

## 20.3 Project Cost Estimates

### 20.3.1 Condition of Project Cost Estimates

The cost estimate was carried out in accordance with the following basic assumption and conditions.

- (1) Administration charge was assumed as 15% of direct construction cost, which includes Contingency charge, Quality control and Agency charge, etc.
- (2) Engineering and Supervision cost was assumed as 10% of direct construction cost.
- (3) Land Acquisition Cost for Bareilly Bypass

Based of the information given by the Environmental Impact Assessment (Social Environmental Aspects), the Land Acquisition Cost in the project area was judged as Rs.300,000 per ha as average. The required land area, subject of the land acquisition, was 255.8 ha. Additional 30% cost was added as solatium.

- (4) Land Acquisition Cost for Gwalior Bypass

Based of the information given by the Environmental Impact Assessment (Social Environmental Aspects), the Land Acquisition Cost in the project area was judged as Rs.188,800 per ha as average. The required land area, subject of the land acquisition, was 101.1 ha (deducted 104 ha of forest area and 6.4 ha of government land). Additional 30% cost was added as solatium.

- (5) Compensation cost for private properties, etc. was assumed as 20% of land acquisition cost. In addition to this, an amount of Rs.  $3,000 \times 10^3$  was included as a cost for compensatory afforestation in Gwalior Bypass, which was estimated in Chapter 14.4.5.2.
- (6) Contingencies inclusive of physical and price contingencies were assumed as 10% of direct construction cost, administration charge, engineering & supervision services, and maintenance equipment cost.

### 20.3.2 Estimated Project Cost

Project Cost of Bareilly Bypass and Gwalior Bypass was estimated as shown in Table 20-20 and 20-21, respectively.

**Table 20-20 Project Cost of Bareilly Bypass**

Item	Amount in Rs.	Remark
1 Direct Construction Cost	1,060,629,000	
2 Administration Charge	159,094,000	1×15%
3 Engineering & Supervision	106,063,000	1×10%
4 Maintenance Equipment Cost	8,643,000	
5 Land Acquisition Cost	99,778,000	+30% as solatium
6 Compensation	15,350,000	
7 Contingencies	133,443,000	(1~4)×10%
Total of Project Cost	1,583,000,000	

**Table 20-21 Project Cost of Gwalior Bypass**

Item	Amount in Rs.	Remark
1 Direct Construction Cost	799,306,000	
2 Administration Charge	119,896,000	1×15%
3 Engineering & Supervision	79,931,000	1×10%
4 Maintenance Equipment Cost	8,643,000	
5 Land Acquisition Cost	24,825,000	+30% as solatium
6 Compensation	6,819,000	
7 Contingencies	100,778,000	(1~4)×10%
Total of Project Cost	1,140,198,000	

## 20.4 Operation and Maintenance Cost Estimates

### 20.4.1 General

Operation and Maintenance Cost was estimated for the project, based on the following assumptions.

#### 20.4.1.1 Operation Costs

(1) Personnel

Staffing requirements for an O/M station was assumed in the structure as shown in Table 20-22. The annual cost for each category of professional rankings in 1997 price was also assumed in the Table.

Table 20-22 Matrix of Staffing Requirement for O/M Station

	Management		Administrative		Maintenance	
	Top Level	Mid Level	Supervisory	Clerical/ Engineers	Specialist	Common
Annual Remuneration Cost (Rs)	310,000	230,000	160,000	80,000	80,000	20,000
Management	○	○		○		
Administration.			○	○		
Civil Eng. Maintenance		○	○	○	○	○
Equipment Maintenance			○	○	○	○
Toll Collection		○	⊙	⊙		
Security			○	○	○	
Others						○

The manpower required for toll collection at the administrative level (marked as ⊙ in the above table) was assumed to be dependent on the traffic volume to handle, while requirements for all of the rest are not affected. The relationship between the expansion rate of toll collection work force and the traffic growth has been derived from the assumption that the required labour force for toll collection is linearly tripled when the traffic volume handled at a toll gate increases ten times if the initial volume is less than about 7,000 vehicles per day, as;

$$Y = 7/9 + 2 \cdot X/9$$

where Y : expansion rate of labour force required for toll collection  
X : growth rate of traffic volume handled at a toll gate.

(2) Toll machine maintenance and repair

4% surcharge to the labour cost for toll collection (shaded portion of Table 20-19)

(3) Utilities and other operation expenses

It was assumed to be dependent upon the number of workers in the O/M station excluding the work force for toll collection (shaded portion in Table 20-19), unit price for 1997 being assumed as Rs. 8,000 per person per annum.

(4) Overhead cost for corporate management

0.5% of the annual toll revenue

### 20.4.1.2 Maintenance Costs

#### A Routine maintenance

##### (1) Highway routine maintenance

Annual costs for materials for minor repairs of earthworks, pavements, bridges and traffic control devices, and vegetation control was assumed as Rs. 16,000 per km per annum in 1997 price

##### (2) Equipment maintenance and fuel

10% of the capital cost for maintenance equipment required for an O/M station listed as in Table 20-23 was assumed as its maintenance costs per annum, and its fuel costs per annum assumed to be 2.5 times of them.

**Table 20-23 Capital Cost for Maintenance Equipment for the O/M Station**

Item	Quantity	Unit Cost (Rs.)	Amount (Rs.)
Sedans	3	320,000	960,000
Vans	4	260,000	1,040,000
Light Trucks	1	415,000	415,000
Heavy Trucks	2	613,000	1,226,000
Water Trucks	1	600,000	600,000
Lift Trucks	1	500,000	500,000
Sign Trucks	4	500,000	2,000,000
Tow Trucks	1	500,000	500,000
Sweepers	1	271,000	271,000
Portable Generators	4	8,100	72,400
Power Mowers	5	7,100	35,500
Chain Saws	1	7,100	7,100
Tampers	1	16,100	16,100
Miscellaneous Hand Tools	Lump sum	1,000,000	
<b>Total</b>			<b>8,643,100</b>

##### Maintenance cost for equipment

Rs. 8,643,100 × 10% = Rs. 864×10<sup>3</sup> per annum in 1997 price

##### Fuel cost for equipment

Rs. 864×10<sup>3</sup> × 2.5 = Rs. 2,160×10<sup>3</sup> per annum in 1997 price

##### (3) Lighting

For toll collection facility lighting, assumed as Rs. 39,000 in average per set per annum in 1997 price. A concept of one set of toll collection facility was judged by its scale and location.

B Periodic maintenance

As a periodic maintenance, pavement overlay work in every 6 years was assumed to be carried out, at the unit cost of Rs.  $3,800 \times 10^3$  per km on the 4-lane section in 1997 price

## 20.4.2 Operation and Maintenance Cost Estimates for Bareilly Bypass

### 20.4.2.1 Operation Costs

(1) Personnel

Staffing for the O/M station which was designed to have total eight (8) toll barriers/tollgates and consequent annual personnel costs for the initial year of operation in 1997 price were assumed as shown in Table 20-24.

Table 20-24 Required Staffing for the O/M station of Bareilly Bypass

	Management		Administrative		Maintenance	
	Top Level	Mid Level	Supervisory	Clerical/ Engineers	Specialist	Common
Annual Remuneration Cost (Rs)	310,000	230,000	160,000	80,000	80,000	20,000
Management	2	2		2		
Administration.			2	4		
Civil Eng. Maintenance		1	1	2	2	12
Equipment Maintenance			1	1	2	6
Toll Collection		1	9	60		
Security			1	2	4	
Others						3
Total No. of Personnel	2	4	5 9	11 60	8	21
Grand Total No. of Personnel	51 69					
Total Cost per Annum	$620 \times 10^3$	$920 \times 10^3$	$800 \times 10^3$ $1,440 \times 10^3$	$880 \times 10^3$ $4,800 \times 10^3$	$640 \times 10^3$	$420 \times 10^3$
Grand Total Cost per Annum	$4,280 \times 10^3$ $6,240 \times 10^3$					

Note: The shaded portions were supposed to be dependent upon the traffic volume handled at the toll gates.

Thus the annual personnel costs for 2002 were estimated as Rs.  $4,280 \times 10^3$  for the fixed portion, and Rs.  $6,240 \times 10^3$  for the dependent portion on traffic volume, and Rs.  $10,520 \times 10^3$  in total, all in 1997 price.

(2) Toll machine maintenance and repair costs

Rs.  $6,240 \times 10^3 \times 4\% = \text{Rs. } 250 \times 10^3$  per annum

(3) Utilities and other operation expenses

Rs. 8,000 per person × 51 persons = Rs. 408×10<sup>3</sup> per annum

- (4) Overhead cost for corporate management

Rs. 255×10<sup>6</sup> (Annual Toll Revenue) × 0.5% = Rs. 1,275×10<sup>3</sup> per annum

- (5) Total operation costs

Independent of traffic volumes excluding overhead cost in 1997 price

Rs. 4,280×10<sup>3</sup> [from (1)] + (3) = Rs. 4,688×10<sup>3</sup> per annum

Dependent on traffic volumes for the first year (2002) in 1997 price:

Rs. 6,240×10<sup>3</sup> [from (1)] + (2) = Rs. 6,490×10<sup>3</sup> per annum

#### 20.4.2.2 Maintenance Costs

- A Routine maintenance cost

- (1) Highway routine maintenance

Rs. 16,000 per km × 29.976 km = Rs. 480×10<sup>3</sup> per annum

- (2) Equipment maintenance and fuel

Rs. 8,643,100 × 10% × 3.5 = Rs. 3,025×10<sup>3</sup> per annum

- (3) Lighting

Rs. 39,000 per set × 3 set = Rs. 117×10<sup>3</sup> per annum

- (4) Total routine maintenance costs in 1997 price:

(1) + (2) + (3) = Rs. 3,622×10<sup>3</sup> per annum

- B Periodic maintenance cost (Pavement overlay)

Rs. 3,800×10<sup>3</sup> per km × 29.976 = Rs. 113,900×10<sup>3</sup> in 1997 price

#### 20.4.3 Operation and Maintenance Cost Estimates for Gwalior Bypass

##### 20.4.3.1 Operation Costs

- (1) Personnel

Staffing for the O/M station which was designed to have two (2) toll barriers and consequent annual personnel costs for the initial year of operation in 1997 price are assumed as shown in Table 20-25.

**Table 20-25 Required Staffing for the O/M station of Gwalior Bypass**

	Management		Administrative		Maintenance	
	Top Level	Mid Level	Supervisory	Clerical/ Engineers	Specialist	Common
Annual Remuneration Cost (Rs)	310,000	230,000	160,000	80,000	80,000	20,000
Management	1	2		2		
Administration.			2	3		
Civil Eng. Maintenance		1	1	2	2	10
Equipment Maintenance			1	1	2	4
Toll Collection		1	2	15		
Security			1	2	3	
Others						3
Total No. of Personnel	1	4	5 2	10 15	7	17
Grand Total No. of Personnel	44 17					
Total Cost per Annum	$310 \times 10^3$	$920 \times 10^3$	$800 \times 10^3$ $320 \times 10^3$	$800 \times 10^3$ $1,200 \times 10^3$	$560 \times 10^3$	$340 \times 10^3$
Grand Total Cost per Annum	$3,730 \times 10^3$ $1,520 \times 10^3$					

Note : The shaded portions were supposed to be dependent upon the traffic volume handled at the toll gates.

Thus the annual personnel costs for 2002 were estimated as Rs.  $3,730 \times 10^3$  for the fixed portion, and Rs.  $1,520 \times 10^3$  for the dependent portion on traffic volume, and Rs.  $5,250 \times 10^3$  in total, all in 1997 price.

- (2) Toll machine maintenance and repair costs

$$\text{Rs. } 1,520 \times 10^3 \times 4\% = \text{Rs. } 61 \times 10^3 \text{ per annum}$$

- (3) Utilities and other operation expenses

$$\text{Rs. } 8,000 \text{ per person} \times 44 \text{ persons} = \text{Rs. } 352 \times 10^3 \text{ per annum}$$

- (4) Overhead cost for corporate management

$$\text{Rs. } 187 \times 10^6 \text{ (Annual Toll Revenue)} \times 0.5\% = \text{Rs. } 935 \times 10^3 \text{ per annum}$$

- (5) Total operation costs

Independent of traffic volumes excluding overhead cost in 1997 price

$$\text{Rs. } 3,730 \times 10^3 \text{ (from (1))} + (3) = \text{Rs. } 4,082 \times 10^3 \text{ per annum}$$

Dependent on traffic volumes for the first year (2002) in 1997 price:

$$\text{Rs. } 1,520 \times 10^3 \text{ (from (1))} + (2) = \text{Rs. } 1,581 \times 10^3 \text{ per annum}$$

### 20.4.3.2 Maintenance Costs

#### A Routine maintenance cost

(1) Highway routine maintenance

$$\text{Rs. } 16,000 \text{ per km} \times 26.497 \text{ km} = \text{Rs. } 424 \times 10^3 \text{ per annum}$$

(2) Equipment maintenance and fuel

$$\text{Rs. } 8,643,100 \times 10\% \times 3.5 = \text{Rs. } 3,025 \times 10^3 \text{ per annum}$$

(3) Lighting

$$\text{Rs. } 39,000 \text{ per set} \times 1 \text{ set} = \text{Rs. } 39 \times 10^3 \text{ per annum}$$

(4) Total routine maintenance costs in 1997 price:

$$(1) + (2) + (3) = \text{Rs. } 3,488 \times 10^3 \text{ per annum}$$

#### B Periodic maintenance cost (Pavement overlay)

$$\text{Rs. } 3,800 \times 10^3 \text{ per km} \times 26.497 = \text{Rs. } 100,690 \times 10^3 \text{ in 1997 price}$$



## ***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*



## **21 Economic and Financial Analysis**

### **21.1 Economic Analysis**

#### **21.1.1 Methodology**

The methodology applied in the Feasibility Study is the same as that of the Pre-feasibility Study in principle with the following modifications.

##### **(1) Financial Costs and Economic Costs**

While 0.8 had been multiplied for the conversion of the financial costs to the economic costs in the Pre-feasibility Study, the conversion in the Feasibility Study was made with the adjustments as described below. The economic costs for the Feasibility Study were estimated at constant prices of FY 1997 and no inflation is taken into account in the analysis.

##### **i) Transfer Items**

Transfer items, such as taxes/duties, customs or subsidies included in the financial costs were deducted at the time of the conversion.

##### **ii) Shadow Exchange Rate**

The Projects will incur foreign currency. The foreign exchange portion was evaluated with a shadow exchange rate (SER) of  $1.18 \times$  the actual exchange rate, which was derived from preliminary estimation with the current statistics on external trade.

##### **iii) Shadow Wage Rate**

Wages of unskilled labours were calculated as 60% of the financial value as suggested by the Planning Commission.

##### **iv) Economic Price of Land**

Economic price of lands is defined as the opportunity costs, i.e., income from the current land use foregone by the implementation of the Projects. The economic benefits through current land use at the Project sites were considered as the opportunity cost. As for the agricultural lands which share most of the lands to be acquired for the Projects, the income by the current cultivation of the land, i.e., sales of the crop yields minus expenditures for the cultivation were inquired for the calculation of the opportunity costs. As for the lands other than those in agricultural use, the opportunity costs of adjacent agricultural lands was applied, assuming that the land use may continue after the relocation to the adjacent agricultural lands.

The economic value of agricultural land was estimated after the inquiry of current crops, areas of cultivation, yields per hectare and ex-farm prices supported by the PWD of Uttar Pradesh, Madhya Pradesh and Ministry of Agriculture. The result shows some 60% of the market price might be the economic value of the agricultural lands for Bareilly Bypass and 55% for Gwalior Bypass. As for the forests in the site of proposed Gwalior Bypass, the forests seem not to contribute to significant economic production. The value is neglected in the analysis.

(2) Revision of Unit VOC and Travel Time Value

a) Unit VOC

The unit VOC was revised for each of the two bypasses with the revisions of the assumptions on road conditions, such as roughness of the road surface, rise and fall in vertical alignment, and price updating of VOC components. Tax portion was also reviewed based on the inquiries with manufacturers and their associations. The foreign portion of the economic VOC was adjusted by the SER with the assumption of foreign portion of each cost component, such as vehicles, tyres and fuel.

b) Unit Travel Time Value

Unit value of travel time was revised with latest data on whole-sale price indices and applied in the analysis of the both bypasses. The latest available data on whole-sale price index shows that 4.2% of price escalation has occurred during the time from July 1997 to January 1998. The price escalation of 5% was assumed during period from the survey of the Pre-feasibility to that of the Feasibility Study.

(3) Sensitivity Analysis

Sensitivity tests were made in the economic analysis for the two bypasses with the following pessimistic variation of the parameters.

- a) Construction cost (+20%)
- b) Operation cost (+20%)
- c) Toll Rate (+20%)

## 21.1.2 Results of Economic Analysis for Bareilly Bypass

### (1) Economic Costs

The economic costs were estimated at constant prices of FY 1997 as follows. The economic costs, as well the financial costs, comprise initial costs and operation/maintenance costs, including routine operation and periodic maintenance/renovation. The total economic initial costs accounts 87% of the financial one.

**Table 21-1 Economic Initial Costs of Bareilly Bypass at Constant Prices of FY 1997**

(unit: Rs. million)

A. Economic Cost	1,378.73
B. Financial Cost	1,583.00
A/B	87.1%

(Note) Both costs include those for land and compensation.

**Table 21-2 Economic O&M Costs of Bareilly Bypass at Constant Prices of FY 1997**

(unit: Rs. million)

Routine Operation /Maintenance in FY 2002	14.14
Environmental Monitoring	0.23
Periodic Overlay (once in 6 years)	99.10

### (2) Economic Benefits

#### a) Estimated Unit VOC

##### Road Conditions for VOC Calculation

The National Highway 24 in and around Bareilly has two-lane with a width of 7.0 m (3.5 m × 2) pavement. Although some parts of the highway have hardened shoulders, all shoulders were assumed as earthened. The proposed bypass will be dual two-lane (pavement width of 7.0 m × 2) with hardened shoulders.

Since the data on road roughness of the National Highway 24 in and around Bareilly was not available, a figure of 5,000 mm/km was assumed during the 20 years period for the analysis. The surface roughness of the proposed bypass is assumed as 3,000 mm/km during the same period.

The rise and fall of 4 m/km was roughly estimated for the VOC calculation for both the national highway and the bypass with an equal figure for rise and fall.

### Price Updating

Prices of VOC components were revised taking account of the inflation occurred during the period between the survey for the Pre-feasibility Study and this Feasibility Study, according to the wholesale price index of the country in general. Price escalation of 5% was assumed during this period. Besides, the prices of major components, such as prices of new vehicles, fuel and tyres were inquired with the assistance by PWD Uttar Pradesh.

The unit VOC was estimated as follows.

**Table 21-3 Unit VOC on the National Highway 24 in Bareilly at FY 1997 Prices**

Speed (km/hour)	Unit VOC (Rs./km)			
	Car	Bus	Truck	Two-wheeler
0-10	13.66	31.07	18.30	2.61
10-20	6.31	15.71	13.33	1.13
20-30	4.84	11.78	10.97	0.84
30-40	4.21	9.93	9.58	0.75
40-50	3.70	7.98	7.84	0.73
50-60	3.14	6.56	6.59	0.76
60-70	3.16	6.21	6.24	0.81
70-80	3.22	6.03	6.05	0.89
80-90	3.36	5.97	5.99	0.99
90-100	3.54	6.01	6.02	1.11

**Table 21-4 Unit VOC on Bareilly Bypass at FY 1997 Prices**

Speed (km/hour)	Unit VOC (Rs./km)			
	Car	Bus	Truck	Two-wheeler
0-10	13.42	30.38	17.64	2.45
10-20	6.06	15.02	12.68	0.97
20-30	4.59	11.10	10.31	0.68
30-40	3.96	9.30	8.86	0.59
40-50	3.53	8.28	7.43	0.57
50-60	3.01	7.12	6.40	0.60
60-70	2.61	5.94	6.05	0.66
70-80	2.67	5.76	5.87	0.73
80-90	2.80	5.70	5.80	0.83
90-100	2.99	5.75	5.84	0.95

b) Estimated Unit Travel Time Value

The unit value of travel time shown in the table below was applied for the economic analysis of Bareilly Bypass.

**Table 21-5 Unit Value of Travel Time per Vehicle in FY 1997**

Type of Vehicle	Travel time saving
passengers on a car	Rs. 267.9/hour/vehicle
passengers on a bus	Rs. 1,945.4/hour/vehicle
commodity in a truck	Rs. 22.3/hour/vehicle
passengers on a two-wheeler	Rs. 67.9/hour/vehicle

c) Estimated Economic Benefits

The economic benefits counted in the Feasibility Study, i.e. VOC saving and travel time saving, by the Project in 2002 and 2012 at the constant prices of Fiscal Year 1997 is given in the table below. For calculation of the economic internal rate of return (EIRR) and the net present value (NPV) of the Project, the benefits between FY 2002 and FY 2012 were linearly interpolated, and the benefits after FY 2012 were assumed to remain constant.

**Table 21-6 Economic Benefits of Bareilly Bypass at FY 1997 Prices**

	(unit: Rs. million)		
	VOC saving	Travel Time Saving	Total
Fiscal year 2002	528.47	1,893.04	2,421.50
Fiscal year 2012	2,350.96	5,238.56	7,589.52

(3) Economic Internal Rate of Return and Net Present Value

The EIRR of the Bareilly Bypass was computed as 45.3% and the NPV as Rs. 5,888 million as shown in the table below in case only VOC saving were counted. The EIRR is 1.5% lower than that in the Pre-feasibility Study, and the NPV is smaller by Rs. 751 million. The difference was resulted mainly from decrease in the future traffic volume on the Bypass, -3% in 2002 and -22% in 2012 as estimated in the future traffic demand forecast, despite a decrease in economic initial cost (-8.3%).

Table 21-7 EIRR and NPV of Bareilly Bypass

(Rs. million)

Fiscal year	Benefit		Cost			Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construction	O & M	Environmental Monitoring	(A)	(B)	(A)	(B)
1998									
1999			335.9			-335.9	-335.9	-267.8	-267.8
2000			521.4			-521.4	-521.4	-371.1	-371.1
2001			521.4			-521.4	-521.4	-331.4	-331.4
2002	528.5	2,421.5		14.1	0.2	514.1	2,407.1	291.7	1,365.9
2003	710.7	2,938.3		14.4	0.2	696.1	2,923.7	352.7	1,481.2
2004	893.0	3,455.1		14.7	0.2	878.1	3,440.2	397.2	1,556.2
2005	1,075.2	3,971.9		14.8	0.2	1,060.1	3,956.8	428.2	1,598.1
2006	1,257.5	4,488.7		15.1	0.2	1,242.1	4,473.3	447.9	1,613.1
2007	1,439.7	5,005.5		114.4	0.2	1,325.1	4,890.9	426.6	1,574.7
2008	1,622.0	5,522.3		15.6	0.2	1,606.2	5,506.5	461.7	1,583.0
2009	1,804.2	6,039.1		15.6	0.2	1,788.3	6,023.2	459.0	1,546.0
2010	1,986.5	6,555.9		15.9	0.2	1,970.3	6,539.8	451.5	1,498.7
2011	2,168.7	7,072.7		16.0	0.2	2,152.5	7,056.5	440.4	1,443.9
2012	2,351.0	7,589.5		16.8	0.2	2,333.9	7,572.5	426.4	1,383.5
2013	2,351.0	7,589.5		115.9	0.2	2,234.8	7,473.4	364.5	1,219.1
2014	2,351.0	7,589.5		16.8	0.2	2,333.9	7,572.5	339.9	1,102.9
2015	2,351.0	7,589.5		16.8	0.2	2,333.9	7,572.5	303.5	984.7
2016	2,351.0	7,589.5		16.8	0.2	2,333.9	7,572.5	271.0	879.2
2017	2,351.0	7,589.5		16.8	0.2	2,333.9	7,572.5	242.0	785.0
2018	2,351.0	7,589.5		16.8	0.2	2,333.9	7,572.5	216.0	700.9
2019	2,351.0	7,589.5		115.9	0.2	2,234.8	7,473.4	184.7	617.6
2020	2,351.0	7,589.5		16.8	0.2	2,333.9	7,572.5	172.2	558.8
2021	2,351.0	7,589.5	-413.6	16.8	0.2	2,747.6	7,986.1	181.0	526.1
						45.3%	100.3%	5,888.0	23,048.4
						EIRR		NPV	



(4) Sensitivity Tests

a) Construction Cost

Increase of 20% in the economic initial or construction cost will result in 4.6% decrease in the EIRR and Rs. 188 million in the NPV, when only VOC saving is counted. The decreased EIRR is still far higher than 12%.

**Table 21-8 Results of the Sensitivity Tests**

Indicators Factors	EIRR (%)		NPV (Rs. million)	
	VOC saving only	+Travel Time saving	VOC saving only	+Travel Time saving
Construct. Cost	40.7%	90.6%	5,699.4	22,859.8
+20%	(-4.6%)	(-9.7%)	(-188.6)	(-188.6)

(note) Figures in ( ) show the difference from the base case.

b) Operation Cost

Sensitivity of change in operation costs (+20%) to the EIRR is negligible for both bypasses. Increase of 20% in the operation costs resulted in decrease of 0.1% of the EIRR with decrease in Rs. 26 million of the NPV (counted VOC saving only).

c) Toll Rate

Increase of 20% in toll rate will cause 4% decrease of the bypass traffic in 2002. The traffic volume on the Bypass will not change in 2012. The decrease in the EIRR will be less than 0.5%. The economic viability seems to have little sensitivity to the change in the toll level at the level of 20%.

(5) Economic Evaluation

The estimated EIRR of the Bareilly Bypass is far larger than 12% even when travel time savings are not counted and even in all pessimistic sensitivity tests. The results of the analysis show high economic viability of the Bypass. The implementation would be very beneficial to the national economy.

### 21.1.3 Results of Economic Analysis for Gwalior Bypass

(1) Economic Costs

The economic costs were estimated at constant prices of FY 1997 as follows. The economic costs, as well the financial costs, comprise initial costs and operation/maintenance costs including routine operation and periodic

maintenance/renovation. The total economic initial costs accounts 88% of the financial one, probably because of the low tax rates and small portion of the foreign portion for on construction.

**Table 21-9 Economic Initial Costs of Gwalior Bypass at Constant Prices of FY 1997**

(unit: Rs. million)

A. Economic Cost	1,003.20
B. Financial Cost	1,140.20
A/B	88.0%

(Note) Both costs include those for land and compensation.

**Table 21-10 Economic O&M Costs of Gwalior Bypass at Constant Prices of FY 1997**

(unit: Rs. million)

Routine Operation /Maintenance in 2002	8.83
Environmental Monitoring	0.23
Periodic Overlay (once in 6 years)	87.60

(2) Economic Benefits

a) Estimated Unit VOC

Road Conditions for VOC Calculation

The National Highway 3 in and around Gwalior has two-lane with a width of 7.0 m (3.5 m × 2) pavement. Although some parts of the highway have hardened shoulders, all shoulders were assumed as earthened. The proposed bypass will be dual two-lane (pavement width of 7.0 m × 2) with hardened shoulders.

Since the data on road roughness of the National Highway 3 in and around Gwalior was not available, a figure of 5,000 mm/km was assumed during the 20 years period for the analysis. The surface roughness of the proposed bypass is assumed as 3,000 mm/km during the same period.

The rise and fall of 5 m/km for the National Highway, and 7 m/km for the bypass were roughly estimated for the VOC calculation with an equal figure for rise and fall.

Price Updating

Prices of VOC components were revised taking account of the inflation occurred during the period between the surveys for the Pre-feasibility Study and this Feasibility Study, according to the wholesale price index of the country in general. Price escalation of 5% was assumed during this period.

Besides, the prices of major components, such as prices of new vehicles, fuel and tyres were inquired with the assistance by PWD Madhya Pradesh.

The unit VOC was estimated as follows.

**Table 21-11 Unit VOC on the National Highway 3 in Gwalior in FY 1997**

Speed (km/hour)	Unit VOC (Rs./km)			
	Car	Bus	Truck	Two-wheeler
0-10	13.66	31.10	18.26	2.62
10-20	6.31	15.74	13.35	1.13
20-30	4.84	11.83	11.01	0.84
30-40	4.21	9.96	9.64	0.75
40-50	3.70	8.00	7.89	0.74
50-60	3.14	6.59	6.62	0.76
60-70	3.16	6.23	6.28	0.82
70-80	3.23	6.05	6.09	0.89
80-90	3.36	5.99	6.03	0.99
90-100	3.55	6.04	6.07	1.11

**Table 21-12 Unit VOC on Gwalior Bypass at FY 1997 Prices**

Speed (km/hour)	Unit VOC (Rs./km)			
	Car	Bus	Truck	Two-wheeler
0-10	13.42	30.45	17.62	2.46
10-20	6.06	15.09	12.71	0.97
20-30	4.59	11.16	10.37	0.69
30-40	3.96	9.37	8.94	0.60
40-50	3.53	8.34	7.49	0.58
50-60	3.01	7.19	6.47	0.60
60-70	2.63	6.00	6.12	0.66
70-80	2.69	5.82	5.94	0.74
80-90	2.83	5.77	5.88	0.84
90-100	3.02	5.81	5.91	0.96

**b) Estimated Unit Travel Time Value**

The unit value of travel time shown in the table below was applied for Gwalior Bypass as well.

**Table 21-13 Unit Value of Travel Time per Vehicle in FY 1997**

Type of Vehicle	Travel time saving
Passengers on a car	Rs. 267.9/hour/vehicle
Passengers on a bus	Rs. 1,945.4/hour/vehicle
Commodity in a truck	Rs. 22.3/hour/vehicle
Passengers on a two-wheeler	Rs. 67.9/hour/vehicle

c) Estimated Economic Benefits

The economic benefits counted in the Feasibility Study, i.e. VOC saving and travel time saving, by the Project in 2002 and 2012 at the constant prices of Fiscal Year 1997 are given in the table below. For calculation of the economic internal rate of return (EIRR) and the net present value (NPV) of the Project, the benefits between 2002 and 2012 were linearly interpolated, and the benefits after 2012 were assumed to remain constant.

**Table 21-14 Economic Benefits of Gwalior Bypass at Constant Prices of FY 1997**

(unit: Rs. million)

	VOC saving	Travel Time Saving	Total
Fiscal year 2002	597.86	943.47	1,541.33
Fiscal year 2012	932.13	1,163.60	2,095.73

(3) Economic Internal Rate of Return and Net Present Value

The EIRR of the Gwalior Bypass was computed as 45.9 % and the NPV as Rs. 2,877 million as shown in the table below, accounting only VOC saving. The EIRR with counting VOC saving only is 26.2% higher than that in the Pre-feasibility Study, while the NPV with counting VOC saving only is larger by Rs. 1,951 million. The major reason for the increase in the EIRR may be as follows:

Despite the difference in the methodology in the conversion of the financial initial cost to the economic cost, the economic initial cost had decreased 41% because of 46% the decrease in the financial cost. The other reason is increase in the economic benefits of VOC saving, 84% in 2002 and 63% in 2012 despite the 12% to 13% decrease in the vehicle kilometer, because of the lowered speed of vehicles due to the consideration of the urban development plan along the National Highway 3.

Table 21-15 EIRR and NPV of Gwalior Bypass

(Rs. million)

Fiscal year	Benefit		Cost			Balance		Discounted Balance (12%)	
	VOC saving (A)	+Time saving (B)	Construction	O & M	Environmental Monitoring	(A)	(B)	(A)	(B)
1998									
1999			217.0			-217.0	-217.0	-173.0	-173.0
2000			393.1			-393.1	-393.1	-279.8	-279.8
2001			393.1			-393.1	-393.1	-249.8	-249.8
2002	597.9	1,541.3		8.8	0.2	588.8	1,532.3	334.1	869.4
2003	631.3	1,596.8		8.9	0.2	622.2	1,587.7	315.2	804.4
2004	664.7	1,652.2		9.0	0.2	655.5	1,643.0	296.5	743.2
2005	698.1	1,707.7		9.0	0.2	688.9	1,698.4	278.2	685.9
2006	731.6	1,763.1		9.2	0.2	722.2	1,753.7	260.4	632.4
2007	765.0	1,818.5		96.8	0.2	668.0	1,721.5	215.1	554.3
2008	798.4	1,874.0		9.3	0.2	788.8	1,864.4	226.8	536.0
2009	831.8	1,929.4		9.4	0.2	822.3	1,919.8	211.1	492.8
2010	865.3	1,984.9		9.5	0.2	855.5	1,975.1	196.1	452.6
2011	898.7	2,040.3		9.5	0.2	889.0	2,030.6	181.9	415.5
2012	932.1	2,095.7		9.7	0.2	922.2	2,085.8	168.5	381.1
2013	932.1	2,095.7		97.3	0.2	834.6	1,998.2	136.1	325.9
2014	932.1	2,095.7		9.7	0.2	922.2	2,085.8	134.3	303.8
2015	932.1	2,095.7		9.7	0.2	922.2	2,085.8	119.9	271.2
2016	932.1	2,095.7		9.7	0.2	922.2	2,085.8	107.1	242.2
2017	932.1	2,095.7		9.7	0.2	922.2	2,085.8	95.6	216.2
2018	932.1	2,095.7		9.7	0.2	922.2	2,085.8	85.4	193.1
2019	932.1	2,095.7		97.3	0.2	834.6	1,998.2	69.0	165.1
2020	932.1	2,095.7		9.7	0.2	922.2	2,085.8	68.0	153.9
2021	932.1	2,095.7	-301.0	9.7	0.2	1,223.1	2,386.7	80.6	157.2
						45.9%	85.4%	2,877.1	7,893.6
						EIRR		NPV	

(4) Sensitivity Tests

a) Construction Cost

Increase of 20% in the economic initial or construction cost results in 5.6% decrease in the EIRR and Rs. 157 million in the NPV (counted VOC saving only). The decreased EIRR is still far more than 12%.

**Table 21-16 Results of the Sensitivity Tests**

Indicators Factors	EIRR (%)		NPV (Rs. million)	
	VOC saving only	+Travel Time saving	VOC saving only	+Travel Time saving
Construct. Cost	40.4%	76.3%	2,745.5	7,762.0
+10%	(-5.6%)	(-9.4%)	(-136.6)	(-136.6)

(note) Figures in ( ) show the difference from the base case.

b) Operation Cost

Sensitivity of change in operation costs (+20%) to the EIRR is negligible for both bypasses. Increase of 20% in the operation costs resulted in decrease of 0.1% of the EIRR, with decrease in Rs. 19 million of the NPV (counted VOC saving only).

c) Toll Rate

No sensitivity was found in toll rate change to the economic viability at 20% level of increase. This may show the high willingness to pay of the bypass users.

(5) Economic Evaluation

The EIRR of the Gwalior Bypass is far higher than 12% even when only travel time savings are not counted and even in all pessimistic sensitivity tests. The results of the analysis show high economic viability of the bypass. The implementation would be very beneficial to the national economy.

## 21.2 Financial Analysis

### 21.2.1 Methodology

#### (1) Financial Internal Rate of Return on Total Investment

Financial internal rates of return (FIRR) on total investment (ROI), including costs of land acquisition and compensation, were computed in the same manner as the Pre-Feasibility Study, with the projection of revenues and costs in 30 years after the start of toll collection and with the assumption of inflation of 7% per annum.

##### a) Financial Costs

The costs estimated in Chapter 20 were applied with the price escalation due to the inflation.

##### b) Revenue

Only toll revenue was counted as the revenue of the Project. The toll revenue was estimated with toll rate estimation and the traffic volume forecasted in Chapter 13. Since the traffic volumes were estimated for 2002 and 2012, those in the year between 2002 and 2012 were linearly interpolated and the volume after 2012 was assumed to remain constant. The toll rates after 2002 were supposed to be revised in every two years with the inflation rate of 7% per annum. The toll rates for each type of the vehicles were rounded in rupee level (no paises were applied). The rates after 2012 were rounded down to the nearest multiples of five.

#### (2) Financial Viability of Implementing Entities.

For the examination of financial viability of the each implementing entity, profit/loss statement and cash flow statement were projected in 30years after the commencement of the bypass operation with the assumptions listed below. The revenue and operation/maintenance costs which was counted for the calculation of FIRR-ROI was applied for the analysis of financial viability of the implementing entities.

##### a) Implementing Entity

BOT type implementation was presumed in the analysis. A Special Purpose Vehicle (SPV) was assumed to be established as the implementing entity for each of the bypasses with the concession of 30 years of operation. Future profit/loss and cash flow of each SPV was estimated in the conditions provided in the Guidelines for Private Investment in National Highway

Projects.

Although there may be possibility for the SPV to run businesses other than the toll road operation, such as advertisement, restaurants, hotels, petroleum pumps, or real estate development, those business other than the toll road operation are not included in the analysis.

b) Capital Costs for the SPV

The costs for land acquisition and clearance of right-of-way such as relocation of utility services, cutting trees, resettlement and rehabilitation of affected establishments, and removal of all encroachments would be born by the Government. Those costs were deducted for the estimation of capital costs for the SPV.

Although up to 40% of the capital cost may be granted by the Government (GOI) and/or the National Highway Authority (NHAI) according to the Guideline, the base case of the analysis on financial viability of the SPV did not apply the capital grant.

c) Equity and Loan

The capital cost would be funded or financed to the SPV in the form of equity or loan. An equity/loan ratio of 1:2 was assumed so that 33% of the capital cost will be funded as equity by investors and 67% of the capital cost will be financed by lending institutes in the base case.

As for the long-term loan to cover the capital expenditure, an interest rate of 20% per annum with the repayment in 15 years after the start of the toll collection was assumed. Short-term loan to cover the yearly deficit in operation and repayment of long-term loan was also applied with the interest of 18% per annum.

d) Depreciation

Depreciation followed the straight-line method, assuming the life expectancy as listed below. Capitalised interest was depreciated with the same duration of the assets. Because the annual costs for the equipment for routine operation/maintenance was estimated 10% of the purchase costs including equipment maintenance and renovation costs, the timing of the next purchase is not easily predictable, and the portion is quite small, the depreciation for the operation/maintenance equipment does not appear in the profit/loss statement estimated for each SPV.



- i) road, bridge, toll booth: 20 years
- ii) overlay: 6 years

e) Tax on the SPV

Corporate tax on the SPV was assumed to be totally exempted in the initial five years from when the SPV starts to generate profits. In subsequent five years, exemption of 30% of the corporate tax was assumed. For the years later, 35% of the net profits (before tax) without any surcharge were calculated as corporate taxes.

After the estimation of profit/loss statement and cash flow statement, the following indicators were forecasted.

- i) Financial Internal Rate of Return on equity (FIRR-ROE)
- ii) First Year of Surplus
  - Annual Surplus in Net Profit/Loss
  - Annual Surplus in Cash Flow
- iii) Maximum Annual Short-term Loan (year and amount)

f) Sensitivity Analysis

Since the FIRR-ROI is near or lower than the interest rate of the long-term loan, the sensitivity tests in this analysis were made to search for measures to raise the FIRR-ROE up to the level at which private investors may feel attractiveness to the implementation of the Projects, while sensitivity tests are normally made for the pessimistic cases for the risk analysis.

Sensitivity tests were made with the following variation of important factors.

- i) GOI/NHAI Capital Grant (40%)
- ii) Interest on Long-term Loan (15%, 10%)
- iii) Toll Rate (+20%)

At first, 40% of the Government capital grants, which is the upper limit provided in the Guideline, was considered for the test. Second, 15% of interest rate, which is near to the recent prime lending rate (PLR), for long-term loan was applied, assuming to have some loan guarantee by the Government or public financial institutes. Third, the case of 10% interest rate for long-term was also tested, assuming some foreign loan by economic co-operation. Although loan conditions of bilateral or multilateral assistance organisation for infrastructure projects and currency loss for the repayment should vary by lending institutes, 10% of interest and 15 years repayment after the start of operation were conservatively applied.

Finally, 20% raise of the toll rate was tested. Although the proposal of the lowest toll rate is the most important factor in awarding the concession, the toll raise was examined in sensitivity tests because low elasticity which was estimated in the traffic forecast might indicate possibility of higher willingness-to-pay of the bypass users.

In addition, the following examinations were made for reference.

- i) How much portion of the GOI/NHAI Grants is necessary in order to attain 20% of the FIRR-ROE (financial internal rate of return on equity) with 20 years of concession period ?
- ii) How long the concession period is required to achieve 20% of FIRR-ROE. with 40% of the capital grants by GOI/NHAI ?

## 21.2.2 Results of Financial Analysis for Bareilly Bypass

### (1) Financial Costs

According to the cost estimate and construction schedule described in Chapter 20 and Chapter 17, the initial costs during the period from 1999 to 2001 will occur as follows.

**Table 21-17 Initial Financial Costs at Current Prices of Each Year**

		(Rs. million)
Fiscal year	1999	336.11
	2000	719.28
	2001	769.63

Operation/maintenance costs are shown at prices of FY 1997 in the table below.

**Table 21-18 O&M Costs of Bareilly Bypass at Constant Prices of FY 1997**

		(unit: Rs. million)
Routine Operation /Maintenance including Environmental Monitoring in FY 2002		15.94
Periodic Overlay (once in 6 years)		113.91

### (2) Toll Revenue

The toll revenue after 2002 up to 2031 was estimated as follows. The proportion of LCV of the "Truck" were assumed as same as in the traffic survey conducted for the Feasibility Study, 14.6% for LCV and 85.4% for other types.

Table 21-19 Toll Rates of Bareilly Bypass at Current Prices of Each Year

(Unit: Rs./vehicle)

section	BP-SH37				SH37-SH33				SH33-EP			
	Car/ Jeep/ Van	LCV	Bus/ Truck	Two- wheeler	Car/ Jeep/ Van	LCV	Bus/ Truck	Two- wheeler	Car/ Jeep/ Van	LCV	Bus/ Truck	Two- wheeler
2002	13	22	45	6	6	11	22	3	25	43	86	12
2003	13	22	45	6	6	11	22	3	25	43	86	12
2004	15	26	51	7	7	13	25	4	28	49	98	14
2005	15	26	51	7	7	13	25	4	28	49	98	14
2006	17	29	59	8	8	14	29	4	32	56	113	16
2007	17	29	59	8	8	14	29	4	32	56	113	16
2008	19	34	67	10	9	17	33	5	37	64	129	18
2009	19	34	67	10	9	17	33	5	37	64	129	18
2010	22	38	77	10	10	19	38	5	42	74	148	20
2011	22	38	77	10	10	19	38	5	42	74	148	20
2012	25	40	85	10	10	20	40	5	45	80	165	20
2013	25	40	85	10	10	20	40	5	45	80	165	20
2014	25	50	100	10	10	25	50	5	55	95	190	25
2015	25	50	100	10	10	25	50	5	55	95	190	25
2016	30	55	115	15	15	25	55	5	60	110	220	30
2017	30	55	115	15	15	25	55	5	60	110	220	30
2018	35	65	130	15	15	30	65	5	70	125	250	35
2019	35	65	130	15	15	30	65	5	70	125	250	35
2020	40	75	150	20	20	35	75	10	80	145	290	40
2021	40	75	150	20	20	35	75	10	80	145	290	40
2022	45	85	170	25	20	40	85	10	95	165	330	45
2023	45	85	170	25	20	40	85	10	95	165	330	45
2024	55	95	195	25	25	45	95	10	105	190	380	50
2025	55	95	195	25	25	45	95	10	105	190	380	50
2026	65	110	225	30	30	55	110	15	120	215	435	60
2027	65	110	225	30	30	55	110	15	120	215	435	60
2028	70	130	255	35	35	60	125	15	140	245	495	70
2029	70	130	255	35	35	60	125	15	140	245	495	70
2030	85	145	295	40	40	70	145	20	160	285	570	80
2031	85	145	295	40	40	70	145	20	160	285	570	80

(Note) BP; beginning point, SH; State Highway, EP; end point

The toll rates and financial cost saving were compared after estimation of the difference in financial costs between the conditions that a vehicle will run on the national highway without the construction of the Bypass and the conditions that a vehicle will run on the Bypass in 2002 and 2012.

The difference, i.e., financial travel cost saving is fairly higher than the toll rate for each type of vehicles.

**Table 21-20 Comparison of the Toll rates with Financial Benefits of the Users**

(Unit: Rs.)

	Car	Bus	Truck	Two-wheeler	Total
<b>2002</b>					
per Trip					
A. Toll	31.1	108.9	100.9	15.6	
B. Financial VOC Saving	59.8	241.6	163.6	-5.5	
C. Financial Time Cost Saving	313.2	2,274.8	26.1	79.4	
D. Total Cost Saving	373.0	2,516.4	189.7	73.8	
Ratio					
A/B	52%	45%	62%	-280%	59%
A/C	10%	5%	387%	20%	19%
A/D	8%	4%	53%	21%	15%
<b>2012</b>					
per Trip					
A. Toll	31.1	108.9	100.9	15.6	
B. Financial VOC Saving	89.5	309.8	201.9	4.3	
C. Financial Time Cost Saving	503.6	3,653.5	41.9	127.5	
D. Total Cost Saving	593.1	3,963.3	243.8	131.9	
Ratio					
A/B	35%	35%	50%	360%	46%
A/C	6%	3%	241%	12%	11%
A/D	5%	3%	41%	12%	9%

(Note) at FY 1997 constant prices

**Table 21-21 Traffic Volume of Bareilly Bypass**

(Unit: vehicles)

section	BP-SH37				SH37-SH33				SH33-EP			
	Car	Bus	Truck	Two-wheeler	Car	Bus	Truck	Two-wheeler	Car	Bus	Truck	Two-wheeler
2002	1,531	1,053	2,974	984	2,775	1,238	4,550	1,843	1,294	639	3,317	756
2003	1,799	1,227	3,470	1,176	3,039	1,361	5,060	2,028	1,498	715	3,639	889
2004	2,067	1,402	3,967	1,367	3,303	1,484	5,570	2,213	1,702	790	3,961	1,022
2005	2,336	1,576	4,463	1,559	3,567	1,606	6,080	2,399	1,905	866	4,283	1,154
2006	2,604	1,750	4,959	1,750	3,831	1,729	6,590	2,584	2,109	941	4,605	1,287
2007	2,872	1,925	5,456	1,942	4,095	1,852	7,100	2,769	2,313	1,017	4,927	1,420
2008	3,140	2,099	5,952	2,133	4,359	1,975	7,609	2,954	2,517	1,093	5,249	1,553
2009	3,408	2,273	6,448	2,325	4,623	2,098	8,119	3,139	2,721	1,168	5,571	1,686
2010	3,677	2,447	6,944	2,516	4,887	2,220	8,629	3,325	2,924	1,244	5,893	1,818
2011	3,945	2,622	7,441	2,708	5,151	2,343	9,139	3,510	3,128	1,319	6,215	1,951
2012 onwards	4,213	2,796	7,937	2,899	5,415	2,466	9,649	3,695	3,332	1,395	6,537	2,084

(Note) BP; beginning point, SH; State Highway, EP; end point

**Table 21-22 Toll Revenue of Bareilly Bypass at Current Prices of Each Year**

(Unit: Rs. million)

Year/Section	BP-SH37	SH37-SH33	SH33-EP	Total
2002	71.91	51.90	131.68	255.50
2003	84.00	57.47	145.88	287.35
2004	109.46	72.47	182.20	364.13
2005	123.23	78.86	198.34	400.43
2006	157.80	97.74	246.88	502.43
2007	173.70	105.07	265.48	544.25
2008	215.96	128.65	324.60	669.21
2009	234.03	137.04	345.80	716.88
2010	288.19	165.63	420.36	874.18
2011	308.89	175.19	444.63	928.72
2012	362.95	193.09	517.99	1,074.02
2013	362.95	193.09	517.99	1,074.02
2014	419.60	234.73	602.84	1,257.17
2015	419.60	234.73	602.84	1,257.17
2016	487.10	264.15	694.35	1,445.60
2017	487.10	264.15	694.35	1,445.60
2018	551.43	305.79	791.93	1,649.16
2019	551.43	305.79	791.93	1,649.16
2020	638.53	364.06	916.73	1,919.32
2021	638.53	364.06	916.73	1,919.32
2022	725.62	405.71	1,047.60	2,178.93
2023	725.62	405.71	1,047.60	2,178.93
2024	832.58	457.23	1,199.60	2,489.42
2025	832.58	457.23	1,199.60	2,489.42
2026	964.42	537.61	1,374.22	2,876.25
2027	964.42	537.61	1,374.22	2,876.25
2028	1,090.69	608.67	1,569.39	3,268.76
2029	1,090.69	608.67	1,569.39	3,268.76
2030	1,265.16	708.59	1,806.25	3,779.99
2031	1,265.16	708.59	1,806.25	3,779.99

(Note) BP; beginning point, SH; State Highway, EP; end point

(3) Financial Internal Rate of Return on Total Investment

Financial internal rate of return on total investment (FIRR-ROI) of the Bareilly Bypass Project was estimated at 22.0%. The net present value (NPV) at discount rate of 20% is Rs. 206 million. The FIRR-ROI is 3.9% lower than that estimated in the Pre-feasibility Study.

Table 21-23 FIRR-ROI of the Bareilly Bypass Project

(Unit: Rs. million)

Fiscal Year	Revenue	Initial Investment Cost	Routine Operation Cost/Environmental Monitoring	Periodic Maintenance / Renovation	Balance	Balance Discounted at 12%
1998						
1999		467.92			-467.92	-324.95
2000		719.28			-719.28	-416.25
2001		769.63			-769.63	-371.16
2002	255.50		22.36		233.13	93.69
2003	287.35		24.28		263.06	88.10
2004	364.13		26.54		337.59	94.21
2005	400.43		28.72		371.71	86.45
2006	502.43		31.36		471.07	91.30
2007	544.25		33.83	224.08	286.35	46.25
2008	669.21		36.87		632.34	85.11
2009	716.88		39.69		677.19	75.95
2010	874.18		43.22		830.96	77.66
2011	928.72		46.42		882.29	68.72
2012	1,074.02		52.12		1,021.91	66.33
2013	1,074.02		55.76	336.28	681.98	36.89
2014	1,257.17		59.67		1,197.50	53.98
2015	1,257.17		63.84		1,193.32	44.82
2016	1,445.60		68.31		1,377.28	43.11
2017	1,445.60		73.10		1,372.50	35.80
2018	1,649.16		78.21		1,570.95	34.15
2019	1,649.16		83.69	504.66	1,060.81	19.22
2020	1,919.32		89.55		1,829.77	27.62
2021	1,919.32		95.81		1,823.50	22.94
2022	2,178.93		102.52		2,076.41	21.77
2023	2,178.93		109.70		2,069.23	18.08
2024	2,489.42		117.38		2,372.04	17.27
2025	2,489.42		125.59	757.36	1,606.46	9.75
2026	2,876.25		134.38		2,741.87	13.86
2027	2,876.25		143.79		2,732.46	11.51
2028	3,268.76		153.86		3,114.90	10.94
2029	3,268.76		164.63		3,104.13	9.08
2030	3,779.99		176.15		3,603.84	8.79
2031	3,779.99		188.48	1,136.59	2,454.92	4.99
FIRR-ROI						22.0%
NPV						206.14

(4) Financial Viability of the Implementing Entities

The initial costs, O&M costs and the toll revenue for the SPV at current prices of each year were estimated. The environmental monitoring cost was excluded out of the O&M costs for the SPV.

**Table 21-24 Initial Cost of the SPV for the Bareilly Bypass at Current Prices**

(Unit: Rs. million)

Total Investment	1,956.84
Less: Land and Compensation	131.81
Less: GOI/NHAI Grants	0.00
Initial Cost for the SPV	1,825.03
of which Equity	608.34
Long-term Loan*	1,216.69

(Note) \*: exclusive capitalised interest

The profit/loss statement and cash flow statement of the SPV for Bareilly Bypass is given in Table 21-28 and Table 21-29. The major financial indicators are listed below.

**Table 21-25 Major Financial Indicators for the SPV-Bareilly Bypass**

Financial Internal Rate of Return on Equity (FIRR-ROE)	%	20.0%
First Years of Surplus		
- Annual Surplus in Net Profit/Loss	Fiscal year	2007
- Annual Surplus in Cash Flow	Fiscal year	2010
Maximum Annual Short-term Loan	Fiscal year	2007
	Rs. million	796.29

(5) Sensitivity Tests on Financial Viability on the Implementing Entity

The results of the sensitivity tests are given in the table below.

**Table 21-26 Financial Sensitivity Tests for the SPV-Bareilly Bypass**

Indicators	Unit	GOI/NHAI Grant	Interest of Long-term Loan		Toll Rate
		40%	15%	10%	+20%
FIRR-ROE	%	26.1%	22.3%	25.1%	23.2%
First Years of Surplus					
- Surplus in Profit/Loss	Fiscal year	2006*	2004	2003	2005
- Surplus in Cash Flow	Fiscal year	2006	2006	2003	2008
Maximum Short-term Loan	Fiscal year	2004	2003	2002	2004
	Rs. million	41.33	165.79	1.05	356.45

(Note) \* exclusive surplus by Government Grant in FY 2002

In order to attain 20% of the FIRR-ROE (financial internal rate of return on equity), the following conditions should be satisfied.

- \* With 20 years of concession period, the 13.5% of the initial cost for the SPV, or Rs. 246.4 million, should be granted by GOI/NHAI.
- \* With 40% of the capital grants by GOI/NHAI, the concession period should extend more than 12 years.

(6) Financial Evaluation

a) Financial Feature of the Project

The Project requires Rs. 1,468 million as capital costs (exclusive costs for land acquisition and compensation, FY 1997 prices), while revenue in 2002 and 2012 would be Rs. 182 million and Rs. 389 million (FY 1997 prices), respectively. The operation expenditure exclusive of depreciation would be Rs. 16 million in 2002 and Rs. 19 million in 2002.

To recover the capital costs (exclusive capitalised interests) with the operating profit (exclusive depreciation) in 2002, it will take 8.8 years, and 4.0 years with the profit in 2012. Operation expenditure (exclusive depreciation) accounts 8.6% of the revenue in 2002, and 4.8% in 2012.

Table 21-27 Financial Conditions of the SPV

(Unit: Rs. million at FY 1997 prices)

Capital Cost *1		1,467.87		
Revenue	FY 2002	182.17		
	FY 2012	389.28		
	(Ratio: 2012/2002)	(2.14)		
Operation Expenditure*2	FY 2002	15.71	Ratio to Revenue	8.62%
	FY 2012	18.66		4.79%
	(Ratio: 2012/2002)	(1.19)	(Average)	6.71%
Operating Profit*2	FY 2002	166.46	Capital Cost Recovery	8.8 years
	FY 2012	370.62		4.0 years
	(Ratio: 2012/2002)	(2.23)	(Average)	6.4 years

(Note) \*1: Exclusive Capitalised Interest

\*2 Exclusive Depreciation

Interest payments would share large portion of the expenditure. The ratio of interest payment to revenue in 2002 is 130%, and 10% in 2012 in the base case.



The financial characteristics of the Project is:

- Large Capital Cost
- Long Term Capital Cost Recovery
- Large Financing Costs
- Small Operating Expenditure

b) Measures to Improve the Financial Viability

The FIRR-ROI of the Project is near to the interest rate for long-term loan, which means the Projects has low attractiveness to the private sector. In case some public authority, such as NHAI, which might expect low return, would join to hold some portion of equity, private investors may have willingness to invest.

When the investors combine the Project with real estate development, whether industrial or residential, near the interchanges with the state highways, the Project can be feasible for them. There may be business chances, such as building truck terminal, motor inns, etc.

According to the results of the sensitivity tests, the 40% capital grants have a large effect to increase the attractiveness. The grants will raise FIRR-ROE by 6.1%, compared to the base case. The grants will also decrease the shortfall in the cash flow, which is covered in the short-term loan in the cash-flow statement. With the Government Grant, some of the private investors may start to feel the attractiveness.

As for 15% of the long-term loan, the measure is not so effective to raise the FIRR-ROE. However, the lowered long-term loan will ease the cash shortfall considerably. In the base cases, maximum requirement of short-term loan will reach to 1.5 times of the toll revenue of the year. Private banks may hesitate to lend that much to the SPV.

Lowered long-term interest to 10% will significantly improve the financial viability of the Project. FIRR-ROE would increase nerly 5%, and no major cash shortfall would occur in the case.

Increase of 20% in toll rate will raise 3% of the FIRR-ROE, and reduced the maximum short-term loan around 55% for the project. The combination with lowered long-term interests might be effective to improve the financial viability.

For the Project, the prospective investors might be the persons who can expect long-term return. To reduce financing costs, such as the Government grants and lowered loan interests, and to minimise the future risk, such as traffic volume assurance might be most important.

Table 21-28 Profit/Loss Statement of the SPV for Bareilly Bypass (Base Case)

Bareilly-Base Case	(Unit: Rs. million)															
	Fiscal Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Revenue</b>	255.50	287.35	364.13	400.43	502.43	544.25	669.21	716.88	874.18	928.72	1,074.02	1,074.02	1,257.17	1,257.17	1,445.60	
<b>Operating Expenditure</b> (Toll Collection/Administration)	135.48	137.38	139.61	141.76	144.37	184.16	187.17	189.95	193.45	196.61	202.26	224.57	228.42	232.55	236.96	
(Routine Maintenance)	16.95	18.50	20.35	22.10	24.27	26.25	28.76	31.00	33.93	36.48	41.48	44.38	47.49	50.81	54.37	
(Depreciation)	5.08	5.44	5.82	6.22	6.66	7.12	7.62	8.16	8.73	9.34	9.99	10.69	11.44	12.24	13.10	
<b>Operating Profit/Loss</b>	113.45	113.45	113.45	113.45	113.45	150.79	150.79	150.79	150.79	150.79	150.79	169.49	169.49	169.49	169.49	
Interest Payment	332.11	347.66	360.60	362.47	358.52	335.96	342.60	288.14	215.81	132.84	110.70	88.56	66.42	44.28	22.14	
(Long-term loan)	332.11	309.97	287.83	265.69	243.55	221.41	199.27	177.13	154.99	132.84	110.70	88.56	66.42	44.28	22.14	
(Short-term loan)	0.00	37.68	72.77	96.78	114.97	114.56	143.33	111.02	60.82	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Net Profit/Loss before Tax</b>	-212.09	-197.69	-136.09	-103.80	-0.46	24.13	139.44	238.79	464.92	599.26	761.06	760.89	962.32	980.34	1,186.50	
Corporate Tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	186.46	186.42	235.77	240.18	290.69	
<b>Net Profit/Loss after Tax</b>	-212.09	-197.69	-136.09	-103.80	-0.46	24.13	139.44	238.79	464.92	599.26	574.60	574.48	726.56	740.16	895.80	
Assumptions	Inflation: 7%	Equity : 33%	Loan : 67%	Long-term Loan Interest: 20%	Short-term Loan Interest: 18%	GOI Grants: 0%										
<b>Revenue</b>	1,445.60	1,649.16	1,649.16	1,919.32	1,919.32	2,178.93	2,178.93	2,489.42	2,489.42	2,876.25	2,876.25	3,268.76	3,268.76	3,779.99	3,779.99	
<b>Operating Expenditure</b> (Toll Collection/Administration)	241.68	246.74	280.21	285.99	292.18	185.36	192.45	200.03	250.26	258.95	268.24	278.18	288.81	300.19	375.58	
(Routine Maintenance)	58.18	62.25	66.61	71.27	76.26	81.59	87.31	93.42	99.96	106.95	114.44	122.45	131.02	140.19	150.01	
(Depreciation)	14.01	15.00	16.05	17.17	18.37	19.66	21.03	22.50	24.08	25.77	27.57	29.50	31.56	33.77	36.14	
<b>Operating Profit/Loss</b>	169.49	169.49	197.56	197.56	197.56	84.11	84.11	84.11	126.23	126.23	126.23	126.23	126.23	126.23	189.43	
Interest Payment	1,203.91	1,402.43	1,368.95	1,633.33	1,627.14	1,993.57	1,986.48	2,289.39	2,239.15	2,617.51	2,608.02	2,990.58	2,979.94	3,479.80	3,404.42	
(Long-term loan)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
(Short-term loan)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Net Profit/Loss before Tax</b>	1,203.91	1,402.43	1,368.95	1,633.33	1,627.14	1,993.57	1,986.48	2,289.39	2,239.15	2,617.51	2,608.02	2,990.58	2,979.94	3,479.80	3,404.42	
Corporate Tax	421.37	490.85	479.13	571.66	569.50	697.75	695.27	801.29	783.70	916.06	912.81	1,046.70	1,042.98	1,217.98	1,191.55	
<b>Net Profit/Loss after Tax</b>	782.54	911.58	889.82	1,061.66	1,057.64	1,295.82	1,291.21	1,488.10	1,455.45	1,701.25	1,695.21	1,943.88	1,936.96	2,261.87	2,212.87	

**Table 21-29 Cash Flow of the SPV for Bareilly Bypass (Base Case)**

Bareilly-Base Case	(Unit: Rs. million)																			
	Fiscal Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
<b>Cash In</b>																				
(Equity)	336.11	831.05	1,101.74		-98.65	-84.24	-22.64	9.65	112.98	174.92	290.23	389.58	615.71	750.05	725.39	743.97	896.05	909.65	1,065.30	
(Long-term Loan)	336.11	272.23	1,101.74																	
(Government Grants)																				
(Net Profit after Tax)					-212.09	-197.69	-136.09	-103.80	-0.46	24.13	139.44	238.79	464.92	599.26	574.60	574.68	726.56	740.16	895.80	
(+ Depreciation)					113.45	113.45	113.45	113.45	113.45	150.79	150.79	150.79	150.79	150.79	110.70	110.70	110.70	110.70	110.70	
<b>Cash Out</b>																				
(Initial Investment)	336.11	831.05	1,101.74		110.70	320.06	515.00	648.35	749.41	971.20	906.99	727.46	448.59	110.70	110.70	446.98	110.70	110.70	110.70	
(Capitalised Interest)	336.11	719.28	769.63																	
(Overlay)		111.76	332.11							224.08										
(Principal Payment of Long-term Loan)					110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	110.70	
(Repayment of Short-term Loan)					209.35	404.30	404.30	537.65	638.70	636.42	796.29	616.76	337.89	636.42	0.00	0.00	0.00	0.00	0.00	
<b>Cash In-Cash Out</b>																				
(Initial Investment)	0.00	0.00	0.00		-209.35	-404.30	-537.65	-638.70	-636.42	-796.29	-616.76	-337.89	-167.12	-639.35	-614.69	-296.99	-785.34	-798.94	-954.59	
(Short-term Loan)	0.00	0.00	0.00		209.35	404.30	537.65	638.70	636.42	796.29	616.76	337.89	167.12	639.35	614.69	296.99	785.34	798.94	954.59	
<b>Net Cash Flow</b>	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Cumulative Cash Flow</b>	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cash Flow for Return on Equity	-336.11	-272.23	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Assumptions	Equity: 33%	Loan: 67%	Long-term Loan Interest: 20%	Short-term Loan Interest: 18%	GOI Grants: 0%															

Fiscal Year	FIRR-ROE																
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031		
<b>Cash In</b>	952.04	1,081.07	1,087.38	1,259.22	1,255.19	1,379.93	1,375.32	1,572.21	1,581.68	1,827.48	1,821.44	2,070.10	2,063.19	2,388.10	2,402.30		
(Equity)																	
(Long-term Loan)																	
(Government Grants)																	
(Net Profit after Tax)	782.54	911.58	889.82	1,061.66	1,057.64	1,295.82	1,291.21	1,488.10	1,455.45	1,701.25	1,695.21	1,943.88	1,936.96	2,261.87	2,212.87		
(+ Depreciation)	169.49	169.49	197.56	197.56	197.56	84.11	84.11	84.11	126.23	126.23	126.23	126.23	126.23	126.23	189.43		
<b>Cash Out</b>																	
(Initial Investment)	0.00	0.00	504.66	0.00	0.00	0.00	0.00	0.00	757.36	0.00	0.00	0.00	0.00	0.00	1,136.59		
(Capitalised Interest)																	
(Overlay)																	
(Principal Payment of Long-term Loan)																	
(Repayment of Short-term Loan)																	
<b>Cash In-Cash Out</b>																	
Short-term Loan	952.04	1,081.07	582.71	1,259.22	1,255.19	1,379.93	1,375.32	1,572.21	1,581.68	1,827.48	1,821.44	2,070.10	2,063.19	2,388.10	2,402.30		
<b>Net Cash Flow</b>	952.04	1,081.07	582.71	1,259.22	1,255.19	1,379.93	1,375.32	1,572.21	1,581.68	1,827.48	1,821.44	2,070.10	2,063.19	2,388.10	2,402.30		
<b>Cumulative Cash Flow</b>	5,209.06	6,290.12	6,872.84	8,132.05	9,387.25	10,767.18	12,142.50	13,714.71	14,539.03	16,366.51	18,187.94	20,258.05	22,321.24	24,709.33	25,975.04		
Cash Flow for Return on Equity	952.04	1,081.07	582.71	1,259.22	1,255.19	1,379.93	1,375.32	1,572.21	1,581.68	1,827.48	1,821.44	2,070.10	2,063.19	2,388.10	2,402.30		

### 21.2.3 Results of Financial Analysis for Gwalior Bypass

#### (1) Financial Costs

According to the cost estimate and construction schedule described in Chapter 20 and Chapter 17, the initial costs during the period from 1999 to 2001 will occur as follows.

**Table 21-30 Initial Financial Costs at Current Prices of Each Year**

		(Rs. million)
Fiscal year	1999	290.07
	2000	543.21
	2001	581.23

(Note) \*: exclusive capitalised interest

Operation/maintenance costs are shown at prices of 1997 in the table below.

**Table 21-31 O&M Costs of Gwalior Bypass at Constant Prices of 1997**

		(unit: Rs. million)
Routine Operation /Maintenance including Environmental Monitoring in FY 2002		10.05
Periodic Overlay (once in 6 years)		100.69

#### (2) Toll Revenue

The toll revenue after 2002 up to 2031 was estimated as follows. The proportion of LCV of the "Truck" were assumed as same as in the traffic survey conducted for the Feasibility Study, 10.4% for LCV and 89.6% for other types.

**Table 21-32 Toll Rates of Gwalior Bypass (Current Prices of Each Year)**

(Unit: Rs./vehicle)

year	Car/ Jeep/Van	LCV	Bus/ Truck	Two- wheeler
2002	36	64	128	18
2003	36	64	128	18
2004	42	73	146	21
2005	42	73	146	21
2006	48	84	167	24
2007	48	84	167	24
2008	55	96	192	27
2009	55	96	192	27
2010	63	110	219	31
2011	63	110	219	31
2012	70	125	250	35
2013	70	125	250	35
2014	80	140	285	40
2015	80	140	285	40
2016	90	165	325	45
2017	90	165	325	45
2018	105	185	375	50
2019	105	185	375	50
2020	120	215	430	60
2021	120	215	430	60
2022	140	245	490	70
2023	140	245	490	70
2024	160	280	565	80
2025	160	280	565	80
2026	185	320	645	90
2027	185	320	645	90
2028	210	370	740	105
2029	210	370	740	105
2030	240	420	845	120
2031	240	420	845	120

(Note) BP; beginning point, SH; State Highway, EP; end point

The toll rates and financial cost saving were compared after estimation of the difference in financial costs between the conditions that a vehicle will run on the national highway without the construction of the Bypass and the conditions that a vehicle will run on the Bypass in 2002 and 2012.

The difference, i.e., financial travel cost saving is fairly higher than the toll rate for each type of vehicles.

**Table 21-33 Comparison of the Toll rates with Financial Benefits of the Users**

(Unit: Rs.)

	Car	Bus	Truck	Two-wheeler	Total
<b>2002</b>					
per Trip					
A. Toll	26.0	91.0	86.3	13.0	
B. Financial VOC Saving	102.0	340.1	249.4	5.1	
C. Financial Time Cost Saving	334.4	2,433.3	27.9	85.2	
D. Total Cost Saving	436.4	2,773.3	277.3	90.3	
Ratio					
A/B	25%	27%	35%	253%	34%
A/C	8%	4%	309%	15%	70%
A/D	6%	3%	31%	14%	23%
<b>2012</b>					
per Trip					
A. Toll	26.0	91.0	86.3	13.0	
B. Financial VOC Saving	133.1	416.6	291.3	14.8	
C. Financial Time Cost Saving	466.2	3380.8	38.8	118.1	
D. Total Cost Saving	599.2	3,797.4	330.1	132.9	
Ratio					
A/B	20%	22%	30%	88%	29%
A/C	6%	3%	222%	11%	53%
A/D	4%	2%	26%	10%	19%

(Note) at FY 1997 constant prices

**Table 21-34 Traffic Volume of Gwalior Bypass**

(Unit: vehicles)

year	"Car"	"Bus"	"Truck"	"Two-wheeler"
2002	311	124	3,983	63
2003	343	134	4,385	70
2004	374	143	4,786	77
2005	406	153	5,188	84
2006	438	162	5,590	91
2007	470	172	5,992	98
2008	501	182	6,393	105
2009	533	191	6,795	112
2010	565	201	7,197	119
2011	596	210	7,598	126
2012 onwards	628	220	8,000	133

(Note) BP; beginning point, SH; State Highway, EP; end point

**Table 21-35 Toll Revenue of Gwalior Bypass (Current Prices of Each Year)**

(Unit: Rs. million)

Year	Total
2002	186.70
2003	205.44
2004	255.72
2005	277.11
2006	341.47
2007	365.93
2008	448.56
2009	476.61
2010	575.91
2011	607.81
2012	729.85
2013	729.85
2014	831.32
2015	831.32
2016	949.31
2017	949.31
2018	1,093.89
2019	1,093.89
2020	1,255.23
2021	1,255.23
2022	1,431.21
2023	1,431.21
2024	1,649.15
2025	1,649.15
2026	1,883.24
2027	1,883.24
2028	2,161.06
2029	2,161.06
2030	2,466.98
2031	2,466.98

(Note) BP; beginning point, SH; State Highway, EP; end point

(3) Financial Internal Rate of Return on Total Investment

Financial internal rate of return on total investment (FIRR-ROI) of the Gwalior Bypass Project was estimated at 21.2%. The net present value at discount rate of 20% is Rs. 89 million. The FIRR-ROI is 4.3% higher than that estimated in the Pre-feasibility Study.

Table 21-36 FIRR-ROI of the Gwalior Bypass Project

(Unit: Rs. million)

Fiscal Year	Revenue	Initial Investment Cost	Routine Operation Cost/Environmental Monitoring	Periodic Maintenance / Renovation	Balance	Balance Discounted at 12%
1998						
1999		290.07			-290.07	-201.43
2000		543.21			-543.21	-314.36
2001		581.23			-581.23	-280.30
2002	186.70		14.10		172.60	69.37
2003	205.44		15.16		190.27	63.72
2004	255.72		16.46		239.27	66.78
2005	277.11		17.67		259.43	60.34
2006	341.47		19.18		322.28	62.46
2007	365.93		20.58	198.07	147.29	23.79
2008	448.56		22.34		426.22	57.36
2009	476.61		23.93		452.68	50.77
2010	575.91		25.98		549.93	51.40
2011	607.81		27.80		580.02	45.18
2012	729.85		30.52		699.33	45.39
2013	729.85		32.65	297.25	399.95	21.63
2014	831.32		34.94		796.38	35.90
2015	831.32		37.38		793.93	29.82
2016	949.31		40.00		909.31	28.46
2017	949.31		42.80		906.51	23.65
2018	1,093.89		45.80		1,048.09	22.78
2019	1,093.89		49.00	446.09	598.80	10.85
2020	1,255.23		52.43		1,202.80	18.16
2021	1,255.23		56.10		1,199.13	15.08
2022	1,431.21		60.03		1,371.18	14.37
2023	1,431.21		64.23		1,366.98	11.94
2024	1,649.15		68.73		1,580.42	11.50
2025	1,649.15		73.54	669.46	906.15	5.50
2026	1,883.24		78.69		1,804.55	9.12
2027	1,883.24		84.19		1,799.05	7.58
2028	2,161.06		90.09		2,070.97	7.27
2029	2,161.06		96.39		2,064.66	6.04
2030	2,466.98		103.14		2,363.84	5.76
2031	2,466.98		110.36	1,004.68	1,351.94	2.75
FIRR-ROI						21.2%
NPV						88.82



(4) Financial Viability of the Implementing Entities

The initial costs, O&M costs and the toll revenue for the SPV at current prices of each year were estimated. The environmental monitoring cost was excluded out of the O&M costs for the SPV.

**Table 21-37 Initial Cost of the SPV for the Gwalior Bypass at Current Prices**

(Unit: Rs. million)	
Total Investment	1,414.51
Less: Land and Compensation	36.23
Less: GOI/NHAI Grants	0.00
Initial Cost for the SPV	1,378.28
of which Equity	459.43
Long-term Loan*	918.85

(Note) \*: exclusive capitalised interest

The profit/loss statement and cash flow statement of the SPV for Gwalior Bypass is given in Table 21-41 and Table 21-42. The major financial indicators are listed below.

**Table 21-38 Major Financial Indicators for the SPV-Gwalior Bypass**

Financial Internal Rate of Return on Equity (FIRR-ROE)	%	18.0%
First Years of Surplus		
- Annual Surplus in Profit/Loss	Fiscal year	2008
- Annual Surplus in Cash Flow	Fiscal year	2012
Maximum Annual Short-term Loan	Fiscal year	2007
	Rs. million	788.55

(5) Sensitivity Tests on Financial Viability of the Implementing Entity

The results of the sensitivity tests are given in the table below.

**Table 21-39 Financial Sensitivity Tests for the SPV-Gwalior Bypass**

Indicators	Unit	GOI/NHAI Grant	Interest of Long-term Loan		Toll Rate
		40%	15%	10%	+20%
FIRR-ROE	%	23.6%	20.5%	23.1%	21.5%
First Years of Surplus					
- Surplus in Profit/Loss	Fiscal year	2006*	2005	2003	2006
- Surplus in Cash Flow	Fiscal year	2008	2008	2003	2009
Maximum Short-term Loan	Fiscal year	2007	2005	2002	2007
	Rs. million	123.74	149.00	4.17	310.89

(Note) \* exclusive surplus by Government Grant in FY 2002

In order to attain 20% of the FIRR-ROE (financial internal rate of return on equity), the following conditions should be satisfied.

- \* With 20 years of concession period, the 29.0% of the initial cost for the SPV, or Rs. 399.7 million, should be granted by GOI/NHAI.
- \* With 40% of the capital grants by GOI/NHAI, the concession period should extend more than 15 years.

(6) Financial Evaluation

a) Financial Feature of the Project

The Project requires Rs. 1,109 million (FY 1997 prices), while revenue in 2002 and 2012 will be Rs. 133 million and Rs. 265, respectively. The operation expenditure exclusive depreciation would be Rs. 10 million in 2002 and Rs. 11 million in 2002.

To recover the capital costs (exclusive capitalised interests) with the operating profit (exclusive depreciation) in 2002, it will take 9.0 years, and 4.4 years with the profit in 2012. Operation expenditure (exclusive depreciation) accounts 7.4% of the revenue in 2002, and 4.1% in 2012.

**Table 21-40 Financial Conditions of the SPV**

(Unit: Rs. million at FY 1997 prices)

Capital Cost *1		1,108.55		
Revenue	FY 2002	133.11		
	FY 2012	264.53		
	(Ratio: 2012/2002)	(1.99)		
Operation Expenditure*2	FY 2002	9.82	Ratio to Revenue	7.37%
	FY 2012	10.83		4.09%
	(Ratio: 2012/2002)	(1.10)	(Average)	5.73%
Operating Profit*2	FY 2002	123.30	Capital Cost Recovery	9.0 years
	FY 2012	253.70		4.4 years
	(Ratio: 2012/2002)	(2.06)	(Average)	6.7 years

(Note) \*1: Exclusive Capitalised Interest

\*2 Exclusive Depreciation

Compared to Bareilly Bypass, the FIRR-ROE in the base case is lower by 1.2%. The Project will get a little smaller attractiveness for the private investors.

Interest payments would share large portion of the expenditure. The ratio of interest payment to revenue in 2002 is 134% in 2002 and 13% in 2012 in base case

The financial characteristics of the Project is as follows, similar to the Bareilly Project.

- Large Capital Cost
- Long Term Capital Cost Recovery
- Large Financing Costs
- Small Operating Expenditure

b) Measures to Improve the Financial Viability

The FIRR-ROI of the Project is near to the interest rate for long-term loan, which means that the Project has low attractiveness to the private sector. In case some public authority which might expect low return would join to hold some portion of equity, private investors may have willingness to raise the fund.

According to the results of the sensitivity tests, the 40% capital grants have a large effect to increase the attractiveness of the Project. The grants will raise the FIRR-ROE by 5.6%, compared to the base case. The grants will also decrease the shortfall in the cash flow, which is covered in the short-term loan in the cash-flow statement.

As for 15% of the long-term loan, the measure is not so effective to raise the FIRR-ROE of the Projects. However, the lowered long-term loan will ease the cash shortfall considerably. In the base case, maximum requirement of short-term loan will reach to 2.1 times of the toll revenue of the year in 2007. Almost no private banks may lend that much to the SPV.

Lowered long-term loan interest rate to 10% will significantly improve the financial viability of the Project. FIRR-ROE would increase more than 5%, and no major cash shortfall would occur in the case.

Increase of 20% in toll rate will raise nearly 3.5% of the FIRR-ROE, and reduced the short-term loan around 60% for the project. Raising the toll rate might be more acceptable to the users than those of Bareilly Bypass. Raised toll rate should accompany the level up in service, such as well maintenance and convenient toll collection, whose cost might be far less than the increase in revenue. The combination with 40% Government Grant may heighten the Project's attractiveness up to the level at which the private sector may consider the investment.

Table 21-41 Profit/Loss Statement of the SPV for Gwalior Bypass (Base Case)

Gwalior-Base Case	(Unit: Rs. million)															
	Fiscal Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Revenue</b>	186.70	205.44	255.72	277.11	341.47	345.93	448.56	476.61	575.91	607.81	729.85	729.85	831.32	831.32	831.32	949.31
<b>Operating Expenditure</b>	99.44	100.49	101.76	102.95	104.43	138.80	140.54	142.09	144.10	145.88	148.56	167.18	169.41	169.41	171.81	174.37
(Toll Collection/Administration)	8.93	9.64	10.54	11.35	12.41	13.33	14.59	15.64	17.10	18.30	20.35	21.78	23.30	23.30	24.93	26.68
(Routine Maintenance)	4.84	5.18	5.54	5.93	6.34	6.78	7.26	7.77	8.31	8.89	9.52	10.18	10.89	10.89	11.66	12.47
(Depreciation)	85.68	85.68	85.68	85.68	85.68	118.69	118.69	118.69	118.69	118.69	118.69	118.69	135.22	135.22	135.22	135.22
<b>Operating Profit/Loss</b>	87.26	104.95	153.97	174.16	237.04	227.13	308.02	334.52	431.81	461.94	581.29	562.67	661.90	661.90	659.51	774.94
Interest Payment	250.81	263.16	274.55	279.16	280.96	271.78	292.43	266.58	251.32	172.20	97.01	66.88	50.16	50.16	33.44	16.72
(Long-term loan)	250.81	234.09	217.37	200.65	183.93	167.21	150.49	133.77	117.05	100.33	83.60	66.88	50.16	50.16	33.44	16.72
(Short-term loan)	0.00	29.07	57.17	78.50	97.03	104.57	141.94	132.82	114.27	71.87	13.40	0.00	0.00	0.00	0.00	0.00
<b>Net Profit/Loss before Tax</b>	-163.56	-158.21	-120.58	-105.00	-43.93	-44.64	15.60	67.93	200.49	289.74	484.28	495.79	611.74	611.74	626.07	758.22
Corporate Tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	121.47	149.88	153.39	185.76
<b>Net Profit/Loss after Tax</b>	-163.56	-158.21	-120.58	-105.00	-43.93	-44.64	15.60	67.93	200.49	289.74	484.28	495.79	611.74	611.74	626.07	758.22
Assumptions	Inflation: 7%		Equity : 33%		Loan : 67%		Long-term Loan Interest: 20%		Short-term Loan Interest: 18%		GOI Grants: 0%					
<b>Revenue</b>	949.31	1,093.89	1,093.89	1,255.23	1,255.23	1,431.21	1,431.21	1,649.15	1,649.15	1,883.24	1,883.24	1,883.24	2,161.06	2,161.06	2,466.98	2,466.98
<b>Operating Expenditure</b>	177.11	180.04	207.99	211.35	214.94	133.11	137.22	141.62	183.56	188.60	193.99	199.76	205.93	205.93	212.54	275.47
(Toll Collection/Administration)	28.55	30.55	32.68	34.97	37.42	40.04	42.84	45.84	49.05	52.48	56.16	60.09	64.29	64.29	68.80	73.61
(Routine Maintenance)	13.35	14.28	15.28	16.35	17.49	18.72	20.03	21.43	22.93	24.54	26.25	28.09	30.06	30.06	32.16	34.41
(Depreciation)	135.22	135.22	160.02	160.02	160.02	74.35	74.35	74.35	111.58	111.58	111.58	111.58	111.58	111.58	111.58	167.45
<b>Operating Profit/Loss</b>	772.20	913.85	885.90	1,043.89	1,040.30	1,298.10	1,293.99	1,507.53	1,465.59	1,694.64	1,689.25	1,961.30	1,955.12	2,254.45	2,254.45	2,191.51
Interest Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(Long-term loan)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(Short-term loan)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Net Profit/Loss before Tax</b>	772.20	913.85	885.90	1,043.89	1,040.30	1,298.10	1,293.99	1,507.53	1,465.59	1,694.64	1,689.25	1,961.30	1,955.12	2,254.45	2,254.45	2,191.51
Corporate Tax	189.19	319.85	310.07	365.36	364.10	454.34	452.90	527.64	512.96	593.12	591.24	686.45	684.29	789.06	789.06	767.03
<b>Net Profit/Loss after Tax</b>	583.01	594.00	575.84	678.53	676.19	843.77	841.09	979.89	952.63	1,101.52	1,098.01	1,274.84	1,270.83	1,465.39	1,465.39	1,424.48

**Table 21-42 Cash Flow of the SPV for Gwalior Bypass (Base Case)**

Gwalior-Base Case	(Unit: Rs. million)																		
	Fiscal Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Cash In</b>	253.84	627.61	832.05	-77.88	-72.54	-34.90	-19.32	41.75	74.04	134.28	186.62	319.17	408.43	602.97	509.53	597.08	607.90	707.67	
(Equity)	253.84	205.59	832.05																
(Long-term Loan)		422.02																	
(Government Grants)																			
(Net Profit after Tax)				-163.56	-158.21	-120.58	-105.00	-43.93	-44.64	15.60	67.93	200.49	289.74	484.28	574.32	461.86	472.68	572.45	
(+ Depreciation)				85.68	85.68	85.68	85.68	85.68	118.69	118.69	118.69	118.69	118.69	118.69	135.22	135.22	135.22	135.22	
<b>Cash Out</b>	253.84	627.61	832.05	83.60	245.09	401.23	519.74	622.67	862.59	872.15	821.47	718.46	482.89	158.07	380.85	83.60	83.60	83.60	
(Initial Investment)	253.84	543.21	581.23						198.07						297.25				
(Capitalised Interest)		84.40	250.81																
(Overlay)				83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	
(Principal Payment of Long-term Loan)				83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	83.60	
(Repayment of Short-term Loan)				161.49	317.63	436.14	539.06	539.06	580.92	580.92	580.92	580.92	580.92	580.92	580.92	580.92	580.92	580.92	
<b>Cash In-Cash Out</b>	0.00	0.00	0.00	-161.49	-317.63	-436.14	-539.06	-580.92	-788.55	-737.87	-634.85	-399.29	-74.46	444.90	128.68	513.47	524.29	624.06	
Short-term Loan	0.00	0.00	0.00	161.49	317.63	436.14	539.06	580.92	788.55	737.87	634.85	399.29	74.46	444.90	128.68	513.47	524.29	624.06	
<b>Net Cash Flow</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Cumulative Cash Flow</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cash Flow for Return on Equity	-253.84	-205.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Assumptions	Equity: 33%	Loan: 67%	Long-term Loan Interest: 20%	Short-term Loan Interest: 18%										GOI Grants: 0%					

Fiscal Year	FIRR-ROE														
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
<b>Cash In</b>	718.22	729.22	735.86	838.55	836.22	918.11	915.44	1,054.24	1,064.21	1,213.09	1,209.59	1,386.42	1,382.41	1,576.97	1,591.93
(Equity)															
(Long-term Loan)															
(Government Grants)															
(Net Profit after Tax)	583.01	594.00	575.84	678.53	676.19	843.77	841.09	979.89	952.63	1,101.52	1,098.01	1,274.84	1,270.83	1,465.39	1,424.48
(+ Depreciation)	135.22	135.22	160.02	160.02	160.02	74.35	74.35	74.35	111.58	111.58	111.58	111.58	111.58	111.58	167.45
<b>Cash Out</b>	0.00	0.00	446.09	0.00	0.00	0.00	0.00	0.00	669.46	0.00	0.00	0.00	0.00	0.00	1,004.68
(Initial Investment)															
(Capitalised Interest)															
(Overlay)			446.09												
(Principal Payment of Long-term Loan)															
(Repayment of Short-term Loan)															
<b>Cash In-Cash Out</b>	718.22	729.22	289.77	838.55	836.22	918.11	915.44	1,054.24	394.75	1,213.09	1,209.59	1,386.42	1,382.41	1,576.97	547.25
Short-term Loan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Net Cash Flow</b>	718.22	729.22	289.77	838.55	836.22	918.11	915.44	1,054.24	394.75	1,213.09	1,209.59	1,386.42	1,382.41	1,576.97	547.25
<b>Cumulative Cash Flow</b>	2,953.63	3,682.85	3,972.62	4,811.17	5,647.39	6,565.50	7,480.94	8,535.18	8,929.93	10,143.03	11,352.62	12,739.04	14,121.44	15,698.41	16,285.66
Cash Flow for Return on Equity	718.22	729.22	289.77	838.55	836.22	918.11	915.44	1,054.24	394.75	1,213.09	1,209.59	1,386.42	1,382.41	1,576.97	547.25

## ***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*

## **22. Implementation Programme**

### **22.1 General**

In order to enhance the private sector participation to National Highway projects, the provisions of the National Highway Act, 1956 was amended in 1995 to permit the implementation of National Highway projects on a BOT basis, and GOI set up "Guidelines for Private Investment in National Highway Projects", followed by the announcement by MOST of "Additional Policy Initiative for Investment in Highway Development" in the earlier half of 1997.

The Guidelines have further been updated/augmented in September, 1997 and notified all Central and State governmental sectors in charge of National Highways and related matters. The summarised provisions of the revised Guidelines (hereinafter referred to as Guidelines) are shown in Table 22-1.

### **22.2 Highway BOT Projects in India**

The Rau Pithampur Link Road in Madhya Pradesh was the first privatisation effort in the surface transport sector in India. The two-lane, 11.5 km long road which links Rau village on NH3 and Pithampur Industrial Estate was constructed with a project cost of Rs. 10 Cr. on a BOT basis by a SPV named "MT Tolls Limited" incorporated by IL&FS and some other local institutions, and opened to traffic in 1993.

The first National Highway project on a BOT basis is the Thane-Bhiwandi Bypass on NH3 in Maharashtra. The Concession under the project cost of Rs. 16.5 Cr. was awarded to Ideal Road Builders Ltd., a contractor in Mumbai. After completion of the construction of 2 years, the National Highway bypass commenced operation as a toll road in 1997.

Besides these two projects, currently the BOT Concessions have been already awarded for additional 10 projects including eight National Highway projects and two other highway projects, each of them being in the various stage of progress depending mainly upon the date of Concession Agreement. Further, a number of other projects are still in the process of development, promotion, or under consideration as shown in Tables 22-2 and 22-3. The National Highway projects listed in the Table are comprised in the categories and quantum of the projects identified for private investment in the Guidelines, which are reproduced in Table 22-4.

**Table 22-1 Provisions of Guidelines for Private Investment in National Highway Projects relevant to Implementation Programme in Feasibility Study on National Highway Bypasses in India , Revised in September, 1997 (1/3)**

<p><b>Identification of Project for Private Investment</b></p> <ol style="list-style-type: none"> <li>(1) One of the approved projects of MOST</li> <li>(2) Project capable of yielding adequate EIRR and FIRR</li> </ol> <p><b>Government Support</b></p> <ol style="list-style-type: none"> <li>(1) Detailed Feasibility Study</li> <li>(2) Land for Right-of-way and en-route facilities</li> <li>(3) Clearance of the Right-of-way Relocation of utility services, Cutting of trees, Resettlement and rehabilitation of the affected establishments, removal of all encroachments</li> <li>(4) Environmental Clearance</li> <li>(5) Clearance from Railways in case of ROB's</li> <li>(6) Giving details of design standards and bore-hole logs at bridge sites, etc.</li> </ol> <p><b>Other Facilitating Measures</b></p> <ol style="list-style-type: none"> <li>(1) Import of Bitumen is permitted under Open General License(OGI).</li> <li>(2) Import duty has exempted on identified high quality construction plants and equipment.</li> <li>(3) In case of projects on the verge of financial viability, suitable traffic support/guarantees could be considered on case to case basis.</li> </ol> <p><b>Tax/Fiscal Concessions/Other Concessions</b></p> <ol style="list-style-type: none"> <li>(1) Concessions for Enterprise  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.</li> <li>(2) Concession for Investors/Financial Institutions             <ol style="list-style-type: none"> <li>1) Deduction up to 40% of the income derived from financing of the investments if the amount is kept in a special reserve</li> <li>2) Exemption for Infrastructure Funds 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</li> <li>3) Deduction equal to 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</li> </ol> </li> <li>(3) Other Concessions             <ol style="list-style-type: none"> <li>1) Profits from housing and other development activities made integral part of BOT highway projects would be treated as income from infrastructure projects for the purpose of tax exemption/concession provided that these are ploughed back to the development of Roads on BOT basis within a period of three years.</li> <li>2) Capital grants up to 40% of the project cost possibly by NHAI/GOI</li> <li>3) Equity participation up to 30% by NHAI</li> </ol> </li> </ol>
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**Table 22-1 Provisions of Guidelines for Private Investment in National Highway Projects relevant to Implementation Programme in Feasibility Study on National Highway Bypasses in India , Revised in September, 1997 (2/3)**

<b>Foreign Investment</b>		
<p>(1) Foreign Direct Investment(FDI) up to 74% equity for road and bridge construction are automatically permitted as a part of infrastructure. FDI proposals beyond that would be considered by the FDI Board on case to case basis.</p> <p>(2) External commercial borrowing is permitted up to 35% of the project cost for Rupee expenditure.</p>		
<b>Concession Period</b>		
<p>The concession period comprises the project-specific construction period and the maintenance/operation period which will be determined on competitive bidding basis and may be up to maximum 30 years.</p>		
<b>Fee</b>		
<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>		
<u>No.</u>	<u>Type of Vehicle</u>	<u>Maximum Amount</u>
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
<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> <p>The revision of the fee may be allowed every year following commissioning of the facility linked to the Wholesale Price Index.</p>		
<b>Project Construction</b>		
<p>The enterprise is to complete the project within the period specified. Time and cost overruns are the responsibility of the enterprise and no price escalation shall be allowed on this account.</p>		
<b>Project Components</b>		
<p>(1) Highway construction</p> <p>(2) Highway related facilities, en route, as may be identified by Implementing Agency</p> <p>Restaurants, Hotels/Motels, Rest/Parking Areas, Loading/unloading terminals for cargo, Ware Houses/godowns, Vehicle repair facilities, Shops for vehicle components, Insurance and medical facilities, Commercial and residential complexes</p> <p>Land for these facilities will be normally acquired by the Implementing Agency. The enterprise will be free to license out such establishment and enjoy the revenue from them.</p>		

**Table 22-1 Provisions of Guidelines for Private Investment in National Highway Projects relevant to Implementation Programme in Feasibility Study on National Highway Bypasses in India , Revised in September, 1997 (3/3)**

<p>(3) Advertisements/Hoardings</p> <p>The enterprise is permitted to allow displaying of advertisements/hoardings within the right-of-way and outside and enjoy the revenue from them.</p> <p><b>Evaluation of Financial Bids</b></p> <p>Evaluation of financial bids will be carried out in the principle of least cost to the user.</p> <p><b>Bankability of The Agreement</b></p> <p>(1) If a separate company is floated as the entrepreneur by the successful bidder, the bidder has to undertake full responsibility for all the Acts, commissions and omissions of the company.</p> <p>(2) It shall be specified that the enterprise shall open an escrow account and credit all the revenues from the project and the funds raised for the project to the same before drawing funds from it.</p>
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**Table 22-2 BOT Opportunities in Highway Sector in India-National Highway (1/2)**  
As of 18 March, 1998

Name of the Project	State	Estimated Cost (Rs MN)	Remarks
Thane - Bhiwandi Bypass on NH 3	Maharashtra	165	Awarded in 1995 Commissioned in 1997 (Ideal Road Builders Ltd.)
Udaipur Bypass on NH 8	Rajasthan	240	Awarded in 1997 Construction to be completed by 9/98 (Atlanta)
Chaltan R.O.B. on NH 8	Gujurat	100	Awarded in 1997 Being completed shortly
Durg Bypass on NH 6 (NHAI)	Madhya Pradesh	660	Awarded in 1997 Construction commenced (Shakti Kumar M.Sananeti)
Narmada Bridge on NH 8	Gujurat	1,200	Awarded in Nov., 1997
Coimbatore Bypass on NH 47	Tamil Nadu	900	Awarded in Oct., 1997
Six R.O.B.s (NHAI)	Rajasthan	500	Project shelved
Panvel Bypass on NH 4	Maharashtra	3,250	Bid received Under evaluation No definite progress
Hubli-Dharwad Bypass on NH 4	Karnataka	700	Awarded in Feb., 1998
Nellore Bypass on NH 5	Andhra Pradesh	1,000	Awarded in Feb., 1998
Five bridges on NH 5	Andhra Pradesh	500	Awarded in 1997 Construction in progress
Viekananda Bridge on NH 34	West Bengal	4,500	LOI issued Land being acquired
Moradabad Bypass on NH 24 (NHAI)	Uttar Pradesh	600	Engineering design in progress
Amravati Bypass on NH 6 (NHAI)	Maharashtra	600	Engineering design in progress

**Table 22-2 BOT Opportunities in Highway Sector in India-National Highway (2/2)**  
As of 18 March, 1998

Name of the Project	State	Estimated Cost (Rs MN)	Remarks
Akola Bypass on NH 6 (NHAI)	Maharashtra	500	Engineering design in progress
Twelve R.O.B.s	Gujarat Uttar Pradesh Andhra Pradesh	800	Not finalised No definite progress
Four-laning of existing roads in aggregate length of 7,000 kms		28,000	Not finalised No definite progress
Other bridges and bypasses		5,000	Not finalised No definite progress
Widening to 4-lane and construction of new 4-lane bypass on NH 4	Maharashtra	1,200	Project shelved
Widening to 4-lane on NH 7	Tamil Nadu	1,500	Project shelved
Widening to 4-lane on NH 45	Tamil Nadu	1,400	Consultant for engineering appointed
Widening to 4-lane on NH 8	Rajasthan	2,300	Bids from private parties invited

**Table 22-3 BOT Opportunities in Highway Sector in India-Other Highways**  
As of 18 March, 1998

Name of the Project	State	Estimated Cost (Rs MN)	Remarks
Rau-Pithampur Link Road from NH 3	Madhya Pradesh	100	Commissioned in 1993 (MT Tolls Ltd.)
Faridabad-Noida-Ghaziabad Expressway (National Capital Region Planning Board)	Delhi Uttar Pradesh Haryana	7,516	Shortlisting of bidders completed Project finalised on 13/2/98 Final bid not fixed
Delhi-Noida Bridge (New Okhla Industrial Development Authority)	Delhi Uttar Pradesh	4,000	Awarded in 1997 Construction commencing shortly (Noida Toll Bridge Co., Ltd.)
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 SH 87 (Govt. of Gujarat)	Gujarat		Bids invited
Widening to 4-lane between Ahmedabad and Mahesana on SH 41 (Govt. of Gujarat)	Gujarat		Ditto

**Table 22-4 Categories and Quantum of Projects Identified for Private Investment in Guidelines**

<u>No.</u>	<u>Category of Projects</u>	<u>Indicated Quantum</u>
<u>Existing Network</u>		
1	Widening from 2 lanes to 4 lanes	4,000 km
2	Major Bridges	50 Nos.
3	Railway over Bridges	50 Nos.
4	Elevated Sections through Urban Areas	To be identified
5	Interchanges	To be identified
6	Bypasses	30 Nos.
<u>New Network</u>		
7	Expressways	1,000 km

## **22.3 Concession Structure of National Highway Projects on a BOT Basis**

### **22.3.1 Basic Structure**

The basic structure of implementation of National Highway projects on a BOT basis is summarised as follows:

- A. GOI has authorised NHAI to implement a particular National Highway project on a BOT basis.
- B. NHAI invites proposals for shortlisting of bidders under the "Tender Notice" and shortlists certain bidders including the "Consortium" (or the "Company").
- C. NHAI invites bids from bidders shortlisted.
- D. NHAI accepts the bid of the Consortium (or the Company) and issues the Letter of Acceptance (LOA) to it.
- E. The Consortium promotes and incorporates the Concessionaire and requests NHAI to accept it as the entity which shall undertake and fulfill and perform the obligations and exercise the rights of the Consortium under the LOA. (Otherwise the Company itself becomes the Concessionaire.)
- F. NHAI accepts the request and accordingly agrees to enter into the Concession Agreement with the Concessionaire.

### **22.3.2 Constitution of a Concession Agreement**

The typical constitution of a Concession Agreement between NHAI and the Concessionaire for a National Highway project on a BOT basis and the subjects prescribed therein, together with brief descriptions relevant to the project implementation programme of the Study, are generally as follows:

1.	Definitions and Interpretations	
1.1	Definitions	
	"Appointed Date" means the date of fulfillment of each of the conditions set forth in Clause 2.4 and shall be deemed to be the date of commencement of the Concession Period.	
	"COD" means the date on which the Tests have been successfully held and the Independent Consultant has certified that the Project Highway is complete in all respects and ready for traffic commercially.	
	"Financial Close" means the date on which the Financing Documents providing for full loan funding by the Senior Lenders required for meeting the Total Capital Cost of the Project have become effective and the Concessionaire has immediate access to such funding under the Financing Documents.	
	"Financial Package" means the financial package of the Project furnished by the Concessionaire along with the Bid indicating the Total Project Cost and the means of financing thereof as submitted to the Senior Lender.	
	"INR" means the lawful currency of India.	
	"Notification" means the Notification No. .... dated ..... issued by Ministry of Surface Transport in exercise of the powers conferred by Section 8(A) of the National Highway Act, 1956 in respect of the levy and collection of the Fees.	
	<i>Others omitted</i>	<i>Omitted</i>
1.2	Rules of reference, etc.	<i>Omitted</i>
1.3	Measurements and Arithmetic Conventions	<i>Omitted</i>
1.4	Priority of Contract Documents and Errors/Discrepancies	<i>Omitted</i>
2.	Grant of Concession	
2.1	NHAI hereby grants to the Concessionaire and the Concessionaire hereby accepts the Concession.	
2.2	Matters the Concessionaire shall be entitled to enjoy and obliged to undertake	<i>Omitted</i>
2.3	The Concessionaire covenants with NHAI that it shall achieve the Financial Close within 180 days from the date of this Agreement. If it shall fail to do so, the Concessionaire shall be entitled to a further period of 90 days subject to an advance weekly payment of a sum @ INR ..... per kilometer per day for each day of delay.	
2.4	NHAI shall be entitled to terminate this Agreement unless all of the following events shall have occurred on or before the expiry 270 days from the date of this Agreement:	
	(1) the Financial Close shall have occurred.	
	(2) the Concessionaire shall have delivered to NHAI the Performance Security.	
	(3) each of the members of the Consortium directly subscribes and holds not less than 5% and together with their respective Associates shall have subscribed to and hold in aggregate at least 51% of the issued and paidup equity share capital of the Concessionaire.	
2.5		<i>Omitted</i>
2.6	The Concession Period shall commence on the Appointed Date and shall terminate on the earlier of:	
	(1) expiry of a period of ..... years from the Appointed Date; or	
	(2) expiry of the reduced Concession Period; or	
	(3) the date of termination of this Agreement in accordance with the provisions of it; or	
	(4) the Transfer Date.	
2.7 and 2.8		<i>Omitted</i>
3.	Conditions Precedent to the Project	<i>Omitted</i>
4.	Scope of Project	<i>Omitted</i>
5.	Performance Security	
	The Concessionaire shall for due and faithful performance of its obligations provide to NHAI a bank guarantee in a sum equivalent to 3% of the Total Project Cost within ..... days of the date of this Agreement. The Performance Security shall be released by NHAI to the Concessionaire having expended and paidout an aggregate sum of not less than 25% of the Total	

Project Cost.	
6. Financing Package and Funding Arrangement	
The Concessionaire has provided to NHAI alongwith the Bid the Financing Package.	
7. Availability of Site and Investigation, etc.	Omitted
8. Project Inspection and No Claim for Incorrect Information	Omitted
9. Obligations of the Concessionaire	
(8) The Concessionaire shall achieve the Completion of the Project Highway within ..... months of the Appointed Date.	
(21) The Concessionaire shall levy and collect Fees from users of the Project Highway at the rates set forth in the Notification and in accordance with this Agreement and Applicable Laws and Applicable Permits.	
<i>Others omitted</i>	
10. Obligations of NHAI	Omitted
11. Representations and Warranties	Omitted
12. Monitoring of Project during Construction Period	Omitted
13. Utilities, Associated Roads, etc.	Omitted
14. Tests	Omitted
15. Completion	Omitted
16. Defects Liability Period	Omitted
17. Operation and Maintenance	Omitted
18. Monitoring during Operation Period	Omitted
19. Fees and License Charge	
19.1 Fees	
The Concessionaire shall be entitled to levy and collect the Fees from the users of the Project Highway pursuant to and in accordance with the Notification and this Agreement.	
The Fees collected shall be deposited in the Project Escrow Account.	
<i>Others omitted</i>	
19.2 License Charges	
In consideration of the said grant of license in respect of the Site and the grant of Concession under this Agreement, the Concessionaire shall pay to NHAI the sums setforth below as License Charges.	
(1) For the first .....(ex. 10) years of the Concession Period in advance the License Charge @ INR 1.00 per year i.e. INR .....(ex. 10.00) on or before the Appointed Date	
(2) For year.....(ex. 11) of the Concession Period, the License Charges shall be the sum equal to the Fees realisable for .....(ex. 5,000) PCUs.	
(3) For each subsequent year till the end of the Concession Period, the License charges shall be the Fees realisable for the immediately preceding year as increased by .....(ex. 20)% of PCUs.	
19.3 Consequences of Changes in Taxes	Omitted
20. Project Escrow Account and Project Funding	
All Fees collected from the users of the Project Highway shall be deposited in the Project Escrow Account.	
The Instruction Letter from the Concessionaire to the Escrow Bank shall, at the time of opening of the Project Escrow Account, irrevocably instruct that the deposits into it shall be appropriated every month in the order of:	
(a) O&M Expenses incurred by the Concessionaire, but not exceeding 1/12 of the sum per annum equal to .....(ex. 4)% of the Total Project Cost;	
(b) The whole or part of the O&M Expenses incurred by NHAI on account of exercise of any of its rights under this Agreement;	
(c) Monthly proportionate provision of Debt Service Payments due in Accounting Year and payment of Debt Service Payments in the month when due;	

(d) Claims of NHAI in respect of sums due on account of loss and damage and on account of advances and losses made by NHAI to the Concessionaire;	
(e) Sums due and payable to NHAI by the Concessionaire in respect of advances made on account of Shortfall Amounts;	
(f) Balance in accordance with the instructions of the Concessionaire.	
<i>Others omitted</i>	
21. NHAI Grant Support	
21.1 NHAI agrees to provide, by way of subsidy, an outright grant of INR.....crores to the Concessionaire (the Grant) for meeting part of the Total Project Cost and part of the O&M Expenses for a period of 30 months from the COD.	
21.2 50% of the Grant shall be disbursed only if all of the following conditions have been satisfied:	
(1) the Concessionaire has achieved the specified Project milestones;	
(2) the Concessionaire is not in Material Breach of this Agreement; and	
(3) the Senior lenders have disbursed not less than 50% of the loan funds in aggregate under the Financing Documents.	
21.3	<i>Omitted</i>
21.4 The balance 50% of the Grant shall be disbursed by NHAI by credit to the Project Escrow Account in 30 equal monthly installments commencing immediately succeeding the month in which COD shall occur.	
22. Revenue Shortfall Loans	
22.1 If the realisable Fees in any Accounting Year during the Concession Period shall fall below the Subsistence Revenue Level, NHAI agrees to provide to the Concessionaire such shortfall by way of loan (Revenue Shortfall Loan) with interest thereon @ SBI PLR per annum. Such Revenue Shortfall Loan shall be disbursed by payment thereof for and on behalf of the Concessionaire to the Senior Lenders towards Debt Service Payments due in the Accounting Year to which the Revenue Shortfall Loan pertains. Such payment to Senior Lenders by NHAI shall be deemed to be disbursement to the Concessionaire.	
22.2 through 22.4	<i>Omitted</i>
22.3 The Concessionaire shall, subject to repayment of all loans and advances and other sums due to Senior Lenders under the Financing Documents, repay the Revenue Shortfall Loans within 12 years from the COD. Balance unadjusted amount of the Revenue Shortfall Loans shall be recovered by NHAI by setoff against the Termination Payments.	
23. Exchange Risk Management and Fluctuation in WPI	
The Concessionaire acknowledges that the Notification provides for annual revision in the Fees for the first 10 years of the Concession Period linked to the extent of 25% thereof to the fluctuation over the base rate of USD to INR set forth in the Notification and 75% thereof linked with increase or decrease in WPI over the WPI on the date of Notification, and after the said 10 years of the Concession Period, the former and latter of these percentages of the extent to which the annual revision in Fees is linked are altered to 10% and 90%, respectively and hereby confirms that save and except as provided in the Notification the Concessionaire is not entitled to and shall not seek any relief whatsoever.	
24. Operation Accounts and Audits	<i>Omitted</i>
25. Consequences of Construction of the Additional Tollways/Expressways and Traffic Sampling	<i>Omitted</i>
26. Insurances	<i>Omitted</i>
27. Force Majeure	<i>Omitted</i>
28. NHAI Required Scope Changes	<i>Omitted</i>
29. Independent Consultant	<i>Omitted</i>
30. Liability and Indemnity	<i>Omitted</i>
31. Change in Law	<i>Omitted</i>
32. Assignment and Charges	<i>Omitted</i>
33. Subletting	<i>Omitted</i>

34. Material Breach and Suspension	Omitted
35. Termination	Omitted
36. Transfer	Omitted
37. Dispute Resolution	Omitted
38. Miscellaneous	Omitted
39. Governing Law/Jurisdiction	Omitted

## 22.4 Implementation of the Bypass Projects

The basic policy for implementation of the two bypass projects under consideration in this Study would be adoption of a BOT scheme, as seemingly suggested by GOI. But its adoptability generally depends upon the results from the financial analysis, socio-economic conditions in the region, and so forth. If, as a toll road, the Bareilly and Gwalior Bypasses are rather financially feasible and have no distinctive difficulties in attaining the local acceptance, implementation of these bypass projects would be discussed on a BOT basis with flexible application of Governmental support, measures, concessions, and privileges set forth in Guidelines including land acquisition by Government, capital grants up to 40% of the Project Cost by NHAI, and equity participation up to 30% by NHAI.

Since, for a BOT project to invite active private investment, assessment of the financial viability of the project is essentially important, the overall cash-flow analysis from the planner's standpoint for each bypass, which has been formulated slightly modifying the method used in Chapter 21, e.g. ignorance of interest payment for short-term loans to supplement single-year funds deficit and of depreciation of periodic maintenance costs, was carried out under the following conditions.

- Concession Period; 33 years (1999 through 2031)
- Construction Period; 3 years (1999 through 2001) with project cost phasing of 20%, 40%, 40% for the respective year
- O/M Period; 30 years (2002 through 2031)
- Total Project Cost excluding land; Estimated in pertaining Chapter
- O/M Expenses; Estimated in pertaining Chapter
- Fees to be levied; Assumed in pertaining Chapter, to be revised every two years linked to WPI
- Toll revenues; Estimated in pertaining Chapter
- Capital Grants by NHAI; For the base case, this was not taken into account. For the sensitivity analysis, 40% of total project cost was considered. In this case, 50% of the grants to be disbursed in 2001 as subsidy to the total project cost, while the balance 50% to be disbursed by credit to the Project Escrow Account in 30 equal monthly



	instalments commencing the first month of operation
• Gear Ratio (D : E);	2 : 1
• Priority in use of funds;	Equity preceding, loans following
• Rate of interest on loan;	20% per annum
• Loan repayment period;	15 years
• Depreciation Period;	20 years
• Rate of inflation;	7.0% per annum
• Tax/Fiscal Concessions;	Tax holidays for the initial 5 assessment years and 30% exempt from Corporate Tax (currently 35%) for the subsequent 5 assessment years, total 10 consecutive years falling within a period of 20 assessment years commencing the first year of operation
• Depreciation;	Assumed on a straight line basis for a period of 20 years
• Equity participation by NHAI;	Assumption not needed, to be discussed after numerical output if necessary

As a result of this analysis, Return on Equity (ROE), Debt Service Coverage Ratio, and the cash flow for each year of the Concession Period, in addition to FIRR, was obtained. It will be possibly evaluated by prospective investors to the Project.

Most crucial for project implementation under current consideration is supposed to be the set-up of feasible financing structure of the project. Particularly, which and how many enterprises/investors would be interested in the proposed project will be the key point.

In respective case studies for the two bypasses, one third of the total project cost in case of no Capital Grant by NHAI, or one third of 80% of the total project cost in case of an allowable maximum NHAI Capital Grant available, was assumed to be provided as equity by the consortium consisting of interested enterprises/investors including such a financial institution as IL&FS. Also, 30% of the equity in aggregate can be supported by NHAI participation, which will lead the equity portion of the private sector, most favourably, being either 18.667% or 23.333% of the project cost. The remaining 53.333% or 66.667% of the total project cost is to be funded through loans as limited recourse financing by the consortium members from domestic/foreign/multilateral financial institutions/banks.

As to financing for infrastructure characterised by high upfront costs, long payback periods, and, consequently, probable risks involved for stakeholders, IDFC is expected to play a vital role in increasing the bankability of projects by enhancing credit, mitigating risks and stretching maturities through a loan guarantee scheme.

However, if it is difficult to expect an optimistic financial feasibility for the bypasses as a toll road, implementation of the whole project by a BOT scheme will be unrealistic. In this case, one option would be that the project implementation is preceded by the public sector to the extent that its viability projection enables private participation afterwards. Then the argument shifts to the timely availability of such public funds to GOI. Some prospective sources would include the loans from OECF, ADB, or WB. But actual possibility is presently unpredictable, and certainly some delay in the starting schedule of the project will be inevitable. Tools to minimise such initial delay may include the JICA Grant Aid to the detailed design, if circumstances allow it.

Conclusively, types of implementation of the two projects under the Study could be grouped, depending mainly upon their viability and subordinately upon the degree of urgency in project implementation, as follows:

- (1) BOT scheme with/without Government supports
- (2) Public sector implementation of the detailed design with JICA Grant Aid and the construction under the OECF loan
- (3) Public sector implementation of both the detailed design and construction under the OECF loan
- (4) Partial public sector implementation with/without JICA and/or OECF schemes precedent to BOT implementation of supplementary construction and O/M.

## **22.5 Implementation Programme of Bareilly Bypass**

### **22.5.1 Financial Feasibility as a BOT Project**

The cash flow simulation for the Bareilly Bypass on a BOT basis was carried out for the base case and its sensitivity analysis as shown in Chapter 21.2.2. In addition to the general condition presented in Chapter 22.4, the specific condition of Bareilly Bypass were as follows:

- Total Project Cost excluding land in 1997 price; Rs. 1,467 million
- Base annual costs of toll road operation excluding overhead cost in 1997 price; Rs. 11.18 million, expenses for each year being indexed to traffic flow growth and inflation
- Base annual costs of routine maintenance in 1997 price; Rs. 3.62 million, expenses for each year being indexed to inflation
- Base costs of periodic maintenance, every 6 years, in 1997 price; Rs. 113.90 million, expenses for corresponding years being indexed to inflation

- Fees to be levied; as fixed for the first year of operation and assumed to be revised thereafter every 2 years linked to inflation, rounded off to the nearest lower multiplier of Rs. 5 only after 11th year of operation as shown in Table 21-19.
- Traffic volumes of users; estimated for the years 2002 and 2012, interpolated for years therebetween and assumed constant thereafter, conservatively for financial feasibility projection only, as shown in Table 21-21.

The resulting cost of capital (FIRR) turned out to be 22.0%. Based on the cash flow analysis, on the other hand, the return on equity to the investors (ROE) was calculated as 20.0%. The output shows that the project, subject to the conditions in the above base case, is staying on some boarder line for private investments to be vitally encouraged. Effects of some changes in the initial conditions, particularly changes in the Fees and application of Government support as well as the composition of debt and equity, to the financial projection should be carefully assessed.

Table 22-5 summarises the simulation result of base case and its sensitivity analysis.

**Table 22-5 Effects of Conditional Variations to Viability of Project**

Case	ROE
(1) Base case	20.0%
(2) NHAI Grant (40%)	26.1%
(3) Interest of long term loan (15%)	22.3%
(4) Interest of long term loan (10%)	25.1%
(5) Toll Fees 20% up	23.2%

According to the future traffic demand forecast, the future traffic volumes on Bareilly Bypass were predicted to be inelastic to the Fees. Consequently, there is no advantage in decrease in the Fees, whereas increase has considerable effects if it is acceptable. Capital Grants by NHAI also effectively contributes to the viability of the Project, especially to equity holders.

Reviewing the above consideration, the Bareilly Bypass Project would be judged to be financially feasible on a BOT basis if some support is duly offered as already set forth in Guidelines.

### **22.5.3 Schedule of Project Implementation**

Subject to the restraint that the bypass be opened to traffic in 2002, the tentative project implementation schedule on a BOT basis under the premise that the detailed design is undertaken by the Concessionaire (actually by the contractor) was outlined as Figure 22-1.

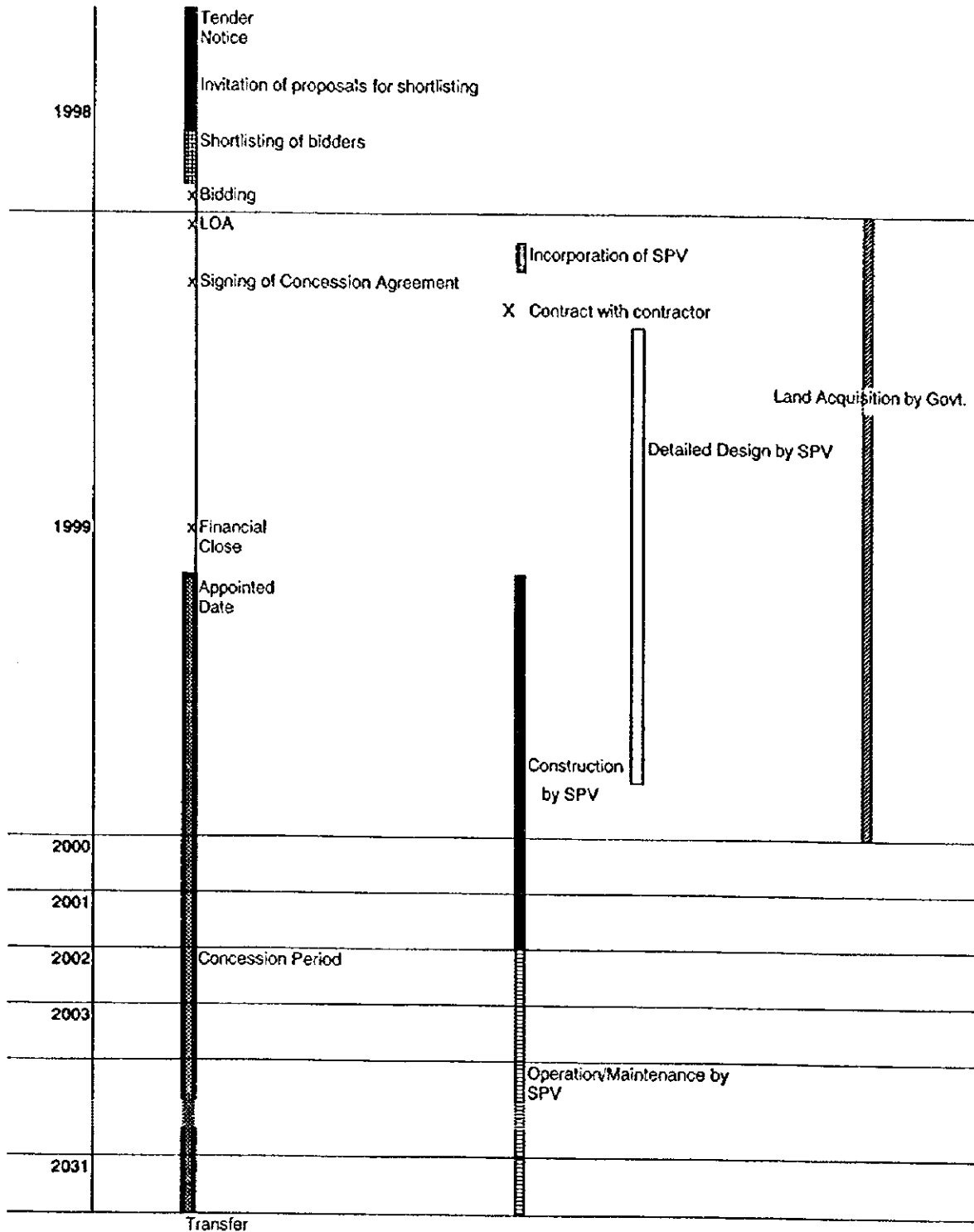


Figure 22-1 Implementation Schedule for Bareilly Bypass on a BOT Basis

## 22.6 Implementation Programme of Gwalior Bypass

### 22.6.1 Financial Feasibility as a BOT Project

The cash flow simulation for the Gwalior Bypass on a BOT basis was carried out for the base case and its sensitivity analysis as shown in Chapter 21.2.3. In addition to the general condition presented in Chapter 22.4, the specific condition of Gwalior Bypass were as follows:

- Total Project Cost excluding land in 1997 price; Rs. 1,107 million.
- Base annual costs of toll road operation excluding overhead cost in 1997 price; Rs. 5.66 million, expenses for each year being indexed to traffic flow growth and inflation
- Base annual costs of routine maintenance in 1997 price; Rs. 3.49 million, expenses for each year being indexed to inflation
- Base costs of periodic maintenance, every 6 years, in 1997 price; Rs. 100.69 million, expenses for corresponding years being indexed to inflation
- Fees to be levied; as fixed for the first year of operation and assumed to be revised thereafter every 2 years linked to inflation, rounded off to the nearest lower multiplier of Rs. 5 only after 11th year of operation as shown in Table 21-32.
- Traffic volumes of users; estimated for the years 2002 and 2012, interpolated for years therebetween and assumed constant thereafter, conservatively for financial feasibility projection only, as shown in Table 21-34.

The resulting cost of capital (FIRR) turns out to be 21.2%. Based on the cash flow analysis, on the other hand, the return on equity to the investors (ROE) is calculated as 18.0%. Under the conditions in the base case, financial projection of the Project turns out to be critical as a BOT project. How increases in the Fees and offer of Government support favourably affect the Project viability must be examined.

Table 22-6 summarises the simulation result of base case and its sensitivity analysis.

**Table 22-6 Effects of Conditional Variations to Viability of Project**

<u>Case</u>	<u>ROE</u>
(1) Base case	18.0%
(2) NHAI Grant (40%)	23.6%
(3) Interest of long term loan (15%)	20.5%
(4) Interest of long term loan (10%)	23.1%
(5) Toll Fees 20% up	21.5%

Based on traffic projection in this Study, the traffic demand on this bypass is estimated to be inelastic to the Fees, thus decreasing in the Fees is meaningless from the aspect of financial feasibility enhancement. Instead, the test was conducted to confirm that remarkable improve in the ROE by increasing the Fees as expected. Naturally the effect of Capital Grants by NHA is also considerable.

Reviewing the above consideration, the Gwalior Bypass Project would be judged to be under the similar conditions to Bareilly Bypass as an exclusive BOT project. Therefore, the Project was also judged to be critically feasible as a BOT basis, if some additional support is duly offered. Though it applies not only to Gwalior Bypass but also to Bareilly Bypass, as a way of subsidy from the public sector GOI may be requested to take part in preceding implementation of the project, partially at least, on a conventional public works basis. If the Indian national budgetary environment is not permissible of it, an option may be to seek loans from, say, OECF. Thus the actually subsidised project, attaining more favourable financial feasibility, will be possibly taken over by a BOT project some time later, if necessary.

#### **22.6.2 Schedule of Project Implementation**

In order to complete the construction by a BOT basis by the year 2002, and commence its operation in 2002, Figure 22-2 will represents the most practical implementation schedule for the Gwalior Bypass. This schedule was established under the assumption that the required detailed design will be undertaken by the Concessionaire (actually by the contractor) after the contract for the project.

In case the bypass implementation is supposed as not successful by a BOT basis exclusively, then GOI will be requested to pursue the budgetary arrangement. One of the ways of this is to utilise foreign/international loans. However usually a considerable time will be required for the period between application for a loan and pledge of it. In case of OECF, it was informed that it requires 12 to 15 months from submission of application, current deadline is in October every year, to actual signing of the Loan Agreement. Therefore it seems no longer possible to commence the bypass operation to the public in 2002.

However when the pure BOT basis construction is not applicable, combination of major civil works construction by GOI utilising foreign/international loans, and the balance construction by private sectors may be the second best option. The tentative project implementation schedule for this case was outlined in Figure 22-3.

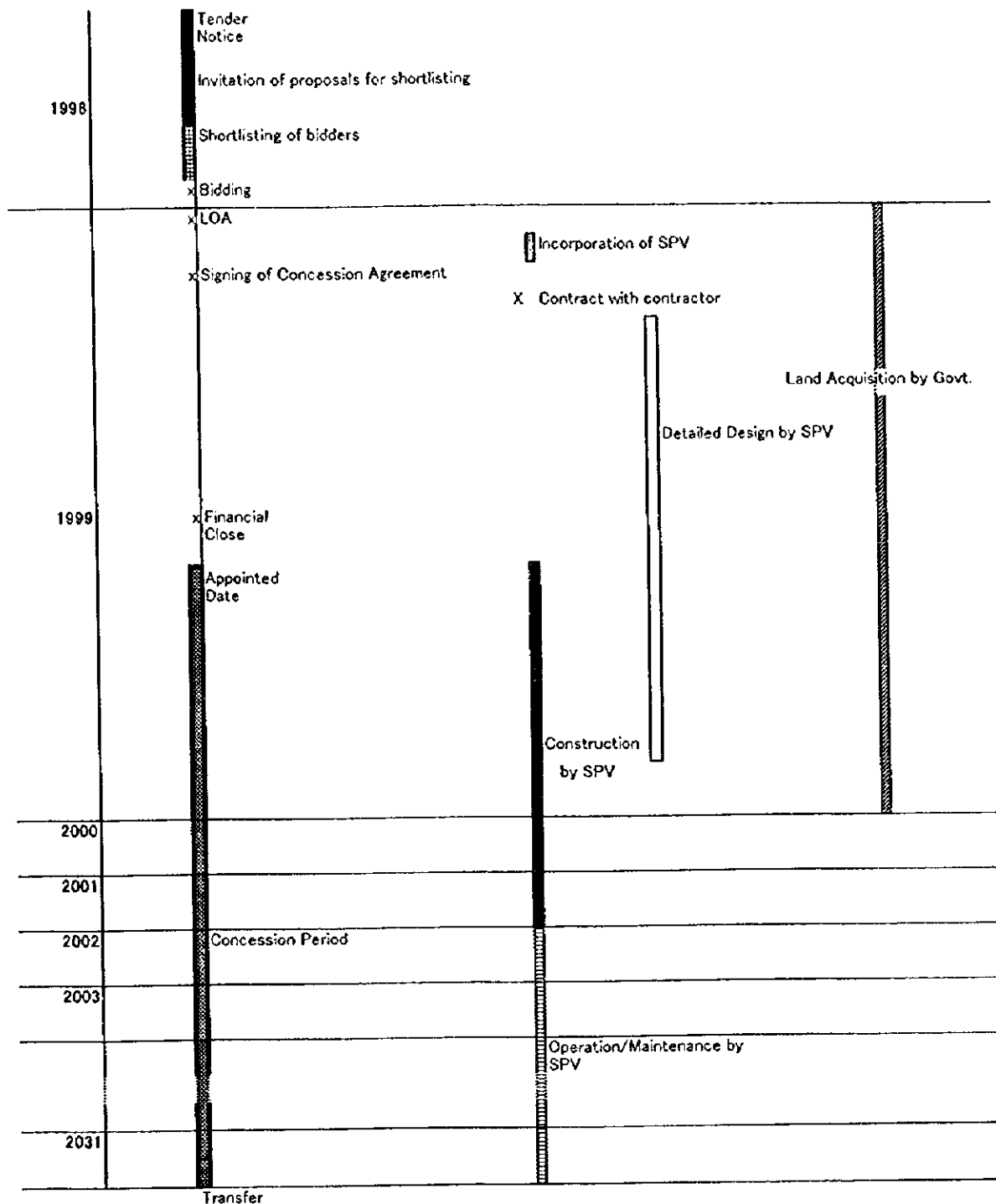


Figure 22-2 Implementation Schedule for Gwalior Bypass on a BOT Basis

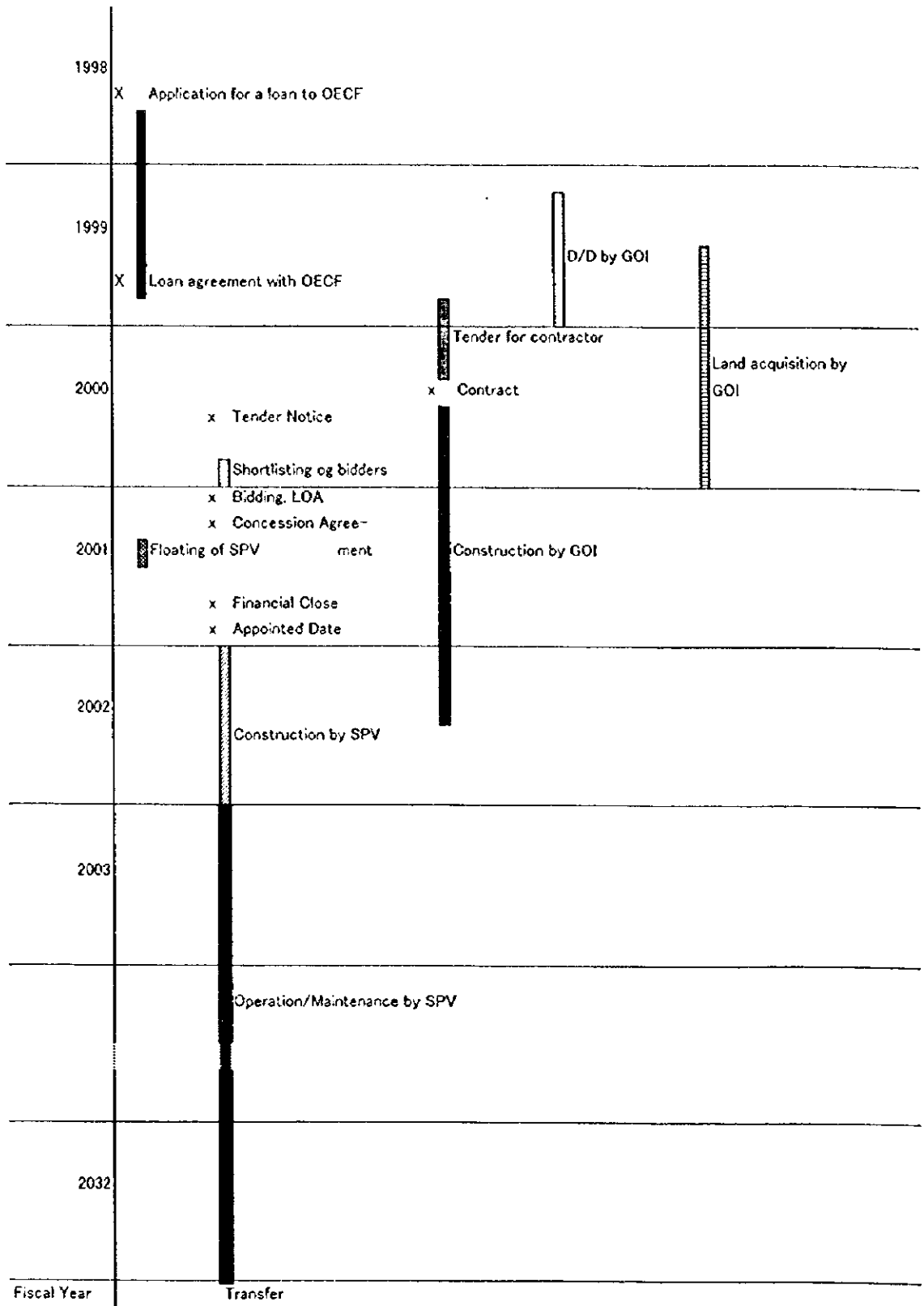


Figure 22-3 An Example of Implementation Schedule for Gwalior Bypass with Preceding Partial GOI Implementation



## ***Feasibility Study***

<i>Chapter 11</i>	<i>Socio-economic Conditions of the Study Area</i>
<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>

## ***Chapter 23*** ***Recommendations***



## 23 Recommendations

This Feasibility Study on National Highway Bypasses in India was carried out in two phases, as follows:

Phase 1 : Pre-Feasibility Study for 10 proposed bypasses, aiming the construction completes in the target year of 2012, and

Phase 2 : Feasibility Study for Bareilly Bypass and Gwalior Bypass selected by the screening in Pre-Feasibility Study, aiming the construction completes in the target year of 2002.

The following Table 23-1 shows the main feature of the proposed 10 bypasses obtained through Pre-Feasibility Study.

**Table 23-1 Summary of Pre-Feasibility Study Output**

Bypass Name	Length (km)	Estimated Project Cost (Rs.)	EIRR (%)		FIRR (%)	Congestion Rate in 2002
			VOC saving only	with Travel Time saving		
1. Bareilly	31.1	1,879,362,000	46.8%	112.1%	25.9%	2.02
2. Patna	49.9	4,923,724,000	27.9%	49.7%	14.2%	1.07
3. Keonjhar	8.5	453,253,000	2.9%	11.6%	Negative	0.81
4. Balugaon	15.4	552,559,000	11.7%	23.0%	13.0%	1.04
5. Vijayawada	28.1	2,054,426,000	23.7%	43.2%	18.6%	0.97
6. Kannur	11.1	1,464,531,000	18.8%	57.4%	7.4%	1.40
7. Nandura	6.4	359,483,000	28.6%	50.2%	19.0%	1.06
8. Khamgaon	10.9	711,891,000	20.0%	36.8%	20.1%	1.45
9. Bhopal	40.3	2,175,863,000	21.6%	56.9%	20.9%	2.03
10. Gwalior	26.0	2,121,407,000	19.7%	34.5%	16.9%	2.06

The above table tells that the construction of all bypasses, except Keonjhar Bypass, is strongly recommended from the viewpoint of contribution to the national economy, as the estimated EIRR (considering VOC saving and Travel Time saving) exceeds 20%. Congestion rates in 2002 shown in the table represents the degree of traffic congestion on the existing national highway in the year of 2002, in case the proposed bypass scheme was not implemented. The value larger than 1.0 means the traffic demand is saturated over the highway capacity. Judging from these values, it was understood that the urgency of bypass requirement would be highest in Bareilly, Bhopal, and Gwalior Bypasses.

The bypass, which is required with the second urgency, would be Kannur Bypass and Khamgaon Bypass. During the field reconnaissance of Kannur Bypass, it was understood that the bypass, proposed to run through the fringe of city area, is strongly required. However the land acquisition and compensation costs were estimated as a huge amount, since the project area is heavily dense built-up area. Although the public in the project area is welcoming the implementation of bypass, it should be conditioned to have compensation satisfactory. It will be the hard

bottleneck to secure the budget for the land acquisition and compensation for the Kannur Bypass.

The urgency of requirement to have Khamgaon Bypass also confirmed by the field reconnaissance. In the Khamgaon city area, there is a rather narrow existing bypass, so-called mini-bypass, at the southern fringe of township. The proposed bypass alignment by this Study also designed along the proximity to this existing bypass. According to the obtained information, there is a scheduled improvement programme of this existing mini-bypass, including widening and re-pavement, to which the local contractor was already awarded to implement by BOT basis. If this scheme accomplished, it will ease the traffic congestion in Khamgaon city up to, possibly, next 10 years. It is recommended to see the current situation carefully, and take a further action when requested in future.

Within the Patna Bypass area, the existing Sone Bridge over the Sone River, tributary of the Ganga River, would be the most severe bottleneck of the existing NH-30. As the estimated EIRR of Patna Bypass Project by the Pre-Feasibility Study was 49.7%, it may be recommended to implement the whole section of proposed bypass. However this construction requires rather huge project cost, and it tends to face the budgetary problem in very early stage. It is recommended to implement the project by appropriate phasing, and to construct the new Sone Bridge at first.

Nine proposed bypasses out of ten was judged as quite feasible in the sense of contribution to the national economy. However judging from the assessment results of Bareilly Bypass and Gwalior Bypass in the Phase 2 : Feasibility Study, the balance bypass projects seem not so attractive to the private investors, in case to intend the implementation by BOT basis. Therefore it is expected for GOI to seek out an appropriate financial source like OECF, ADB or WB, and realise these bypasses step by step.

Bareilly Bypass and Gwalior Bypass were selected in the Pre-Feasibility Study as the subject bypass in the next phase, Feasibility Study. Utilising the obtained data by the further field surveys, the horizontal alignment was optimised as much as possible. The reviewed and re-established design for the Bareilly Bypass gave the increased work quantities, and reduced the EIRR value. On the contrary, the reviewed design of the Gwalior Bypass reduced the work quantities, and increased the EIRR value. Table 23-2 below gives the main feature of both bypasses.

**Table 23-2 Summary of Feasibility Study Output**

Bypass Name	Length (km)	Estimated		EIRR (%)		FIRR (ROI) (%)
		Construction Cost (Rs.)	Project Cost (Rs.)	VOC saving only	with Travel Time saving	
Bareilly	29.98	1,060,628,900	1,583,000,000	45.3%	100.3%	22.0%
Gwalior	26.50	799,305,600	1,140,198,000	45.9%	85.4%	21.2%

The value of FIRR in the above table represents the financial internal rate of return on total investment (FIRR-ROI). This Study assumed the project implementation by private investors. Then the financial viability of SPV, who will be established as the implementing entity for the bypass, was assessed with the condition of 30 years concession for operation. Table 23-3 shows the estimated value of FIRR-ROE (financial Internal Rate of Return on Equity), one of the financial viability indicators.

**Table 23-3 Summary of estimated FIRR-ROE**

Bypass Name	Base Case	Sensitivity Analysis			
		GOI/NHAI Grant	Interest of Long-term Loan		Toll Rate
		40%	15%	10%	+20%
Bareilly Bypass	20.0%	26.1%	22.3%	25.1%	23.2%
Gwalior Bypass	18.0%	23.6%	20.5%	23.1%	21.5%

The details were discussed in Chapter 21.

In addition to the above assessment, the minimum requirement of the followings were also analysed:

Option 1 : Minimum requirement of GOI/NHAI Capital Grant to the SPV with the 20 years concession period, in order to attain 20% of FIRR-ROE.

Option 2 : Minimum requirement of concession years with 40% of GOI/NHAI Capital Grant to the SPV, in order to attain 20% of FIRR-ROE.

Table below shows the result of the analysis for above Option 1 and Option 2.

**Table 23-4 Minimum Requirement to attain 20% of FIRR-ROE**

Bypass Name	Option 1 Required Capital Grant Ratio (Amount)	Option 2 Required Concession Period
Bareilly Bypass	13.5% (Rs. 246.4×10 <sup>6</sup> )	12 years
Gwalior Bypass	29.0% (Rs. 399.7×10 <sup>6</sup> )	15 years

From these cash flow simulation results, it will be concluded as follows:

- (1) In case of Base Case conditions, no private investors will be attracted to the implementation of the project bypass.
- (2) Therefore governmental concession such as capital grants, equity participation, is strongly requested.
- (3) In case the governmental concession mentioned above was granted, or the private investors succeeded to secure the lower interest long-term loan, both bypasses, especially Bareilly Bypass, have possible chance to attract the investors.

In order to implement the project bypass, there will be several options of

implementation method to apply. To find out the most appropriate implementation plan, the following four options were assessed in the Study.

- (1) Carry out the detailed design within JICA Scheme (Grant Aid Basis) and implement the construction under OECF Loan
- (2) Implement the detailed design and construction under OECF Loan
- (3) Implement the detailed design and construction by BOT basis
- (4) Implement the detailed design and construction of fundamental civil works under OECF Loan, and the construction of pavement, surface drainage, toll related facilities, etc., and operation by BOT basis

Figure 23-1 shows the comparison chart of tentative implementation schedule of option (1) to (3), which may represent the earliest schedule in each case. For the comparison purpose, the required period for the detailed design and construction was assumed as 12 months and 36 months respectively, as a conservative duration. Based on this comparison chart, the earliest realisation of the project may be given by the implementation by BOT basis.

**Figure 23-1 Comparison of Implementation Schedule**

Mode of Project Implementation	1998	1999	2000	2001	2002	2003
Feasibility Study by JICA Submission of Draft Final Report Submission of Final Report	▼ ▼					
Option 1 JICA (D/D) - OECF (Construction) Detailed Design by JICA Application to OECF L/A between OECF & GOI Tender for Contractor Construction		▼ —	▼ —	—	—	—
Option 2 OECF (D/D & Construction) Application to OECF L/A between OECF & GOI Tender for Consultant Detailed Design Tender for Contractor Construction	▼	▼	—	—	—	—
Option 3 BOT Tender for Contractor (SPV) Detailed Design by Contractor Construction	—	—	—	—	—	—

The basic policy for the OECF to pledge/commit his finance requires the proposed project to fulfil the following interior process, prior to the implementation of the project:

- obtain the approval to implement the project by Cabinet or the responsible organisation
- get the every clearance related to the EIA procedures
- acquire the land required for the project implementation
- settle the matters related to the displaced people

The above listed items may not cover the all required clearance. However once the Loan Agreement (L/A) was exchanged, the project is strongly requested to attain the smooth implementation progress, and the completion within the scheduled period.

In India, the approval to implement the project means the project sanction by EFC (Expenditure Finance Committee), or CCEA (Cabinet Committee for Economic Affairs). According to the information, the project sanction will be given in accordance with the project scale as shown in Table 23-5.

In order to get the sanction for the proposed project, the applicant is requested to provide the concrete project profile and prove the readiness of the financial arrangement to implement the project. The expected duration to get the sanction was informed as shown in Table 23-6.

**Table 23-5 Demarcation of Project Sanction by Project Scale**

	Required project cost	Sanction given by
(I)	up to Rs. 200 Crores	EFC (Chaired by Secretary, Ministry concerned)
(II)	up to Rs. 500 Crores	EFC (Chaired by Secretary of Ministry of Finance)
(III)	more than Rs. 500 Crores	CCEA

Note : Rs. 1 Crore = Rs. 10,000,000/-

(I), (II), (III) show the tentative category

**Table 23-6 Duration to get the Project Sanction**

Category	Expected duration
(I)	3~6 months
(II)	3~9 months
(III)	6 months~? (depend on the Cabinet's judgement)

Furthermore the required period to get the EIA related clearance would be around 6 months as earliest case. Land acquisition will take place in rather quick manner. Since the legal change was made in last year regarding the land acquisition related to the national highway projects, the MoST is able to acquire the land in compulsory manner. Once the gazette is issued as the land is required for the national highway project, the land will belong to the government property 60 days after. Whole procedure of land acquisition including the evaluation of land/premises, payment of

compensation to the PAPs, etc., will take one year or more.

In some cases OECF commits the loan to the project which covers the detailed design and construction. In this case the borrower (executing agency) will, at first, start the detailed design, including the tender process to select the design consultant. Then, upon the completion of the design, the borrower is able to submit the application to EFC/CCEA to get the project sanction. Therefore, from the viewpoint of getting the approval from the authority concerned to the project construction, it appears too much time consuming after the exchange of L/A for the OECF loan. It may be suggested to separate the loan commitment to the engineering design component and construction component of the proposed project.

Judging from the above consideration, it was recommended to realise the proposed Bareilly Bypass and Gwalior Bypass by BOT basis, in order to complete the project construction in the target year of 2002, which was specified in the Scope of Works of the Study.

In order to attain the smooth implementation, the followings may be recommended:

1. Although the conditions of concession will depend upon the negotiation with the concessionaire, be ready to give the full governmental support which was proposed in the "Guidelines for Private Investment in National Highway Projects" as "Other Concessions".
2. Give the Central (MoST) and State Government Credit to the concessionaire to reinforce his financial situation.
3. The future traffic demand forecast in this Feasibility Study was conducted under the assumption of around 8% of traffic projection rate, which was lower than the expectation of the MoST. Therefore guarantee this 8% traffic projection rate in case the shortfall of actual traffic.
4. Provide the appropriate payment for the land acquisition and compensation to the PAPs. According to the information, land contracts might be sometimes reported lower than the actual paid amount intentionally. Therefore the evaluation for the land acquisition and compensation is recommended to take into account the said situation.
5. To guide and form the public opinion of the concerned area to welcome the bypass implementation. This should support the smooth implementation by the concessionaire.

In addition to the above, the following will be recommended as general matters relating to the project:

1. It was observed that the both MoST and HHAI were involved in the implementation of BOT projects. From the viewpoint of simplify and activation



of the highway related development by BOT basis, it may be recommended to set up the NHAI as the sole agent of the BOT basis projects. The MoST may be requested to concentrate his function to support and monitor the NHAI's activity as the supervising Minister.

2. The estimated project budget for the Bareilly and Gwalior Bypasses may be close to upper limit of the amount manageable by the SPV formed by the sole local contractor. It is recommended to form the SPV by the consortium with financial agencies and local contractors.
3. It may be one idea to establish the SPV by the investment of NHAI and State Government, and to invite local contractors as the consortium members.
4. It is recommended to introduce the international contractors to the India's highway related BOT projects. In order to realise this, it will be requested to relax the condition, or lower the barrier regarding the taxation system, and/or transaction system between foreign currency and local currency. To simplify and shorten the period for administrative/legislative process required for the foreign company may be also recommended.
5. It may be said that the long-term financial market in India is not well developed at the moment. It is understood that the IDFC was established to promote the infrastructure development by BOT basis through IDFC's support on the financial/regulatory aspects. It is recommended to commence the IDFC's services as soon as possible, and utilise his support to the highway related BOT projects to the full extent of his function.









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