

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF SURFACE TRANSPORT
GOVERNMENT OF INDIA

THE FEASIBILITY STUDY
ON
NATIONAL HIGHWAY BYPASSES
IN
INDIA

FINAL REPORT

VOLUME I
MAIN TEXT

AUGUST 1998

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Note

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(as of February 1998)**

PREFACE

In response to the request from the Government of India, the Government of Japan decided to conduct the Feasibility Study on National Highway Bypasses in India and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to India a study team headed by Mr. Eiichi Yokota and composed of the members of Nippon Koei Co., Ltd. And Yachiyo Engineering Co., Ltd., three times between April 1997 and July 1998.

The team held discussions with the officials concerned of the Government of India, and conducted field surveys at the study areas. The team carried out the Pre-Feasibility Study of the proposed 10 bypasses during Phase 1, and the Feasibility Study of Bareilly Bypass and Gwalior Bypass during Phase 2. Then the present report was prepared.

I hope that this report will contribute to the promotion of the projects 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 India for their close co-operation extended to the team.

August 1998



Kimio Fujita

President
Japan International Cooperation Agency



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INTRODUCTION OF THE STUDY

This Final Report for the Feasibility Study on National Highway Bypasses in India (hereinafter referred to as the "Study") was prepared in accordance with the Scope of Works for the Study agreed upon between Ministry of Surface Transport (hereinafter referred to as the "MoST") of Government of India and Japan International Cooperation Agency (hereinafter referred to as "JICA") on 15th November 1996.

1. Project Background

In June 1991, India changed its course, by stabilising and liberalising the economy. The new government's reforms focused on the five key areas of investment regimes, trade regimes, the financial sector, taxation, and public enterprises. Within the past five years, India's economic recovery has been unexpectedly rapid and robust. Helped by reforms, a relaxation in fiscal policies, and an unprecedented sequence of good monsoons, economic growth accelerated to 5 percent in 1992~94, 6 percent in 1994~95, and an estimated 7 percent in 1995~96.

Economic growth has been accompanied by an increase in productivity. One of the main objectives of India's reform program was to make the industrial sector more efficient and increase its export orientation. This has increased the urgent demand for the provision of sufficient infrastructure in the transport sector. However India's transport sector infrastructure have severe bottlenecks which are inhibiting economic growth, international trade, and investment. Consequently, the government's development strategy gives priority to developing efficient infrastructure services. The emphasis in transport is on better planning and project execution, transport operations (railways and roads), pricing policies, and private sector participation.

In the last 40 years, the main traffic mode of passenger shifted to roads by 1970/71, and the goods traffic also shifted to roads by 1988/89. As stated in the Eighth Five Years Plan (1992~97), the Government of India (GOI) recognises that 1) road traffic is likely to increase substantially in the next 10 years, 2) the order of increase may be between 100% and 200%, and 3) the road system has to be strengthened and expanded to meet this expansion in traffic.

In response to the request of the GOI, the Government of Japan has decided to conduct the Study. Accordingly, the JICA, the official agency responsible for the implementation of technical Cooperation programs of the Government of Japan, undertook the Study and organised the Study Team. The Study Team commenced the Study in March 1997 and completed in July 1998.

2. The Feasibility Study on National Highway Bypasses in India

2.1 Objective of the Study

The objective of the study is to:

- 1) conduct a pre-feasibility study on proposed highway bypasses projects (target year for the completion of the construction; 2012), and
- 2) conduct a feasibility study on high priority projects (target year for the completion of the construction; 2002) selected through the previous phase of the Study.

2.2 Study Area

The Study covered the following cities and their peripheral areas where the proposed highway bypasses are located:

	<u>Name</u>	<u>State</u>
1	Bareilly	Uttar Pradesh
2	Patna	Bihar
3	Keonjhar	Orissa
4	Balugaon	Orissa
5	Vijayawada	Andhra Pradesh
6	Kannur	Kerala
7	Nandura	Maharashtra
8	Khamgaon	Maharashtra
9	Bhopal	Madhya Pradesh
10	Gwalior	Madhya Pradesh

2.3 Scope of the Study

In order to achieve the objectives, the Study covered the following items.

Phase 1 : Pre-Feasibility Study on proposed 10 bypasses

(Target year for the completion of the construction is 2012)

1. Collection and analysis of available information, such as;
 - 1) National Development plans
 - 2) Policy and Plans on Transport sector & Road subsector
 - 3) Natural conditions
 - 4) Traffic volume by mode
 - 5) Natural and social environment
2. Surveys of present conditions
 - 1) Traffic survey
 - 2) Road condition

- 3) Natural & Social environment
- 4) Natural condition including topography, geology, weather
3. Evaluation of planning and design standard of road
4. Formulation of socio-economic framework of India as a whole and concerned states
5. Formulation of a basic plan of respective bypasses
6. Standard design of the proposed bypasses
7. Preliminary cost estimate
8. Preliminary economic analysis
9. Implementation and management plan for each project
10. Initial environment Examination (IEE)
11. Formulation of criteria for the priority projects
12. Selection of high priority projects for the second phase of the Study

Phase 2 : Feasibility study for selected high priority projects

(Target year for the completion of the construction is 2002)

1. Collection and analysis of supplementary data
2. Traffic demand forecast
3. Evaluation of alternative routes and selection of the optimal option
4. Field Investigations
 - 1) Topographic survey
 - 2) Geological survey and soil test
 - 3) Hydrological survey
 - 4) Environmental Impact Assessment (Natural Environmental Aspects)
 - 5) Environmental Impact Assessment (Social Environmental Aspects)
5. Preliminary design
6. Cost estimate
7. Formulation of implementation and management scheme
8. Formulation of construction plan
9. Economic analysis
10. Financial analysis
11. Formulation of implementation program
12. Overall evaluation and recommendation

2.4 Implementation of the Study

The JICA Study Team commenced the preparatory work in Japan from 23rd March 1997, then mobilised to India with JICA Advisory Team to carry out the Phase 1, Pre-Feasibility Study, on 7th April 1997. The period of Pre-Feasibility Study was 120 days. After the submission and briefing of the Progress Report, which describes the findings and study output conducted during the stay in India, the Study Team demobilised to Japan on 4th August 1997.

The Study in India was resumed on 16th October 1997 to carry out Phase 2, Feasibility Study. The Study Team conducted the feasibility study of Bareilly Bypass and Gwalior Bypass, which were selected in the previous Pre-Feasibility Study, with the period of 163 days in India. When the Phase 2 study completed, the Study Team submitted the Progress 2 Report to the MoST, and held a briefing meeting with them. The Study Team demobilised from India on 27th March 1998.

The Draft Final Report was prepared in the beginning of June. Then the JICA Advisory Team and Study Team visited India from 21st June to 3rd July 1998, in order to submit the Draft Final Report to the MoST, and to discuss the contents of the Report.

The MoST reviewed the Report and gave their comments to the Study Team. Then the JICA Study Team finalised the Final Report, incorporating the MoST's comments in July 1998. The Project was terminated on 7th August 1998.

Figure 1 shows the General work flow of the Study.

2.5 Organisation

The Study was carried out by the JICA Study Team appointed by the JICA. On commencement of the Study, JICA organised the Advisory Team to advise the Study Team and review the study result. The Study Team kept close communication with the counterpart officials of MoST in carrying out the Study.

The members participated in the Study were listed below:

JICA Advisory Team

Mr. T. Kai	Transport & Development Planning Specialist Institution for International Cooperation
Mr. K. Kozai	Road Planning and Research Section Chief Ministry of Construction
Mr. M. Terashima	Japan Highway Public Corporation
Mr. K. Kubo	Head of Construction Division III Japan Highway Public Corporation

JICA Study Team

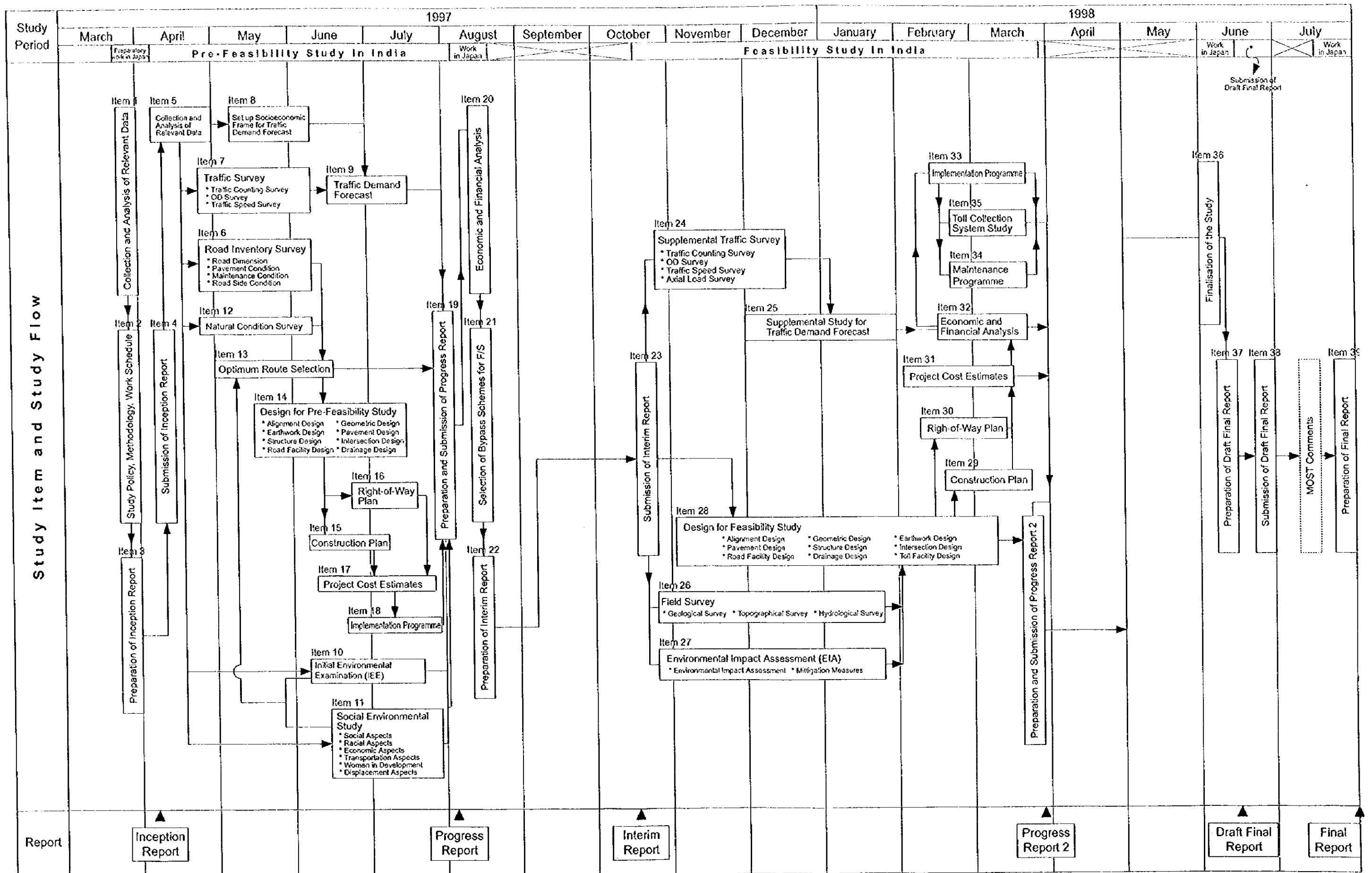
Mr. E. Yokota	Team Leader
Mr. M. Honma	Transport Planner/Co-Team Leader
Mr. K. Ihara	Highway Engineer (1)
Mr. I. Ishimoto	Highway Engineer (2)
Mr. R. Katiyar	Traffic Engineer
Mr. K. Enomoto	Structural Planner

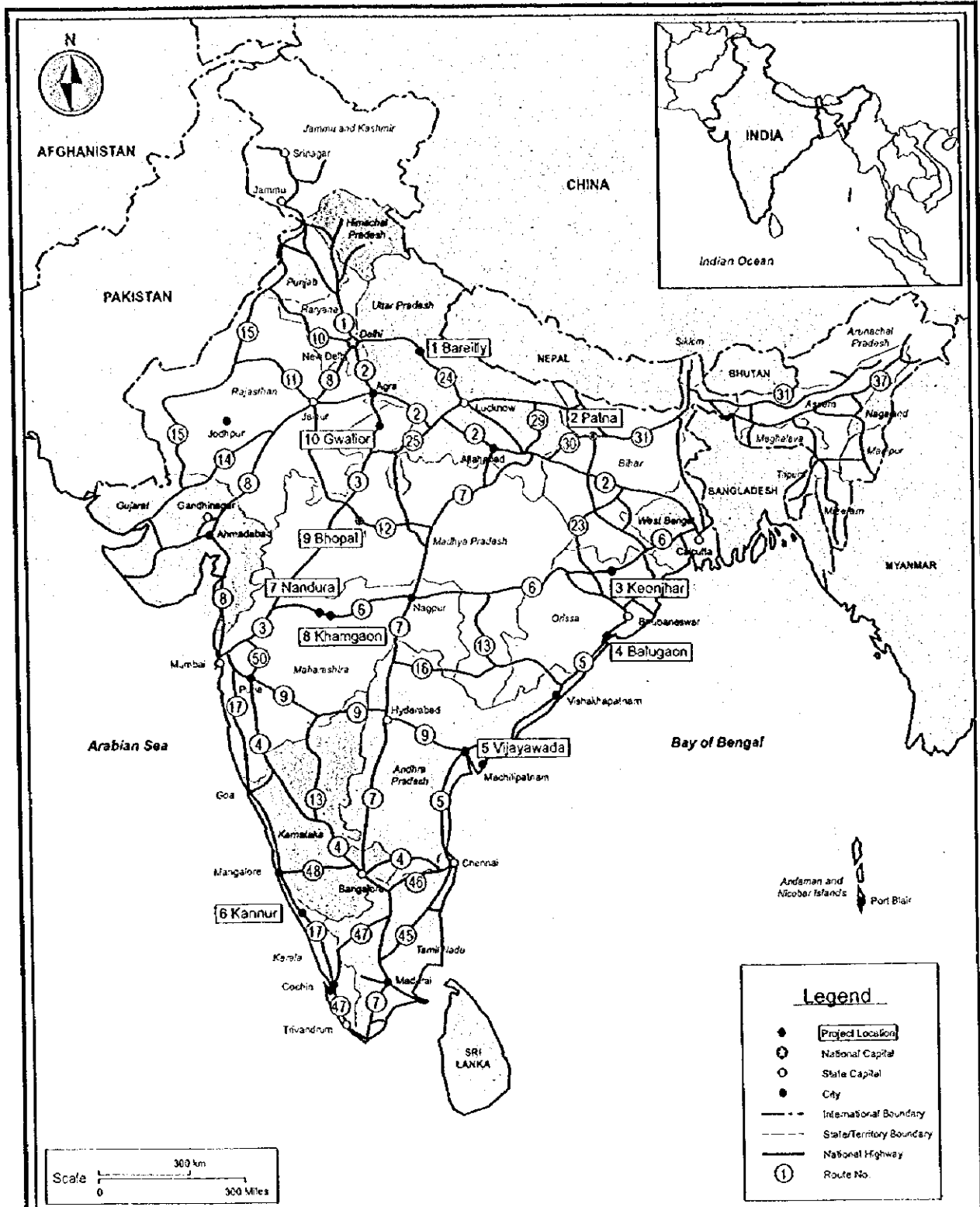
Mr. T. Kametani	Structural Engineer
Mr. N. Sonobe	Construction Planner/Cost Estimator
Mr. N. Hara	Economist
Mr. Y. Tsujimoto	Implementation Planner
Mr. S. Isoda	Implementation Advisor
Mr. R. Itoh	Geodetic Engineer
Mr. Lee Sang Gyoon	Geological Engineer
Mr. F. Shino	Environmental Expert
Mr. Ravi Vishnempet Sundaram	Social Environmental Expert
Mr. M. Kamiya	Administrator

Ministry of Surface Transport

Mr. A. D. Narain	Director General (Road Development and Additional Secretary)
Mr. S. C. Sharma	Chief Engineer (North)
Mr. J. B. Mathur	Chief Engineer (PL & PI)
Mr. P. K. Chakrabarti	Chief Engineer (P-7)
Mr. C. C. Bhattacharya	Chief Engineer (S & R)
Mr. Indu Prakash	Chief Engineer (S & R)
Mr. Nirmaljeet Singh	Chief Engineer (T & T)
Mr. R. K. Sharma	Superintending Engineer (P-8)
Mr. N. S. Jain	Superintending Engineer (P-2)
Mr. R. P. Indoria	Superintending Engineer (PL & PI)
Mr. A. N. Dhodapkar	Superintending Engineer (P-7)
Mr. Avinash Chand	Superintending Engineer (CP-2)
Mr. O. P. Shrivastava	Executing Engineer (PL & PI)

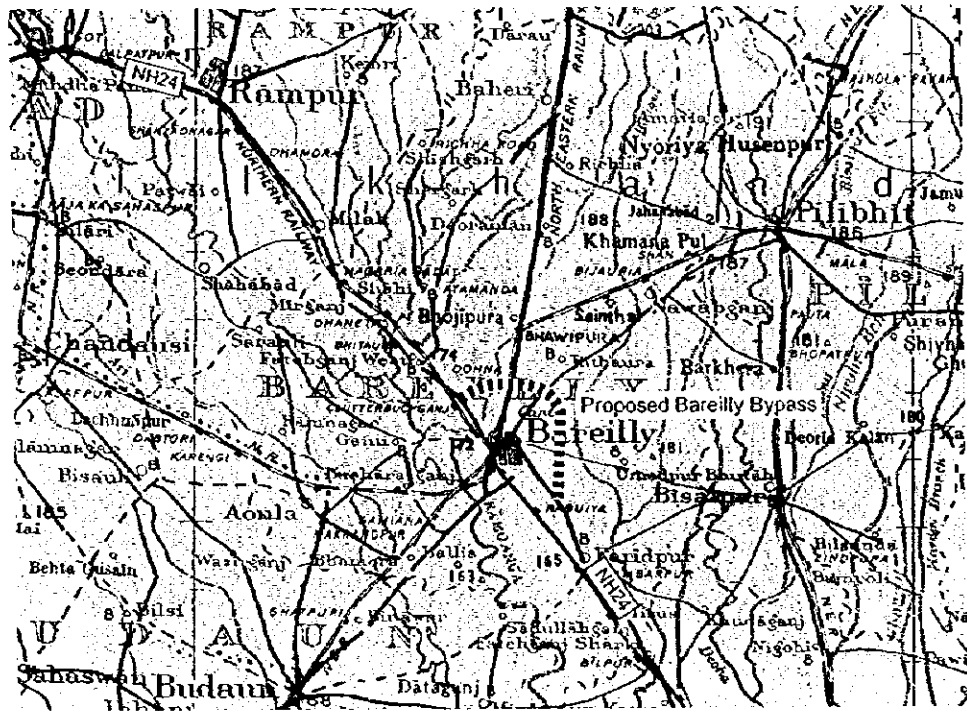
Figure 1 General Work Flow of the Study



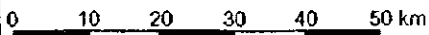


Feasibility Study on National Highway Bypasses in India

Project Location Map



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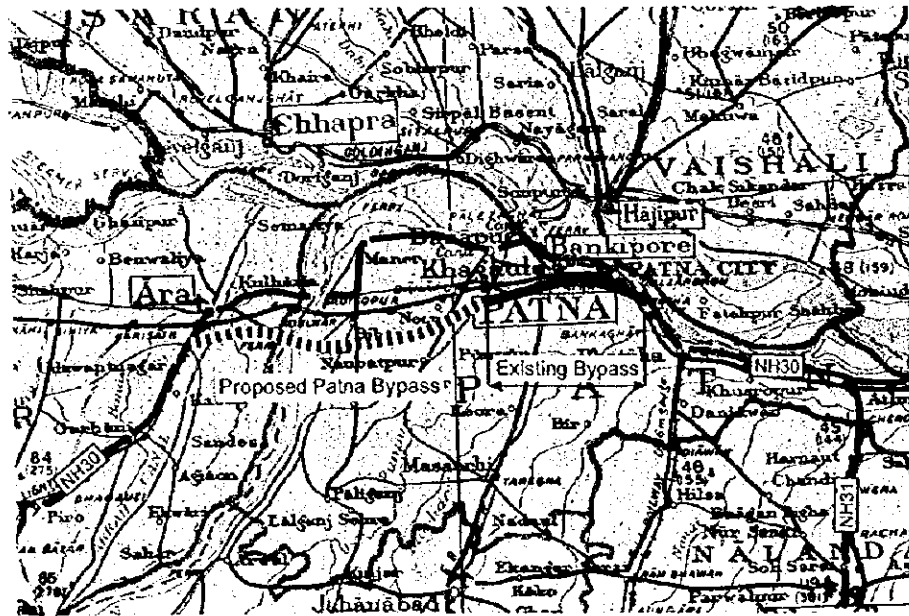


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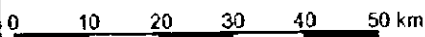
- Proposed Route of Bypass
- [NH24] Route number of National Highway

Location Map of Proposed Bypass (1/9)

**Uttar Pradesh
Bareilly Bypass (L=30.0 km)**



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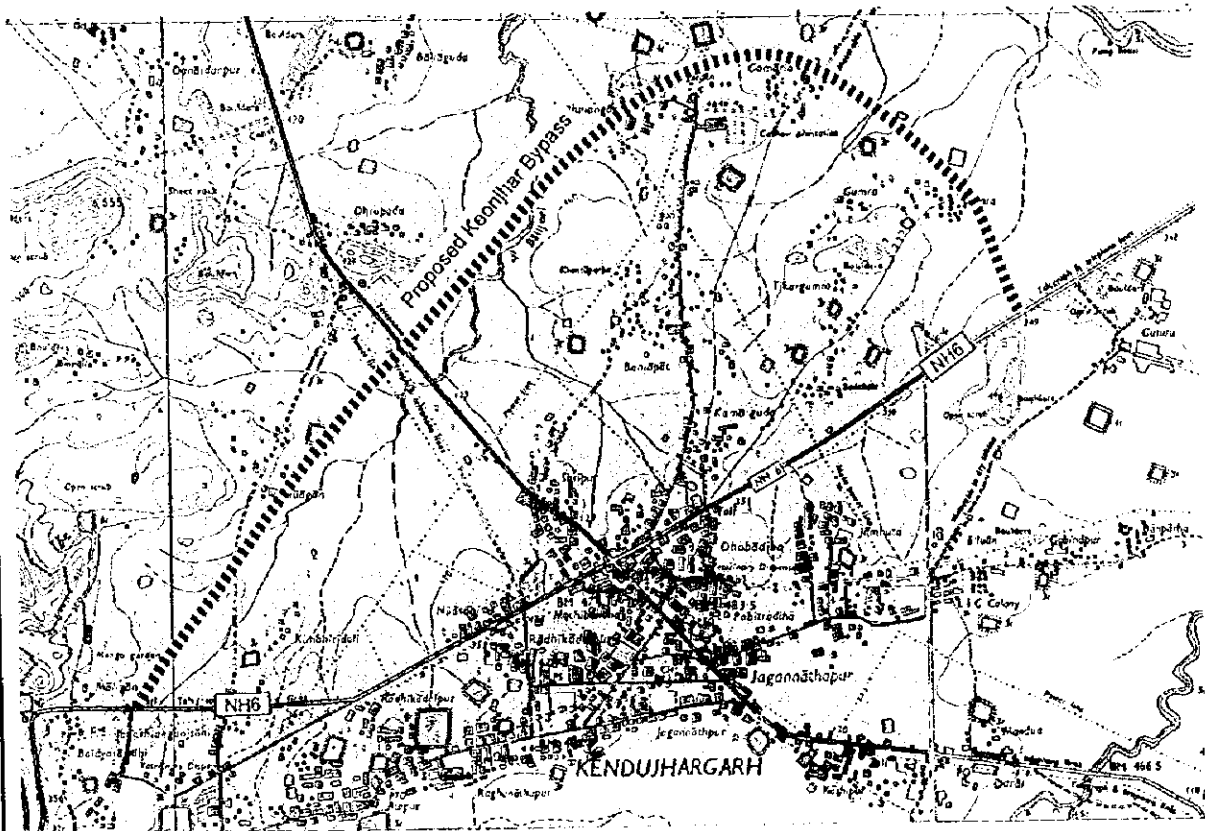


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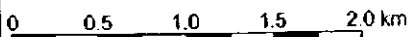
- Proposed Route of Bypass
- NH30 Route number of National Highway

Location Map of Proposed Bypass (2/9)



**Bihar
Patna Bypass (L=49.8 km)**



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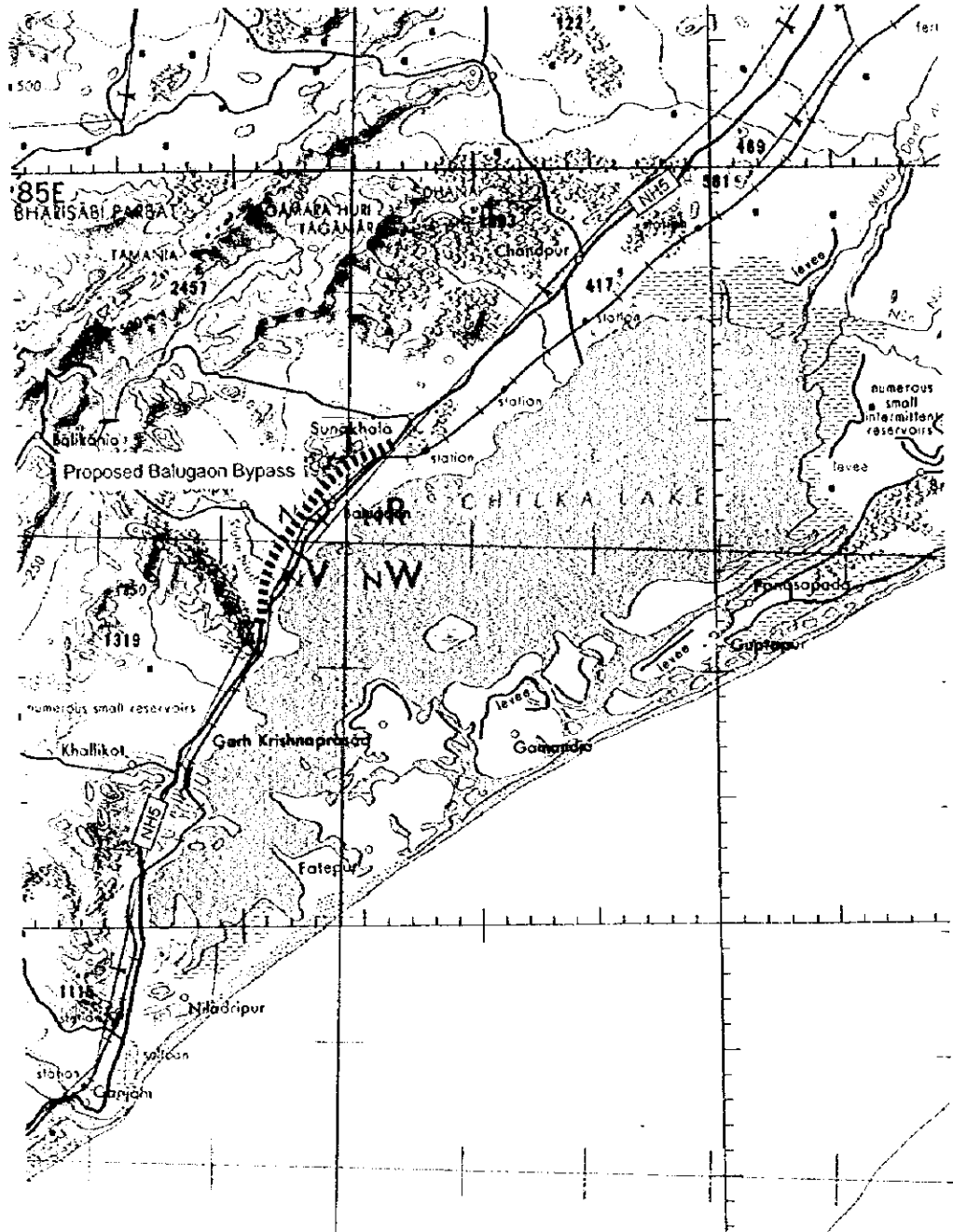


LEGEND

-  Proposed Route of Bypass
-  Route number of National Highway

Location Map of Proposed Bypass (3/9)

**Orissa
Keonjhar Bypass (L=8.5 km)**



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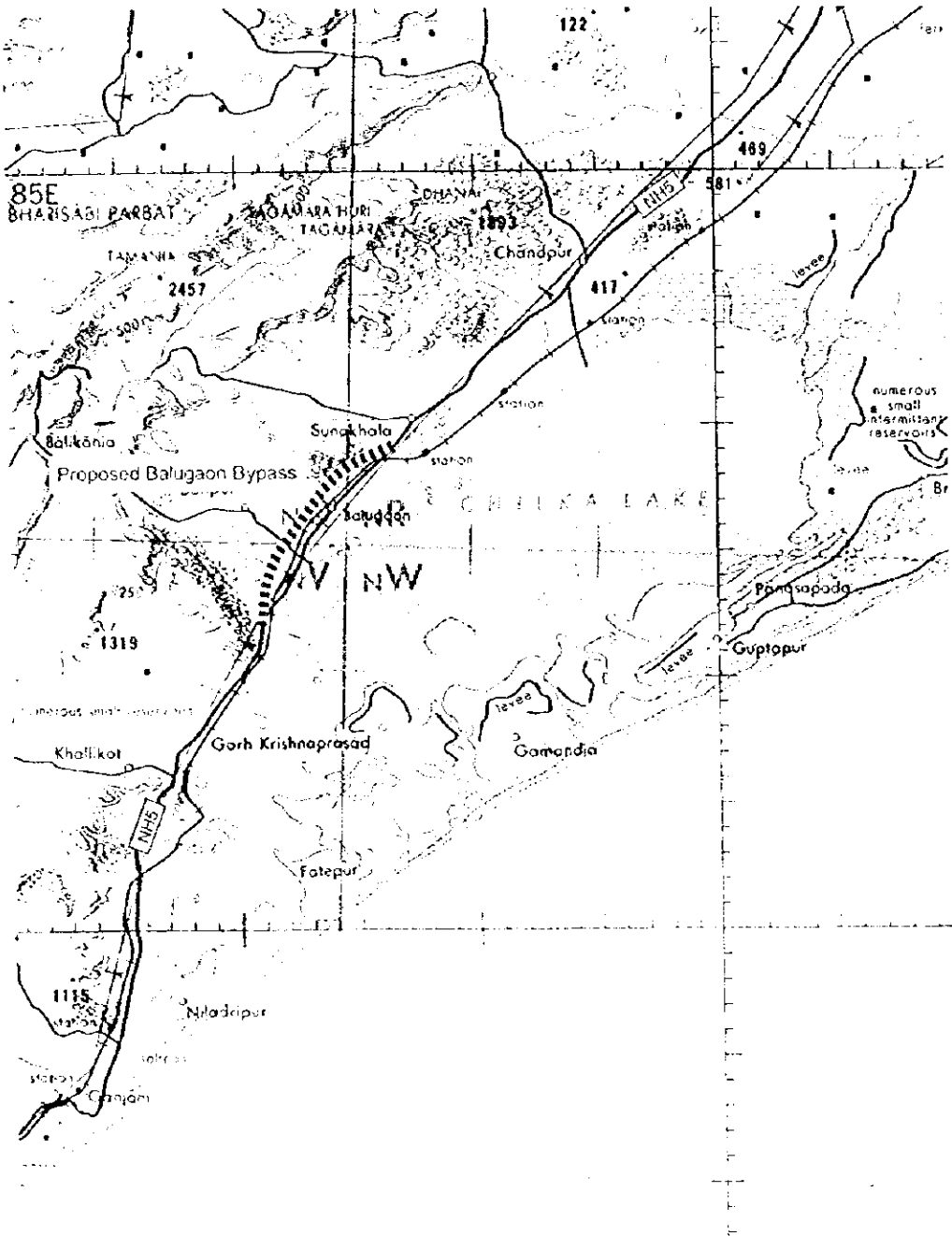


LEGEND

- Proposed Route of Bypass
- [NHS] Route number of National Highway

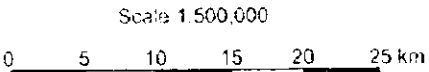
Location Map of Proposed Bypass (4/9)

**Orissa
Balugaon Bypass (L=15.4 km)**



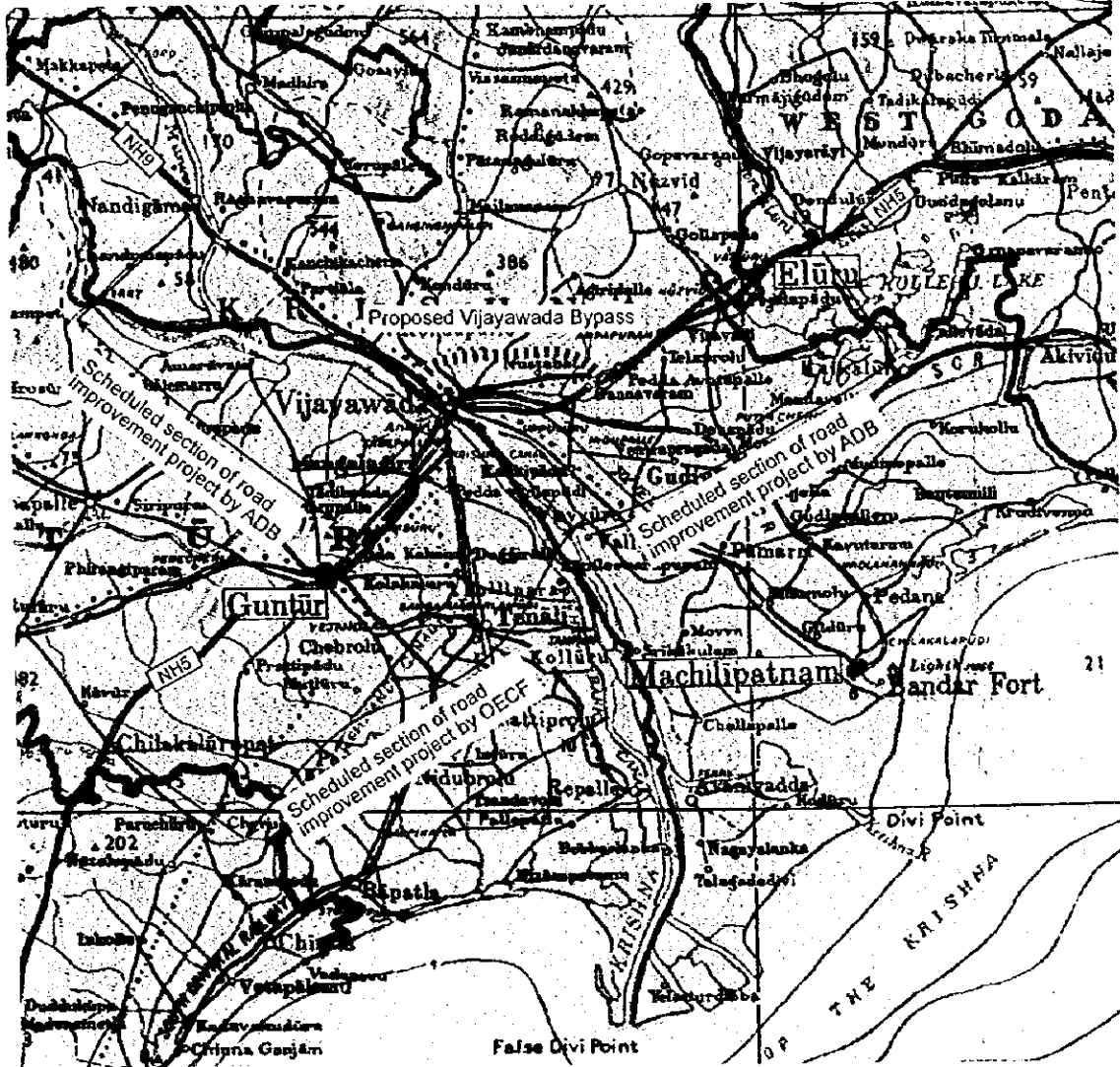
LEGEND

- Proposed Route of Bypass
- Route number of National Highway



Location Map of Proposed Bypass (4/9)

**Orissa
Balugaon Bypass (L=15.4 km)**



Scale 1:1,000,000

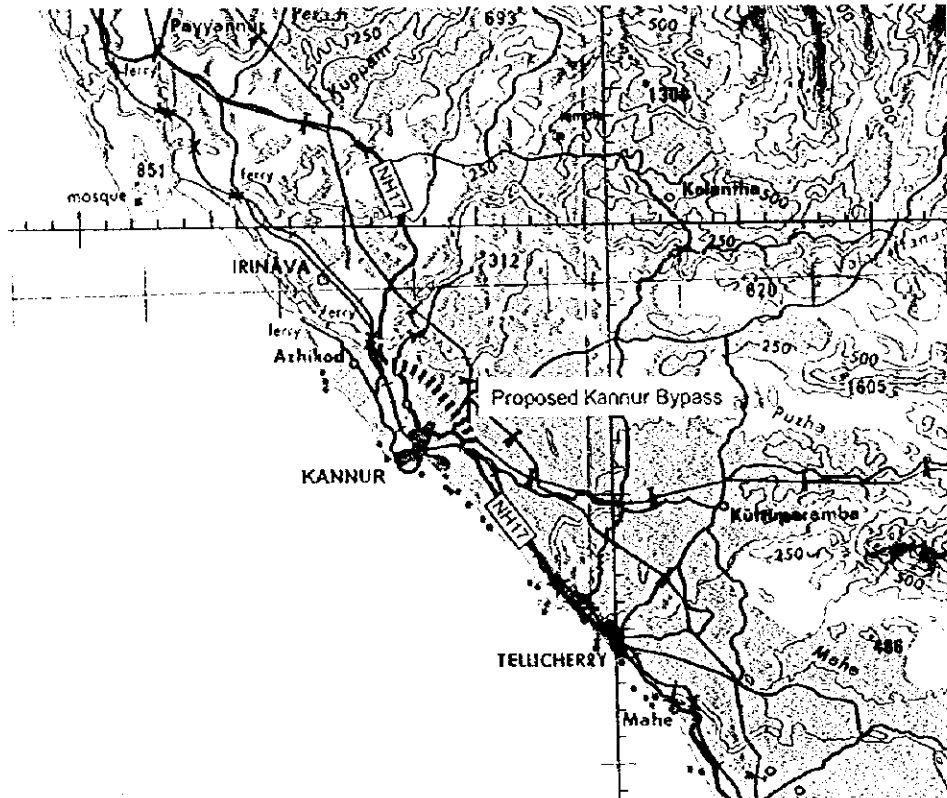
0 10 20 30 40 50 km

LEGEND

- Proposed Route of Bypass
- [NHS] Route number of National Highway

Location Map of Proposed Bypass (5/9)

**Andhra Pradesh
Vijayawada Bypass (L=28.1 km)**



Scale 1:500,000

0 5 10 15 20 25 km

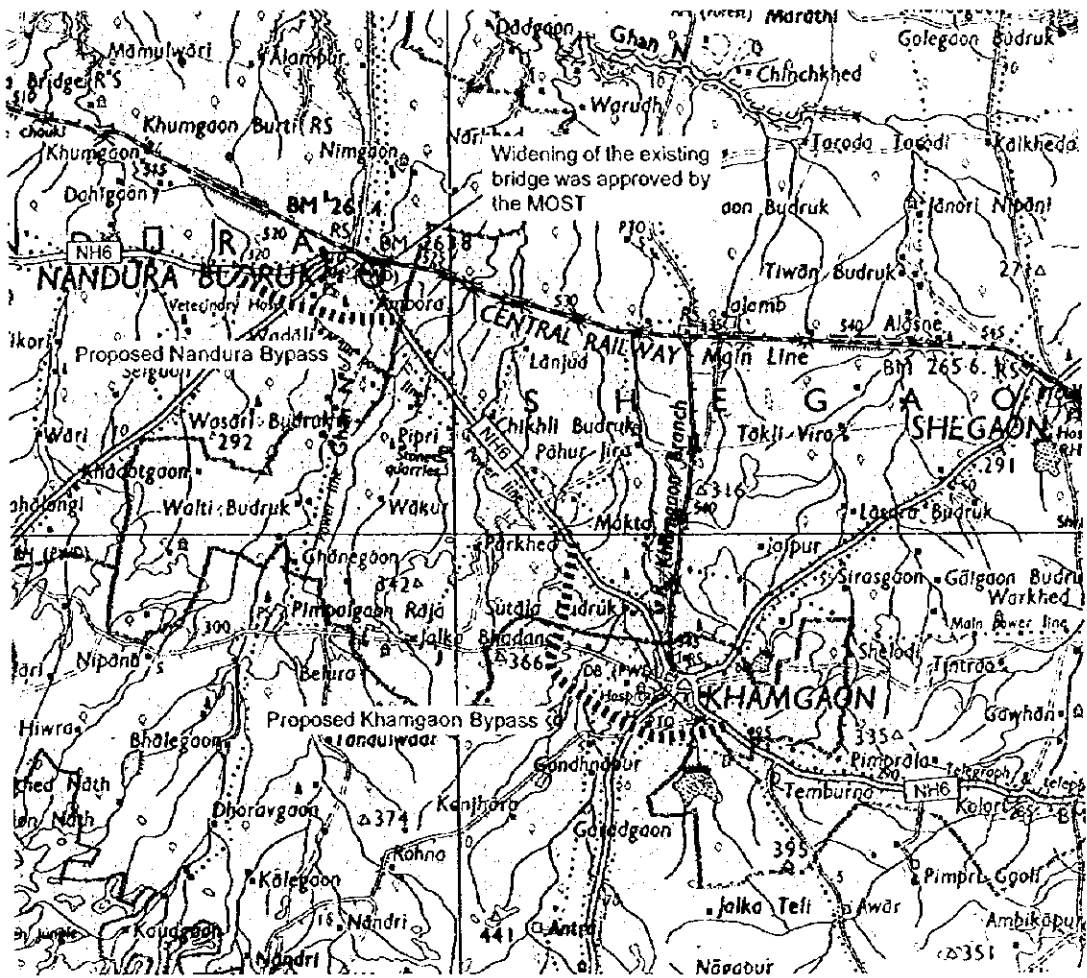
LEGEND

----- Proposed Route of Bypass

NH17 Route number of National Highway

Location Map of Proposed Bypass (6/9)

**Kerala
Kannur Bypass (L=11.1 km)**



Scale 1:250,000

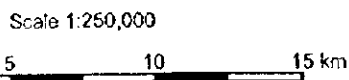
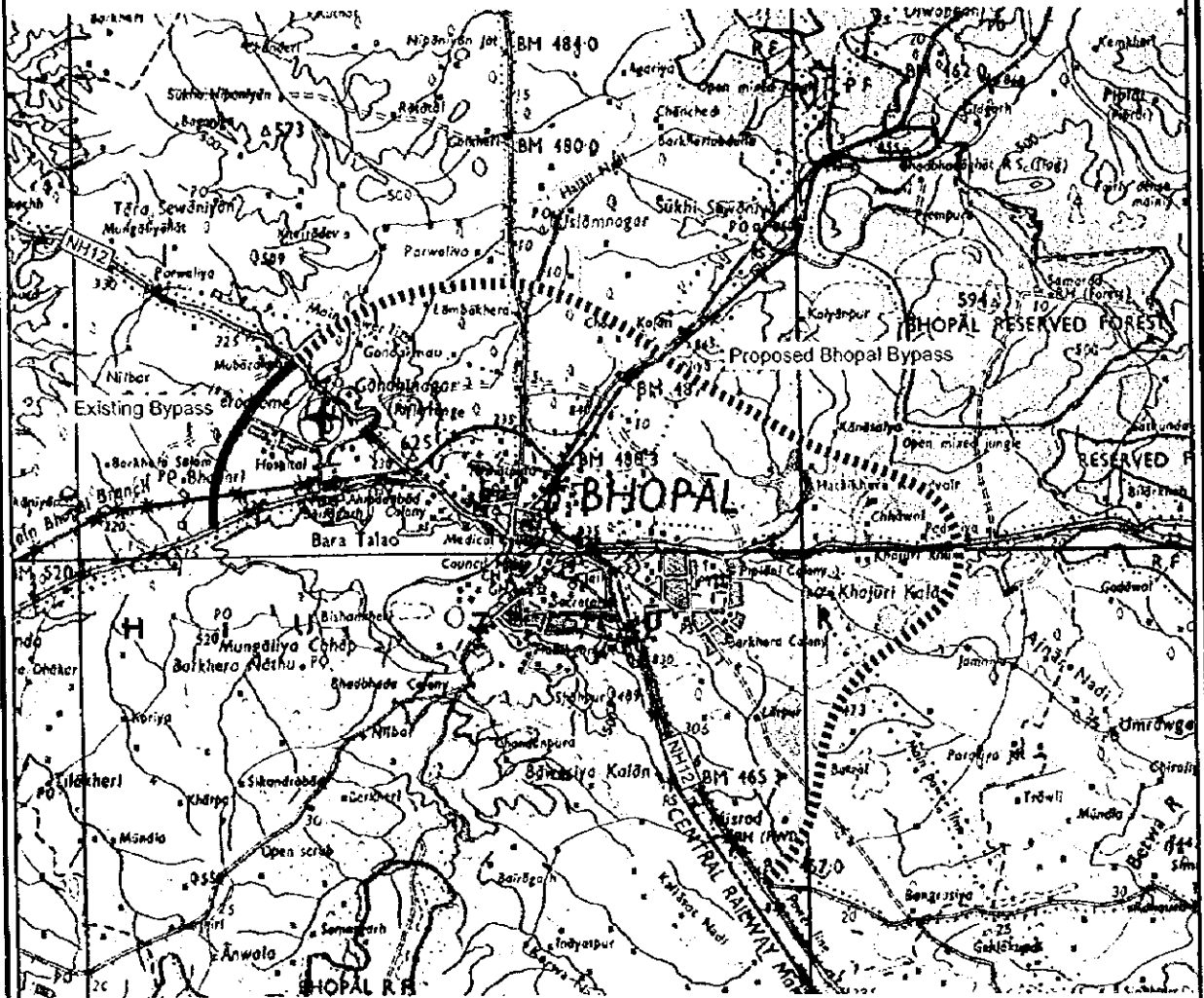


LEGEND

- Proposed Route of Bypass
- NH6 Route number of National Highway

Location Map of Proposed Bypass (7/9)

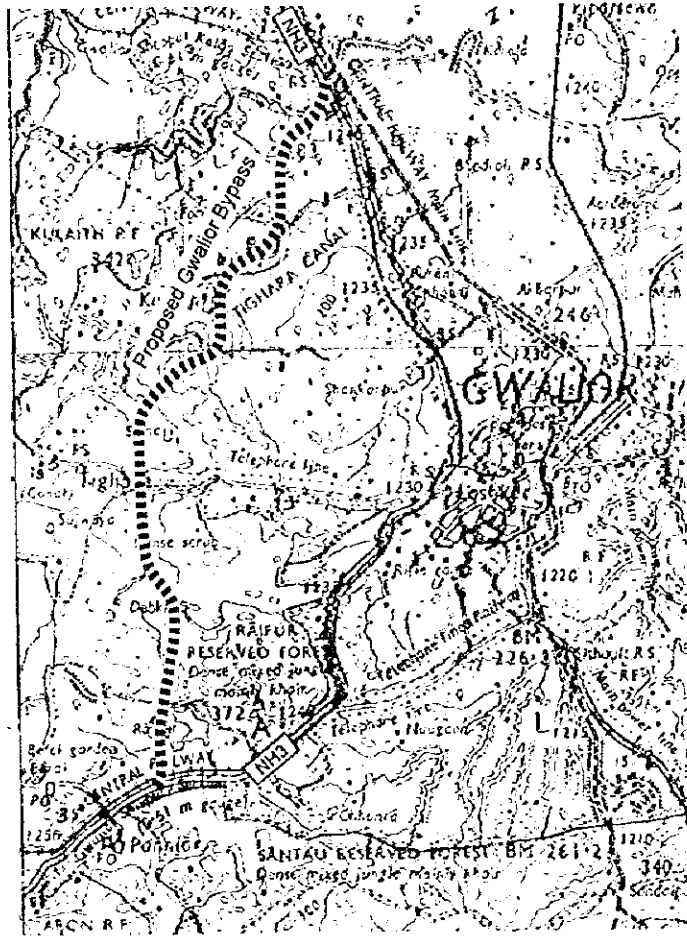
Maharashtra
Nandura Bypass (L=6.4 km) and
Khamgaon Bypass (L=10.9 km)



LEGEND	
	Proposed Route of Bypass
	Route number of National Highway

Location Map of Proposed Bypass (8/9)

**Madhya Pradesh
Bhopal Bypass (L=40.3 km)**



Scale 1:250,000



LEGEND

- Proposed Route of Bypass
- [NH3] Route number of National Highway

Location Map of Proposed Bypass (9/9)

**Madhya Pradesh
Gwalior Bypass (L=26.5 km)**

**THE FEASIBILITY STUDY
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FINAL REPORT

VOLUME I: MAIN TEXT

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Abbreviations

AADT	Average Annual Daily Traffic	NH	National Highway
AASHTO	American Association of State Highway and Transportation Officials	NHAI	National Highway Authority of India
AC	Asphalt Concrete	NNP	Net National Product
ADB	Asian Development Bank	NSDP	Net State Domestic Product
BHEL	Bharat Heavy Electricals Limited	NTC	New Technology Car
CCI	Cabinet Committee of Infrastructure	OD/O-D	Origin-Destination
DBM	Dense Bituminous Macadam	ODR	Other District Road
DHV	Design Hourly Volume	OECD	Overseas Economic Corporation Fund
EIA	Environmental Impact Assessment	OTC	Old Technology Car
EIRR	Economic Internal Rate of Return	PAP	Project Affected Person
EPC	Engineering, Procurement and Construction	PCC	Plain Cement Concrete
FIRR	Financial Internal Rate of Return	PCD	Public Construction Department
GDP	Gross Domestic Product	PCU	Passenger Car Unit
GOI	Government of India	PWD	Public Works Department
Govt.	Government	R & R	Resettlement and Rehabilitation
GSB	Granular Sub-Base	RCC	Reinforced Cement Concrete
HCV	Heavy Commercial Vehicle	RF	Rise and Fall
HFL	Highest Flood Level	ROB	Railway Over Bridge
HUDCO	Housing Urban Development Corporation	ROE	Internal Rate of Return on Equity
HYSD	High Yield Strength Deformed Steel	SC	Scheduled Caste
IA	Implementing Agency	SE	Social Environment
ICIC	The Industrial Credit and Investment Corporation of India	SH	State Highway
IDBI	The Industrial Development Bank of India	SPV	Special Purpose Vehicle
IDFC	Infrastructure Development Finance Company Ltd.	ST	Scheduled Tribe
IEE	Initial Environmental Examination	URUCS	Study for Updating Road User Cost Data
IFCI	The Industrial Finance Corporation of India	UT	Union Territory
IL&FS	Infrastructure Leasing Financial Services Limited	VOC	Vehicle Operation Cost
IRC	Indian Road Congress	VR	Village Road
JC	Junction	VUDA	Vijayawada Urban Development Authority
JICA	Japan International Corporation Agency	WMM	Wet Mix Macadam
JRSO	Japan Road Structure Ordinance	WPI	Wholesale Price Index
LAA	Land Acquisition Act, 1894 and its Amendment by the Central Act in 1984		
LCV	Light Commercial Vehicles		
MAV	Multiple-Axle Vehicles		
MDR	Major District Road		
MoEF	Ministry of Environment and Forests		
MoST	Ministry of Surface Transport		
MoU	Minutes of Understanding		
MSAL	Million Equivalent Standard Axle Loads		
MSL	Mean Sea Level		
NCR	National Capital Region		
NGO	Non Governmental Organisation		

Pre-Feasibility Study

Chapter 1 Socio-economic Conditions of the Study Area

<i>Chapter 2</i>	<i>Traffic Survey and Analysis</i>
<i>Chapter 3</i>	<i>Future Traffic Demand Forecast</i>
<i>Chapter 4</i>	<i>Design Standards</i>
<i>Chapter 5</i>	<i>Preliminary Design of the Bypasses</i>
<i>Chapter 6</i>	<i>Environmental Related Study</i>
<i>Chapter 7</i>	<i>Preliminary Cost Estimates</i>
<i>Chapter 8</i>	<i>Preliminary Economic and Financial Analysis</i>
<i>Chapter 9</i>	<i>Project Implementation Plan</i>
<i>Chapter 10</i>	<i>Priority of the Bypasses</i>

1. Socio-economic Conditions of the Study Area

1.1 Macro-economic Overview

1.1.1 Economic Growth 1985/86 - 1995/96

The Indian economy has grown with an average annual rate of 6.2% over the past ten years (1985/86-1995/96). The Seventh Five Year Plan (1985-90) aimed at a 5.0% of growth rate against the actual achievement of 6.0% per annum. Furthermore, the Eighth Plan (1992-97) is expected to end with an average growth of 6.5% per annum, 0.9% point higher than the target rate of 5.6%, and 0.5% point higher than the actual achievement of the Seventh Plan.

The Indian economy, however, has experienced a severe stagnation in 1991/92. Growth of real GDP at factor cost had fallen to a mere 0.8% in the crisis year of 1991/92 (Figure 1-1). Investment in the most important areas of the economy was a public sector monopoly and foreign investment was negligible. The trade regime imposed licensing restrictions on imports of virtually all commodities. Under the circumstances, the new reforms had initiated in 1991, by introducing the stabilisation and liberalisation of the economy. The situation has changed dramatically since then. The full dimensions of the recovery produced by the reforms are becoming clear. Although there was slow down in the pace of reforms, economic growth in 1996/97 is estimated to be around 6.8%.

The percentage share of agriculture sector in real GDP has been declining progressively from 40 % in 1980/81 to 29% in 1995/96. At present, the same share is dominated by the manufacturing sector (Table 1-1). Transport sector including communication and trade has contributed 20% of GDP in 1995/96.

1.1.2 Annual Inflation

The Wholesale Price Index (WPI) of the fiscal year beginning April, 1996/97 recorded a rate of 7.4% up to February 1997. The first and second quarter of the fiscal year 1996/97 indicated lower WPI than the corresponding period of the previous year 1995/96 with a range of 4.4% to 6.7%. After the end of third quarter of 1996/97, the WPI has shown a rising tendency with higher rates of 6.7% to 7.7%. At the same time, Consumer Price Index (CPI) for industrial workers recorded the rates of 8% to 11% during the fiscal year 1996/97 up to January 1997 (Table 1-2).

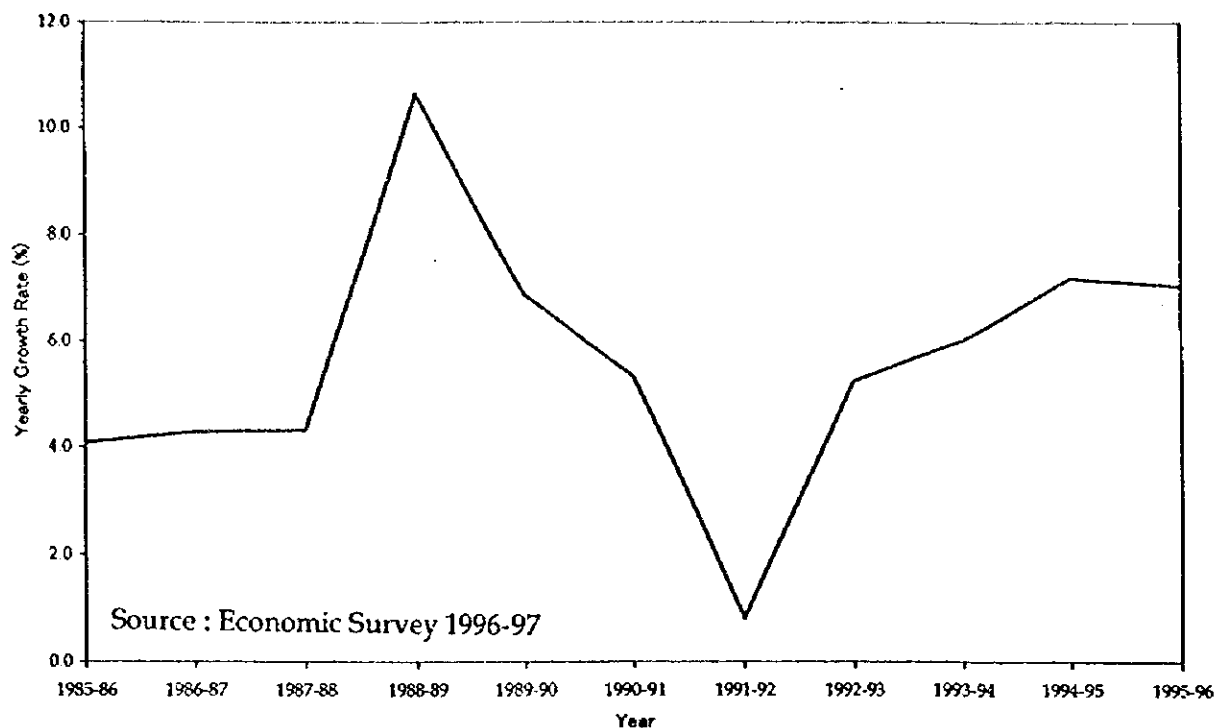


Figure 1-1 Yearly Growth Rate of GDP (1985/86 - 1995/96 : %)

Table 1-1 Gross Domestic Product by Industrial Origin
(At 1980-81 prices)

No.	Sector	Year	(Rs. Crore)			
			1980-81	1985-86	1990-91	1995-96Q
1	Agriculture, forestry and logging, fishing, mining and quarrying		48536 40%	56841 36%	69860 33%	78838 29%
2	Manufacturing, construction, electricity, gas and water supply		29828 24%	40602 26%	59493 28%	80180 29%
3	Transport, communication and trade		20437 17%	27600 18%	37744 18%	54972 20%
4	Banking & insurance, real estate and ownership of dwellings & business services		10791 9%	14708 9%	21700 10%	30866 11%
5	Public administration and defence and other services		12835 10%	16815 11%	23456 11%	29353 11%
	Total		122427 100%	156566 100%	212253 100%	274209 100%

Source : "Economic Survey 1996-97"

Note : (Q) : Quick estimate

Table 1-2 Wholesale and Consumer Price Indices

Month	Wholesale Price Index (WPI)			Consumer Price Index (CPI) for Industrial Workers				
	1994-95	1995-96	1996-97	1994-95	1995-96	1996-97	% Change 1995-96/1994-95	% Change 1996-97/1995-96
April	262	288	303	269	295	324	9.7	9.8
May	265	292	305	272	300	328	10.3	9.3
June	268	293	306	277	306	333	10.5	8.8
July	271	294	309	281	313	339	11.4	8.3
August	272	296	313	284	315	343	10.9	8.9
September	273	297	316	288	317	344	10.1	8.5
October	275	298	317	289	319	346	10.4	8.5
November	276	299	319	291	321	349	10.3	8.7
December	280	298	321	289	317	350	9.7	10.4
January	283	297	320	289	315	350	9.0	11.1
February	285	298	321	291	316		8.6	
March	284	299		293	319		8.9	
Apr-Mar	3294	3549		3413	3753		10.0	

Source : Monthly Economic Indicators, Department of Economic Affairs, Ministry of Finance, April 1997