6.2 Social Environment Study

6.2.1 Objectives

Social Environment (SE) studies of the 10 bypass locations are based on the adoption of a transparent environmental and social policy and have the overall objectives of:

- Enhancement of quality of life and environment in and around the project locations.
- Prevent and minimise adverse environmental and social situations.
- Mitigate possible negative environmental and social impacts.

The scope of the studies in Phase 1 was limited to typical Initial Environmental Examination (IEE) level. The SE studies in Phase 1 focussed on confirming the results of screening and scoping done during project formulation stage, and studying in detail the relevant items identified therein, requiring further study and investigation at each bypass location. Vijayawada and Gwalior bypass locations were studied carefully as no screening or scoping had been conducted for these two sites. In addition to studying impacts on community life and economic activities, land acquisition and resettlement, and indigenous or traditional populations, elements of public consultations and consensus building were incorporated as an integral part of the SE studies. This was done in order to fulfil the aim of a transparent social policy and to facilitate smooth implementation of the bypass projects.

The SE studies in Phase 1 represent an initial review of each of the proposed bypass project locations with the objective of "sizing it up" to delineate the likely adverse social impacts. Further, the SE studies would prioritise the bypass locations in terms of degree of adverse social impacts and easiness/difficulty in land acquisition.

A maximum of three bypass locations having total accumulated length of approximately 60 km will be selected for the feasibility study in Phase 2, based on several criteria including degree of adverse social impacts and land acquisition condition.

6.2.2 Study Methodology

For each bypass site, the geographical boundaries of the study zone were fixed by a one-km wide zone, half km on either side of the centre of bypass road. The following sequence of tasks was carried out in Phase 1.

6.2.2.1 Collection and Analysis of Available Information

(1) Legal and institutional setting in India concerning social aspects.

These include constitutional provisions, international treaties, conventions and protocols on human rights and indigenous people, status of social related

legislation and policies (central and state), summary of key trends in Indian laws and policies, Resettlement and Rehabilitation (R & R) planning and implementation, and social impact and entitlement framework.

(2) Preliminary information about the bypass.

These include detailed route alignment map, length of bypass, list of habitations, villages, towns, along the bypass route within half km on either side from the centre of the bypass, and location and extent of land to be acquired.

(3) Community Life, Social Aspects and Economic Activities

Following kinds of secondary data was collected concerning the villages/ town within the bypass zone:

a) Population, caste profile, religion profile, literacy profile, activity pattern (main workers, marginal workers, non-workers), industrial categories of workers etc.

b) Data on infrastructure facilities such as schools, colleges, hospitals, clinics, drinking water facilities like wells, pumps, road/rail transportation facilities etc. which may be affected by the bypass road alignment.

c) Existing land use pattern

d) Future land use plans like plans for housing colonies, agricultural farms, educational institutions etc. in the vicinity of the bypass.

e) Archaeological sites, tourist spots, Sanctuaries, religious places etc.

f) Data on people below the poverty line, land less persons, and small and marginal farmers.

g) Potential areas requiring land acquisition, involuntary resettlement of population, possible resistance to land acquisition and other R & R problems, likely impact on tribal population etc.

h) Value of land likely to be acquired.

i) Possible direct impact of the bypass on the existing land transportation and trade and other economic activities in the area.

6.2.2.2 Participatory field investigations and surveys

Field investigations and surveys were carried out at each of the 10 bypass locations to supplement and validate information collected in Task 1. In particular, the following were considered:

(1) Identification of specific land acquisition requirements

(2) Identification of project affected persons, their location and kind of impact

(3) Prediction of likely social impacts due to the bypass project and evaluation of the consequences

(4) Identification of specific needs of marginal and vulnerable groups

(5) Identification of alternatives for mitigation of adverse social impacts, including bypass alignment considerations and sites for resettlement, if any.

(6) Preliminary selection of preferred alternative for mitigation of adverse social impacts

(7) Collection of socio-economic data and determining public opinion and public consultation

The field investigations were undertaken using a variety of techniques including baseline surveys, participatory appraisal, focus group discussions, and consultations with local leaders, knowledgeable local persons and community residents. During discussions with community, alternative options for avoiding or minimising displacement were sought. These field studies aimed at ensuring that the project affected persons (PAPs) are fully involved in the decision making process.

For community level socio-economic data collection, in addition to secondary data collection, at least 3 community sites at each bypass location (one close to the centre and the other two close to the two ends of the bypass route) were sampled. Participatory appraisal techniques were used to obtain data on: community social aspects (religion, social groups and status), ethnic aspects (minority, scheduled caste and scheduled tribe etc.), economic aspects such as household structure, occupation, employment status, household income, education, land ownership, value of house/land, and community attitude towards the bypass project.

6.2.2.3 Social Assessment

Based on Task 1 and Task 2, identification and elaboration of adverse social impacts at each bypass location was done. Guidelines of the GOI and JICA were used.

The SE studies in Phase 1 represent an initial review of each of the proposed bypass project locations in order to "size it up" to delineate the likely adverse social impacts, which could result from the construction of the proposed bypass. Another aim was to prioritise the bypass locations in terms of degree of adverse social impacts and easiness/difficulty in land acquisition.

6.2.2.4 Formulation of Mitigation Measures

To the extent possible based on the available data and results of the SE studies in Task 3, preliminary mitigation measures for managing adverse social impacts are enumerated.

6.2.3 Legislation and Policies

Compared to the more specific legal instruments on environmental issues, the legislation, notifications, rules and policies on social issues are less definite. The GOI is in the process of finalising and adopting a comprehensive National Act on Involuntary Settlement. Some states including Orissa have resettlement acts or policies, which apply to the irrigation sector. In addition, some public sector units in the energy sector have resettlement policies. While constitutional provisions provide several guarantees to project-affected persons, international agreements on social and cultural issues have limited application.

6.2.3.1 Constitutional Provisions

The Indian Constitution provides for the protection of project affected peoples (PAPs) through the provisions of fundamental rights and the directive principles

(1) Guarantees. Between the fundamental rights and the directive principles in the constitution, the rights of PAPs (in particular tribal and other vulnerable groups) are protected. The fundamental rights are enforceable while the directive principles are not. These guarantees cover life, property, equality and culture.

(2) Scheme of Governance. No provision in the constitution is specifically concerned with resettlement and rehabilitation. However, various Government agencies and specific ministries are empowered to deal with adverse social impacts and issues of resettlement and rehabilitation (R&R).

6.2.3.2 International Treaties, Conventions and Protocols on Human Rights and Indigenous People

Many international treaties have been signed or ratified by India. These include:

- Universal Declaration of Human Rights.
- International Convention on Economic, Social and Cultural Rights.
- International Covenant on Civil and Political Rights and many other instruments on the prevention of discrimination.
- International Labour Organisation Convention No. 107 concerning Protection and Integration of Indigenous and Other Tribal and Semi-Tribal Population in Independent Countries

With special regard to indigenous/tribal people, there are guarantees mandating Government to take responsibility for their development, with their active participation.

6.2.3.3 Socially Related Legislation and Policies

Legislation and policy on social issues are in a nascent stage of development in India. The Land Acquisition Act, with amendments, enacted thereto by various States, is applicable all over India, irrespective of the project. Maharashtra and Madhya Pradesh States have formulated specific legislation on R&R. Orissa State has formulated in 1994 "The Orissa Resettlement and Rehabilitation of Project Affected Persons Policy (as applicable to water resources policy)".

A draft R&R policy by the Ministry of Rural Development is being discussed and the NGO response paper is in response to the foregoing.

(1) Land Acquisition Act, 1894, and its amendment by The Central Act in 1984 (LAA)

This Act enables the state to acquire private land for public purpose. This sovereign power of the state can be delegated to public bodies and corporations. The Act ensures that no person is deprived of land except under law and entitles the affected person (landowner, tenant or licensee) to a hearing before acquisition with due and adequate compensation made thereafter.

A number of State Governments have also made amendments to the legal provisions in the LAA. Land required for any government project whether Central or State, has to be acquired by the respective State Government. The Collector of the district is the officer who is empowered to acquire the land. He is an officer of the State Government.

Only landowners, tenants and licensees are possible compensation recipients. The land-less, agricultural labourers, artisans, and forest produce collectors are excluded. This Act also provides several methods of valuing the compensation. Several states including Orissa are using negotiations as a means to fix compensation and acquire land.

Grievance/Redress mechanisms are also in place and affected persons may seek the intervention of the Supreme Court.

Concerning compensation of the land acquired under the LAA, the state commits to pay the market price of the land to be acquired. Further, recognising the compulsory nature of acquisition, it provides for the award of a sum of 30% of the market value. In addition, interest is awarded at the rate of 12% per annum of the land market value, for the period commencing on and from the date of publication of the Notification, to the date of the award of the Collector or the date of taking possession of the land, which ever is earlier. Under the LAA, district level Negotiating Committees is authorised to conduct negotiations with landowners to establish full and fair valuation

of land and speedier settlement. If the negotiating process does not result in a "consent award", then land acquisition proceedings continue using the normal procedures established under the Act.

(2) Land Acquisition Process

Four stages are identified in the process of land acquisition:

a) Preparation of land acquisition schedules and estimates

This involves identification of land needed after selection of the alignment. Then on the basis of details of land ownership, land acquisition schedules and acquisition costs need to be estimated. These schedules form part of the Notification to be issued subsequently.

b) Preliminary Investigations

Based on above, a Notification is issued in the Government Gazette is issued under Section 4 of the Act indicating the government's desire to acquire. Simultaneously, the matter is published in two local newspapers. The Notification identifies each piece of land with the Survey Numbers recorded in the Revenue Maps and the extent of acquisition that is needed.

c) Hearing of Objections

The persons interested in the notified land are required to file objections, if any, to the acquisition, with the Collector in writing within a period of 30 days from the publication of the Notification. The Collector, after an enquiry and giving necessary hearing, makes recommendation to the Government. If the Government is satisfied with the Collector's report in regard to acquisition of land for public purpose, a declaration is made to that effect in the Official Gazette.

d) Taking Possession

After issue of the declaration, the Collector is directed to make order for acquisition and give public notice to the concerned persons. The Collector thereafter gives public notice to the Government's intention to acquire land and determines the area of land, the compensation that may be awarded and apportionment of the compensation among the concerned persons. In making the award the Collector has to obtain prior approval of the Government which can also be dispensed with by a Government Notification under Section 11. The Collector has to grant an award within a period of two years from the date of declaration's publication and, if no such award is made, the entire proceedings elapse. The compensation is calculated on the basis of actual sale of property in the nearby area in the recent past, and provides for compensation for standing crops, trees, wells and houses. The affected person can always approach the courts for a review of the awards if

they are dissatisfied.

Since land acquisition proceedings are time-consuming and cause a lot of delay and hardship, the LAA was amended in 1984 which provides for a maximum time limit of one year for completion of all formalities between the issue of the Preliminary Notification and Declaration for acquisition of land. Further, in urgent cases, the Collector is also empowered to take possession of land even before the award is made under Section 17 after the expiry of a minimum of 15 days from the date of issue of notice to the interested persons. This means that the possession can be taken after hearing of objections (to be filed within 30 days), the declaration having been made that the land is required for public purpose (within the maximum period of one year) and notice issued to persons interested in the land (soon after the declaration) plus 15 days, or the maximum period of 410 days.

Further, in case of "urgency" as well as "emergency", the Government has the power to direct that the provisions of the Act as to hearing of objections will not apply, and if such directions are issued, then the declaration that the land is required for public purpose may be made after publication of the preliminary Notification. These stages in land acquisition are shown in Table 6-30.

Table 6-30 Stages in Land Acquisition

Stages	1894 Act	1984 Act	Section 17 of the Act	Urgency Clause
1. Notification	30 days	30 days	30 days	30 days
2. Objections	No maximum period	365 days	30 days	Nil
3. Declaration, Award and Possession	2 years	15 days	15 days	15 days
Total		410 days	75 days	45 days

(3) Legal Framework related to SC/ST in India

Scheduled Tribes of India are conceived as one of the weaker sections of the Indian Population. The Constitution of India provides an elaborate framework for socio-economic development of Scheduled Tribes and for preventing their exploitation by other groups of the society. The three-pronged framework include; (a) goals and objectives are set out in Article 46; (b) legislative and protective framework in Schedule; and (c) financial support in Article 275.

The Directive Principles of State Policy (Article 46) directs the state to "promote with special care the educational and economic interest of the

weaker sections of the people and in particular, of the Scheduled Castes and Scheduled Tribes and protect them from social injustice and all forms of exploitation". In article 41, the state is required to make effective provisions "for securing the right to work, to education and for public assistance in cases of unemployment, old age, sickness and disablement, and in cases of undeserved want". Involuntary resettlement of tribal population from original habitat would constitute an "undeserved want".

The Fundamental Rights of the constitution are applicable to all Indians; it ensures equality before the law (Article 14); prohibits the state to discriminate on grounds of religion, race, caste, sex or place of birth (Article 15); ensures equal opportunity of public employment (Article 16); abolished "untouchability" and ensures freedom of speech and movement. Both the Fundamental Rights and Directive Principles of State Policy apply to all people of India. However, the Constitution also provides specific provisions for protection of the weaker sections from exploitation, and ensures that they can avail of educational and employment opportunities. These special provisions are characterised sometimes as Compensatory Privileges Protective Discrimination or Affirmative Action. Article 342 deals with mechanism of scheduling tribes by the President of India in consultation with the Governor of the State. The Constitution makes a distinction between tribal people to be administered in Scheduled Areas and in Tribal Areas under the Sixth Schedule (north-eastern States).

Article 275 provides for grants to be made to States by the Union Government to enable them to meet the cost of Government-approved schemes to promote the welfare of STs or to raise the level of administration of scheduled areas in the State. Besides the above, Article 330, 332 and 243-D provides for reservation of seats in the House of people and in the Legislative Assemblies of the States and in local elected bodies (Panchayat). Article 164 makes a special provision for a Minister in charge of Tribal Welfare in Bihar, Orissa and Madhya Pradesh.

Several states have State Level Legislation concerning ST. In Orissa for example, the following are in use:

a) The Orissa Scheduled Areas Transfer of Immovable Property (by Scheduled Tribes) Regulation, 1956 as amended in 1993

b) The Orissa Scheduled Areas Moneylender's Regulation 1967

c) The Orissa Debt Relief Act, 1980

d) The Bonded Labour System Abolition Act, 1976

e) The Orissa Land Reforms Act, 1960 (Section 22 and 23)

f) The Orissa Reservation of Vacancies in Posts and Services (for SC and

ST) Act, 1975

(4) Summary of Key Trends in Indian Law/Policies

Legislation and policies to address social issues associated with infrastructure projects are evolving fairly rapidly. Most of these laws and policies are oriented towards improved understanding of two key issues namely - definition of project affected persons (PAPs), and nature and extent of entitlements. Some key changes taking place are:

a) Regarding the inclusion of persons within the definition of "PAPs", unlike the Land Acquisition Act which at one extreme only deals with people who lose land and have valid legal titles, The Draft National Rehabilitation Policy (Ministry of Rural Development) is now moving to a holistic understanding of what R & R means and who a project affected person is. There are many instances where the people are encroaching upon land, which already belongs to the Government. It is comparatively easy, given political will, to clear the encroachments, since the encroaches have no legal standing. Difficulty often arises because of absence of proper land records. Also, to make the persons encroaching amenable as also to obtain political acceptability, policy of compensation and rehabilitation of persons encroaching is being followed by a number of States. In such cases, the removal of encroachments becomes smooth and fast.

b) Regarding the extent and nature of entitlements, while "adequate compensation" was initially the objective of laws/policies, replacement value and even development benefits are now favoured, in order to mitigate the potentially disruptive nature of project-induced displacement and other adverse effects. Correspondingly, compensation has now been re-defined, and includes grants/ allowances/civic amenities leading to establishment of a resource base similar to pre-project conditions. Seven basic categories of issues/ impacts are increasingly being recognised under the entitlement framework. These are: loss of land, loss of structure, loss of source of livelihood, loss of access to common resources and facilities, loss of standing crops and trees, losses during transition of displaced persons/establishments and losses to host communities.

c) Laws/policies now provide for resettlement on a community-wide basis and not on an individual basis. Integration into host communities is also an important consideration.

d) Most policies now view R & R as a time bound activity.

e) Cut off dates for identification of PAPs, and the formulation of eligibility criteria are now specified in some of the laws.

f) National Acts and policies have little provision for public disclosure, consultation and participation, whereas the Orissa R & R Policy and the NGO policy do.

g) Grievance/redress mechanisms are addressed in the National Draft Policy through the provision for setting up of a Grievance Redress Cell including organisations of displaced persons.

The requirement of social assessment is not mandatory under national law. Preparations of R & R plans are required under specific State laws and some policies, but there is no parallel with the environmental clearance required under the EIA Notification, 1994.

6.2.4 Baseline Social Environment Data of Bypass Sites

6.2.4.1 Bareilly, Uttar Pradesh

(1) Land Use Pattern along Proposed Bypass Route

The entire alignment passes mainly through private agricultural lands in two development Blocks of Bareilly district, namely, Bhojipura and Bithri Chainpur. The net cropped area in these two blocks in 1992-93 was 84 percent and 82 percent of their respective total geographical area. The principal agricultural crops are cereals like paddy and wheat, various pulses, oil seeds like mustard and sesame, sugarcane, and potatoes. There are no residential areas or land put to other uses, except public roads, railways, irrigation canals and some eucalyptus plantations. There is a municipal garbage dumpsite in the vicinity of the proposed bypass alignment.

(2) Social and Economic Profile of Affected Villages

26 villages are in close proximity to the alignment. Tihulia and Khangauntia fall within the Bareilly Municipal limits. Of the remaining 24, five are in Bhojipura Block and the remaining 19 in Bithri Chainpur. The five villages in Bhojipura account for only about 5 percent of that Block's population. On the other hand, 19 villages in Bithri Chainpur Block account for about a quarter of that Block's population.

The overall Caste Profile of the population in the five villages of Bhojipura show that 16.99% belong to Scheduled Castes (SC), 0.82% to Scheduled Tribes (ST) and 82.19% belong to the Other Castes. Similarly, the Caste Profile in 19 villages of Bithri Chainpur show that 13.2% belong to Schedule Castes and the balance 86.8% belong to other Castes.

The Literacy rate in both the blocks is really low at 22.03% in Bhojipura and 24.04% in Bithri Chainpur.

The Occupation profile in the five village of Bhojipura shows that majority (80.38%) of the people belong to the agricultural sector (58.07% are cultivators and 22.31% are agricultural labourers). In the 19 villages of Bithri Chainpur, 78% belong to the agricultural sector (49.25% are cultivators and 28.74% are agricultural labourers).

The average size of farm holding is 0.89 hectares. About 72 per cent of all holdings are less than one hectare in size (marginal farmers) with an average size of only 0.37 hectares. Nearly 90 per cent of all holdings are less than 2 ha (marginal and small farmers) with an average size of just over 0.5 ha.

The majority of the population belongs to the non-working group (68.32% in the 5 villages of Bhojipura and 71.86% in the 19 villages of Bithri Chainpur) and the balance constitutes the main and marginal workers.

The average family size in the villages of Bhojipura is 6.6 and that of Bithri Chainpur is 6.4. There are a total of about 919 families in Bhojipura and 3425 families in Bithri Chainpur.

(3) Public Facilities

Based on the discussions with people from various walks of life in the villages like the Block Pramukh, village Pradhans, teachers, shopkeepers, elderly persons and others, it has been concluded that no adverse-affect would be felt by the public facilities like schools, temples, hospitals, water sources and religious places.

(4) Public Consultations

Six villages namely - Khangauntia, Pardhauli, Bilwa, Bhura, Nawadia, and Bithri Chainpur were selected. Khangauntia falls within the municipal limits of Bareilly City. Pardhauli and Bilwa are in Bhojipur Block. These three are located on the Delhi side of the Naintal Road. Bhura, Nawadia and Bithri Chainpur are in the Bithri Chainpur Block and are located on the Lucknow side of the Nainital Road. Khangauntia an Pardhauli were approached through a brick-paved road from Mathurapur on the Delhi side of the National Highway, Bilwa and Bhura from the Nainital Road and Nawadia and Bithri Chainpur from Bisalpur Road.

Discussions were held with people from various walks of life in the villages- Block Pramukh, Village Pradhans, teachers, shopkeepers, elderly persons, and other people likely to be adversely affected by the bypass, including those from Scheduled Castes and minority communities.

The people in all the villages visited appear to be overwhelmingly in favour of the bypass as they expect a number of benefits out of it, such as faster

development of the villages, better transport facilities and greater road safety, more employment opportunities and larger volume of trade. A few however, expressed concern about the loss of land and, as a consequence, the means of livelihood to the marginal and small farmers.

Those possibly losing land in various villages feel that loss of land is inevitable. They expect adequate compensation for their land as well as for ground water wells at market value.

6.2.4.2 Patna, Bihar

(1) Land Use Pattern along Proposed Bypass Route

The land use pattern in the proposed bypass villages indicates that the major use of land is for agricultural cultivation.

The main villages affected by this proposed bypass are: (1) Farhangpur (2) Chandi (3) Narbirpur (4) Lachchantola (5) Jamira (6) Ramnagar (7) Hasanpura (8) Alipur (9) Gothnaula (10) Bhusanula (11)Piprahiya of Sone river area (12) Barampur (13) Bahadurpur (14) Alampur (15) Hula Chak (16) Sarsia (17) Naharpur (18) Chiraura (19) Nagwankahs (20) Dariapur (21) Muhammadpur (22) Sihora (23) Kharagpur (24) Mathurapur (25) Ramtari (26) Nagarbita (27) Nathurpur (28) Eteva (29) Doghra - of Patna area.

(2) Socio-Economic Profile of Affected Villages

The overall caste profile of the population of these 29 villages indicates that majority belong to Other Castes (78.78% in 18 villages of Patna area and 84.12% in 11 villages of Sone River area).

The literacy rate of the population is 38.86% in Patna area and 29.6% in Sone river area.

The occupation profile of the people residing in these villages indicates that majority belong to the category of agricultural labourers and cultivators in Patna area (83.13%; 54.92% - agricultural labourers and 28.21% cultivators) followed by other services (11.54%), trade and commerce (1.69%) and manufacturing and processing (1.12%) In the Sone river area, the major categories are agricultural labourers (44.51%) followed by cultivators (41.91%), other services (7.93%), and trade and commerce (2.05%).

The dependency on agricultural and related activities in Patna and Sone river areas is high.

Non-workers in Patna and Sone river area are 67% and 74% of their respective populations. The main workers in Patna and Sone river area are 32.43% and 25.39% of their respective populations.

The average family size in the 18 villages of Patna is 6.5 and 11 villages of Sone river area are 7.4. The large family size is recorded in Bahadurpur of Patna area (8.2), and Lachchantola (9.6) of Sone river area.

(3) Public Facilities

In both districts public facilities such as hospitals, schools, community centres etc., are not going to be affected. Five irrigation wells and some mango orchards fall within the right of way of the proposed alignment.

(4) Public Consultations

Public consultations were conducted at Saain Chak, Anaith and Bahiyara. These meetings were attended by Panchayat Officials, village elders, and farmers. In general, they were positive about the proposed bypass, as it would lead to increase in business and employment opportunities as well as improved transportation facilities.

6.2.4.3 Keonjhar, Orissa

(1) Land Use Pattern along Proposed Bypass Route

The land use pattern available for 3 of the affected 6 villages in the vicinity of the proposed bypass, indicates that the major use of land is for cultivation (71%). The villages affected by this proposed bypass are: Ghuturu, Gumura, Nuagaon, Gamaria, Bramhamgaon and Maligaon.

(2) Socio-Economic Profile of Affected Villages

The overall caste profile of the population of the affected villages indicates that majority belong to SC/ST (92%; Scheduled Castes- 55% and Scheduled Tribes- 37%), followed by non-SC/ST (8%). The main tribes living in the affected villages are Santal, Sounty, Bhuyan, and Sahara.

The literacy rate of the population is 42.8%.

The occupation profile of the population shows that the majority belong to the category of agricultural labourers (51.04%) followed by cultivators (21.41%), other services (11.20%), manufacturing and processing (6.24%), construction(4.28%) and, trade and commerce (2.63%).

The dependency on agriculture and related activities is high in this area (72.45%).

There are more number of non-workers in Keonjhar area(67.43%), followed by main workers(30.43%).

The average family size is 5.4.

(3) Public Facilities

It was determined that there will be no impact on the public facilities such as schools, hospitals etc., from consultations conducted with state PWD staff.

(4) Public Consultations

Public consultations were conducted with officials at Block level, Gram Panchayat level and the villagers themselves, who are likely to lose their land. There were mixed reactions from the public concerning the bypass. A group of schedule caste people in Nuagaon village expected the bypass to benefit them both economically and socially. They expected economic value of land in the area to go up, and increased opportunities for starting roadside business (shops etc.). They also expected the bypass to provide easy and direct access to the main market. However, scheduled tribes in the same village were not very positive to the bypass project. The loss of agricultural land was equivalent to loss of their only source of livelihood. Moreover, their communities have been living in the same area for generations and they feared that the loss of land would lead to split up of their community, increasingly intrude into their tribal life and increase accidents with livestock.

It is interesting to note that the non SC/ST population and some of the SC population are ready to forego their agricultural lands for this proposed bypass (due to difficulties in cultivation) where as the STs, who are the majority in the area are not ready to lose their agricultural land since their main stay and source of livelihood is agriculture. Moreover, disruption of their strong community ties and split of their communities by land acquisition is undesirable.

6.2.4.4 Balugaon, Orissa

(1) Land Use Pattern along Proposed Bypass Route

The land use pattern existing in the proposed By-pass villages indicates the major use of the land is for cultivation purposes, primarily for rainfed paddy and to some extent irrigated paddy.

(2) Socio-Economic Profile of Affected Villages

The main villages affected are; Bisundi, Gopinathpur, Khanat, Kotari of Banpur Block, and villages Subidi Patnam, Teripara, Khadi-kapalli, Nimikhata, Belapeda, Belugaon, Karadi, Brahman Kusadihi Pur, and Saralasingh, of Chilka Block.

The overall caste profile of the population of these 13 villages indicates that

majority belong to non Scheduled Caste/Scheduled Tribe (SC/ST) (98% in Banpur area (4 villages) and 79% in Chilka area (9 villages). Scheduled Castes (SC) population in Chilka Area (9 villages) is more than in Banpur area.

The literacy rate of the population is higher in Chilka area (53%) than in Banpur area (46%).

The occupation profile of the people residing in these villages indicates that majority belong to the category of cultivators and agricultural labourers in Banpur area (84% - 71% cultivators, 13% agricultural labourers) followed by other services (4.67%), trade and commerce (3.60%) and construction activity (3.37%). The majority of farmers are small and marginal farmers with small size farm holdings (typically less than 2 ha). In the Chilka area, the major occupation is trade and commerce (29% - mainly fish and prawn selling) followed by cultivators (24%), other services (13%), agricultural labourers (8.73%) and transport and communication (8.71%).

There are more number of non-workers in Banpur as well as in the Chilka areas (72%). Similar trend exists in the category of main workers population (27%) in both the blocks i.e. Banpur and Chilka. The average family size in the 4 villages of Banpur is 5.9 and in the 9 villages of Chilka area is 5.7. The biggest family size is recorded in Karadi 7.1 of Chilka area.

(3) Public Facilities

Based on the discussions held with villagers as well as officials, it is determined that there is no impact on any public facilities except a school building near the starting point of the proposed bypass.

(4) Public Consultations

Public consultations were held at the villages Dhuanla, Kotari, Subhddhi Patna and Pranadeipur, Though the people perceive positive impacts of the bypass in terms of reducing the number of accidents and improved employment opportunities, several reservations concerning the bypass project were expressed. Most villagers were aware of the bypass project but had no information on the precise alignment.

Villagers of Dhuania who are mainly engaged in agriculture, said that their lands are highly fertile and agriculture is their main source of income. Losing their land would adversely affect their livelihood. Land cost compensation alone was considered inadequate as the reduction in food grain output would affect the economy of the whole village.

Villagers of Kotari whose mainstay is agriculture expressed anxiety concerning floods in the rainy season due to their lower level location on the

bank of river Kansari, with respect to the already constructed railway line and the proposed bypass road. They also expressed preference for alternative allotment of land for land lost.

Villagers in Subhddhi Patna and Pranadeipur due to their proximity to the existing national highway, railway line and the proposed bypass road expected the accident rate to go up rather than come down.

Villagers of Pranadeipur expressed their anxiety over losing common land used by the villagers for cattle grazing, and also land belonging to the school and temple.

6.2.4.5 Vijayawada, Andhra Pradesh

(1) Land Use Pattern along Proposed Bypass Route

The entire alignment passes mainly through private agricultural land, mostly non-irrigated and a small portion of a mango yard at Nunna. The land use pattern for eight villages existing in the proposed bypass areas, indicates that the major use of the land is for cultivation (61.26%) both irrigated(34.63%) and non-irrigated (22.63%) followed by non-agricultural use (19.05%), forest (11.81%) and cultivable waste land (7.89%).

(2) Socio-Economic Profile of Affected Villages

The main villages affected by this proposed bypass are Gollapudi, (Surayapalem, Thummalapalem), Ambapuram, Nunna, (Payakapuram), Vedurupavuluru, Purushothapatnam, Bahubalendrunigudem, Tempalli, and Atkuru.

The overall caste profile of the population of these eight villages indicates that majority belong to non SC/ST (76.06%) followed by scheduled castes (21.78%) and scheduled tribes (2.17%).

The literacy rate of the population denotes 43.58% at the aggregate level of the eight villages.

The occupation profile of the population shows that the majority belong to the category of agricultural labourers (55.18%) followed by cultivators(13.35%), other services (7.16%), trade and commerce (5.75%), manufacturing, processing, servicing and repairs in industries other than household industries (2.09%).

Non-workers constitute 55.90%), and main workers 43.77% of the total population.

The average family size in these eight villages is 4.2. The biggest family size is

recorded in the village of Gollapudi (4.5).

(3) Public Facilities

Public facilities are not affected by the proposed bypass alignment.

(4) Public Consultations

Consultations and discussions were conducted with the all 8 Vijayawada proposed bypass affected village's elders/leaders as well as top officials of Vijayawada Urban Development Authority (VUDA), National Highway Authorities, and the R&B Department, Government of Andhra Pradesh. Meetings with members of "Fruit Merchants Association" at Vijayawada, "Mango Yard Farmers Association" at Nunna and promoters of the new housing colonies near Gollapudi were also conducted.

The outcome of these public consultations is very positive and the bypass road is most welcome.

Promoters of the new housing colonies are selling their plots by showing the proposed bypass in their brochures. Mr. Mangapati Rao, Vice Chairman, Vijayawada Urban Development Authority (VUDA), emphatically said that if green signal is given to this proposed bypass, land acquisition can be completed within the stipulated time in the Land Acquisition Act of Andhra Pradesh State.

6.2.4.6 Kannur, Kerala

(1) Land Use Pattern along Proposed Bypass Route

The alignment passes mainly garden land (Coconut) and in a small portion through paddy fields. Some areas along the alignment are heavily built up. No alternate alignment avoiding the built up areas is found feasible.

The proposed bypass crosses canal system of Pazhassi Irrigation project at Ch. 2785, 3300, 3810 m. and 5810 m.

The villages affected by this proposed bypass are Vallapatnam-where the bypass starts at km 150.500 of NH 17 and Chirakkal, Puzhathi and Elayavoor where the bypass ends near km 160/000 of NH17. The end point of the bypass is closely located opposite to Kerala State Electricity Board's Sub-station. Of these four villages the percentage of land to be acquired is higher in the village Puzhathi followed by Chirakkal, Elayavoor and Vallapatnam.

The land use pattern of these four villages indicates that the major use of the land is for agricultural cultivation including garden land for coconut cultivation followed by non-agricultural uses (Built up Area/Residential

Buildings),

(2) Socio-Economic Profile of Affected Villages

The caste profile of the population of these four villages indicates that majority belong to non-SC/ST (93.94%) followed by scheduled castes (6.03%) and scheduled tribes (0.03%).

The literacy rate of the population is 82.13% at the aggregate level of the four villages that are likely to the affected.

The occupation profile of the likely PAPs shows that majority belong to manufacturing and processing jobs including household industries (36.6%) followed by trade and commerce (20.85%), other services (15.68%), and construction works (6.2%).

The dependency on agriculture and related activities is negligible (1.12% cultivators, 5.49% agriculture labourers, 2.16% dairy, poultry etc.).

It is interesting to note that the percentage of non-workers is more in these four Villages. The population of children and old and retired persons composes the major chunk of the non-workers group. Main workers constitute about 25% of the total population.

The average family size in these four villages is 6.7. The biggest family size of 8 is recorded in the village Vallapatnam.

80% of farmers are marginal farmers having a land holding less than one ha.

Even though there are only 16,330 families, the number of farmers is 17,644, which workout to 1.08 or 1.1 marginal farmers per family. But the Occupation Profile indicates the farming community to be only 6.61%, including cultivators (1.1%) and agricultural labourers (5.49%). This indicates that people in this area are depending very little on agricultural income and more on non-agricultural sources of income as a source of livelihood.

(3) Public Facilities

As the state highway authorities have yet to fix the alignment the exact public facilities that could be affected by the proposed Khamgaon bypass road cannot be identified at this time.

(4) Public Consultations

Initial discussions were held with a group of village leaders in Edecheri Dhesam (Hamlet) of Puzhathi Gram Panchayat, and panchayat officials of Puzhathi and Cherakkal including elected standing committee members of

the panchayat, and also a few likely project affected families who are going to lose their entire house structure. The result of these public consultations indicated a positive attitude by the affected people towards this proposed Kannur bypass project. It was opined that for the benefit of the area some families has to suffer, but it is the duty of the government to take care of these project affected families/population by providing adequate compensation and R&R package in case of those who are affected by losing their entire economic base (agricultural land).

6.2.4.7 Nandura, Maharashtra

(1) Land Use Pattern along Proposed Bypass Route

The entire alignment passes through mainly private agricultural lands and Government lands. The main villages affected by this proposed bypass are Nandura, Nimgaon, Khudnapur, Wadi, and Rasulpur. The land use pattern available for three villages out of the five villages, indicates that the major use of the land is for agricultural cultivation (85%).

(2) Socio-Economic Profile of Affected Villages

The overall caste profile of the population of these five villages indicates that majority belong to non SC/ST (88.19%) followed by scheduled castes (7.01%) and scheduled tribes (4.80%).

The literacy rate of the population is about 56%.

The occupation profile of the likely PAPs shows that majority belong to the category of agricultural labourers (56.10%) followed by cultivators (21.30%), other services(9.33%), and trade and commerce (6.36%).

The dependency on agriculture and related activities is high in this area (77.10%).

Non-workers and workers are 51.74% and 46% respectively of the total population.

The average family size in these five villages is 5.1. The biggest family size is recorded in the village Nimmagaon and Rasulpur (5.2).

(3) Public Facilities

Public facilities are not expected to be affected by the proposed route alignment.

(4) Public Consultations

Public consultations were held with Nandura village leaders/elders. All of

them were keen to see the proposed bypass project become a reality as soon as possible. They were very concerned about rising incidence of road accidents near Nandura while crossing the road. There were more than 11 accidents during the last 2 years in the city limits of Nandura on NH-6 and victims were mainly young children and old men.

6.2.4.8 Khamgaon, Maharashtra

(1) Land Use Pattern along Proposed Bypass Route

The entire alignment passes mainly through private agricultural land and Government lands. The main villages affected by the proposed bypass are Januna, Sajanpuri, Saroda, Khamgaon, Ghatpuri, and Sutala,. The land use pattern of these six villages indicates that the major use of the land is for agricultural cultivation.

(2) Socio-Economic Profile of Affected Villages

The overall caste profile of the population of these four villages indicates that majority belong to non SC/ST (88.65%) followed by scheduled castes (6.42%) and scheduled tribes (4.93%).

The literacy rate of the population denotes 50.18% at the aggregate level of the four villages, which are likely to be affected.

The occupation profile of the likely PAPs shows that majority belong to the category of the agricultural labourers (37.58%) and cultivators (24.97%) followed by manufacturing, processing, and servicing including household industries (27.22%), and other services (4.18%).

The dependency on agriculture and related activities is high in this area amounting to 62.55%.

The non-workers and workers are 51.2% and 47% respectively of the total population.

The average family size in these four villages is 4.5. The biggest family size is recorded in the village Januna (5.9).

(3) Public Facilities

Officials at PWD, Khamgaon said that preliminary survey conducted for the route alignment indicated that public facilities like schools or temples are not affected.

(4) Public Consultations

Discussions with villager elders/leaders and some of the project affected

persons (PWD, Khamgaon has identified about 83 land owners in the six villages who would lose part of or their entire land holding) in all the six villages were held. The outcome of the public consultations is that by and large, everyone wants the bypass as it will reduce or eliminate present roadside accidents and improve overall business activities in this area. Affected persons expect adequate compensation for land to be acquired.

6.2.4.9 Bhopal, Madhya Pradesh

(1) Land Use Pattern along Proposed Bypass Route

Bhopal Development Plan 2005 indicates the present land use pattern in and around Bhopal City comprising its planning area. Just a little less than half (47%) of the total land available in Bhopal is intended for residential purposes in 1994. About 12% of the land have been developed for recreational purposes, 14% for transportation and 12% for public and semi-public purposes. Commerce and industries are planned in about 14% of the land and public utilities account for the remaining 3%. At present the population is mainly concentrated in the Main Bhopal City, T.T. Nagar, BHEL and BHEL extension, and to a lesser extent in Bairagarh area near the airport. The areas near the existing portion of the earlier planned by-pass and its extension still mainly fall in the rural zone, though there has been some construction of public building (for example, the Central Jail and the residential quarters for its staff, an Engineering College), development of Housing Board colonies and private residential colonies, and industrial estates (Narela Shankari) along it. Appolo Hospital is also being planned along this stretch. On the other hand, the entire length of the route in the revised bypass proposal of 40 km is completely through agricultural land and Government land not yet urbanised.

(2) Socio-Economic Profile of Affected Villages

The overall caste profile of the population of the 26 villages that could be affected indicates that majority belong to non-SC/ST castes (72.94%) followed by scheduled castes (22.91%) and scheduled tribes (4.15%).

The literacy rate of the population denotes 32.58% at the aggregate level of the 26 villages likely to be affected.

The occupation profile of the likely PAPs shows that majority belong to the category of agricultural labourers (39.09%) followed by cultivators (37.32%), other services (5.57%) and trade and commerce (3.00%).

The percentage of non-workers is 60.4% and that of main workers is 36%.

The average family size in these four villages is 5.7. The biggest family size is

recorded in the village Bhanuri (7.3).

Information on the size of land holdings is available readily from published sources only at the district level. The average size of holding in the district is about 3.84 hectares. In most of the districts in the country, a majority of the farmers are marginal or small farmers with less than two hectares. Bhopal district presents a different picture. About 18% of the holdings are marginal and a quarter is in the range of one or two hectares. But the majority of the holdings are above 2 hectares each with about 30% being medium or large. Marginal farms account for only 2% of the total area and small farms for about 10%. The average size of the marginal farms is just under half a hectare, while that of small farms is under one and half hectare. The average size of large farms of 10 hectares or more is 16.65 hectares.

(3) Public Facilities

As the alignment is not yet fixed by the State highway authorities the exact public facilities that could be affected by the proposed by pass road could not be identified.

(4) Public Consultations

To supplement the readily available secondary data and to assess the reactions and concerns of the local communities in the context of the proposal for the bypass, visits to select villages were planned. They were, however, not executed in the absence of a clearly demarcated alignment of the proposed Bypass.

6.2.4.10 Gwalior, Madhya Pradesh

(1) Land Use Pattern along Proposed Bypass Route

The entire alignment passes mainly through Government owned forest land and privately owned agricultural land.

The main villages affected by this proposed bypass are : Nirawali, Gajipura, Baraua, Jinawali, Bilpura, Kulaith, Sojana, Sujwaya, and Raipur. The land use in these villages indicates that the major use of the land is under forest area (43%) followed by cultivation (29%), cultivable waste land (9%) and area not available for cultivation (19%).

(2) Socio-Economic Profile of Affected Villages

The overall caste profile of the population of these nine villages that majority belong to non-SC/ST (84.37%) followed by scheduled castes (12.47%) and scheduled tribes (3.16%).

The literacy rate of the population denotes 24.64% at the aggregate level of the nine villages which are likely to be affected.

The occupation profile of the likely PAPs shows that majority belong to the category of cultivators (63.40%), followed by agricultural labourers (17.41%) other services (3.91%), manufacturing, processing servicing and repairs in industries other than household industry (3.51%), constructions (2.38%) and trade and commerce (1.67%).

The dependency on agriculture and related activities is high in this area.

The percentage of non-workers and workers are 65.3% and 29.14% respectively of the total population.

The average family size in these nine villages is 7.5, The biggest family size is recorded in the village Gajipura (11.1).

(3) Public Facilities

Based on the discussions with people from various walks of life in the villages like the Block Pramukh, village Pradhans, teachers, shopkeepers, elderly persons and others, it has been concluded that no adverse-affect would be felt by the public facilities like schools, temples, hospitals, drinking water sources and religious places.

(4) Public Consultations

Table 6-31 shows the number of families and the extent of agricultural land loss, based on a right of way of 60 m. The extent of loss of land is generally in the range of 1 to 6 Bighas (one Bigha in Madhya Pradesh State is one sixth of a hectare). In addition, there would also be loss of wells dug in the land.

Table 6-31 Affected families and land to be acquired for Gwalior bypass

SL. No.	Name of the Village	Total No. of families	No. with land	Range of Holdings	No. Losing Land	Extent of loss (Bighas)
1.	Unauthorised encroachments	45	-	-	-	-
2.	Nirawali	215	200	2~15	30	1~4
3.	Jinawali	80	10	1~15*	10	1~2*
4.	Bilpura	80	2	2~20	2	1~6
5.	Kulaith	700	250	5~10	60	1~2
6.	Sonana	80	70	3~30	2	1~2
7.	Raipur Kalan	135	80	1~20	20	2~6

Severance of agricultural land (with the bypass passing through individual land holdings) is expected in several cases in Nirawali, Jinawali andKulaith. For instance, all the 25 to 30 families likely to lose land in Nirawali and all the

10 in Jinawali expect to suffer land severance.

The villagers are convinced that there would be no loss of private non-agricultural land, houses, shops or business premises as a result of land acquisition for the bypass. In the unauthorised encroachments near the beginning of the alignment, however, some 45 families would lose their shanty houses.

There is some concentration of people from Scheduled Tribes in Raipur Kalan village. Out of the 60 families belonging to Scheduled Tribes, 20 had land ranging from 2 to 5 Bighas and 4 of them expect to lose most, if not all, of their land because of the bypass.

No involuntary relocation of families from their villages would be there because of the bypass. However, the 45 families living in unauthorised encroachments near the starting point of the proposed alignment have to be removed from their present homes. This may not cause a legal hurdle but the human problem needs to be addressed including consideration of compensation.

Some of the villagers in Sojana and Raipur Kalan expect some benefits out of the bypass, such as faster development of the villages, better transport facilities and greater road safety, and more employment opportunities. Most others are indifferent and do not expect any positive gains to their villages. Many, particularly in Kulaith, are concerned about the loss of land and, as a consequence, the means of livelihood.

All those losing land in various villages (except in Kulaith) feel that loss of land is inevitable and have resigned themselves to that situation. Marginal and small farmers, are very concerned about the possibility of loss of only means of livelihood. They, however, expect adequate compensation at market value for the land lost and water wells, for which they may put up some formal resistance. In Sojana, there is no land loss and resistance is not likely. In Kulaith, however, the situation is different. People in that village expressed the opinion that they would not like to give up their land even for adequate compensation in money terms. To avoid loss of large scale agricultural land, the earlier sarpanch of the village suggested an alternative route for the bypass near the village, but the PWD officials feel it is technically inefficient. Similar resistance could be expected in Nirawali too.

6.2.5 Social Assessment

Table 6-32 summarises the baseline social environment data for the ten bypass sites.

The land acquisition process as explained earlier involves four stages, namely,

Table 6-32 Summary of Socioeconomic Characteristics and Results of Public Consultations at the Bypass Locations

Aspect	Bareilly	Patna	Keonjhar	Balugaon	Vijayawada	Kannur	Nandura	Khamgaon	Bhopal	Gwalior
Land Use	Prime agricultural lands	agricultural use	Agricultural land	Predominantly rainfed agriculture	agricultural use	Mixed gardens and paddy land; some areas built up	Agricultural use	Agricultural and Government land	Private agricultural land and Government land	agricultural land (small holdings) and forest land
Caste Profile	17% SC/ST population	SC/ST: 20%	Majority SC/ST (92%)	Majority non-SC/ST; some SC in Chilka area	non-SC/ST: 76%	Low SC/ST population (6%)	SC/ST: 12%	SC/ST: 11%	27% SC/ST population	15% SC/ST population
Literacy rate	23%	30%	43%	50%	44%	82%	56%	50%	32.60%	25%
Occupation Profile	Majority cultivators and agricultural labourers; small and marginal farmers predominate (90%) having farm holdings less than 2 ha.	Majority agricultural labourers and cultivators (83%); dependency on agriculture high	Majority agricultural labourers (51%) and cultivators (21%) with small holdings; dependency on agriculture very high	Majority cultivators and agricultural labourers; small and marginal farmers predominate (90%) having farm holdings less than 2 ha.	Majority agricultural labourers (55%) and cultivators (13%)	Majority in manafacturing or processing jobs; dependency on agriculture negligible; however marginal farmers predominate (80%)	Majority agricultural labourers (56%) and cultivators (21.3%); dependency on agriculture high (cotton is a major commercial crop)	Majority agricultural labourers (38%) and cultivators (25%); dependency on agriculture high (cotton is a major commercial crop)	Agricultural labourers (39%) and Cultivators (37%); majority large holding farmers; small holding farmers only 18%	Majority in agriculture (cultivators 63% and labourers 17.4%); dependency on agriculture very high
Working Population	25%	28%	30.4%	27%	44%	25%	46%	47%	36%	29%
Average Family Size	6.6	6.5	5.4	5.8	4.2	6.7	5.1	4.5	5.7	7.5
Public Facilities Affected	None	5 irrigation wells and a mango orchard may be affected	None	cattle grazing land; school/temple land loss near Pranadeipur village	None	Alignment not finalised yet	None	None	Alignment not finalised yet	None
Public Consultations	Loss of land acceptable as community benefits are well perceived	Bypass road welcome; no resistance expected	STs expect to lose their means of livelihoodand split of their communities if their land is acquired;	Anxiety over loss of livelihood due to loss of fertile agricultural lands	Bypass road welcome; no resistance expected	Positive attitude; resistance not expected	Bypass road welcome; no resistance expected	Bypass road welcome; no resistance expected	Not conducted as alignment is not fixed yet	Loss of only source of livelihood cause for anxiety; land severance expected
Severance of land and communities	expected to occur	expected to occur	expected to occur	expected to occur	expected to occur	expected to occur	expected to occur	expected to occur	expected to occur	expected to occur
Perceived Social Benefits	Reduction in accidents and improved economic opportunities	Increased business and economic opportunities	economic value of land will go up; opportunities for roadside businesses	Reduction in accidents and improved economic opportunities	Increased business and economic opportunities	Improved road safety and economy of the region	Prevent road accidents; improve overall business activities	Prevent road accidents; improve overall business activities		Road safety, faster development of villages and increased employment oppurtunities
Land Acquisition	Resistance not expected; however large number of families (400) expected to lose land	Difficulties not expected	Strong resistance from STs expected; land acquisition from tribals a sensitive issue; Orissa's R & R policies need to be adhered to.	Resistance/ difficulties perceived or expected in some locations	Difficulties not expected	Very high cost estimated due to compensation for built structures and high cost of land	Difficulties not expected	Difficulties not expected	Large farm holders; difficulties not perceived	Unauthorised encroachments at beginning of alignment. Resistance expected from marginal farmers in Kulaith village (60 families)
Unit cost of land to be acquired (lakh Rs./ha)	2.25~3.00	2.25~3.00	1.75	2.5 : irrigated; 1.25 : un-irrigated	6.2~7.5	3.7~6.2#	3.7	3.7	3~6	3~6

Total land acquisition cost is estimated at 35 crore Rs. based on Kerala PWD estimates using the unit agricultural land cost, an unit cost for acquiring built plots between 6.2 to 8.7 lakh Rs. / ha, and a right of way of 45 m

preparation of land acquisition schedules and estimates, preliminary investigations, hearing of objections and taking possession. At this early stage of pre-feasibility level planning, in almost all the bypass sites, conceptual route alignments are decided, but the exact route alignment with survey and delineation of each piece of land to be acquired (with the Survey numbers recorded in the Revenue maps, as well as the extent of acquisition), is yet to be done.

Therefore at this preliminary stage, the exact extent of land acquisition could not be determined. Estimations are made on the basis of a 80 m right of way and the planned bypass length.

Public consultations at the village level formed the basis for determining market price of land (to reflect latest rates at which land transactions have taken place recently) in the vicinity of the bypass. Table 6-32 presents the unit cost of land to be acquired at each site.

Table 6-33 presents the impacts on the social environment at the ten bypass sites at this Initial Environmental Examination (IEE) stage. Based on the socially related legislation and policies enumerated in Chapter 6.2.3 and baseline social environment data presented in Chapter 6.2.4, the ten bypass sites have been graded in terms of the degree of adverse social impact and difficulty/easiness in land acquisition. Table 6-33 also presents the scoring, based on the criteria shown in the footnote, for the ten bypass sites.

It is seen that the main adverse impact on community life and economic activities are related to acquisition of agricultural land. High dependency of agriculture (except in Kannur) and the relatively large fraction of small and marginal farmers (except in Bhopal where large farm holdings exist) causes the impact to be significant in almost all sites. Only Keonjhar has a majority SC/ST population (92%). Land acquisition from tribal people is a sensitive issue anywhere in India. Orissa State has also enacted a R & R policy in 1994, which though formulated for projects in the water resources sector is equally applicable to other infrastructure projects including roads.

Severance or division of agricultural land is another adverse impact, which is expected in all areas. However, the extent and magnitude of this problem will become clearer only when land to be acquired is clearly identified.

Severance of communities and their resources is another important issue. This problem is to be largely mitigated by consideration of provision of service roads, and suitable underpasses or overpasses after at least every km for pedestrian crossing. Existing network of village roads have been carefully considered to maintain access across the bypass road through provision of culvert type underpasses. These considerations are presented in the preliminary design of the bypass presented earlier.

Table 6-33 Initial Environmental Examination - Social Environment Aspects

Item	Bypass Location									
	Bareilly	Patna	Keonjhar	Balugaon	Vijayawad	Kannur	Nandura	Khamgao	Bhopal	Gwalior
I Community Life and Economic Activities										
1. Severance	B	B	B	B	B	B	B	B	B	B
2. Encroachment onto public facilities	D	D	D	D	D	D	D	D	C	D
3. Impact on local economic activities	B	B	B	B	B	B	B	B	B	B
4. Cultural/Archaeological resources	D	D	D	D	D	D	D	D	D	D
5. Road Safety	E	E	E	E	E	E	E	E	E	E
II Land Acquisition and Resettlement										
1. Land Acquisition	B	B	A	B	B	A	B	B	B	B
2. Involuntary Resettlement	D	D	D	D	D	B	D	D	D	B
III Indigenous or Traditional Populations										
1. Indigenous or traditional populations	D	D	B	D	D	D	D	D	D	D
Degree of Adverse Social Impact	6	8	4	6	8	8	8	8	8	6
Land Acquisition Condition	5	10	5	5	10	0	10	10	10	5

A: Serious Impact Expected
B: Some Impact Expected
C: Extent of Impact Unknown
D: Impact not Significant
E: Positive Impact

Degree of Adverse Social Impact	Score
Negligible	10
Little	8
Acceptable	6
Significant, low mitigation cost	4
Significant, high mitigation cost	2
Not recommended to implement	0

Land Acquisition Condition	Score
No difficulty expected in process or cost	10
Possible to overcome the problem in time	5
Difficulty expected in process or cost	0

No impact is expected on women in the project areas due to the project.

Adverse impacts of land acquisition are expected at all sites. The caste profile, occupation profile, and public consultations conducted helped in clarifying he issues and degree of difficulties expected concerning land acquisition. Keonjhar with a majority of SC/ST population with high dependency on agriculture, and Kannur with significant built-up area and agricultural gardens (mixed cropping) having high cost, are determined to be difficult sites in terms of land acquisition.

Impact on indigenous populations is expected only at Keonjhar with a high SC/ST population having strong community ties and cultural practices. Some isolated pockets along the route alignment at other bypass site also face impacts on the SC/ST population. However, this problem can only be clarified after the alignment

is finalised, land to be acquired surveyed and fixed, and project affected persons clearly identified.

6.2.6 Mitigation Measures

Mitigation measures are actions which reduce, avoid or offset the potential adverse consequences of development activities. The objective of mitigation measures is to maximise project benefits and minimise undesirable impacts. To formulate a mitigation plan, the interrelationships between causes and impacts as well as that between the impacts and mitigation measures has to be fully understood. At this project pre-feasibility stage, some general mitigation measures that have been considered or which are recommended are discussed below.

Mitigation measures in road related projects can be classified into four classes, namely - consideration of alternatives, compensatory measures, corrective measures, and preventive measures. They can be further grouped into measures to be incorporated into design, measures to be incorporated into tender documents, and measures outside the scope of road agencies.

6.2.6.1 Consideration of Alternatives

Consideration of various alternative route alignments keeping in view both existing and proposed urban development plans at various bypass sites, to arrive at a route alignment which minimises unwanted social impacts and avoids prime agricultural land and built up land as much as possible, was an integral part of the pre-feasibility study. Unwanted social impacts include severance of land or communities, encroachment onto public facilities, negative impacts on local economic activities, avoidance of cultural and archaeological resources, and resettlement of communities.

In the feasibility study stage, a more detailed study to refine the selected route alignment to minimise unwanted social impacts will be conducted.

6.2.6.2 Compensatory Measures

In view of the trend in socially related policies towards a better understanding and recognition of PAPs and the extent and nature of entitlements in land acquisition, it would be prudent for all State Governments to go beyond the mandatory provisions under the LAA, and give careful considerations to the recommendations in the Draft National Rehabilitation Policy. At the feasibility study stage, clear identification of PAPs and definition of the extent/nature of their entitlements needs to be done. Then, a clear and transparent compensation and rehabilitation plan for the PAPs at the bypass sites needs to be formulated based on a comprehensive socio-economic profile of the PAPs. This is important as the risk of not formulating acceptable compensatory and rehabilitation plans will only cause unwanted social impacts to build up and delay land acquisition.

6.2.6.3 Corrective Measures

Corrective measures are adapted to reduce adverse impacts to acceptable levels. Issues of severance of communities and road safety have been addressed. Severance of land parcels is dealt with by providing adequate compensation under the LAA. Severance of communities by the controlled access bypass road has been addressed in this phase by considerations of provision of service roads and sufficient number of village roads (underpasses or overpasses), and pedestrian overpasses across the bypass road. These considerations will be further refined in the feasibility study stage. Road safety considerations in terms of avoiding or reducing both human and animal road accidents have been incorporated by making each bypass road a 'controlled access road'. Appropriate barriers to prevent access by animals and people may be installed at critical locations along the bypass road. Further, road safety is enhanced by considerations in road design.

6.2.6.4 Preventive Methods

It is strongly recommended that MoST in co-operation with the State PWDs, initiate a public awareness campaign in the villages affected at each bypass site. This will facilitate better understanding of the impacts on PAPs, and lead to formulation of an acceptable land compensation and rehabilitation plan. At present, National Acts and policies have little provision for public disclosure, consultation and participation. The formal Notification in the land acquisition process is the first official and public declaration of the desire to acquire land by the Government.

6.2.6.5 Measures to be incorporated into Design

Some of the mitigation measures to be considered during the design phase include:

- Vegetation planting and landscaping for improved visual affect and aesthetics
- Necessary noise barriers (wall type); may be necessary only at Kannur site
- Pedestrian underpasses/overpasses as well as village roads and service roads to address issues of severance of communities

6.2.6.6 Measures to be incorporated into Tender Documents

These refer to adverse social impacts during project construction stage which will be addressed in the EIA to be conducted during project feasibility study stage. These mitigation measures are incorporated into the tender documents such as the "Instruction to the Bidders" and "Conditions of Contract". The contractor is bound to carry them out, while the engineer ensures they are properly implemented. Typical examples include spraying water to control public nuisance and health hazard due to dust at road construction sites, or giving priority to PAPs in construction related jobs.

6.2.6.7 Other Measures outside the scope of Road Agencies

All of the road induced social impacts cannot be mitigated by road agencies alone. There are other agencies which are better equipped or have favourable legal backing to do the job. In the present context of bypass roads, issues of encroachments as well as planning and monitoring of settlements development to discourage uncontrolled urbanisation at nodes, are typically dealt with by the respective municipal or urban development authorities. Again, co-ordination with tribal development programs in areas where significant number of PAPs are scheduled tribes needs to be considered in formulating an appropriate compensation and rehabilitation program. These measures are very site specific and need to be formulated during the feasibility study stage.

6.2.7 Work Outline in Phase 2

The following will be studied in detail in Phase 2 concerning social environment aspects as part of the Environmental Impact Assessment (EIA) to be conducted for each selected bypass site.

(1) Alignment considerations to minimise social impacts.

(2) Identification of land to be acquired and related project affected persons (PAPs).

(3) Refine socio-economic profile of PAPs based on data collected in Phase 1 and additional surveys in Phase II.

(4) Assess adverse impacts and formulate mitigation measures including estimation of costs for each project stage namely design, construction and operation.

(5) Prepare a monitoring and management plan including cost estimation for implementation of identified mitigation measures in various project stages.

(6) Risk assessment and evaluation to identify risks associated with not prudently implementing the proposed mitigation measures during each project stage.

(7) Conduct public disclosure and consultation in conjunction with governmental agencies to promote public awareness and acceptability of the project.

Pre-Feasibility Study

Chapter 7
Preliminary Cost Estimates

7 Preliminary Cost Estimates

7.1 Unit Cost of Major Work Item

The construction costs of the proposed bypasses were estimated on the basis of "MOST Standard Data Book for Analysis of Rates", and "Schedule of Rates" of Governments.

7.1.1 Unit Cost Analysis

Out of 7 states where the proposed bypass locate, Schedule of Rates of Bihal and Maharashtra were confirmed to be consistent with the MoST's standard. Therefore, cost data of the schedule were assessed as a reference of latest record.

In order to establish the unit costs for the study, the following three major components of unit costs were analysed.

(1) Labour

There were differences in labour cost among the states. However, for the Pre-Feasibility Study, the Rates shown in Table 7-1 were applied uniformly, as the difference of labour costs does not affect unit costs much.

(2) Material

As the major construction material, costs of cement, steel and bitumen was investigated. The unit prices of these materials shown in the Schedule of Rates of Bihal and Maharashtra were compared with the market prices in Delhi. The comparison results showed little differences of prices regarding cement, bitumen and steel.

Therefore, the basic unit costs were applied for the construction cost estimates uniformly in the project areas. Table 7-2 shows unit costs in the projects.

(3) Machinery

Machinery costs were applied uniformly to the cost estimation, based on the cost introduced in the "MOST Standard Data Book for Analysis of Rates" as shown in Table 7-3.

(4) Hauling Distance

It was assumed that the hauling distance from barrow pits to the project site is 20km in average, and hauling distance from asphalt plant to site is 10km in each project area.

Regarding the aggregate material, hauling distance from rock quarry sites to project site were studied as shown in Table 7-4. Based on this study results, unit cost of cement concrete was estimated for each project site reflecting the hauling distance difference. Table 7-5 shows extra lead cost of the "MOST Standard Data Book for Analysis of Rates".

Table 7-1 Labour cost

	Rs./Day
Operator	85
Labour (Skilled)	75
Labour (Unskilled)	70

Table 7-2 Unit Cost

ITEM	SUBITEM	UNIT	ANALYSIS	BIHAL	MAHARASHTRA	S.N	MOST SPEC.	REMARK
EARTHWORK	CLEARING AND GRUBING	Rs./ha	1,250.0	1,252.4		2.0	201.2	
	EXCAVATION	Rs./m³	29.0					
	EXCAVATION(HARD ROCK)	Rs./m³	170.0	164.7	170.0		302.0	
	EARTH FILLING	Rs./m³	29.0					
	EXTRA LEAD 20KM	Rs./m³	70.0	97.0	69.5			
	LAYING EARTH	Rs./m³	12.2	12.2		7(ii)	305.3.5	
	COMPACTION	Rs./m³	13.0	11.6	13.0	7.0	305.3.5	
PAVEMENT	ASPHALT CONCRETE	Rs./m³	1,670.0	1,666.8	1,545.0	15/14	512.0	
	ASPHALT CONCRETE_SU	Rs./m³	2,480.0	2,479.3	2,400.0	4.6	2201&512	
	BITUMEN SURFACING	Rs./m³	225.0	135.0	225.0	9.0	508(a)	
	D.B.M.	Rs./m³	1,550.0	1,546.2	1,495.0	8.0	507.0	
	W.B.M.	Rs./m³	430.0	305.5	430.0	1.0	404(B)	
	W.M.M.	Rs./m³	590.0	379.9	590.0	2.0	406.0	
	G.S.B.I.Grading I,CBR=30	Rs./m³	420.0	418.6	300.0	3.0	401.0	
	G.S.B. (SERVICE ROAD)	Rs./m³	170.0	170.5	75.0	1.0	404.3.2	
	EXTRA LEAD 10KM	Rs./m³	55.0	55.0	55.0			
	BITUMEN MASTIC	Rs./m²	260.0	164.2	260.0	4.7	515.0	
	TACK COAT	Rs./m²	3.4	3.4	3.1	5.0	503(b)	
	PRIME COAT	Rs./m²	8.4	8.4	7.5	4.0	502(b)	
CULVERT	R.C.C M20_C	Rs./m³	2,330.0	2,331.5	2,150.0	4.0	1000/1700	
	COLD TWIST BAR(20mm)	Rs./ton.	19,000.0	15,287.2	19,000.0	6.0	1000/1600	
	R.C.C PIPE(1000mm)	Rs./m	2,250.0	1,567.8	2,250.0	17/18	1000/2300	
	FOUCDATION_C	Rs./m³	900.0	897.5	900.0	1.0	1000/1700	
	EXCAVATION_C	Rs./m³	48.0	32.3	48.0	8.0	304.0	
BRIDGE (SUPER STRUCTURE)	R.C.C M25_SU(I)	Rs./m³	2,435.0	2,218.6	2,435.0	4.1(ii)	1500&1700	
	R.C.C M25_SU(II)	Rs./m³	2,655.0	2,387.0	2,655.0	4.1(ii)	1500&1700	
	R.C.C M25_SU(III)	Rs./m³	2,895.0	2,723.6	2,895.0	4.1(ii)	1500&1700	
	R.C.C M40_SU(I)	Rs./m³	3,550.0	3,551.2	3,260.0	4.2	1500&1700	
	R.C.C M40_SU(II)	Rs./m³	4,030.0	4,029.1	3,630.0	4.2	1500&1700	
	HYSD(32mm)_SU	Rs./ton.	19,000.0	16,211.9	19,000.0	4.3	1600(N)	
	PC STRAND	Rs./ton.	66,600.0		66,600.0	4.4	1800(N)	
	EXPANSION JOINTS	Rs./m	492.0	491.5		3.13(a)	2100(N)	
	CONCRETE RAILING	Rs./m	489.0	489.0		4.8	1500,1600	
(SUB STRUCTURE)	R.C.C M20_SB	Rs./m³	2,105.0	1,864.7	2,105.0	3.3(b)	1500&1700	
	R.C.C M25_SB	Rs./m³	2,165.0	1,917.4	2,165.0	3.3(b)	1500&1700	
	HYSD(22mm)_SB	Rs./ton.	19,000.0	16,090.9	19,000.0	3.5	1600(N)	
	HYSD(25mm)_SB	Rs./ton.	19,000.0	16,090.9	19,000.0	3.5	1600(N)	
	EXCAVATION_SB	Rs./m³	60.0	50.6	60.0	1.1(b)	304.0	
	EARTH FILLING_SB	Rs./m³	200.0	100.9	200.0	1.3	305.0	
(FOUNDATION)	WELL CURB R.C.C M35	Rs./m³	2,550.0	2,548.0	2,255.0	2.5(i)	1200(N)	
	WELL STEINING R.C.C M35	Rs./m³	2,450.0	2,450.0	2,320.0	2.5(i)	1500(N)	
	BOTTOM PLUG M25	Rs./m³	2,610.0	2,605.8	2,040.0	2.5(i)	& 1700(N)	
	INTERMEDITATE PLUG M25	Rs./m³	1,950.0	1,949.2	1,825.0	2.5(i)		
	WELL CAP R.C.C M35	Rs./m³	2,240.0	2,196.7	2,240.0	2.5(i)		
	CUTTING EDGE	Rs./ton.	26,500.0	24,465.4	26,500.0	2.4	1200(N)&1900(N)	
	HYSD(25mm)_F	Rs./ton.	19,000.0	16,090.9	19,000.0	2.8	1600(N)	
	CAST IN SITU PILE(1000mm)	Rs./m	6,000.0		6,000.0	2.1	"1100,1600"	
	CAST IN SITU PILE(1200mm)	Rs./m	8,500.0		8,500.0	2.1	"1100,1600"	

Table 7-3 Machinery and Equipment

Item	Machinery and Equipment	Unit	Rs.	Remark
Earthwork	Crawler Tractor	per hour	144.0	
	Shovel 1.0m³	per hour	1300.0	
	Motor Grader	per hour	1238.0	
	Vibratory Road Roller 8.5t	per hour	838.0	
	Tipper/Dumper 5 to 6 Ton.	per km	9.1	
Pavement	Hot Mix Plant 40tonne	per hour	5366.0	
	Paver Finisher 60ton.	per hour	1252.0	
	Vibratory Road Roller 8.5t	per hour	838.0	
	Tipper/Dumper 5 to 6 Ton.	per km	9.1	
	Pneumatic Roller	per hour	205.0	
	F.E.loader(1m³)	per hour	408.0	
	Water Tanker	per hour	400.0	
Structure	Concrete Mixer	per hour	65.5	
	Bating Plant(30m³/hour)	per hour	1200.0	
	Transit Mixer(4m³/hour)	per hour	500.0	
	Concrete Pump(6m³/hour)	per hour	250.0	
	Needle Vibrator	per hour	38.1	
	Jack For Restressing	per hour	75.0	
	Grouting Pump	per hour	85.0	

Table 7-4 Hauling distance from quarry sites

Project Area	Unit	Sand		Aggregate	
		Hauling Distance	Place	Hauling Distance	Place
Bareilly	km	90	Haldwani Quarry	90	Haldwani Quarry
Patna	km	20		110	Manpur
Keonjhar	km	15		15	
Balugaon	km	45	Manacuni River	50	Capan Quarry
Vijayawada	km	5	Varadhi	10	Magalgiri
Kannur	km	15	Kimbil	50	Iriingal
Nandura	km	5	Pimpri Deshmukh	5	Pimpri Deshmukh
Khamgaon	km	5	Pimpri Deshmukh	5	Pimpri Deshmukh
Bhopal	km	15		15	
Gwalior	km	10		10	

Table 7-5 Rates for carriage of materials

	Unit	1	2	3	4	5	6~10	11~20	Beyond 20 Km
							(Subsequent Km per Km)		
Rates for Carriage of Materials	per m³	27.00	31.00	35.00	38.00	41.00	2.50	1.70	1.00

7.2 Construction Cost Estimate

7.2.1 Condition of Construction Cost Estimate

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

(1) The project cost is based on the prices in the month of July 1997

(2) The exchange rate of currency is:

US$1.0=Rs. 35.97 as of July mid 1997

(3) All project costs is estimated in Local Currency.

(4) Construction period will be:

- 2 years (when the proposed route length is within 10 km)
- 3 years (when the proposed route length is more than 10 km)
- 4 years for Patna

(5) Except the Patna Bypass, construction will be complete by the end of 2001.

(6) Cost for preparatory work is Lump sum of 30 million Rupees.

(7) The following items were supposed as :

- 2 years (when the proposed route length is within 10 km)
- 3 years (when the proposed route length is more than 10 km)
- 4 years for Patna

7.2.2 Estimated Construction Cost

Table 7-6 shows summary of cost estimates for the 10 proposed bypasses. Cost estimation of each bypass was shown in Table 7-7 to Table 7-16.

Table 7-6 Summary of Cost Estimate

Bypass Name	Total Road Length (Km)	Direct Construction Cost(Rs.)	Cost per Km (Rs.)	Earthwork				Pavement				Bridge/Viaduct				Preparatory Work		Crossing Structure		Service Road		Drainage		Utility		Road Appurtenance	
				Rs.	Rs. per Km	%	Length (Km)	Rs.	Rs. per Km	%	Length (Km)	Rs.	Rs. per m	%	Length (m)	Rs.	%	Rs.	%	Rs.	%	Rs.	%	Rs.	%	Rs.	%
Bareilly	31.1	1,276,103,000	41,032,300	545,098,000	17,641,000	42.7%	30.9	155,006,000	14,725,113	35.7%	30.9	82,737,000	355,091	6.5%	233.0	30,000,000	2.4%	31,327,500	2.5%	93,777,000	7.3%	10,902,000	0.9%	5,451,000	0.4%	21,804,000	1.7%
Patna	49.9	3,425,331,000	68,613,900	556,318,000	11,512,000	16.2%	48.2	709,751,000	14,725,124	20.7%	48.2	1,891,106,000	1,139,220	55.2%	1,660.0	30,000,000	0.9%	49,197,400	1.4%	150,017,000	4.4%	11,126,000	0.3%	5,563,000	0.2%	22,253,000	0.6%
Keonjhar	8.5	314,370,000	36,984,700	93,917,000	11,049,000	29.9%	8.5	125,237,000	14,733,765	39.8%	8.5	13,771,000	245,911	4.4%	56.0	30,000,000	9.5%	19,566,200	6.2%	25,305,000	8.0%	1,878,000	0.6%	939,000	0.3%	3,757,000	1.2%
Balugaon	15.4	365,603,000	23,740,500	29,102,000	1,902,000	8.0%	15.3	225,294,000	14,725,098	61.6%	15.3	15,987,000	225,169	4.4%	71.0	30,000,000	8.2%	18,221,000	5.0%	44,962,000	12.3%	582,000	0.2%	291,000	0.1%	1,164,000	0.3%
Vijyawada	28.1	1,300,741,000	46,289,700	648,884,000	23,174,000	49.9%	28.0	412,303,000	14,725,107	31.7%	28.0	61,674,000	380,704	4.7%	162.0	30,000,000	2.3%	36,562,200	2.8%	65,896,000	5.1%	12,978,000	1.0%	6,489,000	0.5%	25,955,000	2.0%
Kannur	11.1	608,165,000	54,789,600	175,180,000	16,372,000	28.8%	10.7	157,559,000	14,725,140	25.9%	10.7	97,671,000	241,163	16.1%	405.0	30,000,000	4.9%	41,715,000	6.9%	93,777,000	15.4%	3,504,000	0.6%	1,752,000	0.3%	7,007,000	1.2%
Nandra	6.4	239,037,000	37,319,500	48,427,000	7,687,000	20.3%	6.3	92,768,000	14,725,079	38.8%	6.3	27,783,000	254,890	11.6%	109.0	30,000,000	12.6%	13,935,500	5.8%	22,733,000	9.5%	969,000	0.4%	481,000	0.2%	1,937,000	0.8%
Khamgaon	10.9	479,057,000	43,950,200	162,383,000	15,176,000	33.9%	10.7	157,559,000	14,725,140	32.9%	10.7	54,902,000	305,011	11.5%	180.0	30,000,000	6.3%	29,289,000	6.1%	33,557,000	7.0%	3,248,000	0.7%	1,624,000	0.3%	6,495,000	1.4%
Bhopal	40.3	1,361,518,000	33,781,600	453,548,000	11,310,000	33.3%	40.1	590,477,000	14,725,112	43.4%	40.1	68,900,000	272,332	5.1%	253.0	30,000,000	2.2%	66,698,600	4.9%	120,146,000	8.8%	9,071,000	0.7%	4,535,000	0.3%	18,142,000	1.3%
Gwalior	26.0	1,396,539,000	53,713,000	788,078,000	30,546,000	56.4%	25.8	379,908,000	14,725,116	27.2%	25.8	53,445,000	278,359	3.8%	192.0	30,000,000	2.1%	44,503,800	3.2%	45,428,000	3.3%	15,762,000	1.1%	7,881,000	0.6%	31,523,000	2.3%

Table 7-7 Cost estimate of Bareilly Bypass

Item	Sub item	Unit	Rate(Rs.)	Qty	Amount(RS.)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK						
	SITE CLEARANCE	Ha	1,250.00	247.20	309,000.00	
	EXCAVATION	m³	99.02	0.00	0.00	
	EARTH FILLING	m³	99.00	4,251,994.50	420,947,455.50	
	MEDIAN	m³	99.00	120,819.00	11,961,081.00	
	SHOULDER	m³	99.00	38,084.25	3,770,340.75	
	LAYING EARTH	m³	12.20	4,290,078.75	52,338,960.75	L= 30.9 km
	COMPACTION	m³	13.00	4,290,078.75	55,771,023.75	per km
SUB TOTAL(2)					545,098,000.00	17,641,000.00
3 PAVEMENT						
	ASPHALT CONCRETE	m³	1,725.00	19,158.00	33,047,550.00	
	D.B.M.	m³	1,605.00	96,871.50	155,478,757.50	
	W.M.M.	m³	645.00	222,480.00	143,499,600.00	
	G.S.B.I.	m³	475.00	215,918.00	103,036,050.00	
	TACK COAT	m²	3.40	2,583,240.00	8,783,016.00	L= 30.9 km
	PRIME COAT	m²	8.40	1,328,700.00	11,161,080.00	per km
SUB TOTAL(3)					455,006,000.00	14,725,000.00
4 CROSSING STRUCTURE	RC Culvert Box 1 (H=3.5m,W=4.0m)	Nos.	2,035,600.00	1.00	2,035,600.00	
	RC Culvert Box 2 (H=2.5m,W=2.5m)	Nos.	1,030,700.00	27.00	27,828,900.00	
	RC Culvert Box 3 (H=3.0m,W=2.5m)	Nos.	5,892,600.00	0.00	0.00	
	R.C.C.PIPE (DIA=1000mm)	Nos.	146,300.00	10.00	1,463,000.00	
	RC-T-VR(L=17m)	Nos.	375,400.00	0.00	0.00	
	RC-T-DR(L=17m)	Nos.	636,300.00	0.00	0.00	
	Abut-VR(H=10.0m)	Nos.	566,100.00	0.00	0.00	
	Abut-DR(H=10.0m)	Nos.	900,100.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	126,300.00	0.00	0.00	
	Pier-DR(H=8.0m)	Nos.	333,900.00	0.00	0.00	
SUB TOTAL(4)					31,327,500.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	752,500.00	4.00	3,010,000.00	
	RC-T beam(L=17m)	Nos.	674,800.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	582,200.00	14.00	8,150,800.00	
	RC-T beam(L=13m)	Nos.	495,100.00	4.00	1,980,400.00	
	RC-T beam(L=11m)	Nos.	388,300.00	0.00	0.00	
	PC-Hollow(L=25m)	Nos.	2,534,700.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,478,700.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,077,300.00	8.00	8,618,400.00	
	PC-I Beam(L=45m)	Nos.	4,535,100.00	0.00	0.00	
	PC-I Beam(L=36m)	Nos.	3,582,700.00	0.00	0.00	
	PC-I Beam(L=28m)	Nos.	2,488,700.00	0.00	0.00	L= 233 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,528,800.00	4.00	6,115,200.00	
	Abutment(H=10.0m)	Nos.	2,339,700.00	6.00	14,038,200.00	
	Abutment(H=15.0m)	Nos.	4,248,700.00	2.00	8,497,400.00	
	Abutment L(H=15.0m)	Nos.	3,293,000.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	434,300.00	12.00	5,931,600.00	
	Pier(H=10.0m)	Nos.	807,100.00	6.00	4,842,600.00	
	Pier(H=15.0m)	Nos.	1,191,800.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,f=5000)	Nos.	397,900.00	32.00	12,732,800.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	1,470.00	8,820,000.00	
SUB TOTAL(5)					82,737,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	60.78	82,527,084.00	
	BRIDGE-SER.	m	75,000.00	150.00	11,250,000.00	
SUB TOTAL(6)					93,777,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			10,901,960.00	
SUB TOTAL(7)					10,902,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			5,450,980.00	
SUB TOTAL(8)					5,451,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			21,803,920.00	TOTAL LENGTH 31.1 km
SUB TOTAL(9)					21,804,000.00	per km
TOTAL OF DIRECT COST					1,276,103,000.00	41,032,000

Table 7-8 Cost estimate of Patna Bypass

Item	Sub item	Unit	Rate(Rs.)	Qty	Amount (RS.)	Remark
1 PREPARATORY WORK	LAB.EQUIPMENT,ACCOMODATION AND VHICLE, ETC.	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK	PATNA					
	SITE CLEARANCE	Ha	1,250.00	385.60	482,000.00	
	EXCAVATION	m³	99.02	20,717.00	2,051,477.99	
	EARTH FILLING	m³	99.00	4,244,983.00	420,253,317.00	
	MEDIAN	m³	99.00	188,462.00	18,657,738.00	
	SHOULDER	m³	99.00	59,406.50	5,881,243.50	
	LAYING EARTH	m³	12.20	4,325,106.50	52,766,299.30	L= 49.2 km
	COMPACTION	m³	13.00	4,325,106.50	56,226,384.50	per km
SUB TOTAL(2)					556,318,000.00	11,542,000.00
3 PAVEMENT	ASPHALT CONCRETE	m²	1,725.00	29,884.00	51,549,900.00	
	D.B.M.	m³	1,605.00	151,107.00	242,526,735.00	
	W.M.M.	m³	645.00	347,040.00	223,840,800.00	
	G.S.B.I.	m³	475.00	338,364.00	160,722,900.00	
	TACK COAT	m²	3.40	4,029,520.00	13,700,368.00	L= 49.2 km
	PRIME COAT	m²	8.40	2,072,600.00	17,409,840.00	per km
SUB TOTAL(3)					709,751,000.00	14,725,000.00
4 CROSSING STRUCTURE	RC Culvert Box 1 (I.H=3.5m,I.W=4.0m)	Nos.	2,030,300.00	6.00	12,181,800.00	
	RC Culvert Box 2 (I.H=2.5m,I.W=2.5m)	Nos.	1,028,100.00	5.00	5,140,500.00	
	RC Culvert Box 3 (I.H=3.0m,I.W=2.5m)	Nos.	5,877,600.00	5.00	29,388,000.00	
	R.C.C.PIPE (DIA=1000mm)	Nos.	145,300.00	17.00	2,467,100.00	
	RC-T-VR(L=17m)	Nos.	374,700.00	0.00	0.00	
	RC-T-DR(L=17m)	Nos.	635,200.00	0.00	0.00	
	Abut-VR(H=10.0m)	Nos.	564,400.00	0.00	0.00	
	Abut-DR(H=10.0m)	Nos.	897,500.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	125,900.00	0.00	0.00	
	Pier-DR(H=8.0m)	Nos.	333,000.00	0.00	0.00	
SUB TOTAL(4)					49,197,400.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	751,400.00	0.00	0.00	
	RC-T beam(L=17m)	Nos.	673,600.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	581,300.00	34.00	19,764,200.00	
	RC-T beam(L=13m)	Nos.	494,400.00	0.00	0.00	
	RC-T beam(L=11m)	Nos.	387,700.00	10.00	3,877,000.00	
	PC-Hollow(L=25m)	Nos.	2,531,900.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,477,100.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,076,100.00	0.00	0.00	
	PC-I Beam(L=45m)	Nos.	4,530,000.00	0.00	0.00	
	PC-I Beam(L=36m)	Nos.	3,578,600.00	0.00	0.00	
	PC-I Beam(L=28m)	Nos.	2,485,800.00	0.00	0.00	
						L= 1,660 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,524,900.00	6.00	9,149,400.00	
	Abutment(H=10.0m)	Nos.	2,332,700.00	14.00	32,657,800.00	
	Abutment(H=15.0m)	Nos.	4,237,200.00	0.00	0.00	
	Abutment L(H=15.0m)	Nos.	3,284,000.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	493,200.00	24.00	11,836,800.00	
	Pier(H=10.0m)	Nos.	805,500.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,189,300.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,f=5000)	Nos.	397,200.00	64.00	25,420,800.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
(MAJOR BRIDGE)	MAJOR BRIDGE(L=1.35km)	Nos.	1,788,400,000.00	1.00	1,788,400,000.00	
SUB TOTAL(5)					1,891,106,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	96.40	130,851,920.00	
	BRIDGE-SER.	m	75,000.00	255.00	19,125,000.00	
SUB TOTAL(6)					150,017,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			11,126,360.00	
SUB TOTAL(7)					11,126,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			5,563,180.00	
SUB TOTAL(8)					5,563,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			22,252,720.00	TOTAL LENGTH 49.9 km
SUB TOTAL(9)					22,253,000.00	per km
TOTAL OF DIRECT COST					3,425,331,000.00	68,644,000

Table 7-9 Cost estimate of Keonjhar Bypass

Item	Sub Item	Unit	Rate(Rs.)	Qty	Amount(RS.)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC.	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK						
	SITE CLEARANCE	Ha	1,250.00	68.04	85,050.00	
	EXCAVATION	m³	99.02	0.00	0.00	
	EARTH FILLING	m³	99.00	718,502.40	71,131,737.60	
	MEDIAN	m³	99.00	33,254.55	3,292,200.45	
	SHOULDER	m³	99.00	10,482.41	1,037,758.84	
	LAYING EARTH	m³	12.20	728,984.81	8,893,614.71	L= 8.5 km
	COMPACTION	m³	13.00	728,984.81	9,476,802.56	per km
SUB TOTAL(2)					93,917,000.00	11,043,000.00
3 PAVEMENT						
	ASPHALT CONCRETE	m²	1,725.00	5,273.10	9,096,097.50	
	D.B.M.	m²	1,605.00	26,663.18	42,794,395.88	
	W.M.M.	m²	645.00	61,236.00	39,497,220.00	
	G.S.B.I.	m²	475.00	59,705.10	28,359,922.50	
	TACK COAT	m²	3.40	711,018.00	2,417,461.20	L= 8.5 km
	PRIME COAT	m²	8.40	365,715.00	3,072,006.00	per km
SUB TOTAL(3)					125,237,000.00	14,725,000.00
4 CROSSING STRUCTURE						
	RC Culvert Box 1 (LH=3.5m,LW=4.0m)	Nos.	1,994,300.00	3.00	5,982,900.00	
	RC Culvert Box 2 (LH=2.5m,LW=2.5m)	Nos.	1,009,800.00	1.00	1,009,800.00	
	RC Culvert Box 3 (LH=3.0m,LW=2.5m)	Nos.	5,774,700.00	2.00	11,549,400.00	
	R.C.C PIPE (DIA=1000mm)	Nos.	146,300.00	7.00	1,024,100.00	
	RC-T-VR(L=17m)	Nos.	370,000.00	0.00	0.00	
	RC-T-DR(L=17m)	Nos.	627,600.00	0.00	0.00	
	Abut-VR(H=10.0m)	Nos.	553,100.00	0.00	0.00	
	Abut-DR(H=10.0m)	Nos.	879,600.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	123,600.00	0.00	0.00	
	Pier-DR(H=8.0m)	Nos.	326,600.00	0.00	0.00	
SUB TOTAL(4)					19,566,200.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)						
	RC-T beam(L=19m)	Nos.	743,900.00	0.00	0.00	
	RC-T beam(L=17m)	Nos.	667,200.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	575,600.00	4.00	2,302,400.00	
	RC-T beam(L=13m)	Nos.	489,500.00	4.00	1,958,000.00	
	RC-T beam(L=11m)	Nos.	383,600.00	0.00	0.00	
	PC-Hollow(L=25m)	Nos.	2,509,500.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,464,400.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,067,400.00	0.00	0.00	
	PC-I Beam(L=45m)	Nos.	4,489,700.00	0.00	0.00	
	PC-I Beam(L=36m)	Nos.	3,545,900.00	0.00	0.00	
	PC-I Beam(L=28m)	Nos.	2,463,300.00	0.00	0.00	L= 56 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,498,300.00	2.00	2,996,600.00	
	Abutment(H=10.0m)	Nos.	2,284,800.00	2.00	4,569,600.00	
	Abutment(H=15.0m)	Nos.	4,158,100.00	0.00	0.00	
	Abutment L(H=15.0m)	Nos.	3,222,700.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	486,100.00	4.00	1,944,400.00	
	Pier(H=10.0m)	Nos.	793,900.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,172,000.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,f=5000)	Nos.	391,700.00	0.00	0.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
SUB TOTAL(5)					13,771,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	16.98	23,055,444.00	
	BRIDGE-SER.	m	75,000.00	30.00	2,250,000.00	
SUB TOTAL(6)					25,305,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			1,878,340.00	
SUB TOTAL(7)					1,878,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			939,170.00	
SUB TOTAL(8)					939,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			3,756,680.00	TOTAL LENGTH 8.50 km
SUB TOTAL(9)					3,757,000.00	per km
TOTAL OF DIRECT COST					314,370,000.00	369850.00

Table 7-10 Cost estimate of Balugaon Bypass

Item	Sub item	Unit	Rate(Rs.)	Qty	Amount(RS.)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC.	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK						
	SITE CLEARANCE	Ha	1,250.00	122.40	153,000.00	
	EXCAVATION	m³	99.02	0.00	0.00	
	EARTH FILLING	m³	99.00	166,540.50	16,487,509.50	
	MEDIAN	m³	99.00	59,823.00	5,922,477.00	
	SHOULDER	m³	99.00	18,857.25	1,866,867.75	
	LAYING EARTH	m³	12.20	185,397.75	2,261,852.55	L= 15.3 km
	COMPACTION	m³	13.00	185,397.75	2,410,170.75	per km
SUB TOTAL(2)					29,102,000.00	1,902,000.00
3 PAVEMENT						
	ASPHALT CONCRETE	m³	1,725.00	9,486.00	16,363,350.00	
	D.B.M.	m³	1,605.00	47,965.50	76,984,627.50	
	W.M.M.	m³	645.00	110,150.00	71,053,200.00	
	G.S.B.I.	m³	475.00	107,406.00	51,017,850.00	
	TACK COAT	m²	3.40	1,279,080.00	4,348,872.00	L= 15.3 km
	PRIME COAT	m²	8.40	657,900.00	5,526,360.00	per km
SUB TOTAL(3)					225,294,000.00	14,725,000.00
4 CROSSING STRUCTURE	RC Culvert Box 1 (I.H=3.5m,I.W=4.0m)	Nos.	2,013,700.00	0.00	0.00	
	RC Culvert Box 2 (I.H=2.5m,I.W=2.5m)	Nos.	1,019,600.00	5.00	5,098,000.00	
	RC Culvert Box 3 (I.H=3.0m,I.W=2.5m)	Nos.	5,830,000.00	2.00	11,660,000.00	
	R.C.C PIPE (DIA=1000mm)	Nos.	146,300.00	10.00	1,463,000.00	
	RC-T-VR(L=17m)	Nos.	372,500.00	0.00	0.00	
	RC-T-DR(L=17m)	Nos.	631,700.00	0.00	0.00	
	Abut.-VR(H=10.0m)	Nos.	559,200.00	0.00	0.00	
	Abut.-DR(H=10.0m)	Nos.	889,200.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	124,800.00	0.00	0.00	
	Pier-DR(H=8.0m)	Nos.	330,000.00	0.00	0.00	
SUB TOTAL(4)					18,221,000.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	747,900.00	0.00	0.00	
	RC-T beam(L=17m)	Nos.	670,800.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	578,700.00	8.00	4,629,600.00	
	RC-T beam(L=13m)	Nos.	492,200.00	0.00	0.00	
	RC-T beam(L=11m)	Nos.	385,800.00	2.00	771,600.00	
	PC-Hollow(L=25m)	Nos.	2,521,300.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,471,100.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,072,000.00	0.00	0.00	
	PC-I Beam(L=45m)	Nos.	4,511,000.00	0.00	0.00	
	PC-I Beam(L=36m)	Nos.	3,563,200.00	0.00	0.00	
	PC-I Beam(L=26m)	Nos.	2,475,200.00	0.00	0.00	
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,512,600.00	2.00	3,025,200.00	L= 71 m
	Abutment(H=10.0m)	Nos.	2,310,600.00	2.00	4,621,200.00	
	Abutment(H=15.0m)	Nos.	4,200,600.00	0.00	0.00	
	Abutment L(H=15.0m)	Nos.	3,255,700.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	439,900.00	6.00	2,939,400.00	
	Pier(H=10.0m)	Nos.	800,100.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,181,300.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,f=5000)	Nos.	394,600.00	0.00	0.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
SUB TOTAL(5)					15,987,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	29.80	40,462,440.00	
	BRIDGE-SER.	m	75,000.00	60.00	4,500,000.00	
SUB TOTAL(6)					44,962,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			582,040.00	
SUB TOTAL(7)					582,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			291,020.00	
SUB TOTAL(8)					291,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			1,164,080.00	TOTAL LENGTH 15.4 km
SUB TOTAL(9)					1,164,000.00	per km
TOTAL OF DIRECT COST					365,603,000.00	23,740,000

Table 7-11 Cost estimate of Vijayawada Bypass

Item	Sub item	Unit	Rate(Rs.)	Qty	Amount (RS.)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC.	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK						
	SITE CLEARANCE	Ha	1,250.00	224.00	280,000.00	
	EXCAVATION	m³	99.02	0.00	0.00	
	EARTH FILLING	m³	99.00	5,100,480.00	504,947,520.00	
	MEDIAN	m³	99.00	109,480.00	10,838,520.00	
	SHOULDER	m³	99.00	34,510.00	3,416,490.00	
	LAYING EARTH	m³	12.20	5,134,990.00	62,646,878.00	L= 28.0 km
	COMPACTION	m³	13.00	5,134,990.00	66,754,870.00	per km
SUB TOTAL(2)					648,884,000.00	23,174,000.00
3 PAVEMENT						
	ASPHALT CONCRETE	m³	1,725.00	17,360.00	29,946,000.00	
	D.B.M.	m³	1,605.00	87,780.00	140,886,900.00	
	W.M.M.	m³	645.00	201,600.00	130,032,000.00	
	G.S.B.I.	m³	475.00	196,560.00	93,366,000.00	
	TACK COAT	m²	3.40	2,340,800.00	7,958,720.00	L= 28.0 km
	PRIME COAT	m²	8.40	1,204,000.00	10,113,600.00	per km
SUB TOTAL(3)					412,303,000.00	14,725,000.00
4 CROSSING STRUCTURE						
	RC Culvert Box 1 (I.H=3.5m,I.W=4.0m)	Nos.	1,987,800.00	11.00	21,865,800.00	
	RC Culvert Box 2 (I.H=2.5m,I.W=2.5m)	Nos.	1,006,600.00	2.00	2,013,200.00	
	RC Culvert Box 3 (I.H=3.0m,I.W=2.5m)	Nos.	5,756,400.00	2.00	11,512,800.00	
	R.C.C PIPE (DIA=1000mm)	Nos.	146,300.00	8.00	1,170,400.00	
	RC-T-VR(L=17m)	Nos.	369,200.00	0.00	0.00	
	RC-T-DR(L=17m)	Nos.	626,300.00	0.00	0.00	
	Abut-VR(H=10.0m)	Nos.	551,100.00	0.00	0.00	
	Abut-DR(H=10.0m)	Nos.	876,400.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	123,200.00	0.00	0.00	
	Pier-DR(H=8.0m)	Nos.	325,400.00	0.00	0.00	
SUB TOTAL(4)					36,562,200.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	742,600.00	0.00	0.00	
	RC-T beam(L=17m)	Nos.	666,000.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	574,600.00	12.00	6,895,200.00	
	RC-T beam(L=13m)	Nos.	488,700.00	0.00	0.00	
	RC-T beam(L=11m)	Nos.	382,800.00	2.00	765,600.00	
	PC-Hollow(L=25m)	Nos.	2,505,600.00	2.00	5,011,200.00	
	PC-Hollow(L=20m)	Nos.	1,452,200.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,065,900.00	0.00	0.00	
	PC-I Beam(L=45m)	Nos.	4,482,700.00	0.00	0.00	
	PC-I Beam(L=36m)	Nos.	3,540,300.00	2.00	7,080,600.00	
	PC-I Beam(L=28m)	Nos.	2,459,400.00	0.00	0.00	L= 152 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,493,600.00	4.00	5,974,400.00	
	Abutment(H=10.0m)	Nos.	2,276,300.00	2.00	4,552,600.00	
	Abutment(H=15.0m)	Nos.	4,144,000.00	4.00	16,576,000.00	
	Abutment L(H=15.0m)	Nos.	3,211,900.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	484,800.00	8.00	3,878,400.00	
	Pier(H=10.0m)	Nos.	791,900.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,168,900.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth < 10m,I=5000)	Nos.	390,700.00	28.00	10,939,600.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
SUB TOTAL(5)					61,674,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	43.56	59,145,768.00	
	BRIDGE-SER.	m	75,000.00	90.00	6,750,000.00	
SUB TOTAL(6)					65,896,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			12,977,680.00	
SUB TOTAL(7)					12,978,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			6,488,840.00	
SUB TOTAL(8)					6,489,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			25,955,360.00	TOTAL LENGTH 28.1 km
SUB TOTAL(9)					25,955,000.00	per km
TOTAL OF DIRECT COST					1,300,741,000.00	46,290,000

Table 7-12 Cost estimate of Kannur Bypass

Item	Sub item	Unit	Rate(Rs)	Qty	Amount(RS)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC.	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK	SITE CLEARANCE	Ha	1,250.00	85.60	107,000.00	
	EXCAVATION	m³	99.02	134,256.63	13,294,614.03	
	EXCAVATION(HARD ROCK)	m³	240.00	537,026.52	128,886,363.65	
	EARTH FILLING	m³	99.00	82,091.26	8,127,034.34	
	MEDIAN	m³	99.00	41,837.00	4,141,863.00	
	SHOULDER	m³	99.00	13,187.75	1,305,587.25	
	LAYING EARTH	m³	12.20	766,562.15	9,352,058.23	L= 10.7 km
	COMPACTION	m³	13.00	766,562.15	9,965,307.95	per km
SUB TOTAL(2)					175,180,000.00	16,372,000.00
3 PAVEMENT						
	ASPHALT CONCRETE	m³	1,725.00	6,634.00	11,443,650.00	
	D.B.M.	m³	1,605.00	33,544.50	53,838,922.50	
	W.M.M.	m³	645.00	77,040.00	49,690,800.00	
	G.S.B.I.	m³	475.00	75,114.00	35,679,150.00	
	TACK COAT	m²	3.40	894,520.00	3,041,368.00	L= 10.7 km
	PRIME COAT	m²	8.40	460,100.00	3,864,840.00	per km
SUB TOTAL(3)					157,559,000.00	14,725,000.00
4 CROSSING STRUCTURE	RC Culvert Box 1 (I.H=3.5m,I.W=4.0m)	Nos.	2,035,500.00	4.00	8,142,000.00	
	RC Culvert Box 2 (I.H=2.5m,I.W=2.5m)	Nos.	1,036,200.00	0.00	0.00	
	RC Culvert Box 3 (I.H=3.0m,I.W=2.5m)	Nos.	5,991,300.00	4.00	23,965,200.00	
	R.C.C PIPE (DIA=1000mm)	Nos.	146,300.00	5.00	731,500.00	
	RC-T-VR(L=17m)	Nos.	371,700.00	2.00	743,400.00	
	RC-T-DR(L=17m)	Nos.	630,500.00	4.00	2,522,000.00	
	Abut-VR(H=10.0m)	Nos.	572,300.00	2.00	1,144,600.00	
	Abut-DR(H=10.0m)	Nos.	912,900.00	4.00	3,651,600.00	
	Pier-VR(H=8.0m)	Nos.	130,100.00	1.00	130,100.00	
	Pier-DR(H=8.0m)	Nos.	342,300.00	2.00	684,600.00	
SUB TOTAL(4)					41,715,000.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	746,700.00	0.00	0.00	
	RC-T beam(L=17m)	Nos.	669,700.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	577,700.00	0.00	0.00	
	RC-T beam(L=13m)	Nos.	491,400.00	0.00	0.00	
	RC-T beam(L=11m)	Nos.	385,100.00	0.00	0.00	
	PC-Hollow(L=25m)	Nos.	2,517,900.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,459,200.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,070,700.00	0.00	0.00	
	PC-I Beam(L=45m)	Nos.	4,504,800.00	18.00	81,086,400.00	
	PC-I Beam(L=36m)	Nos.	3,558,200.00	0.00	0.00	
	PC-I Beam(L=28m)	Nos.	2,471,800.00	0.00	0.00	L= 405 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,636,200.00	0.00	0.00	
	Abutment(H=10.0m)	Nos.	2,309,500.00	0.00	0.00	
	Abutment(H=15.0m)	Nos.	4,269,000.00	2.00	8,538,000.00	
	Abutment L(H=15.0m)	Nos.	3,308,600.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	502,900.00	16.00	8,046,400.00	
	Pier(H=10.0m)	Nos.	805,100.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,209,800.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,f=5000)	Nos.	393,700.00	0.00	0.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
SUB TOTAL(5)					97,671,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	60.78	82,527,084.00	
	BRIDGE-SER.	m	75,000.00	150.00	11,250,000.00	
SUB TOTAL(5)					93,777,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			3,503,600.00	
SUB TOTAL(7)					3,504,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			1,751,800.00	
SUB TOTAL(8)					1,752,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			7,007,200.00	TOTAL LENGTH 11.1 km
SUB TOTAL(9)					7,007,000.00	per km
TOTAL OF DIRECT COST					608,165,000.00	54,790,000

Table 7-13 Cost estimate of Nandura Bypass

Item	Sub item	Unit	Rate(Rs.)	Qty	Amount (RS.)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC.	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK	SITE CLEARANCE	Ha	1,250.00	50.40	63,000.00	
	EXCAVATION	m³	99.02	28,267.00	2,799,108.38	
	EARTH FILLING	m³	99.00	333,731.00	33,039,369.00	
	MEDIAN	m³	99.00	24,633.00	2,438,667.00	
	SHOULDER	m³	99.00	7,764.75	768,710.25	
	LAYING EARTH	m³	12.20	369,762.75	4,511,105.55	L= 6.3 km
	COMPACTION	m³	13.00	369,762.75	4,806,915.75	per km
SUB TOTAL(2)					48,427,000.00	7,687,000.00
3 PAVEMENT	ASPHALT CONCRETE	m³	1,725.00	3,906.00	6,737,850.00	
	D.B.M.	m³	1,605.00	19,750.50	31,699,552.50	
	W.M.M.	m³	645.00	45,360.00	29,257,200.00	
	G.S.B.I.	m³	475.00	44,226.00	21,007,350.00	
	TACK COAT	m²	3.40	526,680.00	1,790,712.00	L= 6.3 km
	PRIME COAT	m²	8.40	270,900.00	2,275,560.00	per km
SUB TOTAL(3)					92,768,000.00	14,725,000.00
4 CROSSING STRUCTURE	RC Culvert Box 1 (LH=3.5m,LW=4.0m)	Nos.	1,983,500.00	0.00	0.00	
	RC Culvert Box 2 (LH=2.5m,LW=2.5m)	Nos.	1,004,400.00	2.00	2,008,800.00	
	RC Culvert Box 3 (LH=3.0m,LW=2.5m)	Nos.	5,743,900.00	2.00	11,487,800.00	
	R.C.C PIPE (DIA=1000mm)	Nos.	145,300.00	3.00	438,900.00	
	RC-T-VR(L=17m)	Nos.	368,600.00	0.00	0.00	
	RC-T-DR(L=17m)	Nos.	625,300.00	0.00	0.00	
	Abut.-VR(H=10.0m)	Nos.	545,700.00	0.00	0.00	
	Abut.-DR(H=10.0m)	Nos.	874,200.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	122,900.00	0.00	0.00	
	Pier-DR(H=8.0m)	Nos.	324,700.00	0.00	0.00	
SUB TOTAL(4)					13,935,500.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=13m)	Nos.	741,600.00	0.00	0.00	
	RC-T beam(L=17m)	Nos.	665,200.00	4.00	2,660,800.00	
	RC-T beam(L=15m)	Nos.	573,900.00	10.00	5,739,000.00	
	RC-T beam(L=13m)	Nos.	468,100.00	0.00	0.00	
	RC-T beam(L=11m)	Nos.	382,300.00	0.00	0.00	
	PC-Hollow(L=25m)	Nos.	2,502,900.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,460,700.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,054,800.00	0.00	0.00	
	PC-I Beam(L=45m)	Nos.	4,477,800.00	0.00	0.00	
	PC-I Beam(L=36m)	Nos.	3,536,300.00	0.00	0.00	
	PC-I Beam(L=28m)	Nos.	2,456,700.00	0.00	0.00	L= 109 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,490,300.00	2.00	2,980,600.00	
	Abutment(H=10.0m)	Nos.	2,270,500.00	2.00	4,541,000.00	
	Abutment(H=15.0m)	Nos.	4,134,400.00	0.00	0.00	
	Abutment L(H=15.0m)	Nos.	3,204,400.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	484,000.00	10.00	4,840,000.00	
	Pier(H=10.0m)	Nos.	790,500.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,166,800.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,I=5000)	Nos.	390,100.00	18.00	7,021,800.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
SUB TOTAL(5)					27,783,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	12.60	17,108,280.00	
	BRIDGE-SER.	m	75,000.00	75.00	5,625,000.00	
SUB TOTAL(6)					22,733,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			968,540.00	
SUB TOTAL(7)					969,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			484,270.00	
SUB TOTAL(8)					484,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			1,937,080.00	TOTAL LENGTH 64 km
SUB TOTAL(9)					1,937,000.00	per km
TOTAL OF DIRECIT COST					239,037,000.00	37,350,000

Table 7-14 Cost estimate of Khamgaon Bypass

Item	Sub item	Unit	Rate(Rs.)	Qty	Amount(Rs.)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC.	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK						
	SITE CLEARANCE	Ha	1,250.00	85.60	107,000.00	
	EXCAVATION	m³	99.02	0.00	0.00	
	EARTH FILLING	m³	99.00	1,260,032.00	124,743,168.00	
	MEDIAN	m³	99.00	41,837.00	4,141,863.00	
	SHOULDER	m³	99.00	13,187.75	1,305,587.25	
	LAYING EARTH	m³	12.20	1,273,219.75	15,533,280.95	L= 10.7 km
	COMPACTION	m³	13.00	1,273,219.75	16,551,856.75	per km
SUB TOTAL(2)					162,383,000.00	15,176,000.00
3 PAVEMENT						
	ASPHALT CONCRETE	m³	1,725.00	6,634.00	11,443,650.00	
	D.B.M.	m³	1,605.00	33,544.50	53,838,922.50	
	W.M.M.	m³	645.00	77,040.00	49,690,800.00	
	G.S.B.	m³	475.00	75,114.00	35,679,150.00	
	TACK COAT	m²	3.40	894,520.00	3,041,368.00	L= 10.7 km
	PRIME COAT	m²	8.40	450,100.00	3,864,840.00	per km
SUB TOTAL(3)					157,559,000.00	14,725,000.00
4 CROSSING STRUCTURE						
	RC Culvert Box 1 (I.H=3.5m,I.W=4.0m)	Nos.	1,983,500.00	1.00	1,983,500.00	
	RC Culvert Box 2 (I.H=2.5m,I.W=2.5m)	Nos.	1,004,400.00	3.00	3,013,200.00	
	RC Culvert Box 3 (I.H=3.0m,I.W=2.5m)	Nos.	5,743,900.00	4.00	22,975,600.00	
	R.C.C.PIPE (DIA=1000mm)	Nos.	146,300.00	9.00	1,316,700.00	
	RC-T-VR(L=17m)	Nos.	368,600.00	0.00	0.00	
	RC-T-DR(L=17m)	Nos.	625,300.00	0.00	0.00	
	Abut.-VR(H=10.0m)	Nos.	543,700.00	0.00	0.00	
	Abut.-DR(H=10.0m)	Nos.	874,200.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	122,900.00	0.00	0.00	
	Pier-DR(H=8.0m)	Nos.	324,700.00	0.00	0.00	
SUB TOTAL(4)					29,289,000.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	741,600.00	4.00	2,966,400.00	
	RC-T beam(L=17m)	Nos.	665,200.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	573,900.00	14.00	8,034,600.00	
	RC-T beam(L=13m)	Nos.	488,100.00	4.00	1,952,400.00	
	RC-T beam(L=11m)	Nos.	382,300.00	2.00	764,600.00	
	PC-Hollow(L=25m)	Nos.	2,502,900.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,460,700.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,064,800.00	0.00	0.00	
	PC-I Beam(L=45m)	Nos.	4,477,600.00	0.00	0.00	
	PC-I Beam(L=36m)	Nos.	3,536,300.00	0.00	0.00	
	PC-I Beam(L=28m)	Nos.	2,456,700.00	0.00	0.00	
						L= 180 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,490,300.00	2.00	2,980,600.00	
	Abutment(H=10.0m)	Nos.	2,270,500.00	8.00	18,164,000.00	
	Abutment(H=15.0m)	Nos.	4,134,400.00	0.00	0.00	
	Abutment L(H=15.0m)	Nos.	3,204,400.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	484,000.00	14.00	6,776,000.00	
	Pier(H=10.0m)	Nos.	790,500.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,156,800.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,f=5000)	Nos.	390,100.00	34.00	13,263,400.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
SUB TOTAL(5)					54,902,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	21.40	29,056,920.00	
	BRIDGE-SER.	m	75,000.00	60.00	4,500,000.00	
SUB TOTAL(6)					33,557,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			3,247,660.00	
SUB TOTAL(7)					3,248,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			1,623,830.00	
SUB TOTAL(8)					1,624,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			6,495,320.00	TOTAL LENGTH 10.9 km
SUB TOTAL(9)					6,495,000.00	per km
TOTAL OF DIRECT COST					479,057,000.00	43,950,000

Table 7-15 Cost estimate of Bhopal Bypass

Item	Sub item	Unit	Rate(Rs)	Qty	Amount(RS)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC	LS			30,000,000 00	
SUB TOTAL(1)					30,000,000 00	
2 EARTHWORK	SITE CLEARANCE	Ha	1,250 00	320 80	401,000 00	
	EXCAVATION	m³	99 02	1,145 289 60	113,411,034 64	
	EXCAVATION(HARD ROCK)	m³	240 00	286,322 40	68,717,376 00	
	EARTH FILLING	m³	99 00	1,717,240 50	170,006,809 50	
	MEDIAN	m³	99 00	156,791 00	15 522,309 00	
	SHOULDER	m³	99 00	43,423 25	4,892,901 75	
	LAYING EARTH	m³	12 20	3,198,275 75	39,018,964 15	L= 40 1 km
	COMPACTION	m³	13 00	3,198,275 75	41,577,584 75	per km
SUB TOTAL(2)					453,548,000 00	11,310 000 00
3 PAVEMENT	ASPHALT CONCRETE	m³	1,725 00	24,862 00	42,886,950 00	
	D B M.	m³	1,605 00	125,713 50	201,770,167 50	
	W.M.M.	m³	645 00	288,720 00	186,224,400 00	
	G S B I.	m³	475 00	281,502 00	133,713,450 00	
	TACK COAT	m²	3 40	3,352,360 00	11,398,024 00	L= 40 1 km
	PRIME COAT	m²	8 40	1,724,300 00	14,484,120 00	per km
SUB TOTAL(3)					590,477,000 00	14,725 000 00
4 CROSSING STRUCTURE	RC Culvert Box 1 (H=3 5m,I W=4 0m)	Nos	2,022,000 00	3 00	6,066,000 00	
	RC Culvert Box 2 (H=2 5m,I W=2 5m)	Nos.	1,029,400 00	13 00	13,382,200 00	
	RC Culvert Box 3 (H=3 0m,I W=2 5m)	Nos	5,952,800 00	7 00	41,669,600 00	
	R C C PIPE (DIA=1000mm)	Nos.	146,300 00	23 00	3,364,900 00	
	RC-T-VR(L=17m)	Nos.	370,000 00	2 00	740,000 00	
	RC-T-DR(L=17m)	Nos.	627,600 00	0 00	0 00	
	Abut-VR(H=10 0m)	Nos.	568,000 00	2 00	1,136,000 00	
	Abut-DR(H=10 0m)	Nos	906,200 00	0 00	0 00	
	Pier-VR(H=8 0m)	Nos.	129,200 00	0 00	0 00	
	Pier-DR(H=8 0m)	Nos.	339,900 00	1 00	339,900 00	
SUB TOTAL(4)					66,698,600 00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	743,900 00	0 00	0 00	
	RC-T beam(L=17m)	Nos.	667,200 00	0 00	0 00	
	RC-T beam(L=15m)	Nos.	575,600 00	20 00	11,512,000 00	
	RC-T beam(L=13m)	Nos	489,500 00	12 00	5,874,000 00	
	RC-T beam(L=11m)	Nos.	383,600 00	0 00	0 00	
	PC-Hollow(L=25m)	Nos.	2,509,500 00	2 00	5,019,000 00	
	PC-Hollow(L=20m)	Nos.	1,454,400 00	0 00	0 00	
	PC-Hollow(L=16m)	Nos	1,067,400 00	0 00	0 00	
	PC-I Beam(L=45m)	Nos.	4,489,700 00	0 00	0 00	
	PC-I Beam(L=36m)	Nos.	3,545,900 00	0 00	0 00	
	PC-I Beam(L=28m)	Nos.	2,453,300 00	0 00	0 00	L= 253 m
(SUB STRUCTURE)	Abutment(H=7 0m)	Nos.	1,626,300 00	10 00	16,263,000 00	
	Abutment(H=10 0m)	Nos	2,291,600 00	6 00	13,749,600 00	
	Abutment(H=15 0m)	Nos	4,239,400 00	2 00	8,478,800 00	
	Abutment L(H=15 0m)	Nos	3,285,700 00	0 00	0 00	
	Pier(H=8 0m)	Nos	500,200 00	16 00	8,003,200 00	
	Pier(H=10 0m)	Nos	800,800 00	0 00	0 00	
	Pier(H=15 0m)	Nos	1,203,300 00	0 00	0 00	
(FOUNDATION)	Caisson Foundation (Depth <10m,F=5000)	Nos.	391,700 00	0 00	0 00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000 00	0 00	0 00	
SUB TOTAL(5)					68,900,000 00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800 00	80 20	108,895,560 00	
	BRIDGE-SER.	m	75,000 00	150 00	11,250,000 00	
SUB TOTAL(6)					120,146,000 00	
7 DRAINAGE	2% OF EARTHWORK	LS			9,070,960 00	
SUB TOTAL(7)					9,071,000 00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			4,535,480 00	
SUB TOTAL(8)					4,535,000 00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			18,141,920 00	TOTAL LENGTH 40 3 km
SUB TOTAL(9)					18,142,000 00	per km
TOTAL OF DIRECT COST					1,361,518,000 00	33,785,000

Table 7-16 Cost estimate of Gwalior Bypass

Item	Sub item	Unit	Rate(Rs.)	Qty	Amount (RS.)	Remark
1 PREPARATORY WORK	LAB EQUIPMENT,ACCOMODATION AND VHICLE, ETC	LS			30,000,000.00	
SUB TOTAL(1)					30,000,000.00	
2 EARTHWORK	SITE CLEARANCE	Ha	1,250.00	206.40	258,000.00	
	EXCAVATION	m³	99.02	0.00	0.00	
	EXCAVATION(HARD ROCK)	m³	240.00	491,438.00	117,945,120.00	
	EARTH FILLING	m³	99.00	5,181,595.00	512,977,905.00	
	MEDIAN	m³	99.00	100,878.00	9,986,922.00	
	SHOULDER	m³	99.00	31,798.50	3,148,051.50	
	LAYING EARTH	m³	12.20	5,704,831.50	69,598,944.30	L= 25.8 km
	COMPACTION	m³	13.00	5,704,831.50	74,152,809.50	per km
SUB TOTAL(2)					788,078,000.00	30,546,000.00
3 PAVEMENT						
	ASPHALT CONCRETE	m³	1,725.00	15,996.00	27,593,100.00	
	D.B.M.	m³	1,605.00	80,883.00	129,817,215.00	
	W.M.M.	m³	645.00	185,760.00	119,815,200.00	
	G.S.B.L.	m³	475.00	181,116.00	86,030,100.00	
	TACK COAT	m²	3.40	2,156,880.00	7,333,392.00	L= 25.8 km
	PRIME COAT	m²	8.40	1,109,400.00	9,318,960.00	per km
SUB TOTAL(3)					379,908,000.00	14,725,000.00
4 CROSSING STRUCTURE	RC Culvert Box 1 (LH=3.5m,LW=4.0m)	Nos.	2,017,800.00	3.00	6,053,400.00	
	RC Culvert Box 2 (LH=2.5m,LW=2.5m)	Nos.	1,027,300.00	5.00	5,136,500.00	
	RC Culvert Box 3 (LH=3.0m,LW=2.5m)	Nos.	5,940,700.00	5.00	29,703,500.00	
	R.C.C.PIPE (DIA=1000mm)	Nos.	146,300.00	11.00	1,609,300.00	
	RC-T-VR(L=17m)	Nos.	369,400.00	2.00	738,800.00	
	RC-T-DR(L=17m)	Nos.	626,700.00	0.00	0.00	
	Abut-VR(H=10.0m)	Nos.	566,700.00	2.00	1,133,400.00	
	Abut-DR(H=10.0m)	Nos.	904,100.00	0.00	0.00	
	Pier-VR(H=8.0m)	Nos.	128,900.00	1.00	128,900.00	
	Pier-DR(H=8.0m)	Nos.	339,200.00	0.00	0.00	
SUB TOTAL(4)					44,503,800.00	
5 BRIDGE/VIADUCT (SUPER STRUCTURE)	RC-T beam(L=19m)	Nos.	743,000.00	0.00	0.00	
	RC-T beam(L=17m)	Nos.	666,400.00	0.00	0.00	
	RC-T beam(L=15m)	Nos.	574,900.00	22.00	12,647,800.00	
	RC-T beam(L=13m)	Nos.	489,000.00	0.00	0.00	
	RC-T beam(L=11m)	Nos.	383,100.00	2.00	766,200.00	
	PC-Hollow(L=25m)	Nos.	2,506,900.00	0.00	0.00	
	PC-Hollow(L=20m)	Nos.	1,462,900.00	0.00	0.00	
	PC-Hollow(L=16m)	Nos.	1,066,400.00	2.00	2,132,800.00	
	PC-I Beam(L=45m)	Nos.	4,485,000.00	0.00	0.00	
	PC-I Beam(L=35m)	Nos.	3,542,200.00	0.00	0.00	
	PC-I Beam(L=28m)	Nos.	2,460,700.00	0.00	0.00	L= 192 m
(SUB STRUCTURE)	Abutment(H=7.0m)	Nos.	1,623,200.00	6.00	9,739,200.00	
	Abutment(H=10.0m)	Nos.	2,286,000.00	6.00	13,716,000.00	
	Abutment(H=15.0m)	Nos.	4,230,200.00	2.00	8,460,400.00	
	Abutment L(H=15.0m)	Nos.	3,278,500.00	0.00	0.00	
	Pier(H=8.0m)	Nos.	499,400.00	12.00	5,992,800.00	
	Pier(H=10.0m)	Nos.	799,400.00	0.00	0.00	
	Pier(H=15.0m)	Nos.	1,201,300.00	0.00	0.00	
(FOUNDATION)	Caisson Foundation (Depth <10m,f=5000)	Nos.	391,000.00	0.00	0.00	
	CAST IN SITU PILE(1000mm) (10m<Depth <40m)	m	6,000.00	0.00	0.00	
SUB TOTAL(5)					53,455,000.00	
6 SERVICE ROAD	SERVICE ROAD	km	1,357,800.00	26.00	35,302,800.00	
	BRIDGE-SER.	m	75,000.00	135.00	10,125,000.00	
SUB TOTAL(6)					45,428,000.00	
7 DRAINAGE	2% OF EARTHWORK	LS			15,761,560.00	
SUB TOTAL(7)					15,762,000.00	
8 UTILITY DIVERSION	1% OF EARTHWORK	LS			7,880,780.00	
SUB TOTAL(8)					7,881,000.00	
9 ROAD APPURTENANCES	4% OF EARTHWORK	LS			31,523,120.00	TOTAL LENGTH 26.0 km
SUB TOTAL(9)					31,523,000.00	per km
TOTAL OF DIRECT COST					1,396,539,000.00	53,713,000

7.3 Project Cost Estimate

7.3.1 Condition of Project Cost Estimate

The project cost was estimated based on the following basic assumptions 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) Initial maintenance and operation cost was assumed as 2% of direct construction cost.

(4) Land acquisition cost was investigated in project areas as shown in Table 7-17. For this Pre-Feasibility Study, 30% extra cost was added, taking into consideration of possible compulsory acquisition.

Table 7-17 Land acquisition cost data

Project Area	Unit	Land Cost
Bareilly	Rs./ha	300,000
Patna	Rs./ha	300,000
Keonjhar	Rs./ha	175,000
Balugaon(Irrigated)	Rs./ha	250,000
Balugaon(Un-Irrigated)	Rs./ha	125,000
Vijayawada	Rs./ha	750,000
Kannur (Agricultural area)	Rs./ha	620,000
Kannur (Hausing area)	Rs./ha	870,000
Nandura	Rs./ha	370,000
Khamgaon	Rs./ha	370,000
Bhopal	Rs./ha	600,000
Gwalior	Rs./ha	600,000

(5) Compensation cost was assumed as 20% of land acquisition cost except Kannur Bypass. Compensation cost for Kannur Bypass was estimated separately based on the obtained data from the project site.

(6) Contingencies were assumed as 10% of administration charge and cost for engineering and supervision services.

7.3.2 Estimated Project Cost

Summary of project cost estimate is shown in Table 7-18. Project cost estimation of each bypass are shown in Tables 7-19 to 7-28.

Table 7-18 Summary of Project Cost Estimates

Bypass Name	Project Cost	Direct Construction Cost	Administration Charge	Engineering & Supervision	Initial Maintenance Cost	Land Acquisition Cost	Compensation	Contingencies
Bareilly	1,879,362,000	1,276,103,000	191,415,000	127,610,000	25,522,000	97,032,000	14,928,000	146,752,000
Patna	4,923,724,000	3,425,331,000	513,800,000	342,533,000	68,507,000	155,688,000	23,952,000	393,913,000
Keonjhar	453,253,000	314,370,000	47,156,000	31,437,000	6,287,000	15,470,000	2,380,000	36,153,000
Balugaon	552,559,000	365,603,000	54,840,000	36,560,000	7,312,000	40,040,000	6,160,000	42,044,000
Vijayawada	2,054,426,000	1,300,741,000	195,111,000	130,074,000	26,015,000	219,180,000	33,720,000	149,585,000
Kannur	1,464,531,000	608,165,000	91,225,000	60,817,000	12,163,000	88,889,000	533,333,000	69,939,000
Nandura	359,483,000	239,037,000	35,856,000	23,904,000	4,781,000	24,627,200	3,788,800	27,489,000
Khamgaon	711891000	479,057,000	71,859,000	47,906,000	9,581,000	41,943,200	6,452,800	55,092,000
Bhopal	2,175,863,000	1,361,518,000	204,228,000	136,152,000	27,230,000	251,472,000	38,688,000	156,575,000
Gwalior	2,121,407,000	1,396,539,000	209,481,000	139,654,000	27,931,000	162,240,000	24,960,000	160,602,000

Table 7-19 Project Cost of Bareilly Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				1,276,103,000	
2	ADMINISTRATION CHARGE				191,415,000	1x15%
3	ENGINEERING & SUPERVISION				127,610,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				25,522,000	1x2%
5	LAND AQUISITION COST	ha	300,000	249	97,032,000	add 30%
6	COMPENSATION				14,928,000	
7	CONTINGENCIES				146,752,000	(1+2)x10%
	PROJECT COST				1,879,362,000	

Table 7-20 Project Cost of Patna Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				3,425,331,000	
2	ADMINISTRATION CHARGE				513,800,000	1x15%
3	ENGINEERING & SUPERVISION				342,533,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				68,507,000	1x2%
5	LAND AQUISITION COST	ha	300,000	399	155,688,000	add 30%
6	COMPENSATION				23,952,000	
7	CONTINGENCIES				393,913,000	(1+2)x10%
	PROJECT COST				4,923,724,000	

Table 7-21 Project Cost of Keonjhar Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				314,370,000	
2	ADMINISTRATION CHARGE				47,156,000	1x15%
3	ENGINEERING & SUPERVISION				31,437,000	1x10%
4	INITIAL MAINTANANCE & OPERATION				6,287,000	1x2%
5	LAND AQUISITION COST	ha	175,000	68	15,470,000	add 30%
6	COMPENSATION				2,380,000	
7	CONTINGENCIES				36,153,000	(1+2)x10%
	PROJECT COST				453,253,000	

Table 7-22 Project Cost of Balugaon Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				365,603,000	
2	ADMINISTRATION CHARGE				54,840,000	1x15%
3	ENGINEERING & SUPERVISION				36,560,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				7,312,000	1x2%
5	LAND AQUISITION COST	ha	250,000	123	40,040,000	add 30%
6	COMPENSATION				6,160,000	
7	CONTINGENCIES				42,044,000	(1+2)x10%
	PROJECT COST				552,559,000	

Table 7-23 Project Cost of Vijayawada Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				1,300,741,000	
2	ADMINISTRATION CHARGE				195,111,000	1x15%
3	ENGINEERING & SUPERVISION				130,074,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				26,015,000	1x2%
5	LAND AQUISITION COST	ha	750,000	225	219,180,000	add 30%
6	COMPENSATION				33,720,000	
7	CONTINGENCIES				149,585,000	(1+2)x10%
	PROJECT COST				2,054,426,000	

Table 7-24 Project Cost of Kannur Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				608,165,000	
2	ADMINISTRATION CHARGE				91,225,000	1x15%
3	ENGINEERING & SUPERVISION				60,817,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				12,163,000	1x2%
5	LAND AQUISITION COST	ha	620,000	36	28,629,000	add 30%
			870,000	53	60,260,000	
6	COMPENSATION				533,333,000	
7	CONTINGENCIES				69,939,000	(1+2)x10%
	PROJECT COST				1,464,531,000	

Table 7-25 Project Cost of Nandura Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				239,037,000	
2	ADMINISTRATION CHARGE				35,856,000	1x15%
3	ENGINEERING & SUPERVISION				23,904,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				4,781,000	1x2%
5	LAND AQUISITION COST	ha	370,000	51	24,627,200	add 30%
6	COMPENSATION				3,788,800	
7	CONTINGENCIES				27,489,000	(1+2)x10%
	PROJECT COST				359,483,000	

Table 7-26 Project Cost of Khamgaon Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				479,057,000	
2	ADMINISTRATION CHARGE				71,859,000	1x15%
3	ENGINEERING & SUPERVISION				47,906,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				9,581,000	1x2%
5	LAND AQUISITION COST	ha	370,000	87	41,943,200	add 30%
6	COMPENSATION				6,452,800	
7	CONTINGENCIES				55,092,000	(1+2)x10%
	PROJECT COST				711,891,000	

Table 7-27 Project Cost of Bhopal Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				1,361,518,000	
2	ADMINISTRATION CHARGE				204,228,000	1x15%
3	ENGINEERING & SUPERVISION				136,152,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				27,230,000	1x2%
5	LAND AQUISITION COST	ha	600,000	322	251,472,000	add 30%
6	COMPENSATION				38,688,000	
7	CONTINGENCIES				156,575,000	(1+2)x10%
	PROJECT COST				2,175,863,000	

Table 7-28 Project Cost of Gwalior Bypass

	ITEM	UNIT	RATE(Rs.)	QTY.	AMOUNT.(Rs.)	REMARK
1	DIRECT CONSTRUCTION COST				1,396,539,000	
2	ADMINISTRATION CHARGE				209,481,000	1x15%
3	ENGINEERING & SUPERVISION				139,654,000	1x10%
4	INITIAL MAINTENANCE & OPERATION				27,931,000	1x2%
5	LAND AQUISITION COST	ha	600,000	208	162,240,000	add 30%
6	COMPENSATION				24,960,000	
7	CONTINGENCIES				160,602,000	(1+2)x10%
	PROJECT COST				2,121,407,000	

Pre-Feasibility Study

Chapter 8
Preliminary Economic and Financial Analysis

8 Preliminary Economic and Financial Analysis

8.1 Economic Analysis

8.1.1 Methodology

(1) Indicators

In order to examine economic viability of the Projects, economic internal rate of return (EIRR) to show the economic efficiency and net present value (NPV) with a discount rate of 12% to show the scales of economic value of the Projects for the national economy, were calculated with the evaluation period up to 20 years after the commissioning. The discount rate of 12% has been used by the Planning Commission and its application in this was agreed by the MOST.

(2) Economic Cost

Construction and operation/maintenance costs estimated by engineers were financial costs. To convert the financial costs to the economic costs, 0.8 was uniformly multiplied in Pre-feasibility Study. Residual value of the facilities at the end of the evaluation period was assumed 30% including that of lands and was counted as a negative cost of the last year in the cost benefit stream of each Project.

(3) Economic Benefits

Construction and operation of bypasses will result in many types of economic and social benefits for the road users as well as the residents along the existing roads and the bypasses, which include those listed bellow.

1) Benefits generated by investment for the construction

   a. Labour employment

   b. Increased demands for construction materials, etc.

2) Benefits to road users and operators born by operation of the bypasses

   a. Saving in vehicle operation costs (VOC)

   b. Saving in travel time of passengers and commodities

   c. Reduced accident costs

   d. Reduced maintenance costs of the existing roads

   e. Enhanced mobility and expanded activities

   f. More convenient and reliable trips

3) Benefits to the residents and the governments (indirect impacts)

a. Promotion of commerce, agriculture, manufacturing, and other industries

b. Appreciation in land values, especially those adjacent to the bypasses

c. Increase in tax revenue for the governments

d. Improvement in administration, public order, etc.

e. Improved access to health care and education, etc.

f. Improvement in environmental standards, especially in areas along the existing highways

g. Savings in use of energy and foreign currency

Since quantification of most of the above-mentioned benefits is very difficult or requires extensive studies, monetary values of only items 2)-a. and b. were counted. Savings in VOC are the differences in VOC's between those in case "with" a project, and those in case "without" a project, as illustrated below.

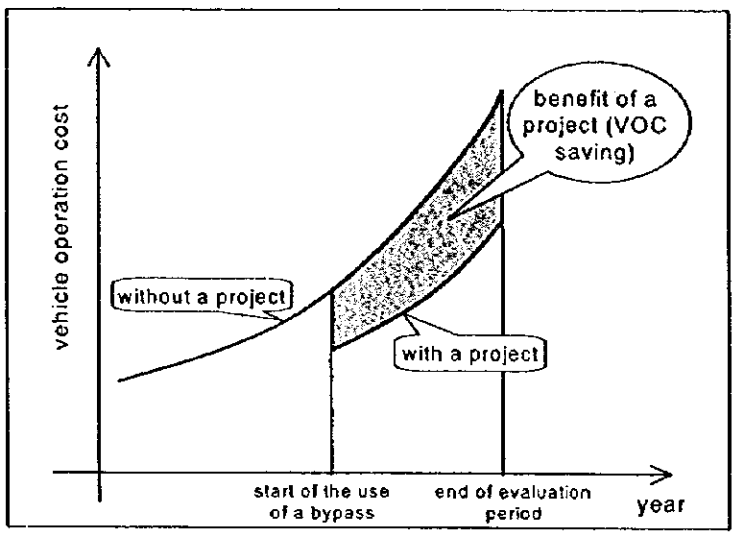

Figure 8-1 Benefit of a Project in VOC saving

Counting of travel time savings into project benefits would be controversial in developing countries. However, the Projects subjected to this analysis are toll roads and the choice of the routes by road users may include travel time savings. The economic analysis was made with and without adding such savings in the benefit streams of the Projects.

8.1.2 Estimated Unit VOC and Travel Time Value

(1) Unit VOC

"Manual on Economic Evaluation of Highway Projects of India", Indian Road Congress (SP-30 of IRC, 1993) was referred for the calculation of unit VOC. The unit VOC in the Manual is calculated based on the "Study for Updating Road User Cost Data", MOST/ADB, 1992, (URUCS), which includes studies on various components of the road users' costs including VOC calculation with the price data as of 1990. Unit VOC as of April, 1993 was calculated in the Manual after an investigation of price increase of major components of VOC from 1990 to 1993.

The VOC's for the Pre-feasibility Study ware calculated with the following assumptions.

Assumed Conditions of Roads

Despite various conditions of the existing roads, two-lane with earthen shoulders and with a pavement width of 7.0 m was assumed for the existing roads subjected to this analysis except Vijayawada, where construction work for widening the national highways has already started, and where four-lane roads with paved shoulders were assumed for existing roads. For all the bypasses, four-lane with paved shoulder were assumed.

Available information on road roughness from a road inventory of the MOST were referred. The road inventory provided by the MOST has data as of December, 1996, on roughness of five sections of the existing roads. The average road roughness is 5,507 mm/km, varying from 4,857 mm/km in Patna to 6,744 mm/km in Vijayawada. Road roughness of 5,000 mm/km was applied for all existing two-lane roads in this analysis, while 3,000 mm/km was applied for projected bypasses and newly constructed highways in Vijayawada throughout the evaluation period although the roughness can be assumed as 2,000 mm/km just after the completion and re-pavement.

Since no data on rise and fall (RF) of the existing road were available, this analysis assumed 5m/km for the existing roads and projected bypasses, a half rise and a half fall, because most of the preliminary figures of RF set for the bypasses at this moment are near 5m/km. All roads were regarded as those in plain areas.

Vehicle Type

The "Manual on Economic Evaluation of Highway Projects of India" (SP-30 of IRC) shows Unit VOC by type of vehicle according to the following vehicle classification.

a. New Technology Car (NTC, Maruti/Suzuki)

b. Old Technology Car (OTC, Ambassador, Premier Padmini)

c. Light Commercial Vehicle (LCV)

d. Two-axled Heavy Commercial Vehicle (HCV)

e. Multi-axled Vehicles (MAV)

f. Bus

g. Two Wheeler

Besides, the future traffic assignment in the Study are conducted for the following vehicle classification.

i. Car (above a. and b.)

ii. Bus (above f.)

iii. Truck (above c. d. and e.)

iv. Two Wheeler (above g.)

As the composition of the NTC and OTC in the actual and future traffic is not known or unpredictable, the VOC of "Car" (i) is assumed as the median of the two VOC's. The composition of LCV (c), HCV (d) and MAV (e) of all survey points counted in the traffic survey for the Study to total "Trucks" (iii) was 12%, 83% and 5%, respectively. This composition was also assumed in the future traffic. The unit VOC of a "Truck" (iii) was calculated as a weighted average of the three VOC's.

Price Updating

Since the equations given in the Appendix 3 of the Manual are based on the prices of April, 1993, the prices of the major components such as those of new vehicles, fuel, and tyres as of July 1997 were inquired in Delhi. Other petroleum products, such as engine oil, other oil and grease were assumed to be escalated to 1.3 times, which is the same rate for diesel.

Fixed costs were assumed to have escalated with the rate of the wholesale price index (WPI), while wages of crews were estimated with the real earning data, which had escalated almost 2% higher than the WPI during the period from 1982-1992.

VOC in Congested Conditions

Volume capacity ratio (VCR) to be applied for the estimation of distance-related VOC in congested conditions for existing roads was not known because the traffic counted and forecast for the Study did not cover all traffic

on existing roads. For example, much volume of the traffic may occur inside a town area, and that volume were not counted. While, the speed of the traffic flow were estimated for the existing roads as well as for the projected bypasses. Hence, unit VOC was estimated in the following process

i) Traffic volume corresponding to a speed was calculated with the speed-flow equations given in the Appendix 2 of the Manual.

ii) VCR was calculated with the capacity given in URUCS (Chapter 6); 2,500 PCU/hour for two-lane roads and 6,200 PCU/hour for four-lane roads.

iii) Congestion conversion factor for distance-related VOC was calculated with the equations given in Table 3 of the Manual.

iv) Up to the speed of the intercept of the equations given in the Appendix 3 of the Manual, congestion conversion factor was multiplied to the distance-related VOC at the intercept speed.

v) At higher speed than the intercept, distance-related VOC for each speed calculated with the equations in the Appendix 3 was applied. The higher the speed is, the higher fuel consumption, then the higher distance-related VOC is.

vi) Time-related VOC was calculated with the equations in the Appendix 3 for each speed.

The Unit VOC was estimated as follows:

Table 8-1 Unit VOC on the Existing Roads (two-lane)

Speed (km/hour)	Unit VOC (Rs./km)			
	Car	Bus	Truck	Two-wheeler
0-10	12.85	28.80	16.87	2.50
10-20	5.86	14.17	12.13	1.07
20-30	4.46	10.44	9.87	0.80
30-40	3.86	8.68	8.55	0.71
40-50	3.39	6.96	7.01	0.69
50-60	2.88	5.72	5.89	0.72
60-70	2.90	5.34	5.51	0.77
70-80	2.96	5.11	5.27	0.85
80-90	3.09	4.98	5.13	0.94
90-100	3.27	4.92	5.07	1.06

Table 8-2 Unit VOC on Projected Bypasses and Existing Roads (four-lane)

Speed (km/hour)	Unit VOC (Rs./km)			
	Car	Bus	Truck	Two-wheeler
0-10	12.68	27.77	15.78	2.36
10-20	5.69	12.83	11.04	0.93
20-30	4.30	8.67	8.78	0.66
30-40	3.70	6.81	7.42	0.57
40-50	3.29	5.80	6.21	0.55
50-60	2.80	5.19	5.35	0.58
60-70	2.44	4.80	4.97	0.63
70-80	2.50	4.57	4.73	0.71
80-90	2.63	4.44	4.58	0.80
90-100	2.81	4.39	4.52	0.92

(2) Unit Value of Travel Time

Same reference as for calculation of the unit VOC was made for the calculation of value of passenger travel time as well as that of commodities loaded on trucks. The aggregate rate of "work trips and non-work trips" in the Manual was applied.

The average occupancy of a car, a bus and a two-wheeler can be assumed as 4.8, 43.0 and 1.5 persons, respectively. Since the driven hours of a truck can be calculated as 6.5 hours/day, the daily value of commodities on truck can be converted to the hourly value by dividing with seven (7).

Time value of passengers may have been escalating corresponding to rate of increase in the earning of a passenger. In this analysis, index of the earning of an employee was applied to estimate the current value. During the ten years from 1982 to 1992, the real earning of an employee had grown at 2.2% per annum. From 1990 to 1997, inflation rates varied from 5.0% to 13.6%, whose cumulative figure was 1.88 times. The hourly value of travel time for a passenger may have increased to 2.16 times, assuming the same working hours in a year.

Current interest rate on general loan from commercial bank for Rs. 2,500-200,000 is 13.5%, while the URUCS applied 15% of the interest. During the period of 1990-1997, the whole sale prices has increased 1.91 times.

The current value of travel time of a passengers and commodities can be estimated as follows:

Table 8-3 Unit Value of Travel Time per Vehicle in 1997

Type of Vehicle	Travel time saving
passengers on a car	Rs. 251.9/hour/vehicle
passengers on a bus	Rs. 1,829.2/hour/vehicle
commodity in a truck	Rs. 21.2/hour/vehicle
passengers on a two-wheeler	Rs. 29.6/hour/vehicle

8.1.3 Result of the Economic Analysis

Economic benefits in the year 2002 and 2012 estimated according to the above-mentioned methods are shown in the table below:

Table 8-4 Economic Benefits

(Rs. million/year)

Bypass Name year	VOC Saving	Travel Time Saving	Total
1. Bareilly			
2002	795.0	3,155.2	3,950.2
2012	2,474.1	6,729.0	9,203.4
2. Patna			
2002	1,534.5	2,289.0	3,823.4
2012	2,740.1	5,383.0	8,123.1
3. Keonjhar			
2002	-0.9	2.1	1.1
2012	50.1	66.2	116.3
4. Balugaon			
2002	6.3	7.5	13.7
2012	151.9	223.2	375.2
5. Vijayawada			
2002	73.8	56.6	130.4
2012	1,320.0	3,172.1	4,492.2
6. Kannur			
2002	147.1	555.5	702.6
2012	456.3	2,688.3	3,144.7
7. Nandura			
2002	31.5	44.1	75.5
2012	261.3	399.9	661.2
8. Khamgaon			
2002	69.4	89.2	158.6
2012	284.9	481.7	766.6
6. Bhopal			
2002	332.6	956.6	1,289.2
2012	790.4	2,914.4	3,704.8
10. Gwalior			
2002	335.6	407.5	743.1
2012	596.4	543.8	1,140.2

(note) at constant prices of 1997

Benefits from VOC saving and travel time saving per km of the proposed bypasses

and comparison of the benefits between those in the year 2002 and 2012 are shown in the table below:

Table 8-5 Benefits per Km

(Rs. million/km/year)

Bypass Name year	VOC Saving		Travel Time Saving		Total	
	amount	'02/'12	amount	'02/'12	amount	'02/'12
1. Bareilly						
2002	25.6	32%	101.5	47%	127.0	43%
2012	79.6		216.4		295.9	
2. Patna						
2002	30.8	56%	45.9	43%	76.6	47%
2012	54.9		107.9		162.8	
3. Keonjhar						
2002	-0.1	-2%	0.2	3%	0.1	1%
2012	5.9		7.8		13.7	
4. Balugaon						
2002	0.4	4%	0.5	3%	0.9	4%
2012	9.9		14.5		24.4	
5. Vijayawada						
2002	2.6	6%	2.0	2%	4.6	3%
2012	47.0		112.9		159.9	
6. Kannur						
2002	5.2	32%	19.8	21%	25.0	22%
2012	16.2		95.7		111.9	
7. Nandura						
2002	1.1	12%	1.6	11%	2.7	11%
2012	9.3		14.2		23.5	
8. Khamgaon						
2002	2.5	24%	3.2	19%	5.6	21%
2012	10.1		17.1		27.3	
9. Bhopal						
2002	11.8	42%	34.0	33%	45.9	35%
2012	28.1		103.7		131.8	
10. Gwalior						
2002	11.9	56%	14.5	75%	26.4	65%
2012	21.2		19.4		40.6	

(note) at constant prices of 1997

Largest VOC saving per km in 2002 will occur in Patna Bypass, followed by Bareilly, Gwalior and Bhopal Bypasses, and largest economic benefits per km in 2002 will be generated in Bareilly, followed by Patna and Bhopal. Benefits from VOC saving and travel time saving a in 2012 will be highest in Bareilly, followed by Patna and Vijayawada.

More than half of the benefits in 2012 will occur in 2002 in Gwalior. In Patna Bareilly, nearly half of the benefit of 2012 will be generated in 2002.

EIRR and NPV-at discount rate of 12% are calculated as follows:

Table 8-6 EIRR and NPV

Name of Bypass	EIRR %		NPV (12% discount) Rs. million	
	VOC saving only	with Travel Time saving	VOC saving only	with Travel Time saving
1. Bareilly	46.8%	112.1%	6,639	30,349
2. Patna	27.9%	49.7%	6,094	22,545
3. Keonjhar	2.9%	11.6%	-176	-10
4. Balugaon	11.7%	23.0%	-9	554
5. Vijayawada	23.7%	43.2%	2,115	9,996
6. Kannur	18.8%	57.4%	599	8,447
7. Nandura	28.6%	50.2%	471	1,550
8. Khamgaon	20.0%	36.8%	389	1,772
9. Bhopal	21.6%	56.9%	1,295	10,620
10. Gwalior	19.7%	34.5%	926	3,194

The EIRR with VOC saving only is highest in Bareilly, followed by Nandura and Patna. Bareilly bypass also shows the highest EIRR with travel time saving into account. The EIRR's of Vijayawada, Bhopal, Khamgaon, Gwalior and Kannur also exceed 12% with positive NPV's even without travel time saving taken into accounts. With travel time saving, all bypasses except Keonjhar show higher EIRR's than 12%. Those nine bypasses show substantial amount of NPV except Balugaon.

The NPV's of Bareilly and Patna Bypasses are the largest in the both case with and without the travel time saving. The NPV's of the two Projects are over Rs. 6 thousand million with VOC saving only and over Rs. 20 thousand million with travel time saving. Bhopal, Kannur and Vijayawada Bypasses score considerably high NPV's, ranging from Rs. 8 to 11 thousand million when travel time saving is taken into accounts.

8.2. Financial Analysis

8.2.1 Methodology

(1) Indicator

Financial internal rate of return (FIRR) on total investment, including that for lands acquisition, was calculated to examine financial viability of the Project.

(2) Evaluation Period

Evaluation period for financial analysis also extends up to 20 years after the commissioning of each bypass. No residual value after the evaluation period was counted in the financial analysis.

(3) Inflation

For the financial analysis, an inflation rate of 10 % was applied for future years of construction and operation/maintenance. The revenue was also estimated with the same rate of inflation, assuming the revision of the toll rates once in three years.

(4) Financial Benefits

Revenue from toll collection was counted as financial benefits of the Projects. The level of the tariff is discussed in Chapter 3. Other probable benefits from tenants or advertisement, etc., was not counted.

8.2.2 Result of the Financial Analysis

The toll revenue in 2002 and 2012 was estimated as given in Table 8-7 according to the toll rates set in Chapter 3. Regarding the revenue per km in the year 2002, Patna Bypass will generate the highest revenue of Rs. million 11.4/year. Khamgaon, Bareilly Nandura and Gwalior Bypasses will also accrue large amount of revenue per km in 2002. In the year 2012, Bareilly and Vijayawada Bypasses will generate the highest revenue collection per km.

In real base (after elimination of effect of inflation), more than half of the revenue of 2012 will be collected in 2002 in Patna, Nandura, Khamgaon and Gwalior Bypasses. On the contrary, toll revenue or number of bypass users will sharply increase from 2002 to 2012 in Vijayawada and Balugaon.

Table 8-7 Estimated Toll Revenue

(Rs. million)

Name of Bypass	length (km)	Revenue 2002	Revenue 2012	Revenue/km 2002	Revenue/km 2012	'02/'12*
1. Bareilly	31.1	306.2	2,023.1	9.8	65.1	39%
2. Patna	49.9	569.6	1,943.7	11.4	39.0	76%
3. Keonjhar	8.5	9.4	73.4	1.1	8.6	33%
4. Balugaon	15.4	25.3	300.2	1.6	19.5	22%
5. Vijayawada	28.2	77.5	1,413.7	2.7	50.1	14%
6. Kannur	11.1	57.2	319.1	5.2	28.8	47%
7. Nandura	6.4	55.7	239.2	8.7	37.4	60%
8. Khamgaon	10.9	110.2	484.0	10.1	44.4	59%
9. Bhopal	40.3	200.6	1,732.7	5.0	43.0	30%
10. Gwalior	26.0	225.2	1,071.0	8.7	41.2	55%

(Note) *: Comparison was made in real base (Effect of inflation is eliminated).

The FIRR's on total investment of the Projects were calculated as follows. Bareilly Bypass shows the highest FIRR, almost 26%. The FIRR's of Bhopal, Khamgaon also exceed 20%. This means that these Projects will generate more than 9% return on total investment in real base. Nandura, Vijayawada, and Gwalior Bypasses also show considerably high FIRR, whose real-base return range from 6.3% to 8.2%. However, some arrangements, such as provision of lands or government investments for the Projects, will be necessary or preferable to promote these Projects. To encourage other Projects, substantial arrangements, such as government subsidy, will be inevitable.

Table 8-8 FIRR on Total Investment

Bypass	FIRR
1. Bareilly	25.9%
2. Patna	14.2%
3. Keonjhar	Negative
4. Balugaon	13.0%
5. Vijayawada	18.6%
6. Kannur	7.4%
7. Nandura	19.0%
8. Khamgaon	20.1%
9. Bhopal	20.9%
10. Gwalior	16.9%

Among the Projects with high financial feasibleness whose FIRR's exceed 20%, Khamgaon and Bareilly Bypasses will start with high toll collection per km, which may contribute to good financial conditions at initial stage of operation, while Bhopal Bypass Project will have to start with low revenue collection.

Gwalior Project will enable the highest revenue collection among the Projects with comparatively high FIRR's which range 15% to 20%. Out of those Projects, Vijayawada will have to start with the lowest revenue.

As for Bhopal and Vijayawada Bypasses, it would be better to start the construction later than other feasible Projects, waiting for increase of the demands for these bypasses which will occur by 2012.