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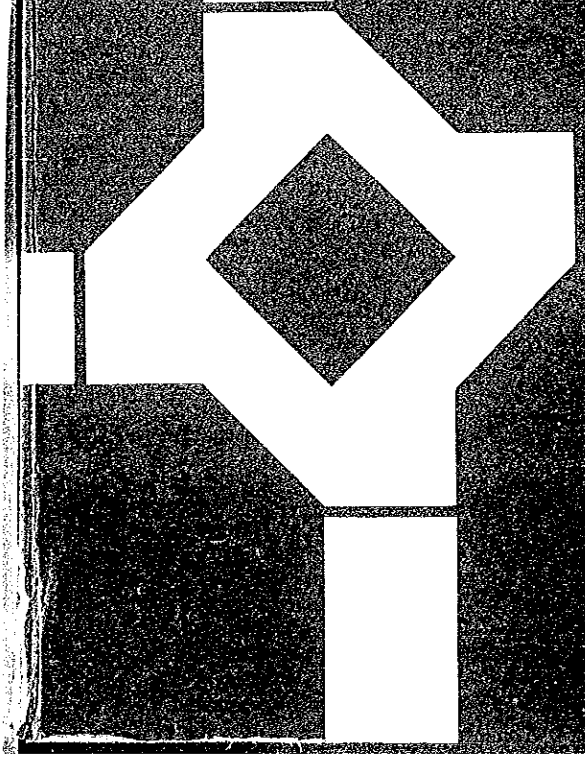
No. 9

MALAYSIA

Feasibility Study for Beluru/Long Lama/Limbang Trunk Road Construction Project in Sarawak

FINAL REPORT

Vol. I: TEXT



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March 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to the request of the Government of Malaysia, the Japanese Government has decided to conduct a feasibility study on the Beluru - Long Lama - Limbang Trunk Road Construction Project which constitutes a part of the 2nd Trunk Road Construction Plan of the Sarawak State.

Recognizing that this Project has a vital role to play on the socio-economic development of this area, the Japan International Cooperation Agency (JICA) dispatched to Malaysia a 5-member survey team headed by Mr. Haruo Yoshikoshi from February 21, 1978 to March 17 for preparation of a feasibility study. The feasibility study itself by the consultant team was carried out in July, 1978.

This report has been compiled on the basis of the field survey by the team, its discussion with officials concerned of Malaysia and further studies made upon its return to Japan.

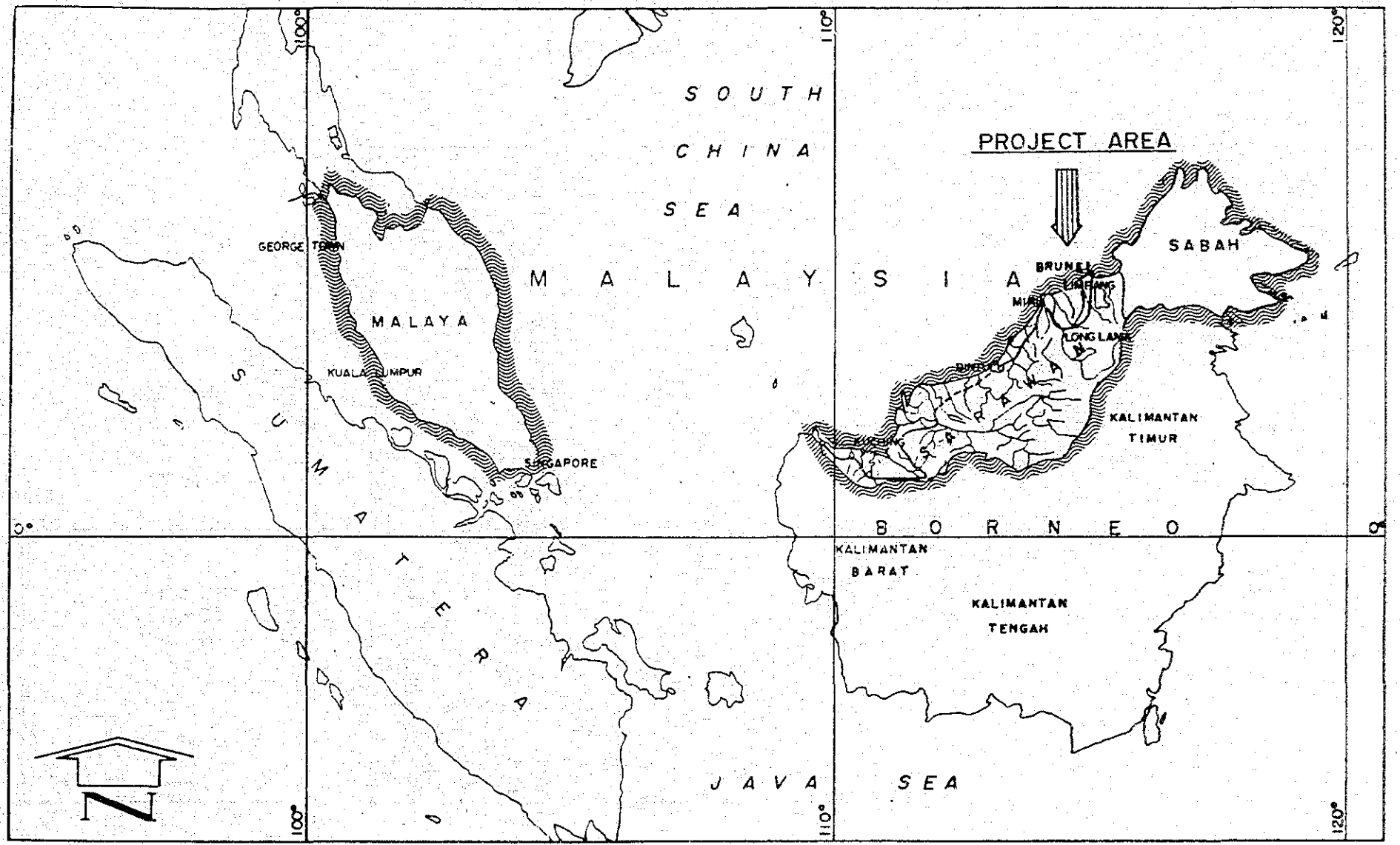
I hope this report will prove to be useful for the development of the Project and will contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of Malaysia for their close cooperation extended to the team.

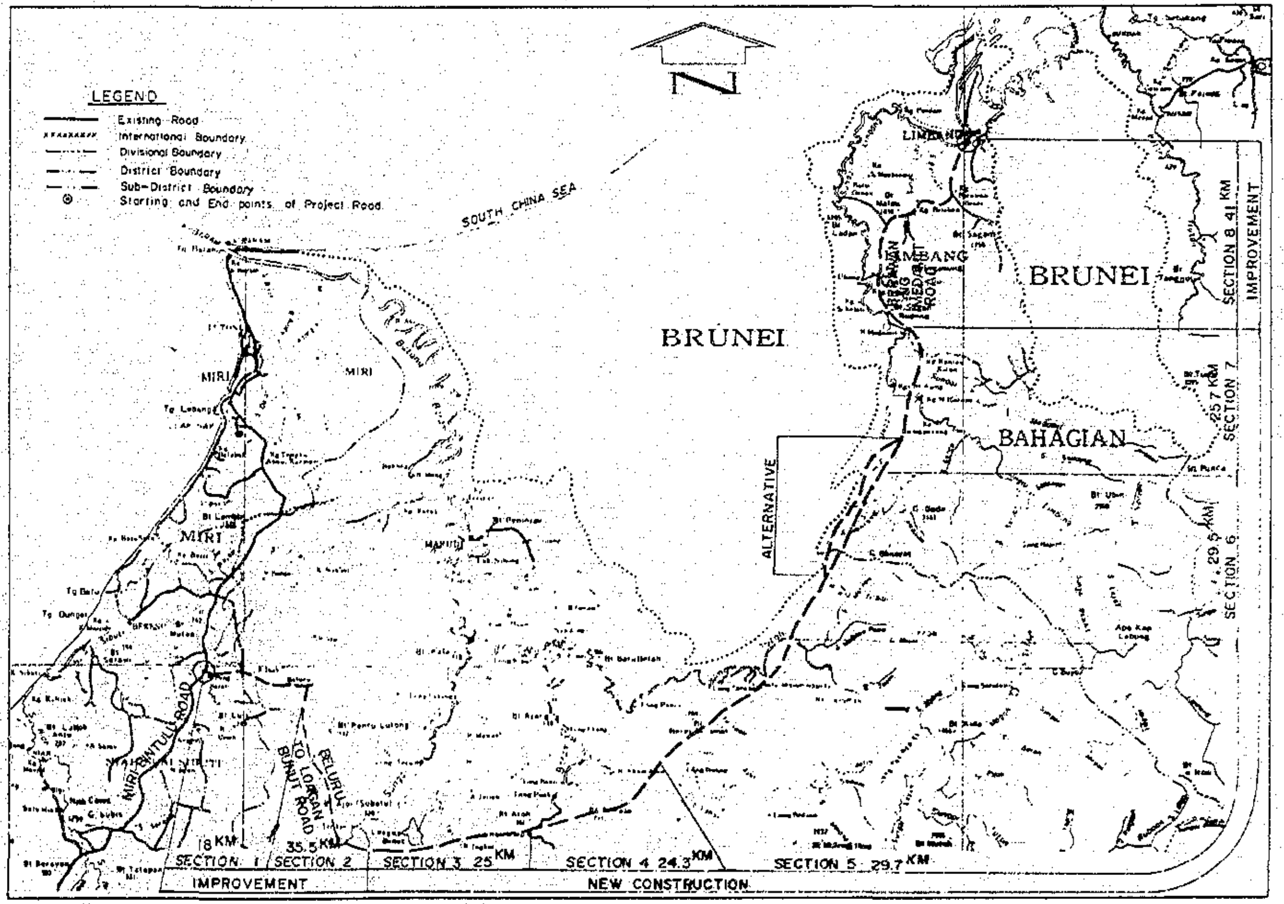
March, 1980

Keisuke Arita
President
Japan International Cooperation Agency

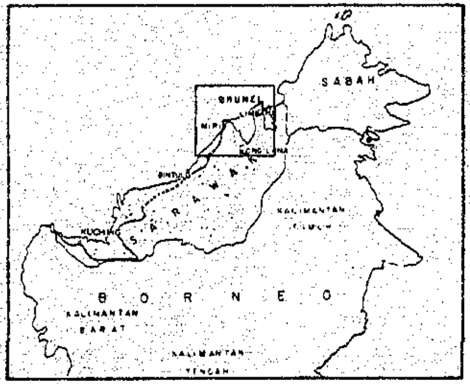
MAP OF MALAYSIA



LOCATION MAP



KEY MAP



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SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Study Area

01. The size of the Study Area is about 28,000 square kilometers (or about 10,800 square miles). It is located in the northern part of Sarawak State and encompasses part of Miri District and Baram District of the 4th Division, and Limbang District of the 5th Division. While the Study Area represents 22% of the entire area of Sarawak State, the Area's population estimated to be 136,000 represents only 12% of the state population. The only existing access between the 4th and 5th Divisions is a road via Brunei. This road, however, is by rivers and a waterway. A regular Malaysian Air System (MAS) flight operates between Miri and Limbang but is served by BN-2 type aircraft with a capacity of only eight passengers. In effect, therefore, the 5th Division is isolated from all other parts of Sarawak.

02. The Study Area can be divided into the following two categories based on the natural conditions and the status of regional development:

(1) The coastal area, where roads are relatively well developed and where urban development has advanced to a fair degree in Miri, Limbang, and other towns.

(2) The under-developed inland area comprising the basin of the Baram River which is the second largest river in Sarawak, the Limbang River, and their tributaries.

The coastal area including Miri town with a population of 40,000, and Limbang town with a population of 8,000, represents 2/3 of the total Study Area population and 1/3 of its size. Miri's importance as the center for the regional economic, social, and administrative activities has been increasing in recent years. This region is connected with Bintulu, where Sarawak's largest deep-water port construction and its hinterland development are currently being carried out, by a trunk road, which was completed in the early 1970s, and is 213 kilometers (132 miles) long. In areas along this road, oil palm

and other large scale agricultural development is being energetically accomplished. No notable development project is being implemented in Limbang, which is separated from other parts of Sarawak State.

In the inland area, on the other hand, rivers are in fact the only means of transportation aside from the limited air service. This area includes topography which ranges from flat swamp lands to mountainous lands, while the Project Road will traverse terrain which is mostly hilly. This area represents 2/3 of the Study Area's size, while its population is only about 48,000, or 1/3 of the Study Area's total population. Due to the absence of adequate transportation facilities, government services are limited in this area, which is one of the most under-developed areas in Sarawak State. The inhabitants live in community dwellings called "long houses," and form communities by race, along navigable rivers. Their living is based on the traditional and primitive slash-and-burn farming method with low productivity.

03. Agriculture and forestry are the major industries in the Study Area, where the manufacturing industry is undeveloped. Aside from oil palm development along the Miri - Bintulu Road, agricultural activities depend on low-productivity slash-and-burn farming. Major products are paddy (27,000 tons in 1976/77) for domestic consumption, rubber (6,500 tons in the same year) and pepper (1,200 tons in the same year) as cash crops. Forestry activity, is vigorous, and the production is high, reaching about one million tons/CF in 1976/77. It is an important export item not only for the Study Area but also for all of Sarawak State. Forestry production is also important to the inland inhabitants as one of their sources of cash income.

Transport Network and the Project Road

04. River network provides a time-consuming and rather expensive but only means of transportation in the major parts of the Study Area where road transportation is not available. Roads are limited to Miri, Limbang, and Marudi and their vicinity, and these cities are

not connected with each other by a road. Air service extends from Miri to Limbang and Marudi and connects a number of inland communities via Marudi, but the service frequency is limited and the aircraft capacity is small (normally only eight passengers). Although river transportation is well developed, it is only the K. Baram - Marudi - Long Lama section of the Baram River that is navigable for large ships (motor vessels of 100 to 150 tons or passenger launches of 50 to 60 passenger capacity) and all other parts of the rivers are served only by small, private boats called "long boats".

05. The project Road, when completed, will connect Miri and Limbang through the inland area, where rivers are the only existing means of transportation, for a total length of 237.3 kilometers (147.4 miles). Of this total extension, roads currently exist in Miri/Bintulu - Sg. Tinjar section for a length of 54.7 kilometres (34.0 miles) and in N. Medamit - Limbang section for a length of 41.4 kilometres (25.7 miles). The traffic is light on these existing sections, which are two-lane gravel surfaced and which function mostly only as feeder roads. The sections of the Project Road to be newly constructed will cross such major rivers as the Baram, Sg. Tutoh, and Sg. Apoh Rivers and run through moderate hills covered by jungle. The Project Road is largely divided into the following sections based on the regional conditions:

Project Road Sections	:	Length kms. (miles)	Current Status 1/
Miri/Bintulu Rd. - Beluru	:	18.4 (11.4)	Existing, ADT 176
Beluru - Sg. Tinjar	:	36.3 (22.6)	Construction nearly completed, ADT 10
Sg. Tinjar - Long Lama	:	26.2 (16.3)	Planned
Long Lama - Sg. Tutoh/Apoh	:	56.7 (35.2)	Planned
Sg. Tutoh/Apoh - N. Medamit	:	58.3 (36.2)	Planned
N. Medamit - Limbang	:	41.4 (25.7)	Existing, ADT 69-832
Total		237.3(147.4)	

1/ ADT (Average Daily Traffic) is that of 1978

Development Potentials and Transport Demand

06. The economic development potential of the Study Area is found to be chiefly in the agriculture, forestry, and tourism sectors, or, more specifically, in the following:

(1) Development of an area along the Project Road which will be suitable for agricultural development, with a total size of about 82,000 hectares including the Limbang Valley development of about 22,000 hectares now under study. In addition to the Limbang Valley development, it is estimated that small and medium scale agricultural development with a total size of about 10,000 hectares will become possible when the Project Road has been completed.

(2) The forestry development potential will fully support continued production at the current level. The Baram River and other major rivers will continue to be utilized for the shipment of logs even after the completion of the Project Road. The Project Road will facilitate supporting activities (workers' movements, inland delivery of materials) and timber processing activities, eliminating the necessity for transporting logs to the export points of either Miri or Limbang.

(3) The Study Area has substantially high and unique tourism development potential such as G. Mulu National Park, and area in the Baram River basin, as well as the Loagun Bunut Lake.

(4) The site conditions at Long Lama are favorable for development as a sub-regional center for the inland development. Upon completion of the Project Road, the importance of Long Lama will increase further since it will serve as the base to support the above discussed various development projects and as an educational, medical, and other service center for the inland areas.

Transportation demands including the factors mentioned above can be classified into the following four types, and have been estimated in the following Table.

a) Normal Traffic: Traffic on the existing parts of the Project Road, estimated based on the past trends and

future growth potential based on regional economic indicators.

b) Diverted Traffic: The passenger and goods traffic which will be diverted from the rivers, which are the only existing transportation routes, to the Project Road upon its completion. The construction of the Project Road will result in substantial reduction in time and cost of transportation for most of the inland areas.

c) Development Traffic: The passenger and goods traffic which will be generated by the implementation of various development projects discussed above, which will become possible by the completion of the Project Road.

d) Induced Traffic: The traffic which will be generated not because of an increase in total potential transport demand but by the reduction in transportation cost which will result from the completion of the Project Road. It is estimated that the construction of the Project Road will result in a 50% to 75% reduction in transportation cost in most of the area. The induced traffic also plays an extremely important role in this Project.

Summary of Forecasted Traffic Volume on the Project Road Sections (ADT)

Road Section	1985	1995	2005	Average Annual Growth Rate (%) 1985-95	1995-2005
Miri/Bintulu Rd. - Beluru	600	1,272	2,432	7.8	6.7
Beluru - Sg. Tinjar	307	664	1,233	8.0	6.4
Sg. Tinjar - Long Lama	311	669	1,227	8.0	6.3
Long Lama - Sg. Tutoh/Apoh	133	294	549	8.3	6.4
Sg. Tutoh/Apoh - N. Medamit	115	237	450	7.5	6.6
N. Medamit - Ukong Junc.	347	792	1,195	8.6	4.2
Ukong Junc. - B. Danau Junc.	366	819	1,223	8.4	4.1
B. Danau Junc. - Kubong Junc.	443	957	1,464	8.0	4.3
Kubong Junc. - Limbang	1,804	3,579	6,236	7.1	5.7

Engineering Background

07. The following are the studies and their findings which have been completed in order to evaluate the feasibility of the Project Road from an engineering point of view:

(1) Aerial photography of areas along the Project Road route, and preparation of topographic maps (in the scale of 1:10,000) from the aerial photographs.

(2) Soil investigation: Various laboratory tests on soil samples obtained from important locations along the planned Project Road route have resulted in finding no significant factors which would tend to obstruct the road construction.

(3) Test Borings: Test borings made at five bridge construction sites on three major rivers have established that a bearing layer can be reached at a depth of 8 to 28 meters.

(4) Construction materials investigation: This Project will require about one million cubic meters of aggregate for road sub-base, surface course, concrete, etc. Aggregate of an acceptable quality can be obtained locally in sufficient quantity chiefly from the vicinity of Batu-Niah, Batu Gading, and Ukong, as well as in Sg. Tutoh and other places--all within the Project Area. Although the unit production cost of aggregate is much lower in Kuching, the transportation cost by sea for a distance of about 700 kilometres makes the local procurement more economical.

(5) Hydrologic Analysis: Seasonal flooding affects the Project Area extensively due to the heavy precipitation of 3,500 to 4,000 millimetres (140 to 160 inches) per year and because of the gentle gradient of the rivers. Hydrological statistics for the rivers, the past flooding traces, flood volumes, topography, and other necessary data have been analyzed in order to determine the planned cross section of bridges and the elevation of the Project Road.

(6) Local contractor status: None of the local contractors are recognized to be capable of executing the Project work alone.

Design Standard and the Selection of Alternative Alignments

08. Two road design standards are currently available: the standard established by the Federal Government chiefly for use in Peninsular Malaysia and that established by the Sarawak State Government. The latter defines various road parameter for trunk roads and feeder roads, but neither of the two has any provision related to topography and, therefore, can be said to be realistic. The JICA Study Team has reviewed, in addition to these two standards, those established by other organizations such as AASHTO and Japanese Organizations, and, based on a comparison of construction costs under different standards, has formulated a recommended design standard as follows:

Recommended Design Standards 1/

	TRUNK ROAD			FEEDER ROAD		
1. Terrain 2/	F	R	M	F	R	M
2. Design Speed	80 (50)	64 (40)	48km/h (30MPH)	64 (40)	48 (30)	40km/H (25mph)
3. Pavement Type		–			–	
4. Surface Width (Pavement / Width)	7.32m	(24)		4.27m	(14)	
5. Usable Shoulder	3.05 (10)	3.05 (10)	1.22m (4)	2.44 (8)	2.44 (8)	2.91m (3)
6. Formation Width	13.42 (44)	13.42 (44)	9.76m (32)	9.15 (30)	9.15 (30)	8.53m (28)
7. Control Reservation		–			–	
8. Reserve Width	61/46m (200/150)			40/30m (1.32/99)		
9. Maximum Gradient (Normal / Absolute)	3 4	5 6	6% 8%	5 6	6 8	8% 10%
10. Critical Grade Length Against Absolute Condition	336 (1,000)	183 (600)	122m (400)	183 (600)	122 (400)	122m (400)
11. Stopping Sight Dist.–Min.	107 (350)	84 (275)	61m (200)	84 (275)	61 (200)	61m (200)
12. Passing Sight Dist.–Min.	549 (1,800)	458 (1,500)	336m (1,100)	458 (1,500)	336 (1,100)	336m (1,100)
13. Minimum Radius	305 (1,000)	220 (750)	153m (500)	214 (700)	153 (500)	100 (330)
14. Transition Curves Min. L	73 (240)	64 (210)	55m (180)	64 (210)	55 (180)	55m (180)
15. Widening	–	0.9 (3)	1.4m (4.5)	0.6 (2)	0.9 (3)	1.5m (5)
16. Superelevation Max./Min.	1:10				1:10	
17. Camber Cross Fall	1:38				1:30	
18. Vert Curves Crest Min. x	26 (85)	17 (55)	9m (28)	17 (55)	9 (28)	9m (28)
Sag Min. x	23 (75)	17 (55)	11m (35)	17 (55)	11 (35)	9m (30)
19 Oblique Grade	10	10.5	11.5%	10.5	11.5	11.5%

1/ Figures in parenthesis are in feet.

2/ F = flat, R = rolling, M = mountanous)

09. In an attempt to determine the best alignment for the Project Road, two alternative routes for the Bg. Baram - Sg. Tutoh section and three alternative routes for Sg. Tutoh - N. Medamit have been compared and evaluated, considering the engineering factors discussed above, social and economic conditions, and, particularly, the following:

- Avoidance of swamps and potential flood areas,
- Selection of the most suitable bridge locations,
- Avoidance of land where the topography would require substantial earthwork
- Provision of easy access to the major existing communities,
- Maximum use of access to areas where agricultural development potentials are present, and
- Minimization of the possible adverse effects of the road construction on the ecological system which should be preserved.

In the case of the Bg. Baram - Sg. Tutoh section, little difference in benefits was recognized between the two alternative routes, and, therefore, the shorter route has been selected because of the lower construction cost involved. As for the latter section, the best route has been decided based on the degree of effects on the ecological system of G. Mulu National Park, the effects of flooding, and the comparison of construction costs.

Preliminary Design

10. The selected optimum route for a total length of 237.3 kilometres or 147.4 miles has been divided into the following eight design sections, and more detailed engineering studies have been completed and a preliminary design has been accomplished based on the 1:10,000 scale topography maps:

Miri/Bintulu Road - Beluru Junction (18.4 kms or 11.4 miles)

This is an existing gravel surfaced road which has been constructed in accordance with the feeder road standard, and the road-side areas have been developed. To upgrade this road to conform with the trunk road standard, with the exception of Beluru Junction to Beluru town, which is to be left as is, the horizontal as well as vertical alignments of the Road must be improved and the existing one-lane wooden bridge

will have to be replaced by a two-lane permanent type bridge.

Beluru Junction - Sg. Tinjar (36.3 kms or 22.6 miles):

The construction of this road is currently being accomplished by Public Works Department of the Sarawak State. This gravel road is being constructed in accordance with the feeder road standard for 9.7 kilometres from Beluru Junction, with the remainder according to the trunk road standard. Sporadic slash-and-burn cultivation activities are seen in the road-side areas, where timber cutting is being actively pursued. All the required bridges are to be designed and constructed as permanent type bridges. Improvement is therefore necessary only for a length of 9.7 kilometres.

Sg. Tinjar - Batang Baram (26.2 kms or 16.3 miles):

Slash-and-burn cultivation is observed sporadically from Sg. Tinjar to an area south of Loagan Bunut, beyond which is jungle. Room for further development is seen on the left bank of the Batang Baram where there is a logging camp, forest roads have been developed on the range for carrying out the logs, and wet paddy have been developed in some parts. In the low land where the Project Road will go through, care was taken to select at least 10 meters above sea level and, at the same time, to maintain the earthwork to a minimum. Both a ferry and bridge crossing have been considered for the Batang Baram, and a study comparison of the two alternatives has been made. The construction of a feeder road from the left bank of the Batang Baram to Long Laput for an extention of 5.7 kilometres (3.5 miles) has also been planned.

Batang Baram - Sg. Apoh (25.4 kms. or 15.8 miles):

Forest roads have been developed and timber cutting is being done in the hilly part of this section. The Project Road will pass by Batu Gading, where aggregate will be obtained, and the timber camp of Sg. Temala, cross the Sg. Apoh, and reach R. Akam Ajang. Large bridges are not planned except for the crossing of the Sg. Temala and the Sg. Apoh.

Sg. Apoh - Sg. Tutoh (30.0 kms. or 18.6 miles):

This is a new road to be constructed in relatively low lying terrain covered by jungle. The route has been selected in order to avoid a peat zone as much as possible and to minimize the requirements for drainage structures. The following feeder roads to connect settlements have also been planned:

Long Bedian Road (23.4 kms or 14.5 miles)
Long Panai Road (11.4 kms or 7.1 miles)
Long Terawan Road (4.7 kms or 2.9 miles)

Sg. Tutoh - Sg. Medalam (32.5 kms. or 20.2 miles):

Because this new road is to be constructed through Mulu National Park, its route has been selected after careful comparison of three alternative routes. The portion of the National Park where this road will run through is hilly land covered by jungle, and the road alignment and river crossing points have been carefully selected. A feeder road has been planned from a point 1.3 kilometres from the Sg. Tutoh crossing to the existing base camp for an extention of 4.6 kilometres (2.9 miles) in order to provide access to the Mulu National Park.

Sg. Medalam - N. Medamit (27.1 kms. or 16.8 miles):

The entire extension of this road (to be newly constructed) will go through hilly lands, where slash-and-burn cultivation has been engaged in. Serious difficulties are not foreseen in construction. For the selection of crossing points for the highly zigzagging alignment from Sg. Limbang to Sg. Medamit, careful exploration and investigation have been completed.

N. Medamit - Limbang (41.4 kms. or 25.7 miles):

This is a gravel road which has been constructed under the feeder road standard. All bridges in this section are one-lane and mostly wooden structures, which necessitate the slowing down of passing automobiles. This road is to be improved to conform with the trunk road standard, and all bridges are to be replaced by permanent type 2-lane bridges.

Economic Analysis and Road Construction Plan

11. Economic assessment has been done in order to evaluate the economic feasibility of the Project implementation and to select the optimum road construction plan. The economic analysis has been made in terms of the internal rate of return, benefit/cost ratio, and net present value, based on the comparison of the project cost consisting of the required design and construction costs and the cost of maintenance throughout the project life (20 years from the commencement of the Project Road's service) with the direct project benefit of transportation cost savings both of which are expressed in economic prices. In view of the low level of predicted traffic volume on the Project Road, the following road construction plans have been analyzed in an attempt to assure the economy of investment:

Alternative Development Plans of Project Road for Economic Evaluation

Construction Stage	Description of Work	Initial Type of Road Surfacing	Code of Alternative
One-Stage Construction	Whole section will be opened for traffic in 1985 including the improvement of existing sections	Gravel	A.1
		Surface Dressing	A.2
		Bituminous Surfacing	A.3
Two-Stage Construction	Option A: 1st Stage (1985): New construction of Sg.Tinjar-Long Lama section plus improvement of existing sections 2nd Stage (1990): New construction of Long Lama-N.Medamit section	Gravel	B.1
		Surface Dressing	B.2
		Bituminous Surfacing	B.3
	Option B: 1st Stage (1985): New construction of Sg.Tinjar-Long Lama-G.Mulu Junction section 2nd Stage (1990): New construction of G.Mulu Junc.-N.Medamit section plus improvement of existing sections	Gravel	B.4
		Surface Dressing	B.5
		Bituminous Surfacing	B.6
Three Stage Construction	1st Stage (1985): Same as of the first stage of Option A of two stage construction plan 2nd Stage (1990): New construction of Long Lama-G.Mulu Junc. section 3rd Stage (1995): New construction of G.Mulu Junc.-N.Medamit section	Gravel	C.1
		Surface Dressing	C.2
		Bituminous Surfacing	C.3

The result of this analysis is shown in the table below.

Analysis Case	IRR (%)	8% Discount Rate				10% Discount Rate			
		Present Value (M$ 000)		B/C Ratio	NPV (B–C)	Present Value (M$ 000)		B/C Ratio	NPV (B–C)
		Cost	Benefit			Cost	Benefit		
A-1	7.45	188,002	178,781	0.95	–9,220	190,241	151,014	0.79	–39,227
A-2	7.69	197,690	192,363	0.97	–5,327	200,163	162,559	0.81	–37,603
A-3	7.92	206,616	205,437	0.99	–1,179	210,067	173,652	0.83	–36,415
B-1	9.07	142,802	155,962	1.09	13,160	139,247	129,798	0.93	–9,449
B-2	9.39	150,673	168,719	1.12	18,046	147,089	140,545	0.96	–6,544
B-3	9.62	158,209	180,772	1.14	22,564	155,079	150,723	0.97	–4,356
B-4	9.03	154,831	168,947	1.09	14,116	153,386	141,517	0.92	–11,869
B-5	9.35	162,210	180,153	1.11	17,943	160,666	150,771	0.94	–9,895
B-6	9.58	170,202	190,940	1.12	20,738	168,852	159,660	0.95	–9,192
C-1	9.83	129,793	149,843	1.15	20,050	125,946	124,573	0.99	–1,373
C-2	10.17	136,979	162,259	1.18	25,280	133,080	135,029	1.01	1,948
C-3	10.41	143,745	173,969	1.21	30,224	140,261	144,914	1.03	4,653

As indicated, stage construction plans will guarantee the economic feasibility of the project implementation and, further, that a 3-stage construction plan is expected to bring in greater economic benefits than a 2-stage construction plan. It should, however, be noted that increment of benefits due to 2-stage construction against one-stage construction is much bigger than that due to 3-stage construction against 2-stage construction. As to the type of road surface, the analysis results do not show any meaningful differences in economic benefits between alternatives, although paved road is slightly advantageous.

Likewise, the economic analysis was made for major road sections as is shown on the table below.

Project Road Sub-Section	8% of Discount Rate			10% of Discount Rate		
	Present Value (M$ 000)		B/C Ratio	Present Value (M$ 000)		B/C Ratio
	Cost	Benefit		Cost	Benefit	
Miri/Bintulu Rd. – Long Lama (80.9 kms.)	47,662	88,160	1.85	47,975	74,650	1.56
Long Lama – G. Mulu Junc. (56.7 kms.)	47,885	44,072	0.92	45,386	35,693	0.79
G. Mulu Junc. – Limbang (99.7 kms.)	104,898	55,511	0.53	110,027	48,295	0.44

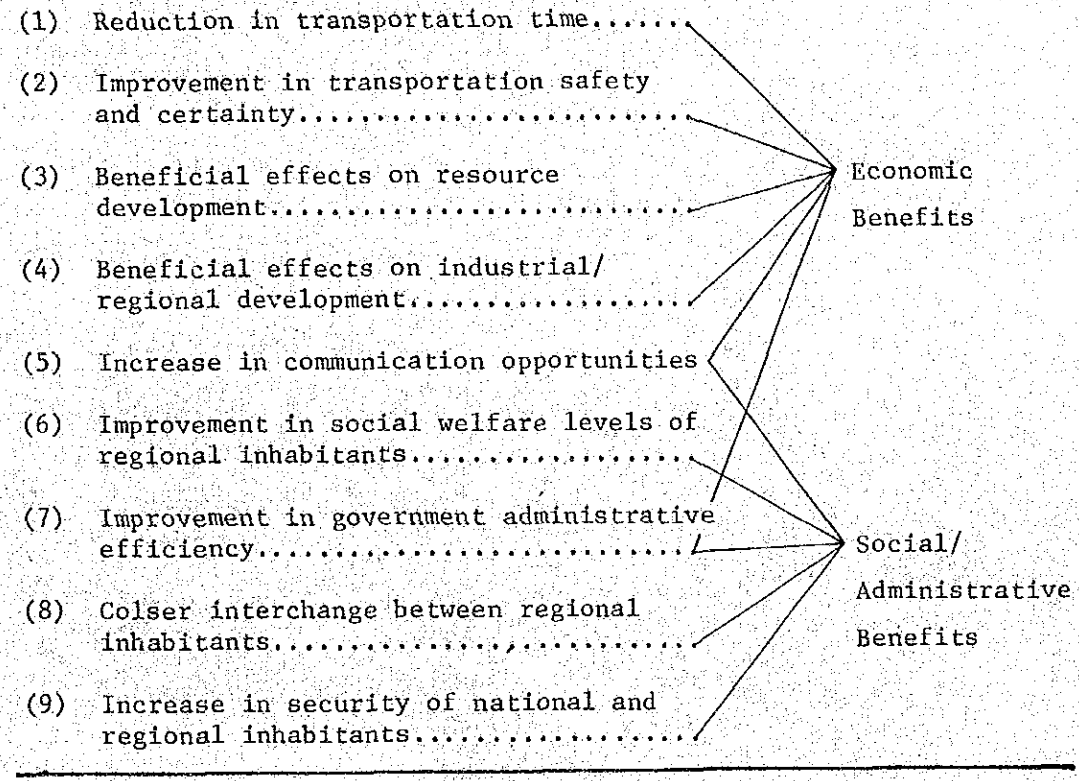
As indicated, the entire Project will depend heavily on the Miri/Bintulu Road – Long Lama section, which will have the greatest

economic effects, followed by Long Lama - G. Mulu Junction Section; sections beyond G. Mulu will have lesser economic effects.

The economic analysis made for the introduction of a ferry or bridge over Bg. Baram at Long Lama resulted in the conclusion that the bridge is economically advantageous.

12. The unique characteristic of this Project is that its implementation is expected to bring about social, economic, administrative, and other intangible benefits in addition to the quantitative benefits used for the economic analysis. Typical of such intangible benefits will be;

Miscellaneous Benefits of Project Implementation



Conclusion and Recommendations

13. The entire Project from Miri/Bintulu Road to Limbang is considered to be economically feasible. It is recommended, however, that the Project be implemented in the following stages in descending order of economic effects.

First Stage : Miri/Bintulu Road - Long Lama Section and N. Medamit - Limbang Section should be opened for traffic in 1985.

Second Stage: Long Lama - G. Mulu Junction including the bridge at Bg. Baram to be constructed by 1990.

Third Stage : G. Mulu Junction - N. Medamit Section to be constructed by 1995.

The Project Road should be constructed, in accordance with the guidelines of Road Note 31, first with surface dressing until the predicted traffic volume reaches a level when further upgrading to bituminous surfacing should be carried out. This level is expected to vary from 1 to 18 years after 1985 by section.

The relevant five feeder roads totalling 49.8 kilometers or 30.9 miles in length should be constructed together with the Project Road.

14. The estimated amount of project costs including that of feeder roads is M$197.8 million at 1979 prices of which M$107.1 million or 54.1% of the total cost is that of foreign component while the rest of M$90.8 million or 45.9% is local component.

Estimated Project Cost (M$ 000)

	Foreign Component	Local Component	Total	(%)
Trunk Road	94,855	80,286	175,141	(88.5)
Feeder Roads	12,195	10,496	22,691	(11.5)
Total (%)	107,050 (54.1)	90,782 (45.9)	197,832	(100.0)

Proposed disbursement schedule of the project cost is as follow:

Disbursement Schedule of the Project Cost

Implementation Phase	Year	Cost M$ 000	(%)	Remarks
1st Phase	1980-82	1,662		Engineering and Preparation
	1983-85	66,806		Construction and Supervision
	Sub-total	68,468	(34.6)	
2nd Phase	1986-87	1,088		Engineering and Preparation
	1988-90	70,971		Construction and Supervision
	Sub-total	72,059	(36.4)	
3rd Phase	1991-92	700		Engineering and Preparation
	1993-95	47,314		Construction and Supervision
	1997-99	9,291		Surfacing
	Sub-total	57,305	(29.0)	
Total		197,832	(100.0)	

15. In order to maximize the benefits expected to be obtained from the implementation of the Project, it is strongly recommended to promote the following schemes along with the Project Road construction:

a) Development of Long Lama as a sub-regional center

b) Utilization program of G. Mulu National Park

c) Programmed development of roadside agricultural potential areas

d) Development of major communities in roadside areas

e) Comprehensive tourism development in the entire study area