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DEDICATED FREIGHT CORRIDOR CORPORATION OF INDIA LIMITED

Scoping Report on Cumulative Impact Assessment of Eastern Dedicated Freight Corridor (Ludhiana – Mughalsarai Section)

APRIL, 2015

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ABBREVIATIONS AND ACRONYMS

AKIC	:	Amritsar – Kolkata Industrial Corridor
AKICDC		AKIC Development Corporation
CIA	:	Cumulative Impact Assessment
CPM	:	Chief Project Manager
CPRs	:	Common Property Resources
DFC	:	Dedicated Freight Corridor
DFCCIL	:	Dedicated Freight Corridor Corporation of India Limited
EA	:	Environmental Assessment
EDFC	:	Eastern Dedicated Freight Corridor
EIA	:	Environmental Impact Assessment
EM	:	Entitlement Matrix
EMP	:	Environmental Management Plan
GHG	:	Greenhouse Gas(es)
ha	:	hectare
IFC	:	International Finance Corporation
IMC	:	Integrated Manufacturing Cluster
IS	:	Indian Standard (Bureau of Indian Standards)
kmph	:	kilometres per hour
LOA	:	Letter of Acceptance
MoEFCC	:	Ministry of Environment, Forest and Climate Change
NAAQS	:	National Ambient Air Quality Standards
NGO	:	Non-Governmental Organisation
PAFs	:	Projects Affected Families
PAPs	:	Project Affected Persons
RAP	:	Resettlement Action Plan
RoW	:	Right of Way
RPF	:	Resettlement Policy Framework
Ro-Ro	:	Roll On – Roll Off
RPM	:	Respirable Particulate Matter
SIA	:	Social Impact Assessment
SPM	:	Suspended Particulate Matter
SPV	:	Special Purpose Vehicle
SR	:	Sensitive Receptors
TH	:	Title Holders
VEC	:	Valued Environmental Components
WDFC	:	Western Dedicated Freight Corridor

1 EXECUTIVE SUMMARY

Background

Conventional railway systems operate with passenger and freight trains sharing the same infrastructure, which often results in conflicting priorities and reduced carrying capacity of the system. Many countries around the world use rail infrastructure for "long haul operations", which is another term for freight corridors, specifically built for transportation of bulk freight goods by railways. However, few countries like Australia, South Africa, China, Netherlands and USA have dedicated freight corridors. Dedicated freight corridors are rail lines whose planned use is restricted to freight trains only. A dedicated rail freight network would consist of an integral network of such lines, either newly constructed lines or existing lines converted to dedicated freight use, with adaptation where necessary.

There is increasing recognition among policymakers in India that transport infrastructure could become a serious bottleneck for future economic growth. This is particularly the case for freight transport as high growth in freight traffic is expected to continue in the medium and long-term. The idea of developing the dedicated rail corridors for freight movement was conceived in 2005 in a joint declaration by the Government of India and Japan. After studying its feasibility and obtaining necessary approvals, the Ministry of Railways established a Special Purpose Vehicle (SPV) – Dedicated Freight Corridor Corporation of India Limited (DFCCIL) – under the Companies Act in October, 2006.

Objective

The broad objective of this scoping report on cumulative impact assessment (CIA) study for the proposed Eastern DFC project form Ludhiana to Mughalrsaria is to identify the cumulative impacts of the project on valued environmental components (VEC) in the project area. The study also analyses the impacts of EDFC on the existing transportation network due to shifting of freight movement from rail to road.

Methodology

"Cumulative impact" is the impact on the biophysical and socio-economic environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what development or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative Impacts are actually summations of Direct and Indirect impacts due to different activities.Cumulative effects address the sustainability of a resource. Avoiding or minimizing adverse environmental consequences resulting from the combination of individual effects of multiple actions over time

For this scoping the following methodology was used:

1. Review of IFC Guidelines on CIA, CIA studies on similar studies and other relevant documents.
2. Study of the EIA/SIA of the EDFC segments available along with the Business Plan of DFCCIL.
3. Analysis the Existing and Proposed Transportation network for Modal Shift evaluation.
4. Identify from the EIA/SIA reports, the Potential Resources and VECs that are likely to be impacted by the EDFC project.
5. Inventories the Past, Present and Future projects in terms of Temporal and Spatial limits.

6. Analysis of the identified Resources and VECs by qualitatively using the Matrix Method to arrive at the Cumulative Impact.
7. Final conclusion in terms of broad cumulative impacts of EDFC and additional analysis to be carried out in the detailed CIA study.

Results

For performing the CIA, the important step is to inventorise and identify potential resources that will be impacted during construction and operation phases of the project. If the project is not likely to cause direct or indirect impacts on a resource, it will not contribute to a cumulative impact on the resource. The identification of such priority resources included those resources that could be substantially affected by the project in combination with other past, present, and reasonably foreseeable future actions and resources currently in poor or declining health or at risk even if project effects are relatively small. The identified priority resources for this project are:

1. Water Resources –Surface Water Resources (Hydrology, the Indo-Gangetic plain, water courses, wetlands, water crossings, perennial rivers) and Ground Water Resources.
2. Ecology –Floral (Vegetation along the corridor), Faunal Species ecological sensitive locations including protected areas such as forests.
3. Socio-cultural conditions (Physical Cultural Resources, Archaeological protected areas, traffic conditions and safety.
4. Land (Land use, soil environment)
5. Air and Noise, Vibration Environment.

The Major VECs identified from the study of EIA/SIA of the three segments and also the CIA Matrix is:

1. Land Ownership and Land use (soil, solid waste)
2. Water Resources (Drainage pattern and Local water bodies)
3. Flora (Vegetation along the ROW)
4. Socio economic (Cultural and Archaeological Features, transportation infrastructure)
5. Air quality and noise level including due to traffic scenario

2 INTRODUCTION

2.1 Background

Dedicated Freight Corridor Corporation of India (DFCCIL) is a Special Purpose Vehicle (SPV) set up under the administrative control of Ministry of Railways to undertake planning & development, mobilization of financial resources and construction, maintenance and operation of the Dedicated Freight Corridors. The Indian Railways' quadrilateral linking the four metropolitan cities of Delhi, Mumbai, Chennai and Howrah, commonly known as the Golden Quadrilateral; and its two diagonals (Delhi-Chennai and Mumbai-Howrah), adding up to a total route length of 10,122 km carries more than 55% of revenue earning freight traffic of IR. The existing trunk routes of Howrah-Delhi on the Eastern Corridor and Mumbai-Delhi on the Western Corridor are highly saturated, line capacity utilization varying from 115% to 150%. The surging power needs requiring heavy coal movement, booming infrastructure construction and growing international trade has led to the conception of the Dedicated Freight Corridors along the Eastern and Western Routes.

The current legislative framework (EIA Notification, 2006) classifies developmental projects into two categories: Category A, for projects with a potential to have significant adverse environmental impacts and Category B, for projects with a potential to have some adverse environmental impacts, but of lesser degree or significance than those for category 'A' projects. Projects falling in both these categories require prior Environmental Clearance (EC), from Central Government and State Government respectively. Railway projects do not fall in either of these categories and thus do not require prior Environmental Clearance. However, looking at the scale of the activities envisaged as part of EDFC and also considering the safeguard policies of the World Bank, all three phases of EDFC have been categorised as 'Category A' projects. In addition, as the implementation of third phase of the project moves forward, DFCCIL intends to understand the cumulative impacts of the EDFC through a Cumulative Impact Assessment (CIA) for EDFC, so that necessary mitigations measures (if any) may be incorporated in EDFC. The current scoping report is a first step in this process.

2.2 Objectives

The objectives of the scoping report is to review the EIA, SIA and other documents / secondary information available with DFCCIL to enable the following.

- Identification of Valued Environmental Components (VECs) in the EDFC project area
- Identification of indirect impacts on land use change and associated developments
- Analyse the impacts of modal shifts on existing road / rail network due to EDFC
- Identify other indirect/induced impacts of the project based on various developments envisaged in the business plan of DFCCIL
- Identify cumulative impacts (Environmental, Social and Developmental) of EDFC
- Identify further analysis required for a more comprehensive CIA
- Recommend 'Management Measures' for the identified cumulative impacts

2.3 Scope of Work

DFCCIL had retained Kadam Environmental Consultants (KADAM) for carrying out the Scoping Study, which will serve as an input to the Comprehensive CIA for EDFC. The present report based on the available information, identifies VECs, Social Impacts and Indirect Impacts, suggests further

analysis required (if any) in the CIA study and recommends Mitigation Measures for identified Cumulative Impacts.

Subsequent to the receipt of the LOA, a team was formed consisting of Mr. Sangram Kadam (Project Director), Mr. Satish Joshi (Project Coordinator), Dr. Dibyendu Banerjee (EIA specialist), Dr. Dushyant Mishra (SIA specialist) and Mr. André van Kuijk (CIA specialist). The team studied the documents received from DFCCIL and other available material and has produced this report.

2.4 Guidance Protocol

While carrying out the Scoping exercise, guidance was taken from ' IFC Good Practice Handbook entitled 'Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets'.

2.5 Documents studied

The documents received from DFFCCIL for study for execution of this project are tabulated in ***Annexure 1.***

2.6 Use of this Report

Nothing contained in the report of KADAM shall be construed as a warranty or affirmation by KADAM that the site and property described in the report are suitable collateral for any loan or that acquisition / selling / possession of such property by any owner / buyer / seller / lender / borrower through foreclosure proceedings or otherwise will pose no risk of potential environmental liability on the part of such owner / buyer / seller / lender / borrower.

3 PROJECT DETAILS – REVIEW OF SIA AND EIA FOR THE EASTERN DFC

The Dedicated Freight Corridor is the most ambitious and biggest ever project in the railway infrastructure sector. The Golden Quadrilateral of Indian Railways, and its diagonals, which comprise about 16% of the total route kilometres, carries about 58% of total freight and 52% of passenger traffic on Indian Railways. The line capacity on these routes has saturated, which has led to serious constraint in meeting the country's transport demand, resulting from 8% to 9% sustained GDP growth. It has, in fact, resulted in a fall in the railways' share in land-borne freight traffic and increase in operating cost. The Eastern Dedicated Freight Corridor with a route length of 1840 km and consisting of the following distinct segments:

1. An electrified single line segment of 400 km between Ludhiana and Khurja
2. An electrified double line segment of 50 km between Khurja and Dadri
3. An electrified double line segment of 342 km between Khurja and Kanpur
4. An electrified double line segment of 391 km between Kanpur and Mughalsarai

Broadly the Eastern DFC will have three segments – EDFC-1, EDFC-2 and EDFC-3. Details of the EDFC in terms of these 3 segments are given below:

3.1 EDFC-1 (Khurja – Bhaupur)

The corridor confines to 342 km (135km under package-1, 130km under package-2 & 107km under package-3) from Bhaupur (km 1040) to Khurja (km. 1370) section of of EDFC. Total length under this present project is 272 km. Bhaupur to Khurja is an important section of Delhi - Howrah double line electrified main trunk route of Northern Central Railway connecting the Northern, Central and Eastern regions of the country. The entire stretch is in the State of Uttar Pradesh and passes through 8 districts of Kanpur Dehat, Auraiya, Etawah, Ferozabad, Hathras,(Mahamaya Nagar), Agra, Aligarh & Bulandsehar. Detours are planned at five locations due to heavy settlement along the existing track. These locations are Achalda, Bhartana, Etawah, Hathras and Aligarh.

Baseline Condition:

Based on EIA study, the important aspects of the baseline scenario are given below:

a. **Ecology**: There is no wild life sanctuary located along the parallel as well as in detour section of the proposed corridor.There is no identified wetland along the proposed corridor.Reserve / Protected forest are located along the proposed alignment from Bhaupur to Khurja. However, these areas are forest land and have scattered plantations of babool.The other major species present along the alignment are neem, shisam, papal, mango, bargad, kanji, labhera, ashok, sirsa, guler, jamun, ber, eucalyptus, mahua and bel.

Water Resource: There are no perennial river / water bodies crossing the proposed alignment.

Socio-cultural: There are a number of religious structures, schools, and colleges located along the proposed alignment.The prominent structure is the Budiya ka Tal near Agra which is a notified monument of the ASI.There are five congested sections with residential / commercial structures located along the existing railway alignment and also there are a number of religious structures, schools, and colleges located along the proposed alignment

Air, Noise and Vibration:

a. The air quality of the project area is generally good except SPM[1]. The concentration of suspended particulate matter at some of the sensitive locations due to proximity with highway and industrial locations. Overall, the results indicate that SPM levels vary from 152-215 µg/m^3, whereas RPM varies from 38-72 µg/m^3 during winter season. During summer, SPM levels were noted to be ranging from 132-196 µg/m^3 and RPM to be around 48-83 µg/m^3 during. SO_2, NO_X and CO levels are well within the NAAQ standards at all the monitoring locations.
b. Noise levels exceed permissible standards at all the locations along the existing railway track (where DFC is proposed in parallel). The noise levels are even higher along these locations when two trains cross the location simultaneously. Noise levels between passenger trains and freight trains show a marginal difference. However, the noise attenuation was found to be ranging from about 5 dB (A) from 12.5 to 25 m and about 10 dB (A) from 25 to 50 m, from the centre of the track.
c. The vibration levels wary from 89.8 dB during train movement and 33.4 dB during other periods of the day. The data further indicates high vibration levels close to the track and gradual decrease as the receptor distance increase from the track.

Potential Impacts identified

i. **Ecology**: There is potential impact on ecology as forest land of about 10.595 ha needs to be acquired. This may also impact wildlife close to the ROW. The alignment of DFC passes through the Taj Trapezium zone where there are restrictions of various operations. DFC affects the zone due to the cutting of trees. The proposed alignment may result in the cutting of approximately 19000 trees in a stretch of 272 km i.e. 7.2 trees per km.
ii. **Landuse**: Change in landuse and topography is anticipated. The proposed project stretch will involve acquisition of about 1428.26 ha of land of which approximately 86% is under private acquisition. Landuse will change from fallow, agricultural or residential to transportation ROW.
iii. **Soil and Solid waste**:The soil quality changes and generation and dumping of solid wastes during construction is also predicted..
iv. **Increased traffic on connecting roads to stations. Increase in Air and Noise pollution.**
v. **Socioeconomic:**

a. Total 10340 families will be impacted by the Project. Out of this, agriculture lands of 9774 families are going to be affected, while 309 structures of 566 families are going to be affected. Of these, major impact will be on 6683 families, and minor impact will be on 2253 PAFs.
b. Impact is predicted for the disruption of congested habitations and cultural in the ROW of the project. About 78 community properties will be displaced because of the project intervention. These include Temples, Samadhi, Hand pumps etc.

Table 3-1Identification of priority resources and VECs for EIA/SIA study: EDFC-1 (Khurja – Bhaupur)

S. No.	Priority Resources
1.	ECOLOGY: Vegetation along the corridor – important species, ecological sensitive locations, including those declared as such, like wildlife sanctuaries, protected/reserve forests.
2.	SOCIOECONOMIC: Landownership, Socio-economic and cultural conditions.

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[1] India has specified now ambient air quality norms for PM2.5 and PM10 and discontinued SPM standard. At the time of EIA study SPM standards were prevailing, hence same baseline data is maintained in this document.

3.	AIR, NOISE AND VIBRATION
4.	SOILD WASTE
5.	LANDUSE Land ownership, topography, visual and aesthetics.

3.2 EDFC-2 (Bhaupur – Mughalsarai)

The present project confines from Mugalsarai (km. 667.00 near Ganj Kwaja) to Bhaupur (km 1048.00) of EDFC. Total length from Mughalsarai to Bhaupur is around 392 km. This section is an important section of Howrah-Delhi double line electrified main trunk route of Northern Central Railway connecting the Northern, Central and Eastern regions of the country. The entire stretch of Mughalsarai-Bhaupur is in the State of Uttar Pradesh and passes through Kanpur Dehat, Kanpur Sadar, Fathepur, Kaushambi , Allahabad, Mirzapur and Chanduli Districts of Uttar Pradesh. There are number of major cities and settlements all along the section and to avoid such heavily built up area, eight detours (Kanpur, Fathepur, Khaga, Sirathu, Bhawari, Allahabad, Manda and Mirzapur) have been proposed at these locations. Since the proposed DFC track generally runs on the left side of the IR tracks (from Mughalsarai to Bhaupur), proposed detours are not considered for the right side (RHS) of the IR network because of technical constrains and high cost of construction for underpass / flyover to the IR tracks

Baseline conditions:

i. **Ecology**: No National Park, Wild life Sanctuary or sensitive natural resources are located in this area. Most of these tree species in this area comprise of common species such as Neem, Pepal, Mango, Eucalyptus, Gulmohar etc. and do not involve endangered species.
ii. **Water Resource**: There are two perennial rivers Yamuna(Km 827) & Tonse (Km794) and number of small water bodies such as Pandu river(Km 1023,983), Ojhla (km 739,741), Khajuri(Km731,736,738) , Balwan(Km 718), Baharia (Km 718) and Jirgo(Km 702) in the ROW, along with the lower Ganga Canal and its distributaries at number of locations (km 1039, 1025,1013,1002, 996, 970, 951, 950, 945, 942, 935, 915, 906, 887, 805, 803, 786, 773, 749, 730, 722, 720, 716, 715, 714, 711, 709, 708).
iii. **Socio-cultural**:. There are number of major cities and settlements all along the section and heavily built up area (Kanpur, Fathepur, Khaga, Sirathu, Bhawari, Allahabad, Manda and Mirzapur).Number of religious structures, schools / educational institutions and Hospitals are located along the proposed alignment.Total number of PAFs are 13034, PAPs are 63968, CPRs are 55.
iv. **Air, Noise, Vibration**: Ambient levels are all within the standard limits.

Potential Impacts identified:

i. **Ecology**: For this section the ROW does not pass through any National Park, Wild life Sanctuary or sensitive natural resources. Impact will be on ROW vegetation, where cutting of about 18148 trees will be done. Acquisition of small parcel of 0.998 Ha. forest land in Mirzapur.
ii. **Landuse**: SRs within ROW are proposed for relocation. Impacts on about 55 CPRs. The proposed project stretch will involve acquisition of about 1400 ha of land, of which approximately 1250.57 ha. (89%) is private land and 149.44 ha (11%) is government land.
iii. **Water Resource**: Qualitative and quantitative impact is expected as the alignment passes over two perennial rivers Yamuna (km 827) & Tonse (Km 794).
iv. **Solid waste**: Earth work of 0.18 million m3 in cutting, 28.2 million m3 in embankment and 2 million m3 of ballast; generation of solid waste.

v. **Air, Noise and Vibration**:
   a. Increased noise & vibration levels in 15 number of sensitive receptors located close to the alignment is predicted.
   b. Impacts on air quality due to dust emission during construction are predicted.

vi. **Socioeconomic:**The main impacts anticipated in this segment due to the project are:
   a. The project affects 568 PAFs private built-up properties of which 278 PAFs are Title Holders. The area of the structure affected is 3.25 ha. Furthermore, about 507 PAFs will require to be relocated. These PAFs are losing more than 25% of their structure.
   b. Total 13034 families are being affected.. Out of this, agriculture land of 12466 families is going to be affected. Out of 623 structures, 568 residential/commercial structures and 55 CPR are going to be affected. Of these, major impact due to structure loss will be on 507 families.
   c. Total 55 community properties are being displaced because of the project intervention. These include Temples, Samadhi, Hand pumps etc.
   d. Health & safety issues during construction activities are also predicted.
   e. **Increased traffic on connecting roads to stations. Increase in Air and Noise pollution.**

Table 3-2Identification of priority resources and VECs for EIA/SIA study: EDFC-2 (Bhaupur – Mughalsarai)

S. No.	Priority Resources
1.	LANDUSE: Changes from habitation, cultural, vegetation to project ROW
2.	WATER RESOURCE: The perennial rivers and water crossings, water bodies, drainage
3.	SOLID WASTE: Earth work, embankment
4.	ECOLOGY: Vegetation along the corridor –removal. Forest land acquiring.
5.	SOCIOECONOMICS: Socio-cultural and human habitations, health
6.	AIR, NOISE AND VIBRATION

3.3 EDFC-3 (Ludhiana – Khurja)

The project section from Khurja to Ludhiana covers three states starting from Khurja Jn. in Uttar Pradesh passing through Haryana and finally terminating at Sanehwal near Ludhiana city in Punjab covering districts of Bulandshahar, Ghaziabad, Meerut, Muzaffarnagar, Saharanpur, Yamunanagar, Ambala, Fatehgarh Sahib, Patiala and Ludhiana. The DFC rail lines are generally co-planned adjacent to existing rail line except at detours (Hapur, Meerut, and Khurja flyover, Tapri, Ambala, Shambhu, and Sirhind) and grade separations (Khurja Fly over, Hapur, Meerut, Tapri, Ambala, Shambhu, and Sirhind). Under this project, an electrified single line of 404.36 km betweenKhurja and Ludhiana is proposed to be constructed. The alignment from Ludhiana to Khurja will be single line with no surface crossing.

i. **Baseline Condition**:

ii. **Ecology**: Presence of Kalanaur Protected Forest and Gangol Reserved forest near Yamunanagar and Meerut respectively.. Birds commonly found in Gangetic plains such as Cattle Egret, House Crow, common Myna, Weaverbird were commonly sighted Poplar, Eucalyptus, Mango, Neem and Shisam are the most dominant species were observed.

Landuse: Primarily agricultural (62%) followed by settlement area (17.3%), water bodies (0.7%), open land (18%), vegetation (1.8%), barren land (0.2%).

iii. **Water resource**: The surface water quality largely conforms to the CPCB prescribed standards while the groundwater quality conforms to the drinking water standards. Rivers present at Yamuna, Markanda, Tangri and Ghaghhar. Canals present at Upper Ganga, Western Yamuna canal.

iv. **Air, Noise, Vibration**: Ambient levels are all within the standard limits.

v. **Socio-cultural**: No Archaeological monuments falls within 300 m of proposed track, but 'chance find' cannot be rules out.

Potential Impacts identified:

i. **Ecology**: The alignment passes through over exploited blocks of Jagadhari, Mustafabad, Rajpura, Sirhind and Khanna. Critical blocks of Barara and Doraha. Semi-critical blocks of Khatauli, Deoband and Gulaothi. Approximately 5707 trees need to cut. Total number of trees to be felled is estimated at 5707.

ii. **Water resource**: River crossing (Yamuna) and Canal crossings at Upper Ganga, Western Yamuna canal, can cause potential impacts on water quality and drainage pattern.

iii. **Solid waste**:Solid waste in the form of top soil from digging and laying of tracks, may cause moderate impact on topography.

iv. **Air, Noise, Vibration:** The significant impact during construction is mainly associated with minor increase in dust borne air pollution, increased noise level, nuisance due to movement and operation of vehicles, establishment of temporary facilities and hindrance in accessibility to common property resources.

v. **Landuse**: Major impact predicted, since the project involves 648.38 Ha. land acquisition, diversion of total 7.4 Ha.Forest land i.e., reserved and protected forests' land (3.4 Ha Reserved Forest, 4.0 Protected Forest).

vi. **Socioeconomic:** The major impacts are due to the fact that:

f. The proposed project stretch will involve acquisition of about 567ha of land.

g. Total 5052 families are affected by the Project. Out of this, agriculture land of 4234 families is going to be affected, while 445 structures of 405 families are going to be affected.

h. Eight community properties are to be displaced because of the project intervention. These include Temples, Samadhi, Hand pumps etc.Shifting of physical cultural structures and borrowing of earth is significant impact.

Table 3-3Identification of priority resources and VECs for EIA/SIA study: EDFC-3 (Ludhiana – Khurja)

S. No.	Priority Resources
1.	WATER RESOURCES: Water bodies, Stream crossing. Water quality
2.	ECOLOGY: Vegetation along the corridor – Ecological sensitivity areas.
3.	SOCIOECONOMIC: Acquisition, Cultural conditionsand presence of archaeological sites.
4.	LANDUSE: Landuse in the project area and the surrounding localities
5.	AIR, NOISE AND VIBRATION
6.	SOLID WASTE Trenching, site preparation.

4 SCOPE AND METHODOLOGY OF THE CIA

In general, the analysis of cumulative impacts in the EDFC project follows the processes recommended by IFC (Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets). The scope of the CIA is governed by the geographic and temporal boundaries that correlate to the resources impacted by the proposed Project, and how the proposed Project intersects with connected actions and other projects across these resources.

Methodology of Cumulative Impact Evaluation

The broad steps used for the preparation of this Scoping report of Eastern DFC are:

Step 1 Identify Resources of Concern

Step 2 Define the Study Time Frame

Step 3 Determine the Potentially Affected Geographic Extent

Step 4 Evaluate Past, Present and Reasonably Foreseeable Future Impacts on the Resource

Step 5 Geographical extent of impact for past, present and future projects.

Step 6 Transportation Network analysis and impact of Modal Shift.

Step 7 Cumulative Effects on Identified Resources

4.1 Step 1: Identify Resources of Concern

The priority resources have been identified by focusing on key resource issues of regional or local significance. Also analysis was carried out about the resources likely to be effected. Further, to recognize potential issues, the following about the resource was considered:

a. Environmentally sensitive
   - Protected by legislation or resource management plans
   - Ecologically important
   - Culturally important
   - Economically important
   - Important to the well-being of a human community

For this evaluation the focus was on priority resources and sustainability of the resource was considered. The reviewing of the EIA reports prepared for the EDFC project has been taken into consideration also to identify resources of concern. Data and reports from State, Regional Govt. Offices, MOEF, and Pollution Control Boards were considered. The regional history of resource degradation in the study corridor and the presence of other proposals that would produce future degradation were also actively considered. Based on this, the identified resources that are likely to be impacted by the EDFC project includes:

- Land use – land use pattern, topography,
- Land Use (solid waste related): top soil, land use
- Water Resource – Hydrology, Drainage pattern
- Ecology – vegetation
- Air quality
- Noise and Vibration

Socio-Economics – Demography, R&R, etc.

4.2 Step 2: Defining the Study Time Frame

When considering the broad scope of evaluating the combined effects of past, present, and reasonably foreseeable future projects, it is the long-term and permanent impacts of individual projects that would have the greatest potential to combine with one another to create significant cumulative impacts.

Therefore, the primary focus of this CIA is to gain an understanding of the potential combined long-term or permanent impacts to resources, ecosystems, and human communities from the proposed Project, connected actions, and other past, present, and reasonably foreseeable future projects. Temporary and/or short-term impacts, which could occur concurrently (geographically and temporally) between the proposed Project, connected actions, and other projects to produce short term cumulative impacts, are considered qualitatively.

The temporal boundaries for this analysis reflect the nature and timing of the proposed Project activities as they relate to knowledge of past, present and future projects that have a high probability developing. For the EDFC project, the duration of potential impacts is has been categorized as:

a. Negligible (N) – Very minor or no impact at all
b. Temporary (T) - Temporary impacts would likely occur during construction, with the VECs and resources returning to pre-construction conditions almost immediately afterward.
c. Short-term (S) - Short-term impacts are defined as those that would continue for approximately 2-3 years following construction.
d. Long-term or permanent (P). - Long-term impacts are those where the VECs would require longer than 3 years to recover. Permanent impacts may occur as a result of activities that modify VEC/resources to the extent that they would not return to pre-construction conditions during the design life of the proposed project.

4.3 Step 3: Determine the Potentially Affected Geographic Extent

Activities within what is termed the Project Cumulative Impact Corridor (PCIC) indicate geographic proximity to the proposed Project (e.g., project area or local areas or regional areas as noted above). In general, the spatial limits of the corridor evaluated in the CIA can be categorized into three categories:

a. Project Area (PA) - Defined as the area of physical disturbance and maximum impact associated within the proposed Project limits; that is, in and along the EDFC railway corridor right-of-way (ROW) and its ancillary facilities, e.g., feeder roads, HUBS, Warehouses, and construction camps.
b. Local Area (LA) - Defined as a 2km distance on either side of the proposed EDFC corridor, and its ancillary facilities.
c. Regional Area (RA) - Defined as a distance greater than 2km on either side of the project.

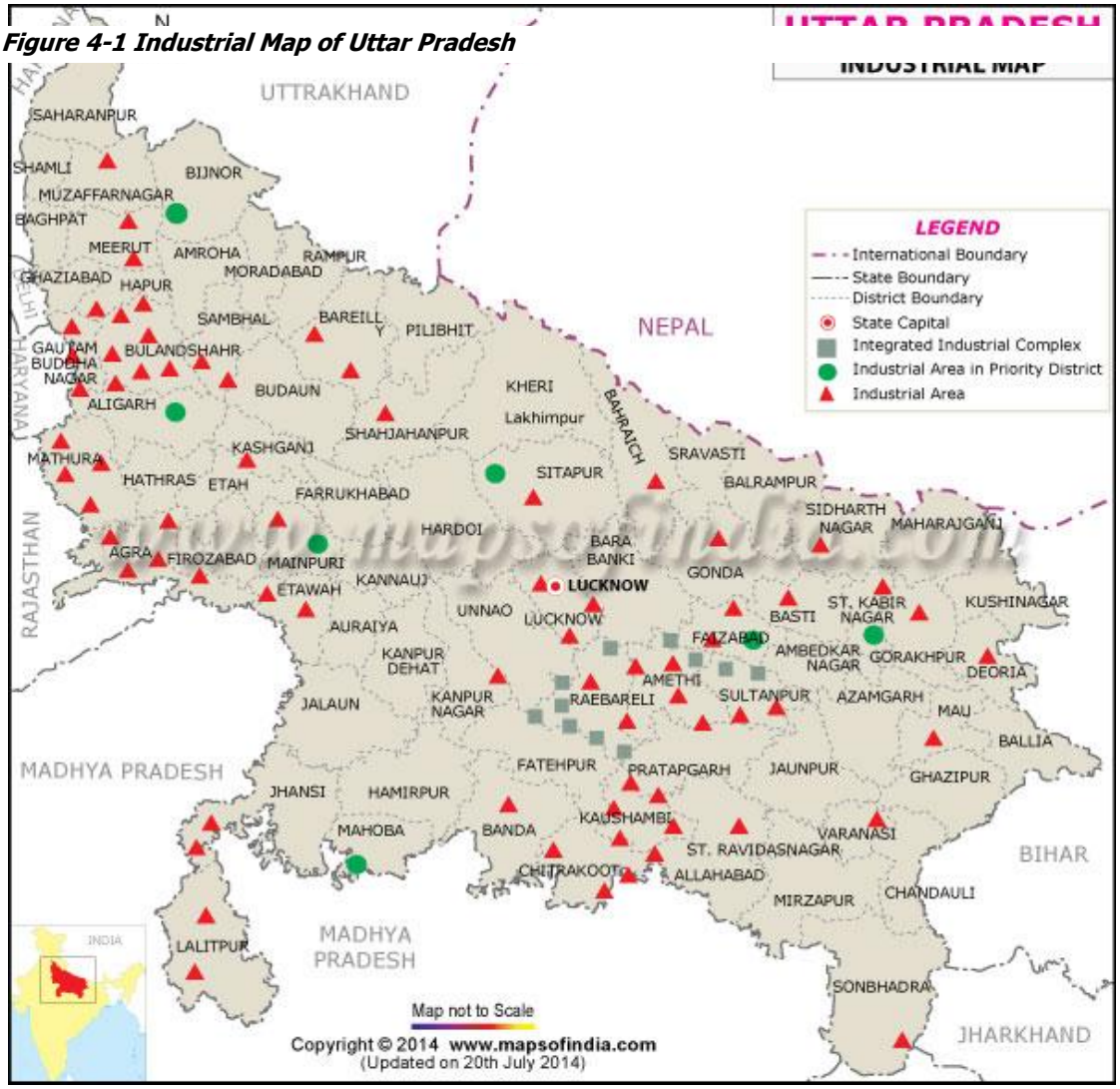
4.4 Step 4: Past, Present, and Reasonably Foreseeable Projects in the EDFC area

The proposed EDFC project would occur in locations that is likely to include existing, under construction, and planned governmental and private projects, including industries, thermal power plants, chemical industries, large building and constructions, industrial areas.The identification of the projects and/or activities to be included in the CIA is to be accomplished through inventory of developmental projects by searching through existing EIA reports from the study area, SIDC websites, Urban Developmental report (State), Survey and land use, etc. and also state

government websites, and private company websites providing publically available data and details on projects and activities within the geographic boundaries of interest.The EDFC corridors traverse through Primarily Uttar Pardesh, Haryana and Punjab. The corridor passing through Haryana and Punjab is much lesser compared to Uttar Pardesh. The nature of developments is similar in all the three states. For this initial assessment example of Uttarpardesh is considered for evaluation. However, detailed analysis covering all the three states will be carriedout in detailed CIA to be undertaken following this rapid CIA report.

EDFC ROW passes through many districts in Uttar Pardesh. This corridor is an important industrial belt. The Industrial map of Uttar Pradesh is given below (***Figure 4-1***) showing important Industrial clusters along the EDFC route.

Figure 4-1 Industrial Map of Uttar Pradesh



4.4.1 Cumulative Impacts from Past Projects

Past projects and activities considered in the CIA are those that have been completed and their physical features are part of the current/existing landscape. Residual (i.e., permanent) effects from these projects/activities are considered to be potentially cumulative with the effects of the proposed EDFC Project. Though detailed information of past and present development is not available at this stage, the nature of development happening along the EDFC project area are small industries (single super phosphate, milk powder, engineering industries). Few industrial

areas were also developed in near past but limited industries have been set up yet. Few thermal power plant is proposed and are at different stage of its development. Major development has happened on construction sector (commercial, residential constructions) and road development. However road conditions are largely poor in Uttar Pardesh yet. There are many industrial pocket housing polluting and non-polluting industries which are operational from many decades. These projects are presented in table 4.1 below. The pollution level or past data is referred from Government sources such as MOEFCC, Central and State Pollution Control Board, Forest and Wildlife Departments.

Table 4-1 Past Projects (recent, major projects) to be considered in the CIA

S.No.	Project name	Project Description	Zones Impacted	Spatial Linkage with EDFC
7.	Liberty Phosphate Limited	Single Super Phosphate Manufacturing Unit	Raebareli, Uttar Pradesh	Raebareli, Fatepur
8.	Samprash Foods Private Limited	Expansion Of Skimmed Milk Powder Manufacturing Unit	Pachpeda, Aligarh, Uttar Pradesh	Pachpeda, Aligarh, Badau, Hathras, Kurja
9.	Holiday Inn Suites Hotel. Inter-Continental Hotels Group	Hotel – 150 Rooms	Noida, Uttar Pradesh	Noida, Ghaziabadh, Dadri, Delhi NCR.
10.	Cattle feed unit. Modi Naturals Limited	Cattle feed 100-TPD	Dist. Pilibhit,Uttar Pradesh	Pilbhit, Bdau, Aligarh, Barelie

The reason of slow development in Uttar Pardesh can be substantiated through following details. The per capita electricity consumption in most of the districts of the three sub-regions is less than that of Uttar Pradesh, other major EDFC/WDFC states and the all India figures. The shortage of power supply has resulted in poor and unreliable power supply with rampant power cuts. As a result, industrial investment in Uttar Pradesh has been constrained, with industries preferring to locate themselves elsewhere. In many cases industries have been forced to set up captive power plants. Similarly, it is observed that the availability of tar roads per lakh of population in most of the districts of the sub-regions is lower than the state average. In addition to the limited availability of roads, their carrying capacity is limited and maintenance remains poor.

The Key Industries present in UP include Information technology, agro processing, tourism, mineral-based industries, textiles, handloom and handicrafts, food processing and sports goods. UP is the second largest producer of sugarcane in the country. In 2012-13, 2.2 million hectares of area in the state was under sugarcane cultivation and total production was at around 132.4 million tonnes (MT).It has emerged as a key hub for IT and ITeS industries, including software, captive business process outsourcing (BPO) and electronics. The state has become a hub for thesemiconductor industry with several major players having their offices and R&D centres in Noida. Considering above facts priority impact areas can be summarised below:

Table 4-2Identification of priority resources from past projects:

S. No.	Priority Resources
1.	Land Resource and Land use
2.	Water Resource – Quality and Quantity
3.	Physico-Chemical quality – Air, Noise, Water, Solid waste
4.	Ecology
5.	Socio-economic, Cultural

4.4.2 Cumulative Impacts from Present Projects

Present/existing projects and activities considered in the CIA as those that have been approved and are under construction. Potential residual (i.e., long-term or permanent) effects from these projects/activities are considered to be potentially cumulative with the effects of the proposed EDFC Project. The nature activities currently are also similar as with past means construction, roads, development, and few industries. Though, the development is expected to pick up in future once infrastructure and power situation improve in these states. A sector wise, present developmental projects and their potential for residual effects to be cumulative with the effects of the proposed EDFC Project is summarised. While some residual effects associated with present projects may be long-term and/or permanent, many of the residual effects of past projects and effects of the proposed Project are localized. When considering the cumulative impacts of these projects in terms of present activities, additional short-term impacts associated with concurrent and/or successive construction schedules also needs to be addressed. Cumulative impacts associated with concurrent construction projects within geographic proximity of the proposed EDFC Project include short-term alterations to soils, terrestrial vegetation, wildlife, wetlands, land use, visual resources, water resources, air quality (primarily dust), noise, and socioeconomics.

Table 4-3Identification of priority resources from present projects:

S. No.	Priority Resources
1.	Land Resource , Land Ownership
2.	Water Resource , Drainage
3.	Physico-Chemical quality – Air, Noise, Solid waste
4.	Ecology - vegetation clearance
5.	Socio-economic, Cultural, health

4.4.3 Cumulative Impacts from Future Projects

Planned future projects and reasonably likely to be constructed or take place in the foreseeable future (based on EC applications, MoEF inputs, State). Potential residual (i.e., long-term or permanent) effects from these projects/activities are considered to be cumulative with the effects of the proposed EDFC Project. Cumulative impacts of these projects in terms of future activities would occur where long-term and permanent residual impacts of the proposed EDFC Project are additive with long-term and permanent impacts of construction and operation of the above projects. These future projects would include some highways, industrial area development, industries and rail corridor development. Detailed investigation and consultation with different developmental organisation at detailed CIA stage will present larger picture. Cumulative impacts of these projects in terms of future activities would occur where long-term and permanent residual impacts of the proposed EDFC Project are additive with long-term and permanent impacts of construction and operation of the above projects.

Among the important industrial developments to take place in proximity to the EDFC is the AKIC. The Union Cabinet gave approval for setting up the Amritsar-Kolkata Industrial Corridor (AKIC) and formation of the AKIC Development Corporation (AKICDC) in January 2014.AKIC will be developed in a band of 150-200 km on either side of the Eastern Dedicated Freight Corridor (EDFC) in a phased manner. AKIC will be spread across a belt of at least 5.5 lakh sq. km comprising 20 cities in seven states -- Punjab, Haryana, Uttar Pradesh, Uttarakhand, Bihar, Jharkhand and West Bengal.In the Phase-I of the AKIC project, each state is encouraged to promote at least one cluster of about 10 sq km area to be called Integrated Manufacturing Cluster

(IMC), in which 40 per cent area would be earmarked permanently for manufacturing and processing activities.

These projects will have a significant environmental and social impact on the priority resources namely Land and soil, Air, noise, Ecology, water resources, Waste generation and socio-cultural and health. The impacts would vary in temporal aspect from short term to permanent and as well as in geographical dimension from project area to regional extent.

Table 4-4Identification of priority resources from future projects:

S. No.	Priority Resources
1.	Land Resource and Land use
2.	Water Resource
3.	Ecology and Flora-fauna
4.	Waste generation
5.	Physico-Chemical quality – Air, Noise, Water
6.	Socio-economic, Cultural

4.5 Step 5: Spatial/Geographically CIA for overlapping Project Areas

Past, present and future projects and development activities are heavily concentrated in key areas of the PCIC. These key areas are characterized by rural populations, mostly in the State of Uttar Pradesh, which generally have lower transportation (road, rail), energy source generation and transmission, and mostly open and fallow land.

Based on the initial work conducted by the World Bank in consultation with DIPP, three sub-regions within Uttar Pradesh namely:

4.5.1 Agra-Aligarh, (EDFC- 3 Area) -comprising of the districts of Agra, Aligarh, Etah, Hathras, & Firozabad.

The following industry groups have emerged as clusters in Agra Aligarh region for further analysis.

a. Leather & Leather Footwear Cluster in Agra
b. Foundry & Light Engineering Cluster in Agra
c. Glass Ware Cluster in Firozabad
d. Locks, Building Hardware, Fabrication, Light Engineering Cluster in Aligarh
e. Food Processing - Flour, Dairy and Meat Cluster in Aligarh

4.5.2 Kanpur-Auraiya (EDFC – 2 Area): comprising of the districts of Kanpur Nagar, Kannauj, Auraiya, Kanpur Dehat, Lucknow & Unnao.

Industrial clusters that have emerged in Kanpur-Auraiya sub-region are:

a. Leather & Leather Products Cluster in Kanpur & Unnao
b. Chikankari Cluster in Lucknow
c. Plastic Packaging Cluster in Kanpur
d. Perfume and Fragrance Cluster in Kannauj
e. Hosiery Cluster in Kanpur

4.5.3 Allahabad-Varanasi (EDFC -2):comprising of districts Allahabad and Varanasi

These sub-regions display a range of characteristics indicating their potential of being transformed into dynamic centres of economic growth of Uttar Pradesh. Their transformation needs to be supported by government or private sector interventions, such as infrastructure enhancement, land assembly, improved logistics and supply chain management, and business networking, etc.The Silk Cluster in Varanasi Cluster (Brocade, weaving, dyeing, etc.) has emerged as an important cluster in Allahabad-Varanasi region for further analysis. This sub-region, belongs to the eastern part Uttar Pradesh, which is amongst the least industrialised regions.

The industrial performance of the three sub-regions at a cumulative level has been assessed according to the investment, employment and industrial units assigned. Two distinct types of industries are identified:

1. High potential industries such as leather products, hosiery and garments, food products and metal products emerge as high potential industries and have attracted high investment, generated relatively higher levels of employment and also have larger industrial units functioning.
    - **Priority resources impacted area – Water resource, Solid Waste, Air quality, Socio-economy.**
2. Medium Potential Industries are those which generate low levels of Investment but contribute moderately in terms of employment and have a medium number of industrial units operating. In this category industries such as cotton textiles, non-metallic mineral products, wool, silk and synthetic fibres and chemical and chemical products feature.
    - **Priority resources impacted area – Water resource – quality and quantity, Air quality, noise, Socio-economy, ecology and human health.**

Though impacts from EDFC will be all along the corridor, but impact intensity and overlap areas will be confined more along the industrial pocket, or residential areas or major development areas. Therefore analysis has been carried focusing on these areas or areas important from specific resource prospective. A summary of the areas/pockets that overlapping with the EDFC project area with other projects is discussed below:

4.5.4 EDFC-1 (Khurja – Bhaupur) – Overlapping areas likely to be impacts are:

1. Khurja
2. Aligarh

4.5.5 EDFC-2 (Bhaupur – Mughalsarai) - Overlapping areas likely to be impacts are:

3. Kanpur
4. Fatehpur
5. Chandauli
6. Mirzapur Area

4.5.6 EDFC-3 (Ludhiana – Khurja) - - Overlapping areas likely to be impacts are:

7. Muzzafarnagar
8. Shamli
9. Saharanpur
10. Ghaziabadh

4.6 Step 6: Transportation network analysis and Modal Shift

The ***Annexure 2*** shows the Transportation map of the existing railway network and the proposed EDFC corridor overlaid by the existing road network in the study area. The results of the analysis of the existing and proposed network yield the following aspects along with the inputs from the DFCC Business Plan. This section again present broader overview however detailed road specific analysis shall be carried out in the detailed CIA.

1. The points of congestion due to exiting road and public transport as well as Industrial clusters and their goods movement will be:
    a. Mathura- Hateras – Bareley Area – Congestion due to State Highway cross the EDFC ROW as well as the Existing railway track
    b. Daulandshar –State highway cross and also presence of proposed priority and feeder roads and slow moving traffic which will increase combustion and higher air emissions
    c. Congestion and impact area near Hamidpur- Kucheser with State Highway 100 crossing over with heavy traffic.
    d. Muzaffarnagar area - existing railway and EDFC in close proximity with State and national Highway along with priority and feeder road cross over. Higher congestion and emissions expected.
    e. Aligarh area – EDFC with State highway cross over and priority roads planned.
    f. Agra – Congestion potential high with priority roads
    g. Overall, that with the mixed traffic networks, it will be problematic at the convergence points (nodes). Especially in Areas where Industrial clusters are present with higher heavy goods vehicle loads moving in or out of the EDFC system. Expected intermingling with public vehicles will be severe bottleneck regarding slow moving traffic, emission, congestion, road accidents.
    h. These problems must be addressed with meticulous planning of networks and systems.

2. The total traffic on the Eastern DFC is expected to grow from 1,41,207 million NTKM in 2016-17 to 289,708 million NTKM in 2036-37 while on the Western DFC it is expected to grow from 1,13,373 million NTKM in 2016-17 to 302,544 million NTKM in 2036-37.
3. The EDFC corridors are being built largely along the existing Delhi-Howrah trunk routes of the Indian Railways. These routes carry a mix of passenger and freight trafficand, being utilized up to 150% of their charted capacity, are fully saturated. As a result,movement of freight trains, which are assigned a lower priority as compared to passenger andother services, is sluggish and inefficient. The idea of building the DFC, therefore, has itsorigin in the need to create additional rail transport capacity, improve operational efficiency,reduce cost of operation and carry higher volumes of freight traffic, necessitated by the rapidlygrowing economy.
4. Against the above backdrop, existing freight traffic (culled from the actual traffic flows for thefull year 2007-08) for which the DFC would provide the most logical (shortest and/or fastest)route was hypothetically assigned to DFC, provided it covered two or more consecutivejunction stations over the DFC. For example, traffic entering at Sonnagar Junction station wasallocated to DFC only if it was destined for Mughalsarai, the next junction station, or beyond.
5. Most of the traffic assigned to the EDFC is likely to originate at existing IR terminals and thenenter the EDFC at one of the identified junction stations, through a feeder route. Likewise, at theother end, it would get off the EDFC at one of the identified junction stations and then travel,through a feeder route, to its destination analogous to an IR terminal.
6. In effect, most of thetraffic assigned to DFC will travel seamlessly - partly on IR and partly on EDFC. Their relativeshares in terms of tonne km for the different reference years (roughly of the order of 45:55 onEastern corridor and 32:68 on the western corridor) have been brought

out in the financialmodel. Since O-Ds of traffic so allocated to EDFC are shared between IR and EDFC, it has notbeen considered as residual traffic.

7. As distinct from the above, other freight traffic available on IR that could have moved over toEDFC but for its failure to meet the 'two junctions' allocation criterion has alone been

Section Name	2016-17			2021-22			2031-32			2036-37		
	Coal	Others	Total	Coal	Others	Total	Coal	Others	Total	Coal	Others	Total
Dankuni – Andal	3.16	9.97	13.13	3.52	13.35	16.87	3.80	21.32	25.12	4.00	26.10	30.10
Andal – Gomoh	4.10	9.52	13.62	4.55	12.88	17.43	5.01	21.03	26.04	5.21	26.07	31.27
Gomoh - Son Nagar	23.90	18.47	42.37	27.12	25.46	52.58	32.34	44.77	77.11	34.77	58.08	92.8
Son Nagar - Mughal Sarai	47.27	19.77	67.04	54.20	27.32	81.5	65.03	48.39	113.4	69.47	63.01	132.5
Mughal Sarai – Allahabad	34.42	20.38	54.80	39.95	28.09	68.04	49.38	49.47	98.9	53.15	64.22	117.4
Kanpur – Tundla	31.19	18.40	49.59	36.36	25.39	61.75	45.44	46.86	92.3	49.04	61.56	110.6
Tundla – Aligarh	29.76	14.14	43.90	34.78	19.57	54.34	41.39	36.47	77.86	44.91	47.92	92.8
Aligarh – Khurja	29.66	14.15	43.81	34.67	19.57	54.24	41.27	36.48	77.75	44.79	47.93	92.7
Khurja – Dadri	13.28	10.47	23.76	14.99	13.75	28.74	19.04	26.07	45.12	20.93	34.83	55.76
Khurja – Kalanaur	16.38	3.67	20.05	19.68	5.82	25.50	22.22	10.41	32.63	23.86	13.10	36.97
Kalanaur – Sirhind	6.99	3.50	10.49	8.96	5.59	14.54	10.56	10.01	20.57	11.74	12.57	24.32
Sirhind - Dhandhari Kalan	3.65	1.81	5.46	4.59	3.15	7.74	5.78	5.19	10.96	6.75	5.96	12.71

Table 4-5Forecasted Traffic (Trains) – EDFC – UP Directions

In terms of 25 tonne axle load

treated asresidual traffic. Although such traffic (mostly of a short lead of 100 km or less) has not beencatalogued separately, it is estimated that it would amount to not more than 15% of totaltrafficon the EDFC.

8. The DFCCIL has carried out detailed, section-wise, traffic assignment exercise to estimatepotential traffic expected to move on the EDFC routes up to 2036-37. The details are tabled below:

Existing Railway Infrastructure

Like all other rail routes in the country, the existing routes are common userlines for passenger as

Table 4-6Forecasted Traffic (Trains) – EDFC – DOWN Directions

Section Name	2016-17			2021-22			2031-32			2036-37		
	Empties	Others	Total	Empties	Others	Total	Empties	Others	Total	Empties	Others	Total
Dhandhari Kalan – Sirhind	2.67	1.36	4.02	2.93	2.43	5.36	3.55	3.65	7.20	5.58	3.80	9.38
Sirhind - Kalanaur	7.47	1.56	9.03	9.58	2.71	12.29	11.83	4.13	15.96	15.30	4.44	19.74
Kalanaur - Khurja	16.94	1.72	18.66	19.78	2.89	22.67	22.95	4.35	27.30	24.12	4.69	28.8
Dadri – Khurja	14.76	6.40	21.16	15.39	7.56	23.0	21.97	13.04	35.0	21.30	16.57	37.9
Khurja - Aligarh	31.70	8.12	39.82	35.16	10.45	45.62	44.92	17.39	62.3	45.42	21.26	66.7
Aligarh - Tundla	31.77	8.13	39.90	35.25	10.47	45.71	45.05	17.41	62.5	48.06	21.27	69.3
Tundla – Kanpur	33.94	8.68	42.63	37.55	11.01	48.56	46.84	17.75	64.6	50.05	21.39	71.4
Kanpur - Allahabad	34.42	9.15	43.57	38.15	12.12	50.27	48.55	18.95	67.50	51.95	23.01	75.0
Allahabad - Mughal Sarai	31.95	13.68	45.63	35.06	18.36	53.41	42.28	30.36	72.65	46.43	38.17	84.6
Mughal Sarai - Son Nagar	48.52	11.06	59.58	54.23	14.70	68.93	65.47	23.43	88.90	70.70	28.77	99.47
Son Nagar - Gomoh	23.36	10.75	34.11	26.39	14.30	40.69	30.12	22.80	52.92	30.42	27.98	58.40
Gomoh - Andal	3.86	15.10	18.96	4.01	18.79	22.81	5.28	26.35	31.63	6.04	30.88	36.92
Andal - Dankuni	3.40	15.50	18.90	4.05	19.31	23.36	4.20	27.18	31.39	6.19	31.96	38.15

In terms of 25 tonne axle load

well as freight services. Besides, their limited capacity is not only fullyutilized by the existing services but even exceeded to the extent of 150% or above on differentstretches of the route.To add to this, the railways follow a strict order of priority which relegates freight services tothe

lowest priority. This results in their slow and sluggish movement, frequent detentions forproviding precedence to passenger services, high operating cost and poor productivity. Thestate of freight operations on the Indian Railways as a whole can be judged from the fact thatgoods trains achieve an average speed of only 25 kmph and a goods wagon runs merely25% of the day.

4.6.1 Modal shift in transportation infrastructure due to the EDFC

Coal has been the most predominant commodity carried by IRconstantly contributing to more than 40% of the total movement (in terms of milliontonnes carried). Again, Coal traffic comprises the principal flow on the Eastern DFC.This is so because a majority of coalmines in India are located in the eastern region(mainly Jharkhand and West Bengal) and coal produced here is transported to thermalpower plants located in the north (Uttar Pradesh, Delhi, Haryana, Punjab, Rajasthan,Himachal Pradesh and J&K).Movement of the commodity on the EDFC in future years is largely dependent on the growth of thermal power generation in the north and the colliery-plant linkages, which could also get revised after commissioning of the EDFC.A huge potential is, therefore, available for increasing the Railways share ofcement and steel traffic by creation of transportation capacity aggressive marketing andefficient services.

The Eastern DFC will have a large potential for introductionof scheduled Ro-Ro services, i.e. transportation of laden road trucks piggyback on flatrail cars. Kolkata-Kanpur, Kolkata-Ghaziabad/Dadri and Kolkata-Ludhiana circuits, ineither direction, are ideal for this purpose. Transportation of road vehicles on flat railcars over long distances will curtail fossil fuel consumption, reduce truck maintenanceand road maintenance cost and saves on damage to environment. In the context of theDFC, substantial savings can also be achieved in respect of travel time and inventorycost. Hence, the potential of RO-RO traffic, especially on Eastern DFC cannot beignored. This will substantially increase the goods vehicle load on the feeder roads towards the EDFC boarding point.

The proposed EDFC is planned to have Junction stations. The junctions are designed for the purpose of taking over and handing overof traffic as between the existing IR network and the EDFC. As most of the originating anddestination terminals are and will continue to be located on Indian Railways, there willnecessarily be a considerable degree of exchange of traffic between IR and the EDFC. Thetraffic projection on EDFC is, therefore, based on the assumption that if a train on the existing IRsystem has to travel over more than two Junctions on the contiguous EDFC route, it will gettransferred to the EDFC.

While EDFC and IR combined will result in shift of substantial goods movement from road to rail thus reducing traffic load on roads in various sections but may lead to increased pressure on the roads connecting the junction/station where goods will be loaded or unloaded. EDFC is also interfacing with Inland Water Transport system to bring seamless connectivity of transport system where navigable route shall be available. One such interface is planned at Varansi. Though it is evident that EDFC will bring beneficial effect on environment due to this model shift but may have impact in localised area (station areas) due to increased traffic on these feeder roads. These aspects shall be more detailed in comprehensive CIA.

4.6.2 Impact on a temporal scale – Stages – level 1, level 2 and level 3:

Level 1: Level one assumes that the observed trend of the past three decades continues till 2016-17, with the modal share rising significantly in favour of roadways. Large-scale investments in highways and expressways are expected to encourage the use of road over railways even for travel distances beyond 700 km. However, it would also lead to congestion due to the increase in road freight traffic which could decrease transport efficiencies after a certain point of time.

Level 2: Level Two sees the introduction of EDFC by 2020. Wagons with higher payload (25 ton per axle) will further improved rail efficiency and capacity. Railway freight transport will see a manifold increase in average speeds from 25 kmph to 50-60 kmph on the freight corridors. This would also be accompanied with tariff rationalization, both of which would work towards attracting more rail based transport.

Level 3: Level Three sees higher investments in rail based freight transport. This level sees an improvement in infrastructure for freight transport via the introduction of EDFC. Rationalization in the tariff regime of railway freight transport, coupled with increased speeds and a shift towards containerization would increase the share of the freight traffic on railways.

4.6.3 Overall Cumulative Impacts due to modal shift(Transportation Network Analysis)

A modal shift will occur when the EDFC will be operational. The impact will be due to the shift from the conventional mode to the dedicated freight mode of transport. The EDFC will have a comparative advantage in a similar market over the conventional mode. Comparative advantages will take various forms, such as costs, capacity, time, flexibility or reliability. Depending on what is being transported, the importance of each of these factors will vary. Overall the modal shift will benefit by:

i. Larger passenger movement on IR with shift of freight load to EDFC and reduced truck movement load on roads (resource effect - Direct: reduced emission or better ambient air quality except in localised areas. Provision of underpasses and traffic bottlenecks in EDFC is contributory to this effect).
ii. Increased industrialisation and development of SEZs, due to improve connectivity and induced economic developed (resource effect – Indirect : water, land, Ambient air quality)
iii. Risks and Hazards related to carriage of hazardous goods (Resource effect- Indirect : all but accidental only)
iv. Solid and hazardous waste generation, e.g. paper, garbage, packaging, waste oil (Resource effect - Indirect: Land and water)
v. Soil degradation and impacts on agricultural productivity (Resource effect ; Direct : land and agricultural productivity)
vi. Socio-Economic (Direct and indirect both) (faster movement of agricultural produce including perishable commodity, development of newer agricultural produce –floriculture, , employment opportunities,)

4.7 Step 7: Cumulative Effects on Identified Resources

As discussed above, cumulative impacts are analysed for common impact areas and contribution from EDFCproject inthat cumulative impact. As analysed before that some impacts would be direct in nature due to EDFC such as change in land use because of land diversion for ROW and some will be indirect or induced because of EDFC and other projects activities such as impact on Ambient air quality, Noise, and Socio-economic. Indirect effects may be less apparent because they occur farther from the proposed project in time or distance. For example, commercial development occurring around the EDFC and the environmental impacts associated with that development. An analysis of the resources potentially sensitive to cumulative effects from past, present, and reasonably foreseeable future projects are presented in the following section. An analysis of impacts resource specific and overlap area with other developments is analysed below:

Environmental Resource	**Nature of Effect due to EDFC**	**Extent of Effect**	**Overall potential from other project activities causing cumulative impact**	**Indirect/ Induced Effect**	**Extent of effect**	**Overall potential from other project activities causing cumulative impact**	**Further Analysis Required (yes/No)**
Land	Change in land use	Confined to project area	Negligible or nil	Yes	Neighbouring areas	Yes	Yes.
Land	Soil compaction and soil quality	Confined to project areas but likely to material sourcing areas as well	Minimal as long as defined guidelines are followed by every project activities including EDFC	No	NA	NA	No
Land	Disposal of Solid waste	Largely confined to Project areas	Minimal	Yes due to various such activities and development of industrial areas and urban areas	Neighbouring areas	Yes	Further assessment is required. However this may be managed well. Effect can be minimised with adoption of better solid waste management and

Environmental Resource	**Nature of Effect due to EDFC**	**Extent of Effect**	**Overall potential from other project activities causing cumulative impact**	**Indirect/ Induced Effect**	**Extent of effect**	**Overall potential from other project activities causing cumulative impact**	**Further Analysis Required (yes/No)**
							debris management practices
Water	Water use during construction	Confined to water source area and can be replenished	Minimal as other project activities are likely to be less as water intensive development activities are likely to be located away from EDFC impact zone	Yes due to development activities and increased demand from Industries	Neighbouring areas.	Yes. Particularly in the industrial and urban areas identified in earlier section.	May be (to plan t enhancement measures under the project even if EDFC contribution is negligible)
Ecological (Flora - Vegetation)	Cutting of trees	Confined to ROW	Significant as large no of trees are being cut even by smaller development activities in the close vicinity	Yes	Neighbouring areas	May be	Yes
Ecological (Fauna)	Effect on habitat or migration route or local fauna	Nil as no such area or route is affected.	Negligible	may	localised	May be	An analysis still shall be undertakenunder

Environmental Resource	**Nature of Effect due to EDFC**	**Extent of Effect**	**Overall potential from other project activities causing cumulative impact**	**Indirect/ Induced Effect**	**Extent of effect**	**Overall potential from other project activities causing cumulative impact**	**Further Analysis Required (yes/No)**
		Negligible effect may be on locally found fauna					detailed CIA to assesses the foreseeable effect on any such habitat even away from EDFC
Air	Effect on air quality	Largely construction area	Medium as ambient air quality has no boundary	Yes	Project areas and beyond (This has effect at various stages of project activities during operation particularly due to traffic model shift	May be high in localised area and Particularly in the industrial and urban areas identified in earlier section	Yes with respect to other developments and quantified assessment
Noise	Increase in ambient noise and vibration level during	Largely confined to Row and construction areas	Minimal	Yes primarily due to construction activities and	Neighbouring areas and traffic congestion areas	May be high in localised areas	Yes with respect to other development

Environmental Resource	**Nature of Effect due to EDFC**	**Extent of Effect**	**Overall potential from other project activities causing cumulative impact**	**Indirect/ Induced Effect**	**Extent of effect**	**Overall potential from other project activities causing cumulative impact**	**Further Analysis Required (yes/No)**
	construction and operation stage			traffic			activities
Social Element	Transportation infrastructure	Beyond project area	Significant	Yes due to various activities	Neighbouring areas	Significant	Yes
Social Element	Physical Cultural Resources	Within project areas	Medium	Yes	Respective other project development areas	Minimal from EDCFC contribution prospective	No
Social Element	Protected Monument	Negligible as no such protected monument located within project areas.	minimal	May be depending on other development activities.	Depend of other project activities and development areas.	Minimal from EDCFC contribution prospective	No

4.7.1 CIA Evaluation :

Following evaluation of CIA potential on VECs and likely extent of effect, further evaluation has been carried out using "Matrix method " for the likely impacted resources. This method provides a means to compare organized data and evaluate project actions (construction and operation) on the specific resource. The Matrix also accounts for the Temporal, Geographical and Type of Impacts to arrive at the Cumulative Effect. The CIA matrix has been prepared and presented for each resource that identifies the primary resource components that are subject to potential adverse effects from the proposed EDFC Project and connected action activities, whether these effects are direct or indirect, and the temporal/duration and spatial/geographic extent of the effects. The CIA matrices provide a preliminary indication as to the potential for cumulative effects based on whether or not long-term or permanent impacts are anticipated for a particular resource area. It does not represent a conclusive determination that cumulative effects are, in fact, occurring. Rather, it directs the discussion of the resource area that follows, where an indication of the significance of the potential for cumulative effects is provided. It has been considered that where long-term or permanent impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also negligible.

Land use:

A summary of potential environmental impacts of the proposed EDFC Project and connected action activities to Land use resources is presented in ***Table 4-7***.

Table 4-7CIA Matrix— Land use

VEC	EDFC and related projects								Geographic Extent (PA/LA/RA)	Cumulative Impact Potential (Yes/No)
	Temporal / Impact Duration									
	Construction				Operation					
	N	T	S	P	N	T	S	P		
Land use			DI					DI	PA	Yes
Loss of top soil			DI		NI				PA	No
Soil erosion/ degradation		II				II			PA	No
Aesthetics/Visual			DI			DI			LA	No
Topography		DI			DI				PA	No
Land Ownership				DI				DI	PA	Yes
Sensitive Land use		DI				DI			PA	No

Notes/Legends:
Geographic Extent - Project Area (PA), Local Area (LA), Regional Area (RA)
Temporal / Impact Duration - Negligible (N), Temporary (T), Short-term (S), Long-term or permanent (P)
Impact Type – Negligible (NI), Direct Impact (DI), Indirect Impact (II)

The proposed Eastern DFC Project would require the acquisition of permanent land from along the corridor ROW and at the locations of proposed ancillary facilities. Long-term impacts areassociated with changes in land use; however, most of the land affected by the proposed Project is used for agriculture and open/fallow land. Therefore, potential cumulative effects to land use are primarily localized and are considered to have low overall significance. Permanent impacts to forested/vegetated lands are associated with the clearing of trees and shrubs within the ROW, and permanent impacts to visual resources are associated with aboveground structures associated with the fright corridor. Visual effects, particularly those associated with ROW disturbance in agricultural areas, would likely be substantially reduced with the first crop growth. Over the long-term, perceptible visible changes resulting from construction and operation would contribute, in the presence of similar facilities from past or future projects, to an intensified industrial character within the proposed Project cumulative impact corridor that could adversely affect the visual

quality of the area. Overall, potential cumulative effects to land use, topography, vegetation and visual resources are primarily localized and are considered to have low overall significance Temporary changes in land use due to construction would include loss of agricultural productivity, potential damage to irrigation systems, visual impacts from the removal of vegetation within the ROW, increased noise and dust. In addition, potential adverse impacts to tree cutting would be reduced through compensatory afforestation. Most of the landscape and topography changes caused by the proposed EDFC Project would be visible as linear changes to vegetation patterns. These are potential areas for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects. Past projects would concurrently affect land use and visual resources to the extent that there is a high density of activity in a geographic area having a similar impact.

Potential effects to soil resources from the proposed Project will be limited to the general footprint of the Project ROW and ancillary facilities. As a result, the potential for additive cumulative effects to these resources is also limited. Potential effects on other aspects of soil resources from the proposed Project are limited in geographic extent and the majority is associated with the construction phase of the proposed Project only. Permanent changes to soil productivity within the EDFC ROW are considered to have low cumulative impact. Potential impacts could include temporary and short-term direct impacts associated with soil erosion and soil compaction; and short-to medium-term direct and indirect impacts associated with topsoil loss and/or degradation. Overall, however, with respect to the proposed Project in combination with the past, present, and foreseeable future projects, permanent changes to soil productivity within the EDFC ROW are considered negligible assuming effective restoration efforts.

VEC: Overall the identified VEC that would be cumulatively impacted would be :

1. General land use
2. Land ownership.

Water Resource:

Summary of potential environmental impacts of the proposed EDFC Project and connected action activities to water resources is presented in ***Table 4-8***.

Table 4-8CIA Matrix— Water Resources

VEC	EDFC and related projects								Geographic Extent (PA/LA/RA)	Cumulative Impact Potential (Yes/No)
	Temporal / Impact Duration									
	Construction				Operation					
	N	T	S	P	N	T	S	P		
Hydrology		DI			NI				LA	No
Drainage pattern				DI		DI			RA	Yes
Reduced Flow	DI				NI				LA	No
Water Quality		II			NI				LA	No
Sedimentation		DI			II				LA	No
Water Bodies, Ponds				DI				DI	PA	Yes
Stream crossing				DI				DI	LA	No

Notes/Legends:
Geographic Extent - Project Area (PA), Local Area (LA), Regional Area (RA)
Temporal / Impact Duration - Negligible (N), Temporary (T), Short-term (S), Long-term or permanent (P)
Impact Type – Negligible (NI), Direct Impact (DI), Indirect Impact (II)

The proposed EDFC project would mostly have negligible effect on water resources with properly implemented and maintained mitigations; therefore, the overall potential for cumulative effects to

water resources is considered low. No permanent effects during the operation of the EDFC are expected. Generally speaking, the proposed Project route has been selected and modified to minimize the potential for impacts to surface water resources, as well as other sensitive environments, by avoiding them whenever possible and shifting the route to limit the area affected. There are a number of waterbodies that would be crossed by the proposed EDFC, that may modify the drainage pattern, but, where mitigation measures would be used to reduce or minimize impacts. The remaining surface water resource areas are potentially affected on a long-term basis primarily during the period of construction, with low potential to persist in the EDFC operation phase.

Potential impacts on surface water resources during construction activities would include temporary increases in total suspended solids concentrations and sedimentation during stream crossings or at upland locations with soil erosion and transport to streams; temporary to long-term changes in drainage pattern and stability caused by channel and bank modifications; temporary to long-term decrease in bank stability and resultant increase in total suspended solids concentrations from bank erosion as vegetation removed from banks during construction is re-establishing; and temporary reduced flow in streams and potential other adverse effects during hydrostatic testing activities and stream crossing construction. Full shrub and vegetation restoration in riparian areas is expected to take more than 3 years; however, the establishment of herbaceous ground cover and other temporary stabilization measures very soon after completion of crossings would ensure that there are no long-term effects to bank stabilityand sedimentation. With respect to the proposed Project in combination with the past, present, and foreseeable future projects, cumulative impacts to groundwater resources are considered negligible. Small water bodies could be affected on a long-term or permanent basis and could potentially contribute to cumulative wetland impacts in project area only.

In summary, with respect to surface water resources, permanent impacts are not expected, except for drainage pattern and water bodies like ponds. These two are the only potential area for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects.

VEC: Overall the identified VEC that would be cumulatively impacted would be :

1. Drainage Pattern

2. Water Bodies.

Ecological Resource

A summary of potential environmental impacts of the proposed EDFC Project and connected action activities to Ecological resources is presented in ***Table 4-9***.

Table 4-9CIA Matrix— Ecological Resources

VEC	EDFC and related projects								Geographic Extent (PA/LA/RA)	Cumulative Impact Potential (Yes/No)
	Temporal / Impact Duration									
	Construction				Operation					
	N	T	S	P	N	T	S	P		
Forest/Protected areas			DI					DI	PA	Yes
Grasslands/pastures			DI				DI		PA	Yes
Wildlife – habitat loss, fragmentation		II				II			LA	No
Exposure to construction, operation activities-noise, air – effect on breeding		II			II				LA	No

Wildlife health stress		II				II			LA	No
Wildlife Migratory/Crossing				II				II	LA	Yes

Notes/Legends:
Geographic Extent - Project Area (PA), Local Area (LA), Regional Area (RA)
Temporal / Impact Duration - Negligible (N), Temporary (T), Short-term (S), Long-term or permanent (P)
Impact Type – Negligible (NI), Direct Impact (DI), Indirect Impact (II)

Permanent effects to terrestrial vegetation resources from the proposed Project are limited to the general footprint of the Project ROW and ancillary facilities. As a result, the potential for additive cumulative effects to these resources is also limited. Forested habitats, including biologically unique forested habitats, if present in the ROW, could be permanently impacted by the construction and operation of the EDFC. Additionally, grasslands and shrubs could be impacted for the long term due to the slow recovery from the impacts of construction. However, most of the land affected by the proposed Project is open and fallow with moderate agriculture in totally rural setting.

During the construction phase, larger expanses of habitat would be cleared for access and use. Forested areas that are not within the permanent ROW would be afforested. Construction would also involve removal of woody shrubs. Restoration of these habitats would be long term. Conservation efforts implemented to offset potential losses would reduce the cumulative impacts associated with the proposed Project.

In summary, with respect to terrestrial vegetation resources, the primary impact concern with respect to potential cumulative effects is the conversion of limited forested area to herbaceous habitats (reducing and fragmenting forested habitats) and long-term impacts to grasslands (which would be restored).These impacts represent the primary areas for cumulative impacts to occur with other past, present, and reasonably foreseeable future projects. Past projects in the area that have historically reduced and fragmented forested habitat may provide the potential for additive cumulative effects.

The only potential direct impacts to wildlife resources are the short-term direct impacts associated with small and immobile wildlife that may not be able to relocate out of construction activities. The overall impacts to populations of wildlife species are not expected to be significant and cumulatively should be negligible. Cumulative impact is expected when the EDFC ROW passes through migratory route of wild animals. This potential is greater for wildlife for which suitable habitat is limited in the Project area or that are otherwise sensitive to disturbance.

VEC: Overall the identified VEC that would be cumulatively impacted would be:

1. Vegetation/Forest Removal, Grassland and Shrubs Removal

2. Obstruction in Migratory Route of wildlife.

Air, Noise and Vibration

A summary of potential environmental impacts of the proposed EDFC Project and connected action activities to Air and noise quality is presented in ***Table 4-10***.

Table 4-10CIA Matrix— Air, Noise and Vibration

VEC	EDFC and related projects								Geographic Extent (PA/LA/RA)	Cumulative Impact Potential (Yes/No)
	Temporal / Impact Duration									
	Construction				Operation					
	N	T	S	P	N	T	S	P		
Dust		DI			DI				LA	No

Gases		DI			DI				RA	No
GHC, Climate		DI			DI				RA	No
Combustion emission			DI		DI				LA	No
Fugitive emission	DI				DI				LA	No
Noise from Construction equipment, vehicles		DI				DI			LA	No

Notes/Legends:
Geographic Extent - Project Area (PA), Local Area (LA), Regional Area (RA)
Temporal / Impact Duration - Negligible (N), Temporary (T), Short-term (S), Long-term or permanent (P)
Impact Type – Negligible (NI), Direct Impact (DI), Indirect Impact (II)

The anticipated overall absence of permanent impacts due to noise generated from the proposed Project indicates that cumulative effects to this resource area are not expected. Where long-term or permanent impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also negligible. Most of the potential effects from noise are short term and associated with the construction phase of the proposed Project only. Short-term noise impacts may be generated during the construction phase by construction equipment and vehicles, etc. Potential effects from noise could include direct impacts to wildlife, residences, recreation and livestock. The noise levels could be perceived as moderately loud with a significant effect over existing levels; however, any peak noise levels would be temporary and intermittent, generally limited to daylight hours, and would decrease with distance. Night-time noise levels would normally be unaffected because most construction activities would be limited to daylight hours.

Vibration impacts are primarily evaluated on a local level; they would not contribute to a geographically meaningful cumulative impact, in combination with the proposed Project. Other current or future projects in the area with potential long-term/permanent vibration impacts may provide the potential for additive cumulative effects. Here too, the relative contribution (and incremental additive effect) of vibration generated by the proposed Project is negligible. Furthermore, additional potential vibration contributors would likely implement similar mitigations, thus reducing overall cumulative impacts from vibration.

In summary, there is the no potential for noise and vibration impacts from the long-term operation of EDFC to be cumulative with other past, present, and reasonably foreseeable future projects.

Contribution to cumulative air quality impacts resulting from construction of the proposed Project would be from activities that generate fugitive dust (e.g., site clearance, preparation of ROW and materials handling) and combustion air emissions (criteria pollutants and GHGs) from construction camp generators, non-road sources, on-road sources, and open burning. There would be no current contribution to cumulative impacts from the construction of past or future projects since the impacts of these projects are short-term and occur at the time of construction only. As a result, contributions to cumulative air quality impacts within the proposed Project cumulative impact corridor from construction of the proposed Project and past or future reasonably foreseeable projects would be negligible.

Contribution to cumulative air quality impacts resulting from operation of the proposed Project would include minimal fugitive emissions. Contribution to cumulative air quality impacts from ongoing operations of past projects within the proposed Project cumulative impact corridor and reasonably foreseeable future projects would be negligible.

The impact due to increased traffic on feeder route may be because of increased vehicular flow but that is also expected in localised area.

VEC: Overall no identified VEC would be cumulatively impacted for this resource.

Solid waste

A summary of potential environmental impacts of the proposed EDFC Project and connected action activities to Solid waste generation is presented in ***Table 4-11***.

Table 4-11CIA Matrix— Solid Waste

VEC	EDFC and related projects								Geographic Extent (PA/LA/RA)	Cumulative Impact Potential (Yes/No)
	Temporal / Impact Duration									
	Construction				Operation					
	N	T	S	P	N	T	S	P		
Top Soil		DI			DI				PA	No
Dug up trenches		DI			DI				PA	No
Overburden			DI			DI			PA	No
Exposure of toxic components	DI				DI				PA	No

Notes/Legends:
Geographic Extent - Project Area (PA), Local Area (LA), Regional Area (RA)
Temporal / Impact Duration - Negligible (N), Temporary (T), Short-term (S), Long-term or permanent (P)
Impact Type – Negligible (NI), Direct Impact (DI), Indirect Impact (II)

The anticipated overall absence of permanent impacts due to solid waste generation from the proposed Project indicates that cumulative effects to this resource area are not expected. Where long-term or permanent impacts are absent, the potential for additive cumulative effects with other past, present, and reasonably foreseeable future projects is also negligible. Most of the potential effects from solid waste are short term, temporary and associated with the construction phase of the proposed Project only. Short-term impacts due to solid waste may be during the construction phase by removal of top soil, digging of trenching, lying of sleepers and rails, etc. Potential effects from solid waste could include direct impacts to visual and aesthetics quality, landscape, moderate dust generation and exposure of lower level soil to the surface, which may undergo transformation.

In summary, there is the no potential for solid waste generation impacts from the long-term operation of EDFC to be cumulative with other past, present, and reasonably foreseeable future projects.

VEC: Overall no identified VEC would be cumulatively impacted for this resource.

Socio-Economics

A summary of potential environmental impacts of the proposed EDFC Project and connected action activities to Socio-economy is presented in ***Table 4-12***.

Table 4-12CIA Matrix— Socio-economics

VEC	EDFC and related projects								Geographic Extent (PA/LA/RA)	Cumulative Impact Potential (Yes/No)
	Temporal / Impact Duration									
	Construction				Operation					
	N	T	S	P	N	T	S	P		
Landownership				DI				DI	PA	Yes
Population		NI			NI				PA	No
Housing				DI	NI				PA	No
Health	NI				NI				PA	No

Economy		DI			NI				LA	No
Transportation		DI					DI		PA	No
Cultural Resources				DI	DI				PA	Yes
Archaeological sites				DI	DI				PA	Yes

Notes/Legends:
Geographic Extent - Project Area (PA), Local Area (LA), Regional Area (RA)
Temporal / Impact Duration - Negligible (N), Temporary (T), Short-term (S), Long-term or permanent (P)
Impact Type – Negligible (NI), Direct Impact (DI), Indirect Impact (II)

The focus of the Cumulative Impact Assessment is long-term or permanent adverse cumulative effects. Construction of Eastern Dedicated Freight Corridor will have cumulative Impacts on land and property due to necessity for temporary and permanent land take that will be required for the Implementation of the project.

Cumulative socio-economic impacts are mainly associated with further loss of agricultural land and need for resettlement in most of the habitations lying along the project corridor. Project will require approx. 4926.60 Ha land in APL-1, APL-2 and APL-3. More than 85% lands belong to agriculture and own by private owners.

Total numbers of 42356 families are affected in different part of the project. Majority of them belong to small or marginal farmer's category. Approx. 2011 private properties and 210 community properties were affected by the project corridor. A part from land acquisitions a huge numbers of structures also affected in all the habitations along the corridor. At many built-up locations land width has been reduced from 17 to 18 meters which has resulted in reducing impact on residential as well as commercial structures.

The local and regional economy will benefit due to the direct economic activity generated by the projects and also the secondary/induced economic activity. The benefits could be seen additionally by entrepreneurial investments, supporting businesses and realization of opportunities and services linked with both kinds of transportation, and also from the subsequent government taxes generated by all direct and induced economic expenditure. The improved transport infrastructure and better accessibility is likely to increase land values within the vicinity of the transport infrastructure as a result of post construction opportunities. An impact on regional land uses and changed agricultural production could be expected. On the basis of above analysis it can be said that there is cumulative impacts of project on economy, locally, regionally and nationally. The significance of the cumulative impact on economy therefore is considered to be of a very large beneficial nature.

Increasing of employment can be expected during construction phases. However cumulative impacts will occur during operational/functional phases. Beside direct workforce required for maintenance and operation of railway and motorway many possibilities for indirect employment opportunities are expected to arise like motels near motorway, shops, restaurants along the motorway and railway. Across all the three sub-regions, more than 50% of the total population lies in the working age group. However, less than 35% of the population is actually gainfully employed. Reasons behind low workforce participation can be attributed to lack of employment opportunities which is a derivative of the nature of labour demand. But the potentially most significant impact on employment it is expected from development of the economy. The significance of the cumulative impact on employment is considered to be of a very large beneficial nature.

Project activities at both of the stages will affect the health conditions in project as well as local areas. It may temporary, short term or long term affect in the area. But it was not studied in the SIA and RAPs, It needs further study.

The effects of project may be visible only in the long term. EDFC appear to have a strong symbolic meaning and denote state building as well as a sense of development and dynamism. Rather than becoming a driver of the economy, poverty and governance conditions restrict the possibilities for enhancing business by project construction. In weak states and recovering economies, more attention must be given to creating funds for sustainable income generating activities. Improvements in livelihood in terms of increased duration of employment and higher earnings for both male and female

The potential for additional direct impacts to cultural resources would be very limited. Indirect impacts during operations could consist of a permanent change in view shed to historic or traditional cultural properties near permanent ancillary facilities. Vibration may lead to damage of cultural assets. Only few structures e.g. "Budhiya Ka Tal" near Athamadpur, Agra were identified. It requires more study further.

VEC: Overall the identified VEC that would be cumulatively impacted would be:

1. Landownership

2. Cultural and Archaeological features

5 SUMMARY AND CONCLUSION

The cumulative impacts(construction and operations stage both) of the project and other reasonably foreseeable project are likely to be minimal to moderate on land, water, ecological, air and noise resources. The extent of impacts is likely to be confined to project area except in case of traffic shift conditions and foreseeable industrial and urban development areas.

Cumulatively with other infrastructure projects on the EDFC corridor, the project will improve accessibility and service provision in the region, resulting in a cumulative beneficial impact on transport and the socio-economic environment. Temporary construction impacts are not expected to result in any cumulative effects as the projects will be spread geographically and in time, thus not affecting the same receptors. However, the accumulation of low adverse impacts on the biodiversity in different locations in the region could significantly affect the regional biodiversity.

During the construction phase of the project, local residentswill be affected by a slight deterioration of air quality andan increase in noise levels. Cumulatively, this will not result in asignificant adverse impact on sensitive land-uses surroundingthe rail project.

The project crosses some streams and channels, which could impact onterrestrial flora and fauna and drainage pattern. Socioeconomically, maximum agricultural land affected by the project is in the project area. It's a permanent affect. It will affect the sustainability of the livelihood of the community. Residential & Commercial Properties are also affecting permanently. Economic activity of the project and local areas may affect badly. During both of the periods health of the community may impact due to different project activities. There is potential cumulative impact of these VECs in the project. Apart from this there is gap in the study of impact on Cultural/ Archaeological Properties and health status existing in the area. It has to be incorporated in a future comprehensive CIA study. Overall, Sustainable regional growth is seen to be positive for the community.**Mitigation:**

Possible management measures:

Best Industry practices and mitigation proposed under respective EIA reports will be implemented to minimise cumulative impacts as impacts are confined to project area primarily. Detailed mitigation measures will be evolved during comprehensive CIA.

The mitigation measures to mitigate the negative impacts due to the development ofproposed EDFC on various priority resources during various phases ofthe project are described hereunder:

1. **Landuse, Landscape**: Plantation programme will be carried out to improve the aesthetic look of theconstruction area.
2. **Soil Quality**: Suitable protection measures consisting of bio-engineering techniques such asplantation of grass and shrubs, may be provided to control erosion. Themeasures shall be applied along the slopes at high embankment where bridgeswill be constructed.Construction work may be avoided during rainy season to evade erosion andspreading of loose material. Top soil removed from agricultural land may be stored separately in enclosedareas with proper bund and utilized during plantation or refilling of excavated area
3. **Cultural**: Any Chance finding of archaeological importance shall be reported to ASI asAncient Monument and archaeological sites and remain (Amended & validation) acts,2010 and would be notified/surrendered to the Competent Authority Chunar regionshall be specifically taken care during excavation.
4. **Air Quality**: The dust generation due to pre-construction activities will be temporary in natureand localized and will be effectively countered by sprinkling of water.During construction locating Plant at a significant distance from nearest human settlement in thepredominant down wind direction should be made.Vehicles delivering fine materials

like soil and fine aggregates shall be coveredto reduce spills on existing roads.During operation - Plantation along the DFC is likely to improve the air quality of the area.

5. **Water Resources**: To mitigate contamination of water, oil interceptor will be provided at plant site and material trucks lay byes.Construction work close to the streams or water bodies will be avoided duringmonsoon.The discharge standards promulgated under the Environmental Protection Act,1986 will be strictly adhered to. All wastes arising from the project will bedisposed off in a manner that is acceptable to the State Pollution Control Board(SPCB).Construction labourers' camps will be located at least 1000m away fromthenearest habitation.
   Bridges & culverts are planned for crossing of alignment over rivers, water channels. Bridges are proposed for two perennial rivers Yamuna & Tonse. During Construction Phase, provision of temporary drainage arrangement due to construction activities mustbe made by contractor and suitable and strict clause must be incorporated ingeneral conditions of the contract document for its effective implementation.Silt fencing may be provided near water bodies.Proper drainage may be planned in the area to avoid water logging.
6. **Noise and Vibration:** Noise standards will be strictly enforced for all vehicles, plants, equipment, andconstruction machinery. All construction equipment used for an 8-hour shift willconform to a standard of less than 90dB(A). If required, high noise producinggenerators such as concrete mixers, generators, graders, etc. must be provided withnoise shields.Machinery and vehicles will be maintained regularly, with particular attention tosilencers and mufflers, to keep construction noise levels to minimum.Workers in the vicinity of high noise levels will be provided earplugs, helmets and willbe engaged in diversified activities to prevent prolonged exposure to noise levels ofmore than 90dB(A) per 8 hour shift.During construction vibratory compactors will be used sparingly within the urbanareas. Proposed tree and shrub plantations planned for avenue plantation especially closeto settlements, may form an effective sound buffer during the operation stage.People will be convinced / educated to prevent sensitive land uses from developingup adjacent to the project corridors.

7. Ecology:

Mitigation Measures for Flora – During construction phase, felling of trees must be undertaken only after obtaining clearance from the ForestDept.-forest areas, Railway Dept and local bodies outside forest area.Trees falling outside the RoW should not be felled.Compensation must be provided before initiating construction activity.Fruit bearing trees shall be compensated including 5 years fruit yield.Labor camps and office site shall be located outside and away from the forest area. During Post Construction Phase, no impact envisaged on flora during post construction phase however,development of green belt is suggested near stations and maintenance ofplantation may be undertaken by Railway Dept. The plantation carried alongalignment and as compensatory afforestation is likely to enhance the ecologicalcondition of the area.
Mitigation Measures for Fauna - Construction Phase, Crossing passages must be made for animal movement by provision of underpass followed with some plantation so that it resembles with the habitat.Water bodies may be developed inside forest areas, as the birds prefer waterbodies. Borrow areas can be also developed as ponds with grasses and shrubs plantedaround it.Silt fencing may be used near water bodies to avoid runoff into the water bodies.Construction activity may be avoided during night hours in forest area.Poaching must be strictly banned in the forest area. It may be ensured by thecontractor that no hunting or fishing is practiced at the site by any of the workerand that all site personnel are aware of the location, value and sensitivity of the wildlife resources.Awareness programme on Environment and Wildlife Conservation may be provided to the work force. Forest Act and Wildlife Act may be strictly adhered to.Post Construction Phase, Animal underpasses made for animals near forest area must be camouflaged tomatch the surrounding environment with plantation of shrubs and trees.Fencing may be provided along DFC in areas to avoid collision, wherever feasible.Landscaping Plan may be formulated for restoration, leveling and landscaping ofthe area once construction activities are over.

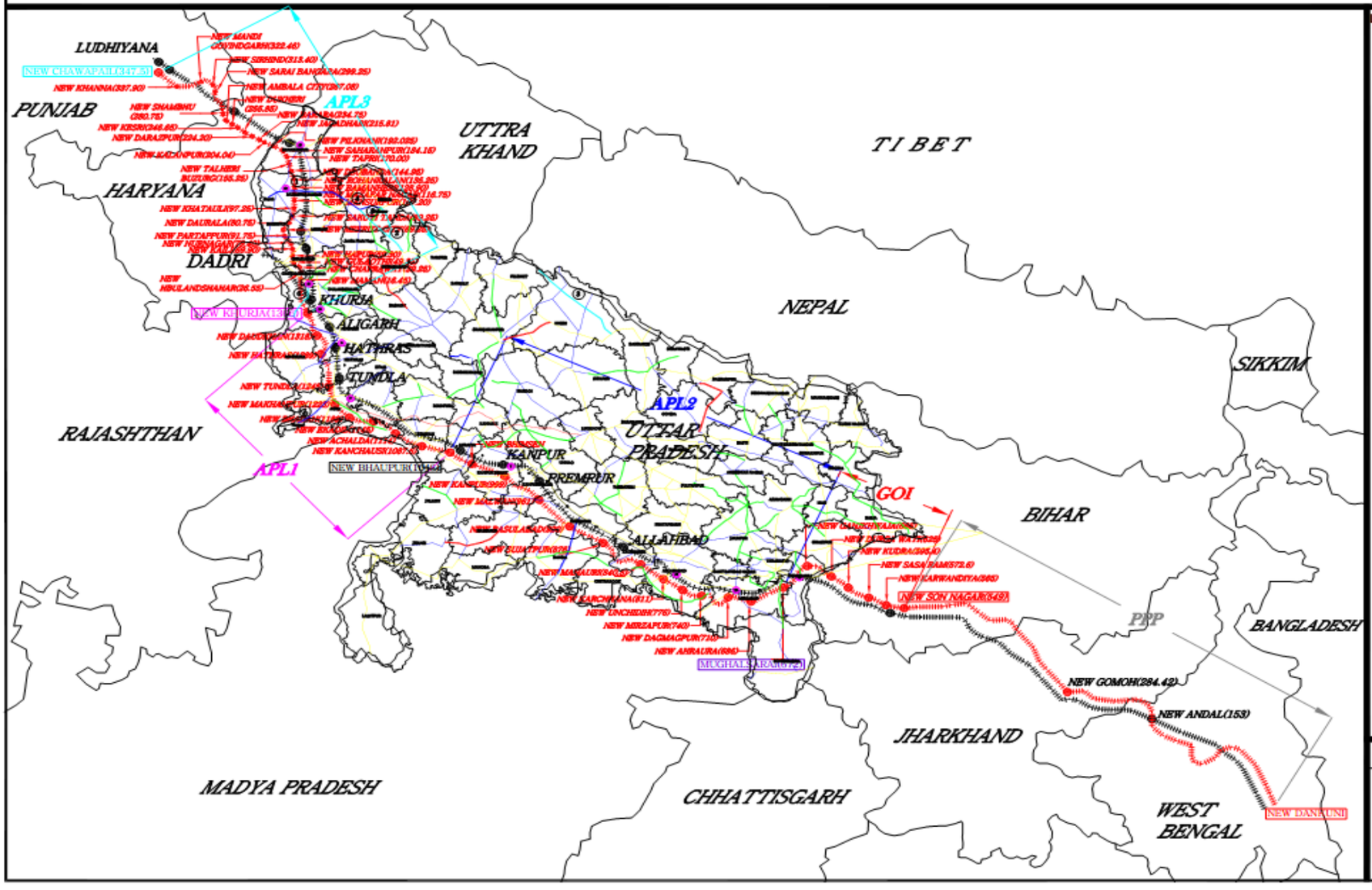
Annexure 1Summary of Documents Received from DFCCIL

S. No.	File Name	Contents	Pages
1	1-EDFC_ALIGN-1-jpg.jpg	Routes and Stations of Eastern Corridor	1
2	Annexures RAP of Khurja-Ludhiana.doc	CENSUS AND BASELINE SOCIO-ECONOMIC SURVEY FOR THE IDENTIFICATION OF PROJECT AFFECTED FAMILIES	49
3	APL-1 EIA Kaurara-Chamrola Vol-1 (Page 1-50).pdf	ENVIRONMENTAL ASSESSMENT (Final) of Kaurara – Chamrola section(Tundla detour of Bhaupur-Khurja section)	50
4	APL-1 EIA Kaurara-Chamrola Vol-2 (Page 51-150).pdf	ENVIRONMENTAL ASSESSMENT (Final) of Kaurara – Chamrola section(Tundla detour of Bhaupur-Khurja section)	100
5	APL-1 EIA Kaurara-Chamrola Vol-3 (Page 151-250).pdf	ENVIRONMENTAL ASSESSMENT (Final) of Kaurara – Chamrola section(Tundla detour of Bhaupur-Khurja section)	100
6	APL-1 EIA Kaurara-Chamrola Vol-4 (Page 251-301).pdf	ENVIRONMENTAL ASSESSMENT (Final) of Kaurara – Chamrola section(Tundla detour of Bhaupur-Khurja section)	51
7	APL-1 RAP Bhaupur-Khurja.pdf	FINAL RESETTLEMENT ACTION PLAN FOR BHAUPUR - KHURJA SECTION OF PROPOSED EASTERN DEDICATED FREIGHT CORRIDOR	122
8	APL-1 SIA-RAP Kaurara-Chamrola.pdf	FINAL RESETTLEMENT ACTION PLAN FOR KAURARA CHAMROLA SECTION (TUNDLA RE-ALIGNMENT)	77
9	APL-2 EIA Bhaupur-Mughalsarai Vol-1 (Page 1-100).pdf	ENVIRONMENTAL ASSESSMENT REPORT (FINAL) Bhaupur - Mughalsarai Section of EDFC	100
10	APL-2 EIA Bhaupur-Mughalsarai Vol-2 (Page 101-200).pdf	ENVIRONMENTAL ASSESSMENT REPORT (FINAL) Bhaupur - Mughalsarai Section of EDFC	100
11	APL-2 EIA Bhaupur-Mughalsarai Vol-3 (Page 201-265).pdf	ENVIRONMENTAL ASSESSMENT REPORT (FINAL) Bhaupur - Mughalsarai Section of EDFC	65
12	APL-2 SIA Mughalsarai-Bhaupur.pdf	RESETTLEMENT ACTION PLAN MUGHALSARAI – BHAUPUR SECTION	146
13	APL-3 EIA Khurja-Dadri Vol-1 (Page 1-100).pdf	ENVIRONMENTAL ASSESSMENT FOR Khurja – Dadari Section	100
14	APL-3 EIA Khurja-Dadri Vol-2 (Page 101-164).pdf	ENVIRONMENTAL ASSESSMENT FOR Khurja – Dadari Section	64
15	APL-3 EIA Pilkhani-Sahnewal Vol-1 (Page 1-150).pdf	DRAFT ENVIRONMENTAL ASSESSMENT FOR PILKHANI- SAHNEWAL SECTION	150
16	APL-3 EIA Pilkhani-Sahnewal Vol-2 (Page 151-246).pdf	DRAFT ENVIRONMENTAL ASSESSMENT FOR PILKHANI- SAHNEWAL SECTION	96
17	APL-3 SIA Khurja-Dadri.pdf	DRAFT RESETTLEMENT ACTION PLAN KHURJA - DADRI SECTION	116

S. No.	File Name	Contents	Pages
18	APL-3 SIA Philkani-Sahnewal.pdf	REVISED DRAFT RESETTLEMENT ACTION PLAN SANEHWAL PILKHANI SECTION	113
19	Bhaupur- Mughalsarai_SIA vol I Report May 12.zip	Social Impact Assessment of Mughalsarai – Bhaupur Section	11 files
20	Bhaupur-Khurja Vol-1 (Page 1-50).pdf	ENVIRONMENTAL ASSESSMENT (EA) AND ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR BHAUPUR – KHURJA SECTION	50
21	Bhaupur-Khurja Vol-2 (Page 51-100).pdf	ENVIRONMENTAL ASSESSMENT (EA) AND ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR BHAUPUR – KHURJA SECTION	50
22	Bhaupur-Khurja Vol-3 (Page 101-150).pdf	ENVIRONMENTAL ASSESSMENT (EA) AND ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR BHAUPUR – KHURJA SECTION	50
23	Bhaupur-Khurja Vol-4 (Page 151-200).pdf	ENVIRONMENTAL ASSESSMENT (EA) AND ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR BHAUPUR – KHURJA SECTION	50
24	Bhaupur-Khurja Vol-5 (Page 201-229).pdf	ENVIRONMENTAL ASSESSMENT (EA) AND ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR BHAUPUR – KHURJA SECTION	29
25	DFCC_Final_Business_Planver_xv_-_Updated_30th_Sept_2014.pdf	Business Plan for Dedicated Freight Corridor Corporation of India Ltd.	75
26	Draft Final Reports - Deloitte.zip	Preparation of a detailed regional economic analysis study of three sub-regional growth centres in Uttar Pradesh	5 files
27	Khurja - Ludhiana field data.xls	Khurja - Ludhiana field data	
28	SIA__Khurja_Dadri_.rar	DRAFT RESETTLEMENT ACTION PLAN DADRI – KHURJA SECTION	1+5 files

Annexure 2 Routes and Stations of Existing Rail Network and the proposed Eastern Dedicated Freight Corridor overlaid with the existing road Network

ROUTES AND STATIONS OF EASTERN CORRIDOR (EDFC)



Legend

- National Highways
- StateHighways
- Phase-II Priority Roads
  1. Shamli-Dhampur
  2. Agra-Tantpur
  3. Fatehpur-khatima
- NEW RAILWAY LINE
- EXISTING RAILWAY LINE
- Potential Phase-II Roads
  1. Panipat Khatima I-SH-12
  2. Moradabad Haridwar dehradun SH-49
  3. Pilibhit Puranpur Lakhimpur Balrampur SH-26
  4. Panipat Khatima II-SH-12
  5. Bijnor Chhajalat SH-76
  6. Hamidpur Kucheser SH-100
  7. Chandausi Dewai Agra SH-39
- Phase-1 Roads
- Industrial Cluser
- Agra Lucnow Exp.
- Remaining state highways (Excluding taken by other authorities)

DFC Stations
1. New Bhaupur
2. New Khanchausi
3. New Achalda
4. New Ekdil
5. New Badhan
6. New Makhanpur
7. New Tundla
8. New Hathras
9. New Daudkhan
10. New khurja
11. New Bhimsen
12. New Kanpur
13. New Malwan
14. New Rasulabad
15. New Sujatpur
16. New Munrui
17. Unchdih
18. Mirzapur
19. Dagmagpur
20. Ahraura Road
21. Dadri
22. New Saharanpur
23. New Muzzafarnagar
24. Chandauli
25. New Karchana

Station Name	Traffic in tones per day
1. New Bhaupur	10000
7. New Tundla	2500
9. New Daukhan	5000
10. New Krurja	2000
18. New Mirzapur	2500
21. Dadri	10000
22. New Saharanpur	5000
23. New Muzzafarnagar	5000
24. Chandauli	10000
25. New Karchna	2500