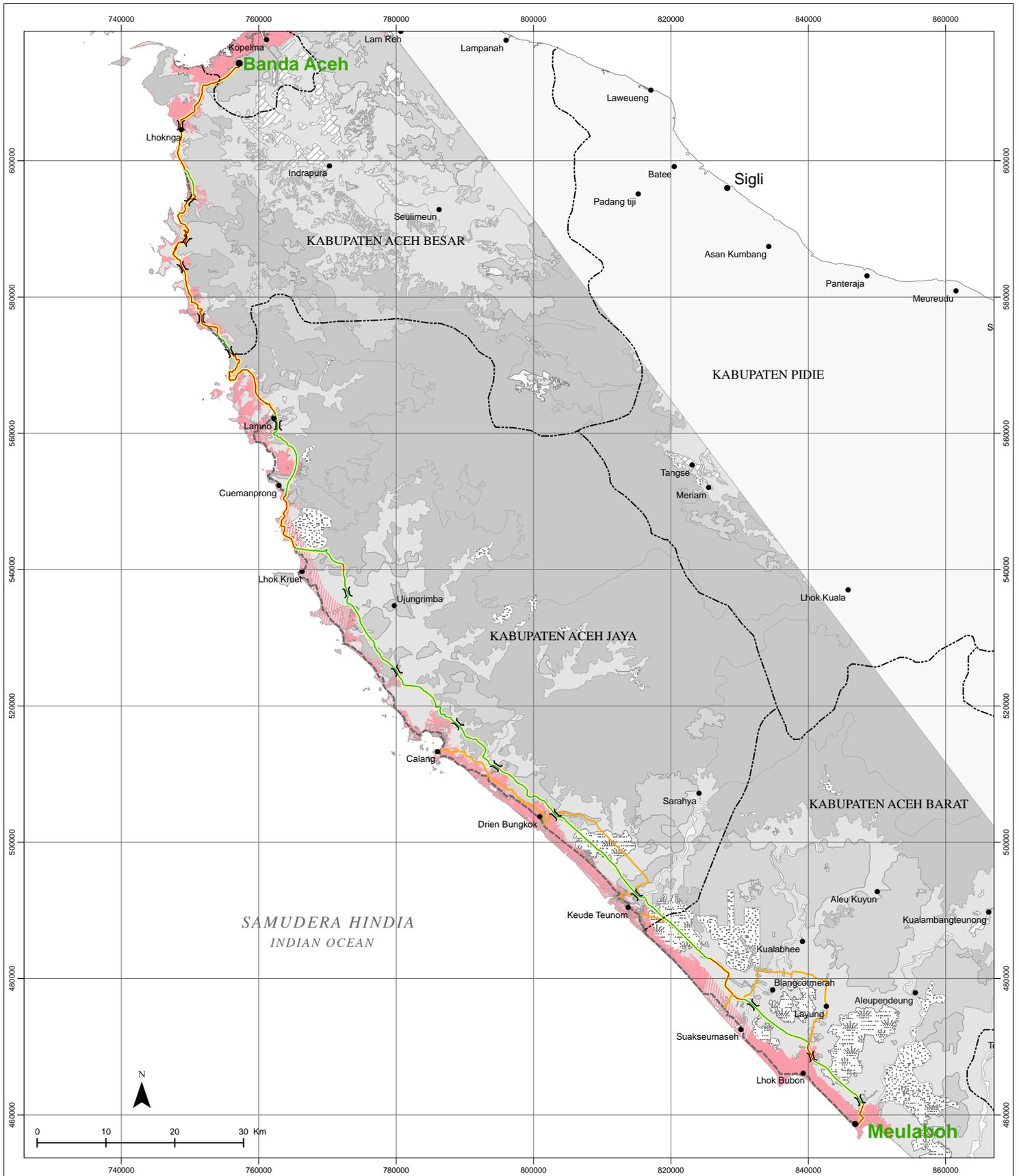
1.5 *USE OF ENVIRONMENTAL MANAGEMENT PLAN*

From Project Proponent's viewpoint, the RKL will:

- Provide environmental documentation, as required by government in accordance with Government Regulation PP No.27 of 1999, to enable other related permits to be obtained.
- Provide guidelines to conduct environmental management resulting in infrastructure activities that can be carried out without disturbing the ecological balance in the road location area.
- Protect Project Proponent from possible claims by other stakeholders in the operation area.
- Demonstrate Project Proponent's commitment to environmental sustainability through the implementation of the environmental management program.

For the Government and local communities, the RKL will:

- Fulfil Project Proponent's environmental obligations as required by the government.
- Provide information and guidelines for the government and local communities to enable their active involvement in supporting, over-seeing and reviewing the implementation, monitoring and reporting of environmental management programs.



RENCANA PENGELOLAAN LINGKUNGAN ENVIRONMENTAL MANAGEMENT PLAN

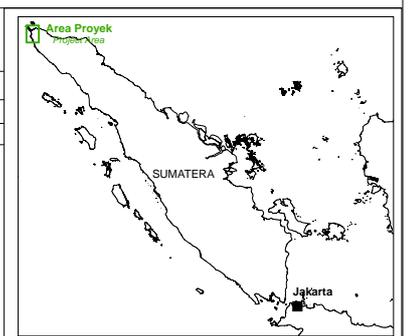
LOKASI PERBAIKAN DAN REKONSTRUKSI JALAN DARI BANDA ACEH SAMPAI MEULABOH BANDA ACEH TO MEULABOH ROAD RECONSTRUCTION AND REHABILITATION

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 MANAGEMENT APPROACH*

The project approach adopted for environmental management of the Banda Aceh to Meulaboh rehabilitation and reconstruction project is similar to that described in the approved ANDAL document and includes technical, social, economic, cultural, public health and institutional components as described in the following sections.

2.1 *TECHNICAL APPROACH*

Technical methods will be used to prevent, control and reduce negative impacts from the road infrastructure project and associated activities in accordance with best available technology and working practices. Efforts will be made to maximize positive benefits and the environmental carrying capacity.

Technical approaches will include the following:

Water management - Reducing adverse impacts on water quality by controlling run-off and soil erosion caused by activities during the pre-construction stage up to the operation stage. Activities with the potential to cause the above impacts include site preparation for road facilities and infrastructure, reclamation and rehabilitation.

Cutting and filling - New sections of the road will be aligned along natural topography contours to minimize soil piling and placement during the construction stage.

Reclamation - During site preparation, topsoil will be removed and temporarily stored for future reclamation activities. Temporary topsoil storage periods will be minimized to control erosion and run-off and to maintain topsoil quality.

Noise and air quality management - Excavation equipment and construction vehicles will be maintained to ensure emissions are kept to a minimum, particularly during the sourcing of raw material, land clearance and earthworks performed near settlement areas.

Waste management - Managing sanitary and hazardous wastes generated by the tsunami and from supporting facilities such as workshops, maintenance areas and camps in order to avoid pollution to surface and groundwater.

Emergency Response Plan –Emergency Response Plan (ERP) and Arrangement for implementation will be made any potential emergency and situation such as the oil and asphalt spills, traffic accidents, fire, land slide, etc.

2.2 *SOCIO-ECONOMIC, SOCIO-CULTURAL AND PUBLIC HEALTH APPROACH*

Social, economic, cultural and public health approaches will be implemented to minimize negative impacts and enhance positive benefits for the villagers in the vicinity of the project area as a result of the infrastructure activities.

- Particular approaches to be used are as follows:
- Respect for local norms, values and human rights.
- Promoting public involvement and participation through transparent project disclosure and capacity building within project-affected communities.
- Local recruitment and contract policy that favours employment of local people wherever the requisite skills and experience are available.
- Human resources training and job proficiency skill development.
- Cooperation with qualified local businesses and enterprises along the road project location to supply goods and services needed to support the new infrastructure and associated project activities.
- Sharing information in a participatory and reasonable manner with the local communities to improve their understanding and perception of the road development and its value as a domestic and national asset.
- Implementation of community development programs to contribute to the well-being and sustainability of the local communities.

2.3 *INSTITUTIONAL APPROACH*

The institutional approach is essential for an effective environmental management system to help insure integrated internal and external control of identified impacts. The project proponent plans to use the following approaches:

- Coordination and cooperation with appropriate regional, municipal and local governments, local communities and other agencies and firms to insure sound environmental management of project activities.

- Regularly updating information to improve the intention and understanding of regulations and laws at the national, regional and local levels so that project proponent activities conform to existing laws and regulations.
- Development of a formal environmental, health and safety management system.
- Transparency in reporting environmental performance.

3 ENVIRONMENTAL MANAGEMENT PLAN

Identification of the significant impacts has been included in the ANDAL document for the various components of the road project, in particular the significant impacts on the environment component. Detail of management plan to mitigate the adverse impacts of the road construction for Banda Aceh to Meulaboh are provided in the Environmental Management Plan (RKL) for the various stage of construction as follows.

3.1 PRE-CONSTRUCTION STAGE

For The Pre- Construction Stage

There is no physical and chemical activity to be considered as there is no activity involved. However, details of the management of the social environment impact will be provided.

3.1.1 Social Economic and Culture

3.1.1.1 Community Income

1) Sources of Impact

A potential impact on community income is

Decreasing community income in agricultural sector due to The 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

Change in Community income due to land acquisition activity

4) Management Objectives

To prevent community income decrease and social conflict

5) *Management Efforts*

- Conducting the activities of land acquisition and resettlement plan as per plan, based on the legal and community agreement including times payment and coordination with the relevant government institutions.
- Conducting the persuasive and proactive approach, for community involvement and providing guidance for money management including payment on transfer process to the right person, security, etc
- Implementing the land acquisition and resettlement activities
- Conducting the Social Feasibility study for the land acquisition activity

6) *Management Locations*

The land acquisition process will require the identification of landowners and legitimate squatters along the sections of road that will be re-routed from the original alignment.

7) *Management Period*

Landowner consultation and negotiation will likely be ongoing during the pre-construction and construction stages.

8) *Financing*

Costs associated with the management of community attitudes and perceptions during the land acquisition process will be for the account and responsibility of the Project Proponent and Local Government.

9) *Institutions of Environmental Management*

a. Implementor

Public Work Department NAD Province (P2JJ) and Locals Government

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

3.1.1.2 *Attitude and Community Perception*

1) *Sources of Impact*

Source of impact the attitude and community perception is the land acquisition process.

2) *Significant Impacts on the Environment*

Conflicts and tensions which may occur during the land acquisition which may cause a negative perception towards the project.

3) *Indicators of Impact*

- Attitude and community perception concerning project activity
- Unresolved issues with land acquisition extending into the construction stage.

4) *Management Objectives*

- To minimize any negative perception, by taking proactive measures to prevent any social conflicts or social gaps and to develop a positive attitude within the community by means of following participatory activities
- To ensure that local people are informed of the project activities;
- To ensure that the wider community is aware of the need for the project and the proposed development;
- To provide a framework for two-way exchange of information, so that positive project outcomes are maximized;
- To incorporate community and stakeholder views and concerns into the activity program;

5) *Management Efforts*

- Sufficient timely information to affected owner
- Procedures for the dissemination of information regarding the calculation of compensation, the method of payment (i.e. direct to owners or through a government body) to ensure an open and equitable compensation process;
- Complaint procedure, including post - construction complaint.
- Assessment of compensation for effects on property/access outside the actual road corridor. In the event that impacts occur on land outside that compensated for, compensation will be evaluated and settled as soon as is reasonably possible after the damage is suffered; and
- In addition to the implementation of the above plan, the land acquisition activities will, where possible be scheduled with due regard for crop cycles to minimize unnecessary impacts on livelihoods and enable the continuation of economic agricultural activities

6) *Management Locations*

The land acquisition process will require the identification of landowners and legitimate squatters along the sections of road that will be re-routed from the original alignment.

7) *Management Period*

Landowner consultation and negotiation will likely be ongoing during the pre-construction and construction stages.

8) *Financing*

Costs associated with the management of community attitudes and perceptions during the land acquisition process will be for the account and responsibility of the Project/Public Work NAD.

9) *Institutions of Environmental Management*

a) Implementor

Public Work Department NAD Province (P2JJ) and Locals Governor

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

3.2 CONSTRUCTION STAGE

Construction activities will impact the physical-chemical, biological and socio-economic and socio-cultural environment.

3.2.1 *Physical-Chemical Environment*

Aspects of the physical-chemical environment that 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.

3.2.1.1 *Air Quality,*

1) *Sources of Impact*

Sources of impact on air quality are mobilization of equipment, land clearing, earthwork, and borrow area activity.

2) *Significant Impacts on Environment*

- Dust to localized to 100 meters from activity areas
- Vehicle emission near to working area

3) *Indicators of Impact*

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

- Dust (dust fall and total suspended particulates exceeding the air ambient standards.
- Communities complaint related to high dust amalgam content.

4) *Management Objectives*

To ensure air quality characteristics of the project area are maintained near the baseline conditions during of the construction stage

5) *Management Efforts*

- Periodically watering the main road area nearby the community settlements specially during the dry season to keep the dust level down.
- Slowing down the vehicles carrying the construction materials at the location nearby the community settlements, with speed maximum 60 Km/hr in town and on unasphalted road.
- Properly wrapping the material truck container with plastic cover to avoid dust sperads and other materials during the mobilization and to prohibit transport of over loaded truck.
- Prosiding and using the safety equipment such as mask, noise cover for employees who work near the dusty location such as the heavy equipment operator, etc.
- Optimization of working schedule and work to help to minimize several material vehicle mobilization trips.
- Regular inspectin and scheduled maintenance of all equipment.

6) *Management Locations*

Environmental management plan to will be implemented to mitigate air quality impacts at the following locations :

- Locations for the heavy equipment mobilization, by mean of watering devise, especially nearby community location.
- Along the community resettlement and employee camp, with the plantations of several tree as a bio filter.

7) *Management Period*

Management period from Construction stage - initiation to completion \pm 3 years

8) *Financing*

Costs for air quality, noise and vibration controls will be for the account and responsibility of the Construction Contractor Project.

9) *Institutions of Environmental Management*

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

3.2.1.2 *Noise and Vibration*

1) *Sources of Impact*

Sources of impact for noise and vibration 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 utilized during 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 on noise sensitive receptors (i.e. community areas); and
- Damage to structures as a result of vibration caused by heavy equipment movement, excavation, etc.

3) *Indicators of Impact*

Reported instances of noise and vibration disturbance by local residents.

4) *Management Objectives*

To ensure noise and vibration in the project area are maintained near baseline conditions for the extent of the construction stage.

5) *Management Efforts*

- Working schedule for the activities with high noise level (foundations and foundations tilts). will be arrange between 08:00 AM to 17:00 PM
- Bore will be pile is necessary in erecting the foundations tilts.
- Selecting 'quiet' construction equipment and working methods. Reductions in source sound power levels of 5-10 dBA may be achievable in some cases;

- Only well-maintained vehicles and equipment should be operated on-site and all machinery should be serviced regularly during the construction stage;
 - Provision of ear protection for activities that are likely to create noise in excess of 90dB to protect worker's health and safety
 - Allowing machinery shutdown when operating in proximity to mosques in accordance with the established weekly prayer schedule.
 - Avoiding simultaneous noisy activities;
- 6) *Management Locations*
All active construction areas, construction camps and maintenance yards and transport along access roads.
- 7) *Management Period*
Management period from Construction stage - initiation to completion \pm 3 years
- 8) *Financing*
Costs for air quality, noise and vibration controls will be for the account and responsibility of the Construction Contractor Project.
- 9) *Institutions of Environmental Management*
- 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

3.2.1.3 *Soil Erosion and Landslide*

- 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) *Management Objectives*

- To prevent and minimize soil compaction, erosion and slope instability caused by site preparation earthworks.
- To prevent and minimize sedimentation to surrounding water bodies.

5) *Management Efforts*

- During the dredging works, digging of the land on the quarry will be dredged conducted on several level, with angle facing inside towards the hills where the land is dredged (Figure 3.1).
- For the roads terrace, it will be arranged so the slopes do not exceed more than 10 % , this is to make sure that the water movement that carrier soil particles can be reduced by rocks and gravels based on the design.
- When the road construction on one terrace is finished then the land on the quarry will no longer be dredged and the tree plantation will have to be conducted. As for the open road area, primarily on the road side it will be re-greened by planting the bushes. On the ditch area by the road primarily in the slopy area it will strengthened by concrete to prevent the erosion. (ie: Paroe and Gerutee area).
- Top soil layer will be kept to rehabilitate and will be covered to prevent it from the erosion.
- An appropriate drainage will be built to accommodate the surface water movement from the rain and wind.

6) *Management Locations*

- Monitoring will be conducted at every quarry location and at inclined 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 5°28'N and 95°15'E. Monitoring will be conducted at the Layeun Village that crosses the fault at 5°15'N and 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.
- Observation for erosion will be carried out at all areas cleared for construction and identified for rehabilitation.
- TSS measurements will be taken at selected surface water quality sampling sites downstream of the construction site (see Figures 3.3 and 3.4).

- Visual monitoring soil contamination will be undertaken at all areas near fuel and chemical storage areas and maintenance activities

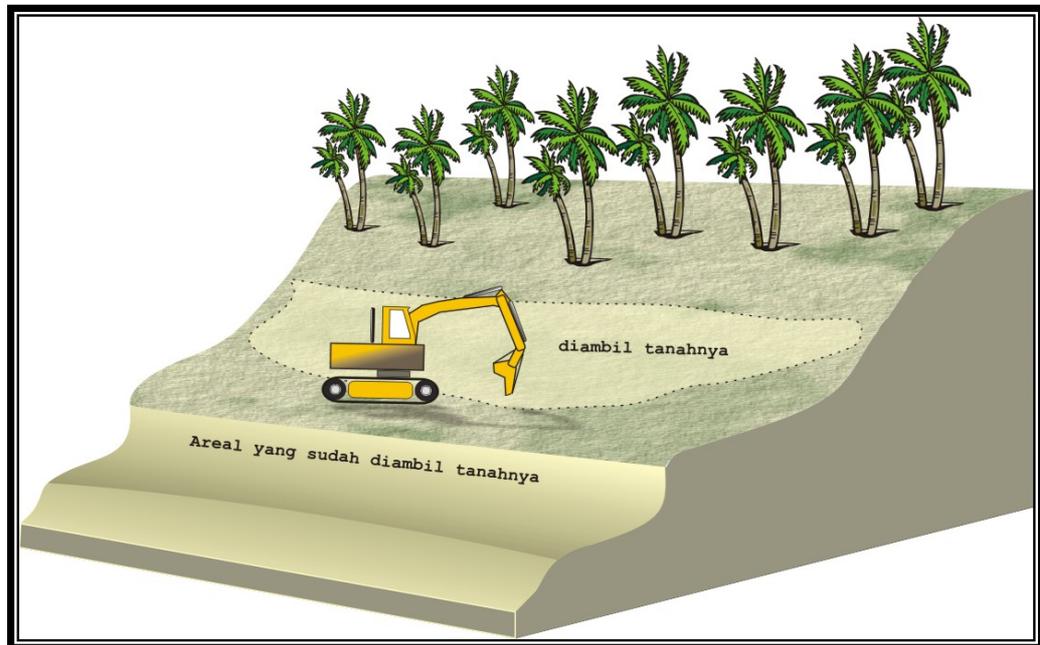


Figure 3.1 Excavation Process at The Quarry To Prevent Erosion

7) *Management Period*

Management at continues from Construction Stage – from initiation to completion

8) *Financing*

Costs for erosion, waste and soil quality controls will be for the account and responsibility of the Construction Contractor Project.

9) *Institutions of Environmental Management*

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

3.2.1.4 *Contamination of land*

1) *Sources of impact*

- Fuel and oil storage activities

2) *Significant Impacts on Environment*

Land contamination may occur as a result of fuel and oil leaks or spills and/or temporary fuel storage that is not stored properly.

3) *Indicators of impact*

- Oil or fuel leaks or spills

4) *Management objectives*

- To prevent and minimize land contamination and water.

5) *Management effort*

- In the lower part of the oil and fuel container an covered with thick plastics to prevent them from leaking or spilling at the time of re-fueling prevent any spill to the land but to the plastic.
- From the plastic the Fuel or oil is absorbed then removed to tank or container of oil waste.

6) *Management Location*

- Road corridor to access the active construction area, construction location, borrow pits, quarries, construction camp, and bunch of temporary top soil.
- Base camp location and workshop and Fuel storage tank.

7) *Management period*

The management efforts will be provided contunuesly during the construction period.

8) *Financing*

Dinancing is the responsibility of the construction contractor with adjusted cost as needed. It is estimated that the cost for the plastic is IDR 1,000,000/basecamp.

9) *Institutions of Environmental Management*

- 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

3.2.1.5 *Surface Water Quality*

1) *Sources of Impact*

Sources of impact for surface water quality is :

- Use of chemicals and fuel/oil.
- 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.
- 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.
- Increase causes of dysentery disease

4) *Management Objectives*

- To minimize disturbance to surface water quality.
- To manage run-off and sediment load from disturbed areas.

5) *Management Efforts*

- Warehouse floors are made of concrete. Proper drainage of surface water outside is provided. Drainage from warehouse is collected separately with trap for oil or fuels oil. For Trap containers when full will be removed to the drum to be sent out to the oil waste management company.
- Solid waste from the warehouse such as oil-filters, metals and tires etc, will be stored in a designated place to be sold or recycled by a third party.
- All waste oil from the warehouse will due stored in closed drums and later sold to a used-oil waste management company.
- Oil or fuel spills will be prevented from breaking into the water body. Spills will be covered with saw dust and later burn at proper location.

6) *Management Locations*

- All river crossings along the Banda Aceh to Meulaboh road alignment.
- All disturbed areas, particularly those areas outside the immediate construction footprint that may be impacted by construction activities.
- Krueng Reudeung River.
- Krueng Lambeso River.
- Krueng Bubon River.
- Lhung Lho Wetland.
- Suak Ular Wetland.

7) *Management Period*

Construction stage - initiation to completion

8) *Financing*

Costs associated with surface water quality management will be for the account and responsibility of the Construction Contractor Project.

9) *Institutions of Environmental Management*

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

3.2.1.6 Hydrology

1) Sources 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. This may contribute to sedimentation if undertaken near watercourses.

3) Indicators of Impact

The Impact indicator is the amount of floods from the water body that is closest to the activities location.

4) Management Objectives

The aim of the environmental management is to prevent floods which is caused by the additional water flow as a result of land opening for the road and quarry.

5) Management Efforts

- After the dredging activities, digging and soil dredging in quarry and land clearing for a specific terrace trees will be planted.
- For the choices of re-vegetation plantation, high adaptation with for local soil condition will be considered.
- When conducting the re-vegetations, the plantation will be taken good care of. Watering and bugs prevention will be also needed.
- To make dropped and ditch to irrigating water on the locations with different elevation, so that the water will not toward the medium crossed.
- Wet land area will be managed by building tunnels or a special drainage which can drain the water out from this swampy area. Appropriate number of tunnel will be constructed that will help water to run smoothly to the downstream. On the swampy area direct irrigation to the nearest river is rather difficult as the elevation differences are not too big. By making the water runs with better quality then it will avoiding a long ditch.
- Construction of tunnels and water exit tunnels to the nearest river will makes it run better.

6) Management Locations

- Management is conducted to all quarry locations and sloping road terraces o slopy roads which have been dredged or flattened, and most of all on the open vegetation area.

- Water circulation management especially on the wetland area which is transversed by the roads terrace of BNA – MBO. This is primarily in the Meudang Ghoh, Suak ular, Suak Seumaseh, Ruesak, and Balee areas (Cot Semeurung) to Gampa.

7) *Management Period*

Construction stage – initiation to completion

8) *Financing*

Costs associated with surface water quality management will be for the account and responsibility of the Construction Contractor Project.

9) *Institutions of Environmental Management*

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

3.2.1.7 *Transportation*

1) *Sources of Impact*

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

2) *Significant Impacts on 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 provide a primary north-south connector between two major economic centers within the region. In addition, communities are currently isolated and ‘cut-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 to 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 localized 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) *Management Objectives*

- To minimize disturbance to local accessibility during the construction phase.
- To reduce opportunities for construction-related accidents.
- To reduce congestion created as a result of construction activities.
- To ensure heavy vehicles are well maintained.

5) *Management Efforts*

- Alternatives (detours) should be provided where possible to maintain required access.
- Traffic controls/signage should be installed as appropriate, particularly in advance of temporary route changes or deviations.
- Regular check and maintenance of access road and vehicles to ensure low emissions.
- A Traffic Management Plan should be developed to reduce potential impacts and cover the following aspects.
- Training to enable drivers to be responsive to local conditions.
- Safety rules, such as the application of speed limits particularly in, and approaching, camps and villages.
- Procedures for dealing with accidents involving injury to local people and livestock.
- Restriction of heavy vehicle movements to specific access roads.
- Contractor will have the responsibility to maintain the road and to repairing bridge damages caused by the project activity .
- Public information mechanism to inform public on detours, closures and new traffic signals.

- 6) *Management Locations*
Aceh to Meulaboh road and access roads.
- 7) *Management Period*
Construction stage – from initiation to completion.
- 8) *Financing*
Costs associated with the management of potential accessibility and traffic related impacts will be for the account and responsibility of the Construction Contractor Project.
- 9) *Institutions of Environmental Management*
 - 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

3.2.2 Biological Environment

3.2.2.1 Flora and Fauna

- 1) *Sources of Impact*
 - Clearance of vegetation.
 - Noise from construction activities (disturbance).
 - Gathering/ hunting of flora and fauna by workers.
- 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).
 - 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 Weed invasion/proliferation of opportunist species (weeds & pests). Injury and mortality due to increased road traffic, particularly protected fauna species.

- Increased exposure to hunting and trapping.
- 3) *Indicators of Impact*
- Total area of vegetation cleared and subsequently rehabilitated following the completion of preparation activities.
 - Changes in fauna population in project area.
- 4) *Management Objectives*
- To prevent unnecessary loss of flora.
 - To restore the ecosystem through reclamation as soon as project activities allow.
 - To minimize impacts on wildlife caused during the preparation stage, mainly by avoiding important and sensitive habitats.
 - To collect local seeds and seedlings and other propagules for use in reclamation.
- 5) *Management Efforts*
- Clearance of vegetation should be restricted to the absolute minimum required to facilitate access and undertaken construction activities.
 - Disturbance of topsoil and vegetation rootstock must be minimized as far as possible. Leaving rootstock in place encourages reseedling. Alternatively, replanting with appropriate local species should assist regeneration.
 - Equipment should be regularly washed down to avoid transporting seeds (invasive species) or plant diseases.
 - The rehabilitation activities should require the re-planting of vegetation in any areas cleared for the construction activities. This will promote soil stability, improve the visual environment and provide faunal habitat into the operation stage. In addition, the rehabilitation efforts may extend to adjacent areas damaged by the tsunami, such as former mangrove areas. This may also compensate for wetland loss caused by construction activities (refer to *Section 3.2.1.3*)
 - Refuelling, fuel loading/unloading, oil change-outs, waste storage and disposal activities must be carefully managed.
 - If sensitive fauna (such as turtles) are identified within areas affected by construction, a Management Plan should be developed to reduce potential impacts as much as possible.
 - Hunting/gathering by construction workers must not be permitted.
 - Where practical, livestock should be moved away from the project operations.
 - Cooperation with the Department of Nature Conservation (Forestry Department) to trap and relocate protected fauna in the project area to proper habitats.

- Localized habitat features such as ponds, nests, dens or burrow sites should be avoided as much as possible.
- Active dining, nesting, spawning, migration and feeding areas should be avoided wherever practicable.
- To provide mobility across the road alignment, provisions should be made in the design of the road to provide animal crossings in the form of culverts, cross drains, etc.; and

6) *Management Locations*

The road corridor and areas of supporting activity focusing on newly constructed road segments and those areas within proximity to potentially sensitive habitats.

7) *Management Period*

Construction stage – from initiation to completion.

8) *Financing*

The cost of terrestrial ecology management will be for the account and responsibility of the Construction Contractor Project.

9) *Institutions of Environmental Management*

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

3.2.2.2 *Aquatic Biota*

1) *Sources of Impact*

- Clearance of stream bank vegetation.
- Construction of road and bridge.
- 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) *Management Objectives*

To ensure that aquatic ecosystems are not adversely affected by construction activities

5) *Management Efforts*

- Rapid and appropriate re-vegetation/restoration of crossings.
- Sensitive habitats/sites should be avoided where possible, such as the wetlands at Lhung Lho and Suak Ular. If unavoidable and sensitive habitats are to be affected, ensure that low impacts methods are used refer to *Section 3.2.1.3*) and that sites are returned to their original state as far as reasonably practicable.

6) *Management Locations*

All river crossings along the Banda Aceh to Meulaboh road alignment.

All disturbed areas, particularly those areas outside the immediate construction footprint that may be impacted by construction activities.

- Krueng Reudeung River.
- Krueng Lambeso River.
- Krueng Bubon River.
- Lhung Lho Wetland.
- Suak Ular Wetland.

7) *Management Period*

Construction stage – from initiation to completion

8) *Financing*

The cost of aquatic biota management will be for the account and responsibility of the Project.

9) *Institutions of Environmental Management*

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

3.2.3 *Social Environment*

3.2.3.1 *Local and Regional Economics, Working Opportunity*

1) *Sources of Impact*

- Recruitment of construction workforce

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. Failure to maximize local employment and business opportunities may result in negative perceptions within the community and may fuel opposition and potential conflict.

3) *Indicator of Impact*

- Proportion of local versus migrant workforce involved in construction activities.
- Number of new small business enterprises.
- Community perception towards the Project in terms of the efficacy of local recruitment.
- Average household income levels over the construction stage

4) *Management Objectives*

- To maximize local benefits of the expanded operation whenever possible, particularly by favouring local procurement of goods, services, and labour.
- To prevent or minimize local community opposition to the project by actively attempting to fulfil local employment demand, without fuelling unrealistic expectations of high employment and economic growth
- To help improve profitability, financial management, and product quality of local goods and services wherever possible.

5) *Management Efforts*

- Labour recruitment should occur in a manner that is objective, transparent, and wherever possible, provide opportunities for people from the local area. The following activities will assist to optimise local employment:
 - The execution of a baseline skills survey of affected communities during the pre-construction stage;
 - A review of skills gaps between the skills available within local communities, those needed on the project and the subsequent determination of training needs;
 - The development and implementation of employment conditions that are in accordance with Indonesian standards, ILO and other relevant international requirements and P2JJ best practice and policy; and
 - Development of training programmes that will benefit both construction stage skills requirements and long term employment demand.
- By cooperation and consultation with government authorities and local communities the project proponent will:
 - Maximize the involvement of local communities in construction and support activities, to the extent possible, based on available skill levels.
 - Give priority to the local supplier of goods and services, which meet requirements of project procurement. The project proponent will determine the requirements of the quality, availability, and delivery of goods and services.
 - In order to optimize the opportunities for local businesses to supply goods and services to the project, P2JJ will undertake the following:
 - A survey of the capabilities of the goods and services that are locally available that are of an acceptable standard and quality;
 - A survey of the capabilities of local construction companies; and
 - Identify opportunities for local supplies with prospective management contractors.

6) *Management Location*

Settlements near the Project area that are considered to currently have either the greatest and most urgent unemployment burden and/ or those communities located directly along the proposed road alignment:

7) *Management Period*

Community relations and development programs focusing on employment and business development will start in the pre-construction stage and will extend into the construction and operation stage.

8) *Financing*

Costs associated with employment, skills development and training will be the responsibility of the Project.

9) *Institutions of Environmental Management*

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

3.2.3.2 *Number of Accidents*

1) *Sources of Impact*

Mobilization of vehicle and movement of materials and equipment especially during the road construction phase

2) *Significant Impacts on Environment*

Number of accidents during the activity project activities community people and livestock

3) *Indicators of Impact*

Total number of accidents during the road project

4) *Management Objectives*

To maintain the road for a good and safe transportation which can encourage the development of local economic and help to increase the living standards and social harmonization

5) *Management Efforts*

- Install proper barriers at the project locations with zink and triplex
- Putting the Project activities sign.
- Provide the workers with health and safety equipment such as helmets, gloves, safety shoes, and safety coveralls, safety glasses and earplug.
- Using the well used equipment.
- Applying the SOP during the project activities to all workers.
- Managing the working hours based on the laws and passing vehicle
- Putting proper traffic signs (see Figure 3.2 for standard traffic sign)

- 6) *Management Locations*
In road and bridge and access roads project.
- 7) *Management Period*
Construction stage – initiation to completion.
- 8) *Financing*
The cost of managing community attitudes and perceptions towards the road construction activities will be for the account and responsibility of the Construction Contractor Project.
- 9) *Institutions of Environmental Management*
 - a) Implementor
Construction Contractor
 - b) Supervisor
Bapedalda, P2JJ, Transportation agency 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

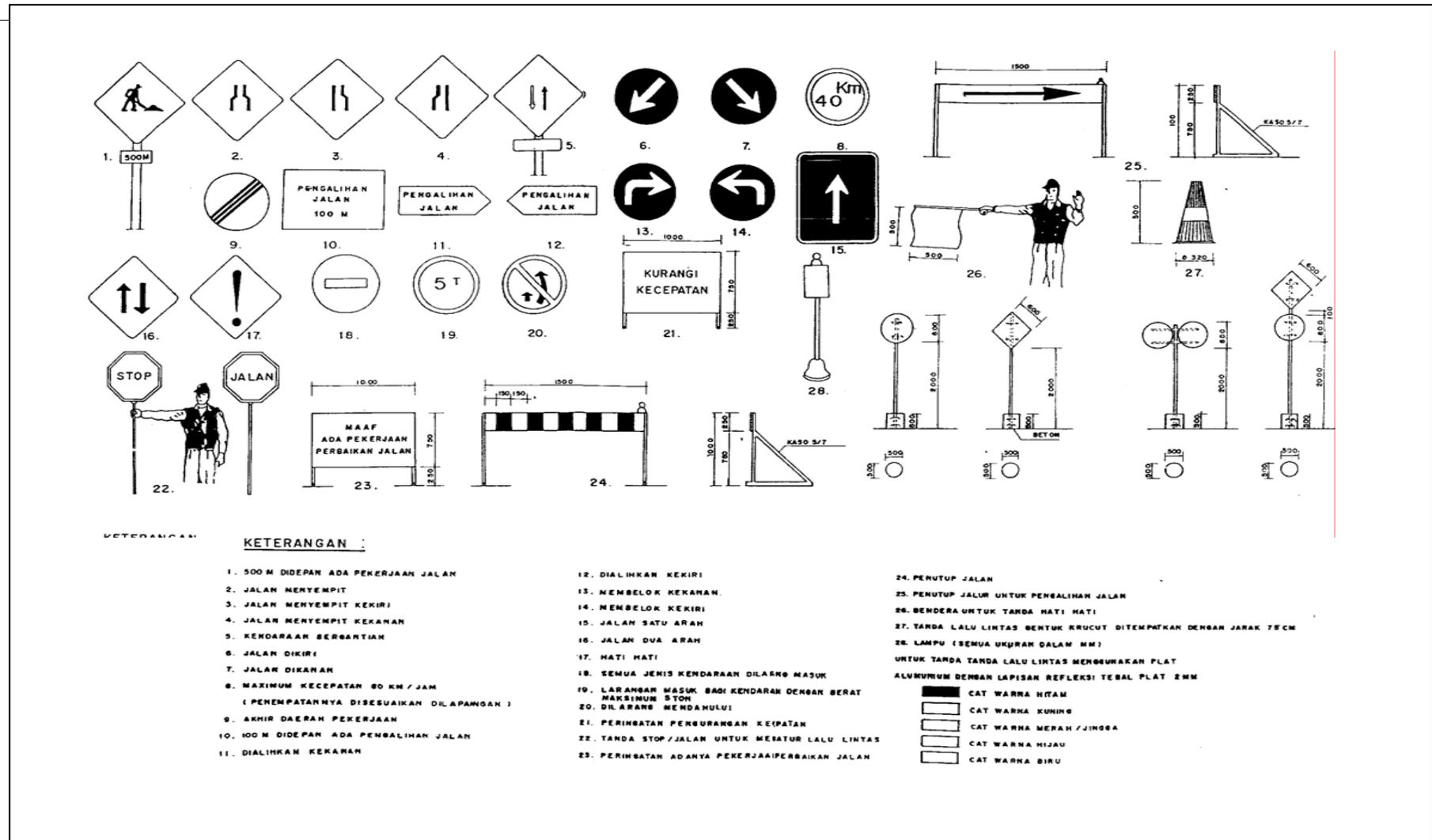


Figure 3.2 Traffic controls/signage Standard The Construction Stage

3.2.3.3 *Community Perception and Attitudes*

1) *Sources of Impact*

- Recruitment of employees
- Presence of contractors in local area and contractor behaviour.
- Construction and upgrading of roads and bridge.
- The unemployment rate among the employable

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.

3) *Indicators of Impact*

- Complaints and grievances from local community members.
- Total and proportional local employee to work in project.
- Increased vandalism and security disturbances.

4) *Management Objectives*

Ensure good community relations and maintain the existing good public image of the Project.

5) *Management Efforts*

- Effective two-way public disclosure and public consultation should be implemented with an opportunity provided for the resolution of grievances received and recorded from individuals in the community.
- Trust should be developed through open and honest communication.
- The activities of contractors, consultants, and company employees should be routinely reviewed to ensure community relations are being maintained.
- The policy should be backed-up by the training of key and selected site personnel to assist in identification of possible areas of cultural heritage importance.
- Contractors should be held accountable for the implementation of established environmental management plans.

6) *Management Locations*

All settlements within proximity to the road construction activities, particularly those on re-aligned sections.

7) *Management Period*

Construction stage – initiation to completion.

8) *Financing*

The cost of managing community attitudes and perceptions towards the road construction activities will be for the account and responsibility of the Construction Contractor Project.

9) *Institutions of Environmental Management*

a) Implementor

b) Supervisor

Bapedalda, P2JJ, Manpower Agency and 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

3.2.3.4 *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 prostitution, gambling or illegal drug or alcohol use which may conflict with local sensitivities.
- These practices/ 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 and 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) *Management Objectives*
- Assist in maintaining order, security and harmony in the community.
 - Foster harmonious relations between incoming workers and local communities.
 - Respect local norm, values, culture and human rights.
- 5) *Management Plan*
- The project proponent should use its influence as employer to encourage responsible behaviour among employees.
 - A 'Code of Conduct' should be established for employees.
 - An open and tolerant company culture should be promoted.
 - Construction camps should be located remotely away from settlements/ villages.
 - Alcohol or drug consumption, prostitution and gambling in project area should be prohibited.
 - Operations should be sensitive to important times in the local cultural calendar, for example religious festivals and minimize or discontinue construction activities at those times.
- 6) *Management Locations*
- All settlements within proximity to the road construction activities, particularly those on re-aligned sections.
- 7) *Management Period*
- Construction stage – from initiation to completion.
- 8) *Financing*
- Cost associated with the management of potential socio-cultural impacts will be for the cost and responsibility of the Project.

- 9) Institutions of *Environmental Management*
 - a) Implementor
Construction Contractor
 - 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

3.2.3.5 *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/ settlements.
 - Environmental sanitation and public health condition.
- 4) *Management Objectives*
 - 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.
 - Participate on improvement of community sanitation and public health through the community development programs.

- Contribute to the improvement of public health in the project area.
- 5) *Management Efforts*
- A medical examination should be performed on each new employee and repeated regularly throughout the term of employment
 - Health and safety procedures for all activities should be developed and implemented.
 - Government programs to improve existing medical and health services in the local communities should be supported as much as possible by the Project.
 - Mosquito control programs should be implemented, if necessary.
 - Each worker should be required to abide by a Code of Conduct which will limit activities in local towns and communities and restrict certain behaviours in the work sites and accommodation
 - Provision of good sanitation including proper waste disposal at its operation and residential accommodations.
 - Participate in environmental sanitation initiatives in communities where its workers are domiciled.
 - Support to the extent possible government programs in improving existing medical health and services in the local communities.
- 6) *Management Location*
- All settlements within proximity to the road construction activities and construction camps.
 - Local public health centres (PUSKESMAS).
 - Villages along road alignment.
 - Medical clinic at construction camp.
- 7) *Management Period*
Operation stage – from initiation to completion.
- 8) *Financing*
Costs for pathogenic disease dispersal management will be for the cost and responsibility of the Project.
- 9) *Institutions of Environmental Management*
- 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

3.3 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.

3.3.1 Physical-Chemical Environment

3.3.1.1 Transportation

- 1) *Sources of Impact*
 - Traffic activity and increased economic growth
- 2) *Significant Impacts on Environment*

Increasing traffic activity and number of accidents at the new road and bridge.
- 3) *Indicators of Impact*
 - Increased traffic congestion along the Banda Aceh to Meulaboh road and supporting along road network.
- 4) *Management Objectives*
 - To minimize disturbance to local accessibility
- 5) *Management Efforts*
 - Ensuring that all road sign and properly completed, including those not completed during the construction stage
 - Ensuring that the plate for road sign is in the form of flat and plain sheet made from the alloy of hard aluminium and must have a thickness of minimum 2 mm. The sheet must be free from grease and , the surface is roughened before its use as a road sign plate.
 - The frame must is made of aluminium alloy that is extracted from metal mixture. Road sign plate must be given an additional frame if the size exceeds 1,0 meter.

- Road sign pillar is a steel pipe with a inner diameter of minimum 40 mm, galvanized by hot dipping process. The same material is also use for pillar holder and covers. All open edge must be covered to prevent water to seep in. And also the additional equipment must be made of aluminium or stainless steel that have a high tensile strength for sign pillar. Concrete for the road sign base must be strong.
 - Paint for road equipment and its coating must be of the best quality. Paint for the steel part must certain high concentration of zinc oxide. Every sign surface must have a reflector made from reflector sheet of “Scotchlite” type Engineering Grade or High Intensity Quality.
 - Ensuring that the Security rail is made of galvanized steel. The Road marks are made by white paint. Concrete block (paving block) pre-print for sidewalks and median 60 mm thick.
 - Ensuring that for the sake of road safety the most important sign related to the maximum speed limit is posted and obeyed.
- 6) *Management Locations*
Aceh to Meulaboh road and access roads.
- 7) *Management Period*
Continuously for operation road and bridges .
- 8) *Financing*
Costs associated with the management of potential accessibility and traffic related impacts will be for the account and responsibility of the local government .
- 9) *Institutions of Environmental Management*
- a) Implementor
Transportation agency
 - b) Supervisor
Bapedalda, P2JJ, and Local government
 - c) Reporting
Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR

3.3.2 *Social Environment*

3.3.2.1 *Local and Regional Economics, Employment Opportunity*

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) *Management Objectives*

To provide the roads accessibility including the bridges which will encourage the development of local economy and increased living standards and social harmonization.

5) *Management Efforts*

- Conducting routine maintenance of the roads and bridges so that the access to transportation is not disturbed.
- Conducting a persuasive approach of community involvement, and proactively providing guidance to help maintain the road and bridges.
- Cooperating with the relevant departments to help building the economic centre such as market place.
- Requesting the district government to build a feeder road to connect the settlement area with the national road.

6) *Management Location*

Aceh to Meulaboh road and access roads.

7) *Management Period*

Continuously for operation road and bridges .

8) *Financing*

Costs associated with the management will be for the account and responsibility of the local government .

- 9) *Institutions of Environmental Management*
 - a) Implementor
Local Government
 - b) Supervisor
Bapedalda, P2JJ, Local Government
 - c) Reporting
Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR

3.3.2.2 *Another Activity (Illegal Logging)*

- 1) *Sources of Impact*
 - Easy accessibility to forest due to the road and bridges
- 2) *Significant Impacts on Environment*

Illegal logging along Banda Aceh to Meulaboh road
- 3) *Indicators of Impact*
 - Increasing illegal logging activities along Banda Aceh – Meulaboh road
- 4) *Management Objectives*

To prevent and minimize illegal logging activities
- 5) *Management Efforts*
 - To help develop policies at the province and district level to prevent illegal logging activities.
 - To coordinate with the relevant department of the province and district levels, and sub district to prevent illegal logging activities.
 - To inform and socialise periodically about the dangers caused by illegal forest exposure and unauthorized plantation.
 - To cooperate with the Forestry department and relevant institution as well as with the local communities to prevent illegal logging.
- 6) *Management Locations*

Protected Forest in road and bridge and access roads project.
- 7) *Management Period*

Continuously for operation road and bridges .

8) *Financing*

The cost of managing accident number towards the road operation activities will be for the account and responsibility of the Local Government (Forestry Agency)

9) *Institutions of Environmental Management*

a) Implementor

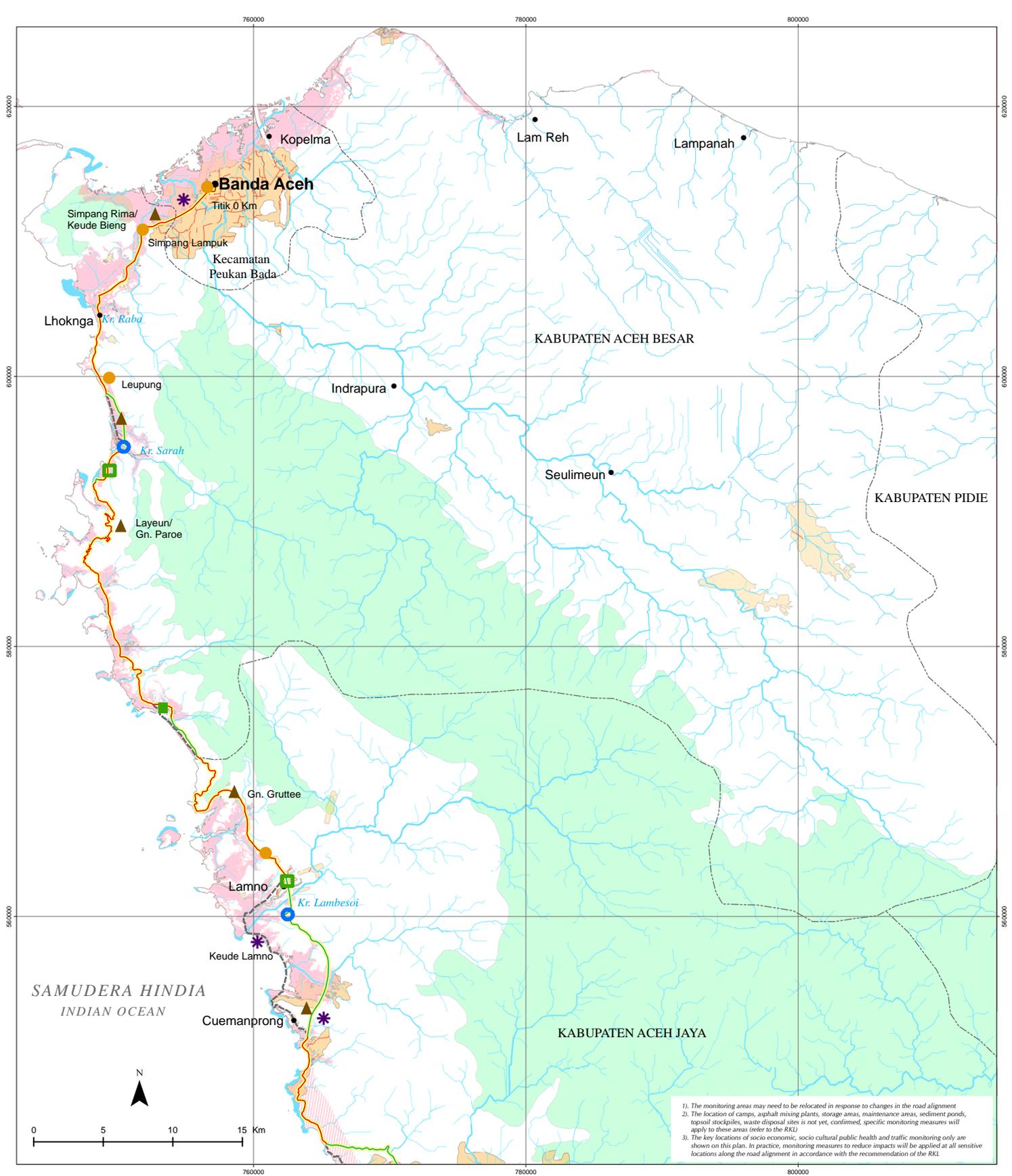
Forestry Agency

b) Supervisor

Bapedalda, P2JJ, and Forestry Agency)

c) Reporting

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



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

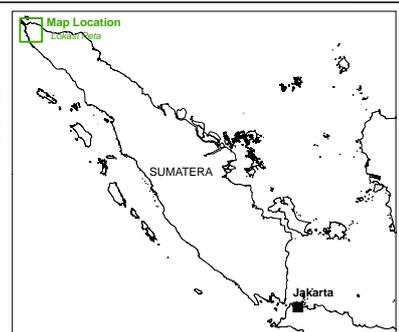
RENCANA PEMANTAUAN LINGKUNGAN ENVIRONMENTAL MONITORING PLAN

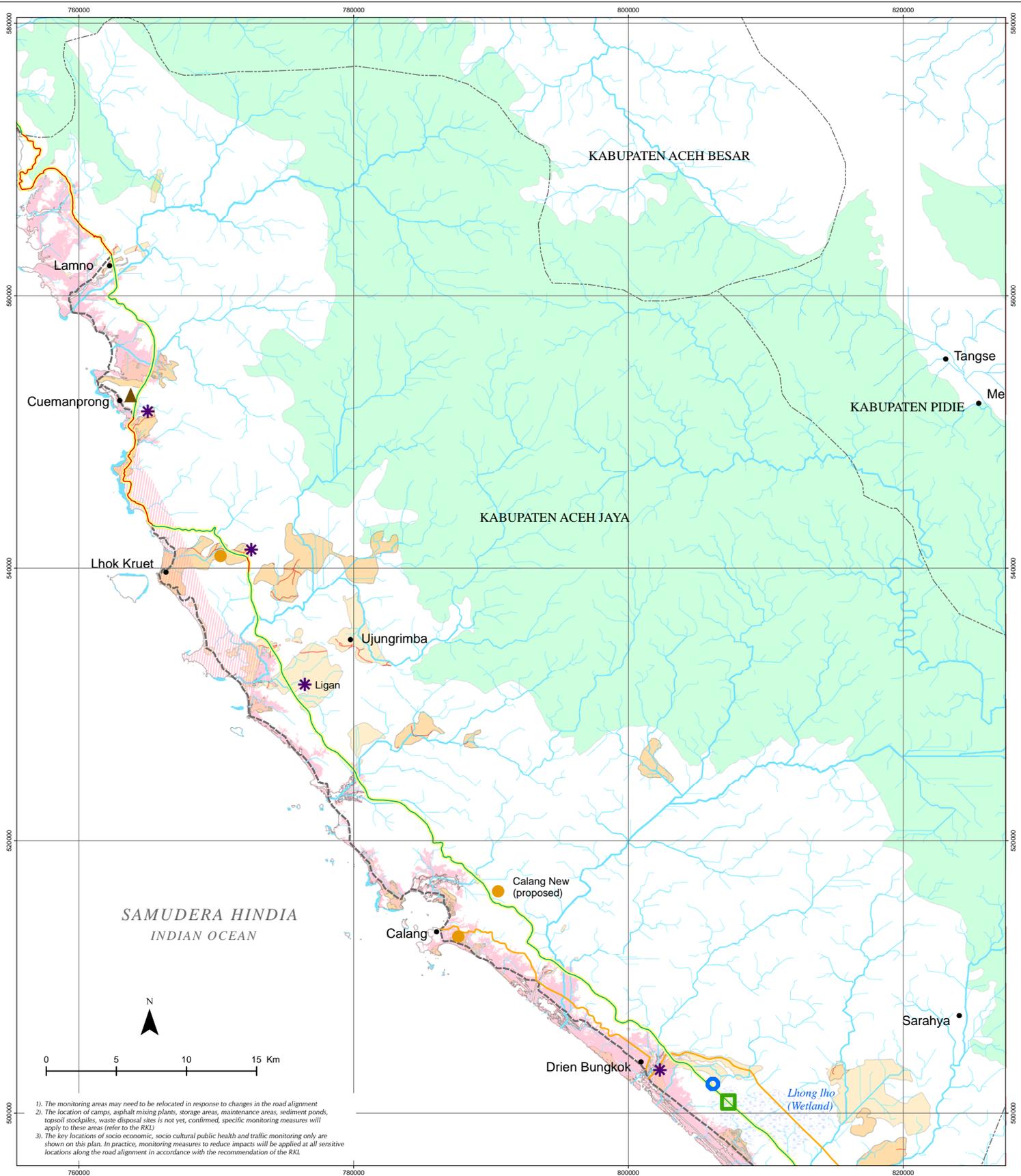
PETA PEMANTAUAN LINGKUNGAN ENVIRONMENTAL MONITORING MAP

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

Gambar Figure	3.3	Digambar Oleh	GGG
No Revisi	0	Diperiksa	KHS
Tanggal Revisi	10/04/05	Digalung Oleh	ERM

Legend	
Jalur Lama Tetap Dipakai Proposed Route (Existing)	Hutan Lindung Protected Forest
Jalur Baru Proposed Route (New)	Area Dampak Tsunami Tsunami Affected Area
Jalur Lama (tidak dipakai) Abandoned Route	Area Dampak Tsunami (perkiraan) Tsunami Affected Area (estimated)
Jalur Sementara (lempang) Japan Temporary Alignment	Lahan Basah Wetland
Batas Kabupaten Regency Boundary	Pemukiman Village
Jalan Akses Access Road	Karang Coral Reef
Sungai River	Biota Perairan Aquatic Biota
Lahan Basah Wetland	Tanah Soil
Kualitas Udara Air Quality	Transportasi, Sosial Ekonomi Budaya dan Kesehatan Masyarakat Traffic, Social Economic Cultural and Public Health
Kualitas Air Water Quality	





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

RENCANA PEMANTAUAN LINGKUNGAN ENVIRONMENTAL MONITORING PLAN

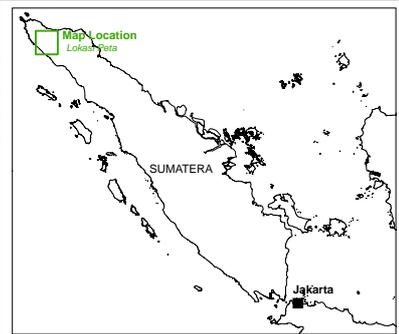
PETA PEMANTAUAN LINGKUNGAN ENVIRONMENTAL MONITORING MAP

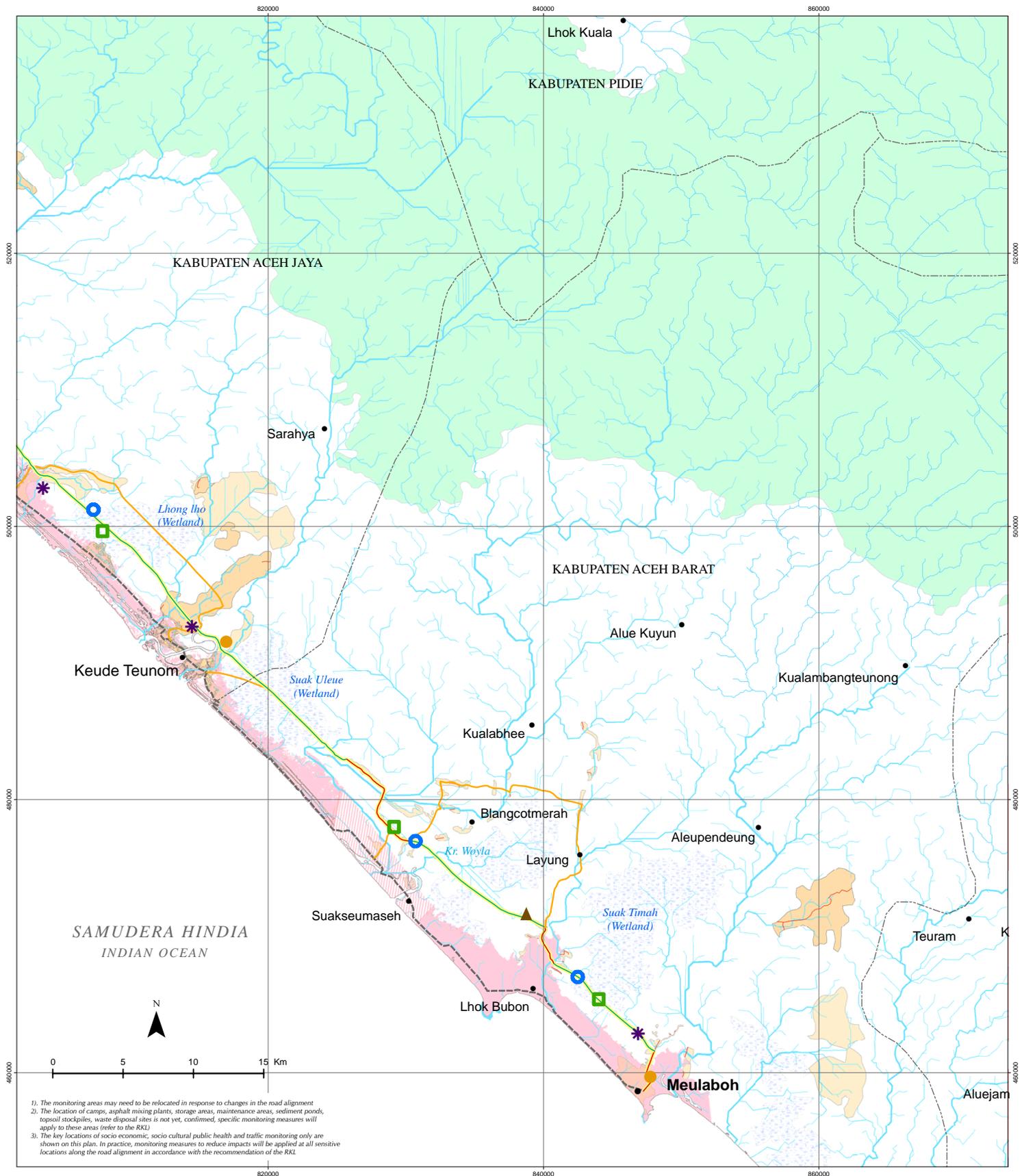
Sumber :
Source :
Sistem koordinat universal transverse mercator (UTM),
Zona 46 Utara, WGS 84

Gambar / Figure	3.4	Digambar Oleh / Drawn By	GGG
No Revisi / Revision No	0	Diperiksa / Checked	KHS
Tanggal Revisi / Revision Date	-	Digabung Oleh / Compiled By	ERM

Legenda

- | | | | |
|---|----------------------------|--|---|
| Jalur Lama Tetap Dipakai
Proposed Route (Existing) | Jalan Akses
Access Road | Hutan Lindung
Protected Forest | Biota Perairan
Aquatic Biota |
| Jalur Baru
Proposed Route (New) | Sungai
River | Area Dampak Tsunami
Tsunami Affected Area | Tanah
Soil |
| Jalur Lama (tidak dipakai)
Abandoned Route | Lahan Basah
Wetland | Area Dampak Tsunami (perkiraan)
Tsunami Affected Area (estimated) | Transportasi, Sosial Ekonomi Budaya dan Kesehatan Masyarakat
Traffic, Social Economic Cultural and Public Health |
| Jalur Sementara (Jepang)
Japan Temporary Alignment | Pemukiman
Village | Kualitas Udara
Air Quality | |
| Batas Kabupaten
Regency Boundary | Karang
Coral Reef | Kualitas Air
Water Quality | |





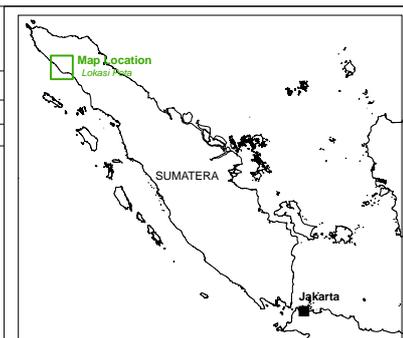
1). The monitoring areas may need to be relocated in response to changes in the road alignment
 2). The location of camps, asphalt mixing plants, storage areas, maintenance areas, sediment ponds, topsoil stockpiles, waste disposal sites is not yet confirmed, specific monitoring measures will apply to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

RENCANA PEMANTAUAN LINGKUNGAN ENVIRONMENTAL MONITORING PLAN

PETA PEMANTAUAN LINGKUNGAN ENVIRONMENTAL MONITORING MAP

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

Gambar Figure	3.5	Digambar Oleh	GGG
No Revisi	0	Diperiksa	KHS
Tanggal Revisi	-	Digambar Oleh	ERM
Revisi Date	-	Completed By	



Legenda

- | | | | |
|---|----------------------------|--|---|
| Jalur Lama Tetap Dipakai
Proposed Route (Existing) | Jalan Akses
Access Road | Hutan Lindung
Protected Forest | Biota Perairan
Aquatic Biota |
| Jalur Baru
Proposed Route (New) | Sungai
River | Area Dampak Tsunami
Tsunami Affected Area | Tanah
Soil |
| Jalur Lama (tidak dipakai)
Abandoned Route | Lahan Basah
Wetland | Area Dampak Tsunami (perkiraan)
Tsunami Affected Area (estimated) | Transportasi, Sosial Ekonomi Budaya dan Kesehatan Masyarakat
Traffic, Social Economic Cultural and Public Health |
| Jalur Sementara (Jepang)
Japan Temporary Alignment | Pemukiman
Village | Kualitas Udara
Air Quality | |
| Batas Kabupaten
Regency Boundary | Karang
Coral Reef | Kualitas Air
Water Quality | |

4 IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT

4.1 IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT

Environmental management during the pre-construction, construction and operation stages is carried-out by the construction contractor.

4.2 SUPERVISION OF ENVIRONMENTAL MANAGEMENT

Environmental management 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 Nangroe Aceh Darussalam Province.

4.3 REPORTING

The construction contractor will submit quarterly reports on implementation of the environmental management program as described in this RKL. Reports will be submitted to:

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

4.4 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 4.1).

Figure 4.1 Organization Structure



LITERATURE

- 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 Raw 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

Management Matrix

**SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(PRE-CONSTRUCTION STAGE)**

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
SOCIAL COMPONENT									
<i>Community Incomes</i>									
Decreasing community income in agricultural sector due to The 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.	Change in Community income due to land acquisition activity	To prevent community income decrease and social conflict	<ul style="list-style-type: none"> Conducting the activities of land acquisition and resettlement plan as per plan, based on the legal and community agreement including times payment and coordination with the relevant government institutions. Conducting the persuasive and proactive approach, for community involvement and prosiding guidance for money management including payment on transfer process to the right person, security, etc Implementing the land acquisition and resettlement activities Conducting the Social Feasibility study for the land acquisition activity 	The land acquisition process will require the identification of landowners and legitimate squatters along the sections of road that will be re-routed from the original alignment.	Landowner consultation and negotiation will likely be ongoing during the pre-construction and construction stages	the Project Proponent and Local Government.	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
<i>Attitude and Community Perception</i>									
Source of impact the attitude and community perception is The land acquisition process	Conflicts and tensions which may occur during the land acquisition which may cause a negative perception towards the project	<ul style="list-style-type: none"> Grievances lodged with construction management. Attitude and community perception concerning project activity Unresolved 	<ul style="list-style-type: none"> To minimize any negative perception, by taking proactive measures to prevent any social conflicts or social gaps and to develop a positive attitude within the 	<ul style="list-style-type: none"> Sufficient timely information to affected owner Procedures for the dissemination of information regarding the calculation of compensation, the method of payment (i.e. direct to owners or through a 	Engagement of all affected property owners/ land users will be required. Management of this impact affects the entire alignment.	Pre-construction and construction stages	the Project Proponent and Local Government.	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

**SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(PRE-CONSTRUCTION STAGE)**

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
		issues with land acquisition extending into the construction stage.	<p>community by means of following participatory activities</p> <ul style="list-style-type: none"> ▪ To ensure that local people are informed of the project activities; ▪ To ensure that the wider community is aware of the need for the project and the proposed development; ▪ To provide a framework for two-way exchange of information, so that positive project outcomes are maximized; ▪ To incorporate community and stakeholder views and concerns into the activity program; 	<p>government body) to ensure an open and equitable compensation process;</p> <ul style="list-style-type: none"> ▪ Complaint procedure, including post - construction complaint. ▪ Assessment of compensation for effects on property/access outside the actual road corridor. In the event that impacts occur on land outside that compensated for, compensation will be evaluated and settled as soon as is reasonably possible after the damage is suffered; and ▪ In addition to the implementation of the above plan, the land acquisition activities will, where possible be scheduled with due regard for crop cycles to minimize unnecessary impacts on livelihoods and enable the continuation of economic agricultural activities 					

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
<i>Air Quality</i>									
Mobilization of equipment, land clearing, earthwork, and borrow area activity	<ul style="list-style-type: none"> ▪ Dust to localized to 100 meters from activity areas ▪ Vehicle emission near to working area 	<ul style="list-style-type: none"> ▪ Reported instances of respiratory irritation or noise and vibration by local residents. ▪ Dust (dust fall and total suspended particulates exceeding the air ambient standards. (13) ▪ Communities complaint related to high dust amalgam content. (14) 	To ensure air quality characteristics of the project area are maintained near the baseline conditions during of the construction stage	<ul style="list-style-type: none"> ▪ Periodically watering the main road area nearby the community settlements specially during the dry season to keep the dust level down. ▪ Slowing down the vehicles carrying the construction materials at the location nearby the community settlements, with speed maximum 60 Km/hr in town and on unasphalted road. ▪ Properly wrapping the material truck container with plastic cover to avoid dust sperads and other materials during the mobilization and to prohibit transport of over loaded truck. ▪ Prosiding and using the safety equipment such as mask, noise cover for employees who work near the dusty location such as the heavy equipment operator, etc. ▪ Optimization of working schedule and work to help to minimize several material vehicle mobilization trips. 	<ul style="list-style-type: none"> ▪ Locations for the heavy equipment mobilization, by mean of watering devise, especially nearby community location. ▪ Along the community resettlement and employee camp, with the plantations of several tree as a bio filter. 	Construction stage - initiation to completion	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 MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
				<ul style="list-style-type: none"> Regular inspectin and scheduled maintenance of all equipment. 					
<i>Noise and Vibration</i>									
Mobilization of equipment, land work such as cut and fill, and land clearing	<ul style="list-style-type: none"> Annoyance and disturbance effects at noise sensitive receptors (ie, community areas). Damage to structures as a result of vibration caused by heavy equipment movements, excavation, etc. 	Reported instances of noise and vibration disturbance by local residents.	To ensure noise and vibration in the project area are maintained near baseline conditions for the extent of the construction stage.	<ul style="list-style-type: none"> Working schedule for the activities with high noise level (foundations and fondations tilts).will be arrange between 08:00 AM to 17:00 PM Bore will be pile is necessary in erecting the foundations tilts.(25) Selecting 'quiet' construction equipment and working methods. Reductions in source sound power levels of 5-10 dBA may be achievable in some cases; Only well-maintained vehicles and equipment should be operated on-site and all machinery should be serviced regularly during the construction stage; Provision of ear protection for activities that are likely to create noise in excess of 90dB to protect worker's health and safety Allowing machinery shutdown when operating in proximity to mosques in 	All active construction areas, construction camps and maintenance yards and transport along access roads.	Construction stage - initiation to completion	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 MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
				<p>accordance with the established weekly prayer schedule.</p> <ul style="list-style-type: none"> ▪ Avoiding simultaneous noisy activities; 					
<i>Soils (Erosion and Land slide)</i>									
<p>Construction of road and related earthwork activities such as site preparation, cut and fill, excavation of borrow pits, quarrying and other supporting activities.</p>	<p>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. Heavy vehicle movements to and from the active construction area will cause soil compaction, potentially increasing the rate and volume of overland flow causing impacts on surface water, agricultural land use and the potential for</p>	<p>Increased erosion, sedimentation and slope instability.</p>	<p>To prevent and minimize soil compaction, erosion and slope instability caused by site preparation earthworks.</p> <p>To prevent and minimize sedimentation to surrounding water bodies.</p> <p>To prevent and minimize soil contamination.</p>	<ul style="list-style-type: none"> ▪ During the dredging works, digging of the land on the quarry will be dredged conducted on several level, with angle facing inside towards the hills where the land is dredged (Figure 3.1). ▪ For the roads terrace, it will be arranged so the slopes do not exceed more than 10 % , this is to make sure that the water movement that carrier soil particles can be reduced by rocks and gravels based on the design. ▪ When the road construction on one terrace is finished then the land on the quarry will no longer be dredged and the tree plantation will have to be conducted. As for the open road area, primarily on the road side it will be re-greened by planting the bushes. On the ditch area by the road primarily in the slopy area it will 	<ul style="list-style-type: none"> • 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 5°28' N and 95°15' E. Monitoring will be conducted at the Layeun Village that crosser the fault at 5°15' N and 95°23' E. Also monitoring will be conducted at 	<p>Construction Stage - initiation to completion</p>	<p>Construction contractor</p>	<p>Bapedalda, P2JJ, Supervision Consultant</p>	<p>Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID</p>

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	<p>flooding.</p> <p>Soil contamination may occur as a result of accidental spills and leaks of fuel and oil and/ or the inappropriate temporary storage of fuel.</p> <p>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.</p>			<p>strengthened by concrete to prevent the erosion.</p> <ul style="list-style-type: none"> ▪ Top soil layer will be kept to rehabilitate and will be covered to prevent it from the erosion ▪ An appropriate drainage will be built to accommodate the surface water movement from the rain and wind. 	<p>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"> • Observation for erosion will be carried out at all areas cleared for construction and identified for rehabilitation. • TSS measurements will be taken at selected surface water quality sampling sites downstream of the construction site (see Figures 2-1 and 2-2). • Visual monitoring soil contamination will be undertaken at all areas near fuel and chemical storage areas and maintenance activities 				

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
<i>Contamination of Land</i>									
Fuel and oil storage activities	Land contamination may occur as a result of fuel and oil leaks or spills and/or temporary fuel storage that is not stored properly	Oil or fuel leaks or spills	To prevent and minimize land contamination and water	<ul style="list-style-type: none"> ▪ In the lower part of the oil and fuel container an covered with thick plastics to prevent them from leaking or spilling at the time of re-fueling prevent any spill to the land but to the plastic. ▪ From the plastic the Fuel or oil is absorbed then removed to tank or container of oil waste 	<ul style="list-style-type: none"> • Road corridor to access the active construction area, construction location, borrow pits, quarries, construction camp, and bunch of temporary top soil. • Base camp location and workshop and Fuel storage tank 	The management efforts will be provided continuously during the construction period.	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
<i>Surface Water Quality</i>									
<ul style="list-style-type: none"> ▪ Use of chemicals and fuel/ oil ▪ Site preparation (earthworks) such as land clearing and development of access roads and quarries 	<ul style="list-style-type: none"> ▪ The clearing of land 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. ▪ Poor waste management practices at the 	<ul style="list-style-type: none"> ▪ Increased sediment load and turbidity in the receiving surface water due to soil erosion. ▪ Increase causes of dysentery disease 	<ul style="list-style-type: none"> ▪ To minimize disturbance to surface water quality. ▪ To manage run-off and sediment load from disturbed areas 	<ul style="list-style-type: none"> ▪ Warehouse floors are made of concrete. Proper drainage of surface water outside is provided. Drainage from warehouse is collected separately with trap for oil or fuels oil. For Trap containers when full will be removed to the drum to be sent out to the oil waste management company. ▪ Solid waste from the warehouse such as oil-filters, metals and tires etc, will be stored in a designated place to be sold or recycled by a third party. ▪ All waste oil from the 	<ul style="list-style-type: none"> ▪ All river crossings along the Banda Aceh to Meulaboh road alignment. ▪ All disturbed areas, particularly those areas outside the immediate construction footprint which may be impacted by construction activities. ▪ Krueng Reudeung River ▪ Krueng Lambeso 	Construction Stage - initiation to completion	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 MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	base camp and active construction areas may lead to the contamination of potable surface water sources. <ul style="list-style-type: none"> ▪ Sewage and sanitary effluent has the potential to adversely affect the quality of receiving water bodies unless properly treated and managed. 			warehouse will be stored in closed drums and later sold to a used-oil waste management company. <ul style="list-style-type: none"> ▪ Oil or fuel spills will be prevented from breaking into the water body. Spills will be covered with saw dust and later burn at proper location 	River <ul style="list-style-type: none"> ▪ Krueng Bubon River ▪ Lhung Lho Wetland ▪ Suak Ular Wetland 				
<i>Hydrology</i>									
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. This may contribute to sedimentation if undertaken near watercourses	The Impact indicator is the amount of floods from the water body that is closest to the activities location	The aim of the environmental management is to prevent floods which is caused by the additional water flow as a result of land opening for the road and quarry	<ul style="list-style-type: none"> ▪ After the dredging activities, digging and soil dredging in quarry and land clearing for a specific terrace trees will be planted. ▪ For the choices of re-vegetation plantation, high adaptation with for local soil condition will be considered. ▪ When conducting the re-vegetations, the plantation will be taken good care of. Watering and bugs prevention will be also needed. ▪ To make dropped and ditch to irrigating water on the 	<ul style="list-style-type: none"> ▪ Management is conducted to all quarry locations and sloping road terraces o slopy roads which have been dredged or flattened, and most of all on the open vegetation area. ▪ Water circulation management especially on the wetland area which is transversed by the 	Construction Stage - initiation to completion.	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 MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
				<p>locations with different elevation, so that the water will not toward the medium crossed.</p> <ul style="list-style-type: none"> ▪ Wet land area will be managed by building tunnels or a special drainage which can drain the water out from this swampy area. Appropriate number of tunnel will be constructed that will help water to run smoothly to the downstream. On the swampy area direct irrigation to the nearest river is rather difficult as the elevation differences are not too big. By making the water runs with better quality then it will avoiding a long ditch. (54 ▪ Construction of tunnels and water exit tunnels to the nearest river will makes it run better 	roads terrace of BNA - MBO. This is primarily in the Meudang Ghoh, Suak ular, Suak Seumaseh, Ruesak, and Balee areas (Cot Semeurung) to Gampa.				
Transportation									
<ul style="list-style-type: none"> ▪ Construction or upgrading of access roads. ▪ Construction of road, facilities and 	<ul style="list-style-type: none"> ▪ The re-alignment and re-building of the Banda Aceh - Meulaboh Road will have a long term positive impact on local 	Increased traffic congestion along the Banda Aceh - Meulaboh road and supporting road network.	<p>To minimize disturbance to local accessibility during the construction phase.</p> <p>To reduce</p>	<ul style="list-style-type: none"> ▪ Alternatives (detours) should be provided where possible to maintain required access ▪ Traffic controls/ signage should be installed as appropriate, particularly in 	Aceh-Meulaboh road and access roads.	Construction stage - initiation to completion.	Construction contractor	Bapedalda, P2JJ, Supervision Consultant	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution			
							Implementor	Supervisor	Reporting	
<p>other infrastructure.</p> <ul style="list-style-type: none"> ▪ Movement of materials and equipment. 	<p>transport and accessibility by provide 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:</p> <ul style="list-style-type: none"> ▪ Repetitive movements of slow, heavy vehicles; ▪ Traffic detours from active 	<p>Complaints from villagers.</p> <p>Increased road accidents.</p> <p>Increased noise and air pollution.</p>	<p>opportunities for construction-related accidents.</p> <p>To reduce congestion created as a result of construction activities.</p> <p>To ensure heavy vehicles are well maintained.</p>	<p>advance of temporary route changes or deviations</p> <ul style="list-style-type: none"> ▪ Regular check and maintenance of access road and vehicles to ensure low emissions. ▪ A Traffic Management Plan should be developed to reduce potential impacts and cover the following aspects: ▪ Training to enable drivers to be responsive to local conditions; ▪ Safety rules, such as the application of speed limits particularly in, and approaching, camps and villages; ▪ Procedures for dealing with accidents involving injury to local people and livestock; ▪ Restriction of heavy vehicle movements to specific access roads ▪ Contractor will have the responsibility to maintain the road and to repairing bridge damages caused by the project activity ▪ Public information mechanism to inform public on detours, closures and new traffic signals 						<p>Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID</p>

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	<p>construction areas; and</p> <ul style="list-style-type: none"> ▪ Specific construction activities (such as the laying of asphalt) temporarily blocking sections of the route. ▪ 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 - Meulobah Road will temporarily increase accessibility. These roads may be retained and 								

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	upgraded in the long term to boost the local road network.								
Flora and Fauna									
<ul style="list-style-type: none"> ▪ Clearance of vegetation. ▪ Noise from construction activities (disturbance). ▪ Gathering/ hunting of flora and fauna by workers. 	<ul style="list-style-type: none"> ▪ Net vegetation loss, resulting in secondary impacts on fauna due to habitat loss; ▪ Toxic/ stress effects on flora and fauna (due to environmental pollution such as air emissions); ▪ Increased predation (ie. from hunting of fauna/ gathering of flora); ▪ Weed invasion/ proliferation of opportunist species (weeds & pests). ▪ Injury and mortality due to increased road traffic; ▪ Direct loss or damage to habitat leading to reduced foraging/ food 	<ul style="list-style-type: none"> ▪ Total area of vegetation cleared and subsequently rehabilitated following the completion of preparation activities. ▪ Changes in fauna population in project area. ▪ . 	<ul style="list-style-type: none"> ▪ To prevent unnecessary loss of flora. ▪ To restore the ecosystem through reclamation as soon as project activities allow. ▪ To minimize impacts on wildlife caused during the preparation stage, mainly by avoiding important and sensitive habitats. ▪ To collect local seeds and seedlings and other propagules for use in reclamation. ▪ To create workforce awareness that hunting is a prohibited activity. 	<ul style="list-style-type: none"> ▪ Clearance of vegetation should be restricted to the absolute minimum required to facilitate access and undertaken construction activities. ▪ Disturbance of topsoil and vegetation rootstock must be minimised as far as possible. Leaving rootstock in place encourages reseedling. Alternatively, regeneration should be assisted by replanting with appropriate local species. ▪ Refuelling, fuel loading/ unloading, oil change-outs, waste storage and disposal activities must be carefully managed. ▪ If sensitive fauna (such as turtles) are identified within areas affected by construction, a Management Plan should be developed reduce potential impacts as much as possible. ▪ Hunting/ gathering by 	The road corridor and areas of supporting activity focusing on newly constructed road segments and those areas within proximity to potentially sensitive habitats.	Construction stage - initiation to completion.	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 MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	<ul style="list-style-type: none"> resources, disturbance and displacement; ▪ Obstruction/ interruption of movement/ migration patterns due to new access roads; ▪ Proliferation of opportunist species (pests); and ▪ Increased exposure to hunting and trapping. 			<ul style="list-style-type: none"> construction workers must not be permitted. ▪ Equipment should be regularly washed down to avoid transporting seeds (invasive species) or plant diseases. ▪ Where practical, livestock should be moved away from operations. ▪ Cooperation with Balai Konservasi Sumber Daya Alam (Forestry Department) to trap and relocate protected fauna in project area to proper habitat. ▪ Localised habitat features such as ponds, nests, dens or burrow sites should be avoided as much as possible. ▪ Active dinning, nesting, spawning, migration and feeding areas should be avoided wherever practicable. ▪ Hunting and trapping of animals, including fish, by workers must not be permitted. 					
<i>Aquatic Biota</i>									
<ul style="list-style-type: none"> ▪ Clearance of stream bank vegetation. 	<ul style="list-style-type: none"> ▪ Aquatic biota will be sensitive to physical changes 	<ul style="list-style-type: none"> ▪ Biodiversity index and abundance 	<ul style="list-style-type: none"> To ensure that aquatic ecosystems are not adversely 	<ul style="list-style-type: none"> ▪ Rapid and appropriate re-vegetation/ restoration of crossings. 	<ul style="list-style-type: none"> ▪ All river crossings along the Banda Aceh to 	<ul style="list-style-type: none"> Construction stage - initiation to completion 	<ul style="list-style-type: none"> Construction contractor 	<ul style="list-style-type: none"> Bapedalda, P2JJ, Supervision 	<ul style="list-style-type: none"> Bapedalda, Public Work Department

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
<ul style="list-style-type: none"> ▪ Construction of watercourse crossings. ▪ Unplanned/unrestricted vehicular crossings of watercourse s. 	<ul style="list-style-type: none"> 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 physico-chemical characteristics of watercourses with secondary impact on aquatic flora and fauna. 	<ul style="list-style-type: none"> index ▪ Fish deaths ▪ Visible changes in stream flow and turbidity 	<ul style="list-style-type: none"> affected by construction activities 	<ul style="list-style-type: none"> ▪ Sensitive habitats/ sites should be avoided where possible, such as the wetlands at Lhung Lho and Suak Ular. If unavoidable and sensitive habitats are to be affected, ensure that low impacts methods are used and that sites are returned to their original state as far as reasonably practicable. 	<ul style="list-style-type: none"> Meulaboh road alignment. ▪ All disturbed areas, particularly those areas outside the immediate construction footprint which may be impacted by construction activities. ▪ Krueng Reudeung River ▪ Krueng Lambeso River ▪ Krueng Bubon River ▪ Lhung Lho Wetland ▪ Suak Ular Wetland 			<ul style="list-style-type: none"> Consultant 	<ul style="list-style-type: none"> NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, BRR, and USAID
<i>Local and Regional Economics, Working Opportunity</i>									
Recruitment of construction workforce.	The construction of the Banda Aceh – Meulaboh Road will generate an opportunity for increased employment and business growth for local communities. Whilst this additional	<ul style="list-style-type: none"> ▪ Proportion of local versus migrant workforce involved in construction activities. ▪ Number of new small business enterprises. ▪ Community 	<ul style="list-style-type: none"> ▪ To maximize local benefits of the expanded operation whenever possible, particularly by favouring local procurement of goods, services, and labour. ▪ To prevent or 	<ul style="list-style-type: none"> ▪ Labour recruitment should occur in a manner that is objective, transparent, and wherever possible, provide opportunities for people from the local area. The following activities will assist to optimise local employment: <ul style="list-style-type: none"> ➢ The execution of a baseline skills survey of 	Settlements near the Project area that are considered to currently have either the greatest and most urgent unemployment burden and/ or those communities located directly along the proposed	Management Period Community relations and development programs focusing on employment and business development will start in the pre-construction stage and will extend into	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

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	<p>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> <p>Failure to maximise local employment and business opportunities may result in negative perceptions within the community and may fuel opposition and potential conflict.</p>	<p>perception towards the Project in terms of the efficacy of local recruitment.</p> <ul style="list-style-type: none"> ▪ Average household income levels over the construction stage 	<p>minimize local community opposition to the project by actively attempting to fulfil local employment demand, without fuelling unrealistic expectations of high employment and economic growth</p> <ul style="list-style-type: none"> ▪ To help improve profitability, financial management, and product quality of local goods and services wherever possible. 	<p>affected communities during the pre-construction stage;</p> <ul style="list-style-type: none"> ➤ A review of skills gaps between the skills available within local communities, those needed on the project and the subsequent determination of training needs; ➤ The development and implementation of employment conditions that are in accordance with Indonesian standards, ILO and other relevant international requirements and P2JJ best practice and policy; and ➤ Development of training programmes that will benefit both construction stage skills requirements and long term employment demand. <ul style="list-style-type: none"> • By cooperation and consultation with government authorities and local communities the project proponent will: • Maximize the involvement 	road alignment:	the construction and operation stage.			USAID

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
				<p>of local communities in construction and support activities, to the extent possible, based on available skill levels.</p> <ul style="list-style-type: none"> • Give priority to the local supplier of goods and services, which meet requirements of project procurement. The project proponent will determine the requirements of the quality, availability, and delivery of goods and services. • In order to optimize the opportunities for local businesses to supply goods and services to the project, P2JJ will undertake the following: <ul style="list-style-type: none"> ➢ A survey of the capabilities of the goods and services that are locally available that are of an acceptable standard and quality; ➢ A survey of the capabilities of local construction companies; ➢ Identify opportunities for local supplies with prospective management contractors. 					

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
<i>Number of Accidents</i>									
Mobilization of vehicle and movement of materials and equipment especially during the road construction phase	Number of accidents during the activity project activities community people and livestock	Total number of accidents during the road project	To maintain the road for a good and safe transportation which can encourage the development of local economic and help to increase the living standards and social harmonization	<ul style="list-style-type: none"> ▪ Install proper barriers at the project locations with zink and triplex ▪ Putting the Project activities sign. ▪ Provide the workers with health and safety equipment such as helmets, gloves, safety shoes, and safety coveralls, safety glasses and earplug. ▪ Using the well used equipment. ▪ Applying the SOP during the project activities to all workers. ▪ Managing the working hours based on the laws and passing vehicle ▪ Putting proper traffic signs (see Figure 3.2 for standard traffic sign) 	In road and bridge and access roads project.	Construction stage - initiation to completion	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
<i>Attitudes and Community Perceptions</i>									
<ul style="list-style-type: none"> ▪ Recruitment of employees ▪ Presence of contractors in local area and contractor behaviour. ▪ Construction 	<ul style="list-style-type: none"> ▪ Positive perceptions and attitudes will result from activities that have real or perceived benefits for the environment or 	<ul style="list-style-type: none"> ▪ Complaints and grievances from local community members. ▪ Criticism published in local and national media. 	To ensure good community relations and maintain the existing good public image of the Project.	<ul style="list-style-type: none"> ▪ Effective two-way public disclosure and public consultation should be implemented with an opportunity provided for the resolution of grievances received and recorded from individuals in the community. 	All settlements within proximity to the road construction activities, particularly those on re-aligned sections.	Construction stage - initiation to completion.	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

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
<ul style="list-style-type: none"> and upgrading of roads and bridge. ▪ The unemployment rate among the employable 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> ▪ Increased vandalism and security disturbances 		<ul style="list-style-type: none"> ▪ Trust should be developed through open and honest communication. ▪ The activities of contractors, consultants, and company employees should be routinely reviewed to ensure community relations are being maintained. ▪ The policy should be backed-up by the training of key and selected site personnel to assist in identification of possible areas of cultural heritage importance. ▪ Contractors should be held accountable for the implementation of established environmental management plans. 					Barat Regency, BRR, and USAID
Social Processes									
<ul style="list-style-type: none"> ▪ The creation of employment for both local and migrant workers. ▪ Community development programs. 	<ul style="list-style-type: none"> Whilst there may be positive effects from the interaction between a migrant workforce and the local population (ie. cultural exchange, knowledge sharing, increased racial tolerance) the concentration of a predominantly male, 	<ul style="list-style-type: none"> ▪ Changes in norms, values, and lifestyle associated with family relationships, religious observances, and community relationships. ▪ Domestic dispute, social 	<ul style="list-style-type: none"> ▪ Assist in maintaining order, security and harmony in the community. ▪ Foster harmonious relations between incoming workers and local communities and ▪ Respect local 	<ul style="list-style-type: none"> ▪ The project proponent should use its influence as employer to encourage responsible behaviour among employees. ▪ A 'Code of Conduct' should be established for employees. ▪ An open and tolerant company culture should be promoted. ▪ Construction camps should 	All settlements within proximity to the road construction activities, particularly those on re-aligned sections.	Construction stage - initiation to completion.	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 MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	<p>migrant workforce, living in camps adjacent to villages can increase the incidence of social ills.</p> <p>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.</p>	disharmony and crime.	norm, values, culture and human rights.	<p>be located remotely away from settlements/ villages.</p> <ul style="list-style-type: none"> ▪ Alcohol or drug consumption, prostitution and gambling in project area should be prohibited. ▪ Operations should be sensitive to important times in the local cultural calendar, for example religious festivals and minimize or discontinue construction activities at those times. 					
Public Health									
<ul style="list-style-type: none"> ▪ Develop and Operational supporting infrastructure ▪ Mobilization equipments and materials, and ▪ Constructions road and bridge activity 	<p>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</p>	<ul style="list-style-type: none"> ▪ Prevalence of infectious and non-infectious diseases over time. ▪ Distribution of diseases in amongst workers and different community groups/ settlements. ▪ Environmental sanitation and 	<ul style="list-style-type: none"> ▪ To ensure that the opportunity for the spread of disease between the non-local workforce and local residents is kept to a minimum. ▪ Contribute to the improvement of public health in the project area. ▪ Participate on improvement of 	<ul style="list-style-type: none"> ▪ A medical examination should be performed on each new employee and repeated regularly throughout the term of employment ▪ Health and safety procedures for all activities should be developed and implemented. ▪ Government programs to improve existing medical and health services in the local communities should be supported as much as possible by the Project. 	<p>All settlements within proximity to the road construction activities and construction camps.</p> <p>Local public health centres (PUSKESMAS). Medical clinic at construction camp.</p>	Operation stage - initiation to completion.	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 MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(CONSTRUCTION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
	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.	public health condition.	community sanitation and public health through the community development programs.	<ul style="list-style-type: none"> ▪ Mosquito control programs should be implemented, if necessary. ▪ Each worker should be required to abide by a Code of Conduct which will limit activities in local towns and communities and restrict certain behaviours in the work sites and accommodation ▪ Provision of good sanitation including proper waste disposal at its operation and residential accommodations. ▪ Participate in environmental sanitation initiatives in communities where its workers are domiciled. ▪ Support to the extent possible government programs in improving existing medical health and services in the local communities. 					

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(OPERATION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
<i>Transportation</i>									
Traffic activity and increased economic growth	Increasing traffic activity and number of accidents at the new road and bridge	Increased traffic congestion along the Banda Aceh to Meulaboh road and supporting along road network	To minimize disturbance to local accessibility	<ul style="list-style-type: none"> ▪ Ensuring that all road sign and properly completed, including those not completed during the construction stage ▪ Ensuring that the plate for road sign is in the form of flat and plain sheet made from the alloy of hard aluminium and must have a thickness of minimum 2 mm. The sheet must be free from grease and , the surface is roughened before its use as a road sign plate. ▪ The frame must is made of aluminium alloy that is extracted from metal mixture. Road sign plate must be given an additional frame if the size exceeds 1,0 meter. 	Aceh to Meulaboh road and access roads	Continuously for operation road and bridges	Local Government	Bapedalda, P2JJ, Local Government	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(OPERATION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
				<ul style="list-style-type: none"> ▪ Paint for road equipment and its coating must be of the best quality. Paint for the the steel part must certain high concentration of zinc oxide. Every sign surface must have a reflector made from reflector sheet of "Scotchlite" type Engineering Grade or High Intensity Quality ▪ Road sign pillar is a steel pipe with a inner diameter of minimum 40 mm, galvanized by hot dipping process. The same material is also use for pillar holder and covers. All open edge must be covered to prevent water to seep in. And also the additional equipment must be made of aluminium or stainless steel that have a high tensile strength for sign pillar. Concrete for the road sign base must be strong. 					

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(OPERATION STAGE)

Sources of Impact	Significant Impacts on Environment	Indicators of Impact	Management Objectives	Management Efforts	Management Locations	Management Period	Institution		
							Implementor	Supervisor	Reporting
				<ul style="list-style-type: none"> ▪ Ensuring that the Security rail is made of galvanized steel. The Road marks are made by white paint. Concrete block (paving block) pre-print for sidewalks and median 60 mm thick. ▪ Ensuring that for the sake of road safety the most important sign related to the maximum speed limit is posted and obeyed. 					
<i>Local and the Regional Economy, Employment Opportunity</i>									
<ul style="list-style-type: none"> ▪ Demobilisati on of construction workforce. ▪ Loss of employment for local workers. ▪ Increased accessibility ▪ Improved economic development 	Local and regional economic	<ul style="list-style-type: none"> ▪ Improving economic family ▪ Number of new small business enterprises. ▪ Average household income levels over the operation stage 	To provide the roads accessibility including the bridges which will encourage the development of local economy and increased living standards and social harmonization	<ul style="list-style-type: none"> ▪ Conducting routine maintenance of the roads and bridges so that the access to transportation is not disturbed. ▪ Conducting a persuasive approach of community involvement, and proactively providing guidance to help maintain the road and bridges. ▪ Cooperating with the relevant departments to help building the economic centre such as market place. ▪ Requesting the district government to build a feeder road to connect the 	Aceh to Meulaboh road and access roads.	Continuously for operation road and bridges	Local Government	Bapedalda, P2JJ, Local Government	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR

Appendix A.
SUMMARY MATRIX ENVIRONMENTAL MANAGEMENT PLAN (RKL)
FOR BANDA ACEH TO MEULABOH ROAD PROJECT
(OPERATION STAGE)

				settlement area with the national road					
Another Activity (Illegal Logging)									
Easy accessibility to forest due to the road and bridges	Illegal logging along Banda Aceh to Meulaboh road	Increasing illegal logging activities along Banda Aceh – Meulaboh road	To prevent and minimize illegal logging activities	<ul style="list-style-type: none"> ▪ To help develop policies at the province and district level to prevent illegal logging activities. ▪ To coordinate with the relevant department of the province and district levels, and sub district to prevent illegal logging activities. ▪ To inform and socialise periodically about the dangers caused by illegal forest exposure and unauthorized plantation. ▪ To cooperate with the Forestry department and relevant institution as well as with the local communities to prevent illegal logging 	Protected Forest in road and bridge and access roads project	Continuously for operation road and bridges	Local Government	Bapedalda, P2JJ, Local Government	Bapedalda, Public Work Department NAD Province, Major of Banda Aceh City, Bupatis of Aceh Besar, Aceh Jaya, and Aceh Barat Regency, and BRR