

Pre-Feasibility Study

- Chapter 1 Socio-economic Conditions of the Study Area*
- Chapter 2 Traffic Survey and Analysis*
- Chapter 3 Future Traffic Demand Forecast*
- Chapter 4 Design Standards*
- Chapter 5 Preliminary Design of the Bypasses*
- Chapter 6 Environmental Related Study*
- Chapter 7 Preliminary Cost Estimates*
- Chapter 8 Preliminary Economic and Financial Analysis*

Chapter 9 Project Implementation Plan

- Chapter 10 Priority of the Bypasses*

9 Project Implementation Plan

9.1 General

To achieve the overall economic development of India, it is imperative to upgrade its infrastructure urgently from the present levels to much higher international ones. Among other sectors, one of the most serious is the deficiency in stock of the highway network.

However, the Government has been able to provide only much less sufficient funds to the improvements of the National Highways, due to competing budget demand from other sectors, in spite of recent rapid traffic growth on most sections in the network. In need of new resources for the improvements of NHs, the Central Government has decided to invite private investment in development, maintenance and management of NHs, by permitting to levy tolls on the users of the improved NHs.

This has led to a new way of implementing NH projects on a BOT basis. In June 1995, the provisions of National Highway Act, 1956 were amended to permit private sector participation. Further, in the earlier half of 1997, the Central Government of India has officially set up "Guidelines for Private Investment in National Highway Projects," and the Ministry of Surface Transport has followed it by announcing "Additional Policy Initiatives for Private Investment in Highway Development." (Hereinafter those are combined and referred to as Guidelines.)

As seen in the previous projects in India, but not limited to India, which were intended to be implemented on a BOT basis, a lot of milestones such as MoU, environmental clearance, concession agreement, final approval of MOST, etc., through the project cycle, have to be handled before the Financial Close, after which the construction could commence. In this chapter, the discussion is concentrated on the present financial and regulatory situation before the financial close being reached, which is vital to the project implementation.

9.2 Background for Public-Private Partnerships in Infrastructure Development

The availability of adequate infrastructure facilities is vital for the acceleration of the economic development of a country and essential at the same time to make the country more attractive to Foreign Direct Investments (FDIs), especially in the globally competitive and liberated market.

Infrastructures services are monopolistic in nature and they involve high upfront costs and long payback periods. Consequently, infrastructure services have been predominantly provided by the public sector in almost all countries, here in India as well. However, against the general trends of fiscal budget deficit and strong demand for infrastructure services, a wave of privatisation and deregulation has been

sweeping infrastructure sectors around the world over the last decade or so.

To cope with this global economic trend, the role of the public sector in investment, delivery of services and in regulation will be required to change and continue to be more vital. Therefore, the introduction of a new framework is required for public-private partnerships in different forms so that appropriate infrastructure investment can materialise.

Infrastructure projects are characterised by large financial outlay requirements and long gestation periods. Investment involves high upfront costs and long term financing since the payback period is long. In the current fiscal situation, the Government will be very constrained to raise resources from the market for providing budgetary support to the public sectors engaged in infrastructure development.

A solution to the problems associated with the traditional approach to infrastructure can be found in commercialising the projects. The recovery of investments should be through a system of user charges, which has a direct relation to the specific benefits with which the facilities provides the users.

9.3 Concept of Commercialisation of Infrastructure Projects

The key problem in commercialisation of infrastructure projects is the appropriate allocation of risks for stakeholders concerned.

Successful formation of an infrastructure project involves the appropriate demarcation and allocation of risks to the different stakeholders in the project. Clarity in this allocation is essential to avoid confusion in the financing and implementation of commercialised infrastructure projects because each stakeholder naturally tends to shift the risk to others.

A key issue in infrastructure financing relates to what recourse the lenders have if investments fail to produce the expected cash-flow. The financing is usually non-recourse with lenders being repaid only from the cash-flow generated by the project. The assessment of the cash-flow stream of an infrastructure project determines the eventual financing structure and the range of instruments required to realise it. In all cases, the viability of the project should be assessed at commercial rates of return.

Build-Operate-Transfer (BOT) : The concessionaire approach has been adopted recently by many developing countries for attracting private sector funds for infrastructure development. The most prominent, and possibly the most widely used, is the "Build-Operate-Transfer" (BOT) arrangement. As the term suggests, the private investors (concessionaire) builds, operates and transfers the facility back to the Government at the end of a specified period, called "the concession period". A transparent regulatory framework is eagerly needed to make BOT-type projects

easier to negotiate and implement.

There will be continued need for state support in many infrastructure projects. In this regard, it is imperative to promote public-private partnerships. Infrastructure investment is particularly risky during the construction period and in the initial years of a project, before a clear income stream emerges. The Government should therefore consciously use its available scarce resources to take significant equity positions in infrastructure projects which otherwise would not receive adequate funding and mingle them with commercial equity funds as well as debt from different sources.

To solve the above problems, the "Infrastructure Development Finance Company Limited" (IDFC) was incorporated on 30 January 1997. IDFC is expected to play a vital role in infrastructure development from financial as well as regulatory aspects.

9.4 Implementation of the Bypass Projects on a BOT Basis

The provisions of Guidelines relevant to the implementation programme for NH bypasses are summarised on Table 9-1

As specified in the Guidelines, privatisation of the NHs will be implemented by the National Highway Authority of India (NHAI), which initiated operation in 1995 as an autonomous body with responsibility for the development, maintenance and operation of the NHs and associated facilities vested by the Ministry of Surface Transport (MOST). Though a number of highway projects have been already underway on a BOT basis as listed in Table 9-2, NHAI, as the Implementing Agency, has engaged in not all of the NH projects yet.

Table 9-1 Provisions of Guidelines for Private Investment in National Highway Projects relevant to the Implementation Programme in Feasibility Study on National Highway Bypasses in India (1/2)

<p>Identification of Projects for Private Investment</p> <ul style="list-style-type: none"> (1) One of the approved projects of MOST (2) Project capable of yielding adequate EIRR and FIRR <p>Government Support</p> <ul style="list-style-type: none"> (1) Detailed Feasibility Study (2) Land for Right-of-way and en-route facilities (3) Clearance of the Right-of-way (4) Relocation of utility services, Cutting of trees, Resettlement and rehabilitation of the affected establishments (5) Environmental Clearance (6) Capital Grants up to 40% of the project cost for BOT projects of National Highways <p>Tax/Fiscal Concessions</p> <ul style="list-style-type: none"> (1) Concessions for Enterprise <ul style="list-style-type: none"> 1) Tax holidays for the initial 5 assessment years and 30% exempt from Corporate Tax for the subsequent 5 assessment years, total 10 consecutive years falling within a period of 20 assessment years beginning with the assessment year in which the Enterprise begins operating and maintaining the infrastructure facility. 2) The profits from the real estate development will be eligible for tax concession available to infrastructure sector to the extent such activities are ploughed to the highway project development. 3) Duty free import of high capacity sophisticated identified equipment for highway projects will be permitted. (2) Concession for Investors/Financial Institutions <ul style="list-style-type: none"> 1) Deduction up to 40% of the income derived from financing of the investments if the amount is kept in a special reserve 2) Exemption for Infrastructure Fund from Income Tax on the incomes from dividend, interest on long-term capital gains of such funds or companies from investments in the form of shares or long-term finance 3) Deduction 20% of the amount subscribed to equity share or debentures issued by the Enterprise from Income Tax, with the limit of Rs 70,000 per year <p>Foreign Investment</p> <p>Foreign Direct Investments up to 74% equity for road and bridge construction are automatically permitted.</p> <p>Concession Period</p> <p>The concession period inclusive of the construction and maintenance/operation periods will be determined on competitive bidding basis and may be up to 30 years.</p>
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(continued)

Table 9-1 Provisions of Guidelines for Private Investment in National Highway Projects relevant to the Implementation Programme in Feasibility Study on National Highway Bypasses in India (2/2)

<p>Revision of Fee</p> <p>The revision of the fee may be allowed every year following commissioning of traffic, linked to the Wholesale Price Index. If the inflation in the same year jumps by 4 point, the revision may be allowed twice a year.</p> <p>Project Components</p> <p>(1) Highway construction</p> <p>(2) Highway related facilities, en route (Restaurants, Motels, Rest/Parking Areas)</p> <p>Land for these facilities will be acquired by the Government. The Enterprise will be free to license out these facilities and enjoy the revenue from them.</p> <p>(3) Other real estate development</p> <p>The project may include other real estate development such as transport nagars, loading/unloading terminals for cargo, warehouses, vehicle repair facilities, vehicle component shops, restaurants, hotels/motels, insurance and medical facilities, and commercial & residential complexes. Cost of land for those shall be paid for by the Enterprise. Land for those activities is to be treated as that for public purpose.</p> <p>(4) Advertisements/Hoardings</p> <p>The Enterprise is permitted to display Advertisements/Hoardings within the right-of-way and outside and enjoy the revenue from them.</p> <p>Evaluation of Financial Bids</p> <p>Evaluation of financial bids will be carried out in the principals of least cost to the user.</p> <p>The maximum toll rates to be charged from various classes of vehicles on existing roads which are widened from 2-lane to 4-lane are approved as follows:</p> <table border="1"> <thead> <tr> <th>NO.</th> <th>Type of Vehicle</th> <th>Maximum Amount</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Car/Jeep, Van</td> <td>Rs. 0.40 per km</td> </tr> <tr> <td>2</td> <td>Light Commercial Vehicle</td> <td>Rs. 0.70 per km</td> </tr> <tr> <td>3</td> <td>Truck and Bus</td> <td>Rs. 1.40 per km</td> </tr> <tr> <td>4</td> <td>Heavy Construction Machinery</td> <td>Rs. 3.00 per km</td> </tr> </tbody> </table> <p>Actual rates will be decided on a case-to-case basis and area-to-area, keeping in view the cost of project, financial viability and the public acceptance. These rates will be reviewed periodically after every three years, being indexed to the Whole Sale Price Index.</p> <p>It has been authorised to levy higher rates of toll for expressways, major bridges, new bypasses, tunnels, etc. after competitive bidding process.</p>	NO.	Type of Vehicle	Maximum Amount	1	Car/Jeep, Van	Rs. 0.40 per km	2	Light Commercial Vehicle	Rs. 0.70 per km	3	Truck and Bus	Rs. 1.40 per km	4	Heavy Construction Machinery	Rs. 3.00 per km
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Table 9-2 BOT Opportunities in Highway Sector in India (1/2)

(1) National Highways		As of 21 July 1997	
Name of the Project	State	Estimated Cost (Rs MN)	Remarks
Thane-Bhiwandi Bypass on NH3	Maharashtra	165	Awarded in 1995 Commissioned in 1997 (Ideal Road Builders Ltd.)
Udaipur Bypass on NH8	Rajasthan	240	Awarded in 1997 (Atlanta)
Chaltan R.O.B. on NH8	Gujarat	100	Awarded in 1997
Durg Bypass on NH6 (NHAI)	Madhya Pradesh	660	Awarded in 1997 (Shakti Kumar M. Sananeti)
Narmada Bridge on NH8	Gujarat	1,200	Bid received Under evaluation
Coimbatore Bypass on NH47	Tamil Nadu	800	Bid received Under evaluation
Six R.O.B.s (NHAI)	Rajasthan	500	Shortlisting of bidders completed Commercial bid to be held by the year end
Panvel Bypass on NH4	Maharashtra	3,250	Bid received Under evaluation
Hubli-Dharwad Bypass on NH4	Karnataka	600	Ditto
Nellore Bypass on NH5	Andhra Pradesh	800	Ditto
Five bridges on NH5	Andhra Pradesh	500	Awarded in 1997
Viekananda Bridge on NH34	West Bengal	4,500	Bid received Under evaluation
Moradabad Bypass on NH24 (NHAI)	Uttar Pradesh	600	Engineering design in progress
Amravati Bypass on NH6 (NHAI)	Maharashtra	600	Engineering design in progress
Akola Bypass on NH6 (NHAI)	Maharashtra	500	Engineering design in progress
Twelve R.O.B.s	Gujarat Uttar Pradesh Andhra Pradesh	800	Not finalised
Four-laning of existing roads in aggregate length of 7,000 km		28,000	Not finalised
Other bridges and bypasses		5,000	Not finalised
Widening to 4-lane and construction of new 4-lane bypass on NH4	Maharashtra	1,200	Invitation for shortlisting of bidders announced Submission of documents by 7/10/97
Widening to 4-lane on NH7	Tamil Nadu	1,500	Invitation for shortlisting of bidders announced Submission of documents by 11/8/97
Widening to 4-lane on NH45	Tamil Nadu	1,400	Ditto
Widening to 4-lane on NH8	Rajasthan	2,300	Ditto

(continued)

Table 9-2 BOT Opportunities in Highway Sector in India (2/2)

(2) Other Highways			As of 21 July 1997
Name of the Project	State	Estimated Cost (Rs MN)	Remarks
Rau-Pithampur Link Road from NH3	Madhya Pradesh	100	Commissioned in 1993 (IL&FS)
Faridabad-Noida-Ghaziabad Expressway (National Capital Region Planning Board)	Delhi Uttar Pradesh Haryana	7,516	Invitation for shortlisting of bidders announced Submission of documents by 4/8/97
Delhi-NOIDA Link Bridge (New Okhla Industrial Development Authority)	Delhi Uttar Pradesh		Bid received Under evaluation
Bangalore-Mysore Expressway (Govt. of Karnataka)	Karnataka	14,000	Awarded in 1997
North West-East Bypass to Pune City (Maharashtra Industrial Development Corp.)	Maharashtra		Under consideration
Worli-Bandra Link Bridge on Western Express Freeway (Mumbai Metropolitan Region Development Authority)	Maharashtra	>3,000	Ditto
Widening to 4-lane between Vadodara and Halol on SH87 (Govt. of Gujarat)	Gujarat		Ditto
Widening to 4-lane between Ahmedabad and Mahesana on SH41 (Govt. of Gujarat)	Gujarat		Ditto

As reviewed in Table 9-3, functions of NHAI in the process of NH projects on a BOT basis are concerned mostly to the implementation procedures. All policy matters are up to the judgement of MOST, and all preparatory works including the feasibility study, land acquisition, environmental clearance, etc., as well as provision of capital grants, are carried out by MOST. Evidently, NHAI was established in the intention that its responsibilities would be eventually extended to cover the whole network of NHs, and, for achieving its objectives, is empowered to raise its own funds other than the Governmental budgets, to acquire land, to collect fees, and to provide consultation and construction services. Currently, however, the institutional structure of NHAI, particularly its personnel resources, seems to be still too dependent upon MOST, hence causing ambiguity of the existence of NHAI and, consequently, hindrances to private initiatives for NH projects.

According to the Guidelines, the prerequisite to be identified as a BOT project of the NH includes two components; 1) to having the promising viability of the project with adequate EIRR and FIRR, and 2) to be an approved project of MOST. Apart from the results from the economic and financial analyses, the relative intensity of needs and local preparedness for construction of each of the ten bypasses are quite diverse as

Table 9-3 Roles Shared between MOST and NHAI specified in Guidelines

Item	MOST	NHAI
Policy Making	All policy matters relating to NHIs are decided by MOST. (Govt.)	
Implementing Agency		Policy of privatisation of NHIs is implemented by NHAI, or, in exceptional cases, by the State PWD. (IA)
Government Support	All preparatory works are carried out by the Govt.	
Land Acquisition		Land for highway construction and highway related facilities are acquired by the IA. The IA may assist in the acquisition of the land for other real estate development, which has been approved accordingly by the IA.
Disclosure of the Feasibility Study Report		The IA will make available the feasibility study report prepared by the Govt. to any interested bidder, maybe charging appropriate fee.
Bidding Documents	The documents must be approved by the Govt.	The documents are prepared by the IA and given to the interested bidders.
Evaluation of Technical Proposals		The technical proposals will be evaluated and finalised by the IA.
Award of the Concession	The Govt. evaluates the bids and approves the award.	A letter of acceptance of the bid will be issued by the IA.
Signing of Agreement		The Concession Agreement shall be signed between the successful bidder and the IA, on behalf of the Govt.
Exceptional Circumstances	The Govt. may suitably extend the concession period to compensate the enterprise to offset its losses caused due to any exceptional circumstances.	
Management of the Highway Stretch	The Govt. agrees that the enterprise will have powers to regulate and control the traffic on the highway stretch.	
Regulatory Framework		The IA will carry out the regulatory functions.
Transfer of the Project	At the end of the concession period, the project shall be transferred by the enterprise to the Govt. free of any cost.	Even after the transfer, the IA will continue to exercise control on the highway-related developments at the entry/exit points and advertisement.

reviewed in Table 9-5.

Recently NHAI announced an invitation for shortlisting of bidders for a BOT project of NH 4 in Maharashtra. As an example of the practice of the highway BOT project, the incentives for private investment incorporated in the Guidelines are compared with the contents of an actual pre-bid documents prepared by NHAI and summarised as shown in Table 9-4. In this example, there are some inconsistencies between the two documents such as equity participation of NHAI stated in the Pre-Documents, of which the Guidelines contain no reference, and environmental clearance for which the Enterprise is responsible in the Pre-Documents in spite of the clear specification in the Guidelines that the Government carries it out.

Table 9-4 Comparison of Incentives for Private Investment between Guidelines and Pre-Bid Documents for NH 4 Project in Maharashtra

Incentives	Guidelines	Pre-Bid Documents
Government Support Detailed F/S Land Acquisition Clearance of ROW Environmental Clearance Capital Grants	Responsibility of Govt. Ditto Ditto Ditto Possibly awarded up to 40% of project cost	Not mentioned Duly stated Ditto Responsibility of Enterprise Duly stated
Tax/Fiscal Concessions Concessions for Enterprise Concessions for Investors	Available Ditto	Duly stated Duly stated
Project Components Other Real Estate Development Advertisement/Hoarding	May be included Permissible	Not mentioned Ditto
NHAI's Equity Participation	Not specified	Possibly up to 30% of the total equity
Enterprise's own resources	Not specified	Required at least 15% of the construction cost

Pre-Bid Documents : Shortlisting of Bidders for Construction, Maintenance and Operation of Widening to 4-Lane Including Strengthening of the Existing 2-Lane Road from Dehu Road to Lonawala and New 4-Lane Bypass from Lonawala to Khandala on NH-4 in Maharashtra, July 1997, NHAI

Table 9-5 Profile of the Proposed Bypasses

Name	State	Proposed Length (km)	Estimated Cost (x106 Rs.)	Traffic Volume (vehicles per day)		Remarks
				Present Traffic on the NH (1997)	Projection on the Proposed Bypass	
Barcilly Bypass on NH 24	Uttar Pradesh	31.10	1,463	12,831	9,891 (2002) 41,743 (2012)	The bypass route approved by MOST in 1993 out of 3 alternatives by PWD was under the Study.
Patna Bypass on NH 30	Bihar	49.84	4,177	10,116	7,967 (2002) 11,475 (2012)	Preliminary design was approved by MOST in 1989. PWD's request for DD is under evaluation of MOST
Keonjhar Bypass on NH 6	Orissa	8.50	360	5,562	741 (2002) 2,469 (2012)	MOST approved PWD proposal.
Balugaon Bypass on NH 5	Orissa	15.40	420	5,602	940 (2002) 4,763 (2012)	MOST approved PWD proposal.
Vijayawada Bypass on NH 5	Andhra Pradesh	28.13	1,492	13,572	1,570 (2002) 14,282 (2012)	Outer Ring Road Plan was approved by MOST. Northern arc as the bypass to connect NH5 and NH9 was under the Study.
Kannur Bypass on NH 17	Kerala	11.14	380	9,592	4,036 (2002) 10,251 (2012)	Due to expansion of the city area, PWD cancelled the original bypass plan. New route was proposed by this Study.
Nandura on NH 6	Maharashtra	6.38	283	7,301	5,355 (2002) 9,790 (2012)	3 alternatives were planned by PWD to ease congestion. Southern bypass route was under this Study.
Khangaon on NH 6	Maharashtra	10.89	549	7,732	6,142 (2002) 11,617 (2012)	MOST approved PWD proposal. PWD has completed topographic survey and bypass design.
Bhopal on NH 12	Madhya Pradesh	40.32	1,732	12,146	7,135 (2002) 19,106 (2012)	Bhopal Regional Master Plan was finalised. Detailed routings under consideration by PWD
Gwalior on NH 3	Madhya Pradesh	26.00	1,603	10,646	5,074 (2002) 10,314 (2012)	MOST approved PWD proposal. Centreline survey by PWD was completed.

9.5 Business Plan of Infrastructure Development Finance Company (IDFC)

As stated earlier, from the financial aspects of the highway BOT projects, the most expected organisation to play a vital role is the Infrastructure Development Finance Company Limited (IDFC) established based on the concept of "The India Infrastructure Report", 22 June 1996 by Rakesh Mohan. The business plan of IDFC, incorporated on 30 January 1997, is summarised below:

(1) Promoters & Capital Structure

IDFC has been promoted by Government of India (GOI), Reserve Bank of India (RBI), Industrial Development Bank of India (IDBI), Unit Trust of India (UTI), Industrial Finance Corporation of India Limited (IFCI), Industrial Credit & Investment Corporation of India Limited (ICICI) and Housing Development Finance Corporation Limited (HDFC).

An authorised share capital is Rs. 5,000 crores comprising equity capital of Rs. 4,000 crores and unclassified share of Rs. 1,000 crores.

The initial equity capital of IDFC was Rs. 1,000 crores broadly classified as follows:

<u>Initial Equity Capital</u>	Rs. crores
Government of India	200
Reserve Bank of India	150
Industrial Development Bank of India	50
Other Domestic Financial Institutions	250
Overseas Institutions and Multilateral Agency	350
<hr/> Total	<hr/> 1,000

(2) IDFC's Mission

The mission of IDFC will be to nurture the growth of private capital flows for infrastructure finance on a commercially viable basis. IDFC will nurture and develop bankable projects as well as develop expertise in structural financing for infrastructure.

On one hand, it will create instruments that mitigate for investors the risks in the infrastructure sector and on the other, it will help create efficient financial structures at the institutional and project level. By enhancing credit, mitigating risk and stretching maturity, it will increase the bankability of projects thereby activating a considerable pipeline that still awaits financial closure.

IDFC does not seek primarily to "provide" capital itself or act as a "conduit" for capital but to lead private capital to where it is most required. In this sense it does not seek to supplant the existing institutions undertaking

infrastructure finance but to develop a system in which greater flows of funds would be available on commercial terms for infrastructure.

In its initial operations, IDFC will concentrate on five key segments of the infrastructure sector: power, telecommunications, ports, roads, and urban finance.

(3) **Key Strategies**

The five key elements of IDFC's strategies to achieve the above objectives would be:

Strong commercial orientation: IDFC will be squarely in the private sector, albeit with a strong government mandate. It will operate as a commercial entity with the objective of being profitable - rates and fees charged on products and services will be market-based.

Value addition and innovation: IDFC's products range seeks to supplement and enhance the capabilities of existing institutions in infrastructure financing. This would primarily be achieved by the introduction of innovative financial products in the Indian market.

Influencing public policy on infrastructure: IDFC will provide leadership in rationalising legal and regulatory frameworks to encourage private sector participation in infrastructure development.

Establishing a long term debt market: A key constraint in the development of the infrastructure financing market in India is the absence of long term financing, especially for construction.

One of IDFC's major initial objectives is to provide a strong input into policy discussions with respect to the constraints presently being faced by projects in terms of achieving financial closure and for implementation thereafter. It has been said that the players, potential sponsors, investors, etc., all face constraints in terms of availability of long term funds and the need to build up skills in project financing. In this respect, IDFC's role as both capital provider and credit enhancer will prove to be pivotal for the long term sustainable flow of private capital for infrastructure finance.

IDFC's contribution towards developing a deep and long term debt market in India would be through the extension of maturity of existing lenders, creation of conditions conducive to securitization of term loans and being a market maker in debt securities in the long run.

Global best practices: IDFC will adhere to global best practices with respect to corporate governance, operating policies and risk management.

9.6 Matters related to Concession Agreement

Through this Study, several financial institutions, multilateral international institutions, accounting houses, contractors, etc. were visited for having discussions and obtaining information about BOT-schemes in the road sector. The discussed matters related to the concession agreement, to be raised for more clarification, are as follows:

(1) Concession Period

It should be noted that the extension of concession period, even more than 20 years, is not any significant incentives for the investors and/or financial institutions. It is related to the current financial debt market where availability of long-term credit is still limited even from major financial institutions such as IFCI, ICICI, IDBI, IL & FS, etc.

(2) Toll System

MOST is strongly advised to explain to the public the necessity to introduce a toll system for the expressway or the bypass road, referring to infrastructure being vital to regional economic growth, "a concept of beneficiary-to-pay", national budget deficit, etc.

(3) Development Activities in the vicinity of the Project

It has been recognised that the income from tolls alone would not cover the project costs. Recognising this problem, MOST has allowed a mandated private entrepreneur to develop larger plots in the vicinity of the project. However, there remains several hurdles to be cleared, being related to the master plans of the towns concerned, availability of such land, its acquisition procedures, etc.. To make this incentive practical and attractive to the investors, the more detailed descriptions should be addressed for the respective project in the pre-bid documents prepared by NHAI.

(4) Ownership of the Acquired Land ----- "Collateral"

According to the Guidelines, the land for highway construction and en route highway-related facilities will be given to the enterprise on lease for the concession period. Therefore, the land acquired by State Government/MOST doesn't belong to the project sponsor, so that the land is not evaluated as assets of the sponsor in accordance with Indian accounting system. There were some opinions that it is advisable that the land concerned be contributed to the project company as equity in kind from NHAI and so is an asset of the project company.

(5) Clarity in the Concession Documents

If there remain a lot of unknown factors or unclear clauses in the documents, they should be regarded as a "commercial risk" for the sponsor, resulting in eventual increase in the project cost and final reflection into toll tariffs. In that respect, the descriptions in the documents should be clear enough to minimise the misunderstanding among the stakeholders of the project and also to minimise the project cost.

(6) Escrow Account

It may be desirable to offer an agreeable rate of return on equity among the stakeholders, say, PLR plus 5 to 10%. In this case, some stabilisation funds should be established and managed by the financial institutions or banks, which open an escrow account for the project.

9.7 Business Operations of a Financial Institution

Among the institutions visited by the Study members, one of the most impressive was the Infrastructure Leasing and Financial Services Limited (IL & FS), which is actively performing infrastructure businesses and financial services both in the public and private sectors. IL & FS was incorporated in 1987 and commenced operation in 1988 as a subsidiary of a nationalised bank, initially shareholded by CBI (50.5%), UTI (30.5%), and HDFC (19.0%) and mandated to address two areas; infrastructure development and financial services. After that it strengthened the relations with multilateral financial agencies and global financial service players and offered the equity share capital to the public, hence currently adding ORIX, IFC, CCF, and others to the shareholders. The features of the projects taken care of by IL & FS are briefly introduced for reference.

(1) Rau Pithampur Link Road

The two lane asphalt road links Rau village and Pithampur Industrial Estate; covering a distance of 11.5 km, and includes a 100 metre long high level bridge across the river Gambhir, a toll plaza, lighting and other amenities. The road was opened to vehicular traffic in November 1993 and is India's first private toll road, developed without recourse to budgetary allocations.

With the project reaching cash break-even, Madhya Pradesh State Industrial Development Corporation (MPSIDC), Madhya Pradesh Audyogik Vikas Nigam Limited (MPAVN) & IL&FS have incorporated and established a Special Purpose Vehicle (SPV) under the name and style "MP Tolls Limited" (MPTL). The toll collection rights would be provided to MPTL. This would be based on the total project cost and would include the recovery of principal and returns as agreed between the parties.

MPTL has a debt/equity ratio of 2:1. Thus of the total project cost of Rs 100

mn, Rs 30 mn of equity would be brought in by MPSIDC, IL&FS and FI's, and the balance Rs 70 mn of debt would be mobilised from FI's through innovatively structured toll bonds. MPTL will seek to list its debt paper on the National Stock Exchange (NSE), in order to create secondary market interest.

The Toll Bonds are a landmark development in financing infrastructure projects on limited recourse format. The bonds have a maturity of 10 years with a stepped up coupon rate to suit the project cash flows. These bonds have received a AA (SO) credit rating from CARE based on the credit enhancement measures in the form of escrow arrangement of the tolls and an irrevocable standby credit facility from IL&FS for two consecutive interest payments. The bonds have received wide acceptance from a variety of investors including financial institutions, banks and corporates.

(2) The World Bank Initiative

The findings of the task force were reviewed by the loan committee of the World Bank, which sanctioned a USD 200 million line of credit, with a sovereign guarantee provided by GOI. The loan has a 20-year tenor to facilitate the development of approved infrastructure projects.

The first tranche of USD 25 million would be made during the first quarter of 1997.

(3) Panvel Bypass

The project envisages a four-lane Continuously Reinforced Concrete Pavement (CRCP) road with a total length of 10.14 km bypassing Panvel town, which is located on the NH-4. The project encompasses in its ambit the construction of three high level bridges, a railway over bridge and toll plazas. The scope of the project also includes lighting near toll plazas arboriculture and amenities such as restaurants, etc.

The Panvel Bypass project is conceived on BOT basis. IL&FS has awarded a contract to Hume Industries (Malaysia), Berhad and John Holland Asia (Holdings) Sdn. Bhd., to finalise the design engineering. The design engineering studies including proposal engineering studies have been completed and the concurrence of the concerned Government authorities obtained. A significant feature of the construction contract tender is that it envisages the award of a fixed price contract for the implementation of the project.

As envisaged in the MoU entered into between Hume Industries, Malaysia and IL&FS, a Special Purpose Vehicle (SPV) has been established in the name of Panvel Bypass Toll Road Limited, to undertake this project as a joint

venture. An approval has since been obtained from Foreign Investment Promotion Board (FIPB) for foreign equity participation.

It is proposed to finance the project with debt equity of 4:1. Hume Industries have agreed to contribute up to 40% equity of the project. As per the current indications, the project would be commissioned in March 2000.

The initial project development efforts were focussed on creating an enabling regulatory framework for private sector participation in the Roads sector. This has led to a considerable delay in the project development cycle. The key milestones completed till date are summarised sequentially.

Milestone	Date
MoU with MOST/PWD/IL&FS	: February 1993
Award of Contract	: March 1994
Environmental Clearance	: December 1994
Amendment of NH Act	: June 1995
World Bank review & eligibility	: November 1995
FIPB approval for Project SPV	: November 1995
Review of design & cost estimates by PWD	: May 1996
Draft concession agreement submitted to MOST	: August 1996
World Bank Review of Concession Agreement	: October 1996

In the final leg of the project development cycle, some milestones still need to be completed.

I	- Final Approval of MOST
II	- Signing of Concession Agreement
III	- Signing of Construction Agreement
IV	- Site Mobilisation
V	- Financial Close

(4) Delhi-Noida Link Bridge

IL & FS has also received in-principle approvals from the ADB for their participation in the debt and equity components of the project. ADB has executed a MoU with the Company to participate to the extent of 20% of the equity and 26% of the aggregate debt on a project recourse basis. The total commitment of the ADB in this project is approximately US\$ 15 million. It is noteworthy that for the first time, the ADB would be undertaking a co-promotional role in the project, with recourse limited to toll cash flows and without guarantees from sponsors.

9.8 Strengthening of Regulatory Framework for NHAI

As described in Chapter 9.4, NHAI, which will eventually take the responsibilities for development, operation and management of all National Highways, has not yet

had the sufficient power to implement even only the BOT National Highway Projects. Due to the shorter time lapse after its establishment, this may be inevitable to a certain degree, but for enhancement of the National Highway development the function and authority of NHAI, particularly its regulatory framework, should be strengthened as early as possible. In this regard, the Government of India is now proposing to undertake the following two studies by utilising part of a grant of US\$ 2 million from the Government of Japan, being administered by the World Bank. NHAI will be the employer for carrying out these two studies. The studies are:

- (1) Road Maintenance and Corridor Management for National Highway System in India (Approx. Cost US \$ 1.1 million)

This study broadly involves development of an effective, efficient and sustainable maintenance management and Corridor Management system for the existing National Highways Network in India.

- (2) Procurement & Contract Management and Institutional Development of NHAI (Approx. cost US \$ 0.3 million)

This study broadly includes formulations of proposals for sustainable institutional strengthening and capacity building for NHAI for its future activities in planning, financing, procurement and contract management which will develop an efficient organisational system for NHAI and contribute in skill development of the staff for monitoring of large size projects with quality assurance.

The institutions concerned such as multilateral agencies, investment banks, accounting houses, local financial institutions, etc. will pay attention to the progress of these studies because NHAI is expected to play more important roles in implementing national highway projects through strengthening of its institutional capabilities.

9.9 Project Implementation Structure for National Highway Bypasses

It may be possible to assume some types of project implementation for the ten bypasses under the Study. Although it is strongly suggested due to urgency in National Highway improvements and scarcity in the Governmental budgets, the BOT scheme might not be readily applicable without any premise to all of the ten bypasses, because each project is under the diversified peculiar local circumstances such as social conditions and perspective viability as a toll road. The possible options for the project implementation may be classified as the followings:

Option A : BOT exclusively by private investment on highway improvement only

Option B : BOT with strong Government support (All Government Support (1) through (5) in Table 9-1 must be granted.)

- Option C : BOT accompanying en-route real estate development supportive to the project viability
- Option D : Semi-Private, Semi-Public (Partial project implementation by the Government with actual expenditure of public funds precedent to the private participation afterwards)
- Option E : Public works (Conventional public-sector implementation of the road project)

Then, reflecting the outcomes from Social Environmental Study in Chapter 7 and Financial Analysis in Chapter 10, the project implementation types for the ten bypasses under the Study could be concluded as follows:

- | | | |
|-----|-------------------|----------------------------|
| 1. | Bareilly Bypass | by Option A |
| 2. | Patna Bypass | by Option B and/or C, or D |
| 3. | Keonjhar Bypass | by Option E |
| 4. | Balugaon Bypass | by Option B and/or C, or D |
| 5. | Vijayawada Bypass | by Option E |
| 6. | Kannur Bypass | by Option B and/or C |
| 7. | Nandura Bypass | by Option B and/or C |
| 8. | Khamgaon Bypass | by Option A |
| 9. | Bhopal Bypass | by Option A |
| 10. | Gwalior Bypass | by Option B and/or C |

In case of implementing a highway project on a BOT basis, the most essential aspect is the financial feasibility of the project viewed from the investors who usually set up the Special Purpose Vehicle (SPV) and participate as equity holders, as well as the financial institutions which offer the loans if the project is judged to be "bankable." The financing structure comprises the concessionaire (SPV), sponsors (investors), financial institutions, the Government, and so on as shown in Figure 9-1. To promote the financing to infrastructure projects such as toll roads, financial security package must be deliberately provided as shown in Figure 9-2.

As compared with other infrastructure projects, the amount of money to be financed for a bypass BOT project is rather small. Therefore, contractors, for example, are likely to show an interest to the project as an investor. For the general reference, the top nine Indian contractors, as well as three financial institutions, are listed in Tables 9-6 and 9-7, respectively. In addition, since taxes have serious influence on private initiatives for infrastructure projects, tax provisions in India in this regard is summarised in Table 9-8.

Table 9-6 Turn-over of the top 9 Contractors in India (95-96)

(in million Rs.)

Name of the Company	Turnover
1. Larsen & Toubro Ltd	43,230
2. Fluor Daniel India Inc	9,300
3. Hindustan Construction Ltd	2,204
4. Punj & Lloyd Co Ltd	1,531
5. VS Demp Co Ltd	1,126
6. Bhageeratha Engineering Co Ltd	773
7. DLF Universal Ltd	742
8. Mackintosh Burn Ltd	264
9. Tata Construction & Project Services Ltd	200

Table 9-7 Financial Highlights of the Three Institutions (1992-93)

Unit : Rs. in crore

	ICICI	IDBI	IFCI
Total Income	1,493.2	3,014.3	1,286.6
Capital (year end)	241.1	753.0	202.5
Reserves	965.4	2,118.9	546.7
Assets (end of the year)	12,354.7	31,083.1	9,973.6
Capital Adequacy Ratio (%)	11.7	13.3	11.0
Debt-equity Ratio	9.2	9.8	9.7
Net Worth	1,200.0	3,400.0	749.2

ICICI : Industrial Credit & Investment Corporation of India Limited

IDBI : Industrial Development Bank of India

IFCI : Industrial Finance Corporation of India Limited

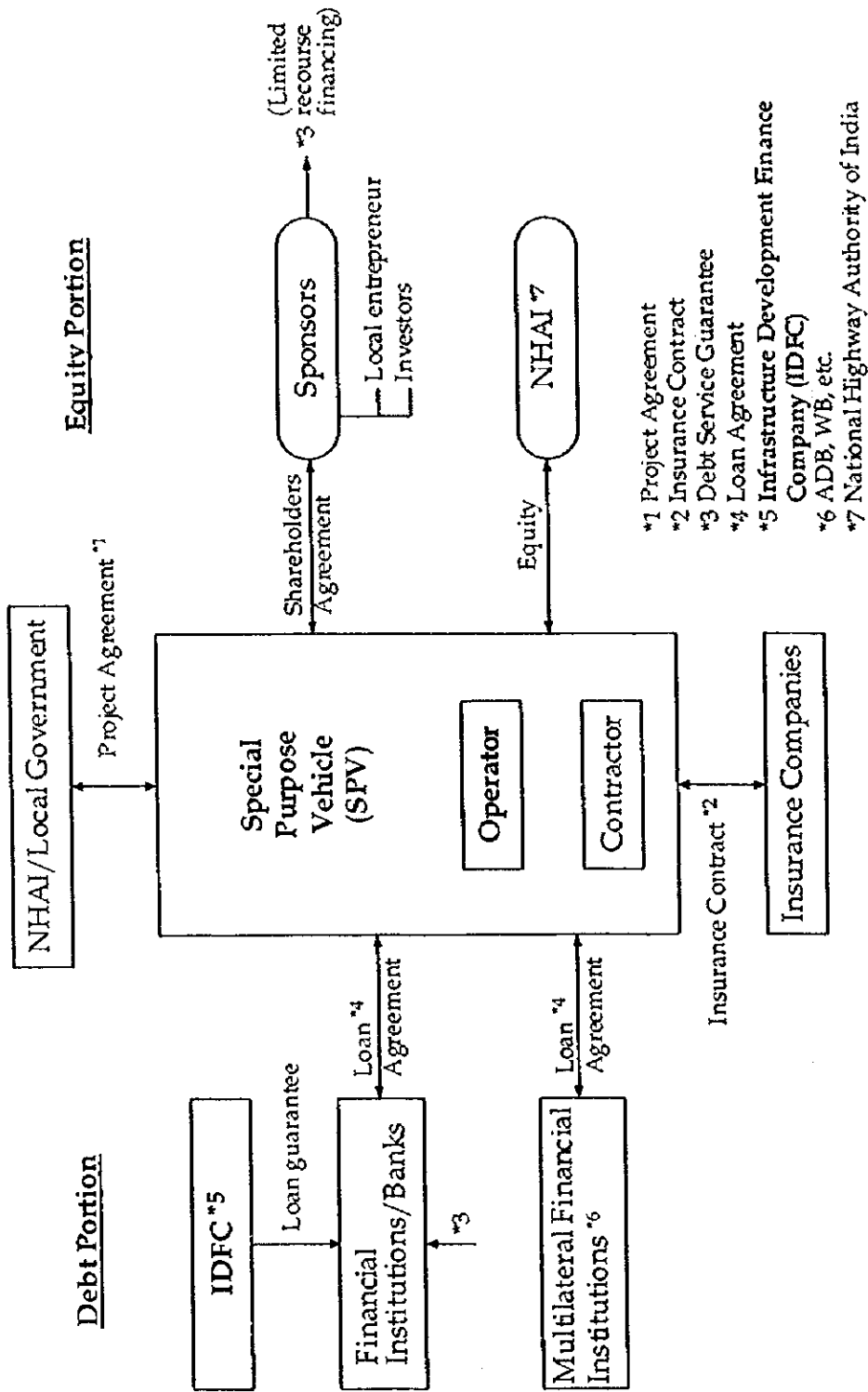
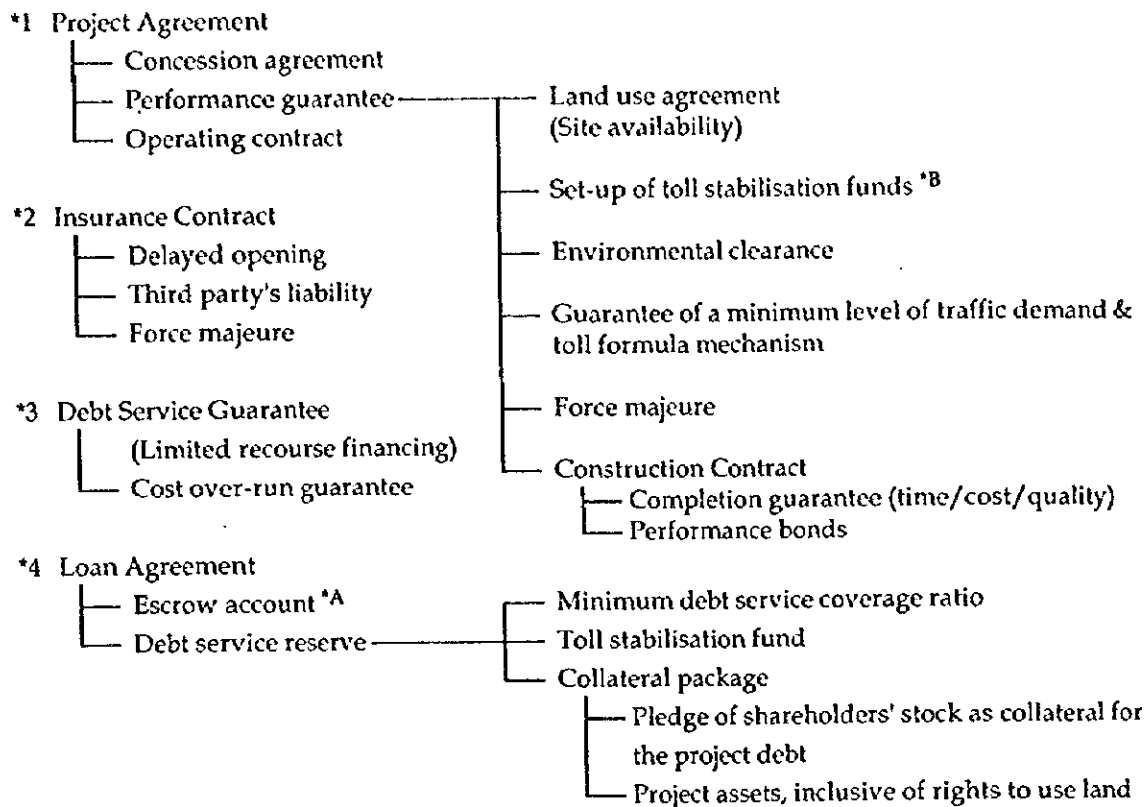


Figure 9-1 Bypass Financing Structure



Note: *A An "Escrow Account", effectively a trust fund, can be set up to which all project revenues and foreign loans are paid. Such an arrangement can avoid the risks of expropriation and ensure a smooth flow of capital and revenues to all parties concerned during the concession period.

*B For transport projects, the initial traffic forecast may be overoptimistic, either due to wrong assumptions, or to the availability of alternative routes, or to an insufficient connecting road network. Income from direct tolls may then fall short of expectations and hence the cash flow of the sponsor is jeopardised.

Figure 9-2 Security Packages of Non-Recourse Financing for Toll Road Infrastructure Project

Table 9-8 Taxation (1/2)

Tax Provision under Indian Laws for Profits on Infrastructure Project

The tax provisions or tax holiday applicable to companies engaged in the business of developing, maintaining and operating any infrastructure facility in India are covered under Sec 80-IA of the Indian Income Tax Act, 1961 [Refer Sub-Section (4A), 5(ia) and 6(iv)]

Sec 80-IA-Sub. Sec. (4A)

This section applies to any enterprise carrying on the business of developing, maintaining and operating any infrastructure facility which fulfils the following conditions, namely:-
The enterprise owned by a company registered in India or by a consortium of such companies;

The enterprise has entered into an agreement with the Central Government or a State Government or local authority or any other statutory body for developing, maintaining and operating a new infrastructure facility subject to the condition that such infrastructure facility shall be transferred to the Central Government, State Government, Local Authority or such other statutory body, as the case may be within the period stipulated in the agreement.

The enterprise starts operating and maintaining the infrastructure facility on or after 1st day of April 1995.

Tax Holiday

Sub-Section (5) (ia)

Profits and gains from such business derived for the initial five assessment years are 100% exempt from tax and thereafter 30% of such profits and gains will be exempt from tax.

Sub-Section (6) (iv)

Tax holidays is for any ten consecutive assessment years falling within a period of twelve assessment years beginning with the assessment year in which an assessee begins operating and maintaining infrastructure facilities.

Sub-Section 12 (ca)

"Infrastructure facility" means:- A road, highway, bridge, airport, port, rail system or any other public facility of a similar nature as may be notified by the Board in this behalf in the Official Gazette. A water supply project, irrigation project, sanitation and sewage system.

Brief Synopsis- Tax Holiday

Any company engaged in an "Infra-structure project" in India on "BOT" or "BOOT" basis can avail of the following tax concessions:-

No tax on the profit of such business for the initial five assessment years. For the next five years, 30% of the Profit are exempt from tax.

Conditions

The enterprise is owned by a company registered in India or by a consortium of such companies.

(continued)

Table 9-8 Taxation (2/2)

The enterprise has entered into an agreement with Central/State Government/Local authority of India and the infrastructure facility will be ultimately transferred to the Indian authority with in the period stipulated.

The infrastructure facility is operated/maintained on or after 1.4.95.

Note: for the purpose of tax concessions, the company can choose any ten consecutive assessment years falling within a period of 12 years beginning with the first assessment year in which the infrastructure facility begins to operate.

2.0 Joint Venture Company

2.1 A foreign company can enter into a Joint Venture Agreement with an Indian Company to form a Joint Venture Company (JVC) in India.

The JVC shall be incorporated under the laws of India (Under the Indian Companies Act, 1956) and shall be subjected to the levy of corporate taxes in India (Under Indian Income Tax Act. 1961).

2.2 Foreign Companies Shareholding in JVC (on repatriation basis)

Foreign investment up to 40% in JVC- RBI Permission required which is relatively easy to get.

Foreign investment being more than 51% - Permission required from FIPB (Foreign Investment Promotion Board), SIA (Secretariat of Industrial Approvals) and RBI (Reserve Bank Of India).

2.3 Criteria for FIPB Approval

High Technology Projects where technology is brought in by Foreign Partner

Infrastructure Projects requiring heavy Capital investment where funding is arranged by Foreign Partner.

Conservation of Foreign Exchange Resources.

Export oriented Projects ensuring foreign Exchange inflows.

2.4 Type of Foreign Investment

Repatriable : Foreign Company can repatriate profits after payment of Indian Taxes. Investment can also be repatriated at the time the foreign company wants to disinvest.

Non Repatriable: Fund blocked in investment and the annual profits cannot be repatriated outside India.

2.5 Corporate Tax

Foreign Company : Profit earned in India are taxed @48%
Royalty, Technical services @50%

Domestic company : Profit Taxed @ 35%
10% Additional Tax on dividends Declared.

9.10 Toll Collection Systems

A toll road attracts vehicles by providing various benefits such as savings in travel time, distance and operating costs, mitigation of congestion, increase in safety and comfort, etc. whose value the motorist conceives surpasses, as a whole, the amount of toll to be levied. Among those benefits the time saving is one of the most influential features for a toll road, thus the toll collection system to be adopted should be designed to accommodate maximum traffic flows with minimum delay and, desirably, minimum number of stops.

The toll collection systems comprise two fundamental features. One is the closed toll system for which the road is usually fully access-controlled so that all users are captured at some locations, while the other is the open toll system which allows some users to go through the road free of charge.

Another feature of the toll road is the type of the toll rates. If the toll road has a sufficiently long distance, or is somehow wide-spread enough to constitute a network, and has a number of access and digress points, the toll rates based on the distance travelled are generally rationalised. On the other hand, a relatively small-sized toll road usually adopts a flat rate system in which the tolls are uniform for each vehicle type regardless of the distances travelled.

The toll collection handling methods can be divided into two; one is manual and the other is automatic. There are emerging many types of the latter such as coin-machines, automatic ticket issuing equipment, prepaid card adjustment system, and electronic toll collection systems (ETC) which are under active investigations as one of the Intelligent Transport Systems (ITS) in some of the developed countries.

The Bypasses under the Study are planned mostly as short-distance detour toll roads on the partially improved National Highways, even if any of them are implemented as a BOT project. Therefore, for the simplicity and ease in applicability, a manually-handled, flat-rate toll system with a barrier-type toll plaza across the main carriageway would be considered suitable to those bypasses. (The necessary number of toll plazas would be three for Bareilly and Bhopal Bypasses and only one for all others.) However, reflecting the MOST policies to the preliminary road design, all Bypasses are assumed to be fully access-controlled, hence the toll collection system to be adopted will be inevitably a closed system.

9.11 Road Maintenance and Operation Programs

A constructed road through implementation of a BOT project consequently turns out to be operated and maintained for a certain period as a toll road. The concessionaire (or SPV as described in Chapter 9.9) has to provide its own personnel, facilities and equipment for maintenance and operation of the toll road.

The maintenance and operation station, usually located beside the road and necessarily adjacent to the toll plaza in case of an operation station, comprises buildings for administration offices and toll collection/communication machines, garages for maintenance vehicles, warehouses, parking spaces, etc. Maintenance equipment includes sedans, vans, trucks, excavators, sweepers, mowers, portable generators, miscellaneous hand tools and so on. The configuration of toll charging equipment depends upon the adopted collection method, but, at least, a real-time, on-line computing and recording system should be provided even in case of manual collection.

Personnel required for toll road maintenance and operation includes such manpower as for management, administration, civil engineering maintenance, equipment (communication, machines, buildings, etc.) maintenance, toll collection, security and so on, each of which generally consists of managers, clerks, technical specialists and labourers.

Activities comprising the road maintenance are as follows:

- 1) Routine maintenance
 - Cleaning of the road
 - Maintenance of earthwork sections such as minor pavement repair, minor pavement markings repainting, roadside maintenance, and vegetation
 - Lighting
 - Bridge maintenance and repair such as for expansion joints, shoes, and railings
 - Tunnel maintenance and repair
 - Maintenance of toll collection machines
- 2) Periodic maintenance
 - Pavement overlay
 - Metal bridge repainting

Pre-Feasibility Study

<i>Chapter 1</i>	<i>Socio-economic Conditions of the Study Area</i>
<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>

Chapter 10 ***Priority of the Bypasses***

10 Priority of the Bypasses

Regarding the scale of bypasses to be selected for the Feasibility Study, the following two aspects was applied as a guideline.

- 1 Maximum three bypasses, and
- 2 Their combined bypass length would not exceed about 60 km

In order to select the bypasses to be forwarded to the second phase of the Study (Feasibility Study), the following aspects were applied as the scoring criteria for the determination of the priority of the project 10 bypasses:

1. Congestion rate in 2002 on NH without a bypass scheme
2. Economic Internal Rate of Return (EIRR) of the project
3. Degree of adverse Environmental Impact by the project
4. Degree of adverse Social Impact by the project
5. Condition of land acquisition
6. Engineering feasibility
7. Contribution to the National Highway Development Plan
8. Required period for implementation

10.1 Considerations for the Scoring Criteria

(1) Congestion Rate in 2002

According to the estimated future traffic projection, the traffic volume will increase and exceed the NH capacity in some proposed bypass area in 2002. Therefore it was understood that the NH which shows the higher congestion rate in 2002 will necessitate the implementation of the bypass, and shall be given the higher priority.

As an indicator of congestion rate, the highest ratio of (Traffic Volume)/(Highway Capacity) on each NH without bypass scheme was adopted. The applied congestion rate was tabulated below.

Name of Bypass	1	2	3	4	5	6	7	8	9	10
Scoring Criteria	Barcilly Bypass	Patna Bypass	Keonjhar Bypass	Balugaon Bypass	Vijayawada Bypass	Kannur Bypass	Nandura Bypass	Khangaon Bypass	Bhopal Bypass	Gwalior Bypass
1 Congestion Ratio in 2002	2.02	1.07	0.81	1.04	0.97	1.40	1.06	1.45	2.03	2.06

(2) Economic Internal Rate of Return (EIRR)

The estimated EIRR value by Pre-Feasibility Study represents the viability of each bypass project. The bypass scheme having higher EIRR shall be given a higher priority. The table below shows the estimated EIRR presented in Chapter 8, Preliminary Economic and Financial Analysis.

Name of Bypass	1	2	3	4	5	6	7	8	9	10
Scoring Criteria	Bareilly Bypass	Patna Bypass	Koonjhar Bypass	Balugaon Bypass	Vijayawada Bypass	Kannur Bypass	Nandura Bypass	Khangaon Bypass	Bhopal Bypass	Gwalior Bypass
2 Estimated EIRR (%)	112.1	49.7	11.6	23.0	43.2	57.4	50.2	36.8	56.9	34.5

(3) Degree of adverse Environmental Impact by the project

Any adverse environmental impact by the implementation of the project bypass shall be avoided as much as possible. The scale of required cost for mitigation measures or the difficulty to provide an appropriate mitigation measures against the adverse environmental impact has to be considered to determine the bypass priority.

(4) Degree of adverse Social Impact by the project

Similar to the above criteria (3) of environmental impact aspect, any adverse social impact also shall be avoided. Even though the proposed bypass shows high EIRR value and was forecasted to have very congested traffic on NH in future, if the community in the concerned area does not welcome the bypass, the implementation will face the difficulty. The social impact aspect was counted as one of the scoring criteria.

(5) Condition of Land Acquisition

To complete the land acquisition process before the commencement of construction in time is very essential to assure the smooth implementation of the project as scheduled. Although the implementation of the bypass is welcomed by the people, and no difficulty is expected in the required process, when the estimated cost of land acquisition and compensation is too excessive, the responsible authority for the land acquisition may face to the difficulty in the budgetary arrangement. The condition of land acquisition was taken into consideration to select the bypass.

(6) Engineering Feasibility

The required construction method is to be feasible in terms of engineering technology. It is indeed valuable to introduce advanced construction engineering to India. However this is not the purpose of this Study. When the bypass is able to be constructed by prevailed common construction technique, it means every contractor may have a chance to bid the project tender, and little possibility of construction delay due to the technical problem. Taking into account these, the engineering feasibility was applied as one of the component of scoring criteria.

(7) Contribution to the National Highway Development Plan

In the 9th Five Year Plan (1997~2002), GOI emphasises the improvement/upgrading of high density corridors (HDCs). At the same time, the development of NH in HDCs is required to concentrate broadly on the quadrilateral with diagonals, connecting the major cities of Delhi, Mumbai, Calcutta and Chennai. Therefore each bypass was evaluated in the light of this development plan.

(8) Required period for implementation

The target year for the opening of the selected bypasses is expected as 2002. In either case of construction by GOI or private investors, the physical period for the detailed engineering design, selection of the contractor, and civil work construction is required. In order to realise this short term scheme, the possible implementation programme (I/P) under the BOT scheme basis would be given as shown in the chart below.

Item	1998	1999	2000	2001	2002
Final Report of Feasibility Study	▼				
Announcement	■				
Tender					
Tender period	■				
Open	▼				
Evaluation	■				
Negotiation		■			
Signinig		▼			
Construction					
Mobilisation		■			
Construction		—————			

In this chart, the detailed engineering design was assumed to be conducted during the construction period as shop drawing basis by the contractor. Although this is quite tight schedule, the civil work construction will be able to start in April 1999, and complete by the end of March 2002. Therefore the required construction period for the selected bypass shall be equal to or

shorter than 36 months.

10.2 Scoring Methodology

It was assumed that the Scoring criteria, (1) Congestion Rate in 2002, and (2) Economic Internal Rate of Return (EIRR) should have major influence upon the scoring result. The other criteria from (3) to (8) were assumed as essential supporting criteria.

In order to give a score to each bypass project, the scoring process was carried out in a summation basis, giving a 100 as a full score, with the following weight to each scoring criterion.

Scoring criteria	Score
1. Congestion rate in 2002	30
2. EIRR	20
3. Degree of adverse Environmental Impact	10
4. Degree of adverse Social Impact	10
5. Condition of land acquisition	10
6. Engineering feasibility	6
7. Contribution to the NH Development Plan	10
8. Required period for implementation	4
Full Score	100

For the scoring purpose, scores for each criterion were applied as shown in the following tables:

1 Congestion Rate in 2002

Degree of congestion	Score
equal to or more than 2.0	30
1.0 to 2.0	Proportional
equal to or less than 1.0	0

2 EIRR

Estimated EIRR	Score
equal to or more than 100%	20
10 to 100%	Proportional
equal to or less than 10%	0

3 Degree of adverse Environmental Impact

Degree of adverse Environmental Impact	Score
negligible	10
little	8
acceptable	6
countermeasure is required at low cost	4
countermeasure is required at high cost	2
not recommended to implement	0

4 Degree of adverse Social Impact by the project

Degree of adverse Social Impact	Score
negligible	10
little	8
acceptable	6
significant. low mitigation cost	4
significant. high mitigation cost	2
not recommended to implement	0

Based on the field investigation, scores for degree of adverse Environmental Impact and Social Impact were judged as below.

Name of Bypass	1	2	3	4	5	6	7	8	9	10
	Bareilly Bypass	Patna Bypass	Keonjhar Bypass	Balugaon Bypass	Vijayawada Bypass	Kannur Bypass	Nandura Bypass	Khangaon Bypass	Bhopal Bypass	Gwalior Bypass
Scoring Criteria										
3 Environmental Impact	7	5	9	8	9	5	9	10	8	8
4 Social Impact	6	8	4	6	8	8	8	8	8	6

5 Condition of land acquisition

Land acquisition condition	Score
no difficulty is expected in process and cost possible to overcome the problem in time	10
possible to overcome the problem in time	5
difficulty is expected in process or cost	0

Based on the obtained field information by the Social Environmental Study, the condition of land acquisition was scored as below.

Name of Bypass	1	2	3	4	5	6	7	8	9	10
	Bareilly Bypass	Patna Bypass	Keonjhar Bypass	Balugaon Bypass	Vijayawada Bypass	Kannur Bypass	Nandura Bypass	Khangaon Bypass	Bhopal Bypass	Gwalior Bypass
Scoring Criteria										
6 Condition of Land acquisition	5	10	5	5	10	0	10	10	10	5

6 Engineering feasibility

Engineering feasibility	Score
feasible, not require any complicated engineering	6
agreeably feasible	3
require complicated engineering	0

7 Contribution to the National Highway Development Plan

Degree of contribution to the development plan	Score
Located on the quadrilateral or diagonal corridor	10
Not located on the above corridor	5

8 Required period for implementation

Required period for implementation	Score
possible to realise the project by April 2002	4
need special effort to realise by April 2002	2
impossible to realise the project by April 2002	0

Regarding the above three scoring criteria 6, 7 and 8, the following considerations were made:

for scoring criteria 6

- Patna Bypass will cross over Sone River and require approximately 1.4 km long bridge. This bridge was proposed to be PC Extra-dosed type or PC Box Rahmen type having 100 to 150 m span. The bridge construction will require the contractor who has high construction technology and ample experience.
- Kannur Bypass will pass through heavily built up areas. Due to hilly terrain condition, the bypass will underpass the existing road which require the provision of over bridge in three locations. For these over bridge construction, a contractor may face the difficulty in his operations.

for scoring criteria 7

- Patna Bypass on NH30, Kannur Bypass on NH17, and Bhopal Bypass on NH12 are not categorised as the high density corridors (HDCs) on the quadrilateral with diagonals.

for scoring criteria 8

- Patna Bypass was judged to require 4 to 5 years construction period.
- Kannur Bypass was considered that the construction period may exceed 3 years due to the densely built-up surroundings and its construction complexity.

The table shown below gives a scoring results by the above mentioned Scoring Method.

Scoring Result

Scoring Criteria	Name of Bypass										Full Score
	1 Bareilly Bypass	2 Patna Bypass	3 Keonjhar Bypass	4 Balugaon Bypass	5 Vijayawada Bypass	6 Kannur Bypass	7 Nandura Bypass	8 Khangaon Bypass	9 Bhopal Bypass	10 Gwalior Bypass	
1 Congestion Rate in 2002	2.02	1.07	0.81	1.04	0.97	1.40	1.06	1.45	2.03	2.06	
Score	30	2	0	1	0	12	2	14	30	30	30
2 Estimated EIRR (%)	112.1	49.7	11.6	23.0	43.2	57.4	50.2	36.8	56.9	34.5	
Score	20	9	1	3	7	11	9	6	10	5	20
3 Environmental Impact	7	5	9	8	9	5	9	10	8	8	10
4 Social Impact	6	8	4	6	8	8	8	8	8	6	10
5 Condition of Land acquisition	5	10	5	5	10	0	10	10	10	5	10
6 Engineering feasibility	6	3	6	6	6	3	6	6	6	6	6
7 Contribution to the NH Development Plan	10	5	10	10	10	5	10	10	5	10	10
8 Implementation period	4	0	4	4	4	2	4	4	4	4	4
Total	88	42	39	43	54	46	58	68	81	74	100
Remark : Bypass Length in km	31.1	49.8	8.5	15.4	28.1	11.1	6.4	10.9	40.3	26.0	

10.3 Recommendation of Bypasses for the Feasibility Study

According to the scoring result, the top priority was given to Bareilly Bypass, the second to Bhopal Bypass and the third to Gwalior Bypass. These three bypasses were forecasted to have traffic over two times of road capacity in 2002. The Study Team agrees that these bypasses are required urgently.

Referred to the expected scale of bypasses to be selected for the Feasibility Study, it was recommended to select two bypasses, Bareilly Bypass and Gwalior Bypass. Based on the preliminary design in the Pre-Feasibility Study, the total length of these two bypasses will be approximately $31.1 + 26.0 = 57.1$ km.

Feasibility Study

Chapter 11 Socio-economic Conditions of the Study Area

<i>Chapter 12</i>	<i>Supplemental Traffic Survey and Analysis</i>
<i>Chapter 13</i>	<i>Future Traffic Demand Forecast</i>
<i>Chapter 14</i>	<i>Field Investigations</i>
<i>Chapter 15</i>	<i>Design Standards</i>
<i>Chapter 16</i>	<i>Design for the Feasibility Study</i>
<i>Chapter 17</i>	<i>Construction Plan</i>
<i>Chapter 18</i>	<i>Toll Collection System</i>
<i>Chapter 19</i>	<i>Operation and Maintenance System</i>
<i>Chapter 20</i>	<i>Cost Estimates</i>
<i>Chapter 21</i>	<i>Economic and Financial Analysis</i>
<i>Chapter 22</i>	<i>Implementation Programme</i>
<i>Chapter 23</i>	<i>Recommendations</i>

11 Socio-economic Conditions of the Study Area

11.1 Uttar Pradesh State (U.P.)

11.1.1 Population and Labour Force Structure of U.P.

The state of Uttar Pradesh has total area extending about 294,000 sq.kms with a population of 139 million (1991). Average annual increase rate of population from 1981 to 1991 is at 2.3% p.a. Population growth in urban area is higher than that of rural area (Table 11 - 1).

About 70% of labour force is engaged in cultivators and agricultural work. A participation ratio to total population was about 30% in 1991 (Table 11-2)

11.1.2 Vehicle Registration of U.P.

Recent trend of vehicle registration in U.P. is shown in Table 11-3. Although the growth rate of cars was at 7.8% p.a., buses and trucks indicate low growth rates (2.7% and 0.4% respectively). Number of vehicles per population was 1.36 vehicles/100 persons in 1991.

11.1.3 Economic Structure of U.P.

The past trend of Net State Domestic Product (NSDP) for U.P. is as shown in Table 11-4. Average annual growth rate of NSDP was recorded as 4.0% for the last ten years (1985/86 - 1995.96). Percentage share of the Primary sector has been going down from 52.3% in 1980 to 43.0% in 1995.

11.2 Bareilly District

11.2.1 Population Distribution and Transport Network

Bareilly, headquarters of the Rohilkhand region and one of the important cities in the U.P. State, is situated in the north central part of the State at a distance about 248 km along NH-24 from Delhi. It is almost midway between the National Capital and Lucknow, the capital of U.P. Other important and neighbouring towns falling on NH - 24 route are Moradabad, Rampur and Shahjahanpur. State Highway 37 and 33 also pass through/emanate from Bareilly affording access to the neighbouring towns of Pilibhit, Nainital, etc. District of Bareilly has 2.8 million population and Bareilly city has 620 thousand population (Urban Area) in 1991. Distribution of urban population is presented in Figure 11-1. Satellite towns in the district such as Baheri, Nawabganj, Faridpur and Aonla are situated along NH 24, SH 37 and SH 33 and connected directly to Bareilly. Figure 11-2 indicates the existing transportation network in Bareilly district. Road network pattern is radiating to/from Bareilly city and no by passable/ detour routes are existing at present.

Table 11-1 Population of Study Area (U.P. & Bareilly)

State/District/Urban Agglomeration/City		(Total) (Rural) (Urban)	Population ('000)		AAGR (81-'91) %	
			1981	1991		
State	Uttar Pradesh	T	110,886.0	139,112.0	2.3	
		R	90,913.0	111,506.0	2.1	
		U	19,973.0	27,606.0	3.3	
Direct Influence Areas (Bareilly District)	Bareilly District	T	2,265.0	2,834.0	2.3	
		R	1,614.0	1,905.0	1.7	
		U	651.0	929.0	3.6	
	Urban Areas in Bareilly District					
		Baheri M.B.		29.7	46.0	4.5
		Aonla M.B.		26.4	34.4	2.7
		Faridpur M.B.		25.7	39.3	4.3
		Nawabganj M.B.		14.9	22.7	4.3
		Sirauli T.A.		11.5	14.6	2.4
		Dhaura Tanda T.A.		11.0	15.1	3.2
		Thuriya Nizammat Khan T.A.		11.0	15.0	3.2
		Shishgarh T.A.		10.4	14.6	3.5
		Richha T.A.		10.0	13.0	2.7
		Senthal T.A.		9.6	11.3	1.6
		Fatehganj Pashchimi T.A.		9.6	14.4	4.1
		Deoranian T.A.			12.4	
		Shahi T.A.		8.8	9.4	0.7
		Bisharatganj T.A.		7.8	9.7	2.2
		Shergarh T.A.		7.7	9.4	2.0
		Rithaura T.A.		7.6	9.7	2.5
		Mirganj T.A.		7.3	9.1	2.2
	Faridpur T.A.			6.0		
	Fatehganj Purbi T.A.		4.4	5.8	2.8	
	Bareilly U.A.		437.8	617.4	3.5	
Neighbouring Districts	Rampur District	T	1,177.0	1,502.0	2.5	
		R	863.0	1,109.0	2.5	
		U	314.0	393.0	2.3	
	Budaun District	T	1,964.0	2,448.0	2.2	
		R	1,646.0	2,017.0	2.1	
		U	318.0	431.0	3.1	
	Shahjahanpur District	T	1,649.0	1,987.0	1.9	
		R	1,329.0	1,574.0	1.7	
		U	320.0	413.0	2.6	
	Pilibhit District	T	1,006.0	1,283.0	2.5	
		R	843.0	1,046.0	2.2	
		U	163.0	237.0	3.8	
	Nainital District	T	1,133.0	1,540.0	3.1	
		R	819.0	1,037.0	2.4	
		U	314.0	503.0	4.8	

Source : Indian Economic Information Yearbook, 1996

Original Source : Census of India 1991 Primary Census Abstract, Vol.1

Note : AAGR : Average Annual Growth Rate (%)

Table 11-2 Labor Force Structure (U.P. & Bareilly)

(Unit : Persons)

Categories	Uttar Pradesh		Breilly District	
	1991		1991	
		%		%
1. Cultivators	22,031,181	53.3	432,560	53.1
2. Agri. Labors	7,833,258	18.9	117,162	14.4
3. Livestock, Forestry etc.	295,684	0.7	5,278	0.6
4. Mining & Quarrying	34,598	0.1	100	0.0
5. Manufacturing, Processing				
a) Household Industry	997,165	2.4	12,171	1.5
b) Other than house-hold	2,208,368	5.3	37,452	4.6
6. Construction	510,520	1.2	16,209	2.0
7. Trade & Commerce	2,550,857	6.2	61,229	7.5
8. Transport, Storage & Commu.	771,224	1.9	24,076	3.0
9. Other Services	4,127,879	10.0	107,890	13.3
Total Workers	41,360,734	100.0	814,127	100.0
Population	139,112,287		2,834,616	
Participation Ratio	0.297		0.287	

Source : Census of India 1991

Table 11-3 Motor Vehicles in Uttar Pradesh State

(Unit : 1,000 vehicles)

Vehicle Type	1991	1992	1993	1994	1995	AAGR% '91-'95
1. Cars	87.6	106.0	106.6	108.4	118.2	7.8
2. Jeeps	39.5	45.1	51.9	49.7	51.6	6.9
3. Taxis	12.6	18.4	17.9	55.4	17.9	9.2
4. Autorickshaws	32.0	37.2	42.0	5.4	45.1	9.0
5. Buses	24.1	24.8	26.9	25.4	26.8	2.7
6. Trucks/Lorries	74.8	77.2	82.7	78.5	75.9	0.4
7. Trailers	13.3	12.2	14.0	14.4	9.9	-7.1
8. Two Wheelers	1,331.5	1,521.3	1,642.9	1,736.4	1,815.4	8.1
9. Tractors	266.3	290.9	356.2	360.4	363.8	8.1
10. Others	16.2	17.5	18.1	14.7	19.9	5.3
All vehicles	1,897.9	2,150.6	2,359.2	2,448.7	2,544.5	7.6

Source : Motor Transport Statistics of India, 1995, Transport Research Wing Ministry of Surface Transport.

Table 11-4 Net State Domestic Product (NSDP) by Industrial Origin (Uttar Pradesh)
(at constant 1980-81 prices)

Categories	(in Rs. Crores)															
	1980-81	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	AAAGR (%) per annum	80/81-90/91	91/92-95/96	85/86-95/96
1. Agriculture	6996.14	7872.68	8071.93	8219.30	9090.36	8925.80	9577.78	9831.21	9604.36	9971.28	10233.10	10429.36	3.2	3.2	1.5	2.9
2. Forestry	267.84	135.69	135.29	136.22	125.63	87.96	87.50	94.22	88.19	93.28	79.14	71.10	-10.6	-10.6	-6.8	-6.3
3. Fishing	23.14	48.01	56.5	55.84	59.68	60.54	67.85	73.93	79.17	86.00	90.89	94.47	11.4	11.4	6.3	7.0
4. Mining & Quarrying	42.43	60.72	69.96	59.19	68.06	84.75	127.67	180.00	153.40	137.00	152.54	195.77	11.6	11.6	2.1	12.4
Subtotal - PRIMARY	7329.55	8117.1	8333.68	8470.55	9343.73	9159.05	9860.80	10179.36	9925.12	10287.56	10549.67	10790.7	3.0	3.0	1.5	2.9
5. Manufacturing	1355.81	2179.26	2304.71	2559.06	3149.37	3255.87	3404.31	3327.96	3409.19	3481.88	3634.51	3793.22	9.6	9.6	3.3	5.7
6. Construction	709.99	730.95	763.81	786.35	821.95	714.90	791.02	768.87	767.44	745.00	761.64	784.66	1.1	1.1	0.5	0.7
7. Electricity, Gas & Water Supply	81.73	130.83	162.59	171.61	229.72	277.18	313.36	249.48	202.55	207.32	229.40	242.37	14.4	14.4	-0.7	6.4
Subtotal - SECONDARY	2147.53	3041.04	3231.11	3517.02	4201.04	4247.95	4508.69	4346.31	4379.18	4434.20	4625.55	4820.25	7.7	7.7	2.6	4.7
8. Transport, Storage & Communications	340.64	453.29	500.07	505.10	528.00	547.90	562.07	568.31	620.07	602.80	629.58	661.18	5.1	5.1	3.9	3.8
9. Trade, Hotels & Restaurants	2049.72	2431.53	2518.65	2592.88	2888.64	2900.16	3033.56	3207.60	3376.52	3482.87	3548.60	3674.17	4.0	4.0	3.5	4.2
10. Banking, Insurance, Real Estate	943.90	1301.03	1421.98	1603.05	1895.46	2118.06	2176.35	2143.61	2091.68	2118.20	2201.09	2292.16	8.7	8.7	1.7	5.8
11. Public Administration, Other Services	1200.48	1626.53	1700.22	1817.41	2061.74	2527.82	2638.18	2427.68	2730.15	2631.33	2775.30	2873.39	8.2	8.2	4.3	5.9
Subtotal - TERTIARY	4594.74	5812.38	6140.92	6518.44	7373.84	8093.94	8410.16	8347.20	8818.42	8835.20	9154.57	9500.9	6.4	6.4	3.3	5.0
Net State Domestic Product (NSDP)	14011.82	16970.52	17705.71	18506.01	20918.61	21500.94	22779.65	22872.87	23122.72	23556.96	24329.79	25111.85	5.0	5.0	2.4	4.0
State Per Capita Income (Rs.)	1278	1375	1402	1433	1584	1593	1652	1627	1615	1617	1641	1666	2.6	2.6	0.6	1.9
Composition Rate (%)																
Primary	52.3	47.8	47.1	45.8	44.7	42.6	43.3	44.5	42.9	43.7	43.4	43.0				
Secondary	15.3	17.9	18.2	19.0	20.1	19.8	19.8	19.0	18.9	18.8	19.0	19.2				
Tertiary	32.4	34.2	34.7	35.2	35.3	37.6	36.9	36.5	38.1	37.5	37.6	37.8				

Source : Directorates of Economic & Statistics of the State Government of Uttar Pradesh and CSO.

Urban Population
(Census 1991: Persons)

●	Under 20,000
●	20,000 - 50,000
●	More than 600,000

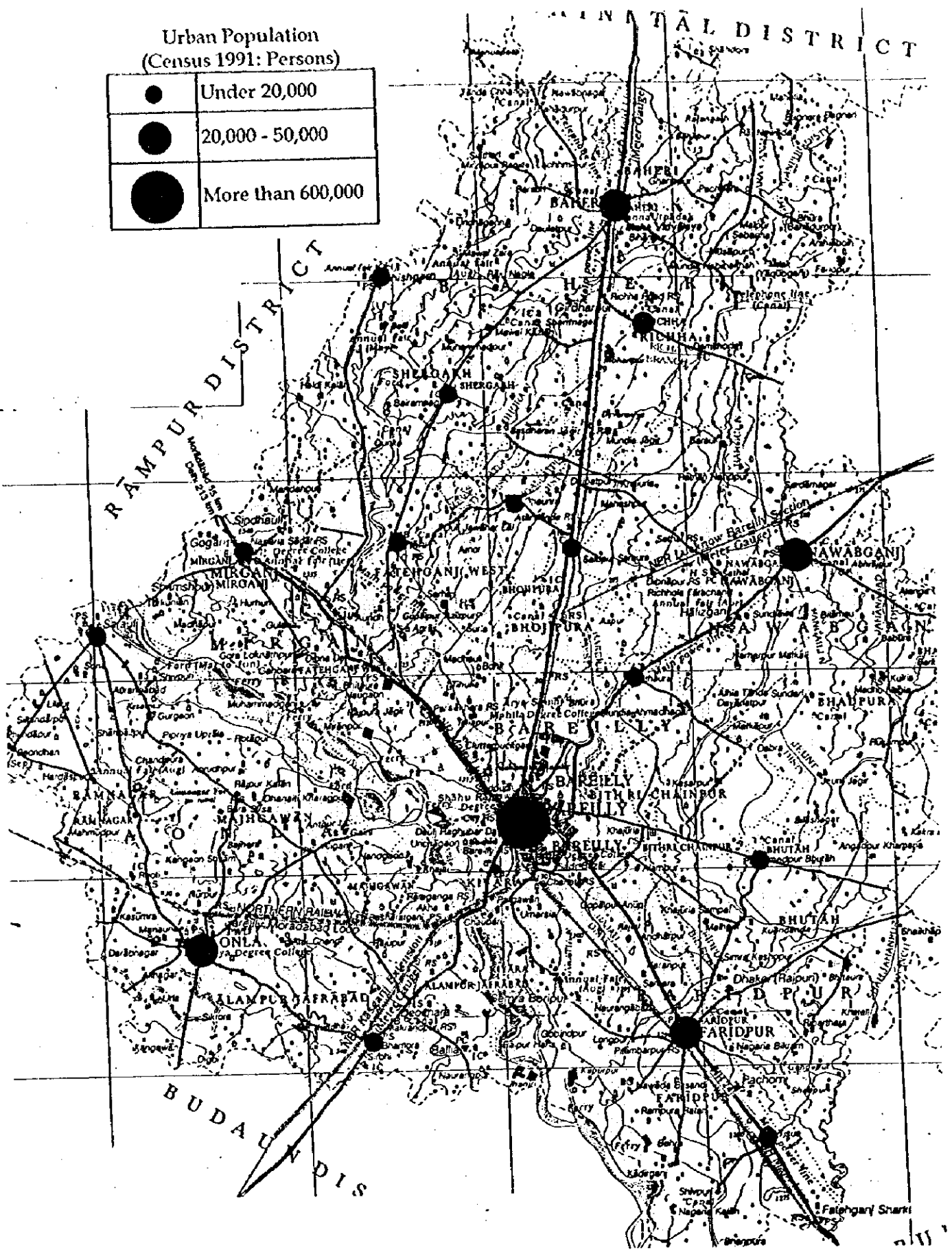


Figure 11-1 Distribution of Urban Population in the Bareilly District
(Census 1991)

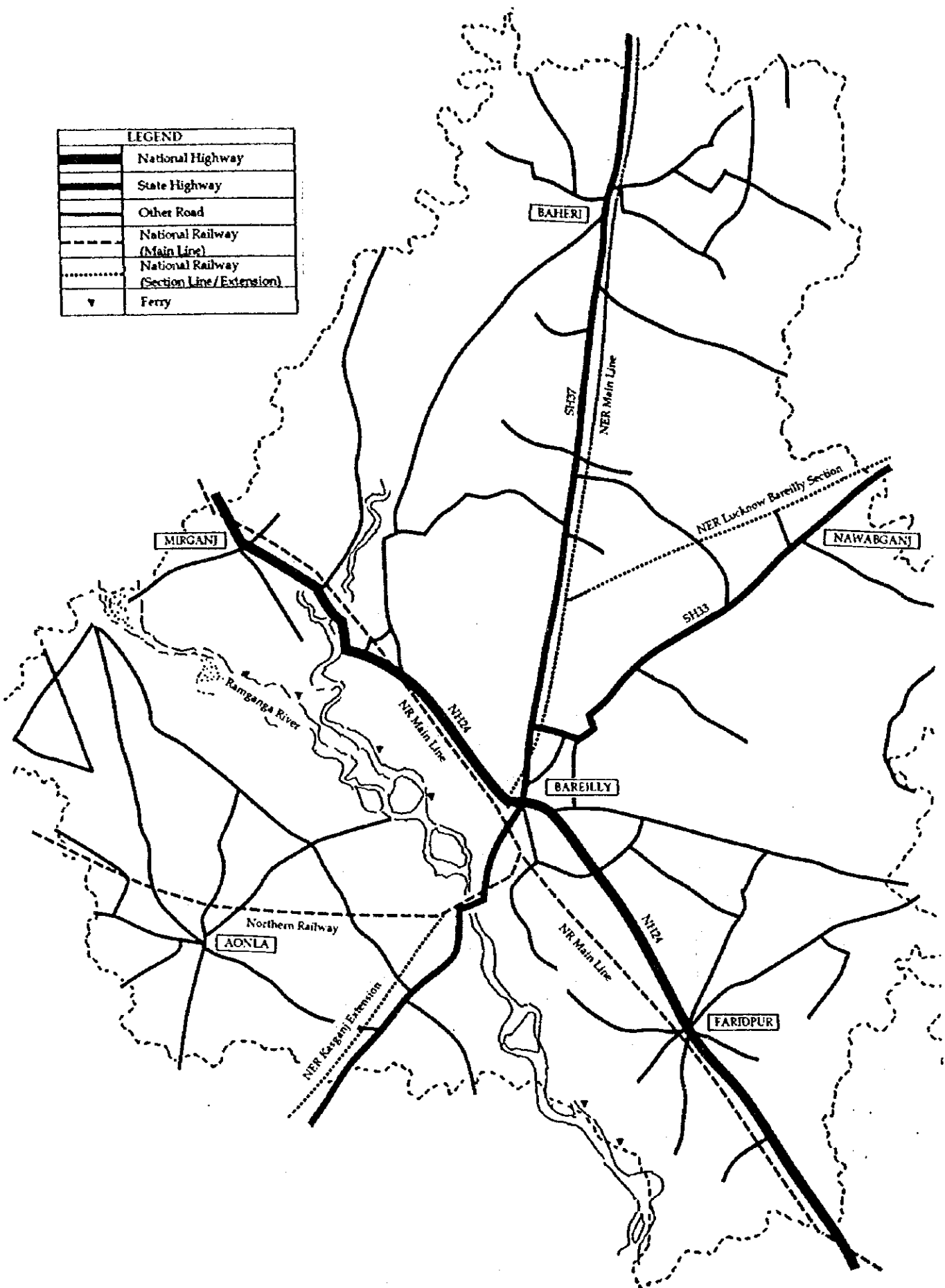


Figure 11-2 Existing Road and Railway Network in Bareilly District

Bareilly also falls on the main trunk route network of the Indian National Railways and thus well connected by railway with important cities via. Dehli, Calcutta, Lucknow etc. as also with other neighbouring towns.

11.2.2 Development Plan for Bareilly (Master Plan)

In order to arrest the growing immigration to the National Capital and reduce the burden of Delhi, the Government of India, as a part of decentralisation policy, has decided to develop **Counter Magnet Cities** in the neighbouring States of U.P., M.P., Haryana, Rajasthan and Punjab. Bareilly is one of such selected Counter Magnet City. These counter magnet cities are expected to act as regional centres in their own regional settings and achieve a balanced pattern of urbanisation. This scenario calls for immediate steps to solve the already unmanageable traffic conditions within Bareilly city. Bareilly which has seen a spindle development with NH-24 as its axis, has no bypass facility inter-linking the National Highway, State Highways and Major District Road passing through or radiating from the city.

Prior to identification as the counter magnet city, in 1974, the first Master Plan for Bareilly was prepared and approved (Plan period 1971 - 1999). In this first version, population of the Bareilly Urban Area will increase to 925,000 by 1996 and the necessity of the Bareilly bypass was already raised as one of new road construction projects.

The revised new Master Plan of Bareilly city for 1986 - 2001 prepared by the Bareilly Development Authority (BDA) in consultation with the Town and Country Planning Department of the Government of U.P. proposed again the necessity of a ring road type bypass for NH -24 around Bareilly. The Barielly Bypass has been one of built-in key components in the future land use plan. The municipal limit of Bareilly has been greatly extended toward west and north-west of the city in uncontrolled way. The Master Plan intends to give the Bypass an important roles not only to solve the traffic problems but also to realise the balanced urbanisation in and around Bareilly city.

11.3 Madhya Pradesh State (M.P.)

11.3.1 Population and Labour Force Structure of M.P.

The state of Madhya Pradesh has total area extending about 443,400 sq.kms with a population of 66 million (1991). Average annual increase rate of population from 1981 to 1991 is at 2.4% per annum. Although about 77% of total population are living in rural area, population growth in urban area was at 3.8% per annum for last ten years (1981 - 1991) which was higher than that of rural area (Table 11-5). About 75% of labour force is engaged in cultivators and agricultural work. A participation ratio to total population has gone down from 38% in 1981 to 29% in 1991 (Table 11-6).

11.3.2 Vehicle Registration of M.P.

Recent trend of vehicle registration in M.P. is shown in Table 11-7. Buses (13.8%) and trailers (12.1%) showed remarkable growth rates. Number of vehicles per population was 2.2 vehicles/100 persons in 1991.

11.3.3 Economic Structure of M.P.

The past trend of Net State Domestic Product (NSDP) for U.P. is as shown in Table 11-8. Average annual growth rate of NSDP was recorded as 4.7% for the last ten years (1985/86 - 1995.96). Percentage share of the Primary sector has been going down from 55.6% in 1980 to 45.3% in 1995.

11.4 Gwalior District

11.4.1 Population, Present Land use and Transport Network

Gwalior is located in the northern part of the State of M.P., about 320 km south along NH-3 from Delhi. Due to the existence of reserved area on the west side of NH-3, the urban area of the Gwalior city is extended to the east side of NH-3 as shown in Figure 11-3. Although the central area of the Gwalior city is avoided from direct passing through by NH-3, problem is limited space for various social/economic activities in the central area. Gwalior District has 1.4 million population and Gwalior city (Urban Area) has about 718 thousand population in 1991. Unlike the State average, about 36% of total labour force is engaged in the service sector and agriculture/cultivator sector's share is only 45% in the District. Gwalior occupies a strategic location on the national transportation network, which is composed of National Highway, Rail, Airways linking the city with various important towns in the country, regions and district centres in the State. At present, Gwalior occupies a location where two railway lines and five roads get converged. The convergence of regional transport routes in the city and their mixing with intra-city traffic creates traffic disorder in the management of traffic movement call for appropriate linkage network of regional roads with the city road network responsible for intra-city.

Table 11-5 Population of Study Area (M.P. & Gwalior)

State/District/Urban Agglomeration/City		(Total) (Rural) (Urban)	Population ('000)		AAGR (81-'91) %	
			1981	1991		
State	Madhya Pradesh	T	52,139.0	66,181.0	2.4	
		R	41,550.0	50,842.0	2.0	
		U	10,589.0	15,339.0	3.8	
Direct Influence Areas (Gwalior District)	Gwalior District	T	1,111.0	1,412.0	2.4	
		R	498.0	582.0	1.6	
		U	613.0	830.0	3.1	
	Community Development Block (C.D.Block) : Rural Areas					
	Ghatigaon (Barai)			85.3	106.4	2.2
	Morar			84.9	105.1	2.2
	Dabra			119.1	135.4	1.3
	Bhitarwar			124.6	132.5	0.6
	Bhander			84.5	102.6	2.0
	Urban Areas in Gwalior District					
	Antari (M.)				8.8	
	Bilaua (M)				10.3	
	Tekanpur (N.M.)				10.7	
	Pichhore (M.)			7.6	9.6	2.4
	Dabra (M.)			33.4	46.6	3.4
	Bhitarwar (M.)				10.2	
	Bhander (M.)			12.5	16.4	2.8
	Gwalior (U.A.)			559.8	717.8	2.5
	(a) Gwalior (M.C.)			542.9	690.8	2.4
	(b) Morar (Cantt)			16.9	27.0	4.8
	Neighbouring Districts	Morena District	T	1,301.0	1,711.0	2.8
R			1,123.0	1,360.0	1.9	
U			178.0	351.0	7.0	
Bhind District		T	970.0	1,219.0	2.3	
		R	804.0	968.0	1.9	
		U	166.0	251.0	4.2	
Datia District		T	312.0	396.0	2.4	
		R	251.0	307.0	2.0	
		U	61.0	89.0	3.8	
Shivpuri District		T	865.0	1,133.0	2.7	
		R	754.0	961.0	2.5	
		U	111.0	172.0	4.5	

Source : Indian Economic Information Yearbook, 1996

Original Source : Census of India 1991 Primary Census Abstract, Vol.1

Note : AAGR : Average Annual Growth Rate (%)

Table 11-6 Labor Force Structure (M.P, & Gwalior)

(Unit : Persons)

Categories	Madhya Pradesh		Gwalior District	
	1991	%	1991	%
1. Cultivators	12,904,121	51.8	141,392	35.0
2. Agri. Labors	5,863,029	23.5	41,219	10.2
3. Livestock, Forestry etc.	345,357	1.4	5,478	1.4
4. Mining & Quarrying	220,904	0.9	2,261	0.6
5. Manufacturing, Processing				
a) Household Industry	601,729	2.4	7,069	1.8
b) Other than house-hold	1,097,189	4.4	43,318	10.7
6. Construction	388,425	1.6	17,097	4.2
7. Trade & Commerce	1,190,029	4.8	41,369	10.3
8. Transport, Storage & Commu.	424,905	1.7	14,368	3.6
9. Other Services	1,898,833	7.6	90,014	22.3
Total Workers	24,934,521	100.0	403,585	100.0
Population	66,181,170		1,412,610	
Participation Ratio	0.377		0.286	

Source : Census of India 1991

Table 11-7 Motor Vehicles in Madhya Pradesh State

(Unit : 1,000 vehicles)

Vehicle Type	1991	1992	1993	1994	1995	AAGR% '91-'95
1. Cars	59.5	64.5	69.7	71.7	77.2	6.7
2. Jeeps	40.7	43.4	44.1	44.6	45.6	2.9
3. Taxis	5.6	6.6	7.9	7.9	8.0	9.3
4. Autorickshaws	24.1	26.6	27.7	29.2	31.4	6.8
5. Buses	18.2	20.6	23.2	26.8	30.5	13.8
6. Trucks/Lorries	70.4	77.0	81.1	83.6	88.1	5.8
7. Trailers	46.8	53.5	58.7	64.2	73.8	12.1
8. Two Wheelers	1,092.8	1,232.6	1,325.6	1,431.1	1,561.1	9.3
9. Tractors	94.0	105.6	115.8	126.3	144.9	11.4
10. Others	8.4	8.0	8.6	8.9	9.1	2.0
All vehicles	1,460.5	1,638.4	1,762.4	1,894.3	2,069.7	9.1

Source : Motor Transport Statistics of India, 1995, Transport Research Wing Ministry of Surface Transport.

Table 11-8 Net State Domestic Product (NSDP) by Industrial Origin (Madhya Pradesh)
(at constant 1980-81 prices)

Categories	1980-81	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	AAGR (%) per annum			
													'80/81- '90/91	'91/92- '95/96	'85/86- '95/96	
1. Agriculture	3060.72	3880.71	3517.13	3937.24	4276.49	3999.16	4785.91	4221.29	4624.88	5400.31	5264.11	5187.17	4.6	5.3	2.9	
2. Forestry	588.94	354.22	286.73	217.53	203.69	213.86	229.52	220.31	176.96	163.42	171.66	151.84	-9.0	-8.9	-8.1	
3. Fishing	5.14	10.94	12.36	12.84	14.94	15.73	18.91	22.53	24.67	23.85	36.93	42.46	13.9	17.2	14.5	
4. Mining & Quarrying	246.06	206.69	218.75	222.75	318.94	374.06	353.71	310.71	416.57	446.01	458.16	479.26	3.7	11.4	8.8	
Subtotal - PRIMARY	3900.86	4452.56	4034.97	4390.36	4814.06	4602.81	5388.05	4774.84	5243.08	6033.59	5930.86	5860.73	3.3	5.3	2.8	
5. Manufacturing	859.67	896.69	872.60	1169.39	1266.59	1493.94	1774.62	1312.03	1637.44	1636.77	1845.58	2039.82	7.5	11.7	8.6	
6. Construction	399.88	280.76	269.28	292.64	311.57	306.70	314.76	315.77	292.78	317.76	338.96	377.66	-2.4	4.6	3.0	
7. Electricity, Gas & Water Supply	27.91	159.17	179.59	184.42	178.72	209.95	240.29	328.56	301.82	352.67	431.49	504.58	24.0	11.3	12.2	
Subtotal - SECONDARY	1287.46	1336.62	1321.47	1646.45	1756.88	2010.59	2329.67	1956.36	2232.04	2307.20	2616.03	2922.06	6.1	10.6	8.1	
8. Transport, Storage & Communications	183.67	233.30	246.16	257.12	264.60	263.76	310.70	344.29	351.83	370.70	399.37	447.23	5.4	6.8	6.7	
9. Trade, Hotels & Restaurants	769.25	901.80	921.73	1008.23	997.91	1046.95	1184.06	1353.63	1350.90	1403.89	1483.80	1570.44	4.4	3.8	5.7	
10. Banking, Insurance, Real Estate	369.13	514.42	552.62	722.13	746.49	867.45	896.05	849.79	841.86	840.00	876.11	913.02	9.3	1.8	5.9	
11. Public Administration, Other Services	502.07	733.20	731.65	851.40	947.27	933.67	1012.14	1023.04	1039.82	1119.25	1131.94	1217.89	7.3	4.5	5.2	
Subtotal - TERTIARY	1824.12	2382.72	2452.16	2838.88	2956.27	3111.83	3402.95	3570.75	3584.41	3733.84	3891.22	4148.58	6.4	3.8	5.7	
Net State Domestic Product (NSDP)	7012.44	8171.90	7808.60	8875.69	9527.21	9725.23	11120.67	10301.95	11059.53	12074.63	12438.11	12931.37	4.7	5.8	4.7	
State Per Capita Income (Rs.)	1358	1409	1315	1459	1529	1523	1698	1538	1618	1731	1749	1784	2.3	3.8	2.4	
Composition Rate (%)																
Primary	55.6	54.5	51.7	49.5	50.5	47.3	48.5	46.3	47.4	50.0	47.7	45.3				
Secondary	18.4	16.4	16.9	18.6	18.4	20.7	20.9	19.0	20.2	19.1	21.0	22.6				
Tertiary	26.0	29.2	31.4	32.0	31.0	32.0	30.6	34.7	32.4	30.9	31.3	32.1				

Source : Directorates of Economic & Statistics of the State Government of Madhya Pradesh and CSO.

11.4.2 Development Plan for Gwalior (Mater Plan)

(1) Concept Underlying the Perspective Plan 2005

The first development plan of Gwalior was published in the year 1978. Of late, its identification as a **Counter-Magnet to the National Capital** has opened up new possibilities of development of the city. The present plan 1995 - 2005 is envisaged to cater to the needs of a **projected population of 1.25 million** by the year 2005.

The city is made up of **three urban units** namely Lashkar, Gwalior and Morar as shown in Figure 1-3. Each unit has received some sort of impetus for its growth in different periods of history. The future of the city is said to lie in the harmonious development of these three units with necessary interface with the proposed Counter-Magnet Area and Industrial Growth Centres. Therefore, Gwalior was planned as an integral part of its Region and Sub-region and Counter-Magnet to National Capital Region. The basic plan concept and strategy is to integrate these three townships and yet maintain their individual identities.

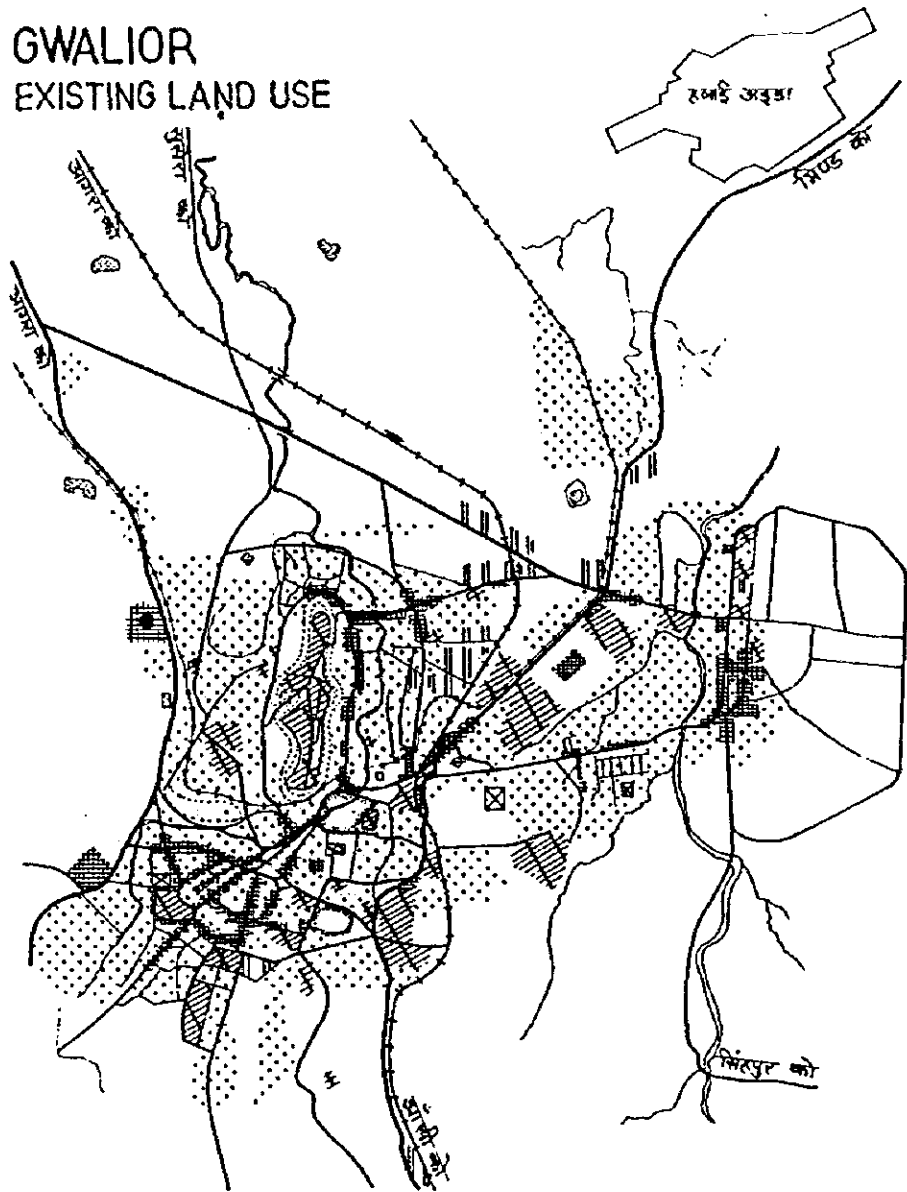
(2) Land Use Pattern

The general considerations kept in view while evolving land use pattern were as follows :

- a) Mixed land use zoning
- b) Development of Trade based commercial areas.
- c) Introduction of flatted factories and small scale Industries in commercial areas.
- d) Decentralisation of work centres
- e) Preservation of environs of the buildings of architectural elegance and historical importance.
- f) Minimum dislocation of present land use pattern.
- g) Close relationship between work place and Residential Area.

The future land use pattern 2005 is presented in Figure 11-4.

GWALIOR EXISTING LAND USE



LEGEND













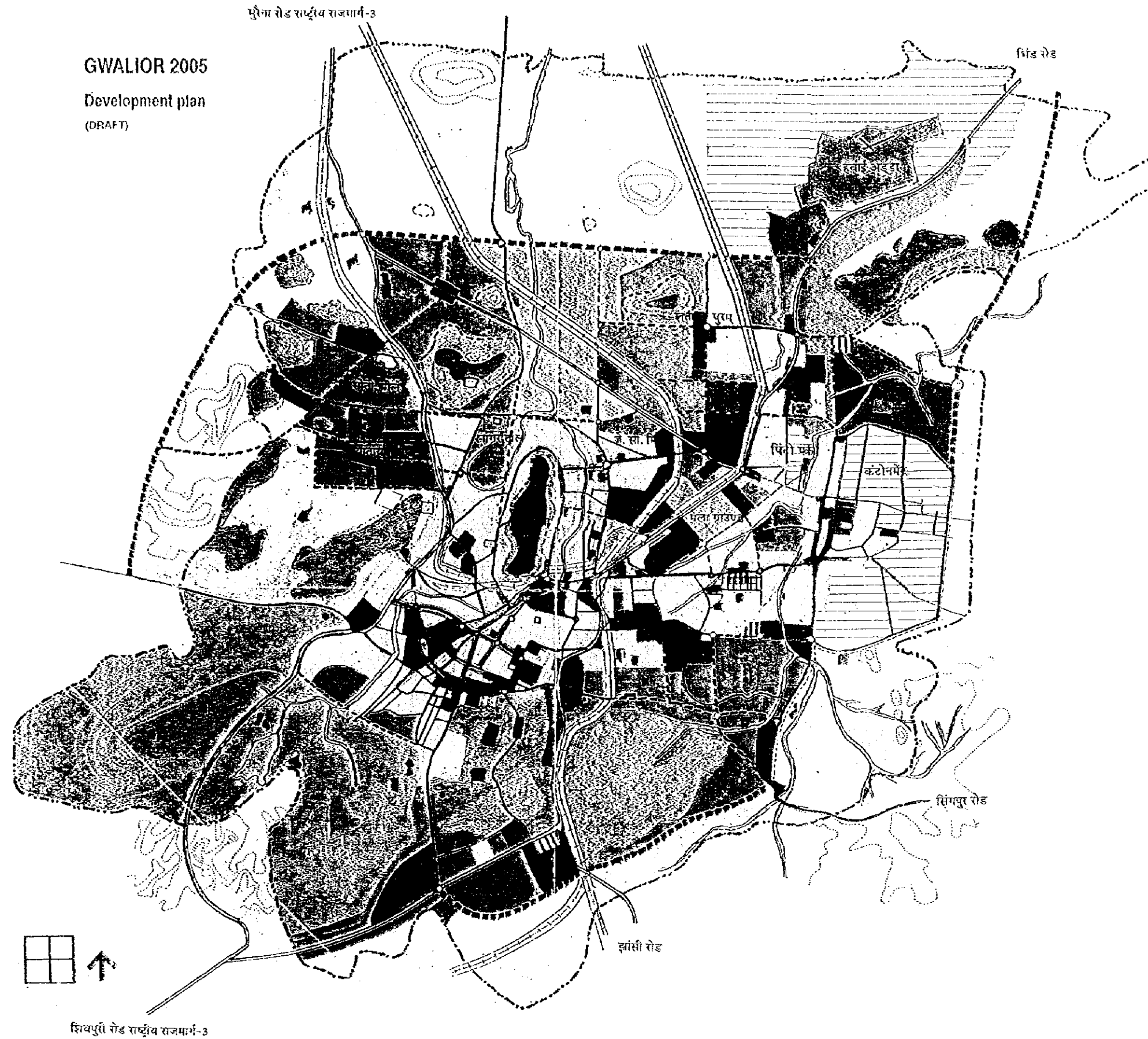
-  Residential
-  Commercial
-  Industrial
-  Public & Semi-Public
-  Transport
-  Existing Road
-  Railway
-  Parking Area
-  Recreational
-  Park
-  Play Ground
-  Pond & Waterway

Figure 11-3 Existing Land Use of Gwalior

GWALIOR 2005
Development plan
(DRAFT)



Legend	Existing	Proped	संकेत
Residential			
General	[Pattern]	[Pattern]	अवधारित साधारण
Commercial			
City Centres	[Pattern]	[Pattern]	नगरीय केन्द्र
Sub-City Centres	[Pattern]	[Pattern]	उपनगरीय केन्द्र
General Commercial Including Business And Service Establishment	[Pattern]	[Pattern]	साधारण वाणिज्यिक व्यवसाय एवं सेवा संस्थापन सहित
Whole Sale Market/Mendi	[Pattern]	[Pattern]	पोक बाजार/मंडी
Warehousing	[Pattern]	[Pattern]	भंडारण
Oil Depot	[Pattern]	[Pattern]	हेल भंडारण
Industrial			
Light and Service Industries	[Pattern]	[Pattern]	हल्के तथा सेवा उद्योग
Industries Estate and Major Industrial Establishment	[Pattern]	[Pattern]	औद्योगिक क्षेत्र और बृहद औद्योगिक प्रतिष्ठान
Public And Semi-Public Uses			
Administrative Complex	[Pattern]	[Pattern]	सार्वजनिक एवं अर्धसार्वजनिक प्रशासकीय इतिहास
Other Administrative Establishment/Institute	[Pattern]	[Pattern]	अन्य प्रशासकीय प्रतिष्ठान/संस्थान
Education (Regional And City LEVEL)	[Pattern]	[Pattern]	शिक्षा (क्षेत्रीय एवं नगर स्तरीय)
Health (Regional And City Level) MELA GROUND	[Pattern]	[Pattern]	स्वास्थ्य (क्षेत्रीय एवं नगर स्तरीय) मेला स्थल
Transportation			
Airport	[Pattern]	[Pattern]	विमान दल
Railway Station, Railway Line	[Pattern]	[Pattern]	रेलवे स्टेशन रेलवे लाइन
Inter State Bus Stand	[Pattern]	[Pattern]	अंतरराज्यीय बस स्थानक
Transport Nagar	[Pattern]	[Pattern]	सड़कवाह नगर
Recreation			
City Park	[Pattern]	[Pattern]	आनंद भूमी
Play Fields/Stadium	[Pattern]	[Pattern]	खेल मैदान/स्टेडियम
City Forest/Afforestation/ Forest	[Pattern]	[Pattern]	नगर वन/वृक्षारोपण वनक्षेत्र
Agricultural			
Green Belts/Agriculture	[Pattern]	[Pattern]	कृषि हरित क्षेत्र / कृषि क्षेत्र
Village Abadi	[Pattern]	[Pattern]	ग्रामीण इलाहा
Market Gardening	[Pattern]	[Pattern]	सब्जी बाग
River/Nallah/Canal	[Pattern]	[Pattern]	नदी/नाला/काल
Public Utilities And Facilities			
	[Pattern]	[Pattern]	सार्वजनिक सेवाएं एवं सुविधाएं

Figure 11-4 Future Land Use Pattern (Qwalior 2005)

Feasibility Study

Chapter 11 Socio-economic Conditions of the Study Area

Chapter 12 Supplemental Traffic Survey and Analysis

Chapter 13 Future Traffic Demand Forecast
Chapter 14 Field Investigations
Chapter 15 Design Standards
Chapter 16 Design for the Feasibility Study
Chapter 17 Construction Plan
Chapter 18 Toll Collection System
Chapter 19 Operation and Maintenance System
Chapter 20 Cost Estimates
Chapter 21 Economic and Financial Analysis
Chapter 22 Implementation Programme
Chapter 23 Recommendations

12 Supplemental Traffic Survey and Analysis

12.1 Types of Traffic Survey

The following five types of traffic survey were carried out for the Feasibility Study on the Gwalior and Bareilly Bypass :

- (1) Classified traffic volume count survey
- (2) Roadside Origin-Destination (O-D) survey
- (3) Speed and delay survey
- (4) Axle load survey
- (5) Opinion survey on toll bypass

The detailed contents and duration of each survey are shown in Table 12-1.

All above surveys were conducted during the period from 10th November 1997 to 22nd November 1997.

12.2 Classified Traffic Volume Count Survey

The traffic count survey was carried out for 3 consecutive days (continuous 24 hours survey for three days) at locations shown in Figure 12-1 (5 locations in Bareilly) and Figure 12-2 (3 locations in Gwalior). Vehicle counts were taken for 13 vehicle types at 15 minutes interval.

12.3 Roadside Origin-Destination (O-D) Survey

12.3.1 Survey Method

The O-D survey was carried out along with the traffic count survey for two consecutive days for 12 hours on each day. The survey was done on working days only and any holidays in between were excluded. The survey was conducted at the same locations as traffic count. In addition to fast moving vehicles, slow moving vehicles such as cycles, cycle rickshaws, agricultural tractors, animal drawn and hand drawn vehicles were also stopped and interviewed as well. In general, such slow vehicles are excluded from O-D survey. However, in order to grasp the volume of through traffic by such slow vehicles, those were included in this O-D survey.

12.3.2 Traffic Zone System for O-D Survey

The O-D data collected from the survey site was coded for origin and destination as per the zoning tables and zoning maps. In this Feasibility Study, the more detailed traffic zone systems than those of Pre-Feasibility Study were prepared for both Bareilly and Gwalior Bypasses. The zone tables and zone maps are presented in Table 12-2 , Figure 12-3 for Bareilly Bypass and in Table 12-3, Figure 12-4 for Gwalior Bypass.

Table 12-1 Types and Contents of Traffic Survey

	Type of Survey	Bypass	No. of Survey Stations/Sections	No. of Vehicle Types	Hours	Duration (days)
1)	Classified Traffic Volume Count Survey	Bareilly	5	13	24 hours	3 days
		Gwalior	3	13	24 hours	3 days
2)	Roadside O-D Survey (Average sample size = 25 % including slow vehicles)	Bareilly	5	7	12 hours	2 days
		Gwalior	3	7	12 hours	2 days
3)	Speed-Delay Survey	Bareilly	5		3 time bands	3 days
		Gwalior	3		3 time bands	3 days
4)	Axle Load Survey (Target Sample Rate = 25% of truck traffic)	Bareilly	1	Trucks (2-6 axles)	12 hours	1 day
		Gwalior	1	Trucks (2-6 axles)	12 hours	1 day
5)	Opinion Survey on Toll Bypass	Bareilly	Target Samples 170 samples			
		Gwalior	170 samples			

Vehicle Classification

Traffic Counting Survey
1. Car, Jeep, Taxi
2. Auto Rickshaw
3. Van/Tempo
4. Bus
5. Minibus
6. Two Wheeler
7. Light Commercial Vehicle (LCV)
8. 2-Axle Truck (HCV)
9. Multi Axle Truck (MAV)
10. Agricultural Tractor/Trailer
11. Cycle
12. Rickshaw
13. Animal Hand Drawn

Vehicle Classification

O-D Survey
1. Car, Jeep, Taxi, Vans, 3-wheelers
2. Buses and Mini Buses
3. Trucks
4. Two Wheelers
5. Cycles, Rickshaw
6. Agriculture Tractors
7. Animal/Hand Drawns

Bareilly Bypass (Uttar Pradesh State) NH 24

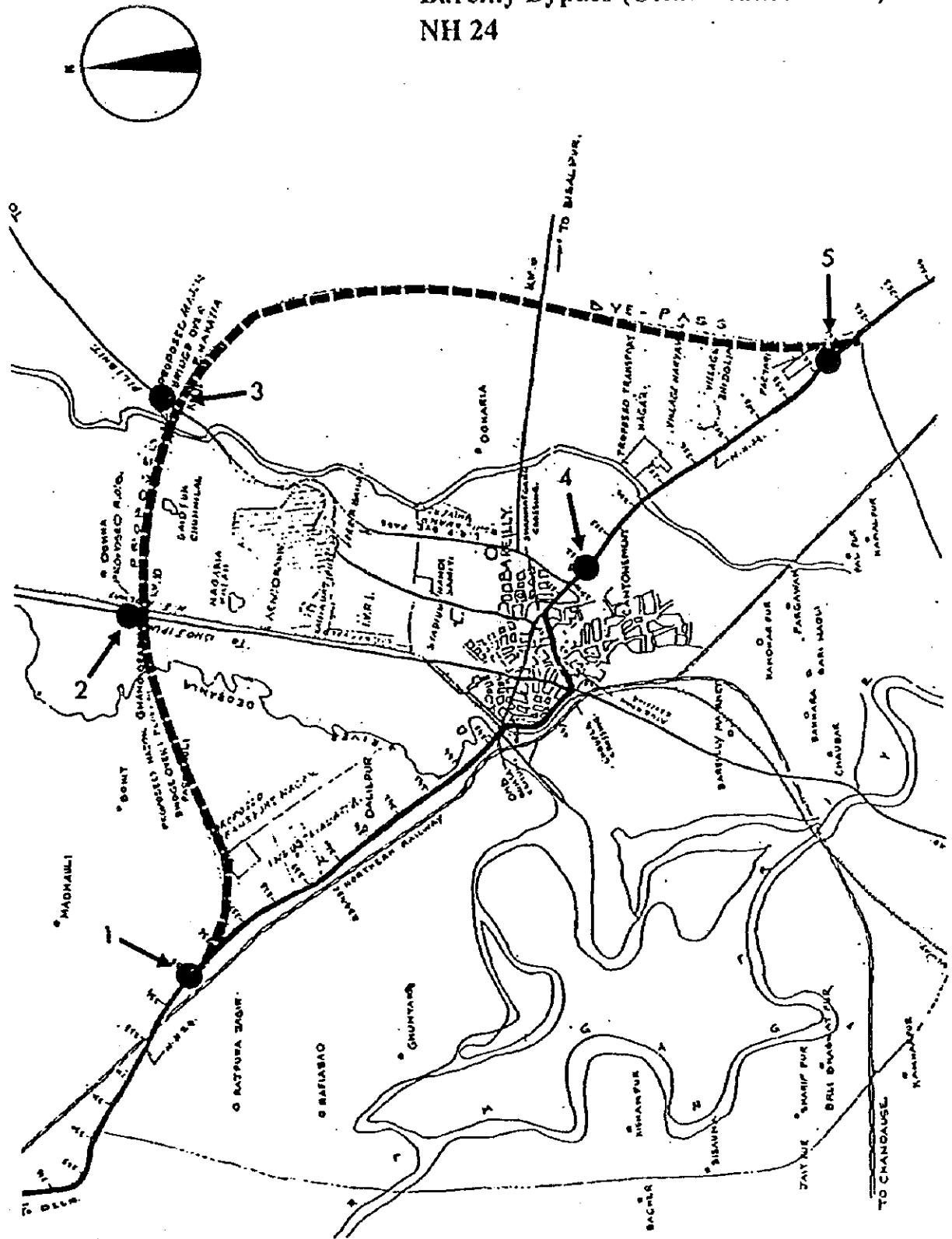


Figure 12-1 Locations of Traffic Count and O-D Survey (Bareilly)

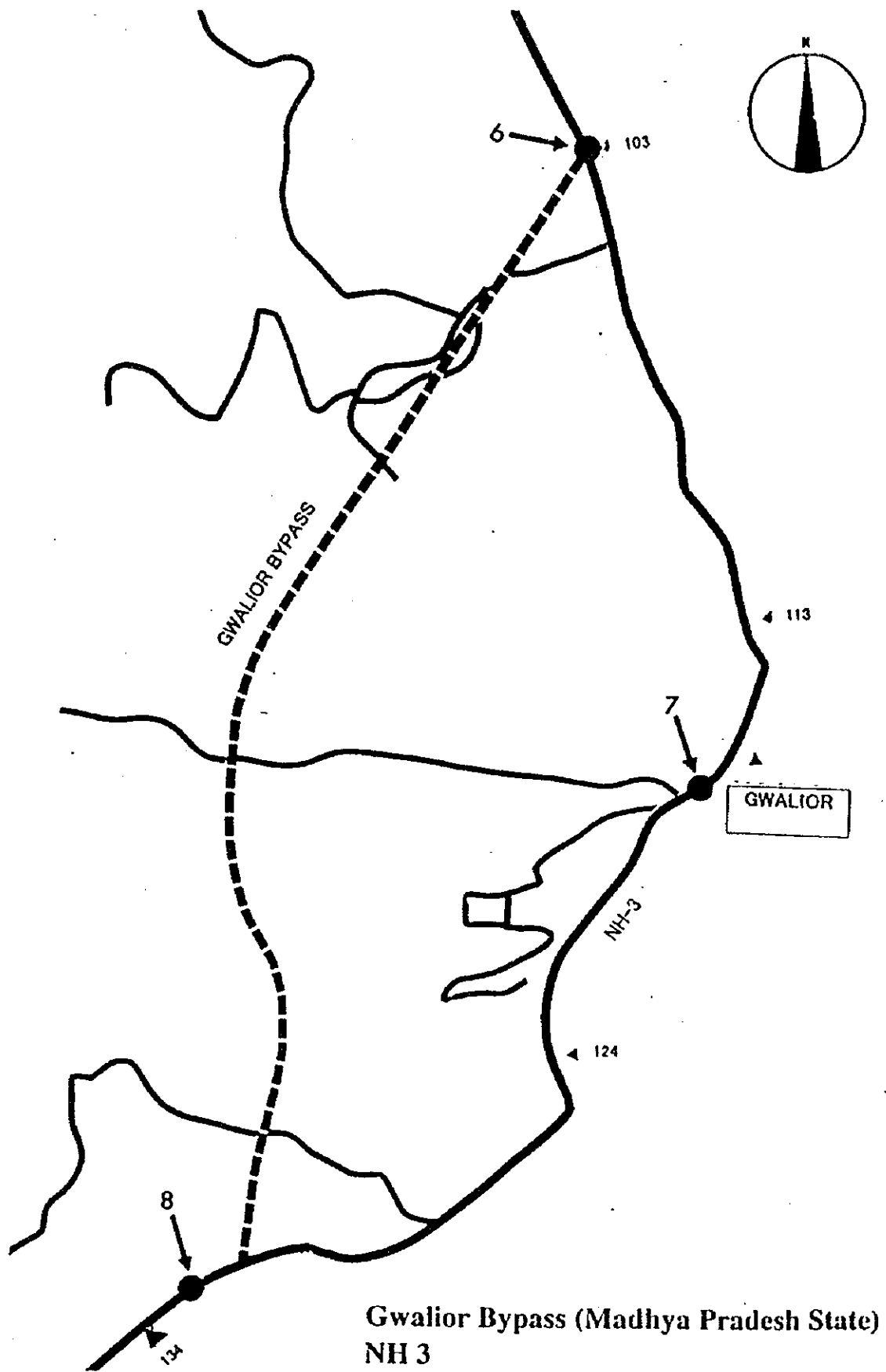


Figure 12-2 Locations of Traffic Count and O-D Survey (Gwalior)

Table 12-2 Traffic Zoning for the Bareilly Bypass

Zone No.	Zone Name / Description	Major Cities in the Zone
	(Bareilly District)	
1	Bareilly City	Bareilly
2	West Bareilly Tahsil	Kiyar, Ramganga
3	North - East Bareilly Tahsil	Rithaura, Ahmadnagar, Dayanatpur
4	South - East Bareilly Tahsil	Kesarpur, Bithri Chainpur, Alampur, Khajuria
5	Baheri and Shergarh Tahsils	Baheri, Richha, Shegarh, Bhojipura
6	Mirganj, Fatehpur West Tahsils	Mirganj, Fatehpur West, Shampur
7	Aonla Tahsil	Aonla, Ramnagar, Majgawan, Sarauli
8	Faridpur	Faridpur, Alampur Jafrabad, Bhutah
9	Nawabganj Tahsil	Nawabganj
	(Neighboring Districts)	
10	Rampur District	Rampur, Milak, Shahabad
11	Budaun District	Budaun, Datagang, Sahaswan
12	Shahjahanpur District	Tihara, Shahjahanpur, Jalabad
13	Pilibit District	Pilibit, Pranpur, Bisalpur
14	Nainital District	Nairital, Haldwani, Kichha
	(Rest of the Uttar Pradesh State)	
15	Chamoli and Almora Districts	Chamoli, karnaprayag
16	Pithoragarh District	Pithoragarh, Champawat
17	North and North West U.P.	Ghaziabad, Moradabad, Meerut, Bulandshahar
18	Aligarh, Agra, Mathura, Etah, Firozabad, Maininuri Districts	Aligarh, Agra, Mathura, Etah, Firozabad, Maininuri
19	Kheri District	Kheri, Mohamdi
20	Kanpur, Allahabad, Jhansi and Fatehnur Districts	Kanpur, Allahabad, Jhansi, Fatehpur
21	Lucknow	Lucknow, Malihabad
	(Outside of Uttar Pradesh)	
22	Norhtern India	Delhi, Chandigarh, Haryana, Punjab, J & K, H.P.
23	Rajasthan and Gujrat	Jaipur
24	M.P., Maharashtra, Karnataka, Kerala, A.P., Orissa	Mumbai
25	Bihar and West Bengal	Calcutta
26	Nepal	

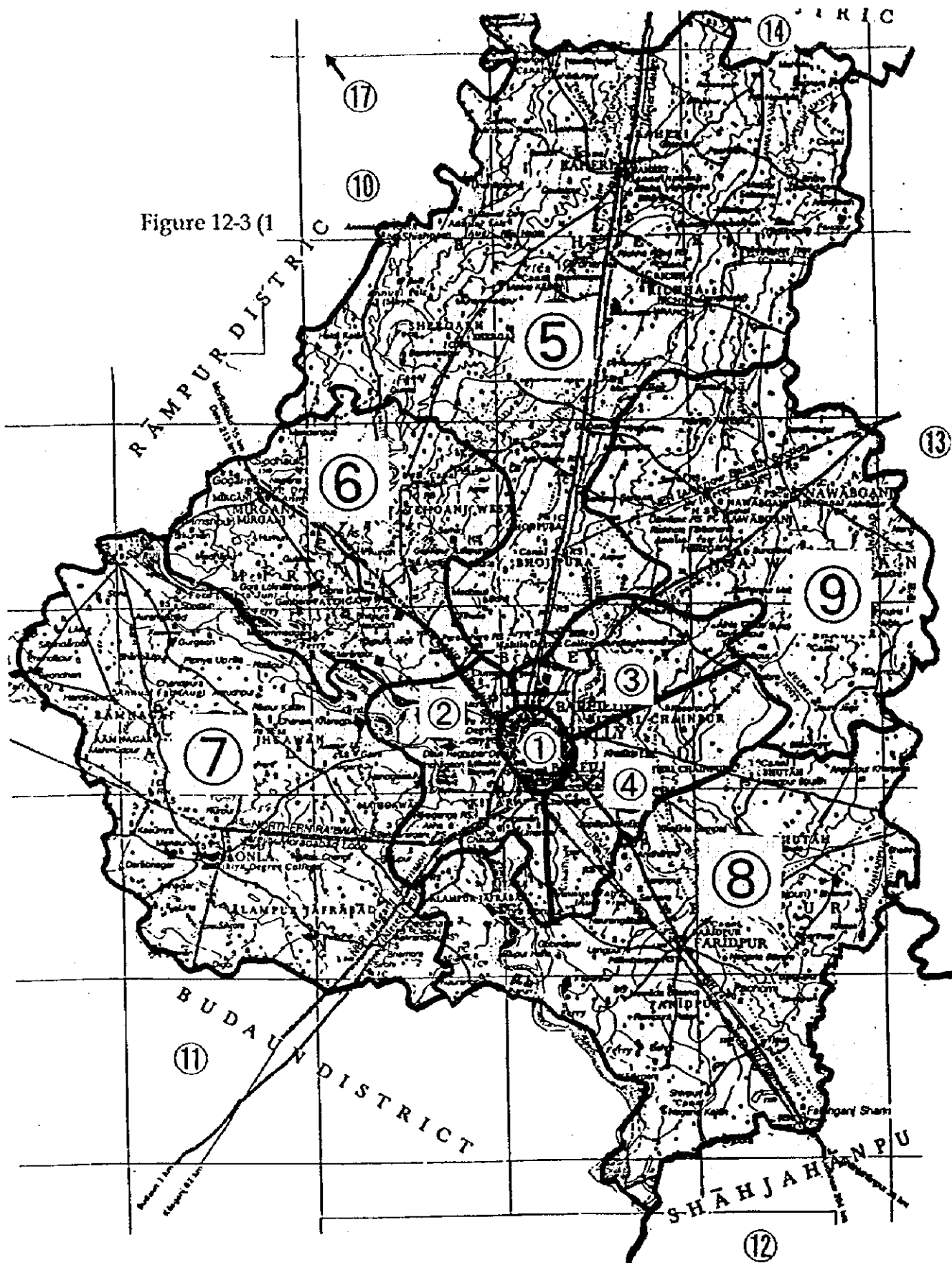


Figure 12-3 (1

Figure 12-3 (1/2) Traffic Zone Map (Bareilly)

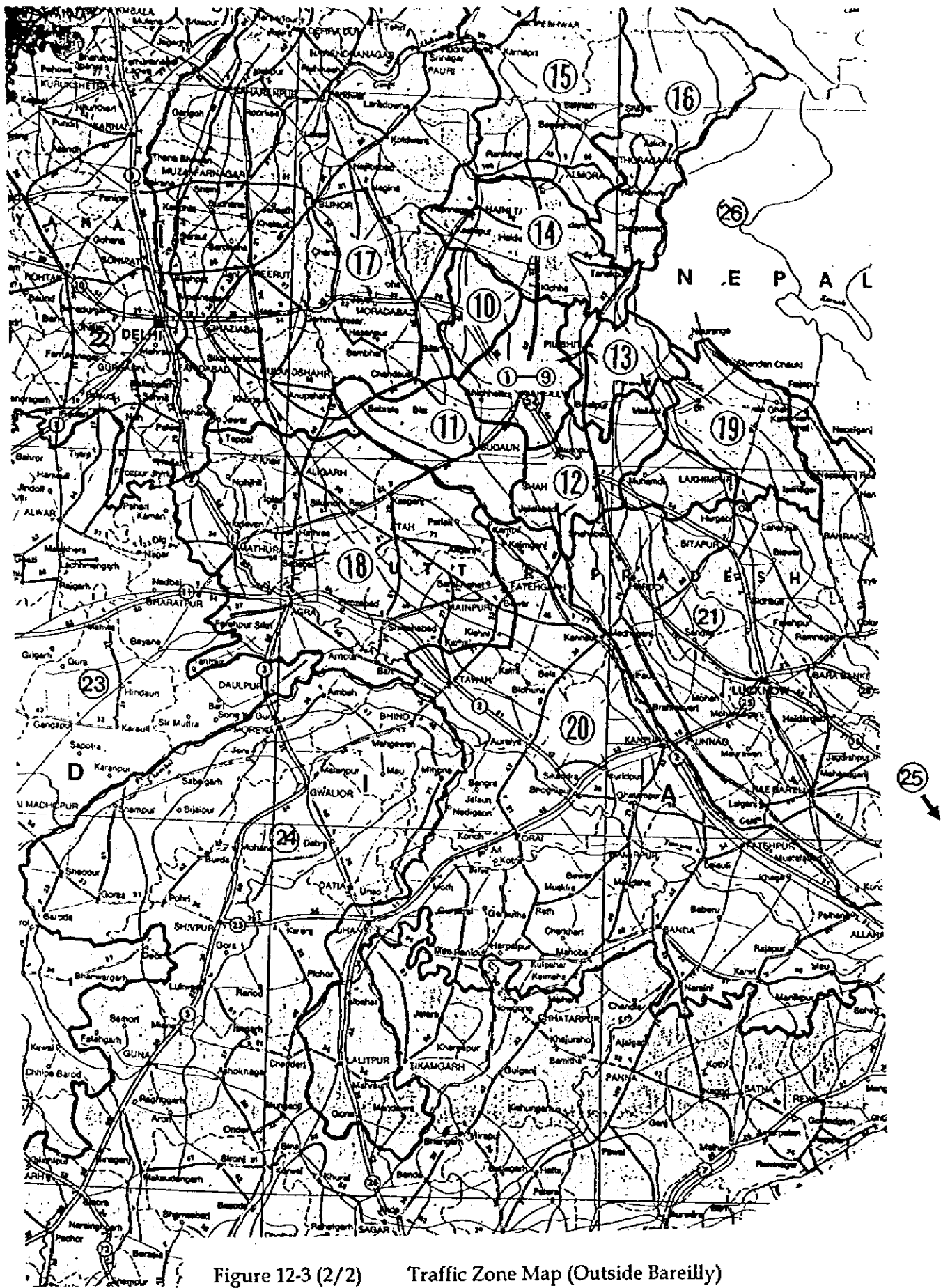


Figure 12-3 (2/2) Traffic Zone Map (Outside Bareilly)

Table 12-3 Traffic Zoning for the Gwalior Bypass

Zone No.	Zone Name / Description	Major Cities in the Zone
	(Gwalior District)	
1	Gwalior City	Gwalior
2	New city area (West of NH 3 & East of Proposed Bypass)	New city area
3	South Gwalior	Barai, Aron, Bitarwar, Chitoli, Mohana, Ghatigaon
4	North Gwalior	Morar, Behat, Bhageh, Pichhor, Dabra
	(Neighboring Districts)	
5	Morena, Ambah and Jora Tahsil	Morena, Amba, Jora, Chaukrauda, Porsa
6	Sabalgarth, Bijaipur and Sheopur Tahsil	Sabalgarth, Bijaipur, Sheopur, Goras, Pura
7	Bhind District	Bhind, Mahgawan, Gohad, Lahar
8	Datia District	Datia, Indergarh, Unao
9	Shivpuri District	Shivpuri, Karera, Kolaras, Pichor
	(Rest of the Madhya Pradesh State)	
10	Western Districts of M.P.	Bhopal, Guna
11	Rest of the districts in M.P.	Jabalpur, Sagar
	(Outside of M.P.)	
12	Delhi, Haryana, Punjab, H.P. and J & K	Dehli
13	North - West U.P.	Agra, Dehradun, Mathura, Bareilly
14	Eastern - U.P.	Kanpur, Lucknow, Varanasi, Faizabad
15	Rajasthan	Jaipur
16	Southern India	Kota, Mumbai, Vadodara, Surat, Bangalore, Ahmadabad, Madras
17	Orissa, Bihar & rest of North - East India	Bhubaneshwar, Cuttack, Patna, Calcutta, Guwahati

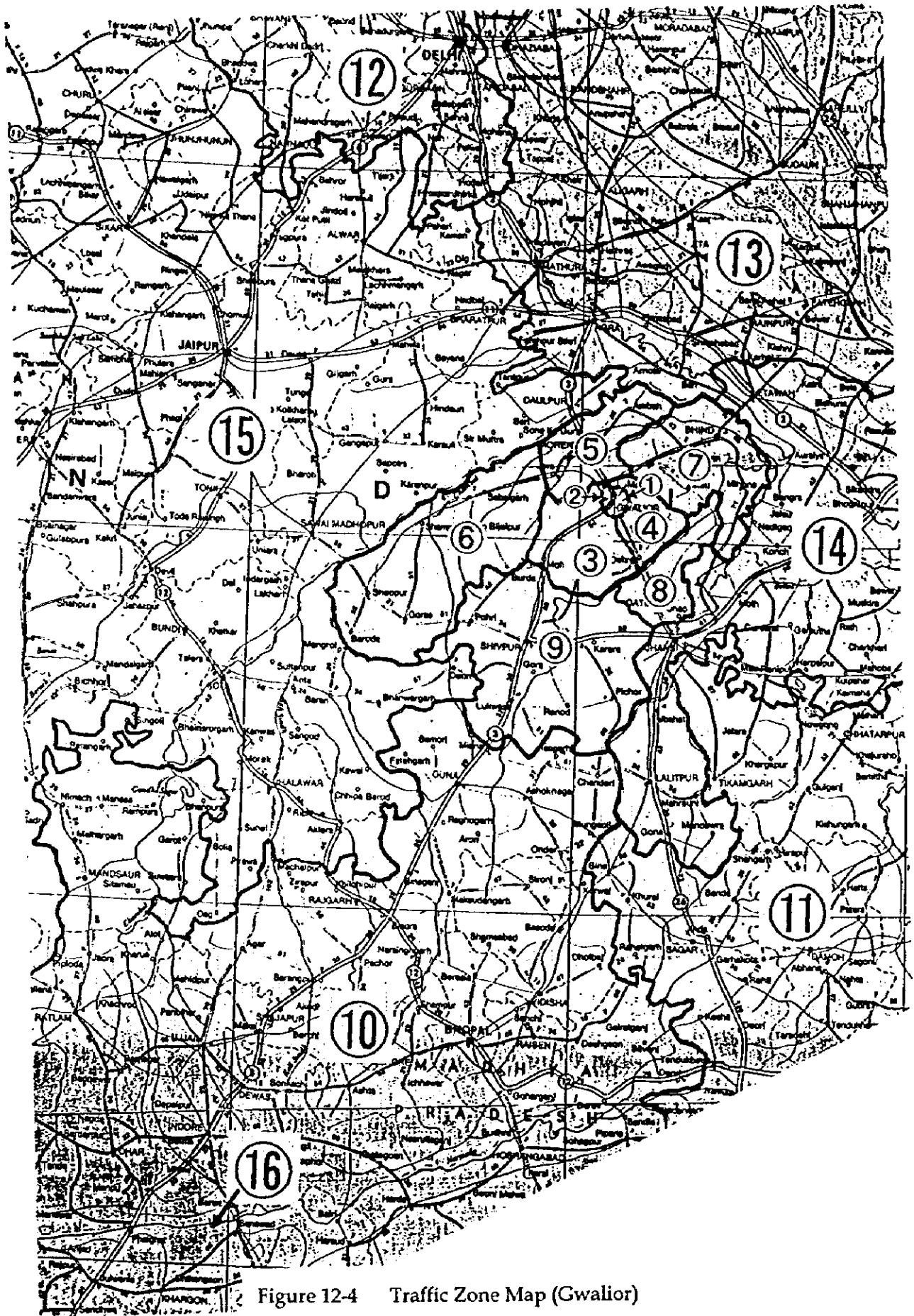


Figure 12-4 Traffic Zone Map (Gwalior)

12.4 Speed and Delay Survey

The speed and delay survey was carried out by using the moving car method. The survey corridor has been divided into sections so that the speeds for each stretch can be assessed separately. The test car has travelled along the corridor and information about journey time, delays, vehicles encountered in the opposite direction, vehicles overtaken by the test car and the vehicles overtaking the test car were recorded.

12.5 Axle Load Survey

Axle load survey was conducted along with the traffic count survey and O-D survey for 1 day for 12 hours at one location in each day. The survey was done on a working day. Police help was also taken up to stop vehicles. Axle load survey was carried out at location 4 (NH-24, km 252) for Bareilly and location 8 (NH-3, km 133.3) for Gwalior Bypass. Vehicles were stopped on random sample basis.

12.6 Opinion Survey on Toll Bypass

12.6.1 Objective of Survey

Opinion survey was carried out in and around both Bareilly and Gwalior cities. The main objectives of the survey are to find out the followings :

- the need/usefulness of the proposed bypass
- opinion about levying tolls on users and willingness to pay
- the amount the respondents are willing to pay towards tolls

12.6.2 Survey Method

The opinion survey is only as indicative survey. This survey was carried out separately from the roadside O-D survey not to prevent traffic flows and to avoid low sampling rate of the O-D survey.

The respondents of this survey have been categorised as :

- 1) Farmers
- 2) Traders/Truck operators
- 3) Representatives of industries
- 4) Local leaders and influential people

Selection of the respondents was random to cover the entire geographic influence area. Selection of the local political leaders/ influential people was based on the information collected from the PWD/other public offices.

Interviewers visited directly to randomly selected people or pre-selected people and explained the purposes of survey, then filled up the questionnaires during their

interviews. After interviews, the interviewers left the interviewees taking the filled questionnaires with them.

12.7 Analysis of Traffic Survey for the Bareilly Bypass

12.7.1 Classified Traffic Count Survey

(1) Traffic Characteristics

The average daily traffic volumes (i.e. average of three days survey) at five survey locations in Bareilly are summarised in Table 12-4. The highest traffic in the five points is observed at Station No.4 (NH-24 : km252) with 25,000 PCUs per day including slow vehicles. The Station No.3 (SH-33 : km42) shows the lowest traffic volume with about 12,000 PCUs per day.

Traffic characteristics by each survey location are shown in Table 12-5. Regarding the percentage share of trucks, those on NH-24 (at location 1, 4 and 5) are higher than that on SH-37 and SH-33. Percentages of the volumes of fast vehicles near the beginning/ending points of the Bypass (location 1 and 5) are higher than other survey locations. The peak hour ratios are varying in the range from 6.6% to 10.3% with an average of 8.4%. The Day Time Traffic Ratio at location No. 5 (NH-24 : km 260) is lowest because of high share of truck traffic.

Hourly traffic variations by each survey location are illustrated in Figure 12-5. The survey locations which include many local traffic to/from Bareilly tend to show the clear morning peak and afternoon peak (location 2,3 and 4).

(2) Average Annual Daily Traffic (AADT)

In order to estimate the traffic volume as an AADT, the results of traffic count survey conducted on the stage of the Pre-Feasibility study in May 1997 were compared with the results of this time survey in November 1997. The results of comparison are shown in Table 12-6 and it was found that there were big differences between two results except for the location No.1 (NH-24: km235). The traffic volumes at location No. 2, 3 and 5 were lower by 35-40% comparing to the traffic in May. It is understood that the traffic was affected by the seasonal fluctuations to some extent and that May is a peak season. However, it was necessary to check whether the entire portion of above differences can be explained by the seasonal fluctuations or not. Therefore, the three days average were broken down to day by day base in order to examine whether the averages were affected by an irregular traffic in a particular day. The day by day base traffic volumes of each survey location are also presented in Table 12-6. Daily traffic of each survey day at location No. 2, 3 and 5 indicates stable volumes during three days survey and no irregular traffic

Table 12-4 Results of Traffic Count Survey (Bareilly : 3 days average)

Survey period : 3 days 24 hours at each station
Survey Date : from 10 Nov. 97 to 22 Nov. 97

Survey Location No.(km)	FAST MOVING VEHICLES										SLOW MOVING VEHICLES					Total Vehicles			Total PCUs	
	Car/Jeeep Taxi	Van Tempo	Auto Rickshaw	Two Wheeler	Bus	Truck			Total of Truck	Tractor Trailer	Animal/HD	Cycle Rick	Cycle Rick	Fast	Slow	Total	Fast	Slow	Total	
						LCV	2-Axle	MAV												
1 NH24 (km235)	1499	289	756	1732	1202	698	3014	160	3872	272	250	3104	349	9350	3975	13325	17080	3858	20938	
2 SH37 (km14)	983	111	694	1418	410	204	1813	25	2042	290	267	5673	231	5658	6461	12119	9123	5192	14315	
3 SH33 (km42)	1185	238	834	1470	393	339	1282	12	1633	259	359	2569	58	5753	3245	8998	8181	4000	12181	
4 NH24 (km252)	1306	115	876	2625	757	637	3928	95	4660	207	411	5675	1216	10339	7509	17848	18445	6630	25075	
5 NH24 (km260)	973	12	500	689	626	463	3298	39	3800	177	135	793	18	6600	1123	7723	14020	1574	15594	

Note : LCV : Light Commercial Vehicle
2-Axle : 2-Axle Truck
MAV : Multi-Axle Truck

Table 12-5 Characteristics of Traffic

Survey Station No.	NH or SH	ADT in Vehicles	Vehicle Composition (%)					Peak Hour Ratio %	Day Time Ratio %	
			Cars	Buses	Trucks	2-W Vehicles	Fast Vehicles			Slow Vehicles
1	NH24	13325	19.1%	9.0%	29.1%	13.0%	70.2%	29.8%	7.3%	71.2%
2	SH37	12119	14.8%	3.4%	16.8%	11.7%	46.7%	53.3%	10.3%	81.4%
3	SH33	8998	25.1%	4.4%	18.1%	16.3%	63.9%	36.1%	9.8%	82.0%
4	NH24	17848	12.9%	4.2%	26.1%	14.7%	57.9%	42.1%	7.9%	71.1%
5	NH24	7723	19.2%	8.1%	49.2%	8.9%	85.5%	14.5%	6.6%	62.5%
Average			17.3%	5.6%	26.7%	13.2%	62.8%	37.2%	8.4%	73.6%

Note : Cars include passenger cars, jeeps, vans and three wheelers.
Day Time Ratio = (Day time traffic / ADT) x 100%
Day time traffic = Traffic from 06:00 till 18:00 hours.

Hourly Traffic Variation(BAREILLY)

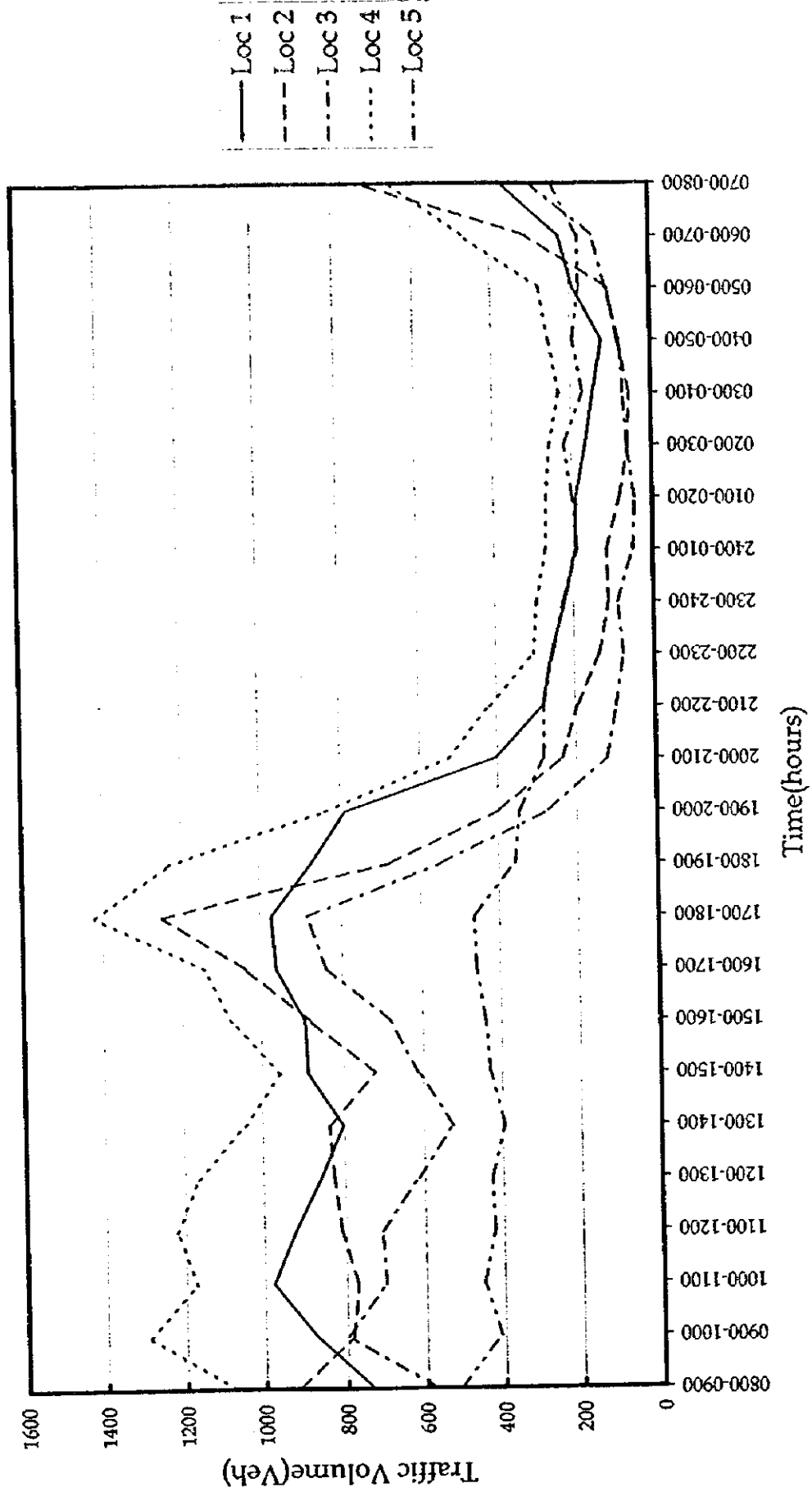


Figure 12-5 Hourly Traffic Variation (Bareilly)

volumes are observed.

In addition to the above examinations, the results of other traffic count survey conducted at the same survey locations were compared with this survey and presented in Table 12-7. The table also shows a big variation of traffic although the compared other data was based on the survey conducted in 1996.

It was decided, through the analyses above, that the AADT may be calculated as an average of traffic volumes surveyed in May and in November 1997 judging that the both results are correct.

12.7.2 Origin - Destination (O-D) Survey

(1) Sampling Rate

The sample size of the O-D survey ranged from 20% to 48% for fast vehicles and from 6% to 30% for slow vehicles as shown in Table 12-8. Total 19,565 samples of fast vehicles were collected during the two days interview. An average sampling rate of fast vehicles was at 35.3% of total 12-hour traffic.

(2) Present O-D Matrix

The expansion factors to expand sample O-D matrix were calculated by each direction of each survey location, by vehicle type and by each survey day. The expanded O-D matrices were combined to obtain both directions O-D matrices and averages of two days O-D traffic were calculated by each O-D pair. The O-D matrix by each location was then combined further into one O-D matrix by vehicle type. The combined O-D matrix for fast vehicles and for slow vehicles are presented in Table 12-9 and Table 12-10 respectively. The volumes of through traffic are calculated as follows :

	<u>Total vehicle trips (A)</u>	<u>Through traffic (B)</u>	<u>(B/A)x100%</u>
Fast vehicles	33,104	6,031	18.2%
Slow vehicles	20,441	902	4.4%

Figure 12-6 shows the desire line diagram for fast vehicles.

12.7.3 Traffic Speed and Delay Survey

The average journey speed on NH-24 surveyed on divided eight stretches is summarised in Table 12-11. The expected tendency that the higher speed in off- peak hour and lower speed in peak hour is not clearly observed. The lowest journey speed by the test car in morning peak was at the stretch of RTO Chowk - Bareilly Bypass Crossing (stretch No. 2) with average speed of 24 km/hour.

Table 12-6 Comparison of Three Days Traffic Variations (Bareilly)
(in November & May 1997)

Survey Location No.	Survey Date	Vehicle Type (Fast vehicles) (Vehicles/day : Both directions)				
		Cars	Buses	Trucks	2-Whls	Total
1 NH24 (km235) (km233)	10 Nov. 97 (Mon.)	1807	902	3244	1052	7005
	11 Nov. 97 (Tue.)	3092	1542	4854	1841	11329
	12 Nov. 97 (Wed.)	2750	1160	3525	2306	9741
	Average (Nov.)	2550	1201	3874	1733	9358
	12 May 97 (Mon.)	2649	1929	3681	1414	9673
	13 May 97 (Tue.)	2619	2301	4189	1628	10737
	14 May 97 (Wed.)	2390	1930	3193	1626	9139
	Average (May)	2553	2053	3688	1556	9850
	AADT	2551	1627	3781	1645	9604
	2 SH37 (km14) (km14)	17 Nov. 97 (Mon.)	1700	407	1861	1532
18 Nov. 97 (Tue.)		1726	457	2105	1311	5599
19 Nov. 97 (Wed.)		1954	363	2174	1417	5908
Average (Nov.)		1793	409	2047	1420	5669
13 May 97 (Tue.)		2231	586	3035	1616	7468
14 May 97 (Wed.)		2937	849	4089	1948	9823
15 May 97 (Thu.)		2428	595	2829	1750	7602
Average (May)		2532	677	3318	1771	8298
AADT		2163	543	2682	1596	6983
3 SH33 (km42) (km38)		18 Nov. 97 (Tue.)	1863	324	1356	1268
	19 Nov. 97 (Wed.)	2222	420	1620	1462	5724
	20 Nov. 97 (Thu.)	2691	433	1931	1690	6745
	Average (Nov.)	2259	392	1636	1473	5760
	15 May 97 (Thu.)	3024	1921	3129	2098	10172
	16 May 97 (Fri.)	3070	1811	2670	2072	9623
	17 May 97 (Sat.)	2727	1608	2883	1780	8998
	Average (May)	2940	1780	2894	1983	9598
	AADT	2600	1086	2265	1728	7679
	5 NH 24 (km260) (km262)	20 Nov. 97 (Thu.)	1427	621	3598	756
21 Nov. 97 (Fri.)		1407	632	3941	660	6640
22 Nov. 97 (Sat.)		1640	628	3871	663	6802
Average (Nov.)		1491	627	3803	693	6615
14 May 97 (Wed.)		2379	1223	4424	1993	10019
15 May 97 (Thu.)		2356	1313	4666	2054	10389
16 May 97 (Fri.)		2562	1449	4164	1883	10058
Average (May)		2432	1328	4418	1977	10155
AADT		1962	978	4111	1335	8385

Table 12-7 Comparison of Traffic Volumes by Count Surveys

Location	Study / Project	Cars 3 whlrs.	Buses	Trucks	2-whlrs.	Total
2 SH 37 (km 14)	JICA Bypass Study (November 1997)	1793	409	2047	1420	5669
	JICA Bypass Study (May 1997)	2532	677	3318	1771	8298
	(*) "Strategic Option Study "(March 96)	1933	563	2640	791	5927
3 SH 33 (km 42)	JICA Bypass Study (November 1997)	2259	392	1636	1473	5760
	JICA Bypass Study (May 1997)	2940	1780	2894	1983	9597
	(*) "Strategic Option Study "(March 96)	1290	915	2909	1618	6732
5 NH 24 (km 260)	JICA Bypass Study (November 1997)	1491	627	3803	693	6614
	JICA Bypass Study (May 1997)	2432	1328	4418	1977	10155
	(*) "Strategic Option Study "(March 96)	1807	563	4195	791	7356

Note (*): "Strategic Option Study for Uttar Pradesh" March 1996, CES.

Table 12-8 Sample Size and Sampling Rate of O - D Survey
(Bareilly)

Survey Station No.	Date	Fast Moving Vehicles			Slow Moving Vehicles		
		Sample Size (Vehicles)	12 hour Traffic Volume	Sampling Rate (%)	Sample Size (Vehicles)	12 hour Traffic Volume	Sampling Rate (%)
1 NH 24 (km235)	11 Nov. 97	1755	8686	20.2%	261	3799	6.9%
	12 Nov. 97	2985	7583	39.4%	480	5473	8.8%
	Two days total	4740	16269	29.1%	741	9272	8.0%
2 SH 37 (km14)	17 Nov. 97	1793	4297	41.7%	346	4990	6.9%
	18 Nov. 97	1404	4091	34.3%	369	5282	7.0%
	Two days total	3197	8388	38.1%	715	10272	7.0%
3 SH 33 (km 42)	18 Nov. 97	1208	3771	32.0%	254	2373	10.7%
	19 Nov. 97	1797	4814	37.3%	346	3534	9.8%
	Two days total	3005	8585	35.0%	600	5907	10.2%
4 NH 24 (km252)	19 Nov. 97	1906	6083	31.3%	397	6053	6.6%
	20 Nov. 97	2940	7692	38.2%	951	6695	14.2%
	Two days total	4846	13775	35.2%	1348	12748	10.6%
5 NH 24 (km260)	21 Nov. 97	1966	4064	48.4%	168	725	23.2%
	22 Nov. 97	1811	4347	41.7%	251	824	30.5%
	Two days total	3777	8411	44.9%	419	1549	27.0%
Average		19565	55428	35.3%	3823	39748	9.6%

Table 12-9 Present O-D Matrix for the Bareilly Bypass (Fast Vehicles, 1997)

O-D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	TOTAL	
1	92	832	1510	1931	1995	1252	88	1511	691	395	7	613	891	840	20	24	260	5	22	105	233	300	12	19	43	11	13672	
2	1125	45	0	5	0	15	0	0	2	21	2	5	3	0	0	0	17	0	0	3	13	14	0	5	2	0	1276	
3	1796	0	5	1	0	8	0	6	3	10	0	2	6	8	0	0	10	4	0	0	0	5	4	2	0	0	1870	
4	1084	6	0	61	1	2	4	43	0	18	0	4	3	5	0	0	28	3	0	0	2	92	0	5	2	0	1965	
5	1960	8	0	2	11	13	0	4	0	10	5	7	0	3	0	0	0	10	0	6	4	15	0	4	0	0	2062	
6	925	8	0	9	1	6	0	0	8	1	1	6	4	1	0	0	9	0	0	8	7	2	1	4	3	0	1002	
7	81	0	2	13	0	2	0	0	0	0	2	2	2	2	0	0	1	0	0	2	0	28	0	0	0	9	147	
8	1651	2	2	46	4	8	0	0	2	8	1	3	3	35	0	0	13	0	0	3	0	1	16	0	0	1	1796	
9	594	0	2	2	0	5	0	0	2	2	0	0	0	0	0	0	4	0	0	0	0	3	8	0	2	4	624	
10	313	5	4	18	4	2	0	13	0	4	1	41	30	8	0	0	12	6	6	17	67	1	1	0	2	2	590	
11	12	2	0	2	0	1	1	1	0	0	1	12	5	4	0	9	0	0	0	0	0	4	13	0	0	2	0	78
12	455	10	0	18	3	1	0	0	0	17	19	2	6	48	0	5	60	9	8	3	12	43	1	2	2	0	723	
13	735	3	8	9	1	12	3	2	0	15	9	6	6	9	0	28	38	0	3	3	52	17	0	2	0	2	968	
14	1285	3	5	4	0	4	0	0	0	8	38	28	64	11	4	0	25	62	0	70	160	16	4	5	14	2	1847	
15	53	0	0	0	0	0	0	0	0	0	1	2	4	0	0	0	0	0	0	1	0	1	0	0	0	0	62	
16	67	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	79	
17	312	16	2	22	1	7	7	6	2	17	0	53	39	12	0	0	49	10	5	96	159	38	6	8	65	13	945	
18	20	3	2	2	2	0	0	13	0	12	0	6	27	68	0	2	15	3	3	4	2	17	1	3	6	0	211	
19	37	0	2	0	0	0	0	0	4	0	3	1	9	0	7	0	9	4	2	2	20	12	1	11	11	0	189	
20	230	0	0	5	3	3	3	8	0	1	39	1	0	12	66	0	75	2	22	2	12	95	1	0	6	0	583	
21	206	5	0	6	14	1	2	1	2	53	2	4	3	176	0	0	133	14	33	3	13	227	17	4	11	2	932	
22	346	10	3	34	1	5	8	15	7	6	5	43	39	20	0	0	54	18	10	82	316	10	9	21	310	18	1579	
23	15	0	2	4	0	0	0	0	0	1	0	5	3	2	0	0	1	0	0	2	9	25	0	0	8	0	81	
24	30	9	0	1	3	0	0	0	0	2	4	0	2	1	23	0	26	0	0	2	4	230	11	1	10	1	522	
25	40	11	0	11	3	0	0	9	2	72	3	9	4	17	0	0	63	1	14	4	4	230	11	1	10	1	522	
26	3	1	0	0	0	0	0	0	0	4	0	0	0	3	0	0	1	0	0	0	0	19	0	0	2	0	33	
TOTAL	13473	984	1349	2006	2047	1327	131	1681	730	761	38	900	1104	1363	20	40	871	189	129	421	1089	1277	95	98	213	50	33104	

Table 12-10 Present O-D Matrix for the Bareilly Bypass (Slow Vehicles, 1997)

O-D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	TOTAL	
1	89	1083	1396	3287	2144	317	90	552	123	17	0	6	33	57	1	4	1	0	0	0	0	19	0	0	0	0	0	9507
2	1310	27	0	0	0	27	1	0	0	0	0	1	1	0	0	0	0	0	0	0	14	0	0	0	0	0	0	1381
3	1552	0	53	12	0	20	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8	0	0	0	0	0	1646
4	2478	15	0	86	0	0	0	162	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2750
5	2959	0	0	0	15	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2977
6	203	0	0	6	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212
7	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
8	464	22	15	279	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	793
9	65	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65
10	12	8	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	27
11	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
12	793	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	800
13	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
14	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
16	7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
17	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	35
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
20	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	3	0	0	3	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	1	5	12	0	0	0	1	0	30
23	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	10121	1162	1468	3981	2191	367	95	697	128	17	0	15	35	57	1	4	2	0	0	1	24	8	8	8	8	0	0	20441

Table 12-11 (1/2) Speed and Delay Data (1/2)
Bareilly (Average)

Road: NH-24
Date: 15 Nov., 24 Nov., 25 Nov. 1997
Direction: Up (South to North)

Stretch No.	Stretch		Run No.	Period	Total Km.	Running Time (sec)	Delay Time (sec)	Journey Time (sec)	Test Car Journey Speed (km/h)
	From	To							
1	Andarpura	Bareilly Bypass Crossing	1	Noon	11.6	886	19	905	46.1
			2	Morning	11.6	885	47	932	44.8
			3	Evening	11.6	816	68	884	47.3
2	Bareilly Bypass Crossing	RTO Chowk	1	Noon	2.3	294	106	400	20.7
			2	Morning	2.3	258	75	333	24.9
			3	Evening	2.3	215	23	237	34.9
3	RTO Chowk	Chowky Chowk	1	Noon	0.8	115	0	115	25.0
			2	Morning	0.8	78	0	78	37.2
			3	Evening	0.8	84	0	84	34.5
4	Chowky Chowk	Choupla Chowraha	1	Noon	1.2	165	12	177	24.4
			2	Morning	1.2	119	0	119	36.3
			3	Evening	1.2	118	0	118	36.8
5	Choupla Chouraha	Mazaar Chowk	1	Noon	1.9	292	8	300	22.8
			2	Morning	1.9	228	12	240	28.6
			3	Evening	1.9	276	50	326	21.0
6	Mazaar Chowk	Quilla Chawni	1	Noon	0.9	117	0	117	27.7
			2	Morning	0.9	93	0	93	35.0
			3	Evening	0.9	126	27	153	21.2
7	Quilla Chawni	Railway Crossing	1	Noon	11.9	953	17	970	44.2
			2	Morning	11.9	769	47	816	52.5
			3	Evening	11.9	895	44	939	45.6
8	Railway Crossing	Fatehganj West	1	Noon	2.4	223	0	223	38.7
			2	Morning	2.4	168	0	168	51.6
			3	Evening	2.4	165	0	165	52.4

Table 12-11 (2/2) Speed and Delay Data Analysis (2/2)
Bareilly (Average)

Road: NH-24
Date: 15 Nov., 24 Nov., 25 Nov. 1997
Direction: Down (North to South)

Stretch No.	Stretch		Run No.	Period	Total Km.	Running Time (sec)	Delay Time (sec)	Journey Time (sec)	Test Car Journey Speed (km/h)
	From	To							
8	Fatehganj West	Railway Crossing	1	Noon	2.4	225	0	225	38.4
			2	Morning	2.4	173	0	173	50.1
			3	Evening	2.4	185	0	185	46.7
7	Railway Crossing	Quilla Chawni	1	Noon	11.9	865	39	904	47.4
			2	Morning	11.9	804	28	832	51.5
			3	Evening	11.9	1295	28	1323	32.4
6	Quilla Chawni	Mazaar Chowk	1	Noon	0.9	175	26	201	16.1
			2	Morning	0.9	122	0	122	26.7
			3	Evening	0.9	84	0	84	38.6
5	Mazaar Chowk	Choupla Chowraha	1	Noon	1.9	277	21	298	23.0
			2	Morning	1.9	239	33	272	25.2
			3	Evening	1.9	224	9	233	29.4
4	Choupla Chouraha	Chowky Chowk	1	Noon	1.2	150	0	150	28.8
			2	Morning	1.2	127	0	127	34.2
			3	Evening	1.2	95	13	108	40.2
3	Chowky Chowk	RTO Chowk	1	Noon	0.8	80	0	80	36.0
			2	Morning	0.8	80	0	80	36.0
			3	Evening	0.8	77	0	77	37.4
2	RTO Chowk	Bareilly Bypass Crossing	1	Noon	2.3	436	38	474	17.5
			2	Morning	2.3	306	40	345	24.0
			3	Evening	2.3	350	27	377	22.0
1	Bareilly Bypass Crossing	Andarpura	1	Noon	11.6	809	26	835	50.0
			2	Morning	11.6	737	60	797	52.4
			3	Evening	11.6	847	36	883	47.3

12.7.4 Axle Load Survey

Axle load survey was carried out at NH-24 (km 252) together with O-D survey. Total 349 samples were collected from the survey. Table 12-12 shows the summary of results of analysis. The distribution of axle load by truck type 3 (Medium truck with 2 axles) indicates the high average load on rear axle (5.23 tons).

12.7.5 Opinion Survey on Toll Bypass

Number of samples interviewed by category and their opinions on the toll bypass are summarised in Table 12-13. More than 90% of interviewed persons replied that the bypass is necessary from the view points of traffic problem, accidents and pollution etc. At the same time, they agree the toll bypass and are willing to pay toll charges

The amounts of willingness to pay vary depending on the degree of distance savings, time savings and by category as well. It should be noted, however, that the people tend to declare the amounts to the low side. Persons managing industrial company have replied the highest toll level and followed by traders/truck operators and then farmers as shown in Figure 12-7 and Figure 12-8.

Table 12-12 Summary of Axle Load Survey (Bareilly)

Loaded Vehicles						
Vehicle Type	No. of Samples	Axle Loading (tons)				Gross Weight (tons)
		Axle 1	Axle 2	Axle 3	Axle 4	
2	21	27.26	50.82			78.08
(Average)		1.30	2.42			3.72
3	191	494.57	998.70			1493.3
(Average)		2.59	5.23			7.82
4	7	19.42	27.73	26.89		74.04
(Average)		2.77	3.96	3.84		10.58
Loaded + Unloaded Vehicles						
1 & 2	93	40.77	72.93			113.70
(Average)		0.44	0.78			1.22
3	249	593.15	1132.03			1725.18
(Average)		2.38	4.55			6.93
4	7	19.42	27.73	26.89		74.04
(Average)		2.77	3.96	3.84		10.58
Weight per Axle (Loaded & Unloaded : tons)						
		2 Axles	3 Axles	4 Axles		
Total Weight		1838.88	74.01			
No. of Vehicles		342	7			
No. of Axles		684	21			
Weight per Axle		2.69	3.53			

Table 12-13 Summary of Opinion Survey (Bareilly Bypass)

No. of Samples		Levying Toll				Reasons of "Yes" or "No" and Opinions on the Bypass
Category	Yes/No	Yes	No	Total		
1 Farmers	Yes	40	0	40	a) Travelling problems will be solved. b) Useful for the villagers. c) It shall be made 15 km away from the city.	
	No	0	0	0		
	Total	40	0	40		
2 Traders & Truck Operators	Yes	38	2 (*)	40	a) Bypass is a better selection to lighten traffic & pollution problems. b) No. of accidents would be reduced. (*) No mentions about the reasons of "No".	
	No	0	0	0		
	Total	38	2 (*)	40		
3 Industries & Factories	Yes	29	7 (*)	36	a) It is good proposal to solve traffic problems and to protect pollution. b) Bypass should be made early to avoid traffic jam. (*) No reasons were mentioned	
	No	0	0	0		
	Total	29	7 (*)	36		
4 Local Leaders	Yes	37	3 (*)	40	a) Heavy traffic will be passed outside the city. b) Reducing traffic accidents and protect pollution. (*) No reasons were mentioned.	
	No	0	0	0		
	Total	37	3 (*)	40		
All Categories	Yes	144	12	156	c) Levying toll charges should be universal. d) Agree with the proposed alignment of the Bypass. e) The Bypass will be very necessary.	
	No	0	0	0		
	Total	144	12	156		

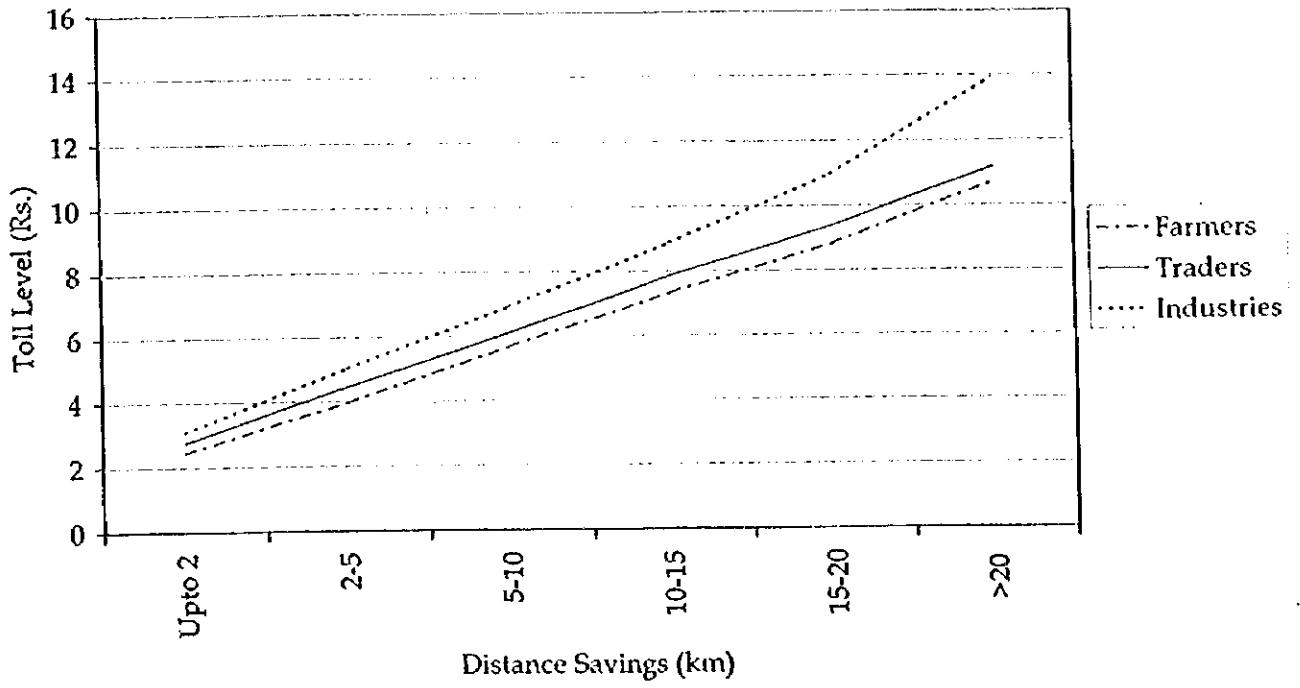


Figure 12-7 Average Toll Level Responded by Interviewees (1/2)

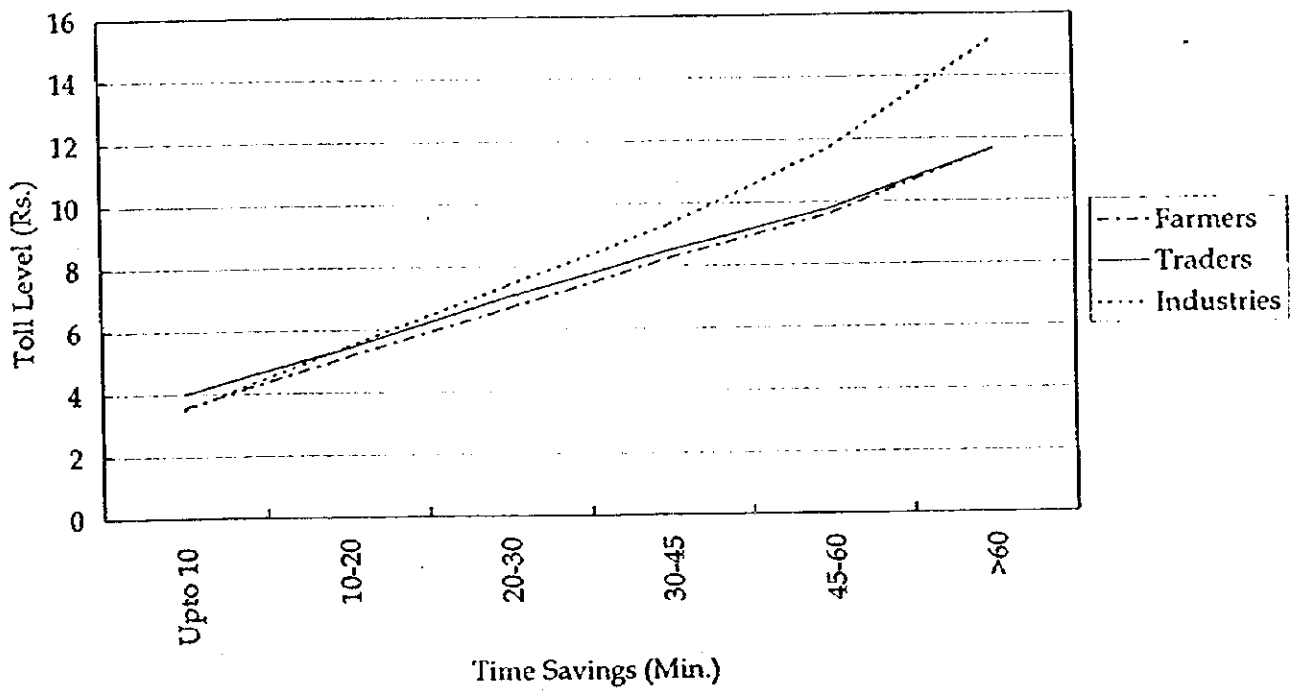


Figure 12-8 Average Toll Level Responded by Interviewees (2/2)