THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

FEASIBILITY STUDY
ON
IRRAWADDY RIVER BRIDGE
CONSTRUCTION PROJECT

FINAL REPORT

MARCH 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

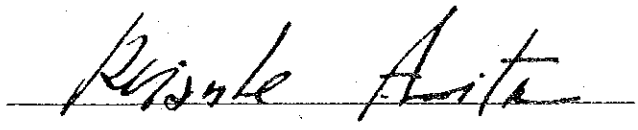
In response to the request of the Government of the Socialist Republic of the Union of Burma, the Japanese Government has decided to conduct a feasibility study on the Irrawaddy River Bridge Construction Project and entrusted the study to the Japan International Cooperation Agency. J.I.C.A. sent to Burma a survey team headed by Dr. Tadayoshi Okubo, who was succeeded by Mr. Keikichi Yoshida, during a period from November 10, 1985 to January 23, 1987.

The team had discussions with the officials concerned of the Government of Burma and conducted a survey in the project area. After the team returned to Japan, further studies were made and the present report has been prepared.

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

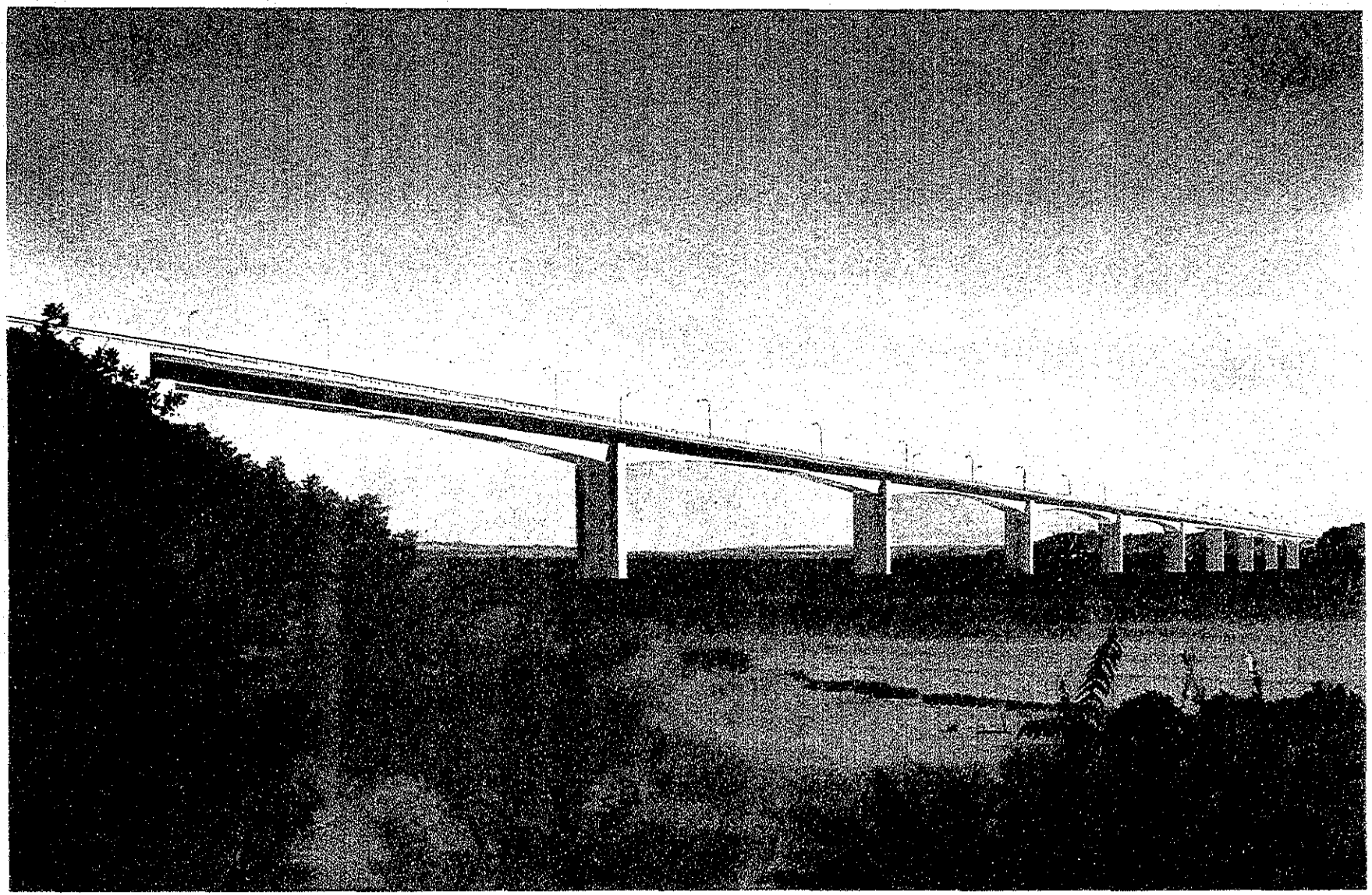
I wish to express my deep appreciation to the officials concerned of Burma for their close cooperation extended to the team.

March, 1987

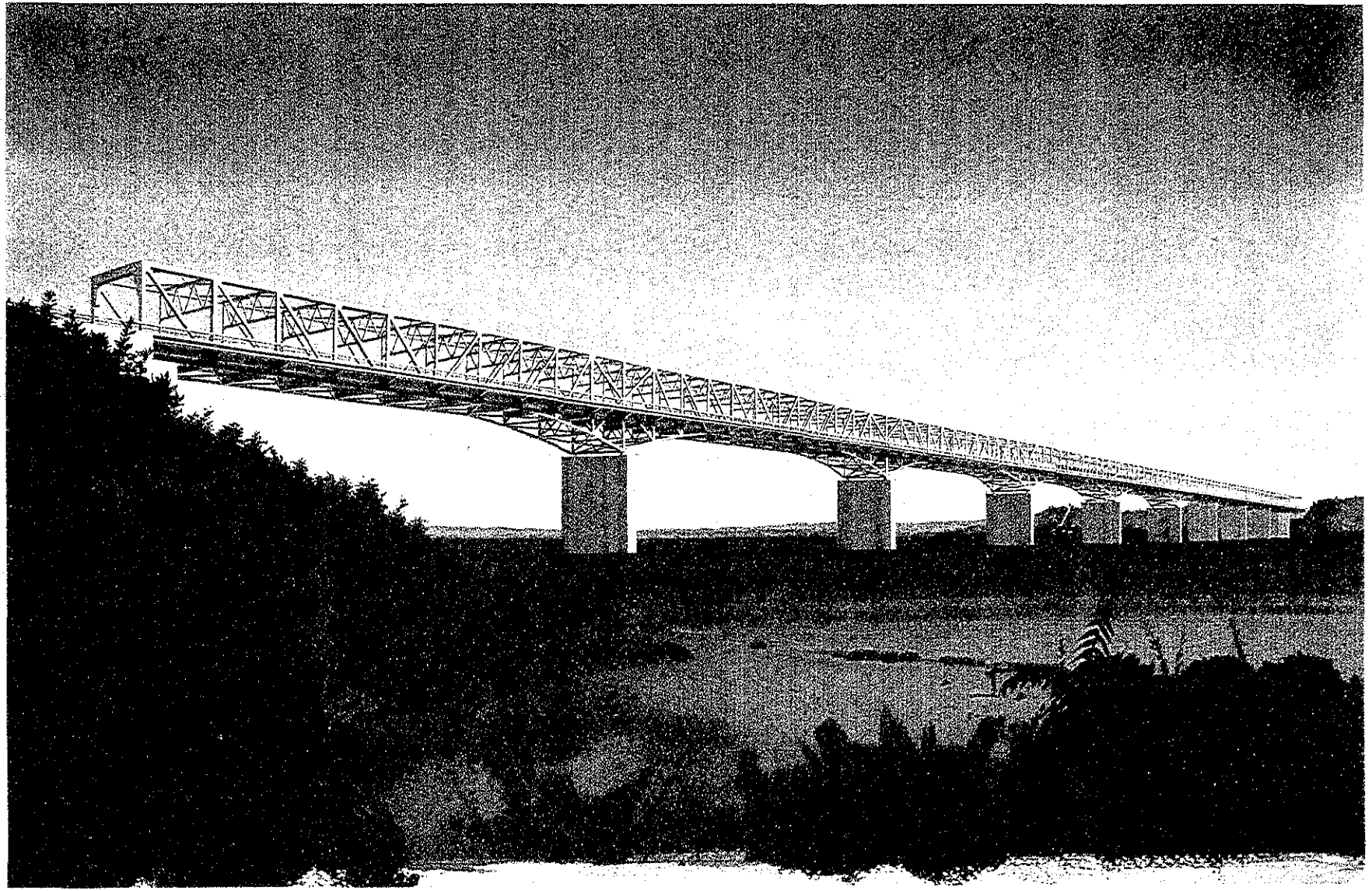


Keisuke Arita
President

Japan International Cooperation Agency



IRRAWADDY RIVER ROAD BRIDGE (PC BOX GIRDER)



IRRAWADDY RIVER RAIL — CUM — ROAD BRIDGE (STEEL TRUSS)

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ADT	Average Daily Traffic
B/C	Benefits Costs ratio
BRC	Burma Railways Corporation, Ministry of Transport and Communication
CC	Construction Corporation, Ministry of Construction
FY	Fiscal Year
ft	Feet
g	Gallon
GDP	Gross Domestic Product
GOA	Government of Australia
GOB	Government of the Socialist Republic of the Union of Burma
HV	Heavy Vehicle
in	Inch
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IRR	Internal Rate of Return
JICA	Japan International Cooperation Agency
K	Kyat (Burmese Unit of Currency)
km	Kilometer
LV	Light Vehicle
MOA & F	Ministry of Agriculture and Forest
MOC	Ministry of Construction
MOE	Ministry of Energy
MOP & F	Ministry of Planning and Finance
MOT & C	Ministry of Transport and Communication
ml	Mile
mph	Miles per hour
n.e.s.	not easily specified
NPV	Net Present Value
RTC	Road Transport Corporation
TOR	Terms of Reference
Township	Administrative area within a State or a Division
UNDP	United Nations Development Programme
US $	United States Dollar
vpd	Vehicles per day
vph	Vehicles per hour
VOC	Vehicle Operating Costs

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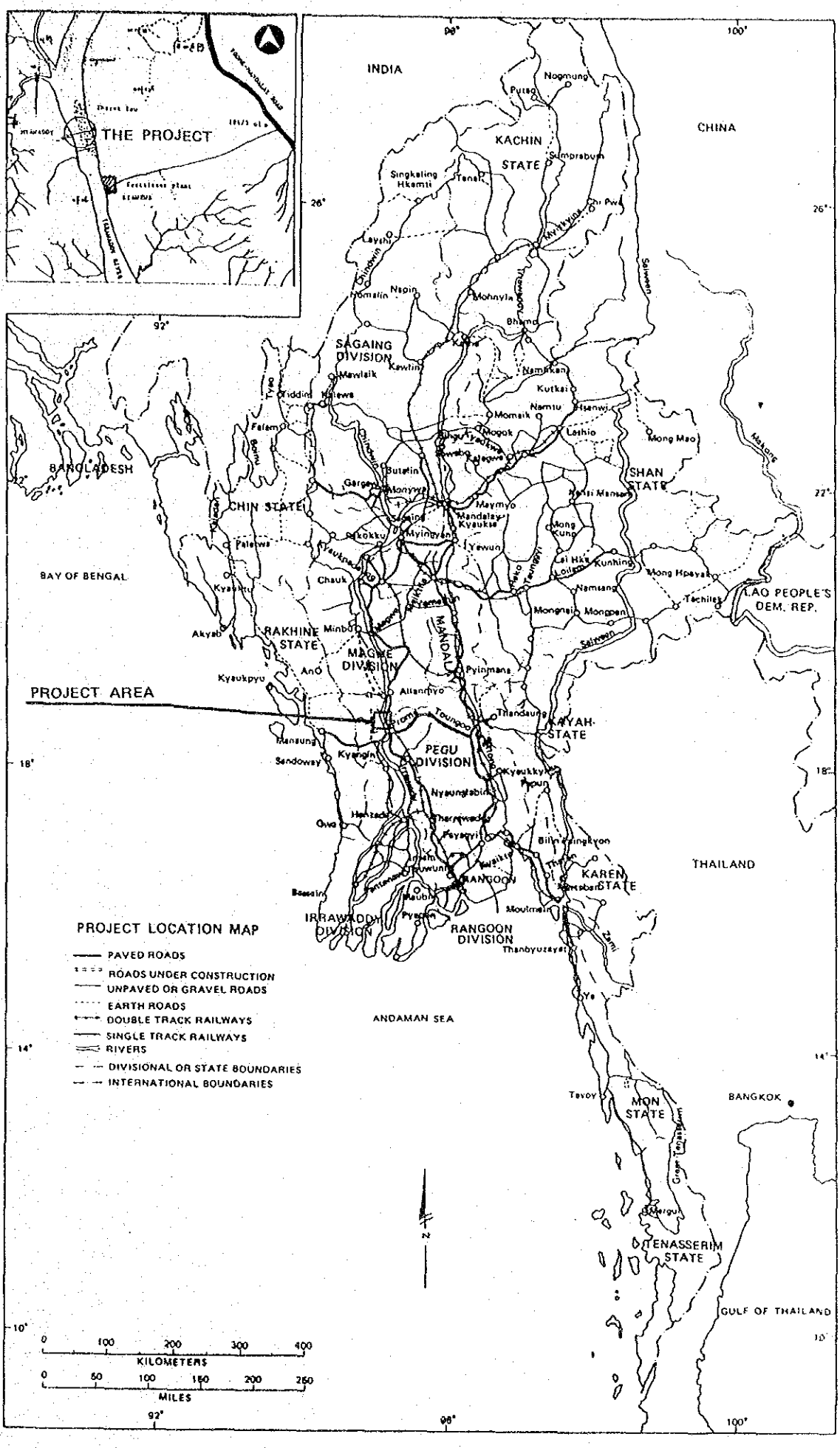
SUMMARY AND CONCLUSION


THE PROJECT
INDIA
CHINA
BANGLADESH
BAY OF BENGAL
ANDAMAN SEA
THAILAND
LAO PEOPLE'S DEM. REP.
GULF OF THAILAND
KACHIN STATE
SAGAING DIVISION
CHIN STATE
SHAN STATE
RAKHINE STATE
MAGWE DIVISION
MANDALAY
PEGU DIVISION
KAYAH STATE
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RIVERS
DIVISIONAL OR STATE BOUNDARIES
INTERNATIONAL BOUNDARIES
KILOMETERS
MILES

SUMMARY AND CONCLUSION

1. BACKGROUND

The Government of the Socialist Republic of the Union of Burma has proclaimed a 20 Year Development Plan to be ending in 1993/94 with the aim of augmenting the economy and social welfare of the country. Currently the Government is implementing the Fifth Four Year Plan in which a number of development projects are proposed to be implemented. In these four year plans improvements of transport networks have been emphasized because they are a prerequisite condition for the development of regions away from Rangoon.

In the case of the region within and along the west bank of the Irrawaddy River, the region has been found to be in an initial stage of development with abundant resources of arable land and forest as compared to the east of the river. Over the past decades, industrial plants together with plans for agricultural development have increased for the west bank of the river. In order to support the growth of the regional economy, Bassein-Monywa Road, namely Western Highway, has been under construction and about half of this road has already been completed. The secondary/feeder road network project to be linked to the Western Highway is expected to be implemented in near future. At the same time, the Bassein-Kyangin Railway Line is planned to be extended northward up to Thayet and Minbu in the near future.

Under these circumstances, the necessity to link the west side of the Irrawaddy River with the east side directly by a land transport system has increased and the Government places the top priority on the construction of the bridge across the river near Prome City, at the mid-point between Rangoon and Mandalay along the Irrawaddy River.

2. OBJECTIVE OF THE STUDY

The objective of the Study is to carry out the feasibility study for the construction of Irrawaddy River Bridge, which would be constructed as a RAILWAY-CUM-ROAD Bridge or ROAD BRIDGE near Myawaddy in order to stimulate the social and economic activities of the area lying on the Western Bank of the Irrawaddy River.

3. CONTENTS OF STUDY

In view of the necessity to meet the requirement of the economic and traffic studies, the direct influence area (DIA) was defined including both sides of the Irrawaddy River.

The study was conducted in the DIA since November 1985 in close cooperation of the Burmese counterpart staff.

From the characteristics of the study the following work items, among others, were carried out to meet the Scope of Work:

- Economic studies to forecast the economy of the whole country and the direct influence area
- Studies on river crossing traffic in the direct influence area and the forecast of those using the bridge
- Topographic surveys, soil investigation and hydrological study
- Engineering studies including preliminary design and cost estimate
- Economic analysis of the bridge project

4. STUDIES ON ECONOMIES

4.1 The Whole Country

The economy of the whole country was studied by using statistical data and "Reports to the Pyithu Hluttaw". Economic growth was forecast given specific assumptions on foreign and domestic constraints. The forecast is compatible with development outlined in the current 5th Four-Year Development Plan and the Twenty-Year Development Plan. The forecast of economic growth and population are as follows:

	1985	2000	2010	(2010/1985)
Gross Domestic Product				
(1985/86 prices, million kyat)	57,733	111,199	178,526	(3.092)
(Average growth)		├-----(4.6% p.a.)-----┤		
Population in '000	37,115	49,495	59,613	(1.606)
(Average growth)		├-----(1.91% p.a.)----┤		

4.2 The Direct Influence Area

The area of Burma has tremendous potential, development of which is urgently necessary considering the current circumstances of the nation's economy. The influence area, particularly the west side of the river, has been identified to contain large potentials for development in agriculture/forestry and manufacturing/mining.

Based on the forecast of the nationwide economy, the economy in the direct influence area of the bridge project (townships on both sides of the Irrawaddy River are divided into ten zones) was forecast in two cases without the bridge project and with the bridge project. (Road bridge and rail-cum-road bridge.)

(In 1985/86 prices)

	1985/86	2000/01	2010/11	'10/85
GRP in DIA				
1. Without GRP in mill. kyat	12,046.6	23,407.7 (1.00)	37,545.6 (1.00)	3.12
2. With Rail-cum-Road Bridge GRP in mill. kyat	12,046.6	25,202.0 (1.08)	41,222.3 (1.11)	3.42
3. With Road Bridge GRP in mill. kyat	12,046.6	24,944.4 (1.06)	40,367.6 (1.09)	3.35

The difference of GRP between "with" and "without" is the net economic development associated with the bridge project, from which the development benefit attributable to the bridge project is estimated. It is forecast GRP of 2010 in the DIA will develop by approximately 10% higher when the bridge is completed.

5. TRAFFIC STUDIES

5.1 Transportation

The transportation system was studied as in the country as a whole and in the direct influence area. A schematic of trunk transport lines is shown in Fig. 1.

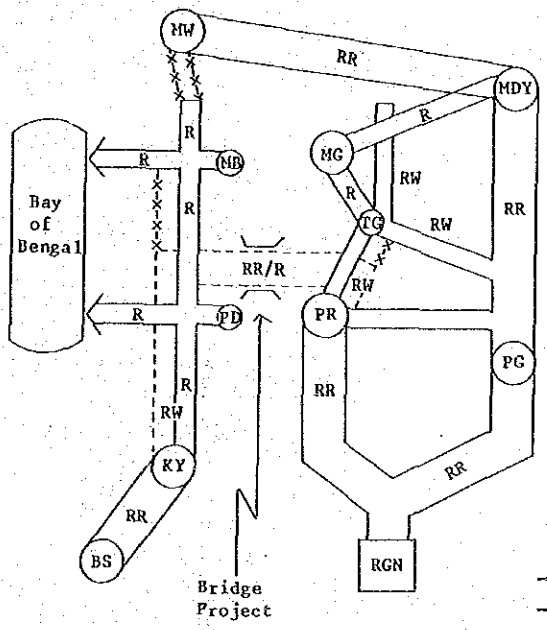
a) Railways and roads in the west side can be linked with the east side by the bridge.

b) There are three north-south corridors: Rangoon-Pegu-Mandalay, Rangoon-Prome-Mandalay and the Western Highway. The bridge can connect west to east at midpoint.

c) After the bridge is completed, the network can be extended further to Monywa and Taungdwingyi.

d) The bridge can serve as a direct through-point for land transport between the outports of Bassein and others along the west coast and inner/upper Burma.

Fig. 1 TRUNK NETWORK



Legend:

RR : Road and Railway Corridor
R : Road corridor
RW : Railway corridor
RGN : Rangoon
PG : Pegu
PR : Prome
MG : Magwe
MDY : Mandalay
MW : Monywa
MB : Minbu
PD : Padaung
KY : Kyangin
BS : Bassein
TG : Taungdwingyi

------ to be constructed by 1993
-x-x-x programs after 1994.

5.2 Traffic Analysis

Surveys on river crossing traffic were conducted. Current traffic at major river-crossing points in DIA, using Z-craft, passenger boats and cargo boats is as follows:

(per day)

	Passenger	Cargo	Vehicle
Ferry boat, barge, Z-craft	20,202	790^{t}	-
Vehicles on Z-craft	1,474 (in vehicles)	529^{t} (in vehicles)	275
Total	21,676	1,319^{t}	275

Traffic growth was forecast by using the economic forecast of the direct influence area. Traffic volume on the bridge was estimated by determining a diversion pattern from the existing ferry boat usage, assuming the bridge opened in 1993/94. The results are shown below:

	1993/94		2010/11	
1. Road Bridge				
Diverted, etc.	564		1,232	
Development-related	36		431	
Total	600	vehicles	1,663	vehicles
2. Rail-cum-road Bridge				
Railway passengers				
Diverted, etc.	3,104		6,782	
Development-related	205		2,543	
Total	3,309	passengers	9,325	passengers
Railway cargo:				
Diverted, etc.	175.7		384.0	
Development-related	11.6		144.0	
Total	187.3	tons	528.0	tons
Roadway:				
Diverted, etc.	372		813	
Development-related	25		305	
Total	397	vehicles	1,118	vehicles

6. STUDIES ON ROUTE AND BRIDGE TYPE

6.1 Bridge Route

6.1.1 Examination Area

The area, in which the location was studied, proposed for the bridge has the following characteristics:

- It is over 550 miles from the river mouth to the confluence with the Chindwin River, so the proposed location near Myawaddy/Kyawzwa is the mid-point of the Irrawaddy River.
- The river channel is stable and the main stream course is still at the site. River width becomes larger downstream of Prome.

- Prome, the largest town in the direct influence area, is the regional center of transport network on the east side area. It is the focus of roads to Rangoon, Mandalay and through Pegu Yoma to Oktwin and railways to Rangoon and a planned line to Taungdwingyi joining in the existing Mandalay-Rangoon system. The bridge's proximity to Prome has the advantage of an approach to these trunk lines.

- The bridge is located between the industrial town of Padaung and crude oil and natural gas production area of Minbu town. The bridge will support the development of these adjacent industrial growth cores on the west bank.

6.1.2 Route Comparison

Two bridge routes were studied intensively in the examination area defined by the Scope of Work: the southern route (Route II) passing through the housing compound of the Kyawzwa fertilizer plant and the northern route (Route I) passing near Thayet Taw village, both in Myede Township of Magwe Division.

As a result of the comparative study between the proposed Route I and II, it is concluded that the construction costs for both routes are similar. However, on Route II the approach railway on the west bank would require an expensive tunnel construction, and difficulties were found in land acquisition for run through the residential area of Kyawzwa fertilizer plant. On balance, Route 1 was selected.

6.2 Bridge Type

6.2.1 Road Bridge

The following two types were studied for the road bridge.

-1. Steel truss bridge
-2. PC box girder bridge

There will be no serious technical problems in the course of construction in either type. However, the PC box girder bridge will results in lower cost of construction and maintenance than for the steel truss bridge. The PC box girder bridge is recommended to be used for preliminary design and project assessment. The recommendation was agreed by GOB.

6.2.2 Rail-cum-Road Bridge

The following bridge types were compared in the case of rail-cum-road bridge.

A. Simultaneous traffic of roadway and railway
   -1 Steel single deck truss bridge (roadway with railway at the side)
   -2 PC box girder bridge (roadway with railway at the side)
   -3 Steel double deck truss bridge (roadway upper, railway lower)
   -4 Combination type of Alternatives A-1 and A-2
   (Over the navigation channel: steel truss bridge)

B. Two stage construction
   -5 Steel truss bridge (roadway with railway at the side)

C. Alternative traffic between roadway and railway
   -6 Steel single deck truss bridge (roadway with railway at the center)

These alternatives were compared in cost, serviceability to traffic and technical matters in construction. As a result of these engineering and economic studies, the following three types were selected:

1. Steel single deck truss (railway on one-side)
2. PC box girder (railway on one-side)
3. Steel double deck truss (roadway upper, railway lower)

The selection were discussed at the Interim Report meeting, at which time the GOB and the Study Team agreed to the proposed alternative 1, steel single deck truss type for further study: preliminary design and project assessment.

7. PRELIMINARY DESIGN AND COST ESTIMATE FOR THE SELECTED BRIDGE TYPES

7.1 Road Bridge - PC Box Girder Type

Preliminary design work was conducted on the selected PC box girder bridge. Project cost, related tax and duties were studied as shown below:

Project Cost of the Bridge Structures

	Net Cost						Tax/Duties		Fin. Total	
	Foreign		Local		Total		Local		Total	
	Y Bill	K Mill	Y Bill	K Mill	Y Bill	K Mill	Y Bill	K Mill	Y Bill	K Mill
Project	8.77	365.3	2.26	94.1	11.03	459.4	1.15	48.1	12.18	507.5
Engineering Fee	1.01	42.0	0.10	4.2	1.11	46.2	0	0	1.11	46.2
Contingencies	0.98	40.7	0.23	9.8	1.21	50.5	0.12	4.8	1.33	55.3
Total	10.76	448.0	2.59	108.1	13.35	556.1	1.27	52.9	14.62	609.0

In 1985/86 prices

K 1.00 = Yen 24.00

Main features of the road bridge are shown below:

a) Location : Route I
b) Bridge Length : 1,149.5 m
c) Bridge Type : Cast-in-situ prestressed concrete box girder (maximum span length = 132 m)
d) Bridge Sections : Width 12.3 m
(carriageway width 6.5 m)
(shoulder width 1.0 m x 2)
(sidewalk width: 1.5 m x 2)
(handrail, etc. 0.8 m)
e) Construction Period : 48 months

7.2 Rail-cum-Road Bridge - Steel Single-deck Truss Type (Railway on one-side)

Preliminary design work was conducted on this selected bridge type. Project cost, related tax and duties were studied as shown below.

Project Cost of the Bridge Structures

	Net Cost						Tax/Duties		Fin. Total	
	Foreign		Local		Total		Local		Total	
	Y Bill	K Mill	Y Bill	K Mill	Y Bill	K Mill	Y Bill	K Mill	Y Bill	K Mill
Project	12.19	508.0	2.09	87.1	14.28	595.1	1.17	48.7	15.45	643.8
Engineering Fee	1.01	42.0	0.10	4.2	1.11	46.2	0	0	1.11	46.2
Contingencies	1.32	55.0	0.22	9.1	1.54	64.1	0.12	4.9	1.66	69.0
Total	14.52	605.0	2.41	100.4	16.93	705.4	1.29	53.6	18.22	759.0

In 1985/86 prices

K 1.00 = Yen 24.00

Main features of the Rail-cum-road bridge are shown below:

a) Location : Route I

b) Bridge Length : 1,149.5 m

c) Bridge Type : Single deck steel truss with the railway on one-side (maximum span length = 132 m)
(maximum span length = 132 m)

d) Bridge Sections : Total width: 17.40 m
Main frame 14.40 m
(railway 3.81 m)
(carriageway 6.50 m)
(shoulder 1.00 m x 2)
(handrail, etc. 2.09 m)
Sidewalks 1.50 m x 2

e) Construction Period : 48 months

8. ECONOMIC ANALYSIS

8.1 Economic Benefits

Economic benefits consist of those related to diverted traffic and induced traffic. The benefits were estimated by comparing the transport cost of the bridge using traffic to those without the bridge using the existing ferry boats. These savings in traffic cost were forecast to increase at 5.0% per annum upto the year 2000 and 4.5% per annum thereafter. Savings in ferry boat operation due to reduced traffic volume were also estimated.

Development benefit of the regional economy attributable to the bridge project was estimated from the GRP of DIA assuming the bridge completion in 1992. Such benefit would be small when the bridge first opens, however, they will grow at a high rate in the subsequent several years.

These benefits are formulated into the streams of 30 years from 1993 to 2022 and used to estimate the economic return for the road bridge and the rail-cum-road bridge, respectively.

8.2 Project Cost

The result of the preliminary design presented the cost of construction, disbursement plan, and periodic maintenance cost. The net cost (excluding duties and taxes) are summarized as follows: follows:

	Road Bridge	Rail-cum-Road Bridge
Net Cost	K 556.1 million	K 705.4 million
Net Maintenance Cost (every ten years)	K 0.8 million	K 7.2 million

8.3 Benefit-cost Analysis

Economic benefits in terms of traffic cost savings and development benefit and economic cost of the project are used in the benefit-cost analysis. They result in the following economic return:

1) With economic benefits of diverted traffic and induced traffic and savings in ferry operation cost.

	Road Bridge	Rail-cum-Road Bridge
B/C ratio (i = 10%)	0.41	0.38
IRR	4.6%	4.2%

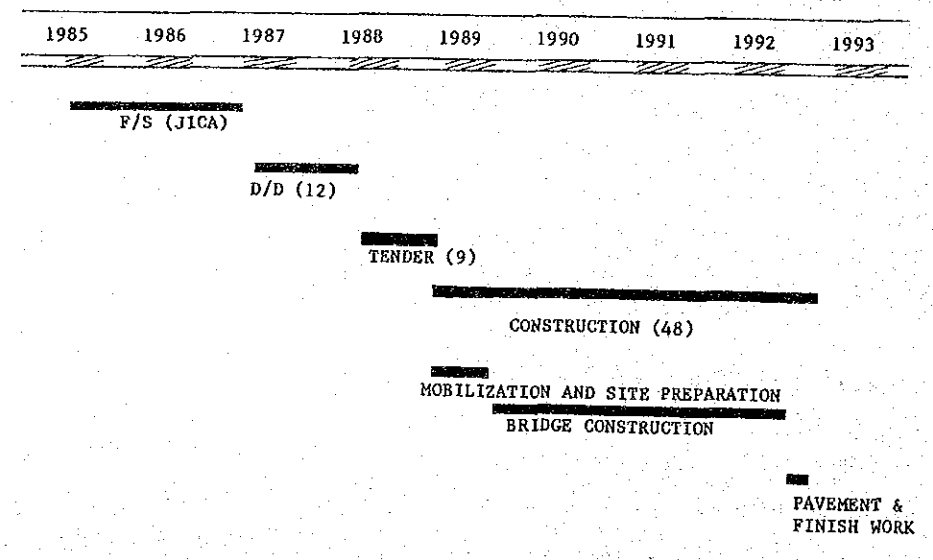
2) A higher economic growth in the DIA is forecast compared with the case without the bridge. From this forecast the development benefit of the bridge is estimated. When the development benefit is added on the above 1), the total economic return will be:-

	Road Bridge	Rail-cum-Road Bridge
B/C ratio (i = 10%)	0.61	0.57
IRR	6.8%	6.4%

9. IMPLEMENTATION SCHEDULE

The overall project inplementation schedule is shown in Fig. 2.

Fig. 2 OVERALL IMPLEMENTATION SCHEDULE OF IRRAWADDY RIVER BRIDGE CONSTRUCTION



LEGEND: F/S : Feasibility Study
D/D : Detailed Engineering Design
▨ : Rainy Season

10. CONCLUSION

The proposed bridge can serve as a key east-west linkage for the formation of a national transport network and increase efficiency of the movement of passengers and cargos crossing the Irrawaddy River. With this linkage, the network can have the first and direct land transport approach to the Bay of Bengal and Bassein Port.

Traffic forecast was conducted by studying existing river crossing movement in the direct influence area.

Estimating the benefit of diverted traffic, induced traffic and savings in the ferry operation cost, the economic analysis for both bridge types yields an IRR of approximately 4%.

In addition to the above economic analysis, the development benefit was also calculated. In this calculation, a tentative regional development plan has been assumed by extracting plans and projects from the on-going 5th Four Year Plan and by findings of the area's development potential, since no regional development plan has been worked out for the influenced area of the project by the Government of Burma.

As a result of the analysis based on the above forecast, IRR increases to approximately 6%. It is considered that the estimated IRR is not high enough to present economic viability of this project.

Under the circumstances, it is an urgent necessity to formulate an integrated plan of development covering economic sectors of manufacturing, agriculture and others as well as various infrastructures. When the development plan is consolidated, the estimated benefits and IRR in this study can increase by the growth prospect.

Under the condition that the development plan, which aims to utilize abundant resources in the area, is consolidated and implemented by the Government of Burma, the construction of

bridge is recommendable. The suitable type of its structure is:-

- PC box girder type for a road bridge, or
- Steel single-deck truss type for a rail-cum-road bridge with railway on one-side.

CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background

In response to the request of the Government of the Socialist Republic of the Union of Burma (hereinafter referred to as "GOB"), the Government of Japan decided to implement a Feasibility Study on Irrawaddy River Bridge Construction Project (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, is undertaking the Study in close cooperation with the authorities of BURMA.

1.2 Objective

The objective of the Study is to carry out a feasibility study for the construction of the Irrawaddy River Bridge, which would be constructed as RAILWAY-CUM-ROAD BRIDGE or ROAD BRIDGE near MYAWADDY in order to stimulate the social and economic activities of the area lying on the western bank of the Irrawaddy River.

1.3 Execution of the Study

1.3.1 Organization

The study begun jointly by JICA and Construction Corporation (CC). JICA has organized both the Advisory Committee and the Study Team.
CC has set up the Burmese Steering Committee and Burmese Counterpart of the Study Team.

(a) Japanese Group

The JICA Advisory Committee comprises six members as follows:

Members of the Advisory Committee

Dr. Nobuyuki NARITA (Chairman)	Ministry of Construction
Mr. Hajime ASAKURA * (Tetsuo YAMANE)	Honshu-Shikoku Bridge Authority
Mr. Minoru KIRYU * (Yoich SUZUKI)	Institute of Developing Economies
Mr. Masahiro KOREMURA	Ministry of Transport
Mr. Shigeki WATANABE * (Yutaka IIDA)	Ministry of Construction
Mr. Sadakazu YAMAGUCHI	Ministry of Transport

The Study Team comprises 12 members as follows:

Members of the Study Team

Mr. Keikichi Yoshida * (Dr. Tadayoshi OKUBO)	Team Leader
Mr. Teruhiko HORIE	Transportation Economics & Economic analysis
Mr. Masahide SHIMMYO	Development Economy
Mr. Keikichi YOSHIDA	Traffic/Highway Planner
Mr. Hideyuki ITABASHI	Traffic Survey
Mr. Nobutsugu CHIDA	Bridge Planning (Superstructure)
Mr. Junnosuke MORI	Bridge Planning (Superstructure)
Mr. Takayoshi ONO	Bridge Planning (Structure)
Mr. Masanao KOYAMA	Railway Planning
Mr. Tsutomu KAMEYAMA	Hydrology & Hydrography
Mr. Masao OKUDA	Soils & Materials
Mr. Ryoichi MINAMI	Topographic Surveys

Note: * Mr. Hajime ASAKURA, Mr. Shigeki WATANABE and Mr. Minoru KIRYU succeed Mr. Tetsuo YAMANE, Mr. Yutaka IIDA and Yoichi SUZUKI respectively. Mr. K. YOSHIDA succeeds Dr. T. OKUBO.

(b) Burmese Group

Burmese Steering Committee consists of six members as follows:

Member of the Steering Committee

U Khin Maung Yin * (U Khin Maung Maung)	Managing Director, CC
U Kyi * (U Khin)	Director of Engineers (Road), CC
U Aye KoKo * (U Than Aye)	Director of Engineers (Planning), CC
U Htun Thein	Chief Engineer, BRC
Daw Mya Mya Kyi	Director, Planning Department, MOP & F
U Kyaw Mya * (U Kyaw Thein)	Staff Officer II, Roads & Bridges Planning, CC

Burmese Counterpart of the Study Team are organized as follows;

Mmbers of Burmese Counterpart

U Kyaw Hoe	Staff Officer II Bridge Design Roads & Bridges Division, CC	Team Leader
U Than Myint	Senior Staff Engineer Planning & Design, BRC	Member
U Maung Hone	Assistant Staff Engineer Planning & Design, BRC	Member
U Shwe Tun Maung	Staff Officer II Soil Test Laboratory, CC	Member
U Khin Maung	Staff Officer III Road Design, CC	Member
U Myo Kywe	Staff Officer III Road Planning, CC	Member
U Kyaw Shein	Staff Officer III Bridge Design, CC	Member
U Po Yin	Civil Engineer IV Road Design, CC	Member
U Hla Soe	Staff Officer III Road Planning, CC	Coordinator

Note: * U Khin Maung Yin, U Aye KoKo, U Kyi and U Mya Aung - U Kyaw Mya succeed U Khin Maung Maung, U Khin, U Than Aye, U Khin and U Kyaw Thein, respectively.

1.3.2 Outline of the Study

The implementation of the study is divided into two consecutive phases scheduled as Phase I up to middle of August 1986 and Phase II ending in March 1987.

Phase I

Phase I study covers following activities:

(1) Socio-Economic and Traffic Study

(a) Socio-economic data collection and analysis

(b) Traffic data collection and analysis

(c) Elaboration of future regional framework

(d) Forecast of future traffic demand

(2) Engineering Studies

(a) Topographic map and aerial photograph collection;

(b) Engineering data collection and analysis;

b-1 soil and geological data

b-2 hydrological and hydrographic data

b-3 materials data

b-4 meteorological data

b-5 seismic data

b-6 construction machinery, equipment and ship

b-7 construction materials

(c) Surveying

c-1 soil and geological surveying including drilling and testing

c-2 hydrographic surveying

(d) Review of design criteria applied to the existing long span bridges

(e) Examination on the design criteria

e-1 geometric design

e-2 structural design

e-3 navigation clearance

(f) Elaboration of alternative plans

f-1 type of bridge

f-2 staged construction

(g) Rough design for each alternative plans.

(3) Evaluation for Each Alternative Plans

(a) Rough cost estimates for each alternative plans ;

(b) Rough estimates of benefits

(c) Rough economic evaluation

(d) Selection of optimum plan

Phase II

Phase II study will cover following activities:

(1) Engineering Studies

(a) Surveying ;

a-1 center line surveying

a-2 supplement surveying on soil, geological, hydrographic and others, if necessary

(b) Engineering work

b-1 preliminary design

b-2 quantity estimation

(c) Examination on the construction program

c-1 construction method

c-2 construction schedule

(d) Cost estimates .

d-1 land acquisition cost

d-2 temporary works cost

d-3 construction cost

d-4 maintenance cost

(2) Economic Evaluation ;

(a) Estimates of benefit

(b) Estimates of NPV, IRR and B/C .

(c) Sensitivity analysis,

Fig. 1.3.1 WORKING SCHEDULE & STAFFING SCHEDULE

Legend : Work in Burma / Work in Japan

Working Schedule \ Fiscal Year / Month	1985 4	5	6	7	8	9	10	11	12	1	2	3	1986 4	5	6	7	8	9	10	11	12	1	2	3
1. Preparatory Works in Japan																								
2. Site Reconnaissance																								
3. Data Collection & Consultation with Relevant Agencies																								
4. Preparation in Rangoon for Field Surveys																								
5. Understanding of Existing Regional Development Programmes																								
6. Existing Socio-economic Conditions & Land/Use Pattern																								
7. Problems & Development Plans																								
8. Socio-economic Framework																								
9. Design Standards & Bridge Site																								
10. Approach Road & Railways to the Bridge																								
11. Engineering Survey & Investigation																								
12. Preparation of Progress Report																								
13. Determination of the Economic Framework																								
14. Forecast of Traffic Demand																								
15. Transport Cost Study																								
16. Benefits to Bridge Users																								
17. Structural Types																								
18. Rough Construction Cost Estimate & Implementation Programme																								
19. Economic Assessment																								
20. Selection of the Best Alternative Plan																								
21. Preparation of Interim Report																								
22. Impact of the Project on the Region																								
23. Quantification of the Impact																								
24. Refinement of the Benefits to Bridge Users																								
25. Benefits of the Project																								
26. Preliminary Design																								
27. Cost and Execution Plan of Construction																								
28. Detailed Surveying & Supplementary Investigation																								
29. Economic Evaluation & Conclusion																								
30. Preparation of Draft Final Report																								
31. Preparation of Final Report																								
Staffing Schedule																								
Team Leader — T.OKUBO/ K.YOSHIDA																								
Transportation Economics & Economic Analysis — T.HORIE																								
Development Economy — M.SIMMYO																								
Traffic/Highway Planning — K.YOSHIDA																								
Traffic Survey — H.ITABASHI																								
Bridge Planning (Superstructure) — N.CHIDA																								
Bridge Planning (Superstructure) — J.MORI																								
Bridge Planning (Stucture) — T.ONO																								
Railway Planning — M.KOYAMA																								
Hydrology & Hydrography — T.KAMEYAMA																								
Soil & Materials — M.OKUDA																								
Topographic Survey — R.MINAMI																								
Report																								

Progress Report ▲ Interim Report ▲ Draft Final Report ▲ Final Report ▲

The working schedule and staffing schedule are shown as Fig. 1.3.1.

1.3.3 Layout of This Report

Based on the approach and methodology mentioned in the Inception Report, Phase I and II studies have been completed. The work activities involved are presented in this report.

Chapter 1 provides the introductory background and the objectives of the study.

Chapter 2 summarizes socio-economic aspects and outlines development forecast.

Chapter 3 discusses the economic development of the direct influence area in association with the bridge project.

Chapter 4 describes the existing and future transport system including railway, road and waterway.

Chapter 5 discusses the traffic study, which contains an analysis of the fundamental data, the methodology and the results of the traffic forecast.

Chapter 6 describes in detail the topography and geology of the project area and also presents finding and evaluation of hydrological aspects.

Chapter 7 describes the engineering study on route and bridge type based on an analysis of data collected and results of field investigation. A route and two bridge types are determined.

Chapter 8 discusses the preliminary design on the selected two bridge types: a PC box girder road bridge and a steel truss rail-cum-road bridge.

Chapter 9 describes costs estimate including an analysis of unit price.

Chapter 10 discusses economic appraisal, including user benefits and development benefit.

Chapter 11 presents the inplementation program.

Chapter 12 summarizes the conclusion of the study.

CHAPTER 2 SOCIO-ECONOMIC CHARACTERISTICS

CHAPTER 2 SOCIO-ECONOMIC CHARACTERISTICS

2.1 General Framework

2.1.1 Purpose

The purpose of this chapter is to present basic materials for judging the feasibility of the Irrawaddy River Bridge Construction Project from an techno-economic viewpoint.

To achieve this purpose, the study identifies the present socio-economic situation and forecasts future socio-economic characteristics of Burma.

2.1.2 Contents

This chapter is divided broadly into two parts. This first part deals with present socio-economic characteristics, development policies, and forecasts of the socio-economic features of the country as a whole.

The second part deals with the present socio-economic characteristics, economic potentials, and forecasts of the socio-economic features of the Irrawaddy River basin area. This information centers on that area which would be strongly influenced by the construction of the Irrawaddy River Bridge. The direct influence area is defined afterwards in chapter 3, but its zones are used in the economic study.

2.1.3 Framework for Forecasting

(1) Basis for Forecasting

All forecasts are prepared with a 1985/86 fiscal year basis, and all figures are valued at 1985/86 constant prices.

(2) Final Fiscal Year for Forecasting

The final fiscal year for forecasts is 2010/11. FYs presented in tables are 1985/86, assumed to be the basis year, followed by 1990/91, 2000/01 and 2010/11.

(3) Forecast Method Adopted

A balance check method is adopted for the forecasts. Where contradictory data was encountered, priority was given to the more comprehensive data.

(4) Cases Forecasted

The forecast are prepared for three cases: the standard case, higher and lower cases. Three cases were used due to different assumptions concerning some unsettled factors in the international commodities and financial markets and other areas of economic activity.

2.2 The Whole Country

2.2.1 Existing Socio-Economic Characteristics

2.2.1.1 Geographic Condition

Burma lies between latitudes 10° and 20°N, and longitudes 92° and 100°E, and covers an area of about 678 thousand square kilometers.

Low lands in the basins of the Irrawaddy, Chindwin, Salween and Sittang Rivers are surrounded by hills and mountains. Most of the fertile land of Burma is in these basins, and rivers have long served as a means of transport for the people. Almost all of the development activities are found in these areas.

2.2.1.2 Demographic Condition

(1) Population

According to the 1983 Census, Burma has a population of 35.3 million, of which the male population was 17.5 million and female 17.8 million. Percentage distribution by age groups is 41.5% of persons under 15 years of age, 52.5% in the 15-59 age group, and 6.0% 60 years and older. The labour force is 47.7% of the total population.

The annual growth rate of the population was 2.02% between 1973 and 1983. Present annual growth rates are approximately 2.0% and seem to be declining slightly from year to year.

Total population in 1985/86 is estimated at 37.115 million. The government projects an average annual growth rate of 1.96 per cent during the 5th Four-Year Plan period, and that population will increase to 40.113 million in mid-1989/90.

(2) Labour Force

The slight decline in the population growth rate can be attributed to a declining birth rate. As a result, the percentage distribution of persons in the 15-59 year group is increasing.

According to the Report to the Pyithu Hluttaw[1], annual growth rate by age group between 1974/75 and 1985/86 was 0.93% for the age group under 15 years, 2.68% for those 15-59, and 3.07% for 60 years and older.

The annual growth rate of labour force is higher than that of the population for this reason, and the "Guidelines"[2] estimates that the annual growth rate of labour force in the 5th Four-Year Plan period will be 2.5%.

(3) Active Labour Force

The active labour force is estimated at 15.13 million persons in 1985/86. It consists of 40.8% of the population, and 72.0% of 15-59 age group.

Agriculture is the dominant economic activity, with most of active labour force (63.3%) engaged in agricultural activities. The portion of the labour force engaged in agriculture is followed by 9.7% engaged in trade, 8.5% in processing and manufacturing and 3.8% in administration.

By institutional classification, 89.3% of the active labour force engages in the co-operative and private activity, and only 10.7% work for the state sector. (See Table 2.2.1)

(4) Concentration and Dispersion of Population

There is no large concentration of population in Burma. The share of urban population is approximately 24.0% of the total population according to the 1983 Census, with the balance residing in rural area. Annual growth rates of population in the populous towns between 1973 and 1983 are as follows:

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1 Ministry of Planning and Finance, Report to the Pyithu Hluttaw on Financial, Economic and Social Conditions of the Socialist Republic of the Union of Burma. (Hereinafter referred to as the "Report").

2 Planning Department, Ministry of Planning and Finance, Extracts from the Guidelines for the 5th Four-Year Plan. (Hereinafter referred to as the "Guidelines").

Rangoon (2,459) 2.01%, Mandalay (533) 2.46%, Moulmein (220) 2.49%, Pegu (150) 1.99%, Bassein (144) 1.35%, Taunggyi (108) 3.71%, Akyab (Sittwe) (108) 1.85%, and Monywa (107) 2.70%.[3]

Table 2.2.1 PERCENTAGE DISTRIBUTION OF THE ESTIMATED ACTIVE LABOUR FORCE BY ECONOMIC SECTOR, 1985/86

	State Sector	Co-operative and Private Sectors	Total
Agriculture	0.5	62.7	63.3
Livestock and Fishery	0.1	1.2	1.3
Forestry	0.6	0.6	1.2
Mining	0.5	0.1	0.6
Processing and Manufacturing	1.2	7.3	8.5
Power	0.1	0.0	0.1
Construction	1.1	0.5	1.6
Transport and Communications	0.8	2.5	3.3
Social Services	1.7	0.6	2.3
Administration	3.6	0.2	3.8
Trade	0.5	9.3	9.7
Workers n.e.s.	-	4.2	4.2
Total	10.7	89.3	100.0

Source: Report to the Pyithu Hluttaw 1986/87, Ministry of Planning and Finance.

n.e.s.: not easily specified

2.2.1.3 Land Utilization

Land utilization is affected by topography, weather and other physical conditions. The land utilization pattern has changed very little in recent decades.

The percentage distribution of land utilization in 1985/86 is as follows: net areas sown 12.2%, fallow land 2.7%, cultivable waste land 12.6%, reserved forests 14.9%, other forest areas 32.7%, and other lands 24.9%. The net areas sown increased at an annual rate of 0.47% in the last eight years.

3 Figures in parentheses indicate the population in 1983. Population figures are expressed in 000'. (Population Census, 1983)

2.2.1.4 Performance of the National Economy

Gross domestic product (GDP) at 1969/70 constant producers' prices increased only by 2.0% per annum in the period of 1970/71 to 1973/74, and by 4.7% per annum in the 2nd Four-Year Plan period.

In the 3rd Four-Year Plan period, the annual growth rates accelerated by 6.5%, due to a series of reforms intended to reorient economic policies in a more open and pragmatic fashion. These economic policies were maintained during the 4th Four-Year Plan period, which ended in March 1986. The annual growth rates are recorded to be 5.5%, despite of unfavourable international economic environments. Table 2.2.2 shows performance since 1969/70.

Main causes of this performance are explained as follows:

a) The imports increased dramatically during 1976/77 and the 3rd Four-Year Plan period, due to increases of foreign loans, grant receipts and exports based on the reoriented economic policies.

b) The increased imports contributed to the growth in domestic investments (gross domestic fixed capital formation).

c) Increased investments expanded GDP with short time lags.

d) However, increases of foreign loans and grant receipts encountered obstacles for various international economic reasons, and the rate of increase in export volume slowed down in the 4th Four-Year Plan period. In the plan's latter half, export commodity prices declined, although the export volume continued to increase at reasonable rates.

e) The investment ratio to GDP declined slightly in the 4th Four-Year Plan period compared with the 3rd Four-Year Plan period.

2.2.1.5 Present Characteristics of the National Economy

Per capita GDP at 1985/86 prices is Kyat 1,555.5, and GDP per active labour force is Kyat 3,815.8 in 1985/86. Those figures are low compared with the ASEAN countries.

Table 2.2.2 GROSS DOMESTIC PRODUCT AND GROSS DOMESTIC EXPENDITURE

	Annual Growth Rates at 1969/70 Prices (%)				Percentage Distribution (GDP = 100.0) (%)					GDP at Current Prices, 1985/86 (Million Kyat)	Percentage Distribution, 1985/86, at Current Prices
	1970/71 to 1973/74	1974/75 to 1977/78	1978/79 to 1981/82	1982/83 to 1985/86	1969/70	1973/74	1977/78	1981/82	1985/86		
Goods	1.7	4.5	7.7	5.7	51.7	51.0	50.6	53.0	53.4	35275.1	61.1
Agriculture	2.7	3.6	8.5	4.7	27.2	28.0	26.8	28.9	28.1	22434.4	38.9
Processig and Manufacturing	-0.4	7.1	5.3	6.1	10.7	9.7	10.7	10.2	10.4	5735.0	9.9
Services	3.5	5.8	6.8	5.8	23.0	24.4	25.4	25.6	26.0	8449.1	14.6
Transportation	-1.3	3.1	7.8	6.1	5.9	5.1	4.8	5.1	5.2	1986.9	3.4
Trade	1.4	4.0	3.4	4.5	25.3	24.6	24.0	21.3	20.6	14008.4	24.3
Gross Domestic Product	2.0	4.7	6.5	5.5	100.0	100.0	100.0	100.0	100.0	57732.6	100.0
Consumption	0.7	4.6	5.5	6.1	90.5	89.1	88.7	85.4	87.4	49838.6	86.3
Gross Domestic Fixed Capital Formation	-9.5	16.6	14.4	2.3	11.6	7.2	11.0	14.7	13.0	9782.3	16.9
Increase in Inventories	-	-	-	-	1.6	2.2	0.3	2.5	-0.2	-192.6	-0.3
Exports (fob)	-1.7	3.4	9.9	5.7	5.4	4.6	4.4	4.8	4.9	3234.2	5.6
Imports (cif)	-22.1	14.5	21.6	-4.2	-9.0	-3.1	-4.4	-7.4	-5.1	4929.9	-8.5
Gross Domestic Expenditure	2.0	4.7	6.5	5.5	100.0	100.0	100.0	100.0	100.0	57732.6	100.0

Source: Report to the Pyithu Hluttau 1986/87, Ministry of Planning and Finance
- indicates a negative value.

Following are present characteristics of the Burmese economy.

(1) Balance of payments

Net exports at current prices in terms of national accounts are continuing deficits. This deficit ratio was counted at 2.9% of GDP in 1985/86. One of the causes of those deficits is due to a deterioration in terms of trade in recent years. As a result, Burma is financing her deficits with official foreign loans and grants through various channels.

This strained balance of payments is bringing on a decline of merchandise imports in real terms in the 4th Four-Year Plan period.

(2) Investment

The investment ratio recovered during the 3rd Four-Year Plan period, compared with the very low levels of the 2nd Four-Year Plan and the 1970/71 to 1973/74 periods. This investment ratio was slightly declined in the 4th Four-Year Plan period.

The investment ratio in 1985/86 is 16.9% at 1985/86 prices. This is a low level compared with some ASEAN countries, where the investment ratio has been around 25% of GDP in recent years.

The marginal output capital co-efficient, which is defined as an incremental increase of GDP with a one year-lag of investment in each year, was approximately 0.315 (at 1985/86 constant prices) during the 3rd and 4th Four-Year Plan periods.

(3) Economic activities by sector

Higher growth occurred in the goods sector in the 3rd and 4th Four-Year Plan periods. Within the goods sector, higher growth was achieved in power, mining, and livestock and fishery. Processing and manufacturing achieved slightly higher growth than the goods sector average, even with under-utilized production capacity.

The agriculture has also recorded remarkable progress. While the expansion of gross sown acreages is growing at an annual rate of slightly over 1%, the diversification of sown crops continues and the agricultural productivity per acre has risen at an annual rate of nearly 5% in the last eight years. Production of newly developing crops such as maize, wheat and sunflowers has shown a large expansion, and paddy, pulses and cotton have also risen.

Production of transport services at 1969/70 constant prices grew at an average annual rate of 7.1% in the 3rd Four-Year Plan period and followed by 5.6% in the 4th Four-Year Plan period.

Transport activity in Burma occupies a relatively low share in the national economy compared with other Southeast Asian countries. The percentage distribution of transportation to the total value of production at current producers' prices is 3.4% in 1985/86, while such shares were 4.6% for Thailand in 1975 and 5.6% for Indonesia in 1980, according to the input-output tables of each country.

Percentage distribution of GDP in 1985/86 at current producers' prices is as follows: goods sector 61.1%, including 38.9% for agriculture and 9.9% for processing and manufacturing, services sector 14.6%, including 3.4% for transportation, and trade sector 24.3%.

(4) Prices and price structure

Since the 3rd Four-Year Plan period, rates of increase in the price level have slowed down.

GDP deflators rose by 13.8% per annum in the 2nd Four-Year Plan period, followed by 3.0% in the 3rd Four-Year Plan period and by 2.5% in the 4th Four-Year Plan period.

Table 2.2.3 shows the increased rates of selected deflators by plan period since 1969/70. The 2nd Four-Year Plan period recorded a rapid price rise except in services. However, the 3rd and 4th Four-Year Plan periods maintained relative price stability, although some prices like exports, services and imports rose in the 3rd Four-Year Plan period. The other characteristic was a declining trend of export prices in the 4th Four Year Plan period, especially in its latter half.

Those developments brought on a structural change of prices in Burma. As shown in Table 2.2.2 above, the percentage distribution of GDP by sector shows widely different features when other price valuation basis is used. The percentage distribution of goods to GDP in 1985/86, for example, is 61.1% at 1985/86 prices as against 53.4% at 1969/70 constant prices. Therefore, the economic structure is understood to have different features by using other price valuation basis.

Table 2.2.3 ANNUAL RATES OF INCREASE IN SELECTED DEFLATORS

	1970/71 to 1973/74	1974/75 to 1977/78	1978/79 to 1981/82	1982/83 to 1985/86
(GDP Deflators)				
Goods	8.3	16.2	2.7	2.5
Agriculture	11.5	16.7	3.0	2.7
Processing and Manufacturing	4.9	16.5	1.4	3.1
Services	1.3	2.1	7.5	0.8
Transportation	1.6	5.5	7.5	1.3
Trade	10.2	16.5	1.7	2.3
GDP	7.2	13.8	3.0	2.2
(GDE Deflators)				
Consumption	7.0	14.3	2.1	2.8
Gross Fixed Capital Foremation	10.2	15.3	7.6	0.8
Exports	17.5	12.2	8.9	-6.7
Imports	14.9	20.6	5.3	1.0
(Value of Production Deflators)				
Value of Production	8.2	13.9	2.6	2.3

Source: Report to the Pyithu Hluttaw 1986/87, Ministry of Planning and Finance.

Main structural changes of prices are as follows:

a) The rates of increase in service prices were moderate, while those of goods were generally higher.

b) The rates of increase in investment goods were higher than consumer goods except during the 4th Four-Year Plan period.

c) Export prices declined in the 4th Four-Year Plan period. This brought on a deterioration of the terms of trade.

(5) Productivity by economic activity

Table 2.2.4 shows a sector-wise productivity differential, which is calculated by using the "Report", in 1985/86 at 1969/70 constant prices as well as at 1985/86 prices. (Figures of GDP per active labour force are Kyat 3,815.8 at 1985/86 prices as against Kyat 1,366.5 at 1969/70 constant prices.)

As shown in Table 2.2.4, productivity is higher in trade and secondary industries than primary industries (agriculture, livestock, fishery and forestry). By institutional classification, the productivity in state sector is higher than cooperative and private sectors. The productivity differential at 1985/86 prices is more narrow range than at 1969/70 constant prices. This reflects the structural change of prices since 1969/70 to 1985/86.

2.2.2 Directions of Economic Development Policy

2.2.2.1 Basic Directions of Economic Development Policy in Burma

Burma has been implementing a series of economic development projects and policies in Four-Year Plans within the guidelines of long and short term plans laid down by the Burma Socialist Program Party for the achievement of economic and social development.

The basic document for economic policy in Burma was the long-term Twenty-Year Plan announced in December 1973. The main economic objectives of this plan, which covers 1974/75 through 1993/94, are as follows:

(1) to double the standard of living of all nationalities of the Union and to fulfil to the maximum extent the food, clothing, shelter and social needs of all of the people.

Table 2.2.4 GDP PER ACTIVE LABOUR FORCE IN 1985/86

(GDP = 100)

	at 1969/70 Constant Prices			at 1985/86 Prices
	State Sector	Co-operative and Private Sectors	All Sectors	All Sectors
Agriculture, Livestock, Fishery and Forestry	76	56	56	73
Processing and Manufacturing	474	66	123	117
Other Goods	309	114	257	145
(Other Goods, except Power)	225	114	194	128
Transportation and Communications	328	134	179	115
Other Services	285	100	195	105
Trade	2,096	119	212	249
GDP	366	68	100	100

Source: Report to the Pyithu Hluttaw 1986/87, Ministry of Planning and Finance

Note: $\frac{\text{GDP by sector/Active labour forces by sector}}{\text{GDP/Active labour forces}}$

(2) to transform smoothly by planning the Burmese economic structure from an agricultural country to an agriculture-based industrial country in accordance with the laws of balanced plan in a national economy.

2.2.2.2 Directions of the 5th Four-Year Plan

The primary objective of the 5th Four-Year Plan, which covers 1986/87 through 1989/90, is to accelerate the growth of aggregate output by streamlining existing economic activities and programmes with a view to achieving the objectives of the long-term Twenty-Year Plan.

To achieve this, the GDP at constant producers' prices is planned to increase at an average rate of 4.5% per annum. Per capita GDP is planned to increase at an average rate of 2.5% per annum and

labour productivity is planned to increase at a rate of 2.1%. To achieve those objective, measures adopted to ensure successful implementation of the 5th Four-Year Plan are:

(1) to further strengthen the active participation of the people in planning process and plan implementation;

(2) short-term special program for extensive cultivation of selected crops will be formulated and implemented in order to achieve domestic self-sufficiency, to fulfil domestic raw material requirements, to facilitate diversification and expansion of exports and to enhance farm income;

(3) to formulate and implement specific programmes to boost export earnings not only from the export of goods but also from exporting services;

(4) to maintain consistency among the existing economic activities and programs in accordance with prevailing economic conditions;

(5) to strive for effective utilization of existing productive resources;

(6) to raise the efficiency of investment through efficient allocation and use of resources; and

(7) to strive to effect improvements in production efficiency, and maximum cost-effectiveness in every field of economic activity.

2.2.2.3 Directions of the Long-term Economic Development Policies after 1993/94

No official documents are available concerning long-term economic development policies after 1993/94. The Government aims for balanced economic growth in all regions although some newly established industrial factories are being located in specific areas. The economic effect of such new establishments is relatively limited in the view of the economic development of the whole country. Therefore, each region will perform its economic growth in accordance with balanced development policies.

2.2.3 Forecasting of the National Economy

2.2.3.1 General Procedure

(1) Data Used

The forecasts are prepared mainly by using data from the 3rd Four-Year Plan forward. This choice was made because some co-efficients, such as growth rates, relative prices and balance of payments structure have changed since the 3rd Four-Year Plan period due to rearrangement of economic policies and the new coefficients will be continued in the coming years.

(2) Conversion of Price Valuation Basis

The valuation uses Kyat at 1985/86 constant prices. Figures valued at 1969/70 constant prices are converted to figures valued at 1985/86 constant prices by using the deflators in these years. It is important to note that co-efficients valued at 1985/86 constant prices differ, in some respect, to co-efficients valued at 1969/70 constant prices.

(3) Forecast Method

A balance check method, which checks various variables at each step and secures the consistency among variables, is adopted for forecasting. With these checks, a model of the national economy will be developed by using published statistical data.

(4) Presuppositions

1) Crude Oil and Petroleum Products

In all cases, an assumption is made that crude oil and petroleum products imports can be avoided by timely energy policies enforced by the government, in which priority is given to the development of domestic natural gas and electric power in accordance with energy demands.

2) Terms of Trade

Presuppositions of the terms of trade differ from case to case. This is due to different assumptions for the world economic situation in the future.

2.2.3.2 Main Points of Forecasting Procedure

(1) Key Points for Forecasting

The balance check is divided into four blocks, namely balance of payments, demand, production, and primary industries. Thereafter, balances and consistencies among blocks are again examined through the whole economy.

A detailed explanation of forecastings is given in Appendix 2-1. The key point is as follows:

Burma has large economic potential, but this potential fails to be fully exploitated by the limitation of import ability. So, the most important factor is the forecasting of import ability.

Import ability is forecast by the following equation: (Merchandise imports) = (forecast merchandise exports) + (net receipts of non-merchandise accounts except interest payments) + (net grants) + (net loans receipt) - (interest payments)

(2) Main Co-efficients and Equations in the Standard Case

1) Balance of Payments Block

a) Receipts of grants and gross foreign loans, which are exogenous co-efficients, will increase by 2.5% per annum in the real terms. This figure is estimated by using "Twenty-five Years of Development Cooperation, a Review (a 1985 Report) from OECD.

b) The interest rate paid on foreign loans outstanding stays within the range that occurred in the 1980s.

c) The terms of trade in the national accounts basis deteriorate by 5% in 1986/87. After 1987/88, they stay at the same level as 1986/87.

d) The exports of main commodities are forecast according to the following equations:

For main agricultural products: (export) = (domestic production) - (domestic consumption)

For main forestry and traditional exported mineral products: (export) = (increased value of supply) + (export value in the basis year)

For other minor export commodities and newly exportable commodities: (export) = (production) x (fixed rates)

2) Demand Block

a) The capital goods import ratio of total imports is fixed at 58%, although performance fluctuate from 52% to 61% in recent years.

b) The import requirement ratio of total investment is fixed at 33%, which reflects the performance in recent years.

c) The marginal output·capital co-efficient on GDP is fixed at 0.315, with a one year time lag.

3) Production and Primary Industries Blocks

The total value is, in principle, controlled by the demand block. Approaches came from the value of the production side and not from the GDP side. Maintaining consistency with the demand block, forecasting by economic activity is prepared using following equations.

a) Agriculture

By main commodity group, (production) = (gross acreage sown) x (yield per acre)

b) Processing and Manufacturing

To be forecasted as a function of selected agriculture and livestock production for food industries, and to be forecast by extraprolations of recent trends and by considering commercial operation of on-going projects for other industries.

c) Power

To be forecast by a function of industrial use, service use and domestic use.

d) Construction

To be forecast by a correlation with the investment estimates from the past performance.

e) Trade

To be forecast by a function of the production for commodities, such as agriculture, livestock, fishery, forestry, mining, processing and manufacturing.

f) Transportation

Transportation is related to all productive activities including services, and all demand including consumption and exports. A transportation matrix for Burma was created using the Input-Output Tables for Thailand in 1975 and Indonesia in 1980. The co-efficients by sector are estimated by using this matrix. (Refer to Appendix 2.2 for the transportation matrix) The forecast is prepared by multiplying each estimated co-efficient to value of production and demand by sector.

g) Other Goods and Services

Estimated trends, considering growth in the demand block, are adopted by main commodity group.

(3) Main Co-efficients and Equations in the Alternative Cases

The general forecasting method in the two alternative cases is the same with the standard case. However, some co-efficients and trends have been changed.

1) The Higher Case

a) Balance of Payments Block

The world economic situation is forecasted with a more optimistic view than that of the standard case. Under the forecast economic development, foreign demands to Burmese exportable commodities increase at more higher rates than

the Standard Case, and the Burmese export prices show relatively lesser decline compared with the standard case. That is:

1 total exports increase at rates shown in Appendix Table 2.2.3.2.

2 the rates of detrioration in terms of trade show a moderate decline approximately by 1% per annum up to 1990/91 and thereafter they stay at the same level as 1990/91.

b) Demand Block

1 Due to increase of imports, the ratio of imported capital goods to the total imports rises and the imported capital goods are used in more efficient than that of the standard case.

2 The marginal output·capital co-efficient to GDP is fixed at 0.330, not 0.315. The figure of 0.330 is the average of six out of the last eight years.

c) Production and Primary Industries Block

Due to narrow adjustments in the balance of payments, the growth rates of economic activity are higher than the standard case.

2) The Lower Case

The world economic situation is forecast with a more severe outlook. It is set in presupposition that the increase of total exports is lower than the standard case (See Appendix Table 2.2.3.4), and that the terms of trade deteriorate by approximately 10% in 1986/87, 2.5% in 1987/88, and followed by 1% per annum during 1888/89 to 2000/01, and by 0.5% per annum during 2001/02 to 2010/11.

Adjustments to the balance of payments are broader than the standard case, and they influence various activities in the demand and production blocks.

2.2.3.3 Features Forecasted of the National Economy

Tables 2.2.5 to 2.2.7 show the results for the standard case, while Appendix Table 2.2.3.1 and 2.2.3.2 illustrate for the higher case and Appendix Tables 2.2.3.3 and 2.2.3.4 illustrate the lower case.

(1) Standard Case

1) General Feature

The annual growth rate of GDP at 1985/86 constant prices will be 4.7% between 1986/87 to 1990/91, followed by 4.4% for 1991/92 to 2000/01 and by 4.8% for 2001/02 to 2010/11. Those forecast growth rates are at approximately the same level as the 2nd Four-Year Plan period, and at low levels compared with the 3rd and 4th Four-Year Plan periods.

Annual growth rates are highest between 2001/02 to 2010/11, and lowest for 1991/92 to 2000/01. Main reasons for this situation are due to relative burdens of foreign debt servicing, and time lags between investment and economic growth.

Burma has a higher potential for economic growth than indicated by the annual growth rates of 4.4% through 4.8% in GDP. However, full realization of this potential is held down to a certain extent due to the strained balance of payments. The extent of this dampening is relatively broader in 1991/92 to 2000/01 and narrower in 2001/02 to 2010/11.

Higher growth may be realized if higher yields per acre are achieved due to speedy extension of high-yield varieties in agriculture, as this activity needs little foreign currency.

2) Characteristics of Demand

a) Foreign Trade

The forecast growth rates for export quantum are not lower than those of the 4th Four-Year Plan period. The following may be pointed out:

First, there will be a deterioration of the terms of trade. Import capability is restricted to a certain extent through all forecast

period. Second, slow growth of exports of newly exportable commodities is forecast. This factor is a strong influence especially between 1991/92 and 2000/01, and restricts import capability.

b) Investment (Gross Fixed Capital Formation)

Another characteristic on the demand side is low investment levels. The ratio of investment to GDP is forecast as approximately 14% in the period of 1986/87 through 2000/01 compared with around 17% in 1985/86. This investment ratio contributes to the economy's low growth rate.

3) Characteristics of the Production Side

A structural change will take place between economic activities. Percentage distributions will decline in agriculture, forestry, social and administrative services,and rentals and other services, while livestock and fishery, mining, processing and manufacturing, power, communications will go up.

This is due to growth differentials by main commodity group. Followings are the main features of these changes.

a) Agriculture

Paddy production is forecast to increase at moderate rates. This is due to a slight declining trend in sown acreage in recent years, and achieving a relatively high yield per acre vis-a-vis paddy production in other developing countries. Crops like vegetable oil materials, maize, wheat and sugar cane are forecast to increase at reasonable rates due to lower yields per area among Asian countries, increasing domestic demand and increased diversification of sown crops.

b) Livestock, Fishery and Forestry

Fowl, duck meat and marine fish production will record relatively high growth rates.

Teak production will increase only slowly and its share of total production will actually decline compared with hardwoods and other forest products.

Table 2.2.5 VALUE OF PRODUCTION (STANDARD CASE)

	At 1985/86 Constant Prices Kyat in million				Annual Growth Rates Percentage			Percentage Distributions Percentage			
	1985/86	1990/91	2000/01	2010/11	1986/87 to 1990/91	1991/92 to 2000/01	2001/02 to 2010/11	1985/86	1990/91	2000/01	2010/11
Goods	69,819	88,394	137,945	228,244	4.8	4.6	5.2	68.5	68.5	68.8	69.5
Agriculture	25,502	31,230	45,451	68,141	4.1	3.8	4.1	25.0	24.2	22.7	20.7
Livestock and Fishery	6,687	8,976	15,508	27,511	6.1	5.6	5.9	6.6	7.0	7.7	8.4
Forestry	1,217	1,471	2,082	2,999	3.9	3.5	3.7	1.2	1.1	1.0	0.9
Mining	1,115	1,733	3,275	6,091	9.2	6.6	6.4	1.1	1.3	1.6	1.9
Processing and Manufacturing	31,695	40,795	64,868	109,950	5.2	4.7	5.4	31.1	31.6	32.4	33.5
Power	465	729	1,658	3,634	9.4	8.6	8.2	0.5	0.6	0.8	1.1
Construction	3,137	3,459	5,104	9,919	2.0	4.0	6.9	3.1	2.7	2.5	3.0
Services	13,611	17,095	25,812	40,257	4.7	4.2	4.5	13.4	13.3	12.9	12.3
Transportation	3,423	4,359	6,722	10,863	5.0	4.4	4.9	3.4	3.4	3.4	3.3
Communications	242	462	1,145	2,711	13.8	9.5	9.0	0.2	0.4	0.6	0.8
Financial Institutions	2,121	2,707	4,232	6,699	5.0	4.6	4.7	2.1	2.1	2.1	2.0
Social and Administrative Services	5,261	6,582	9,740	14,697	4.6	4.0	4.2	5.2	5.1	4.9	4.5
Rentals and Other Services	2,563	2,985	3,973	5,288	3.1	2.9	2.9	2.5	2.3	2.0	1.6
Trade	18,483	23,505	36,617	59,927	4.9	4.5	5.0	18.1	18.2	18.3	18.2
Value of Production (at Producers Prices)	101,913	128,993	200,374	328,428	4.8	4.5	5.1	100.0	100.0	100.0	100.0

Note: Totals may not be consistent as the amount of each component has been rounded off.

Table 2.2.6 GROSS DOMESTIC PRODUCT (STANDARD CASE)

	At 1985/86 Constant Prices Kyat in million				Annual Growth Rates Percentage			Percentage Distributions Percentage			
	1985/86	1990/91	2000/01	2010/11	1986/87 to 1990/91	1991/92 to 2000/01	2001/02 to 2010/11	1985/86	1990/91	2000/01	2010/11
Goods	35,275	44,213	67,930	109,502	4.6	4.4	4.9	61.1	60.9	61.1	61.3
Agriculture	22,434	27,326	39,678	59,351	4.0	3.8	4.1	38.9	37.7	35.7	33.2
Livestock and Fishery	4,352	5,880	10,235	18,157	6.2	5.7	5.9	7.5	8.1	9.2	10.2
Forestry	807	968	1,366	1,964	3.7	3.5	3.7	1.4	1.3	1.2	1.1
Mining	661	1,045	1,949	3,624	9.6	6.4	6.4	1.1	1.4	1.8	2.0
Processing and Manufacturing	5,735	7,425	12,001	20,891	5.3	4.9	5.7	9.9	10.2	10.8	11.7
Power	317	490	1,119	2,460	9.1	8.6	8.2	0.5	0.7	1.0	1.4
Construction	968	1,079	1,582	3,055	2.2	3.9	6.8	1.7	1.5	1.4	1.7
Services	8,447	10,562	15,952	24,917	4.6	4.2	4.6	14.6	14.6	14.3	14.0
Transportation	1,987	2,541	3,946	6,416	5.0	4.5	5.0	3.4	3.5	3.5	3.6
Communications	204	367	910	2,155	12.5	9.5	9.0	0.4	0.5	0.8	1.2
Financial Institutions	1,313	1,668	2,617	4,140	4.9	4.6	4.7	2.3	2.3	2.4	2.3
Social and Administrative Services	2,762	3,442	5,094	7,687	4.5	4.0	4.2	4.8	4.7	4.6	4.3
Rentals and Other Services	2,183	2,544	3,385	4,505	3.1	2.9	2.9	3.8	3.5	3.0	2.5
Trade	14,008	17,769	27,317	44,106	4.9	4.4	4.9	24.3	24.5	24.6	24.7
Gross Domestic Product (at Producers Prices)	57,733	72,544	111,199	178,511	4.7	4.4	4.8	100.0	100.0	100.0	100.0

Note: Totals may not be consistent as the amount of each component has been rounded off.

Table 2.2.7 GROSS DOMESTIC EXPENDITURE (STANDARD CASE)

	Value at 1985/86 Constant Prices Kyat in million				Annual Growth Rates Percentage			Percentage Distributions Percentage			
	1985/86	1990/91	2000/01	2010/11	1986/87 to 1990/91	1991/92 to 2000/01	2001/02 to 2010/11	1985/86	1990/91	2000/01	2010/11
1. Consumption, Total	49,839	63,787	96,698	148,145	5.1	4.2	4.4	86.3	87.9	87.0	83.0
2. Gross Domestic Fixed Capital Formation	9,782	10,148	15,510	30,598	0.7	4.3	7.0	16.9	14.0	13.9	17.1
3. Increase in Inventories	-193	35	28	208	-	-	-	-0.3	0.0	0.0	0.1
4. Exports (f.o.b), Total	3,234	4,348	7,787	16,969	6.1	6.0	8.1	5.6	6.0	7.0	9.5
5. (Less) Imports (c.i.f.), Total	4,930	5,774	8,825	17,409	3.2	4.3	7.0	-8.4	-8.0	-7.9	-9.8
Gross Domestic Expenditure	57,733	72,544	111,199	178,511	4.7	4.4	4.8	100.0	100.0	100.0	100.0

Note: Increase in Inventories includes Statistical Discrepancy.
Totals may not be consistent as the amount of each component has been rounded off.
- means a negative value.

c) Mining

Natural gas is forecast to raise its share of total production, as will non-metallic industrial materials and heavy metals. Production shares of crude oil and tin will decline in the future.

d) Processing and Manufacturing

The growth rates of industrial materials, machinery and equipment will be higher than clothing and wearing apparel.

e) Power and Communications

Their growth rates are forecast to exceed the national economy average in the effort to satisfy extensive domestic demand.

4) Per Capita GDP

The population is forecast to increase by 1.96% per annum between 1986/87 and 1990/91, followed by 1.93% between 1991/92 and 2000/01, and by 1.88% between 2001/02 and 2010/11. Detail will be described below and in the Appendix 2.3.

Per capita GDP is forecast to increase from Kyat 1,555.5 in 1985/86 to Kyat 1,773.8 in 1990/91, Kyat 2,246.7 in 2000/01, and Kyat 2,994.5 in 2010/11 at 1985/86 constant prices.

(2) Higher Case

The annual growth rate of GDP at 1985/86 constant prices will be 5.6% between 1986/87 and 1990/91, 6.0% between 1991/92 and 2000/01, and 6.3% between 2001/02 and 2010/11.

In order for this case to be realized, the international economic environment must improve and the diversification of exportable commodities must make substantial progress. In this case, the investment ratio to GDP will remain at around 16% between 1986/87 and 2000/01, and rise to around 19% thereafter.

The contribution percentage points by factor of those presupposition are approximately estimated as follows, through the all forecast periods.

Broken down annual growth rate is shown by Y_n/Y_{n-1}. It is calculated by the following equation, $\Delta Y_n/Y_{n-1} = I_{n-1}/Y_{n-1} \cdot \Delta Y_n/I_{n-1}$. It can be defined as the product between investment ratio and capital co-efficient.

where Y : GDP
ΔY : marginal GDP
I : gross fixed capital formation (investment)
n : fiscal year

The contribution percentage points by factor are of the difference of 1.4% points (6.0% in the Higher Case against 4.6% in the Standard Case). It is composed of:-

a) Rise of investment ratio (I_{n-1}/Y_{n-1}); 1.2% points, of which, rise in import efficiency (efficient use of imported capital goods); 0.65% points, and rise of import capacity through increase of exports; 0.55% points.

b) Rise of marginal output·capital co-efficient; 0.2% points and

c) Change of terms of trade; negligible

If this case is realized, the economic potential in Burma will be improved and point to better directions for the future.

(3) Lower Case

The annual growth rate of GDP at 1985/86 constant prices will be 4.2% between 1986/87 and 1990/91, followed by 3.9% between 1991/92 and 2000/01, and by 3.7% between 2001/02 and 2010/11.

The contribution percentage points are of the difference by (-) 0.75% points (3.9% in the lower case against 4.6% in the standard case).

Decline of investment ratio; (-) 0.75% points consist of the decline of import capacity through lower increase of exports; (-) 0.55% points, and the deterioration of terms of trade; (-) 0.2% points.

No contribution percentage points are for marginal output·capital co-efficient and the other factors.

The result of this case might be pessimistic for future economic potential due to a declining trend in the investment ratio.

2.3 Influence Areas of the Project

2.3.1 Existing Socio-Economic Characteristics

The Irrawaddy River Basin area includes the States/Divisions of Rangoon, Irrawaddy, Pegu, Magwe, Mandalay, Sagaing, Chin and Kachin. Of these, Kachin is located in the upper most stream area and is far from the projected bridge. By its location, therefore, it will have little influence on the project.

In addition, Rakhine faces the Bay of Bengal and does not belong to the Irrawaddy River Basin, but its economy has relations with the direct project influence area via Taungup-Padaung road and Minbu-An road.

Rangoon, Irrawaddy and the west half of Pegu are located in the lower Irrawaddy River Basin, while Magwe and some area of Mandalay are located in the middle basin. Sagaing is located in the upper and middle Irrawaddy River basins and also in the Chindwin River, which is a main tributary.

Considering these geographic conditions, the review of socio-economic conditions of the related States/Divisions are conducted by the States/Divisions of Rangoon, Irrawaddy, Pegu, Magwe, Mandalay, Sagaing, Rakhine and Chin. Other States/Divisions are reviewed briefly by group.

2.3.1.1 Socio-Economic Classification of the Irrawaddy River Basin Area

The related States/Divisions are classificated to four group. The first is Rangoon, and the second is Irrawaddy and Pegu, belonging to lower Burma. Magwe, Mandalay and Sagaing for the third group. The fourth group includes the surrounding areas, such as Rakhine and Chin, plus the other surrounding States/Divisions.

2.3.1.2 Demographic Conditions

According to the 1983 Census, the total population of the eight Divisions was 26.858 million and comprised of 76.1% of the total population of the country. The population of mid-1985/86 is estimated at 28.232 million (76.1% of the total population). The population of each Division and divisional group is shown in Table 2.3.1.

Table 2.3.1 MAIN INDICATORS ON POPULATION AND LAND UTILIZATION BY STATE/DIVISION

	Population in 1983 Census (000s)	Population Density in 1983 (Persons per Km^2)	Ratio of net area sown to the total (%)	Ratio of culturable land to the total (%)
Rangoon	3973.8	391	53.8	66.6
Irrawaddy	4991.1	142	42.9	56.0
Pegu	3800.2	96	25.7	35.7
Magwe	3241.1	72	19.0	28.6
Mandalay	4580.9	124	29.1	41.3
Sagaing	3856.0	41	13.1	20.3
Rakhine	2045.9	56	10.5	17.1
Chin	369.0	10	2.6	50.0
Surrounding Div.				
Group I	904.0	10	1.8	25.6
Group II	3718.7	24	3.7	22.5
Group III	3825.5	39	7.8	16.3
Whole Country	35313.9	52	12.2	27.5

Source: 1983 Population Census and Documents supplied by the Planning Department

Note: Figures on land utilization are based on 1984/85 provisional figures.

The average annual growth rate of population between 1973 and 1983 was 2.02%, which was at the same level as all of Burma. Population growth rates of Mandalay, Rangoon, Sagaing and Magwe were higher than the national average, while Chin, Rakhine, Pegu and Irrawaddy were lower.

Table 2.3.1 shows the population density per square kilometer in 1983. Rangoon has the highest population density, and Divisions belonging to the second and third groups occupy the next rank, except Sagaing. The members of the fourth group, such as Rakhine and Chin and the other surrounding States/Divisions, have generally low population densities. These different population densities reflect the socio-economic structure of each State/Division.

2.3.1.3 Land Utilization

Land utilization types, differ between the divisional groups. As shown in Table 2.3.1, Rangoon and Irrawaddy have high ratios of net area sown to the total average. The Divisions of Mandalay, Pegu, Magwe and Sagaing exceed the average ratio of the whole country, while Rakhine and Chin are below average.

Net area sown in Burma is concentrated in the divisions of the first three groups. These six Divisions constitute 75.7% of the net area sown in the country, as against 38.6% of the total land acreage. The ratio of total culturable land to total land acreage in the eight divisions is also higher than the national average.

The land pattern in each of the eight Divisions affects the economic activities, especially agricultural production. Present land utilization patterns by Division are shown in Table 2.3.2.

2.3.1.4 Economic Structure

The economic structure of the Influence Area may be divided into four groups. Overall existing features are shown in Table 2.3.3 and Table 2.3.4. The following analysis uses primarily Table 2.3.3 and Table 2.3.4 as its data source.

Rangoon, the first group, has a high per capita gross regional products[1)] (GRP) over 1.5 times the nationwide average. Economic structure is largely specialized to services and trade sectors.

The second group including Irrawaddy and Pegu and the third one including Magwe, Mandalay and Sagaing have characteristics of generally advanced primary industries, while services and trade sectors are relatively under-developed. Primary industry occupies more than 50% of each GRP in all five Divisions. Agriculture predominates in Sagaing, Pegu and Irrawaddy, while livestock, fishery and forestry predominate in Irrawaddy and Magwe. The second group and the third group differ in main agricultural products. Paddy is the dominant product in the second group, while this crop is not dominant in the third group.

1: Gross regional product is defined as the gross value added originated from the territorial sphere of the region defined.

Table 2.3.2 LAND UTILIZATION BY STATE/DIVISION, 1985

(Unit: 1,000 Acres)

	Net Are Sown	Fallow Land	Culturable Waste Land	Sub-total	Reserved Forests Areas	Other Forest	Other Land	Total
Rangoon	1,353	143	177	1,673	300	22	518	2,513
Irrawaddy	3,722	510	631	4,863	1,780	470	1,570	8,683
Pegu	2,505	329	645	3,479	3,344	1,052	1,862	9,737
Magwe	2,109	621	433	3,163	2,483	3,056	2,373	11,075
Mandalay	2,662	743	378	3,783	2,392	1,164	1,810	9,149
Sagaing	3,057	682	1,009	4,748	5,799	6,177	6,658	23,382
Rakhine	953	258	342	1,553	415	4,495	2,625	9,088
Chin	234	1	4,211	4,446	387	1,196	2,871	8,900
Surrounding States/ Divisions:								
I	390	63	5,178	5,631	1,286	10,438	4,648	22,003
II	1,434	858	6,382	8,674	2,167	16,348	11,310	38,499
III	2,010	242	1,649	3,901	4,627	10,200	5,429	24,157
Total	20,429	4,450	21,035	45,914	24,980	54,618	41,674	167,186
	(Percentage Distribution)							
Rangoon	6.6	3.2	0.8	3.6	1.2	0.0	1.2	1.5
Irrawaddy	18.2	11.5	3.0	10.6	7.1	0.9	3.8	5.2
Pegu	12.3	7.4	3.1	7.6	13.4	1.9	4.5	5.8
Magwe	10.3	14.0	2.1	6.9	9.9	5.6	5.7	6.6
Mandalay	13.0	16.7	1.8	8.2	9.6	2.1	4.3	5.5
Sagaing	15.0	15.3	4.8	10.3	23.2	11.3	16.0	14.0
Rakhine	4.7	5.8	1.6	3.4	1.7	8.2	6.3	5.4
Chin	1.1	0.0	20.0	9.7	1.5	2.2	6.9	5.3
Surrounding States/ Divisions:								
I	1.9	1.4	24.6	12.3	5.1	19.1	11.2	13.2
II	7.0	19.3	30.3	18.9	8.7	29.9	27.1	23.0
III	9.8	5.4	7.8	8.5	18.5	18.7	13.0	14.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Planning Department.

Note: Total as of 1985/86 provisional. Each state/division as of 31th March, 1985.

Table 2.3.3 PERCENTAGE DISTRIBUTION OF CONSOLIDATED SECTORS AND RELATIVE LEVEL OF PER CAPITA GRP

	Percentage distribution of gross regional product in 1985/86			Per capita gross regional product (whole country = 100)
	Primary Industry	Secondary Industry	Tertiary Industry	
	(%)	(%)	(%)	
Rangoon	18.8	13.8	67.4	156
Irrawaddy	59.0	12.6	28.4	106
Pegu	58.4	12.9	28.7	111
Magwe	55.0	17.5	27.5	103
Mandalay	53.3	12.1	34.6	101
Sagaing	60.2	10.7	29.1	102
Rakhine	40.4	13.0	46.6	65
Chin	49.2	8.9	41.9	64
Others	45.9	14.2	39.9	73
Whole country	47.8	13.3	38.9	100

Note: Primary industry includes agriculture, livestock and fishery, and forestry.
Secondary industry includes mining, processing and manufacturing, power and construction.
Tertiary industry includes all other industries.

Table 2.3.4 SPECIALIZED COEFFICIENT BY MAIN ECONOMIC ACTIVITY BY MAIN DIVISION, 1985/86

	Agriculture	Livestock, Fishery and Forestry	Mining, Processing and Manufacturing	Other Goods	Services	Trade
Rangoon	0.31	0.73	1.03	1.07	1.51	1.87
Irrawaddy	1.25	1.19	0.95	0.93	0.81	0.68
Pegu	1.26	1.07	0.99	0.90	0.78	0.71
Magwe	1.16	1.10	1.38	1.01	0.83	0.63
Mandalay	1.17	0.88	0.88	1.04	0.85	0.91
Sagaing	1.34	0.92	0.78	0.94	0.82	0.70

Note: Specialized coefficient by main economic activity

$$= \frac{\frac{\text{Share of main economic activity by division}}{\text{Gross regional product}}}{\frac{\text{Share of main economic activity of the whole country}}{\text{Gross regional product}}}$$

Magwe Division has Burma's major oil and natural gas fields, and some industrial materials and chemical factories. For these reasons, Magwe is relatively specialized in secondary industries such as mining, processing and manufacturing.

Per capita GRP in the second and third groups is in the range of 100 to 110% of the nationwide average.

The fourth group is Rakhine and Chin. These two states are located in the surrounding area, and their per capita GRP is around 65% of the nationwide average. A relatively high percentage distribution of services and trade does not indicate development, but rather reflects under-developed agricultural production.

2.3.1.5 Main Characteristics by State/Division

(1) Rangoon Division

Rangoon Division has 38 townships. Its total population was 3.97 million in the 1983 Census and the annual growth rate was 2.22% between 1973 and 1983. The population of Rangoon town area was 2.5 million in 1983, and the annual growth rate was 2.01% between the recent two Census years.

An important characteristic is that the population of central Rangoon town area has a declining trend. According to the 1983 Census, the population of 5 townships in the central area declined and for 3 townships was under 1.0% of growth rates per annum between the two Census periods.

Rangoon is the capital of Burma and the nationwide business centre. The Division's economic structure includes a large percentage distribution of trade and various service sector. As a percentage of the whole country, those shares are estimated at approximate 33% for trade and 28% for various services except transportation. Some projects in social services like hospitals and sport facilities construction have been implemented. An expansion project of the international airport is also in progress in the transportation sector.

In processing and manufacturing, many factories and establishments for the production of personal- and household-use items are located here. An oil refinery is also located in the east sub-urban area.

In land utilization, 54% of the total acreage was cultivated in 1984/85. Fallow land and culturable waste land occupied another 13%. Forest area has a rather a low percentage distribution.

Agriculture is active in the sub-urban area and paddy is the dominant product in this sector. However, the percentage distribution of this sector is estimated to be less than 6% that of the whole country in 1985/86. In livestock, the production of duck and fowl meat has a large share. In forestry, some teak saw mills are located here.

(2) Irrawaddy Division

Irrawaddy Division has 26 townships. Its population was 4.99 million in the 1983 Census and the annual growth rate was 1.85% between 1973 and 1983. Irrawaddy is the most populous Division in Burma.

Net area sown occupies around 43% of the total acreage, and fallow land and culturable waste land is 13%. Those figures indicate a highly specialized land use for agriculture. Forest land occupies 26% of the total acreage, and around 80% of forest land is reserved forest. This figure indicates the advanced forest product development.

In the field of economic activities, agriculture is dominant. The gross value added (net output) from agriculture is estimated to occupy nearly half of Irrawaddy's gross divisional product, and around 19% of the national product. The main crop is paddy; oil seeds such as groundnut, sesamum and sunflower are ranked next.

The Lower Burma Paddy Land Development project and Flood Protection project are being implemented in the division.

In livestock, poultry (duck and fowl meat) and pork occupy a relative high share, and this pattern is, in principle, the same for Pegu division. In forestry, an equipment improvement project is being implemented in its southwestern region.

In processing and manufacturing, cement, sheet glass, jute products, plywood and some other goods have been produced. Rice is also produced in several large-scale rice mills. Kyangin cement mill completed its extension work in 1985/86, and its production capacity is expected to increase by 480 thousand tons per annum.

For electric power, two natural gas turbine projects are being implemented along the Irrawaddy river basin.

(3) Pegu Division

Pegu Division has 28 townships. Its population was 3.8 million in the 1983 Census and the annual growth rate was 1.80% between 1973 and 1983. The division is cut in two by the Pegu Mountains, and the population divided approximately 55% to the east and 45% to the west of the mountains according to the 1983 Population Census.

The land utilization is 26% for net area sown, 10% for fallow land and culturable waste land, 45% for forest area and another 19% for other land. The forest land is mainly in the Pegu mountains area.

Economic activity is also divided into two regions. The centre of the east region is Pegu town (the capital of the division), and the centre of the west region is Prome, which is a regional business centre. GRP is estimated to be divided in at proportion to the population.

The proposed Irrawaddy Bridge Construction Project is located just north of the west region of the Division. For this reason, the west region is one of the most influenced areas of the project.

In economic activities, agriculture is estimated to occupy nearly 50% of its GRP and to account for 15% of GDP. Paddy is the major item, followed by oil seeds extracted from groundnut, sesamum and sunflower. Sugar cane is produced in the north part of the east region. The North Nawin Dam, which is expected to irrigate around 100 thousand acres in Prome area, has completed its pilot stage, and the South Nawin Dam project began construction in 1985/86.

Livestock and fishery are estimated to occupy approximately one eighth of the domestic output. The production of duck, fowl, and pork

occupies large shares. Along with Magwe and Irrawaddy, Pegu is also an implementation area of the Burma Livestock Project.

In forestry, Pegu is one of the main producing divisions in the country. The East Pegu Yoma Project was implemented in the 3rd and 4th Four-Year Plan periods.

In processing and manufacturing, a few large machinery and equipment producing factories are located in Padaung township. In the west region,a textile mill and pottery plant were established in recent years, while some sugar mills, alcohol, canning and tapioca factories were established in the east region. To supply electric energy to large industrial factories in the west region, a natural gas turbine power station, including its extension, was constructed in Prome area.

(4) Magwe Division

Magwe Division has 25 townships. Its population was 3.3 million in the 1983 Census, and the annual growth rate was 2.09% between 1973 and 1983. The Irrawaddy River Bridge Project is located in the southern region of this Division. Therefore, the project will exert a broad influence on the future socio-economic conditions of this Division.

A characteristic of Magwe is its relatively active mining, processing and manufacturing activities. The Division produces more than 90% of Burma's crude oil and more than 50% of its natural gas in 1985/86.

Two oil refineries are located in Mann and Chauk along the Irrawaddy River. Three fertilizer plants are located in Sale, Kyunchang and Kyawzwa. The newest plant is located in Kyawzwa, with a capacity of 600 metric tons per day and was completed in 1984/85. The operating plants in Sale and Kyunchang have capacities of 465 metric tons and 207 metric tons per day, respectively. There are no other fertilizer factories in the country. A cement factory, located in the southern region, produces around 36% of the domestic output in 1984/85. A ceramic glassware factory in Chauk is under construction, and will be completed in 1987/88.

A heavy industrial factory is located in Malun, Minbu area. A cigarette factory, located in the northern region, is producing around a half of the domestic output.

In electric power, three natural gas turbine power stations, located in Pakokku, Minbu, and Chauk are operating in the Division.

The Division is classified as part of the dry zone of central Burma. Its land utilization is 19% net area sown, nearly 10% for fallow land and culturable waste land, around 22% for reserved forests, and nearly 28% for other forest areas. The remaining 21% is other lands. This land utilization pattern would indicate development potential if under-utilized lands are converted into well utilized ones.

In agricultural production, paddy output occupies less than 3% of the whole country. Paddy is produced mainly in the west bank area of the
Irrawaddy River. Sesamum, groundnut and tobacco are main crops in the division. In livestock, mutton, fowl meat, fresh milk and beef are main products.

(5) Mandalay Division

Mandalay Division has 29 townships. Its population was 4.6 million in the 1983 Census and the annual growth rate was 2.25% between 1973 and 1983.

The division belongs to the dry zone of central Burma. Its land utilization is 29% net area sown, 12% fallow land and culturable waste land, 26% reserved forests, 13% other forest areas, and 20% for other lands. This pattern indicates that the land is slightly more developed than in Magwe, but is less developed than Irrawaddy.

In agriculture, the division is estimated to produce more than 15% of the domestic output in 1985/86. Main crops with a high percentage distribution within the whole country are products for edible oil such as sesamum and groundnut, and commercial crops such as sugar cane, tobacco, cotton and pulses. Paddy is not a main crop in the division, because the division is located in the dry zone.

The Sedawgyi Dam project, with electric power generation, is nearly completed. The project will irrigate around 100 thousand acres of the land. Kinda Multipurpose Dam in Myittha area is also being constructed. In livestock, the Division is a major producer of mutton. Production of fresh milk and beef is also considerable. In Yezin, located in the Division's most southern region, projects research/study complex devoted to the primary industries are being implemented.

The Division is producing various non-metallic minerals, gem stone and steel billet (steel billet is classified in the mining sector).

Reflecting active commercial crop production, the Division has many food and beverage processing factories and establishments. The division also has a relatively high share of the production of construction materials and industrial raw materials. Recently sugar mills, food canning, textile, marble and brick factories began operation. Extension work on a beverage factory and distillery is in progress.

Mandalay town is the trade centre of Central Burma and had a population of 532,000 in 1983. Therefore, trade is more active in this division than in all other Divisions except Rangoon.

(6) Sagaing Division

Sagaing Division has 38 townships. Its population was 3.9 million in the 1983 census, and the annual growth rate was 2.14% between 1973 and 1983.

The land utilization pattern is 13% net area sown, 7% fallow land and culturable waste land, nearly 25% reserved forests, over 26% other forest areas. The remaining 28% for other land reflects broad unutilized areas in its northern region.

The dominant economic activity is agriculture, and over 50% of GRP came from agriculture in 1985/86. Wheat production accounted for approximately 75% of the domestic output. Sesamum, groundnut and tobacco have shares around 20 percent of the domestic output in 1985/86. Maize is another crop of note.

The Chang-Oo Flood Protection project in the Chindwin river basin is nearly completed and ground water projects are being implemented.

In livestock, fresh milk, beef and mutton are main products.

In mining, a copper mine is being developed in the Salingyi area in the south western region. A coal field is also located in the Division.

In processing and manufacturing, a textile mill is operating, along with rice mills and several industrial and construction materials producing factories. A wheat flour mill, having an annual capacity of 18 thousand metric tons of wheat flour, is expected to be completed in 1986/87.

Monywa town had a population of 107 thousand in 1983, and is functioning as a regional trade centre of the Chindwin river basin area.

(7) Rakhine State

Rakhine state has 17 townships. Its population was 2.0 million in 1983 Census, and the annual growth rate was 1.79% between 1973 and 1983.

Land utilization is around 10% for net area sown, 6 per cent fallow land and culturable waste land, only 5% reserved forests, nearly 50% other forest areas, and 29% other lands. The chief characteristic of land utilization is the existence of vast economically under-utilized forest areas and other lands.

This is a state of peripheral area in the west region, and is separated by the Rakhine mountains from central Burma. But its southern part is included within the direct influence area of the Project.

The population falls 12% into the southern part and 88% into the northern part. The forest utilization pattern differs from south and north. Approximately 61% of the reserved forests in the state are in the southern part, while of other forest areas, only 43% is in the southern part. This suggests that forestry is relatively developed in the southern part.

The state is economically under-developed compared with the central regions. Its per capita GRP is estimated at approximately 65% of the nationwide average in 1985/86. The main reason for this is relatively low agricultural activity.

Main crops are paddy and sugar cane. Livestock, fishery and forestry are also relatively active. Projects like marine fishery and marine prawn development are being implemented. In forest products, the state produces 414 thousand units of teak and hardwood logs and 16.8 million units of bamboo. In processing and manufacturing, ice, salt, sugar, marble and rice mills exist.

(8) Chin State

Chin state has 9 townships. Its population was nearly 0.4 million in 1983 Census, and the annual growth rate was 1.33% between 1973 and 1983.

In land utilization, net area sown occupies only less than 3%, against over 43% of culturable waste land, and nearly 46% of unreserved forest areas and other lands.

The southern part of the State borders the northern part of Magwe Division, while its northen part is close to Sagaing Division by means of either the Gangaw-Monywa route or the Kalewa route. The population is divided between 40% in the southern part and in the northern part of 60%.

The economy depends on primary sectors, which are generally under-developed compared with other Divisions. In the goods-producing sector, livestock has a relatively high share. In agriculture, which is generally under developed, net sown area is divided in half between paddy products and maize. However, a large potential exists for utilization of vast areas of culturable waste land.

(9) Surrounding States/Divisions: Group I

Kachin State belongs to this group, and is related to the Project indirectly through Sagaing division. The population was 0.9

million in the 1983 Census, and the annual growth rate was 2.05% between 1973 and 1983. Net area sown is less than 2% of the nationwide acreage, and more than 90% of the land is not utilized sufficiently.

In agriculture, main crops are paddy, groundnut and sugar cane, of which sugar cane has a relatively high share. In livestock, pork has a relatively high share. In forestry, a project has been implemented to increase production.

In processing and manufacturing, 5.2 thousand metric ton of sugar is produced per year. Other main products are sawn timber and rice. Jade is mined here and stone quarried.

(10) Surrounding States/Divisions: Group II

Shan state belongs to this group, and it is related to the Project indirectly through Mandalay Division. The population was 3.7 million in 1983 Census, and the annual growth rate was 1.58% between 1973 and 1983. Less than 4% of the nationwide acreage is net area sown, and nearly 90% of the land is economically under-developed.

Main products are mineral products from the northern portion and agricultural and forest products from the southern portions. In agriculture, wheat, sugar cane and groundnut have relatively high shares in the domestic output. Paddy production accounts for nearly 6 percent of the domestic output. An agricultural specialty is the production of tea leaves, potatoes and various fruits. The acreage of tea plantations occupies 9% of areas sown in this state.

In livestock, fresh milk, beef and pork occupy around 10 percent of domestic output in 1985/86. In forestry, a great deal of charcoal is produced here.

In mining, lead/sulphide ore is produced in the Bawdwin Mine in north Shan, almost the entire domestic output. Refined silver, lead and other heavy metals are also produced. Production of gypsum accounts for around 90% of the domestic output, and around 75% for coal.

In processing and manufacturing, non-foods industries are under-developed in general.

(11) Surrounding States/Divisions: Group III

This group consists of four states/divisions of Kayah, Karen, Mon and Tenasserim. Those four states/divisions relate to the Project indirectly through Pegu and Rangoon divisions.

The population was 3.8 million in 1983 Census, and the annual growth rate was 2.41% between 1973 and 1983.

In land utilization, net area sown occupies 8% of the total land, and nearly 9% is fallow land and culturable waste land. Residuals consisted of 18% for reserved forest, 42% for other forest areas and 23% for other lands. This land utilization pattern is, as a whole, similar to Rakhine state, and more developed than Chin, Kachin and Shan. The average per capita GRP at present is estimated to be 75% of the nationwide average.

In agriculture, paddy is the most common crop, but its percentage to the nationwide production is slightly less than that of population. Sugar cane and rubber are also planted. A special agricultural characteristic of this area are coconut plantations. The plantations spread along the coast area. In livestock, fishery and forestry, a few fishery development projects are being implemented in Tenasserim and Mon.

In mining, tin and tangsten are produced in some areas of Kaya, Mon and Tenasserim. The Tin and Tangsten Expansion Project was implemented in Tavoy, Tenasserim Division.

In processing and manufacturing, Mon is the nation's sole supplier of pulp in 1985/86, and two thirds of all paper is produced there. Mon's shares of sugar and salt are around 13% and 8% at present. The construction of a tire and rubber factory in Thaton, Mon state, will be completed in 1986/87. A cement factory in Pa-an, Karen state, is completed and will operate in 1986/87 with a capacity of 240 thousand metric tons per annum.

In electric power, a natural gas turbine power station has been already completed and a steam power station, with three generators, will be completed in 1986/87 in Thaton, Mon state. Lawpita Biluchaung hydro-electric power project No. 1, having a proposed capacity of 28 megawatts, will be completed in 1989/90 in Kayah state.

2.3.2 Development Potential

It may be necessary to define the concept of "development potential" as opposed to "development possibility". Development possibility means a possibility under conditions which ignore the constraints of present socio-economic situations, while development potential means the development forecast under the various constraints of the national economy and world economy.

The regional economic development potential is identified within the context of national economic development. Plans and projects in the region are evaluated from the perspective of their contribution to the region as well as to the nation. Regional development plan for Irrawaddy Basin Area is being studied by the Burmese Government and no conceptual plan is yet known. The following are the findings of the study team which should be emphasized in the preparation of the regional development plan (Details are discussed in Appendix 2.5):

1) Land utilization in Magwe Division would suggest that the Division has a large development potential in the agricultural sector.

2) Forest resources in the Rakhine mountains can be substantially exploited if transport and other sectors are developed to support the growth of forestry products.

3) Manufacturing plants in Padaung, Thayet, Myede, etc. can be utilized as an industrial core. Manufacturing plants should increase in number and capacity to demonstrate an agglomeration effect.

4) Agro- and forest-based manufacturing plants will have locational advantages because of development potential in agricultural and forest production in the DIA.

Fertilizer plants use natural gas resources for production. They are not an agro-based industry, but a resource-based industry. The area may have locational advantages in the utilization of natural gas in other petro-chemical products.

5) Petro-chemical complex plans using natural gas should be carefully studied in light of world markets. The world market presently has excess supply of petro-chemical products and stiff price competition is the rule.

2.3.3 Forecasting of Socio-Economy by State/Division

2.3.3.1 Forecasting of the Population

(1) Forecast Method

The population of the Union is forecast by using available demographic data, such as the census, population stratification by five-year age brackets, birth and death rates. Both birth and death rates are assumed to decelerate with birth rates exceeding death rates only slightly.

The population forecast for State/Divisions is adjusted to maintain consistency with the Union total. According to the censuses of 1973 and 1983, the migration on the social factors is considered to be modest in extent. This direction is assumed to continue. Considering this direction, the population by States/Division is forecast by using a time sequential trend between the two census years. This details are discussed in Appendix 2.3.

(2) Population Forecasting

As shown in Table 2.3.5, future rates of increase in the Irrawaddy basin area will be higher than the average of the Union. Rangoon, Mandalay, Sagaing and Magwe will have larger growth rates and other States and Divisions will have growth rates less than that of the Union. Their differences, however, will be not large.

2.3.3.2 Forecast Method for Divisional Economy

Little data such as consumption, investment, increase in inventories, and interdivisional transactions of goods and services are available to estimate the demand side of Divisional economies. For this reason forecasting is prepared from production side only. The forecasting is prepared for the standard case.

A dividing method is adopted for forecasting. Indicators for the dividing are selected from various statistical documents provided by the Government of Burma, and percentage distributions are calculated for use with these documents. Figures forecast are estimated by multiphying these percentage distributions against nationwide figures thereby producing the estimates for Divisions and States.

The number of the indicators included 12 for agriculture, 8 for livestock and fishery, 7 for forestry, 7 for mining, 10 for food and beverage industries, nearly 50 for processing and manufacturing, 6 for the other goods producing sector, 6 for other services except transportation, and 3 for trade. The indicators for transportation are compiled by utilizing, after some adjustment, the transportation matrix, which is estimated for forecasting at the nationwide scale. Details of the forecasting method are shown in Appendix 2.4.

2.3.3.3 Main Characteristics of the Forecasting

Table 2.3.6 shows GRP by State/Division in 1985/86, 1990/91, 2000/01 and 2010/11. Appendix Table 2.3.3.1 shows the annual growth rates in each period and Appendix Table 2.3.3.2 shows percentage distribution by sector. Appendix Table 2.2.3.3 shows the percentage distribution by State/Division of GRP. Table 2.3.7 presents per capita. Main characteristics of the results are as follows;
GRP. Main characteristics of the results are as follows;

(1) Growth Rates

State/Division are classified into four groups. The highest growth is forecast for the third group of Magwe, Mandalay and Sagaing. Next is Rangoon Division followed by the second group of Irrawaddy and Pegu. Growth rates of surrounding Divisions are generally lower.

Another characteristic is a converging trend of growth rates among groups over the course of the forecast period. For example, the difference of annual growth rates between the second group and the third group is forecast at 0.7% in the period of 1986/87 to 1990/91. This difference will be 0.5% for 1991/92 to 2000/01 and 0.3% for 2001/02 to 2010/11. The difference between Rangoon and the third group converages from 0.6% points in the period of 1986/87 to 1990/91 to zero in 2001/02 to 2010/11.

Initiatives for economic growth differ by sectors. In Rangoon, economic growth will be led mainly by tertiary industries. Magwe will be led by secondary industries, while the other States/Divisions will be mainly led by primary industries. The difference of growth rates between the second group and the third group reflects primaly different crop patterns, that is the difference between paddy and non-paddy patterns. However, multi-cropping and diversification of sown crops will progress more rapidly in the second group of Irrawaddy and Pegu than in the third group. This is one reason for a converging trend in growth rates among groups over the years. The main reason for relatively low growth rates in the surrounding States/Division is the under-developed infrastructure, especially in areas ready for agricultural and forest production. (See Appendix Table 2.2.3.1)

(2) Economic Structure

As mentioned above, the percentage distribution of agriculture will decline to a limited extent and the distributions of the other sectors will go up in country-wide. This structural change is observed in all divisions. Pegu, Magwe, Rangoon and surrounding divisions will reduce their agricultural shares to some extent, but Sagaing and Irrawaddy will experience a smaller decline.

Table 2.3.5 POPULATION FORECASTING BY STATE/DIVISION

	Population (000s)					Annual Growth Rates (%)			
	1983 Census	1985/86	1990/91	2000/01	2010/11	1974 to 1983	1986/87 to 1990/91	1991/92 to 2000/01	2001/02 to 2010/11
Rangoon	3,973.8	4,197	4,672	5,779	7,119	2.22	2.17	2.15	2.11
Irrawaddy	4,991.1	5,234	5,716	6,799	8,071	1.85	1.78	1.75	1.73
Pegu	3,800.2	3,985	4,359	5,215	6,240	1,80	1.81	1.81	1.81
Magwe	3,241.1	3,400	3,761	4,589	5,572	2.09	2.04	2.01	1.96
Mandalay	4,580.9	4,820	5,369	6,629	8,128	2.25	2.18	2.13	2.06
Sagaing	3,856.0	4,059	4,497	5,493	6,657	2.14	2.07	2.02	1.94
Rakhine	2,045.9	2,151	2,346	2,790	3,319	1.79	1.75	1.75	1.75
Chin	369.0	386	416	485	566	1.33	1.50	1.55	1.55
Surrounding[1] States/Divisions:									
I	904.0	951	1,041	1,242	1,464	2.05	1.83	1.78	1.66
II	3,718.7	3,873	4,240	5,056	6,002	1.58	1.73	1.78	1.73
III	3,833.2	4,059	4,480	5,418	6,475	2.41	1.99	1.92	1.80
Total	35,313.9	37,115	40,897	49,495	59,613	2.02	1.96	1.93	1.88

Source: For 1983, 1983 Population Census. Other documents supplied by the Planning Department are used for the estimate. See also Appendix 2.3

Note: 1 Surrounding State and Divisions I means Kachin State, II means shan State, and III includes Kayah, Karen and Mon States, Tenasserim Division and Burmese citizens abroad.

Table 2.3.6 GROSS REGIONAL PRODUCT

1985/86 (Kyat in Millions)

	Rangoon	Irrawaddy	Pegu	Magwe	Mandalay	Sagaing	Rakhine	Chin	Surrounding States/Divisions			Whole Country
									I	II	III	
Agriculture	1,245	4,165	3,354	2,452	3,442	3,348	625	122	363	1,638	1,682	22,434
Livestock, Fishery and Forestry	668	914	657	533	595	531	250	67	113	264	569	5,160
Mining, Processing and Manufacturing	1,161	905	751	827	738	557	231	25	167	510	524	6,396
Other Goods	242	179	138	121	175	135	52	9	26	101	108	1,285
Transportation	455	280	224	177	237	201	73	12	35	139	154	1,987
Other Services	1,804	736	560	478	708	571	302	54	134	545	571	6,462
Trade	4,616	1,424	1,188	834	1,673	1,101	633	95	233	1,055	1,157	14,008
Gross Divisional Product	10,190	8,603	6,872	5,422	7,567	6,444	2,165	384	1,070	4,251	4,765	57,733

1990/91

	Rangoon	Irrawaddy	Pegu	Magwe	Mandalay	Sagaing	Rakhine	Chin	Surrounding States/Divisions			Whole Country
									I	II	III	
Agriculture	1,394	5,089	3,967	3,048	4,323	4,277	703	149	420	1,954	2,003	27,326
Livestock, Fishery and Forestry	862	1,197	887	730	815	722	334	77	148	354	722	6,848
Mining, Processing and Manufacturing	1,434	1,180	985	1,127	1,028	765	289	35	209	704	713	8,470
Other Goods	308	212	165	149	213	163	63	11	32	124	131	1,570
Transportation	569	357	285	234	313	265	91	15	43	174	195	2,541
Other Services	2,260	902	688	594	889	711	370	66	164	669	707	8,021
Trade	5,866	1,792	1,498	1,062	2,140	1,404	796	117	294	1,331	1,470	17,769
Gross Divisional Product	12,693	10,730	8,474	6,944	9,720	8,306	2,646	469	1,311	5,311	5,941	72,544

Note: Surrounding States/Divisions I means Kachin, and II means Shan. Surrounding States/Divisions III includes Kayah, Karen, Mon and Tenasserim.

Totals may not be consistant as the amounts of each component are rounded off.

Table 2.3.6 GROSS REGIONAL PRODUCT

2000/01 (Kyat in Millions)

	Rangoon	Irrawaddy	Pegu	Magwe	Mandalay	Sagaing	Rakhine	Chin	Surrounding States/Divisions			Whole Country
									I	II	III	
Agriculture	1,742	7,587	5,547	4,535	6,545	6,726	894	222	561	2,759	2,561	39,678
Livestock, Fishery and Forestry	1,453	2,034	1,498	1,252	1,397	1,211	554	134	251	607	1,209	11,601
Mining, Processing and Manufacturing	2,222	1,802	1,577	1,895	1,830	1,352	443	65	334	1,217	1,212	13,949
Other Goods	562	347	274	260	366	277	104	17	54	212	229	2,701
Transportation	889	528	428	373	507	426	137	24	65	265	305	3,946
Other Services	3,460	1,317	1,010	888	1,362	1,070	540	94	240	979	1,047	12,007
Trade	9,290	2,675	2,252	1,620	3,311	2,156	1,190	171	439	1,991	2,222	27,317
Gross Divisional Product	19,618	16,289	12,585	10,823	15,317	13,219	3,862	727	1,944	8,030	8,785	111,199

2010/11

	Rangoon	Irrawaddy	Pegu	Magwe	Mandalay	Sagaing	Rakhine	Chin	Surrounding States/Divisions			Whole Country
									I	II	III	
Agriculture	2,352	11,590	7,991	6,779	9,940	10,649	1,188	331	775	4,051	3,706	59,351
Livestock, Fishery and Forestry	2,509	3,281	2,711	2,269	2,486	2,062	976	289	416	1,027	2,095	20,121
Mining, Processing and Manufacturing	3,713	3,186	2,704	3,403	3,344	2,470	683	132	553	2,112	2,215	24,515
Other Goods	1,164	694	550	537	759	572	203	35	107	423	471	5,515
Transportation	1,455	874	686	613	829	692	211	40	100	415	500	6,416
Other Services	5,462	1,979	1,530	1,365	2,144	1,657	814	139	359	1,459	1,580	18,487
Trade	15,435	4,203	3,570	2,595	5,380	3,482	1,878	264	682	3,105	3,512	44,107
Gross Divisional Product	32,090	25,806	19,743	17,561	24,882	21,584	5,953	1,230	2,992	12,592	14,079	178,511

Note: Surrounding States/Divisions I means Kachin, and II means Shan. Surrounding States/Divisions III includes Kayah, Karen, Mon and Tenasserim.

Totals may not be consistant as the amounts of each component are rounded off.

Table 2.3.7 PER CAPITA GROSS REGIONAL PRODUCT AT 1985/86 PRICES

(1) Per Capita Gross Regional Product

	Rangoon	Irrawaddy	Pegu	Magwe	Mandalay	Sagaing	Rakhine	Chin	Surrounding States/Divisions			Whole Country
									I	II	III	
1985/86	2,428	1,644	1,724	1,595	1,570	1,588	1,007	994	1,125	1,098	1,174	1,555.5
1990/91	2,717	1,977	1,944	1,846	1,810	1,847	1,128	1,128	1,259	1,253	1,326	1,773.8
2000/01	3,395	2,396	2,413	2,358	2,311	2,406	1,384	1,499	1,565	1,588	1,621	2,246.7
2010/11	4,508	3,197	3,164	3,152	3,061	3,242	1,793	2,173	2,044	2,098	2,174	2,994.5

(2) Differential by State/Division

	Rangoon	Irrawaddy	Pegu	Magwe	Mandalay	Sagaing	Rakhine	Chin	Surrounding States/Divisions			Whole Country
									I	II	III	
1985/86	156	106	111	103	101	102	65	64	72	71	75	100
1990/91	153	106	110	104	102	104	64	64	71	71	75	100
2000/01	151	107	107	105	103	107	62	67	70	71	72	100
2010/11	151	107	106	105	102	108	60	73	68	70	73	100