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STAFF APPRAISAL REPORT

MALAYSIA

SABAH - SARAWAK ROAD PROJECT

May 9, 1983

Transportation Division 2
Projects Department
East Asia and Pacific Regional Office

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CURRENCY EQUIVALENTS

Currency unit	=	Ringgit (M\$)
US\$1.000	=	M\$ 2.30
M\$ 1.00	=	US 0.43

FISCAL YEAR

January 1-December 31

MEASURES AND EQUIVALENTS

1 foot (ft)	=	0.3048 meters (m)
1 mile (mi)	=	1.6094 kilometers (km)
1 square mile (sq mi)	=	2.59 square kilometers (sq km)
2.204 lbs	=	1 metric ton (m ton)

ABBREVIATIONS AND ACRONYMS

ADT	=	Average Daily Traffic
EPU	=	Federal Economic Planning Unit
ERR	=	Economic Rate of Return
FELDA	=	Federal Land Development Authority
FPWD	=	Federal Public Works Department
FMP	=	Fourth Malaysia Plan
GDP	=	Gross Domestic Product
LNG	=	Liquified Natural Gas
MAS	=	Malaysian Airlines System
MRCU	=	Mechanized Road Construction Unit
PM	=	Peninsular Malaysia
SAFODA	=	Sabah Forest Development Authority
SLDB	=	Sabah Land Development Board
STOL	=	Short Take-Off and Landing Aircraft
SDO	=	State Development Office
SEPU	=	State Economic Planning Unit
SPWD	=	State Public Works Department
vpd	=	Vehicles Per Day

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This report is based on the findings of the Appraisal Mission consisting of Messrs. B.P. Coukis (Economist), W. Sikorski (Engineer-Consultant), H. Beenhakker (Regional Transport Advisor) and J.M. Verdier (Training Specialist) which visited Malaysia in September 1982.

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IBRD 16938: Sabah-Sarawak Road Project

INTRODUCTION

The Government of Malaysia has requested Bank Group assistance for the improvement of road infrastructure in the States of Sabah and Sarawak. The proposed project would assist the upgrading of rural trunk roads and the expansion of the agricultural road system in Sabah; support staff training in the Sabah and Sarawak Public Works Departments; help establish a road maintenance organization in Sarawak; and, through feasibility studies, help identify economically justified road improvements. In addition, the project would include a port development study covering the whole of Malaysia.

The project was prepared by the Federal Economic Planning Unit and by the State Governments of Sabah and Sarawak. A pre-appraisal mission visited Malaysia in February 1982 and this report is based on the findings of an appraisal mission comprising Messrs. B. P. Coukis (Economist), W. Sikorski (Engineer-Consultant), H. Beenhakker (Regional Transport Advisor) and J. M. Verdier (Training Specialist) which visited Malaysia in September 1982.

I. THE TRANSPORT SECTOR

A. Geographic and Economic Setting

1.01 The Federation of Malaysia consists of 13 states with a land surface of 337,000 sq km and a population of about 13 million. Eleven states are on the Malay Peninsula (135,000 sq km). The states of Sabah and Sarawak are on the island of Borneo and separated from the Peninsula by 650 km of the South China Sea.

1.02 Sabah and Sarawak have about 60% of the total surface of Malaysia, with Sarawak approximately twice as large as Sabah. Most of the production comes from exploitation of natural resources (timber, oil, gas), about 60% of the labor force is engaged in agriculture, and both states show large imports of food and manufactured products. The industrial sector is relatively undeveloped, and especially so if compared with Peninsular Malaysia (PM). Both states have considerable agroindustrial potential whose development is constrained by shortage of skilled and experienced staff and by poor road communications. The completion of an all-weather road system and a network of feeder roads penetrating into the rural areas is a pressing need for both Sabah and Sarawak.

Sabah

1.03 The State of Sabah (Map IBRD 16938) has an area of about 74,000 sq km and a strongly indented coastline with many natural harbors. The

climate is hot and humid, rainfall is between 1,800 and 3,800 mm with the heaviest precipitation between November and March. Total 1982 population is about 1.1 million (from 653,000 in the 1970 census), has been growing at about 5% p.a. over the past ten years, and includes immigrants from Indonesia and the Philippines. District centers are generally small and only Kota Kinabalu, Sandakan and Tawau are towns of any importance. The interior comprises highlands with summits from 300 to 1,000 m which, to the east, grade down to rolling terrain in the lower reaches of the main navigable rivers. To the west, the highlands are abruptly bordered by mountain ranges extending north-northeast throughout the state, and creating major obstacles in east-west highway communications.

1.04 Most of the land surface is mountainous and covered with dense forests. Until recently, the state economy relied primarily on forestry and logging but the importance of oil and copper is growing. Total value of exports has increased from M\$534 million in 1970 to M\$4,474 million in 1980. The corresponding values for imports were M\$499 and M\$3,061 million. From 1970 to 1980, gross domestic product (GDP) per capita increased from M\$1,286 to M\$2,023 and is expected to continue growing by about 3-4% in real terms. Government wishes to increase agricultural output by planting oil palm and cocoa and by extending assistance to rice farmers so as to bring down the food import bill which, in 1980, reached M\$353 million or 12% of imports. Statistics are lacking but there is a serious income disparity between the export-related activities and the subsistence sector which employs the bulk of the rural population. Labor shortages may cause continuing immigration from the Philippines and Indonesia.

Sarawak

1.05 The State of Sarawak (Map IBRD 16938) has an area of about 128,000 sq km and a 1982 population of about 1.4 million. In the south and east it borders Kalimantan and in the north it surrounds the Sultanate of Brunei. In the northeast it borders Sabah but there is no paved road connection between the two Malaysian States. The climate is hot and wet: temperatures are between 22° and 32°C and rainfall between 3,000 and 4,000 mm. Kuching, Sibü and Miri are the only large towns: almost 75% of the population lives in dispersed farm settlements or small villages with less than 1,000 population. The densest rural population concentrations are in west and central Sarawak.

1.06 Sarawak comprises a high interior zone grading down to a swamp plain that backs the coast. The plateaus in the interior have summits between 1,200 and 2,400 m and intervening valleys are narrow even when they contain major rivers. The coastal plain comprises deep peat swamps with little potential for settlement or agriculture. The swamp plain has greatly affected road communications: less than 100 miles of the coastal area is backed closely by hills. The main rivers drain west and north, are commonly free of rapids and have long provided the main lines of communication.

1.07 Sarawak exports petroleum, timber, rubber and pepper and imports food, beverages, chemicals, manufactured goods, machinery and transport equipment. The balance of trade has been positive since 1970 with surpluses of M\$11 million and M\$1,743 million for 1970 and 1980, respectively. Detailed statistics on domestic product and income are lacking but the available material suggests that GDP has increased from M\$911 million in 1971 to about M\$1,273 million in 1980. As in Sabah, there is a significant income disparity between the modern and the subsistence sectors. The Government is keen to promote rural development and to improve the quality of life in the hinterland but difficulty of access and lack of experienced staff hinder planning and implementation of development schemes. Poor communications are a major constraint to supplying adequate services and facilities to areas where living standards are low.

B. The Transport System

Road Transport

1.08 Details on the road sector in Sabah and Sarawak are given in Chapter II.

1.09 Between 1970 and 1981 the Sabah motor vehicle fleet grew from 35,000 to 136,000 and, at present, motorcycles represent 8%, cars 51% and trucks 23% of the total. Most of the fleet is based in major towns on the west and east coasts and its rapid growth caused correspondingly rapid traffic volumes which, in 1981, exceeded 1,000 vehicles per day on several rural trunk road segments. Traffic counts are carried out at selected points once or twice a year and show that trunk roads generally register more than 500 ADT; furthermore, it has been observed that when a road was upgraded to bitumen standard there is an upward surge of traffic reflecting pent-up demand. Public transport of passengers and goods is regulated by the Sabah Road Transport Authority. Bus licenses cover routes and maximum fares. Licenses for transport of goods regulate service regions and routes but not freight rates. The road traffic ordinance allows a maximum 9 ton single axle and 15 ton tandem axle load. Government has strengthened control of vehicle weight by installing at selected points of the road network 5 permanent weighing stations under the ongoing Third Highway Project.

1.10 In Sarawak, the motor vehicle fleet grew from 68,000 in 1976 to 128,000 in 1981. ADT near the main towns (Kuching, Sibul, Bintulu, Miri) is reaching several thousand vehicles, thinning out to between 200 and 600 on rural sections of trunk roads. Traffic counts are made at selected points once or twice a year and annual traffic growth in recent years was between 10% and 16%. The Sarawak Land Transport Department is responsible for licensing vehicles and issuing traffic regulations. The March 1982 ordinance permits maximum single-axle load of 9 tons and tandem axle of 14 tons, with

a maximum weight of 14 tons for 2-axle vehicles and 19 tons for 3-axle vehicles. Overloading is frequent, particularly of logging trucks, but control of vehicle weight is only by sporadic police campaigns.

Railways

1.11 Sarawak has no railways. The Sabah State Railway (96 miles) runs from Kota Kinabalu southwards to Beaufort and turns into the Crocker Range to reach Tenom. This was the first all-weather land transport facility to be built in the State but in recent years road transport has been competing and railroad traffic has decreased from 93,000 tons in 1975 to 51,000 tons in 1980. Passenger traffic increased from 775,000 journeys in 1975 to just over 1 million in 1980 and currently contributes about two thirds of the railway revenues. Nevertheless, the railway has been in deficit over the past few years, averaging about M\$2 million p.a. The recent completion of a paved road from Kota Kinabalu to Papar and Beaufort offers a better service and may be expected further to diminish railroad traffic. The Government has phased out railway passenger service between Kota Kinabalu and Beaufort as of March 1, 1983. However, railway service provides the only all-weather access from Beaufort to the logging areas around Tenom and this should continue because the difficult terrain between the Pegalan Valley and the west coast makes any road connection extremely expensive.

Maritime Transport

1.12 Both in Sabah and in Sarawak, the shortcomings of the all-weather road network explain the numerous ports and anchorages serving coastal and riverine traffic. When the trunk road network has been completed, port activity will most likely concentrate in Kota Kinabalu, Sandakan, Tawau, Labuan and Sapangar Bay (for Sabah) and in Kuching, Miri, Sibul and Bintulu (for Sarawak). Sabah ports handled a total of 600,000 tons in 1970 and 2.8 million tons in 1980 for an average annual increase of 16.6%. In Sarawak, the growth rate was lower (6.1%) and the 1970 and 1980 traffic figures were 1.6 million and 2.9 million respectively. Between 1970 and 1980 coastal trade between PM and Sabah/Sarawak increased from 800,000 to 1.4 million tons. Major ports are adequately serviced by international shipping companies while a large fleet of domestically-owned vessels services the smaller ports and anchorages.

1.13 In Sabah, the expansion programs of Kota Kinabalu and Sandakan ports were completed in 1976 and 1977 respectively: the handling capacity of the former was increased from 311,000 tons to 953,000 tons and of the latter from 335,000 to 624,000 tons. In Sarawak, construction of the new port in Bintulu started in 1979 to cater for both general and bulk cargo traffic as well as for handling of liquified natural gas (LNG), ammonia and urea. The expansion of Kuching port was completed in 1975 and increased capacity from 300,000 to 650,000 tons. Sibul port capacity was also expanded by 1977 from 175,000 tons to 450,000 tons.

1.14 Projections in the Fourth Malaysia Plan (FMP) show that over the 1981-85 period total cargo in Sabah is expected to increase from 2.8 million to 4.9 million tons and in Sarawak from 2.9 million to 6.5 million tons. In Sabah, the construction of an industrial jetty complex in Sepangar Bay and the expansion of Tawau port are scheduled for completion in 1983. Additional works will further expand the capacity of Kota Kinabalu and Sandakan ports from 900,000 to 2.5 million tons and from 600,000 to 1.2 million tons respectively. In Sarawak, work has been completed on the new port in Bintulu which handles in 1983, an initial throughput of 1.7 million tons subsequently to be expanded to 6 million metric tons annually. The port of Kuching will also be expanded by 1985 at which time capacity will have increased from 650,000 to 1.3 million tons. Port improvements have been made throughout Malaysia over the past few years and the need for more is envisaged. The time is ripe to consider port needs for the country as a whole and to examine port investments in conjunction with measures to improve efficiency in harbor operations.

Air Transport

1.15 Air transport volumes increased dramatically in Sabah and Sarawak between 1970 and 1980 although not by as much as in PM. In the late 1970s, extension of the Kota Kinabalu International Airport was completed, enabling it to receive wide-bodied aircraft, while improvement works were carried out on the Kuching International Airport, and the airports of Sandakan, Miri and Bintulu. The Malaysian Airline System (MAS) offers daily services among Kuala Lumpur, Kota Kinabalu and Kuching while foreign carriers operate direct routes between Sabah, Sarawak, Singapore, Manila and Hong Kong. MAS continued to give priority to internal air services in Sabah and Sarawak with the number of airports served increasing from 17 in 1972 to 25 in 1980.

1.16 During the 1981-85 period, air passenger and air cargo traffic are expected to increase by 10% and 15% respectively. In Sabah, improvement of Tawau airport was completed in 1981 while the expansion of Sandakan airport is underway to cater for medium-range aircraft, and further improvements to the Kota Kinabalu airport are to be completed in 1984. In Sarawak, new airports, catering for short and medium-range aircraft, are to be constructed at Sibu, Bintulu and Limbang. The expansion of the Kuching International Airport, including the construction of a new terminal building, cargo complex and other ancillary facilities, is scheduled for completion in 1983. Rural air services in Sabah and Sarawak will be expanded by providing more rural airfields and by introducing bigger short take-off and landing (STOL) aircraft.

C. Transport Planning and Coordination

1.17 In both Sabah and Sarawak, the State Economic Planning Unit (SEPU) and the State Development Office (SDO) have been integrated into a State

Office of Development in the Chief Minister's Department. The large expansion of public sector development programs in the 1970s imposed heavy strains, not yet relieved, on planning and implementation capacity. The Sabah and Sarawak state government structure provides an adequate framework for policy formulation, coordination of subsectors, and preparation and implementation of multisectoral programs. Full use is not being made of this potential because operating ministries lack adequately staffed planning and implementation units and SDO's do not have enough personnel to make up for these shortages.

1.18 In both Sabah and Sarawak, highway planning was, until recently, quite limited because the ministries concerned proceeded more or less on their own. Roads were built where needed and, subject to the funds available, maximum lengths were the objective, rather than careful selection of economically justified links constructed to sound standards. For a long time, maintenance of existing facilities received a much lower priority than construction. As a result, many roads became impassable during the rainy season and others required heavy repairs shortly after construction was completed. Over the last few years, the SEPUs and the State Public Works Departments (SPWDs) in both States have become aware of the importance of maintenance and of the fact that planning and intersectoral coordination have tangible benefits. However, maintenance organizations are only now being established and trained personnel is lacking.

D. Previous Bank-Financed Projects

1.19 This would be the eighth Bank-financed transportation project in Malaysia, the fourth in Sabah, and the first in Sarawak. The First Port Project in Sabah (Loan 774-MA of US\$16.1 million in 1971); the Railway Project (Loan 799-MA of US\$16.0 million in 1971); the First Highway Project (Loan 851-MA of US\$16.0 million in 1972); the Second Highway Project (Loan 931-MA of US\$19.5 million in 1974); and the Urban Transport Project for Kuala Lumpur (Loan 1214-MA of US\$26.0 million in 1976) have all been completed albeit with delays due to contractors' mobilization difficulties, late ordering and receipt of materials, project management problems, late issue of permits and licenses, land acquisition difficulties, and removal of squatters from right-of-way. The Third Highway Project (Loan 1376-MA of US\$35.0 million in 1977) is virtually completed except for one section on the East Coast Road in Sabah where the contractor experienced severe financial problems. After substantial delays he has secured additional financing and completion is expected in mid-1984, about 30 months behind schedule. The Bank has agreed to a 2-year extension of the closing date to June 30, 1984. All other components have been satisfactorily completed. The Second Sabah Port Project (Loan 1580-MA of US\$13.0 million in 1978) has been virtually completed but is about 14 months behind schedule, due to

delays during the early stages of design and construction. The closing date was extended to June 30, 1983 but the overall project cost remains within appraisal estimates.

II. THE HIGHWAY SUBSECTOR

A. Road Network

2.01 In Sabah, the classified road network comprises 5,370 km, of which 1,660 km or 31% are bitumen paved and the remaining gravelled. Road density is 0.07 km per sq km. These indicators are inferior to those of PM where 86% of classified roads are paved and road density is 0.13 km per sq km. Roads are subdivided into trunk and feeder, 1,760 km and 3,610 km, respectively. There is also considerable mileage of private access roads to logging areas and plantations. Road condition is generally poor, mainly because roads were built to lower standards than those required by current traffic volumes and composition. Although substantial road improvements have been made in recent years, much remains to be done. The emphasis is now on upgrading the existing roads, on building new roads to adequate standards and on maintenance.

2.02 In Sarawak, development of the road network has lagged behind that of Sabah and PM. In 1982 the total length of classified roads was 3,170 km, of which 807 km were bitumen paved, 2,255 km gravelled and 108 km earth roads. Paved roads represent 25% of the total length and road density is 0.025 km per sq km. Prior to 1958 there were only 130 km of roads located around larger towns and transport of passengers and goods was by river and coastal shipping. Roads are divided into trunk (970 km), feeder (1,340 km), and rural (860 km). In addition to the classified network there are private roads and logging tracks some of which will in future be incorporated into the state network. The first trunk road system joining Kuching with Sibul, Bintulu and Miri was completed in 1982. The Government aims to build the second trunk road system situated more inland, to provide access to several isolated areas, and to connect with the Sabah network through Limbang and Lawas.

B. Administration, Staffing and Training

Sabah

2.03 The State Public Works Department (SPWD) of the Ministry of Infrastructure Development is responsible for planning, design, construction, maintenance and administration of the highway network, construction and maintenance of airfields, some ports, government building, drainage,

water supply and sewage disposal. SPWD field organization comprises divisions, districts and construction teams (Chart 1). The Assistant Director in charge of the Road Branch supervises all matters related to the highway network. At the headquarters level, Road Branch includes sections for planning, design, major projects and maintenance. The Mechanical Branch, responsible for equipment, operates on a commercial accounting basis, charging rates allowing for equipment depreciation. The Mechanical Branch includes planning and control units, accounts, central workshop and store, divisional, district and project unit workshops and a quarry section. A computerized vehicle and equipment management system is now being put in place.

2.04 The Road Branch has a total staff of about 3,300: this includes some 100 engineers and technicians, 200 foremen and overseers, 300 administrative and clerical staff, 1,200 skilled and semi-skilled personnel and about 1,500 laborers. The road maintenance unit employs about 1,900 staff: about 15 engineers and technicians, 100 foremen and overseers, 400 operators and drivers, 235 administrative and other skilled personnel and 1,150 laborers. To maintain and repair the SPWD fleet of 2,280 major items (560 vehicles, 740 trucks, 750 earthmoving equipment, and 230 pavers, hot mix plant, stone crushers and other ancillary plant), the Mechanical Branch employs a total of about 1,100 persons: about 10 engineers, 40 technicians, 130 foremen and senior tradesmen, 150 tradesmen and 620 administrative and other skilled and semiskilled personnel and 150 laborers. Since 1975 the growth of SPWD personnel was about 15% per year which was indispensable in terms of numbers but left much to be desired in terms of skills.

2.05 Recruitment of skilled and experienced personnel is hampered by state-wide labor shortages and relatively low salaries. Professional posts are usually filled by newly graduated engineers. Practically all supervisor posts have been filled by young school-leavers or older, experienced but poorly educated laborers and tradesmen. For vehicle and equipment maintenance, repair and operation, SPWD has to recruit trade assistants and apprentices and to train them on the job. Under the Third Highway Project, consultants entrusted with the organization of road maintenance have provided substantial assistance to the SPWD training center, preparing manpower forecasts, new personnel schemes of service for internal promotion purposes, and training materials. In addition, they have trained nine local instructors and started the implementation of a comprehensive training program. These training efforts undertaken by SPWD have to be further supported and expanded so as to improve the skills of staff already in place and to fill vacancies (which for many posts can be done only by lateral transfer or internal promotion) with qualified and properly prepared personnel. Additional instructors and training materials are needed for this purpose.

Sarawak

2.06 The organization and responsibilities of the Sarawak SPWD (Chart 2) are similar to those of the Sabah SPWD: under the Department Director, the Assistant Directors are in charge of buildings, roads and airfields, armed forces works, water supply and sewerage, electricity supply, design and investigation, mechanical branch and administration. The field organization includes 7 divisions subdivided into 25 districts and 14 mechanized road construction units (MRCU) attached to the divisions. The MRCUs constitute the main organizational difference with the Sabah SPWD because they carry out by force account practically all construction of roads, airfields and site development. SPWD manpower is relatively large, about 10,000 men, of whom about 6,000 are daily paid. Engineers and equivalent grade staff are about 210, technicians 160, junior technicians and supervisors 430, administrative and clerical staff 600, foremen and overseers 580, artisans, mechanics, plant operators and drivers about 3,000. Divisional engineers have large responsibilities and dispose of large manpower; for example, the First (Kuching) and the Third (Sibu) Divisions, respectively, employ 2,500 and 1,400 persons.

2.07 The Assistant Director in charge of the Roads and Airfields Branch is responsible for the road network and airfields. The Branch headquarters office has 12 engineers, 91 technicians and 240 other staff. Mechanical Branch comprises central workshop and store, workshops in divisions, districts and MRCU depots, and quarry and asphalt premix units. The SPWD equipment inventory lists 3,100 major items including 350 light vehicles, 1,100 trucks, 1,470 earthmoving equipment, and 180 stone crushing, paving and major ancillary plant. About 30% of the equipment inventory is overaged.

2.08 Just as in Sabah, the Sarawak SPWD faces considerable training needs. There are few adequately skilled tradesmen for repair and operation of equipment and for surveying and supervision of field works. There is some organized training but staff is mainly trained on the job. Career development plans provide for internal promotion but few instructors and courses are available to prepare the staff for the examinations. Since 1962 the Road Branch operates the Junior Technical Assistants School, providing one year training courses for junior technical assistants employed by the Government in the fields of surveying, building, road construction, and water supply, followed by two years of practical training. To date, only 280 students have graduated and many were subsequently lost to the private sector. In 1982 there were only 30 trainees, and two West German volunteers served as instructors. The school has no residential facilities and a bare minimum of teaching aids and equipment. A mechanics mates school is in operation within the Central Workshop in Kuching. The school is run by a German volunteer, scheduled to leave in February 1983, and has very limited facilities (one classroom and part of a shed for about 15 trainees) and no space is available for its expansion.

C. Planning and Financing

2.09 In view of the relatively recent introduction of economic planning procedures in both Sabah and Sarawak, and taking into account the limited staff available, road planning pursues sound objectives with insufficient means. In both states, the emphasis is on the creation of an all-weather trunk road network connecting the main centers of production; on the expansion of the agricultural road system to support rural development; and on the establishment of sound maintenance practices. Identification of road improvements is done by the Road Branches of the two SPWDs working in collaboration with the respective State Ministries of Works. Collaboration is close and cordial but staff is short: the planning unit of the Sabah SPWD Road Branch consists of two engineers, one of whom is primarily responsible for the development of agricultural access roads. In the Sarawak SPWD, the Road Branch staff includes one senior executive engineer with an assistant for road planning and research. Staff in the two SEPUs involved in road planning is also responsible for planning every other form of physical infrastructure so that, not surprisingly, the overall capacity for long-term planning and monitoring of road transport development is rather low. Lack of staff has prevented the Government from devoting the attention it would have liked to give to such issues as vehicle regulation and licensing, transport pricing and cost recovery. Table 13 shows revenues generated by road and Table 14 gasoline prices. User charges in both states cover maintenance expenditures (Tables 1 and 2) but there is some doubt as to whether each class of vehicle (for example, small commercial cars versus logging trucks) pays its fair share. The appraisal mission discussed these policy issues with the Government and is satisfied that they will be confronted as more experienced staff becomes available over the next few years.

2.10 In both states, road construction and maintenance are financed by federal allocations and by the state budget. Highway investments have been growing rapidly: in Sabah they increased from M\$57 million in 1975 to M\$258 million in 1981 while the corresponding figures for Sarawak are M\$20 million and M\$66 million. Road maintenance expenditures have been growing by about 15% annually during the last five years both in Sabah and in Sarawak and the amount budgeted per km would have been sufficient for roads initially constructed to sound standards. However, most of the roads require extensive upgrading before they can be incorporated into the routine maintenance program. Tables 1 and 2 show details of expenditures incurred in recent years.

D. Design and Construction

Sabah

2.11 Feasibility studies and engineering design are carried out mainly by consultants, foreign or local, often working in joint ventures. The Sabah road design standards, applied to all new construction and improvement works, are patterned on the federal standards and specified in six groups: from 01 to 06 (Table 3). Roads of 01 and 02 standards are gravelled, while those of higher standards are bitumen paved. Pavement is designed on the basis of projected traffic and authorized axle loads. The SPWD materials laboratory assists in the design and supervision of works, has a staff of 8 engineers and 12 technicians; it requires some strengthening through the provision of additional geotechnical investigations equipment and training (para. 3.10).

2.12 Road construction and improvements are carried out by foreign and local contractors and by force account. Contracts for large projects are usually entrusted to foreign contractors who now carry out about M\$90 million worth of road works per year. Five Sabah contractors with adequate equipment, good organization and a total annual output of about M\$50 million are currently working on roads. In addition, a number of small contractors for road upgrading and resurfacing jobs carry out work of about M\$20 million per year. The road construction industry did not exist ten years ago but is now active and expanding. Its main problem is shortage of qualified technical staff and skilled labor and this explains the relatively high minimum wage of M\$ 12.5 (US\$5.4) per day. There is substantial immigration, numbering now about 80,000, of temporary laborers from Indonesia and the Philippines.

2.13 Force account operations are carried out by 4 project units under direct control of SPWD headquarters and by 8 divisional construction units. Project units provide the flexibility needed for urgent and remote works. The annual output of all force account operations is about M\$80 million.

2.14 Supervision of works and administration of contracts are carried out by foreign and/or local consultants and the Major Projects unit of the Road Branch. Large contracts are under direct control of headquarters and small-size contracts under divisional engineers. Supervision of works is organized and carried out in a satisfactory manner.

Sarawak

2.15 Design of roads and medium-size bridges is carried out in-house by SPWD which found this adequate and convenient for its force account operations. Large bridges are usually designed by specialist foreign consultants, and road feasibility studies financed by external aid are carried out

by consultants of the donor country. The local consultancy for highways is limited to individuals who can provide little more than surveying services, while the extensive use of PM consultants has not so far been required because of the prevalent method of force account construction. Design standards are not yet fully finalized, and those now in force are shown in Table 4. Pavement is designed on the basis of traffic projections. Trunk roads are usually built first with a gravel surface and are paved as traffic grows.

2.16 The investigation and design unit of the Road Branch is staffed by 3 engineers, 14 technicians and draftsmen and about 50 men for field surveys. In soil investigations the unit is assisted by the SPWD Central Materials Laboratory, which is fairly well staffed and equipped, but needs some additional equipment and assistance by a geotechnical engineer.

2.17 MRCUs were first established in 1962 and presently carry out practically all road construction and improvement as well as airfield and site development work. Personnel of a unit varies from 200 to 500, and equipment is allocated according to the work program. The total 1981 construction output of the MRCUs was about M\$ 110 million. Construction of large bridges is by foreign contractors. Smaller bridges and culverts are often built by local contractors. Sections of rural roads are built by contract, especially when the work is reserved for "bumiputera" contractors,^{/1} usually in contracts of an amount below M\$ 120,000. Some other works, including earthmoving and quarrying, are contracted, but the total of such work is less than 5% of the MRCU's combined output. There is a number of contractors registered with SPWD for civil works, roads, earthwork and quarrying but their experience is to a large extent limited to the private sector. The Government is planning to reduce the SPWD force account capacity and carry out more road work by contract, releasing some MRCU equipment and manpower for road maintenance. The Road Construction Sector Study, recently commissioned by the Federal Government, will include recommendations related to construction methods appropriate for Sarawak.

E. Maintenance

Sabah

2.18 Road maintenance has been strengthened with consultant assistance through the Third Highway Project and the recently organized maintenance unit extends downwards from SPWD headquarters through divisions and districts. District superintendents and divisional maintenance engineers are responsible directly to the chief executive engineer in charge of the

^{/1} Bumiputera contractor is an appellation reserved for contractors of a truly indigenous origin.

maintenance unit. They have personnel, equipment and funds reserved for road maintenance and accounted separately from other road expenditures. Equipment allotted in 1982 to road maintenance included 107 light vehicles, 160 trucks, 150 items of earthmoving equipment and 42 items of ancillary plant. A road inventory and a cost accounting system are currently being implemented.

2.19 Maintenance programs and budgetary estimates are prepared by divisional maintenance engineers and reviewed by the maintenance unit in headquarters. Annual maintenance expenditure is currently about M\$10,000 per km (US\$4,350), and about equal to the maintenance cost in PM, but the Sabah State Government considers it inadequate because of poor road conditions due to low standards allowed when roads were built, higher than in PM cost of labor, materials and equipment, and the fact that depreciation of equipment is not included in PM unit costs.

2.20 Funds for road maintenance come from a Federal Government allocation and from the State's own resources. The federal allocation of M\$6,200 per mile was provisionally increased in 1982 to M\$9,300 and applies only to roads with a minimum 14-foot width. The 1981 expenditures for maintenance of roads and bridges were M\$43.5 million, with an additional M\$9.9 million for remedial works on storm and flood damage. More figures related to maintenance expenditures are shown in Table 1.

Sarawak

2.21 In Sarawak there is no clear separation between road construction and maintenance. An engineer of the Road Branch is responsible for monitoring maintenance budget and operations. Maintenance accounts are in principle separated from other road expenditure accounts. For budgetary purposes, maintenance costs are estimated on the basis of road mileage and weighted average costs. The federal allocation is as in Sabah: currently M\$9,300 per mile per year. The Sarawak SPWD estimate (quoting the same arguments as Sabah in para. 2.19) for adequate maintenance is an average of M\$16,000 per mile leading to a total requirement of M\$32 million, while the 1982 allocation was about M\$20 million.

2.22 The State Government of Sarawak has decided to improve road maintenance by setting up a maintenance unit in SPWD headquarters for programming, resource allocation, progress monitoring and cost accounting, and setting up, on a pilot basis, road maintenance organizations in two divisions: First (Kuching) and Third (Sibu). These divisions are responsible for 896 km and 402 km of roads, respectively, representing about 40% of the total network.

III. THE PROJECT

A. Objectives

3.01 The project has been cast in the context of the Government's developmental objectives and of the Bank's lending strategy for Malaysia. Sabah's and Sarawak's incidence of poverty is larger than that of peninsular Malaysia. The project would provide for access roads to support agricultural and agro-industrial activities in the rural areas of Sabah and would assist the future development of both Sabah's and Sarawak's transport networks so that both States can base the development of their transport system on concrete plans for agricultural, forestry and industrial growth. The project contains large staff training components for the Sabah and Sarawak SPWDs and, in addition, a separate component is designed to establish road maintenance organizations in two divisions in Sarawak. Assistance for policy formulation will be extended to the Federal Economic Planning Unit which would conduct a nationwide ports study and to both Sabah and Sarawak through the road transport review which would allow the two States to produce a coordinated program for road improvements and would further strengthen the collaboration among SDO's and SPWDs in project preparation and sectoral planning.

B. Description

3.02 The project consists of:

- (a) road improvements in Sabah comprising construction and upgrading of 192 km rural trunk roads and of about 100 km agricultural access roads;
- (b) staff training in the Sabah and Sarawak SPWD;
- (c) strengthening of Sarawak SPWD road maintenance organization;
- (d) a road transport review in Sabah and Sarawak and road studies in Sarawak; and
- (e) a national ports study.

Road Improvements

3.03 In January 1980, Government appointed consultants (joint venture of P. Fraenkel and Partners, Konsultant Kumpulan and Malaysia International Consultants) to carry out feasibility studies in Sabah for the improvement

of rural trunk roads totalling about 350 km and for construction of two major bridges. The Sandakan-Telupid and the Lahad Datu-Sandakan roads were among the items found to be economically justified and the Government requested the Bank to include their improvement in the project. The two bridges are located on the Lahad Datu-Sandakan road and will replace ferries on the Kinabatangan and Segama rivers. The Government considers replacement of the ferries as an essential measure, necessary to ensure rapid transportation in emergencies, and has undertaken to finance fully the construction of these bridges (para. 3.05). In July 1981 the Government commissioned the same consultants to carry out detailed engineering of the roads and bridges. The detailed engineering report and the drawings of project roads were reviewed by the appraisal mission and found satisfactory. Total length of trunk road improvements to be financed under the project would be 192 km, consisting of 75.4 km of the new Sandakan-Telupid road and 116.6 km of the Lahad Datu-Sandakan road (paras. 3.04 and 3.05). The engineering reports reviewed by the appraisal mission provide, in separate volumes for each project road, substantial geotechnical data obtained by the consultant from soil investigations related to subgrade conditions along the alignment of project roads, sources of road materials and aggregates, and the results of boreholes at the location of bridge foundations and deep cuts on new alignments.

3.04 The existing Sandakan (mile 33)-Telupid road (87.8 km) is the only unpaved section of the highway linking the eastern and western parts of Sabah. From Sandakan to mile 33 the road is paved. From mile 33 to Telupid, the road is situated on generally hilly terrain. It was built in the 1960s to low geometrical standards with gradients frequently in excess of 10% and in places as high as 14%. The present traffic is about 350 vehicles per day (vpd) about half of which are heavy vehicles including about 40 logging trucks. Vehicle speed is low because of poor road standards and rough gravel surface. Under the project, the road will be built to O5 standard (Table 3) partly on new alignment resulting in road length shortening of 12.4 km. The proposed construction standards imply 7.3 m wide asphaltic concrete pavement on a formation of 12 m average width. The works will include five new bridges of 20 m and 30 m spans, totalling 230 m.

3.05 The Lahad Datu-Sandakan road (121.8 km) is part of the East Coast road joining Tawau with Sandakan. The project section of the road joins the Sandakan-Telupid road at mile 32 (Labuk Junction). The existing road was built in the 1970s to gravel standards and has generally satisfactory alignment and gradients, except on about 20 km from Labuk Junction, where the vertical alignment requires improvement. The present traffic is about 450 vpd at Labuk Junction, growing to 800 vpd near Lahad Datu. Under the project, the road will be improved to O5 standards (Table 3). The works will consist of improvements of curves and gradients, widening of formation, drainage, pavement, and three new bridges totalling 120 m length. Two major bridges (Kinabatangan and Segama) would be built with the Government's own financial resources concurrently with road improvements. The Kinabatangan

bridge is designed by the consultant as a steel truss of 3 spans: 72 m, 144 m and 72 m, with approach spans of 25 m, while the Segama bridge is designed as a 3-span plate girder of 60 m, 90 m and 60 m. The appraisal mission discussed with the State Government bridge design and it is understood that tenderers would be requested to present alternative concrete structures. The construction contracts for the two major bridges would include approach sections of the new road totalling, respectively, 3.5 km and 1.75 km, which would thus be excluded from the project contracts. Assurances were obtained during negotiations that the Government would undertake and complete construction of the Kinabatangan and Segama bridges by December 31, 1987.

3.06 For the two project roads, the pavement proposed by the consultants would have 5 cm asphaltic concrete on a crushed stone base 15 cm on the Lahad Datu-Sandakan road and 18 cm on the Sandakan-Telupid road, 15 cm subbase and 25 cm selected subgrade. This pavement is expected to be adequate for 20 years provided a 5 cm asphaltic concrete overlay is applied after 10 years. Logging trucks exceeding legal axle limits of 9 ton for single axle and 15 ton for tandem axle should be prevented from using the project roads. Logging traffic has to be accommodated however and the Government proposes to use existing roads and tracks. Assurances were obtained during negotiations that necessary measures would be taken to bar logging trucks from using project roads without unduly constraining forest exploitation. This may be accomplished through adequate maintenance of the existing roads and tracks, through the installation of appropriate traffic warning signs, and through adequate traffic control at points of access to the project roads.

3.07 Agricultural access roads proposed for inclusion in the project would support agricultural development and improve rural living conditions by providing all-weather access to areas served seasonally or unreliably by road. A total amount of M\$ 50 million including supervision, and physical and price contingencies would be spent on improvements identified and evaluated by a working committee of SEPU, SPWD and SLDB officials. Candidate items may be existing roads requiring upgrading, or "penetration" roads whose construction will open up new agricultural areas. Out of five roads initially considered for inclusion in the project, the working committee has identified three economically justified roads: (a) the Sapi-Nangoh road (34 km); (b) the Lahad Datu-Bakapit road (29 km); and (c) the Tawau-Merotai road (21.6 km). Proposed improvements would be to standards 02, 03, or 04 (Table 3), depending on traffic considerations. For example, the Sapi-Nangoh penetration road would be built to 02 standards, while the Lahad Datu-Bakapit road would be improved to 04 standards because the present traffic is already about 500 vpd. Detailed engineering drawings for the Lahad Datu-Bakapit road, prepared by local consultants, were reviewed by the appraisal mission and found satisfactory. The construction cost of this road, including a 90 m bridge plus contingencies and supervision, is estimated at M\$ 20 million. For the other two roads, no engineering design was available at the time of appraisal and their combined total cost estimate of about M\$ 25 million was based on results of detailed engineering studies for similar roads in the area.

3.08 Bank financing of agricultural access road improvements will be subject to Bank final review and acceptance of the detailed design and of an economic evaluation showing economic rate of return of 12% or more. Detailed design and supervision will be carried out by local consultants and construction will be by contract.

Staff Training in the Sabah SPWD

3.09 The project would assist the Sabah SPWD in strengthening its manpower planning and training capacity. The SPWD training center would be given assistance through services of specialized consultants for (a) manpower planning; (b) training of local instructors; and (c) staff training. Training operations would cater to the needs of all SPWD sections, with emphasis on personnel in the Road and Mechanical branches. First priority will be given to the training of local instructors. Course syllabi will be prepared for (a) refresher courses, courses needed to facilitate internal promotion, and courses to help staff being transferred to new duties; (b) induction courses; and (c) basic training. Each training program will be designed so as to comply with personnel regulations regarding job descriptions, internal promotion, and examinations. Courses should be organized for all trades up to junior technician in respect of the existing staff (i.e., a combined 1982 total of about 700) and for the additional 250 new staff hired annually to fill vacancies. Thus, the training center would be required to cater, over a 3-year period covered by the project, for an output of about 500 trainees annually. In addition, seminars for higher-level staff would be organized, including subjects such as manpower planning and development, and monitoring and evaluation systems.

3.10 To achieve the above objectives the project would finance 180 man-months of consultant assistance over a 3-year period in a 5-member team composed of one manpower planning and development expert (team leader), and four specialists-instructors in engineering, mechanics, and equipment operation for 36 months each and in storekeeping for 24 months. In addition, services of a geotechnical engineer for a 12-month period would be provided to assist the SPWD materials laboratory. To strengthen the team's performance, the terms of reference should require that the experts acquire familiarity with the Malay language to communicate with the trainees in the subjects of their specialization. The project would also provide for ten local (or from neighboring ASEAN countries) instructors during a 3 year period and for fellowships of 3 to 6 months duration for 10 instructors and 5 professional staff of the SPWD. The list of teaching aids, equipment, tools, furniture, vehicles and materials required for the increased workload of the training center will be determined by the SPWD in cooperation with the consultant team. The list will include additional equipment for the Materials Laboratory costing not more than M\$300,000.

Staff Training in the Sarawak SPWD

3.11 The target group for training contains the staff working on road construction and maintenance, equipment, vehicle operation and repairs, and in building trades. The existing, and very limited, training facilities are located in an area where additional buildings cannot be constructed. The project will provide for construction and equipment of a new training center which will accommodate the existing school that would be extended to offer courses for works overseers and foremen, mechanical and building tradesmen, equipment operators and drivers. SPWD owns a suitable site at the Stutong Forest Reserve near Kuching where the training center can be built. The capital investment will include site development, classrooms, workshops, offices, stores, hostel, equipment, vehicles, tools, furniture, and teaching aids.

3.12 To assist the SPWD with the construction and operation of the new training center, with the preparation and acquisition of teaching aids, with the training of instructors and with the establishment of a comprehensive manpower management system, the project would finance the services of a 6-member consultant team composed of one management planning and development expert (team leader), five specialist instructors in engineering, buildings, mechanics, equipment operation and storekeeping. The team leader and the engineering and building trades instructors would provide services during 48 months, the instructors for mechanical trades and equipment operation during 36 months, and the instructor in storekeeping during 24 months. In addition, a geotechnical engineer would provide assistance to the Central Materials laboratory during a 9-month period. The total assistance will amount to 249 man-months. The team should mobilize in two stages: in the preparatory stage, it would consist of three experts required to assist in the design, in the supervision of construction and equipment of the training center and in the start of its operations. In the second stage, it would comprise the full team to carry out a training program with an annual output of about 600 trainees which in addition, would require about 20 local (or from neighboring ASEAN countries) instructors. The project would provide training fellowships for about 10 instructors and 5 professional staff of SPWD.

3.13 Completion of the new training center is the critical milestone for launching the proposed training program. It is estimated that construction would require about two years. Training activities should begin after one year, immediately after essential facilities have been completed. While design, tendering and construction of the Training Center is underway, Sarawak SPWD would carry out the following steps: (a) arrange for the creation of the required posts for instructors in the establishment list; (b) estimate optimum and minimum staff requirements; and (c) develop with the assistance of consultants a detailed training program for the different staff categories.

Road Maintenance Organization in Sarawak

3.14 The Sarawak SPWD proposes to strengthen its road maintenance organization to ensure adequate programming, resource allocation, execution of maintenance work, progress monitoring and cost accounting. These objectives require strengthening of the road maintenance unit at SPWD Headquarters. The project will also assist SPWD in setting up road maintenance organizations in the First (Kuching) and the Third (Sibu) Divisions. The Government regards these as first steps in a process which will eventually provide Sarawak with a thorough road maintenance organization.

3.15 For this purpose, the project would finance consulting services of one civil engineer and one mechanical engineer (for 3 years) and one accountant (for 2 years), a total of 96 man-months. The existing road maintenance facilities in Kuching and Sibu divisions will be upgraded and two new maintenance depots set up: in Balai Ringin in the First division and in Selangau in the Third division. The upgrading of existing facilities will include building improvements and provision of additional equipment and tools. The new depots would require land acquisition and development, construction of workshops, offices and stores and provision of workshop equipment and tools. Moreover, provision will be made for additional road maintenance equipment (4 graders and 8 rollers) for the new depot in Selangau.

Road Transport Review and Feasibility Studies

3.16 The growth of the Sabah and Sarawak economies is expected to continue and this will strain the capacity of the road network. The project would include a review covering the road networks of the two States in order to: (a) identify constraints upon the optimal operation of road transport in the two States and between them; (b) identify constraints from inadequate road infrastructure upon agricultural, forestry and other resource development; and (c) establish priorities for the expansion and improvement of the road transport network. The project would finance the provision of about 80 man-months of consulting services to perform the above tasks.

3.17 The review will identify priorities in development of trunk and feeder roads in Sabah and Sarawak. While Sabah has prepared feasibility studies and detailed engineering for a number of roads, in Sarawak such studies are still to be done. To assist Sarawak in compiling a portfolio of economically justified road improvements, selected on the basis of priorities established by the road transport review, the project would provide for studies of about 500 km of trunk roads and of about 100 km of feeder and rural roads.

National Ports Study

3.18 At Government's request, the project would finance the foreign exchange cost of a National Ports Study for the whole of Malaysia. The aim

of the study would be to review existing port facilities and current administrative practices, and to prepare a long-term port development program including both an investment plan and measures for operational improvements. The study would be carried out by specialized consultants.

C. Cost Estimates

3.19 The total cost of the project, including 18% taxes in the local cost component and contingencies, is estimated at M\$340.2 million (US\$147.9 million), with a foreign exchange component of 58% or US\$86.0 million. Project components and costs are shown in Table 3.1.

3.20 Construction cost of rural trunk roads was estimated using quantities from detailed engineering studies and December 1982 base prices, checked against current contract rates in Sabah. The agricultural access roads component provides for a total allocation of M\$50 million, proposed by Government as a ceiling, and including contingencies and supervision. The cost of buildings for the Sarawak training center and road maintenance depots is based on estimated floor surface and 1982 costs per sq ft in Sarawak, while equipment, tools, furnishing and teaching aid costs were estimated on the basis of summary lists discussed between the Sarawak SPWD officials and the appraisal mission.

3.21 On the basis of experience from the Third Highway Project the supervision cost of rural trunk roads construction was estimated at 7% of the construction cost, with a 36% foreign exchange content in view of the substantial participation of local consultants in this type of services. Expatriate consultants including experts with non-academic as well as academic qualifications for training were estimated to cost an average of US\$10,000 per man-month, comprising remuneration, international travel, consulting firms' overheads and fees and local expense allowances. The all-cost inclusive rate for consulting services for the national ports study, road transport review, feasibility studies, and technical support was estimated at US\$12,500 per man-month in line with the current international rates for this type of services. The current average cost for local consultants is about US\$5,000 per man-month.

3.22 Physical contingencies are estimated at 10% of cost for road construction components on the basis of detailed engineering. The same percentage has been applied on the training, road maintenance and study components. The price contingency is based on the implementation schedule (Annex 1) and on the assessment of international price escalation trends: 8% in 1983, 7.5% in 1984, 7% in 1985 and 6% in 1986 and thereafter. The same price escalation trend applies to the local construction market conditions. The above assumptions lead to 22% price contingency being added to the cost of road construction. The same percentage was applied to all other components, which, taken together, account for a relatively small (13.5%) portion of the total project cost.

Table 3.1: PROJECT COST ESTIMATES

	M\$ million			US\$ million			Foreign exchange (%)
	Local	Foreign	Total	Local	Foreign	Total	
1. Road Improvements							
a. Rural trunk Roads, construction supervision	70.00	97.00	167.00	30.43	42.17	72.60	58
	7.50	4.20	11.70	3.26	1.83	5.09	36
Subtotal Trunk Roads	<u>77.50</u>	<u>101.20</u>	<u>178.70</u>	<u>33.69</u>	<u>44.00</u>	<u>77.69</u>	
b. Agr. Access Roads, construction supervision	15.00	21.00	36.00	6.52	9.13	15.65	58
	1.28	0.72	2.00	0.56	0.31	0.87	36
Subtotal Agr. Access Roads	<u>16.28</u>	<u>21.72</u>	<u>38.00</u>	<u>7.08</u>	<u>9.44</u>	<u>16.52</u>	
Subtotal Road Improvements	<u>93.78</u>	<u>122.92</u>	<u>216.70</u>	<u>40.77</u>	<u>53.44</u>	<u>94.21</u>	
2. Sabah Training							
a. Consulting services	1.24	2.90	4.14	0.54	1.26	1.80	70
b. Local instructors	0.76	0.32	1.08	0.33	0.14	0.47	30
c. Fellowships	-	0.40	0.40	-	0.17	0.17	100
d. Equipment, vehicles, tools, materials	0.40	1.60	2.00	0.17	0.70	0.87	80
Subtotal Training Sabah	<u>2.40</u>	<u>5.22</u>	<u>7.62</u>	<u>1.04</u>	<u>2.27</u>	<u>3.31</u>	
3. Sarawak Training							
a. Consulting services	1.27	4.01	5.28	0.55	1.74	2.29	70
b. Local instructors	1.52	0.64	2.16	0.66	0.28	0.94	30
c. Fellowships	-	0.40	0.40	-	0.17	0.17	100
d. Buildings	1.20	0.80	2.00	0.52	0.35	0.87	40
e. Equipment, vehicles, tools, materials	0.44	1.76	2.20	0.20	0.76	0.96	80
Subtotal Training Sarawak	<u>4.43</u>	<u>7.61</u>	<u>12.04</u>	<u>1.93</u>	<u>3.30</u>	<u>5.23</u>	
4. Sarawak Road Maintenance							
a. Consulting services	0.83	1.93	2.76	0.36	0.84	1.20	70
b. Land acquisition	0.20	-	0.20	0.09	-	0.09	-
c. Buildings and land development	1.20	0.80	2.00	0.52	0.35	0.87	40
d. Workshop equipment, tools, materials	0.24	0.96	1.20	0.10	0.42	0.52	80
e. Road maintenance equipment	0.50	2.00	2.50	0.22	0.87	1.09	80
Subtotal Maintenance Sarawak	<u>2.97</u>	<u>5.69</u>	<u>8.66</u>	<u>1.29</u>	<u>2.48</u>	<u>3.77</u>	
5. Studies							
a. Road Transport Review	0.69	1.61	2.30	0.30	0.70	1.00	70
b. Sarawak Road Feasibility Studies	0.45	1.05	1.50	0.19	0.46	0.65	70
c. National Port Study	1.38	3.22	4.60	0.60	1.40	2.00	70
Subtotal Studies	<u>2.52</u>	<u>5.88</u>	<u>8.40</u>	<u>1.09</u>	<u>2.56</u>	<u>3.65</u>	
Subtotal, Net Project Cost	<u>106.10</u>	<u>147.32</u>	<u>253.42</u>	<u>46.12</u>	<u>64.05</u>	<u>110.17</u>	
Physical contingencies 10%	<u>10.61</u>	<u>14.73</u>	<u>25.34</u>	<u>4.61</u>	<u>6.41</u>	<u>11.02</u>	
Subtotal	<u>116.71</u>	<u>162.05</u>	<u>278.76</u>	<u>50.73</u>	<u>70.46</u>	<u>121.19</u>	
Price contingencies 22%	<u>25.68</u>	<u>35.74</u>	<u>61.42</u>	<u>11.16</u>	<u>15.54</u>	<u>26.70</u>	
Total Project Cost	<u>142.39</u>	<u>197.79</u>	<u>340.18</u>	<u>61.89</u>	<u>86.00</u>	<u>147.89</u>	58
Front-end Fee on Bank loan	-	0.51	0.51	-	0.22	0.22	
Total Financing Required	<u>142.39</u>	<u>198.30</u>	<u>340.69</u>	<u>61.89</u>	<u>86.22</u>	<u>148.11</u>	<u>58</u>

Base cost estimates in December 1982 prices.

D. Financing

3.23 The proposed Bank loan of US\$86.22 million including a front-end fee of US\$0.22 million would finance 58% of the total project cost, equivalent to the foreign exchange component. The Government contribution of M\$142.4 million (US\$61.9 million equivalent) would include taxes amounting to about 18% of the total project cost.

E. Implementation

3.24 The Federal Economic Planning Unit would be responsible for the National Ports Study and the Road Transport Review for Sabah and Sarawak. The Sabah SPWD Director would be responsible for road improvement and SPWD training components and the Sarawak SPWD Director would be responsible for SPWD training, and road maintenance components under the overall responsibility of the Federal Ministry of Works and Utilities. Monitoring of project implementation would be carried out by joint working groups of the Sabah and Sarawak SPWDs and SDO's. Physical and financial progress reports from the implementing agencies would be submitted to the Federal Government and the Bank on a regular basis. Monitoring reports on project progress would be prepared by the implementing agencies and reviewed by the Federal Economic Planning Unit and the Treasury. Consultants engaged by the two States would assist the respective SPWDs in supervision of infrastructure works, staff training, road maintenance, and studies. Construction would be carried out by contractors. The project implementation schedule shown in Annex 1, was discussed and confirmed at negotiations. The project will not cause any environmental or ecological problems.

3.25 Land acquisition is significant only for the Sandakan-Telupid Road. Government has already commenced the procedure to acquire the necessary right of way and assurances were obtained at negotiations that this procedure will be completed by the time construction contracts are awarded.

3.26 Road construction will be carried out by equipment-intensive methods because labor shortages and the resulting high wages preclude the economic use of large numbers of unskilled laborers in construction.

F. Procurement

3.27 Trunk road construction contracts amounting to about US\$83 million would be awarded on the basis of international competitive bidding (ICB) according to the Bank Guidelines for Procurement. The trunk roads construction would be put to tender in four packages of about equal size: for the Sandakan-Telupid road, package (a) would cover the length from Telupid to

km 34.20 and package (b) from km 34.20 to mile 33. For the Lahad Datu-Sandakan road, package (c) would cover the length from Labuk Junction to Km 53.20 (Kinabatangan Bridge approach) and package (d) from km 56.70 to Lahad Datu. The access sections to the Kinabatangan and Segama bridges, respectively 3.5 km and 1.75 km would be excluded from the contracts: these sections are part of the proposed bridge improvements to be financed in total by the Government (para. 3.05). Agricultural access roads estimated at more than US\$2.5 million would also be procured by ICB, while roads estimated to cost below this amount, as well as buildings for the training center and for the maintenance depots in Sarawak would be procured by local competitive bidding (LCB) which is open to foreign contractors. The aggregate amount of LCB procurement would be about US\$7.0 million in about 12 contracts.

3.28 In April 1982, the Government published in the local press an invitation for prequalification of contractors for the Sandakan-Telupid and for the Sandakan-Lahad Datu roads, sending at the same time prequalification notices to the local representatives of 27 countries. The response was satisfactory: 43 construction firms from 10 countries, including domestic contractors, applied for prequalification.

3.29 Purchase of equipment and materials for the training and maintenance components would be by ICB for packages estimated at more than US\$200,000. Packages estimated to cost less than US\$200,000, would be procured according to local procedures, which are satisfactory. In the evaluation of equipment bids, local manufacturers would be allowed a margin of preference equal to the applicable customs duty or 15% of the c.i.f. price, whichever is lower.

3.30 Draft documents and contracts for works in excess of US\$2.5 million covering about 96% of the project's works component and for equipment in excess of US\$500,000 will be subject to prior review by the Bank. The Bank Guidelines will be followed for the procurement of consulting services, and all agreements for such services will be entered into under terms of reference and conditions satisfactory to the Bank.

G. Disbursements

3.31 Disbursements would be at the rate of: (a) 58% of total expenditures for civil works and buildings; (b) 100% of foreign expenditures for imported equipment, tools and materials or the ex-factory price net of taxes for items manufactured locally, and 70% of total cost of other local expenditures; (c) 100% of total expenditures for consulting services for studies and technical assistance, and 50% of total expenditures for works supervision; and (d) 100% of total expenditures for overseas fellowships. Disbursements would be against normal documentation except that statements of expenditure would be used for small purchases of equipment, tools and materials (items costing less than US\$10,000 equivalent each).

Based on these allocations and on the project implementation schedule (Annex 1), the schedule of cumulative disbursements has been estimated as shown in Table 5. It is expected that project loan disbursements will be somewhat faster than the typical profile established for highway projects in the region because the bulk of project expenditures is for the construction of road segments for which detailed engineering is completed and procurement procedures have already been initiated. Acquisition of right-of-way is not anticipated to cause delays (para. 3.25). Disbursements from the Bank loan would not exceed the foreign exchange component and are expected to be completed by June 30, 1989.

H. Accounts and Audits

3.32 All agencies involved in project implementation are subject to normal government controls and audit procedures which are satisfactory. They would each maintain separate project accounts. Assurances were obtained that all project accounts for each fiscal year would be audited by an independent auditor acceptable to the Bank; and that certified copies of audited financial statements would be forwarded to the Bank within nine months of the close of each financial year.

IV. ECONOMIC EVALUATION

4.01 Out of an estimated base project cost of US\$110.2 million, road improvement components account for about US\$94.2 million, or 86% and are justified on the basis of vehicle operating cost and maintenance cost savings estimated after a comparison of road facilities before and after improvement. Benefits from institution-building components (staff training, road maintenance organization, studies) cannot be satisfactorily quantified and have been excluded from the economic evaluation calculations which are summarized below.

A. The Sandakan-Telupid Road

4.02 The area of influence extends 20-30 km on each side of the Sandakan-Telupid road and contains about 7,000 inhabitants, expected to increase to 15,000 by the year 2000. The road serves a number of agricultural projects, whose full effect has not yet emerged. In addition, there are numerous committed projects scheduled to be launched during the FMP by the Sabah Land Development Board (SLDB), the Department of Lands and Surveys, and the Department of Agriculture. Forestry activities in the area continue to be important, with ten current concessions for forest exploitation, covering a total area of 120,000 ha. A large portion of the forests has

already been logged, leaving a balance of about 30,000 ha which, over the next 10 years, are expected to yield about 60 million cubic feet of timber. The overall prospects for the area served by the road are for increased agricultural activity with the emphasis on oil palm, rubber, rice and cocoa in both estate and smallholder settlement schemes. As projects mature, real incomes will increase and so will transport demand. Employment and income generated by logging activities will decline as current concessions expire by 1990 but forest clearance will continue to ensure that good quality agricultural land remains in ample supply. Land improvement will consolidate the town of Sandakan as the main import and export center for the Labuk-Sugut and the Kinabatangan Districts, and the higher economic activity is expected to increase traffic on the Sandakan-Telupid Road from about 300 vpd in 1980 to about 2,000 vpd in 2005. The economic evaluation compared construction and repaving costs of the proposed road with vehicle operating and maintenance cost savings expected to result from the road improvements. The basic parameter was the projected traffic growth. Traffic counts were carried out on two separate links: Link A101 - Mile 33 west of Labuk Junction to mile 53 and Link A102 - Mile 53 to Telupid.^{/1} Table 6 shows assumed growth rates and traffic forecasts for 1980-2005. Vehicle operating cost estimates are shown in Table 9. Road maintenance cost savings have been estimated by comparing the requirements of the existing road with those of the proposed one. Total savings are shown in Table 10. The net benefit streams (Table 8) show an economic rate of return of 17.6%. The sensitivity of the ERR was tested by varying costs + 10% and benefits + 10%. The ERRs range from 14.9% to 19.2%.

B. The Lahad Datu-Sandakan Road

4.03 For traffic analysis purposes,^{/1} the Lahad Datu-Sandakan road was subdivided into five segments, of which the last carries mostly local traffic in excess of 2,300 vehicles ADT in 1982.

Labuk Junction-Bukit Garam Junction (B201)	23.4 km
Bukit Garam Junction-Kinabatangan River (B202) ...	32.3 km
Kinabatangan River-Segama River (B203)	51.1 km
Segama River-Segama Junction (B204)	9.5 km
Segama Junction-Lahad Datu (B205)	5.5 km

4.04 The area of influence extends 15-20 km on each side of the road and contains about 35,000 persons, most of whom live in or near Lahad Datu.

^{/1} For details, see Sabah Rural Trunk Roads Feasibility Study in the Project File.

No official figures are available but rural population along the road is growing fairly rapidly and the area of influence may reach 75,000 inhabitants by the year 2000. There is ample agricultural land and the Department of Lands and Surveys, the Federal Land Development Authority (FELDA), and SLDB are sponsoring smallholder and estate schemes for the cultivation of cocoa, oil palm, coffee, pepper, rice and rubber. Logging output has been virtually exhausted but the Sabah Forest Development Authority (SAFODA) proposes to develop 5,500 ha of new forests at Batu Puteh, where the road crosses the Kinabatangan River. Further population growth in Lahad Datu (which over 1970-80 grew at an annual rate of 17%), increased exchanges between the Lahad Datu and the Sandakan and Kota Kinabalu areas, and the gradual maturity of settlement and estate development will strengthen transport demand and from 600 vpd at the Sandakan road junction, traffic is expected to reach over 3,000 vpd in 2005.

4.05 The economic evaluation compared construction and repaving costs with vehicle operating and maintenance cost savings associated with the proposed improvements, taking as key variable the assumed traffic growth rates for each link of the road. Table 7 shows traffic estimates for 1980-2005. Vehicle operating cost estimates are shown in Table 11. Maintenance cost savings would arise through lower maintenance expenditures on the improved road, compared with the higher expenditures necessitated by the unsatisfactory condition of the existing route. By road link, maintenance cost savings are shown in Table 12. The net benefit streams (Table 8) show an economic rate of return of 13.2%. The sensitivity to ERR was tested by varying costs \pm 10% and benefits \pm 10%. The ERRs range from 10.9% to 18.4%.

C. Agricultural Access Roads

4.06 Road works under this component are to support agroindustrial and/or agricultural projects and to serve the rural population. Agricultural access roads included in the project are in areas with existing and planned SLDB and FELDA plantations. For the development of plantations, SLDB, like FELDA, signs contracts with private organizations which do the land clearing, build service roads on the plantations and plant the young trees, primarily palm oil and cocoa. Depending on the size of the plantations to be developed, the contracts last from 2 to 4 years. After this period, SLDB/FELDA take over the maintenance of the plantations and their aim is to have the plantation workers become shareholders participating in profit-sharing once the young trees reach maturity. Funds for the construction of mills, such as those for the production of palm oil, are normally obtained from the private sector without difficulty.

4.07 The Sabah State Government has developed methodologies for the appraisal of improvements of existing access roads and for the construction of "penetration" roads, or roads which presently do not exist and will open

new agricultural areas. SEPU, PWD and SLDB have established a Working Committee to identify and appraise candidate roads. The committee, which is competent to carry out these tasks, is augmented by a FELDA official if proposed roads lead to FELDA plantations. Depending on the availability of data, access road improvements are appraised following the consumer surplus or producer surplus approach, or a combination of the two. The Working Committee investigated a number of candidate roads and proposed as a start the following three.

4.08 The Sapi-Nangoh Road (34 km) will support the development of an SLDB-sponsored oil palm scheme. The road starts at about the mid-way point of the project section of the Sandakan-Telupid road, leads northward to Nangoh and will eventually form a section of the planned East Coast road system to Pitas where it will join the West Coast roads. The Sapi and Nangoh plantations and the plantations along the road are expected to employ 2,300 rural poor. The construction of this road will also be beneficial to the planned development of the Trusan Sapi Padi (rice) estate to be located east of the proposed palm oil plantation along the road. The Lahad Datu-Bakapit Road (29 km) will serve major agricultural development areas such as the SLDB Silabukan I and II schemes, the FELDA-sponsored Tenku scheme as well as numerous smallholders cultivating cocoa along both sides of the proposed road. When fully developed, the SLDB schemes will employ about 2,200 persons while the FELDA scheme will support about 15,000. The existing road is a low standard gravel road, servicing an already productive agricultural area, where additional development schemes are in progress. The road forms a section of the existing road to Tengku and of the proposed road to Tambisan on the northeast coast thereby opening an extensive area hitherto inaccessible to rural development. The Tawau-Merotai Road (21.6 km) serves a population of 10,000 working on a total of about 48,000 ha of oil palm, cocoa, rubber and softwoods. SLDB, FELDA, smallholder and private schemes under exploitation or development are within the road's area of influence. Despite the road's poor condition which often requires closure after heavy rains, traffic volumes average about 800 vehicles per day.

4.09 The Working Committee (para. 4.07) found that the above three roads have ERR's of 12% or more and Annex Table 8 shows the net benefit streams of each. The Tawau-Merotai Road (ERR 19.8%) and the Lahad Datu-Bakapit Road (ERR 15.1%) are justified on the basis of vehicle operating cost and maintenance savings. The Sapi-Nangoh Road has been evaluated as part of an integrated agricultural development project which shows an ERR of 11.7%. The economic justification took into account the costs and benefits of an investment package consisting of the proposed road, of the further development of an isolated plantation near Nangoh, of a new plantation along the road, and of a mill with a capacity of 30 tons/hour to be increased, two years later, to 60 tons/hour.

D. Risks

4.10 There are no unusual risks associated with the project. Timely improvement of agricultural access roads in Sabah would depend on close collaboration among SEPU, SPWD and numerous agencies (SLDB, FELDA et. al.) involved in rural development. To improve inter-agency cooperation, the Government has established a working committee under the SEPU Director of Development and this group has prepared the evaluation of the roads included in the project. The possible delay in availability of right of way is taken care of by an early commencement of the land acquisition process (para. 3.25). The prequalification procedure launched in 1982 (para. 3.28) had indicated wide interest of foreign and domestic contractors promising keen competition for the proposed road construction contracts. The usual risk of implementation delays in individual components has been mitigated through the selection of high priority items: road improvements in Sabah concord with the State's highway development program and trunk road segments included in the project are in an advanced stage of preparation; improvement of the Sabah and Sarawak SPWD training capacity is urgent because of nationwide shortages of qualified manpower; road maintenance and road construction studies have high priority in Sarawak.

4.11 The possibility of optimistic assumptions regarding construction costs and benefits for the road improvement components has been tested by varying costs + 10% and benefits + 10%. The results are given in Table 4.1 and show that road improvements have an overall ERR of 15.0% with a range from 12.6% to 16.4%.

4.12 The sensitivity of the ERR has also been subjected to a switch value analysis at the 12% opportunity cost of capital. Table 4.2 summarizes the results of the analysis and shows the range within which actual costs and benefits can deviate from estimated levels without jeopardizing the economic justification of the proposed road improvements. The low values shown for the Sapi-Nangoh road reflect the need for careful implementation and cost monitoring of all the other components of the agricultural scheme to which the road belongs (para. 4.09).

Table 4.1: ROAD IMPROVEMENTS: SENSITIVITY ANALYSIS OF ERR (%)

Cost	Benefits	Sandakan-Telupid road	Lahad Datu-Sandakan road	Tawau-Merotai road	Lahad Datu-Bakapit road	Sapi-Nangoh road	All roads
As estimated	As estimated	17.6	13.2	19.1	15.1	11.7	15.0
+ 10%	As estimated	16.3	12.1	17.7	14.0	10.8	13.9
- 10%	As estimated	19.2	14.5	20.7	16.4	12.7	16.4
As estimated	+10%	19.0	18.4	20.6	20.4	12.6	16.2
As estimated	-10%	16.1	12.0	17.5	13.8	10.7	13.8
+ 10%	-10%	14.9	10.9	16.2	12.8	9.9	12.6

Table 4.2: SWITCH VALUE ANALYSIS

Road Improvement	Switch values	
	Costs	Benefits
Sandakan-Telupid road	+54.4	-35.3
Lahad Datu-Sandakan road	+11.0	- 9.9
Tawau-Merotai road	+69.4	-41.0
Lahad Datu-Bakapit road	+31.0	-23.7
Sapi-Nangoh road	- 3.2	+ 3.3
All roads	+29.3	-22.6

V. AGREEMENTS REACHED AND RECOMMENDATION

5.01 During negotiations, assurances were obtained with respect to the following:

- (a) that Government would undertake and complete construction of the Kinabatangan and Segama bridges by December 31, 1987 (para. 3.05);
- (b) that appropriate measures would be implemented to bar logging trucks exceeding the legal axle limits from using the project trunk roads in Sabah (para. 3.06); and
- (c) that the right-of-way acquisitions required for the Sabah road improvements would be completed before construction contract awards (para. 3.25).

5.02 Subject to the above, the proposed project would be suitable for a Bank loan of US\$86.22 million, with a 15-year maturity including a grace period of three years. The Borrower would be the Government of Malaysia.

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SABAH-SARAWAK ROAD PROJECT

Project Implementation Schedule

IBRD fiscal year calendar year quarter	FY84		FY85				FY86				FY87				FY88			
	1983		1984				1985				1986				1987		1988	
	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2		
Sabah Trunk Roads																		
Civil works																		
Tendering	---																	
Bid evaluation		---																
Contract award			---															
Construction																---		
Consultant services																		
Procurement	---																	
Bid evaluation		---																
Work supervision																---		
Sabah Agric. Access Roads																		
Engineering design																		
Procurement of contracts																		
Road 1			---															
Road 2				---														
Road 3					---													
Road 4						---												
Construction																		
Road 1																		
Road 2																		
Road 3																		
Road 4																		
Supervision services																		
Sabah SPWD Training																		
Consultant proposals	---																	
Contract negotiations		---																
Recruit additional local instructors																		
Fellowships																		
Training services																		
Sarawak SPWD Training																		
Consultant proposals	---																	
Contract negotiations		---																
Stage 1: Prep. services																		
Construction of training center																		
Recruit local instructors																		
Fellowships																		
Procurement of equipment																		
Stage 2: Training services																		
Sarawak Road Maintenance																		
Consultant proposals																		
Contract negotiations																		
Consultant services																		
Buildings & land dev.																		
Procurement of equipment																		
Sabah-Sarawak Road Transport Review																		
Consultant proposals	---																	
Contract negotiations		---																
Services																		
Sarawak Feasibility Studies																		
Consultant proposals																		
Contract negotiations																		
Services																		
National Ports Study																		
Consultant proposals	---																	
Contract negotiations		---																
Services																		

--- Provision for time over-run

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APPRAISAL OF THE SABAH-SARAWAK ROAD PROJECT

Documents and Data in the Project File

A. Reports and Studies on the Transport Sector

1. Fourth Malaysia Plan, 1981-1985 (Kuala Lumpur, 1981)
2. General Transport/Railway Study for Peninsular Malaysia (Canadian Pacific Consulting Services Ltd., 1978)
3. Yearbook of Transport Statistics - Malaysia 1980 (Ministry of Transport, Kuala Lumpur)

B. Reports and Studies Relating to the Project

1. Sabah Rural Trunk Roads - Feasibility Study (Peter Fraenkel et al., 1981)
2. Sabah Rural Trunk Roads - Detailed Engineering Report (Peter Fraenkel et. al., 1982)
3. Appraisal of the Sapi-Nangoh Penetration Road and Agricultural Investments in its Zone of Influence (Sabah SEPU, PWD, SLDB, September 1982)
4. Appraisal of the Lahad Datu-Bakapit Road (Sabah Sepu, PWD, SLDB, September 1982)
5. Appraisal of the Merotai-Tawau Road (Sabah SEPU, PWD, SLDB, October 1982)
6. Sabah: Statistical Background for the Proposed Sabah-Sarawak Road Project (Sabah, SEPU, 1982)
7. Sarawak: Statistical Background for the Proposed Sabah-Sarawak Road Project (Sarawak SEPU, 1982)
8. Sabah: Road Maintenance and Upgrading Programs - Status (Sabah SPWD, 1982)
9. Sabah: Program of Technical Support Services to Assist the Department in Staff Development and Training (Sabah SPWD, 1980)

10. Sarawak: Need for a Training Program for Mechanics and Plant Operators (Sarawak SPWD, 1982)
11. Terms of Reference for the Project Consulting Services
12. Development of a Road System in Sarawak (Sarawak SPWD, 1982)

C. Working Papers

1. Sabah Agricultural Access Roads: Working Papers
2. Sarawak: Improvement of SPWD Training
3. Sabah: SPWD Equipment List, 1982
4. Sabah: SPWD Establishment, 1982
5. Sarawak: SPWD Equipment List, 1982
6. Sarawak: SPWD Establishment, 1982
7. Sabah Rural Trunk Roads: Economic Analysis
8. Economic Rate of Return and Sensitivity Analysis Calculations
9. Detailed Schedule for Project Implementation

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SABAH-SARAWAK ROAD PROJECT

Sabah: Highway Capital and Maintenance Expenditures
(in M\$ million)

	1975	1976	1977	1978	1979	1980	1981	1982 (Est.)
<u>Capital Expenditures</u>								
<u>Federal Funded</u>								
Trunk roads	34.33	39.27	44.30	100.51	91.58	105.61	96.65	116.80
Agricultural roads	-	-	-	-	0.43	4.55	10.05	14.30
Subtotal	<u>34.33</u>	<u>39.27</u>	<u>44.30</u>	<u>100.51</u>	<u>92.01</u>	<u>110.16</u>	<u>106.70</u>	<u>131.10</u>
<u>State Funded</u>								
Federal & rural roads	10.91	4.46	11.33	22.54	37.51	63.00	77.64	48.00
District 8 council roads	5.34	4.71	7.02	9.83	19.24	38.57	35.46	5.00
Urban roads	6.29	3.68	6.52	7.78	9.68	20.76	38.80	44.00
Subtotal	<u>22.54</u>	<u>12.85</u>	<u>24.87</u>	<u>140.15</u>	<u>66.43</u>	<u>122.33</u>	<u>151.90</u>	<u>97.00</u>
Total	<u>56.87</u>	<u>52.12</u>	<u>69.17</u>	<u>140.66</u>	<u>158.44</u>	<u>232.49</u>	<u>258.60</u>	<u>228.10</u>
<u>Maintenance Expenditures /a</u>								
Road maintenance	18.82	22.49	21.78	28.06	32.67	36.24	43.45	52.00
Storm/flood damage repairs	0.16	0.43	5.40	2.61	4.27	5.55	9.91	5.00
Total	<u>18.98</u>	<u>22.98</u>	<u>27.18</u>	<u>30.65</u>	<u>36.94</u>	<u>41.79</u>	<u>53.36</u>	<u>57.00</u>

/a Include Federal and State funding.

Source: SPWD Sabah

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SABAH-SARAWAK ROAD PROJECT

Sarawak: Highway Capital and Maintenance Expenditures
(in M\$ million)

	1975	1976	1977	1978	1979	1980	1981	1982 (Est.)
<u>Capital Expenditures</u>								
<u>Federal Funded</u>								
Trunk roads	12.80	14.06	17.83	19.23	17.93	24.18	37.00	67.40
Feeder roads	1.47	3.08	4.06	4.88	6.16	9.86	8.80	13.82
Subtotal	<u>14.27</u>	<u>17.14</u>	<u>21.89</u>	<u>24.11</u>	<u>24.09</u>	<u>34.04</u>	<u>45.80</u>	<u>81.22</u>
<u>State Funded</u>								
Feeder roads	5.42	4.07	4.88	5.86	7.88	10.60	12.00	14.70
Rural roads	-	-	-	5.77	5.23	7.67	8.50	10.00
Subtotal	<u>5.42</u>	<u>4.07</u>	<u>4.88</u>	<u>11.63</u>	<u>13.11</u>	<u>18.33</u>	<u>20.50</u>	<u>24.70</u>
<u>Total</u>	<u>19.69</u>	<u>21.21</u>	<u>26.77</u>	<u>35.74</u>	<u>37.20</u>	<u>52.37</u>	<u>66.30</u>	<u>105.92</u>
<u>Maintenance Expenditures /a</u>								
<u>Total Expenditures</u>	<u>5.77</u>	<u>6.80</u>	<u>8.16</u>	<u>16.53</u>	<u>10.94</u>	<u>12.21</u>	<u>13.19</u>	<u>19.37</u>

/a Include Federal and State funding.

Source: SPWD Sarawak.

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SABAH-SARAWAK ROAD PROJECT

Sabah Road Design Standards

Design class	01			02			03			04			05			06		
Traffic ADT	below 50			50-200			200-500			500-1,000			1,000-2,000			above 2,000		
Pavement type	gravel			gravel			DBST			DBST			asphaltic concrete			asphaltic concrete		
Pavement width (m)	4.80			5.40			6.70			6.70			7.30			7.30 single or dual		
Reserve width (m)	20-40			30-40			40			40			40			45		
Terrain	M	H	F	M	H	F	M	H	F	M	H	F	M	H	F	M	H	F
Design speed (km/h)	30	50	60	30	50	60	50	65	100	50	80	100	65	100	100	65	100	100
Maximum gradient (%)	10	9	6	10	9	6	8	7	5	8	6	4	8	6	4	8	6	4
Critical length (m)	270	300	450	270	300	450	340	365	520	340	450	550	340	450	550	450	520	550
Shoulder (embankment) (m)	0.9	0.9	1.2	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.5	2.5	2.5	3.0	2.5	2.5	3.0
Shoulder (cutting) (m)	0.6	0.6	1.2	0.9	0.9	1.5	1.0	1.5	2.0	1.0	2.0	2.5	1.2	2.5	3.0	1.2	2.5	3.0
Maximum surelevation (%)	10	8	6	10	8	6	10	8	6	10	6	6	8	6	6	8	6	6
Minimum radius (m)	50	140	380	50	140	380	70	140	400	70	250	400	140	400	400	140	400	400

Note:

- ADT - average daily traffic
- DBST - double bitumenous surface treatment
- m - meters
- km/h - kilometers per hour
- M - mountainous
- H - hilly
- F - flat

Source: SPWD Sabah and Sabah Rural Trunk Roads Feasibility Study, G. Fraenkel & Associates.

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SABAH-SARAWAK ROAD PROJECT

Sarawak Road Design Standards

General design data	Road standard			
	Trunk	Feeder	Development	Rural
Design speed (mph)	50	30-40	30	30
Pavement width (ft)	24	14	14	14
Shoulders (ft)	10	8	5	5
Camber to road	1 in 38	1 in 30	1 in 30	1 in 30
<u>Super Elevation</u>				
- Maximum	1 in 12	1 in 12	1 in 12	-
- Minimum	1 in 38	1 in 30	1 in 30	-
<u>Horizontal curve radius</u>				
(ft) - Normal	1,000	700	500	500
- Maximum	750	500	300	150
Widening (according to)	MOT Tables	PWD Tables	PWD Tables	-
<u>Maximum Gradient (%)</u>				
- Normal	5	5	7	7
- Maximum	7	10	10	10
<u>Minimum vertical curve (ft)</u>				
(vision height 3 ft 9 in)				
- Normal	600	400	300	400
- Minimum	400	300	-	250
Reserve width (ft)	150-300	99-132	99	66-99
Pavement type	DBST or AC	DBST or gravel	gravel	gravel
<u>Side Drains</u>				
Width (ft)	6	3	3	3
Depth (ft)	3	2	2	2
Invert width (ft)	2	1.5	1.5	1.5
Berm (ft)	2.5	1.5	1.5	1.5
Maximum slope of embankment	1-1.5	1-1.5	1-1.5	1-1.5

mph = miles per hour, ft = feet, in = inches,
DBST = double bituminous surface treatment, AC = asphaltic concrete.

Source: SPWD Sarawak.

MALAYSIASABAH-SARAWAK ROAD PROJECTSchedule of Estimated Disbursements

IBRD Fiscal year & semester	Cumulative disbursements (US\$ million)	%	Regional disbursements profile (highways) (%)
<u>1984</u>			
1st	1,000	1	2
2nd	9,000	10	7
<u>1985</u>			
1st	16,500	19	14
2nd	26,000	30	23
<u>1986</u>			
1st	36,000	42	32
2nd	47,000	54	43
<u>1987</u>			
1st	57,000	66	53
2nd	67,000	78	62
<u>1988</u>			
1st	73,000	85	71
2nd	79,000	92	78
<u>1989</u>			
1st	83,000	96	85
2nd /a	86,220	100	90
			94
			96
			100

/a Closing Date - June 30, 1989.

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SABAH-SARAWAK ROAD PROJECT

Sandakan-Telupid Road

Traffic Forecast
1980-2005

	<u>Link A-101</u>				<u>Link A-102</u>				<u>Traffic growth rates (%)</u>		
	<u>1980</u>	<u>1986</u>	<u>1995</u>	<u>2005</u>	<u>1980</u>	<u>1986</u>	<u>1995</u>	<u>2005</u>	<u>1980/84</u>	<u>1985/94</u>	<u>1995/2005</u>
	<u>(ADT)</u>				<u>(ADT)</u>						
<u>Private Cars</u>									10	12.5	7.5
Normal	37	69	191	394	14	26	73	151			
Generated	-	14	38	79	-	5	15	30			
<u>Pick-ups</u>									10	12.5	7.5
Normal	37	69	191	394	21	39	107	220			
Generated	-	14	38	79	-	8	21	44			
<u>Jeeps</u>									10	7.5	5.0
Normal	68	115	216	352	60	101	188	307			
<u>Medium Trucks</u>									10	10.5	7.5
Normal	142	251	579	1,194	141	249	575	1,185			
<u>Logging Trucks</u>									Constant from 1980-1990		
Normal	-	-	-	-	40	40	-	-			
<u>Total</u>	<u>284</u>	<u>532</u>	<u>1,253</u>	<u>2,492</u>	<u>276</u>	<u>468</u>	<u>979</u>	<u>1,937</u>			

Source: Sabah PWD

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SABAH-SARAWAK ROAD PROJECT

Lahad Datu-Sandakan Road

Traffic Forecast
1980-2005

	Link B-201				Link B-202				Link B-203				Link B-204				Traffic growth rates (%)		
	1980	1986	1995	2005	1980	1986	1995	2005	1980	1986	1995	2005	1980	1986	1995	2005	1980/84	1985/94	1995/2005
	(ADT)				(ADT)				(ADT)				(ADT)						
<u>Private Cars</u>																	10.0	12.5	7.5
Normal	106	196	540	1,112	60	112	309	637	69	128	354	730	257	477	1,316	2,711			
Generated	-	39	108	222	-	22	62	127	-	26	71	146	-	95	263	542			
<u>Pick-ups</u>																	10.0	12.5	7.5
Normal	54	100	275	568	40	75	208	429	14	82	225	463	62	114	315	649			
Generated	-	20	55	114	-	15	42	86	-	15	45	93	-	23	63	130			
<u>Jeeps</u>																	10.0	7.5	5.0
Normal	89	151	282	460	41	69	129	210	63	106	199	324	150	253	474	772			
<u>Trucks</u>																	10.0	10.0	7.5
Normal	109	193	445	916	65	115	265	546	76	134	310	639	186	329	759	1,564			
<u>Total</u>	<u>358</u>	<u>699</u>	<u>1,705</u>	<u>3,392</u>	<u>206</u>	<u>408</u>	<u>1,015</u>	<u>2,035</u>	<u>252</u>	<u>492</u>	<u>1,204</u>	<u>2,395</u>	<u>655</u>	<u>1,291</u>	<u>3,190</u>	<u>6,368</u>			

Source: Sabah PWD

MALAYSIA
SABAH-SARAWAK ROAD PROJECT

Road Improvements: Net Benefit Streams
(M\$ '000)

Year	Trunk roads		Agricultural access roads			Total
	Sandakan- Telupid road	Lahad Datu- Sandakan road	Tawau- Merotai road	Lahad Datu- Bakapit road	Sapi- Nangoh road	
1	-21,774	-21,564	-6,025	-5,091	- 7,046	-61,500
2	-30,956	-30,190	-6,025	-5,091	- 6,222	-78,484
3	-30,956	-30,190	-6,025	-5,091	-11,839	-93,100
4	7,561	3,842	3,469	1,560	-15,740	692
5	13,204	8,974	3,643	1,765	- 5,205	22,381
6	14,341	9,892	3,823	1,980	58	30,094
7	15,989	13,410	4,014	2,204	718	35,835
8	16,955	12,001	2,816	2,432	2,252	36,456
9	17,047	13,225	4,425	2,649	4,719	42,065
10	19,847	14,334	4,646	2,883	4,427	46,137
11	21,282	14,527	4,878	3,131	8,572	52,390
12	20,983	17,784	5,123	3,396	10,744	57,940
13	24,118	20,754	3,980	3,669	12,616	65,137
14	25,619	20,283	5,646	3,932	14,398	69,878
15	25,578	21,443	5,929	4,222	14,836	72,008
16	31,437	23,421	6,225	4,521	15,037	80,641
17	31,618	17,719	6,538	4,815	14,910	75,660
18	27,754	26,602	6,466	5,126	16,622	80,570
19	36,187	28,400	7,208	5,448	15,811	93,054
20	38,739	30,382	7,569	5,805	15,178	97,673
21	43,349	33,028	7,946	6,188	14,462	104,973
22	44,368	35,002	8,344	6,589	13,995	108,298
23	47,515	38,295	7,365	7,035	13,432	113,642
ERR	17.6	13.2	19.1	15.1	11.7	15.0

Source: Government and Mission

Table 9

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SABAH-SARAWAK ROAD PROJECT

Sandakan-Telupid Road: Vehicle Operating Cost Estimates
(M\$ per km)

	Existing road	Improved road	VOC savings
Private cars	0.616	0.359	0.257
Pickups	0.942	0.617	0.325
Jeeps	1.164	0.636	0.428
Medium trucks	1.543	0.996	0.547
Logging trucks	3.647	2.272	1.375

Table 10

Sandakan-Telupid Road: Total Maintenance Cost
Savings, 1983-2005
(M\$ million)

	Link A-101	Link A-102	Total
	<u>5,892</u>	<u>7,975</u>	<u>13,867</u>

Tables 9 and 10 source: SPWD Sabah and Sabah Rural Trunk Roads Feasibility Study.

Table 11

MALAYSIA

SABAH-SARAWAK ROAD PROJECT

Lahad Datu-Sandakan Road: Vehicle Operating
Cost Estimates
(M\$ per km)

	Existing road	Improved road	VOC savings
Private cars	0.597	0.357	0.240
Pickups	0.879	0.615	0.264
Jeeps	1.093	0.635	0.458
Medium trucks	1.496	0.971	0.525

Table 12

Lahad Datu-Sandakan Road:
Total Maintenance Cost Savings, 1983-2005
(M\$ million)

B-201	B-202	B-203	B-204	Total
3,041	3,704	6,038	1,628	14,411

Tables 11 and 12 Source: SPWD Sabah and Sabah Rural Trunk Roads Feasibility Study.

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SABAH-SARAWAK ROAD PROJECT

Estimated Revenue from Road User Charges, 1977-1981

	US\$ million									
	1977		1978		1979		1980		1981	
	Sabah	Sarawak	Sabah	Sarawak	Sabah	Sarawak	Sabah	Sarawak	Sabah	Sarawak
<u>Petroleum</u>										
Import duty	18.6	8.3	14.5	8.0	15.8	9.5	19.4	11.3	19.5	n.a.
Excise tax	6.0	9.6	13.1	13.8	15.5	16.8	17.1	19.1	17.2	n.a.
<u>Vehicle</u>										
registration and other fees	12.6	8.8	14.4	10.4	17.8	11.1	20.1	14.6	23.4	n.a.
<u>Total</u>	<u>37.2</u>	<u>26.7</u>	<u>42.0</u>	<u>32.2</u>	<u>49.1</u>	<u>37.4</u>	<u>56.6</u>	<u>45.0</u>	<u>60.1</u>	-

Source: Sabah and Sarawak SEPU.

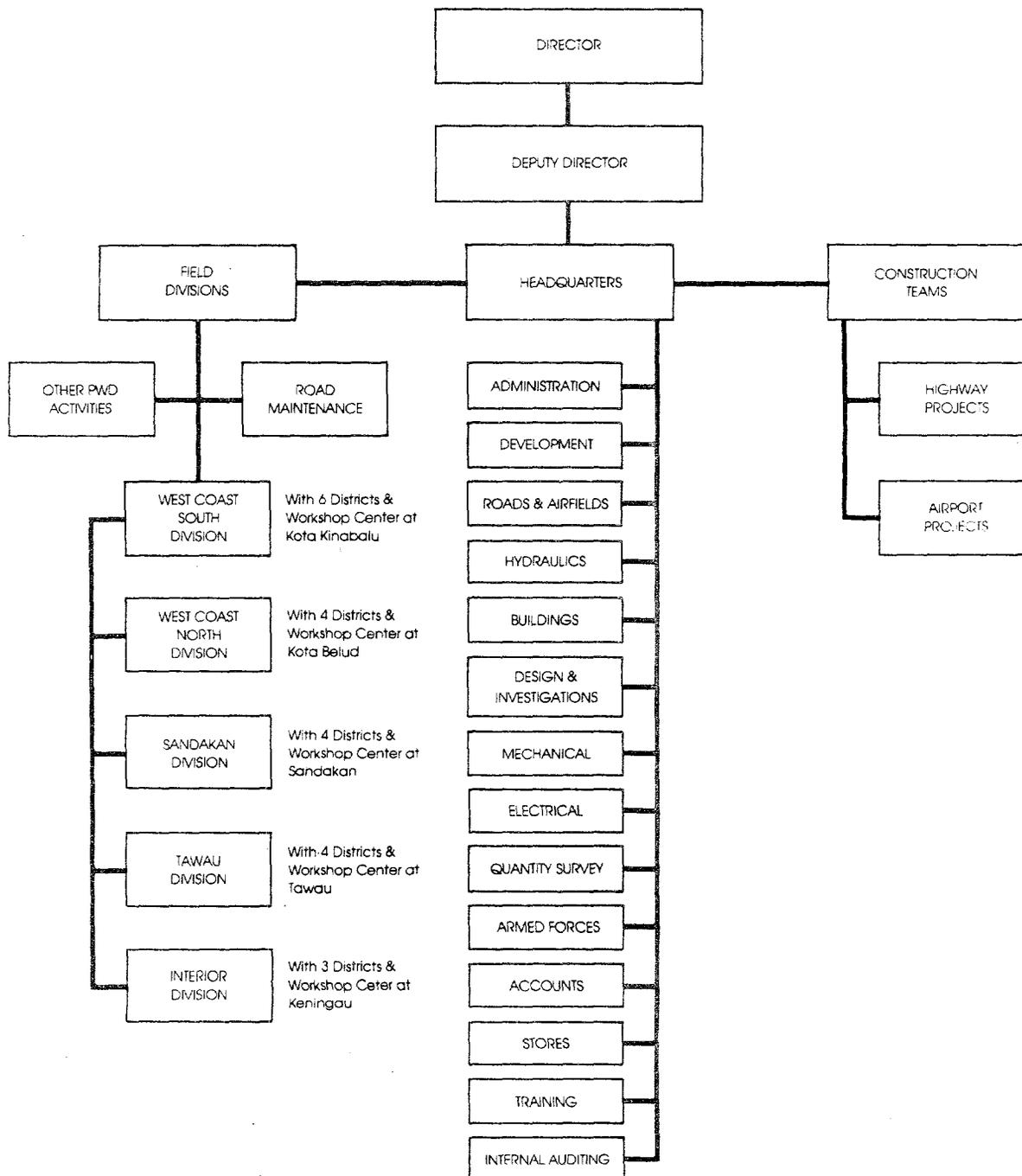
MALAYSIA
SABAH-SARAWAK ROAD PROJECT

Diesel and Petrol Prices, 1975-1980

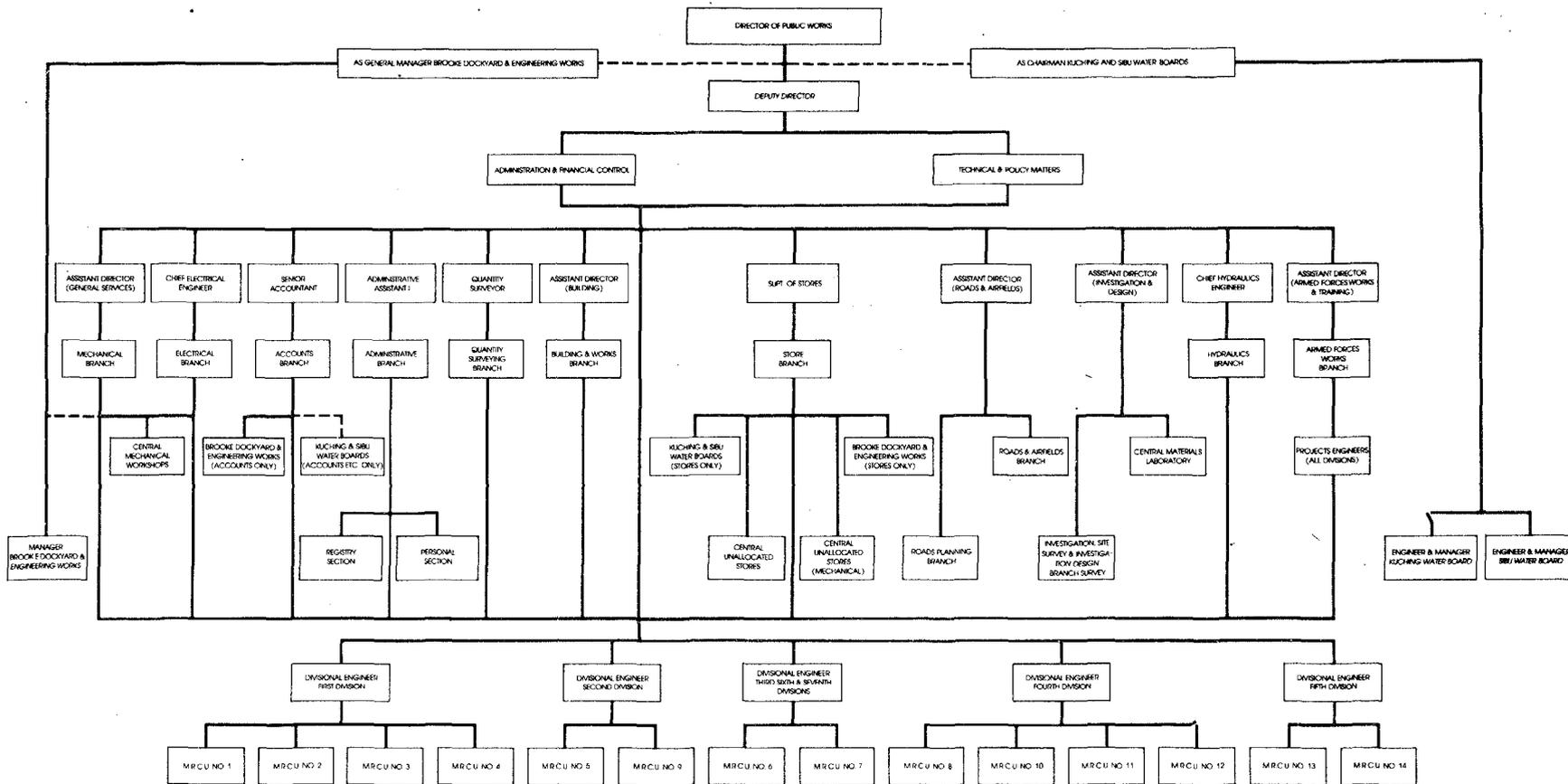
Effective date of price	Diesel		Petrol			
	per gallon (M\$)	per liter (M cents)	per gallon (M\$)	per liter (M cents)	per gallon (M\$)	per liter (M cents)
Before February 1976	1.00	-	3.10	-	2.65	-
February 1976	1.18	-	3.38	-	3.00	-
June 1979	1.20	-	3.48	-	3.10	-
August 1979	1.30	28.6	3.69	81.2	3.35	73.7
April 1980	1.62	35.6	4.04	88.9	3.82	84.0
August 1980	1.80	39.6	4.63	102.0	4.40	97.0

Source: Highway Planning Unit, Ministry of Works and Utilities.

MALAYSIA
SABAH SARAWAK ROAD PROJECT
State of Sabah
Organization of Public Works Department



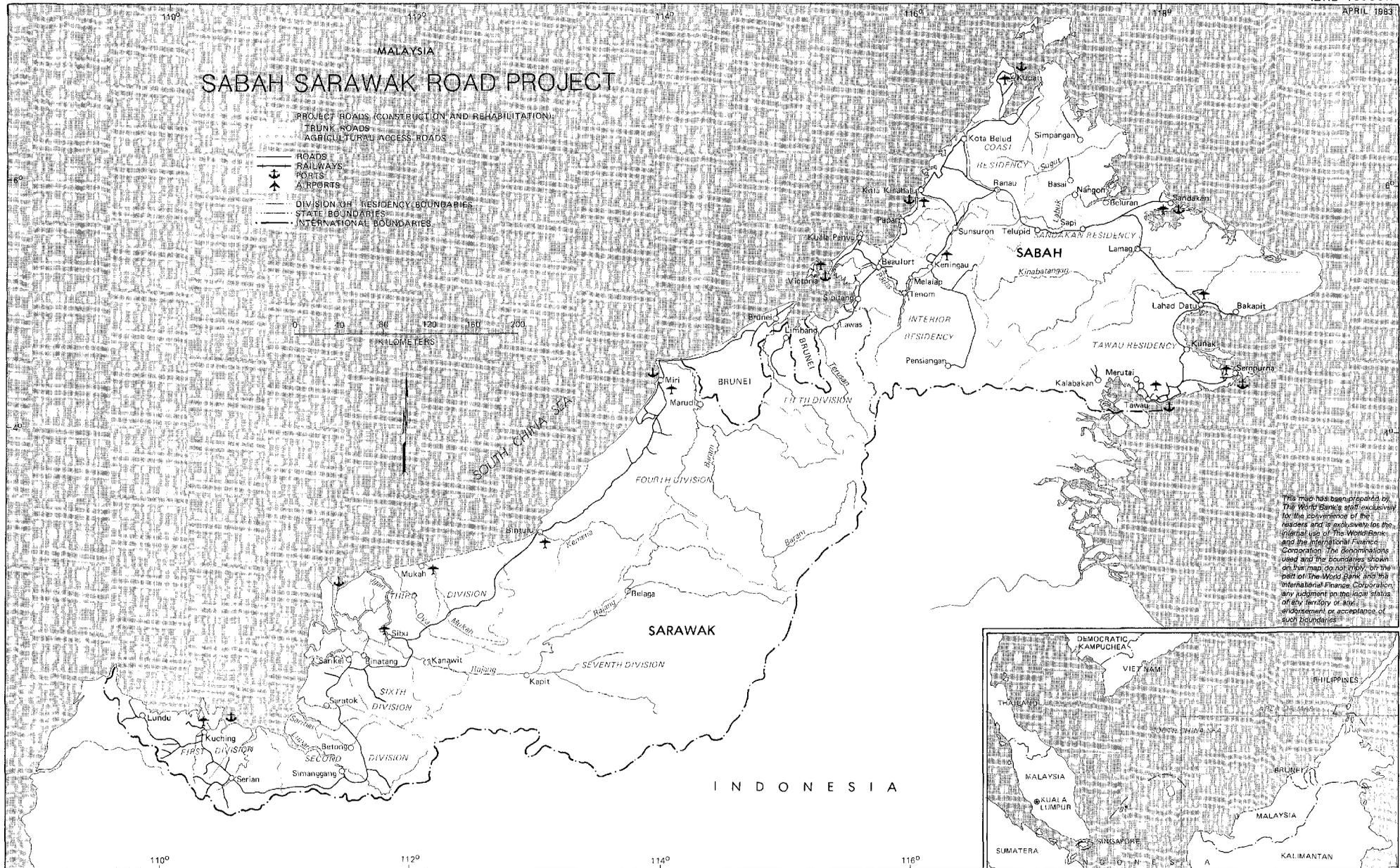
MALAYSIA
 SABAH SARAWAK ROAD PROJECT
 State of Sarawak
 Organization of Public Works Department





SABAH SARAWAK ROAD PROJECT

- PROJECT ROADS (CONSTRUCTION AND REHABILITATION)
- TRUNK ROADS
- AGRICULTURAL ACCESS ROADS
- ROADS
- RAILWAYS
- PORTS
- AIRPORTS
- DIVISION OR RESIDENCY BOUNDARIES
- STATE BOUNDARIES
- INTERNATIONAL BOUNDARIES



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