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**THE REPUBLIC OF INDONESIA  
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MINISTRY OF PUBLIC WORKS**

**DEVELOPMENT STUDY  
ON  
COASTAL ROADS IN EAST COAST OF SUMATRA  
FINAL REPORT**

**MAIN TEXT**

**DECEMBER 1992**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

国際協力事業団

24566

## PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a development study on Coastal Roads in East Coast of Sumatra and entrusted the study to the Japan International Cooperation Agency (JICA).

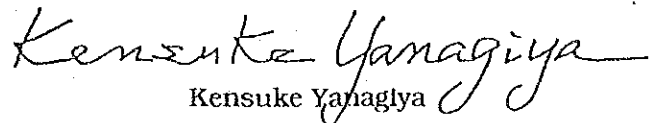
JICA sent to Indonesia a study team headed by Mr. Satoshi WATABE, Pacific Consultants International, three times between October 1991 and October 1992.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

December 1992



Kensuke Yanagiya

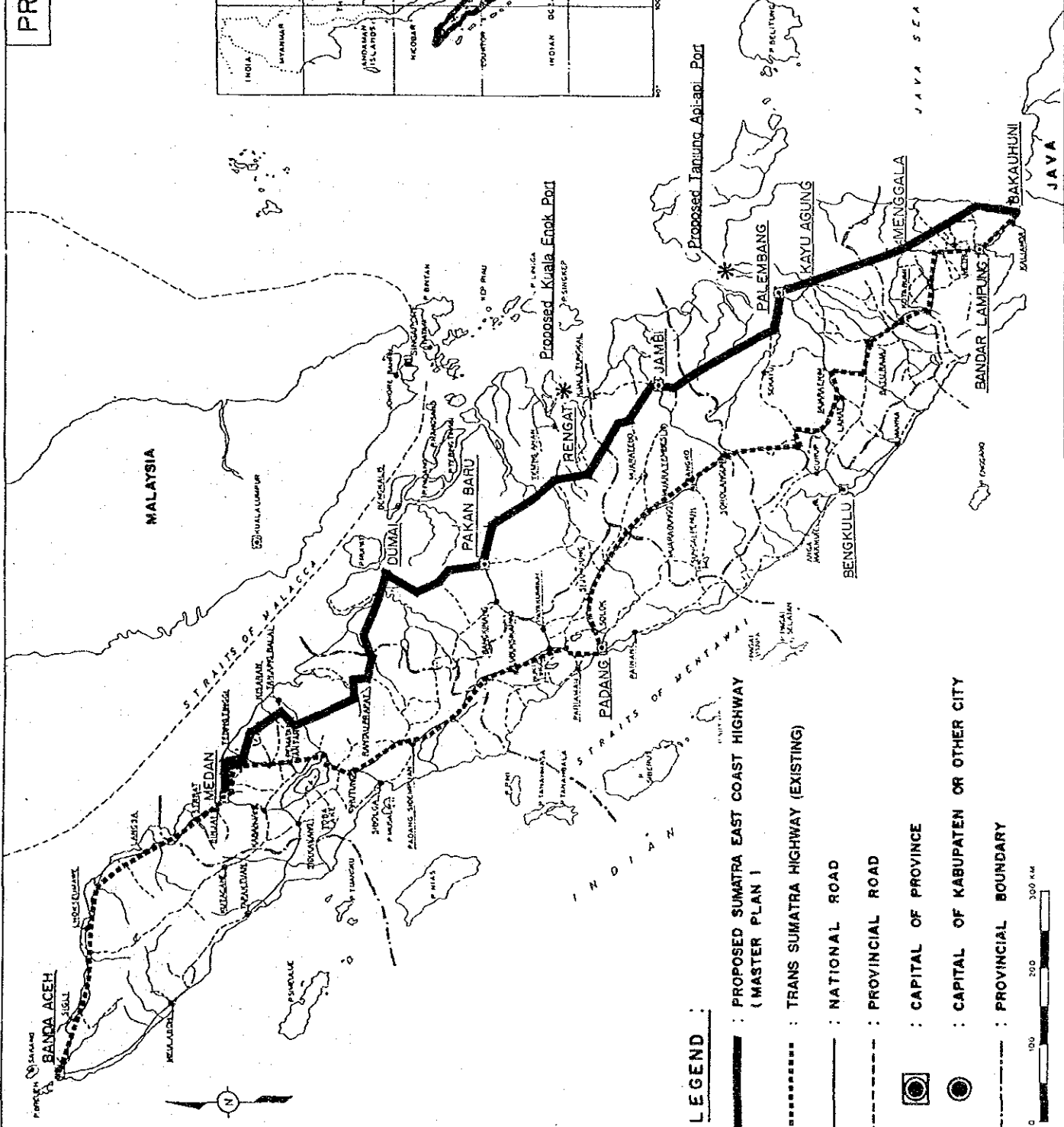
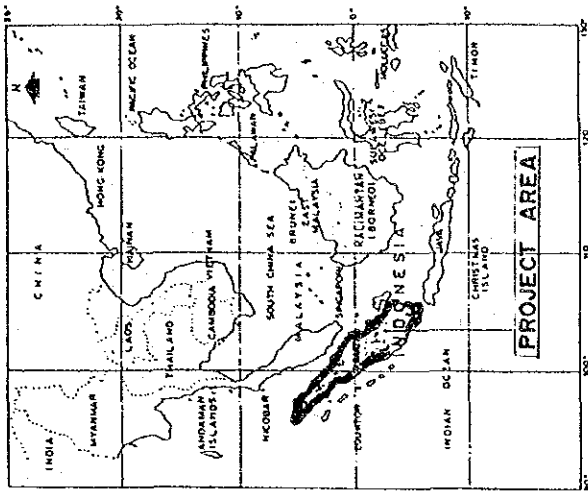
President

Japan International Cooperation Agency












# PROJECT LOCATION MAP



## LEGEND :

-  : PROPOSED SUMATRA EAST COAST HIGHWAY ( MASTER PLAN I )
-  : TRANS SUMATRA HIGHWAY (EXISTING)
-  : NATIONAL ROAD
-  : PROVINCIAL ROAD
-  : CAPITAL OF PROVINCE
-  : CAPITAL OF KABUPATEN OR OTHER CITY
-  : PROVINCIAL BOUNDARY





**DEVELOPMENT STUDY  
ON  
COASTAL ROAD IN EAST COAST OF SUMATRA**

**FINAL REPORT**

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#### Chapter 10

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## ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
AADT	Annual Average Daily Traffic
APBN	Anggaran Pendapatan dan Belana Negara (National budget)
ASEAN	Association of Southeast Asian Nations
BAPPEDA	Badan Perencanaan Pembangunan Daerah, Regional Development Planning Board
BARPENAS	Badan Perencanaan Pembangunan Nasional, National Development Planning Board
B/C	Benefit Cost Ratio
BPS	Biro Pusat Statistik, Central Bureau of Statistics
CBR	California Bearing Ratio
cm, cm <sup>2</sup> , cm <sup>3</sup>	Centimeter, square centimeter, cubic centimeter
DBM	Dinas Bina Marga Directorate General of Highways, Ministry of Public Works
Dia. or $\phi$	Diameter
DPU	Departmen Pekerjaan Umum, Ministry of Public Works
EC	European Community
EIRR	Economic Internal Rate of Return
EL	Elevation
F/S	Feasibility Study
GDP	Gross Domestic Product
GKP	Gross Kabupaten Product
GOI	Government of Indonesia
GRDP	Gross Regional Domestic Product
IBRD	International Bank for Reconstruction and Development
ICOR	Incremental Capital Output Ratio
I/P	Implementation Program
IRI	International Roughness Index
JICA	Japan International Cooperation Agency
Kab.	Kabupaten (Regency)
Kec.	Kecamatan (Sub-district)
Kel.	Kelurahan (Village)
Kod. or Kodya	Kotamadya (Municipality)
Km	Kilometer
m,m <sup>2</sup> ,m <sup>3</sup>	Meter, square meter, cubic meter
NIEs	Newly Industrializing Economies
NPV	Net Present Value
OD	Origin and Destination
OECD	Overseas Economic Cooperation Fund
PCU	Passenger Car Unit
PERMUKA	Perusahaan Umum Kereta Api, Public Corporation of Railways
PMUs	Project Management Units
PIR	Perkebunan Inti Rakyat (Smallholder Tree-crop Development)
RDC	Regional Development Center
REPLITA	Rencana Pembangunan Lima Tahun, Five-Year Development Plan
Rp.	Rupiah
SIJORI	Singapore, Johor and Riau
VOC	Vehicle Operating Cost



**Chapter 1**  
**INTRODUCTION**



# CHAPTER 1

## INTRODUCTION

### 1.1 Background for the Study

The Republic of Indonesia is the world's largest archipelago consisting of some 13,667 islands with approximately 1,920,000 km<sup>2</sup>. The total population is approximately 179 million.

The island of Sumatra consists of the eight provinces of Ache, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, and Lampung. The land area is approximately 474,000 km<sup>2</sup> (25 % of the total land area), with a population of approximately 36 million (20 % of the total population). It ranks second both in land area and in population.

In Indonesia, 60 % of the population is concentrated on the island of Java which has less than 7 % of the land area (density is 800 persons/km<sup>2</sup>), while the island of Sumatra abounds in natural resources and the population is one-third that of Java with a density of 76/km<sup>2</sup>, one tenth that of Java. In order to reduce the density and imbalance of the population, the Government of Indonesia has a resettlement program and a program to redistribute the population. Due to its proximity, and the convenience of travel means, Sumatra has been considered as the most suitable site for relocation of the population by the Government.

#### (1) Problems of the Road Network in Sumatra

The Five-Year National Development Plan, the so-called Repelita, is the basic policy paper and embodies the facets of economy, society, religion, education, and other social issues. Repelita V covers the period from April 1989 to March 1994 and establishes the following 3 basic principles:

- 1) to pursue a fair distribution policy in the resulting development;
- 2) to reach a satisfactory level of economic development;
- 3) to realize a healthy and active society.

In addition real GDP growth is expected to be an average of 5 % during the 5 year period. The road budget is Rp 16,600 billion (which covers approximately 80 % of the Rp. 20,500 billion for transport, communication, and tourism), and roads have been given top priority.

At the end of Repelita IV, the density of roads (National and Provincial) in Sumatra is 34.4 km/1000 km<sup>2</sup>. This is approximately one half that for the island of Java and is very low. The road network in Sumatra is comprised of 3,746 km of National Roads and 12,535 km of Provincial Roads, of which approximately 30 % are paved, and suffers from defects of road geometry, drainage facilities, and many other problems.

In 1984, as a part of the Asia Highway, the Trans Sumatra Highway was completed. This was constructed with a view to developing the rural areas and improving and contributing to the raising of the living condition of the people residing along the road. The highway extends from Banda Aceh in the north to Bakauhuni at the southern tip of the island covering a distance of 2,600 km. However, the highway travels along the western mountain ranges and does not pass through Pekanbaru, Jambi, Palembang, which are large core cities.

On the other hand, as a part of the Trans Java Tollway System the Merak - Tangerang section of approximately 77.5 km is under construction on Java Island, and the Targerang - Jakarta section of approximately 26.0 km length has already been opened to the public.

## (2) Sumatra Development Plan

The economic development of Sumatra is being hindered due to low development of roads. There are four economic centers: the Northern (Aceh, North Sumatra Province); Central (West Sumatra, Riau Province); Southern (Jambi, Bengkulu, South Sumatra Province); and Jakarta (Lampung Province), and they have very little interrelationship.

### - Northern Sumatra Integrated Regional Development Plan

JICA prepared in the 2 years from 1988 to 1990, the Northern Sumatra Integrated Regional Development Study, for which a report has been prepared. In the report, the IDEP (Integrated Development Program Site) has been designated.



In this development program, the Coastal Roads in the East Coast of Sumatra (hereinafter called the "Sumatra East Coast Highway") has been recommended as a top priority project.

- Southern Sumatra Integrated Regional Development Plan

An ongoing study is being conducted by JICA to develop four provinces of Jambi, Bengkulu, South Sumatra and Lampung, similar to the study prepared for the Northern Sumatra Integrated Regional Development Plan.

- Development Project for Riau Province

Riau Province exports 60 % of all the petroleum products of Indonesia, and is an important area. However, it also has rubber and palm oil plantations. This conforms with the policy of Indonesia to reduce its heavy reliance on petroleum products.

Due to its geographical position or proximity to Singapore, there is a plan to develop Singapore - Johor - Riau Triangle area (SIJORI). The basic principal of the development of the SIJORI triangle is to utilize the mutual resources of the three areas in such a way that each area may gain some benefit. The utilization of mutual and different comparative advantages between resources in industrial development will bring about economies of scale.

Together with the various development plans, the construction of the highway, which will traverse the east coast of Sumatra including new seaport developments of Tanjung Api-api, South Sumatra and Kuala Enok, Riau, will contribute to regional development, agricultural production, industrial production, and relocation of population. It will also enhance travel to Java from the east coast cities of Sumatra. These projects will conform with the policies of Repelita V and will help realize fulfillment of the national road network. This has given rise to the preparation of a Sumatra East Coast Highway Plan.

## **1.2 Objectives of the Study**

The objectives of the study are as follows:

- 1) To prepare a basic plan for a regional trunk road network which will interconnect the principal cities on the East Coast of Sumatra (design year is 2010).

Subject road sector : Medan to Bandar Lampung to Bakauhuni; total distance approximately 1,900 km.

2) Pre-Feasibility Study:

Preparation of a Pre-Feasibility Study for the basic plan for the road network described in paragraph 1) above, especially for road sectors with a high degree of importance (design year is 1997).

Subject road sector : Rengat - Jambi, Palembang - Menggala - Bakauhuni; total distance approximately 600 km assumed.

3) Feasibility Study:

Preparation of a Feasibility Study for the road sectors of high importance described in paragraph 2) above (design year: 1997).

Subject road sector : Kayuagung - Menggala; total distance approximately 180 km.

### 1.3 Study Area

The study area (see Project Location Map) is located on the east coast of Sumatra, and will include the five provinces of North Sumatra, Riau, Jambi, South Sumatra, and Lampung, which will be directly involved, and the three provinces of Aceh, West Sumatra and Bengkulu which will be indirectly affected. The traffic demand forecast, which will be taken into account concerning socio-economic matters, will include in the study that of Java Island.

### 1.4 Study Schedule

(1) Phasing:

The study period is 15 months, and the entire period is divided into three study phases as follows:

- 1) Masterplan for the Sumatra East Coast Highway Project (Phase I).
- 2) Pre-Feasibility Study, approximately 600 km (Phase I).
- 3) Feasibility Study, approximately 180 km (Phase II).

(2) Study Flow Chart:

The entire study will be conducted as shown in the Flow of the Study chart, Fig. 1.1. The flow chart indicates separation of the various studies, the degree of analysis, the time schedule for submission of reports, and the reports required.

**1.5 Reports**

The results of the studies performed and to be submitted in accordance with paragraph 1.4 are described at the various stages in Table 1.1.

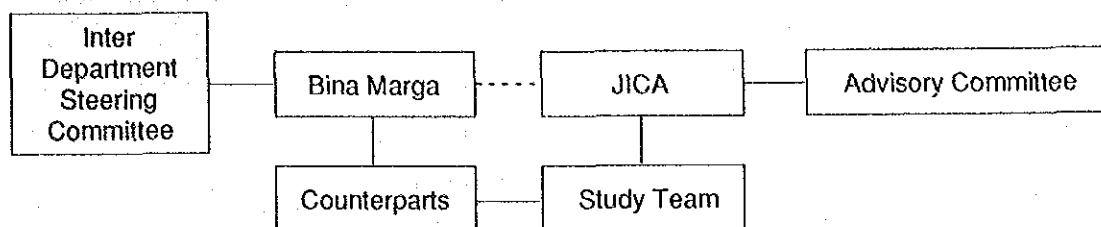
**Table 1.1 Reports to be Submitted**

Reports to be Submitted		Time of Submittal	Principal Contents
(1)	Inception Report	Mid.-October, 1990	Basic Design of the Study, Study Items, Method of Study, Study Schedule, etc.
(2)	Interim Report	Mid.-March, 1991	Results of Study and Analyses. Future Demand Forecast. Selection of Preventive Maintenance, Comparison of Outlines. Basic Concept of East Coast Trunk Highway, Pre-Feasibility Study (Preliminary Design), Preliminary Economic Analysis and Evaluation, Selection of Feasibility Study Road Section (183 km)
(3)	Progress Report	Mid.-July, 1992	Investigation of Current Road Conditions. Investigation of the Road Environments, Environment Impact Study, Forecast of Road Traffic Demand, Selections of Road Design Criteria
(4)	Draft Final Report	Mid.-October, 1992	Preliminary Design, Cost Estimate, Economic Analysis and Evaluation, Preparation of Project Plan and Recommendations
(5)	Final Report	Mid.-December, 1992	Modification of Draft Final Report based on comments by Indonesian side



## 1.6 Study Organization

The project is performed with the following organizational arrangement:



**Fig. 1.2 Organization Chart**

The staff personnel to be engaged in this project for the Indonesian and Japanese side are as follows:

1) Advisory Committee, Indonesian Side:

<u>Name</u>	<u>Position</u>
Ir. Syarifuddin Alambai	Director of Planning
Ir. J. Hutabarat	Chief of Subdirectorates of General Planning
Ir. Moh Anas Aly	Chief of Subdirectorates of Road Design

2) Counterpart Team, Indonesian Side:

<u>Name</u>	<u>Position</u>
Ir. J. Hutabarat	Subdirectorates of General Planning
Drs. Muchsin Assegaf	Subdirectorates of General Planning
Ir. Peter Sepang MS.	Subdirectorates Road Planning
Mr. Didi Raside	Subdirectorates General Planning
Ir. Satrio Utomo	Subdirectorates Road Design
Ir. Atang Rivai	Subdirectorates Bridge Design
Ir. Sumaryanto Msc.	Subdirectorates General Planning
Ir. Erwanto W.	Subdirectorates General Planning
Mr. R.A.W. Smith	Consultant Second A.T. to Planning & Programming

3) JICA Advisory Committee:

<u>Name</u>	<u>Position</u>
Yasuo KASHIMA	Advisor to Civil Division, Osaka Metropolitan Prefecture
Hiromasa KISHI	Acting Chief, Planning Section, Planning Department, Japan Highway Corporation.
Toshio KIMATA	Sub-Head of Traffic Safety Investigation Section, Road Division, Chubu Regional Construction Bureau, Ministry of Construction
(Noriaki MATSUSHIMA)	Ministry of Construction
Yuichi SEKIGUCHI	Japan International Cooperation Agency (JICA)
(Masayuki KOIKE)	Japan International Cooperation Agency (JICA)

4) JICA Study Team:

<u>Name</u>	<u>Position</u>
Satoshi WATABE	Team Leader
Shuuichi YUMOTO	Regional Planner
Hajime KINUGAWA	Highway Engineer
G. BENHAM (Jim McBride)	Transport Planner
Kazuo MIZUKOSHI	Road Engineer
Masatoshi KANEKO	Transport Economist
Torao TOKOZUMI	Structure Engineer
Koichi MIKI	Topographical and Soils Survey Specialist

## **Chapter 2**

### **PHYSICAL AND NATURAL CONDITIONS IN THE STUDY AREA**





## CHAPTER 2

### PHYSICAL AND NATURAL CONDITIONS IN THE STUDY AREA

The island of Sumatra has a length of approximately 1,700 km running north and south, and a width of approximately 300 km in the east to west direction. It straddles the equator and extends from lat. 6° N. to lat. 6° S. The seas surrounding the island are the Indonesian Ocean to the west, the Malacca Strait to the east, and the Sunda Strait between it and the island of Java.

The geography, climate, natural conditions and natural disasters are described in this chapter.

#### 2.1 Geography and Geological Features

The island of Sumatra lies at the junction of the Asian Plate called the Sunda Shield, and the Indian Ocean Plate which lies underneath it, and was formed by the energy released by the two plates, with many curvatures, faults, and earth movements. The Barisan Mountain Range which rises to more than 2,000 m was formed by the many volcanic earth movements of the Tertiary Period, and is situated over the plates.

For the above reasons, the Barisan Mountain Range has outcrops of the tertiary period of the cenozoic era caused by volcanic actions. On the other hand, the low plains are covered by alluvial deposits, as are the rivers and coastline.

The geographic composition cross-section of the study site lies in regions "3", the Eastern Plains and Hills, and "4" the Eastern Coastal Swamplands, (See Fig. 2.1) which consist of the geography and geological features described as follows:

##### "3". The Eastern Plains and Hill Region

This region lies between the Barisan Mountain Range and the East Coastal Swamplands, and is comprised of gently sloping hills and plateaus, and has many rivers which flow to the east from the Barisan Mountain Range. The region drops from an elevation of 200 m to 50 m, and the rivers flow through the wetlands after leaving the high grounds. The geological features change from alluvial deposits on the surface to volcanic and igneous rock. This region produces petroleum oil and natural gas.

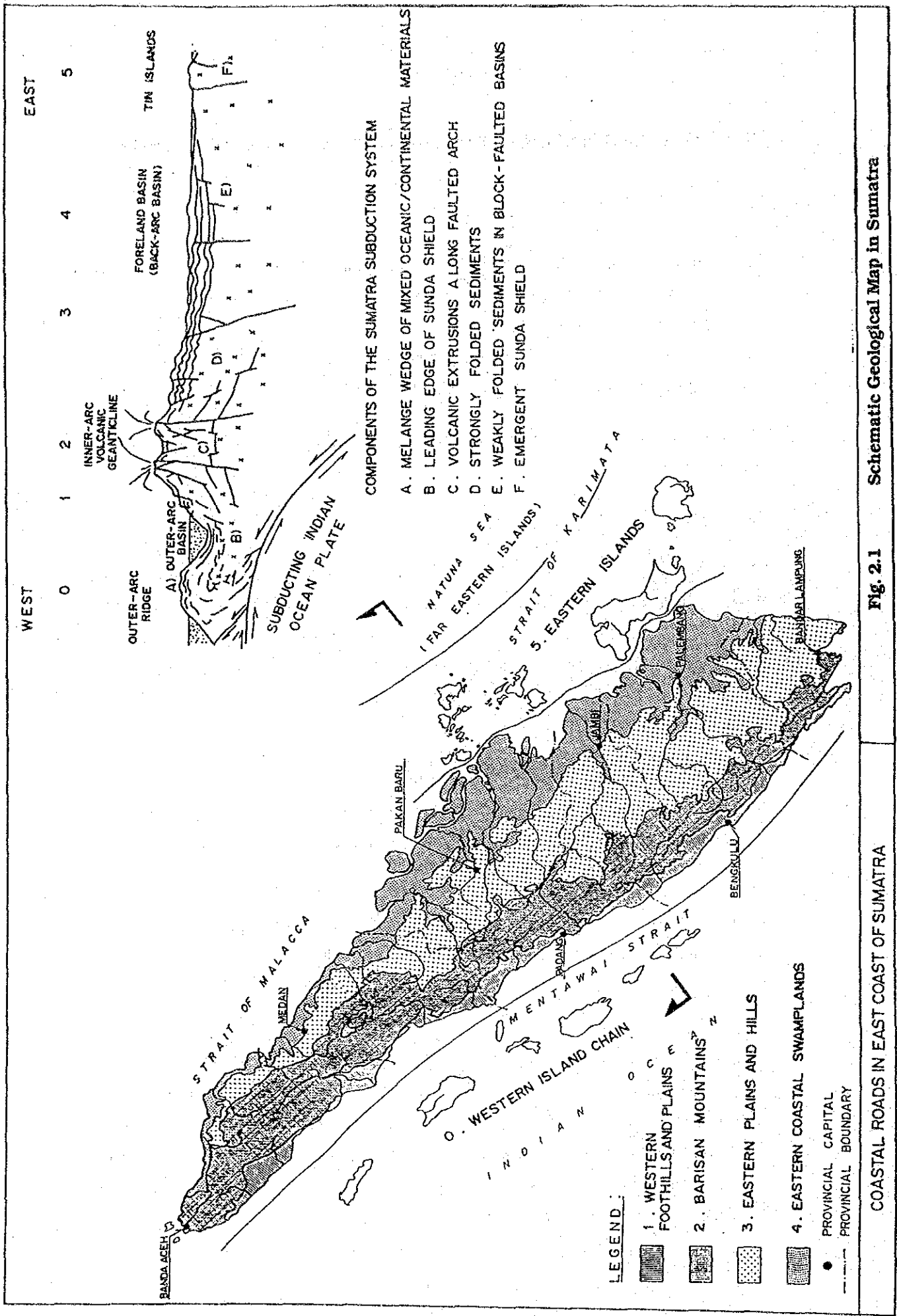


Fig. 2.1 Schematic Geological Map in Sumatra

Fig. 2.1

COASTAL ROADS IN EAST COAST OF SUMATRA

#### "4." The East Coastal Swampland Region

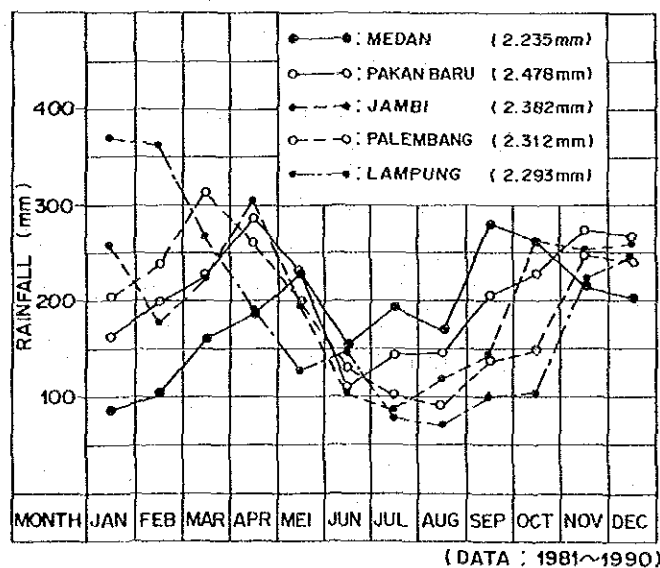
This region is situated along the Malacca Straits and is a broad expanse of alluvial wet lands at the low end of the Eastern Plains and Hills. It is washed by several meters of flood waters and tidal salt waters. Geologically it has been formed by alluvial deposits. This region also produces oil and natural gas.

In the study area, while the sections of the suburbs of Medan, Dumai, Jambi, Palembang and Lampung Province border area pass through the regions "4", the other sections pass through the regions "3".

### 2.2 Climate

The weather of Sumatra features high temperature and high humidity, and is affected by trade winds of Indo-Australia origin. The temperature is almost constant with an average in the range of 25° to 27°C. The humidity is also constant at more than 80 % throughout the year. Rainfall is 2,000 to 6,000 mm throughout the year, and differs to some degree with the locality. Rainfall is high in the Barisan Mountain Range and the plains, ranging from 5,000 to 6,000 mm, and decreases towards the coastline to 2,000 to 3,000 mm. The rainfall also varies by the month. In Lampung Province the weather is similar to that of Java, the peak being in November - March. The rainfalls in the areas other than Lampung Province show less fluctuation than Lampung Province. They have two rainfall peaks, October - December and March - May, while the dry season (June - August) shows more rainfall than Lampung Province.

The monthly rainfall for 1981 to 1990 is shown in Fig. 2.2.



**Fig. 2.2** Monthly Rainfall of Main Cities Source: Meteorology and Geophysics Board

### 2.3 Natural Environment

Sumatra has a rich natural environment. Classification of the forestry was changed in 1982 based on the functions for the forestry products and supply of farm lands, production of non-forestry products, river flow management, utilization for recreational and tourism spots, micro-stabilization of the weather, stabilization of the national living pattern, and preservation of animal and plant life. The decrease in the total areas of forests will affect the environmental condition and increase in natural disasters.

Classification of natural reserve areas is shown in Table 2.1. As a first measure, in order to preserve nature, there are five types of classification established; nature reserves, protection forest, limited production, normal production forest and convertible forest. The Sumatra East Coast Highway will not pass directly through the preserved forest areas as a general rule. However, there may be cases where the road will pass close to the Way Kampas National Park, and near other preserved areas in Riau, Jambi, and South Sumatra Province, and extreme care will have to be exercised when planning the highway in these areas.

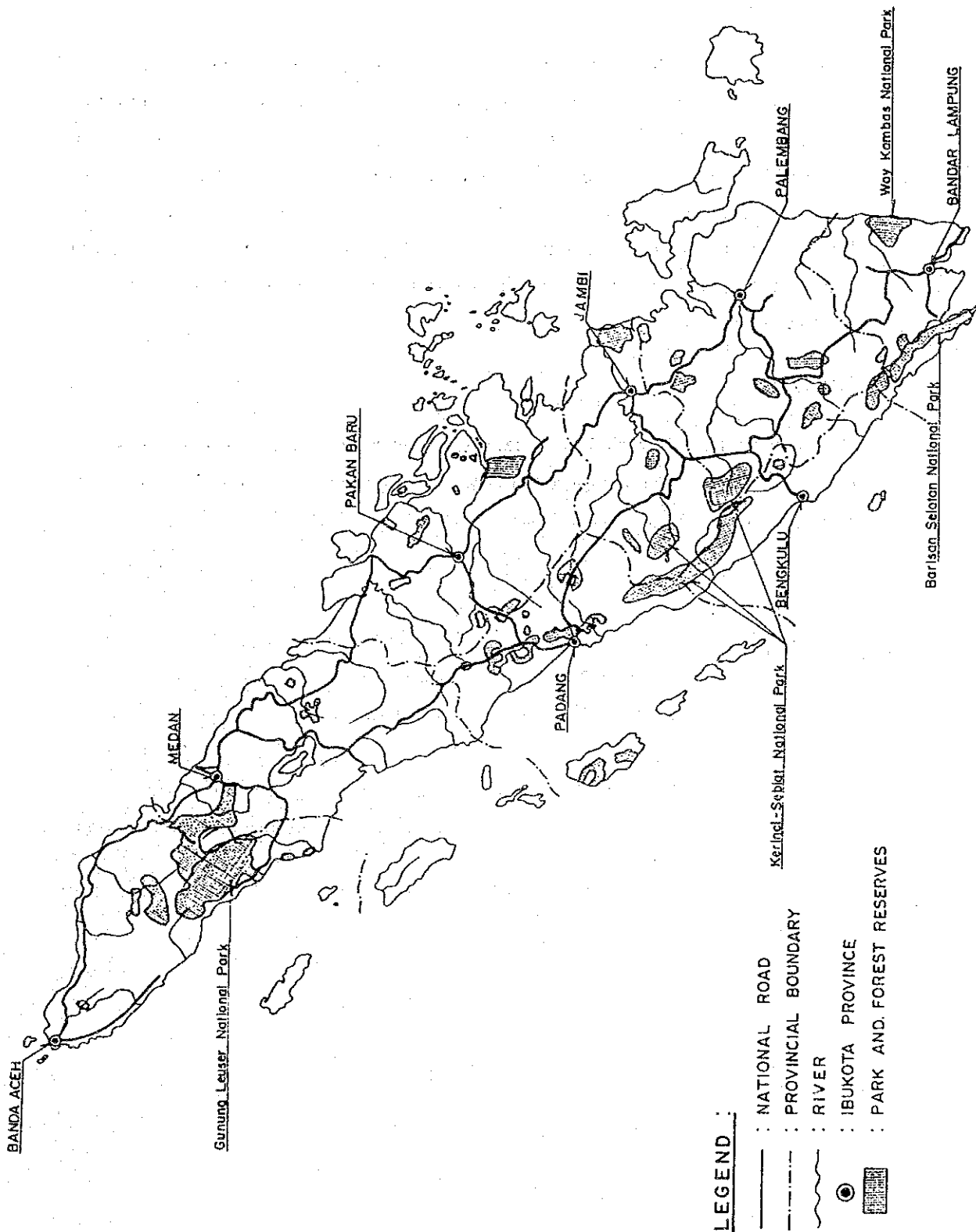
Fig. 2.3 shows the distribution of the natural forest reserves.

It will be necessary to pay special attention when performing earth works during construction operations, and to make modifications in routing of rivers and roads to preserve the natural reserves.

**Table 2.1 Classification of Natural Reserve Areas**

Function	Purpose	Permitted Exploitation
1. Nature Reserves*	General conservation. Recreation	None
2. Protection Forest	Watershed preservation	None
3. Limited Production	Timber production	Selective felling
4. Normal Production Forest	Timber production	Controlled clear felling
5. Convertible Forest	Timber production. Conversion to agricultural land.	Clear felling

NOTE:\* Nature Reserves include national park, game preserve and recreational park as well as protected forest.



**Fig. 2.3** Distribution of National Reserve Areas

**COASTAL ROADS IN EAST COAST OF SUMATRA**

## 2.4 Natural Disasters

Natural disasters which occur in Sumatra are generally limited to landslides, earthquakes and floods.

### 1) Landslides

Most of the landslides in Sumatra are cases where the upper layer of saturated and unstable soils slide over a layer of non-permeated soils, or landslides caused by earthquakes. For this reason, many of the landslides have a tendency to occur at acute slopes where the soils have lost their capacity to retain waters due to excessive felling of trees. See Fig. 2.4. Many of the landslides occur in mountainous and hilly areas. The Trans-Sumatra Highway is situated in this area and has experienced road closures due to landslides.

### 2) Earthquakes

Sumatra was created by large volcanic actions, and many earthquakes still occur. Many of the earthquakes originate along the fault from Semango Bay to Way Bay in north. The locations of faults are indicated in Fig. 2.5.

### 3) Floods

Floods can be classified by the locations where they occur into "inland" type and "lowland" type. Fig. 2.4 shows flood prone areas. As indicated by the figure, the lowland type of floods have a tendency to occur in the East Coastal swamp area. The tidal range in this area is from 2 to 5 m. The soils do not have the capacity to retain waters due to excessive felling of trees and there has been a rise in the accumulation of earth, giving rise to the occurrence of floods.

In the planning for roads and bridges it will be necessary to take account of the occurrence of earthquakes and floods.

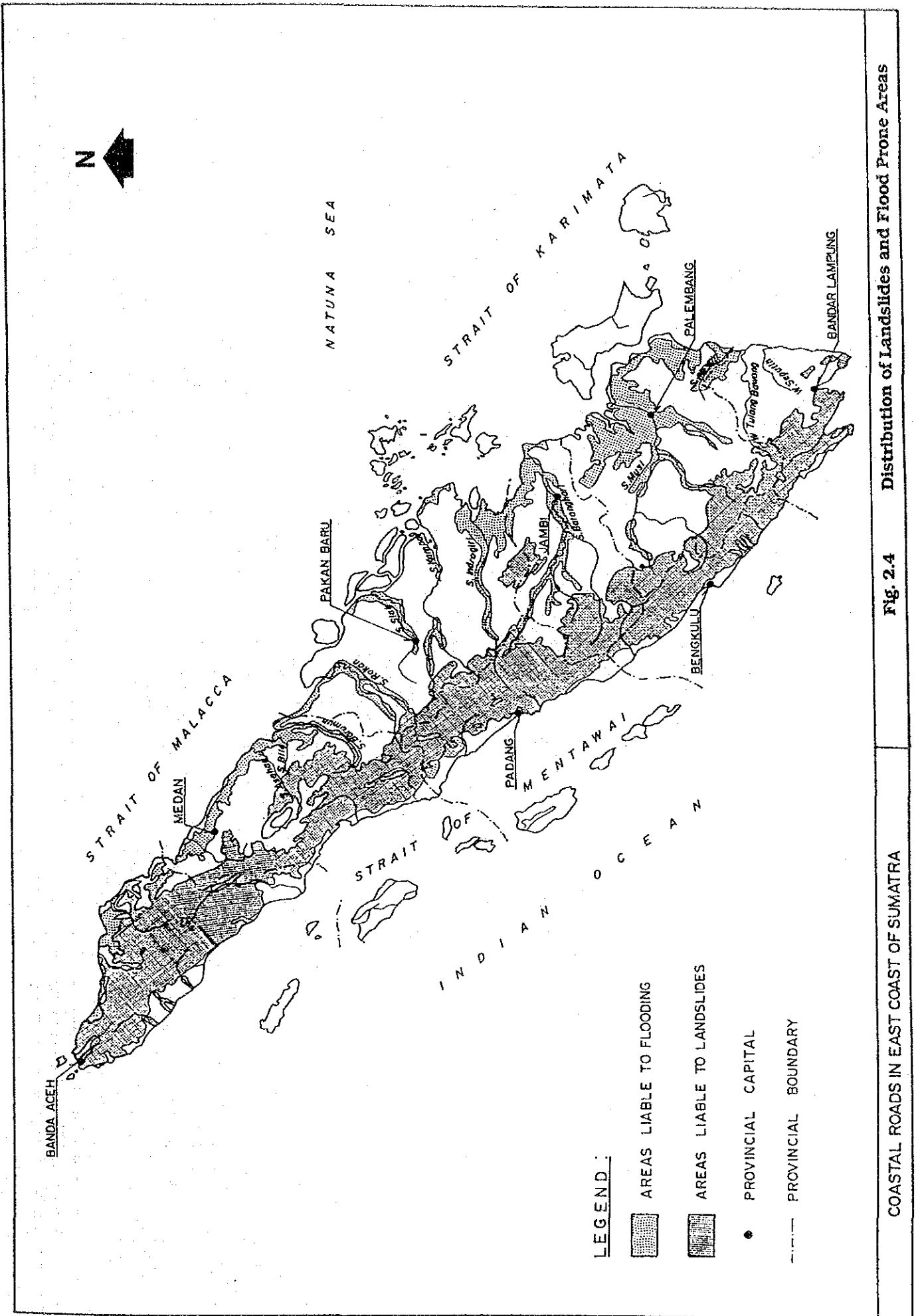


Fig. 2.4 Distribution of Landslides and Flood Prone Areas

COASTAL ROADS IN EAST COAST OF SUMATRA

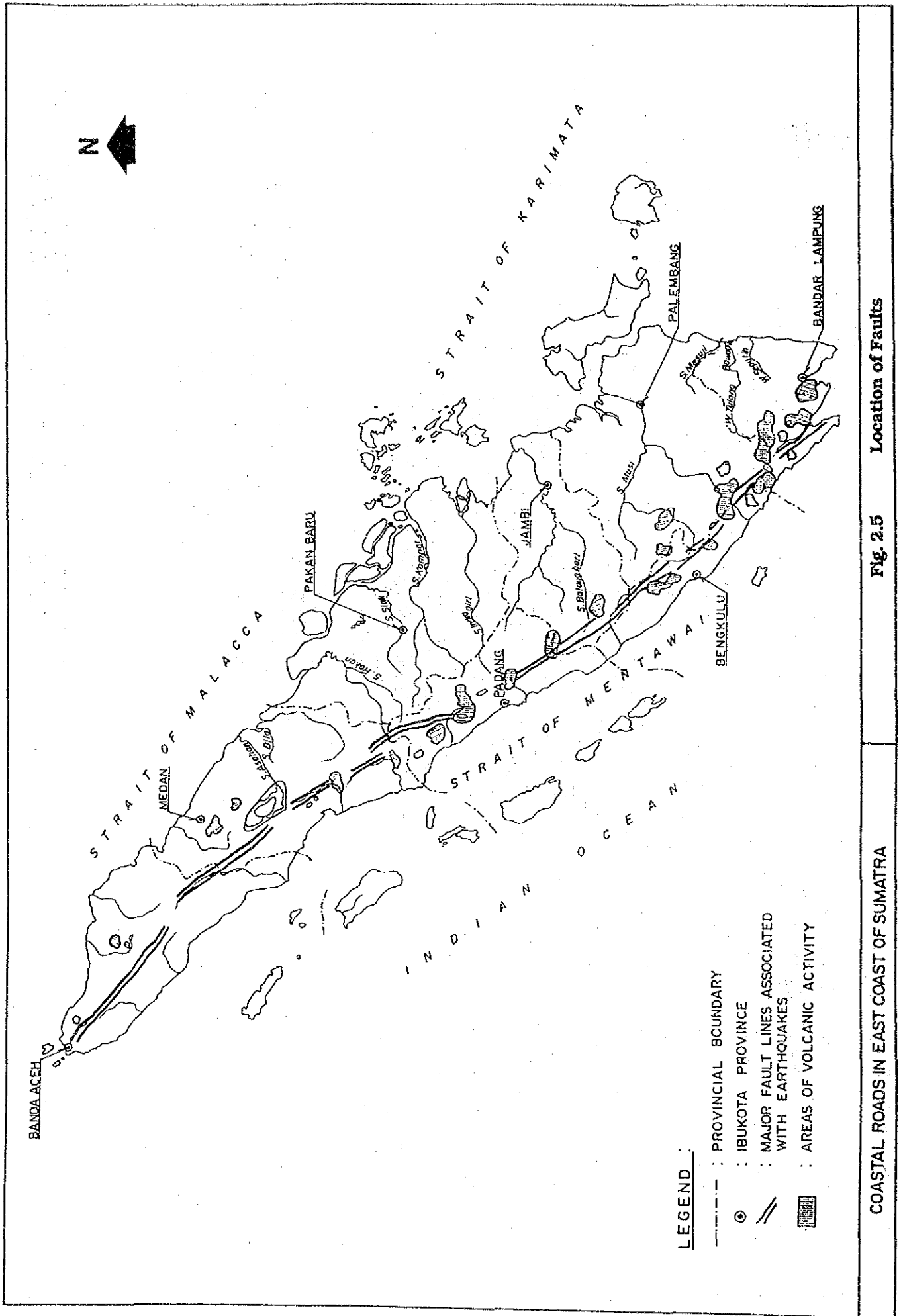


Fig. 2.5 Location of Faults



**Chapter 3**  
**SOCIO-ECONOMIC CONDITIONS OF THE STUDY AREA**



## **CHAPTER 3**

### **SOCIO-ECONOMIC CONDITIONS OF THE STUDY AREA**

#### **3.1 Administrative Structure**

The administrative system of the Republic of Indonesia is composed of 5 different levels of administrative hierarchy. They are Provincial, Kabupaten/Kotamadya (Regency/Municipality), Kota Administratif, Kecamatan and Kelurahan/Desa.

The total number of Provinces in Indonesia is 27, among which the Special Districts of D.I. Aceh, DKI Jakarta and D.I. Yogyakarta are included. The Kota Administratif is defined as an urbanized area emerging from the Kecamatan level, but which is not yet matured as a Kotamadya level.

Sumatra Island includes 8 Provinces, namely Aceh, North Sumatra, Riau, West Sumatra, Jambi, Bengkulu, South Sumatra and Lampung. These provinces consist of a total of 47 Kabupatens as shown in Table 3.1.

#### **3.2 Population**

##### **3.2.1 Population in Indonesia and Sumatra**

According to the 1990 Census survey and Statistical Year Book in Indonesia, 1989, the population of Indonesia is estimated at 164 million in 1985 and 179 million in 1990. The population growth is 1.8% p.a. The population in the major islands of Indonesia is summarized in Table 3.2.

Java island which has a dominant population of about 60% in Indonesia shows relatively lower growth rates than the other islands. Efforts of transmigration from the densely populated Java island to Sumatra and Kalimantan islands have been made in the past decades.

**Table 3.1 Administrative Districts in Sumatra**

Province	Kabupaten	Kotamadya
Aceh	Aceh Selatan Aceh Tenggara Aceh Timur Aceh Tengah Aceh Barat Aceh Besar Pidie Aceh Utara	Banda Aceh Sabang
North Sumatra	Nias Tapanuli Selatan Tapanuli Tengah Tapanuli Utara Labuhan Batu Asahan Simalungun Dairi Karo Deli Serdang Langkat	Sibolga Tanjung Balai Pematang Siantar Tebing Tinggi Medan Binjai
Riau	Indragiri Hulu Indragiri Hilir Kepulauan Riau Kampar Bengkalis	Pekanbaru Batam
West Sumatra	Pesisir Selatan Solok Sawah Lunto/ Sijunjung Tanah Datar Padang Pariaman Agam Limapuluh Koto Pasaman	Padang Solok Sawah Lunto Padang Panjang Bukit Tinggi Payakumbuh
Jambi	Kerinci Bungo Tebo Sarolangun Bangko Batanghari Tanjung Jabung	Jambi
South Sumatra	Ogan Komering Ulu Ogan Komering Ilir Muara Enim (Liot) Lahat Musi Rawas Musi Banyuasin Bangka Belitung	Palembang Pangkal Pinang
Bengkulu	Bengkulu Selatan Rejang Lebong Bengkulu Utara	Bengkulu
Lampung	Lampung Selatan Lampung Tengah Lampung Utara	Bandar Lampung

**Table 3.2 Population Distribution and Annual Growth**

Major Island	Population (x 1000)			% Distribution			Annual Growth(%)	
	1980	1985	1990	1980	1985	1990	1985/1980	1990/1985
1) Sumatra	28,017	32,603	36,455	19.00	19.87	20.33	3.08	2.26
- Aceh	2,611	2,972	3,416	1.77	1.81	1.90	2.62	2.82
- N. Sumatra	8,361	9,422	10,256	5.67	5.74	5.72	2.42	1.71
- Riau	2,169	2,548	3,306	1.47	1.55	1.84	3.27	5.35
- W. Sumatra	3,407	3,698	3,999	2.31	2.25	2.23	1.65	1.58
- Jambi	1,446	1,745	2,016	0.98	1.06	1.12	3.83	2.93
- Bengkulu	768	943	1,179	0.52	0.57	0.66	4.19	4.57
- S. Sumatra	4,630	5,370	6,277	3.14	3.27	3.50	3.01	3.17
- Lampung	4,625	5,905	6,006	3.14	3.60	3.35	5.01	0.34
2) Java	91,270	99,852	107,574	61.88	60.87	59.99	1.81	1.50
3) Nusa Tenggara	8,487	9,336	10,164	5.75	5.69	5.67	1.93	1.71
4) Kalimantan	6,723	7,722	9,110	4.56	4.71	5.08	2.81	3.36
5) Sulawesi	10,410	11,554	12,521	7.06	7.04	6.98	2.11	1.62
6) Maluku/Irian Jaya	2,585	2,980	3,498	1.75	1.82	1.95	2.88	3.26
Indonesia Total	147,492	164,047	179,322	100.00	100.00	100.00	2.15	1.80

Source: "Statistical Year Book of Indonesia, 1989", Central Bureau of Statistics for 1980 and 1985  
 Hasil Sensus Penduduk 1990, page 99.

The population of Sumatra is 36.5 million (1990 Census), the scale of which is roughly equal to East Java (32.5 million) or West Java (35.4 million). The population growth has slowed down during the second half of the last decade (2.3%) compared with that of the first half of the last decade (3.1%).

### 3.2.2 Population Distribution in Sumatra

The population distribution by Kabupaten in Sumatra is shown in Table 3.3. Medan with 1.73 million population is the largest city in Sumatra, and is followed by Palembang with a 1.14 million population.

## 3.3 Gross Domestic/Regional Product (GDP/GRDP)

### 3.3.1 GDP of Indonesia

Indonesia's GDP in 1989 is 167,495 Billion Rupiah at current price and 107,523 Billion Rupiah at 1983 constant price as shown in Tables 3.4 and 3.5. The average real growth rate of GDP was 6.5% p.a. during 1983-1989. This economic situation is partly attributed to adherence to market-oriented policies under a relatively stable

**Table 3.3 (1) Population by Kabupaten/Kotamadya in Sumatra**

Province	Kabupaten/Kotamadya	Population in 1990	
Aceh	Kab. Aceh Selatan	342,901	
	Aceh Tenggara	185,768	
	Aceh Timur	585,971	
	Aceh Tengah	199,659	
	Aceh Barat	385,700	
	Aceh Besar	240,219	
	Pidie	420,107	
	Aceh Utara	846,435	
Kod.	Banda Aceh	184,699	
	Sabang	24,416	
<b>Subtotal</b>		<b>3,415,875</b>	
North Sumatra	Kab. Nias	589,184	
	Tapanuli Selatan	954,332	
	Tapanuli Tengah	214,467	
	Tapanuli Utara	695,777	
	Labuhan Batu	733,521	
	Asahan	884,594	
	Simalungun	805,365	
	Dairi	276,980	
	Karo	257,981	
	Deli Serdang	1,602,749	
	Langkat	812,229	
	Kod.	Sibolga	71,895
		Tanjung Balai	108,202
		Pematang Siantar	219,328
Tebing Tinggi		116,767	
Medan		1,730,752	
Binjai		181,904	
<b>Subtotal</b>		<b>10,256,027</b>	
Riau	Kab. Indragiri Hulu	367,470	
	Indragiri Hilir	477,958	
	Kepulauan Riau	458,463	
	Kampar	567,790	
	Bengkalis	903,919	
	Kod.	Pekanbaru	398,621
Batam		106,825	
<b>Subtotal</b>		<b>3,283,036</b>	

Source: "Library Hall Statistic Documentation", Central Bureau Statistic

**Table 3.3 (2) Population by Kabupaten/Kotamadya in Sumatra**

Province	Kabupaten/Kotamadya	Population in 1990
West Sumatra	Kab. Pesisir Selatan	371,934
	Solok	427,476
	Sawah Lunto/ Sijunjung	297,129
	Tanah Datar	342,139
	Padang Pariaman	501,718
	Agam	407,767
	Limapuluh Koto	297,009
	Pasaman	451,151
	Kod. Padang	631,543
	Solok	42,715
Sawah Lunto	15,279	
Padang Panjang	38,577	
Bukit Tinggi	83,811	
Payakumbuh	90,872	
<b>Subtotal</b>		<b>3,999,120</b>
Jambi	Kab. Kerinci	279,146
	Bungo Tebo	361,243
	Sarolangun Bangko	350,284
	Batanghari	324,017
	Tanjung Jabung	361,403
Kod. Jambi	34,066	
<b>Subtotal</b>		<b>2,018,149</b>
South Sumatra	Kab. Ogan Komering Ulu	964,460
	Ogan Komering Ilir	771,463
	Muara Enim (Liot)	582,396
	Lahat	601,843
	Musi Rawas	511,949
	Musi Banyuasin	883,719
	Bangka	513,946
	Belitung	192,972
	Kod. Palembang	1,141,036
Pangkal Pinang	113,163	
<b>Subtotal</b>		<b>6,278,937</b>
Bengkulu	Kab. Bengkulu Selatan	298,214
	Rejang Lebong	367,980
	Bengkulu Utara	342,601
Kod. Bengkulu	170,327	
<b>Subtotal</b>		<b>1,179,122</b>
Lampung	Kab. Lampung Selatan	1,825,040
	Lampung Tengah	1,900,648
	Lampung Utara	1,643,485
	Kod. Bandar Lampung	636,706
<b>Subtotal</b>		<b>6,005,879</b>
<b>Total</b>		<b>36,436,145</b>

Source: "Library Hall Statistic Documentation", Central Bureau Statistic

macroeconomics environment and adoption of an outward orientation which encourages export growth.

The industrial structure of Indonesia still relies upon the agricultural sector (23.6%), but the manufacturing sector is steadily growing and has expanded its share from 11.1% in 1983 to 18.3% in 1989 in terms of current prices.

**Table 3.4 GDP and Industrial Structure of Indonesia at Current Prices**

Industrial Origin	1983		1989		Growth Rate % p.a
	Billion Rp.	(% Share)	Billion Rp.	(% Share)	
1. Agriculture, Forestry and Fishery	17,696.2	(24.0%)	39,547.0	(23.6%)	14.3%
2. Mining and Quarrying	13,967.9	(19.0%)	22,140.4	(13.2%)	8.0%
3. Manufacturing Industries	8,211.3	(11.1%)	30,573.3	(18.3%)	24.5%
4. Electricity, Gas and Water Supply	524.3	(0.7%)	1,008.3	(0.6%)	11.5%
5. Construction	4,597.2	(6.2%)	8,884.2	(5.3%)	11.6%
6. Trade, Hotel and Restaurant	12,009.4	(16.3%)	28,330.4	(16.9%)	15.4%
7. Transportation and Communication	3,978.0	(5.4%)	9,305.5	(5.6%)	15.2%
8. Banking and Other Financial Institutions	2,039.2	(2.8%)	6,550.8	(3.9%)	21.5%
9. Ownership of Dwellings	1,961.8	(2.7%)	4,151.1	(2.5%)	13.3%
10. Public Administration and Defense	5,711.5	(7.8%)	11,174.2	(6.7%)	11.8%
11. Services	3,000.8	(4.1%)	5,829.5	(3.5%)	11.7%
Gross Domestic Product	73,697.6	(100.0%)	167,494.7	(100.00%)	14.7%

Source: Statistical Year Book of Indonesia, 1985 and 1989



**Table 3.5 GDP and Industrial Structure of Indonesia at 1983 Constant Price**

Industrial Origin	1983		1989		Growth Rate % p.a
	Billion Rp.	(% Share)	Billion Rp.	(% Share)	
1. Agriculture, Forestry and Fishery	17,696.2	(24.0%)	21,996.2	(20.5%)	3.7%
2. Mining and Quarrying	13,967.9	(19.0%)	16,817.7	(15.6%)	3.1%
3. Manufacturing Industries	8,211.3	(11.1%)	19,835.9	(18.4%)	15.8%
4. Electricity, Gas and Water Supply	524.3	(0.7%)	615.6	(0.6%)	2.7%
5. Construction	4,597.2	(6.2%)	5,878.0	(5.5%)	4.2%
6. Trade, Hotel and Restaurant	12,009.4	(16.3%)	17,214.2	(16.0%)	6.2%
7. Transportation and Communication	3,978.0	(5.4%)	5,811.4	(5.4%)	6.5%
8. Banking and Other Financial Institutions	2,039.2	(2.8%)	4,288.4	(4.0%)	13.2%
9. Ownership of Dwellings	1,961.8	(2.7%)	2,877.7	(2.7%)	6.6%
10. Public Administration and Defense	5,711.5	(7.8%)	8,396.9	(7.8%)	6.6%
11. Services	3,000.8	(4.1%)	3,790.8	(3.5%)	4.0%
Gross Domestic Product	73,697.6	(100.0%)	107,522.8	(100.0%)	6.5%

Source: Statistical Year Book of Indonesia, 1985 and 1989

### 3.3.2 GRDP of Sumatra

The GRDP of each province in Sumatra during 1983 to 1989 is shown in Table 3.6. The GRDP of Sumatra accounts for about 20% of the GDP of Indonesia in 1989. The growth rate (1988-1990) of Sumatra's GRDP during the same period is relatively higher, i.e. 7.5% p.a., than Indonesia's GDP, i.e. 5.7% p.a. at 1983 constant prices. Lampung had the highest growth rate of 9.4% p.a. and was followed by North Sumatra, Bengkulu and Riau all with more than 8.0% p.a.

**Table 3.6 GRDP of Sumatra (Non oil & gas at 1983 constant price)**

(Unit : Billion Rp.)

	1983		1989		Annual Growth Rate
Aceh	1,184	2.0%	1,645	2.0%	5.6%
North Sumatra	3,275	5.4%	5,303	6.3%	8.4%
West Sumatra	1,234	2.0%	1,710	2.0%	5.6%
Riau	963	1.6%	1,534	1.8%	8.1%
Jambi	475	0.8%	707	0.8%	6.9%
South Sumatra	2,466	4.1%	3,678	4.4%	6.9%
Bengkulu	261	0.4%	422	0.5%	8.3%
Lampung	1,039	1.7%	1,777	2.1%	9.4%
Total of Sumatra	10,897	18.1%	16,776	19.9%	7.5%
Indonesia *)	60,343	100.0%	84,266	100.0%	5.7%

Notes:

\*) National Income of Indonesia, 1983-1989

**3.4 Landuse in Sumatra and the Study Area**

The landuse by province in Sumatra (1989) is presented in Table 3.7. Provinces in which more than half of the entire land is forest land are West Sumatra, Riau, Bengkulu and Aceh in that order. The average of the forest land area in Sumatra is 50%, with Lampung the lowest with 32% in 1989 because many of the forest areas have largely been cleared for transmigration settlement areas. South Sumatra and Riau have large swamp areas of 11% and 5% respectively.

Provinces which have a high share of plantation estate area are North Sumatra with 18%, Jambi with 14%, Lampung with 14%, followed by South Sumatra with 9% and Riau with 9%. Plantation estate development has been encouraged in past decades and the total area in Sumatra (59,870 km<sup>2</sup>) accounts for half that of the total for Indonesia (117,200 km<sup>2</sup>).

North Sumatra, Lampung and Aceh have been extensively developing wetland farming.

**Table 3.7 (1) Present Landuse by Province in Sumatra (1989)**

Landuse/Vegetation Type	Aceh		N. Sumatra		Riau		W. Sumatra	
	Km <sup>2</sup>	%	Km <sup>2</sup>	%	Km <sup>2</sup>	%	Km <sup>2</sup>	%
(1) Forest	31,577	57.0	29,668	41.9	58,795	62.2	31,537	63.4
(2) Housing Compound	3,330	6.0	2,611	3.7	3,736	4.0	1,056	2.1
(3) Dry Field	3,467	6.3	5,073	7.2	5,159	5.5	2,713	5.4
(4) Shifting	1,550	2.8	2,248	3.2	935	1.0	1,363	2.7
(5) Grass Land	1,241	2.2	1,727	2.4	134	0.1	423	0.8
(6) Swamp	1,162	2.1	1,780	2.5	4,687	5.0	453	0.9
(7) Dyke	310	0.6	58	0.1	27	-	2	-
(8) Water	37	0.1	66	0.1	22	-	66	0.1
(9) Fallow Land	2,903	5.2	4,180	5.9	4,356	4.6	1,300	2.6
(10) Private Wood	2,062	3.7	5,270	7.4	6,204	6.6	5,105	10.3
(11) Estate	4,522	8.2	12,690	17.9	8,385	8.9	3,536	7.1
(12) Wet Land	3,231	5.8	5,418	7.7	2,120	2.2	2,226	4.5
Total	55,392	100	70,789	100	94,561	100	49,780	100

**Table 3.7 (2) Present Landuse by Province in Sumatra (1989)**

Landuse/Vegetation Type	Jambi		S. Sumatra		Bengkulu		Lampung	
	Km <sup>2</sup>	%	Km <sup>2</sup>	%	Km <sup>2</sup>	%	Km <sup>2</sup>	%
(1) Forest	19,973	44.6	42,218	40.7	12,304	58.1	10,803	32.4
(2) Housing Compound	1,382	3.1	2,796	2.7	390	1.8	2,153	6.5
(3) Dry Field	3,208	7.2	4,530	4.4	979	4.6	4,566	13.7
(4) Shifting	1,122	2.5	2,109	2.0	232	1.1	2,209	6.6
(5) Grass Land	355	0.8	1,294	1.2	119	0.6	161	0.5
(6) Swamp	741	1.7	11,154	10.8	498	2.4	1,176	3.5
(7) Dyke	12	-	18	-	7	-	31	0.1
(8) Water	98	0.2	193	0.2	39	0.2	80	0.2
(9) Fallow Land	2,519	5.6	13,384	12.9	1,764	8.3	3,512	10.5
(10) Private Wood	6,828	15.2	11,946	11.5	2,285	10.8	1,729	5.2
(11) Estate	6,435	14.4	9,468	9.1	1,835	8.7	4,730	14.2
(12) Wet Land	2,128	4.7	4,579	4.4	715	3.4	2,157	6.5
Total	44,801	100	103,689	100	21,167	100	33,307	100

Source: Land Area by Utilization for Outside of Java, 1989  
Central Bureau of Statistics

### 3.5 Registered Motor Vehicles

The number of registered vehicles (excluding motorcycles) in Indonesia has increased from approximately 2,061,000 vehicles in 1985 to 2,570,000 vehicles in 1989, which gives an annual growth rate of 5.7% between 1985 and 1989. The annual growth rate of buses over the years 1985-1989 is very high at 17.6%, whilst in the same period that of passenger cars was 4.6% per year and that of trucks 3.0% per year (refer to Table 3.8).

The annual growth rate of registered vehicles in Sumatra is 9.3%. Every province in the Southern part of Sumatra has a high annual growth rate of more than 10%. Jambi is the highest followed by South Sumatra, Lampung, Bengkulu and Riau (9.7%).

Sumatra is second next to Java in the number of registered vehicles. It has 16.6% passenger vehicles, 18.4% buses and 24.8% trucks of all Indonesian registered vehicles. In Sumatra, trucks have the largest share at 46.1%, the second, passenger cars, have 38.3% and the third, buses, have 15.6%. It is to be noted that the truck percentage is higher than that of other vehicles in Sumatra. For instance, in Java, passenger cars have a 49.4% share, trucks 32.4% and buses 18.2%. Thus in Java passenger car percentage is the highest.

North and South Sumatra provinces, where industries have developed well, have more registered vehicles than other provinces in Sumatra. They have approximately 183,000 and 123,000 vehicles respectively, resulting in 59.7% of all Sumatra vehicles, being only two provinces out of eight. (Refer to Table 3.9).

Table 3.8 Number of Registered Vehicles in Indonesia

Type of Vehicle	Region	Year					Percent of Total in 1989	Growth Ratio (% p.a) 1989/1985	Percent of Grand Total in 1989
		1985	1986	1987	1988	1989			
Passenger Cars	Sumatra	127,866	142,278	168,843	186,993	196,329	16.6	9.0	38.3
	Java	756,768	809,258	877,561	768,250	853,347	72.2	2.4	49.4
	Sulawesi	41,818	46,530	50,194	36,389	42,396	3.6	0.3	33.1
	Kalimantan	29,527	30,432	33,068	37,612	40,045	3.4	6.3	44.2
	Others	33,179	35,461	40,437	43,862	50,136	4.2	8.6	45.2
	Indonesia	989,158	1,063,959	1,170,103	1,073,106	1,182,253	100.0	3.1	46.0
Buses	Sumatra	49,835	54,986	74,168	75,216	80,155	18.4	10.0	15.6
	Java	147,087	166,780	189,380	276,588	314,188	72.2	16.4	18.2
	Sulawesi	13,452	15,983	18,823	14,660	20,257	4.7	8.5	15.8
	Kalimantan	8,150	8,852	9,747	9,196	9,739	2.2	3.6	10.8
	Others	8,780	9,973	11,260	10,071	10,594	2.4	3.8	9.6
	Indonesia	227,304	256,574	303,378	385,731	434,933	100.0	13.9	16.9
Trucks	Sumatra	182,246	189,793	212,417	225,061	236,426	24.8	5.3	46.1
	Java	523,783	543,896	583,376	525,871	559,774	58.8	1.3	32.4
	Sulawesi	62,529	67,221	71,367	56,353	65,306	6.9	0.9	51.0
	Kalimantan	37,602	38,142	39,301	38,290	40,778	4.3	1.6	45.0
	Others	39,178	43,279	47,233	47,006	50,177	5.3	5.1	45.2
	Indonesia	845,338	882,331	953,694	892,581	952,461	100.0	2.4	37.1
Total	Sumatra	359,947	387,057	455,428	487,270	512,910	20.0	7.3	100.0
	Java	1,427,638	1,519,934	1,650,317	1,570,709	1,727,309	67.2	3.9	100.0
	Sulawesi	117,799	129,734	140,384	107,402	127,959	5.0	1.7	100.0
	Kalimantan	75,279	77,426	82,116	85,098	90,562	3.5	3.8	100.0
	Others	81,137	88,713	98,930	100,939	110,907	4.3	6.5	100.0
	Indonesia	2,061,800	2,202,864	2,427,175	2,351,418	2,569,647	100.0	4.5	100.0

Source: Statistical Year Book of Indonesia, 1990

**Table 3.9 Number of Registered Vehicles in Sumatra**

Province/Area	Year	Passenger Vehicle	Bus	Truck	Total
Aceh	1985	6,715	3,632	12,403	22,750
	1986	7,340	4,093	12,826	24,259
	1987	10,598	4,093	14,432	29,123
	1988	13,543	1,493	12,570	27,606
	1989	13,543	1,867	15,650	31,060
North Sumatra	1985	46,775	24,647	62,537	133,959
	1986	50,424	27,974	65,501	143,899
	1987	54,753	29,988	67,352	152,098
	1988	66,414	30,551	72,087	169,052
	1989	72,824	33,335	76,917	183,076
Riau	1985	11,452	1,823	15,007	28,282
	1986	13,009	2,103	16,304	31,416
	1987	15,507	2,750	17,720	35,977
	1988	17,271	3,241	19,054	39,566
	1989	17,854	3,483	19,637	40,974
West Sumatra	1985	14,174	6,148	20,124	40,446
	1986	15,776	6,794	21,417	43,987
	1987	17,285	7,701	23,209	48,195
	1988	11,694	9,097	21,557	42,348
	1989	12,128	10,121	22,471	44,720
Jambi	1985	4,669	1,894	7,294	13,857
	1986	5,338	1,955	7,453	14,746
	1987	6,772	4,132	9,066	19,970
	1988	7,479	4,299	10,086	21,864
	1989	7,662	4,371	10,284	22,317
South Sumatra	1985	30,319	9,164	37,132	76,615
	1986	34,659	9,459	37,939	82,057
	1987	43,967	19,992	46,149	110,108
	1988	48,554	20,800	51,339	120,693
	1989	49,741	21,147	52,346	123,234
Bengkulu	1985	1,643	827	7,850	10,320
	1986	1,878	853	8,021	10,752
	1987	2,382	1,803	9,757	13,942
	1988	2,631	1,876	10,854	15,361
	1989	2,695	1,907	11,067	15,669
Lampung	1985	12,119	1,700	19,899	33,718
	1986	13,854	1,755	20,332	35,941
	1987	17,574	3,709	24,732	46,015
	1988	19,407	3,859	27,514	50,780
	1989	19,882	3,924	28,054	51,860
Sumatra Total	1985	127,866	49,835	182,246	359,947
	1986	142,278	54,986	189,793	387,057
	1987	168,843	74,168	212,417	455,428
	1988	186,993	75,216	225,061	487,270
	1989	196,329	80,155	236,426	512,910

Source: Statistical Year Book of Indonesia, 1990

**Chapter 4**  
**CURRENT TRANSPORTATION PROFILE**





## CHAPTER 4

### CURRENT TRANSPORTATION PROFILE

#### 4.1 General

Five transportation modes, i.e. road, railway, river, sea and air are utilized in Sumatra. Cargo and passenger transportation share by mode is presented in Table 4.1 and Fig. 4.1. Refer to Fig. 4.2 for the major transportation network in Sumatra.

**Table 4.1 Cargo and Passenger Transportation Share by Mode in Sumatra, 1988**

Mode	Cargo		Passenger	
	Magnitude (ton)	Share (%)	Magnitude (person)	Share (%)
1) Road	32,600,000	51.17	194,500,000	95.17
2) Railway	5,294,000	8.31	2,251,000	1.10
3) River	7,354,513	11.54	6,452,637	3.16
4) Air	2,813,019	4.42	548,413	0.27
5) Sea	15,648,600	24.56	618,410	0.30
Total	63,710,132	100.00	204,370,460	100.00

Sources:

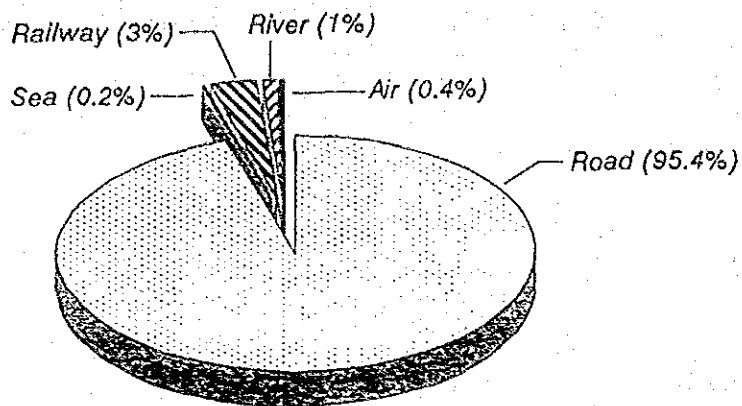
- 1) 1982 OD Survey data updated to the year 1988
- 2) "Indonesia Year Book 1990", Central Bureau of Statistics
- 3) 1988 National OD Survey
- 4) Estimates by the Study Team

#### 4.2 Road Transportation

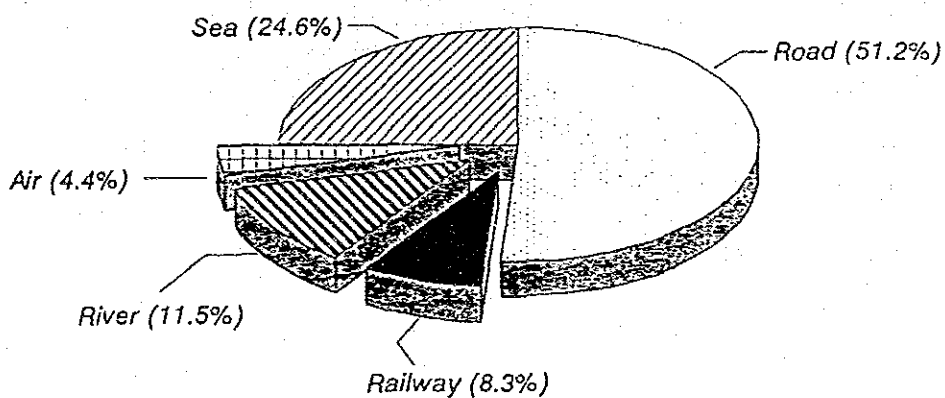
##### 4.2.1 Road Network

(1) Road Network in Indonesia and Sumatra

The length of national and provincial roads in Sumatra is 4,670 kilometers and 15,222 kilometers respectively in 1989. These roads are asphalt-paved or unpaved, of which asphalt paved sections account for 94.0% and 68.4% respectively.



PASSENGER TRANSPORTATION SHARE  
IN SUMATERA, 1988



CARGO TRANSPORTATION SHARE  
IN SUMATERA, 1988

Sources :

1. 1982 OD Survey projected to the year 1988
2. 'Indonesia Year Book 1990', Central Bureau of Statistics
3. 1988 National OD Survey
4. Estimates by the Study Team

COASTAL ROADS  
IN  
EAST COAST OF SUMATRA

Fig. 4.1

Cargo and Passenger  
Transportation Share  
in Sumatra, 1988



Table 4.2 shows present road network conditions in Sumatra together with a comparison with other islands of Indonesia.

Road densities in Indonesia and Sumatra are 0.14 and 0.18 km/km<sup>2</sup> respectively which are lower than in Nusa Tenggara and Sulawesi. However when traffic conditions in each island are noted it can be seen that Sumatra has higher figures in vehicles, passengers and cargo movement and is next to Java (refer to Table 4.3).

**Table 4.3 Road Traffic in Indonesia and Sumatra**

Island	Vehicle	Passengers	Cargo
	Veh-km x 10 <sup>6</sup>	Person-km x 10 <sup>9</sup>	Ton-km x 10 <sup>6</sup>
Sumatra	3,250	18	3,700
Java	11,910	76	14,900
Nusa Tenggara	290	1	100
Kalimantan	420	2	180
Sulawesi	860	4	390

Source: Person - Trip Data, 1982

## (2) Road Network in Each Province of Sumatra

Present road conditions in each province are presented in Table 4.4. Road density in Riau, Jambi and South Sumatra is much lower than in the other provinces and unpaved national roads are seen in Jambi, Bengkulu and Lampung. See Fig. 4.3 for the road network in Sumatra.

The road network in the Sumatra East Coast Area (i.e. north Sumatra, Riau, Jambi, South Sumatra and Lampung) has the following major constraints:

- To date there is no road network directly linking Lampung and Palembang, which is the second largest city in Sumatra, and all vehicle traffic in this link is forced to pass via Marlapura (this results in about 1.7 times travel distance compared with the direct link);
- Many national road sections have substandard carriageway width of 4.5 m in the east coast area and some sections are still not paved (refer to Table 4.5);

**Table 4.2 Road Network in Indonesia**

Description	Sumatra	Java	Nusa Tenggara	Kalimantan	Sulawesi	Maluku & Irian Jaya	Total
Area(km <sup>2</sup> )	473,481	131,596	88,488	539,460	189,216	496,486	1,918,727
Population(1000) 1990	36,455	99,320	10,165	9,110	12,522	3,497	171,069
Density (psn/km)	77.0	754.7	114.9	16.9	66.2	7.0	89.2
GDP (billion) 1988	26,568	40,644	2,814	7,934	4,091	2,814	84,865
<b>National</b>							
Paved	4,389	2,274	2,110	1,864	2,342	442	13,421
(%)	94.0%	100.0%	78.4%	71.3%	79.7%	22.2%	78.1%
Unpaved	281	0	583	750	597	1,553	3,764
Total	4,670	2,274	2,693	2,614	2,939	1,995	17,185
<b>Provincial</b>							
Paved	10,412	6,597	1,735	1,296	3,761	1,518	25,319
(%)	68.4%	93.8%	46.5%	27.2%	57.4%	44.6%	62.2%
Unpaved	4,810	435	1,995	3,464	2,795	1,886	15,385
Total	15,222	7,032	3,730	4,760	6,556	3,404	40,704
<b>Regency</b>							
Paved	15,731	32,213	5,683	3,268	6,613	1,979	65,487
(%)	28.3%	56.5%	28.9%	16.5%	21.0%	26.1%	34.3%
Unpaved	39,786	24,779	14,015	16,577	24,848	5,591	125,596
Total	55,517	56,992	19,698	19,845	31,461	7,570	191,083
<b>Municipal</b>							
Paved	6,010	4,001	0	825	1,223	178	12,237
(%)	65.2%	74.2%	0	78.9%	82.1%	76.7%	70.4%
Unpaved	3,203	1,393	0	220	267	54	5,137
Total	9,213	5,394	0	1,045	1,490	232	17,374
<b>Total</b>							
Paved	36,542	45,085	9,528	7,253	13,939	4,117	116,464
(%)	43.2%	62.9%	36.5%	25.7%	32.8%	31.2%	43.7%
Unpaved	48,080	26,607	16,593	21,011	28,507	9,084	149,882
Grand Total	84,622	71,692	26,121	28,264	42,446	13,201	266,346
	31.8%	26.9%	9.8%	10.6%	15.9%	5.0%	100.0%
Road Density (km/km <sup>2</sup> )	0.179	0.545	0.295	0.052	0.224	0.027	0.139
Length (km/psn)	2.321	0.722	2.570	3.103	3.390	3.775	1.557
National (km/km <sup>2</sup> )	0.010	0.017	0.030	0.005	0.016	0.004	0.009
National and Provincial (km/km <sup>2</sup> )	0.042	0.071	0.073	0.014	0.050	0.011	0.030
Km/GDP	3.185	1.764	9.283	3.562	10.375	4.691	3.138

Source: Vehicles and Length of Road Statistics - 1989

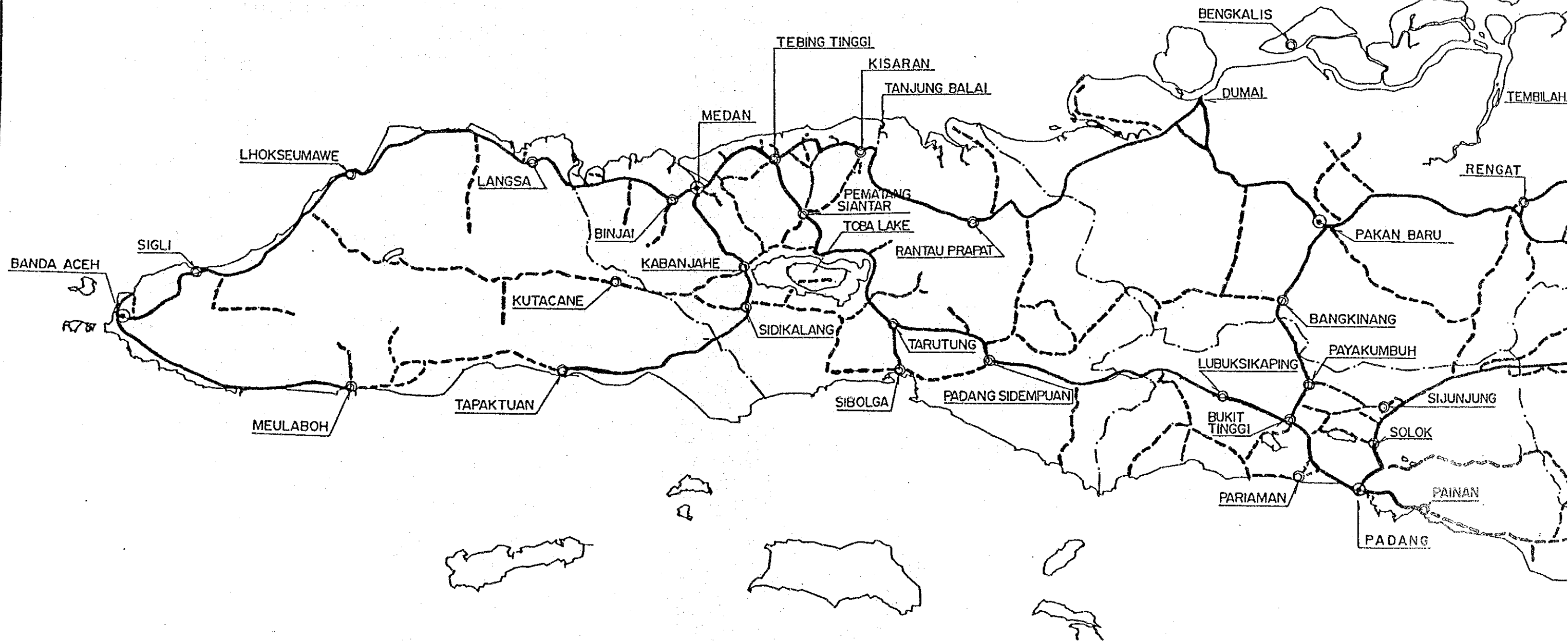
Notes: psn = Person  
 km = kilometer  
 GDP = Gross Domestic Product

**Table 4.4 Road Conditions in Each Province of Sumatra**

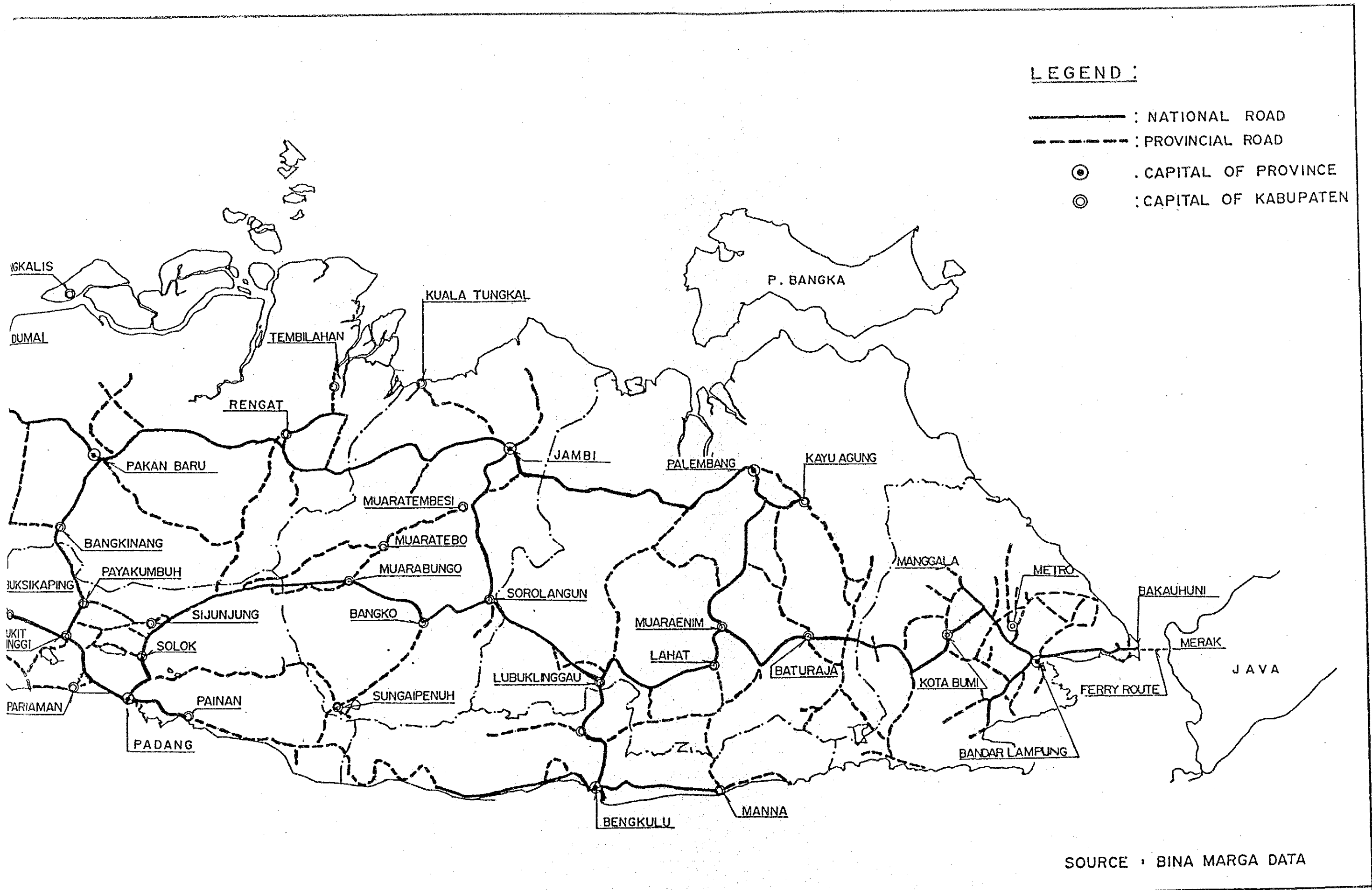
Description	Aceh	North Sumatra	West Sumatra	Riau	Jambi	South Sumatra	Bengkulu	Lampung	Total
Area(km <sup>2</sup> )	55,392	70,789	49,778	94,561	44,800	103,688	21,168	33,307	473,483
Population(1000) 1990	3,416	10,256	3,999	3,306	2,016	6,277	1,179	6,006	36,455
Density (psn/km)	61.7	144.9	80.3	35.0	45.0	60.5	55.7	180.3	77.0
<b>National</b>									
Paved	492	846	802	103	540	1,013	190	403	4,389
(%)	100.0%	100.0%	100.0%	100.0%	76.4%	99.5%	76.3%	89.0%	94.0%
Unpaved	0	0	0	0	167	5	59	50	281
Total	492	846	802	103	707	1,018	249	453	4,670
<b>Provincial</b>									
Paved	1,054	2,353	1,024	900	741	1,916	988	1,436	10,412
(%)	51.0%	90.1%	90.5%	35.4%	53.0%	69.5%	89.9%	89.0%	68.4%
Unpaved	1,011	258	107	1,645	658	842	111	178	4,810
Total	2,065	2,611	1,131	2,545	1,399	2,758	1,099	1,614	15,222
<b>Regency</b>									
Paved	1,697	4,831	2,919	949	764	1,998	924	1,649	15,731
(%)	23.0%	29.8%	39.9%	13.6%	20.4%	27.7%	40.5%	37.6%	28.3%
Unpaved	5,675	11,394	4,399	6,038	2,977	5,205	1,358	2,740	39,786
Total	7,372	16,225	7,318	6,987	3,741	7,203	2,282	4,389	55,517
<b>Municipal</b>									
Paved	313	3,070	1,186	415	210	384	193	239	6,010
(%)	86.0%	69.8%	60.5%	40.5%	68.9%	85.7%	71.7%	53.6%	65.2%
Unpaved	51	1,326	774	610	95	64	76	207	3,203
Total	364	4,396	1,960	1,025	305	448	269	446	9,213
<b>Total</b>									
Paved	3,556	11,100	5,931	2,367	2,255	5,311	2,295	3,727	36,542
(%)	34.5%	46.1%	52.9%	22.2%	36.7%	46.5%	58.9%	54.0%	43.2%
Unpaved	6,737	12,978	5,280	8,293	3,897	6,116	1,604	3,175	48,080
Grand Total	10,293	24,078	11,211	10,660	6,152	11,427	3,899	6,902	84,622
	12.2%	28.5%	13.2%	12.6%	7.3%	13.5%	4.6%	8.2%	100.0%
Road Density (km/km <sup>2</sup> )	0.186	0.340	0.225	0.113	0.137	0.110	0.184	0.207	0.179
Length (km/psn)	3.013	2.348	2.803	3.224	3.052	1.820	3.307	1.149	2.321

Source: Vehicles and Length of Road Statistics - 1989

Notes: psn = person  
km = kilometer



COASTAL ROADS IN EA



SOURCE : BINA MARGA DATA

COASTAL ROADS IN EAST COAST OF SUMATRA

Fig. 4.3 ROAD NETWORK IN SUMATRA





- General distance between the existing Sumatra Highway and the national road which links the major cities of Dumai, Pakan Baru, Rengat, Jambi and Palembang is approximately 150 kilometers and only three major east-west connections are provided (i.e. Muara Enim-Palembang, Sarolangun-Jambi and Bukittinggi-Pekanbaru); and
- The existing Sumatra Highway passes through the Barisan mountain range in West and North Sumatra, thus the carriageway width is limited to 4.5 m in steep terrain and frequent major landslides have occurred in past years.

**Table 4.5 Surface Condition of National Roads in East Coast Area**

Unit: Kilometer

Province	Asphalt	Gravel	Unpaved	Total
North Sumatra	846	-	-	846
Riau	103	-	-	103
Jambi	540	160	7	707
South Sumatra	1,013	-	5	1,018
Lampung	403	50	-	453
<b>Total</b>	<b>2,905</b>	<b>210</b>	<b>12</b>	<b>3,127</b>

Source: Vehicles and Length of Road Statistics - 1989

### (3) Road Classification

The Indonesian road network is divided into two categories, these being the Primary road system and the Secondary road system. The Primary road system consists of three classifications by function, namely Primary Arterial, Primary Collector and Primary Local roads. Classification and the respective responsible agencies are shown in Table 4.6.

**Table 4.6 Road Classification and Administration (except Tollway)**

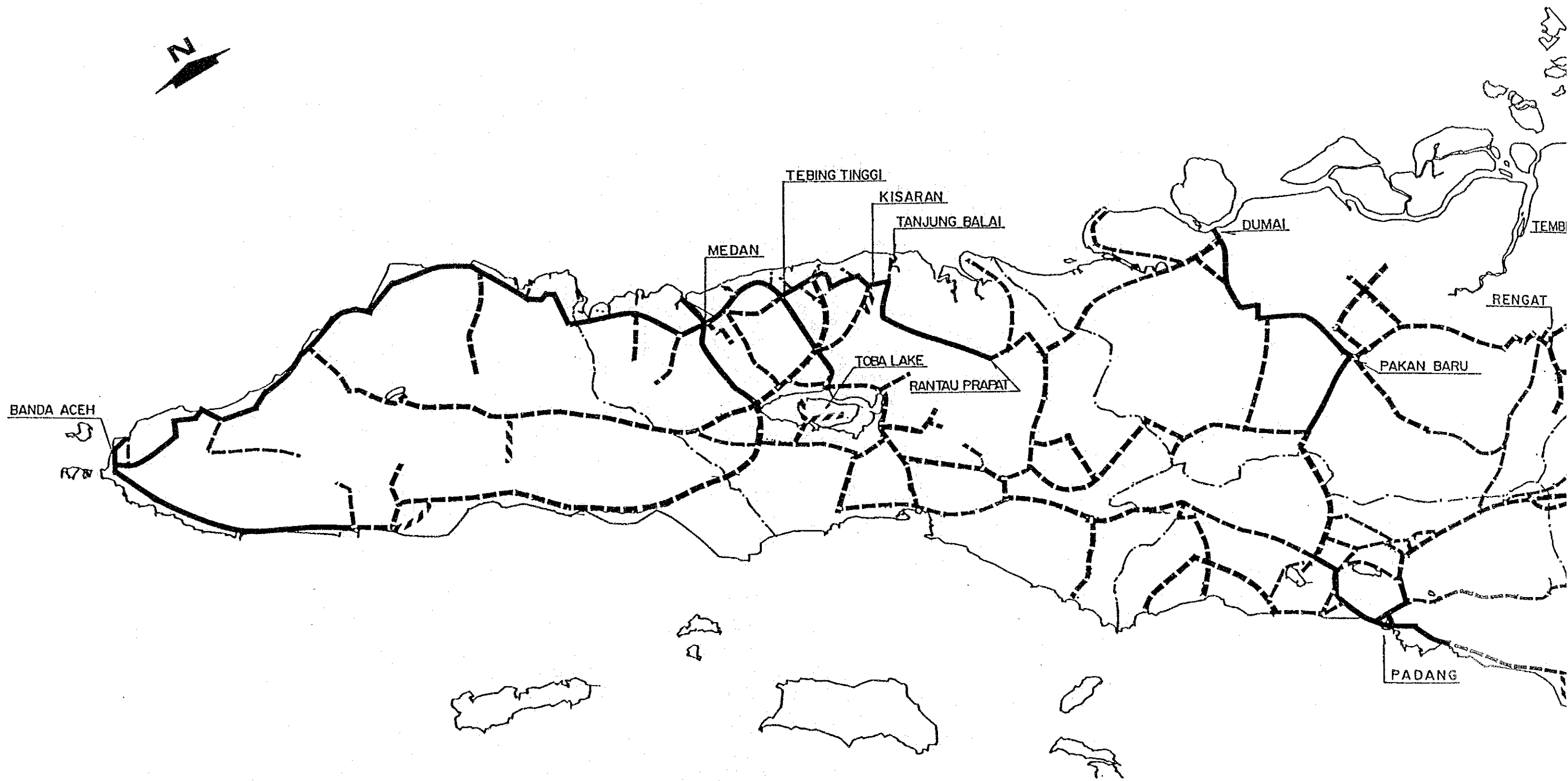
Road Network	Road Classification		Responsibility	
	Functional Classification	Administrative Classification		
Primary Road System	Primary Arterial Road		National Road	Ministry of Public Works
	Primary Collector Road	KP1	Provincial Road	Provincial Government
		KP2		
		KP3	Kabupaten Road	Kabupaten Government
		KP4		
Primary Local Road				
Secondary Road System	Secondary Arterial Secondary Collector Secondary Local	Urban and Kabupaten Road	Municipal Government	

Source: Bina Marga Data

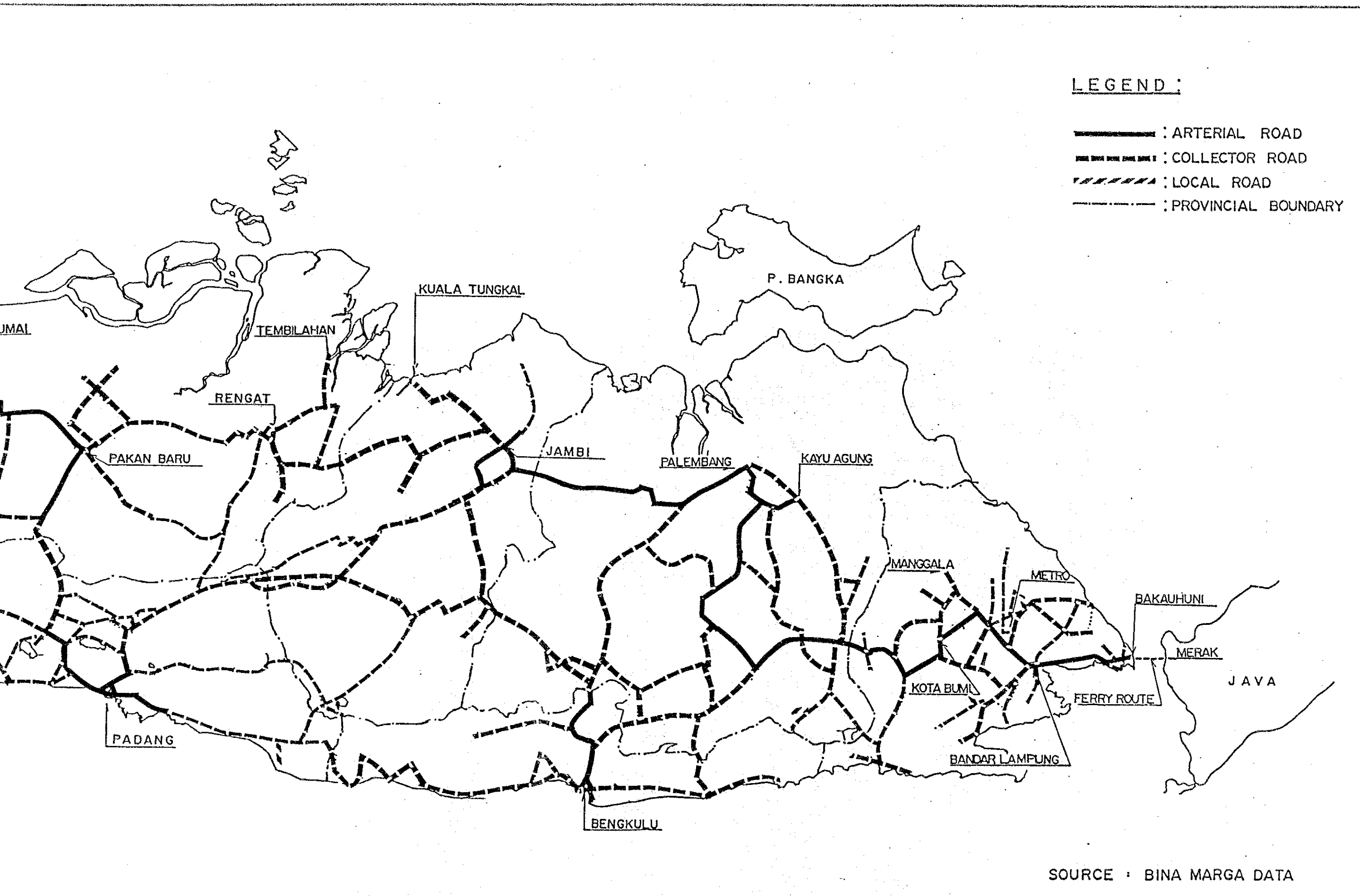
- Notes:
- KP1 - Primary Collector connecting provincial capitals
  - KP2 - Primary Collector connecting provincial capitals with Kabupaten and urban capitals
  - KP3 - Primary Collector connecting Kabupaten and urban capitals
  - KP4 - Other Primary Collector

Figs. 4.4 and 4.5 show the existing road network with classification and road width respectively, based on Bina Marga's road inventory data in IRMS (Interurban Road Management System).

Existing roads, where the Sumatra East Coast Highway is proposed, belong to the classification Collector Road for 50% of their length according to the IRMS. Some of the sections still have a road width of 4.5 - 6.0 m.



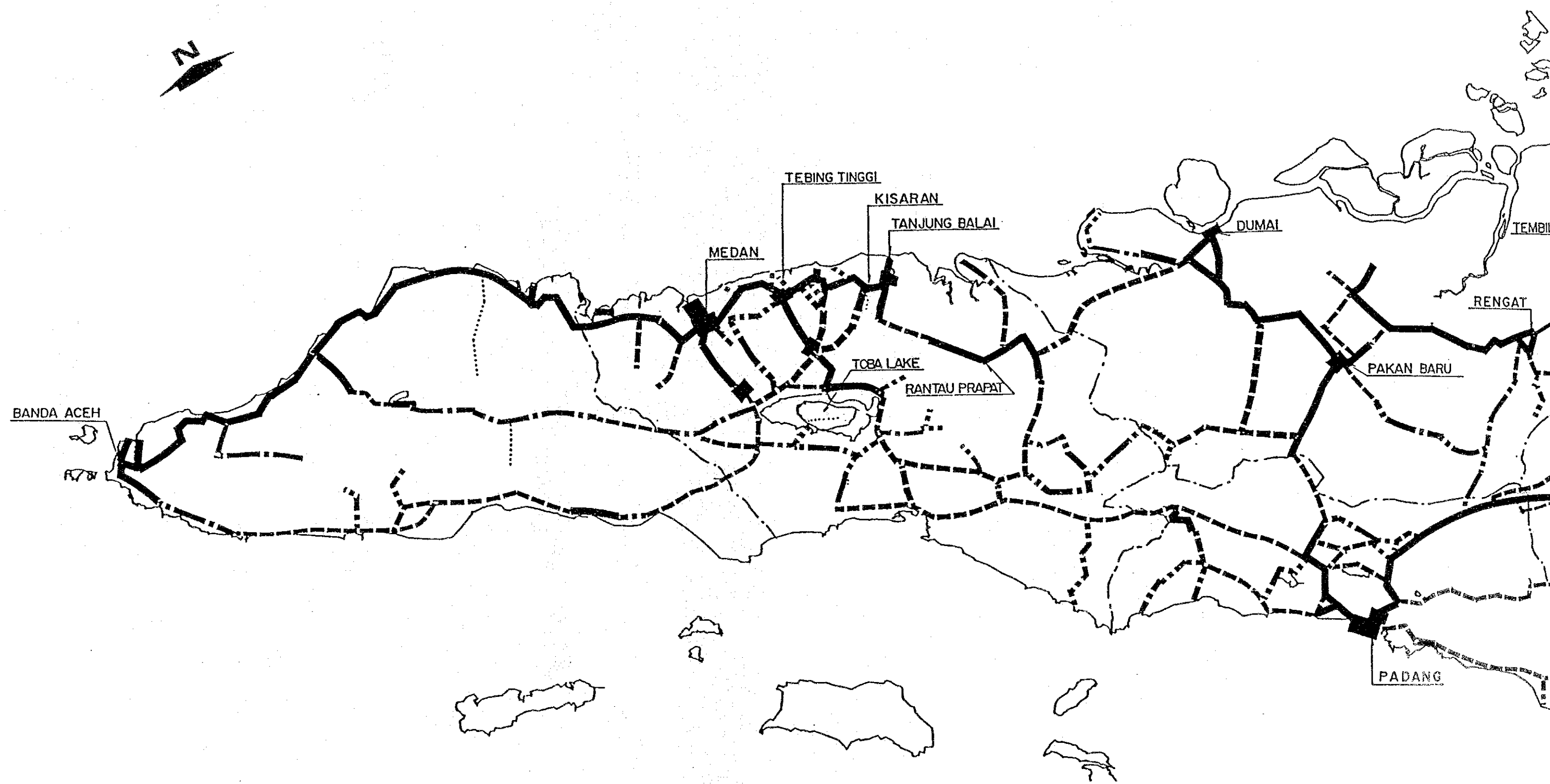
COASTAL ROADS IN



COASTAL ROADS IN EAST COAST OF SUMATRA





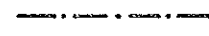
Fig. 4.4

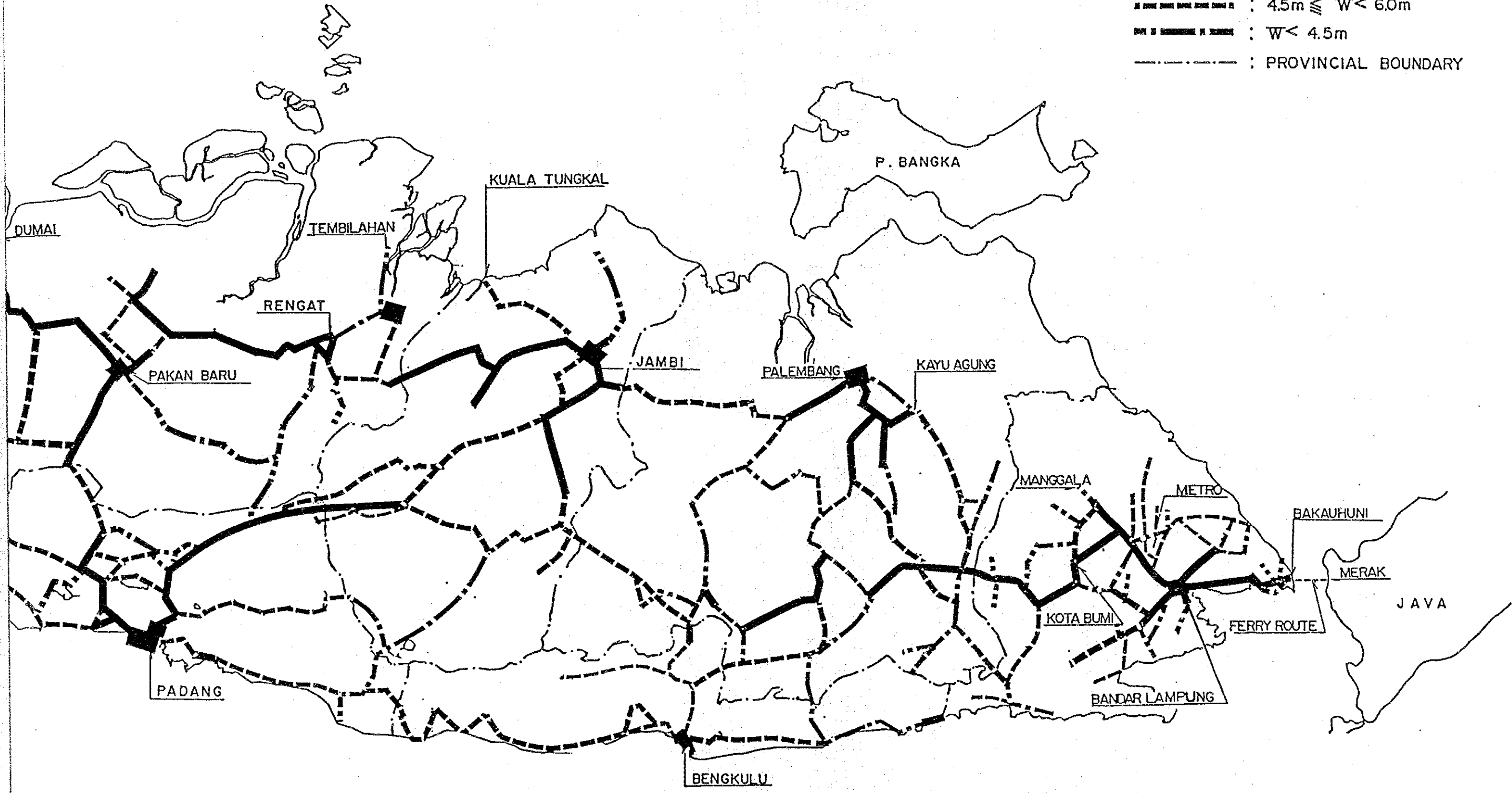
Road Classifications in Sumatra



COASTAL ROADS IN

**LEGEND :**

-  : CARRIAGEWAY WIDTH.  $W > 10m$
-  :  $6.0m \leq W \leq 10m$
-  :  $4.5m \leq W < 6.0m$
-  :  $W < 4.5m$
-  : PROVINCIAL BOUNDARY



SOURCE : BINA MARGA DATA

COASTAL ROADS IN EAST COAST OF SUMATRA

Fig. 4.5 Road Width in Sumatra







#### **4.2.2 Road Traffic**

Traffic characteristics are shown in Fig. 4.6 for the East Coast Highway, Trans Sumatra Highway and east-west links between both highways with the following notable features:

- Traffic volumes in 1990 range from 400 to 4,000 vehicles/day for the East Coast Highway, from 2,000 to 4,000 vehicles/day for the Trans Sumatra Highway and from 1,700 to 4,300 vehicles/day for the east-west links. The section with the least traffic volume is Pakangbaru to Jambi section at 500 vehicles/day which is due to the unsatisfactory geometric and pavement condition of the national road;
- Traffic volume between Medan and Binjai within the Metropolitan area is a relatively large volume of about 34,000 vehicles/day; and
- Most road sections have over 40 % of heavy vehicle composition.

#### **4.3 Railway Transportation**

There is no trans Sumatra railway system. PERUMKA (Perusahaan Umum Kereta Api, formerly PJKA) is operating the following three individual networks in Sumatra (refer to Fig. 4.7):

- North Sumatra Railways surrounding Medan;
- West Sumatra Railways which connect Padang and its hinterland; and
- South Sumatra Railways which encompass the provinces of South Sumatra and Lampung.

The total lengths of the above railway systems are 1,052 km, 204 km and 679 km respectively and all the systems are operated with a single track.

##### **(1) North Sumatra Railways**

The network consists of Besitang-Medan-Rantauprapat main line and five spurs. Medan-Belawan spur is connected with Medan international airport and transports about 70% of the cargo of North Sumatra Railways. Total passengers in 1988 is 1,280,000 and the total cargo transported in 1987 is 770,000 ton of which 530,000 ton was estate product (i.e. palm oil).

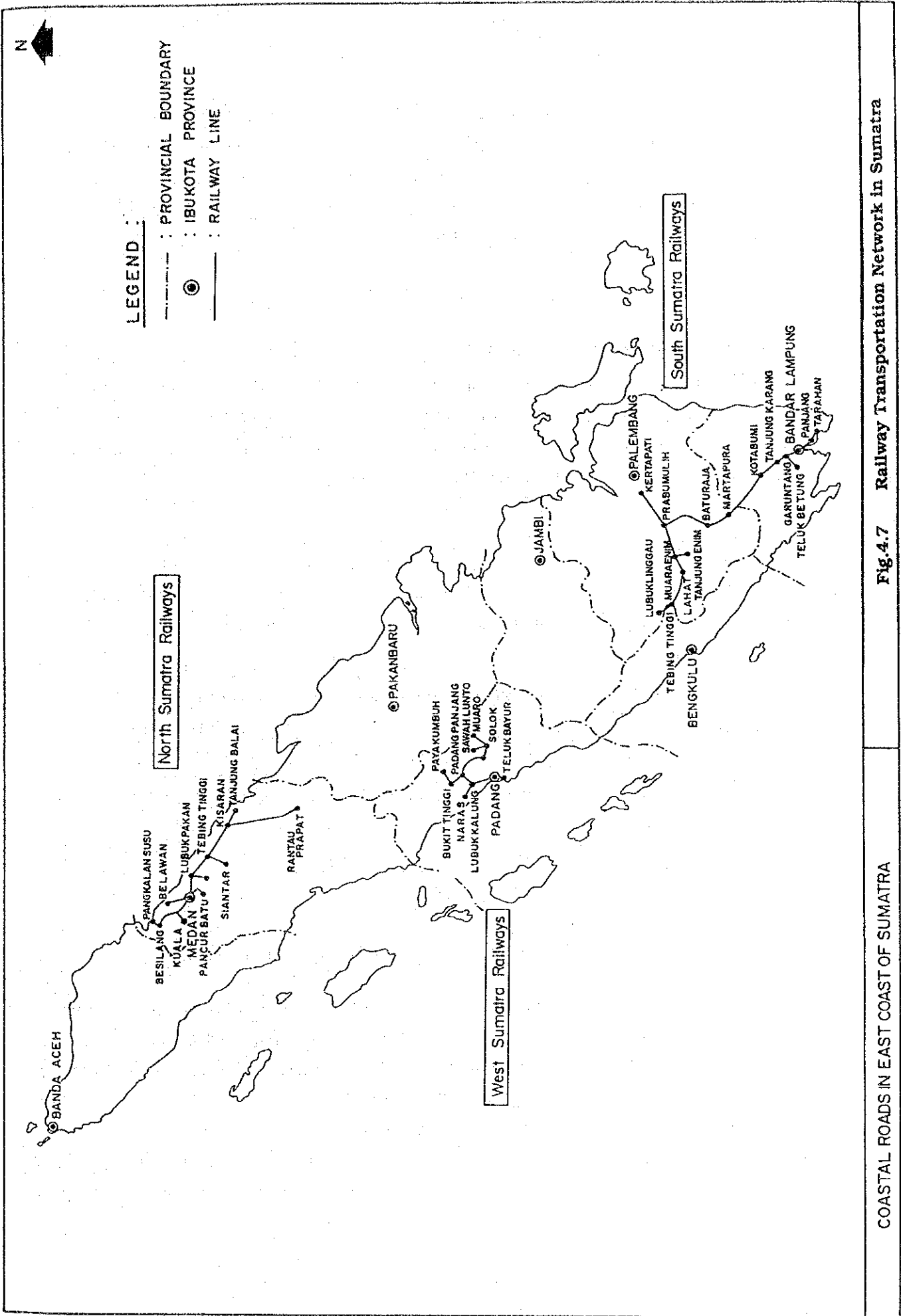


Fig.4.7 Railway Transportation Network in Sumatra

(2) West Sumatra Railways

The main network consists of Padang-Ombilin coal mine and the spur to connect with Indarung cement plant. The total cargo transported in 1987 is 1,290,000 ton and proportions of cement and coal are 800,000 ton (62%) and 490,000 ton (38%) respectively. Passenger traffic has been very minor and West Sumatra Railways has carried no passengers since the end of 1990.

(3) South Sumatra Railways

Main lines connect Palembang - Bandar Lampung - Panjang (major port) and Prabumulih - Muaraenim (coal mine) - Lubuklinggau (agricultural product). South Sumatra Railways carried 940,000 passengers (1988) and transported 2,020,000 ton of cargo (1987). There is a special port for coal loading at Tarahan and the railway transported 1,240,000 ton of coal in 1987.

(4) Summary

Table 4.7 shows the past trend of railway passengers in Sumatra. The total number of railway passengers in Sumatra in 1988 has decreased to approximately 84% of the number in 1985.

**Table 4.7 Trend of Railway Passengers in Sumatra (1984-1988)**

Unit: 1,000 person

Railways	1984	1985	1986	1987	1988
N. Sumatra	1,525	1,630	1,597	1,630	1,280
W. Sumatra	22	33	23	17	29
S. Sumatra	1,195	1,030	1,039	987	942
Total	2,742	2,693	2,659	2,634	2,251

Sources:

- 1) Railways Statistics - 1987
- 2) "Indonesia Year Book 1990", Central Bureau of Statistics

Table 4.8 shows the past trend of railway cargo in Sumatra. Production of coal and cement is increasing in recent years and railway cargo transported in 1987 is 1.7 times that of 1983. Table 4.9 shows the items of railway cargo based on 1987 statistics.

**Table 4.8 Trend of Railway Cargo Transported in Sumatra (1983-1987)**

Unit: 1,000 ton

Railways	1983	1984	1985	1986	1987
N. Sumatra	563	598	664	743	772
W. Sumatra	925	1,260	1,398	1,521	1,293
S. Sumatra	903	1,251	1,486	1,713	2,021
<b>Total</b>	<b>2,391</b>	<b>3,109</b>	<b>3,548</b>	<b>3,977</b>	<b>4,086</b>

Sources:

- 1) Railways Statistics - 1987
- 2) "Indonesia Year Book 1990", Central Bureau of Statistics

**Table 4.9 Railway Cargo Transportation by Item**

Unit: ton

Item	North Sumatra	West Sumatra	South Sumatra	Total
Coal	-	493,730	1,242,049	1,735,779
Manufactured Goods	3,491	92	13,619	17,202
Sugar	-	-	19,893	19,893
Estate Products	534,850	-	-	534,850
Crude Oil	140,884	-	157,622	298,506
Fertilizer	35,241	-	13,400	48,641
Cement	-	798,720	374,361	1,173,081
Others	57,405	400	200,217	258,022
<b>Total</b>	<b>771,871</b>	<b>1,292,942</b>	<b>2,021,161</b>	<b>4,085,974</b>

Sources:

- 1) Railways Statistics - 1987
- 2) "Indonesia Year Book 1990", Central Bureau of Statistics

#### 4.4 Sea Transportation

Sea transportation in Sumatra is divided into two types. One is cargo ship transportation and the other is ferry transportation, the latter between Bakauhuni and Merak.

##### 4.4.1 Cargo Ship Transportation

There are 94 operational ports of various sizes in Sumatra. 83 out of the 94 ports are located in the east coastal region and 11 in the west coastal region. Principal ports are Lhokseumawe, Belawan and Dumai on the east coast, Pekanbaru, Rengat, Jambi and Palembang on rivers, and Padang (Teluk Bayur) and Bandar Lampung (Panjang) on the west coast. The locations are shown in Fig. 4.8.



Ports in Sumatra handle 43% by value of all exports and imports of Indonesia and 61% of the total tonnage. Main materials exported are natural energy resources such as crude oil and coal and primary products such as plantation crops and wood. The ports play an important role in both export and inland transport for their hinter land. In particular, the ports in the east coastal region handle 90% of all Sumatra cargo tonnes (in both inter island and international transport). They have contributed much to the development of the east coast industries (see Tables 4.10 and 4.11).

#### (1) Cargo Tons and Commodities

Weight of cargoes handled (both inter island and international) for each province and principal port in Sumatra is shown in Table 4.11 (in 1988). Riau province handled the largest amount, 46 million tons in total, being 47% of all Sumatra cargoes. The second largest amount was handled by Aceh province, 32%, followed by North Sumatra with 7% and South Sumatra with 5%.

Cargoes handled by the fifteen principal ports in Sumatra account for 82.5% of all Sumatra ports. Ports which handle the largest weight of cargoes are Dumai, Lhokseumawe, Belawan and Palembang in that order. 74% of the cargoes of Dumai port in Riau are international, of which 99% are petro chemical products and LNG, the rest are wooden products, etc. Lhokseumawe port in Aceh also handles petro chemical products amounting to 98% of the international cargoes, the rest is fertilizer, etc. In contrast with the above, at Belawan port in North Sumatra, inter island cargoes account for 56%, which is a little more than the international cargoes.