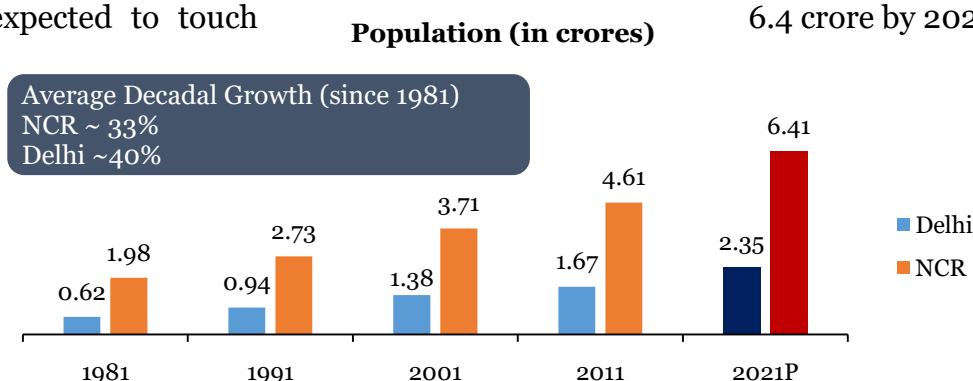


# Implementing Regional Rapid Transit System (RRTS)

## Relevance of Regional Rapid Transit System (RRTS) in NCR

### Context

Delhi is a city of opportunities not only for nearly 1.6 crore<sup>1</sup> of its citizens but also for people living in the National Capital Region (NCR), a coordinated planning region centered around National Capital Territory (NCT) of Delhi. The region encompasses entire city of Delhi and several districts surrounding it from the states of Haryana, Uttar Pradesh and Rajasthan. The region is the fastest growing urban agglomeration in India with population exceeding 4.6 crore<sup>2</sup> and is expected to touch 6.4 crore by 2021.<sup>3</sup>

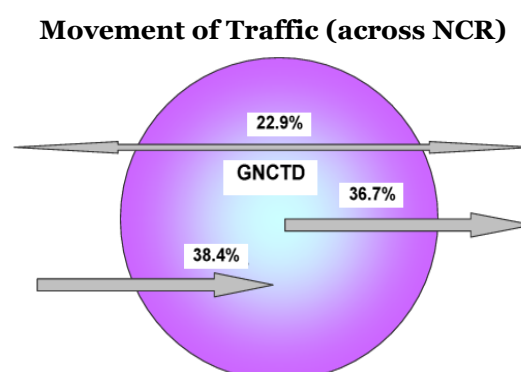


Source: Travel Demand Forecast Study, Delhi-Meerut RRTS Corridor

The following discussion paper highlights the role that Regional Rapid Transit System (RRTS) will play in not only decongesting Delhi, but also in generating other positive externalities for the entire region. Once operational, RRTS will be the backbone of public transportation in NCR.

### Nature of Vehicular Traffic Crossing Delhi Borders

As per the Functional Transport Plan, 2032, more than 1 million (about 1,107,043) vehicles cross Delhi borders in a day (based on 2007 data). About 1/4th of vehicular traffic is of transient nature, i.e., NCR to NCR crossing Delhi.<sup>4</sup> This highlights that an alternative mode of regional transportation, such as RRTS, can relieve the roads of significant vehicular traffic travelling within NCR but do not have origin or destination within Delhi.



Source: Functional Plan on Transport for NCR - 2032

ODs	Percentage	Remarks
Internal – External (IE)	36.7%	Origin within NCTD
External – Internal (EI)	38.4%	Destination within NCTD

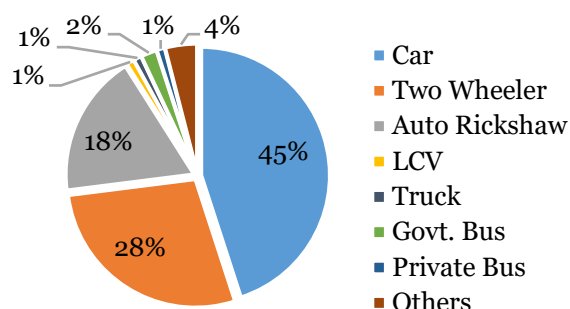
<sup>1</sup>2011 census

<sup>2</sup>2011 census

<sup>3</sup>Travel Demand Forecast Study, Delhi-Meerut Corridor, NCRPB

<sup>4</sup>Functional Plan on Transport for NCR, 2032

**Modal Split of Road Traffic (near Delhi)**



External – External (EE)	22.9%	(both O&D outside NCTD)
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Additionally, as the traffic moves closer to Delhi, the share of motorized vehicular traffic increases in the total traffic.

The rapidly growing size of the capital city and its population, along with the increasing influx of people from the surrounding areas, are leading to congestion on the roads and serious environmental issues in Delhi.

## Vehicular Traffic Growth and its Implications in Delhi

*Source: Travel Demand Forecast Study, Delhi-Meerut RRTS Corridor*

Master Plan of Delhi (MPD) 2021 notes that the period between 1981 and 2001 and subsequently 2011 has seen a phenomenal increase in the growth of vehicles and traffic in Delhi. There has been a rise in per capita trip rate (excluding walk trips) from 0.72 in 1981 to 0.87 in 2001 and exponentially more in 2011. Keeping in view the population growth, this translates into an increase from 45 lakh trips to around 118 lakh trips in 2001 and 144 lakh trips till 2008. As per the Transport Demand Forecast Study (TDFS) undertaken by Government of National Capital Territory, Delhi (GNCTD) and approved by Unified Traffic and Transportation Infrastructure Planning & Engineering Centre (UTTIPEC) in 2011, it is seen that between 2001 and 2008, the private motor vehicle trips have increased from 28% to 35% and non-motorized vehicle trips from 9% to 15%; however, bus trips have unfortunately decreased from 60% to 42% of the total number of trips. Based on the rate of increase in the number of trips between 1981 and 2001/2011, it is estimated that the total trips would rise to 280 lakh per day by the year 2021, including 257 lakh motorized trips and 23 lakh non-motorized trips.<sup>5</sup>

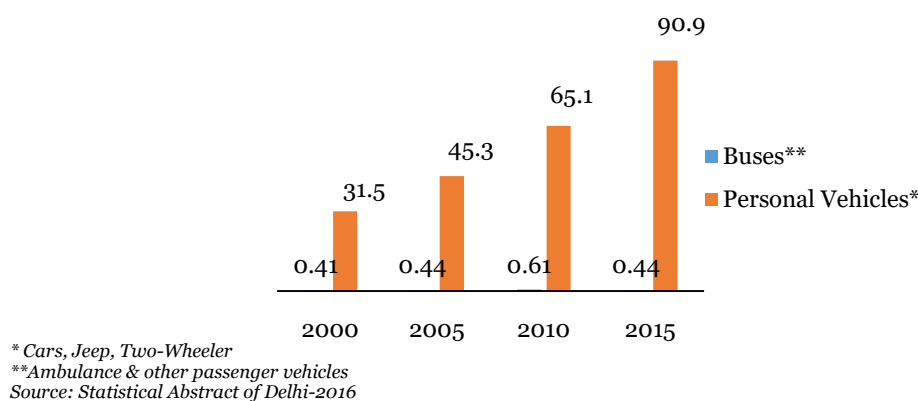
Despite measures by way of increasing the length of the road network and road surface space through widening, construction of a number of flyovers / grade separators and, launching of the Metro, the traffic congestion has continued to

<sup>5</sup> [http://moud.gov.in/upload/uploadfiles/files/Decongesting\\_TrafficDelhi06.pdf](http://moud.gov.in/upload/uploadfiles/files/Decongesting_TrafficDelhi06.pdf)

increase unabated. Roads already occupy approximately 21 percent of the total area of the city, which clearly limits the potential for increase in road space.<sup>6</sup>

Also, a recent study by Centre for Science and Environment (CSE) highlights that congestion on Delhi roads is growing at 7% annually. About 537 cars and 1,158 two-wheelers are added every day on the roads.<sup>7</sup> Some of the important observations highlighted in the report are:

- **Arterial roads connected to NCR cities are more congested:** Most of the arterial roads are conduit for traffic from the neighboring NCR cities. For instance, Sri Aurobindo Marg connecting to Gurugram via NH 8 has an average speed of 10 km/hr during evening peak hours. CSE's earlier analysis in 2010 has shown that cars that entered Delhi daily from cities of NCR were more than the total cars registered in the city in 2014-15.



- **Average speed is significantly lower than the design / regulated speed:** The arterial roads<sup>8</sup> have been designed to achieve a driving speed of 50-70 km/hr as per UTTIPEC's street design guidelines as well as Indian Road Congress (IRC) guidelines for urban roads. The regulated speed is 40-55 km/hour. The actual observed average peak speed on these roads now is 26 km/hr and off-peak is 27 km/hr, which is 50-60 per cent lower than the design speed.
- **Non-peak hours are vanishing:** In Delhi, the non-peak hours have nearly disappeared. For most part of the day, speed remains constant. There is negligible variation between peak and non-peak speeds. The average morning and evening peak speeds are 28 km/hr and 25 km/hr, respectively<sup>9</sup>. But the off-peak speed is 27 km/hr which is almost equal to peak speeds.

<sup>6</sup> [http://moud.gov.in/upload/uploadfiles/files/Decongesting\\_TrafficDelhi06.pdf](http://moud.gov.in/upload/uploadfiles/files/Decongesting_TrafficDelhi06.pdf)

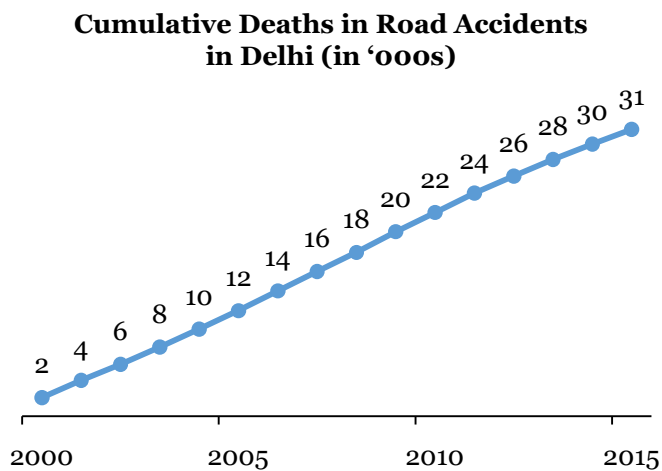
<sup>7</sup> <http://www.cseindia.org/content/congestion-delhi-roads-has-worsened-%E2%80%93-says-new-analysis-cse-latest-google-map-data>

<sup>8</sup> 13 selected arterial roads in the study

<sup>9</sup> 13 selected stretches in the study

- **Air pollution worsens as congestion builds up:** CSE has also analysed hourly air quality data for nitrogen dioxide (NO<sub>2</sub>), largely influenced by traffic, for a selected day. CPCB's real time monitoring data for NO<sub>2</sub> from Anand Vihar, R K Puram, Mandir Marg and Punjabi Bagh shows that when the average morning peak speed of 28 km/hr drops to 25 km/hr in the evening, NO<sub>2</sub> levels increase from 68 microgram/cubic metre to 94 microgram/cubic metre, an increase of 38 per cent. Further, a report, "Comprehensive Study on Air Pollution and Green House Gases in Delhi - 2016", submitted to Government of Delhi (GNCTD) by Indian Institute (IIT), Kanpur, highlights that the levels of particulate matter (PM<sub>10</sub>& PM<sub>2.5</sub>) are 4-7 times higher than the national air quality standards, and attributes vehicular pollution as the second largest and most consistently contributing source of particulate matters.

Additionally, **road safety** has emerged as the most important issue in the recent times, next to health and pollution. The traffic congestion issues have inevitable consequences in terms of accidents. As per report on road accidents in India published by Ministry of Road Transport and Highways, in 2015, Delhi has recorded the highest number of deaths, i.e., 1,622, among the 50 one-million plus cities in India.<sup>10</sup>



Source: Statistical Abstract of Delhi-2016

All the above implications due to traffic congestion and have **significant effect on the economy**. According to a study<sup>11</sup> by IIT Madras, Chennai, in 2013, the estimated annual congestion cost<sup>12</sup> New Delhi Rs 54,000 crore, 12.5 per cent higher than Delhi's total annual budget for the year 2017-18, and is estimated to increase to Rs 90,000 crore a year by 2030. This is further expected to get worse, especially as Delhi has now crossed the 10-million mark of total vehicle registrations.

<sup>10</sup>Road Accidents in India, 2015 –MoRTH (<http://pibphoto.nic.in/documents/rlink/2016/jun/p20166905.pdf>)

<sup>11</sup> [http://www.ee.iitm.ac.in/~krishnaj/Publications\\_files/papers/Draft\\_journal\\_cost.pdf](http://www.ee.iitm.ac.in/~krishnaj/Publications_files/papers/Draft_journal_cost.pdf)

<sup>12</sup>The congestion cost includes – Productivity Losses, Air Pollution Costs, Accidents and Fuel Wastage

In October, 2014, a High Power Committee (HPC) under the Chairmanship of Secretary, Urban Development, was constituted to study and suggest measures to decongest Delhi. The Committee recommended various measures regarding decongesting Delhi, including an improved connectivity for regional transportation in NCR.<sup>13</sup> The Committee felt that the Regional Rapid Transit System (RRTS) Corridors planned by NCRPB is the most critical transit system that will help decentralize growth/ urbanization in the NCR and reduce permanent immigration into Delhi while facilitating growth of satellite towns.

## About Regional Rapid Transit System (RRTS)

Regional Rapid Transit System (RRTS) is a rail based high-speed transit system with a design speed of 180 kmph and an average speed of 100 kmph. Once operational, it will be the fastest, most comfortable and safest mode of commuter transport in NCR. Such high-speed seamless connectivity will reduce pollution and congestion in NCR, thus driving balanced and sustainable urban development in the region. A total of 8 corridors have been identified for creating high speed RRTS links in the National Capital Region, of which 3 corridors – Delhi to Meerut, Delhi to Alwar and Delhi to Panipat - are being taken up for development in the 1st phase. The three corridors will converge at Sarai Kale Khan in New Delhi, and will also have seamless integration with other modes of transportation, such as Delhi Metro Rail Stations, ISBTs (Inter-state Bus Terminals), Airports, and Indian Railways Stations.



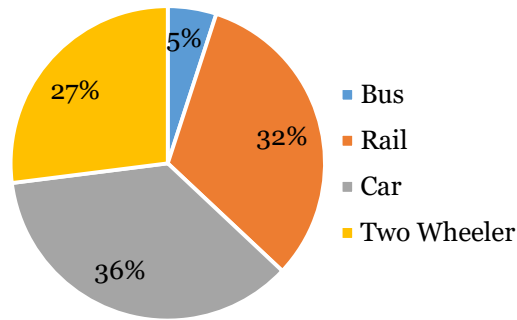
**Delhi-Meerut Traffic:** The total passenger movement along the study corridor is 6,89,415 passengers per day in 2010 (base year). The modal share in figure below shows that maximum (36%) share of passengers is carried by car followed by Rail (32%). Bus and rail together carry about 37% of total passengers. The mode wise breakup of demand is following

base year travel presented in the chart.<sup>14</sup>

**Existing Modal Split  
(Along Delhi - Meerut)**

<sup>13</sup> [http://moud.gov.in/upload/uploadfiles/files/Decongesting\\_TrafficDelhi06.pdf](http://moud.gov.in/upload/uploadfiles/files/Decongesting_TrafficDelhi06.pdf)

<sup>14</sup> DPR



Source: DPR of Delhi-Meerut RRTS Corridor

## Mobility Options

- **Recommendations of High Powered Committee on Regional Connectivity:**
  - RRTS should be implemented to provide for commuters coming to and from Regional Centers and Delhi;
  - Regional Mass Rapid Transit system should be implemented to connect to sub-regional and regional centers;
  - Regional connectivity to be enhanced by road system;
  - Dedicated bus system to be augmented and implemented for regional corridors complete with ITS system and common mobility card; and
  - Bus terminals to be created with mixed use and multi-facility for passenger comfort.
- **Functional Plan on Transport for NCR, 2032:** Various mobility options have been proposed in the Functional Plan on Transport for NCR -2032, prepared by NCRPB, for the sustainable development of urban transport in order to curb growing pollution congestion and vehicular growth. It recommends integrated multi modal transport plan for NCR which mainly consists of:
  - Road System - 4 expressways and 17 regional expressways
  - Regional Rail Transit System (Commuter) - 8 RRTS corridor to connect Delhi with suburbs to be developed by NCRTC
  - Rail links - 9 new rail links
  - Mass Rapid Transit System (metro) - 14 metro lines in the regional and sub regional centers

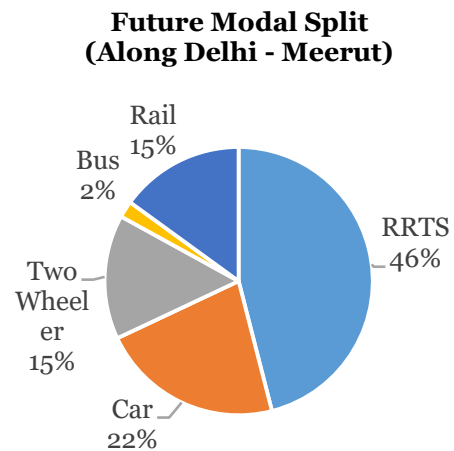
These sub-sector networks need to be integrated with each other in order to provide seamless transfer amongst each other and extend the accessibility of every location within the region and enable mobility of the people of the region.
- **Master Plan of Delhi, 2021:** The Master Plan of Delhi, 2021, envisages that the future transport system shall consist of a mix of rail and road based systems, which may include, metro rail, ring rail, dedicated rail corridors for daily commuters (RRTS/IRBT corridors as identified in NCR Plan 2021), BRTS, and other mass transit modes.



## Relevance of RRTS

RRTS is one of the most suitable option to create a mass and regional rapid transport system for NCR.

- Impact on modal share:** The proposed RRTS would provide an efficient public transport for commuting between Delhi, Meerut, Ghaziabad and other towns enroute. The system will provide substantial time savings apart from other benefits like comfort, safety etc. These characteristics will promote use of public transport in the region and modal split in favor of public transport will increase substantially. The expected future modal split post-implementation of RRTS is presented in chart. It may be observed that public transport share post RRTS will be 63 percent as against 37 percent presently.
- Multi-modal integration:** The 3 RRTS corridors will intersect 7 Delhi Metro lines at various stations. While RRTS will act as backbone for regional transportation, Delhi Metro lines will complement by providing as feeder and dispersal services.



*Source: DPR of Delhi-Meerut RRTS Corridor*

Delhi Metro Line	RRTS Integration Points with DMRC
Red line	Kashmere Gate
Yellow line	Jor Bagh, Kashmere Gate
Blue line	Indraprastha, New Ashok Nagar, Anand Vihar
Violet line	Kashmere Gate
Magenta line	Munrika
Pink line	Sarai Kale Khan, Anand Vihar
Phase IV	Aerocity, Burari Crossing, Indraprastha

*Source: DPR, Delhi-Meerut Corridor*

- Economic Benefits:** The RRTS project is expected to bring in benefits in terms of saving in time, VOC (Vehicle Operating Cost)/fuel cost and also benefits due to improved environmental conditions, comfort and reduced accidents.

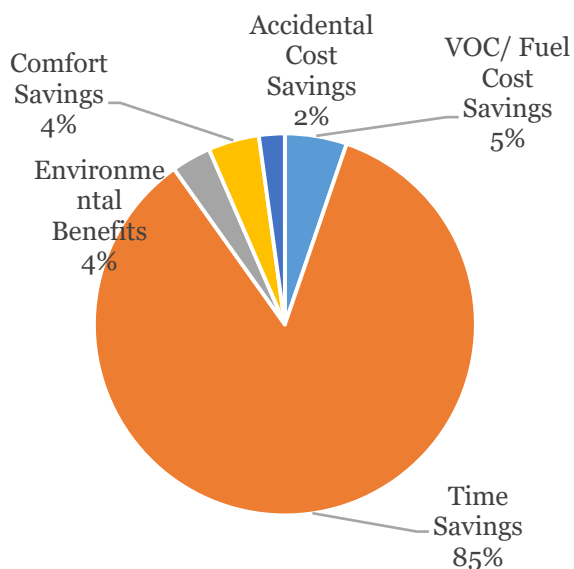
Pollutant	2021	2031	2041
PM	45	55	70
NOX	340	419	531

### Reduction in Pollutants ('000 tonnes)

HC	617	761	964
CO	611	753	954

Source: DPR of Delhi-Meerut RRTS Corridor

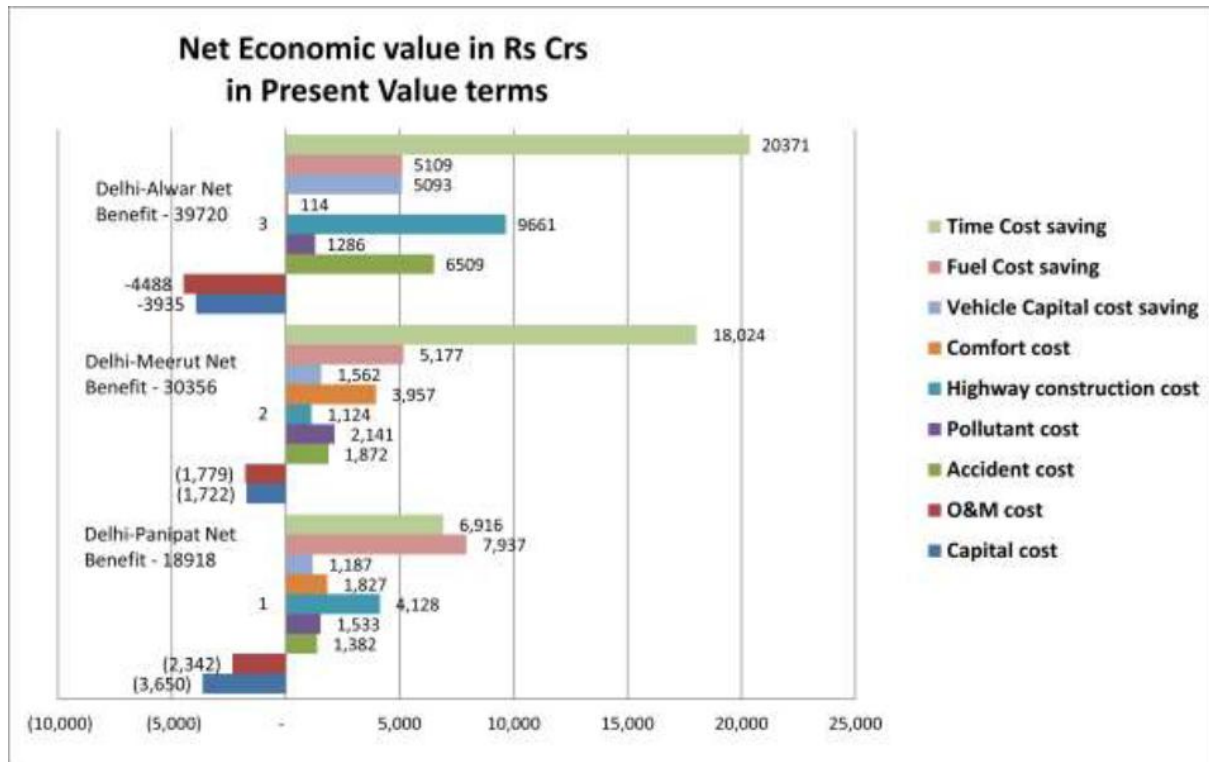
Estimated cumulative savings in fuel, vehicle operating costs/fuel, environmental benefits, comfort savings and accidental cost savings over a period 2025-2054, is expected to be INR 38,378 crores. It has been estimated that project is expected to yield 19.81% of Economic Internal Rate of Return (EIRR) or cumulative net economic benefits of INR 28,766 crore (in terms of net present value).



Source: DPR of Delhi-Meerut RRTS Corridor

- Net Benefits of 3 Corridors for Delhi:** The net benefits during life cycle period (2016-2046) of RRTS Delhi – Alwar, Delhi Panipat and Delhi- Meerut are estimated as Rs 39,720 crore, Rs 18,918 crore and Rs 30,356 crore respectively (in net present value terms) for extending alignment in Delhi.





Source: Dispersal Study for RRTS Stations in Delhi

- Approval of DPR for Delhi-Meerut RRTS Corridor:** NCRTC has sought the approval of DPR of Delhi-Meerut RRTS corridor from both Government of UP (GOUP) and Government of National Capital Territory, Delhi (GNCTD) on 9th December, 2016. The GOUP has approved the DPR on 19th May, 2017, while the approval of DPR from GNCT Delhi is still awaited.

Any delays in approvals will result in cost overruns due to escalation and loss in realization of revenue and profit. It will also affect realization of economic benefits of the project, mainly savings in travel time, decongestion of roads & NCT Delhi and significant reduction in pollution levels in NCT Delhi & NCR.

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