No. 152

THE STUDY
ON
NATIONAL TRANSPORT PLAN
IN
THE ISLAMIC REPUBLIC OF
PAKISTAN

Final Report
Summary

February 1995

ALMEC CORPORATION
CONSULTANTS INTERNATIONAL

The exchange rates used in the Study are:

US $1.00 = Pakistan Rupees 25.960
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Rs. 1.00 = ¥4.59
(Average during 1992-93)
Source: Economic Survey 1993-94

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PREFACE

In response to a request from the Government of the Islamic Republic of Pakistan, the Government of Japan decided to conduct a master plan study on the National Transport Plan and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Pakistan a study team headed by Mr. Osamu Ohtsu, ALMEC Corporation, three times between January and November, 1994.

The team held discussions with the officials concerned of the Government of Pakistan, further studies were made and the present report was prepared.

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

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

February 1995

Kimio Fujita
President
Japan International Cooperation Agency

February 1995

Mr. Kimio Fujita

President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sirs:

We are pleased to formally submit herewith the final report of "The Study on National Transport Plan in the Islamic Republic of Pakistan".
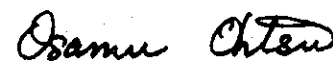
This Report compiles the results of the Study which was undertaken both in Pakistan and Japan, from January 1994 to February 1995 by Study Team, organized jointly by ALMEC Corporation & Pacific Consultants International.

We owed a lot to many people for the accomplishment of this report. First, we would like to express our deep appreciation and sincere gratitude to all those who extended their kind assistance and cooperation to the Study Team, in particular, Ministry of Communications, National Transport Research Centre and Planning & Development Division.

We also acknowledge the officials of your agency, the JICA Advisory Committee and the Embassy of Japan in Pakistan.

We wish the report would be able to contribute really to Pakistan's transport development in the future.
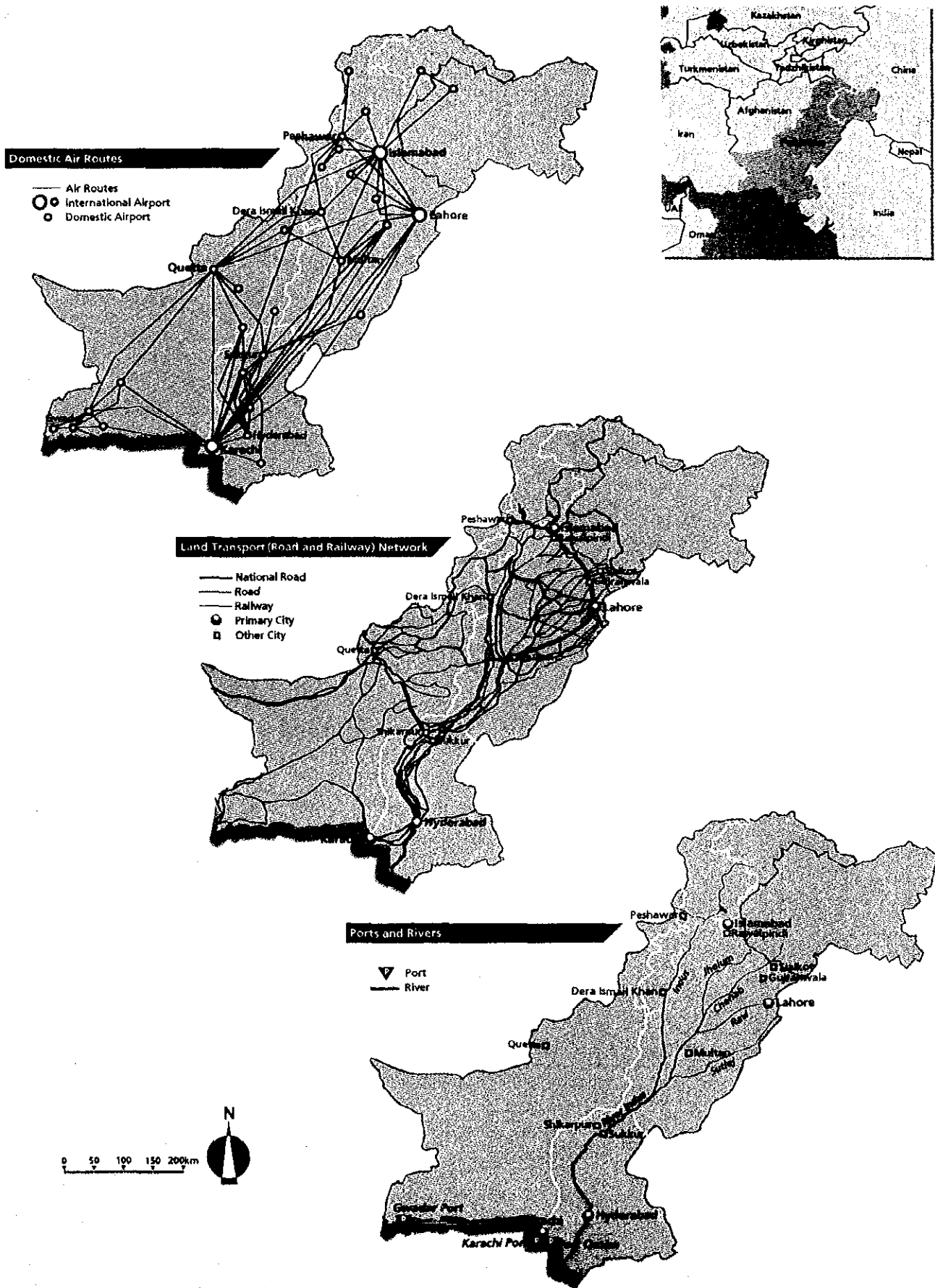
Very truly yours,

Osamu Ohtsu
Team Leader
The Study Team for
National Transport Plan Study in
Pakistan

Maps of the Study Area

Domestic Air Routes

- Air Routes
- ⃝ International Airport
- ○ Domestic Airport

Peshawar
Islamabad
Dera Ismail Khan
Lahore
Multan
Quetta
Hyderabad
Karachi

Kazakhstan
Uzbekistan
Turkmenistan
Tadzhikistan
China
Afghanistan
Iran
Nepal
UAE
Oman
India

Land Transport (Road and Railway) Network

- National Road
- Road
- Railway
- ● Primary City
- ▫ Other City

Peshawar
Islamabad
Gujranwala
Dera Ismail Khan
Lahore
Quetta
Sukkur
Hyderabad
Karachi

Ports and Rivers

- ▽ Port
- River

Peshawar
Islamabad
Rawalpindi
Sialkot
Gujranwala
Dera Ismail Khan
Lahore
Quetta
Multan
Sukkur
Gwadar Port
Karachi Port
Hyderabad

N

0 50 100 150 200km

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Outline of the Study

The Study on National Transport Plan in the Islamic Republic of Pakistan

Study Period: January 1994 - March 1995
Counterpart Agency: National Transport Research Centre, MOC

1. Background of the Study

The recent economic development in Pakistan, same as in other developing countries, resulted in a remarkable increase of transportation demand along the nationwide transport corridors for various transport modes. However, the transport system has not been adequately maintained nor improved to cope with the changes in demand due to the lack of comprehensive transport planning, in spite of the Government efforts to remove the bottlenecks in the each transport system.

JICA conducted the National Transport Plan Study both in 1981 and in 1987, and the results of the studies were successfully utilized in the transport sector for the 6th and 7th Five Year Plans and were appreciated by the Government of Pakistan.

2. Purpose of the Study

The Study aims at reviewing and updating the National Transport Master plan (target year 2005-06) and formulating the investment programmes for the 8th FYP (1993-94 to 1997-98).

3. Study Area

The Study focuses mainly on national and international trunk routes and inter-regional transport networks connected with the trunk routes, covering all modes of transport for the whole of Pakistan. The Study, therefore, covers not only physical aspects of each mode of transport such as road, road transport, railway, port, shipping, airport & aviation and inland water transport, but also transport policy directions and an initial environmental examination.

4. Outline of the Plan

The plans in this study consists of mid-term master plan for the year 2005-06 and a short-term proposals for 1997-98, together with general planning directions.

4.1 Economic Development and Projection of Gross Domestic Fixed Capital Formation

Economic development scenario as a basic framework for the National Transport Plan is:

- Stable annual growth of GDP (over 6%) is projected during 8th to 10th FYP period.
- Infrastructures, such as energy / water and transport, are to be improved to cope with the increasing activities of the production / services sectors.
- Total amount of GFCF for transport and communications sub-sector are Rs.198 billion for 8th FYP and Rs.750 billion for 8th - 10th FYPs for the total of public & private sectors.

Table A   Projection of Economic Growth and Financial Framework

	7th FYP	8th FYP	9th FYP	10th FYP
Population Growth (%)	3.1	3.0	2.6	2.6
GDP Growth (%)	5.0	7.0	6.3	6.2
Growth of Export (%)	18.4	12.5	10.0	8.0
Growth of Import (%)	17.5	7.5	8.0	7.0
Growth of Trade Balance (%)	6.2	-8.7	-8.2	-13.1
Total GFCF, Transport Sector (Rs. billion)	130.8	197.8	248.4	304.4
Private Sector	42.5	67.3	99.4	137.0
Public Sector	88.3	130.6	149.0	167.4

4.2 Demand Forecast

The previous traffic demand forecast was updated taking into consideration the present traffic situation and projected future economic growth. Especially, the modal split between rail and road and increasing container freight traffic demand were carefully examined from various aspects.

Table B   Traffic Demand Projection

Sub-sector Items	1992-93	1997-98	2005-06	Average Annual Growth Rate (%) 92-93~97-98	Average Annual Growth Rate (%) 97-98~05-06
Road Planning					
No. of vehicle trips per day (000)	159	208	309	5.6	5.0
Pass-kms/year (million)	71,071	96,615	148,036	6.3	5.5
Ton-kms/year (million)	28,636	30,180	41,639	1.0	4.1
Railway Planning					
Pass-kms per year (million)	16,511	22,790	36,089	6.7	5.9
Ton-kms per year (million)	6,051	13,692	21,131	17.7	5.6
Port Planning					
Dry cargo per year (000 ton)	16,138	20,132	29,541	4.5	4.9
Liquid cargo per year (000 ton)	14,093	17,418	24,968	4.3	4.6
Containered (000 ton)	5,142	7,684	13,792	8.4	7.6
Airport Planning					
Domestic					
Pass/year (000)	3,861	5,668	9,650	8.0	6.9
Ton/year (000)	42	59	100	7.0	6.8
International					
Pass/year (000)	4,128	5,049	7,072	4.1	4.3
Ton/year (000)	130	164	246	4.8	5.2

4.3 Basic Planning Policies and Strategies

Most of the basic policies / strategies proposed in the previous NTPS are still applicable to this plan, i.e.:

- Full utilization of existing facilities with minimum cost.
- Rational modal split based on the functions and relative costs by mode.
- Strengthening railways in long-distance freight transport.
- Integrated development of various transport modes with the total cost minimized.
- Investment on transport infrastructure for the development of isolated regions.
- Encouragement of transport investment by the private sector.

In addition to the above, the following points were also examined and proposed in this plan.

- Containerization of freight transport (multi-modal transport, dry-port).
- Trade and transport between Central Asian States.
- Options for institutional reform.
- Necessary research support required in the transport sector (NTRC).

4.4 Summary of the Proposed Projects and Recommendations by Sub-sector

In line with the basic policies, each sub-sector plan was formulated. Major projects proposed are:

4.4.1 Road and Road Transport

1) Highway construction:
   Dual carriage construction of N-5, improvement of Indus Highway, ISB-LHE Motorway, etc.
2) Road maintenance and rehabilitation:
   Application of the NHA system to provincial and other roads, countermeasures to excessive Loading by trucks and review of design criteria of pavement.
3) Public transport passenger service:
   Establishment of statistical data collection system, analysis on operation cost and revenue and restructuring of provincial bus corporations.
4) Road accident reduction:
   Training of traffic police, upgrading of related institutes and analysis of accidents' records for better traffic management.
5) Provincial roads improvement study:
   Comprehensive study on provincial road improvement by province.

4.4.2 Railway

1) Railway facility improvement:
   Doubling of tracks, electrification, rehabilitation of track, revamping of signaling, repair of bridges, revamping of alignment, etc.
2) Rolling stock:
   Increase in fleet, enhancement of performance, revamping of maintenance system / facility, etc.

3) Passenger transport improvement:
   Introduction of higher-speed trains.
4) Freight transport improvement:
   Installation of freight terminals, expansion of container transport capacity and construction of dry-ports.
5) Modernization of management information system and communication network.

4.4.3 Port

1) Improvement of Karachi and Qasim ports:
   Effective utilization of existing facilities, establishment of full container terminals, modernization of dry bulk terminals and construction of additional liquid terminal.
2) Development of other minor ports: Gwadar deep sea port and Keti Bunder port.

4.4.4 Shipping

1) Modernization of merchant fleet:
2) Institutional improvement:
   Upgrading of PSW's organization, introduction of new Merchant Shipping Act, restructuring of PNSC, etc.
3) Strengthening of sea linkage:
4) Improvement of financial aspect:
   Participation of the private sector, and enhancement of fund sources.

4.4.5 Airport and Aviation

1) Improvement of major three airports as international airport:
   Islamabad, Karachi and Lahore airports.
2) Facility improvement to meet demand increase and larger aircrafts introduction.
3) Construction of small feeder airports from the civil minimum point of view.
4) Upgrading of air navigation systems.
5) Expansion of service route network and tourism promotion.

Table C   Summary of Proposed Projects and Costs for 1997-98

Sub-Sector	Major Projects	Rs. million	
Roads:		73,226	
	Motorway		9,460
	National Highway (committed)		60,714
	National Highway (recommended))		681
	Provincial Highway (recommended)		2,371
Railway:		40,700	
	Track Renewal / Improvement		10,850
	Signaling / Control System		1,560
	Rolling Stock		23,300
	Electrification / Information System		1,290
	Others		3,700
Ports*:		14,572	
	Karachi Port		8,790
	Qasim Port		5,757
	Others		25
Airport / Aviation*:		38,560	
	Airport Projects		8,833
	Aviation Projects		29,727
		167,058	

Note: * including private / corporate sector

Table D   Summary of Proposed Projects and Costs for 2005-06

Sub-Sector	Major Projects	Rs. billion		(%)
Railways :		145.6		(37.1)
	Track Renewal	7.1		
	Rehabilitation of Rolling Stock	6.6		
	Procurement of Rolling Stock	75.0		
	Signaling	7.3		
	Speed-up / Double Tracking	13.3		
	Electrification	17.4		
	Container Transport Improvement	2.4		
	Modernization / Others	3.2		
	Miscellaneous	13.3		
Roads :		119.8		(30.5)
	Motorway	9.5		
	National Highways	103.2		
	Provincial Roads	7.2		
	Maintenance / Rehabilitation	n.a		
	Others	n.a		
Ports :		19.9		(5.1)
	Karachi Port	12.1	(8.4) *	
	Qasim Port	7.8	(6.3) *	
	Others	0.0		
Airport / Aviation :		107.3		(27.3)
	Airport Development	16.3	(7.3) **	
	Aviation Development	90.9	(90.9) **	
	Grand Total	392.6		(100.0)

Note : 1)   * by private sector
              ** by corporate sector

The total (public, private and corporate sectors) investment required by each transport sub-sector accounts for Rs 393 billion for the mid-term master plan and Rs 167 billion for the short-term plan, respectively. For the mid-term plan, a considerable investment by the private / corporate sector is expected; Rs 15 billion by private sector and Rs 98 billion by the corporate sector.

5. Evaluation

These proposed projects were preliminarily evaluated from varioue viewpoints.

5.1 Assessment of Investment Scale

The results of the projection of financial capability in the transport sector (including telecomm. sub-sector) indicated an investment capacity of Rs 190 billion during the 8th FYP period and Rs 440 billion during the 8th to 10th FYP period. The total investment amount required for the proposed projects is considered to be of a reasonable scale.

5.2 Economic Evaluation

Preliminary benefit-cost analyses were carried out in order to assess the economic viability of the proposed projects. The proposed projects were evaluated as a project package by sub-sector and the result indicated that the proposals were economically viable with the EIRR ranging 12 to 35 %.

5.3 Initial Environmental Examination

The environmental aspects of the proposed projects were reviewed. No major adverse environmental impacts were identified, however, some attention has been drawn to sensitive ecological issues and need for full IEAs. These would apply to new airports, inland waterways, and major port and shipping projects.

6. Proposals on Further Studies

Some further detailed studies, which were out of the scope of this study, were recommended for the 8th FYP period in order to formulate better transport policies and confirm the feasibility of high priority projects. They are:

- Transport sector industry study
- Provincial road development plan study
- Comprehensive regional development and local road improvement study
- Karachi port modernization study
- Study on electrification of major railway routes
- Moghalpura locomotive factory modernization study
- Local airports improvement study

Abbreviations / Acronyms

AAGR	Average Annual Growth Rate
AC&C	Aeronautical Communication and Control
ACC	Area Control Center
ADP	Annual Development Programme
AFTN	Aeronautical Fixed Telecommunication Network
AIP	Aeronautical Information Publication
ALS	Standard Approach Lighting System
AMSS	Automatic Message Switching System
APL	American President Lines
ASF	Airport Security Force
ATIS	Automatic Terminal Information Service
ATS	Air Traffic System
BOT	Build, Operate and Transfer
C&F	Cost and Freight
C&W	Communications and Works Department
CAA	Civil Aviation Authority
CAS	Central Asian States
CAT	Category
CATI	Civil Aviation Training Institute
CDEP	Central Development Working Committee
CFS	Container Freight Station
CIS	Confederation of Independent States
DEL	Diesel Electric Locomotive
DME	Distance Measuring Equipment
DRF	Depreciation Reserve Fund
DVOR	Doppler VHF Omnidirectional Radio Range
DWT	Dead Weight Ton
ECC	Economic Coordination Committee of the cabinet
ECNEC	Executive Committee of National Economic Council
ECO	Economic Cooperation Organization
EIRR	Economic Internal Rate of Return
EL	Electric Locomotive
FAA	Federal Aviation Agency, USA
FATA	Federal Administrated Tribal Area
FIR	Flight Information Region
FOB	Free on Board
FYP	Five Year Plan
GDP	Gross Domestic Products
GNP	Gross National Products
HAT	Highest Astronomic Tide
HP	Horse Power
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IOC	Iron Ore and Coal
IRNS	Indus River Navigation Study
ISB	Islamabad
IWT	Inland Water Transport
JCAB	Japan Civil Aviation Bureau
JICA	Japan International Cooperation Agency
KHI	Karachi
KKH	Karakhoram Highway
KPT	Karachi Port Trust
LDP	Lahore Dry Port
MEAV	Modern Equivalent Asset Value
MHHW	Mean Higher High Water

MHLW	Mean Higher Low Water
MLHW	Mean Lower High Water
MLLW	Mean Lower Low Water
MLS	Microwave Landing System
MOC	Ministry of Communications
MOD	Ministry of Defense
MOR	Ministry of Railway
MSC	Milwa Shipping Company
MSL	Mean Sea Level
NDB	Non-Directional Radio Beacon
NHA	National Highway Authority
NLC	National Logistic Cell
NM	Nautical Mile
NSC	National Shipping Corporation
NTC	National Tanker Company
NTPS	National Transport Plan Study
NTRC	National Transport Research Center
NWFP	North-West Frontier Province
OD	Origin and Destination
OP	Oil Pier
ORE	Other Revenue Expenditure
PAF	Pakistan Air Force
PAPI	Precision Approach Path Indicator
PCWD	Provincial Communications and Works Department
PDD	Planning and Development Division
PERAC	Petroleum Refining and Petrochemical Corporation Ltd.
PIA	Pakistan International Airlines
PISC	Pan Islamic Steamship Corporation
PMC	Pakistan Mercantile Services Ltd.
PMD	Pakistan Meteorological Department
PNSC	Pakistan National Shipping Corporation
POL	Petroleum Products
PPSC	Pakistan Postal Services Corporation
PQA	Port Qasim Authority
PR	Pakistan Railway
PSN	Pakistan Shipping Corporation
PSO	Public Service Obligation
PSR	Primary Surveillance Radars
PSW	Ports and Shipping Wing, MOC
PTA	Provincial Transport Authority
RCD	Regional Cooperation for Development
RCLL	Runway Center Line Lights
REDL	Runway Edge Lights
RENL	Runway End Lights
RFTKs	Revenue Freight Ton-Kilometers
RIV	Rapid Intervention Vehicle
RPKs	Revenue Passenger-Kilometers
RSE	Ray Shipping Enterprises Ltd.
RTA	Regional Transport Authority
RTHL	Runway Threshold Lights
RVR	Runway Visual Range
SAARC	South Asian Association for Regional Cooperation
SALS	Simple Approach Lighting System
SAP	Social Action Programme
SCO	Special Communication Organization
SL	Steam Locomotive
SSR	Secondary Surveillance Radars
TACAN	Tactical Air Navigation System
TCLL	Taxiway Center Line Lights
TEDL	Taxiway Edge Lights

TEU	Twenty-foot Equivalent Unit
TRB	Transport Research Board, USA
TSL	Tristar Shipping Lines Ltd.
UK	United Kingdom
UNCTAD	United Nations Conference for Trade and Development
UNDP	United Nations Development Programme
VOR	VHF Omnidirectional Radio Range
VORTAC	VOR and TACAN
WAPDA	Water and Power Development Authority

TABLE OF CONTENTS

List of Tables and Figures

CHAPTER 1   INTRODUCTION

1.1   Outline of the Study

"The Study on National Transport Plan in the Islamic Republic of Pakistan" was started in January, 1994, in accordance with the scope of work agreed between the Japan International Cooperation Agency (JICA) and Government of Pakistan on 24th April, 1993.

The main objectives of the Study are;

- to propose a short term investment plan for incorporation in the Rolling Plan and Annual Development Programmes of the 8th Five Year Plan, keeping in view a long-term perspective.

- to focus mainly on national and international trunk routes and inter-regional transport network connected with the trunk routes, covering all modes of transport for the whole of Pakistan.

The study flow chart is illustrated in Figure 1.1.1 and 1.1.2.

Figure 1.1.1   Flowchart of National Transport Plan Study
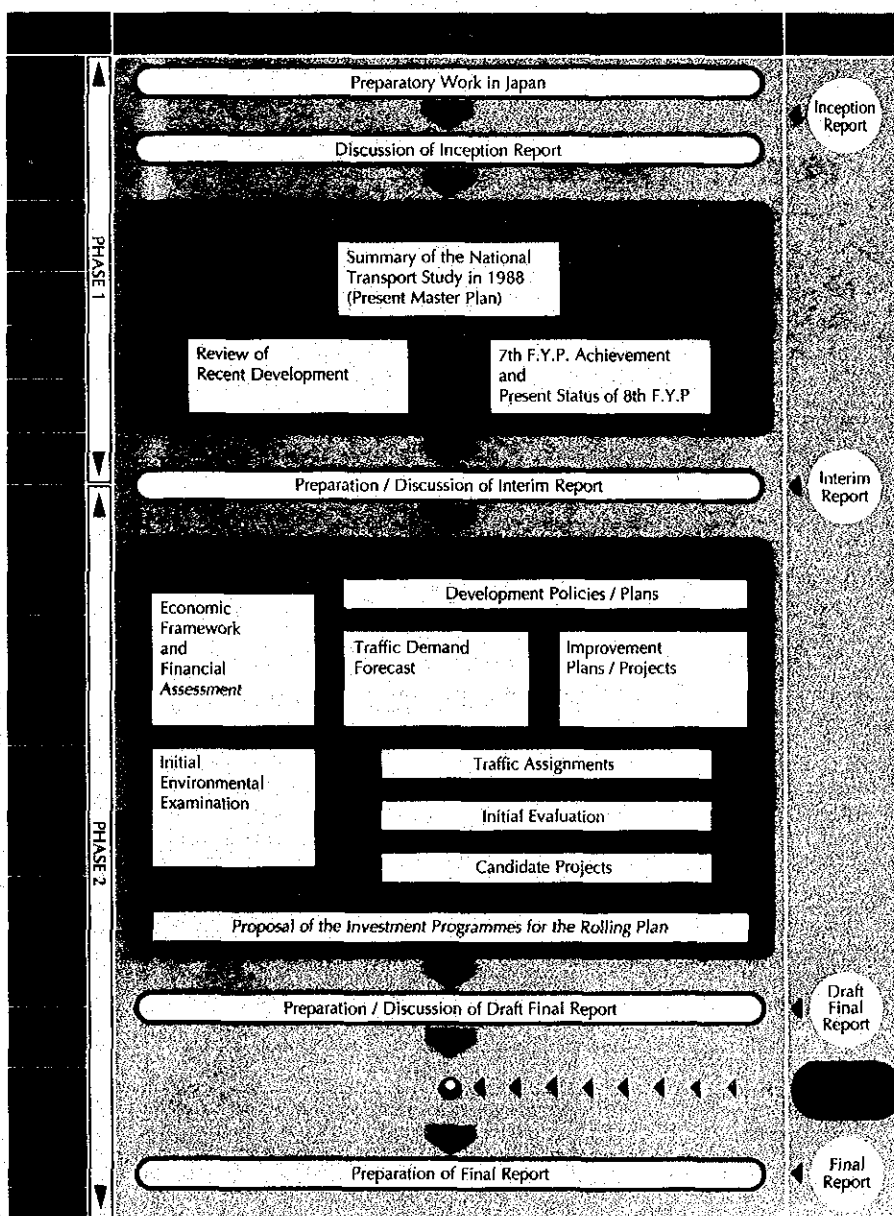
Figure 1.1.2　Maps of the Study Area
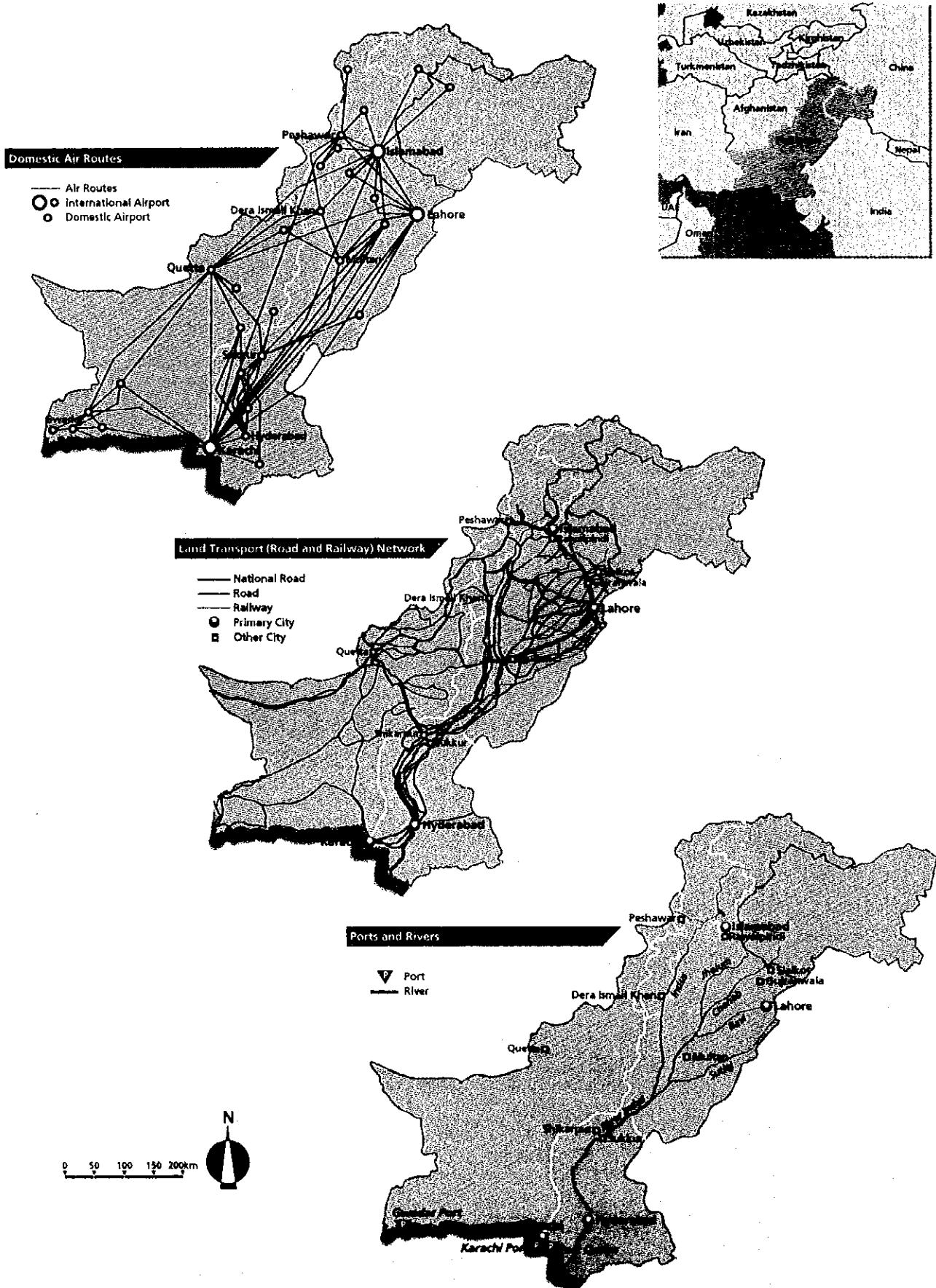
1.2 Reporting

In the course of the Study, the following three reports were submitted.

(1) Inception Report

The Inception Report, presenting the study plan in line with the agreed scope of work, was submitted at the commencement of the Study in the middle of January 1994, and Phase 1 study was conducted both in Pakistan and in Japan, from January to June.

(2) Interim Report

At the end of the Phase 1 , the middle of July 1994, the Interim Report was prepared on the basic planning directions for the proposed new investment programmes.

The Interim Report was included the following aspects :

- General view of economy and transport,
- Present status and problems by each mode,
- Future economic framework,
- Transport demand forecast,
- Revision of Master Plan, and
- Preliminary environmental study.

After the presentation of the Interim Report in July, the Phase 2 study was undertaken to validate the proposals/recommendations, in line with the 8th Five Year Plan (especially in Transport Sector) authorized by the Pakistan Government in June 1994.

(3) Draft Final Report

The Draft Final Report was prepared as a result of Phase 2 study both in Pakistan and in Japan, from July to October 1994.

This Final Report has been prepared with necessary revisions in consideration of the comments from the Pakistan Government as well as the comments given at the Steering Committee held in the course of the study. The report consists of 4 volumes, i.e. ;

1. Summary

2. Volume I - Economic Analysis and Demand Forecast -

  - Introduction
  - Socioeconomic Framework
  - Transport Demand Projections

3. Volume II - Studies by Sub-sector -

  - Road Planning
  - Road Transport Planning
  - Railway Planning
  - Port Planning
  - Shipping
  - Airports and Aviation Planning
  - Inland Water Transport

  - Transport Planning Directions
  - Initial Environmental Examination
  - Technology Transfer through Transport Planning Software

4. Appendices

CHAPTER 2   TRANSPORT SYSTEM - EXISTING SITUATION

2.1   Transport System

The interregional transport system in Pakistan consists mainly of three modes; road, railway and air. Both the coastal shipping and inland water transport only serve local movements. The existing pipeline is important for transporting petroleum and natural gas.

For the international transport, maritime and air transport are the major modes for freight and for passenger respectively. Road plays only a limited role, although trunk roads connect neighboring countries; Iran in the west, Afghanistan in the north-west, China in the north and India in the east. No reliable data exists on Pakistan's international road transport and it is believed that the present traffic volume across these borders is marginal. Railway also has no direct links with other countries. In the future, however, the international land (road and railway) links will be highlighted in relation to the emerging Central Asian States (CAS), the Asian Highway Scheme and increasing social/economic ties in the Economic Cooperation Organization (ECO) countries.

The existing national transport network was developed around the north- south corridor in Punjab and Sind Provinces. Road, railway and air routes are responsible for the movement of passenger and freight along this corridor between up-country (Lahore, Rawalpindi, Islamabad, Peshawar, etc.) and lower-country (Karachi and environs) in accordance with the present distribution pattern of economic activities and traffic demand.

Figure 2.1.1   National Transport Corridors

MAJOR TRANSPORT CORRIDORS

MINOR TRANSPORT CORRIDORS
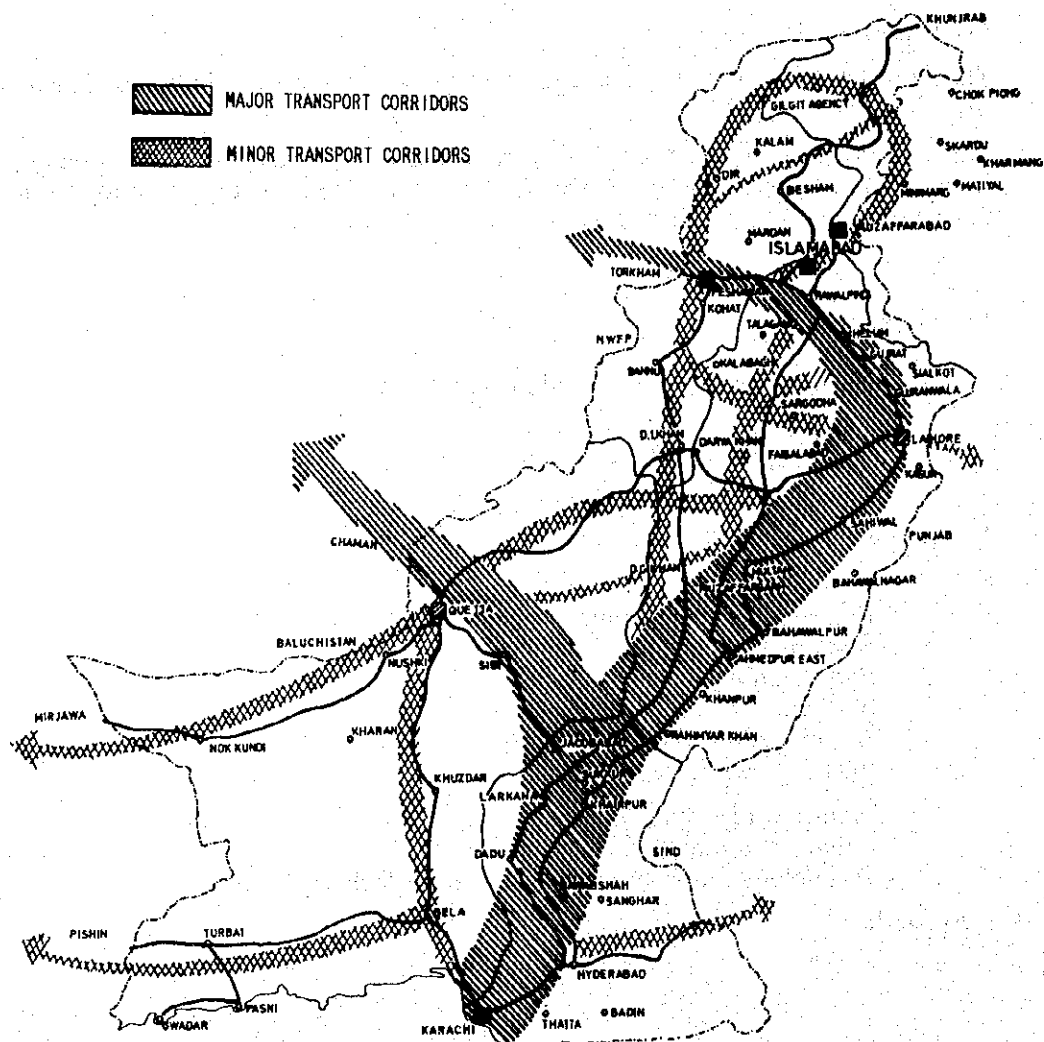
Figure 2.1.2 Concept of the Asian Highway

- 5 -
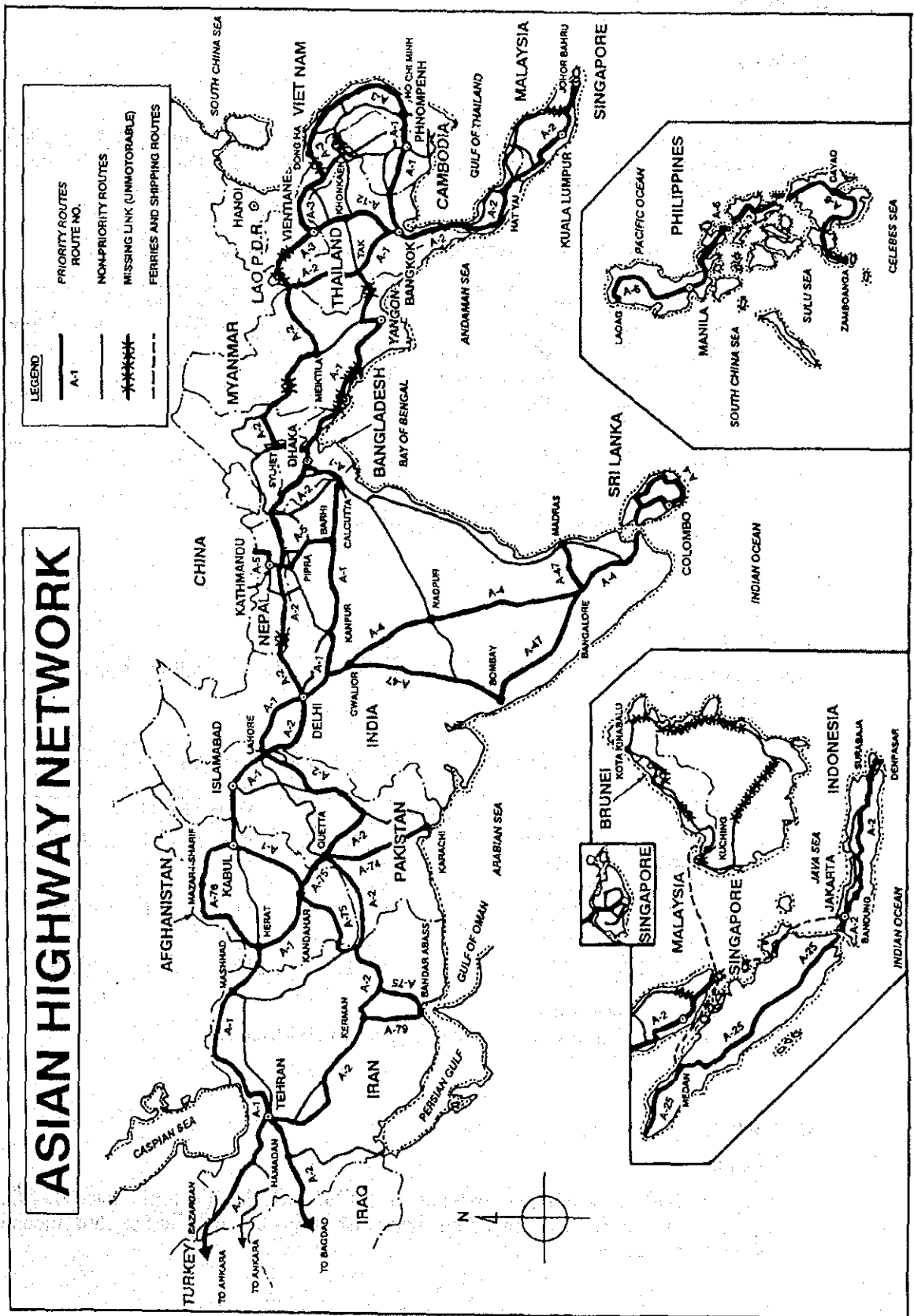
2.2 Traffic

(1) Passenger

1) Domestic

In the last decade, overall traffic demand has been steadily increasing in parallel to the economic development. Railway, however, has shown a moderate growth, thus losing its share in the national transport market.

Table 2.2.1   Modal Shares in Domestic Passenger Transport

Year	Passenger-kms (billion)				Modal Shares (%)			
	Road	Railway	Air	Total	Road	Railway	Air	Total
1982-83	79.5	16.5	1.3	97.3	82	17	1	100
	(6.4)	(2.3)	(10.1)	(5.8)				
1987-88	108.5	18.5	2.1	129.1	84	14	2	100
	(4.5)	(2.4)	(5.2)	(4.2)				
1992-93	135.0	20.8	2.7	158.5	85	13	2	100

Source : Planning Commission
Note : Figures in parenthesis show average annual growth rate (%).

2) International

International passenger transport has been dominated by air, with sea transport in continuous decline.

Table 2.2.2   Modal Shares in International Passenger Transport

Year	No. of Passengers (000)			Modal Shares (%)		
	Air	Sea	Total	Air	Sea	Total
1982-83	3,341	30	3,371	99	1	100
	(2.3)	(-0.7)	(2.3)			
1987-88	3,752	29	3,781	99	1	100
	(2.7)	(-1.8)	(2.6)			
1991-92	4,167	27	4,194	99	1	100

Source : PIA and KPT
Note : Figures in parenthesis show average annual growth rate (%).

(2) Freight

1) Domestic

Railway has lost its share remarkably in the last decade. It is to be noted that the absolute freight volume carried by railway has been also in decline despite the continuous expansion of the freight market.

Table 2.2.3   Modal Shares in Domestic Freight Transport

Year	Ton-kms (billion)			Modal Shares (%)		
	Road	Railway	Total	Road	Railway	Total
1982-83	21.2	7.5	28.7	74	26	100
	(6.5)	(1.3)	(5.3)			
1987-88	29.1	8	37.1	78	22	100
	(4.9)	(-4.4)	(3.2)			
1992-93	37	6.4	43.4	85	15	100

Source : Planning Commission
Note : 1)Figures in parenthesis show average annual growth rate (%).
       2)Excludes pipeline, air and inland water transport.

2) International

International freight transport is dominated by sea transport. Import has grown more rapidly than export. The trade imbalance has increased over the last decade with import larger than export.

Table 2.2.4   Past Trends of Port Traffic

(000 tons)

Year	Import	Export	Total
1982-83	13,004	3,525	16,529
	(5.8)	(3.6)	(5.3)
1987-88	17,226	4,213	21,440
	(7.5)	(5.4)	(7.1)
1992-93	24,755	5,476	30,231

Source : KPT and PQA
Note : Figures in parenthesis show average
       annual growth rate (%).

2.3   Overall Review of Five Year Plans

Pakistan has pursued seven FYPs since 1955; First FYP (1955-1960), Second (1960-1965), Third (1965-70), Non-Plan period (1970-1978), 5th (1978-83), 6th (1983-88) and 7th (1988-1993), and is now in its the 8th FYP period.

These FYPs are the master plans directing national economic and social development within the framework of medium term (5 years) and are operationalized through the instrument of annual plans. They cover not only physical infrastructure plan but also the other sectors such as industry, human resources development, etc.

(1) GDP and GNP Growth

Annual growth rates of GDP and GNP during the FYP period are summarized below :

Table 2.3.1　Historical Trends of GDP and GNP Growth

| | Period | Annual Growth Rate (%) | |
		GDP	GNP
1st	FYP (1955-60)	3.1	3.0
2nd	FYP (1960-65)	6.8	6.8
3rd	FYP (1965-70)	6.7	6.8
	Non-plan (1970-78)	4.2	4.9
5th	FYP (1978-83)	6.0	6.3
6th	FYP (1983-88)	6.8	5.3
7th	FYP (1988-93)	5.0	4.4
8th	FYP (1993-98)	7.0 (target)	

(2) Share of Transport Sector in GDP and GFCF

An overview of the transport sector in comparison with other economic activities is presented in the following table.

Table 2.3.2　Share of GDP & GFCF in the 6th and 7th FYPs by Economic Activity

	6th FYP Total	GDP Share	GFCF Share	7th FYP Total	GDP Share	GFCF Share
1.0 GFCF (A+B+C)	235,908	12.40	100.00	427,164	16.97	100.00
A Private Sector	99,095	5.21	42.01	203,445	8.08	47.63
B Public Sector	81,920	4.31	34.73	130,633	5.19	30.58
C General Government	55,380	2.91	23.48	93,086	3.70	21.79
D GFCF (A+B)	181,015			334,078		
A' Private Sector	99,095	5.21	54.74	203,445	8.08	60.90
B' Public Sector	81,920	4.31	45.26	130,633	5.19	39.10
		9.52	100.00		13.28	100.00
2.0 SECTOR-WISE						
2.1 Agriculture	27,926	1.47	11.84	41,429	1.65	9.70
2.2 Mining and quarrying	5,000	0.26	2.12	7,585	0.30	1.78
2.3 Manufacturing	30,377	1.60	12.88	71,052	2.82	16.63
2.3 Large Scale	24,649	1.30	10.45	58,634	2.33	13.73
2.3 Small Scale	5,754	0.30	2.44	12,469	0.50	2.92
2.4 Construction	4,764	0.25	2.02	10,124	0.40	2.37
2.5 Electricity and gas	27,561	1.45	11.68	68,481	2.72	16.03
2.6 Transport and communication	34,040	1.79	14.43	53,479	2.13	12.52
2.7 Wholesale and retail trade	1,956	0.10	0.83	3,986	0.16	0.93
2.8 Financial institution	36,717	1.93	15.56	56,927	2.26	13.33
2.9 Services	13,842	0.73	5.87	21,529	0.86	5.04
		11.18			16.12	
3.0 GDP Market Price	1,901,880			2,516,534		

Source : (1) Economic Survey 1993-94, Economic Advisor's Wing, Finance Division
(2) Economic Survey 1992-93, Economic Advisor's Wing, Finance Division
(3) JICA Study Team

(3) Review of Transport Sector in the 7th FYP

The Seventh Five Year Plan (1987-88 to 1992-93) initially aimed at :

  1) Optimal utilization of the existing capacity of the system by rehabilitation and proper maintenance,

  2) Rational allocation of freight traffic between railway and road,

  3) Integrated systems approach to ensure greater improved performance of the national transport system,

  4) Accelerated cost recovery programmes, rational pricing policies for public sector services and self financing by public corporations, and

  5) Introduction of the private sector into the roads, airline, port and shipping industry.

An investment of Rs. 26.65 billion (at 1987-88 prices) in the Federal and Provincial Public Sector and Rs. 39.57 billion for the Public Sector Corporation was made against the plan allocation of Rs. 29.2 billion and 32.3 billion respectively. The actual utilization to the plan allocation was 93.7 % in the Federal/Provincial Public Sector and 89.1 % in the Public Sector Corporation.

Although an improvement in railway/road freight traffic share envisaged : from 20:80 in 1987-88 to 26:74 in 1992-93, the share further deteriorated to 14:86 in 1992-93 as a result of operational inefficiency and lack of motive power. Thus, a greater strain on the road transport caused uneconomical investment for road construction/maintenance and road transport. International traffic as handled by PIA and at Karachi & Qasim ports has almost attained the targeted traffic volume in the plan.

The detailed analyses on the performance of the 7th FYP were made for each sub-sector and are presented in the main volume.

(4) Eighth Five Year Plan

The framework of the 8th FYP, approved on 31st May 1994, was prepared in consultation with the Federal and Provincial Government agencies.

The target of GDP growth per annum is 7.0 %, and total plan size is Rs. 752 billion for public sector and Rs. 949 billion for private sector. These figures were Rs. 553 billion and Rs. 596 billion respectively in the 7th FYP. The ratio of the 8th FYP to the 7th FYP (in real terms) is 1.36 in public sector, 1.59 in private sector and 1.48 for combined total.

The outline for the transport and communications in the 8th FYP is summarized as follows;

  1) The policy initiatives for the establishment of a comprehensive transport system should be based on the following 13 parameters:

    a. The rationale for inland freight traffic between rail and road network is that the railway should haul long lead traffic and roads should carry short lead traffic.

    b. A significant shift of freight traffic to railways to achieve maximum utilization of its inherent capacity is necessary to reduce relative transportation costs;

    c. Privatization of the railway's operations in selected areas would be explored;

    d. Commercial exploitation of railway lands and property development will be carried out;

    e. In the road sub-sector, the highway development programme would be broadened by induction of the private sector and the   realization of road user charges;

    f. Toll roads would be developed and all those sections on national highways which are either newly constructed or improved will be tolled;

    g. The port facilities shall be developed for containerization of traffic with the help of dry ports and bonded warehouses;

    h. Private sector would be given incentive for participation in shipping and ports sub-sectors;

    i. The Karachi Shipyard and Engineering Works shall be re-vitalized by modernization;

j. Participation of private sector in the airline industry shall be encouraged;

k. New air terminal projects at Islamabad, Lahore and Peshawar would be implemented through the private sector on Build Operate and Transfer (BOT) basis;

l. Participation of the private sector in the development programme of telecommunication facilities would be accelerated; and

m. Establishment of multimodal transport system would be studied and developed.

2) Traffic forecasts for the planning period are:

Table 2.3.3   Projection of Transport Demand

Unit	Benchmark 1992-93	Targets 1997-98	ACGR %
Railway:			
Freight (Million Tonne Km)	6,400	9,850	9.00
Passenger (Million Passenger Kms.)	20,771	22,932	2.00
Road:			
Road Freight (Million Tonne Kms.)	37,000	40,390	1.80
Passenger (Million Passenger Kms.)	135,000	154,481	2.70
Port:			
Dry Cargo (Million Tonnes)	11.1	13.0	3.21
Liquid Cargo (Million Tonnes)	11.5	14.4	4.80
Steel Mill (Million Tonnes)	2.6	2.7	0.80
Air:			
Domestic			
Passenger MRPKS	2,737	4,006	7.90
Freight MRFTKS	42	53	4.80
International			
Passenger MRPKS	7,739	9,741	4.70
Freight MRFTKS	449	522	3.10
Pipe Line			
Million Tonne Kms.	1700	1700	

3) Major targets in the transport sector are:

1. Double the rail track from Lodhran to Peshawar (800 kms),

2. Manufacture of 1,367 high capacity wagons,

3. Completion of the Indus Highway (1,189 kms and Kohat Bypass 26 kms),

4. Completion of dualization of National Highway N-5 (1,764 kms),

5. Completion of Lahore - Islamabad Motorway (355 kms),

6. Improvement and upgrading of RCD Highway N-25 and N-40, (601 & 433 kms, respectively)

7. Initiation of work on Makran Coastal Road (600 kms),

8. Start of work on Lowari Tunnel (9 kms), and

9. Construction of deep sea port at Gwadar through private sector participation.

4) Total allocation of federal programmes is shown below :

Table 2.3.4   Budgetary Allocations by Executing Agencies, Federal Programme
(8th FYP)

(Rs. Million)

Ministry / Sub-Sector	Public Sector (PSDP)	Public Sector Corporations		Total
		Budgetary	Non Budgetary	
1. Ministry of Railways	40,041	-	-	40,040
2. Ministry of Communication				
a) National Highways Authority	-	74,687	-	74,687
b) D.G. Ports & Shipping	3,256	-	-	3,256
c) K.P.T.	-	-	1,500	1,500
d) SCO i/c Others Communications	1,144	-	-	1,400
e) Research and Highway Safety	200	-	-	200
f) P.P.S.C.	-	-	2,900	2,900
Sub-Total (2)	4,600	74,687	4,400	83,687
3. Ministry of Defense				
(Aviation Division)				
a) Civil Aviation Authority	-	-	4,406	4,406
b) Airport Security Force	607	-	-	607
c) Air Lines	-	-	1,300	1,300
d) Pakistan Met. Dept.	485	-	-	485
Sub Total (3)	1,092	-	5,706	6,798
4. Planning & Development Division				
National Institute of Transport	50	-	-	50
Total (T & C)	45,783	74,687	10,106	130,576
5. Pakistan Telecommunication Corporation (Outside Budget)	-	-	18,300	-

2.4 Problem Areas

(1) General

The transport sector is one of the most important sectors in the national economy. In the successive Five Year Plans, transport sector has been allocated the second largest budget only next to the energy sector.

However, the efficiency and performance of the sector are considered generally low due to a number of reasons. Major problem areas are:

- Unreasonable modal split between road and railway;

- Poor management and inefficient utilization of transport infrastructure and facilities;

- Utilization of obsolete equipment and difficulty in its replacement;

- Lack of marketing and low levels of transport service;

- Institutional deficiency and the absence of effective enforcement; and

- Shortage of capital investment.

Since these problems are interrelated and occur more or less in a vicious circle, the overall efficiency of the national transport system has been greatly affected. As details are shown in the

main report, this section briefly reviews the problems faced by the transport sector.

(2) Road and Road Transport

The road network configuration itself is considered to be fairly adequate to cope with the traffic demand increasing as a result of the expanding economic activities. Major problems are:

- Rapid deterioration of roads due to overloading of trucks, improper engineering and poor maintenance;

- High incidence of traffic accidents due to improper driving behavior and poor traffic management; and

- Distortion of the transport service market by government.

(3) Railway

The Pakistan Railway (PR) is at present in a vicious circle of poor service level due to poor management and obsolete facilities, decline of patronage and the lack funds for investment, fund. Passenger trains are slow and impunctual while the freight trains do not meet the demand on offer due to poor management of wagons, overaged facilities and the priority given to passenger trains. Tracks are not well maintained and both the locomotives and wagons are in shortage.

(4) Port and Shipping

The Karachi Port is not equipped with container handling equipment despite the high percentage of containerized cargoes both in the import and export. Due to the lack of efficient facilities and poor management, productivity is unacceptably low both in Karachi Port and Qasim Port, and the long waiting time of dry bulk carriers result to too much congestion at Karachi Port.

Most of Pakistan's merchant fleet are superannuated and fail to capture the current demand for containers. There are also issues regarding the state-owned Pakistan National Shipping Company (PNSC) and the existing institutional/ legal framework for the shipping industry.

(5) Airport and Aviation

Presumably due to the existence of self-financing public corporation, PIA, the problem of aviation sector seems to be less serious. Among others, however, the following problems can be pointed out:

- Use of 15 airports is shared with Pakistan Air Force;

- Majority of local airports incur financial losses;

- The major airports, Karachi, Lahore and Islamabad, still experience a capacity problem for the terminal building and/or runway; and

- Entrance of new private airlines has not necessarily been successful.

CHAPTER 3   SOCIO-ECONOMIC FRAMEWORK

3.1   Growth of Gross Domestic Products

The annual average growth rate of the economy computed for each FYP period from the 5th to 7th were 6.4 %, 6.8 % and 5.0 % respectively. The previous master plan prepared in 1988 projected growth rate at 6.4 % for the 7th FYP. Actual growth during the same period was therefore lower than the forecast of previous master plan study. During the 7th FYP period, economic growth progressed steadily at around 5 %, however, in 1992-93 at the terminal year of the 7th FYP it declined substantially and consequently brought down the growth of the economy to 5.0 %.

In the previous master plan, economic growth was projected at 6.0 %, 5.7 % and 5.7 % during the 8th - 10th FYP respectively. The projection of economic growth under this study are 7.0 %, 6.3 % and 6.2 % which were delineated by the compilation and amalgamation of growth projections by sector based on growth projection of production, consumption and trade of each selected commodities as well as services. Table 3.1.1 below "Trend and Projection of GDP Growth" summarizes the economic growth and its projection. The growth of production of selected commodities were projected taking into account the past trend of production, consumption and trade, demand and supply situation, government policy, competitiveness in the international market, etc. in terms of volume. The projected increase/decrease of selected commodities in volume was converted into the monetary terms based on the analyses of previous master plan study in a constant factor cost of 1980-81. The projected growth of GDP and GNP is delineated from the above mentioned process, the datails of which are described in Chapter 2.2.3 of the main report. For the projection of economy during 8th FYP, various targets set out by the Eighth Plan document were refered and used as much as possible.

Table 3.1.1   Trend and Projection of GDP Growth

(Unit : per cent)

Period	5th FYP	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
GDP	6.4	6.8	5.0	7.0	6.3	6.2
Agriculture	5.9	5.7	2.9	4.7	4.4	4.0
Mining and Quarrying	-	14.5	6.3	11.4	8.1	7.0
Manufacturing	-	8.3	6.3	9.8	7.2	7.2
Construction	-	8.3	5.1	7.8	6.0	6.0
Electricity and Gas Dis	-	10.1	10.4	8.2	7.0	6.5
Transport and Comm.	-	6.7	7.4	5.8	6.5	6.5
Commerce	-	8.3	4.7	8.3	8.0	8.0
Banking and Insurance	-	1.9	3.5	5.8	7.5	7.5
Housing	-	6.5	5.3	5.3	6.0	6.0
Public Adm. and Defense	-	4.5	2.8	5.5	3.0	2.5
Other Services	-	6.5	6.5	6.5	7.0	6.0

The trend and projection of economic growth for each sector is outlined as follow:

(1) Agriculture

Growth of agriculture sector decelerated during 7th FYP because of depressed production of cotton and wheat due to diseases (leaf curl virus) and natural calamities. It is foreseen that wheat production will not be able to meet the growing demand due to high growth rate in population associated with increase of income per capita and the limited cultivable area appropriate for wheat production in general. Other agricultural products which have high potential to earn foreign exchange by exports such as rice and cotton are, however, projected to increase considerably and steadily.

(2) Mining and Quarrying

The share of the mining and quarrying sector in GDP has been minimal at less than 1 %, however, its growth is essential to minimize the spending of scarce foreign exchange required for the importation of crude oil and petroleum products. In line with the economic growth as a whole, a steady increase consumption of petroleum products can be foreseen. In order to meet growing demand for petroleum products, various plans for construction of new refineries are underway and implementation will be during 8th - 10th FYP. Crude oil production will likewise increase to meet with the expansion refining capacity. Due to freer economic system and acceleration of international investments in the field of oil exploration, the growth of crude oil production is projected higher than the actually experienced during the past two FYP periods. Coal production is projected to grow rapidly taking into account the expansion in power generating capacity by coal fired thermal power plants.

(3) Manufacturing

Rapid growth in the manufacturing sector is expected for the 8th FYP period resulting from the realization of economic development policies set out in the middle of the 7th FYP; these are to decentralize economic control, to deregulate various policies related to investment, to enhance capital inflow from abroad based on market oriented economy as well as to prepare appropriate scale of economic infrastructures so as to remedy a significant shortage of capacity of necessary utilities for the manufacturing sector such as electric power supply and transportation facilities.

(4) Electricity and Gas Distribution

Power development has been progressing very rapidly since the beginning of the 8th FYP in order to fill the gap between supply and demand and to create sound and rigid industrial basis for accelerated growth in the manufacturing sector which promises a increased foreign exchange earnings. That will give a positive impact to the national economy as a whole and the power development and gas distribution will be proceeded rapidly by both government and private investment.

(5) Transport and Communications

Parallel to the national economic growth, the transport and communications sector will grow steadily. However, in the 8th FYP, it is expected that major developments in road transport and railway infrastructure will be completed, thus, a growth will be expected from the 9th FYP.

3.2   Growth of Balance of Payment

(1) Exports

The need for foreign exchange has increased from year to year especially after experiencing a sharp drop of foreign exchange income from abroad mainly from the labour export to the Middle Easter. The government has emphasized the promotion of exports and have prepared the ground to accelerate exports of value added products since the middle of the 7th FYP. Freer regulation in foreign investment will enhance capital inflow especially for the export oriented manufacturing sector and other related economic infrastructures operated by the private sector. Capital inflow has began rapidly in the form of bonds issued and traded through the security exchange market which is thought to be a new type of fund raising mechanism for private enterprises in Pakistan. It is foreseen that the growth of export will decline slightly from the 9th FYP period due to increase in local demand, however, export growth will not be below the level of GNP growth. Exports are expected to grow and its share in GNP will also increase as shown in Table 3.2.1.

Table 3.2.1   Trend and Projection of Export Growth

(Unit : per cent)

Period	5th FYP	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Growth of Exports	19.4	20.4	18.4	12.5	10.0	8.0
Share of Exports as % of GNP	8.6	9.2	12.7	15.2	18.6	20.9

(2) Imports

Parallel to the growth of exports, imports are also projected to grow rapidly. It is foreseen that various type of capital goods will be required by the manufacturing plants to produce exportable products be competitive in price and quality in the international market. The volume and value of imported materials for production of such products for export and for the domestic market will also increase. Table 3.2.2 shows the trend and projected growth of imports and its change in the share in GNP.

Table 3.2.2   Trend and Projection of Imports Growth

(Unit : per cent)

Period	5th FYP	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Growth of Imports	17.0	10.1	17.5	7.5	8.0	7.0
Share of Imports as % of GNP	17.5	16.4	17.6	19.3	20.5	21.6

(3) Trade Balance

As growth of exports exceeded the growth of imports, trade balance improved in the 6th FYP , however, it did not continue in the 7th FYP. It is projected that from the 8th FYP, trade balance would improve continuously due to realization in export drive. Balance of trade has always been as import accounted for 20% of GDP over the past three FYP periods, and it is expected to continue until the 10th FYP. However, gradual improvement is projected as shown below.

Table 3.2.3   Trend and Projection of Trade Balance

(Unit : per cent)

Period	5th FYP	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Growth of Trade Balance	8.3	-6.3	6.2	-8.7	-8.2	-13.1
Share of Trade Balance as % of GNP	11.6	9.8	5.6	4.9	2.4	1.1

(4) International Payment

Outstanding debt was 8.1 % in the 6th FYP and 7.6 % in the7th FYP. This reflects an improvement in the international debt situation. Debt servicing in the same period was 1.4 % and 3.2 %.per GNP. It is projected that the debt servicing ratio per export will be 19.7 %, 22.4 % and 18.3 % and share in GNP will be 3.1 %, 3.1 % and 2.9 % for 8th - 10th FYP in average. The amount of loans and grants from the rest of the world has been declining sharply since 1988-89, however, capital inflow by direct foreign investment and by bond issue and the purchase by international investors will fill the gap in long-term capital requirement.

3.3   Growth of GNP

(1) Expenditure

Expenditures have been growing steadily and private consumption expenditure has grown faster than the expenditure of the government and public corporation as seen below.

Table 3.3.1   Trend and Projection of Expenditure

(Unit : per cent)

Period	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Private Consumption Expenditure	6.8	4.3	6.7	6.4	6.4
General Government Expenditure	11.7	-1.7	-3.0	-1.0	0.0
Gross Fixed Capital Formation	5.8	5.4	10.0	5.5	5.2
Change in Stocks	2.6	5.0	6.9	6.0	6.2

The share of each type of expenditure to total expenditure is shown in the below Table 3.3.2.

Table 3.3.2   Trend and Projection of Share of Expenditure

(Unit : per cent)

Period	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Private Consumption Expenditure	69.8	67.5	70.1	72.0	74.0
General Government Expenditure	11.8	12.8	8.9	6.1	4.5
Gross Fixed Capital Formation	16.8	17.0	19.4	20.5	20.2
Change in Stocks	1.7	1.7	1.7	1.4	1.4
Total Expenditure	100.0	100.0	100.0	100.0	100.0

As presented in the two tables, private expenditure will grow constantly and its share will expand on the contrary to that of government expenditure. Privatization of various government corporation and enhancement of private economy will reflect in the composition of total expenditure which constitutes GNP. Rapid growth of gross fixed capital formation in other words "investment" is expected in the 8th FYP and this will form the basis for steady growth of the national economy.

In view of public development and recurrent expenditures, as the dependency of foreign aid has been as high as 30 % of total expenditure and its debt service ratio has been over 24 % per export earning and 16 % per total foreign exchange earning. During the 7th FYP debt servicing has increased drastically at an annual average growth of 28.6 %. The government will make effort to reduce foreign aid dependency and instead of decreased foreign government or official aid the foreign exchange capital inflow from foreign private investment and bond issue is encouraged to increase. The government in general is taking a retrenchment policy to curve deficit and to curve debt service.

(2) Gross Domestic Fixed Capital Formation

Share of private sector in GFCF will grow and public sector's share will decrease as shown in the below Table 3.3.3.

Table 3.3.3   Trend and Projection of Share of GFCF

(Unit : per cent)

Period	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Private Sector's GFCF	42.0	47.6	55.9	60.0	66.0
Public Sector's GFCF	34.7	30.6	24.0	25.0	21.0
General Government	23.3	21.8	20.1	15.0	13.0
Total GFCF	100.0	100.0	100.0	100.0	100.0

(3) Gross Fixed Capital Formation of the Transport Sector

The trend and projected share of the transport sector's GFCF and its share in GDP are shown below.

Table 3.3.4   Trend and Projection of GFCF in Transport Sector

(Unit : per cent)

Period	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Share of Transport Sector's GFCF					
Per Total GFCF	14.4	11.3	11.5	10.2	9.7
Per GDP	1.8	2.1	2.4	2.2	2.0

Total amount of GFCF for the transport sector in 1992-93 was Rs. 35 billion and the total amount of GFCF for the 7th FYP period was Rs. 130.8 billion in constant 1992-93 prices. For the past two FYP periods the projected amount of GFCF for the transport sector in constant 1992-93 prices is shown in Table 3.3.5.

Table 3.3.5   Trend and Projection of GFCF in the Transport Sector

(Unit : Rs. billion)

Period	6th FYP	7th FYP	8th FYP	9th FYP	10th FYP
Total GFCF for Transport Sector	34.0	130.8	197.8	248.4	304.4
Private Sector	11.0	42.5	67.3	99.4	137.0
Public Sector	23.0	88.3	130.6	149.0	167.4

The share of GFCF by public in the transport sector is further analyzed in Table 3.3.6. The share of the same in the 8th FYP is prepared in accordance with Eighth Plan. The share and amount of GFCF is projected taking into account the compilation of estimates prepared by the respective sector analyses. It is suggested to that these figures serve as a guideline for actual budgeting of development investment. It is to be used solely for a checking of an appropriateness of the size of investment for transport sector and for each mode of transport.

With regard to the proportion of total investments in the transport sector, it is significant that improvement and development of railway has been emphasized from 8th FYP and it is assumed to continue toward 10th FYP taking into account of plan of reinforcement of North - South corridor by railway system. The development of the road system is forecasted to slow down from the 8th FYP as its peak demand of development after completion of trunk road and other important road networks as discussed in the relevant chapter of this report.

Table 3.3.6 Trend and Projection of GFCF in Transport Sector by Mode of Transport
(constant 1992-93 price)

(Unit : Rs. billion)

Period	7th FYP	8th FYP	9th FYP	10th FYP	8th-10th FYP
Total GFCF for Transport Sector	130.8	197.8	248.4	304.4	750.6
Public Sector	88.3	130.6	149	167.4	447
Railways	10.6	40	53.7	67	160.7
Roads	37.2	74.7	68.5	58.6	201.8
Civil Aviation	6.7	6.8	13.4	16.7	36.9
Ports and Shipping	5.6	7.6	10.5	16.7	34.8
Transport Others	0.3	0.2	0.4	1.6	2.2
Post Office and PTC	27.8	1.1	2.7	6.7	10.5

The development cost estimated for the 8th - 10th FYP or as a mid-term development plan period of the transport sector, is thought to be adequate in view of the scale of investments projected for the public sector.

3.4 Economic Development Scenario

In the middle of the 7th FYP period, an important economic policy was announced by the government which will play a vital role in the formulation of the Pakistan economy. The most important element of this policy is to accelerate privatization of government owned assets as well as to induce foreign investment. The significant policies adopted by the government since the middle of the 7th FYP are the sale of government enterprises to the local and foreign investors, deregulation and decentralization of economic controls and the enhancement of the freer market oriented economy, introduction of foreign investment and capital and promotion of exports of non-traditional commodities.

As the policy implementation started in the late 7th FYP the result of such reformation did not appear significantly in the 7th FYP. It is envisioned that these policies will take shape in the 8th FYP period. Rapid increase of fixed capital formation can be foreseen to be helped by a rapid inflow of foreign investment and capital due to the relaxation of regulation concerned with foreign investment. A result of formulation of fixed capital and assets for production of various commodities and services during 8th FYP will appear in the 9th FYP. Based on the establishment of economic foundation being created in accordance with newly adopted economic development policy during the 9th FYP, the economy during 10th FYP will proceed steadily.

During the 8th FYP various economic infrastructure is needed to be established or to be renovated in order to cope with a rapid increase in demand for various services. It is foreseen that the development of the power sector will proceed rapidly to over come an acute shortage in power supply which is considered to be a most important infrastructure. As power sector grows, the manufacturing sector is also expected to grow.

As discussed in Chapter 2, the volume of production in the past was almost 15 % lower than projected. The projected consumption of various commodities in the previous master plan study was only 8 % lower than the actualy recorded figures in 1992-93 and it is projected to be 6 % and 4 % lower than the previous projection. This indicates that the volume of trade projected in this study is much higher than that of previous one at 128 % in 1992-93 (actual), 124 % in 1997-98 and 116 % in 2005-06.

CHAPTER 4　TRANSPORT DEMAND PROJECTIONS

4.1 Methodology

In order to establish a basis for transport planning, transport demand projections were conducted. The target year is 1997-98 for the short-term and 2005-06 for the mid-term. The outline of the work conducted is presented in Figure 4.1.1.

Figure 4.1.1　Outline of Transport Demand Projections
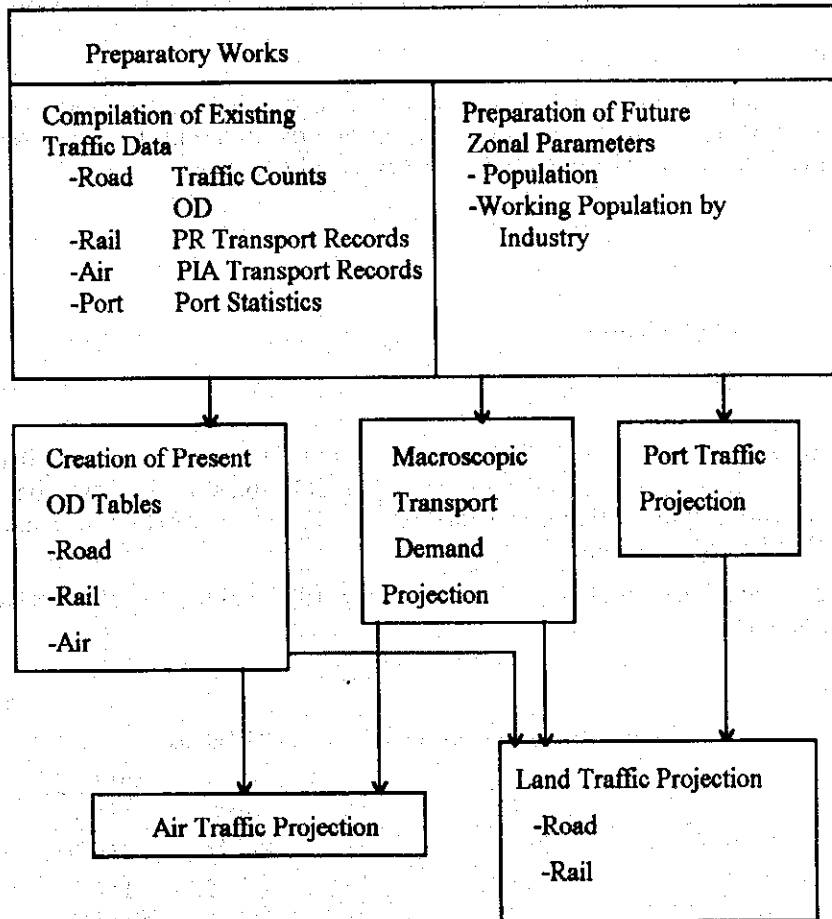
(1) Preparatory Works

Based on the future national/regional socio-economic framework mentioned in the previous chapter, some parameters including population and employment by major industrial group have been broken down into zones so that they can be used to determine future distribution of traffic.

(2) Creation of Present OD Tables

Based on the compiled traffic data, present OD tables have been created for road, rail and air(domestic only). This is explained in Section 4.2.

(3) Projection of Macroscopic Transport Demand

Although this study deals with intercity (interzonal) transport, macroscopic transport indicators expressed in passenger kms and ton kms are useful to discuss overall traffic demand as well as modal split including urban (intrazonal) traffic. Hence, overall passenger kms and ton kms were projected vis-a-vis future socio-economic framework for land (road and rail) and air (domestic), as explained in Section 4.3.

(4) Projection of Port Traffic

In accordance with the future commodity-wise production and consumption projected in the previous chapter, future import and export were estimated by commodity. This is explained in Section 4.4.

(5) Projection of Land Traffic

After analyzing the current intermodal relation between road and rail, future traffic demand was projected for the "current modal share" case and the "economically desirable" case. In the latter case, the role of Pakistan Railway was highlighted and the impact of multimodal transport for containers to/from inland dry ports was taken into account, as explained in Section 4.5.

(6) Projection of Air Traffic

For domestic air traffic, future trip distribution was estimated considering the proposed new airports. International air traffic demand was projected by direction mainly in relation to future socio-economic framework. The explanation is given in Section 4.6.

4.2 Creation of Present OD Tables

(1) Road

The NTRC conducted a nation-wide OD survey in 1990. The result was compiled into 33-zone OD tables for 7 vehicle types. In order to use these OD tables as the study basis, the vehicle types were reclassified into 5 categories based on the JICA 51 zoning system and 5 vehicle OD tables as of 1992-93 were created.

Table 4.2.1 compares the number of trips between 1985-86(JICA), 1990(NTRC)and 1992-93(JICA, this study).

Table 4.2.1   Comparison of Vehicle OD Tables

(trips/day)

Year	Car	Bus	Truck	Total
1985-86 (JICA)	33,100	17,587	19,209	69,896
	(14.2)	(-2.0)	(20.1)	(12.9)
1990 (NTRC)	60,054	16,026	44,563	120,643
	(10.1)	(14.3)	(7.8)	(9.8)
1992-93 (JICA)	76,377	22,389	53,736	152,502

Note : 1) Figures in parentheses show average annual growth rates.
2) Motorcycle is not included. Car includes pickup and wagon.
3) Zoning is different between NTRC and JICA.

Given the 1992-93 vehicle OD tables, passenger OD tables have been prepared by multiplying the average number of passengers by number of vehicles. Similarly, using the data of average load per truck, commodity OD in terms of tonnage was created. Table 4.2.2 compares road OD tables between 1985-86 and 1992-93.

Table 4.2.2 Comparison of Road Passenger and Freight OD Tables

Year	000 trips/day	000 tons/day
1985-86 (JICA)	851	116
	(8.2)	(15.7)
1992-93 (JICA)	1,479	322

Note : Figure in parentheses shows average
        annual growth rate.

(2) Railway

In the absence of passenger travel pattern data such as station-to-station ticket sales records, the 1992-93 PR passenger OD table was estimated assuming the same travel pattern as the JICA 1985-86 PR OD table rectified by the data on the number of passengers classified by class and by travel distance.

With regard to PR's commodity transport, detailed records as of 1992-93 were obtained. By compiling these records, commodity OD tables were created item wise(19 items). It should be noted that the transported volume of PR decreased remarkably during this period.

A comparison between 1985-86 and 1992-93 is presented in Table 4.2.3.

Table 4.2.3 Comparison of PR Passenger and Freight OD

Year	000 trips/day	000 tons/day
1985-86 (JICA)	134	33
	(2.7)	(-4.4)
1992-93 (JICA)	162	24

Note : Figure in parentheses shows average
        annual growth rate.

(3) Air (Domestic)

Domestic air passenger and cargo OD tables were based from PIA transport records as of 1992-93.

Table 4.2.4 Comparison of Air Domestic Passenger and Cargo OD

Year	000 trips/year	000 tons/year
1985-86 (JICA)	2,300	30
	(7.7)	(4.9)
1992-93 (JICA)	3,861	42

Note : Figure in parentheses shows average
        annual growth rate.

4.3 Projection of Macroscopic Transport Demand

This section deals with projections of macroscopic transport demand expressed in passenger kms or ton kms. In Pakistan, these macro-indicators have been used traditionally as national plan targets or parameters to determine modal split among various modes of transport. It should be noted, however, that the accuracy of these macro-indicators is considered to be low for road transport due to the lack of means of measurement and that urban (intrazonal) traffic which is out of the scope of this study is included in these macro-indicators.

(1) Land Transport (Road and Railway)

Table 4.3.1 shows projected land traffic in terms of passenger kms and ton kms. Regression analyses were carried out in relation to GDP, because these macro-indicators usually have a strong correlation with the scale of national economy (for more details, refer to "Transport Sector in Pakistan", Ghiasul Haq, NTRC, Sept.1993). As a result, land passenger traffic demand will grow at an annual rate of 7.0 percent from 1992-93 to 1997-98 and 5.9 percent thereafter upto 2005-06. For the same period, land freight traffic demand will grow at an annual rate of 6.2 and 5.5 percent respectively.

Table 4.3.1 Projected Land Transport Demand

Year	Passenger kms (million)			Ton kms (million)			GDP (Rs. million, 1980-81 price)
	Road	Rail	Total	Road	Rail	Total	
1992-93	13,500	17,082	152,082	37,000	6,180	43,180	491,345
			(7.0)			(6.2)	(7.0)
1997-98			213,632			58,275	688,028
			(5.9)			(5.5)	(6.3)
2005-06			338,757			89,341	1,119,492

Note : Figures in parentheses show average annual growth rates.

The next step is to determine the proportion of interzonal trips in order to define the scope of the projections of this study as compared to the projected macro-indicators. Table 4.3.2 shows the proportion of interzonal trips measured for the years 1980-81, 1985-86 and 1992-93 in the National Transport Plan Study (JICA). Inter-zonal passenger kms and ton kms were calculated based on the OD tables and distances between zones. The proportion of interzonal traffic is higher in freight traffic than in passenger traffic, and railway is more specialized in inter-zonal transport than road. Although there are some fluctuations, the share of interzonal traffic is gradually declining both in passenger and freight traffic. Future shares of interzonal traffic were estimated using the ratio of increment of interzonal traffic to that of total traffic in the past. Table 4.3.3 summarizes the projected result for both passenger traffic and freight traffic. Interzonal traffic will increase at a slightly lower rate than that of total (including urban) traffic reflecting the rapid growth of urban traffic.

Table 4.3.2   Share of Interzonal Traffic in Land Passenger and Freight Transport

Year		Passenger kms (million)			Ton kms (million)		
		Road	Rail	Total	Road	Rail	Total
1980-81	Total	65,991	16,387	82,378	18,207	7,918	26,125
(JICA, 1983)	Interzonal	36,590	14,950	51,540	16,514	7,791	24,305
	Ratio	0.554	0.912	0.626	0.907	0.984	0.93
1985-86	Total	97,181	16,850	114,031	26,888	8,270	35,158
(JICA, 1988)	Interzonal	45,969	15,803	61,772	21,198	8,270	29,468
	Ratio	0.473	0.938	0.542	0.789	1.000	0.838
1992-93	Total	135,000	17,082	152,082	37,000	6,180	43,180
(This Study)	Interzonal	71,071	16,511	87,582	28,636	6,051	34,687
	Ratio	0.526	0.967	0.576	0.774	0.979	9.803

Source : NTPS JICA in 1983, 1988 and this study

Table 4.3.3   Summary of Future Land Transport Demand (Total and Interzonal)

Year	Pass. kms (million)		Ratio of Interzonal	Ton kms (million)		Ratio of Interzonal
	Total	Interzonal		Total	Interzonal	
1992-93	152,082	87,582	0.576	43,180	34,687	0.803
	(7.0)	(6.4)		(6.2)	(4.8)	
1997-98	213,632	119,405	0.559	58,275	43,872	0.753
	(5.9)	(5.6)		(5.5)	(4.6)	
2005-06	338,757	184,125	0.544	89,341	62,770	0.703

Note : Figures in parentheses show average annual growth rates.

(2) Air Transport

Table 4.3.4 shows projected domestic air transport demand in terms of passenger kms and ton kms. Similarly to land transport, regression analyses were carried out in relation to GDP.

Passenger transport demand will grow at an annual rate of 7.9 percent and 6.6 percent for the 8th FYP period and thereafter respectively. Cargo transport demand will show an annual growth of 6.6 percent upto the year 2005-06. It is to be noted that air transport demand is mostly interzonal.

Table 4.3.4   Projected Domestic Air Transport Demand

Year	Passenger kms (million)	Ton kms (million)	GDP (Rs. million in 1980-81 price)
1992-93	2,545	37	491,345
	(7.9)	(6.6)	(7.0)
1997-98	3,716	51	688,028
	(6.6)	(6.6)	(6.3)
2005-06	6,176	85	1,119,492

Note : Figures in parentheses show average annual growth rates.

4.4 Projection of Port Traffic

(1) Import/Export of Major Commodities

For 13 major commodities, production and consumption were projected by commodity according to the future economic framework, and imports/exports were calculated as the difference between production and consumption.

(2) Import/Export of Other Miscellaneous Commodities

Aside from the 13 major commodities, there are many other items being exported and imported. They were classified into 3 sub-categories in order to estimate future import/export volume. The first "Miscellaneous Dry Import" sub-category includes chemicals, jute, paper, tea, timber, vehicles and so on. A regression analysis was carried out in relation to GDP considering the wide coverage of this sub-category. The second "Miscellaneous Dry Export" sub-category includes textile, cowdung, various grains, footwears, leather goods and so on. Most of commodity items that fall in this category are produced by manufacturing industries of Pakistan. For this sub-category, a regression analysis was conducted in relation to the GDP of the manufacturing industry. The third "Miscellaneous Liquid Export" sub-category actually comprises a single item; molasses. Production and export of molasses usually have a strong relationship with sugar production. In the past, however, export of molasses has been fluctuating and little correlation was observed with sugar production. Hence, the proportion of molasses export to sugar production was calculated for the last five years and its average was applied to projected sugar production for the years 1997-98 and 2005-06.

(3) Summary

According to the above mentioned procedure, import/export projections by commodity item were summarized as presented in Table 4.4.1.

Table 4.4.1   Summary of Port Traffic Projections

			(000 tons)	
		1992-93	1997-98	2005-06
Import		23,664	30,033	41,307
Dry		11,877	13,851	18,217
	- Wheat	2,868	2,852	3,656
	- Sugar	67	67	22
	- Cement	44	307	-
	- Fertilizer	1,153	1,659	1,306
	- Iron / Steel	752	857	1,934
	- Minerals (Ore)	1,701	2,168	2,952
	- Coal / Coke	1,045	801	618
	- Rock Phosphate	280	309	309
	- Miscellaneous	3,967	4,831	7,420
Liquid		11,787	16,182	23,090
	- Edible Oil	1,230	1,980	1,519
	- Crude Oil	3,945	2,155	9,705
	- Petroleum Product	6,612	12,047	11,866
Export		4,953	7,517	13,202
Dry		3,940	6,281	11,324
	- Rice	1,032	1,555	2,156
	- Cotton	263	521	1,346
	- Cement	-	-	94
	- Miscellaneous	2,645	4,205	7,728
Liquid		1,013	1,236	1,878
	- Molasses	1,013	1,236	1,878

4.5 Projection of Land Traffic

This section describes the process of land traffic projections. This section intends to further breakdown the projected macroscopic demand indicators into the form of OD matrices. At the same time, modal split between road and railway is examined and, after allocating certain traffic demand to railway, vehicle OD matrices are created to meet the remaining traffic demand.

(1) Projection of Land Traffic Demand (Road and Railway Combined)

1) Trip Generation/Attraction

In order to approximate land traffic generation/attraction by zone, regression analyses were conducted. Among the available zonal parameters (population and working population by industry), population and non-agricultural working population were chosen as explanatory variables to best fit the current tendency of generation/attraction of passengers and freight, respectively.

Due to possible large deviation of calculated values from the actual situation, however, future theoretical values were calibrated using the ratio of actual value to the theoretical value calculated for the present situation by the regressional equations.

2) Trip Distribution

The Fratar convergence calculation was applied to obtain future OD matrices using future trip generation/attraction by zone estimated above and 1992-93 OD tables as the present pattern.

3) Calibration to Macro Demand Forecast

The OD matrices created above were calibrated as against the macro transport demand indicators, i.e. passenger kms and ton kms (those of interzonal). The OD matrices thus created have the features as presented in Table 4.5.1. Number of passengers and tonnage of commodity will increase at a slightly lower rate than passenger kms and ton kms. This implies that average trip length would gradually increase in the future. However, this should not be understood that the overall traffic demand tends to be longer, since the share of urban (intra-zonal) traffic is expected to be larger.

Table 4.5.1   Summary of Interzonal Land Traffic Projections (Road and Railway Combined)

Year	Passenger			Commodity		
	Passenger No. (000/day)	Passenger Kms (mil./yr.)	Average Trp Len. (kms)	Tonnage (000/day)	Ton Kms (mil./yr)	Average Trp Len. (kms)
1992-93	1,638	87,582	162	347	34,687	303
	(6.1)	(6.4)		(3.9)	(4.8)	
1997-98	2,199	119,405	165	421	43,872	316
	(5.2)	(5.6)		(3.9)	(4.6)	
2005-06	3,304	184,125	169	573	62,770	332

Note : Figures in parentheses show average annual growth rates.

(2) Modal Split between Road and Rail

1) Modal Split as of 1992-93

In 1992-93, modal shares of road and railway in passenger transport had the following characteristics:

    a. Pakistan Railway (PR) has a strong and steady patronage for longer distance travel. The

Figure 4.5.1 Desired Lines of Land Passenger Traffic Demand
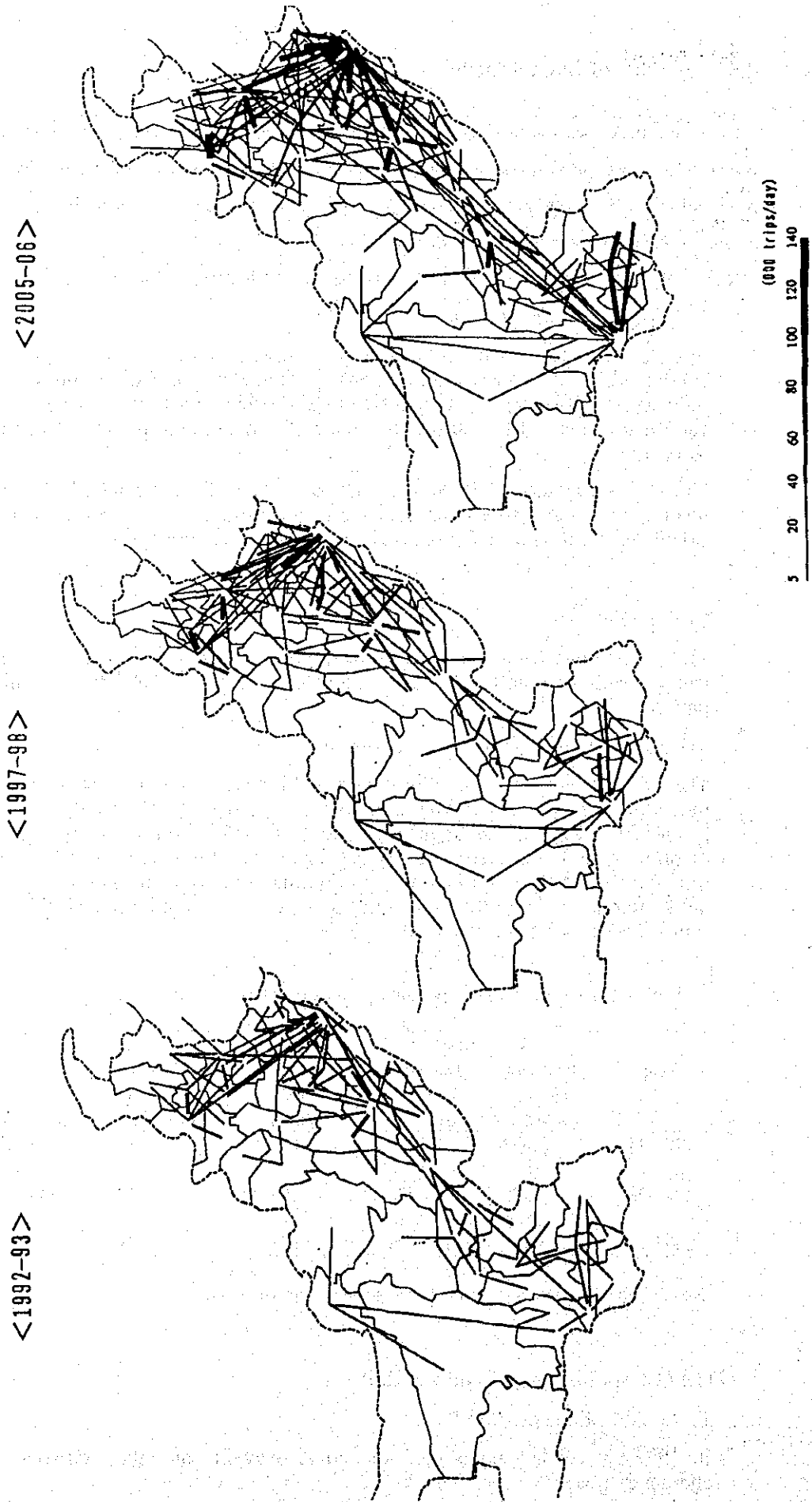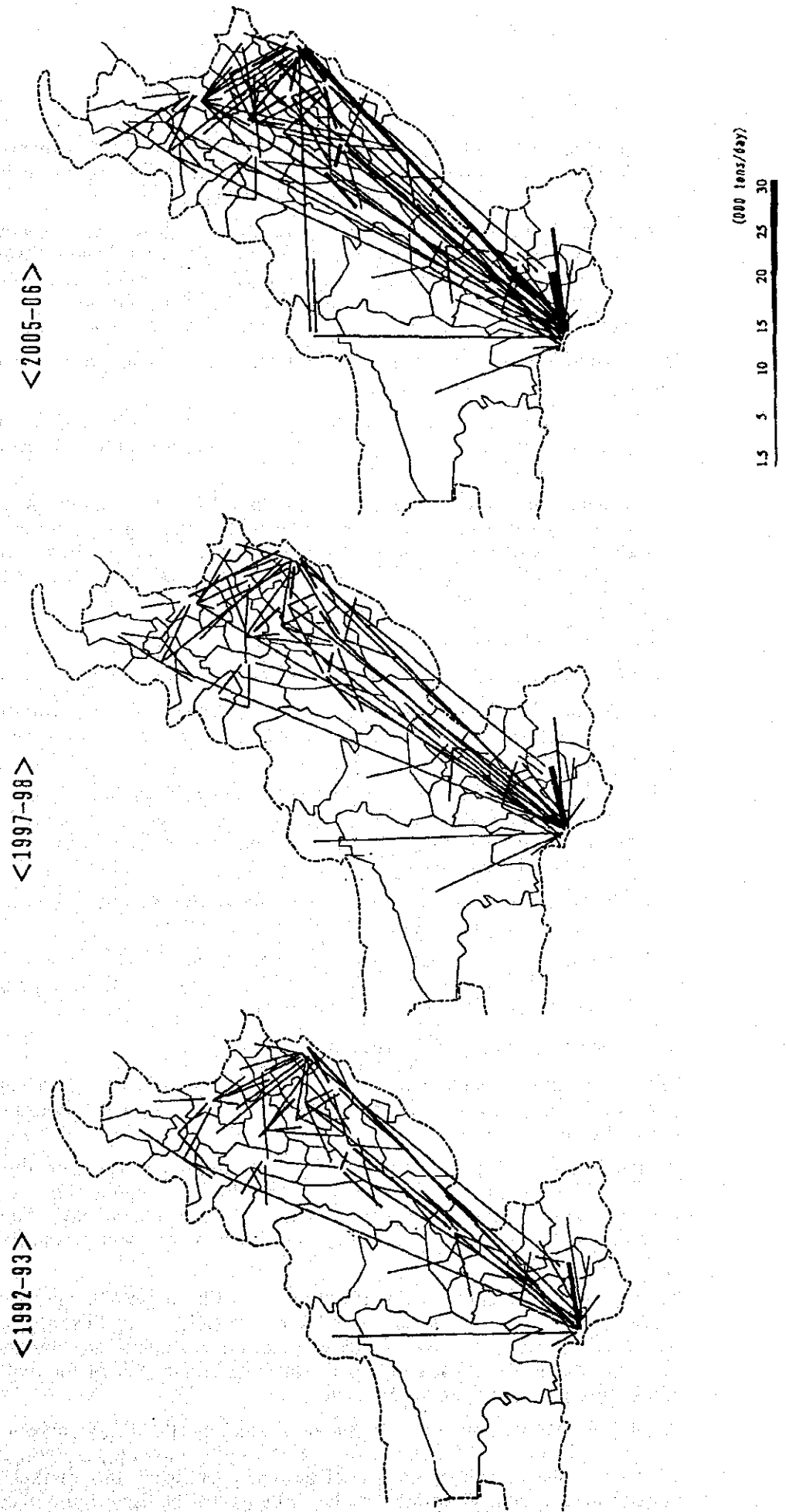
<1992-93>

<1997-98>

<2005-06>

(000 trips/day)

5   20   40   60   80   100   120   140

Figure 4.5.2 Desired Lines of Land Freight Traffic Demand

<1992-93>

<1997-98>

<2005-06>

(000 tons/day)

1.5   5   10   15   20   25   30

motivation of using PR as reported is safety and comfort. However, judging from the fact that PR's patronage sharply decreased after 1989-90 when its fare rose remarkably, a part of PR users may be sensitive to fare levels.

b. PR is playing a major role in longer distances while road carries a number of passengers in shorter distances. The break-even distance where road and railway are equally chosen can be calculated at 966 kms. Passengers who travel more than this distance tend to use PR on the average. However, if zones where railway service is unavailable are excluded from this analysis, this break-even distance will go down to 775 kms.

With regard to freight traffic, intermodal relation of road and railway can be summarized as follows:

a. Road carries about 93 percent of interzonal freight traffic in terms of tonnage (about 83 percent in terms of ton kms). Unlike passenger traffic, road seems to be dominant in all distance ranges.

b. Despite the dominance of road, PR's share tends to be larger in longer distances. The break-even distance where road and railway are equally chosen is 1889 kms. This distance is reduced to 1450 kms if zones unserviced by railway are excluded from the analysis, although this distance is still in fact beyond the actual distances between most major activity centers in Pakistan.

2) Economic Consideration

From the detailed analysis on break-even distance, the following can be concluded:

a. Economic break-even distances based on the estimated traffic-variable rail costs (not full rail costs), actual road costs and actual usage are 275 kms for passenger and 750 kms for freight.

b. These break-even distances, however, change depending on the type of service and assumptions used on capacity, utilization and loading practice. For instance, if road vehicles comply with legal loading limitations, the freight break-even distance of 750 kms would become under 300 kms.

c. Therefore, these break-even distances should not be understood as a clear-cut point. Rather, a flexible wide-range target should be pursued.

d. Nevertheless, the perceived actual break-even distances are far longer than the economically desirable break-even distances. How to fill the gaps between them would be one of the major policy directions.

3) Dry Port Operation by Pakistan Railway

The volume of containers transported between Lahore Dry Port (LDP) and Karachi port has remarkably increased from 4 thousand TEUs in 1986-87 to 17 thousand TEUs in 1990-91 mostly by PR.

Although LDP is the only busy dry port at present, transport of containers between Karachi and other dry ports also seems to be promising for PR, judging from the recent tendency and the distance (the nearest dry port is Quetta; 862 kms by railway). The little imbalance in container traffic between northbound and southbound would contribute to improve the performance of PR.

The ratio of containers to total port traffic was 0.180 in 1992-93 and is projected to arrive at 0.208 and 0.263 in 1997-98 and 2005-06, respectively. Using this ratio, container volumes to be carried between Karachi port and dry ports were estimated as shown in Table 4.5.2. Here, the ratio above was halved due to the fact that about half of international containers are stuffed/stripped in and around Karachi.

As of 1992-93, dry ports related container traffic, mostly of LDP, accounted only for about 5 percent of the total PR freight traffic of 6,180 million ton kms. Although it is still unknown whether all existing dry ports would be equally utilized, this market is considered to be hopeful for PR. Since they are "existing", they must be used to the maximum even if some additional investment is required.

Table 4.5.2 Projection of Containers between Karachi Port and Dry Ports

(000 tons/year)

Dry Port	Distance (kms)	1992-93		1997-98		2005-06	
		Total	Cont'r	Total	Cont'r	Total	Cont'r
Peshawar	1,685	543	7	816	85	1,306	171
Rawalpindi	1,512	372	10	589	61	1,008	132
Lahore	1,223	2,505	205	3,627	377	6,355	833
Sialkot	1,305	170	3	226	24	333	44
Multan	933	2,002	0	2,608	271	4,141	542
Quetta	862	951	0	1,316	137	2,059	270
Total	-	6,543	222	9,182	955	15,202	1,992
Ton Kms (mil./y)			280		1,099		2,302

4) Railway Capacity

An analysis on PR's capacity revealed the following:

a. PR's inherent line capacity, calculated under the assumption that tracks are well maintained and minor existing bottlenecks such as local speed restrictions are removed, is sufficient to meet a far larger demand than actually transported. It is about 92 billion passenger kms and 84 billion ton kms a year (number of trains was assumed the same for passenger and freight).

b. Due to the limited number of locomotives, the line capacity is lowered to about 32 billion passenger kms and 22 billion ton kms. Further, the scarcity of wagons/coaches brings it down to about 19 billion passenger kms and 11 billion ton kms.

c. By shortening average turn-around time of freight wagons from the current 15.4 days to 7 days as proposed, which requires some additional locomotives, the line capacity for freight traffic could be lifted upto about 22 billion ton kms.

Although the above figures need to be checked in detail in relation to the demand pattern, it is reasonable for this study to assume the following capacity for PR:

<1997-98>
- Passenger: 25 billion pass. kms (30% increase from 1992-93)
- Freight : 22 billion ton kms (100% increase from 1992-93; shorten turn-around time and increase wagons and locomotives to some extent)
<2005-06>
- Passenger: 38 billion pass. kms (50% increase from 1997-98)
- Freight : 33 billion ton kms (50% increase from 1997-98)

These targets could be attained mainly by increasing locomotives, coaches and wagons and by managerial measures such as shortening wagon turn-around time. However, some major investment such as track dualization may be needed in critical sections. If the railway network is to be extended towards land-locked Central Asian States, major construction work would become necessary and above railway capacities mentioned earlier should be reviewed totally.

5)Traffic Demand Assigned to PR

Based on earlier discussions, traffic demand for railway was extracted from the land traffic OD matrices (road and rail combined) for the following cases:

<Case 1 - Current Modal Split>

This case assumes the current modal split between road and railway to be maintained in the future. The present modal share of the railway by zone pair was applied to future land traffic volume of the same zone pair.

<Case 2 - Economically Desirable Modal Split>

This case assumes an economically desirable break-even distance of 275 kms for passenger and 750 kms for freight. By zone pair, the share of railway was determined so that it becomes 0.5 at the break-even distance (L), 0 at 1/2*L and 1.0 at 2*L. For freight, a break-even distance of 300 kms was also tested. In addition, container volume between Karachi port and inland dry ports was preempted as PR's market before the above calculation.

The result is presented in Table 4.5.3.

Table 4.5.3   Traffic Demand Assigned to PR for Different Cases (Interzonal Traffic Only)

	1992-93	1997-98	2005-06
[Passenger] million passenger kms			
Case 1 - Current Modal Split	16,511	22,790	36,089
Case 2 - Economically Desirable Modal Split at 275 kms	-	39,951	64,416
Approximate Line Capacity	19,000	25,000	38,000
[Freight] million ton kms			
Case 1 - Current Modal Split	6,051	6,933	10,086
Case 2 - Economically Desirable Modal Split at 750 kms	-	13,692	21,131
Case 2 - Economically Desirable Modal Split at 300 kms	-	23,649	35,703
Approximate Line Capacity	11,000	22,000	33,000

As shown in Table 4.5.3, passenger traffic demand of Case 1 (Current Modal Split) will increase quite rapidly while Case 2 (Economically Desirable Modal Split) will bring the demand to an unrealistic level beyond the capacity limitations. This can be attributed to the fact that strong patronage for PR is seen in long distance travel even at present and that the demand for longer distance travel will increase fairly rapidly as the economy grows. Therefore, Case 1 (Current Modal Split) was taken as future targets in this study. This is different from the so-called "Do-Nothing Case", because upgraded maintenance and performance as well as increasing locomotives and coaches are implicitly assumed. Actually to meet this demand, higher speed train operations will be needed just to maintain current shares of the railway.

Freight traffic, on the contrary, does not show any drastic increase in Case 1 (Current Modal Share Case). This is primarily due to the already eroded marketing basis of PR's freight transport. This situation must be drastically changed. In this study, the Case 2 (Economically Desirable Modal Split at 750 kms) was taken up as a reasonable (but not so easy) target. Case 2' could be pursued as a long-term target.

Figures 4.5.3 to 4.5.6 present the demand patterns.

6) Modal Split between Road and Rail (Summary)

In the process of extracting railway demand from total land traffic demand, the demand for road transport was also determined. Table 4.5.4 shows the results. In this table, the railway ton kms growth rate between 1992-93 and 1997-98 (17.7% p.a.) might seem to be unrealistic. However, this is a level attainable mainly by managerial measures without major investment, and is not high as compared to the levels attained in the last decade. Since it is imperative for PR to recover its lost market in the coming years, this target should be taken seriously.

Table 4.5.4   Projection of Interzonal Road and Railway Traffic Demand   (Summary)

		1992-93		1997-98		2005-06
[Passenger]						
Million pkms/year	-Road	71,701	(6.3)	96,615	(5.5)	148,036
	-Rail	16,511	(6.7)	22,790	(5.9)	36,089
	Total	87,582	(6.4)	119,405	(5.6)	184,125
000 Trips/day	-Road	1,479	(6.1)	1,984	(5.2)	2,972
	-Rail	159	(6.2)	215	(5.6)	332
	Total	1,638	(6.1)	2,199	(5.2)	3,304
Ave.trip length (kms)	-Road	146		148		151
	-Rail	315		321		329
	Total	162		165		169
[Freight]						
Million tkms/year	-Road	28,636	(1.1)	30,180	(4.1)	41,639
	-Rail	6,051	(17.7)	13,692	(5.6)	21,131
	Total	34,687	(4.8)	43,872	(4.6)	62,770
000 tons/day	-Road	322	(3.6)	384	(3.8)	517
	-Rail	24	(8.4)	36	(5.7)	56
	Total	347	(3.9)	421	(3.9)	573
Ave.trip length (kms)	-Road	269		238		244
	-Rail	764		1,153		1,143
	Total	303		316		332

Note : Totals may not sum due to rounding.
   Figures in parentheses show average annual growth rates.

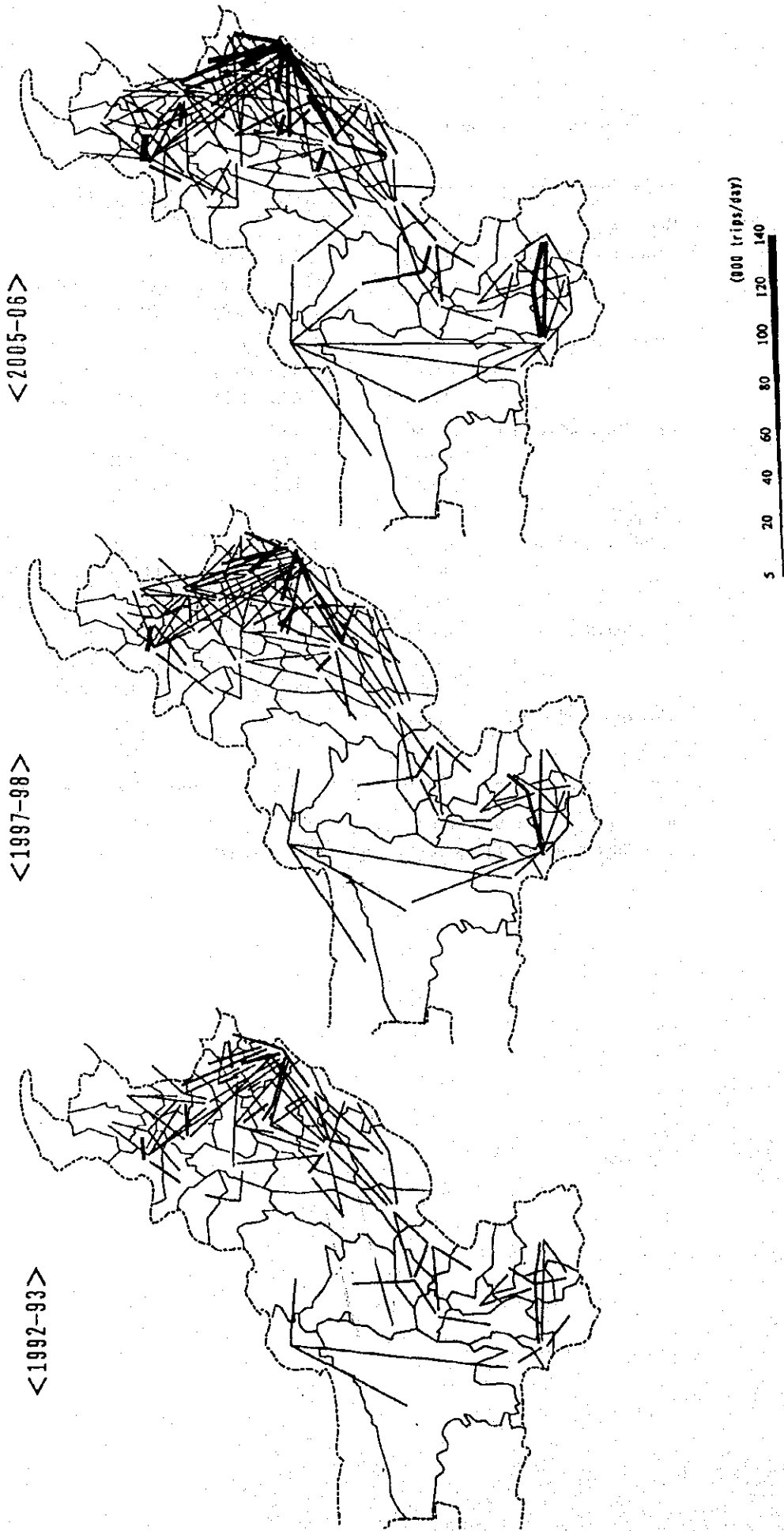Figure 4.5.3 Desired Lines of Road Passenger Traffic Demand

<2005-06>

<1997-98>

<1992-93>

(000 trips/day)

5   20   40   60   80   100   120   140

Figure 4.5.4 Desired Lines of Railway Passenger Traffic Demand

<1992-93>

<1997-98>

<2005-06>

(000 trips/day)

5 20 40 60 80 100 120 140

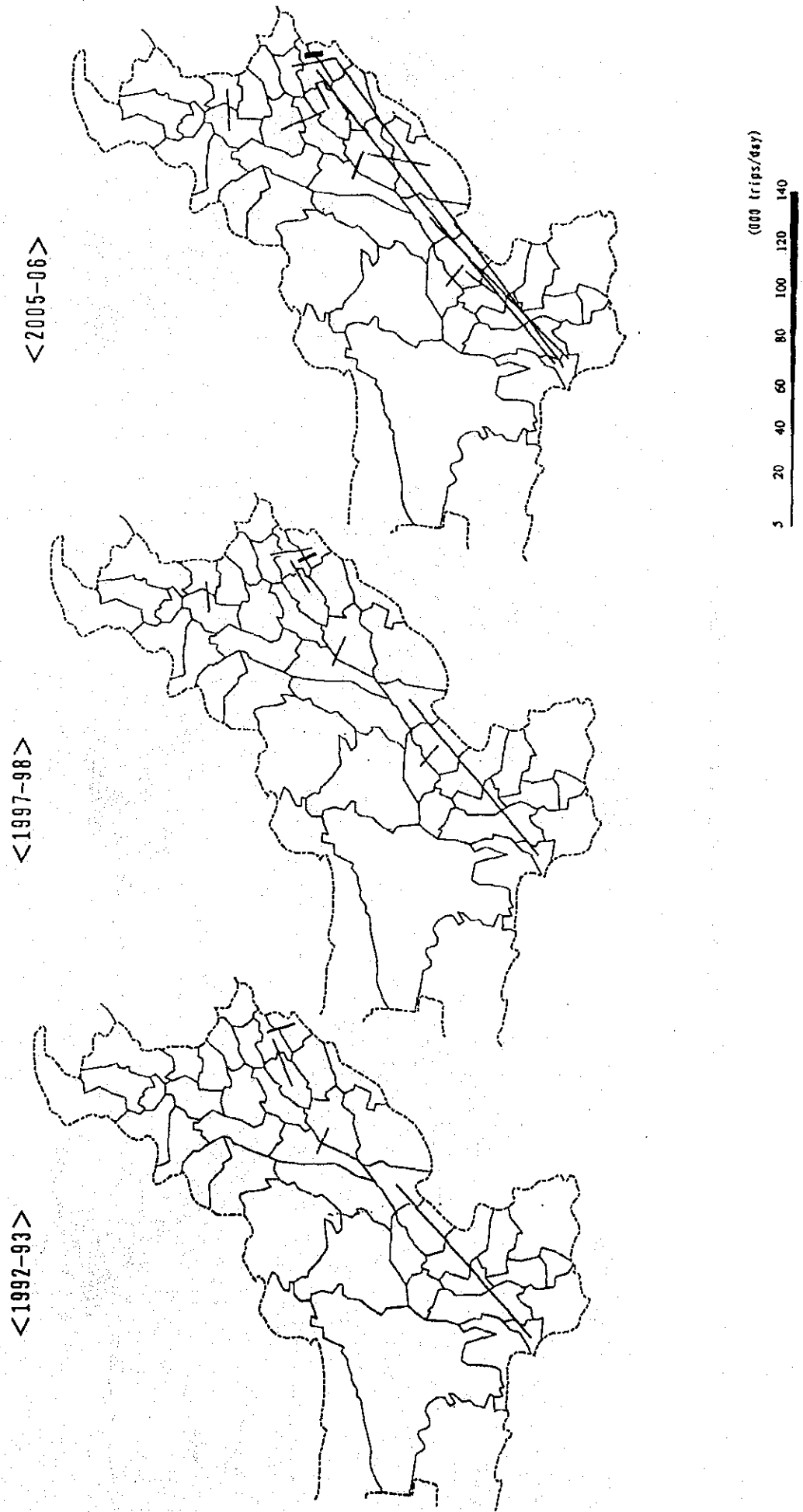Figure 4.5.5   Desired Lines of Road Freight Traffic Demand

<2005-06>

<1997-98>

<1992-93>

(000 tons/day)

1.5   5   10   15   20   25   30
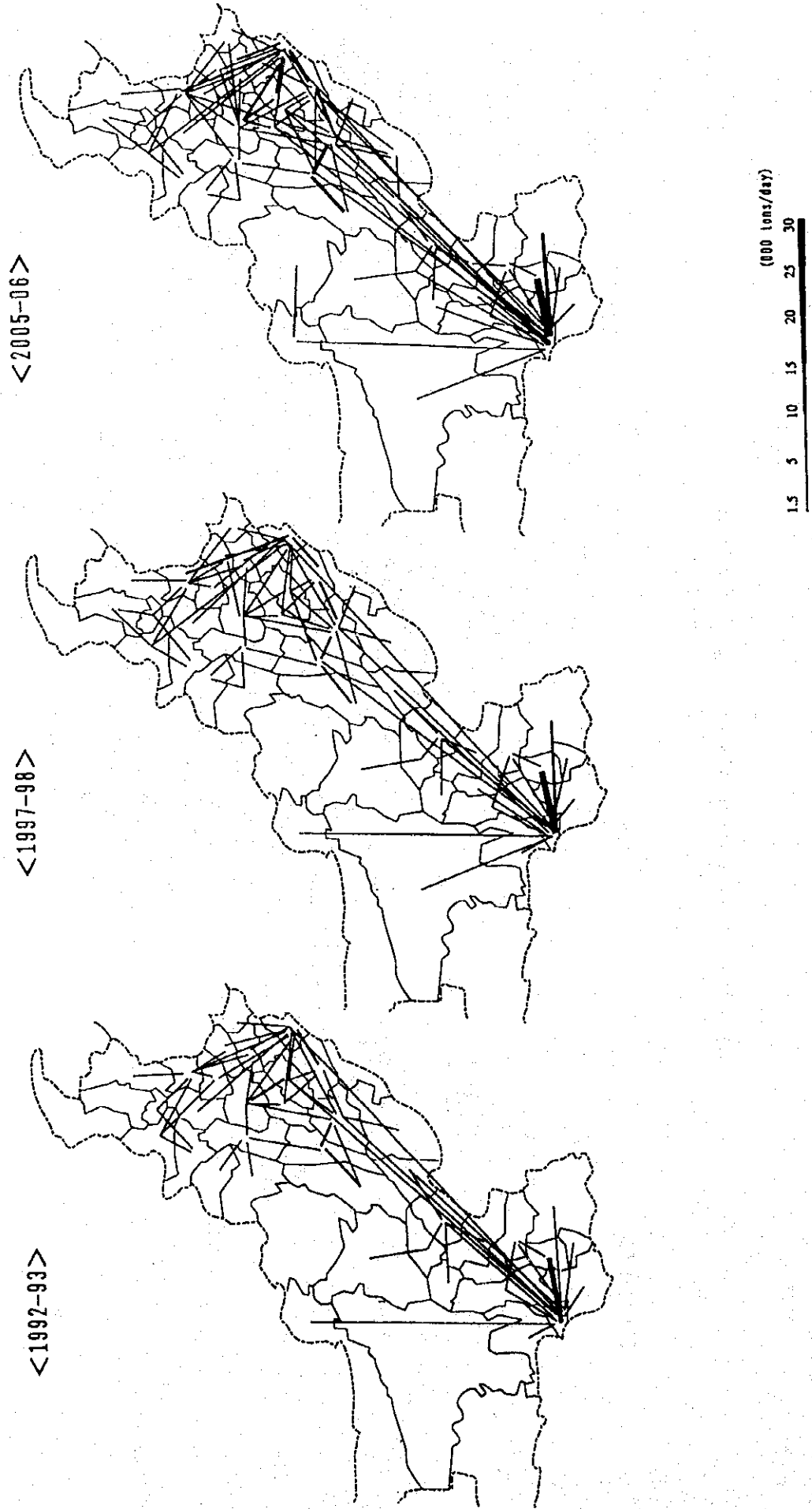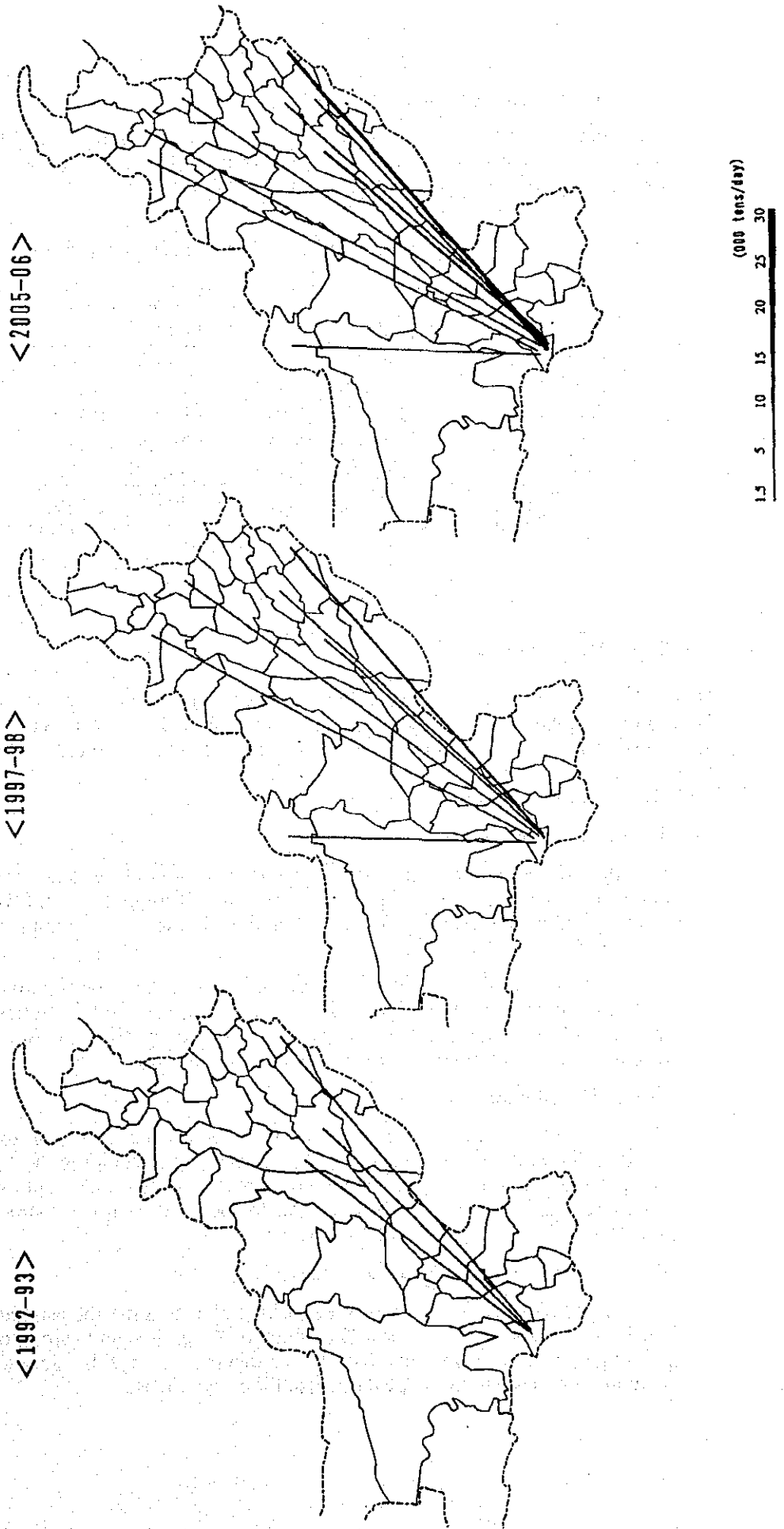
Figure 4.5.6   Desired Lines of Railway Freight Traffic Demand

<2005-06>

<1997-98>

<1992-93>

(000 tons/day)

1.5   5   10   15   20   25   30

7) Creation of Road Vehicle OD Matrices

The estimated future road OD matrices in terms of passengers and tonnage were converted into road vehicle OD matrices using the projected number of vehicles on road by average load of each vehicle type. Table 4.5.5 shows the results.

Table 4.5.5 Projected Road Vehicle OD Matrices

	No. of Trips per Day				
	1992-93		1997-98		2005-06
Motorcycle	6,350	(4.9)	8,083	(4.2)	11,241
Car	51,676	(6.9)	72,275	(5.7)	112,357
Wagon	24,701	(7.0)	34,635	(6.3)	56,655
Bus	22,389	(5.5)	29,254	(4.6)	42,002
Truck	53,736	(3.6)	64,088	(3.8)	86,343
Total	158852	(5.6)	208,335	(5.0)	308,598

Note : Figures in parentheses show average annual growth rates.

4.6 Projection of Air Traffic

This section intends to further breakdown the estimated macroscopic demand indicators into the form of OD matrices. At the same time, international air traffic was also projected in terms of the number of passengers and tonnage. OD matrices were not created unlike domestic air traffic.

(1) Domestic Air Traffic

1)Trip Generation/Attraction

In order to approximate air traffic generation/attraction by zone, regression analyses were conducted. Among available zonal parameters (population and working population by industry), non-agricultural working population was chosen as explanatory variable to best fit the existing situation.

However, due to the possible large deviation from the actual situation, future theoretical values were calibrated using the ratio of actual value to the theoretical values calculated for the present by the regressional equations. For zones where new airports are planned or proposed, however, theoretical values were taken as calculated.

2) Trip Distribution

This stage of demand forecast aims to produce OD matrices. For zones where airports are existing, the Fratar convergence calculation was applied holding the 1992-93 OD matrices as the present pattern. For zones where airports do not exist but are planned, estimated generation and attraction were allocated to the three major airports (Karachi, Lahore and Islamabad) in proportion to the current shares.

3) Calibration to Macro Demand Forecast

The OD matrices created above were calibrated as against the estimated passenger kms and ton kms. As shown in Table 4.6.1, number of passengers will grow slightly faster than passenger kms. This implies that shorter distance trips will increase rapidly in the future. Similar tendency can be pointed out also for cargo traffic.

Table 4.6.1   Summary of Domestic Air Traffic Projections

Year	Passenger		Cargo	
	Pass. No. (000/year)	Pkms (million)	Tonnage (000 tons/y)	Tkms (million)
1992-93	3,861	2,545	42	37
	(8.0)	(7.9)	(7.0)	(6.6)
1997-98	5,668	3,716	59	51
	(6.9)	(6.6)	(6.8)	(6.6)
2005-06	9,650	6,176	100	85

Note : Figures in parentheses show average annual growth rates.

(2) International Air Traffic

Table 4.6.2 shows future projections as to international air traffic. First, the number of PIA passengers by direction (Middle East, Europe, Far East and Regional) was calculated using regressional equations with GNP as independent variable. Then total number of PIA passengers was calculated, and, using this as an independent variable, regression analysis was carried out to obtain the total number of international passengers (not only of PIA).

The volume of international air cargo has been largely fluctuating within a certain range in the past 10 years and no significant correlation was found with other parameters. Naturally, however, air cargo volume should increase as economy grows. Therefore, it was assumed that air cargo would increase at the same growth rate as the number of PIA passengers.

Table 4.6.2   Future Projections of International Air Traffic

Year	Total No. of Pass. (000)	No. of PIA Passengers (000)					Air Cargo (000 tons)	GNP (Rs. million, in 1980-81 prices)
		Total	M.East	Europe	F.East	Regional		
1992-93	4,128	2,029	1,191	399	232	206	130	496,946
	(4.1)	(4.8)	(2.6)	(9.0)	(6.0)	(6.9)	(4.8)	(6.9)
1997-98	5,049	2,569	1,357	615	310	287	164	693,915
	(4.3)	(5.2)	(4.2)	(6.7)	(6.0)	(5.2)	(5.2)	(6.2)
2005-06	7,072	3,840	1,884	1,032	493	431	246	1,126,559

Note : Figures in parentheses show average annual growth rates.