

Infrastructure and Low-Carbon Transport :

Case Study of Delhi - Mumbai Freight Corridor

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Dedicated Freight Corridors


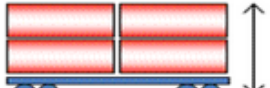
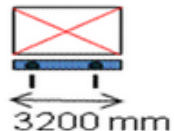
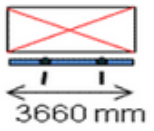

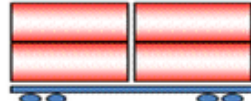



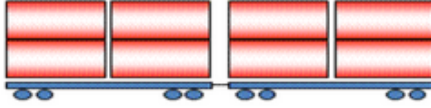
- In 2006, the Ministry of Railways established a Special Purpose Vehicle (DFCCIL) for construction, operation and maintenance of proposed dedicated freight corridors.
- The Eastern Dedicated Freight Corridor (1839 km) and the Western Corridor (1483 km) are being implemented. Both corridors will be commissioned by 2016-17
- The two corridors on completion would cost about Rs. 80,000 crore in 2016-2017
- Funding would be combination of debt from bilateral/multilateral agencies, equity from Ministry of Railways and Public Private Partnerships

Dedicated Freight Corridors

- The railways have tied up Japanese funding of Rs 30,000 crore for the 1,490-km western corridor, while the World Bank is expected to lend about \$2.4 billion for the 1,800-km eastern corridor
- In the first phase, the company has completed land acquisition for 90% (600 kms) of the western corridor and about 50% for the Eastern Corridor
- The other four corridors are still in the planning stage

Source: http://articles.economictimes.indiatimes.com/2011-04-23/news/29466466_1_western-corridor-freight-corridor-industrial-corridor

Design Features of DFC

Feature	Existing	On DFC
Moving Dimensions		
Height	 <p>4.265 m</p>	 <p>7.1 m for Western DFC 5.1 m for Eastern DFC</p>
Width	 <p>3200 mm</p>	 <p>3660 mm</p>
Container Stack	 <p>Single Stack</p>	 <p>Double Stack</p>
Train length	 <p>700 m</p>	 <p>1500 m</p>
Train Load	 <p>4,000 Ton</p>	 <p>15,000 Ton</p>

Currently, it takes a freight train about 50 hours to cover the 1400 km Delhi to Mumbai stretch. Once the freight corridor is commissioned, it would take 17 hours to travel the same distance

Scenarios for the Delhi-Mumbai Corridor Study

➤ Business - as - usual (BAU)

- There are two BAU scenarios – With DFC and Without DFC
- These are based on future projections of freight traffic obtained from studies carried out by ILFS and E&Y
- CO2 emissions are based on the most recent assessments of the CEA
- Emission factors are projected on the basis of national energy-economy models developed by IIMA researchers

➤ Low Carbon Scenario – Conventional

- This scenario is based on supply side interventions leading to improvements in energy efficiency and energy intensity
- It also incorporates policy instruments such as carbon price to meet CO2 emission reduction targets corresponding to the international agreements on climate change

- The integrated energy-economy models at the national level use price signals to choose among alternative energy sources and competing infrastructures based on market allocation principles

➤ Low Carbon Scenario – Sustainable

- Though similar to LCS conventional, the underlying paradigm is different
- It emphasizes co-benefits of pursuing sustainable development goals along with strategies for reducing carbon emissions
- Energy security is an important national objective
- Inclusive development is another important goal
- Behavioural (consumer) responses are also considered

Examples of Sustainable Transitions

- At present, about 30% of freight movement is of coal. Why not produce electricity at pitheads and transmit by wires? Or gas and oil pipelines from ports
- Similarity at city-level
 - Use of cleaner low-carbon fuels
 - More public transport
 - Non motorized transport
 - Integrated land-use transport planning
- Co-benefits and inclusiveness are the two main thrusts of the sustainable development scenarios
- Thus, from 2010 to 2050, even if total carbon decrease is same between Low Carbon– Conventional and Low Carbon–Sustainable, scenarios, they will deliver differently on other indicators.

Illustrative Results for Delhi – Mumbai Freight Corridor

Total Freight Traffic

(billion t.km)

		2010	2016	2020	2030	2040
Without DFC	Rail	209	220	231	252	274
	Road	82	130	207	393	660
With DFC	Rail	204	268	353	551	831
	Road	-	-	-	-	-

Emission Factors of National Grid Mix

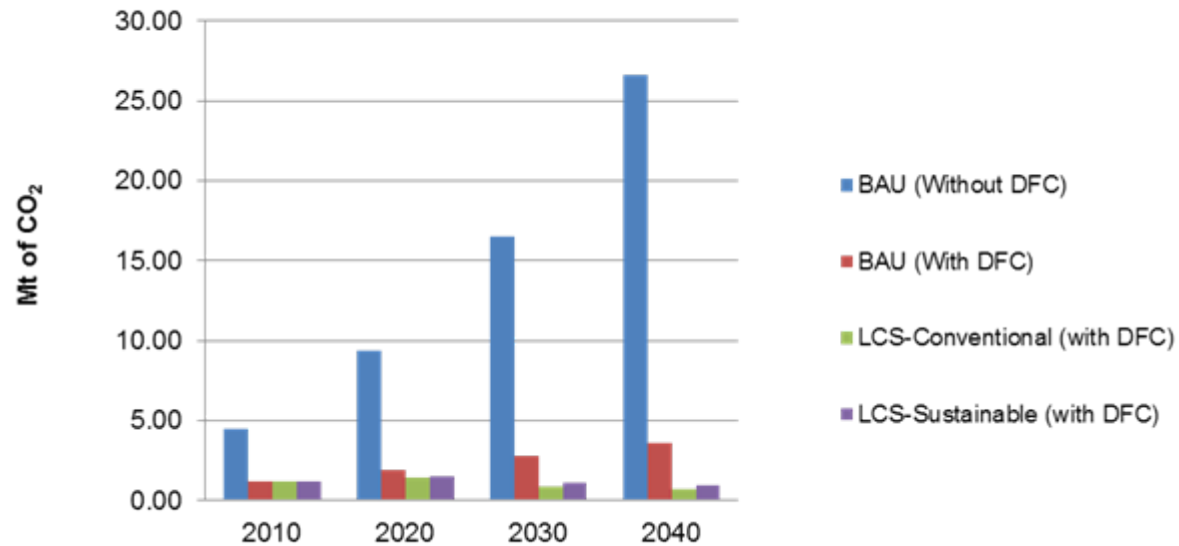
(tCO₂/MWh)

Scenario	2010	2020	2030	2040
BAU	0.89	0.82	0.75	0.65
LCS - Conventional	0.89	0.62	0.25	0.12
LCS - Sustainable	0.89	0.64	0.30	0.17

BAU : Business As Usual

LCS: Low Carbon Scenario

Annual GHG Emissions from Freight Movement



Annual GHG Emissions from Freight Movement

(Million tCO₂)

Scenario	2010	2020	2030	2040
BAU (without DFC)	4.51	9.35	16.49	26.61
BAU (with DFC)	1.22	1.95	2.78	3.61
LCS-Conventional (with DFC)	1.22	1.47	0.91	0.68
LCS-Sustainable (with DFC)	1.22	1.51	1.10	0.93

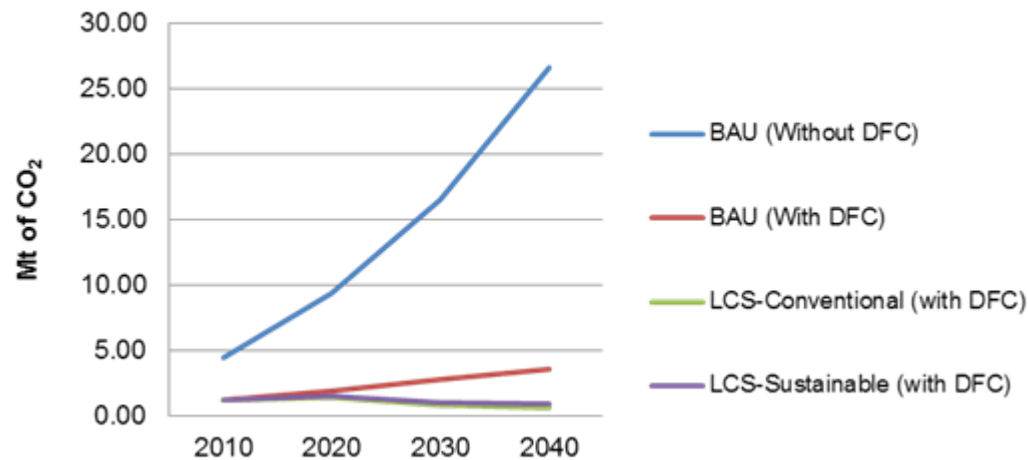
- For long-term policy analysis, the DFC - No DFC comparison is less important
- Even in the No-DFC scenario there can be important transitions that are not captured in the BAU projections, which are largely driven by changes in the grid-mix of electricity generation (and to some extent on the proportion of electric to diesel traction in locomotives)
- The grid-mix could change more drastically in favour of low carbon options, e.g. renewables, even in the baseline without DFC, or use of coal could bounce back with success of Carbon Capture and Storage (CCS)
- Energy security could drive the mix in one direction whereas safety considerations would drive it in the other direction

- Even in the transport sector, for example, trucks could switch to liquid bio-fuels/ hydrogen fuel cells/ electric vehicles
 - As a result, the difference in carbon emissions between DFC and No-DFC scenarios would reduce considerably

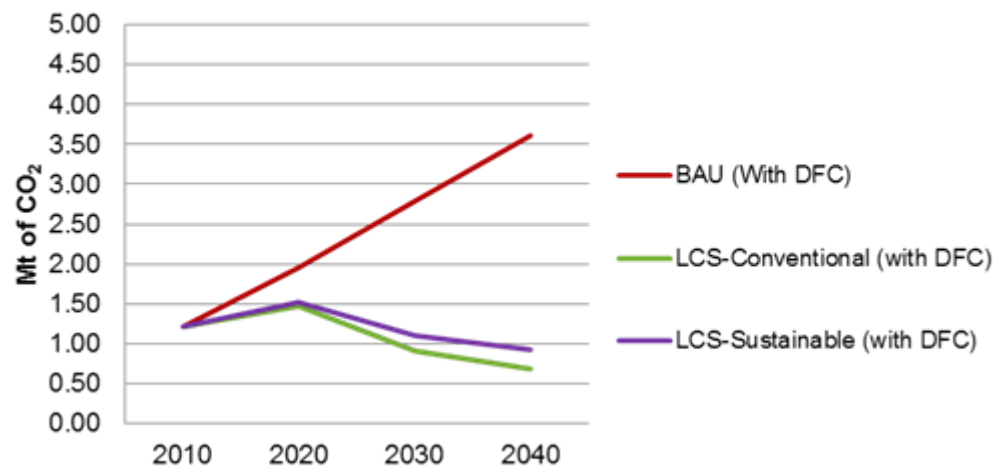
- Competition and choice is not only between DFC and No-DFC (project level options) but also between alternative modes
 - Location of power plants and transmission
 - Pipelines for petroleum products
 - Coastal shipping and inland water transport (IWT)

- All scenarios involve multiple trade-offs other than carbon reduction. Actual gains would depend on the development path taken. Therefore, more useful to focus on the comparison of LCC and LCS scenarios

Annual GHG Emissions from Freight Movement



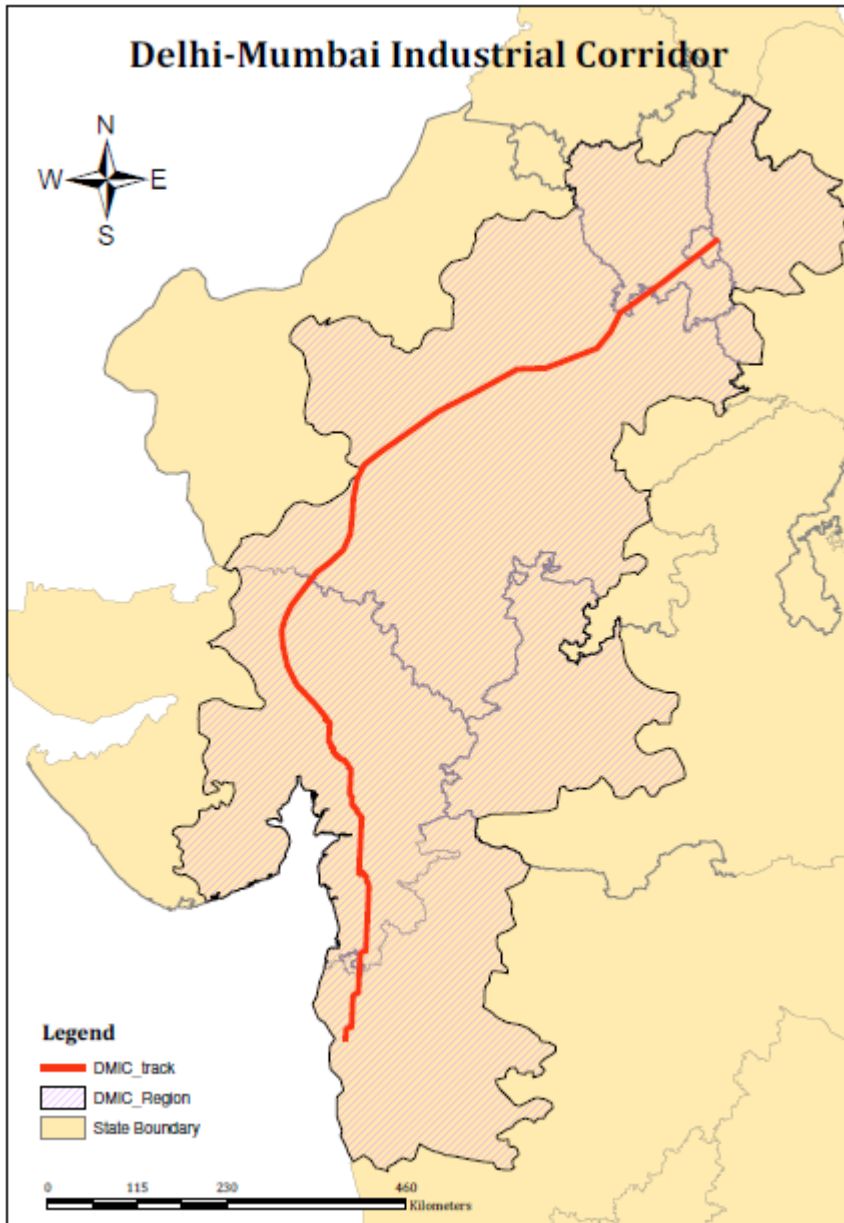
Annual GHG Emissions from Freight Movement



Delhi Mumbai Industrial Corridor

- The Delhi Mumbai Industrial Corridor (DMIC) is an ambitious project taken up by the Government of India in conjunction with the DFC
- The DMICDC was established as the central SPV for monitoring various other SPVs to be formed to undertake development of the Delhi-Mumbai Industrial Corridor
- The main stakeholders of the DMICDC are the Department of Industrial Policy and Promotion, Infrastructure Leasing and Financial Services Limited (IL&FS), and Infrastructure Development Finance Company (IDFC)
- There are indications that IL&FS and IDFC may exit the DMICDC. Their combined share of 51% would then be transferred to government-owned financial institutions like the LIC and HUDCO, making DMICDC a wholly government-owned entity.

Delhi Mumbai Industrial Corridor

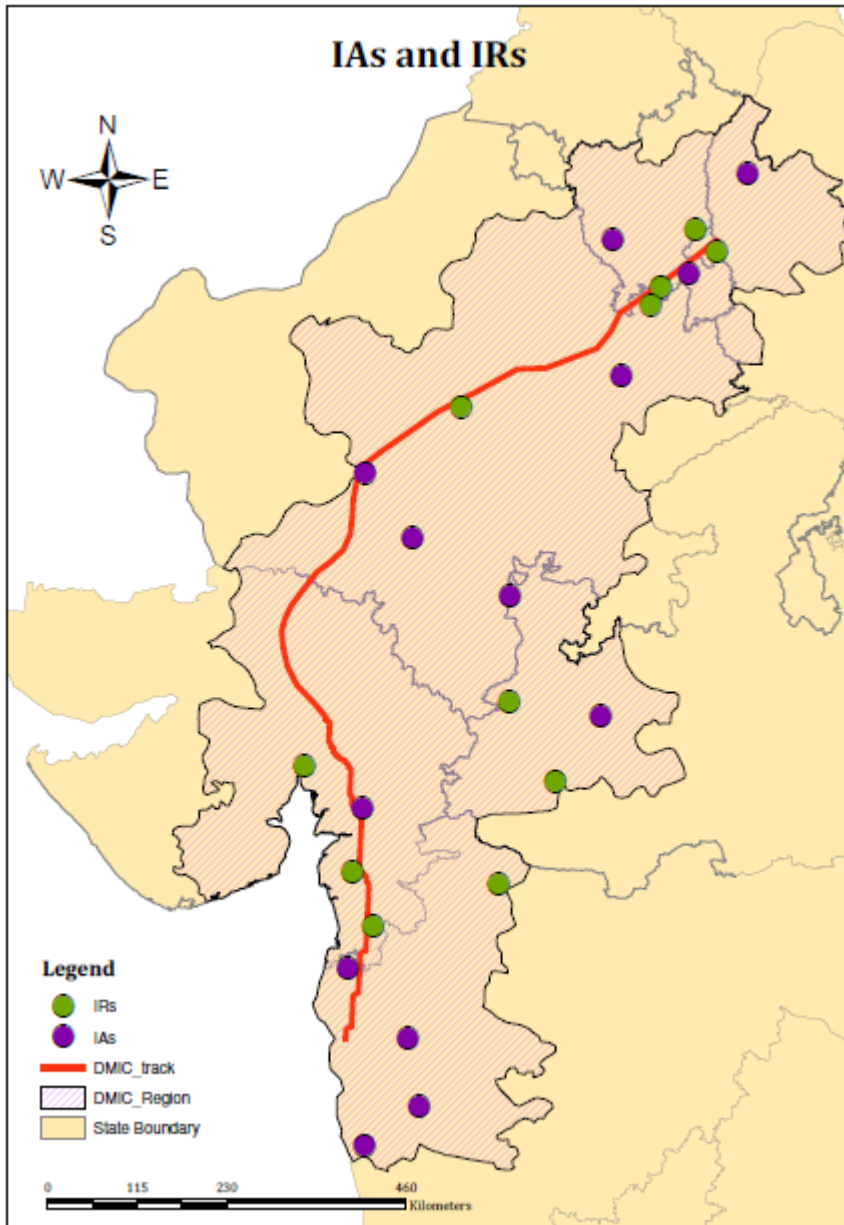


Features

• Total Area (sq. km)	514107
• Total Population (million)	199.88
• Population Density	389
• Urban Population (%)	38.7
• % of total exports	60%
• Foreign Direct Investment	52%
• Gross industrial output	54% of India

- DMIC passes through 6 states, namely, Haryana, Delhi, Rajasthan, Uttar Pradesh, Madhya Pradesh, Gujarat and Maharashtra

Planned Developmental Nodes



- Twenty-four market oriented centers
- 13 nodes are being developed as Industrial Areas (IA) with a minimum area of 100 sq km
- 11 nodes are being developed as Investment Regions (IR) with a minimum area of 200 sq km.
- 1st Phase during 2008-2012 would see the development of 6 IR and 6 IAs and rest of the development would be phased out in the next 4 years.

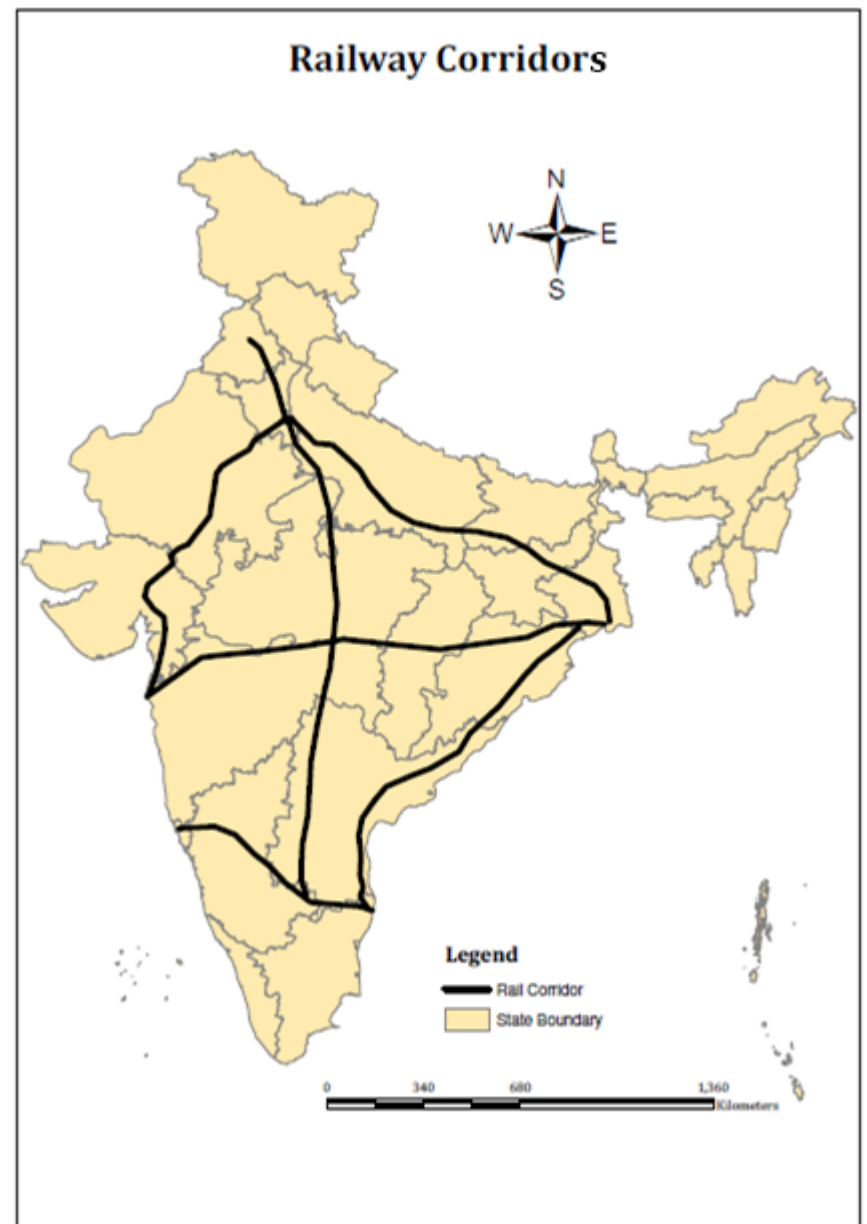
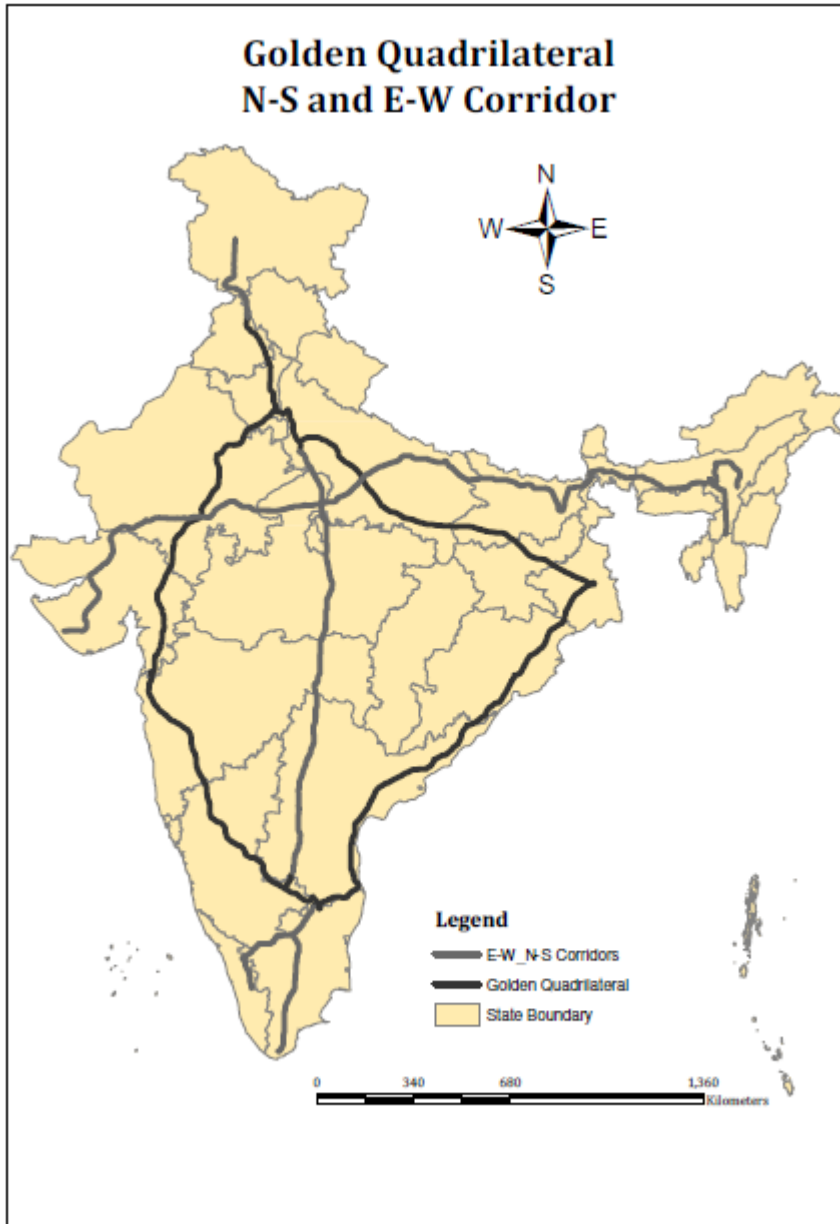
Regional Development Strategy

- DMIC project is being implemented for a stretch of 1483 km
- The project would comprise of seven new cities, nine industrial parks, three ports, six airports and a 1,483 km high-speed rail and road network that will be connect trading hubs
- The industrial corridor has proposed a revolving fund of Rs.18,500 crore to finance trunk infrastructure such as sewage disposal and roads, with the government providing 35-40 per cent of the financing.
- The proposed new cities will get Rs. 2,500 crore, while Rs. 1,000 crore will be available for planning and project development.

Eco-Cities

- DMIC plans to develop self-sustaining, energy efficient and eco-friendly cities with a well developed public transport system
- Seven such cities have been planned at Ahmedabad-Dholera region in Gujarat, Nasik-Igatpuri-Sinnar in Maharashtra, Manesar-Bawal in Haryana, Khushkhera-Bhiwadi-Neemrana in Rajasthan, Dadri-Noida-Ghaziabad in Uttar Pradesh, Pitampura-Dhar-Mhow region in Madhya Pradesh, and Dighi Port industrial Area in Maharashtra.
- Later, seventeen such cities have been planned for development. About Rs. 185 billion would be required for the development of these cities.
- To build an efficient transport system, accessible road network and storm water drainage and sewerage system in the cities a total amount of about Rs. 175 billion would be utilized.

Proposed Dedicated Freight Corridors



Low-Carbon Transport and Development

- This case study takes a long-term perspective of development while recognizing that implementation horizon of specific projects has to be short-term
- Transport and development have a symbiotic relationship. A robust development strategy needs strong transport infrastructure and conversely transport infrastructure is necessary for achieving full potential of regional development
- The Dedicated Freight Corridor (DFC) is an important decision, but the development outcomes in this case would be largely determined by the success of the DMIC strategy
- Low-carbon transport infrastructure decisions have to be aligned with low-carbon sustainable development actions on several fronts to maximize social welfare gains

Thanks !