

SUMMARY INITIAL ENVIRONMENTAL EXAMINATION

ROAD REHABILITATION-2 PROJECT

IN

INDONESIA

April 2004

CURRENCY EQUIVALENTS

(as of 10 March 2004)

Currency Unit	–	rupiah (Rp)
Rp1.00	=	\$0.0001164
\$1.00	=	Rp 8,585

ABBREVIATIONS

AADT	–	Annual Average Daily Traffic
ADB	–	Asian Development Bank
AMDAL	–	environmental impact assessment
ASEAN	–	Association of Southeast Asian Nations
Kepala adat	–	person implementing the traditional law
Bapedalda	–	Environmental Impact Management Agency
Bappenas	–	National Development Planning Agency
CO	–	carbon monoxide
dBA	–	'A' weighted equivalent decibel
DFT	–	design and field team
DGRI	–	Directorate General of Regional Infrastructure
Dinas	–	Provincial Sub-Project Management
EHSM	–	Environment health and safety manager
EIA	–	environmental impact assessment
EMMP	–	environmental management and monitoring plan
ha	–	hectare
HC	–	hydrocarbon
IEE	–	initial environmental examination
IPK	–	land clearing permit (Izin Pemothongan Kayu)
Kabupaten	–	region/district
LARP	–	land acquisition and resettlement plan
MM	–	man-month
NGO	–	nongovernment organization
NO ₂	–	nitrogen dioxide
NO _x	–	nitrogen oxides
O ₃	–	ozone
PMU	–	project management unit
PM ₁₀	–	particulate matter (particle size <10µm)
PPTA	–	project preparation technical assistance
RAP	–	reclaimed asphalt pavement
ROW	–	right-of-way
SDEA	–	sub-directorate of environmental affairs
SO ₂	–	sulfur dioxide
TKH	–	Trans-Kalimantan Highway
TOR	–	terms of reference
TSCC	–	Trans-Sumatra Central Corridor
TSEC	–	Trans-Sumatra Eastern Corridor
UKL/UPL	–	environmental management and monitoring plan
warung	–	roadside mobile stores

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I. INTRODUCTION

1. The proposed Road Rehabilitation-2 Project (the Project) for the islands of Sumatra and Kalimantan, Republic of Indonesia has been classified as category “B” Sensitive Project in accordance with ADB’s environmental assessment requirements. An Initial environmental examination (IEE) report was prepared for each group of road links comprising the Trans-Sumatra Central Corridor (TSCC), Trans-Sumatra Eastern Corridor (TSEC), and Trans-Kalimantan Highway (TKH). This report summarizes the environmental impacts based on the information in the IEE report of project preparatory technical assistance (PPTA).¹ In addition, the Government’s regulatory requirements of AMDAL (environmental impact assessment) and UKL/UPL (environmental management and monitoring plan) for road rehabilitation project were also reviewed. The results of the assessment indicate that the preparation of AMDAL and UKL/UPL are not required for this Project.

2. In determining environmental impacts of the Project, year 2003 is used as the base year for forecasting with impacts predicted in 2008. The extent of the study has been limited to the existing ROW with the exception of noise, which is considered up to 100m on either sides of the roadway.

II. DESCRIPTION OF THE PROJECT

3. The Project involves rehabilitation of 1,266 km of national road sections in ten provinces on the TSCC, TSEC and TKH: 261 km of betterment² and 389 km of periodic maintenance³ in North Sumatra, West Sumatra, Riau, Jambi, South Sumatra and Lampung, and 202 km of betterment and 414 km of periodic maintenance in West, Central, South and East Kalimantan. In addition to this, 21 timber or log bridges in West, Central and South Kalimantan will be replaced. The periodic maintenance and betterment works for roads and bridges are all in the existing ROW, even when widening of pavements and shoulders is carried out. No land acquisition and resettlement will be required. The Project also includes measures to improve road maintenance funding, strengthen the capabilities of provincial road agencies, monitoring environmental aspects, and toughen controls over damage to roads by heavy-loaded trucks. The project’s civil works will include collection of borrow materials, quarry operations, excavation for embankment cut and fill, aggregate mixture, cement works, masonry, asphalt plants and the establishment of construction camps.

4. In the aftermath of the Asian financial crisis, the Government’s budget allocations for road maintenance fell short of needs and the condition of the roads deteriorated. In Sumatra, as a result transport costs have increased and their associated inter-regional trade flows have been affected. In Kalimantan, it has raised the costs of transport between the main provincial centers; in some cases, strategic routes have even become impassable for the whole periods of the year. By restoring the condition of high-priority links, the Project will facilitate trade, investment and economic growth in Sumatra and improve the accessibility, and reduce poverty in areas of potential growth in Kalimantan.

¹ ADB. 2003. *Road Rehabilitation-2 Project*. Manila.

² Betterment is defined as the improvements and additions to surface and subsurface drainage, widening and strengthening within existing right of way of pavements and shoulders, has design life cycle of 10 years.

³ Periodic maintenance consists of single or double layer asphalt concrete overlays and associated reshaping of roadway shoulders and minor drainage works, pavement markings. It has a design life cycle of 5 years.

5. The Project is scheduled to commence in January 2005 and to be completed in July 2008. The Directorate General of Regional Infrastructure (DGRI), Ministry of Settlements and Regional Infrastructure will be the executing agency (EA). DGRI will establish a Project Implementation Unit (PIU) to coordinate design, implementation, supervision of the road rehabilitation, maintenance, road safety and capacity building components. DGRI's project management in the 10 project provinces will be through P3JJ units, the local representation of DGRI in the provinces, assisted by consultants funded under the Project.

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources in Project Area

1. Topography and Soil

6. The TSCC's topography in West Sumatra is mainly hilly, with some flat and swampy areas. High mountains and the large Danau Toba crater lake dominate central North Sumatra. In Jambi the TSCC is generally flat and swampy. Embankment slopes and shoulders are silty sand with clay fractions. The links in South Sumatra have consolidated sand and gravel terrace deposits, with some alluvial plain meander belt and valley-bottom deposits. Embankment slopes and shoulders are sandy-silt with clay and sand fractions. The topography of the corridor in Lampung is generally flat. Embankment slopes and shoulders are clayey-silt with sand fractions.

7. The TSEC links run in North Sumatra through mainly lowland areas with swamps. There are coal and oil deposits and old sedimentary rocks, often metamorphosed, along the route between Bts L Batu and the Riau border. Volcanic cones, some still active, indicate the presence of old continental crust close to the link Sp Kawat-Bts L Batu. Most links in this corridor in Riau run through lowland plain, including alluvial islands with average elevation less than 200m above sea level. The soil is generally of Orgaosol type (Histosol) containing much organic material. Lowland Riau also contains bauxite deposits.

8. Most of the TKH in West Kalimantan are in mountainous/rolling terrain (Teraju-Balai Bekuak-Aur Kuning); Tayan-Teraju is relatively flat. Embankment slopes are silty-sand. Links in Central Kalimantan are in southern coastal areas and swamps 0-50m above sea level. Embankments are sandy-silty with clay. The northern and central parts of South Kalimantan contain the Meratus mountain range; in the west it is low and swampy; and in the east, forest and grassland. Embankments are sandy-silty with clay. Links in East Kalimantan run along lowland regions with rivers flowing from the west to the eastern coast. Embankments are sandy-silty with clay.

2. Climate

9. Sumatra has a largely tropical monsoon climate. June-September are relatively dry. Temperatures vary from 20° to 32°C, with humidity between 83 and 90%. Average rainfall is 1,000-4,000 mm/year. Kalimantan enjoys a dry season between May and September with rains between October and April, when tropical showers alternate with clear skies. Average temperature varies from 17°C to 36°C, with humidity 81-95%; average rainfall varies from 2,000 to 3,560 mm/year.

3. Water Resources

10. Indonesia receives abundant rainfall and has approximately 6% of the world's freshwater resources. The distribution varies between islands. Indonesia's water quality is deteriorating. The overall water river quality is poor. DO levels progressively worsen towards the river mouth to the point that only limited forms of aquatic life can survive in the lower reaches of the rivers. Suspended solids increase with distance downstream. Artisan small-scale mining (gold production from the dredges and hard rock small-scale mines) along the rivers (11 Kapuas tributaries) in Central Kalimantan is a major source of river pollution. Illegal miners use toxic mercury to separate gold from ore and this mercury is seeping into the local environment, poisoning the miners, plants and the local river. The impact on the river water is very critical.

11. Groundwater resources are limited and used for domestic, municipal, and industrial purposes. The quantity and quality of groundwater have also been adversely affected by water and wastewater management practices in the past ten years. Domestic sewage, factory wastes, and agricultural runoff are responsible for groundwater pollution; lack of an appropriate pricing policy and slow and declining aquifer recharge have led to overexploitation of groundwater beyond sustainable yields. Ambient air quality along the TKH is within standards because of low traffic. The project will have the positive impact of reducing resuspension of dust by paving the roads.

4. Air Quality

12. Analysis of air quality data in Indonesia shows that PM_{10} concentrations in major urban areas are higher than the standard in June to September⁴, SO_2 levels are growing rapidly; NO_2 concentrations quintupled between 1992 and 2000 but have largely remained below the standard of $150\mu g/m^3$. CO concentrations in 2001 for Medan and Pekanbaru were significantly above the standard ($10mg/m^3$).

5. Noise

13. Noise levels along the corridors were estimated using empirical relationships⁵ commonly used in Indonesia. The noise levels 15m from the road exceed standards for residential and human settlement of 55dBA along many of the TSCC and TSEC links and some of the TKH. The noise predictions confirm the findings of other noise studies showing that the noise standards are frequently exceeded near to roads countrywide.

B. Ecological Resources in Project Area

14. The TSCC road links pass through three protected areas (Table 1). Rimbo Panti nature reserve⁶ and Rimbo Panti recreational park⁷ in link 030 Lubuksikaping-Panti, lie 100km from Bukittinggi and comprise areas of 2,830ha and 570ha, respectively. The areas mainly comprise of swamp forest (2,050 ha, 60.29%) with smaller areas of tropical rainforest (900 ha, 20.47%) and secondary forest (450 ha, 13.23%). Land set in these protected areas are aside for conservation of

⁴ World Bank . 2003. *Indonesia Environment Monitor*. Jakarta.

⁵ Malkhamah, S., (1992-1996). *Journal of Civil Engineering*, Jogjakarta: University of Gadjah Mada.

⁶ Rimbo Panti nature reserve is classified as IUCN Category Ia, which is defined as an area of land possessing some outstanding or representative ecosystems, or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.

⁷ Rimbo Panti recreational park is classified as IUCN Category V which is defined as the area of land, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

genetic resources and life-supporting systems; watershed and catchment area protection; and the development of science and education. The main management objectives of these protected areas are identification, protection and safety of flora and fauna, tourism development, and promotion of research and development. Melampah Alahan Panjang⁸ (link 029 Kumpulan-Lubuksikaping) with an area of 22,364ha is a protected forest and natural reserve. Sumpur II, with an area of 54,223ha, is another protected forest near link 032 Panti - Bts. Sumut. The main function of these protected areas are conservation, watershed and catchments, flora and fauna protection and safety, tourism, flora and fauna inventory and identification, and research and development. The major activities of the corridor are transportation of goods and services to North Sumatra and tourism. This corridor links two famous tourist spots, Lake Toba in North Sumatra and Bukittinggi in West Sumatra.

Table 1: Information on Protected Forest in Project Area

Link No.	Protected Area and Category	Management Authorities	Restriction for Road Rehabilitation ¹	Major Use of the Corridor	Landuse within the Protected Area	Management Practices
Link 030 Lubuksikaping-Panti	Rimbo Panti Nature Reserve and Recreation Park	Under joint management of: - Provincial Forestry Office - Kabupaten Forestry Office - Board of Conservation Natural Resources - Regional Tourism Office	No Restriction	1. Part of middle Trans Sumatra Highways 2. Main route for transportation of goods and services to North Sumatra 3. Link two famous tourism region Lake Toba in Sumatra and Bukit Tinggi in West Sumatra	- Conservation Area - Watershed and Catchment Area	- Conservation Activities - Flora and Fauna Protection and Safety - Tourism - Flora and Fauna Inventory and Identification - Research and Education
Link 029 Kumpulan-Lubuksikaping	Malampah Alahan Panjang Natrure Reserve and Protected Forest	Under joint management of: - Provincial Forestry Office - Kabupaten Forestry Office - Board of Conservation Natural Resources	No Restriction	1. Part of middle Trans Sumatra Highways 2. Main route for transportation of goods and services to North Sumatra 3. Link two famous tourism region Lake Toba in Sumatra and Bukit Tinggi in West Sumatra	- Conservation Area - Watershed and Catchment Area	- Conservation Activities - Flora and Fauna Protection and Safety - Tourism - Flora and Fauna Inventory and Identification - Research and Education
Link 032 Panti-Bts. Sumut	Sampur II Protected forest	Under joint management of: - Provincial Forestry Office - Kabupaten Forestry Office - Board of Conservation Natural Resources	No Restriction	1. Part of middle Trans Sumatra Highways 2. Main route for transportation of goods and services to North Sumatra 3. Link two famous tourism region Lake Toba in Sumatra and Bukit Tinggi in West Sumatra	- Hydrology Area - Conservation Area - Watershed and Catchment Area	- Conservation Activities - Flora and Fauna Protection and Safety - Tourism - Flora and Fauna Inventory and Identification - Research and Education

¹Overlay within the road right-of-way

⁸ Gn. Belimbing, Gn. Tayap, Melampah Alahan Panjang, Sumpur II, and Sungaidawak, are all categorized as IUCN Category VI, protected area managed mainly for the sustainable use of natural ecosystems. These protected areas contain predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

Table 1— (continued)

Link No.	Protected Area and Category	Management Authorities	Restriction for Road Rehabilitation ¹	Major Use of the Corridor	Landuse within the Protected Area	Management Practices
Link 079-1 Tayan-Teraju	Sungaidawak Protected forest	Under joint management of: - Provincial Forestry Office - Kabupaten Forestry Office - Board of Conservation Natural Resources	No restriction	1. Main corridor to connect West and Central Kalimantan 2. Strategic route to connect with ASE Highway 3. Jungle rubber and shifting cultivation along the corridor	- Hydrology Area - Conservation Area - Watershed and Catchment Area	- Conservation Activities - Flora and Fauna Protection and Safety - Flora and Fauna Inventory and Identification
Link 069 Aur Kuning-Sandai	Belimbing Protected forest	Under joint management of: - Provincial Forestry Office - Kabupaten Forestry Office - Board of Conservation Natural Resources	No restriction	1. Main corridor to connect West and Central Kalimantan 2. Strategic route to connect with ASE Highway 3. Jungle rubber and shifting cultivation along the corridor	- Hydrology Area - Conservation Area - Watershed and Catchment Area	- Conservation Activities - Flora and Fauna Protection and Safety - Flora and Fauna Inventory and Identification
Link 020 Sandai-Nanga Tayap	Gunung Tayap Protected forest	Under joint management of: - Provincial Forestry Office - Kabupaten Forestry Office - Board of Conservation Natural Resources	No restriction	1. Main corridor to connect West and Central Kalimantan 2. Strategic route to connect with ASE Highway 3. Jungle rubber and shifting cultivation along the corridor	- Hydrology Area - Conservation Area - Watershed and Catchment Area	- Conservation Activities - Flora and Fauna Protection and Safety - Flora and Fauna Inventory and Identification

¹Overlay within the road right-of-way

15. The TKH also passes through three protected forests in West Kalimantan: on links 079–1 Tayan-Teraju (Sungaidawak), 069 Aur Kuning-Sandai (located in Belimbing) and 020 Sandai-Nanga Tayap (Gunung Tayap). All three are IUCN Category VI forests. All are protected forests managed mainly for the sustainable use of natural ecosystems.

16. During project preparation it was evident that the protected areas in West Sumatra and Kalimantan are well managed and maintained. Rimbo Panti recreational park has hot spring and hiking trails, attractive to tourists. Improved access will help develop responsibly-managed tourism in this corridor. Tourism contributes 30% of West Sumatra's GDP and road rehabilitation along this corridor is highly expected.

C. Human and Economic Resources

17. Population densities vary from 45 to 214 persons/km² in the two Sumatra corridors and 11-69 persons/km² along the TKH. In Sumatra the incidence of poverty in rural areas is similar to urban areas. In Kalimantan poverty rates are higher in rural areas than in urban. Agriculture is one of the major sectors of the economy along TSCC and TKH, with the main food products being rice, corn, peanuts, small green peas, cassava, soybean, fruits and vegetables. The main commercial crops are copra, oil palm, rubber, cacao and pepper. The main forest products are log, processed woods, veneer, plywood, blackboard, slate pencil, resin and rattan. Areas along the TSEC are rich in mining deposits such as petroleum, natural gas, coal, gold, silver, platinum, copper, granite, kaolin, limestone, clay and obsidian.

IV. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

18. The longer-term environmental impacts of the proposed project are likely to be insignificant with impacts resulting directly from construction activities only. Environmental impacts during construction are dependent on: (i) contractors' work practices, especially those related to the storage of construction materials and cleanliness of the work sites; (ii) cooperation by local communities in terms of traffic management and use of land and utilities; (iii) enforcement of construction practices and standards through supervision; and (iv) implementation of mitigation measures identified in the IEE included in bid and contract documents.

A. Physical Environment

1. Soils and Materials

19. The main impacts during construction are from extraction of fill materials from rivers or borrow pits, conversion of land for materials stockpiles, soil erosion in borrow pits and on uncompacted embankments, and soil contamination by fuel and construction material spillage. To reduce soil erosion, construction should take place mainly in the dry season; participants in public consultations also suggested this. To reduce soil damage, especially in Kalimantan, embankments will be given grass cover as soon as possible, embankments will be monitored during construction for signs of erosion, long-term material stockpiles will be covered to prevent erosion, and the contractor's plans for sources of spoil will be submitted to the PMU for approval and monitoring. The spoil plan should show the locations of any borrow pits and measures to be taken to rehabilitate these on project completion. DGRI will approve and monitor implementation of the plan.

2. Recycling of Construction Materials

20. Contractors will be encouraged to recycle reclaimed asphalt pavement (RAP) in cold mixes or aggregate in granular or stabilized surface material and to use recyclable materials such as fly-ash wherever possible. In addition to saving cost, this will reduce environmental impacts of quarrying, reduce dumping of waste materials and reduce air quality impact.

3. Slope Stability and Drainage

21. In mountainous regions of Sumatra most retaining structures are gravity-type, made of masonry. Mostly the thickness is adequate but some cracks, broken sections and poor drainage are evident. Effective retaining structures are included in the design to protect slopes in the mountainous regions of West Sumatra and Kalimantan.

22. Embankments on earth/gravel roads in Kalimantan tend to disrupt natural watercourses and culverts are often not present. Water collects on the upstream side and sometimes spills over the embankment. The subgrade is often damaged where there are no cross- and side-drains. Improved drainage structures will improve slope stability and are included in the proposed rehabilitation works.

4. Water

23. The Project roads will cross numerous creeks and rivers and could affect the surface runoff flow pattern. There are 21 bridges require reconstruction in TKH, including periodic maintenance of bridges and culverts in Sumatra. The Project will likely increase silt load during construction if embankments and construction materials are washed out with rainwater. During operation of the Project, the water quality could be affected by accidents near rivers or creeks, involving vehicles containing toxic and hazardous substances. Oil and grease from engine leaks might pollute surface water. Mitigation measures are recommended in the IEE to control silt load from the embankments and toxic and hazardous waste discharge. Mitigation and monitoring measures will be enforced during construction to protect surface water pollution from construction waste, especially along TKH where 21 bridges require reconstruction.

5. Air Quality

a. Construction Impacts

24. During construction, air quality is likely to be degraded by exhaust emissions from the operation of construction machinery; fugitive emissions from aggregates, concrete, and asphalt plants; and dust generated from haul roads, unpaved roads, exposed soils, and material stock piles. In order to mitigate this, the following will be implemented: (i) Construction equipment will be maintained to a good standard and idling of engines discouraged. Machinery causing excessive pollution (e.g., visible smoke) will be banned from construction sites. (ii) Aggregate, asphalt, and concrete plants will be operated within the terms of Government pollution control guideline, and located as far away from human settlements and protected areas as possible. (iii) The contractor will submit a dust suppression program to DGRI prior to construction. The plan will detail action to be taken to minimize dust generation (e.g., spraying of roads with water), and will identify equipment to be used.

b. Operational Impacts

25. The operation of the Project road will lead to air pollution including HC, CO, NO_x, SO₂, and PM. Predicted worst-case pollutant concentrations indicate that air quality in all three corridors will generally be below the ambient air quality standards.

6. Exhaust Emission and Resuspension of Dust

26. Evaluation of exhaust emissions indicate that pollution will be less than produced in the "without project" scenario except for NO_x emissions which increase under the project scenario. This is because vehicle speeds will be higher; NO_x emissions increase with vehicle speeds up to about 70 km/h. When the project is completed the dust generated will be less, due to better paved roads. Dust is common on existing earth roads in Kalimantan, deposited within 20 to 30m of the edge of the road, a health risk to roadside communities and risk of damage to the biological environment.

27. The CALINE-4⁹ model is used to determine the worst-case air quality scenario along the corridors in Sumatra. The prediction indicates that the concentrations of CO, PM, and NO₂ are mostly within ambient air quality standards of Indonesia in all three corridors. Two links of Lampung (Tegineneng-G. Sugih and G. Sugih-Terbanggi Besar) along TSCC, two links in North Sumatra (Sp. Kawat-Bts. L. Batu and Rantau Prapat-Aek Nabara) and one link in Riau (Sp. Balam-Sp.

⁹ BREEZE Roads GIS Pro, Trinity Consultants USA, 2003.

Batang) in TSEC have higher PM concentration because of the high traffic volumes and heavy-duty vehicles. This also confirms other studies in Indonesia, which indicate that particulate concentration is high in some of the selected locations with heavy traffic volume.

7. Noise and Vibration

28. Operation of heavy machinery can generate high noise levels. Prevention of noise and vibration will be an issue during construction. Machinery operations will be restricted to between 0600 to 2100 hours. In addition, a limit of 70dBA will be set in close vicinity of the construction site and strictly followed. Controlled blasting using low volume charges will reduce the potential for damage to structures, whilst owners of houses that will obviously be damaged will be fully compensated. A compensation policy guideline has been prepared by DGRI.

29. Future noise levels along the corridors were predicted “with” and “without” Project scenarios. The results show that noise levels along the Project road will be higher in 2008 with the implementation of the Project. There is no need to provide noise attenuation. However, roadside planting along project influence areas using densely leafed shrubs and trees should provide some attenuation of up to 2-4dBA by absorption, diffraction, and reflection of noise. The main focus of noise mitigation will be on reducing levels at sensitive receptors such as schools and hospitals. During road operation, heavy vehicle movements can cause vibration damage to nearby house structures. However, these vibrations will have a minor impact on houses located further than 50m from the roadways.

B. Ecological Environment

30. A short-term impact on ecology along the rehabilitated roads is likely to occur in and around the quarry sites, material stockpiles, and workforce camps due to minor vegetation clearance. Quarry sites and similar locations will be covered by grass, rehabilitation works are proposed to be undertaken by local labor therefore no additional demands are expected on the local natural resources.

31. Road rehabilitation will improve accessibility to Rimbo Panti, Melampah Alahan Panjang and Sumpur II in West Sumatra. The impacts of road rehabilitation on protected areas are analyzed “with” and “without” project scenarios. The analysis considered whether there are sufficient buffer zones to protect rare habitats and strict area from human disturbances. Based on the discussion with provincial forest department, field visits, and current maintenance practices, it is concluded that there will be no significant impact on the protected areas of West Sumatra due to the road rehabilitation (simple overlay), however, some minor negative impact is expected during the construction and operation, which will be mitigated by limiting construction camp in the protected section of the road, improved road sign and awareness display board, and the provision of improved roadside fence. A special monitoring and management plan will be established (e.g., asphalt and mixing plants will be set-up at outside the protected forest and transport the material to overlay the pavement in the protected section) to secure the environmental protection in the protected areas. Excluding the rehabilitation of the protected sections from the corridor will have more negative environmental and socio-economic consequences as: (a) traffic will be slowed down in “without” project case generating more pollution by allowing the pavement to deteriorate; (b) the provincial government will lose revenue from the tourism and transport sectors for the poor accessibility;¹⁰ and (c) the current maintenance and management practices of forest authorities will be hindered by the poor accessibility and eventual less economic importance of the areas.

¹⁰ Tourism and transport sectors contribute 30% and 8% of West Sumatra's GDP, respectively.

Provincial forest, environmental management agencies, and NGOs were consulted regarding the rehabilitation of the protected sections of the road. Written clearances and no-objection are obtained for simple overlay within the road ROW from the provincial forest and environmental management agencies and are available in the IEE.

C. Socioeconomic Environment

1. Compensation Plan

32. The Project will not require any land acquisition, resettlement, or removal of permanent structures. Some temporary disturbances, however, are possible due to displacement of roadside stores (*warung*), setting up temporary construction camps, and cutting of trees. Public consultations indicate as concern for a policy guideline on compensation plan to be disclosed to the local community. Such a policy and plan has been prepared by DGRI.

2. Accessibility and Regional Cooperation

33. The proposed road rehabilitation in most of the road links in TKH will have poverty reduction impact through improved accessibility to the Provincial capitals, and enhanced regional cooperation connecting with ASEAN highway. The existing condition of the road is impassible between West and Central Kalimantan, which is responsible for social and economic isolation of the local economies. This constraint limits the mobility of the rural poor and substantially increases marketing costs for their agricultural products. The provision of improved accessibility can result in reduced transport costs, improved access to social services and to employment opportunities, new markets for farm produce, and increased agricultural production, which will eventually generate larger rural income.

3. Illegal Logging

34. During the PPTA study, the Consultant discussed with the provincial forest departments regarding the road rehabilitation impact on logging concessions going on in the close proximity of the roads, TSCC, TSEC, and TKH. The nature of logging in the project areas is of a non-industrial, and community based. The Project areas have largely been logged out by commercial-scale operations. What is left is a residual level of forest product utilization at the community scale for local uses. It is therefore considered that the rehabilitation of project links will have little impact on the scale or intensity of such logging.

35. Furthermore, the Government has taken actions to deal with illegal logging issues nationwide. A committee has been formed, Bappenas in chair to address special issues (including illegal logging) related to road infrastructure development under a *Kepmen No. 277M/PPN/06/2002*.¹¹ A number of agencies (Bappenas, Department of Finance, DGRI, and DGLC) are involved in the committee, which is formed by two sub-committees (a supervisory sub-committee and a technical directions sub-committee). Technical sub-committee is responsible to identify and resolve social issues (including illegal logging) arising during the implementation of road infrastructure development project. In practice, provincial forest departments have set up forest stations and checkpoints along major roads, including some road links in the Project, to monitor log transport.

¹¹ Pembentukan Tim Pengarah Dan Tim Teknis Pelaksanaan Road Rehabilitation Sector Project, June 28, 2002.

4. Community Impacts

36. Construction camps may place stresses on nearby communities. The contractors will be required to establish a mechanism by which local people can raise grievances. The use of local labor and the provision of construction support services will be encouraged and will help alleviate potential conflicts. Village leaders consulted during public consultation meetings requested measures to involve local people in road construction and maintenance.

5. Proper Construction Practices

37. Contractors' conformity to contract procedures and specifications during construction will be carefully monitored. During public consultations it became evident that prime contractors tended to use sub-contractors without ensuring their conformity with prime-contract clauses. Such practices reduce the quality of construction and the benefits of the project. Contractors will be made to follow standard construction practices, monitored and supervised by Field Team consultants employed under the project.

6. Health, Safety, and Hygiene

38. Impacts of the project on public health are likely to arise from construction camps. There will be a potential for diseases to be transmitted, exacerbated by inadequate health and safety practices. Each contractor will therefore be required to recruit an environmental, health and safety manager to address environmental, health, and safety concerns in the camps.

7. Tourism

39. The tourism is one of the major sources of revenue for West Sumatra due to its natural attractions. The Project will improve access to Rimbo Panti and Malampah Alahan Panjang in West Sumatra and Meratus Mountains in South Kalimantan by rehabilitating the roads in TSCC and TKH. Hence the number of tourists currently accessing these resources will be increased.

V. INSTITUTIONAL REQUIREMENT AND ENVIRONMENTAL MONITORING PLAN

A. Institutional Framework and Environmental Monitoring Program

40. An environmental management and monitoring plan (EMMP) was prepared to mitigate the potential environmental impacts of the Project (Appendix 1) and the frequency of environmental monitoring is attached as Appendix 2. The agencies involved in executing and monitoring the environmental aspects of the project include DGRI's Sub-Directorate of Environmental Affairs, responsible for managing the social and environmental impacts of road projects, and the P3JJs (Provincial DGRI office) and provincial works agencies, responsible for environmental monitoring under the IEE (Table 2). The Core Team consultant will be responsible for incorporating the EMMP into engineering design and undertake environmental monitoring during construction. The field specialists will supervise the monitoring of mitigation measures during construction. In addition, each contractor will be required to nominate an environmental, health and safety manager responsible for meeting the contractors' environmental and health responsibilities.

Project Stage	Responsible Organization	Responsibilities
Detailed Design	<ul style="list-style-type: none"> Core Team Consultant Sub-project management and supervision team 	<ul style="list-style-type: none"> Incorporation of mitigation measures into engineering design and technical specification.
	<ul style="list-style-type: none"> Sub-Directorate of Environmental Affairs 	<ul style="list-style-type: none"> Review and approve environmental mitigation and management measures.
Construction	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Implementation of required environmental measures
	<ul style="list-style-type: none"> Design and Field Team Site Engineer Field Team Consultants 	<ul style="list-style-type: none"> Supervise contractor's implementation of environmental measures on a daily basis. Enforce contractual requirements
	<ul style="list-style-type: none"> Field Team Consultants 	<ul style="list-style-type: none"> Audit construction phase through environmental inspections and collection of monitoring data. Submission of quarterly reports. Provision of awareness/training to workers and technology transfer to the contractor.
	<ul style="list-style-type: none"> Sub-project Management Team Provincial/Kabupaten BAPEDALDA 	<ul style="list-style-type: none"> Ensure compliance with Government legal requirements during construction. Review complicated issues that arises from the Project.
Operation	<ul style="list-style-type: none"> Sub-Directorate of Environmental Affairs and Sub-project Management Team (Dinas) 	<ul style="list-style-type: none"> Provide budget to undertake environmental monitoring.
	<ul style="list-style-type: none"> Local BAPEDALDA 	<ul style="list-style-type: none"> Review monitoring reports
	<ul style="list-style-type: none"> Sub-Directorate of Environmental Affairs and Dinas 	<ul style="list-style-type: none"> Implement the environmental management and monitoring plan

B. Environmental Management Training

41. As a component of the project, the capacity of the Sub-Directorate of Environmental Affairs, and provincial agencies will be strengthened through a program of training in basic and advance environmental and social management. Outline TOR is included in Appendix 3.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

42. The IEE process included public participation and consultation to help DGRI achieve public acceptance of the Project. The PPTA Consultant has involved a wide range of participants representing affected people, community leaders, NGOs, provincial governments, and DGRI. These were organized in seven provincial capitals for a sample of road links and were joined by a total of 173 people mostly from the Project affected areas. The affected people and the local communities expressed support for the Project perceiving benefits to the community and the region. The main concerns expressed related to the provision of proper drainage, quality

construction, proper engineering practices during construction, and transparency in construction work. Responses to these concerns are incorporated in the Project's design.

43. The IEE report documenting the mitigation measures and consultation process is available for public review. As the public consultation is an ongoing process, additional disclosure and consultation will be done during construction and operation phases through preparation and dissemination of a Project brochure in Indonesian, explaining the affected peoples' entitlements and the procedures for obtaining compensation and recording grievances and setting up a formal grievance redress committee with a representation from the affected people.

VII. FINDINGS AND RECOMMENDATIONS

44. The IEE study reveals that no significant negative environmental impacts are likely to occur due to the construction activities and normal operations after the proposed rehabilitation. Recommendations are made to mitigate expected negative impacts in the IEE.

45. Positive impacts of the project will be economic and better accessibility in Project areas by enhancing increased trade and economic flow, reduced travel time between the provincial capitals, and improvements in road safety (in particular in the mountainous areas and high traffic volume links) in providing better shoulder.

46. Soil erosion is expected after project completion, roads passing along the rivers will require slope protection, for which provision has been made in the engineering design. The residual impact on the environment will be minor and in some cases, positive where erosion has been active and henceforth will be controlled. Environmental management and monitoring will be required for 42 months, covering preconstruction and construction period.

47. Minor negative impacts are expected during implementation of the civil works in the protected forest and natural reserve by civil works. A special management plan, road sign, information display board, and roadside fence will mitigate this. The cost of these mitigation measures has been included in the Project budget.

48. Environmental and social management and advance environmental training of Government officials at different stages in the project cycle is required and has been included in the Project budget.

VIII. CONCLUSION

49. The Project will cause some minor environmental impacts, which will be both positive and negative. The impacts resulting from the Project include (a) less air emission and resuspension of dust, (b) increased noise levels along the corridor, (c) increased growth in the economy of the region, (d) substantial income and employment opportunities, (e) improved living conditions, (f) reduced poverty, and (g) provision of a communication link currently impassible in Kalimantan.

50. Implementation of appropriate mitigation measures during construction and operation phases will minimize the negative impacts of the Project to acceptable levels. Environmental monitoring of the Project will be undertaken during construction regularly and through the first five years of its operation by local BAPEDALDAs to ensure that the measures are being implemented properly.

51. In conclusion, the Project will have overall beneficial impacts in reducing air pollution, dust, and noise pollution and improving socioeconomic conditions along the project corridor, and will have insignificant negative impacts, which will be carefully monitored and adequately mitigated. There is no further environmental study required for this project.

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
Design Stage					
Non Motorized Traffic	Exposed to high speed motorized traffic	Consideration is made in the preliminary engineering design to strengthen shoulder (1.5m in both side) for the non-motorized transport and the pedestrians. Where space permits, either as a part of the roadway features (sub-standard pavement) or a separate surface a meter or two width from the edge of the roadbed is considered, especially in the region where road is passing through the village, schools, and markets. Special provisions are also made at bridge designs.	Design Consultants	DGRI and P3JJ	Feasibility and Design Phase
Increased traffic	Increased pedestrian vs. vehicle accidents due to traffic volume and higher speed	A rehabilitated road will attract more traffic after its completion, due to the long-suppressed traffic coming back onto the road. To help reduce the risk of serious accidents, speed control signs and other visual means be used at the entrance and through the urban zones of towns and villages along the road. Many of the activities of the villages are centered on the road and thus there is a large pedestrian back and forth across the road. Proper speed control will help improving both safety and noise reductions, particularly in the evening.	Design Consultants	DGRI and P3JJ	Feasibility and Design Phase
Compensation for temporary and mobile stores and plants	Social instability	DGRI has prepared a compensation policy guideline by defining the compensation and resettlement framework outlining who is entitled to compensation, what will be the compensation mechanisms, how much the compensation will be paid according to the type of damages (e.g., a fruit growing tree will be compensated three harvest equivalent). In the approaches to towns and villages and the road through them, mobile vendors (warung) who sell items on the ground or from makeshift stands at the edge of the pavement, will be encouraged to conduct their business at new strengthened shoulders.	Resettlement Expert	DGRI and Dinas	Feasibility stage and Design Phase
Strengthening and construction of existing culverts & bridges.	Social and community disturbances by flooding	Damaged culverts and small bridges will be reconstructed with proper engineering design to allow smooth water flow of the natural creeks and canals. 21 bridges require construction in West, Central and South Kalimantan.	Design consultants	DGRI and P3JJ	Design Phase, Construction Phase

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
CONSTRUCTION PHASE					
Natural Environment					
Dust/Odor	Breathing problem for the residence and to the school children	<ul style="list-style-type: none"> Water will be sprayed during the construction phase in all mixing areas where dry materials are handled and / or crushed. Temporary access roads to aggregate sites must be included in the dust suppression program. A spraying schedule will be prepared by the contractor and will serve as the basis of a dust control program. The Project authorities will regularly monitor this schedule. Vehicles delivering materials to and from the construction sites should be covered to reduce spills. Asphalt application will be heated liquid bitumen sprayed onto an aggregate base. Bitumen preparation sites will be noisy, with some odor and a considerable risk of fire. Therefore, all bitumen preparation and loading sites must be over 500m downwind from any community development, and the contractor must have spill and fire protection equipment available to rapidly deal with any accidents. Mixing and crushing plants/operations should be equipped with dust suppression devices such as water sprays. Operators should wear dust masks and ear protection. 	Contractor	DFT and Consultant with assistance from Bapedalda if required	Construction Phase
Air Pollution		<ul style="list-style-type: none"> Vehicles and machinery used for construction are to be regularly maintained so that air quality conforms to national standards. 	Contractor	DFT and Consultant with assistance from Bapedalda	Construction Phase
	Protected Areas in TSCC	<ul style="list-style-type: none"> Special care must be taken to inspect carefully whether all construction vehicles are properly maintained and correctly operated (including the use of dust filters or hoods) during construction in the protected areas. 			

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
Noise		<ul style="list-style-type: none"> Noise standards at aggregate crushing plants and bitumen preparation sites will be strictly enforced to prevent exceedances of acceptable noise standards 55 dBA for residential and human settlement area if it is very close to the residential area and 70dBA for industrial area if it is far from the human settlement. Maintenance of machinery and vehicles should be enhanced to minimize noise. When construction is taking place at < 100 m from the villages along both sides, and the road passes within 150m of sensitive areas such as hospitals, construction should be stopped from 20:00 to 06:00. This will reduce nighttime noise levels, which in most towns are non-existent. 	Contractor	DFT and Consultant with assistance from Bapedalda if required	Construction Phase
	Protected Areas in TSCC	<ul style="list-style-type: none"> It must be ensured that noise level in all protected area sections of the roads is kept 55 dBA during construction. 			
Water					
Alteration of drainage	Flooding	<ul style="list-style-type: none"> In sections along creeks and canals, earth and stones will be properly disposed of so that they do not block rivers and streams, resulting in adverse impact on water quality and flow regime. All necessary measures will be taken to prevent earthworks and stone works related to the road from impeding cross drainage at rivers / streams and canals or existing irrigation and drainage systems. 'Side-borrow' sites will be used as drainage ditches and designed such that they drain into the nearest watercourse. But at a slope (e.g., <5%) permitting fine suspended materials to settle down. 	Contractor	Dinas and DFT	Construction Phase
Stagnant water as insect- borne disease vectors	Malaria, dengue fever and schistosomiasis	<ul style="list-style-type: none"> The formation of standing waters on construction sites in tropical areas often leads to the spread of insect-borne diseases such as malaria, dengue fever and schistosomiasis. Therefore there must be a vigorous program by the contractor to avoid such standing waters, including the removal of old materials such as used tires and storage drums. In cases, where standing waters are managed by their owners (users), e.g., through fish or waterfowl stocking, they will be held responsible for insect control. The owners / users should be 	Contractor	Contractor EHSM and Consultant	Construction Phase

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
		given information about the dangers of waterborne diseases in standing water and how to prevent them.			
Siltation	Sedimentation in watercourse	Construction materials containing fine particles, e.g., limestone or laterite should be stored in an enclosure such that sediment-laden water does not drain into nearby watercourses, but rather percolates slowly into the soil. See measure for soil erosion.	Contractor	Dinas and DFT	Construction Phase
Contamination of water table or surface drainage		In road rehabilitation the most severe possible water quality impact could come from spilled bitumen or any petroleum products used to thin the bitumen. Bitumen is stored in drums which may leak or which are often punctured during handling after long periods (> 6 months in the elements) of storage. Bitumen will not be allowed to enter either running or dry streambeds and nor can be disposed of in ditches or small waste disposal sites prepared by the contractor. Bitumen storage and mixing areas must be protected against spills and all contaminated soil must be properly handled according to MOE or other acceptable standards. As a minimum, these areas must be contained, such that any spills can be immediately contained and cleaned up. Prior to initiating the work, the contractor will meet with the provincial Bapedalda to determine the proper siting of the mixing areas and the handling and management of such spills. Any petroleum products used in the preparation of the bitumen mixture must also be carefully managed to avoid spills and contamination of the local water table only 3-6 meters below the road surface.	Contractor	Contractor EHSM and Consultant with assistance from Bapedalda if required.	Construction Phase
Contamination from waste water (other than sewage)		All justifiable measures will be taken to prevent the wastewater produced during construction from entering directly into rivers and irrigation systems	Contractor	Contractor EHSM and Consultant	Construction Phase
Contamination from fuel and lubricants		Vehicle maintenance and refueling should be confined to areas in construction camps designed to contain spilled lubricants and fuels. Waste petroleum products must be collected, stored and taken to approved disposal sites, according to MOE requirements.	Contractor	Contractor EHSM and Consultant	Construction Phase

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
Construction Camp and Sanitation and Waste Disposal		<ul style="list-style-type: none"> Sufficient measures will be taken in the construction camps, i.e., provision of garbage bins and sanitation facilities. All toilet facilities should be at least 300m from water sources or existing residences. Prior to initiating work, the contractor will present a simple sewage management plan to the SDEA and Dinas for approval. Drinking water will meet national potable water standards. Solid waste and garbage will be collected in bins and disposed of daily, according to a brief and basic waste management plan prepared by the contractor and approved by the SDEA and Dinas, prior to the commencement of civil works. To make sure that the natural water movement (in terms of flow and volume) is maintained. 	Contractor	Contractor EHSM and Consultant	Construction Phase
	Protected areas in TSCC	<ul style="list-style-type: none"> It must be ensure that there will be no construction camp within 500m of the protected area section of the road. Care must be taken to strictly follow daily collection of solid waste from the protected area section of the road in TSCC. 			
Asphalt and mixing plant	Protected areas in TSCC	<ul style="list-style-type: none"> During civil works of the protected areas in TSCC, it must be ensured that all asphalt and mixing plants are outside the protected area. Mixing of bitumen and aggregates must be done outside the protected area and transported to these sections for simple overlay to avoid all possible impacts. 	Contractor	Contractor EHSM and Consultant	Construction Phase
Recycle of construction material		<ul style="list-style-type: none"> Contractors will be encouraged to recycle reclaimed asphalt pavement as in cold mixes or aggregate in granular or stabilized surface material for village access road maintenance and to use recyclable materials as much as possible, such as fly-ash. 	Contractor and Village Leader	Dinas, DFT, and Consultant	Construction Phase
Soil					
Soil erosion		<ul style="list-style-type: none"> On stapes and other potentially erodible places along the roadside, appropriate vegetation that retards erosion should be planted. On sections with high filling and deep cutting, the slopes should be protected retaining wall and planted with appropriate vegetation. 	Contractor	Dinas, DFT, and Consultant	Construction Phase

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
Loss of topsoil		<ul style="list-style-type: none"> The topsoil (15cm or so) should be kept and refilled after excavation is over to minimize the impact on productive lands. It may be necessary to construct new access roads to aggregate sites, and place them through agricultural lands. These temporary roads will be made along existing farm tracks so as to avoid losses to agricultural lands. Contractors will be required to present proposed construction road alignments and hauling schedule for approval before construction is to commence. 	Contractor	Dinas, DFT, and Consultant	Construction Phase
Compaction of soil		Construction vehicles should operate within the corridor of impact, i.e., approximately 9 m to either side of the carriageway centerline, to avoid damaging soil and vegetation. It will be most important to avoid soil compaction around trees. Generally the rule will be to avoid driving heavy equipment or trucks anywhere into the 'drip-line' of a tree (defined as imaginary line around a tree where rainwater falls freely to ground unimpeded by the tree's foliage).	Contractor	DFT, and Consultant	Construction Phase
FLORA					
Loss of trees	Deforestation	A tree-cutting and replanting scheme will be prepared within the first four months of the start of civil works.	Contractor	Dinas, DFT, and Consultant	Construction Phase
Fauna					
Extinction of birds, animals etc.		<ul style="list-style-type: none"> Construction workers should be advised to protect natural resources and wild animals. Hunting is strictly prohibited, especially in the protected areas. Stream crossings that are dry during the work period should be kept unobstructed at all times and the channels should not be altered. Many of the streams for which culverts will be sized, are tidally influenced and therefore adequate measures keep such flows unimpeded must be considered in calculating the culvert sizes. 		DFT and Consultant	Construction Phase
Social Environment					
Loss of access	Social grievances and	<ul style="list-style-type: none"> Temporary bypasses should be constructed and maintained (including dust control) during the construction period 	Contractor	Dinas, DFT, and	Construction Phase

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
	grievances and disturbances	<p>(including dust control) during the construction period particularly at bridge crossings.</p> <ul style="list-style-type: none"> A grievance redress committee must be formed in association with Kepala Desa before starting the civil work and advance notice must be given to the community about the construction schedule. 		and Consultant	
Traffic jams and congestion	Social havoc	If there is traffic jams during construction, measures should be taken to relieve the congestion through better coordination between the contractor, the Provincial Transportation Department and the police.	Contractor	Dinas and DFT	Construction Phase
Road safety; collisions between vehicles, people and livestock	Traffic injuries and fatalities	<ul style="list-style-type: none"> Control speed of construction vehicles through road safety education and fines. Allow for adequate traffic flow around construction areas. Provide adequate signage, barriers and flag persons for traffic control Communicate to the public through community consultation and newspaper announcements regarding the scope and time frame of projects, as well as certain construction activities causing disruptions or access restrictions. 	Contractor	Dinas, DFT, and Consultant	Construction Phase
Deterioration of health of workers due to poor camp conditions	Health impact	<ul style="list-style-type: none"> Make certain that there is good drainage at all construction areas, to avoid creation of stagnant water bodies, including water in old tires especially in urban / industrial areas. Provide adequate sanitation and waste disposal at construction camps. Provide adequate health care for workers and locate camps away from sensitive areas. 	Contractor	Contractor EHSM, DFT, and Consultant	Construction Phase
Littering with waste construction materials		All construction materials should be reused, recycled and properly disposed of. This will become particularly important at the many small bridge replacement sites, where old reinforced concrete will need to be properly disposed of. All worn out parts, equipment and empty containers must be removed from the site to a proper storage location designated by Dinas.	Contractor	Contractor EHSM, Dinas, DFT, and Consultant	Construction Phase

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
Awareness on HIV/AIDS and STD	Spread to the community along the corridors	<ul style="list-style-type: none"> All construction workers will be adequately trained in basic sanitation and health care issues (e.g., how to avoid transmission of sexually transmitted diseases such as HIV/AIDS). Group consultation will be done to create awareness among the community about these diseases. 	Contractor	Contractor EHSM, DFT, and Consultant	Construction Phase
Littering/polluting with solid waste and smoking	Protected areas in TSCC	<ul style="list-style-type: none"> Awareness campaign for road users education on the importance of the protected areas to preserve the protected sites is considered. Improved road sign and awareness display board (non-smoking, no-horn, no-dumping signs) including existing laws for violation is recommended in the protected areas. 	Contractor	Contractor EHSM, DFT, and Consultant	Construction Phase
Protected area encroachment	Protected areas in TSCC	<ul style="list-style-type: none"> The contractors will be encouraged to employ local labor during construction. Provision of improved roadside fence is considered in the protected areas. 	Contractor	Contractor EHSM, DFT, and Consultant	Construction Phase
Operational Phase					
Natural Environment					
Dust Nuisance	Potentially moderate impact	<ul style="list-style-type: none"> Maintain and clean roads properly. Replace roadside tree plantations lost to construction and encourage new afforestation projects 	Local community under contract from SDEA/ Dinas	Dinas and DFT	Operation Phase
Air Pollution	Atmospheric pollution	<ul style="list-style-type: none"> A consultant under an SDEA/Dinas contract with the cooperation from DGLC should check emissions from diesel trucks, buses and old vehicles regularly and force ill maintained vehicles to service their automobile. 	Consultant	Dinas and DFT	Operation Phase
		<ul style="list-style-type: none"> By increasing roadside plantations, localized air pollution will be reduced due to the blocking effect of foliage and through photosynthesis. 	Local community under contract from SDEA/ Dinas	Dinas and DFT	Operation Phase
Noise		Based on monitoring results, at places with noise violation, mitigation measures such as earth berm, dense layered plantation to block the noise, or other measures like wooden noise barriers	Local community under contract	Dinas and DFT	Operation Phase

ENVIRONMENTAL MONITORING AND MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION					
Activity	Potential Impact	Mitigation measures	Persons to Implement	Persons to Monitor	Timing
		should be considered.	from SDEA/ Dinas		
Water Resources					
Contamination from spills due to traffic movement and accidents	Accidental spills of toxic material and loss of life	Contingency plans for cleanup of spills or oil, fuel, and toxic chemicals, based on a spill contingency plan will prepared by Consultant for government, within one week of the commencement of the Project.	Contractor	Dinas and DFT	Operation Phase
Maintenance of Storm Water Drainage System		The drainage system will be periodically cleared so as to ensure adequate storm water flow. Local community groups under contract from Dinas will be responsible for cleaning the drainage facilities especially clearing the clogging of drains, cutting of grasses, and clearing the shrubs, etc. Employing local people will be efficient and effective, as well as economic as these localized problems can be easily resolved at the early stages.	Contractor	Dinas and DFT	Operation Phase
Ecological Resources					
Afforestation along the roads		Plantation and maintain designated areas by local community along the road, on token payment basis is recommended. A portion of the profits raised from the trees and plants (e.g., from the sale of timber) can be given to the community.	Local groups of women or landless people	Dinas and DFT	Operation Phase

FREQUENCY OF ENVIRONMENTAL MONITORING

Impact	Location	Means of Monitoring	Frequency of Monitoring
Construction Phase			
Sourcing of Spoil	All borrow sites. Refer to maps of borrow materials.	Inspection of borrow pits	Spot checks
Soil Erosion	Along the links in West Sumatra and Kalimantan	Site inspection	Ongoing/monthly
Chemical Storage and Use	All construction camps	Site inspection	Ongoing/monthly
Construction Camp	Applied to entire project corridor. No camp inside the protected section of links 30 and 32.	Site inspection	Ongoing/monthly
Surface Water Quality	Throughout project corridor and at all associated work sites.	Measurement of DO, COD, BOD, SS, fecal coliforms, conductivity, turbidity, pH, oils and greases and temperature	Monthly or after pollution event
		Site Inspection	Ongoing/monthly
Dredging Spoil	Throughout project corridor at all construction sites	Analysis of benthic sediment for meals and organic content	Predredging
Dredge water runoff	Throughout project corridors, sites temporarily acquired and borrow areas.	Measurement of metals and SS	Monthly or after significant pollution event
Drinking Water Quality	Throughout project corridors.	Measurement of DO, pH, fecal coliforms, As and Fe	Monthly or after significant pollution event
Air Quality and Dust	Throughout project corridors, access roads, construction sites and borrow areas.	Measurement of dust and TSP	Monthly or after complaint
		Measurement of NO _x , SO ₂ , Pb, CO and THC	Before construction and midway through construction
		Site inspection	Ongoing/monthly
		Inspection of aggregate, asphalt and cement facilities.	Spot-checks
Noise and Vibration	Throughout project corridors, construction sites and borrow areas.	Measurement of noise dBA	Monthly or after complaint
		Consultation with the Community	Ongoing
Forest Encroachment	Links 30 and 32, West Sumatra	Site inspection	Ongoing
Exploitation of Trees	Links in West Sumatra and South Kalimantan	Regulate strictly IPK (Land Clearing) Permit	Ongoing

Impact	Location	Means of Monitoring	Frequency of Monitoring
Health and Safety	Construction camps of entire project	Site Inspection	Ongoing/monthly
Waste Disposal	Construction camps of entire project	Inspection of waste disposal sites and construction camps	Spotchecks
Community	Entire project corridor	Consultation with community groups	Before construction/Ongoing
Compensation Plan	Entire project corridor	Site inspection (temporary disturbances, trees, crops, construction camps etc.)	Ongoing
Socioeconomic	Entire project corridor	Poverty Reduction Monitoring Program	Twice during construction
Public Safety	Entire project corridor	Site inspection	Ongoing/monthly
Operational Phase			
Noise and Vibration	Only for links with AADT 10,000 or more	Measurement of noise dBA	Once every quarter or after a complaint for 5 years
Air Quality and Dust	Only for links with AADT 10,000 or more	Measurement of TSP, NO _x , SO ₂ , Pb, CO, and THC	Once every quarter or after a complaint for 5 years
Water Quality	Throughout project corridors, worksites and construction camps.	Measurement of DO, SS, conductivity, turbidity, pH, oils and greases and temperature	Once every quarter or after a complaint for 5 years
Socioeconomic	Entire project corridor	Poverty Reduction Monitoring Program	Once
Tree plantation and nursing	ROW width of 50m plus any areas to be cleared	Site inspection	Once every 6 months for 2 years

OUTLINE TERMS OF REFERENCE FOR CONSULTING SERVICES FOR STRENGTHENING CAPABILITIES IN ENVIRONMENTAL AND SOCIAL MANAGEMENT

A. Objectives

1. The objective of the services are (a) to help build up the capacity and procedures of DGRI's Sub-directorate of Environmental Affairs (SDEA) to undertake analyses of environmental and social impacts of road rehabilitation projects and to prepare environmental and social impact management plans in accordance with Government regulations and donor guidelines, and (b) to provide training on environmental and social management to the provincial sub-project management (Dinas) and design and field teams (DFT). This will be done through a program of technical assistance and training over a period of 3 months.

B. Scope of Work

2. The consultant's scope of work will include the following tasks:

- (i) reviewing prevailing government regulations and donor guidelines governing the assessment and management of environmental and social impacts of road rehabilitation projects;
- (ii) identifying the procedures and tasks required to be performed by SDEA to meet the requirements of these regulations and guidelines;
- (iii) reviewing the skills available within SDEA trainers and assessing the need for advance level training to strengthen the capability to review complex EIA problems;
- (iv) reviewing the skills of provincial sub-project management, design and field teams and assessing the need for training to establish the capability to meet environmental and social management monitoring requirements;
- (v) preparing a short-term staff training plan and associated materials to meet immediate needs;
- (vi) undertaking the training through a combination of hands-on assistance, on-the-job training, training workshops, and short-term advance level training in a training institute;
- (vii) evaluating the effectiveness of the training provided by measuring improvements in attitudes and skills achieved;
- (viii) prepare outline proposals for the longer-term development of SDEA's organization and capabilities.

C. Organization and Staffing

3. The services are expected to be provided over a three-month period by a small team comprising one domestic environmental/social and poverty specialist/team leader and one domestic curriculum and material development specialist.

Domestic Experts	No.	Total MM
Environmental Social/Poverty Specialist	1	3
Curriculum and Material Development Specialist	1	3
Total, Domestic Experts	2	6

4. The environmental and social/poverty specialist will be the training organizer with a minimum of 10 years experience in training environmental and social management of road infrastructure projects and must possess a relevant post-graduate degree

preferably Masters in civil engineering/environmental management. The curriculum and material development specialist will have similar education and experience.

D. Supervision

5. The team will work in association with the trainers of SDEA, reporting to the head of the sub-directorate on a day-to-day basis. Overall supervision will be by the Steering Committee established under DGRI's chairmanship to supervise implementation of the proposed Project as a whole.

E. Outputs

6. The team's outputs will include: (i) an inception report after month 1, reviewing SDEA's skills and training needs and setting out detailed proposals for training under the consultancy, (ii) an interim report after month 2, with details of materials developed and training provided to date, and (iii) a draft final report after month 3, containing a description of achievements, details of the training services provided, including all materials, an assessment of their effectiveness in meeting objectives, and recommendations for further training assistance.