

1. Project Profile and Japan's ODA Loan



Region map of project site



National Highway 24

1.1 Background

National Highway 24 is an important main route connecting the capital city of Delhi and Lucknow, the state capital of Uttar Pradesh (UP), and it acts as a bypass for National Highway 2, which connects Delhi and Calcutta. National Highway 24 is also an important distribution route connecting the grain-producing area east of Delhi with the consumption center in the capital city, and it plays an important role as major commuting route connecting the residential area that has developed in recent years east of Delhi with the capital city.

Accompanying the sudden growth in traffic volume in recent years, travel costs are rising as the road's level of serviceability declines due to increased traffic accidents and traffic jams. In response to this state of affairs, the Ministry of Road Transport and Highways (MORTH) planned to increase the traffic carrying capacity by widening the road to 4 lanes, and it actually expanded to four lanes the 27.6 km section of road from the starting point in New Delhi to the Ghaziabad Bypass. However, since the remaining of total 499 km¹ length road was still two-lane, many vehicles travelling east from New Delhi toward the suburbs on National Highway 24 were unavoidably entangled in a traffic jam at the 27.6 km point. Moreover, in Hapur because stores are concentrated along National Highway 24 and the highway also intersects with a state road in the center of town, traffic jams were pronounced, and this caused transportation costs to increase and resulted in many traffic accidents.

So, on National Highway 24, a particularly strong and urgent need for road widening and bypass construction arose on the section between Ghaziabad and Hapur.

1.2 Objective

The project's objective was to promote the smooth flow of traffic on National Highway 24, which connects the capital city of Delhi with Lucknow, the capital city of Uttar Pradesh (UP), by widening

¹ Cf. This is equivalent to the distance on the Tomei & Meishin Expressway from the Tokyo Interchange to the Kyoto-Minami Interchange (approximately 488 km).

from two lanes to four lanes the section from Ghaziabad to Hapur in UP and also by constructing a bypasses with four lanes in both directions, thereby contributing to the improvement of the economic and social environment in the region surrounding the road.

1.3 Borrower/Executing Agency

Borrower: President of the Republic of India

Executing Agency: Ministry of Road Transport and Highway

1.4 Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	4,827 million yen/2,795 million yen
Exchange of Notes/Loan Agreement	December 1994/February 1995
Terms and Conditions	
-Interest Rate	2.6%
-Repayment Period (Grace Period)	30 Years (10 Years)
-Procurement	General Untied
Final Disbursement Date	April 2002
Main Agreement	KNR Construction Ltd. (India) Nagarjuna Construction Co.Ltd. (India) JV
Consultant Agreement	Consulting Engineering Services (India), International Consultants and Technocrats PVT.Ltd. (India), Scetauroute International (France), Pacific Consultants Co., Ltd. (Japan) JV
Feasibility Study, etc.	1992, UP State Government

2. Results and Evaluation

2.1 Relevance

2.1.1 Relevance of the Plan at the Time of Appraisal

In India’s 8th 5-year plan (1992-1997), improvement of the economic and social environments through more efficient distribution was declared as a goal.

National Highway 24 is one of the important routes for the metropolitan area of Delhi and improvement of traffic was an urgent issue. Traffic jams and traffic accidents occurred frequently due to the increase in traffic volume (21,000 PCU/day as of 1995)². Consequently, this project’s priority and level of urgency was high.

2.1.2 Relevance of the Plan at the Time of Evaluation

In India’s 10th 5-year plan (2002-2007), the National Highway Development Programme (NHDP)³ is declared as an important policy. The widening of the main national highway including National Highway 24 to four lanes is an important part of that plan.

Consequently, the importance of this project is considered high at the current point in time.

² PCU is an abbreviation for Passenger Car Unit and is a unit indicating traffic volume. The standard traffic volume required for expanding a road to four lanes in India in 1995 was 15,000 PCU/day.

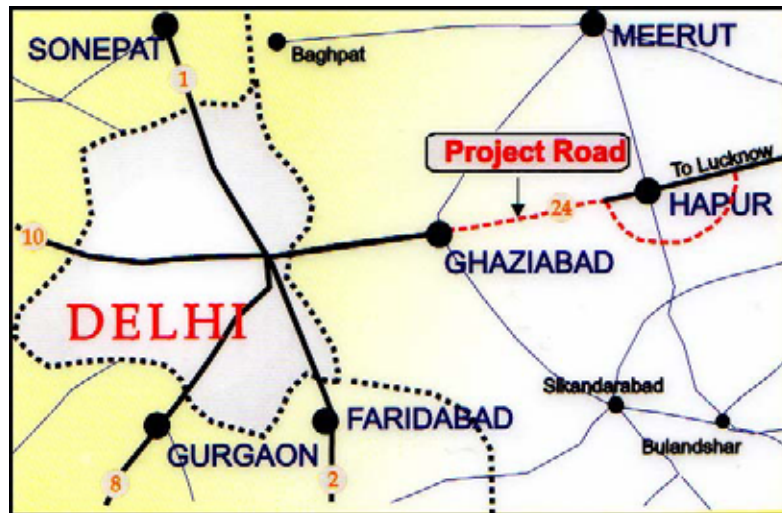
³ National Highway Development Programme: a development plan for national roads that connect Delhi, Mumbai, Chennai, and Calcutta (known as the “Golden Quadrilateral”) as well as the national highways that lie on the diagonals of the quadrilateral.

2.2 Efficiency

2.2.1 Output

The project road is the area from the 27.6 km point from Delhi to the 58.8 km point from Delhi along National Highway 24. The site map for this project is shown below. (The project road is shown as a dashed line in Figure 1.)

Figure 1: Site Map of this Project



The actual output of the project is as described below.

Figure 2 The bypass constructed through this project

- (1) Expansion of the Existing Road (from two lanes to four lanes) (project road: from the 27.6 km point to the 48.6 km point)

This output was implemented as planned.

- (2) Bypass Construction (project area: 48.6 km point to the 58.8 km point)

To build an eco road⁴ of the required height and width, the height of the bypass was altered from 1.5 meters -2 meters to 4 meters – 6 meters higher than the surrounding roads. Except for that alteration, the bypass was implemented according to plan.



- (3) Pavement of Existing Roads (project area: 27.6 km point to the 48.6 km point)

This output was implemented as planned. Furthermore, guardrails were installed to ensure the safety of residents' passage.

⁴ "Eco road" refers to a road where detailed consideration has been given to preservation of the natural environment in all stages from the study and planning stages to the design, building, and management stages. Together with selecting appropriate routes so as to minimize alterations to the natural environment, various design features are incorporated, including usage of many tunnels and bridges so that animals' habitats are not split apart and installation of structures that allow animals to cross the road safely. It is surmised that the embankment was raised in this case in order to prevent animals from entering the roadway and to build a culvert to allow the animals to pass safely to the other side.

(4) New Installation and Reinforcement of Bridges and Culverts

It was decided to construct an overpass (elevation 37.9 meters) as a part of this project upon consultation with the National Highways Authority of India (NHAI) and the Ministry of Railways after commencement of this project. Except for that alteration, this output was implemented as planned.

2.2.2 Project Period

In the original plan, the project was scheduled to last 68 months from February 1995 to September 2000 (from the signing of the loan agreement to the completion of construction in the project area). However, the completion of construction was delayed due to the above-mentioned adjustments in the output. For that reason, the actual project period was 92 months, from February 1995 to September 2002.

2.2.3 Project Cost

The project cost was 4,273 million yen, or 71% of the originally planned amount (of 5,976 million yen). The lower actual cost was due to the effect of exchange rate fluctuation and efficient ordering through competitive bidding, etc.

Furthermore, there was no resident relocation accompanying the land acquisition (34.3 ha) because no residents resided in the area acquired. Along a portion of the road, there were illegal occupants operating makeshift shops selling soft drinks, fruit, and daily sundries, etc. (16 shops). The resident relocation of those shops was implemented based on state law (with 32.9 million rupees in grants), and no problem occurred.

Moreover, both the consultant and the contractor were very highly evaluated by the executing agency, and no problem was reported concerning their supervisory or construction capabilities, etc.

As stated above, although there was a delay in the project period, the output achieved exceeded the plan, including the consideration given to the eco road and the installation of the overpass and the project cost was less than originally planned. Thus, it can be said that overall there were no problems in the efficiency of the project’s implementation.

2.3 Effectiveness

2.3.1 Reduction of Time Required

Road construction on this project’s road section was completed in September 2002. On Table 1 is shown the travel time required before and after completion of road construction on the project’s road section.

Table 1: Travel Time on Project’s Road Section (minutes)

	Time Required Before Project	Time Required After Project
Ordinary Traffic	90	25
Peak Traffic	120	35

Source: National Highway Authority of India (NHAI)

Due to this project, the time required to travel the project’s road section was reduced by approximately one hour during ordinary traffic times and by one and a half hours during peak traffic

times.

2.3.2 Traffic Volume's Forecast Rate of Increase

The total average daily traffic volume in 2003 and 2004 following completion of the road construction on this project's road section was 9,812 vehicles/day and 10,987 vehicles/day, respectively. These figures were both less than the planned level (Table 2).

The actual figures are lower than the planned figures because the traffic volume figures at the time of appraisal were based on measurements (measurements by eye) at junctions and not at interim points on the road, while actual traffic volume in 2003 and thereafter was measured automatically at toll booths. For this reason, the actual figures are smaller and comparison on the same basis as the planning figures is impossible.

As stated above, although the change in traffic volume on the given section of road is unclear, on the bypass the actual percentage increase in traffic volume (11.9% actual increase) exceeded the planned level (9% planned increase) at the point in time two years following the completion of construction. So, it seems that the effects of the project are gradually becoming apparent.

2.3.3 Road Transport Volume

At the time of appraisal, no planned level was set for the average daily freight and passenger transport volume on the project road. Comparing the figures for FY2002 and FY2003, the average daily transport volume for freight and passengers increased by approximately 3% and 5%, respectively (Table 3).

2.3.4 Economic Internal Rate of Return (EIRR)

2.3.4.1 Recalculation of EIRR Taking Reduction of Travel Expense as a Benefit

At the time of appraisal, the EIRR was calculated as 22.3%, assuming a project life of 15 years, taking the project cost, operation and maintenance cost, and restoration construction cost as expenses, and taking reduction of travel expense as a benefit.

When EIRR was recalculated for this study using the same conditions used at the appraisal, the result was 7.3%. The reason the EIRR in this study was less than the figure in the appraisal is that the actual traffic volume was less than the volume forecast in the appraisal. This is because the actual traffic volume was not measured at the same location as at the time of appraisal.

2.3.4.2 Calculation of EIRR Taking Reduction of Travel Time as a Benefit

Because the necessary data on reduction of travel time was unobtainable at the appraisal, it was not included as a benefit in EIRR calculation. However, this study attempted to calculate EIRR with the

Table 2: Average Daily Traffic Volume on Project Road (vehicles/day)

		2003	2004
Passenger Cars	Planned	9,578	10,584
	Actual	6,424	7,099
Buses	Planned	4,765	5,165
	Actual	1,623	1,868
Trucks	Planned	11,684	12,654
	Actual	1,765	2,020
Total	Planned	26,027	28,403
	Actual	9,812	10,987

Source: National Highway Authority of India (NHAI)

Table 3: Average Daily Transport Volume on Project Road

Fiscal Year	Freight (ton/day)	Passengers (persons/km/day)
FY2002	20,400	100,000
FY2003	21,000	105,000

Source: National Highway Authority of India (NHAI)

inclusion of both reduction of travel expense and reduction of travel time as benefits. As a result, an EIRR of 11.2% was calculated when reduction of travel time was included as a benefit.

2.3.5 Financial Internal Rate of Return (FIRR)

FIRR as not calculated at the appraisal, but this study attempted to calculate FIRR using the following method. FIRR was calculated taking the project cost, operation and maintenance cost, and restoration construction cost as expenses, the same as for the EIRR, and taking the toll fee income collected at the toll booths as a benefit. The result was an FIRR of 2.6%.

To sum up the above, because there are no appropriate baselines for comparison, judgment concerning the forecast increase in traffic volume and the effect on road transport volume is difficult. However, it may be said that a positive effect is apparent in the reduction of travel time. Consequently, the objective of this project “to promote the smooth flow of traffic at the project target area” can be considered to be basically achieved.

2.4 Impact

2.4.1 Promotion of Industrial and Economic Development in the Region Surrounding the Road

According to the executing agency, the estimated number of beneficiaries of this project is 180,000 persons (cf. the population of Minato City, Tokyo is 170,000 persons). From FY1991 to FY2001, the population of Ghaziabad, a city in the project region, basically doubled from 454,156 persons to 968,521 persons, and the population of Hapur, another city in the project region, increased by 1.4 times, from 146,262 persons to 211,987 persons. Considering that the total population of UP increased by approximately 1.3 times during the same period, the population of Ghaziabad is growing very rapidly.

Commercial development, etc. is progressing rapidly together with the population growth, and Ghaziabad’s role as a satellite town is growing stronger. Following the implementation of this project, large stores and a large-scale residential area with 500 houses was constructed along National Highway 24, and it is anticipated that this will further promote industrial and economic development in the region surrounding the road.

Figure 3: Dental junior college being constructed along the road following this project



2.4.2 Improvement of Access to Social Services

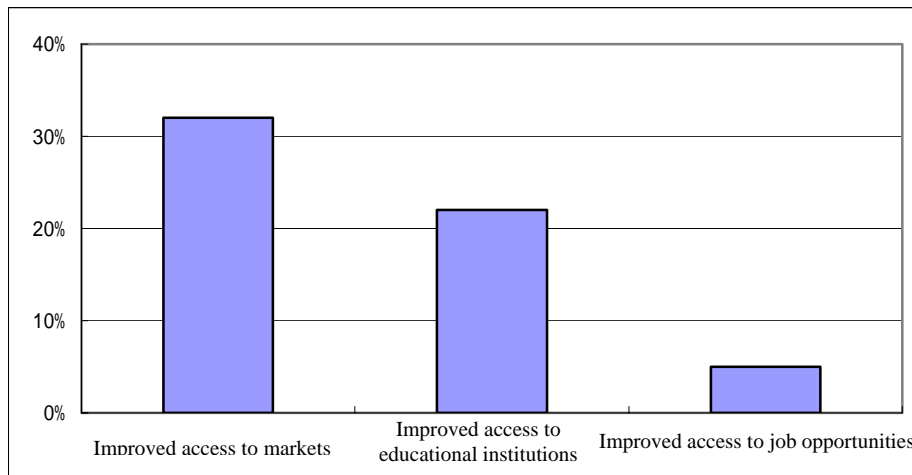
Following the implementation of this project, a new technical college, law school, dental junior college, and an international school were constructed along National Highway 24.

In this study, a survey of area residents was conducted to better understand the impact of this project on residents in the region surrounding the road. The survey was conducted with the participation of 97 residents, including 35 farmers, 30 persons involved in commerce and industry, and 32 other ordinary residents. The results of this resident survey are displayed below.

-Results of Survey of Residents in Region Surrounding Road-

-Improvement of Access to Social Services-

When questioned concerning improvement of access to social services as a result of this project, approximately 80% of respondents replied that “access to social services along the road improved due to the improvement in the road condition.” As specific improvements, 32% mentioned “improved access to markets and factories,” 22% mentioned “improved access to educational institutions,” and 5% mentioned “improved access to job opportunities.”



Furthermore, according to the results of the beneficiary survey, travel time from Hapur to Delhi was 2 and a half to 3 and a half hours prior to the implementation of this project in 2000, but following the implementation of the project in 2003, travel time was greatly reduced to 1 and a half to 2 and a half hours. So, it appears that the project greatly contributed to improved access to Delhi.

2.4.3 Increases in Incomes of Residents in the Region around the Road

According to the survey of 30 persons involved in commerce and industry among the area residents in the project region, approximately 80% replied that their average monthly household incomes rose by 2,256 rupees in the year from FY2002 to FY2003 due to increases in transport volume of agricultural products and shorter transport time. Meanwhile, according to the survey of 35 farmers, only 31% replied that their average monthly household incomes increased the year from FY2002 to FY2003 due to an increase in transport volume of agricultural products. A mere 6% of farmers replied that they have switched to commercial crops, and so this can be surmised that, at the current point in time, the uptrend in farmers' income is not particularly striking.

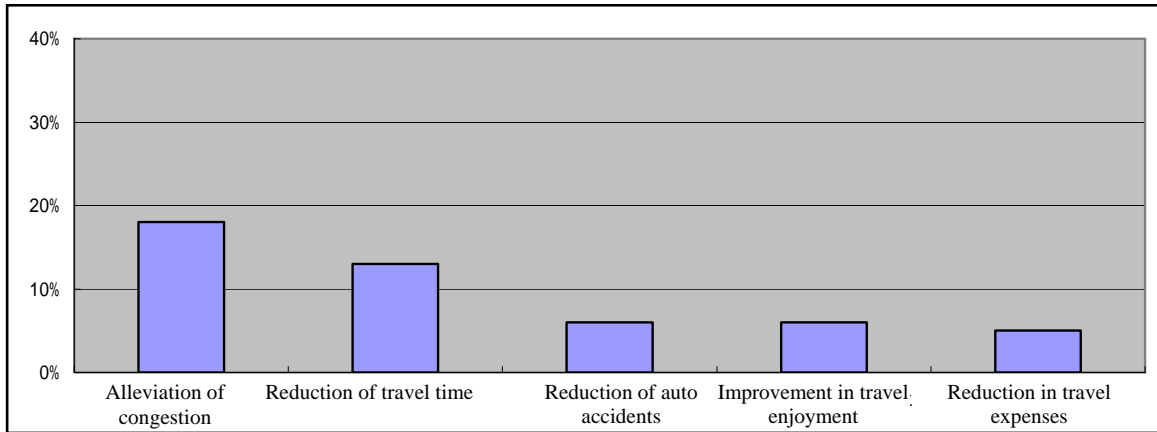
2.4.4 Increased Convenience of Transportation

According to the results of the residents' survey in this study, nearly 100% of area residents replied that the convenience of transportation improved due to this project. The results of the survey concerning increased convenience of transportation due to this project are displayed below.

-Results of Survey of Residents in Region Surrounding Road-

-Increased Convenience of Transportation-

When questioned concerning convenience of transportation in relation to this project, as specific improvements, approximately 18% mentioned “alleviation of traffic congestion in Hapur,” approximately 13% mentioned “reduction in travel time,” 6% mentioned “reduction in auto accidents,” and “increase in enjoyment of auto trips,” and approximately 5% mentioned “reduction in travel expenses” (Furthermore, half of the residents replied that there are multiple improvements such as improvement of convenience of transportation and reduction of travel time.)



2.4.5 Negative Social and Economic Effects

According to the results of the residents’ survey in this study, approximately half of the area residents responded that the project had social and economic effects that included deterioration of public peace and order.

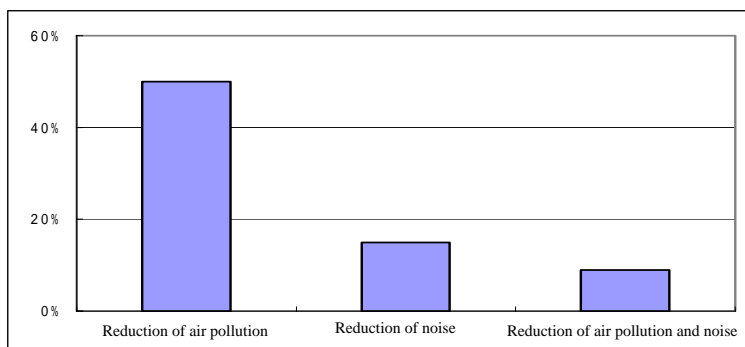
2.4.6 Impact on the Environment

No quantitative data could be obtained, but according to the executing agency, it was reported that air pollution and noise were ameliorated in the city of Hapur due to the alleviation of traffic congestion as a result of this project. The results of the survey of area residents concerning the environmental impact of this project are shown below.

-Results of Survey of Residents in Region Surrounding Road-

-Environmental Impact-

When questioned concerning the environmental impact of this project, approximately 75% of respondents replied that “positive environmental effects were realized through road improvements.” As specific improvements, 50% mentioned “reduction of air pollution,” 15% mentioned “reduction of noise,” and 9% mentioned “reduction of air pollution and noise.”



2.5 Sustainability

2.5.1 Executing Agency (National Highway Authority of India (NHAI))

2.5.1.1 Operation and Maintenance System

The executing agency of this project is the Ministry of Road Transport and Highways⁵. Under the supervision of the Ministry of Road Transport and Highways, the National Highway Authority of India (NHAI) is responsible for operation and maintenance of the project. NHAI was established in 1988 by the National Highway Authority Law as an agency for constructing national highways and implementing their operation and maintenance. NHAI began to function in February 1995. For this project, subcontractors under the management of NHAI are undertaking operation and maintenance of the national highway and operation of the toll booths, and no problems have been reported.

2.5.1.2 Technical Capacity

The operation and maintenance of this project is being implemented in accordance with the quality control manual. The NHAI has established a training system for quality control and project evaluation methods, etc., is providing opportunities to staff for periodic training, and is endeavouring to improve operation and maintenance of technology.

Figure 4: Toll booth on the project road



2.5.1.3 Financial Status

Following the completion of road work on the project road (September 2002), the operation and maintenance cost from December 2003 to November 2004 was 29.4 million rupees. Also, since the monthly average toll fees collected in FY2004 by the national highway toll booths was 9.15 million rupees, the annual income exceeds the operation and maintenance cost. Therefore, efforts are necessary to ensure that this trend continues in the future.

2.5.2 Operation and Management Status

This survey mission inspected the project road area during the field survey. No problems had occurred in either the structural elements or the pavement of the constructed road. Periodic road cleaning as well as operation and maintenance are being conducted by NHAI, and the operation and maintenance condition is satisfactory.

⁵ The executing agency at the time of appraisal was the Ministry of Surface Transport. However, in July 2000, this ministry was divided into the Ministry of Shipping and the Ministry of Road Transport and Highways. Thus, the executing agency for this project became the Ministry of Road Transport and Highways.

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

None

Comparison of Original and Actual Scope

Item	Planned	Actual Performance
1. Output		
1) Widening of existing road	2-lane to 4-lane Project area: from the 27.6 km point to the 48.6 km point (total length: 21 km)	As planned
2) Bypass construction	Project area: from the 48.6 km point to the 58.8 km point (total length: 11.2 km) Bypass height: 1.5 m to 2 m	Project area implemented as planned Height of bypass altered to 4 m to 6 m
3) Pavement of existing road	Project area: from the 27.6 km point to the 48.6 km point Asphalt pavement	As planned
4) New construction and reinforcement of bridges and culverts	3 bridges under 30 m 1 bridge over 30 m and less than 60 m 1 bridge over 60 m m (5 bridges total)	In addition to the plan, additional construction of an overpass was added.
2. Project Period		
Consultant selection	July 1994-July 1996	October 1997
Consulting service	June 1995-September 2000	December 1997-May 1999
Bidding/Evaluation	January 1996-July 1996	July 1998-August 1999
Engineering works	November 1996-April 2000	April 1999-September 2002
3. Project Cost		
Foreign Currency	1,376 million yen	111 million yen
Local Currency	4,600 million yen (1,369 million rupees)	4,161 million yen (1,420 million rupees)
Total	5,976 million yen	4,273 million yen
ODA Loan Portion	4,827 million yen	2,792 million yen
Exchange Rate	1 rupee = 3.36 yen	1 rupee=2.93 yen